Electroencephalographic field influence on calcium momentum waves
Supplementary Material

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The first author, Lester Ingber <ingber@alumni.caltech.edu>, is responsible for the main text in http://dx.doi.org/10.1016/j.jtbi.2013.11.002 , the computer codes, and graphs of EEG data and CMI data. The last part of this file contains all these graphs (60 pages), with the A-model and no-A-model graphs side by side.

The other authors, Marco Pappalepore <marco.pappalepore@gmail.com> and Ronald R. Stesiak <rrstesiak@hotmail.com>, are responsible for the following supplementary analysis (231 pages).

Graphical Results

The graphical analysis has been challenging; due to the fact different presentations of the same data reveal different findings. Therefore, the data have been organized into three major groupings of graphical results; involving study from the individual case, then at the channel level with each specific grouping of cases averaged; separating the analysis into two: a comparison of the paradigms to each other, then a comparison of the no-**A** vs. **A** signals together per each paradigm separately. Finally, three dimensional plots displaying the aggregation of data for the groups and scenarios studied are analyzed.

The criteria in determining positive or good impacts of the **A** model are generally assumed to be increased separation of signals, improved synchrony, calming of signal without over-flattening, amplifying signal without introducing noise, positive changes in signal morphology; as roughly compared to the EEG plots, and improved signal-to-noise ratio (which has additional benefit of often removing transients).

Appendix A contains data at the individual subject level, with all six channels studied at once; and is precisely the same format used in the original studies (Ingber, 1997, 1998); which will yield direct comparisons. This further provides an opportunity to notice any general trends or relationships across all channels simultaneously at the individual subject level.

Appendix B approaches the study at the paradigm level; used to success and accepted in previous studies (Begleiter et al, 1995, 1997). Specifically, the channels have been split into separate analysis and averaged appropriately according to each sub-group. The plots are arranged by each category: EEG, CMI no-**A** Model, and CMI **A** Model; as well as Train and Test. Further, they are divided by the two groups; alcoholic and control. Just the {m|n} paradigms were chosen as it was determined displaying all paradigms {1|m|n} made it more difficult to discern patterns. Nevertheless, for completeness, all three paradigms have been plotted in exactly the same fashion in Appendix C.

Appendix D is again analyzing at the channel level; however it is comparing the effects of the **A** model vs. the no-**A** model directly in each plot. These are arranged by each paradigm {1|m|n}, and split into alcoholic and control, and Train and Test. EEG data is not included as the **A** model only applies to the CMI.

Appendices E and F contain detailed summaries of analysis in spreadsheet format that were used as an intermediate step in analyzing the plots contained within Appendices B and D.

Appendix G contains all of the three dimensional plots analyzed in the final section.

1 Individual Case Level

Starting at the individual case level as in the previous papers, it is apparent the **A** model provides further signal to noise ratio, separation of signals, improvements in synchrony, and a reduction in frequency as compared to the no-**A** model across all paradigms and both groups; and in fact in the majority of cases. Further, though the CMI are different representations of the data than the EEG, it may be readily observed utilizing the same criteria; but in a slightly more objective sense, the **A** model also improves upon the overall clarity and insight into the underlying data in comparison to the EEG plots. This overall improvement is most apparent when viewing the following figures; broken down by group and paradigm. The figures are grouped into sets of two; with the first one representing the no-**A** plot, and the second the **A** plot for each case, and are all contained in Appendix A:

a_1: Figs. 17 and 18, Figs. 19 and 20 (pp. 25-29)
a_m: Figs. 27 and 28, Figs. 29 and 30 (pp. 40-44), Figs. 39 and 40 (pp. 58,59)

a_n: Figs. 55 and 56, Figs. 57 and 58 (pp. 82-86)

c_1: Figs. 65 and 66, Figs. 67 and 68, Figs. 69 and 70, (pp. 97-104), Figs. 79 and 80 (pp. 118,119)
c_m: Figs. 91 and 92 (pp. 136,137)
c_n: Figs. 109 and 110, Figs. 111 and 112 (pp. 163-167)

While the **A** model seems to improve upon the no-**A** model, sometimes noisy signals are introduced. Their amplitude is so strong they consistently exceed the upper and lower bounds of the plot area, and are generally more tightly compacted and sinusoidal. It is unknown whether this is a positive or negative attribute; however, it is pronounced in the following cases:

a_1: Figs. 3 and 4 (pp. 4,5), Figs. 7 and 8 (pp. 10,11)
a_m: Figs. 25 and 26 (pp. 37,38), Figs. 35 and 36 (pp. 52,53)
a_n: Figs. 51 and 52, Figs. 53 and 54 (pp. 76-80)

c_1: Figs. 67 and 68 (pp. 100,101)
c_m: Figs. 85 and 86, (pp. 127,128) Figs. 95 and 96, Figs. 97 and 98 (pp. 142-146)

The attribute seems fairly group and paradigm agnostic; however, no examples were noted in the c_n group.

Perhaps an anomaly; present in only a few cases, a characteristic sometimes appears as a shift in the opposite direction or domain of the **A** signals from the mass of signals of their no-**A** counterparts. This is more easily understood when observed from the only known plots this occurs:

case a_1_371; Figs. 11 and 12 (pp. 16,17)
case a_m_375; Figs. 35 and 36 (pp. 52,53; in the Train plots)
case a_m_369; Figs. 27 and 28 (pp. 40,41)
case a_n_372; Figs. 53 and 54 (pp. 79,80; in the Train plots).

A final observation to point out is the **A** model produces visibly flat to nearly flat waves; almost always about the origin across the entire epoch, in over half of the cases. This behavior may be a result of the **A** model over compensating; or flattening, particular signals. This action also appears group and paradigm agnostic, and may be easily observed in the following subset of figures for reference. Note in this case, the figures listed are only the **A** model plots; as the behavior is absent in the no-**A** plots:

a_1: Figs. 8 (p. 11) and 16 (p. 23)
a_m: Figs. 24 (p. 35) and 32 (p. 47)
a_n: Figs. 48 (p. 71) and 50 (p. 74)

c_1: Figs. 72 (p. 107) and 74 (p. 110)
c_m: Figs. 82 (p. 122) and 92 (p. 137)
c_n: Figs. 102 (p. 152) and 112 (p. 167)

There are no observations to report regarding the Train vs. Test scenarios for any case.

In concluding this first analysis, the **A** model appears to outperform the EEG representation in 31 cases (Appendix A, pp. 5,8,11,17,23,26,37,56,59,62,68,71,77,83,86,89,92,98,119,125,128,131, 134,137,146,149,161,164,167,176,179); falls short in 17 cases (pp.

2,20,35,41,44,50,53,65,74,80,95,107,110,116,140,143,170); and any benefit is indeterminate in 12 cases (pp. 14,29,32,47,101,104,113,122,152,155,158,173); yielding the total of 60 comparisons in the study. Of note, in 2 particular cases where the **A** model fell short of the EEG plots, its no-**A** counterpart performed better (pp. 52 vs 53, and 64 vs 65).

2 Paradigm Level

All of the plots examined in this section may be found in Appendix B; as described in the introduction. This analysis will determine if there are any improvements or deficiencies with the **A** model when directly comparing two paradigms at the individual channel level; as is often done in research and clinical practice for EEG signals (Begleiter et al, 1995, 1997). Upon initial inspection, including all three paradigms blurred the analysis, so the 1 paradigm was dropped to improve readability. However, it is analyzed in the next section; and the plots including all three paradigms have been retained for review in Appendix C. For this section, referring back to Appendix B, the m and n paradigms have been plotted together; for each channel; organized into three main groups: raw EEG, CMI no-**A**, and CMI **A**. Each of these groups are further broken down into alcoholic and control, and still retain the separate Train and Test plots for each group; comparing Train and Test directly side by side in each figure. The EEG plots are represented in Figs. 1 (alcoholic group) and 2 (control), CMI no-**A** for the alcoholic group in Fig. 3, CMI **A** for alcoholic group in Fig. 4, CMI no-**A** for control in Fig. 5, and CMI **A** for control in Fig. 6.

2.1 EEG: Paradigms m vs. n

In examining the EEG plots; in Appendix B, Figs. 1 and 2, there is evident separation of signals between the m and n paradigms across both the alcoholic and control groups. In every sub-plot, the n paradigm is almost always greater in mV across entire epoch. Very similar behavior of the signals is evident in all of the plots; the signals are tight together in the beginning of the epoch; then spread further apart as time progresses. One noticeable difference is they exhibit synchronous behavior for the P7,P8 and T7,T8 channels across all plots; but this quality is reduced for the F3,F4 channels. When comparing the alcoholic to the control groups, there are a few distinguishing features. For the P7,P8 channels, the control group shows greater separation of signals; with consistently increased amplitude in the n paradigm. A more subtle quality reveals itself as a slightly noisier; or more oscillatory behavior; evident in the alcoholic group in the T7 and T8 signals; in both Train and Test.

Finally, most present in the control group, the signal is amplified and further separated in the Test plots for P7,P8 channels and less so in the T7,T8 channels.

2.2 CMI: Paradigms m vs. n

In comparing the CMI indicators, as organized in Appendix B, and as mentioned previously, this particular study examines how the no-**A** and **A** models display the relationship between the m and n paradigms at the channel level; mirroring the EEG analysis.

The study begins with the alcoholic group, attempting to describe any effects on the no-**A** vs **A** models, beginning with the Train data (Appendix B, Figs. 3 and 4 respectively), and organized as mentioned by channel. If not explicitly specified, any change reported are in reference to the **A** model.

Some plots reveal as too ambiguous to risk remark. The study then progresses through each scenario until reaching conclusions.

Criteria in determining what is a positive effect of either model are *generally* as follows and repeated here: increased separation of signals, improved synchrony, calming of signal without over-flattening, amplifying signal without introducing noise, positive changes in signal morphology; as roughly compared to the EEG plots (often revealing themselves as a negative offset of the m paradigm to the n paradigm), and improved signal-to-noise ratio (which has additional benefit of often removing transients). The levels of observation are detailed; and so they have been placed into Appendix E for individual review in spreadsheet format; producing Fig. 1, with the detailed descriptions removed for readability. This presentation of the data imparts again a much easier to read graphical format demonstrating the effect of the no-**A** and **A** models under all scenarios in this same Fig. 1; which of course may be cross-referenced to the plots in Appendix B as well as the analysis in Appendix E.

In examining Fig. 1, It has been divided into three main subsections; all of which are evaluating the effects of the **A** and no-**A** models when comparing the m and n paradigms together.

The first group are the results from just the alcoholics group; divided into Train and Test. Overall, the effect of the **A** model does seem to have a positive effect on clarifying or improving the data according to the aforementioned criteria; with strongest improvements noticed in channel F3 in the alcoholics, Train group, and F3 again and T7 in the Test sub-group. Slight to moderate changes are observed in most remaining data. Channel T8; however, showed degradation of the **A** model in both Train and Test. These data are specifically displayed in Appendix B, Figs. 3 and 4. Channels P7 and P8, in examining the plots in Appendix B, where too ambiguous to render a definitive opinion and accordingly observed in Fig. 1. It should be noted overall applying the **A** model on Test data results in a further disparity of signals between m and n; with greater amplification in all cases except T8.

The second group are the results from the control subjects. It is clear the **A** model shows similar level of improvements as observed in the alcoholics groups. It may be observed; however, the no-**A** model outperforming **A** in channels T7 and T8 in the Train data. It can be observed from the plots in Appendix B; Figs. 5 and 6, the signals seem to be over-flattened for channels T7 and T8 in the control, Train group with the **A** model. However, the **A** model seems to be able to address the noisier Test data with even greater separation of signals.

Moving to the third group, this is comparing the ability of the **A** model to more readily discern or magnify differences between the alcoholic and control groups overall. For sensors F3, F4, P7, and P8, the **A** model does in fact magnify differences between the groups. However, for the remaining sensors, the model either had worse effect or inconclusive for the T7 and T8 channels; actually making it more difficult to discern between the two groups. An over-flattening effect in the Train data can again be seen in channels T7 and T8 across both alcoholics and control groups. All of these effects may be studied in detail in Appendix B; Figs. 3, 4, 5 and 6.

In conclusion of the comparison between the CMI models, overall the **A** model improves the distinction between the m and n paradigms in both alcoholic and control groups. For channels F3,F4,P7 and P8, the **A** model does well magnifying or clarifying differences between the alcoholic and control groups; yet falls short on the T7 and T8 channels. This subset of plots revealed the majority portion of successful cases translates to an overall superior rating of the **A** model.

In contrast to the first section (comparing the CMI vs EEG at the individual case level with all signals present on each sub-plot), it is more difficult to compare the CMI vs EEG data when plotted in this format; especially when examining the majority of the CMI Test plots which in most cases produce amplification of signals. As mentioned earlier, the **A** model is an improvement over the no-**A** model; and this can be most evident when comparing the Train data of the alcoholic group, in Figs. 3 and 4, left plots; Appendix B. Specifically, tying this observation to the EEG data, the **A** model reintroduces the separation of the m and n paradigms; with n exhibiting mostly greater values which may be successfully compared to the EEG data. It is noted the **A** model appears to perform worse than its no-**A** counterpart in this subset of data observed in the plot of channel T8; however.

Again, when moving the analysis to the Test data, further disparity is observed between the EEG and CMI data. However, when examining the CMI models together, as mentioned earlier, the **A** model appears to improve separation of signals; mostly in the form of disparate amplitudes. Additionally, the **A** model in Test data across both groups also shows the overall positive shift of the n paradigm above the m paradigm as with the Train cases; with exceptions noted in channels T7 and T8 within the alcoholic Test data in Fig. 4, right plot; Appendix B. This supports the previous conclusions the **A** model is an improvement over the no-**A** model for the CMI.

In conclusion with respect to the EEG data, it is observed the morphologies of the CMI Test data are too different to render a definitive answer; however, again the **A** model seems to be an improvement to the no-**A** model when attempting to compare to the EEG plots. However, the CMI do reveal a greater ability to distinguish between alcoholic and control groups vs the EEG plots when examining channels F4, P7 and P8 between the three representations of data in Figs. 2,4 and 6, right side plots (Appendix B). This is evident by the **A** model showing a reduction in amplitude of the n signal in the control group the EEG data does not reveal as significantly within these channels. A hint may be perhaps the CMI could be used in conjunction with the EEG data to offer a different perspective to the data; as the CMI do separate the signals in most cases and show greater sensitivity to the underlying data than the EEG; which may be useful if further future analysis is performed to validate this theory.

2.3 CMI no-**A** vs **A** per Individual Paradigm

This particular study separates the paradigms individually; but comparing the effects of the no-**A** vs. the **A** models directly; as well as attempting to further compare any improvements on the discernment of the signals as well as alcoholic vs. control and train vs. test. The study begins with the 1 paradigm, divided into alcoholics; Train and Test, then control, Train and Test, then alcoholics vs. control; Train and Test. The remaining {m|n} paradigms are organized exactly the same. All of the plots may be referenced in Appendix D.

Criteria in determining what is a positive effect of either model are the same as in the previous section. The levels of observation are again detailed; and so they have been placed into Appendix F for individual review. The observations have been organized into a much easier to read graphical format demonstrating the effect of the no-**A** and **A** models on each paradigm under all scenarios in Fig. 2 of this section; not to be confused with a figure in an Appendix.

For Paradigm 1, the **A** model struggled overall to yield any strong conclusions with one exception. In comparing the alcoholics vs. control, Test group, channels F4 & P7 increased the ability to discern differences between the two groups that were absent in the no-**A** model; supported in more detail in Appendix D, Figs. 1 and 4. The remaining data were balanced between moderate, unknown, and worse categories of improvement for this paradigm.

The m paradigm showed the most improvement in the ability to distinguish the signals from each other with the **A** model in the control group; as well as the ability to discern alcoholic from control subjects overall. Of note, channel F3 in the alcoholics, Train group; channels F4 and P7 in the alcoholic, Test group, and the T8 channels in all three Test data comparisons were made worse by the **A** model; reference Appendix D, Figs. 2 and 5. However, the **A** model performed better overall at handling the perhaps less noisy control data; with greater improvements as identifiable in Fig. 2

(Appendix D).

The n paradigm showed weaker overall discernible improvements; though only two seemingly uncorrelated cases showed a disadvantage to the no-**A** model; visible in Fig. 2 at the end of this study. In 8 out of 24 overall comparisons involving the separate signals in the alcoholic and control; Train and Test groups, the **A** model showed moderate improvement with one strong improvement of these evident; with the remainders inconclusive. Of most note, this paradigm showed improvements in the ability to distinguish alcoholics from control subjects in the Test data; as can be seen in Fig. 4 (main paper); as well as comparing the Test sub-groups in the detailed plots in Appendix D, Figs. 3 and 6.

In attempting to compare any improvement in the discernment between the three paradigms, most of the data were inconclusive; with with following exceptions. Most notably, in examining the Test, control data in Appendix D, Figs. 4,5 and 6, a difference in morphology is introduced between {1|m|n} within the F4, P7, and P8 channels. All three channels demonstrate the same behavior between the paradigms with only one exception, further strengthening the validity of this finding. Specifically, the 1 paradigm appears as near flat in all cases except channel F4; with the m paradigm appearing as amplified; though not to the point of noisiness, and the n paradigm shows moderate amplification sitting right between the 1 and m paradigms. Conversely, examining the P7 and P8 channels in the alcoholic Test group for the {m|n} paradigms (Figs. 2 and 3, Appendix D), there is an opposing effect from the same channels in control of greater amplification in the n paradigm compared to the m paradigm. It is concluded the **A** model performs best at distinguishing the three paradigms compared to the no-**A** and EEG plots; when examining the Test control group, channels F4, P7, and P8.

In conclusion, this was the most difficult analysis to perform; and the results are indeed overall mixed; with improvements in some areas; weak-to-moderate improvements in others, and unknown or worse in many cases. However, it can be discerned again from Fig. 2 in this study the **A** model shows the most improvement in Paradigm m; with an ability to discern alcoholic from control subjects in the Test data in Paradigm n. Of further note, when discerning between the three paradigms, for the specific subset previously mentioned, the **A** model performs best over the no-**A** model and EEG plots at disseminating differences between the three paradigms.

2.4 Graphical Results: All Channels Combined

This final graphical sub-study concludes with plotting all of the channels in this analyis together; rendering a final, three dimensional view for the averages of each case ((a|c),{1|m|n}, and Train and Test) to reveal any benefits or deficits of the **A** model. EEG plots are also performed on this sub-set as a comparison. All of this data can be found in Appendix G. For this study, an overall view of the three dimensional morphology of the data will be the method used to analyze and draw conclusions. While more subjective, this study affords a different look into the overall analysis and strengthens it. The study will proceed as the previous ones; first examining EEG data, then the CMI no-A vs. A models; further divided into Train and Test, and the three paradigms {1|m|n}. This final study will further be divided into two sub-sections. The first will compare the ability of the CMI to improve the distinction between alcoholic and control data; with the second section analyzing any benefits observed from the CMI when comparing the paradigms to each other.

2.4.1 Alcoholic vs. Control

In comparing the EEG plots with all channels in the study plotted sequentially, some observable differences may be seen between alcoholic and control groups; as well as between the three paradigms {1|m|n}. In Fig. 1 of Appendix G, the EEG reveals a prominent ridge of positive voltage roughly along the middle channels of the control group in paradigm 1 that distinguishes it from the alcoholic group in the same paradigm. In Fig.2, now the ridge in the control group has become a valley of negative voltages; as expected with the m paradigm from the earlier studies, and this behavior is mostly mirrored in the alcoholic group with much less pronounced though visible differences between the two groups; most notably the alcoholic plot appears noisier. Moving to Fig. 3, examining paradigm n, the voltages are; as witnessed again in earlier studies, roughly in-between the two paradigms. Although here again, a very distinguishable ridge of positive voltages again appears in the control group; distinguishing it from the alcoholic group. In examining the remaining three EEG Figs. 4,5 and 6; these are all the Test data. There is actually little difference overall between Test vs. Train data. However, the peak of positive voltages seen in the Paradigm n, Train, control group in Fig. 3 becomes prominent in Fig. 6. Further, in the same figure, the alcoholic group exhibits an even lowered trough during the early part of the epoch, visible in the P7,P8 and T7 channels; amplifying the differences between alcoholic and control groups. It is clear Paradigm n exhibits the most positive change in ability to discern between alcoholics and control for the EEG study. For the remaining paradigms, a general slight amplification is observed when moving to the Test plots; though the differences between alcoholic and control are slightly diminished in contrast to the n paradigm; where again the differences were magnified.

Moving to the CMI plots, they have been organized with Train data being compared first for both groups and all paradigms; with the alcoholic group as the top sub-figure on each page, and the control group the bottom. Further, these plots are ordered by paradigm studied {1|m|n}, and each pair of figures at this level compares the effects of the no-**A** vs. the **A** model; with the no-**A** plots always numbered odd; and **A** even. As mentioned earlier in the paper, note the CMI data in general are not meant to be directly analogous to the EEG data; though rough comparisons may be observed. The main goal here is to discern whether the CMI data (further comparing no-**A** vs. **A** models) does a better job of displaying differences between the paradigms and groups.

In examining the Train data for paradigm 1 with the no-**A** model as shown in Fig. 7, the differences between the alcoholic and control groups are less distinguishable when compared to the EEG plots; though a slight positive overall amplification of signal again separates the control group from the alcoholic group. As opposed to the central ridge in the EEG, the positive signals appear more distributed about the channels. Moving to Fig. 8, which as described in the overall organization is the same data but with the **A** model applied, a distinction can be seen again; though with different overall morphology; with the differences between alcoholic and control somewhat magnified than with the no-**A** model. The **A** model appears to increase the separation of signals; calming most; amplifying others. This behavior though is somewhat under scrutiny as relayed in the earlier studies as sometimes perhaps over-flattening the signal, though here it seems to serve well. Perhaps a further positive difference of the **A** model is a re-introduction of a negative trough in the alcoholic group evident in the beginning of the epoch in channel P8; which resembles the EEG signals. A final slight improvement of the **A** model is a slightly greater separation of signal as the epoch progresses with the alcoholic group trending more positively when compared to the no-**A** model; again paralleling the EEG data. This behavior is specifically observed in the F3 channel as the epoch progresses. Put much more simply, the **A** model seems to improve the morphology of the alcoholic group over the no-**A** model if a loose comparison is made to the EEG data (Figs. 1,7 and 8). The control plot; however, seems over filtered with the **A** model; with the no-**A** plot revealing more information about the data. To summarize, though the **A** model improves upon the CMI representation with the alcoholic group, the EEG plots represent the paradigm and groups the best.

Moving along to Figs. 9 and 10, the m paradigm is now under study; again for the Train data. The no-**A** model in general displays poorer ability to discern between the two groups (alcoholic and control); though a positive ridge appears in the alcoholic group across the epoch about the T7 channel; absent in the control group as seen in Fig. 9. Somewhat detrimentally, tight sinusoidal oscillations are introduced and witnessed along the epoch in the T8 channel in the control group in the same figure; leading to a blurring of trend. Moving to the **A** model represented in Fig. 10, this sinusoidal trend appears reduced in the control group, and introduced in the alcoholic group; which is perceived as positive behavior. Further, the **A** model appears to amplify the differences between the groups; most notably in the form of the negative troughs introduced in the control group roughly about the middle of the plot; as well as again the negative trough introduced at the beginning of the epoch looking across the channels in the alcoholic group. The results are mixed if observing noisy behavior, with the expected reduction most noticed in channel T8 in control; yet with an increase in noise in channel F3 (Fig. 10, lower plot). However, all of these qualities do combine to improve the ability to discern differences between alcoholic and control groups in Train data for paradigm m favoring the **A** model over the no-**A** model. It is determined the **A** model performs best in this case overall compared to the no-**A** model and EEG plots.

Observing the Train plots for paradigm n in Figs. 11 and 12, it is evident the **A** model flattens the signals; removing features and thereby greatly diminishing the ability to differentiate the two groups. A redeeming quality of the no-**A** model does amplify the relative noisiness of the alcoholic data along the epoch in the F3 channel; though the distinguishing peak evident in the EEG control data seems to be clipped or over-filtered by the CMI in general. Therefore, the EEG plots demonstrate the best performance here.

Moving back to the 1 paradigm, but now examining the CMI Test data (Figs. 13 and 14), it is apparent both amplification and separation have been introduced; along with noise in all plots when compared to the Train data. In this case, the no-**A** model does a better job at discerning between the alcoholic and control groups than the EEG plots. The control group appears to be well modeled; illustrating and improving the distinction of the positive peak roughly in the middle of the channels; with the trough perhaps increased in magnitude in the early part of the epoch. Of seemingly counter to expectation, the **A** model introduces stronger oscillations in the F3 channel of the control group, and appears to filter out the trough from the EEG data. It is unknown whether the intermittent peaks scattered throughout the no-**A**, alcoholic plot are positive or negative attributes; it is believed they are perhaps increased sensitivity to the changes in signal; which is positive behavior; though when represented in this fashion, they seem to negatively affect the plot. Moving to the **A** plots, Fig. 14, the signals almost appear to be transposed from their no-**A** counterparts. From purely this representation of the data at least, it seems the **A** model performs very poorly against the no-**A** model; though it can be stated this is where the most difference between the alcoholic and control groups may be noted. It is these disparities which render this particular analysis inconclusive.

With the m paradigm, Figs. 15 and 16, the no-**A** model appears to introduce too much volatility in the form of many very tight, rapid and severe oscillations in the alcoholic data; which appear to be correctly filtered with the **A** model. For this reason alone, the **A** model performs better. Utilizing the **A** model, differences between the two groups may be discerned, though perhaps the algorithm negatively effects the T8 channel in the control group. If the T8 channel is discarded, the control plot is noticeably less noisy though at similar amplitude overall in 3D morphology; rendering a greater distinction between the alcoholic and control groups with the **A** model than the EEG data.

Examining the n paradigm, Figs. 17 and 18, overall the **A** model introduces what appears to be a positive form of filtering the data, which is most noticeable in the beginning of the epoch across all signals comparing the control data. In addition, a greater amplification of certain signals appears in the alcoholic plot with the **A** model. Finally, an increased separation of signals is most evident in examining the alcoholic plot along the F3 channel vs. the no-**A** model. Put in a different way; the F3 channel is reduced in noise without over-flattening, and the remaining signals are amplified. In conclusion, when comparing the two CMI models, the **A** model appears better; though the EEG data present the most intuitive and clear differences between the alcoholic and control groups.

2.4.2 Paradigms {1|m|n}

In examining the Train data for the three paradigms, the most apparent example is had with the **A** model performing best at distinguishing the m paradigm from the n paradigm within the alcoholic group comparing Figs. 2,3,9-12, Appendix G. This conclusion is reached as the **A** model describes the alcoholic data in paradigm m with a slight ridge across channels P7,P8 and T7 (Fig. 10, upper plot). This ridge is replaced by a valley in the n paradigm (Fig. 12, upper plot). Further, within these same plots, the alcoholic data in paradigm m is noticeably noisier than in paradigm n.

Though an improvement is noticed with the **A** model over the no-**A** model in the majority of cases comparing the two models, the no-**A** model appears superior in two cases; the control plots in Figs. 7 and 11. The EEG plots seem to perform the best with the remaining cases and still therefore overall in this sub-study; though the improvements of the **A** model are significant.

Test data present the most difficult analysis; as the CMI model seems to amplify the signals in general vs. the Train data; as well as introducing some transients and noise. As mentioned earlier; however, the CMI are inherently different representations of the data and this behavior is expected to a degree; rendering definitive conclusions more difficult.

In examining the efficacy of discerning the paradigms within the Test data, The **A** model shows the most discerning differences between alcoholic and control data within paradigm m (Figs. 5, 15 and 16). Clouding this positive result; however, is the presence of introduced noise in channel T8 as seen in Fig. 16, bottom plot. However, the **A** model shows an improvement in positively filtering the signals when comparing it to the no-**A** plots; yet retaining visible signal information and trends. Further, the control data appear as less noisy; though with greater amplitude than the alcoholic plot (Fig. 16). These traits combine to increase the discernment between the alcoholic and control groups when compared to the EEG plots (Fig. 5).

In comparing the ability of discerning the remaining paradigms in the Test group, the EEG plots demonstrated the most intuitive and clear differences. The differences between the no-**A** and **A** plots have already been recorded in the previous section; however, it may be summarized the CMI results comparing the two models are mixed; though with that, it is important to note improvements in cases are evident with the **A** model; and it even surpassed the EEG plots in this sub-study with the m paradigm.

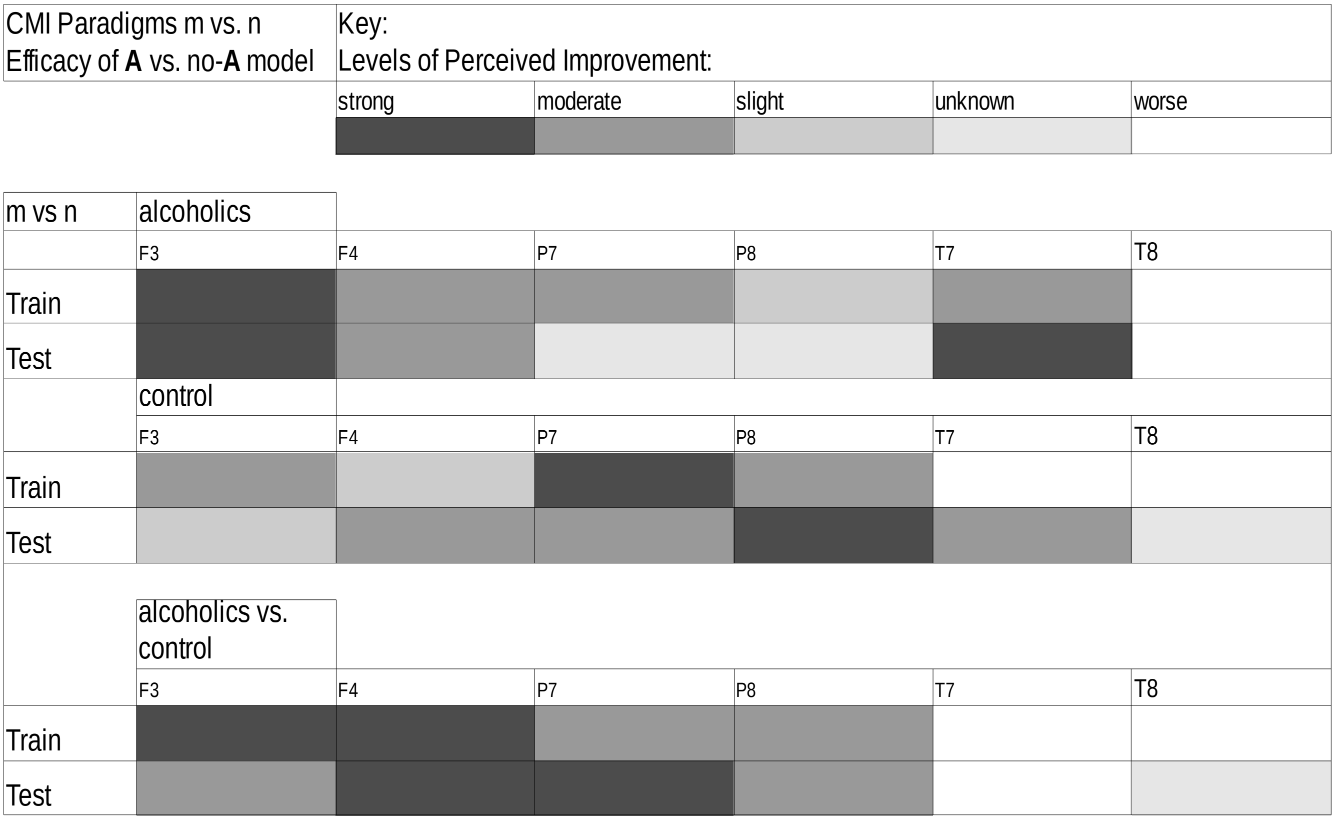

CMI Paradigms m vs. n
Efficacy of **A** vs. no-**A** model
Key:
Levels of Perceived Improvement:
strong
moderate
slight
unknown
worse
m vs n
alcoholics
F3
F4
P7
P8
T7
T8
Train
Test
control
F3
F4
P7
P8
T7
T8
Train
Test
alcoholics vs. control
F3
F4
P7
P8
T7
T8
Train
Test

FIG. 1.

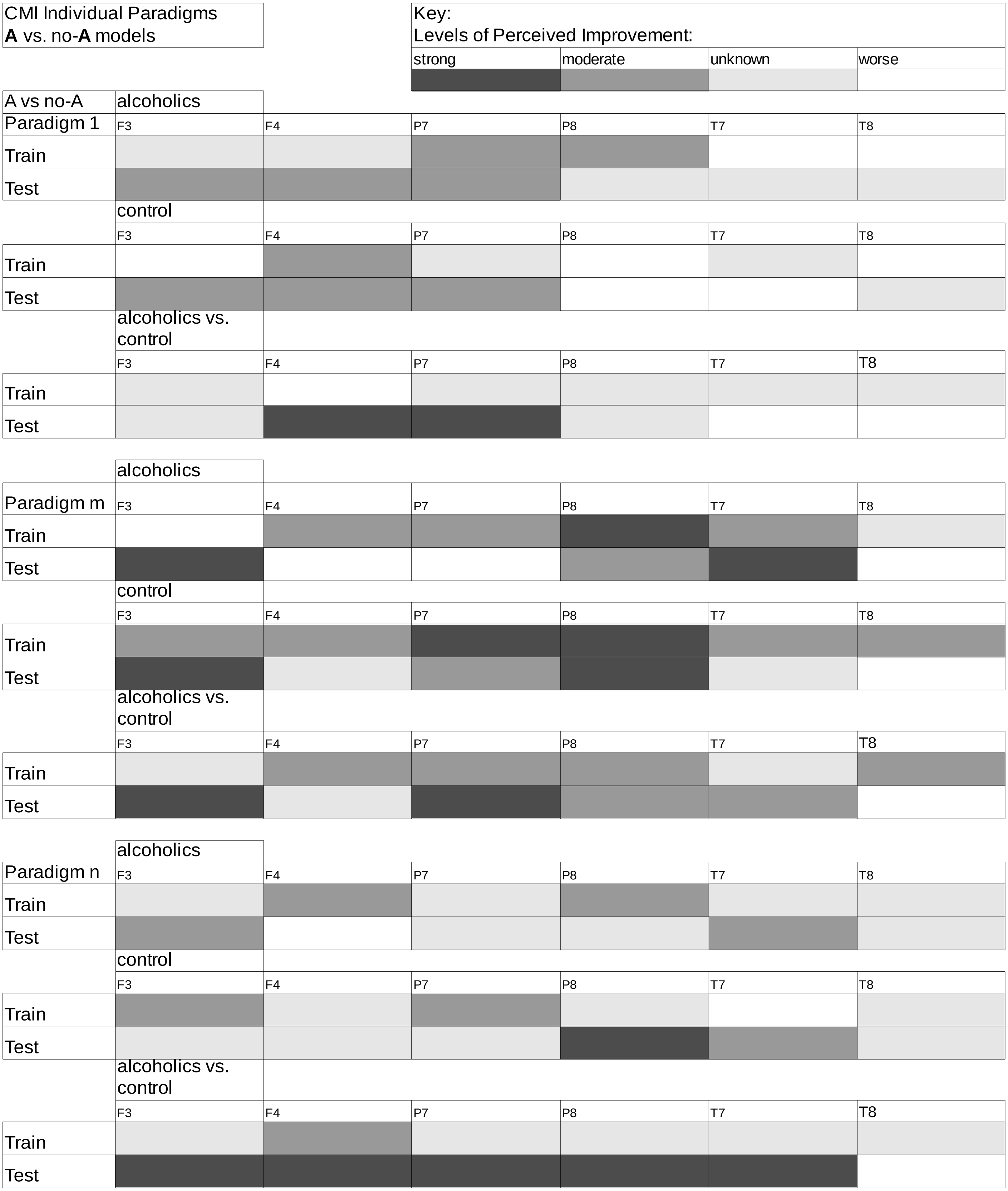

CMI Individual Paradigms
A vs. no-A models
Key:
Levels of Perceived Improvement:
strong
moderate
unknown
worse
A vs no-A
Paradigm 1
alcoholics
F3
F4
P7
P8
T7
T8
Train
Test
control
alcoholics vs. control
Paradigm m
Paradigm n

FIG. 2.

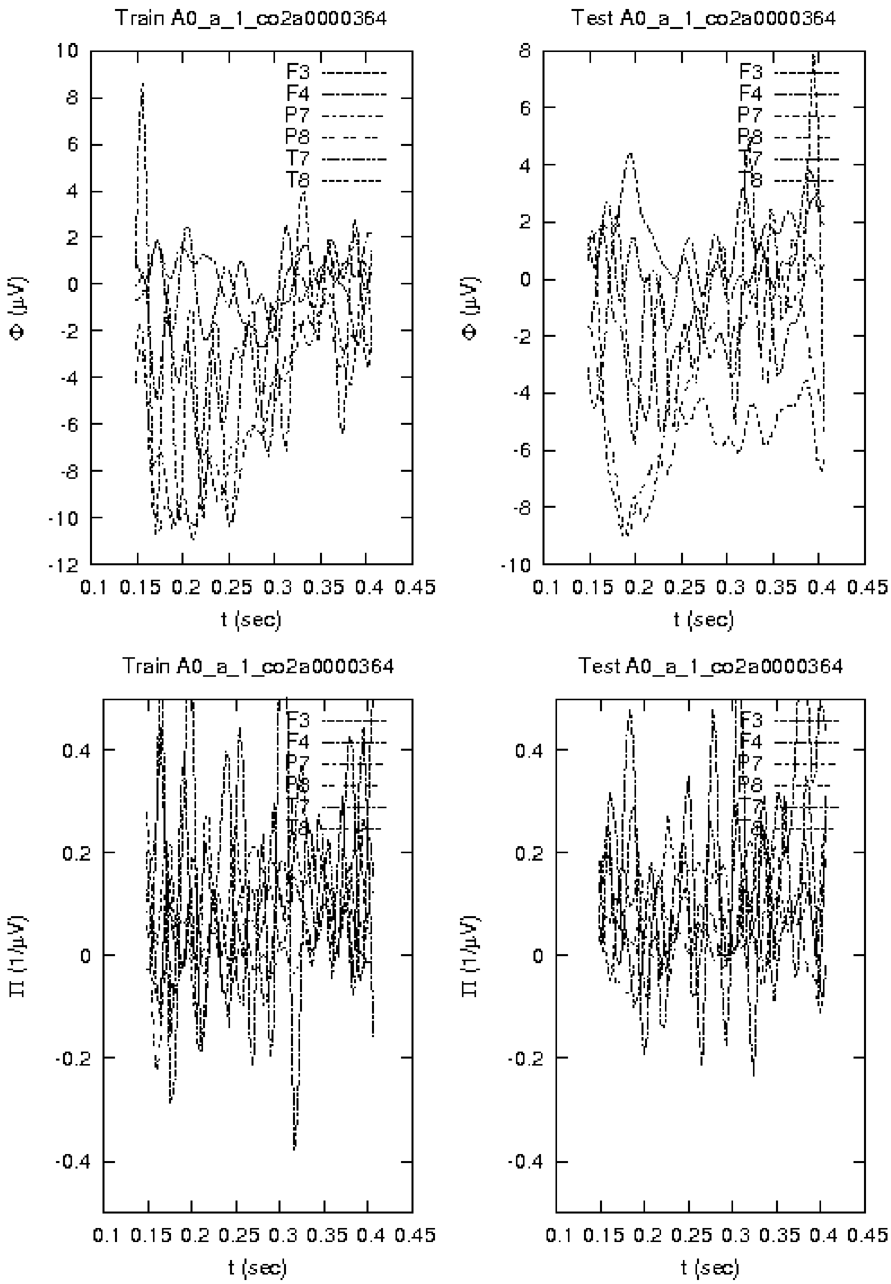


FIG. 1.

EEG

There is a transient wave in the Train graph at about t=0.16 sec. Further, the amplitude is roughly 2 μvolts greater in Train at approximately t=.16 sec. There is a transient wave in the Test graph of approx. +8 μvolts, around t=0.38; there is a smaller transient wave of about +4.1 μvolts at about t=0.18. The right graph appears to have more synchrony and complex waveforms. The left graph appears to converge more at t>0.3 to the end of the sample.

CMI

Only noticeable difference is slightly greater amplitude of entire signal in Train graph. Signals fairly resemble each other and seem noisy; but a pattern can be witnessed of repeating peaks; especially evident are the negative peaks at roughly t=.16, .21, .25, .29, and .33 present in both plots.

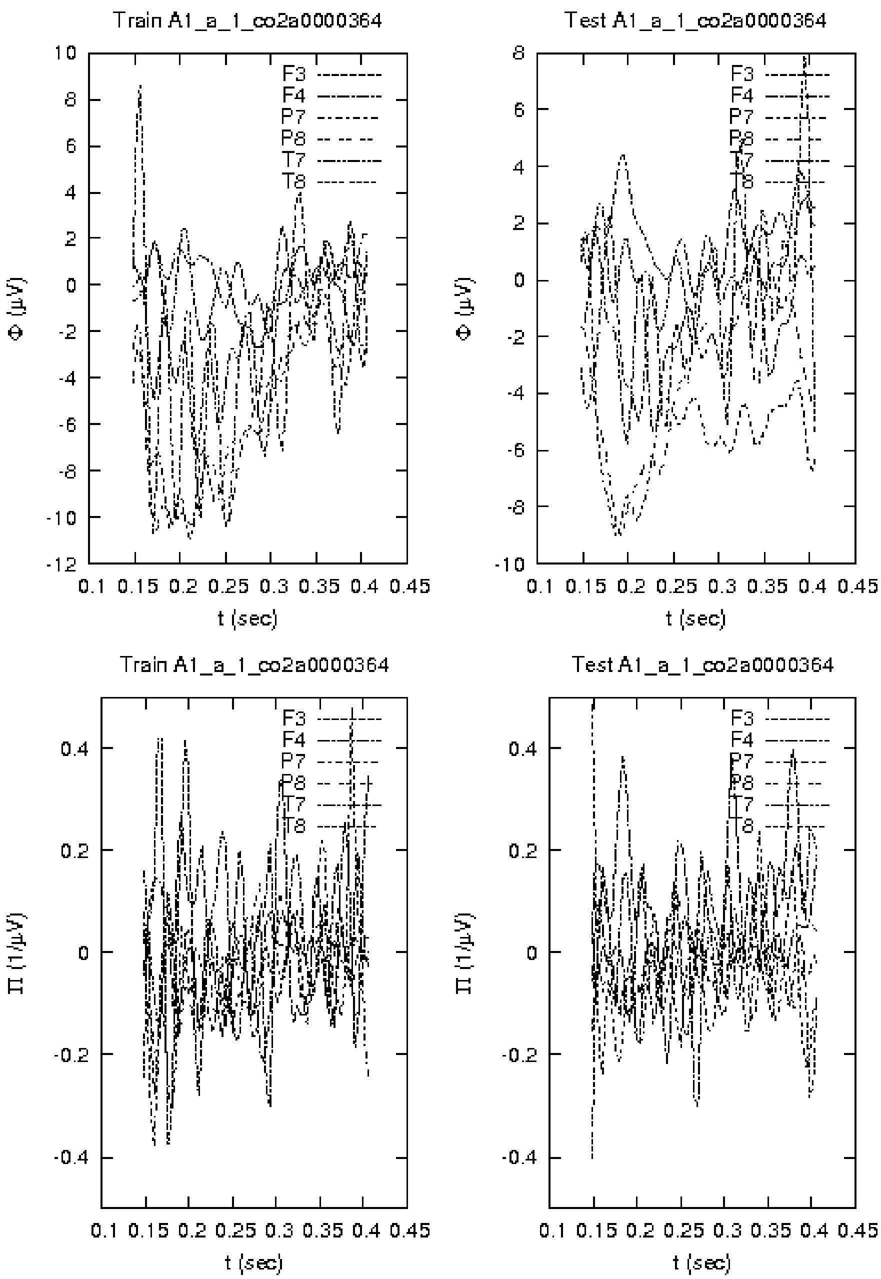


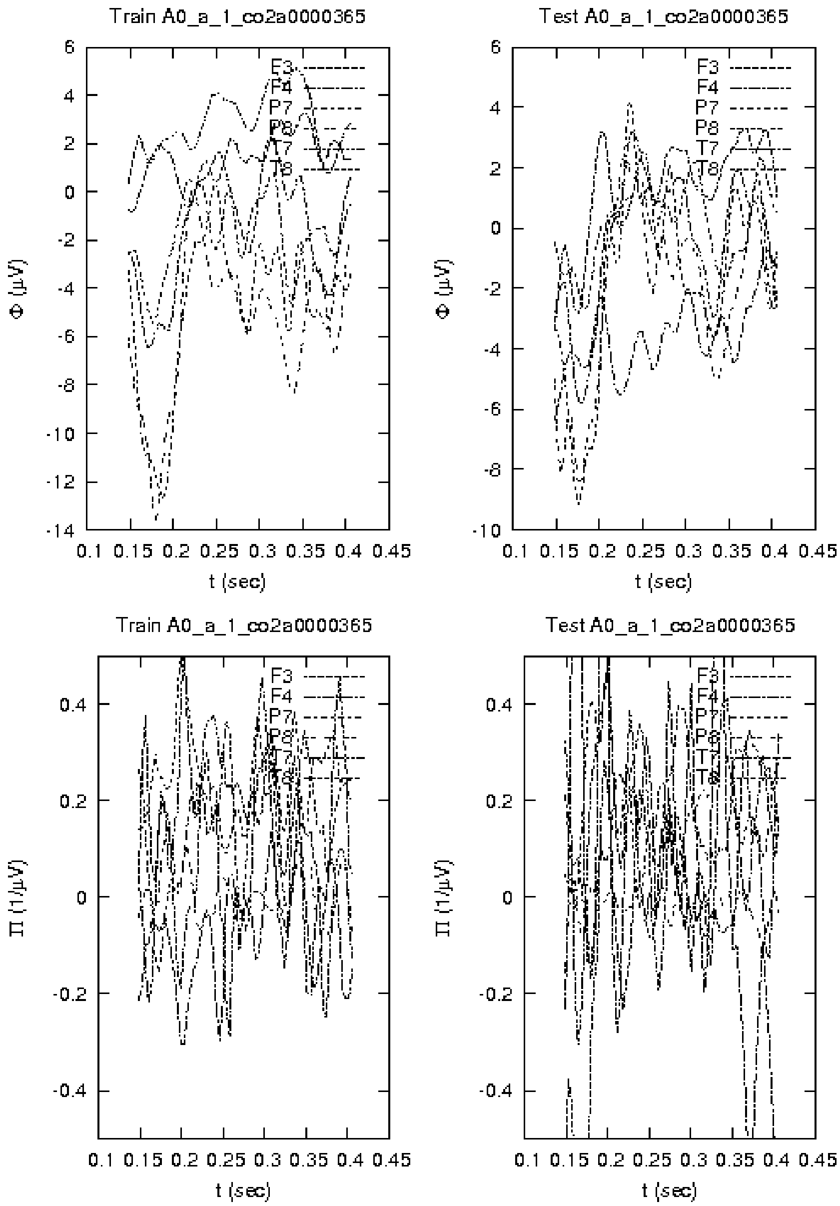
FIG. 2.

CMI

Both plots are moderately noisy and save for a few transient waves in the beginning of the Train plot; and a severely sharp positively and negatively peaked wave of very high amplitude in the beginning of the run in the Test plot, they resemble each other as time passes.

A0 vs. A1

The repetitions of especially the lower transient group of peaks present in A0 plots (FIG. 3.) vanish in the A1 plots (FIG. 4.). Overall, save for the slightly increased amplitude in the A0 plots, and the aforementioned anomalies, A0 vs. A1 fairly resemble each other.



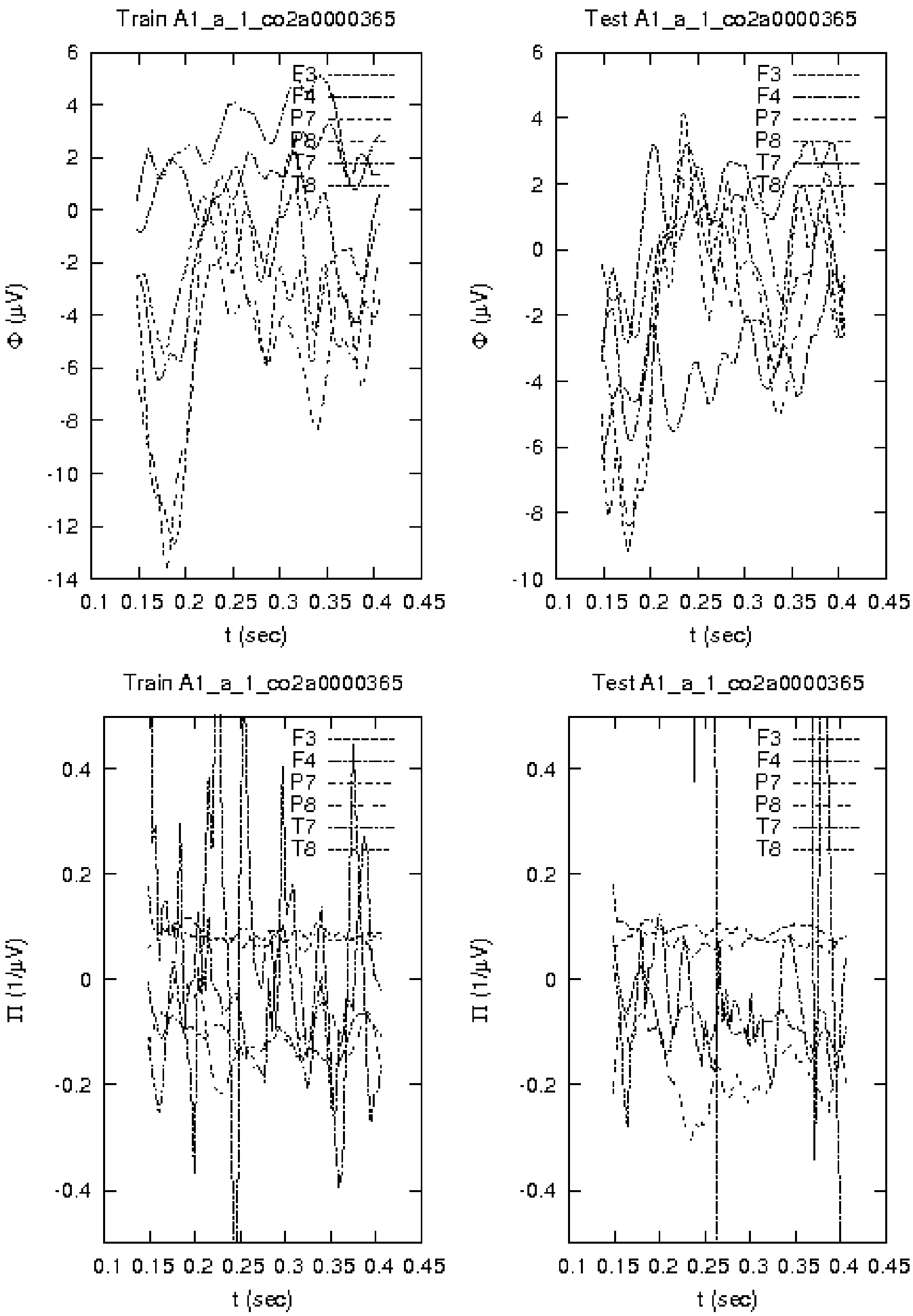
EEG

The Test graph shows an overall reduction in negative amplitude of +2 μvolts. Additionally, there are three symmetric, complex waves: P7&P8, T7&T8, and F3&F4 visible in Train; but the distinction is diminished in Test. Both graphs exhibit a sharp negative complex transient in the beginning, comprised of P7&P8, then somewhat approach a rhythmic, steadier state as time passes.

CMI

There exists multiple, negative and positive, transient spikes in the Test graph; perhaps an overall amplification of the signal. The data is noisier in general across both; but greater noise in the signal is present in Test.

FIG. 3.



EEG

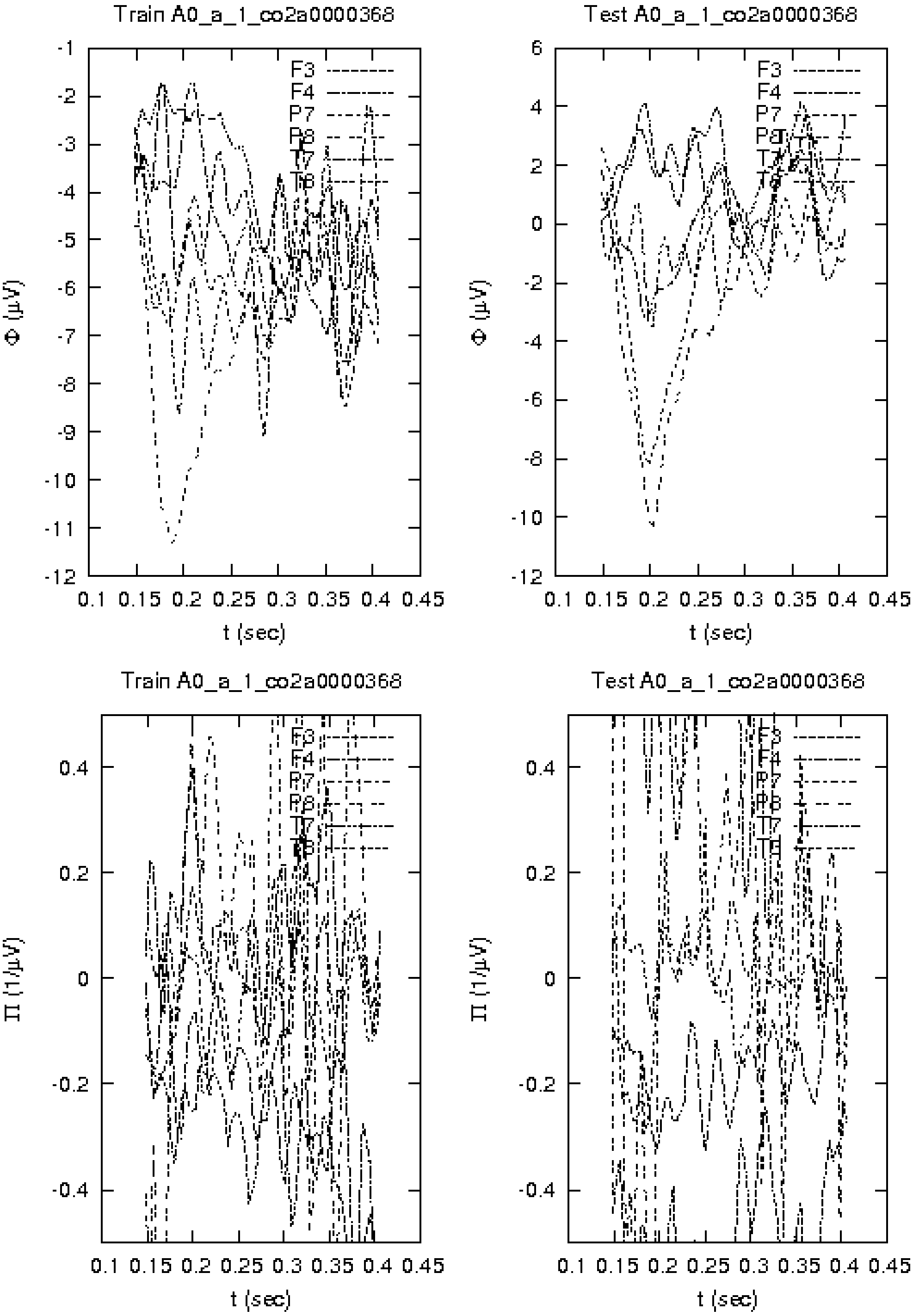
CMI
There is a pronounced separation of signals in both plots; with some being quite calm; and others showing severe swings in amplitude across entire μvoltage axis. The F4 signal seems to have by far the most amplitude; and gains even more amplitude in Test, flying off the y-axis in both directions.

FIG. 4.

Appendix A

A0 vs. A1

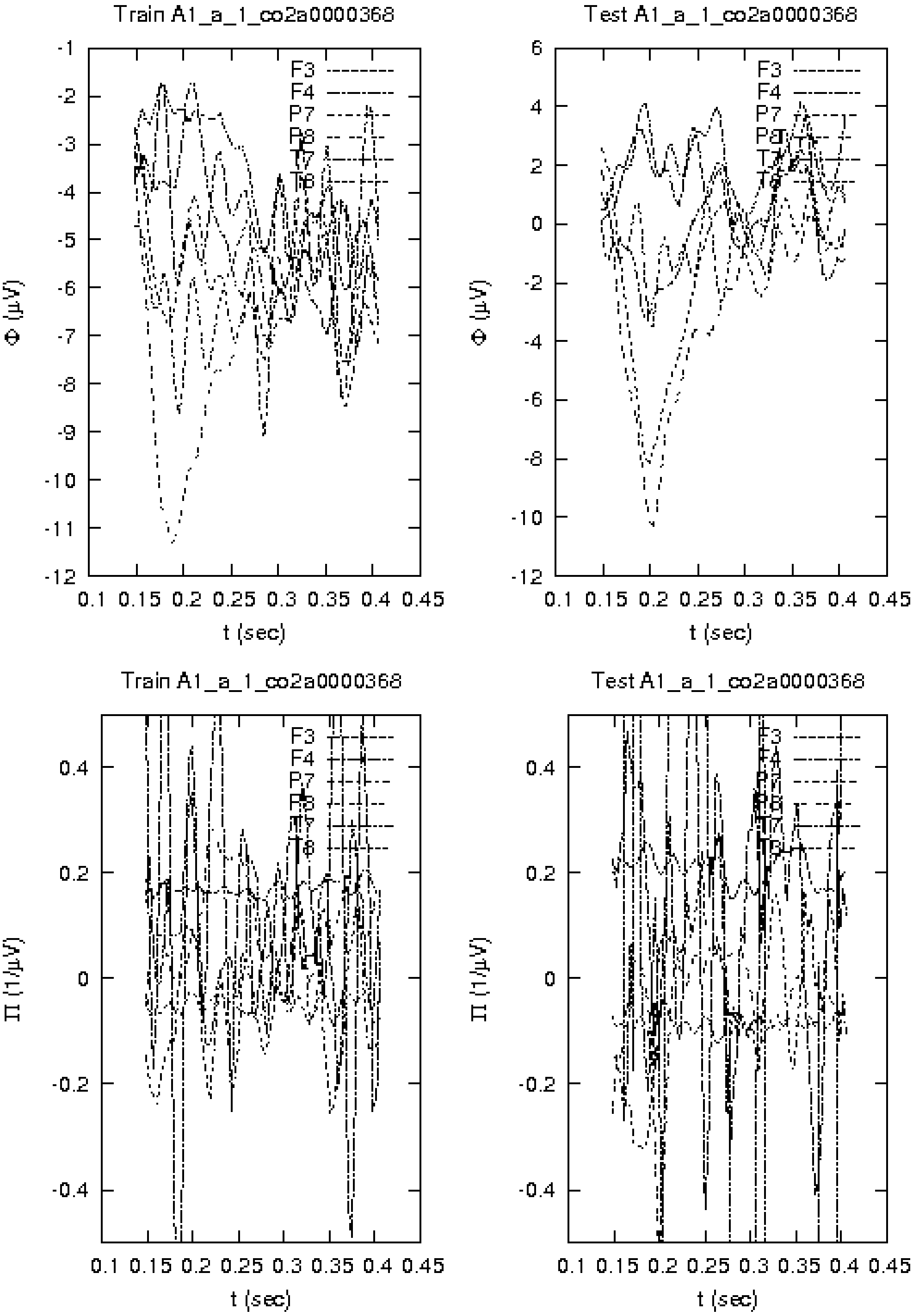
There exists a profound difference in the cleanliness and separation of signals after applying **A**. Further, perhaps a hidden volatility of F4 causes the **A** algorithm to exaggerate its amplitude. Finally, P7&P8 are very calm.



EEG
Train shows highly separated signals in the first half of the time range; in the second half there's more symmetry and compactness of the waveforms. Test, which has a wider amplitude range, shows the same behaviour with respect to time, with even more synchrony in the second half of the time range. Test has a slightly greater amplitude range, also shifted upwards with respect to Train. Test shows also the strongest transient, at t=0.2.

CMI
Train has a greater superposition of waves (also with more compactness). In the second half of the time range there's a more evident crossing of signals (the whole picture resulting noisier). There seems to be a divergence in signals after t=0.35.
In Test the waves are widespread across the entire amplitude range, with less intersections among them. Test signals tend to exceed more frequently the bounding box limits.

FIG. 5.



CMI

Both graphs have similar silhouettes, with a central horizontal band delimited by two almost flat signals; and with positive and negative peaks, more concentrated in the upper region and taller in the lower one. Train and Test appear to have a constant trend.

FIG. 6.

A0 vs. A1

Application of **A** clears the divergence observed in the final part of the time range for Train. High oscillations appear confined in isolated peaks. Also Test waveforms are constrained in the A1 version, and the overall figure becomes very similar to the Train A1 graph.

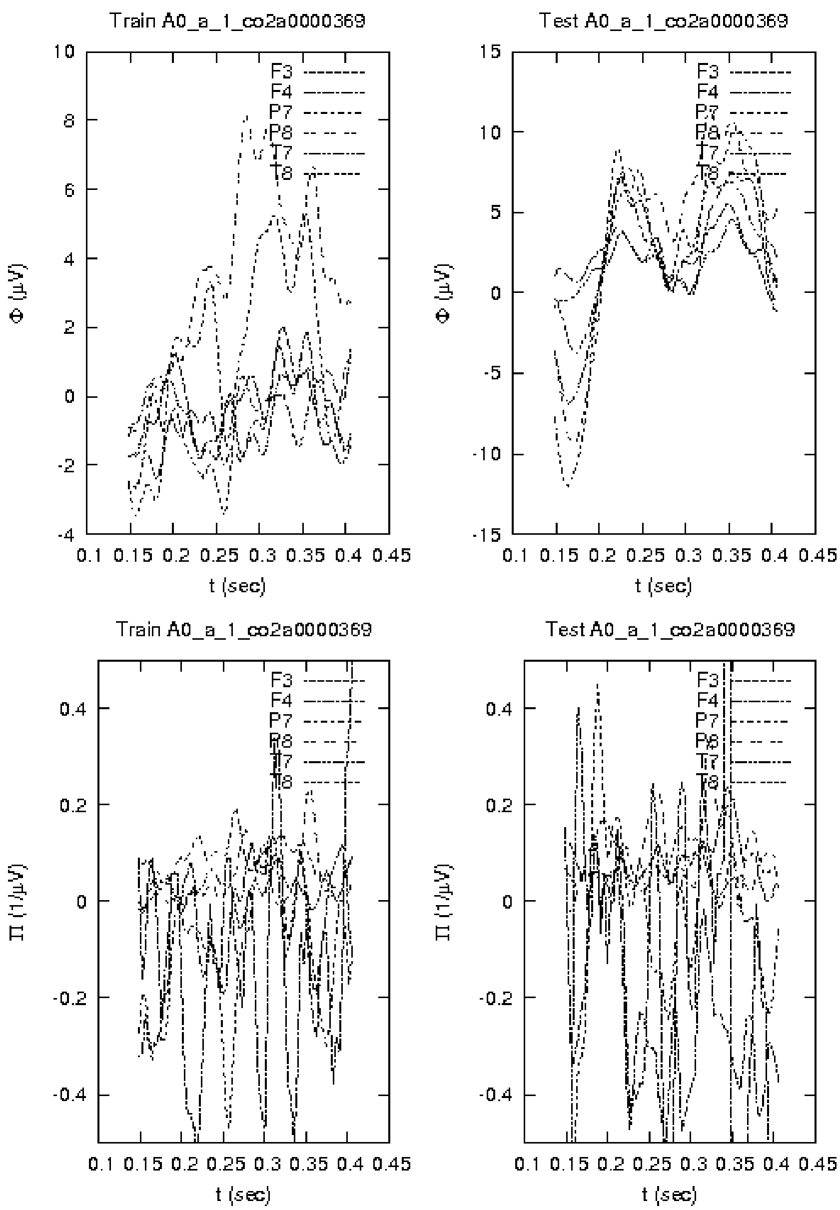


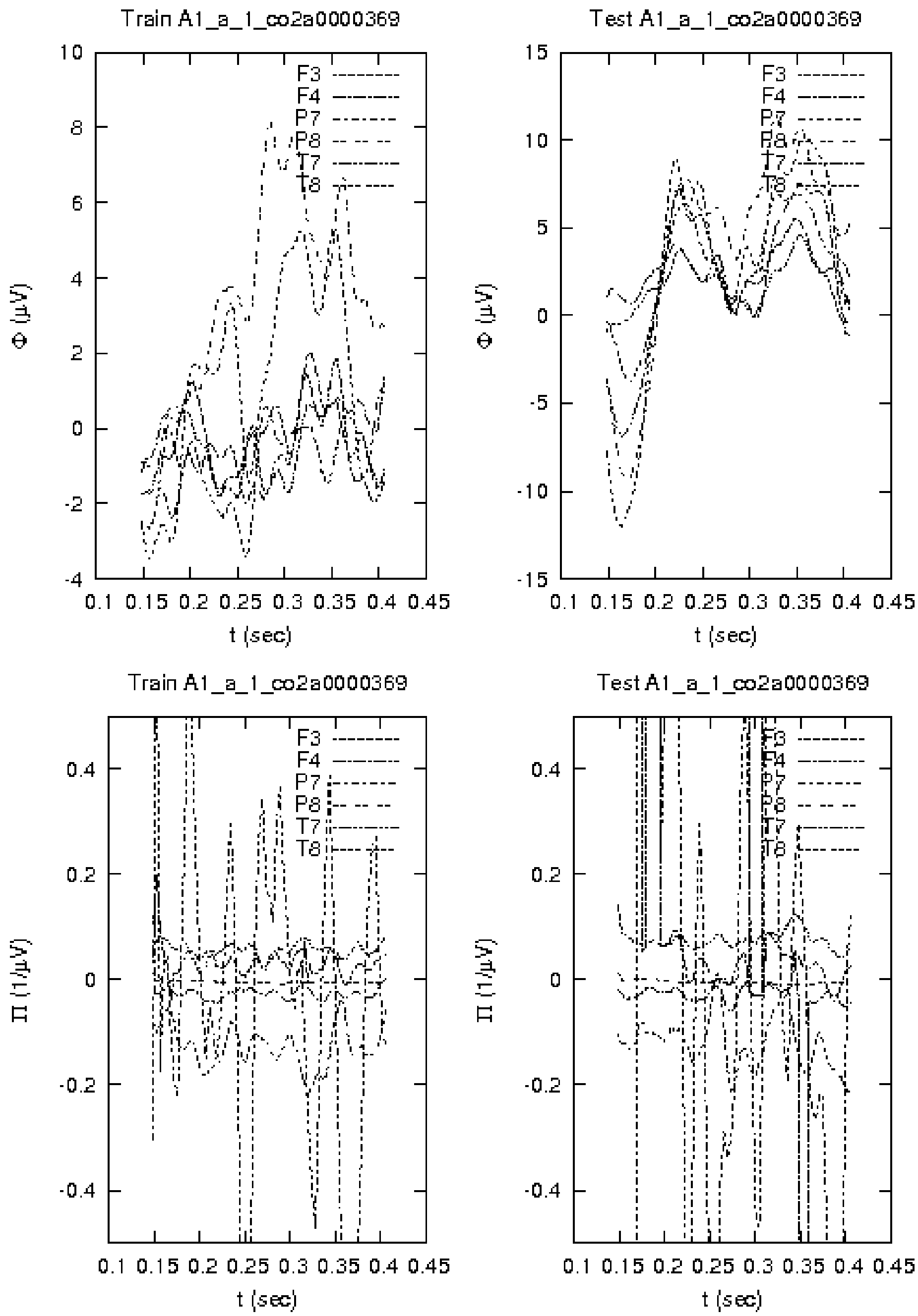
FIG. 7.

EEG

The Test graph is markedly different than Train in almost every way. Test exhibits two major peaks and one major trough; readily apparent; with all channels exhibiting very similar complex morphology. Train shows a clustering of four synchronous and complex channels; with P7 and P8 also synchronous with increasing positive amplitude as the epoch progresses.

CMI

Test exhibits slightly stronger amplitude; with a few positive transients in the beginning of the epoch differentiating itself from Train. Both plots exhibit a clustering of signals about the origin, with Train showing F4 as strong negative amplitude with five distinct troughs. P4 is complex with F4 in Test.



CMI

There is a separation and calming of signals in both plots; with a clustering of very regular, sinusoidal waveforms near the origin, and in Train and Test, P7 stands out with very strong amplitude across the epoch; joined by F4 in Test towards the end of the epoch.

FIG. 8.

A0 vs. A1

A very noticeable separation of signals and cleanliness of signal is noted when **A** is applied. **A** does increase volatility in two waveforms markedly. Contrary to the EEG plots, the waveforms with CMI analysis gain symmetry and sinusoidal attributes.

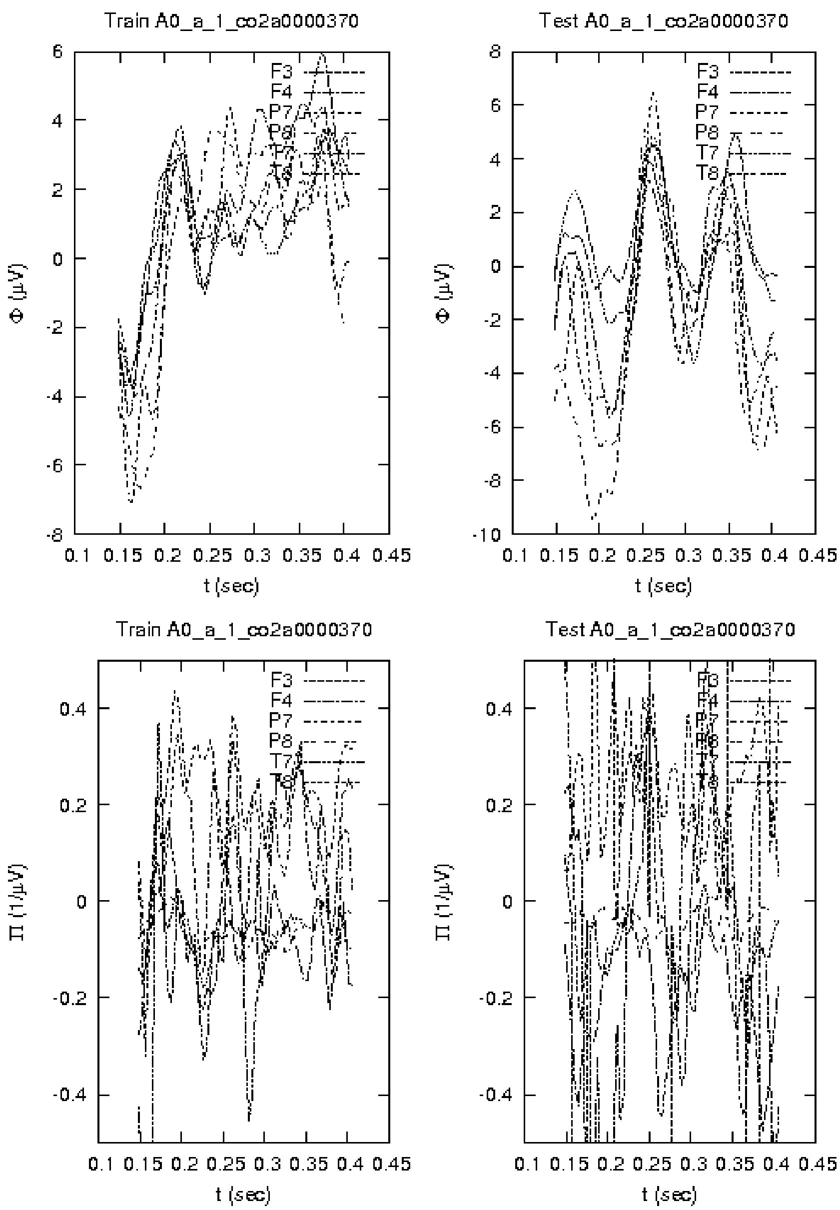


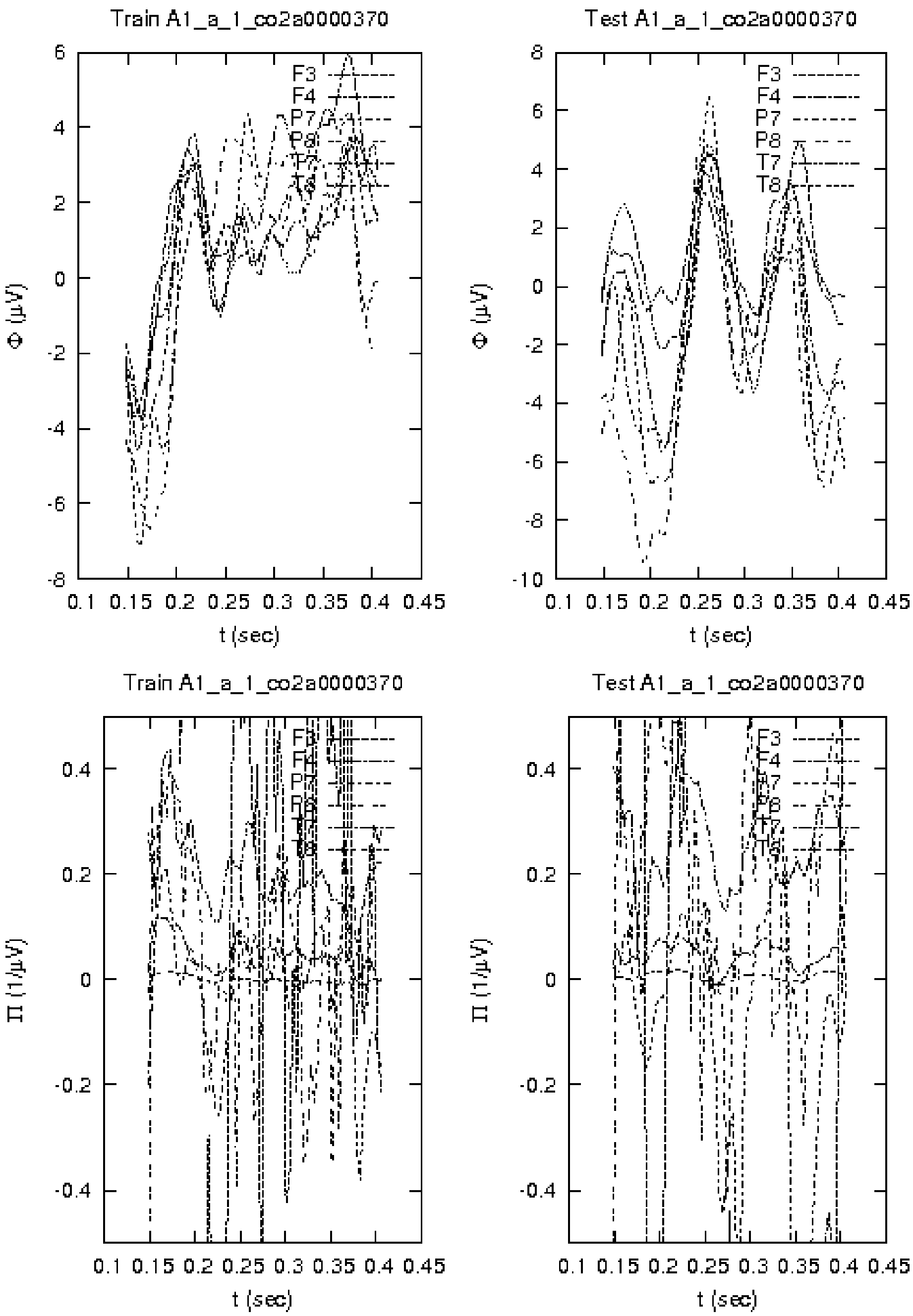
FIG. 9.

EEG

The Test graph is markedly different than Train in almost every way. Test exhibits three major peaks and three major troughs; readily apparent; with all channels exhibiting very similar complex morphology. The channels also are all complex in Train; however there is only one pronounced negative clustering at the beginning of the epoch; with the remainder of the epoch almost never crossing into negative μV.

CMI

Test exhibits noticeably stronger amplitude; with both plots exhibiting moderately noisy signal; however, sinusoidal behavior can be observed. Again, Test has greater amplitude across entire epoch. There is a negative transient at the beginning of the epoch in Train.



CMI

There is a separation of signals in both plots; with a subset of irregular but sinusoidal waveforms near the origin; and the remaining waveforms exhibit strong sinusoidal amplitude. Train shows slightly more noisiness of the stronger signals.

FIG. 10.

A0 vs. A1

A very noticeable separation of signals is noted when **A** is applied. **A** does increase volatility in two to three waveforms markedly.

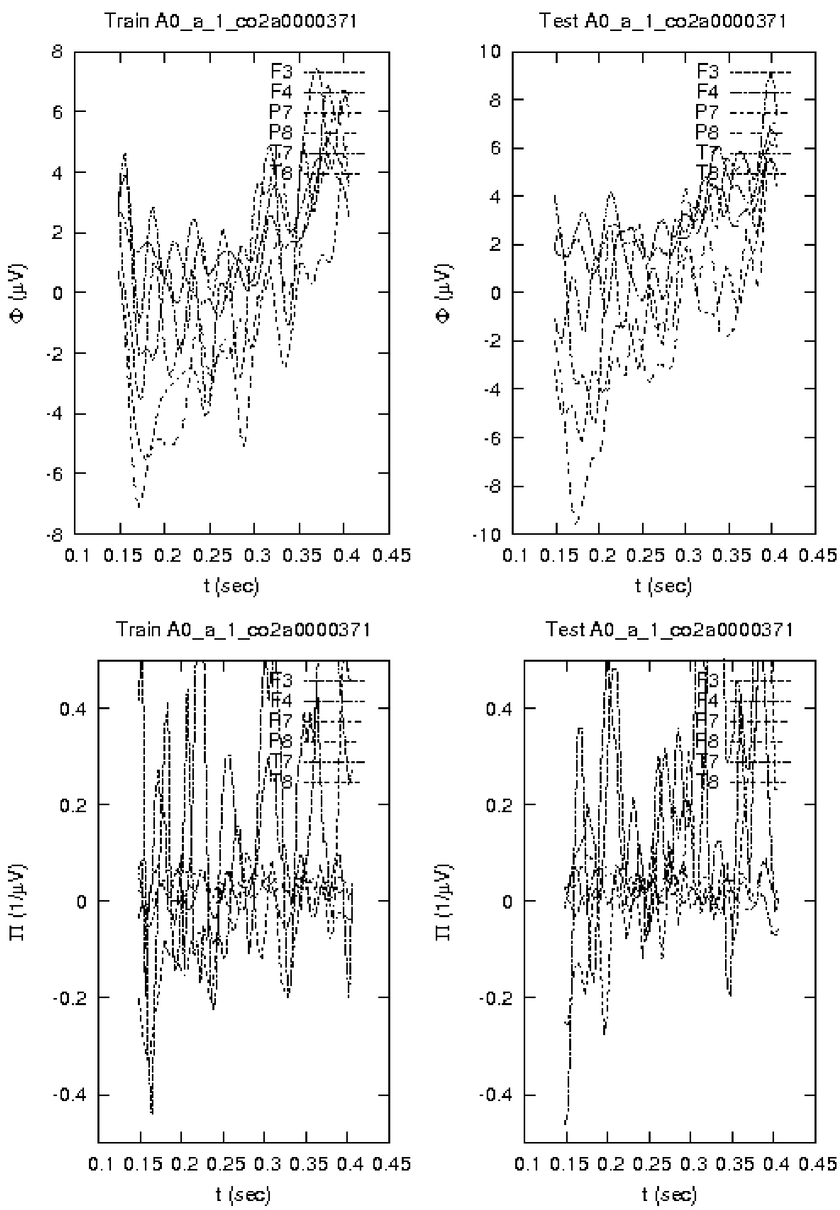


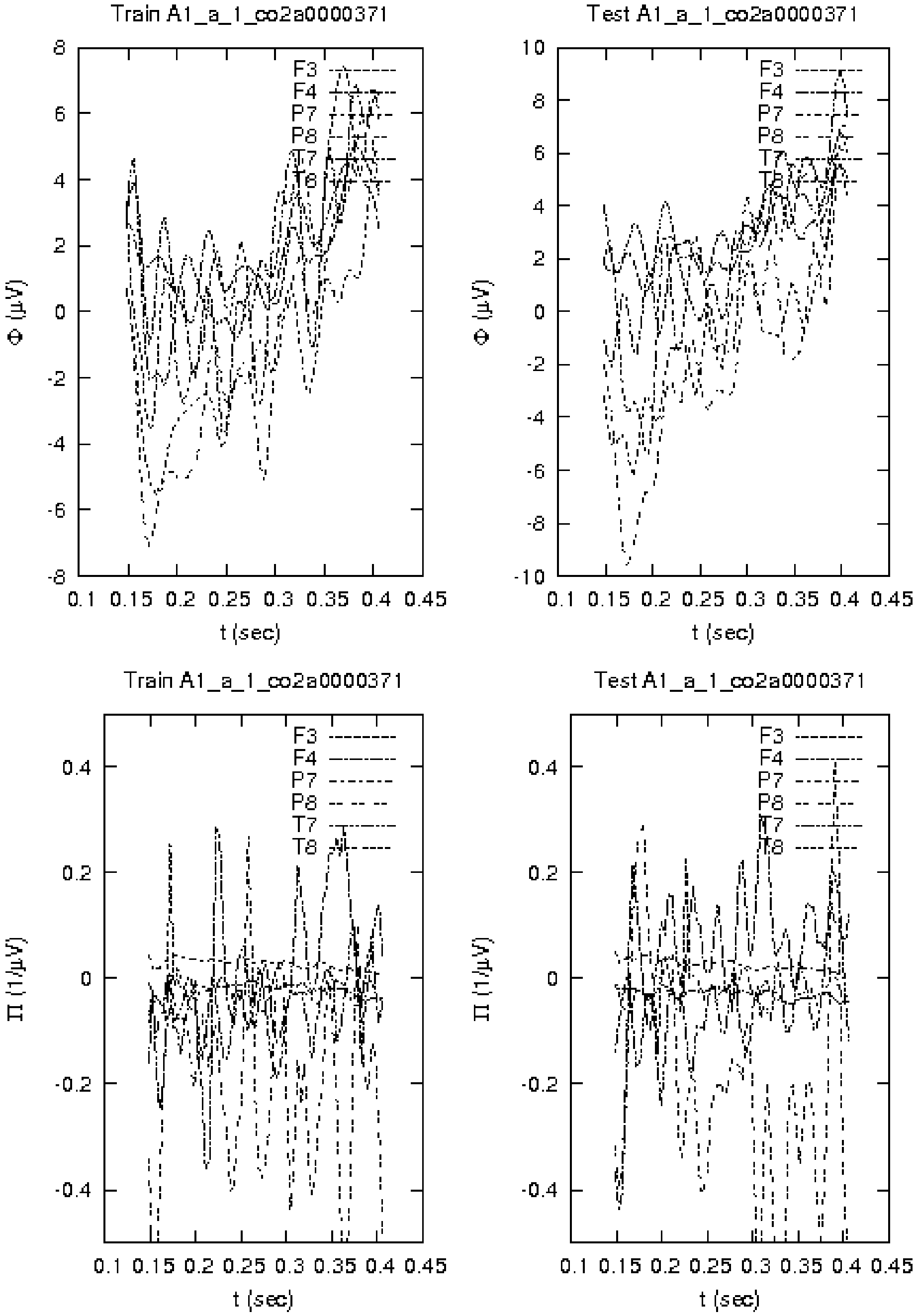
FIG. 11.

EEG

Both plots resemble each other with the main distinction of a +2 μV increase in positive and negative amplitude in Test. There is noticeable synchrony and symmetry across all signals.

CMI

Both plots resemble each other; save for the negative transient in F4 at beginning of epoch in Test. There appears to be several waveforms clustered about origin with near constant sinusoidal amplitude.



CMI

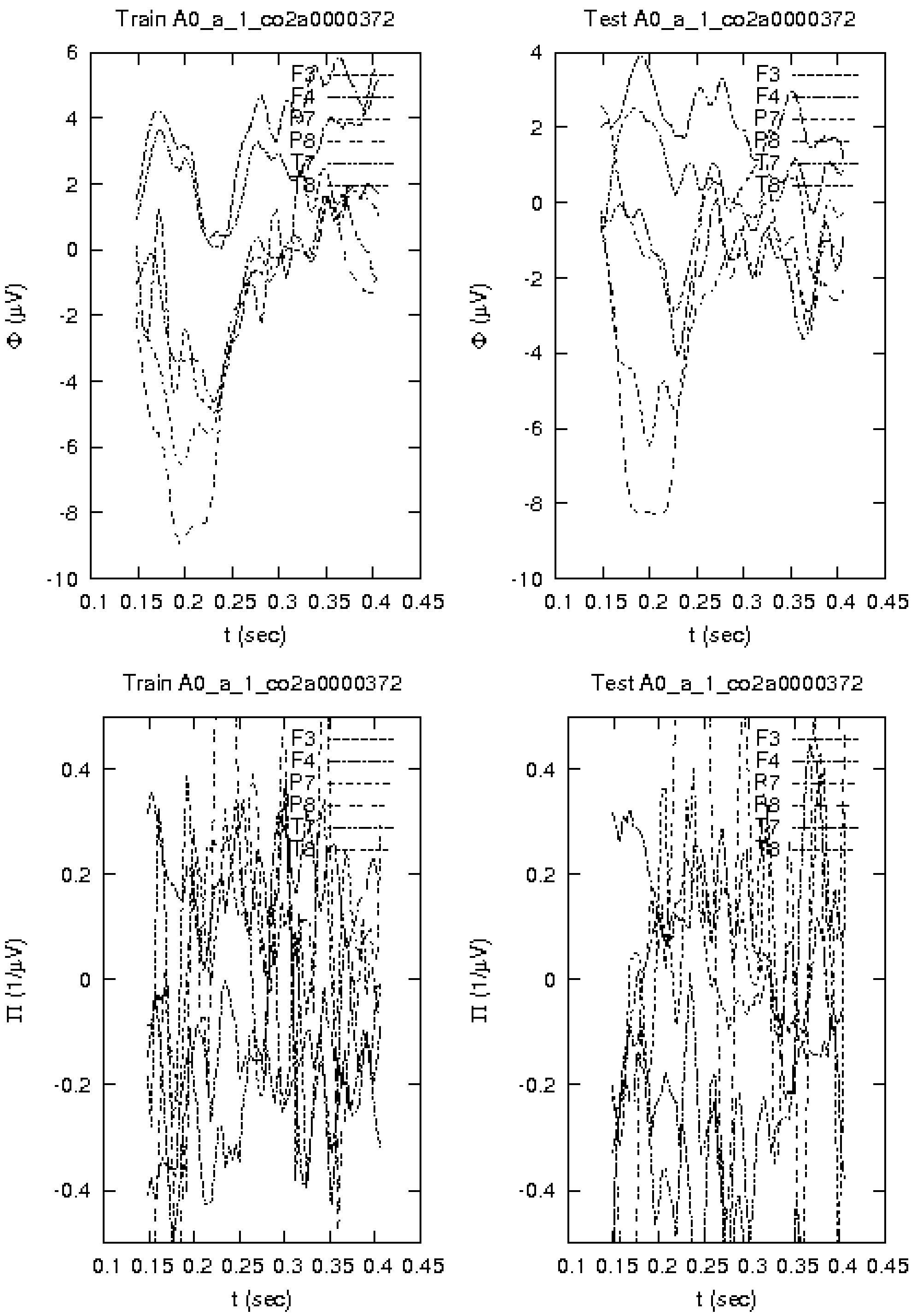
There is a separation of signals in both plots; with a subset of almost flat waves near origin; P7 and F3. P8 appears to oscillate fairly regularly with strong negative amplitude; with also a few peaks in the positive domain. F4 also exhibits stronger amplitude over most waves; with sinusoidal behavior evident.

FIG. 12.

A0 vs. A1

A very noticeable separation of signals is noted when **A** is applied. **A** does increase amplitude in two waveforms; however, a profound separation and revelation of nearly flat waveforms appears near the origin; P7 and F3.

Appendix A



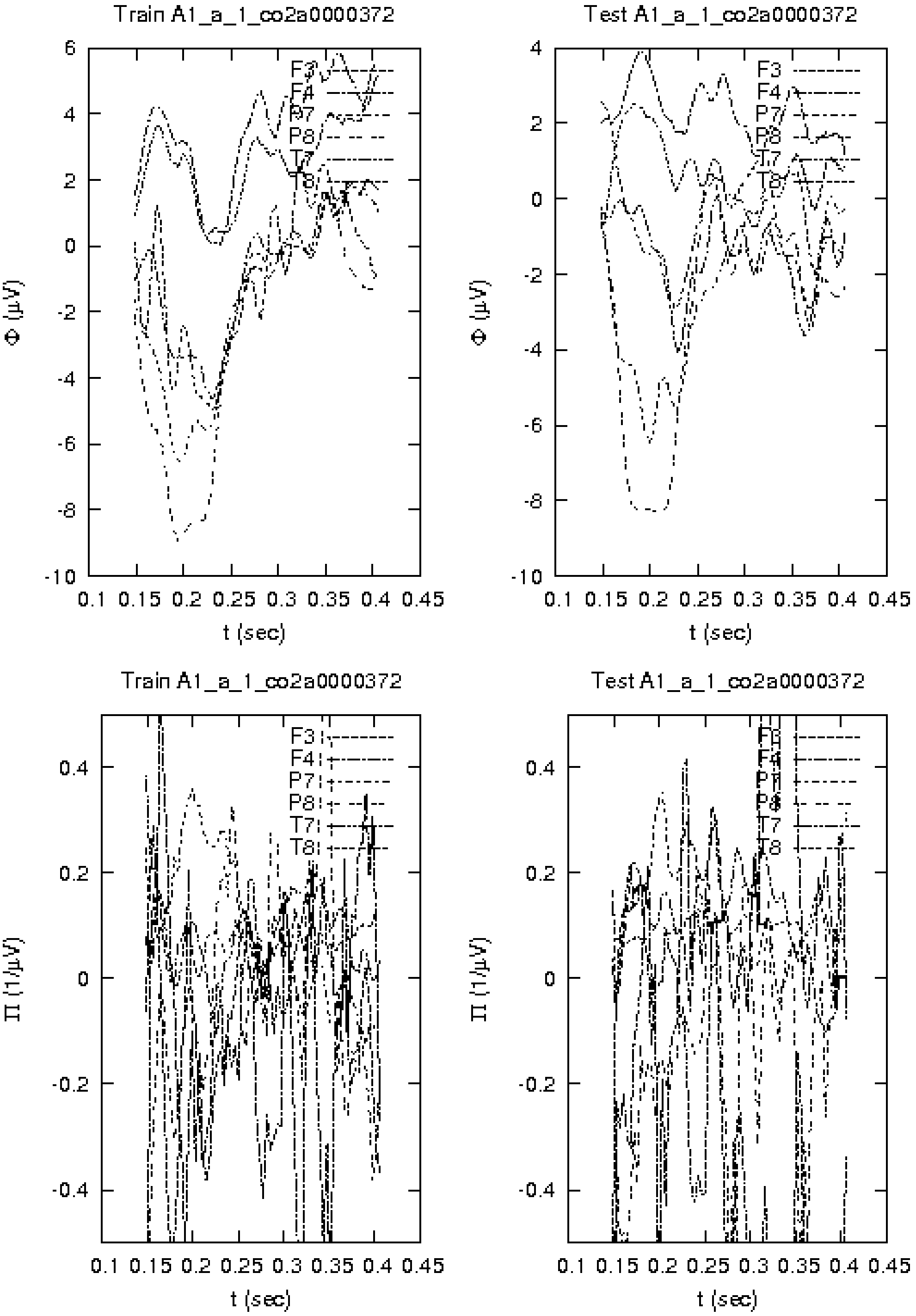
EEG

Train has a broader amplitude range. Since the beginning of the time range it shows a transient of two signals greater than the others. After t=0.23 the remaining signals become synchronous. Peaks are smooth and little pronunciated. The waveforms show an increasing trend. Test has less synchronous signals, although some of its waveforms superimpose after t=0.23. It has a constant trend, and as for Train it shows a greater amplitude differentation before t=0.23.

CMI

Both Train and Test are noisy, with several irregular oscillations and superpositions. Test shows more peaks exceeding the bounding box limits, especially among the negative ones. Train instead has more intersections around the horizontal y=0 axis, and is a little less clear to read. Both graphs have a constant trend. Test has a high concentration of negative peaks at t=0.28.

FIG. 13.

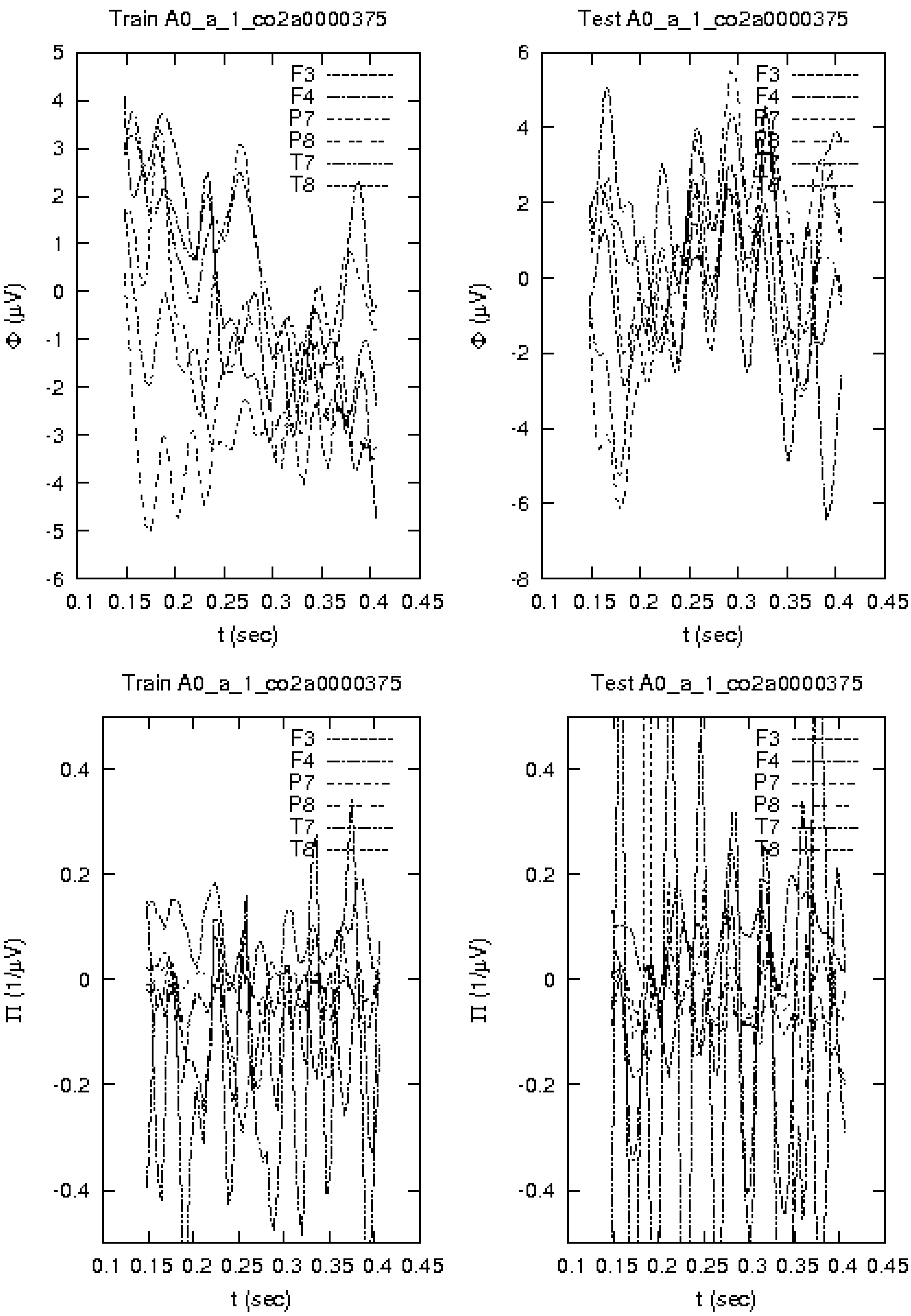


CMI
Both Train and Test have compacted peaks, more pronunciated in the lower part of the graphs. Train shows a lower peak gap centered at t=0.25. It looks a little bit more noisy than Test, with various signal superpositions near the horizontal y=0 axis. In Test the upper part of the graph is cleaner and more readable. Both graphs show a constant trend.

FIG. 14.

A0 vs. A1

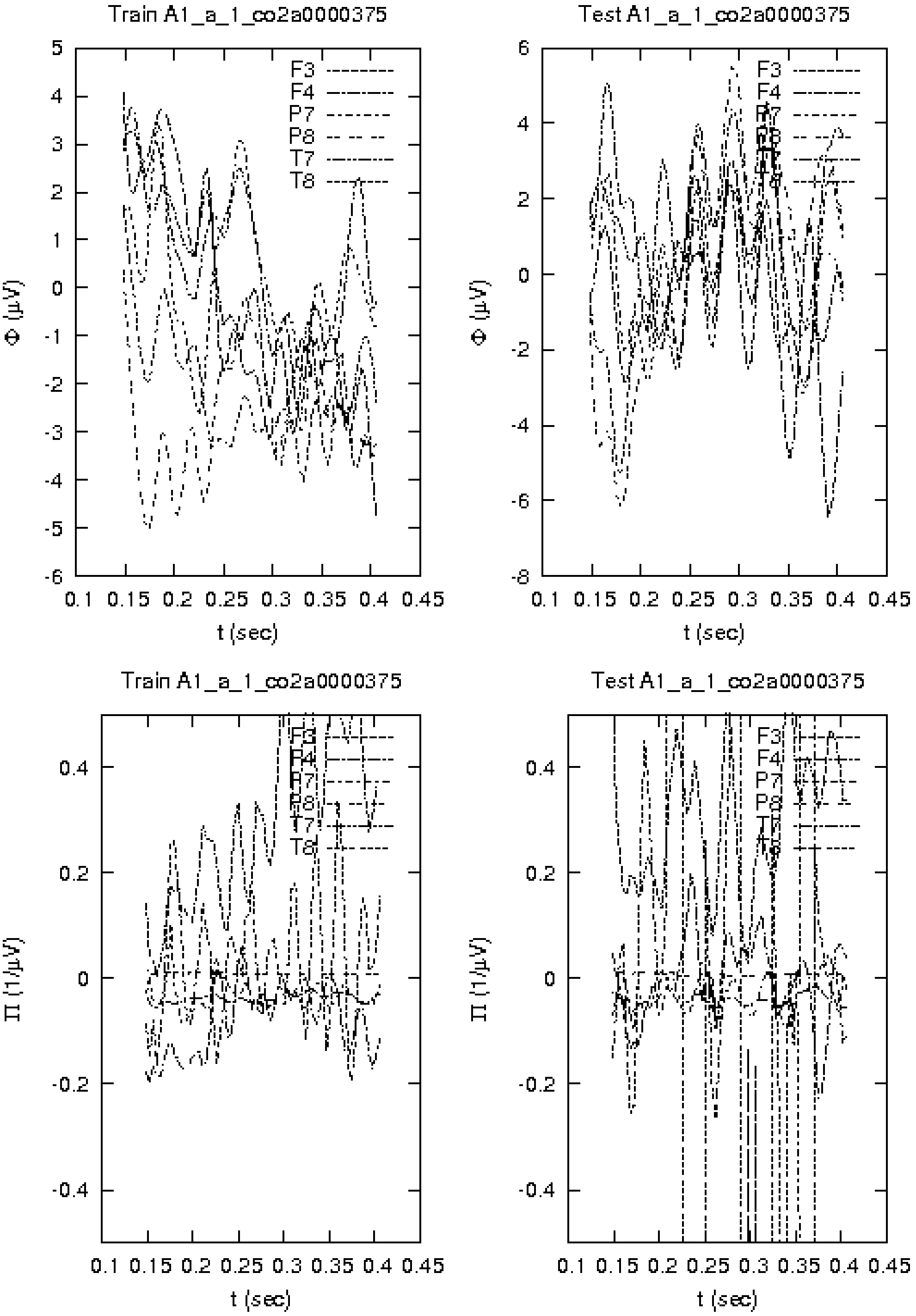
Train, after **A** application, becomes more compact and with a smoother upper skyline, apart from a single signal, the highest one, which becomes more crisp and high in absolute values. Also in the lower part, most signals appear compacted around the central horizontal axis in the A1 version, apart from a single negative signals which remains isolated(lower than all other waveforms) and more pronunciated than in the A0 version.
Also Test, after use of **A**, looks more disciplinated in its oscillations. Almost all the upper peaks that in the A0 version exceed the bounding box limits appear well contained in the A1 figure; in the lower part they are reduced in number, maintaining (in a less pronunciated manner) their greatest concentration at t=0.28.



EEG
Test shows a slightly wider range of amplitudes. Train signals look more disaggregated in the first half of the time interval with a transient with negative amplitude, while in the second one they become more dense and symmetric. For both graphs there's a higher symmetry at t=0.3. Test waveforms show a stronger symmetry and their envelop is quite similar to a modulated sinusoid. Test shows also signs of signal superposition (i.e. strong symmetry).

CMI
Train has deep negative peaks, and moderated positive peaks; Test instead shows a highly intense but quite regular oscillatory dynamics. In both graphs there's a positive trend for some of the signals after t=0.3, which means that in both figures some of waveforms has increasing peaks until the end of the time interval.

FIG. 15.



CMI
Train shows a growing trend. It has a group of compacted waves, plus one which constantly augments for the entire time range. Test, which has greater amplitudes, doesn't show this growing trend, but instead keeps generally constant and auto similar(apart from a lack of great negative oscillations until t=0.2). It also has a group of more compact waveforms, plus some that have quite strong oscillations.

FIG. 16.

A0 vs. A1

A0 Train signals are mostly located in the lower part of the graph (around and above the y=0 horizontal axis), while A1 Train waveforms keep themselves mostly around the y=0 axis and above it.
A0 Test graph shows an intense peak series both over and under the y=0 axis. They are quite regular and reach the box limits(with only a lack of positive peaks for t in [0.3, 0.35]). The signals around the y=0 axis look more noisy. A1 Test graph has less extremal and regular oscillations in its greaterst peaks, and appears less noisy and with more terse waveforms around the central horizontal axis.

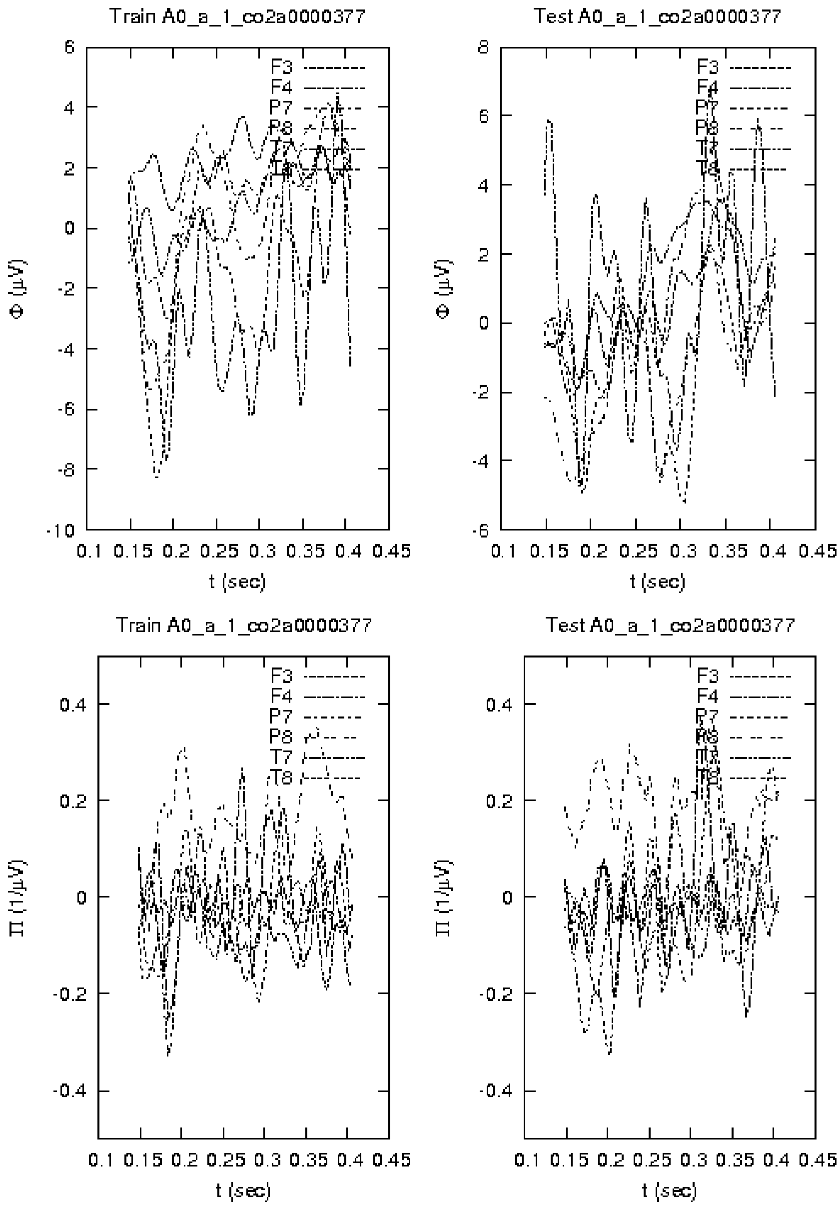


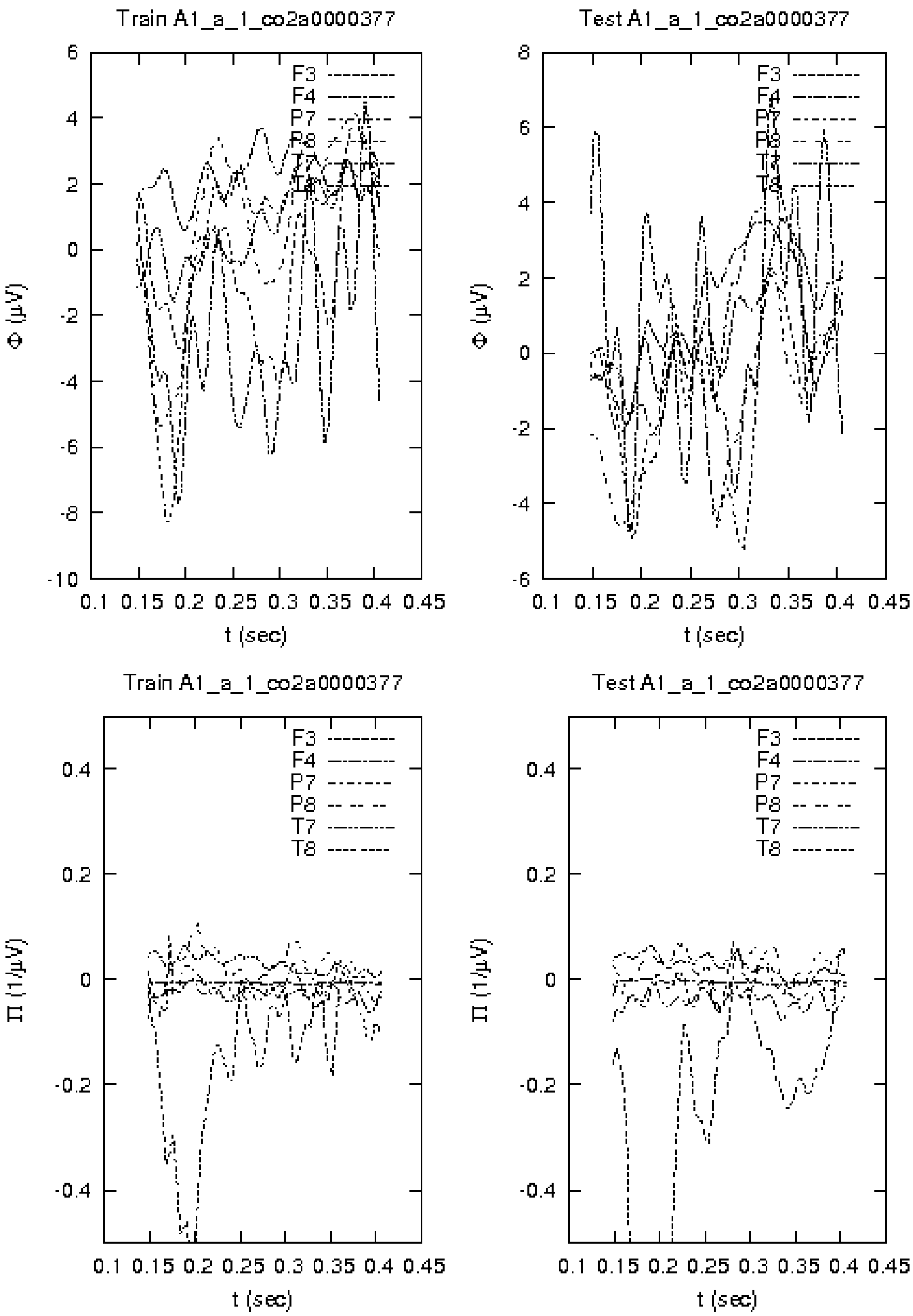
FIG. 17.

EEG

The Test graph shows an overall shift in positive amplitude of +2 µvolts and -4 µvolts negative amplitude. Additionally, there are five positive transients in Test; all T7. Both graphs are monomorphic across all signals; with 5-6 major oscillations.

CMI

There is a clustering of waves about the origin present in both plots. Both plots are markedly similar.



EEG

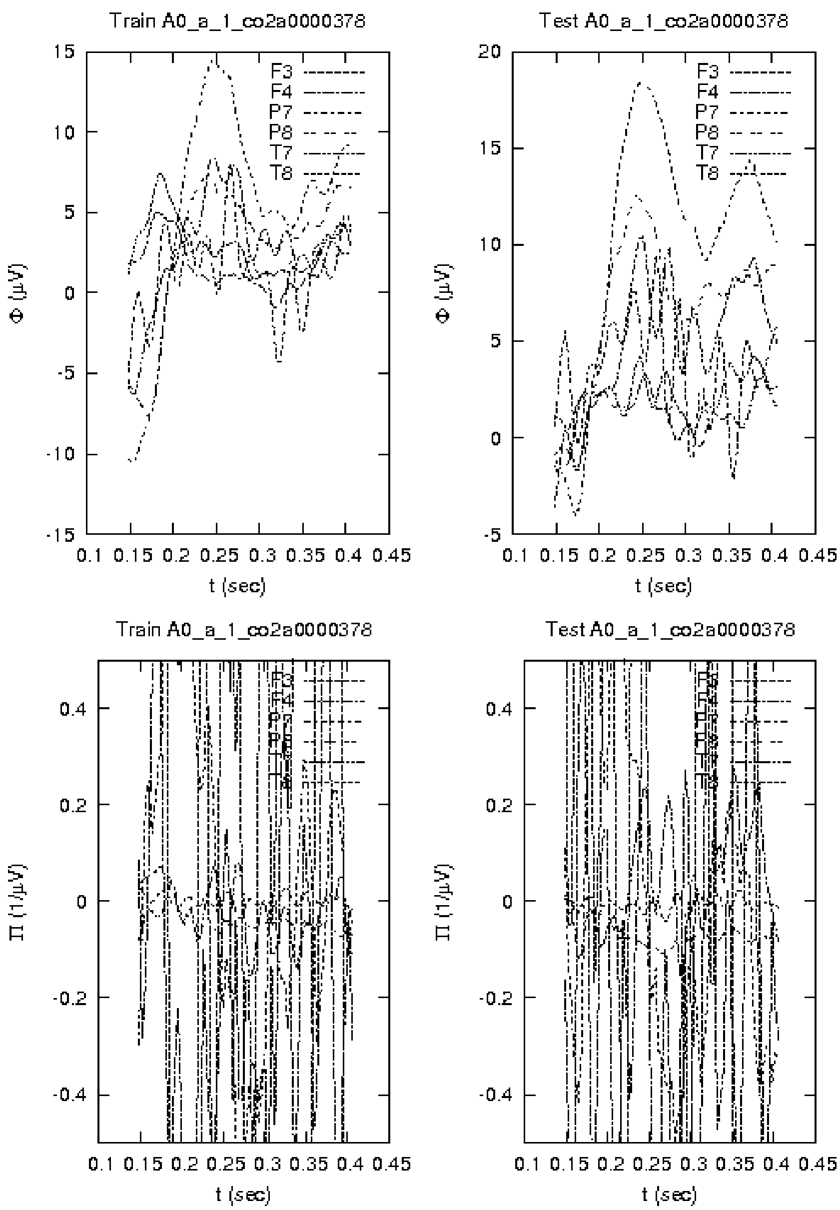
CMI

There is a pronounced separation of signals in both plots. Both plots resemble each other strongly. T8 exists almost entirely in the negative domain. Remaining waves are clustered about the origin with very low amplitude yet rhythmic sinusoidal characteristics.

FIG. 18.

A0 vs. A1

After applying **A**, 5 signals are all reduced in amplitude but with similar morphology otherwise without **A**. The remaining signal, T8, is strongly negative amplitude.



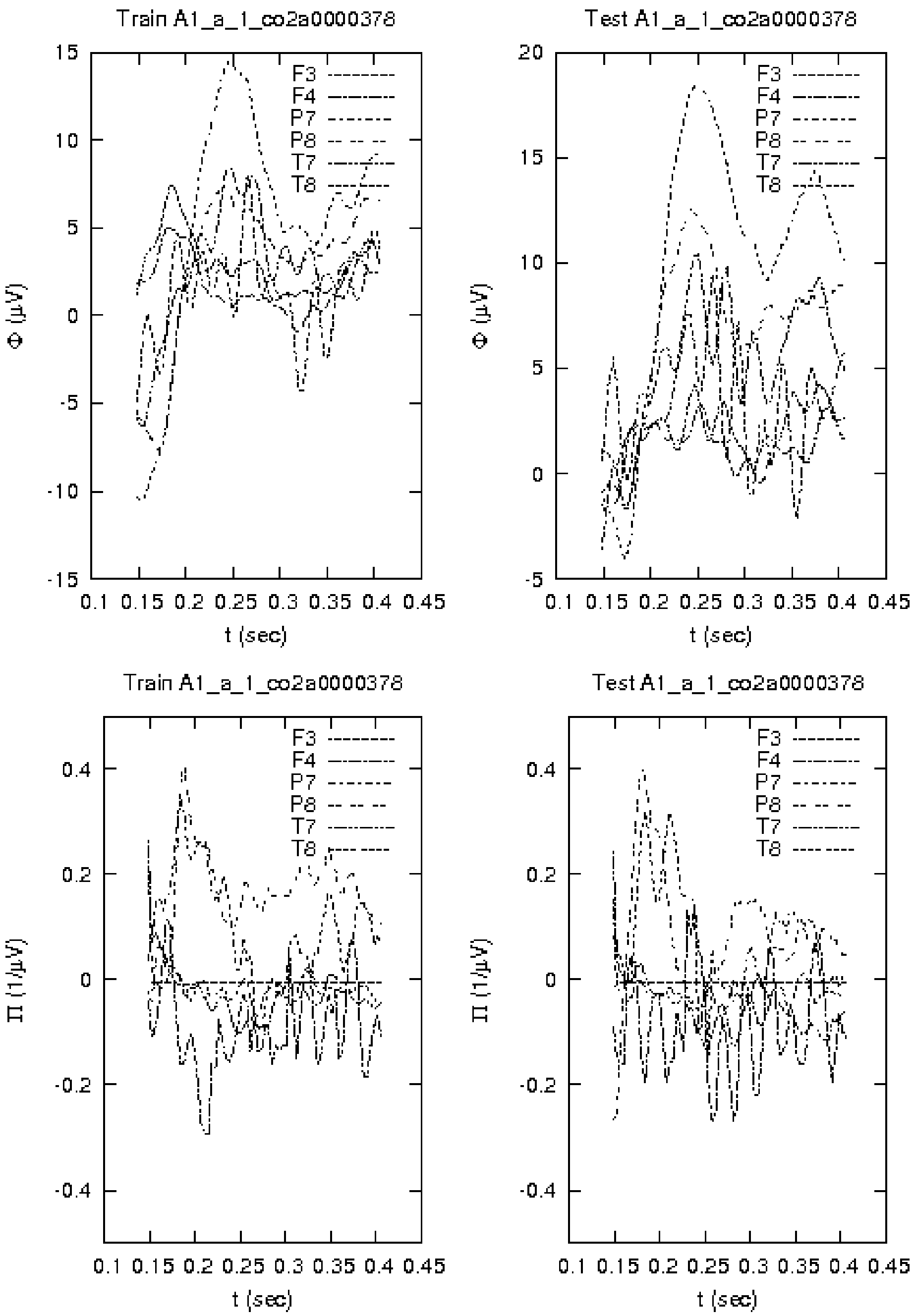
EEG

The Test graph shows an overall shift in positive amplitude of +5 μvolts and -5 μvolts negative amplitude. Both graphs exhibit strong overall amplitude. F4 appears generally transient in both. All signals are fairly to strongly monomorphic. There appears to be a strong synchrony and symmetry across all pairs of electrodes.

CMI

Approximately half of the waveforms are fairly clustered about the origin; with the remainder very volatile and noisy. Sinusoidal characteristics are readily visible in all waveforms; differing mainly in amplitude. There appears an elevated amplitude in Test.

FIG. 19.



EEG

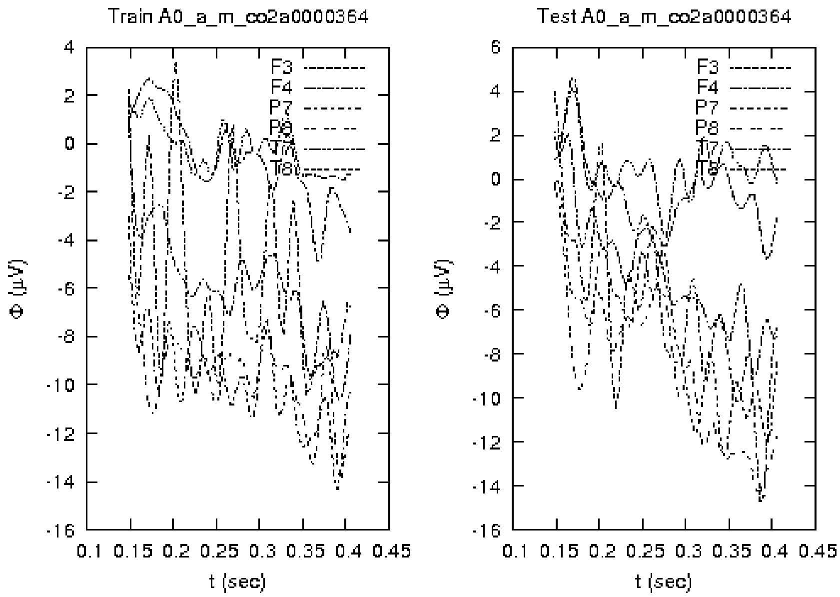
CMI

There is a pronounced separation of signals in both plots. Both plots resemble each other strongly and have two waves that are almost exclusively in the positive domain; and the remainder almost all in the negative domain. All waves exhibit less symmetry; as borrowed from neurology symantics.

FIG. 20.

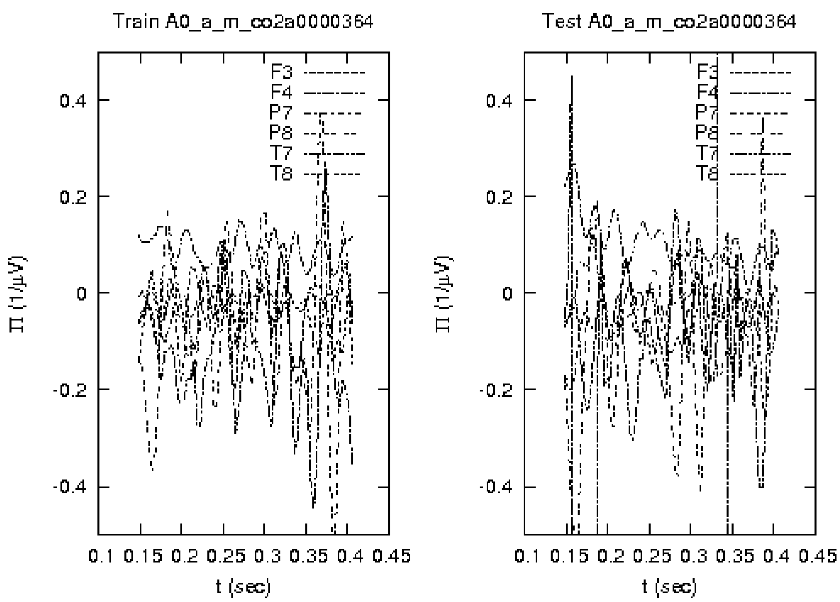
A0 vs. A1

After applying **A**, the volatility is completely absent. Also, there seems to be a polarization of signals; some almost exclusively in positive domain; others in the negative. Finally, after applying **A**, the symmetry is reduced. As that is a neurological description, unsure of its validity here.



EEG

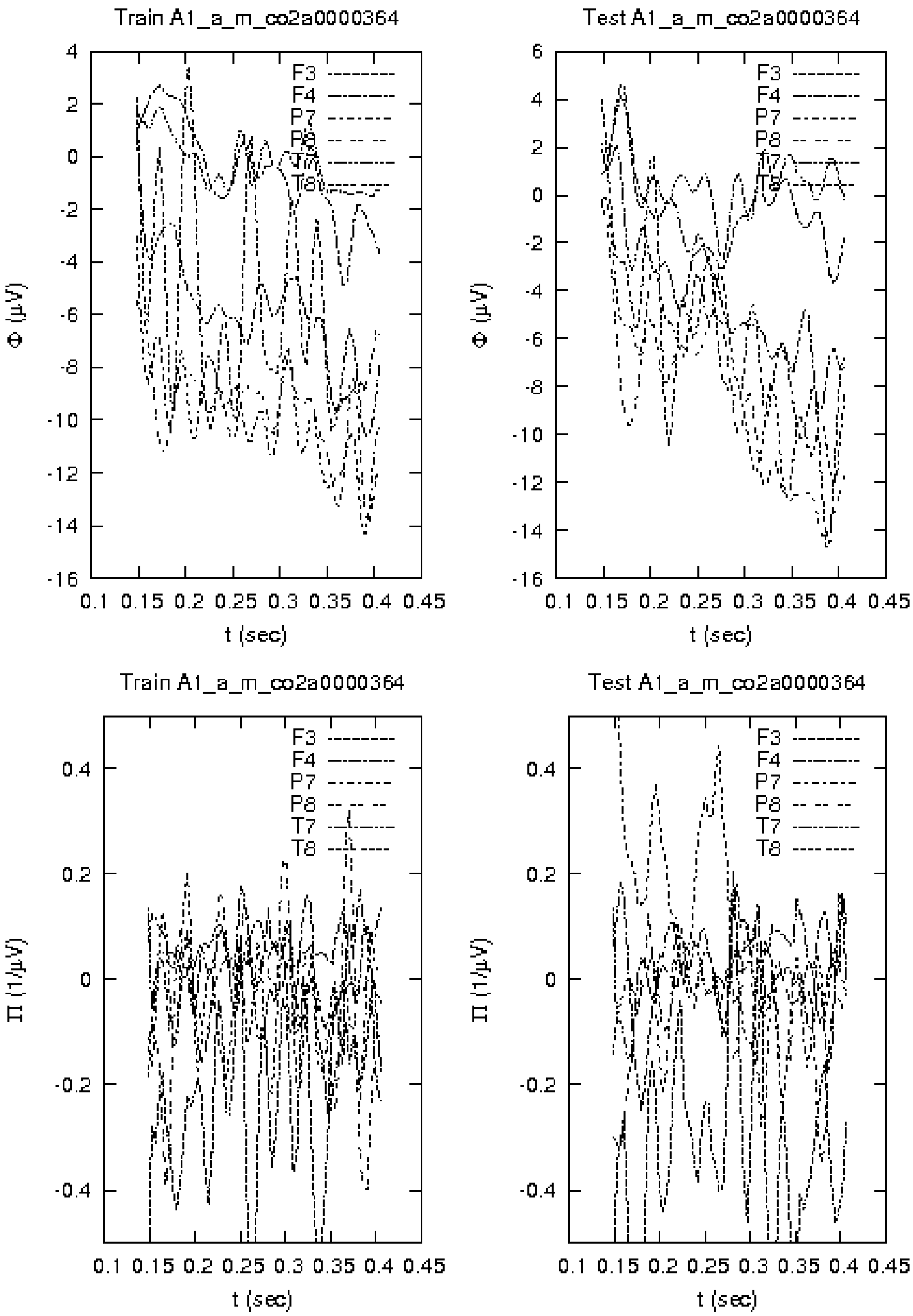
The Test graph shows an overall increase in positive amplitude of +2 μvolts. F3&F4 have symmetry; with the remaining signals clustered together at lower μVolts throughout epoch in both plots. T8 exhibits less amplitude in Test. All signals appear organized and sinusoidal in both plots.



CMI

All waveforms are clustered together about the origin; with increased negative signals overall. Test exhibits stronger negative amplitude with some values greater than -y bounds. Test shows a positive and negative spike at t=0.16 from P8 and F4. F4 is more volatile in Test; with positive and negative transients also at t=.34. Behavior is noticeably sinusoidal; however and not too noisy to discern individual waves.

FIG. 21.



EEG

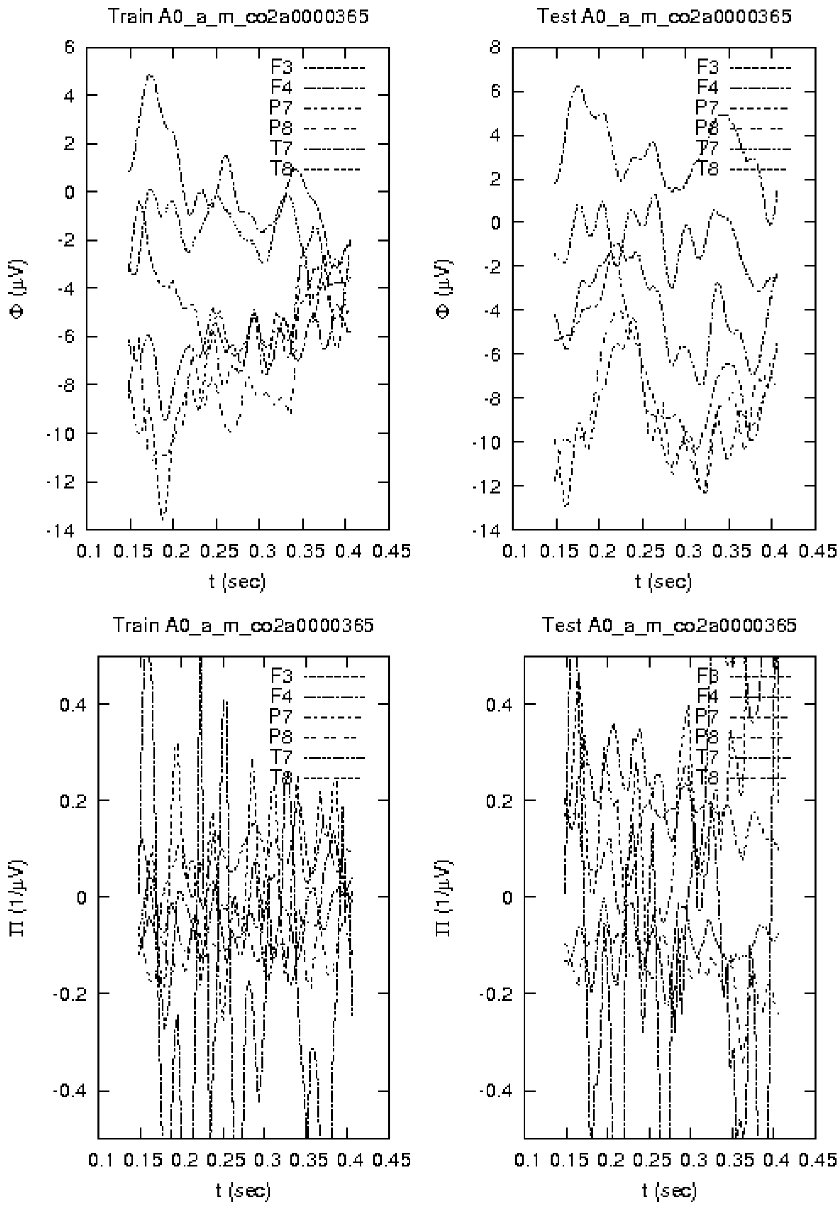
CMI

P7 shows a significant increase in amplitude in Test during first half of epoch; with three transient spikes. F3 exhibits increased negative amplitude in Test. Remaining signals appear clustered about origin in both plots; with all waves exhibiting sinusoidal behavior of moderate frequency and noise.

FIG. 22.

A0 vs. A1

It is difficult to tell the effects of **A** in these plots. It appears almost as though F3 replaces P8 with **A** applied. P7 becomes transient in the Test **A** plot; differing even from Train **A**. Remaining signals seem somewhat unaffected; save for the increased negative amplitude throughout epoch in F3.



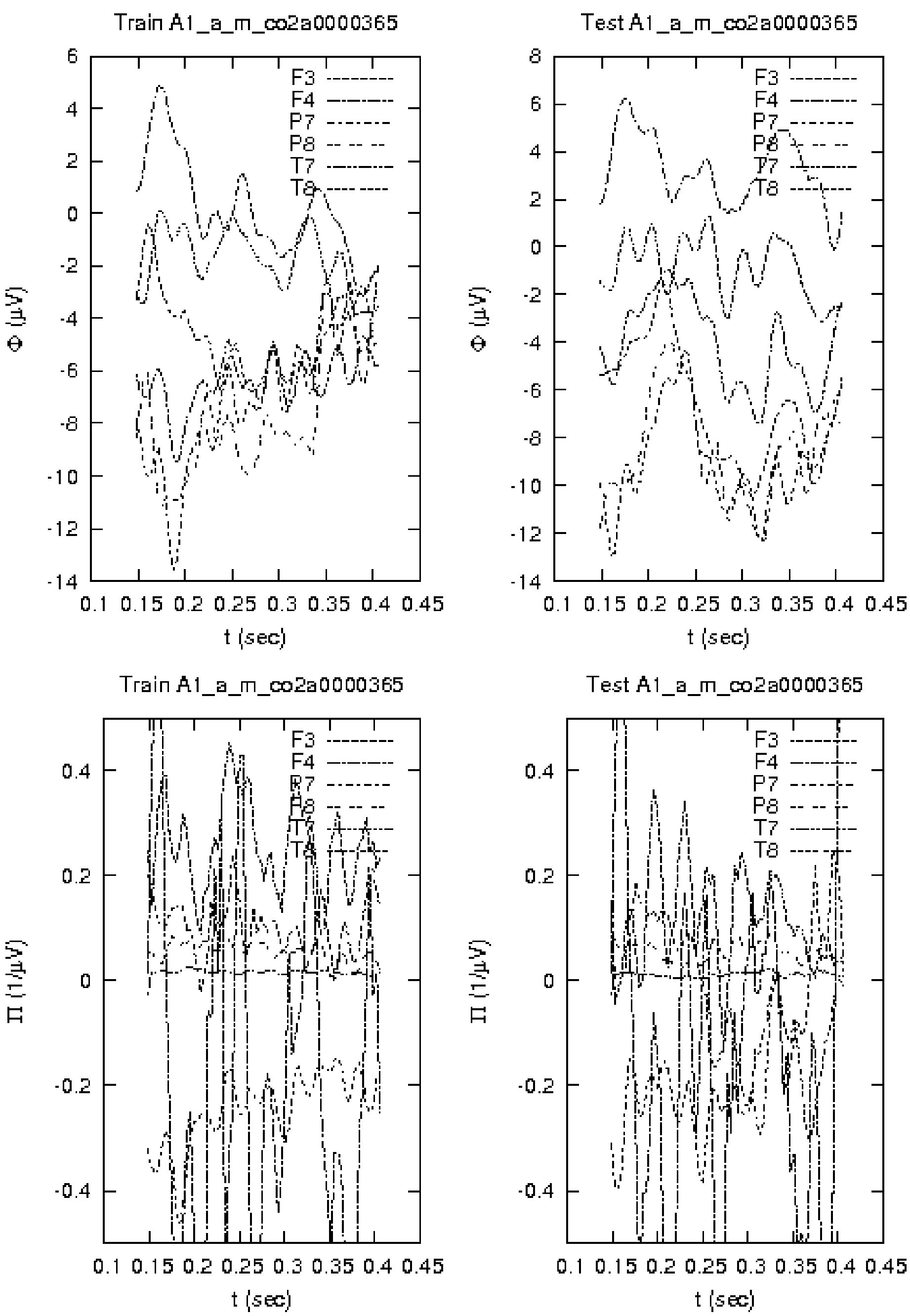
EEG

The Test graph shows an overall shift in positive amplitude of +2 μvolts. Amplitude. All Signals are easily discernible; with pronounced synchronous behavior and symmetry present in Test across all signals and entire epoch. All signals become more clustered as epoch progresses in Train; while in Test not nearly so.

CMI

F4 is most pronounced throughout entire epoch in both plots; exhibiting severe and regular sinusoidal swings in amplitude. The remaining signals are more clustered about origin throughout epoch in Train; with a separation easily visible in Test. F3 and P8 appear to exhibit similar morphology in Test. T8 exhibits increased amplitude in Test.

FIG. 23.



EEG

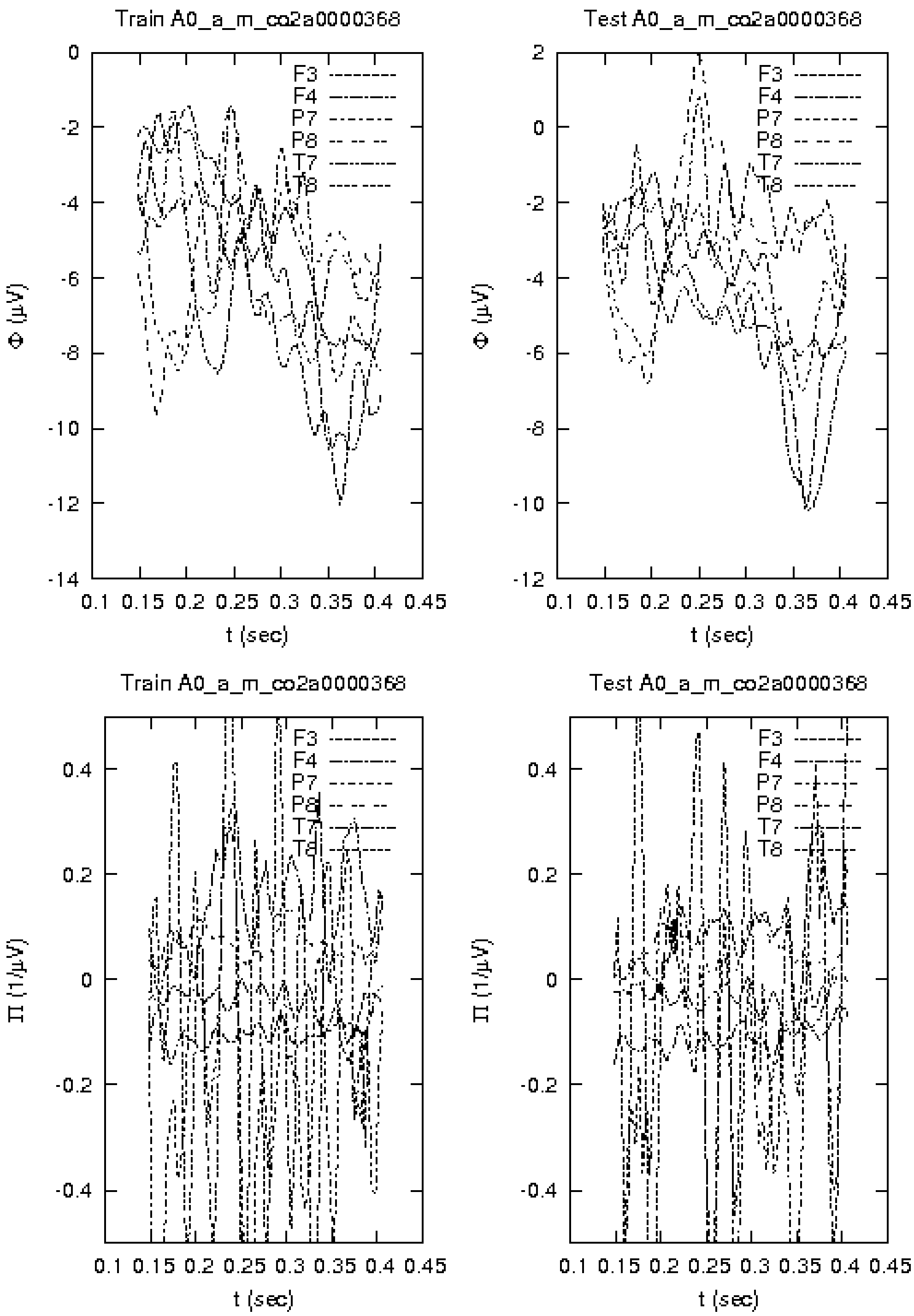
CMI

There are many different morphologies present across both plots. Easily discernible is the almost flat waveform of T7. F4 continues to exhibit severe amplitude but with somewhat regular sinusoidal peaks and troughs. Remaining waveforms are also fairly regular and sinusoidal.

FIG. 24.

A0 vs. A1

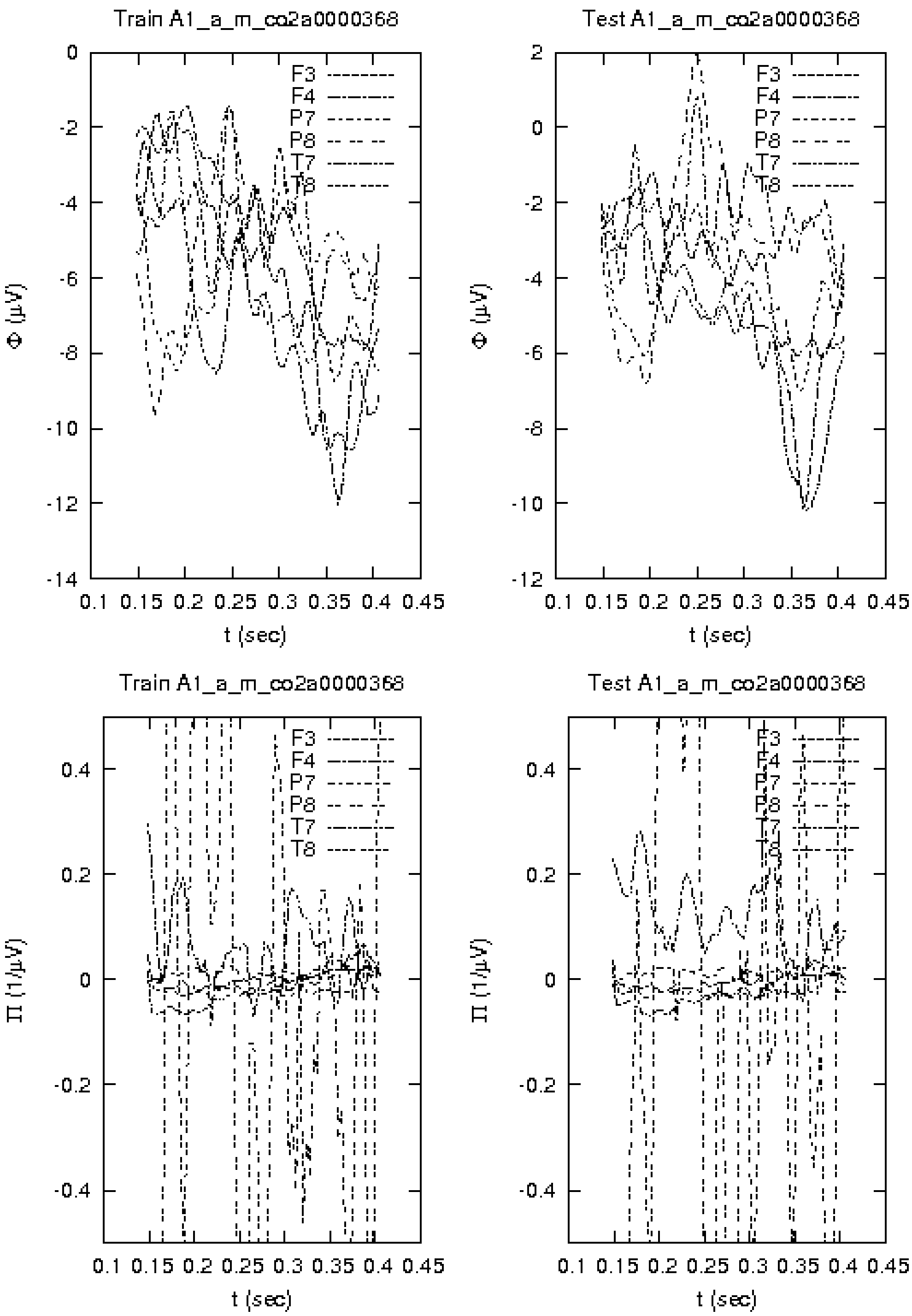
After applying **A**, F4 seems unaffected; however, remaining waves exhibit separation and are individually discernible; with moderately less noise. Of significance is the appearance of an almost flat wave; T7; as previously mentioned. In short, **A** seems to have a calming effect on all signals except F4.



EEG
Both graphs show a moderately decreasing trend (more accentuated in Train). Amplitude ranges are almost equal. Train has the lowest negative peak, while Test has the two highest positive peaks (a complex of two peaks located at t=0.25). A complex with negative amplitude appears for both signals at about t=0.15.

CMI
Both graphs show a central body of compact waveforms around the horizonal axis at y=0, and a little group of highly oscillating signals. The compact waves have a wider range of amplitudes in Train. The oscillations in the lower graph are more frequent in Train, while in the upper part they have the same density. In Test there's a gap in lower peaks at about t=0.2. Train shows a slightly decreasing trend, while Test is a bit increasing, as can be observed in the right side of the graph.

FIG. 25.

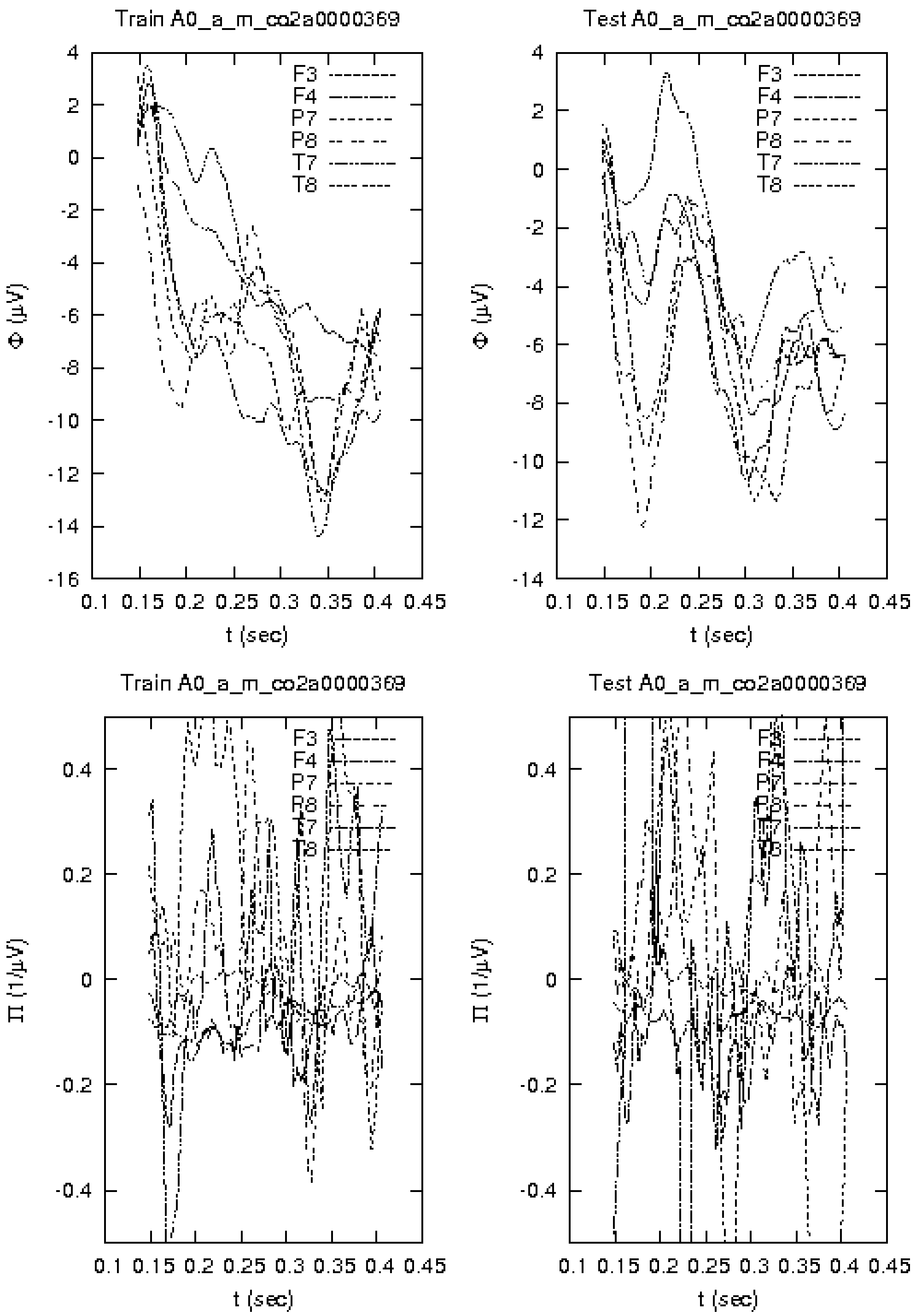


CMI
Train and Test show a central body of waveforms around the y=0 axis, and a group of oscillating signals which exceed the box limits. The high oscillations are not uniformely distributed all over the t axis, in both graphs. The central waveforms have the higher part more pronunciated, while while the lower part keeps near the central axis. In Train the central signals are a little less pronunciated and have a stable trend, while in Test they are higher but appear decreasing.

FIG. 26.

A0 vs. A1

The application of **A** in Train makes the central group of waves more clean and compact, but with more structure for A1(In A0 the central waves have higher amplitudes but look all similar). The oscillating signals also appear reduced in their number and less noisy.
In Test, A0 and A1 appear similar for the distribution of high oscillations, since in both can be noticed a gap for t in [0.2, 0.25]. The central waves appear more compact and less noisy in A1.



EEG
Both Train and Test show a decreasing trend and a sinusoidal behaviour. The former aspect is stronger in Train, while the latter is less pronuciated in its envelop of signals. In Test the sinusoidal behaviour is more remarkable, which is a symptom of greater synchrony through most of its signals. Train has a slightly wider amplitude range, with a negative peak outstanding Test's lower bound of 2μV.

CMI
Both Train and Test have many more peaks in the upper half of the graph. The silhouettes look quite similar, although Train appears emptier in its lower right region: Test peaks are more pronunciated and often exceed the graph lower bound. Both graphs show a constant trend and seem to have an equivalent level of noise.

FIG. 27.

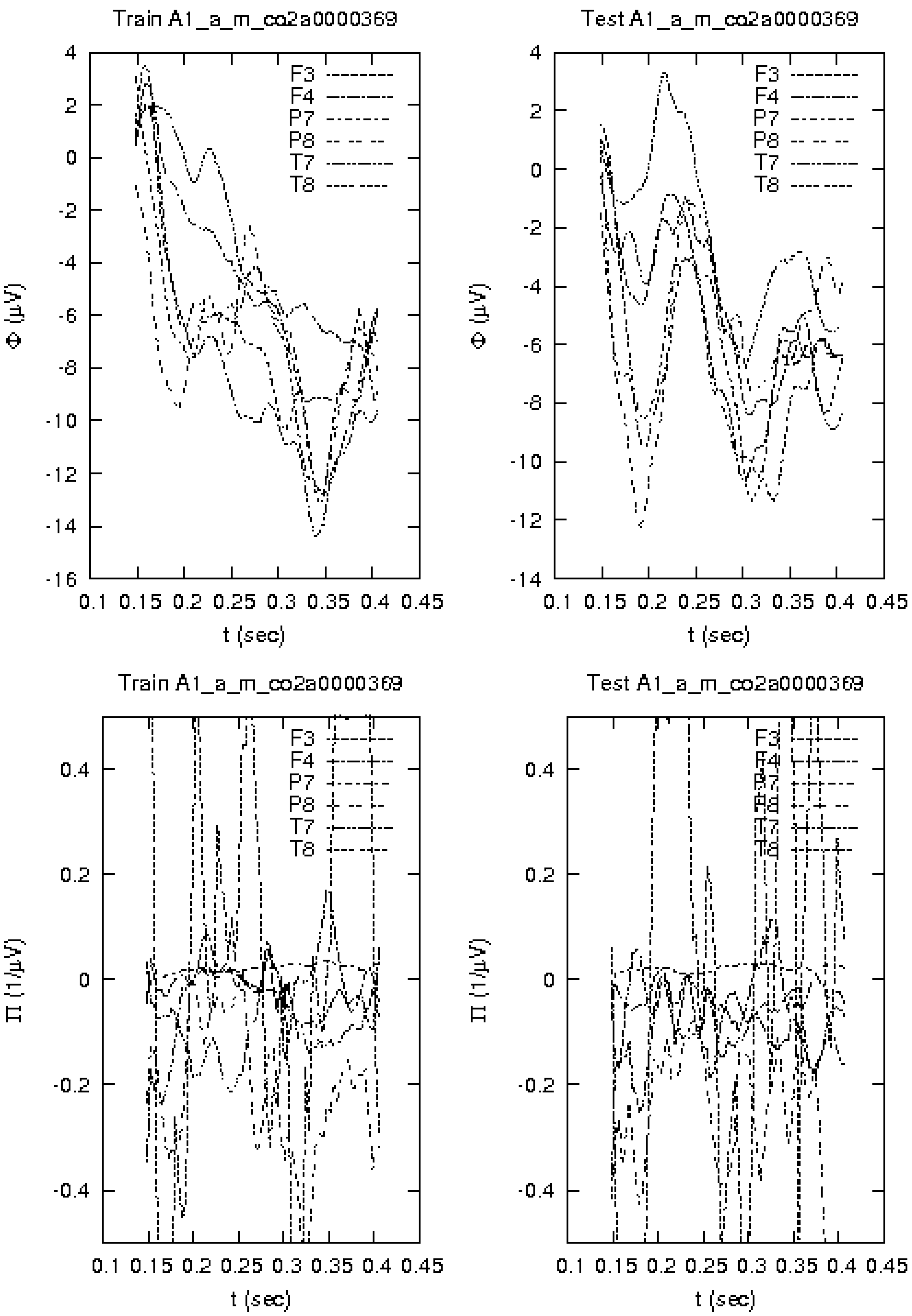


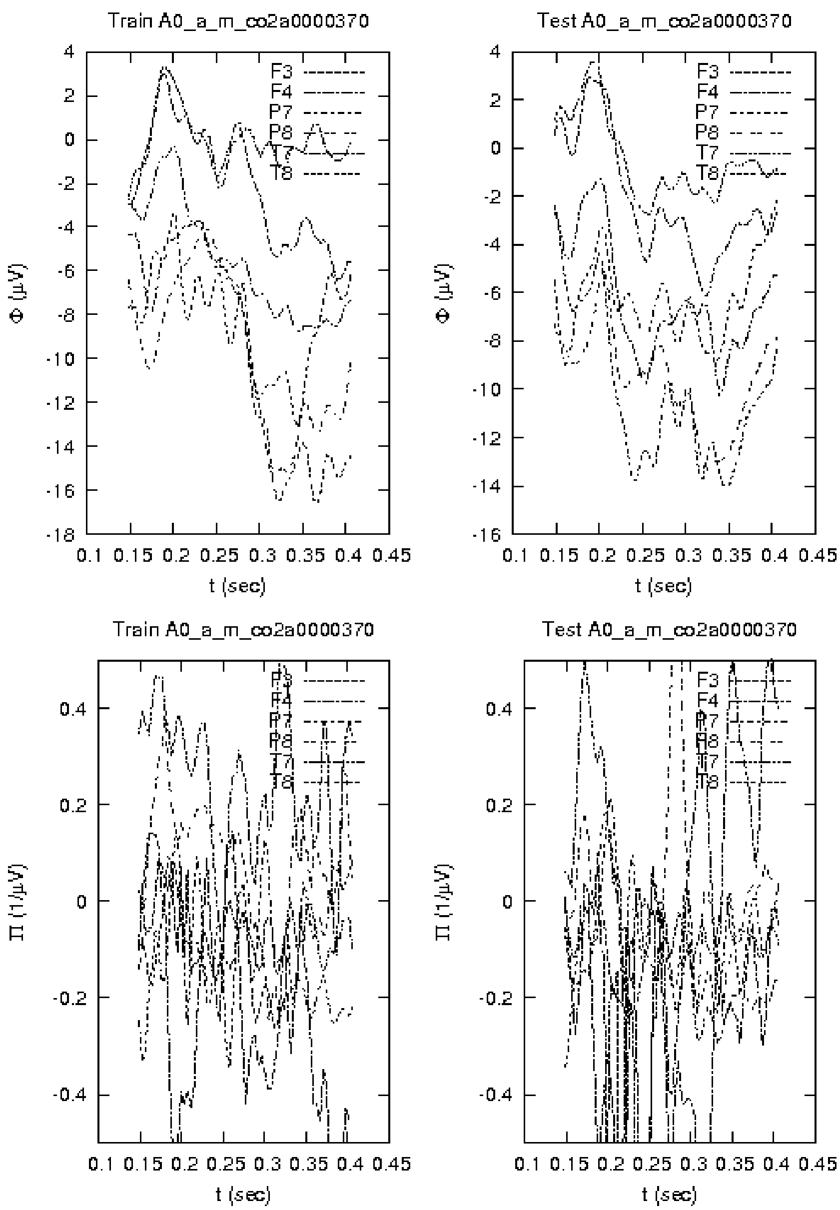
FIG. 28.

CMI

Train and Test show groups of peaks under and over the horizontal axis at y=0. Both show an empty gap in the lower region in the time range [0.2, 0.27], and another in the upper region in [0.27, 0.33]. Test has a slightly larger number of peaks; it has more intense oscillations in the last segment of the time range. Train shows a region of intense signal crossing at y=0 and t=0.3.

A0 vs. A1

In Train, the application of **A** seems to bring an intense part of the oscillation from the upper half of the graph to the lower one just as a sort of inversion of sign. The same result happens in Test. In the A1 version, both Train and Test look very similar in noisiness and overall silhouettes.



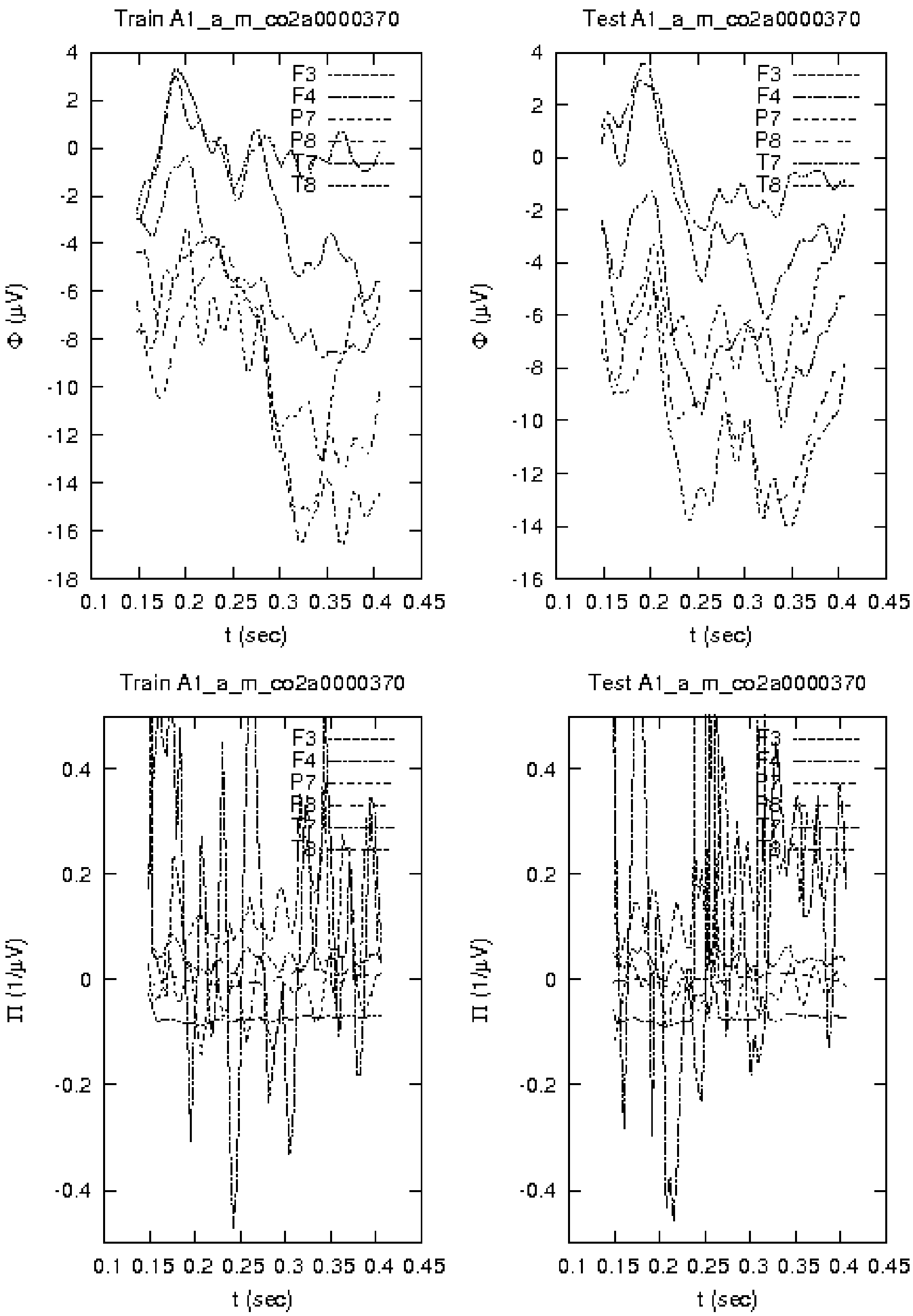
EEG

The Test graph shows an overall reduction in negative amplitude of 2 μvolts. Loosely complex and symmetrical waves are apparent in Test of all signals. This behavior is present in Train, but less so. Both plots show a marked symmetry present in all signals.

CMI

Increased amplitude in T7 in Test at beginning and end of sample; decreased amplitude of same signal in middle of sample. A prominent positive transient spike in P8 at approx. t=.26 introduced in Test. Additional further negative increase in amplitude of F4 in Test. There is a general increase in noise in the negative μvoltages present in Test; with a noticeable decrease in μvolts of the grouped signals around the origin of the μV axis.

FIG. 29.



EEG

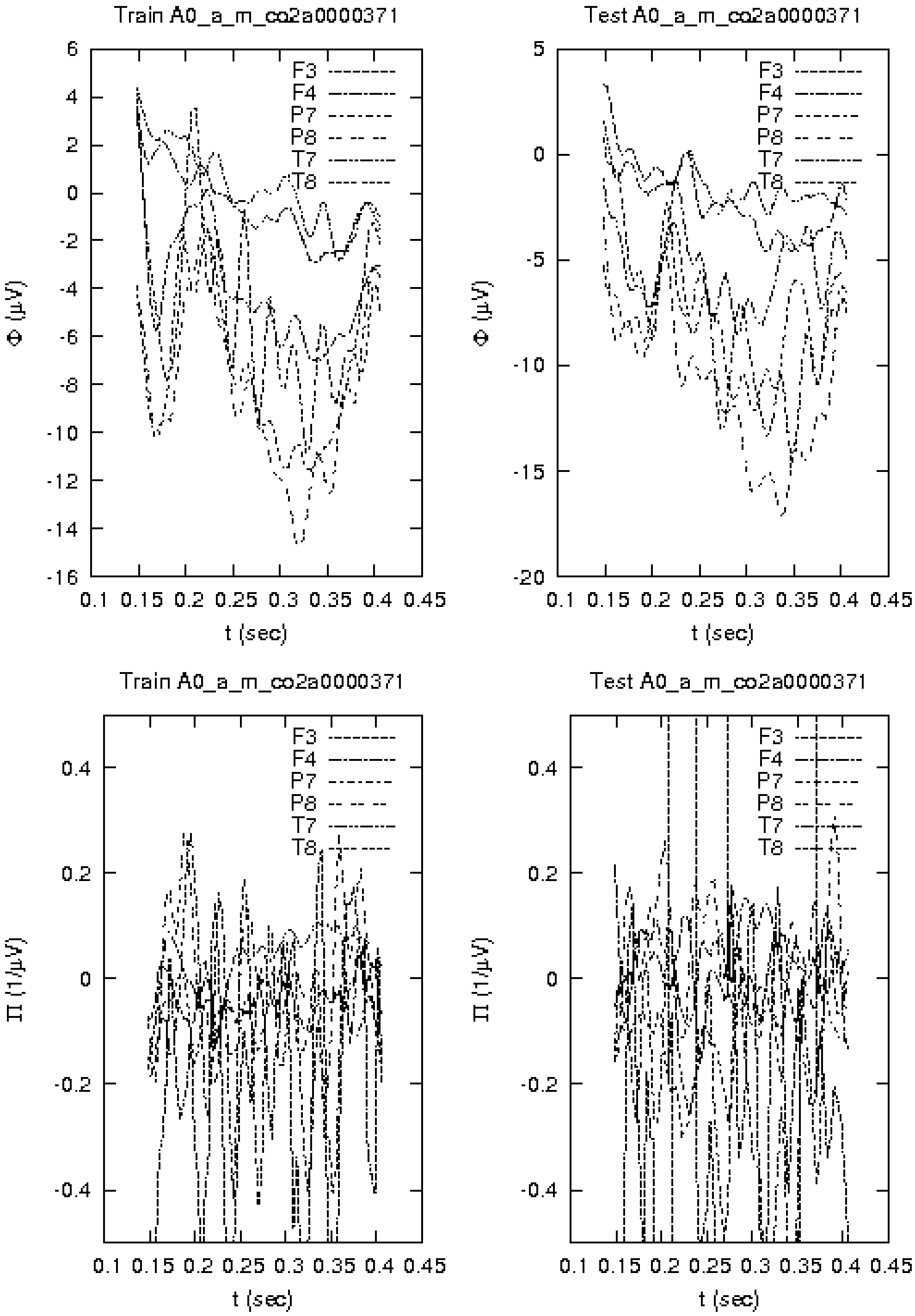
CMI

There is a pronounced separation of signals in both plots; with 4 waves being quite calm and near the origin of x-axis across entire sample. F4 shows strong sinusoidal amplitude across entire range. There is a transient introduced in F3 in Test at around t=.25. Finally, there is increased 1/μV noticeable in Test during last third of sample in two wave forms; with the cluster of 4 waves undisturbed.

FIG. 30.

A0 vs. A1

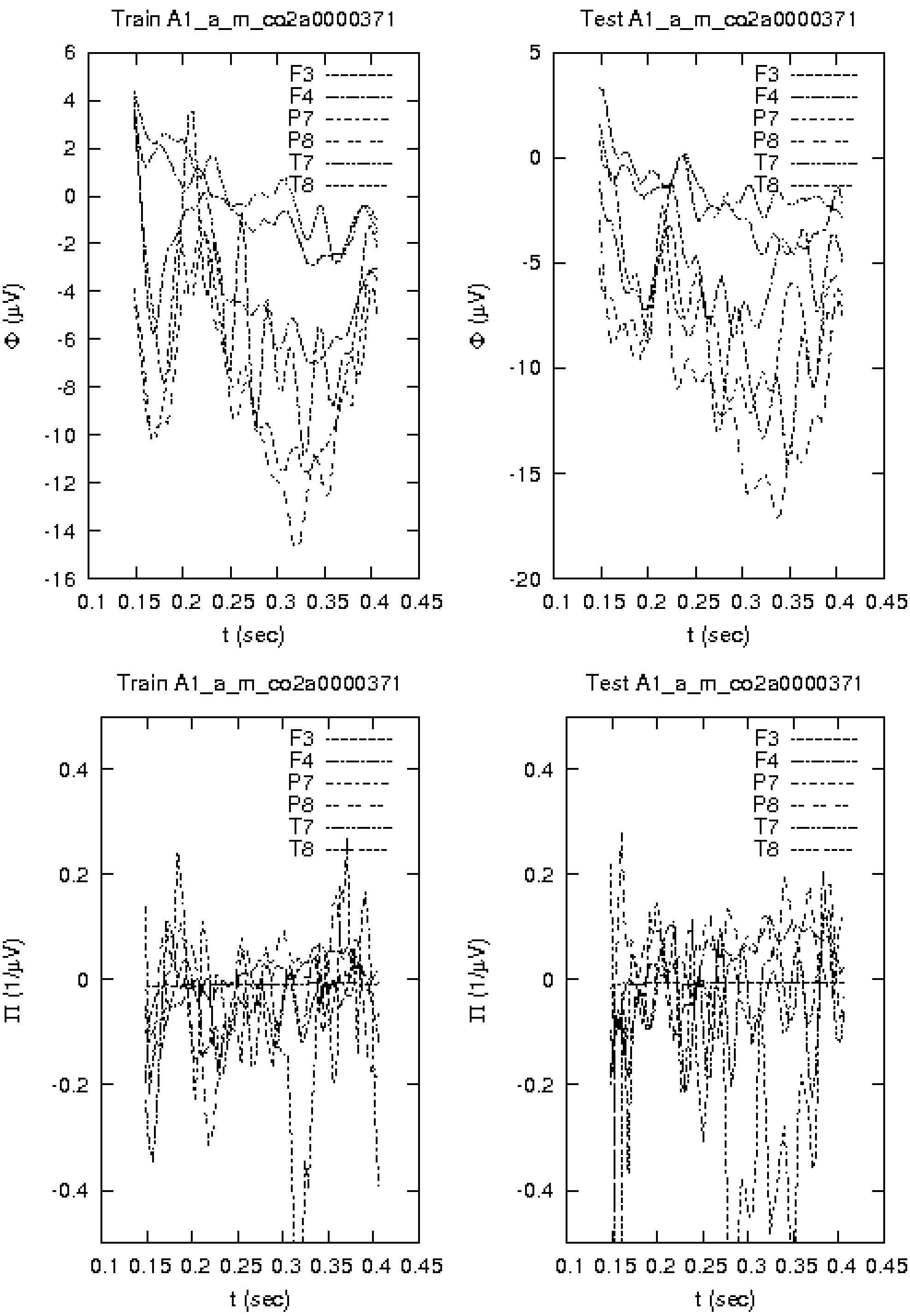
There exists a profound difference in the separation of signals after applying **A.** F4 has by far the most amplitude; and exhibits strong sinusoidal swings. There is also a very noticeable grouping of 4 sinusoidal waves about the x-axis with similar frequencies and amplitudes; differing only in level of μvolts to each other; also introduced after applying **A.**



EEG
Train and Test have similar overall amplitude ranges. Train amplitudes appear to compress inside a strict range around t=0.23. Both in Train and Test there are three couples of signals which show symmetry. These signals are cleaner in Train and more overlapping in Test.

CMI
Both in Train and Test, the higher part of the graph is more limited in absolute value. The peaks of the lower part often exceed the graph range limits. Peaks in Test are more separated and distinguishable. Both signals remain constant in average value. Train has more density of waves around the central horizontal axis, while in Test they lay slightly scattered around the central zone. Train shows a cleaner structure, while Tests appears slightly more noisy.

FIG. 31.



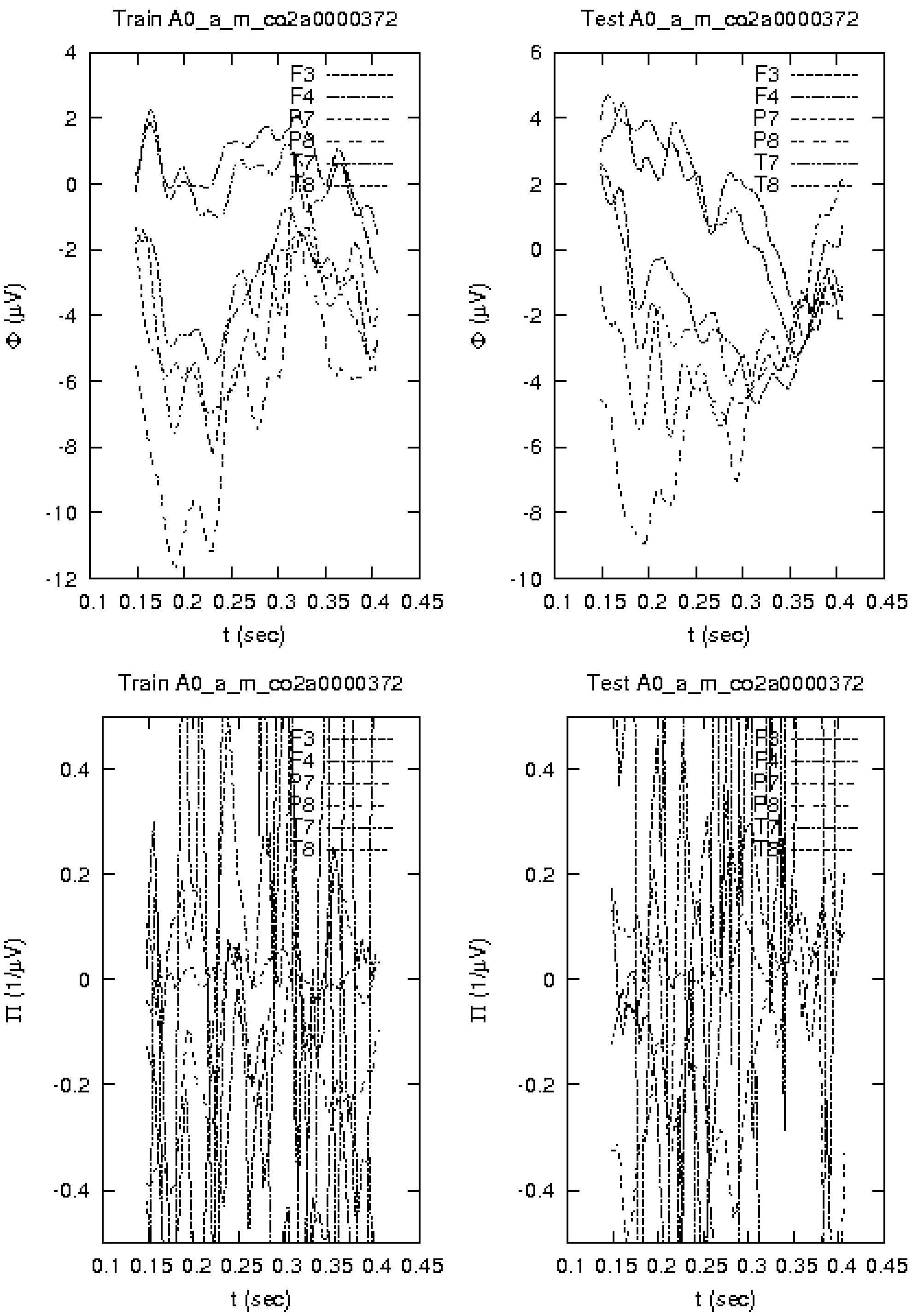
CMI

Train shows more compact signals; in the upper part of the graphs it has clearer peaks standing over lesser waves. Also in the lower part, it has few well defined peaks standing toward the negative direction. Test has a wider range of amplitudes, and some widespread groups of peaks. Traces of wave superposition around the central axis. Both in Train and Test, at t=0.18 the wavegroups compress near amplitude = 0. Trend is constant.

FIG. 32.

A0 vs. A1

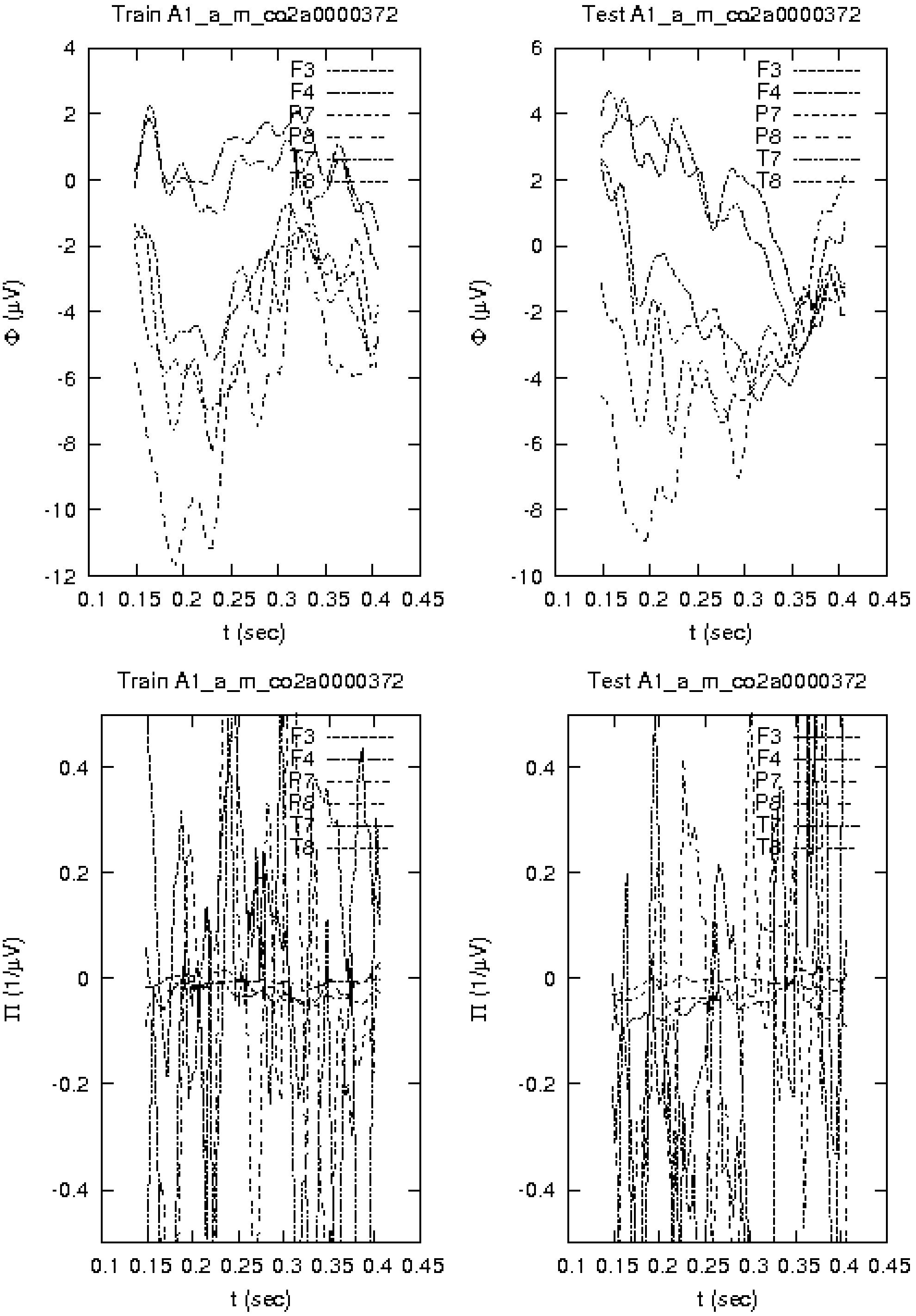
A application makes peaks appear more differentiated in amplitude values, and also more unique and isolated.



EEG
Test amplitude range appears shifted of +2μV from Train. Both graphs show a transient of twho isolated signals which stand upon the others for the entire time range. The remaining signals have a slightly increasing trend for Train as well as for Test, with waveforms aggregating and gaining synchrony at the end of the time range, especially for Test.

CMI
Train and Test show very intense oscillations, with a synchronic character in Train and a more noisy aspect in Test. Amplitude ranges are equiparable, with both graphs having their bounding box exceeded by the respective signals. Test has some evident peak gaps in the last part of the time range, both over and under the horizontal y=0 axis.

FIG. 33.

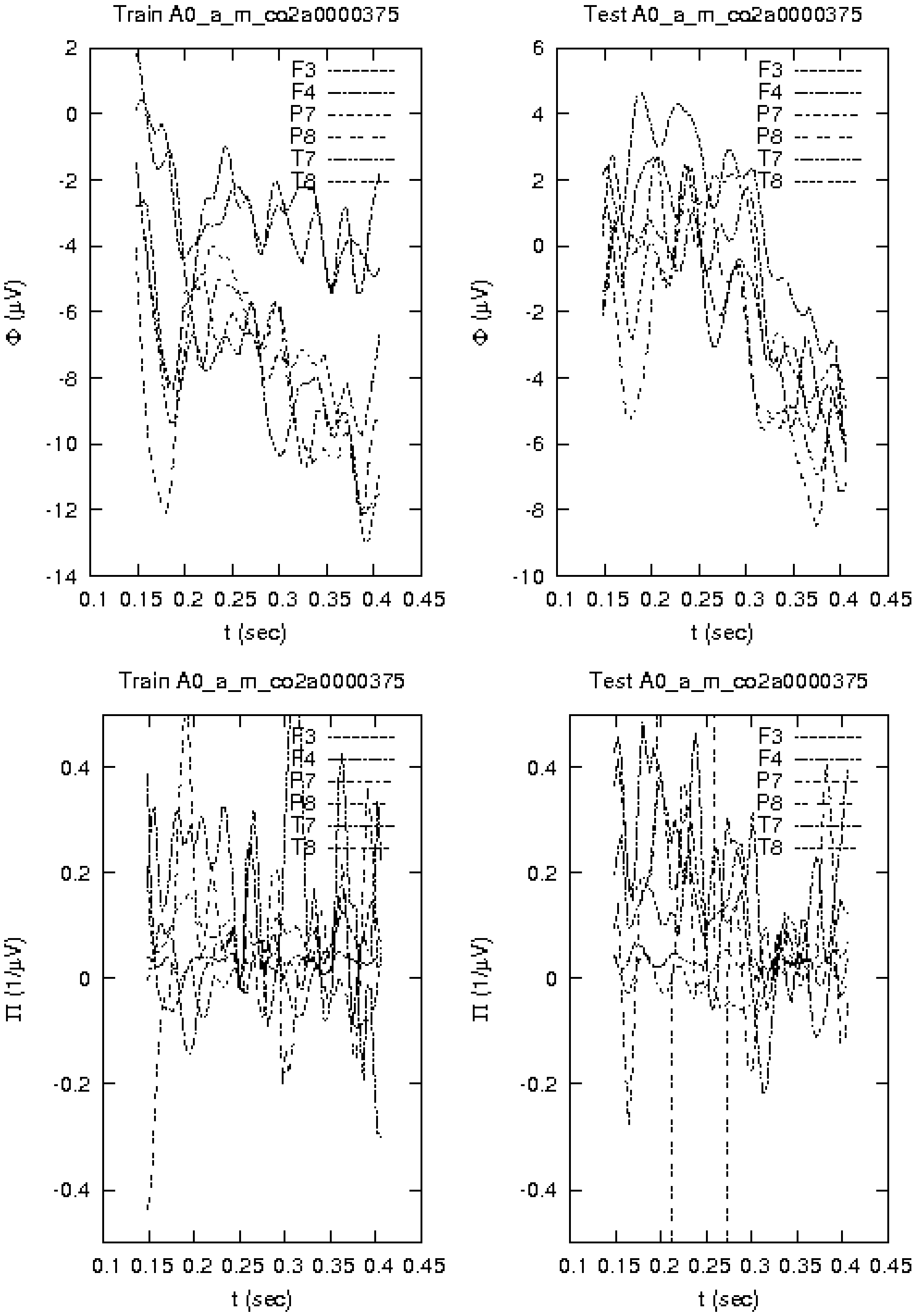


CMI
Train and Test have very steep oscillations. Train shows some peak gaps in the upper left and in the middle center region of the graph; while Test has only one relevant peak gap in the central upper region. Train presents more diffuse superposition signs, while in test they are mostly located in the left lower part of the figure. Amplitude ranges are similar, and both graphs see their bounding boxes limits exceeded.

FIG. 34.

A0 vs. A1

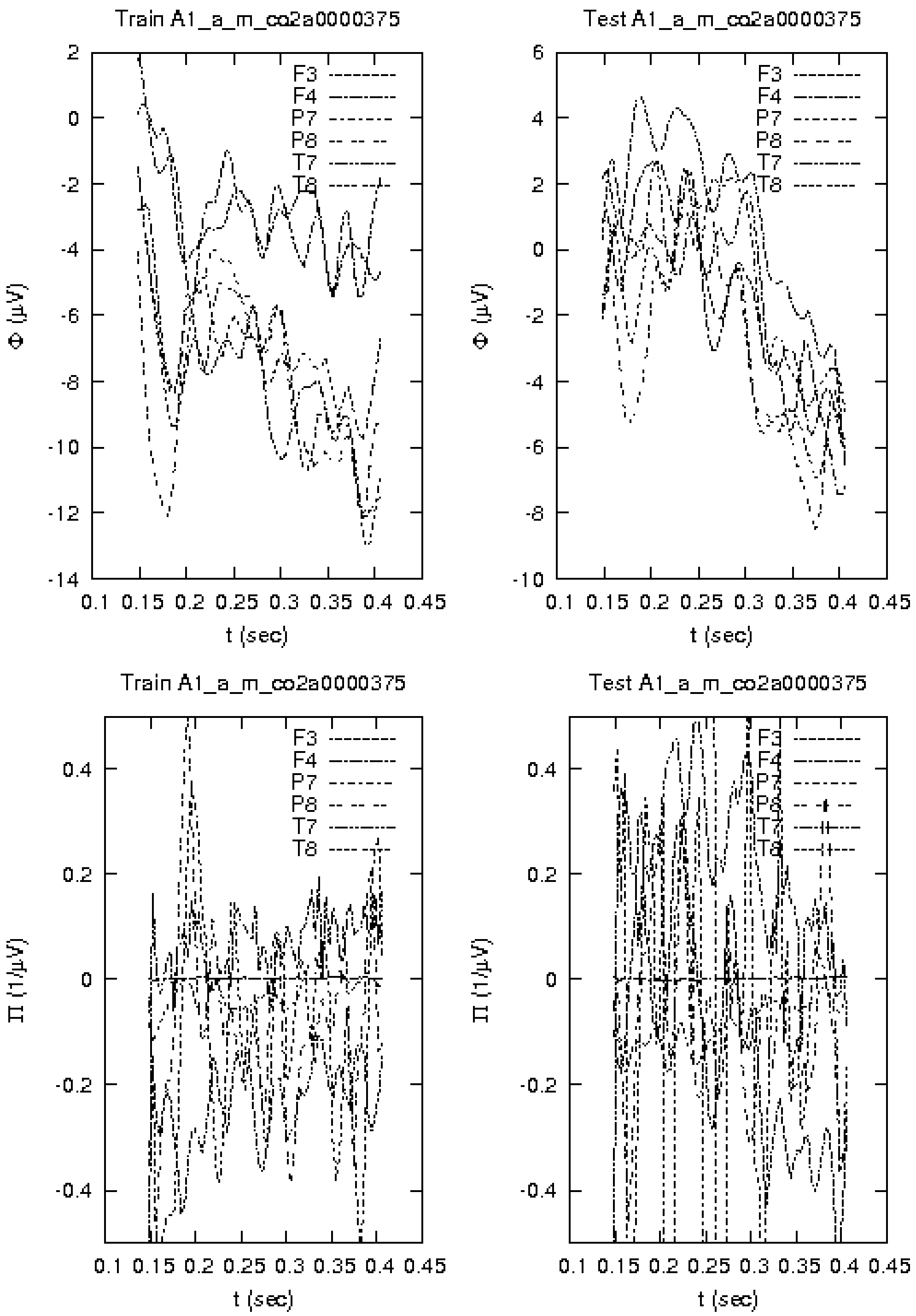
The A1 version of Train looks somehow more compacted and disciplinated; while the A1 version of Test maintains a strongly oscillating and noisy character, although oscillations are reduced in number. In both graphs, after the application of A a couple of almost flat signals appear around the horizontal y=0 axis.



EEG
Train has most of its signals inside of a nearly sinusoidal envelop with decreasing trend. A transient of two signals detaches after t=0.2 and remains higher than the other waves. In the initial part of the time range, until t=0.2, there 's high synchrony in most of the remaining signals. Test has a less widespread distribution of waveforms, which appears shifted upwards of 4μV and no transients. Peaks are gentle and not very pronunciated; it overall looks a bit more synchronic than Train.

CMI
Both Train and Test have sharp peaks, mostly in the upper half of the graph; and each one shows less activity in the time range [0.33, 0.36]. Test peaks are a bit higher, also negative ones, but Train has a more intense positive peak around t=0.31, which even exceeds the bounding box's upper limit. Signals for both graphs have a number of crossings, causing the pictures to look a bit noisy, although without very strong oscillations. Trend is constant in each graph.

FIG. 35.

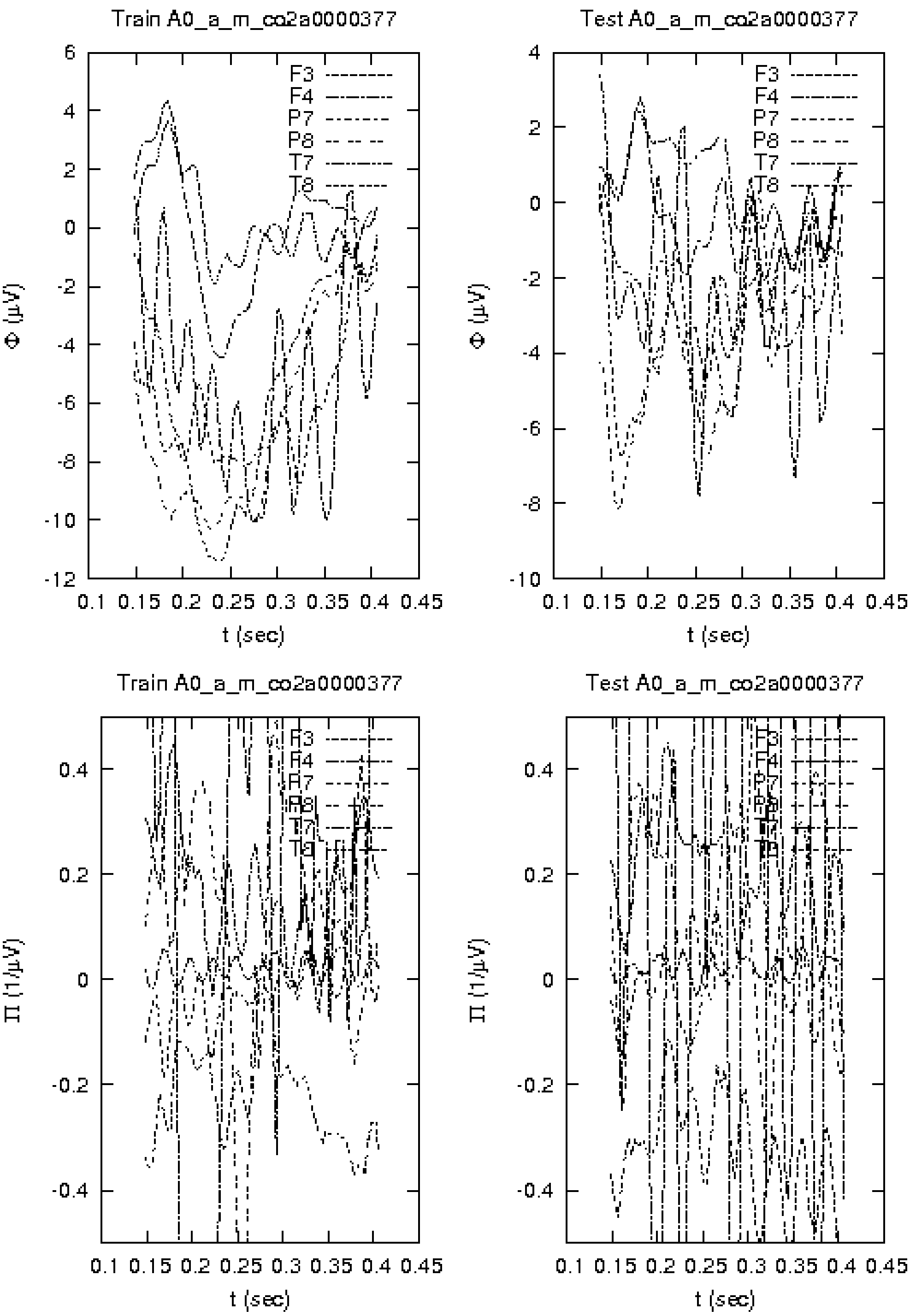


CMI
Train has its highest peaks above the horizontal y=0 axis, while positive ones are rather limited in amplitude, apart from a very high positive spike for t=0.18. Train has an overall constant trend. On the other hand, Test has a decreasing trend, with most of its activity in high positive amplitudes, for the first half of the time range, going down to negative waveforms in the last interval. Test has more complicated crossings and appears noisier.

FIG. 36.

A0 vs. A1

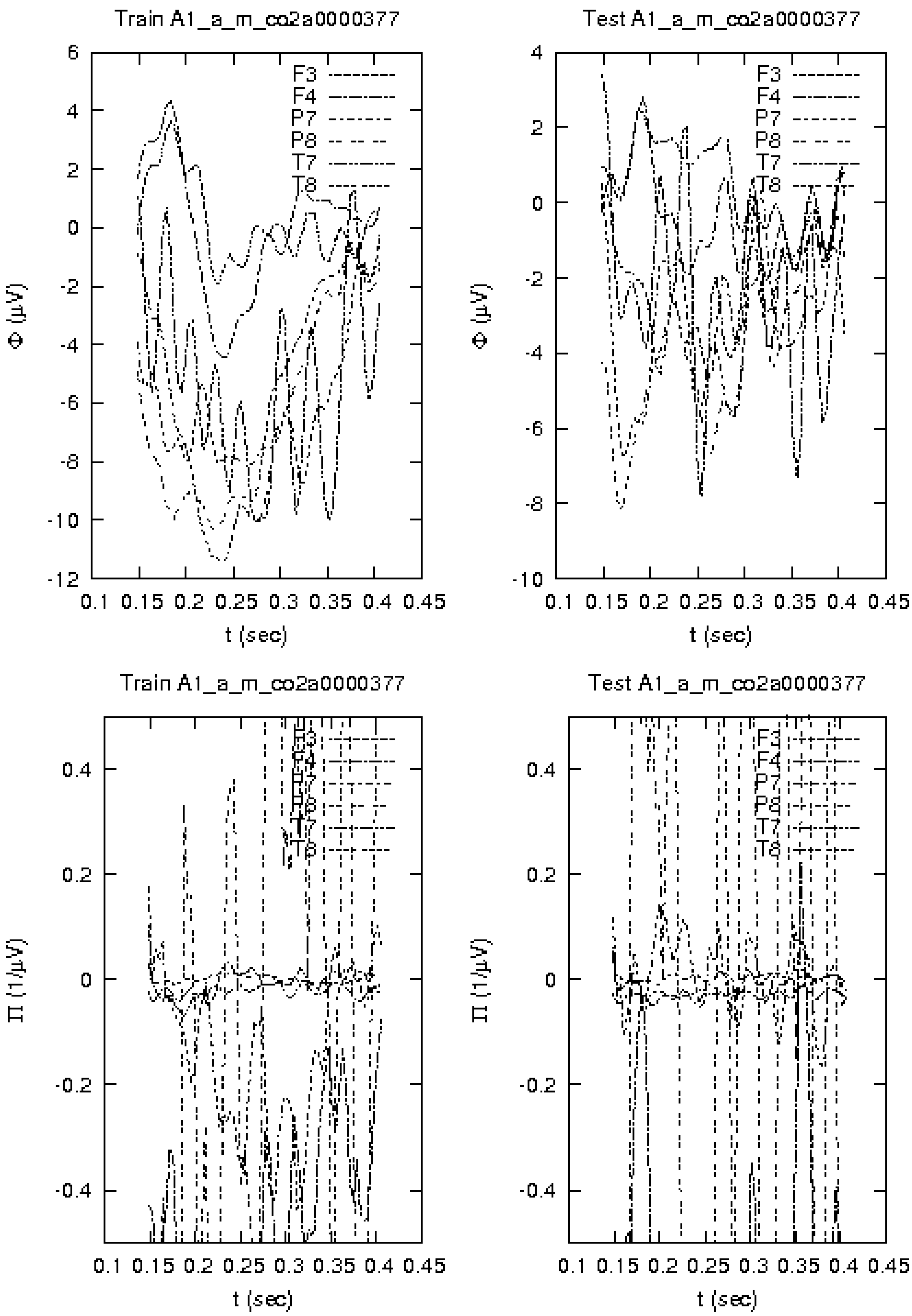
A application to Train inverts the occupation of amplitudes, switching them from mainly positive to mostly negative in the A1 version. Test doesn't show this inversion in the first half of the time range, maintaining its highest peaks with positive amplitudes; it has instead change of sign (to negative) and amplification in the second half of the temporal axis, with a more structured activity made of sharp and intense negative peaks.



EEG
Train's signals appear to obey synchronically (although with few superpositions) to a great sinusoidal envelop, centered around the y=-3 horizontal axis. The envelop has a first positive peak around t=0.17, and a lower peak at t=0.24. Peaks in this graph are quite smooth. Test shows a constant trend with evidence of symmetry between some couples of its signals. In the latest part of the time range, after t=0.37, the signals become more compact around a single sinusoidal pattern.

CMI
Train overall silhouette can be split into two main phases of the tame range: before t=0.3, there are different waveforms spread all over the amplitude range. After t=0.3, almost all the waveforms compact above the y=0 horizontal axis (except for one with a negative trend), with sharper and symmetrical oscillations. Test looks instead uniform throughout all the time range, with very high oscillations that often exceed the bounding box limits.

FIG. 37.

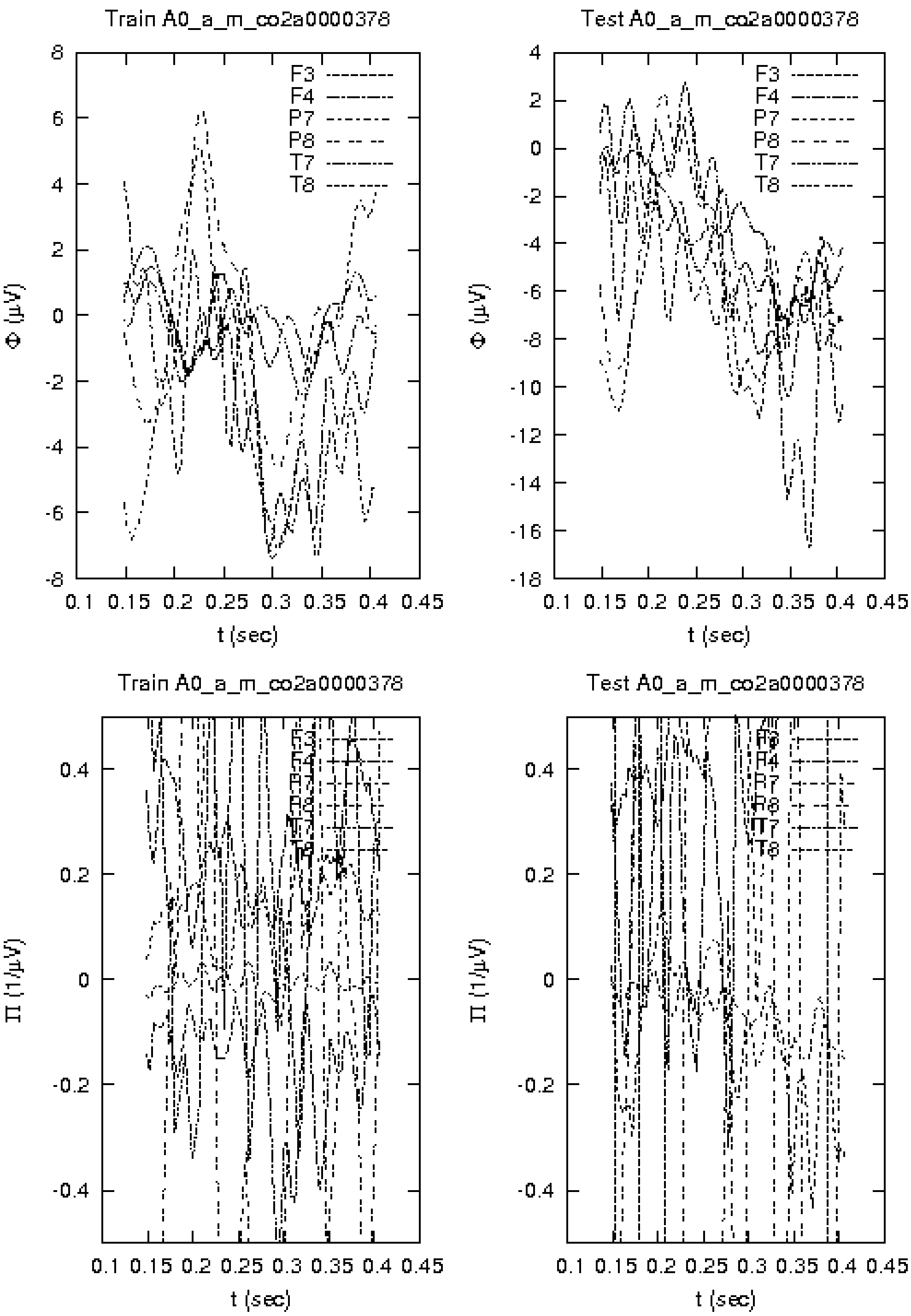


CMI
Train has a group of waveforms which are well compacted around the horizontal y=0 axis. Some of the signals are instead mainly negative with high oscillations. An isolated waveform remains to cover all the amplitude range. Test looks similar to Train, but it hasn't the group of negative oscillating signals, which instead appear all centered around the horizontal y=0 axis. As Train, Test shows the isolated waveform spanning over all the amplitudes. Both graphs have constant trend.

FIG. 38.

A0 vs. A1

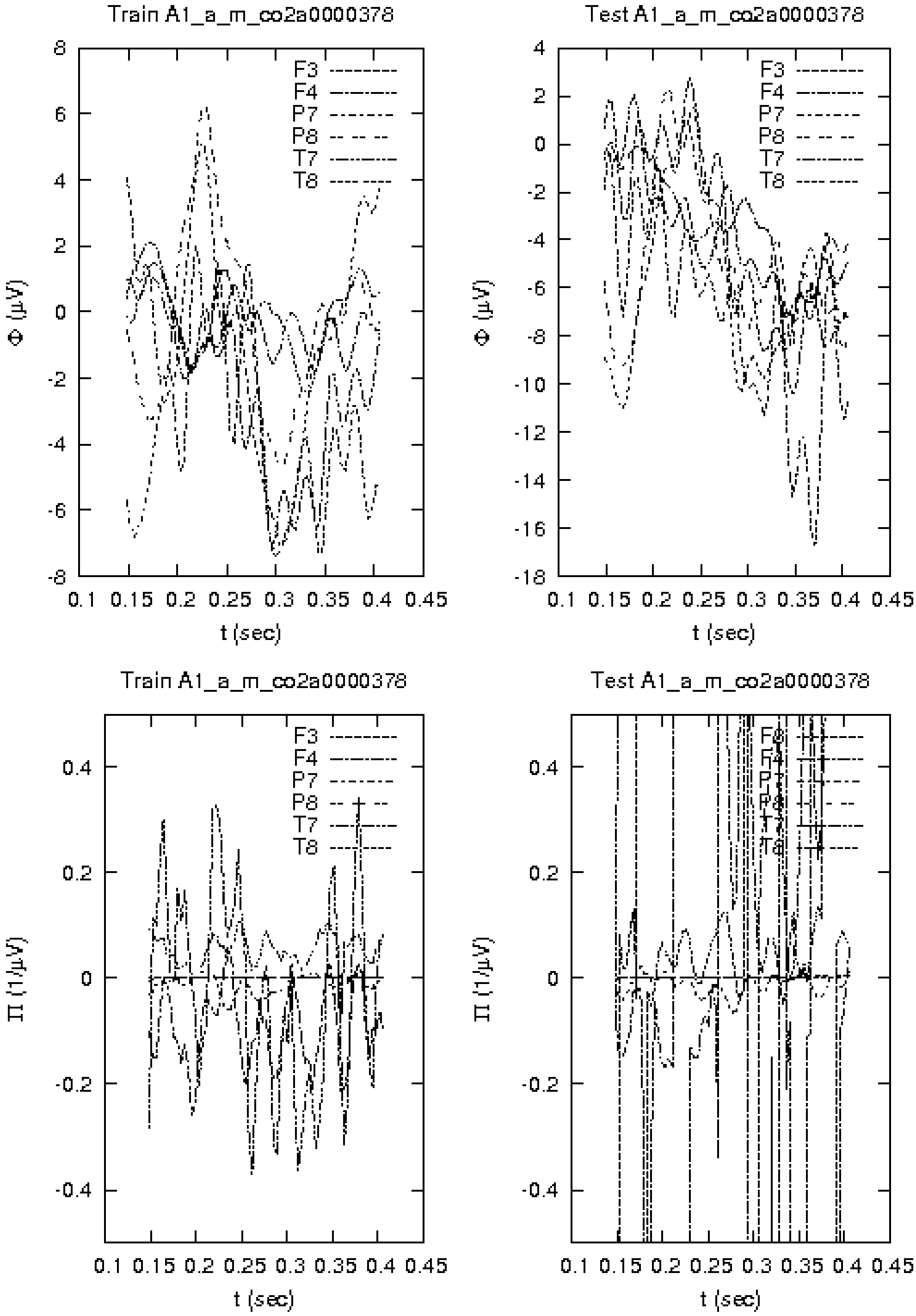
Application of **A** seems to bring many of the waveforms in Train from the upper half of the graph to the lower one (like a sign inversion); some of the signals get instead flatted around the horizontal y=0 axis. Test in the A1 version appears cleaned too from many of its higly oscillating signals, which now are confined again around the central horizontal axis. Test maintains a single highly oscillating waveform.



EEG
Train has alternate phases of positive-negative amplitudes for most of its signals. Its amplitude range is [-6, 6]. At t=0.23 there's a transient of two positive, high signals. For t=0.27 a transient starts of two negative waveforms (reaching -7μV) with increasing trend. Waveforms are quite synchronous, although there are not strong superpositions. Test has a larger amplitude range, [-17, 3], with a decreasing trend and more differentiated waveforms.

CMI
Both graphs have very strong oscillations and sharp peaks, which often exceed the bounding box limits. Train has a greater presence of of positive and negative amplitudes in the middle horizontal band; in Test these central waveforms are less evident. Trend is nearly constant for Train and slightly decreasing for Test.

FIG. 39.



CMI
Train's signals remain well contained in the central horizontal band. They present sharp peaks with varying heights, a zone of positive peak gap for t in [0.25, 0.35]. The waveform features appear well readable and little noisy, and superposition traces are very rare in the figure. For Test, there are instead many peaks exceeding the bounding box limits, and a part of the signals that remains constrained at low amplitudes, for positive and negative values. Anyway, the overall picture appears little noisy.

FIG. 40.

A0 vs. A1

A application seems to cut out most of strong oscillations and peaks in Train. The signals remaining in the mid horizontal band have amplitude reduced and structure simplified. In Test the highest peaks appear almost unaffected by the application of **A**, while the mid band waveforms look smoother and a bit amplified.

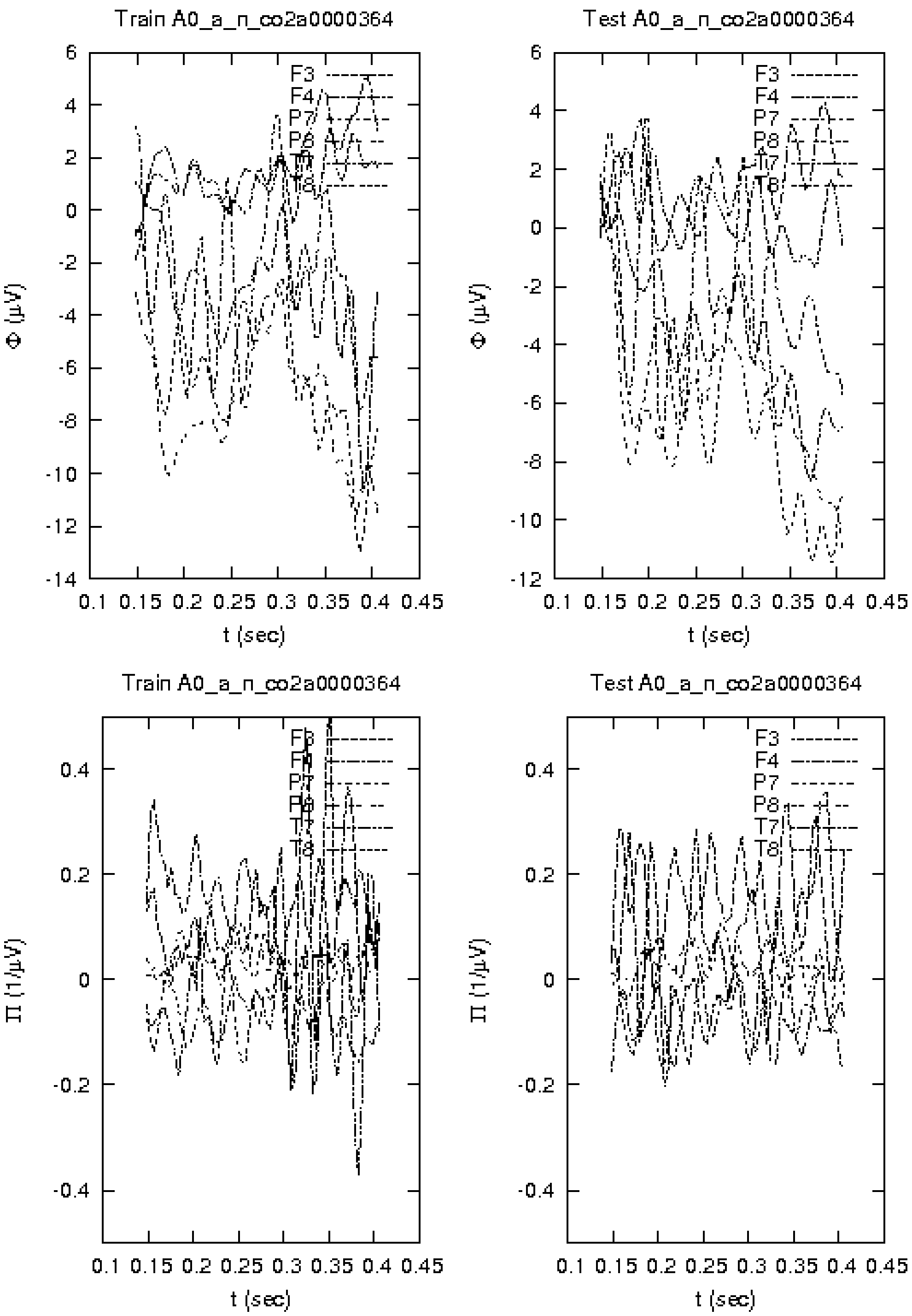


FIG. 41.

EEG

Train's amplitude range is 2μV larger than Test. In both graphs there's a main group of signals, mostly with negative values, envelopped in a rough sinusoid, with negative trend in the second half of the time range; synchrony is low however, as most waveforms have differm and poorly aligned peaks. In both figures there are also a couple of signals separated from the others, due to higher positive values. In Train these signals show positive trend after t=0.3, while in Test they keep nearly constant in average.

CMI

Both figures look centered on the horizontal y=0 axis, each one having the lower half with shorter peaks. Peaks are more regular in Test for amplitude, while they have a slightly more irregular distribution on the t axis. In Train amplitudes tend to vary, but the peak distribution is more regular over t. Train shows two strong peaks (one positive, one negative) in the final part of the time range.

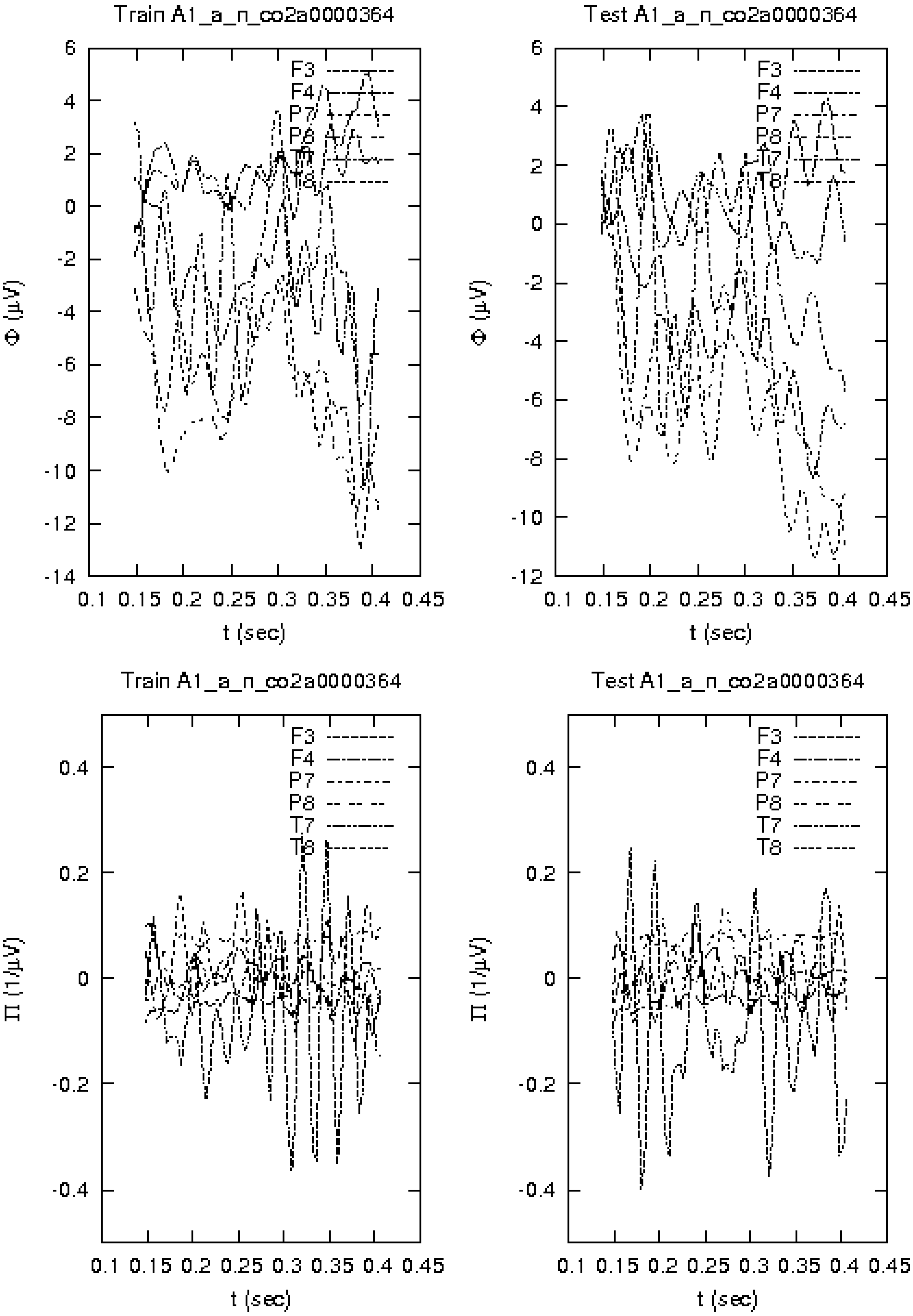
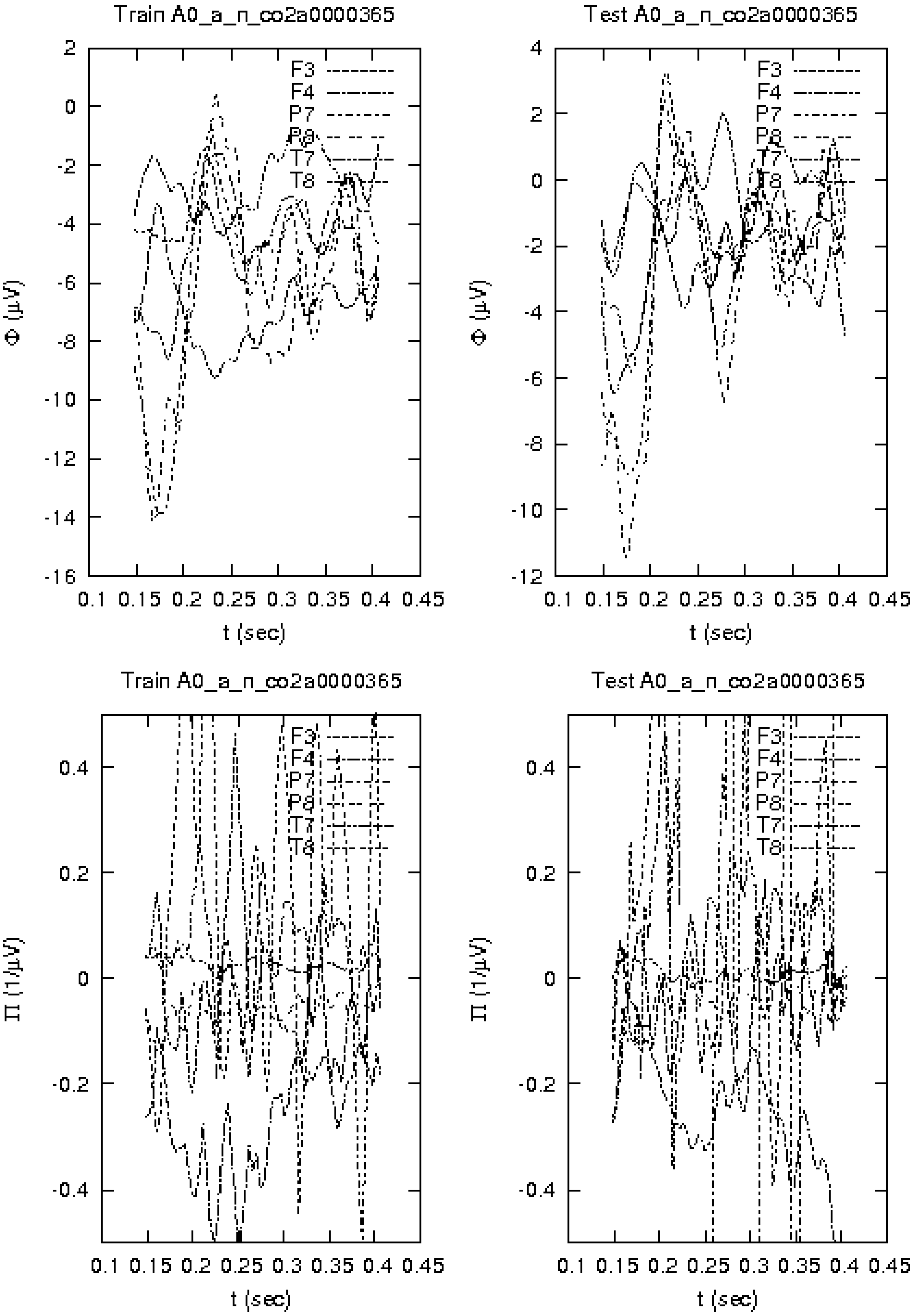


FIG. 42.

CMI
Both Train and Test have higher and better distinguished peaks in the lower half of the graph. The upper part shows for both figures many waveforms, superposing or intersecting. Many of Test's negative peaks form small groups (while in Train they keep more separated). The waveforms near the y=0 axis for Test have less superposition intersections, looking more readable.

A0 vs. A1

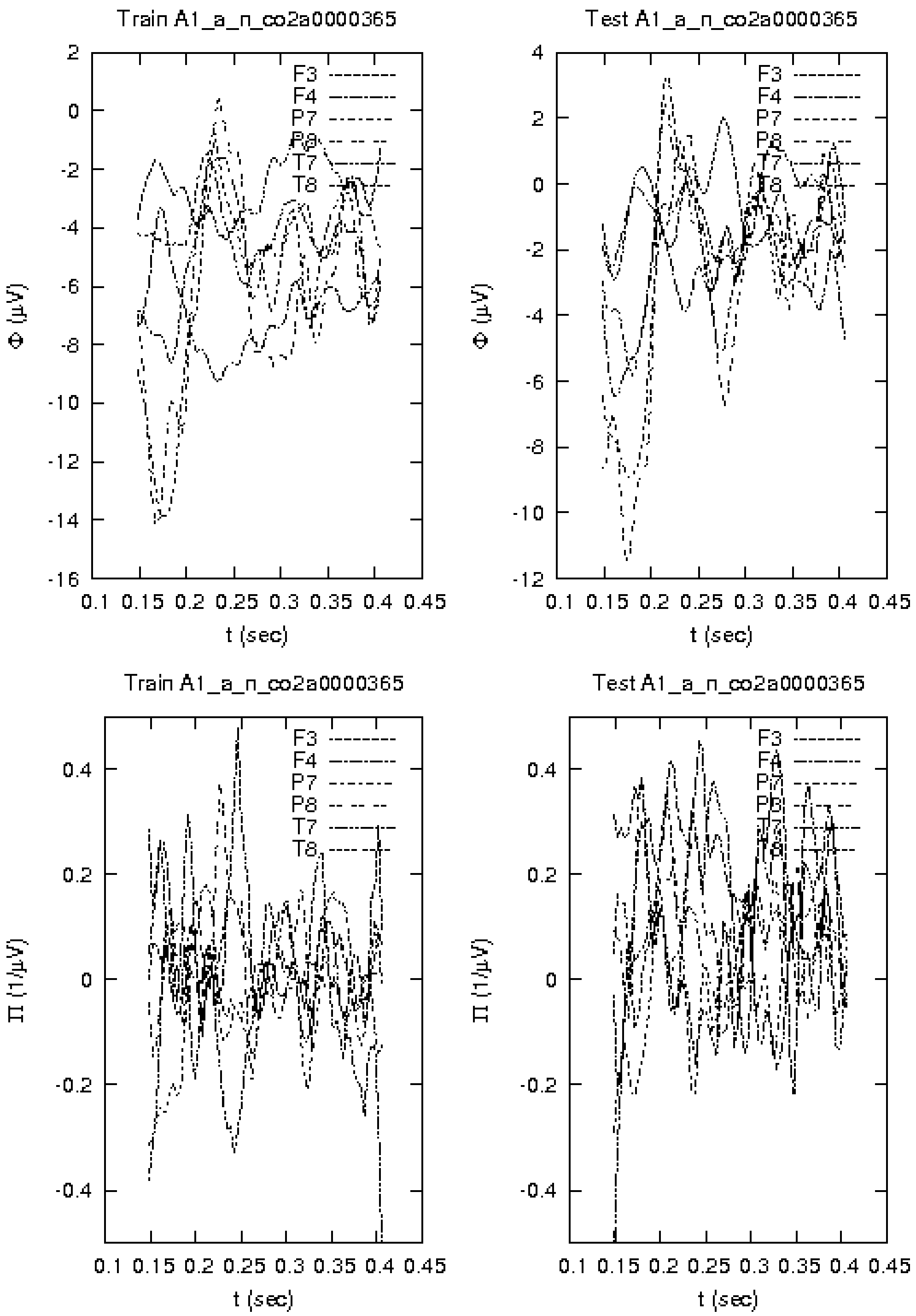
Application of **A** has the effect of inverting the overall silhouettes for both Train and Test, passing to an upper half with lower waveforms and a lower half with more pronunciated peaks. These ones look isolated and more distinguishable, and have greater and more variable amplitudes.



EEG
Both graphs have rather similar silhouettes, since their amplitude ranges tend to shrink as time increases, and they have a slightly increasing trend. Train and Test also show synchrony around a sinusoid in the first half of the time range, but Test appear definitely more compact and with more superpositions and symmetry. The amplitude ranges have similar extension, but in Test are shifted upwards of 2µv.

CMI
Also CMI graphs show similar overall figures: in the upper half of the graph, a highly peaked group of waves. An almost constant waveform on the y=0 axis. A lower group of signals, not as peaked as on top, but with an ascending trait around the middle of the time range. Test appears with a slightly increasing trend (apart from an isolated signals which falls down at the end of time range). Test also looks more intense and noisy around the y=0 axis.

FIG. 43.

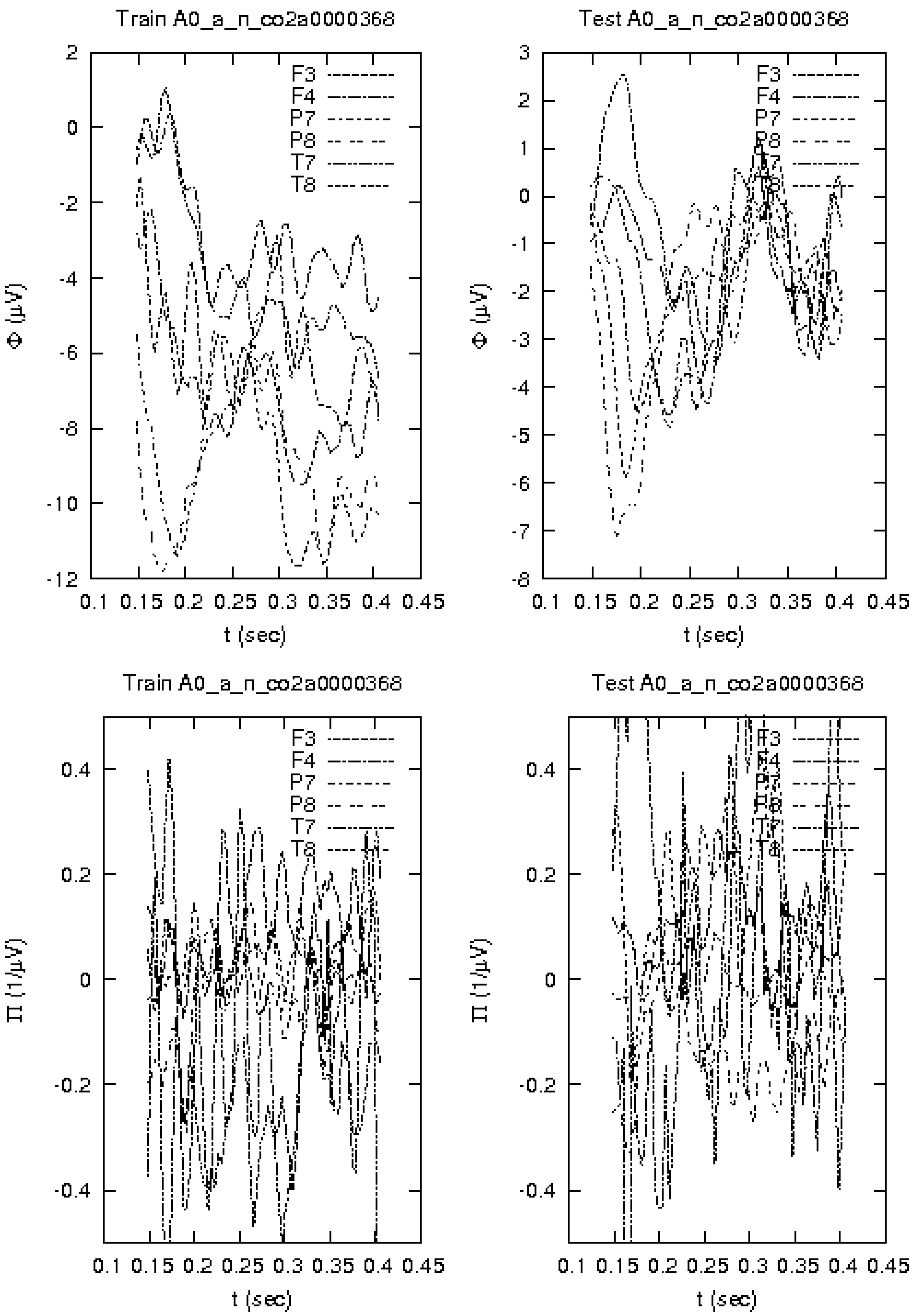


CMI
Train and Test have compact and similar silhouettes, almost without peaks exceeding the bounding box. The amplitude ranges are similar, but Test appears shifted upwards of 0.1. Train shows more sinusoidal forms, with a lot of superposition around the y=0 axis. Both seem to have a constant trend.

FIG. 44.

A0 vs. A1

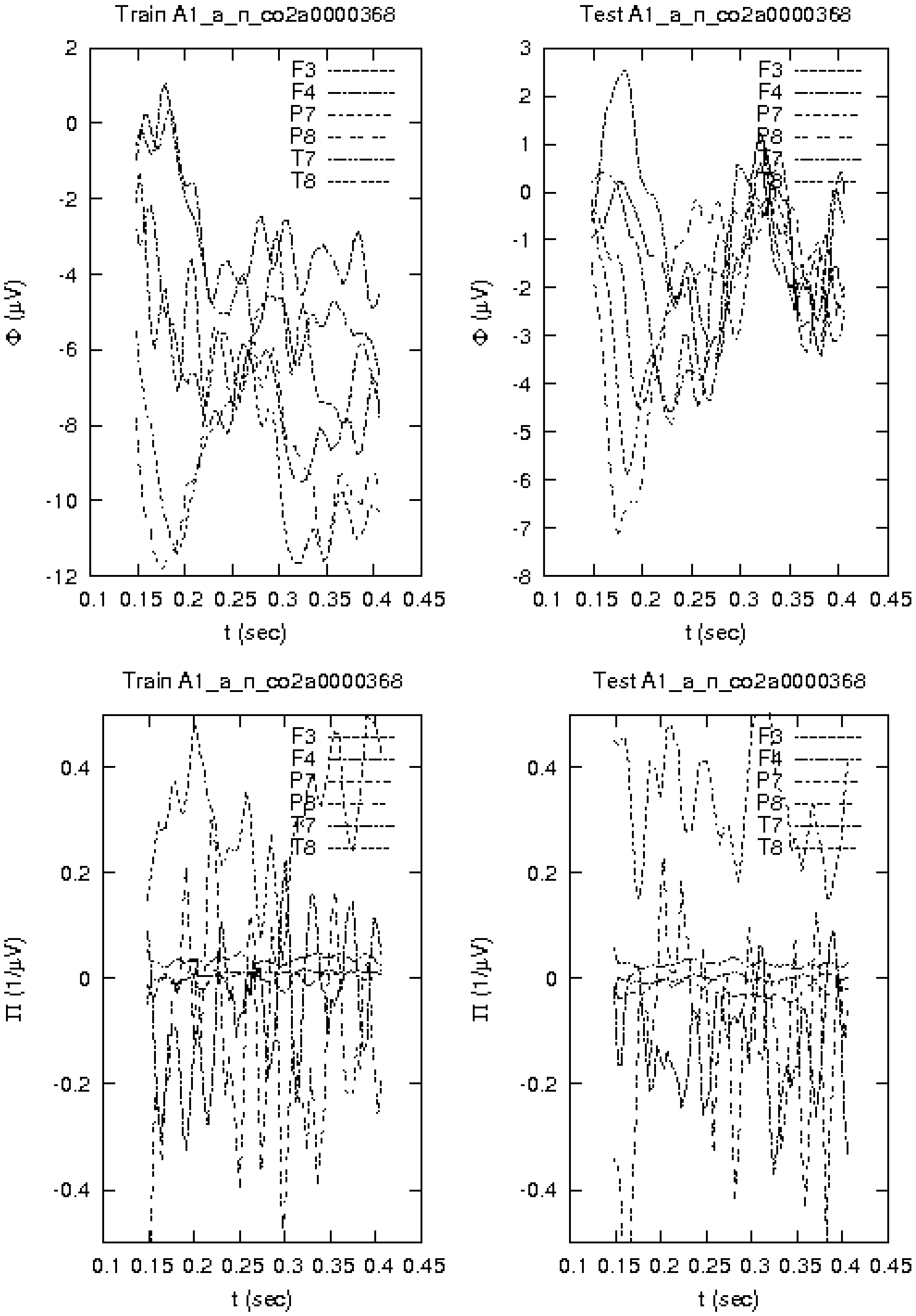
Application of **A** in Train seems to have the effect of compressing the waveforms in a narrower horizontal band. This produces for Train a noisy superposition. Also in Test signals appear more compacted in the A1 version, but here the superposition corresponds to more aligned and similar waveforms (in pairs, not overall), so that in A1 Test appears a little less noisy than Train.



EEG
Train has a wider range of amplitudes. Signals are scattered in early t values, then they compress but earlier in Train. Then, Test show much more compression and symmetry than Train.

CMI
Train has a cleaner upper part of the graph. Meanwhile, its lower part is more crowded of superposing peaks. Test has in upper and lower parts a greater distinction of peaks and morphology. Train has more evidence of signal superposition across the y=0 horizontal axis. Test shows some very high peaks exceeding the graph upper limit. Both graphs show overall constant trend.

FIG. 45.



CMI
Both graphs contain a signal higher than and separated from the others. The one in Test graph has a greater number of peaks.
Train exhibits a higher density of medium peaks.
In the lower part of the graph, Train peaks are uniform and more regular, while in Test they show a trend increasing in their absolute value.

FIG. 46.

A0 vs. A1

The effect of **A** is a strong reduction in the noisiness of the graphs, altogether with the appearance of the isolated, higher signal.

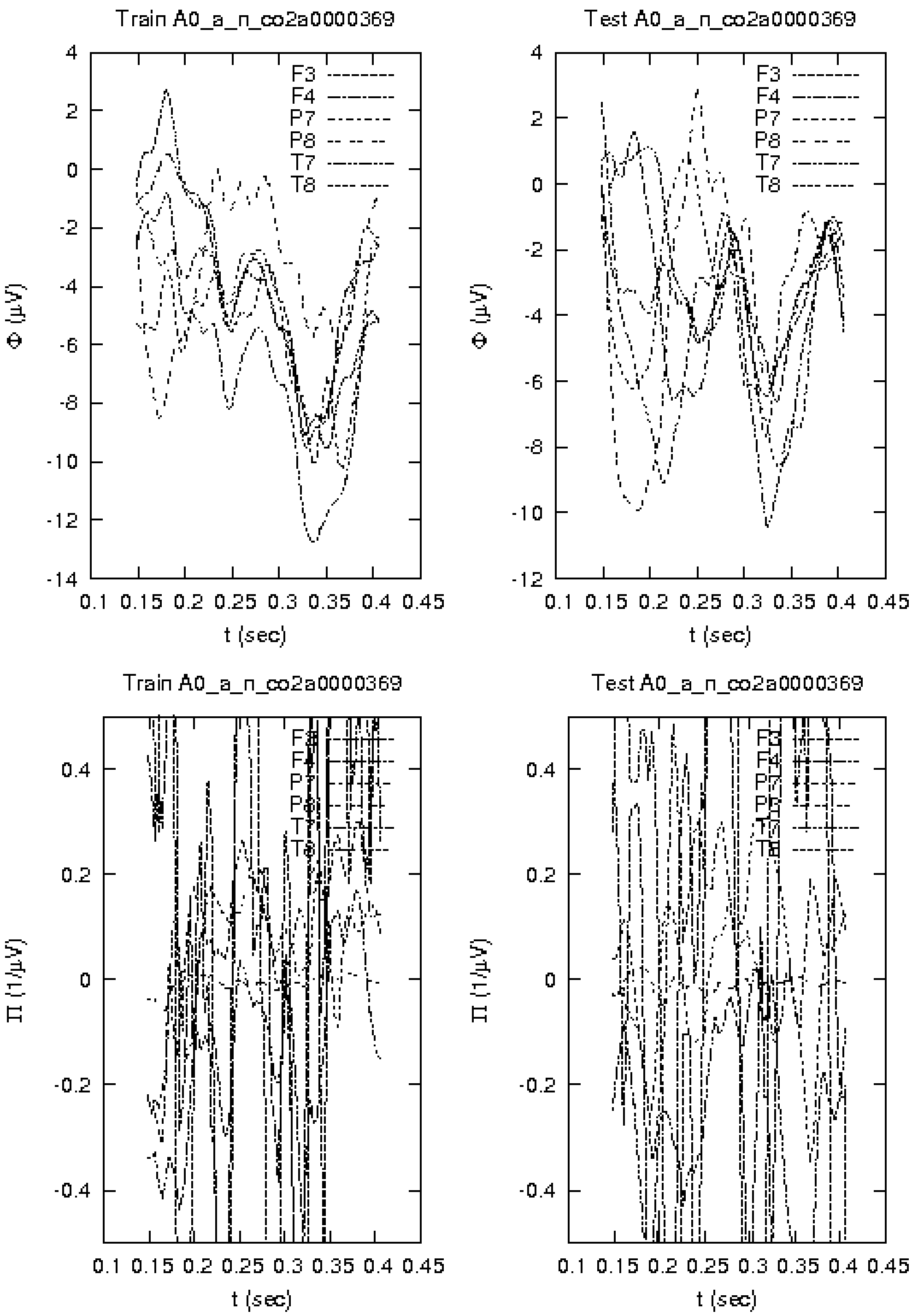
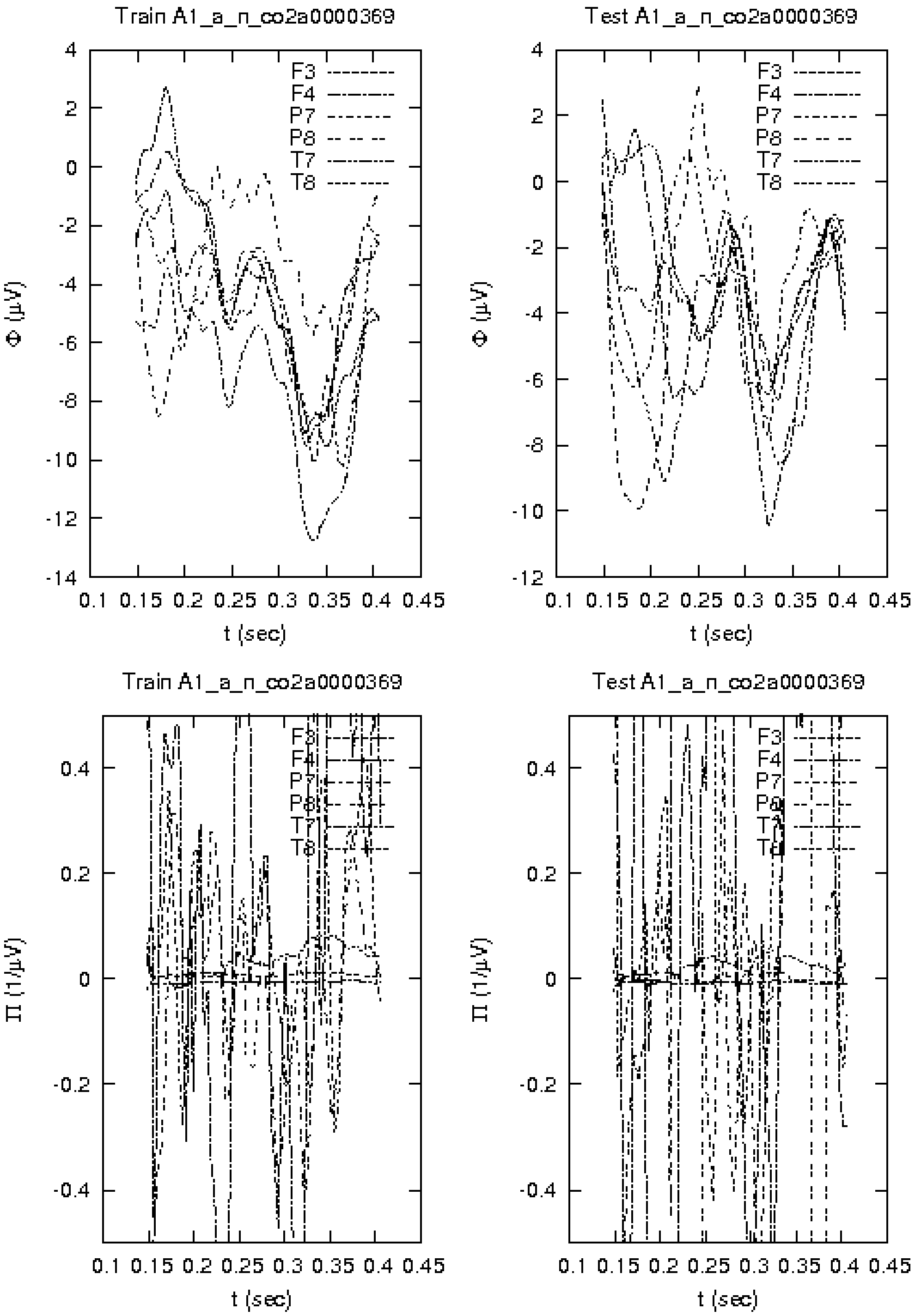


FIG. 47.

EEG
Train has a slightly wider amplitude range. It shows synchrony in some well formed waves, vaguely sinusoidal. A transient in the middle of the time interval is amplified in Test so that it becomes a spike at t = 0.25. In the final part of the signal, Test show more waveform superposition (and hence symmetry) than Test.

CMI
Strong isolated peak in Train at t=0.15. Peaks in Train have a more dense and noisy aspect. Signal in Test is cleaner and equally distributed over the t axis. Train shows a slightly increasing trend, as a number of signals increases towards the end of the time interval. Test remains constant on average.

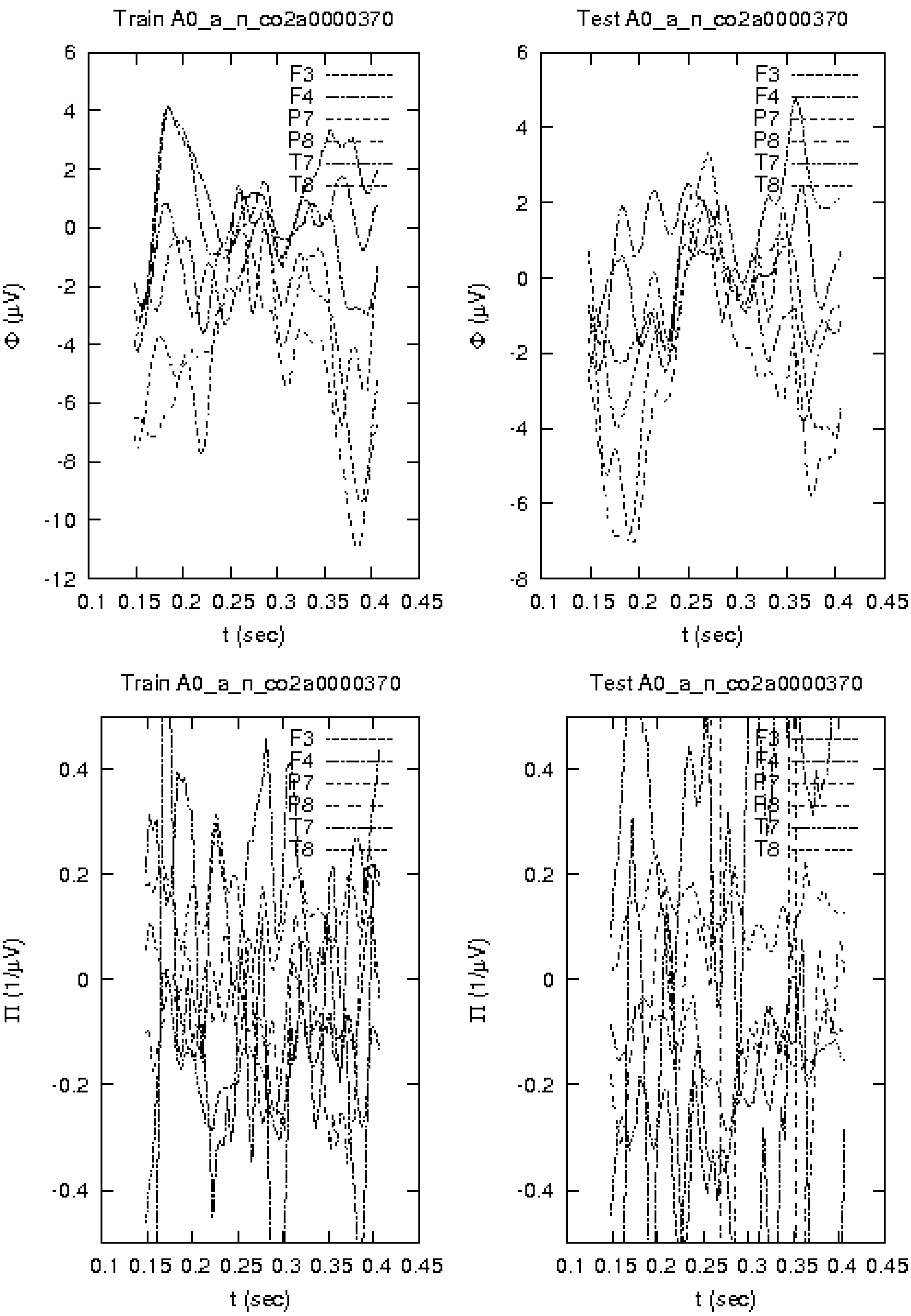


CMI
Both graphs show a high number of peaks, and an isolated (for smoothness) signal near the horizontal axis. Train has more variety in the height of peaks, while Test is more uniform.

FIG. 48.

A0 vs. A1

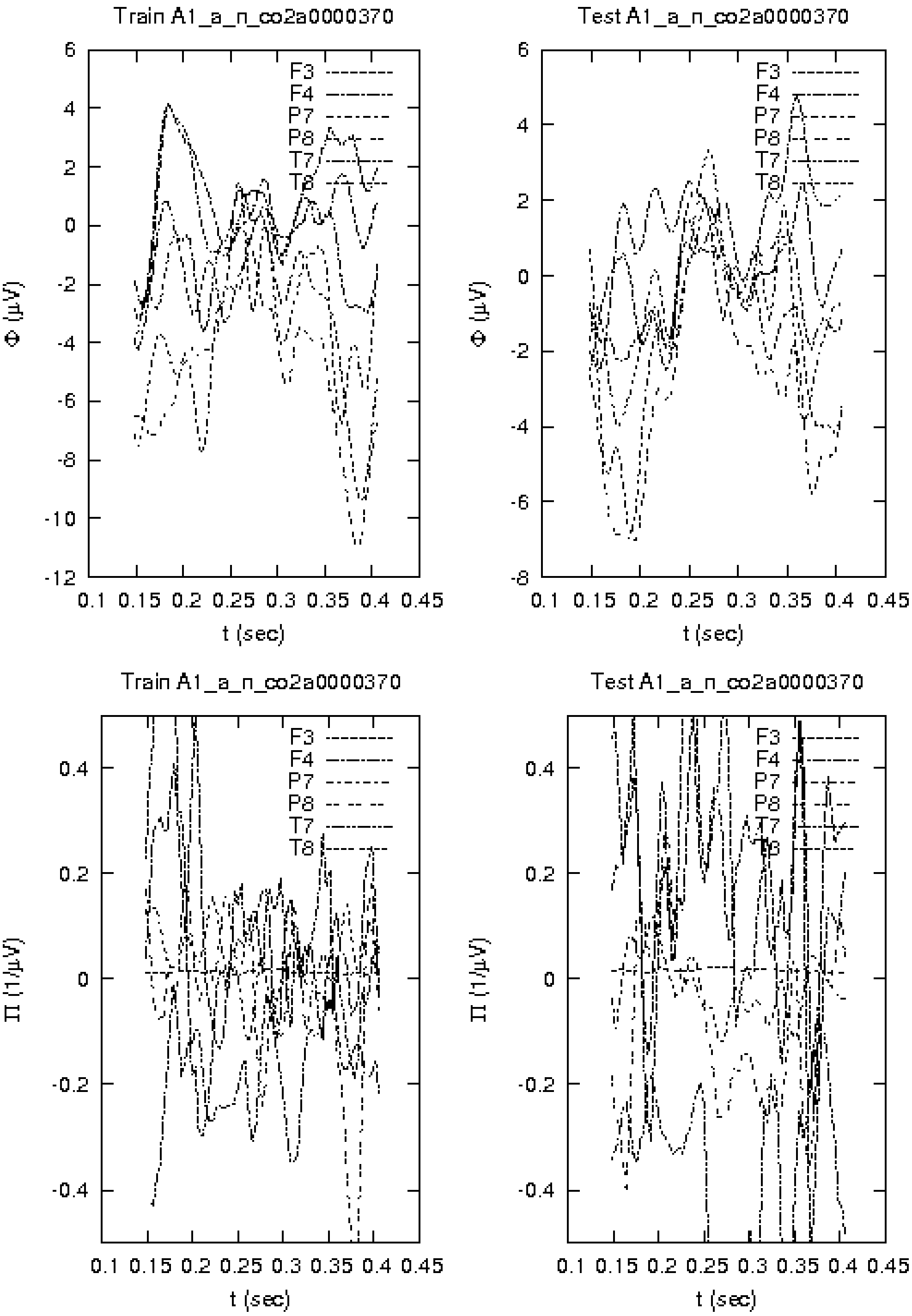
The A1 graph show a middle component which is more plain and contained. In without application of A, the corresponding signal is more structured in amplitude and peak morphology.



EEG
Train and Test waveforms are similar in that they present three analogous time phases in their behaviour: the first and the third with wide amplitude range, and the second with signals compacted in a small horizontal band. Peaks are smooth and don't exceed the figures' limits. For Train there are larger and slightly less frequent peaks, also aggregating into some greater structures, while in Test they are a bit slimmer. Both graphs show symmetry for their main oscillation points.

CMI
Train has sharp and noisy signals, which remain enough compacted in the bounding box limits. The internal waveforms have differentiated amplitudes and create a non uniform structure. Some zones of peak gaps, both positive and negative, are easily noticeable. There are various points of signal superposition and crossing, reducing the graph's readability. Test has many peaks escaping the upper and lower limits, but its amplitudes are more uniformly distributed throughout the time range, looking more amorphous.

FIG. 49.



CMI
Train Starts with 0.2 seconds of high positive oscillations, and then continue for the rest of the time range with more contained peaks, on both sides of the y=0 axis, a little more pronunciated in the negative half. Test shows many different behaviours, with strong positive and negative signals, and middle band waveforms that repeatedly change sign. This graph has various zones of signal superposition, and many of its waveforms exceed the bounding box limits. Both graphs have also a near flat waveform nearly on the y=0 axis.

FIG. 50.

A0 vs. A1

A application makes the A1 version of Train more compacted in amplitude, although it remains still noisy and with many crossings. Amplitudes in Test appear instead unaffected, but the graph appears more empty in the internal band surrounding the middle of the time range and the positive y=0 axis, as if positive and negative signals had been torn apart to make it possible to watch through.

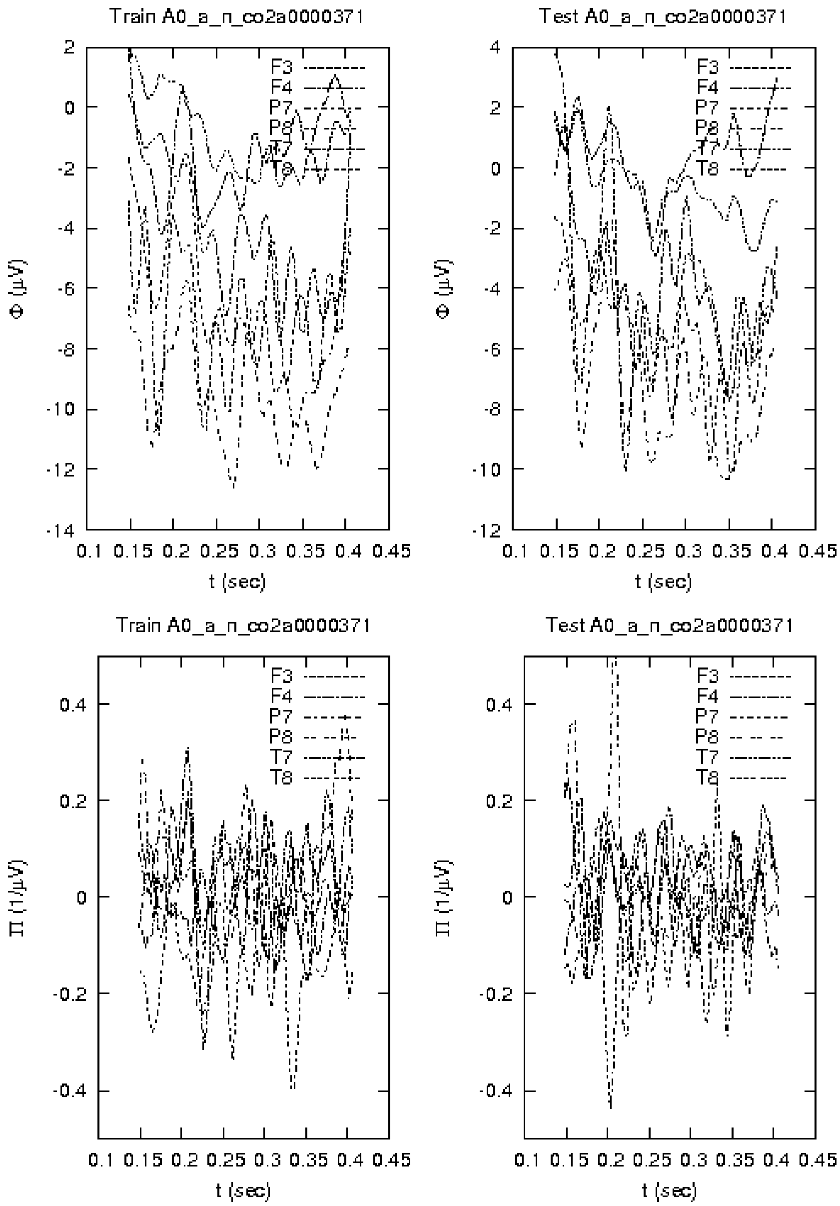


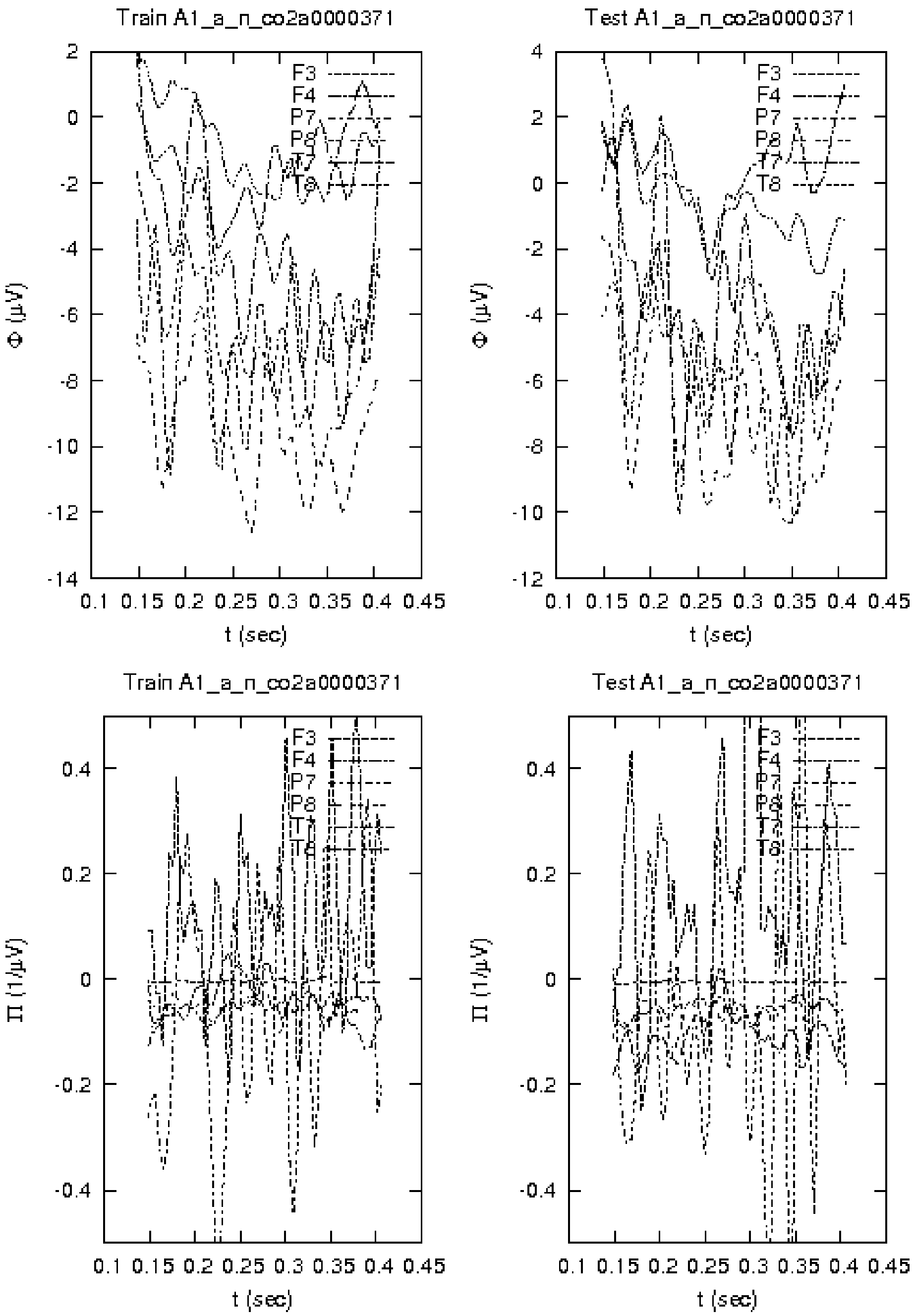
FIG. 51.

EEG

Both graphs resemble each other. Similar morphologies, symmetry, and synchronous behavior across all signals and entire epoch; with a noticeable closer synchrony in Test. Further, clear separation is visible in all signals, with an Amplitude shift of +2μV in Test. F3 and F4 diverge at end of epoch in Test, with F4 trending positive in Test and negative in Train at end of epoch.

CMI

All waveforms are clustered about origin evenly throughout the epoch. Overall appears moderately noisy with very little visible separation. Most transient wave forms are P8 in the positive domain and P7 in the negative domain. Test shows P8 as most transient, with both plots showing P7 as exhibiting fairly sinusoidal behavior with very visible and distinguished negative troughs.



EEG

CMI

There are many different morphologies present across both plots. Easily discernible is the almost flat waveform of T8. There is a fairly tight grouping of waveforms about origin in the negative domain; with the remaining two waveforms, F3 and F4 exhibiting strong amplitude yet sinusoidal behavior.

FIG. 52.

A0 vs. A1

After applying **A**, F3 and F4 stand out with strong amplitude, and T8 becomes almost flat. There are much greater separation of waveforms and differing morphologies visible as well; with a grouping of three waveforms very discernible about origin in mostly negative domain.

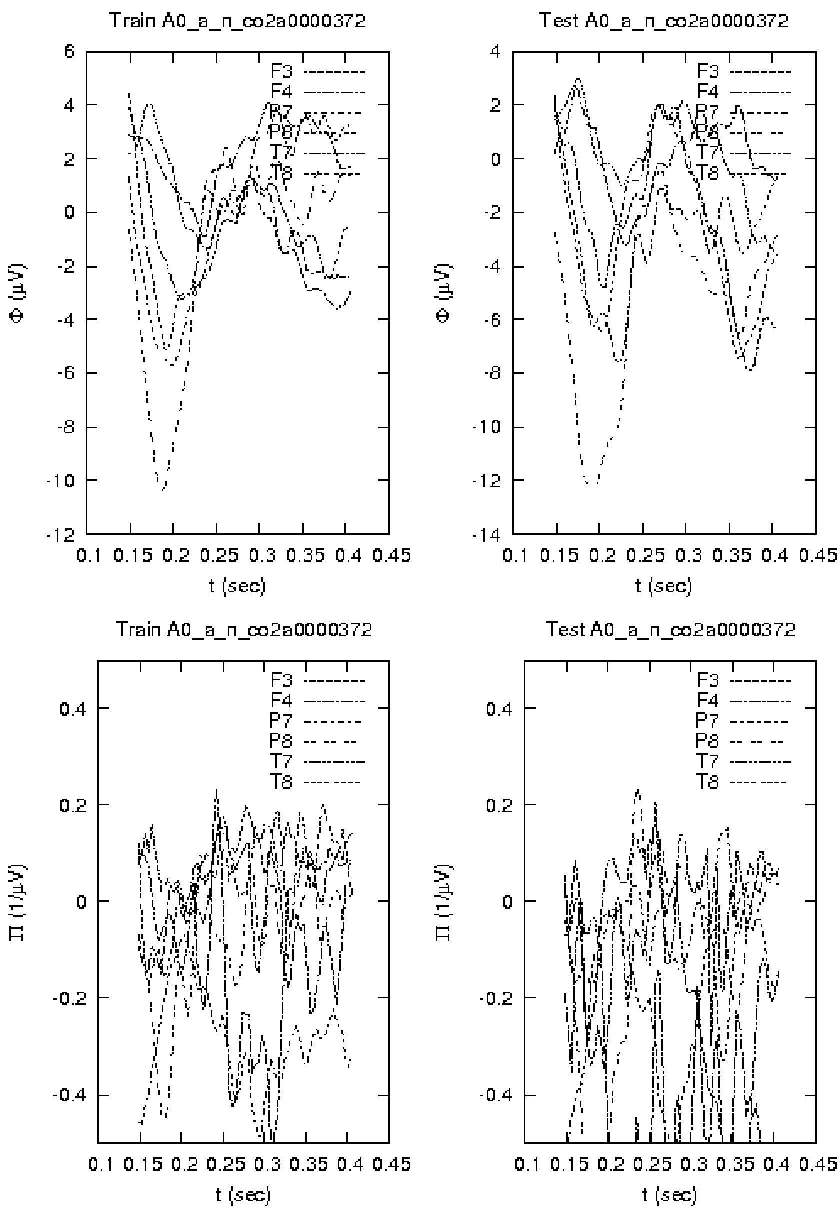


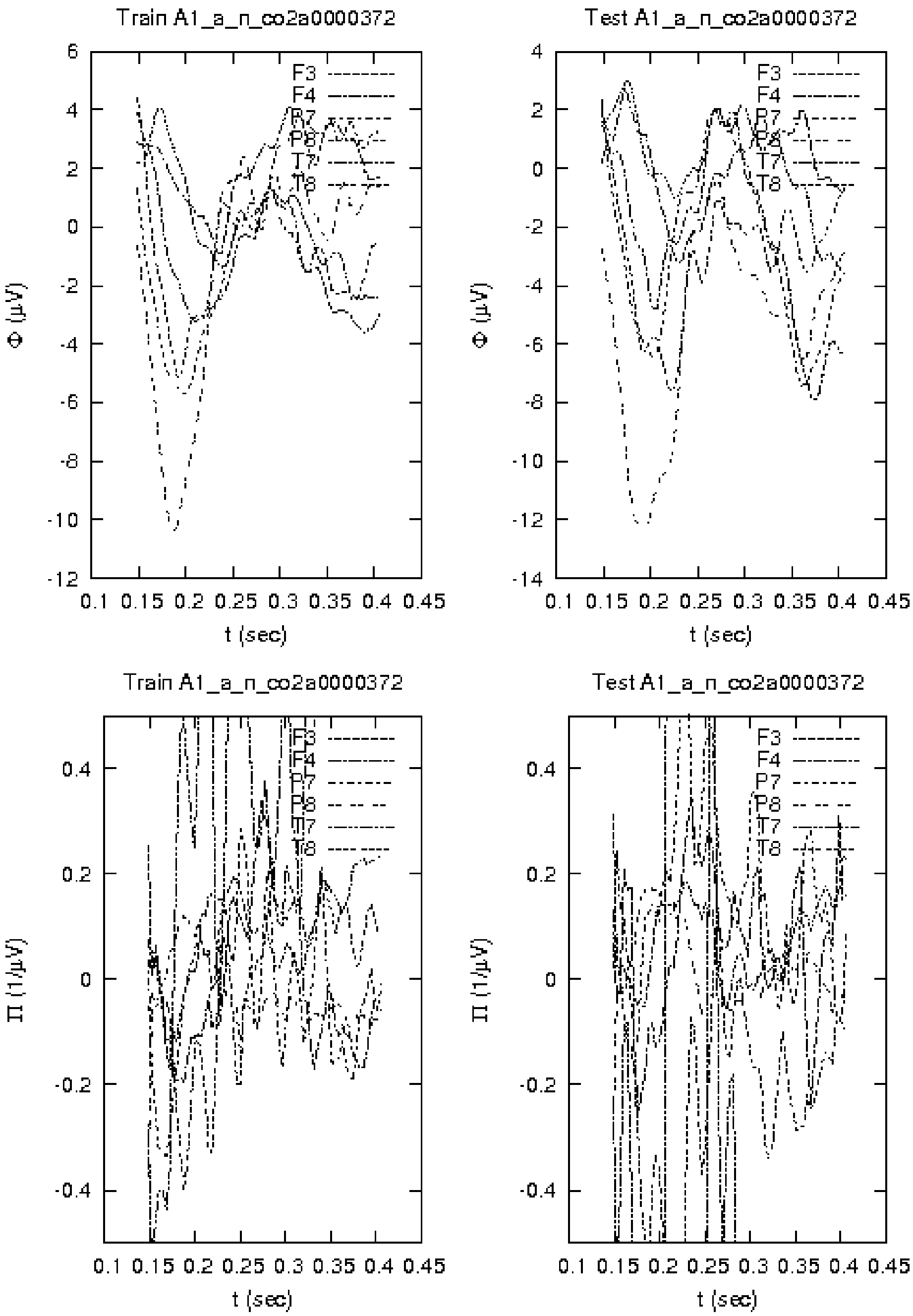
FIG. 53.

EEG

Both graphs resemble each other. Similar morphologies, symmetry, and synchronous behavior across all signals and entire epoch; with slighty closer synchrony in Test. Further, clear separation is visible in all signals, with an Amplitude shift of +2μV in Test.

CMI

All waveforms are clustered about origin throughout the epoch; with negative amplitude across all wave forms. Overall appears moderately noisy with very little visible separation. Greater negative amplitude is clearly visible in Test; with waveforms exceeding negative bounds frequently.



EEG

CMI

There is much stronger amplitude in T7; with even stronger in Test. There appear to be a clustering of waves visible about the origin; exhibiting similar sinusoidal behavior. Greater negative amplitude is present in Test, noticeably T8 and T7.

FIG. 54.

A0 vs. A1

After applying **A**, significant positive amplitude increases appear across most of epoch. There still remains a clustering of similar sinusoidal signals near origin.

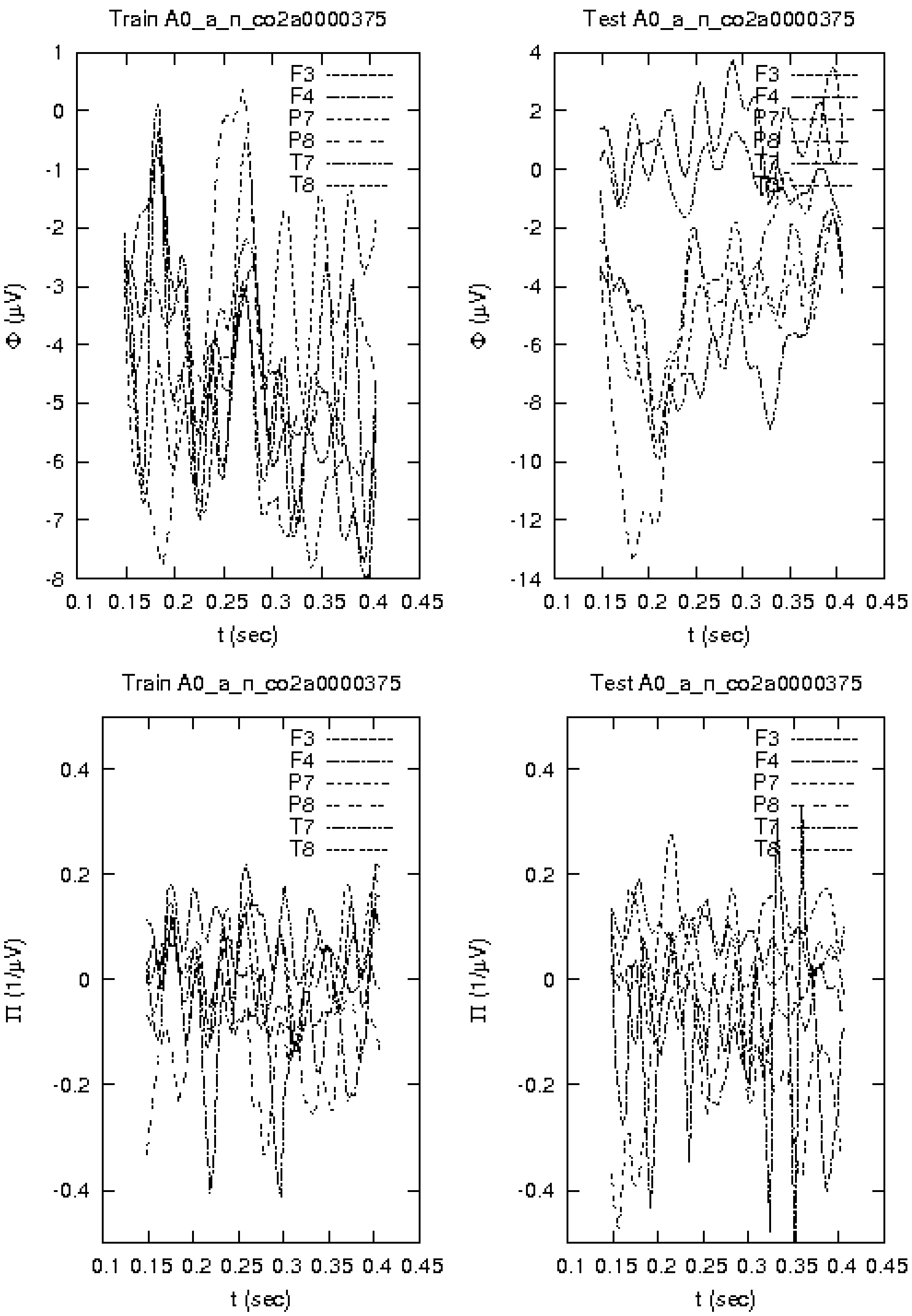
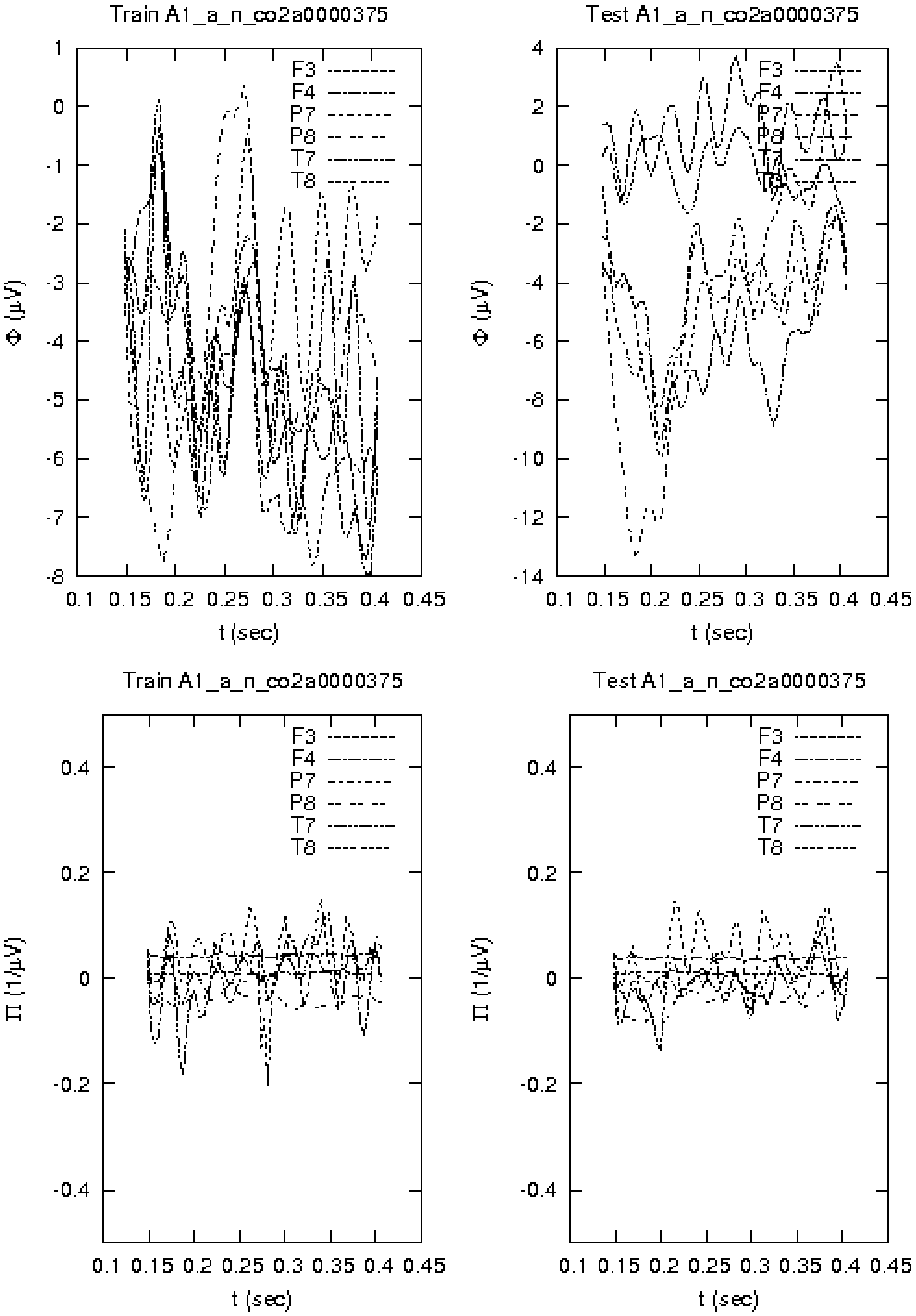


FIG. 55.

EEG
Amplitude ranges are quite different, [-8, 1] for Train and [-13, 4] for Test. Train shows imperfect superposition and symmetry of many waves in the first half of the time range. Test instead has two main quasi-sinusoidal groups of waveforms, one in the upper part of the graph and another in the lower section. These groups present signs of symmetry. Test shows an increasing trend and looks more clean.

CMI
The two graphs look similar, in that they have an upper skyline of several contained peaks, and a lower and more pronunciated silhouette of negative peaks. The amplitude ranges are almost identical.
Test shows higher variations, and appears also less constant in trend, while Trend looks more compact and regular in its peaks.

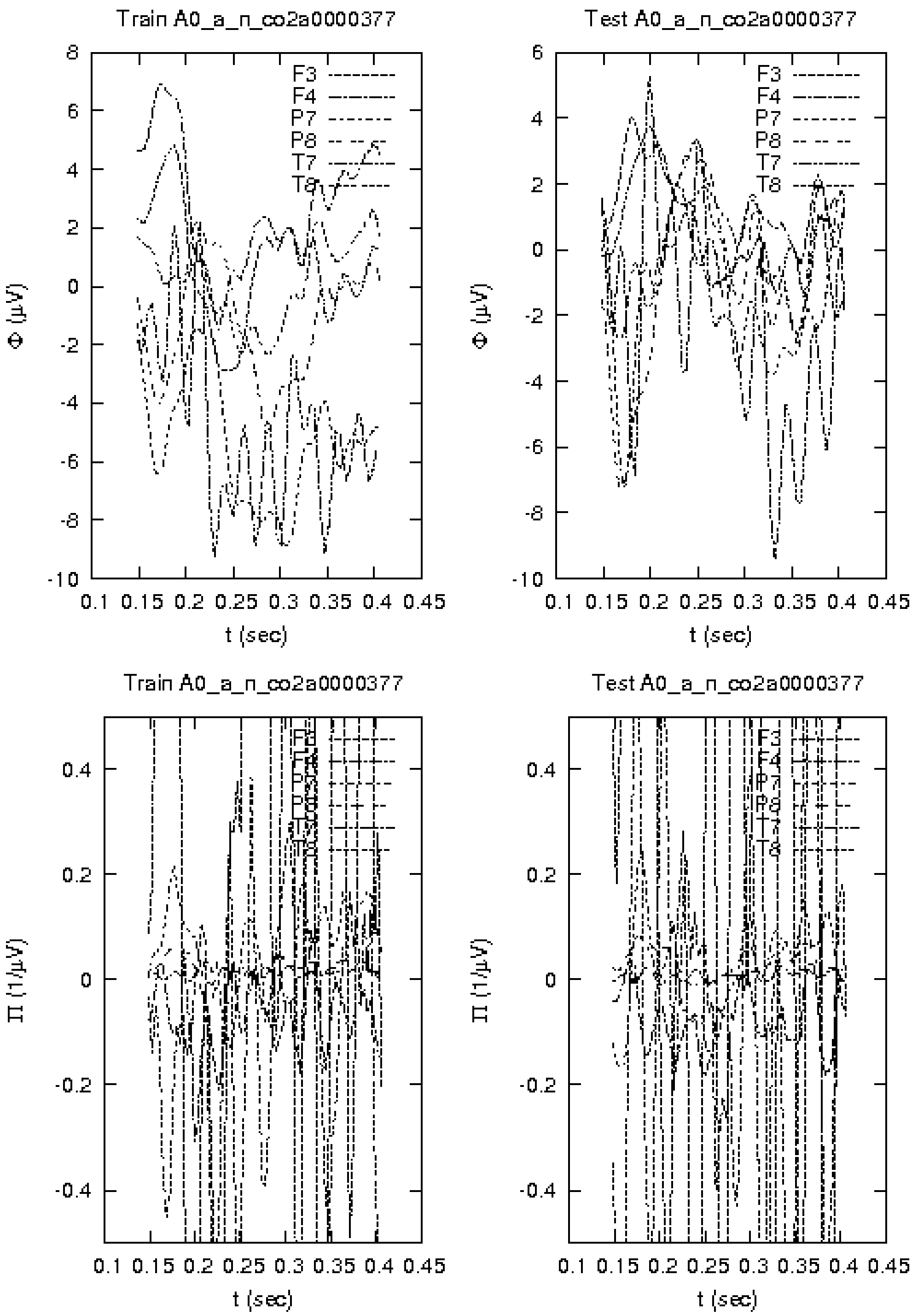


CMI
Both graphs are very compact in their overall figure. They show a pair of almost flat signals, and then lower and upper peaks which are again very similar in distribution. Train shows just one more pronunciated negative peak at t=0.27, and slightly higher oscillations. These signals are so compacted and regular, sinusoidal-like in their oscillations, that they could be defined “tranquil”.

FIG. 56.

A0 vs. A1

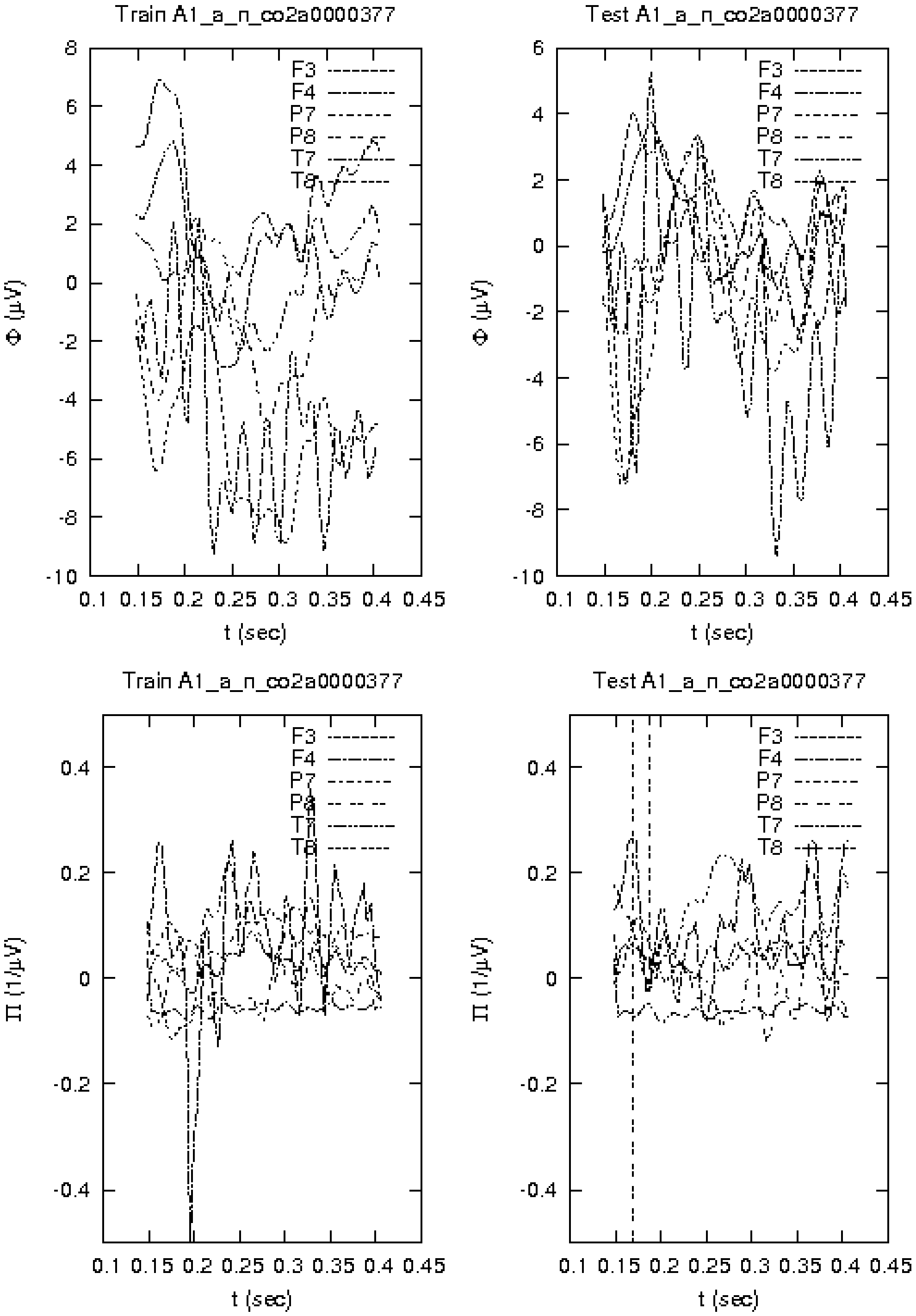
A application causes a drastic reduction in noise, amplitude and structure in A1 graphs. A vague similarity in the overall A0-A1 silhouettes can be observed both for Train and Test(excluding compression), but it's very hard to notice.



EEG
Train's signals are highly separated, with little synchrony in their oscillations, most in the early time range [0.12, 0.18]; in this same time range, signals are centered around the y=1 horizontal axis. After t=0.2, divergence augments and the waveforms' barycenter drifts down, centering around the y=-2 axis. Test shows sharper peaks, with similar amplitudes, and a more strict signal envelop which resembles vaguely a sinusoid. Both graphs look relatively calm and little noisy.

CMI
Train and Test have many high peaks which very often go out of the bounding box. Some waveforms also keep in the central horizontal band, centered around the horizontal y=0 axis. Train has thees latter components a bit more pronunciated and with larger peak aggregations. Both graphs look quite noisy. Train shows a positive peak gap for t in [0.17, 0.23], while Test in that range has medium height positive peak. Trend is overall constant.

FIG. 57.



CMI
Train and Test have very similar silhouettes, centered on the horizontal y=0 axis, and with a higher positive component which weakly escapes the central horizontal band; under y=0 there's just a couple of nearly flat signals. In both graphs there's a single signal which shows a very strong oscillation in the first part of the time range, but apart from that both show a constant trend. Train is a bit more irregular in signal amplitudes, with some little variations and a moderate amplitude reduction in the last part of the time range.

FIG. 58.

A0 vs. A1

A application produces a heavy compactification of the waveforms, pratically killing all the very sharp negative peaks, and strongly containing the positive ones in the central horizontal band; peaks become larger and lower. For both graphs, just a strong oscillation in the first part of the time range escapes this process and makes it to the A1 version.

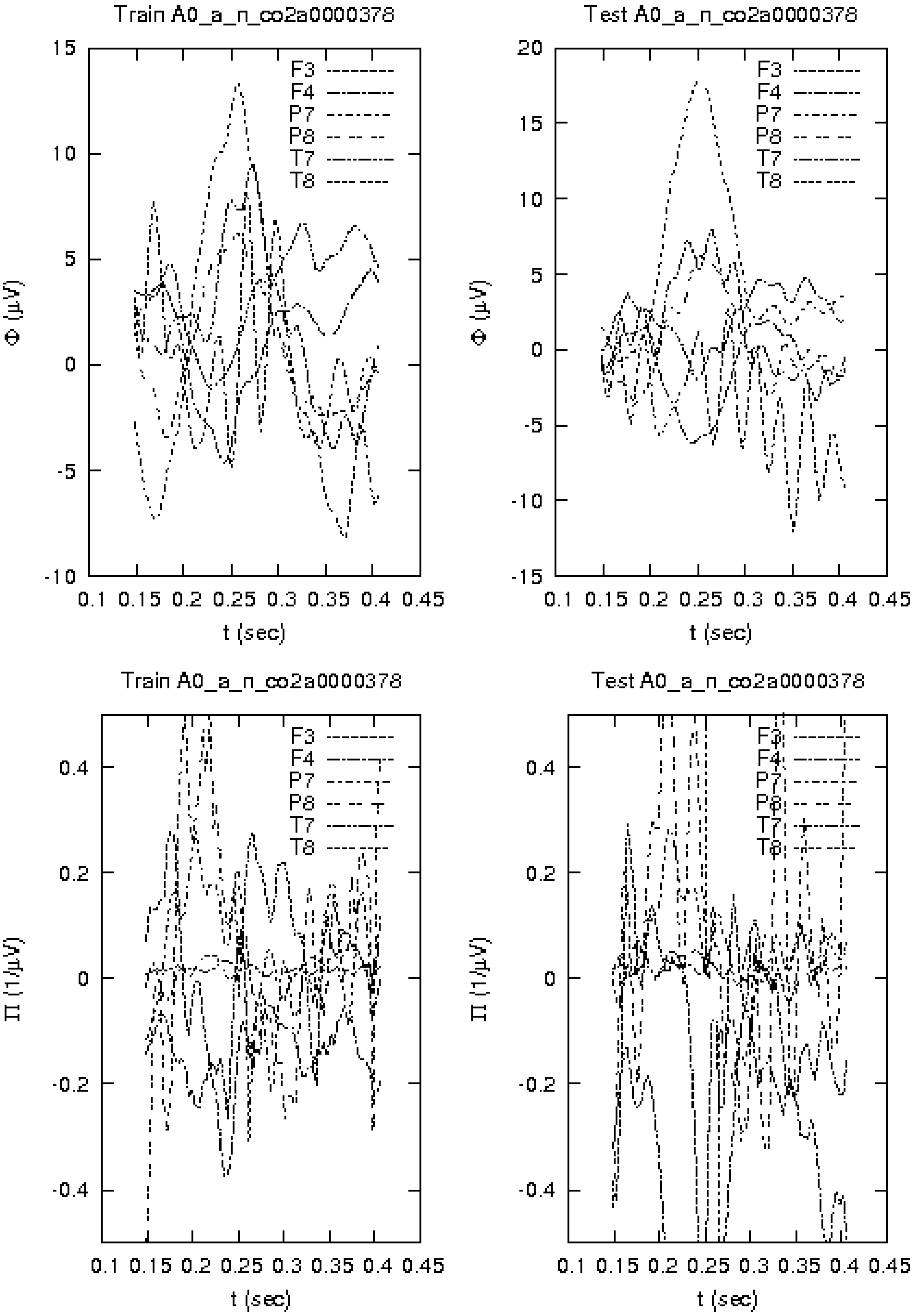


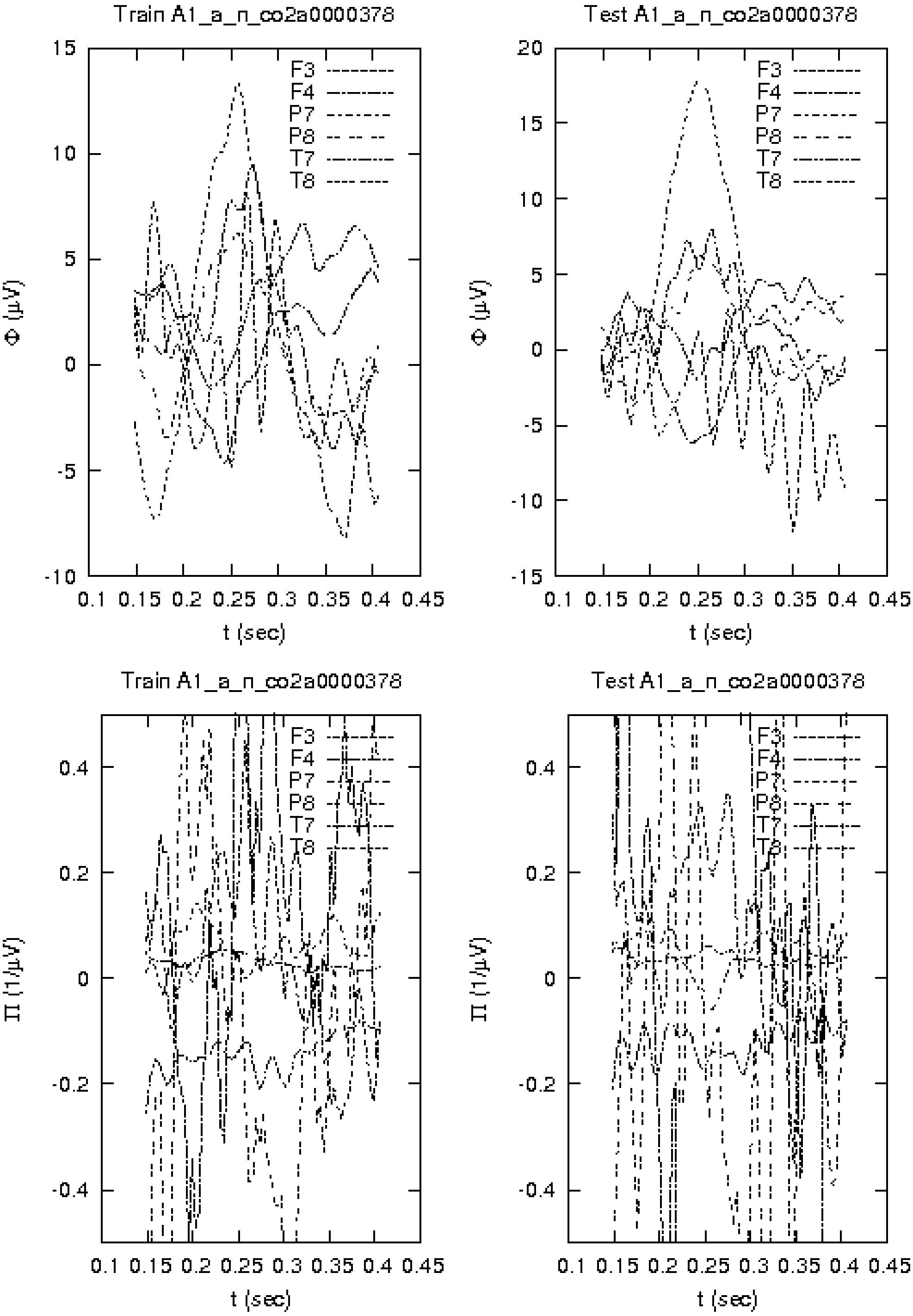
FIG. 59.

EEG

Train has peaks that are very large and high, and as a consequence they aren't very sharp. Some of them aggregate in greater structures, and the overall silhouette of the graph is tranquil with calm oscillations. There's little synchrony through its wave, with little or no coincidence of curves. Most of Train's signals are confined in the mid horizontal band, centered on the y=2 axis. Test has a similar profile, with analogous amplitudes, but its biggest features greater than the ones in Test, waves and peaks, force a rescaling of the graph that give the sensation that its other waveforms are smaller.

CMI

Train has peaks contained but irregular for amplitude and aggregations. Only in a few cases they reach the bounding box limits. There are some middle band zones, for t in [0.18, 0.32], with a lack of low value signals (in part positive, in part negative). Test looks similar to Train, with the difference that the negative signals appear amplified to very high negative values, exceeding the lower limit. Trend is constant for both graphs.



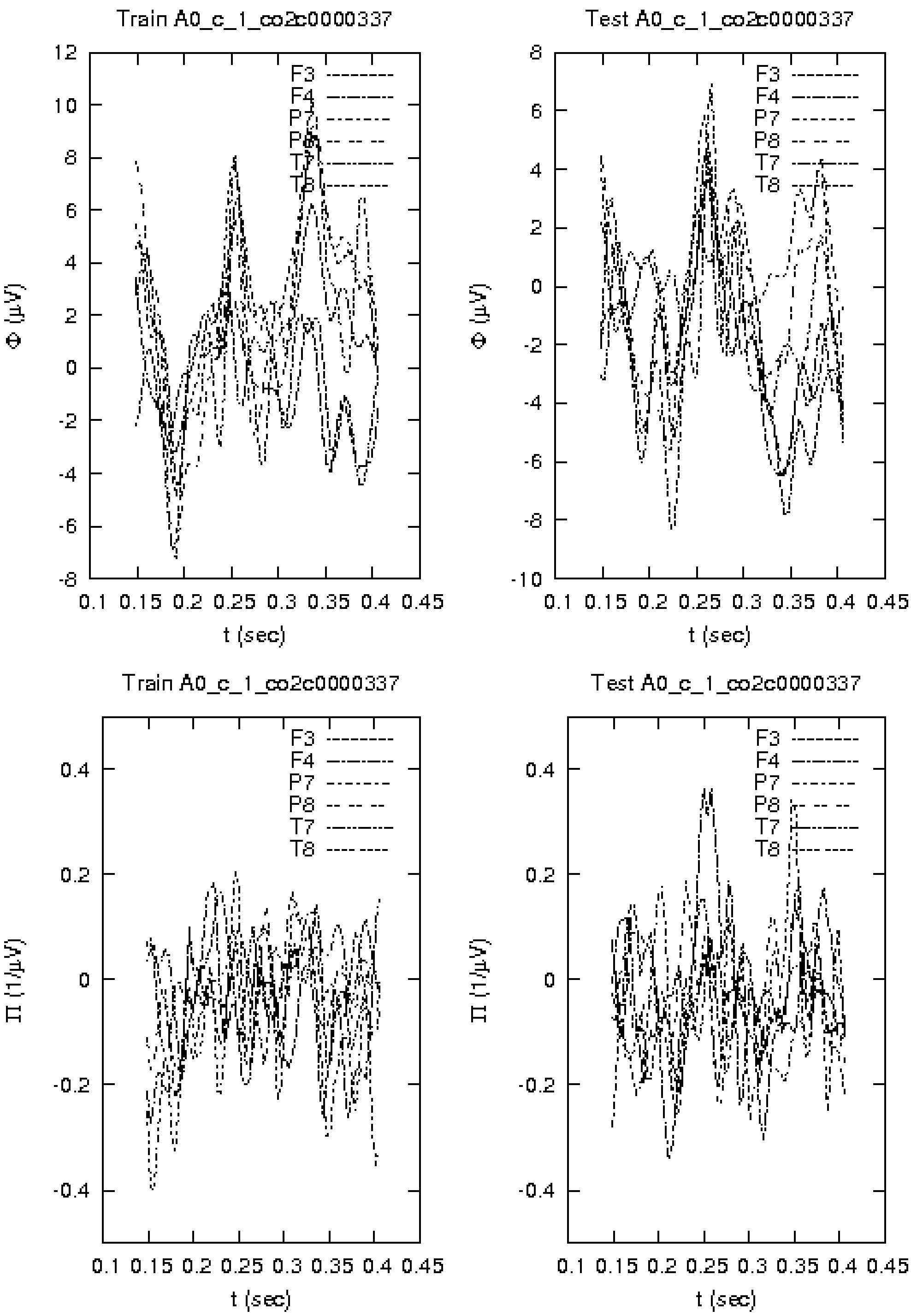
CMI

An evident feature of Train is that it's marked by a horizontal band of two nearly flat signals, at y=0 and y=-0.2. Other waveforms are made of sharp and high peaks, with few intersections or superpositions. Test has a layout similar to Train, but in the last part of the time range the positive waveforms appear more limited, while the negative ones look more pronunciated towards the lower limit. The overall trend is constant and the graphs appear little noisy.

FIG. 60.

A0 vs. A1

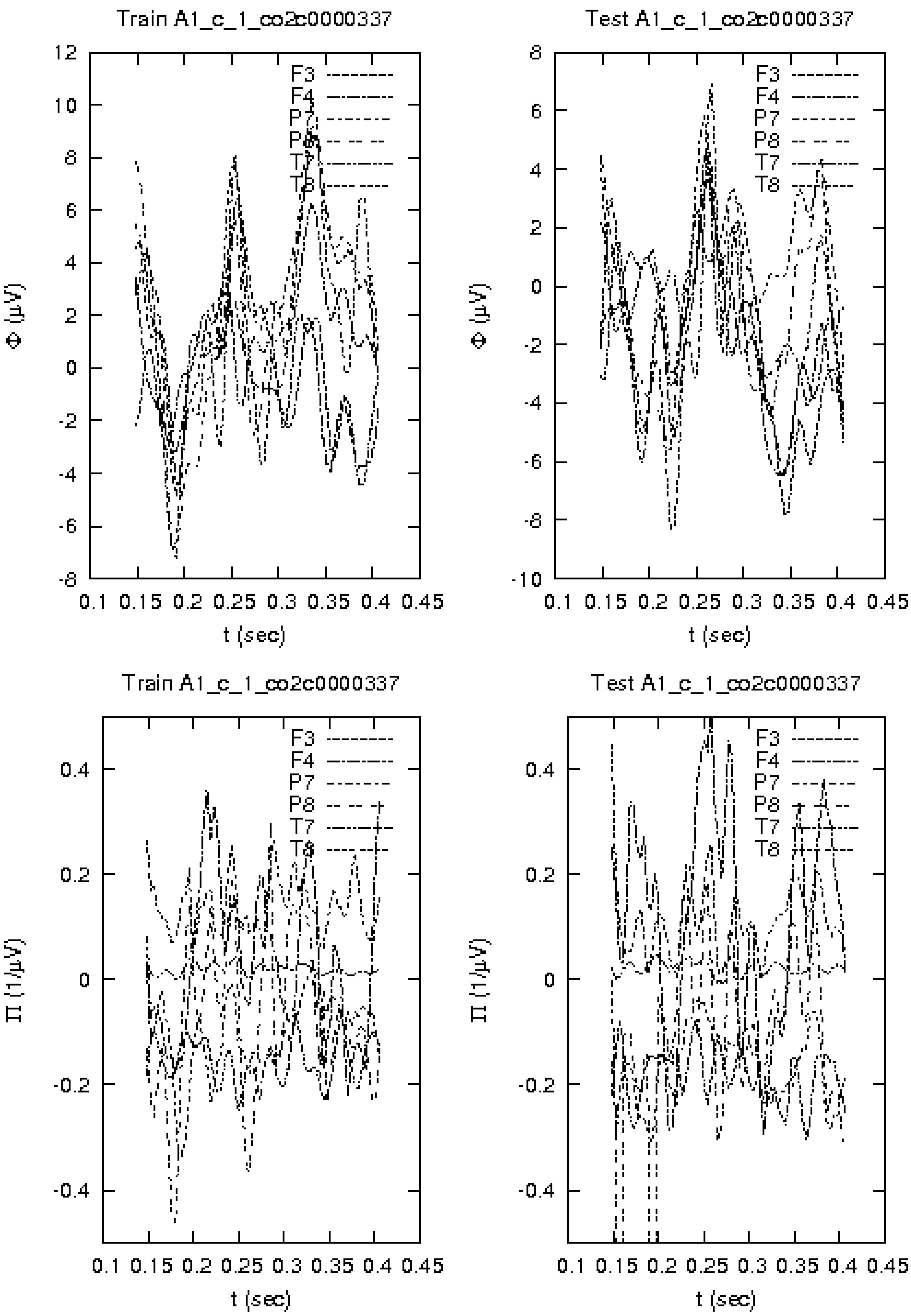
For Train, **A** application determines the amplification of positive and negative signals, with many of them reaching the bounding box limits in the A1 version. In Test the amplification is more noticeable for negative components, also with the effect of splitting negative peaks(which appear less aggregated in A1), while especially positive peaks of the last part of the time range remain very similar to the A0 version.



EEG
Train and Test have similar amplitude ranges, although for Test they are 2μV lower. All the waveforms are well fitted into a sinusoidal envelop, centered around the horizontal y=0 axis, so there's a high level of synchrony. Test has almost all the waveforms aggregated in a positive peak at t=0.27, with a positive transient of two high signals in the preceding 2 seconds.

CMI
The waveforms in Train fit roughly into an intense sinusoid, but are not well synchronous, so that they show many superpositions and crossings, with a loss of readability. They are well compacted in height and show a constant trend. For Test, signals model a more irregular silhouette, with variations in height and many complex intersections. A pair of relevant peaks correspond to the main positive prominences in the EEG figure(this same correspondance is just slightly noticeable in the Train figures).

FIG. 61.



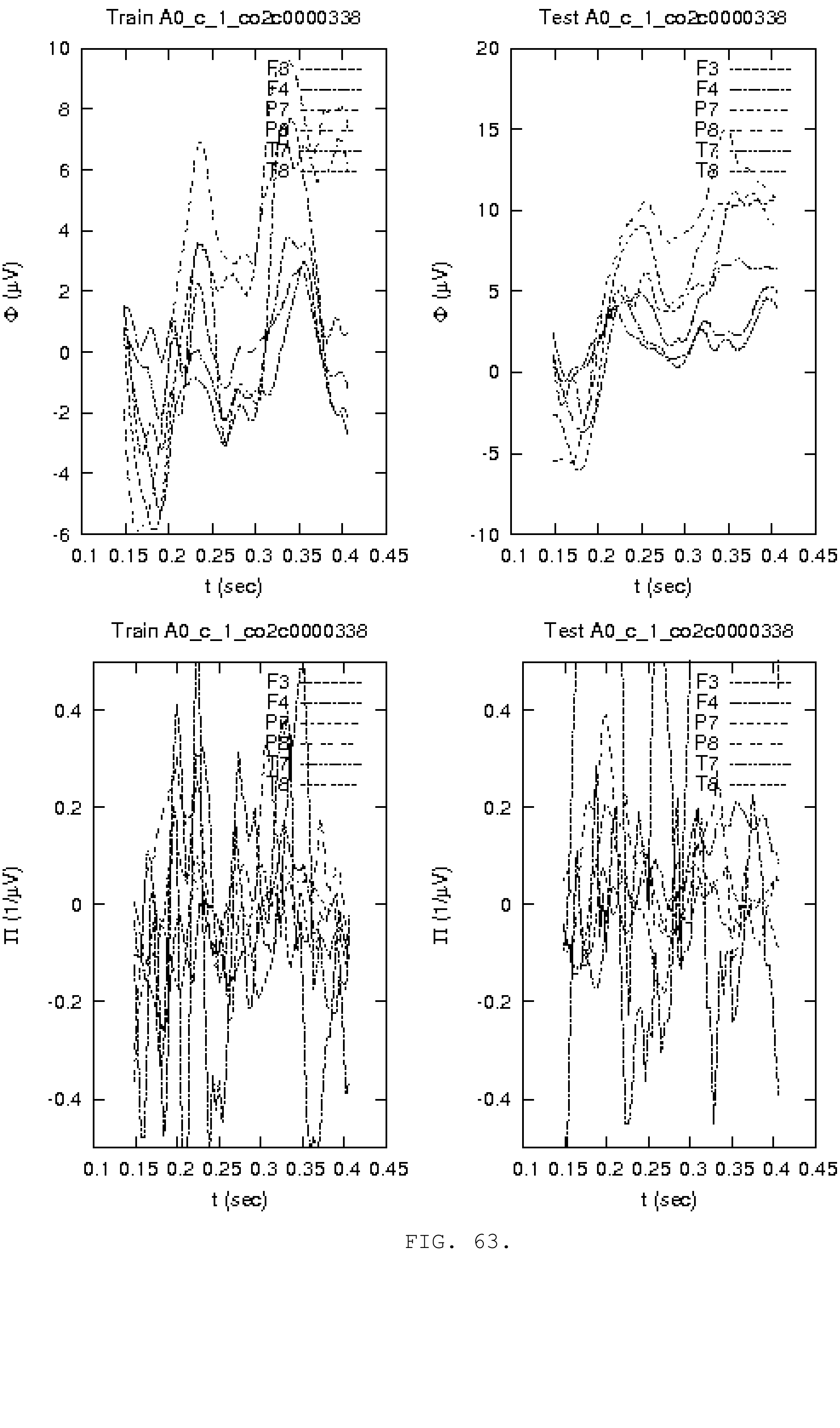
CMI

Here we have, for both graphs, the waveforms split into two main groups, one in the positive half of the figure, and the other in the negative half. In Test there are higher positive peaks, although it has also a positive peak gap around t=0.32, where Train has normal waves. Train shows a negative transient at t=0.17; it also has more superpositions and crossings, especially in the lower right zone. Both graphs have a constant trend.

FIG. 62.

A0 vs. A1

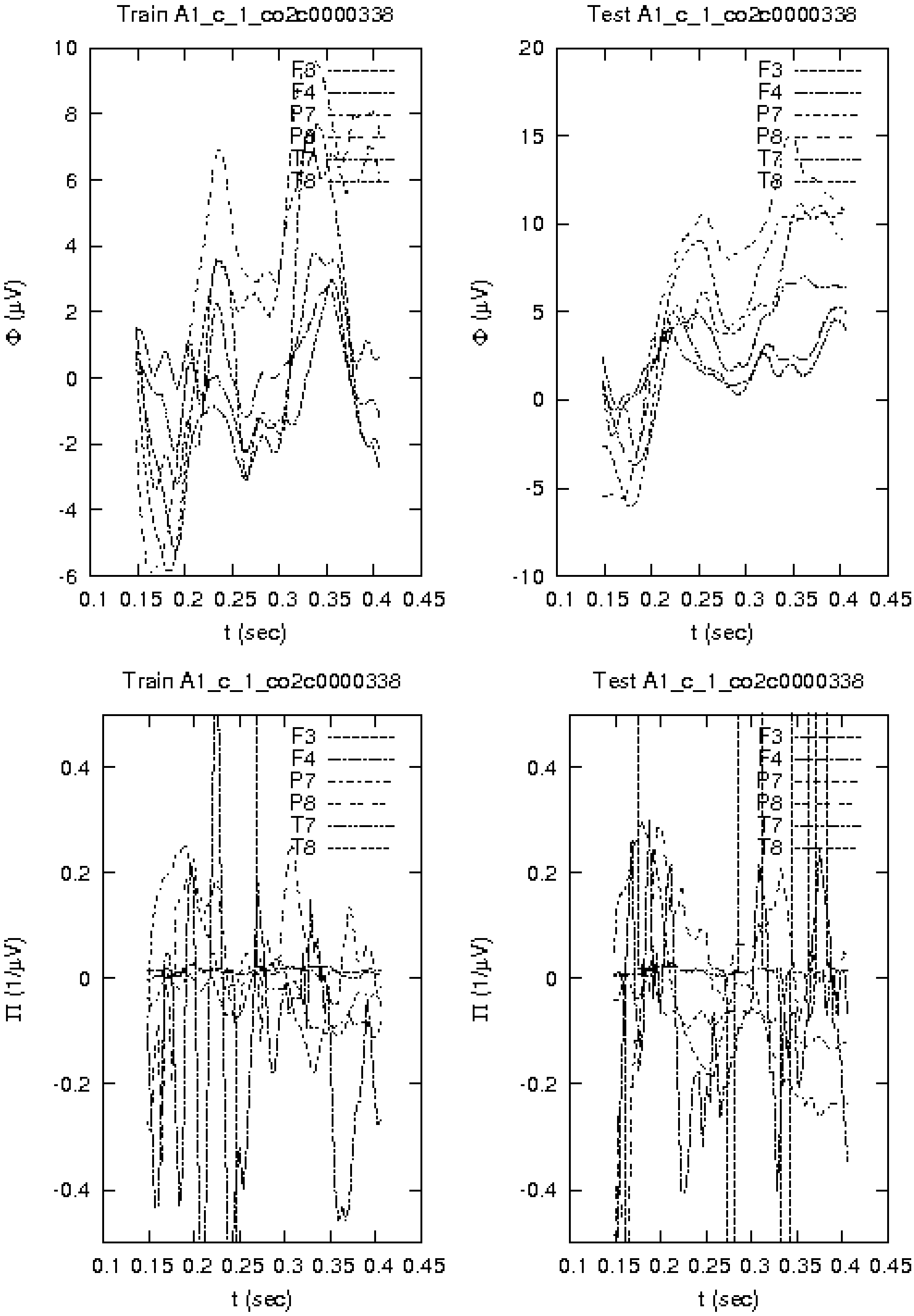
Application of **A** introduces a horizontal splitting of the signals into two waveform groups, one above and the other under the y=0 axis. It makes the waves less synchronous and compact(no more similar to the A0 sinusoidal envelop), with higher peaks and different features that would make hard to superimpose them again as in the A0 version.



EEG
Test has a broader amplitude range. Train signals appear symmetrically comprised within a sinusoidal envelop with increasing trend. All the signals are confined in the bounding box limits, and the figure is readable and little noisy. After t=0.4 a couple of waveforms detaches themselves from the main envelop for a transient. Test shows a similar envelop, with even more compactness and symmetry. The graph is very smooth in its curves, with high symmetry and readability. Also here the trend is ascending.

CMI
Train has sharp peaks which remain inside the figure limits. Around the central horizontal axis at y=-0.1, there are many superimposing waveforms. There's a gap of lower peaks for t in [0.27, 0.35]. Test appears with slighlty less pronunciated and differentiated peaks, and looks a bit more uniform in its silhouette. It exhibits two main groups of merged negative peaks.

FIG. 63.



CMI
Train has a regular aspect, with a uniform series of negative peaks. The upper part is traversed by few limited waveforms. There's a negative peak gap for t in [0.27, 0.34]. Test appears more irregular in peak aspect, with some different signals in the lower half of the graph, and more sharp and spiky waveforms in the upper one. There seems to be an alternate distribution of positive-negative peak groups along the time range. It has a greater tendence in exceeding the bounding box limits.

FIG. 64.

A0 vs. A1

The A1 version preserves Train's sharpest negative peaks and a subset of positive peaks(with modestly reduced amplitudes); the other waveforms look more compacted around the horizontal y=0 axis. The application of **A** seems to force Test signals to become more distinguished as clearly positive or negative signals, in specific zones of the time range.

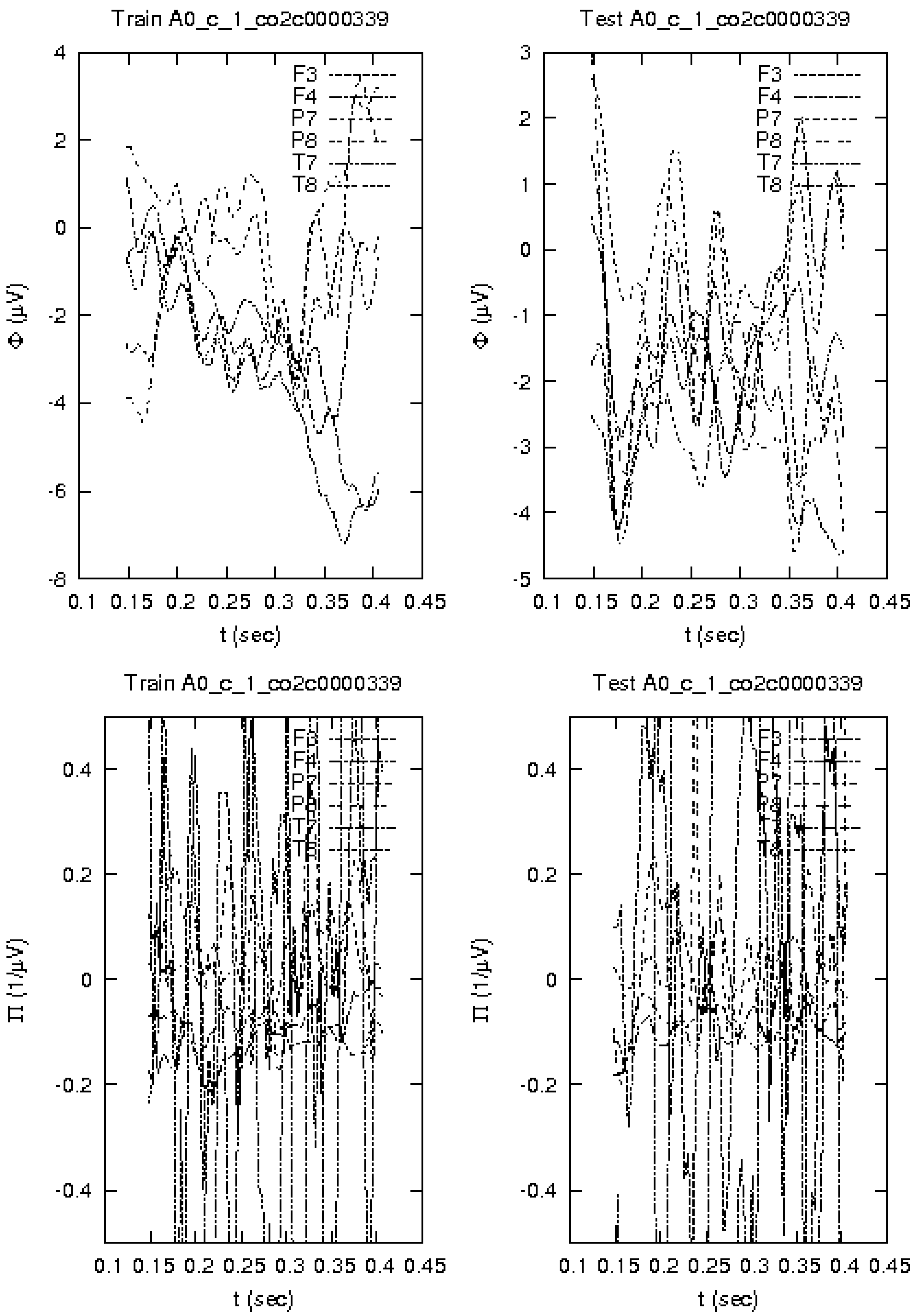
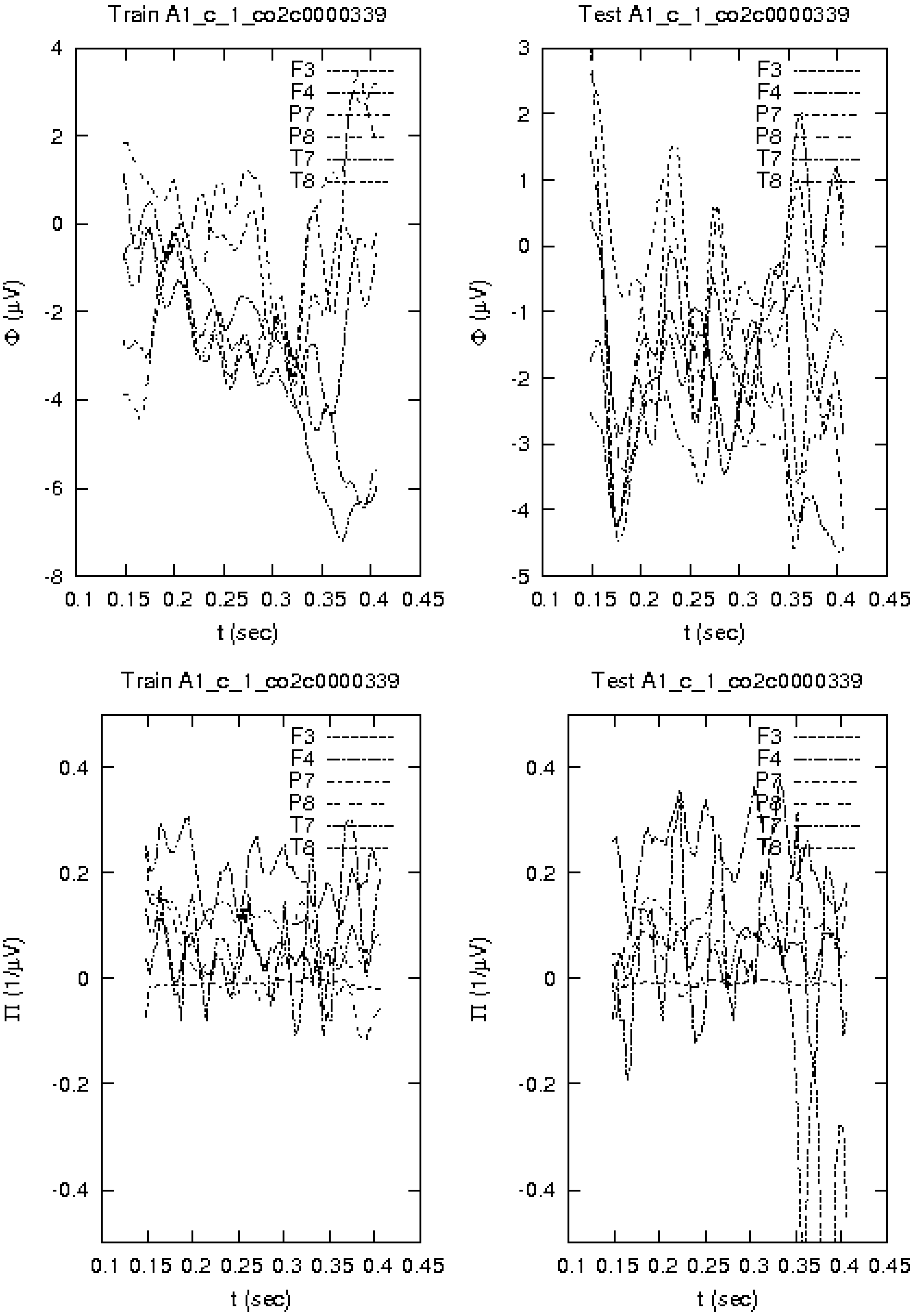


FIG. 65.

EEG
Train presents no strong oscillations (well envelopped signals). Its features are smooth. There's a decreasing transient at end of the time window; other signals increase in that same part of the interval. There are some synchronic superpositions for the intial 2/3 of the time range. There's an initial phase of synchrony for Test in a negative oscillation. More synchronous peaks lay in the remaining time range but there are also many crossings and the overall picture has a noisy character. Most activity is beneath the horizontal y=0 axis, with constant trend.

CMI
Both Train and Test show very high peaks often exceeding the bounding box limits. Train has a more significant mass of waveforms occupying the entire positive half of the graph, while mid-band signals in Test are confined under y=0.2. The greatest concentration of crossings appears in the latest part of the time range. The overall trend is constant for both graphs.



CMI

Most of the signals in Train are in the positive half of the graph. They are well contained and not very high. Some superpositions are within the waveforms at lower positive amplitudes. In Test, many peaks appear to form a single positive skyline above all the other signals. Its peaks reach higher amplitudes than train, and it also invades the right negative quadrant with deep oscillations from one of its signals. Both graphs maintain low crossings and good readability.

FIG. 66.

A0 vs. A1

A application reduces strongly the height and the frequency of the peaks both for Test and Train, leaving many of them aggregated in larger structures. They are maintained in the positive half of the graph. A fraction of peaks touching the lower negative limit survives only in A1 version of Test, in the final part of the time range, while all the other remain in a clear and little noisy disposition. Both A1 versions present a nearly flat signal located at about y=0.02.

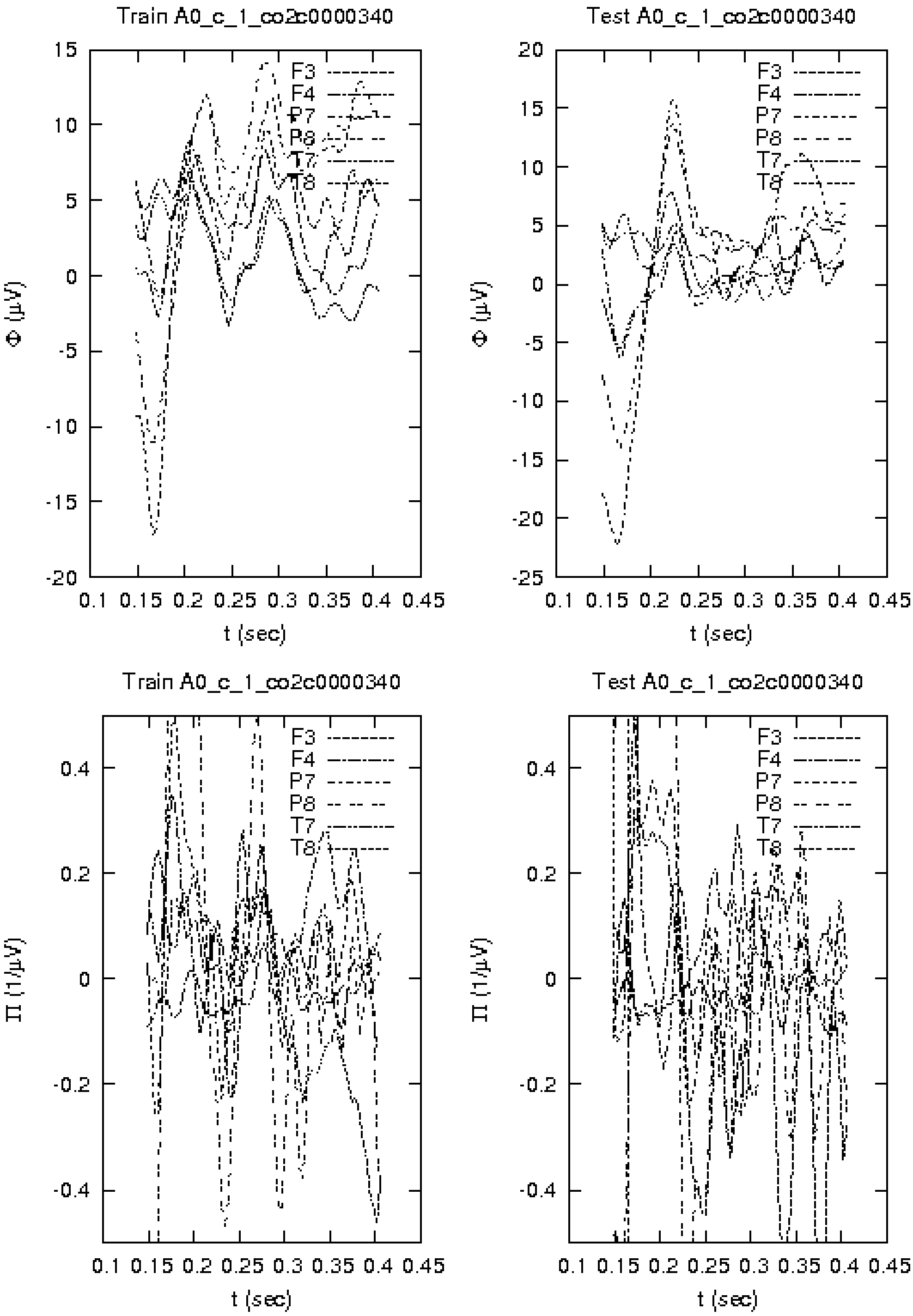
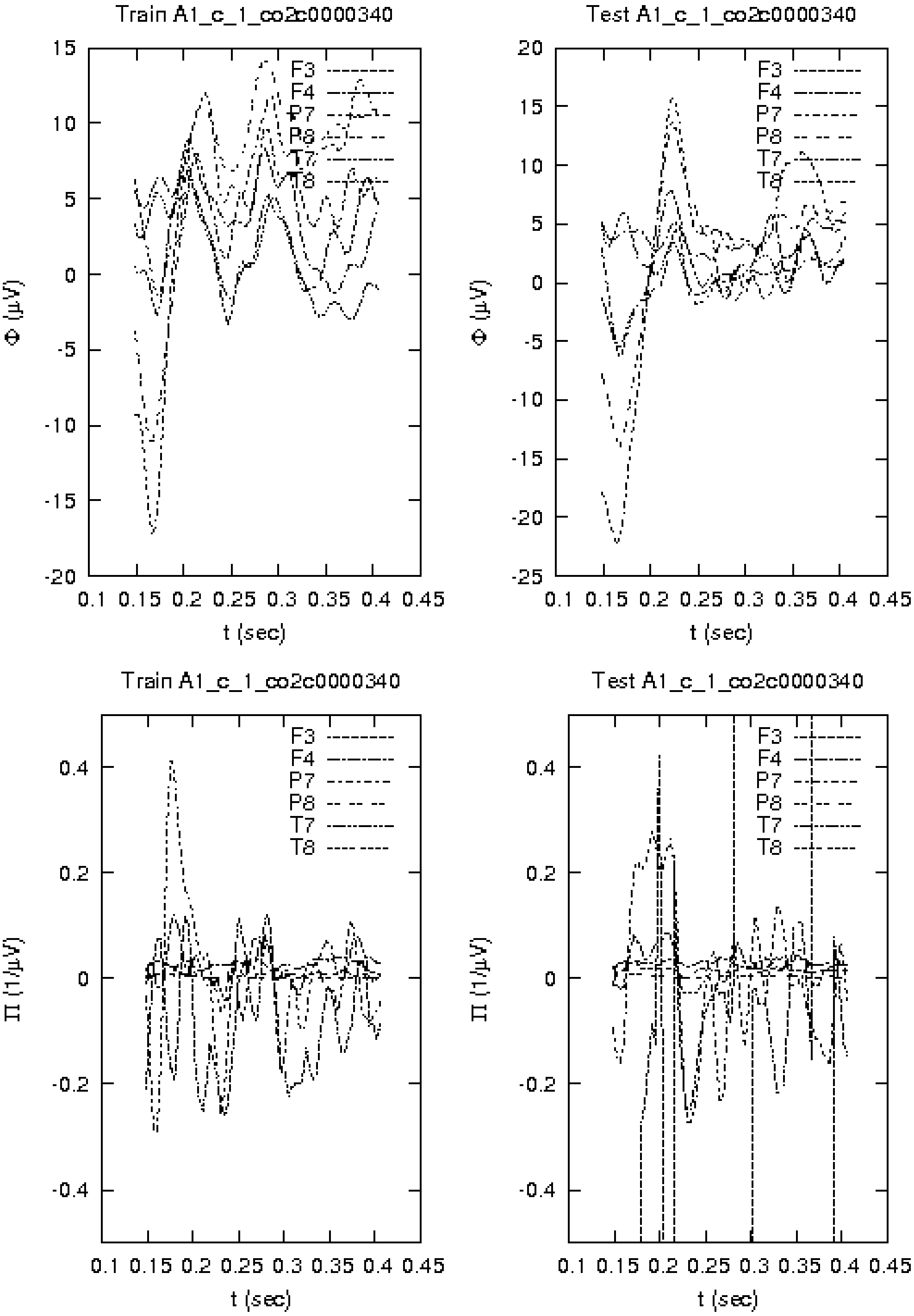


FIG. 67.

EEG
Train and Test have similar silhouettes: after a transient made by a strong oscillation of a couple of signals, a regular body of stable waves with near-sinusoidal envelop continues until the end of the time range; its signals show a good synchrony, being in phase with many oscillations, although with different amplitudes. Train also has a more regular amplitude range, while in Test the curves of the envelop tend to vary; in Test the initial transient is also more pronunciated, reaching -23μV.

CMI
Both Train and Test show an initial interval in which they have stronger positive oscillations, but less pronunciated negative peaks. Then, after t=0.3 for Train and t=0.23 for Test the activity goes down to the negative area of the graph. Train has more clearly separated aggregation of peaks, while in Test they form almost uninterrupted large groups and the overall picture looks noisier.

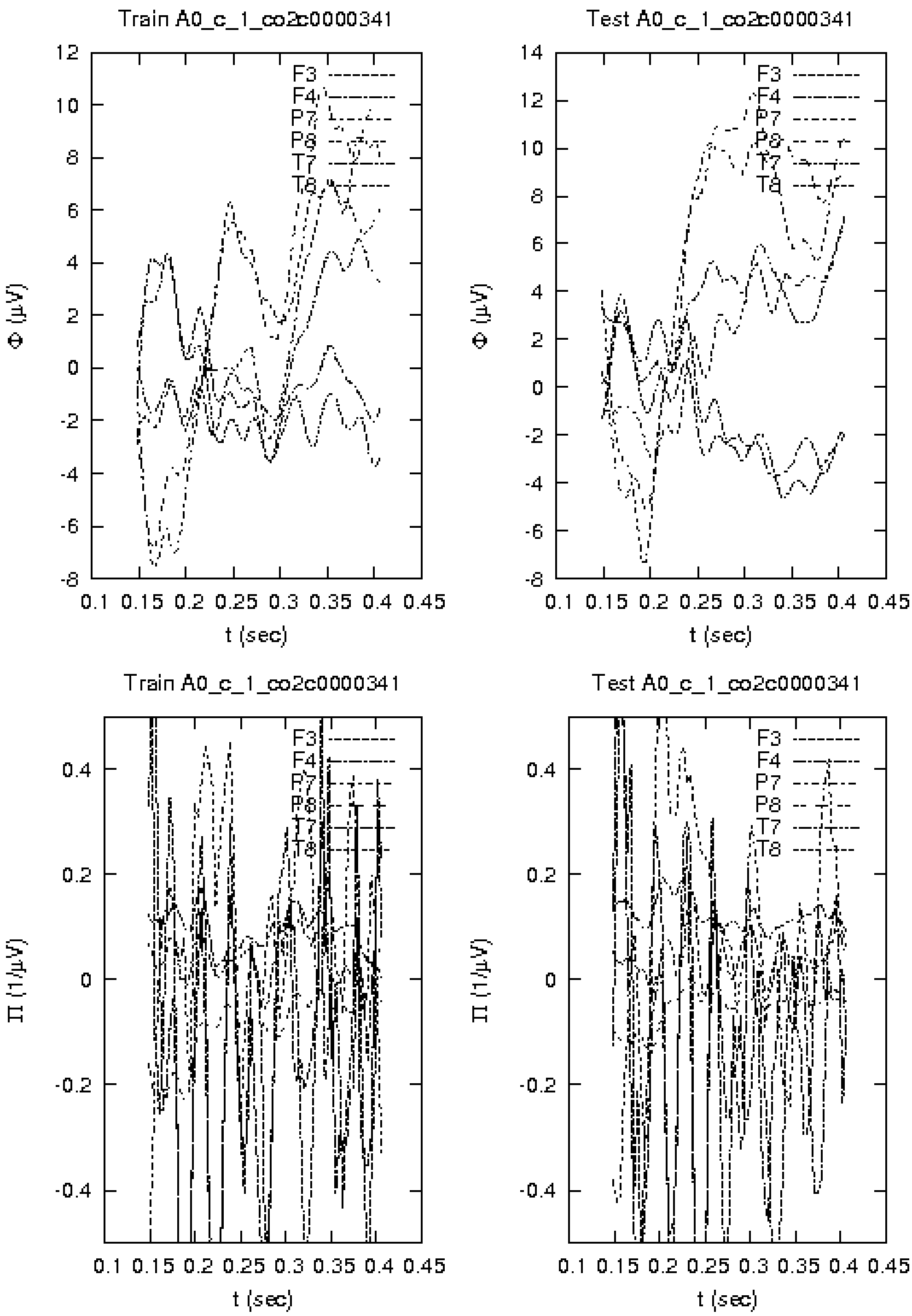


CMI
Train and test have in common a quite regular body of activity, with an initial strong positive component, and then regular groups of compacted oscillations around the y=0 axis. The main difference is that only Test has evidence of a strongly peaked signal which abundantly exceeds the bounding box limits. Amplitude ranges are similar, and the trend is constant with negative peaks a little more pronunciated than positive ones.

FIG. 68.

A0 vs. A1

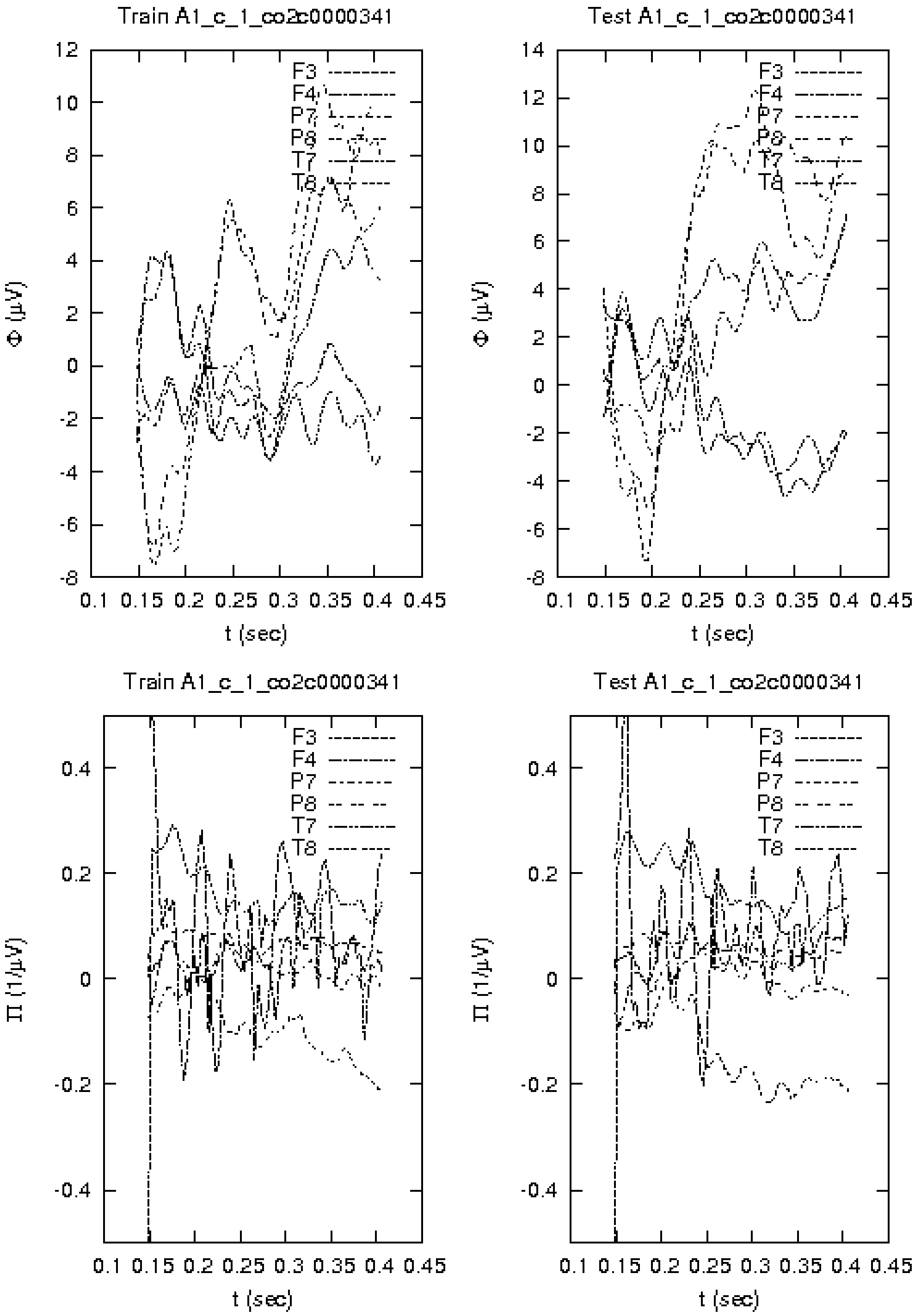
A application preserves the initial strong positive component in waveforms, while making all signals more compact and readable: peaks have lesser amplitudes and are more clearly distinguished in the A1 version of the graphs. The amplitude difference between positive and negative peaks is accentuated, with positive ones resulting more reduced.



EEG
The time range for Train can be divided into three segments, corresponding to three oscillations for many of the signals. These oscillations envelops follow an increasing trend. Test has instead only two of these phases, the second with greater divergence and vertical separation of three couples of signals, and they could be seen as three transients. All waves have calm and soft dynamics; for both graphs this is a situation of synchrony. Amplitude ranges are very similar between the two figures.

CMI
Train and Test have similar silhouettes, being traversed by oscillations which are very intense and well separated in isolated peaks. The upper side has fewer and lower peaks. It's hard to notice qualitative differences between the two figures; Test looks to have slight amplitude range reduction in the final instants of the time range (after t=0.37). Train shows a net positive peak gap for t in [0.24, 0.27], while Test has a similar feature for t in [0.26, 0.37] (with the exception of a single high positive peak in the range).

FIG. 69.



CMI
Train and Test have a strong similarity in their silhouettes, also because they present specific and corresponding signal behaviours which occurr at about the same time in each graph. After a single, initial strong oscillation at about t=0.15, both graphs show a mix of oscillations of various amplitudes (not exceeding the middle horizontal band), which then compact themselves after t=0.27. After that time there's also for both graphs an isolated negative signal. Waves in Test appear just a bit slimmer and less oscillationg, as if they had less energy.

FIG. 70.

A0 vs. A1

The application of **A** determines a strong reduction in wave amplitude and distribution, resulting in more recognizable features and dynamics. The morphology of the overall silhouettes remains similar for both Train and Test, apart from the peak reduction occurring in the A1 version.

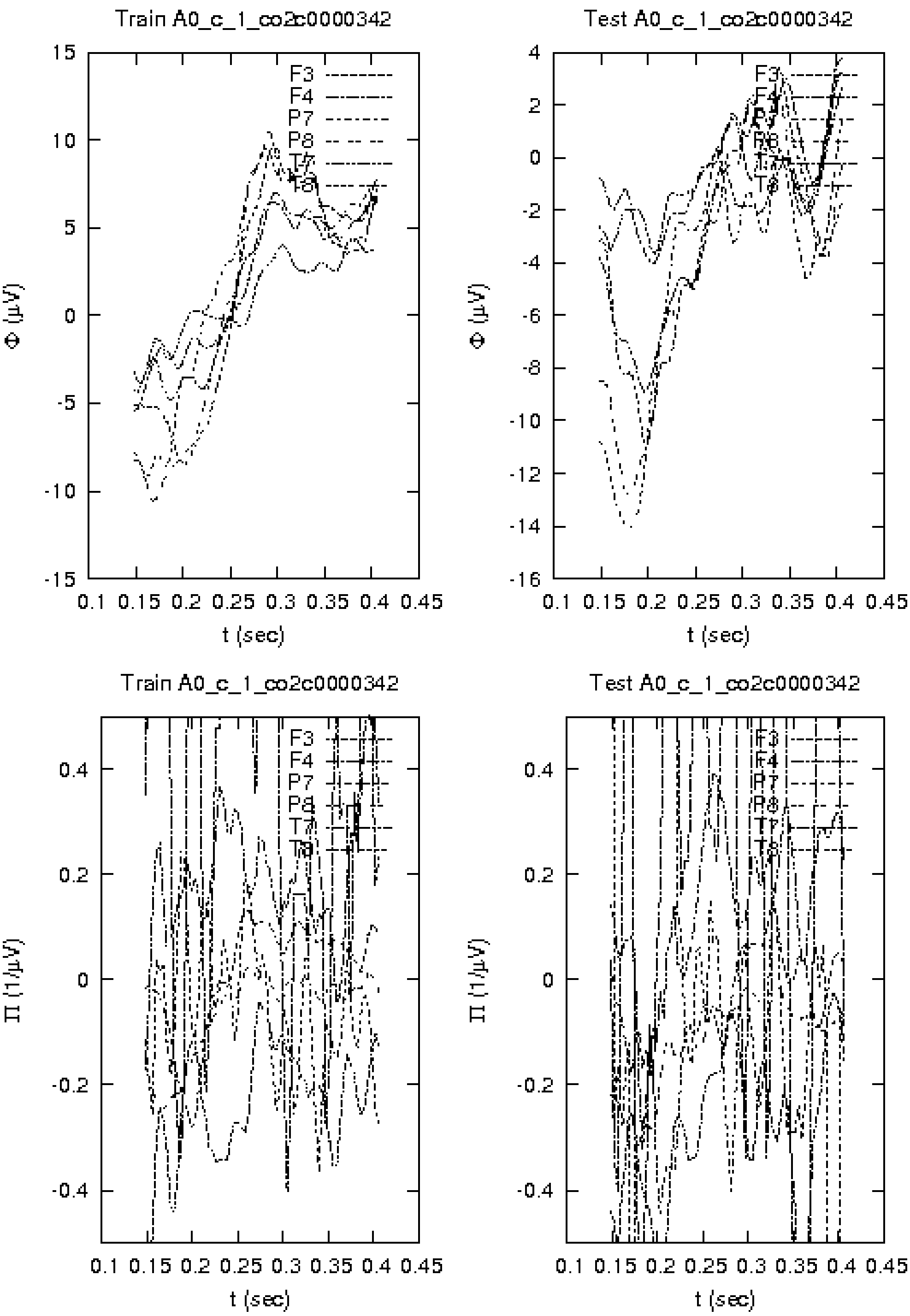
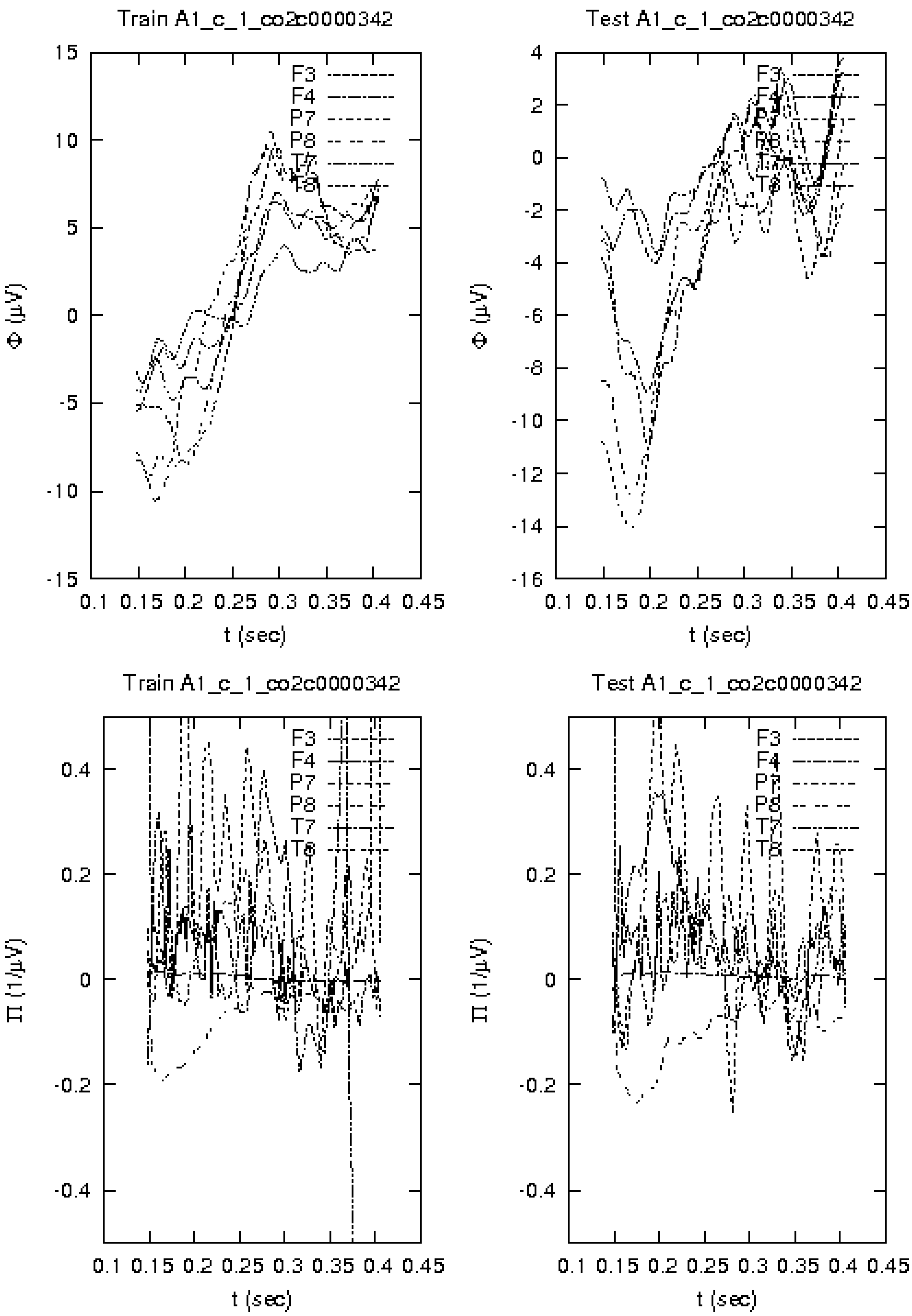


FIG. 71.

EEG
Train presents signals in strong synchrony within a well defined envelop, which is symmetric with respect to the y=2 axis. It has increasing trend. There are few crossings between signals, with very smooth peaks.
Test has a shorter amplitude range, and good synchrony in its waveforms. It hasn't the symmetry of Train, but exhibits more irregularity in signals, with a little more pronunciated peaks. Trend is increasing although it can be seen as a temporary phase of a sinusoidal envelop.

CMI
Train has a central body of activity with aggregations of positive and negative peaks. One of the signals repeatedly crosses the box upper limit, through all the time range with the exception of the central part of the range. The lower limit is touched only once at the beginning of the time range. There are many crossings in the mid band region, giving noisy character to the figure.
Test is similar but with higher and sharper peaks, and also with high protrusions of the negative activity that cross also the lower box limit.

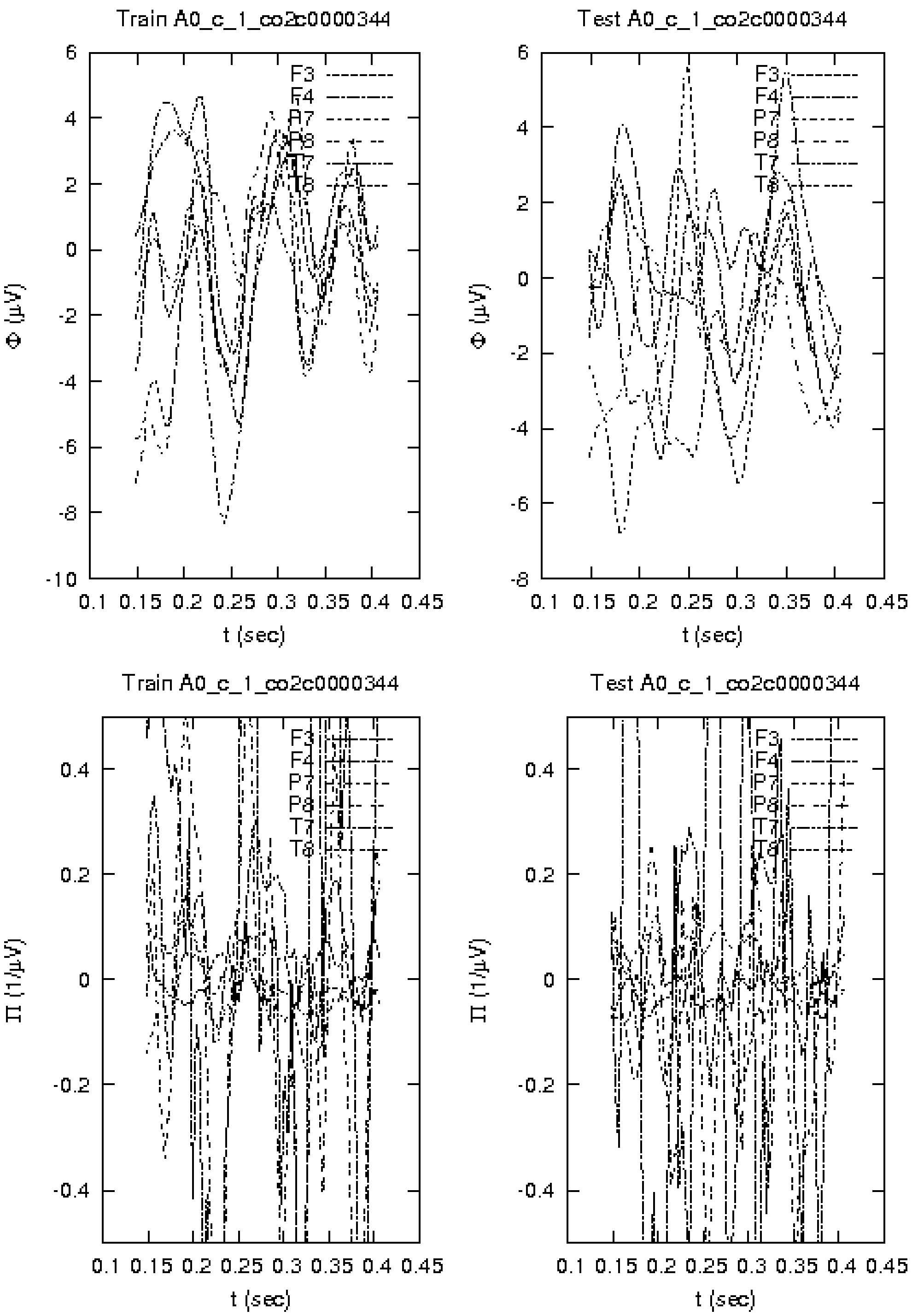


CMI
Train and Test have very similar silhouettes, with a crowded group of positive peaks for 2/3 of the time range, then a short peak gap followed by a smaller peak group. Negative activity is present mainly in the last part of the time axis, with structures of low value peaks. Train has also a single signal exceeding the lower box limit in at the end of the time range. Train's peaks are higher and they form greater aggregations and noisier crossings, while Test's peaks are more strict and sharper.

FIG. 72.

A0 vs. A1

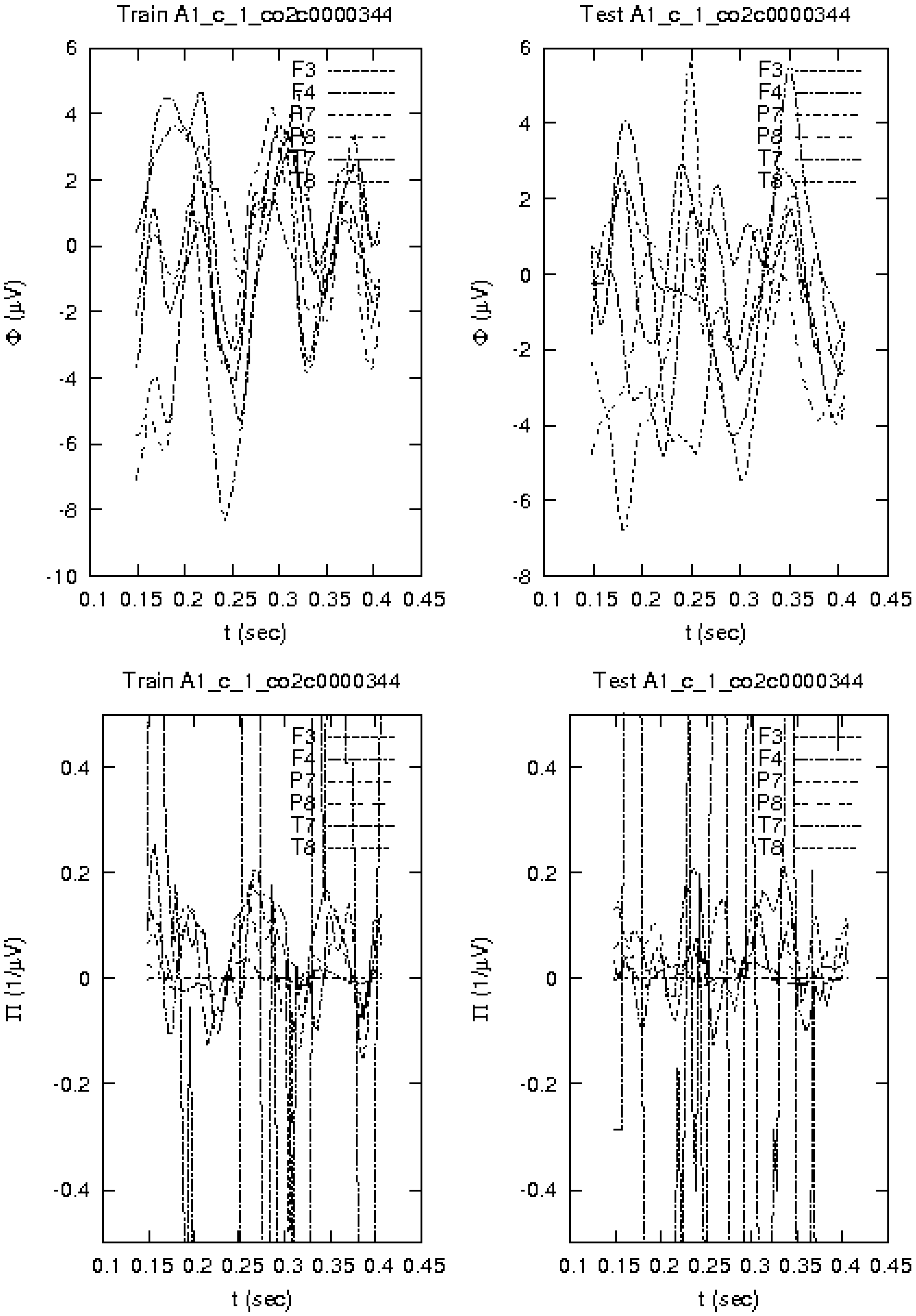
A application strongly reduces negative activity, leaving only a few structures of little and aggregated peaks. High aggregations are replaced by separated, medium-height peaks. Mid band activity becomes more intense, with greater crowding of signals, crossings, and noisy superpositions.



EEG
Train shows a more symmetric behaviour, with most of the signals aligning along a sinusoid. Amplitude ranges are quite similar, but Test has some positive and negative peaks more elongated. Test signals are less aligned and synchronic, apart from the tail of the time range where they converge in a positive peak envelop around t=0.35.

CMI
Both graphs show a lower region denser in peaks, although in Test it's more filled than in Train. For this reason the stucture in Train is somehow more readable as a sinusoidal envelop, intermixed with high peaks. In many points the positive and negative peaks exceed the bounding box limits.

FIG. 73.

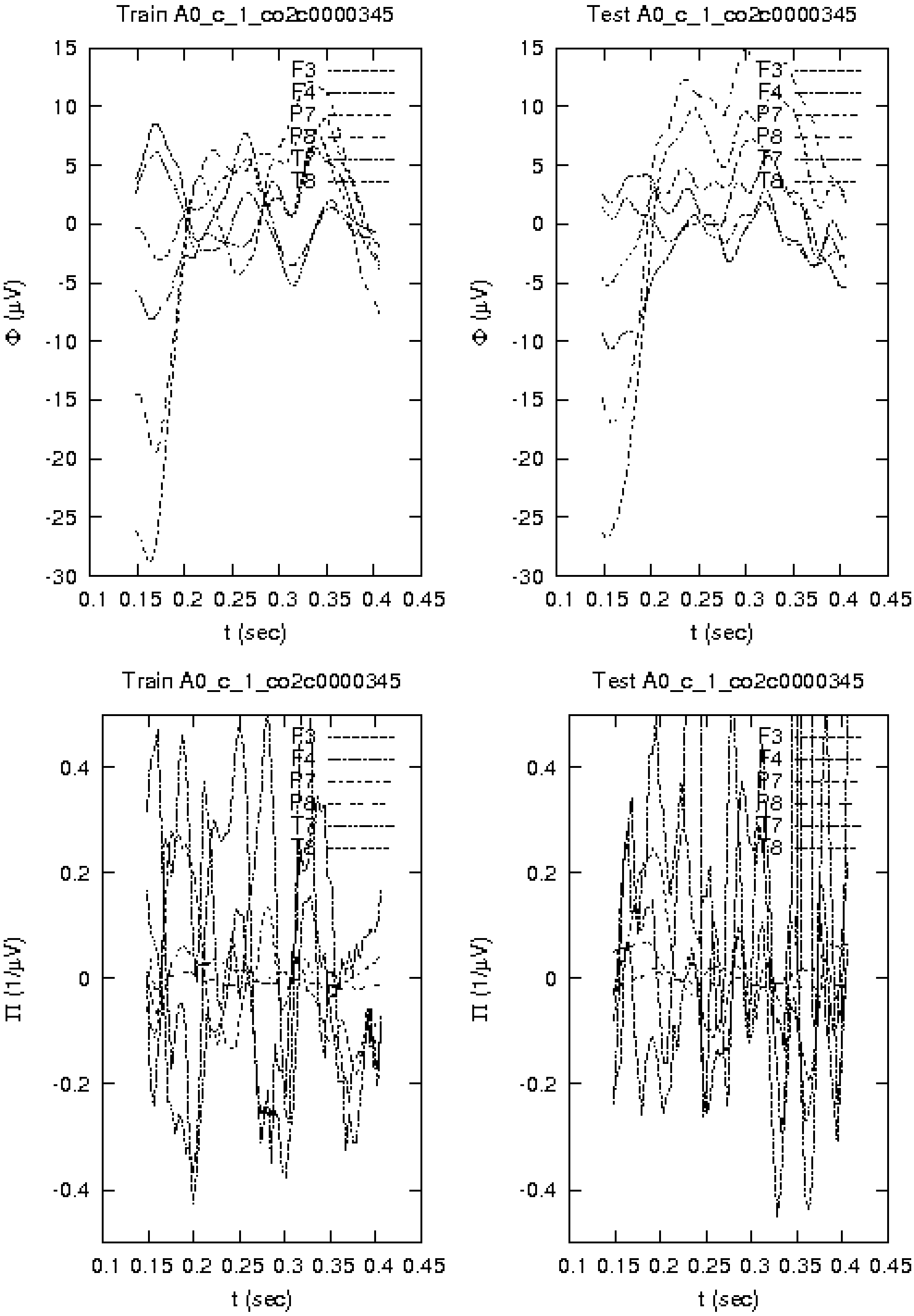


CMI
Train and Test show similar silhouettes: a sinusoidal central body of waveforms, alterned with more rare and highly oscillating signals. Both graphs exhibit a constant trend. Train is a little denser and uniform in its high oscillation distribution.

FIG. 74.

A0 vs. A1

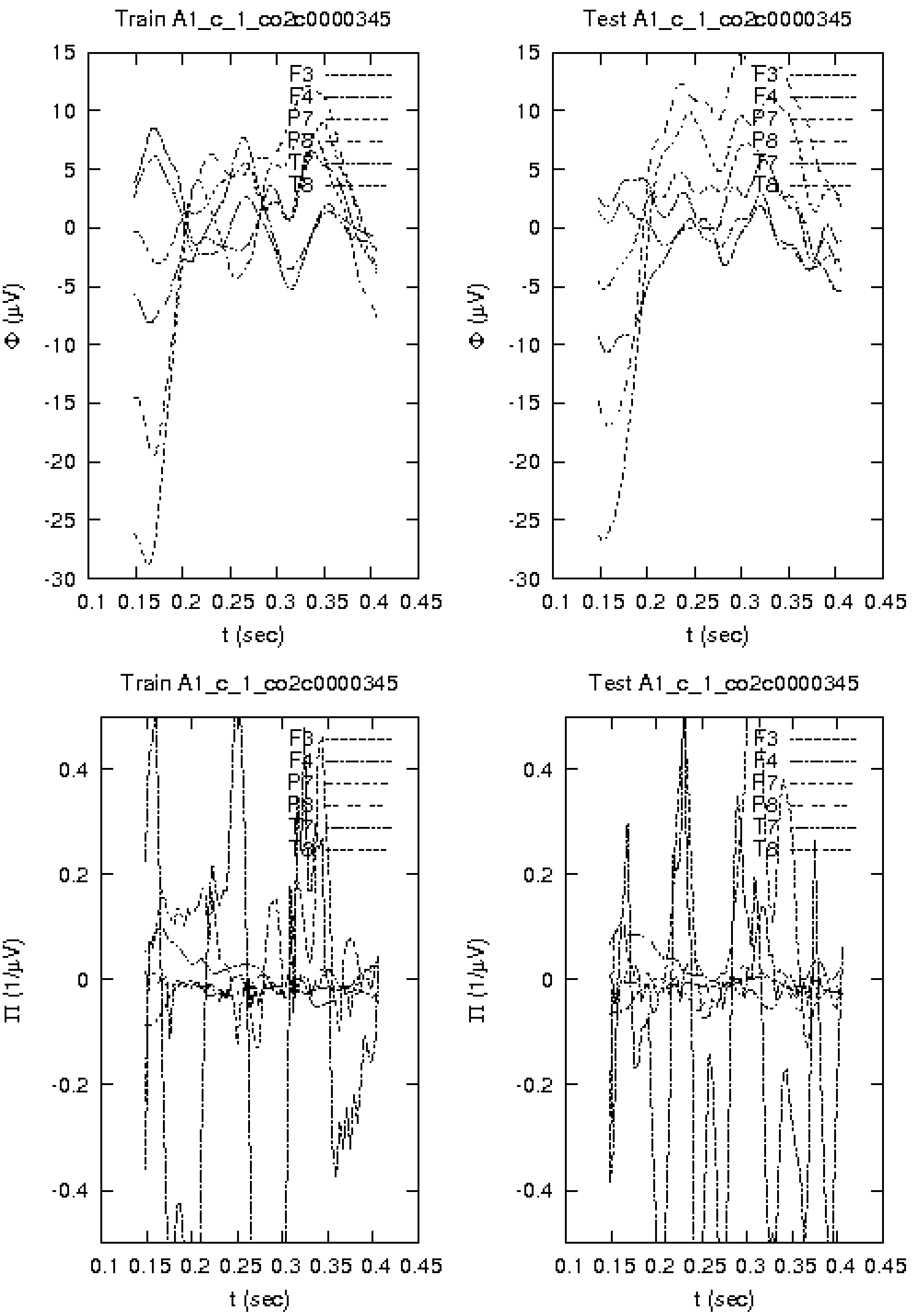
In the A1 graphs we see a very more compact central body of waves, which isn't almost distinguishable in the A0/Test plotting. Trend remains constant in all figures. Especially for Test(also for Train but less), important variations can be observed in the distribution of high oscillations along the y=0 axis, which in A0 appear more distributed on the whole time range, while in A1 are more localized in specific spots.



EEG
Train and Test signals exhibit a sinusoidal behaviour, very clear and with little noise, with peaks in phase, determining an overall synchrony of the waveforms. On the other side, there's very little superposition of the waves(mostly for t in [0.35, 0.4]). Amplitude ranges are quite similar, with Test waveforms looking a little more amplified after t=0.2.

CMI
Train and Test show similar silhouettes, with contained peaks and oscillations. Test amplitudes are a little greater and tend to exceed the bounding box upper limits after t=0.35. In both graphs are distinguishable three groups of negative peaks, well separated in Train and nearer, almost continuous in Test. Train has almost no positive activity after t=0.35(except from a transient of two signals), while Test shows there its highest positive peaks.

FIG. 75.

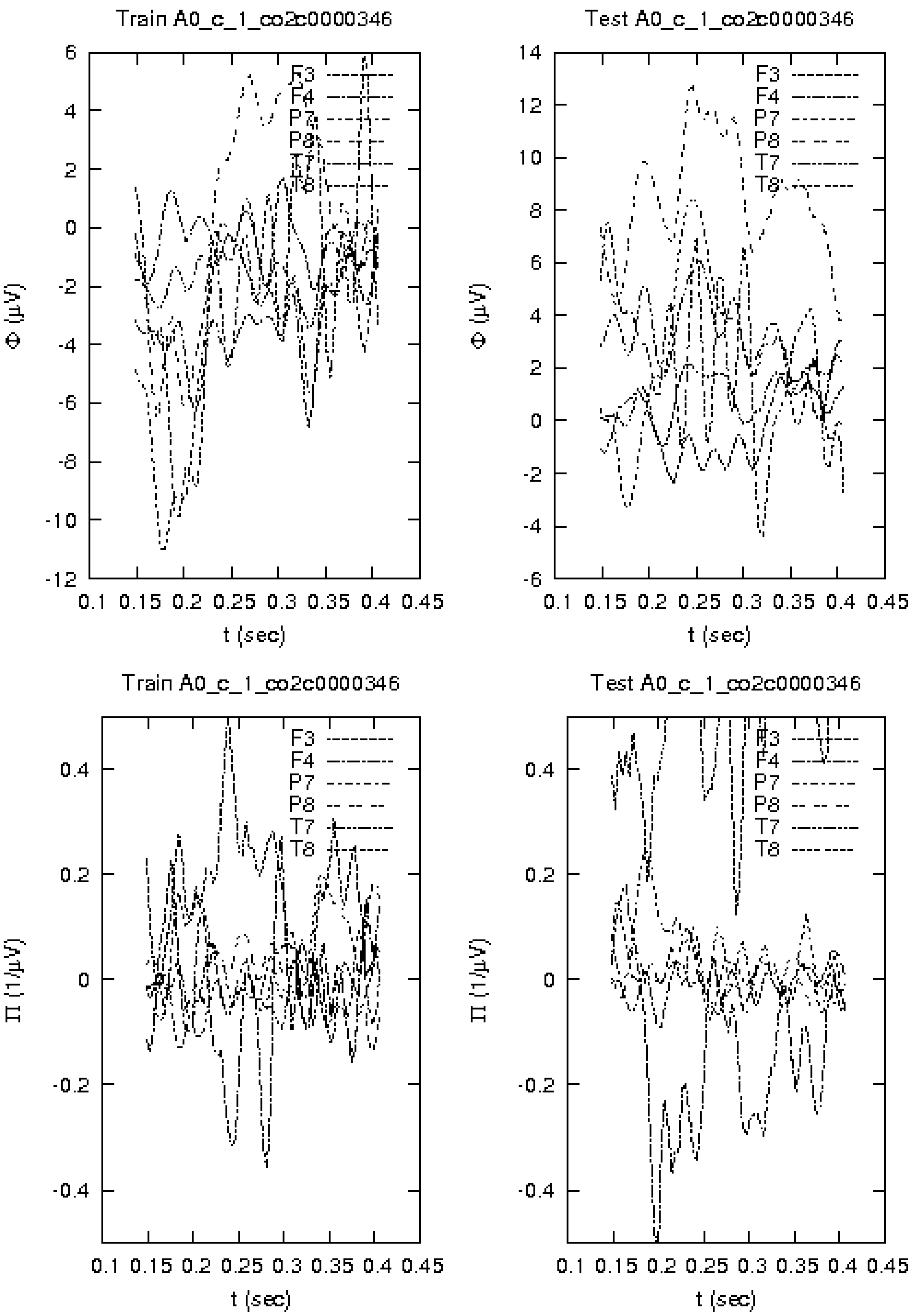


CMI
Train and Test have similar figure structure, with more massive peak groups in the lower part of the graph, and fewer with positive amplitudes. In both graphs there are some near-flat signals around the horizontal y=0 axis. For these waveforms Train has more signs of superposition and crossings. Train shows more uninterrupted great peaks, while Test has its main peak groups broken into smaller structures with shorter time range.

FIG. 76.

A0 vs. A1

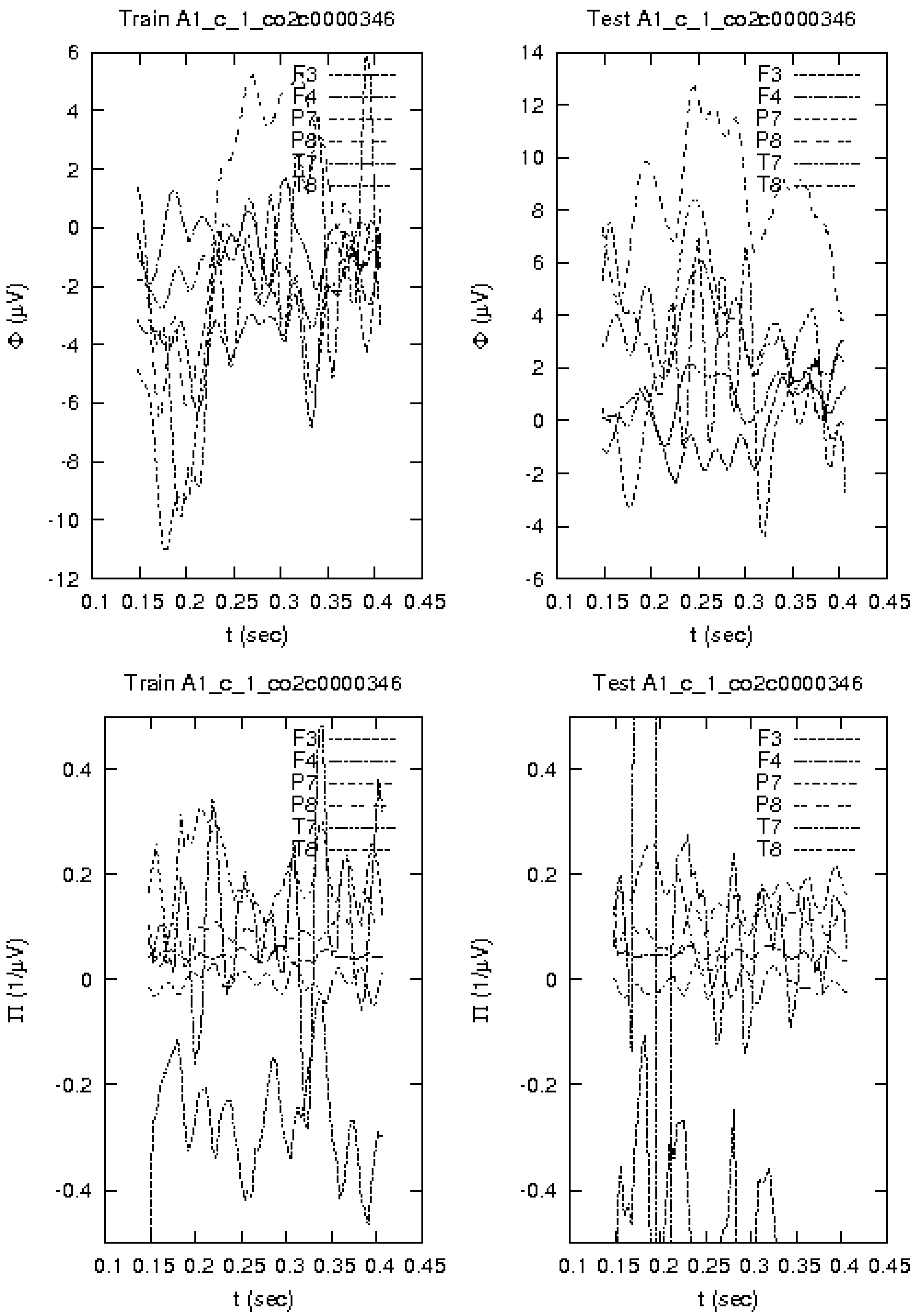
Application of **A** makes figures cleaner and waveforms more compact, with less crossings. Especially Test shows a reduction of noisiness and looks more readable in the A1 version.



EEG
Train shows an initial deep negative group of waves scattered on all amplitudes; then plots become more compact around y=-2. From t=0.23 there's a transient of a high positive signal. In the final part of the time range there are complicated crossings and a single high positive peak. Most of the synchrony is located at the beginning of the time range. Trend is slightly increasing. Test has scattered and smooth modulations of waves on various amplitudes. Its signals differ in frequency, amplitudes and offset and present little symmetry. It has constant trend.

CMI
Train has most of its signals concentrated around the y=0 axis, with complex crossings. Peaks are differentiated by height, but appear with similar frequencies through various waveforms. There's one very high positive signal,and only two prominent negative peaks In Test there's one very high positive signal, exceeding the box upper limit. Under the y=0 axis, there's one relevant negative signal with peeks aggregated in three main groups.

FIG. 77.



CMI
Almost all of Train's waveforms are above the y=0 axis; only one strong negative signal has its oscillation in the lower half of the graph. Peaks are moderately sharp, but oscillations are relatively calm. Peaks have simiilar frequencies but different heights. In Test peaks have more similar amplitudes and are a little bit sharper, with a slightly greater presence under the y=0 axis. Here the strong negative signal exceeds often the box lower limit.

FIG. 78.

A0 vs. A1

A application makes peaks more regularly distributed and with similar heights; in Test their amplitudes are also increased. The negative signals are enhanced and brought to often exceed the lower bounding box limit; strong positive waveforms are instead removed.

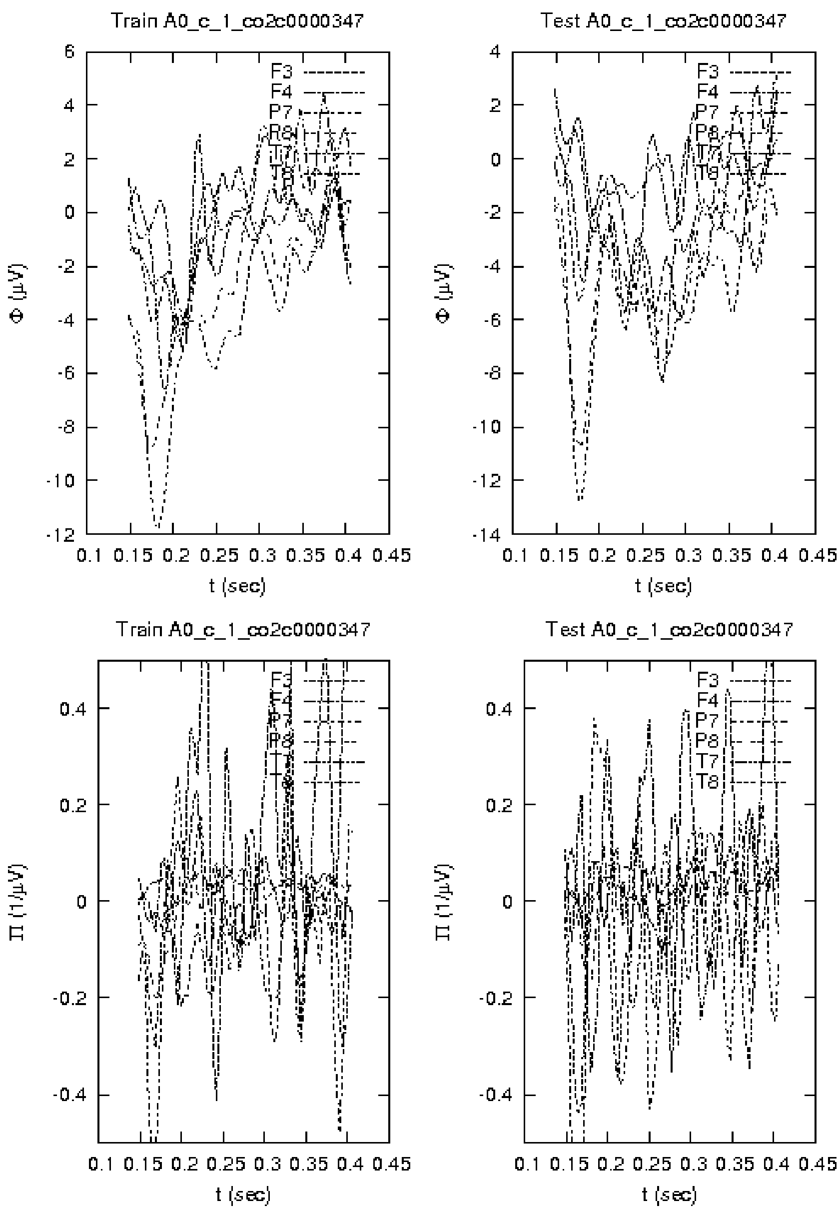


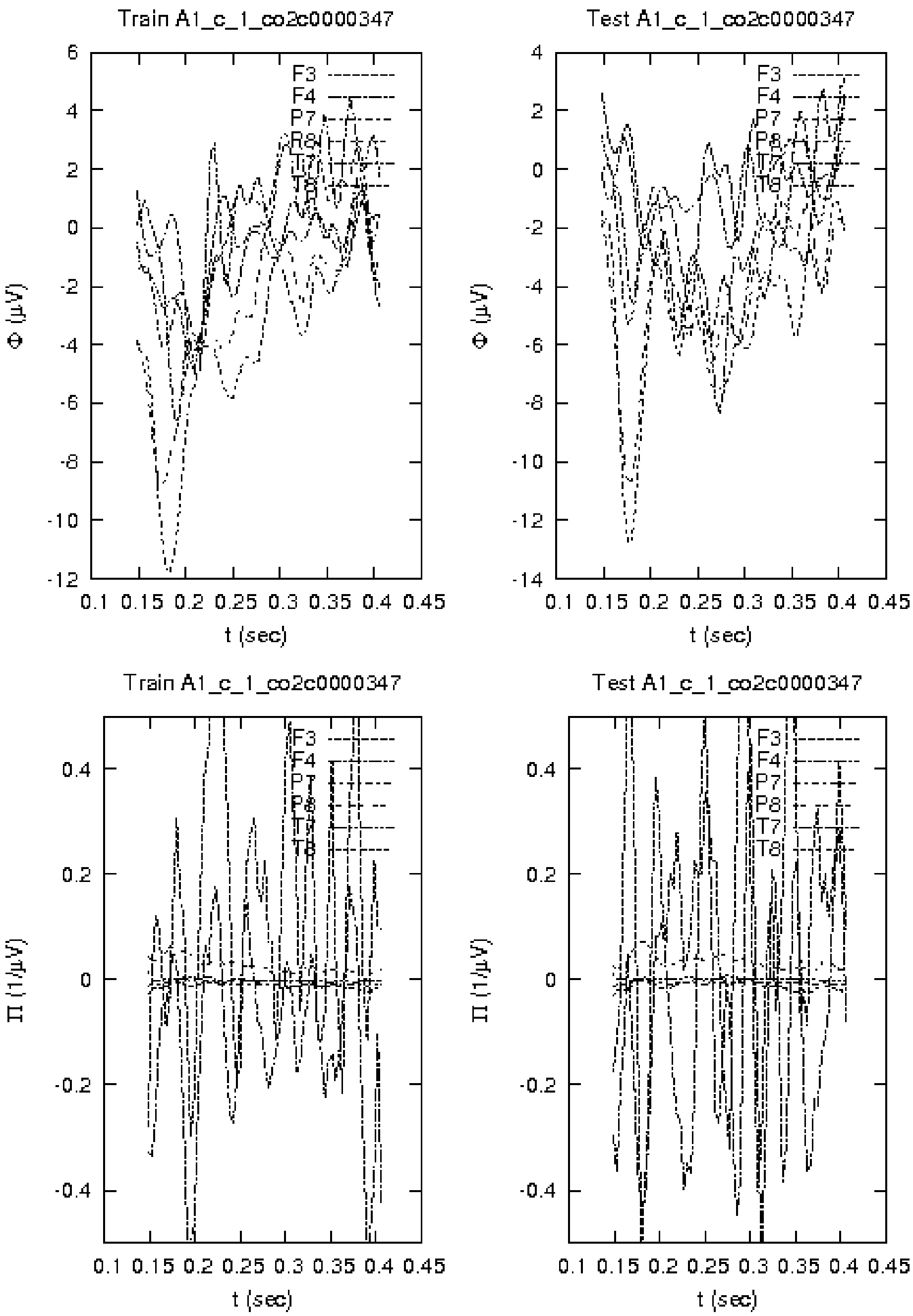
FIG. 79.

EEG

The Test graph shows an overall shift in amplitude of -2 μvolts. Both graphs exhibit a sharp negative complex transient in the beginning, comprised of P7 & P8. Minus the aforementioned differences, the two graphs resemble each other somewhat in frequency and amplitude.

CMI

There exists multiple, negative and positive, transient spikes in the Test graph; perhaps an overall amplification of the signal. The data is noisier in general across both; but greater noise in the signal is present in Test. The transient spikes occur at regular sinusoidal intervals; and even more so in Test.



EEG

CMI

There is a pronounced separation of signals in both plots; with 4 waves being quite calm; and remaining showing severe swings in amplitude across entire μvoltage axis. The F4 signal seems to have by far the most amplitude; and gains even more amplitude in Test, approaching the y-axis in both directions across entire time range.

FIG. 80.

A0 vs. A1

There exists a profound difference in the cleanliness and separation of signals after applying **A.** F4 has by far the most amplitude; but is pretty regularly repeating and sinusoidal. Finally, as mentioned earlier, 4 signals appear calm across entire sample.

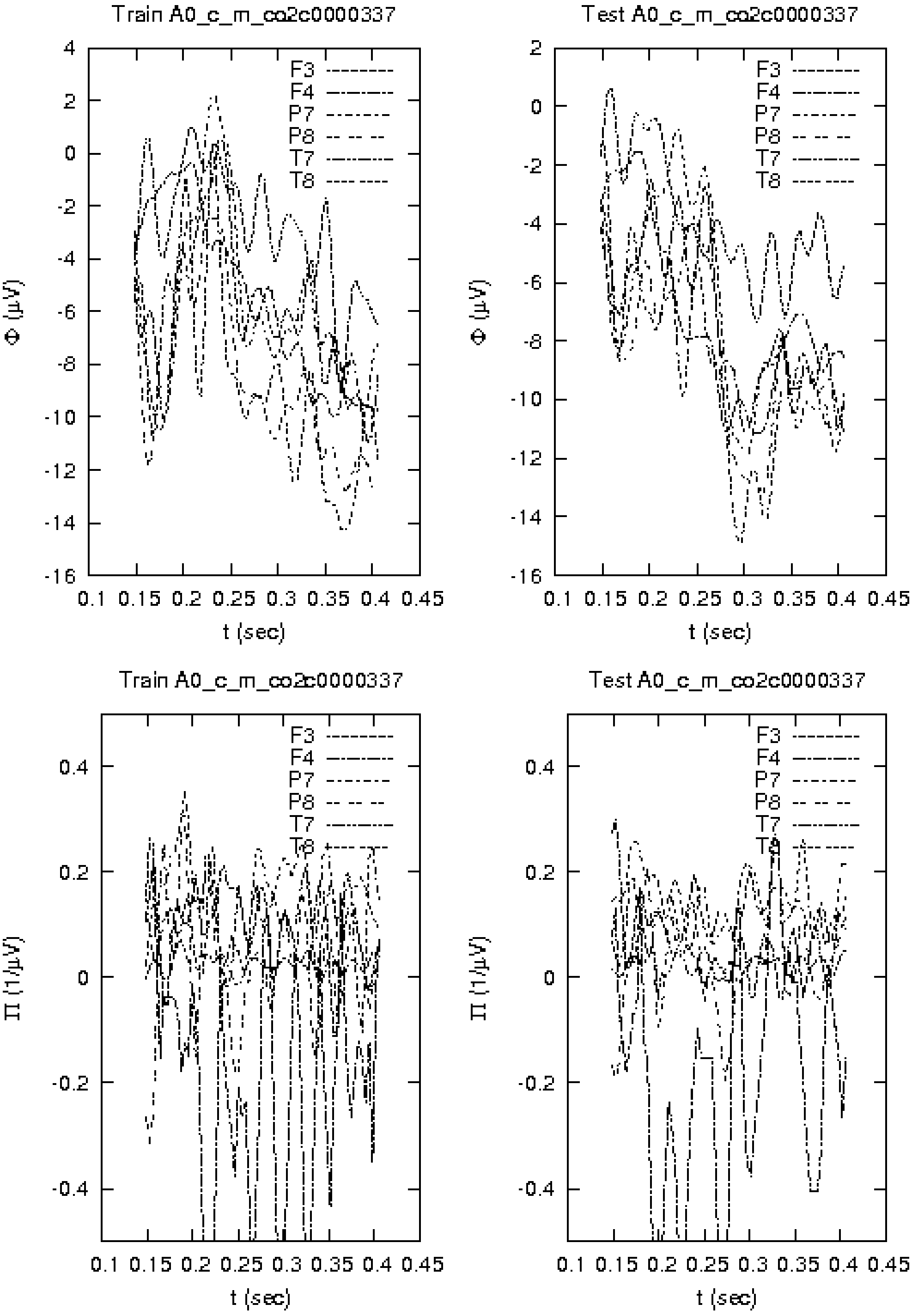
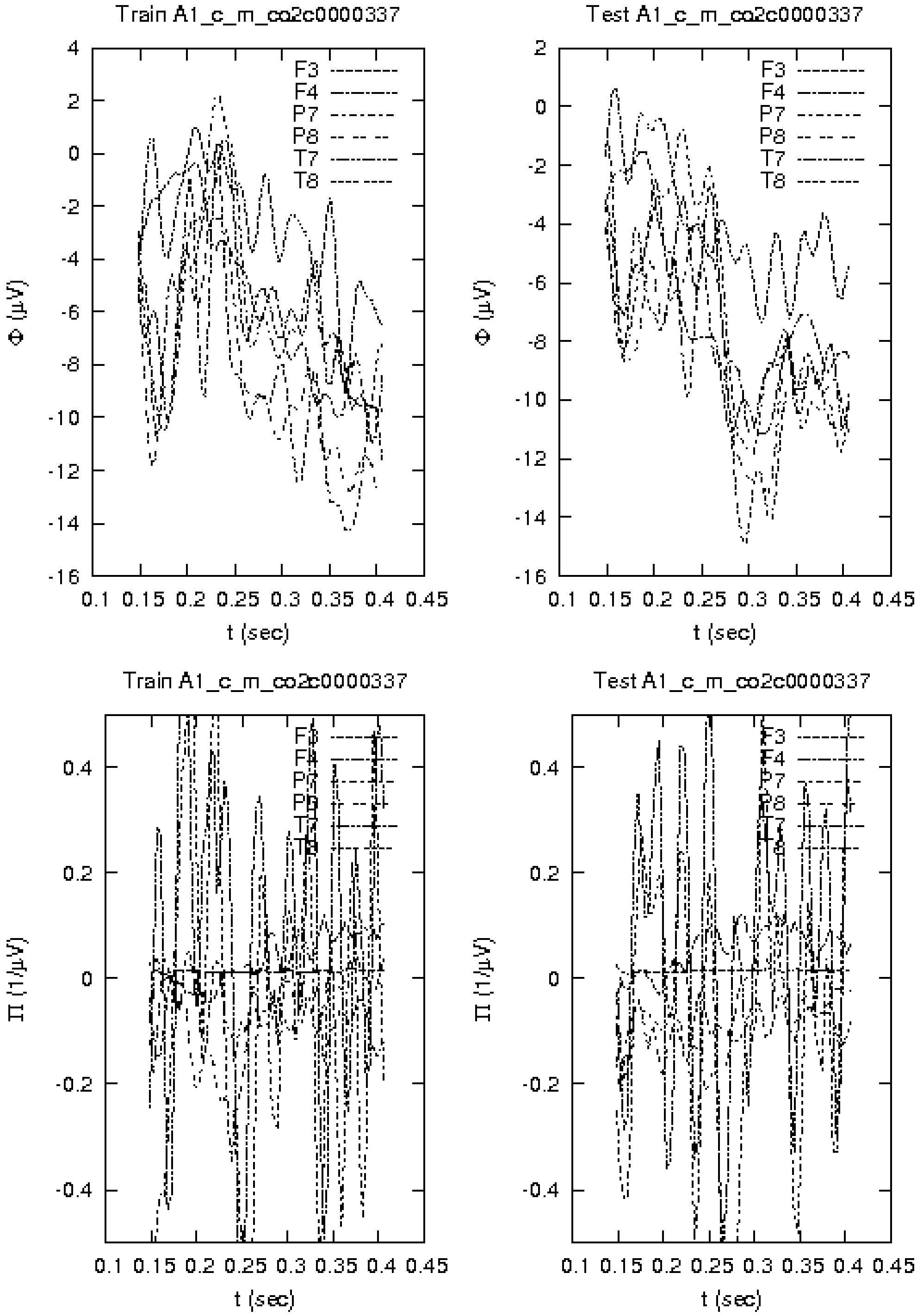


FIG. 81.

EEG
Both graphs show a pretty regular envelop with a slightly decaying trend. Train signals are centered around y=-6 with amplitude range=16, while for Test they deelop around the y=-7 axis and have amplitude range 14. Waveforms are well smooth and little noisy, with many signs of superposition and symmetry. In Test there's a remarkable transient of a single, higher signal after t=0.27. In Train there's a very smooth positive growing curve for t in [0.12, 0.2] which is quite uncommon among the many sharp peaks usual for this kind of pictures.

CMI
Train and Test have most of the signals above the y=0 axis, whith low but frequent peaks having many superpositions and crossings, and therefore with a quite noisy aspect. Both graphs present also an isolated negative signal with high oscillations and peaks that tend to exceed the bounding box limits. Train looks somehow noisier than Test, and has also more negative peaks. Test shows more synchronic positive waveforms, and more evident oscillations around y=0.

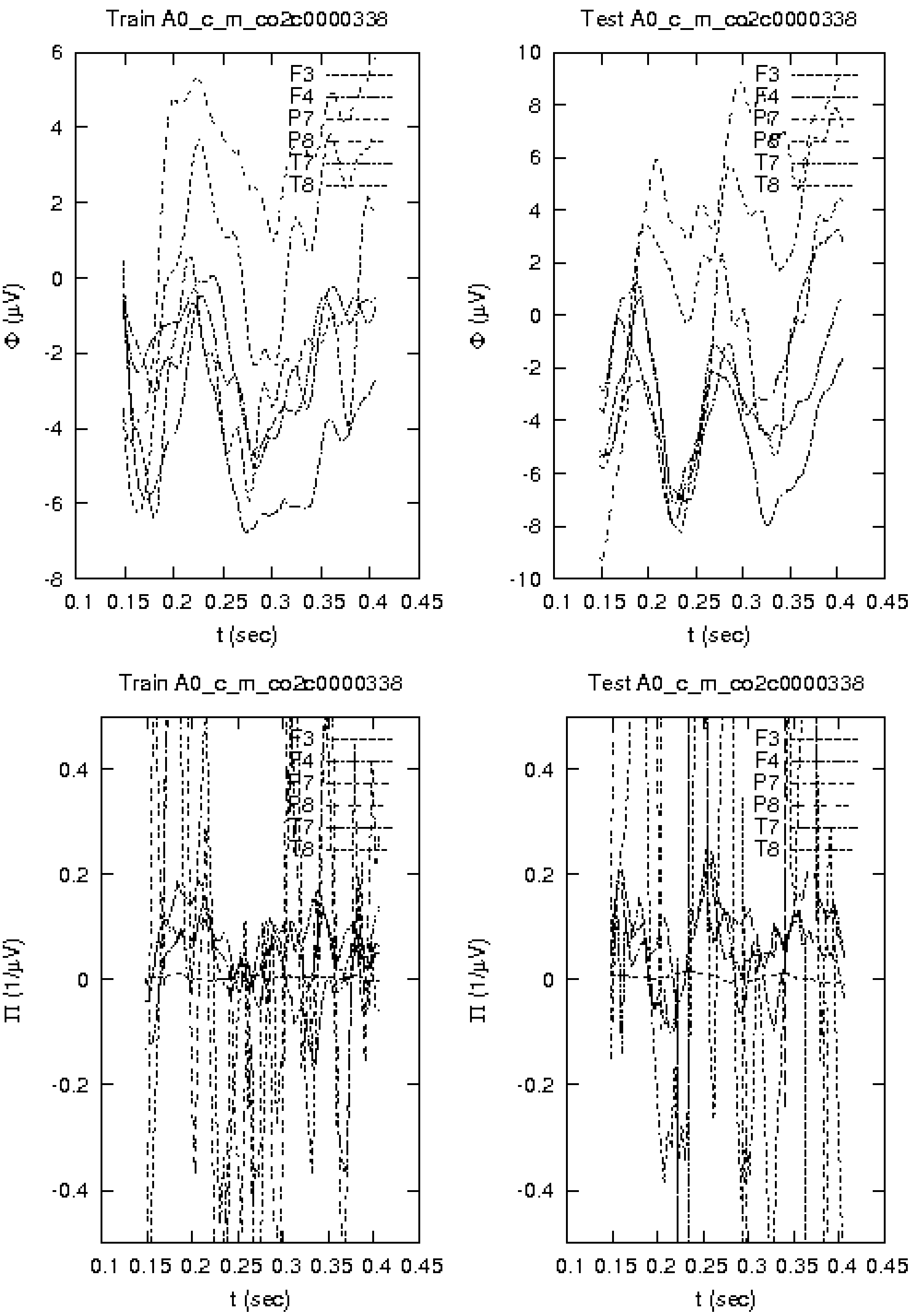


CMI
Train and Test have intense and symmetric oscillations around the y=0 axis. They have also a pretty similar distribution. Peaks are very strict and sharp, but rarely touch the bounding box limits. In Test there's a greater evidence of some more compacted waveforms in the central horizontal band, with a slightly increasing trend and very smooth low peaks. Test peaks are a bit more contained.

FIG. 82.

A0 vs. A1

Application of A makes the A1 version pictures more symmetric, regularizing the positive peak height with respect to the negative ones, and also making their frequency more stable. Peaks become sharper, with more isolation and less superposition, with a slight gain in readability.



EEG
Both graphs have various similar waveforms scattered through different amplitudes, with a greater concentration on negative values. In Train there's evident symmetry between all of the waveforms. Signals have overall constant trend and are characterized by modulated oscillations with smooth curves and peaks. Test also shows symmetry, with noticeable signal superpositions around t=0.23. It has a very slightly increasing trend.

CMI
Train and Test have a main body of waveforms in the mid-band areas, with sharp peaks and rigid oscillations; and a set of very strong peaked signals exceeding the bounding box limits. Train has a positive peak gap for t in [0.22, 0.3] Test presents a negative peak gap for t in[0.15, 0.18]. A nearly flat signal is present in both graphs. They have also a group of waveforms in the mid-band area with sharp but limited peaks. These ones are higher in Test.

FIG. 83.

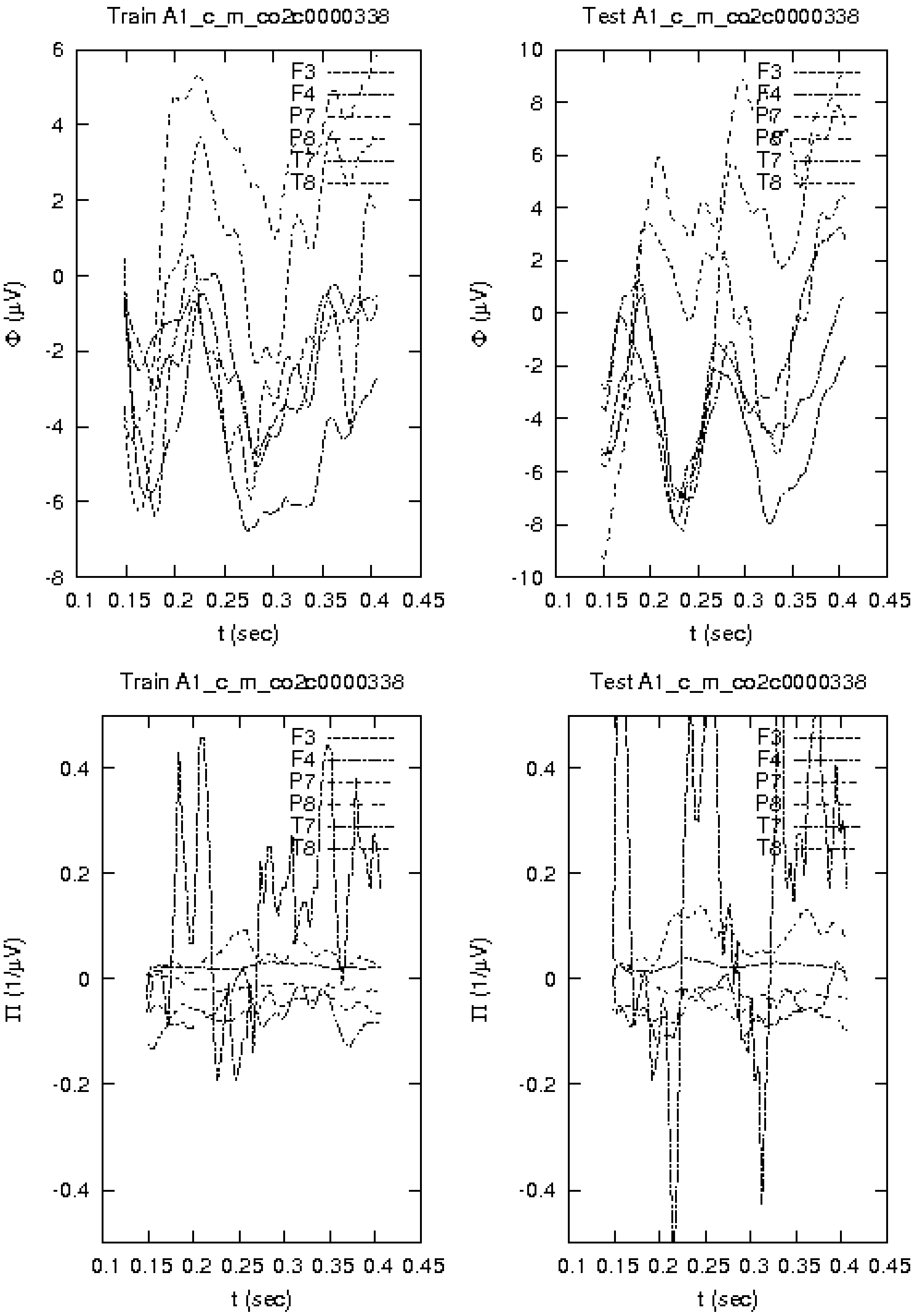


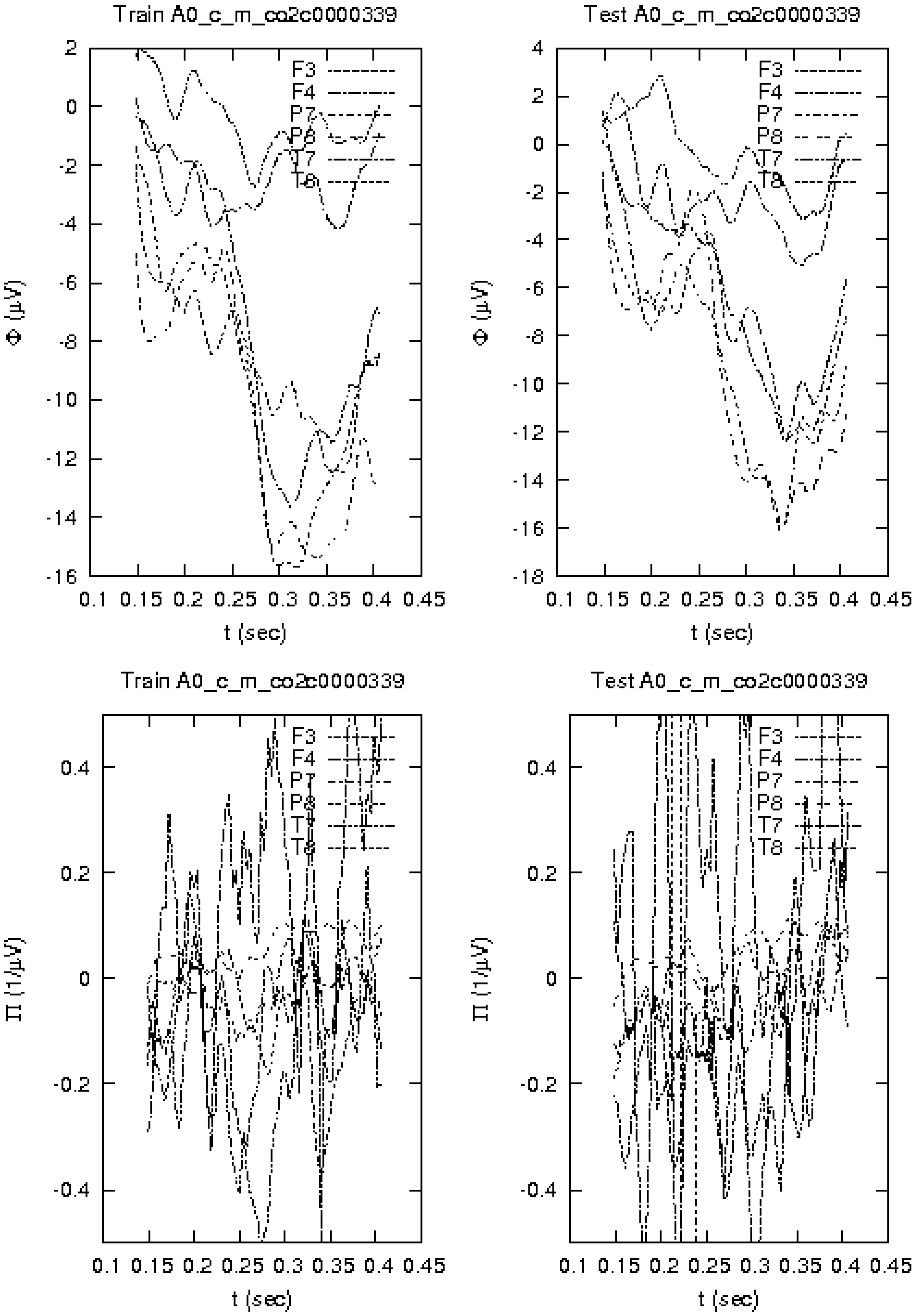
FIG. 84.

CMI

Train has many nearly flat signals(mostly negative), around the horizontal y=-0.02 axis. In the figure there's only one waveform, higly pronunciated, with sharp and irregular peaks, mostly positive. Test looks similar, with a slightly higher midband positive waveform, and a sharper version of the strong signal, with also negative peaks.

A0 vs. A1

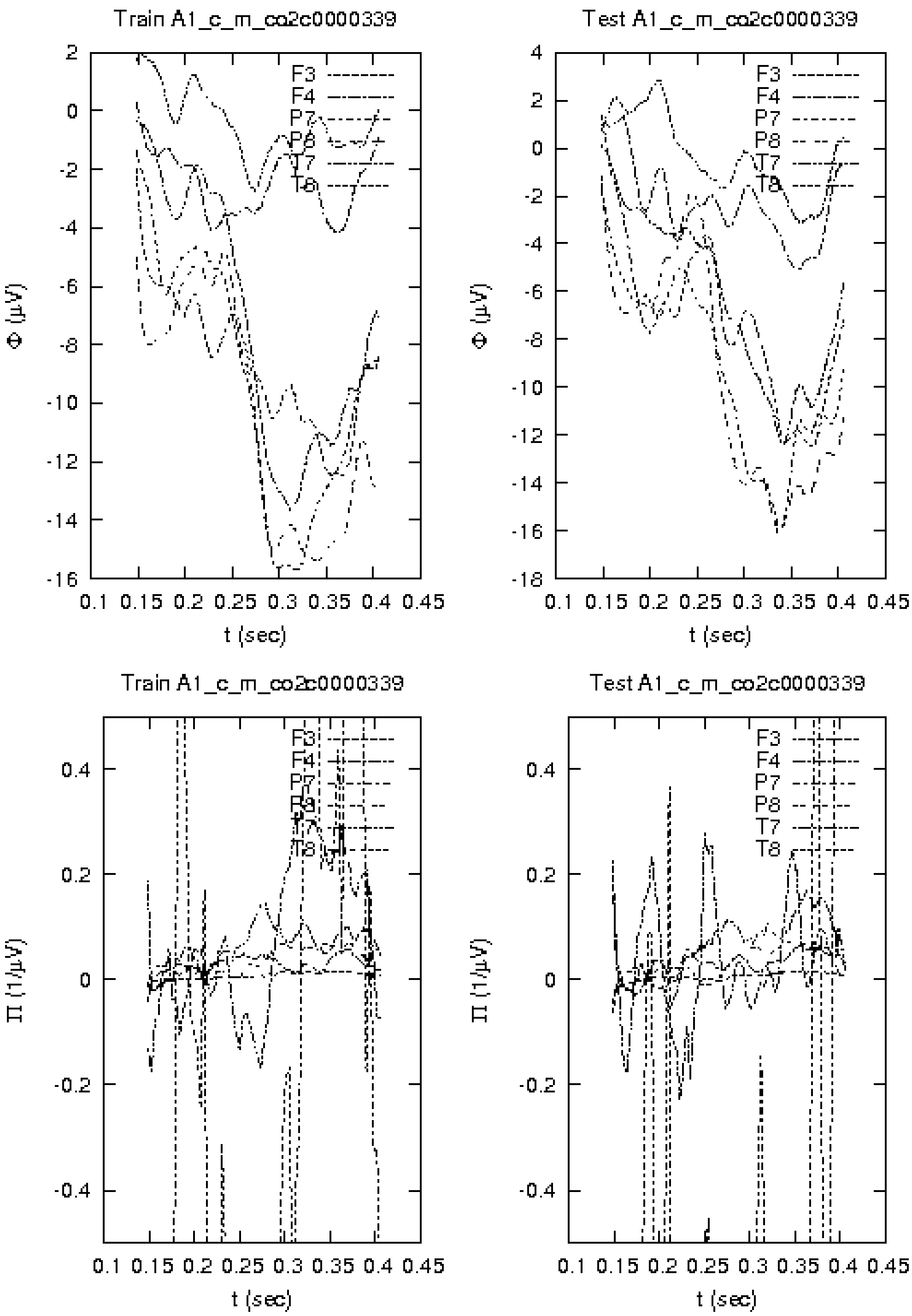
A application strongly reduces the extreme peaks and smooths and flattens the mid-band sharp waveforms of the A0 version.



EEG
Test and Train show very similar amplitude ranges and behaviour, although not identical in the details. Around t = 0.32 a transient of a couple of quietly symmetrical signals diverges from the others, being then rejoined slowly in the latest part of the t range.

CMI
Test shows more superposition, and hence symmetry, in the central region. Test has also higher and more uniform peaks in both upper and lower regions of the graph. Train shows constant trend, while Test is slightly increasing.

FIG. 85.



CMI
Test as steeper peaks, and a more strict-looking signal's landscape. Overall, the two graphs look quite similar, also with the same constant trend.

FIG. 86.

A0 vs. A1

After the application of A there seem to be preserved only some of the strong oscillations present in the original graphs. A signal weakly oscillating is also isolated as a result. As usual more cleanliness and readability in the A1 version.

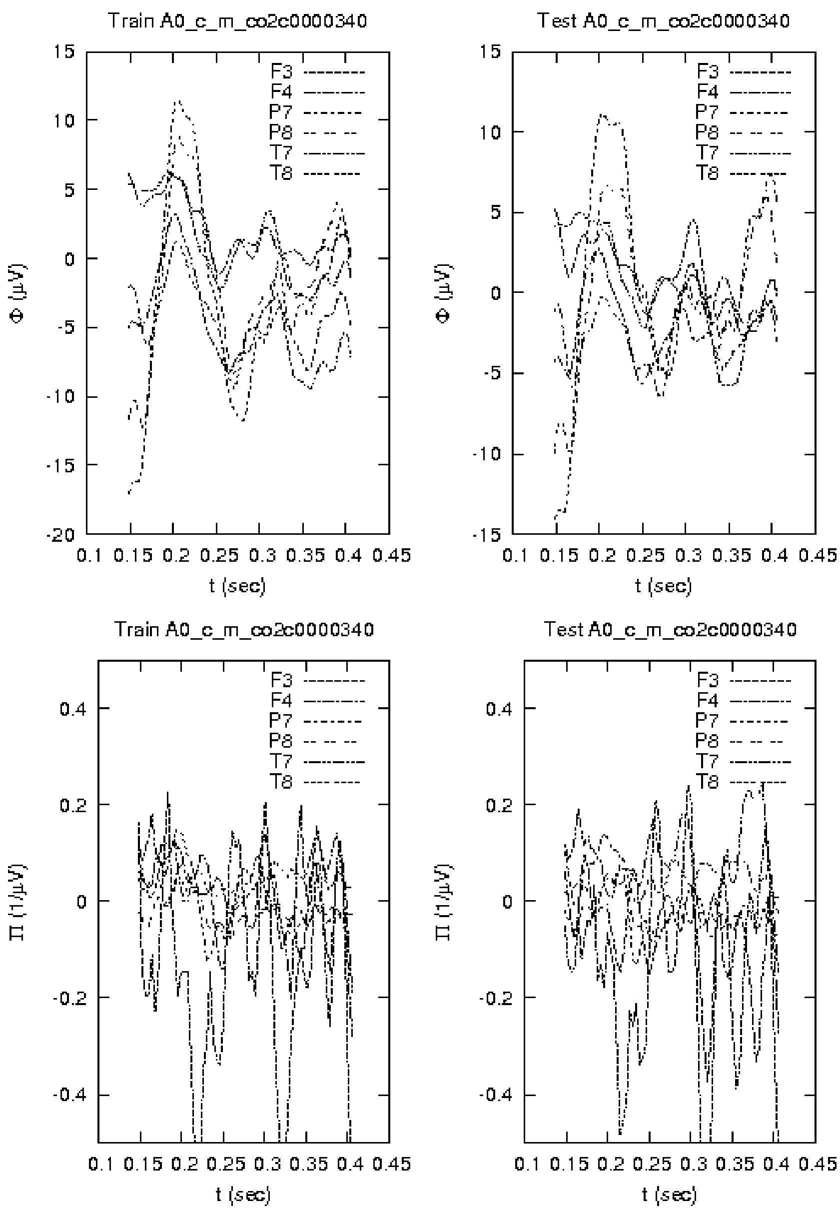


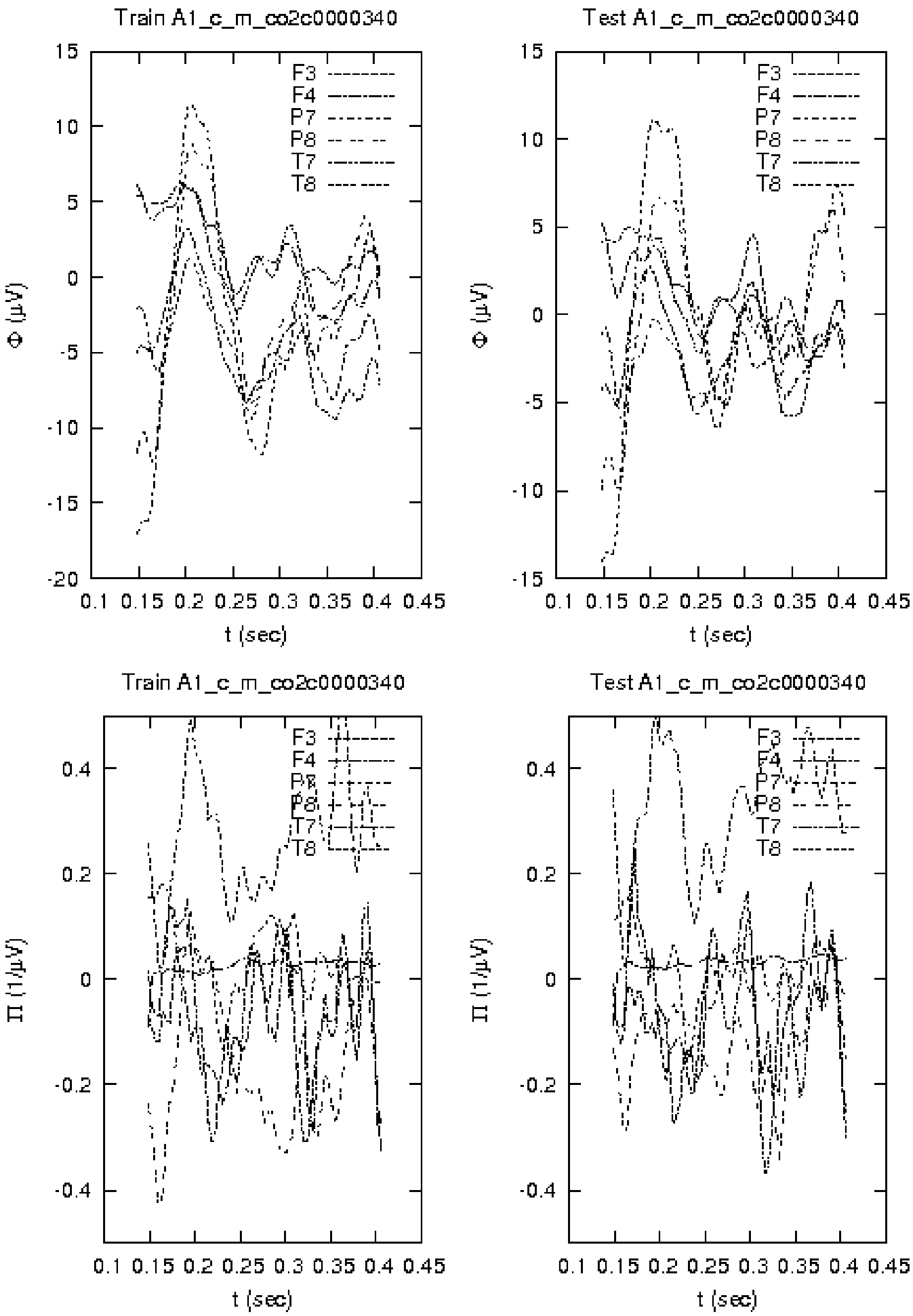
FIG. 87.

EEG

Both graphs resemble each other. Similar morphologies, symmetry, and synchronous behavior across all signals and entire epoch; with a noticeable negative transient at beginning of epoch and positive transient from same signal; P7 at t=.2. The signals are slightly compressed in Test.

CMI

F3 is pronounced across entire epoch in the negative domain; with three major troughs, visible in both plots. All remaining waveforms are moderately noisy, of lower amplitude, and resemble each other across entire epoch.



EEG

CMI

There are many different morphologies present across both plots. Easily discernible is the almost flat waveform of F4. T8 stands out with moderate, positive amplitude; with remaining waves mostly in the negative domain.

FIG. 88.

A0 vs. A1

After applying **A**, F8 stands out and F4 becomes almost flat. There are much greater separation of waveforms and differing morphologies visible as well.

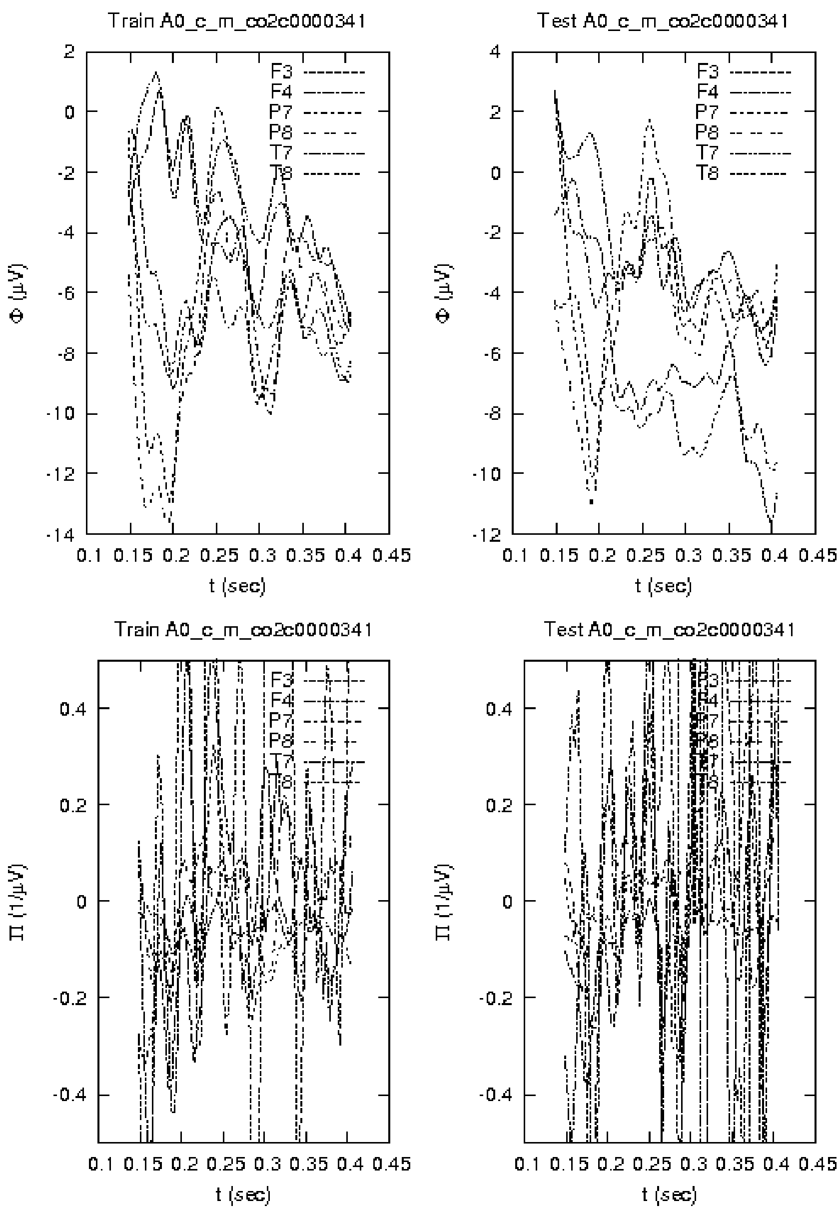


FIG. 89.

EEG

The Test graph shows an overall shift in amplitude of +2 μvolts. Additionally, there is a drop in μvolts to -12 on the Test graph at approximately t=0.4 seconds. In addition, this wave is associated with T7 and together they are complex. In the left graph, synchrony is pronounced across all 3 groups. Looking at the left graph, as time goes by, the signal calms down.

CMI

Only obvious difference is increased amplitude across entire epoch in the Test graph. There is a possible super-positioning of signals in the Test data.

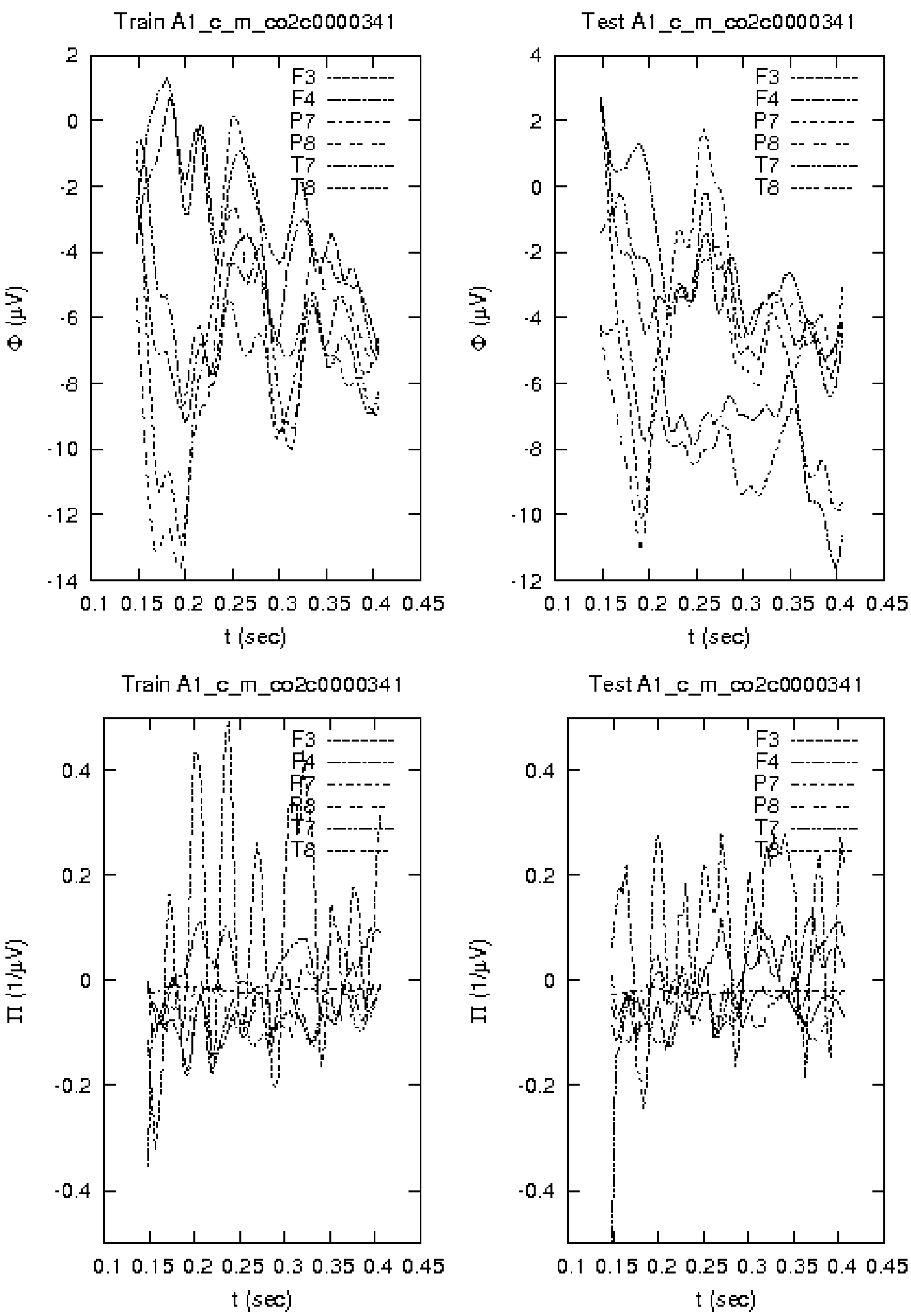


FIG. 90.

EEG

Note: EEG data is identical to the A0 plots in FIG. 1., so this section will be intentionally blank throughout the rest of the paper.

CMI

There is a pronounced negative signal present at the beginning of the epoch in Test. The peaks at 0.4 μvolts in Train reduce to 0.2 μvolts in Test. The uniform wave visible peaking around 0.1 μvolts in Train is reduced during first half of the epoch in Test.

A0 vs. A1

There exists a profound difference in the cleanliness of signal after applying **A.**

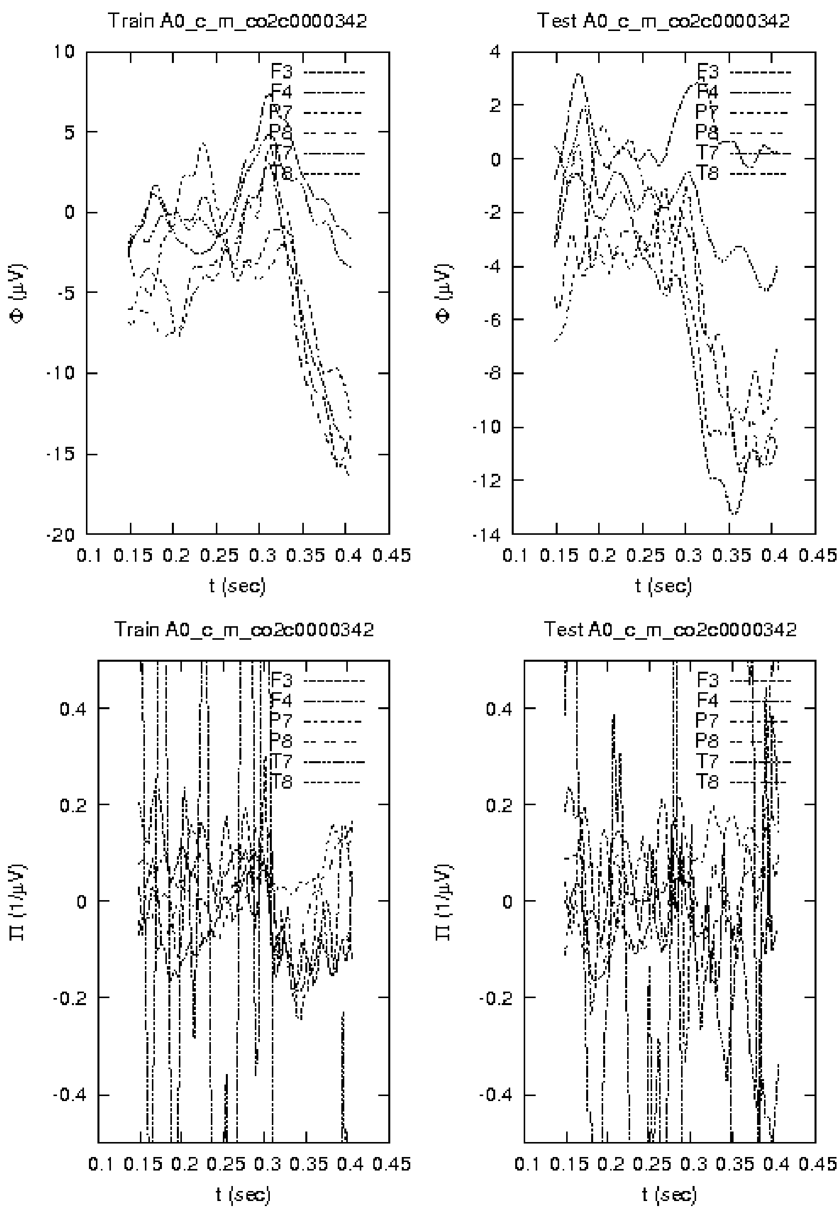


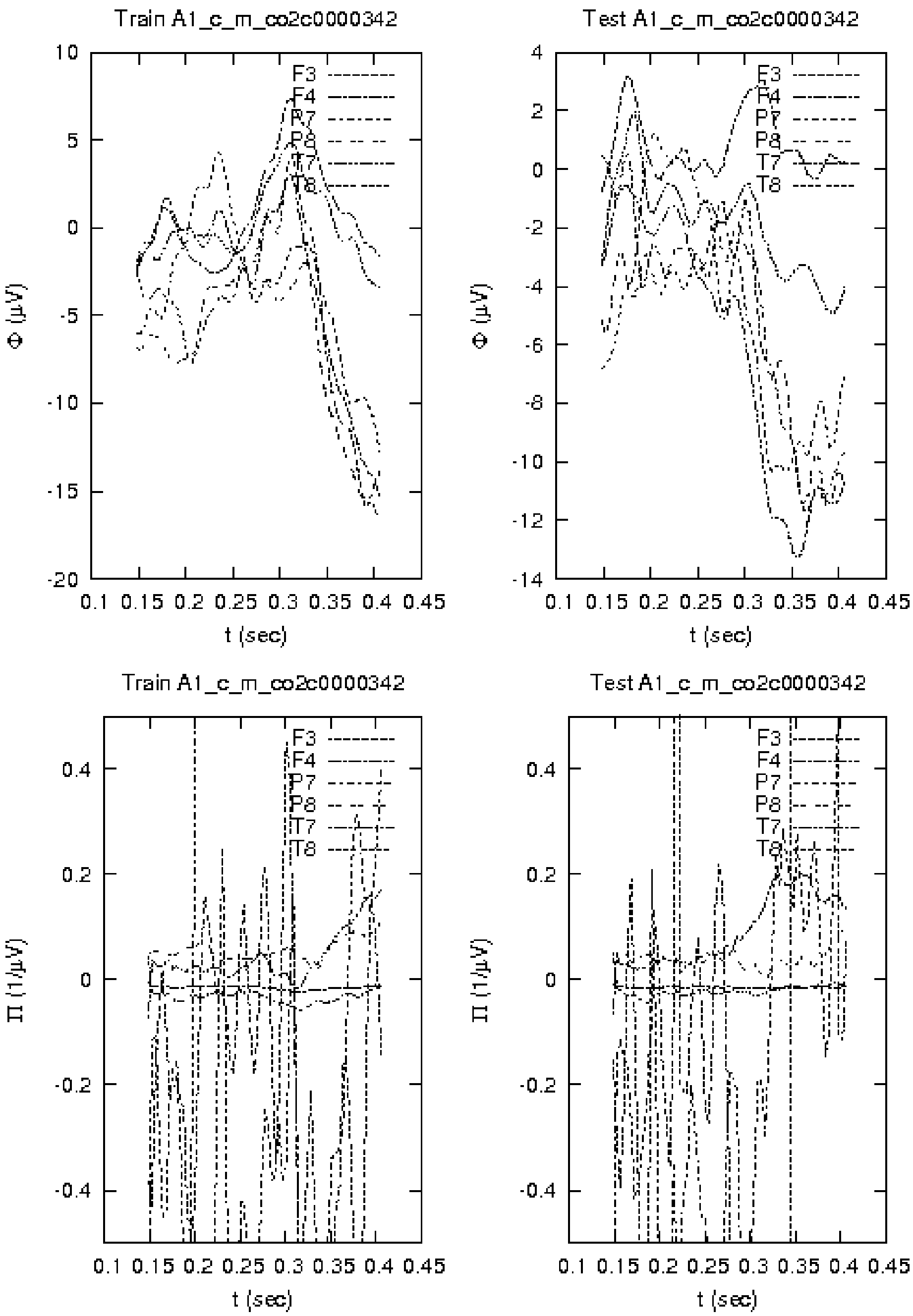
FIG. 91.

EEG

The Test graph shows an overall reduction in positive amplitude of 3 μvolts; with additional complex , synchronous peaks occurring at t=.17. The signals appear more synchronous overall in Test.

CMI

Increased positive and negative amplitude in T7 in Train during first half of measurement; drastically decreasing to below the measured μvoltages in the negative domain. T7 appears similar during first half in Test; though with reduced amplitude. Further, it maintains sinusoidal behavior throughout duration. There are several clustered signals around the x origin in both plots; exhibiting sinusoidal behavior of similar amplitude throughout epoch; though a trough of these signals is noticeable in the Train graph during last third of epoch.



EEG

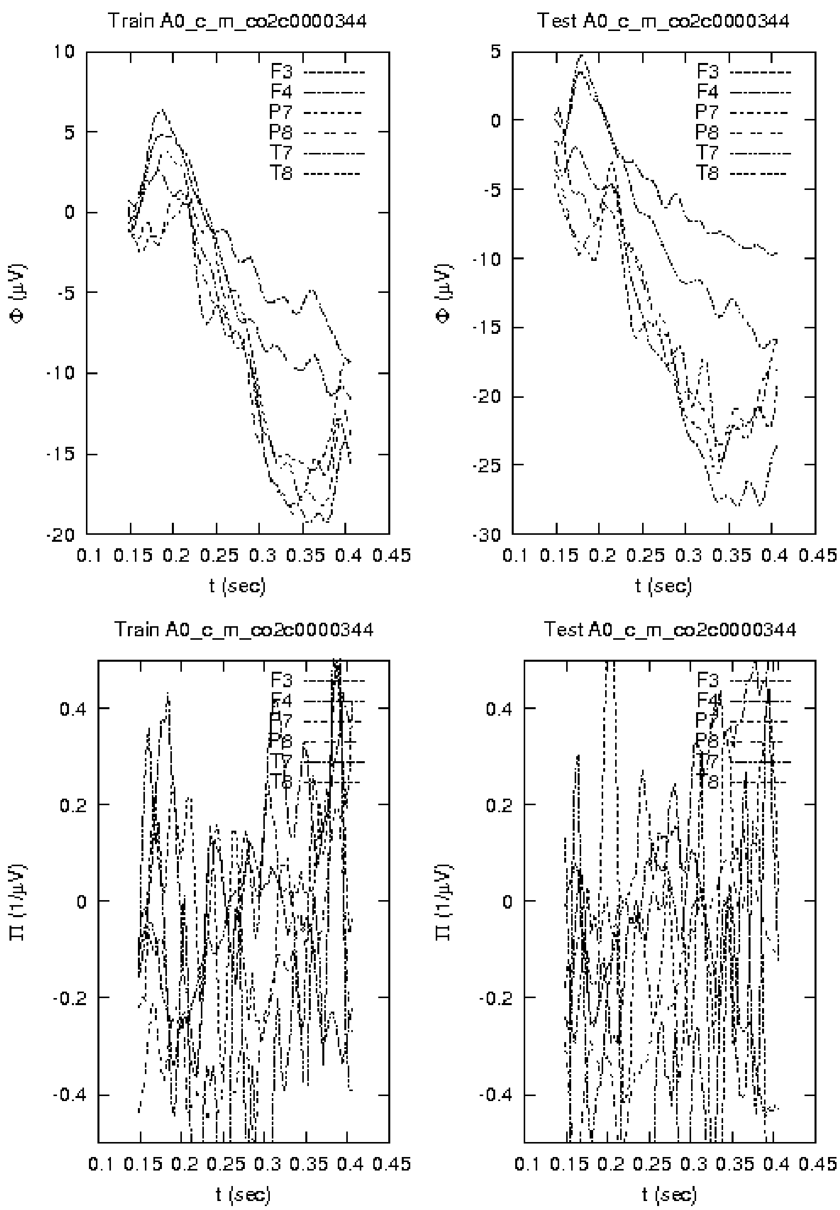
CMI

There is a pronounced separation of signals in both plots; with 4 waves being quite calm and near the origin of x-axis during most of the epoch, with two signals increasing in amplitude during remainder of epoch. Two waves show marked volatility across entire epoch in both graphs; at several times leaving the y bounds. These waves are mostly negative in values, increasing to positive at the end of the epoch.

FIG. 92.

A0 vs. A1

The separation of signals is present in both sets of plots; however, when **A** is applied, the signals near the origin exhibit significantly quieter behavior; with much less sinusoidal frequency and reduced amplitude. The volatility of the other two signals is present int both sets; though somewhat less noisy with reduced amplitude after **A** is applied.



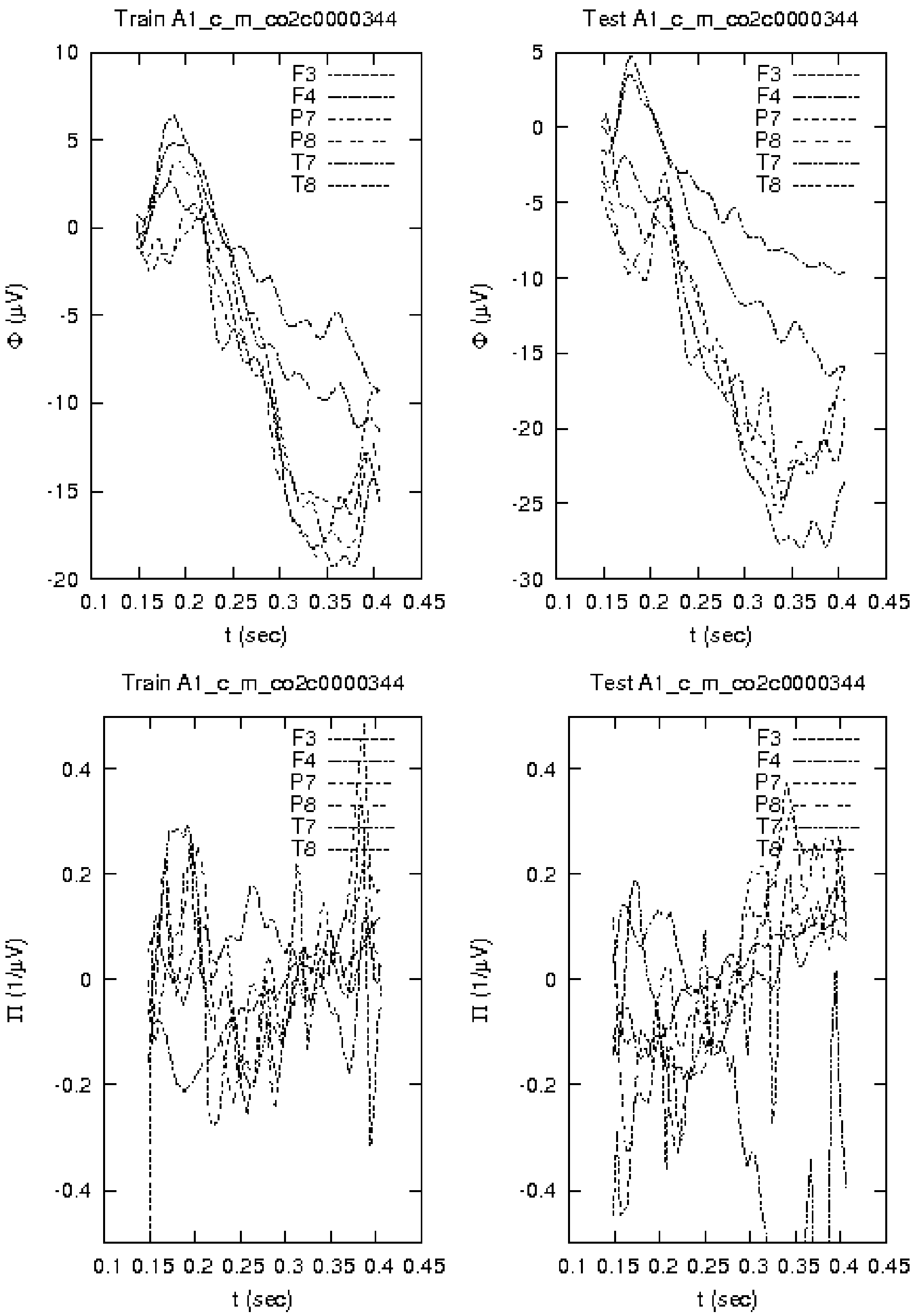
EEG

The Test graph shows an overall negative shift in amplitude of approximately 5 μvolts in 4 of the signals increasing to approximately negative 5-7 μvolts during epoch for all signals. F3 & F4 exhibit symmetry. And remainder of signals exhibit combined symmetry and synchrony.

CMI

Extremely noisy signal throughout entire epoch and across all waves. All signals exhibit strong positive and negative amplitude; with high sinusoidal frequency. Transient peak at t=.2 in Test. Slightly elevated amplitude in Test as epoch progresses. Entire signal is skewed to negative domain; with an increase in positive amplitude towards end of epoch; also noticeable from EEG plots.

FIG. 93.



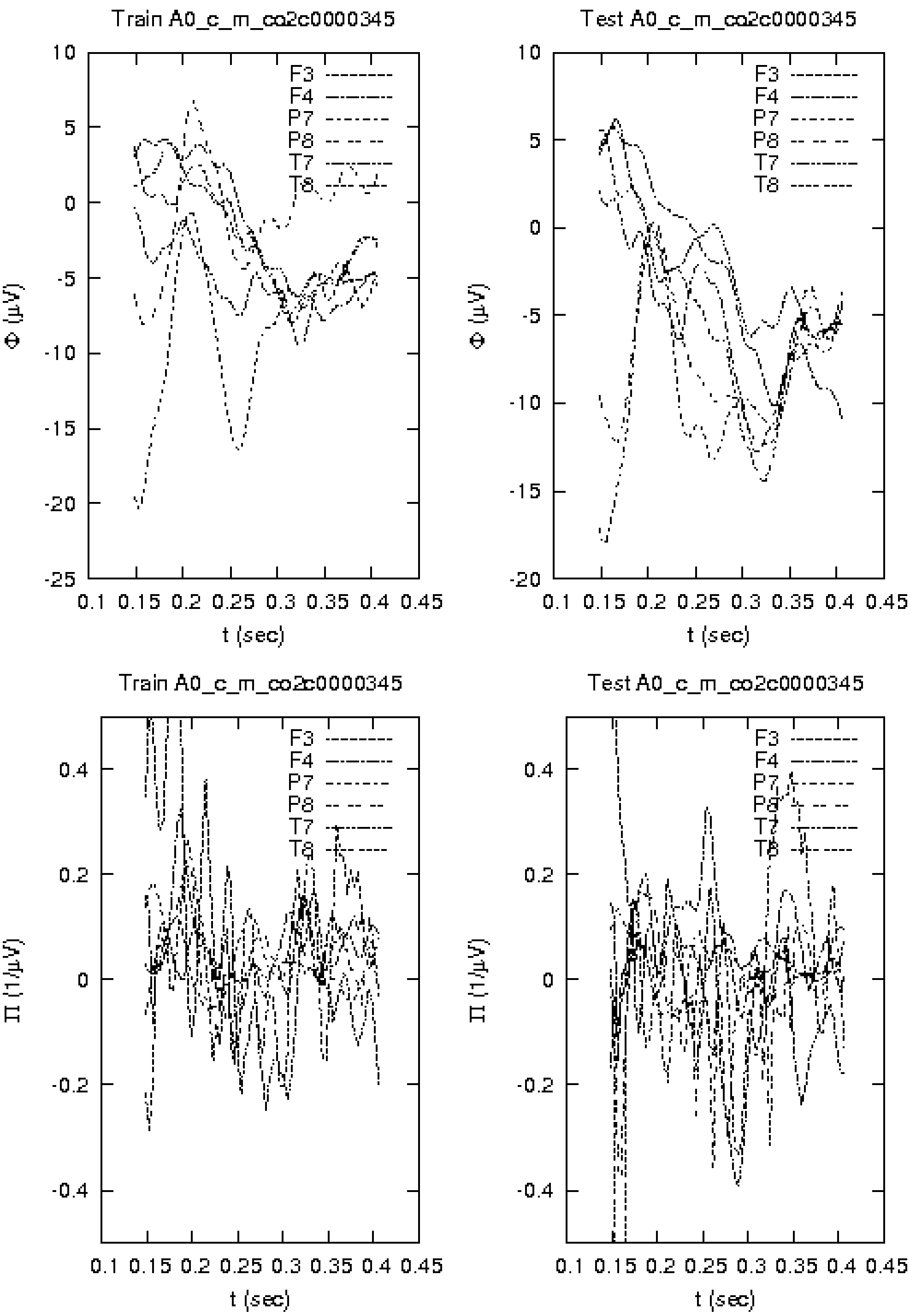
CMI

There is a separation and calming of signals in both plots; however they still exhibit higher than usual sinusoidal frequency as compared to the other CMI A1 plots in the study. T7 gains strong negative amplitude in Test; exceeding the y bounds. The negative transient trough at t=.4 in Train occurs earlier in Test. Peaks at end of epoch in Train almost vanish in Test.

FIG. 94.

A0 vs. A1

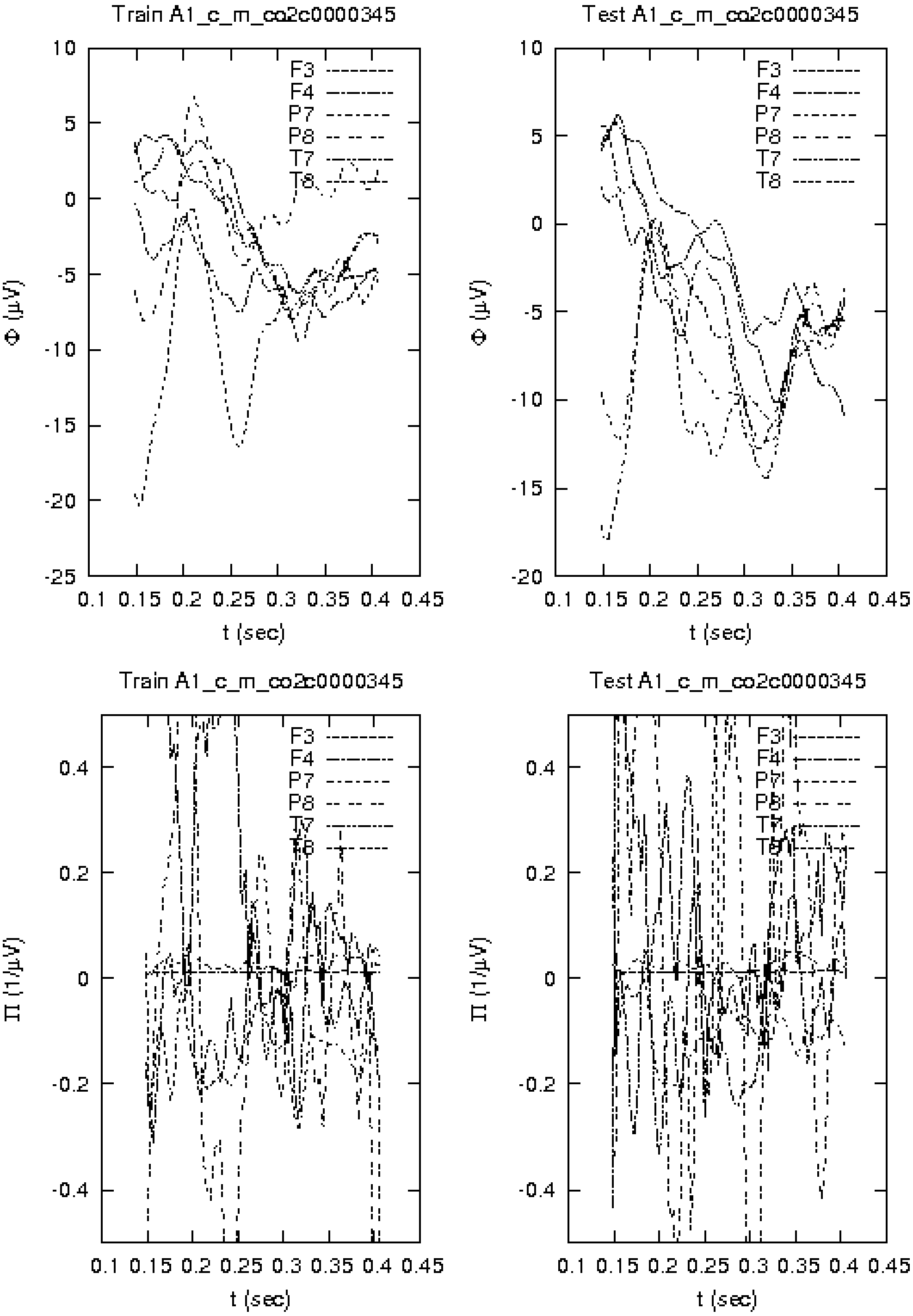
A very noticeable separation of signals and cleanliness of signal is noted when **A** is applied. Contrary to the EEG plots, a mostly positive trend of multiple signals is observed in the CMI plots after **A** is applied.



EEG
Train and Test have separated waveforms in the initial part of the time range. Around t=0.17 and later after t=0.3 there appears to be more superposition and symmetry. Train shows a positive, single wave transient from t=0.27 till the end of the time range; Test has one negative single wave transient from t=0.37 to the end of the time range. Test looks a bit more synchronic.

CMI
Train has a shorter amplitude range than Test. Both graphs see many noisy waveforms compacted and with various crossings around the horizontal y=0 axis. They are not well in phase, though. Both graphs show strong activity in the beginning of the time range, and then another period of intensity after t=0.35.

FIG. 95.

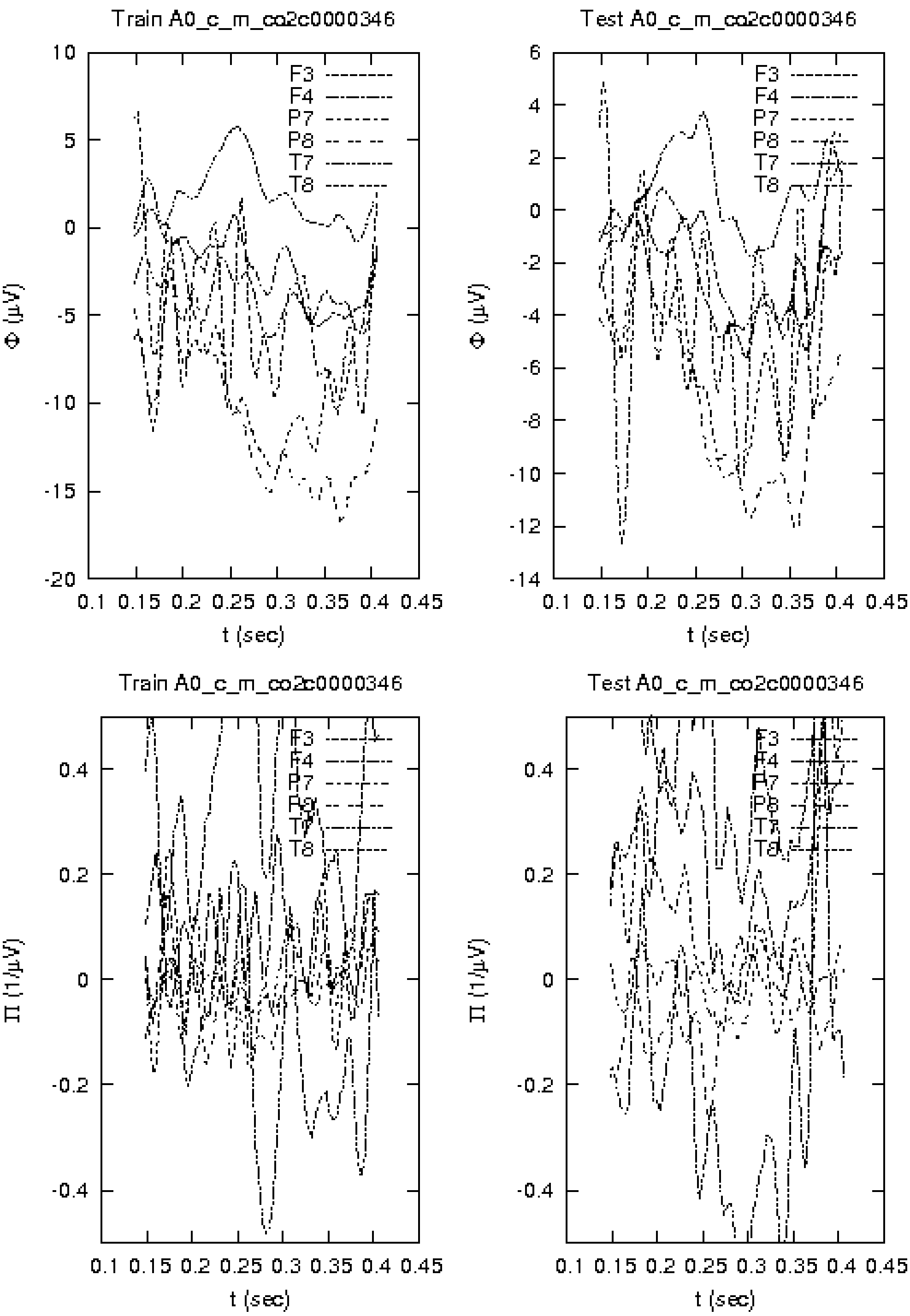


CMI
Train and Test present several disaggregated waveforms. They are irregular and show a particular structure (with not uniform oscillations), so they don't look too much noisy. Train is quite more readable, while Test has more traces of superposition of waveforms. Both figures have oscillations exceeding the bounding box limits. In both graphs appears to be a constant trend.

FIG. 96.

A0 vs. A1

A Very unusual for this kind of confrontation, in this case the application of produces in the A1 case an amplification of the signals. Although not very readable, waveform structure are albeit more distinguished in A1 than in A0, this one looking more like a superposition of very noisy and similar signals.



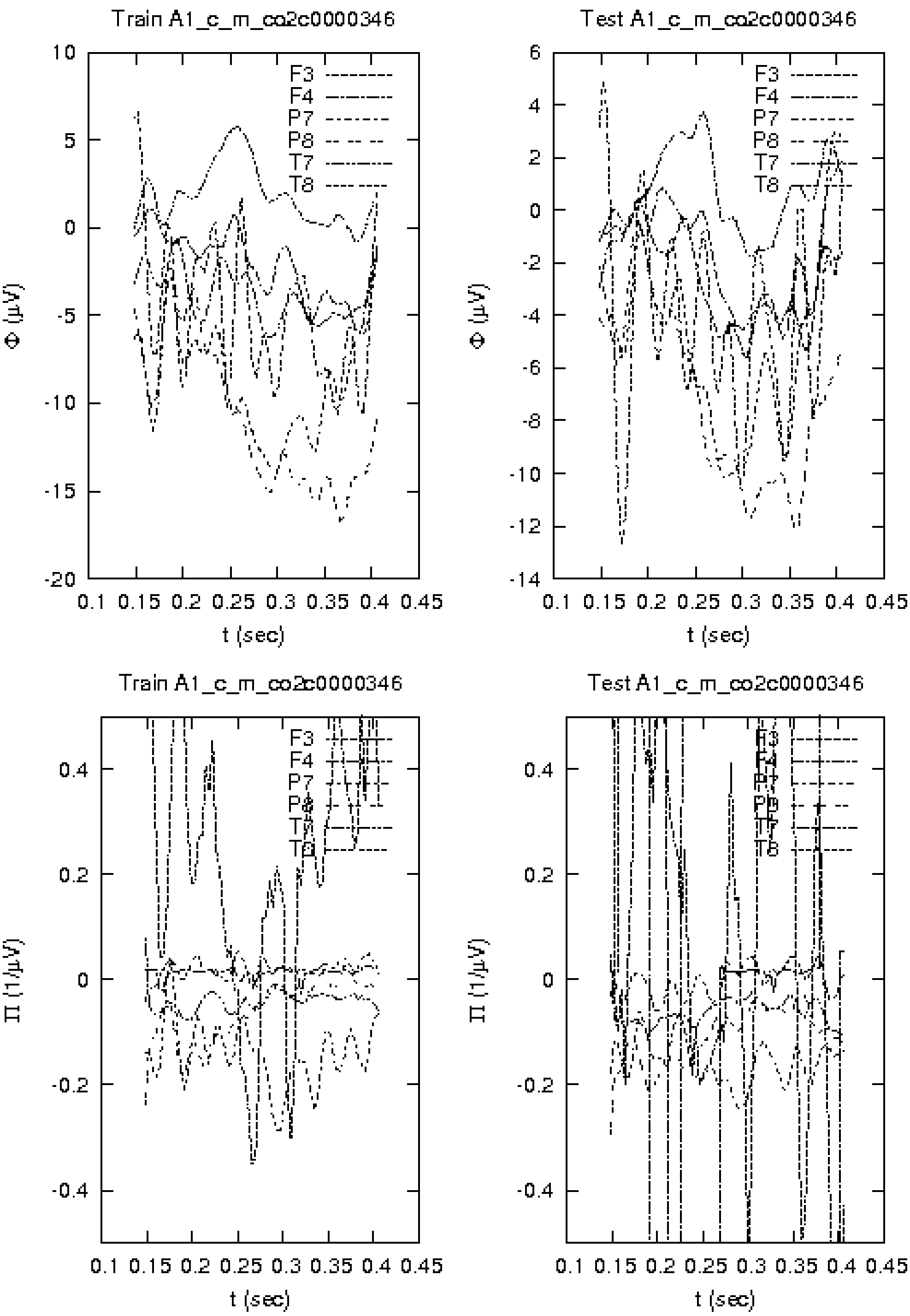
EEG

Train and Test have similar silhouettes. A body of different waveforms with a slightly decreasing trend, with a transient made up of a single higher positive signal. In Train this signal is almost untouched by other waveforms, while in Test it's accompanied by some peaks which repeatedly get near to it. Train has a larger amplitude range. Both graph show an initial negative peak of nearly the same amplitude. Signs of synchrony can be seen in the lower and middle oscillating waves.

CMI

Train looks noisier, with many crossings and signal superpositions. Test instead has a greater separation of waveforms, with a small central band around the y=0 axis which is a little crowded, but then highly separated by the other waves, which lay at distant amplitudes. Test tends also to have greater aggregation of peaks, which are larger and generally higher than the ones in Train. In both graphs, after the first half of the time range, the extreme negative peaks get more pronunciated.

FIG. 97.

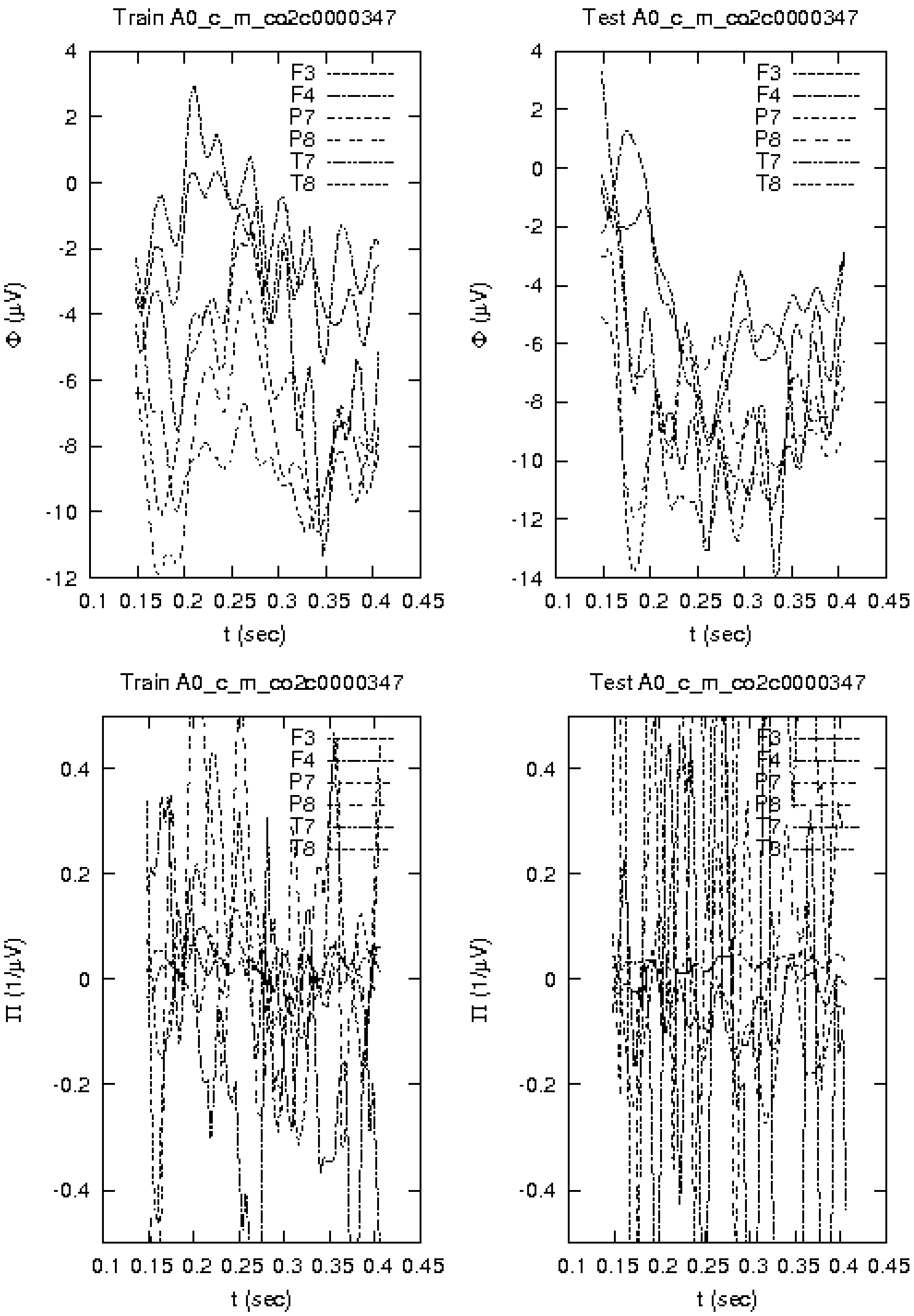


CMI
Train has most of its signals under the y=0.01 axis, with only a strongly peaked waveform that explores the positive half of the graph. The negative region is occupied by moderate peaks with trembling and irregular waveform. Test has more compacted mid band waves, though with irregular aspect, mixed with a very strongly peaks signal which reaches both the upper and the lower bounding box limits. Trend is overall constant, with Train looking a bit more readable and Test more normalized in its small components.

FIG. 98.

A0 vs. A1

After application of **A**, Train has amplitudes reduced and looks less noisy, with greater readability. A1 version of Test has smoother mid-band peaks; these elements are more separated, with higher amplitudes for extremal signals. Trend is overall constant for both graphs, with mid band waves barycenter shifted down from y=0 to y=-0.1.



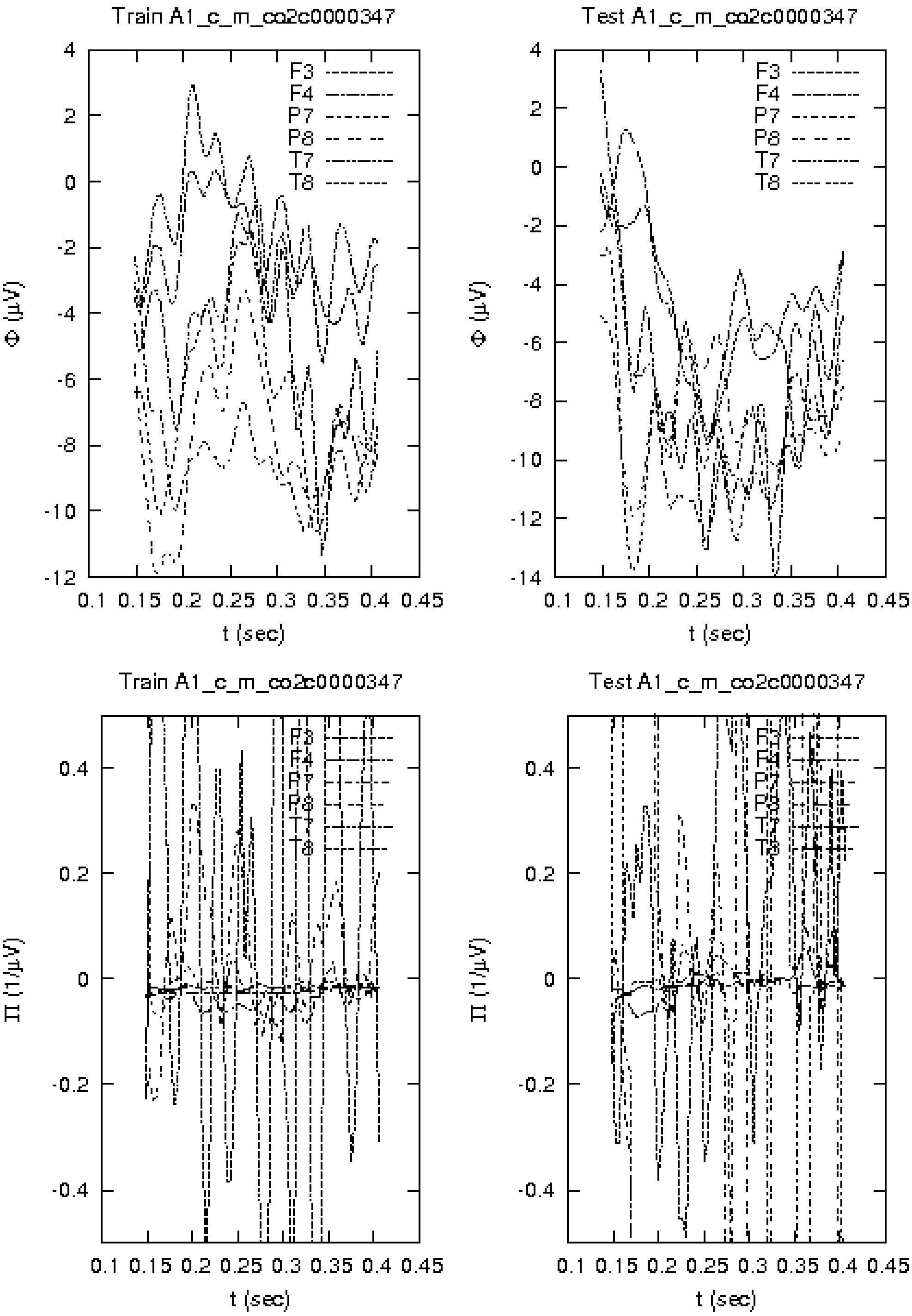
EEG

Train has quite synchronous waveforms, especially around t=0.27. The signals are very fluid, with sinusoidal-like behaviour. Test shows a wider amplitude range. There's a high positive oscillation transient at the begin of time range, then the graph's activity continues at lower amplitudes. Trend is slightly increasing after t=0.23. There's noticeable synchrony with superposition of waves in the lower negative signals.

CMI

Train shows intense oscillations with irregular heights and distribution. It has some lack of negative peaks in the middle of each of the two halves of the time range. There's also a lack of positive peaks for t in [0.27, 0.33]. Test looks very noisy, with highly intense oscillations. A single, nearly flat signal can be observed at y=0.03. Peak distribution and their heights are almost uniform, exceeding very frequently the bounding box limits.
Trend is nearly constant for both graphs.

FIG. 99.



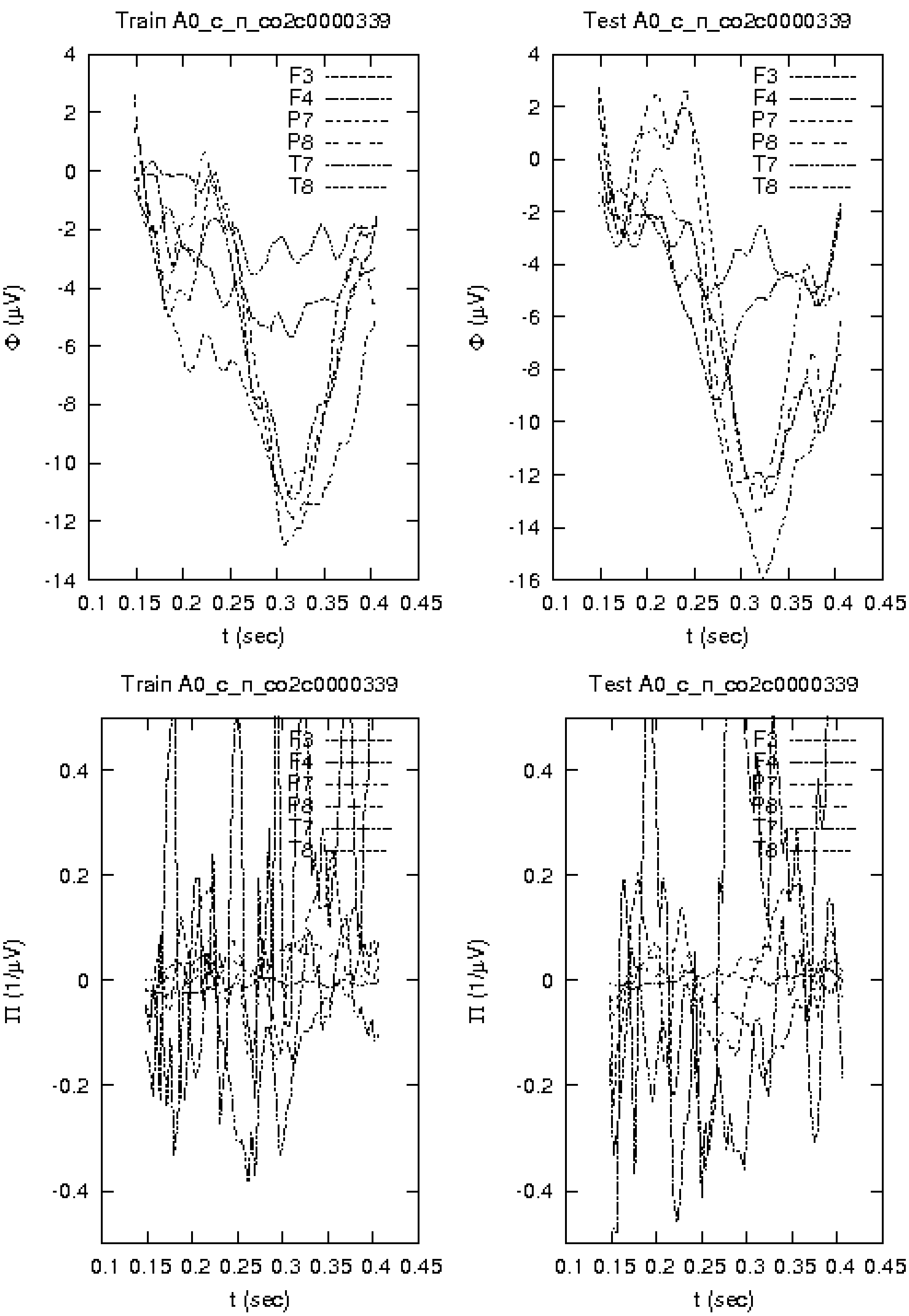
CMI

Peaks in Train are very sharp and high, but well separated and regular in distribution. Among them, negative peaks are a bit more limited at the beginning and ending of the time range. There's a body of irregular waveforms around the y=-0.02 axis. Test also has many sharp positive and negative peaks, irregular in distribution and height, and with some aggregation. There's evidence of a body of activity in a strict mid horizontal band around y=0. Trend is constant for both graphs.

FIG. 100.

A0 vs. A1

Application of **A** in Train splits peak aggregations completely in separate entities with uniform width and distribution on time. Heights reflect roughly the A0 version. Mid-band activity is reduced to compacted waveforms.
In Test we see a reduction of the number of peaks in the first half of the time range, especially in the upper left quadrant of the graph, arriving to produce partial lacks of activity(positive and negative) for t<0.25. There's evidence of regularization of middle band signals. Some positive peak aggregations remain at the beginning and in the middle of the time range.



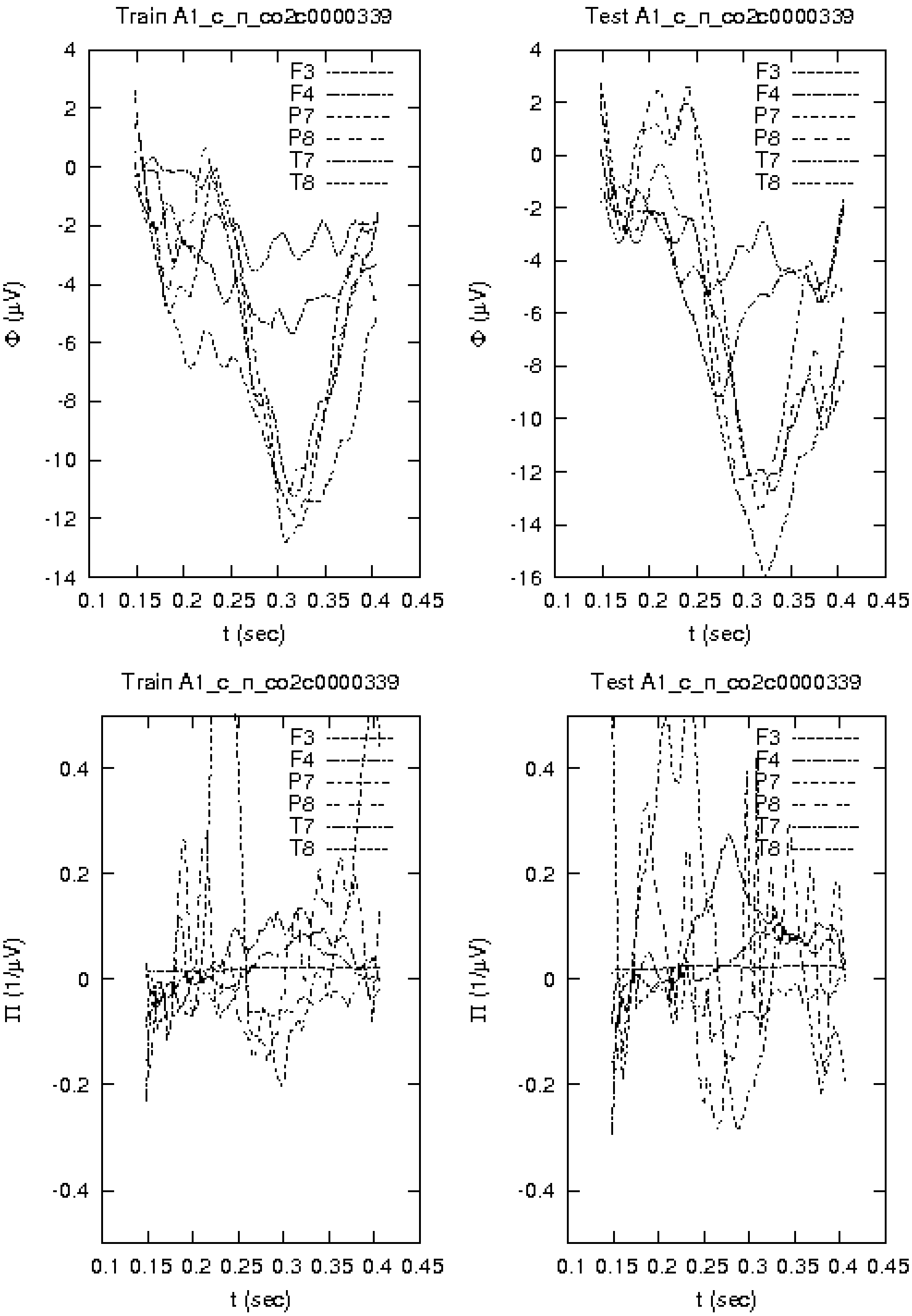
EEG

Test has a wider amplitude range. Train shows a weak form of symmetry, a couple of signals with sinusoidal behaviour, and also Test shows the same form; amplified. The higher peak of the sinusoid in Test (amplitude 2 at t=0.2 to 0.25) could be classified as complex.

CMI

Train shows more peaks exceeding the graph's y axis; Test shows a single, huge peak in the t interval [0.25, 0.35]. Amplitude ranges are very similar for both. Train appears with a little more intense oscillations(although lesser in amplitude value). Test shows greater and more uniform movements, so it can be judged less noisy.

FIG. 101.



EEG

CMI

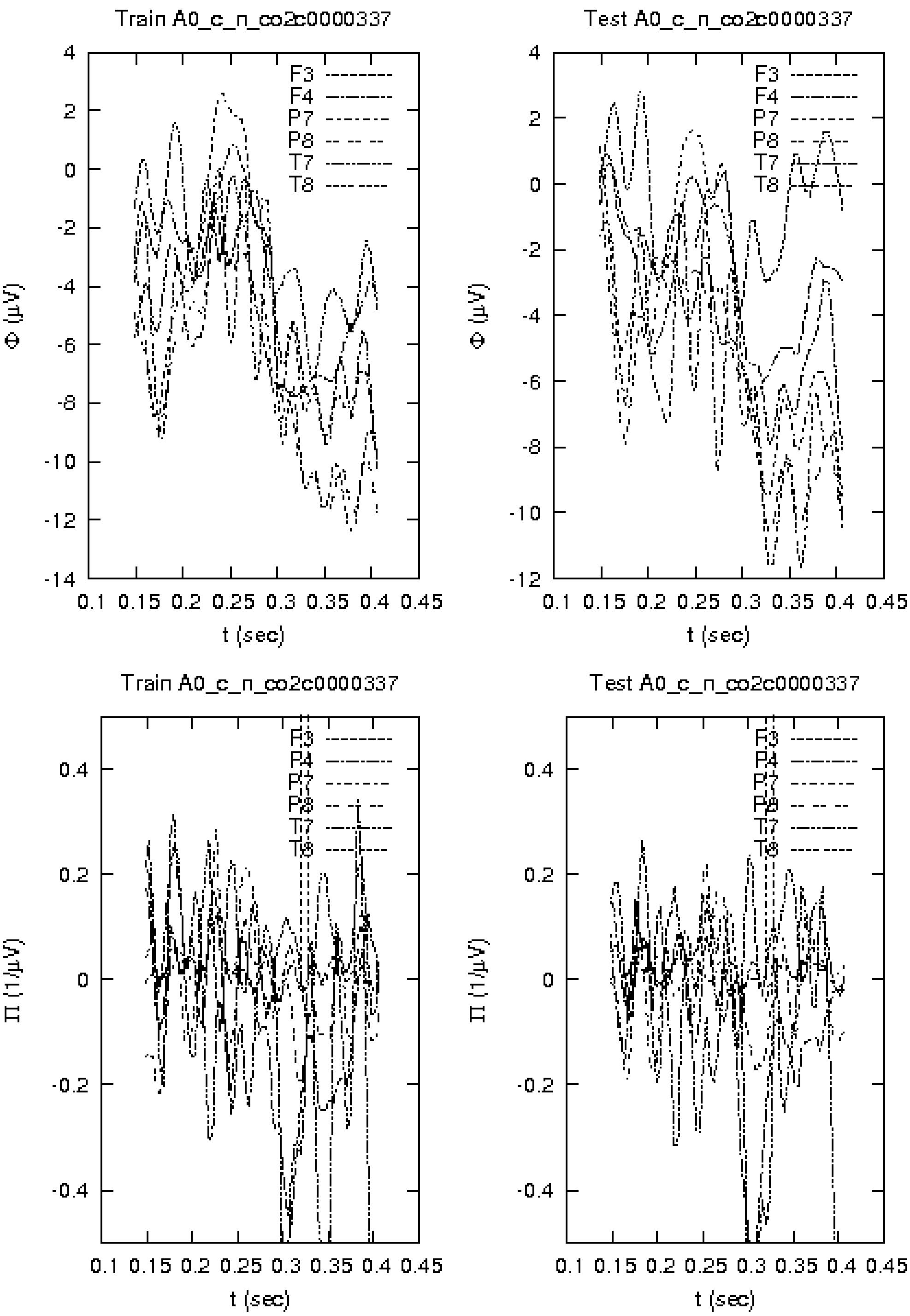
Train appears more compact in amplitude, with only 2 high positive peaks. Test appears less compact, and disturbed by a greater number of oscillations. Both graphs contain a stable trend with two peaks of activity at the beginning(t=0.23) and at the end (after t=0.35) of the time range. The peaks are more distinguishable in Train.

FIG. 102.

A0 vs. A1

Train : amplitudes in A0 are more distributed across the whole range. Graph A1 shows instead a more compact behaviour, with the exception of a pair of huge peaks. A0 looks almost uniformly perturbed, while in A1 a growing trend in oscillation amplitudes can be detected apart from isolated peaks.

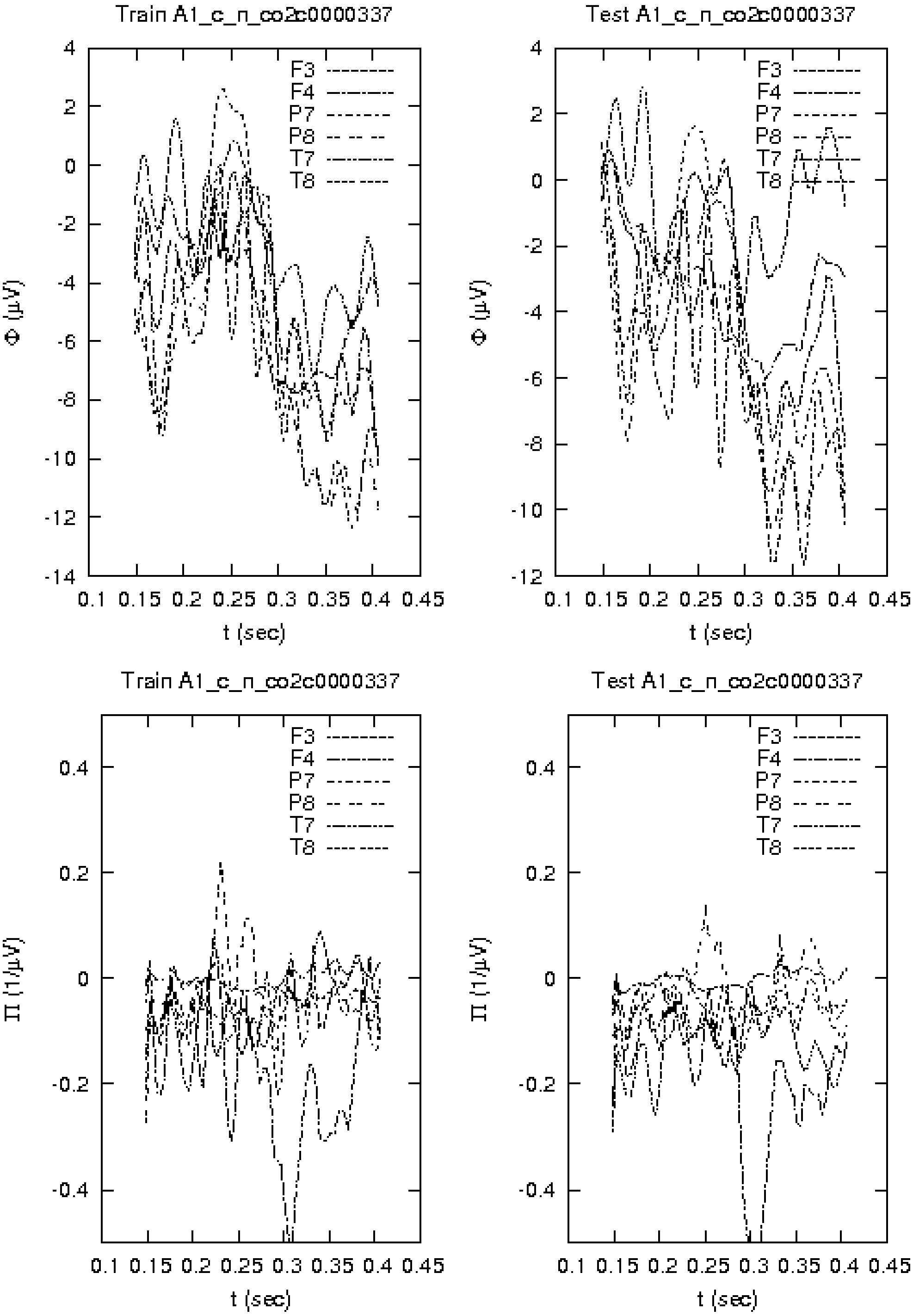
Test : A0 shows a little higher volume of oscillations. A1 appears a bit more compact, but analogous. We have a stable trend; A0 is full of peaks on the whole interval, while A1 has three peak gaps (1st and 3rd among negative peaks, the 2nd between positive peaks).



EEG
Train appears to follow a decreasing sinusoidal envelop. Test has a decreasing trend too, but its signals are slightly less synchronous and have greater divergence: in Test, a single signal transient detaches from the others in the second half of the time range, resulting in a wider occupation of the right half of the figure. In Train at t=0.23 there are several signal superpositions. Amplitude ranges are similar, although Train looks more compact in following its envelop sinusoid.

CMI
Both graphs are mainly plotted in the mid horizontal band, with a single high peak at about t=0.33, and some greater activity for negative amplitudes, in the second half of the time range. Train has a noticeably high positive peak at the end of the time range, at t=0.38, that Test hasn't. Peaks are intense; Train, bears traces of signal superpositions; in Test there are many crossings, which make the picture noisier. Trend is constant for both figures.

FIG. 103.



CMI

Both graphs look very compact, with few peaks above the horizontal y=0 axis, and definitely more activity in the lower half of the picture. At t=0.3 there's a large negative peak, slightly fatter and higher for Test. Apart from this one, other structures seem more split and separated in Test than in Train, although the overall silhouettes are quite similar. The few positive peaks are more pronunciated in Train, and they start a little before in the time range. Both graphs have constant trend.

FIG. 104.

A0 vs. A1

Application of **A** makes the positive peaks collapse, while preserves negative ones in a more compacted form. Especially for Test, the resulting figure appears less noisy and more readable, with single aggregated structures in place of the original crossing signals.

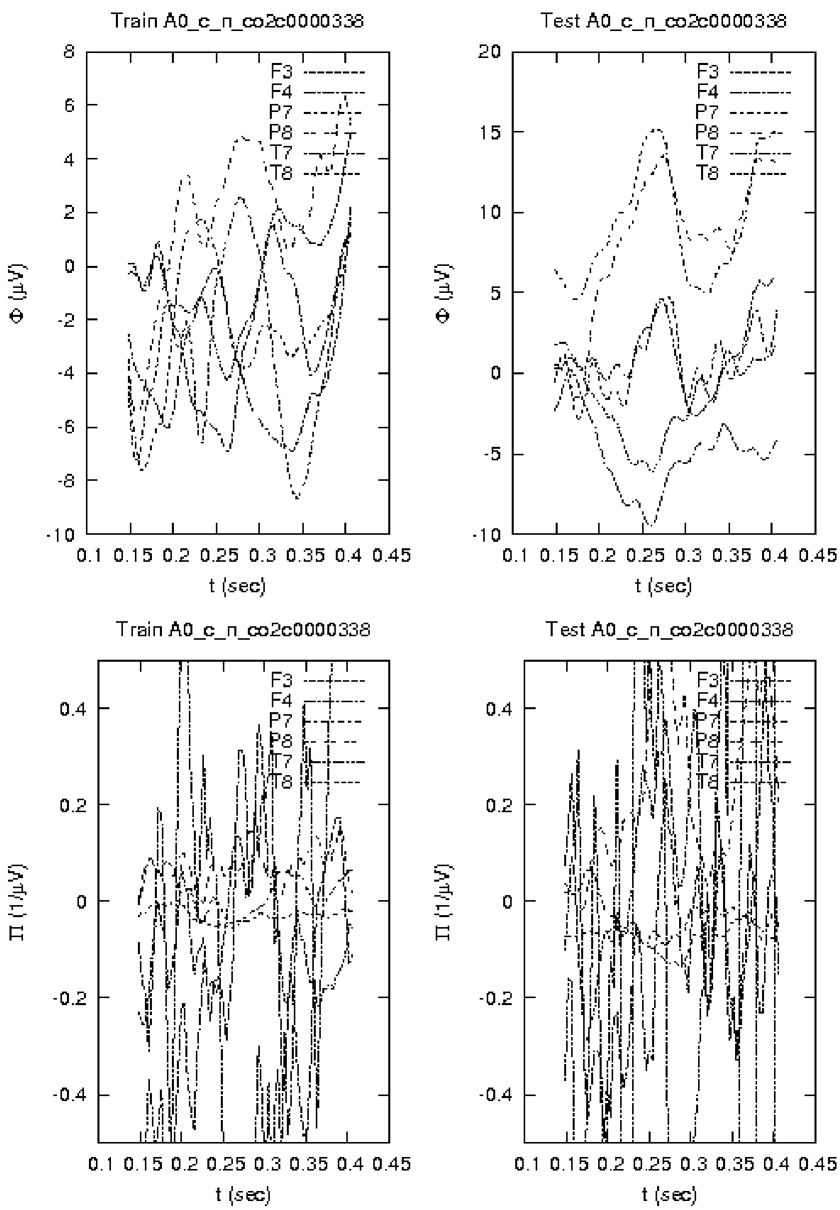


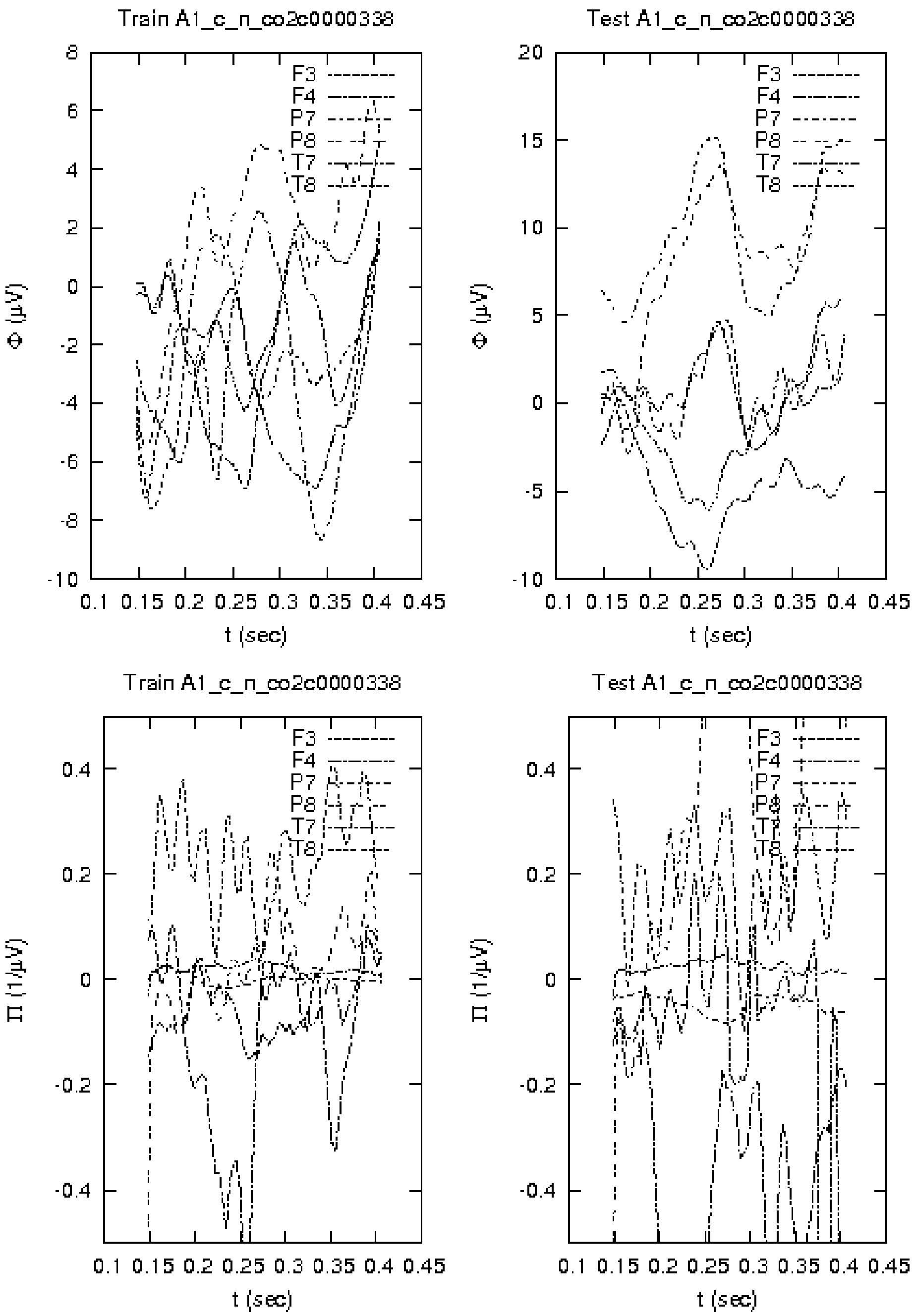
FIG. 105.

EEG

The Test graph exhibits very strong symmetry across all pairs of channels. Further, there is a strong upward skew of approximately 10μV in P7 and P8 as compared to Train.

CMI

Increased amplitude is evident across all waveforms in Test. There appear to be three waveforms somewhat clustered about origin in both plots; with remaining waves significantly noisier.



EEG

CMI

There are two almost flat waves, F3 and F4, about origin. T7 has strong, sinusoidal negative amplitude, while T8 exhibits moderate to strong positive amplitude; both across entire epoch. There is a transient, negative wave at beginning of epoch in both plots; P8. Test exhibits stronger amplitude across most waveforms; with multiple peaks and troughs leaving bounds of plot.

FIG. 106.

A0 vs. A1

After applying **A**, the most noticeable difference is less volatile and more discernible separation of waveforms. In addition, both positive and negative amplitude is reduced.

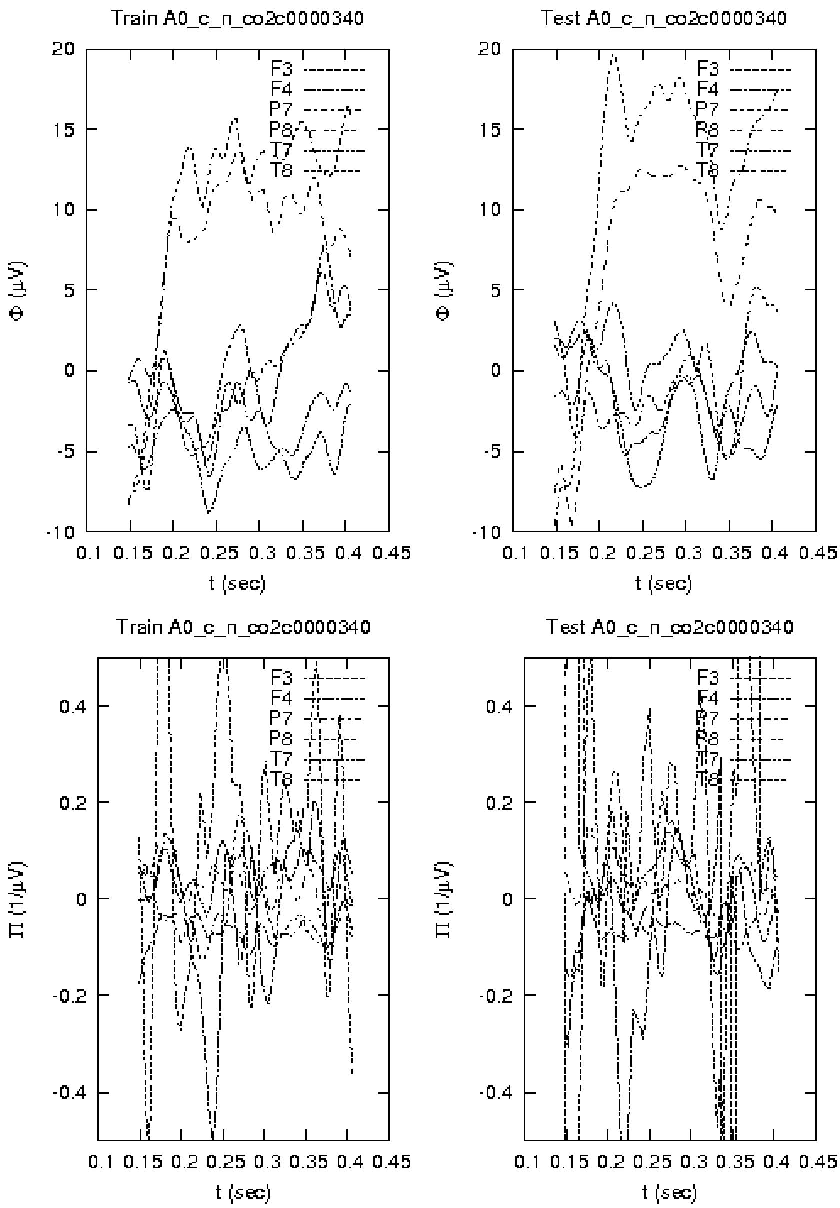


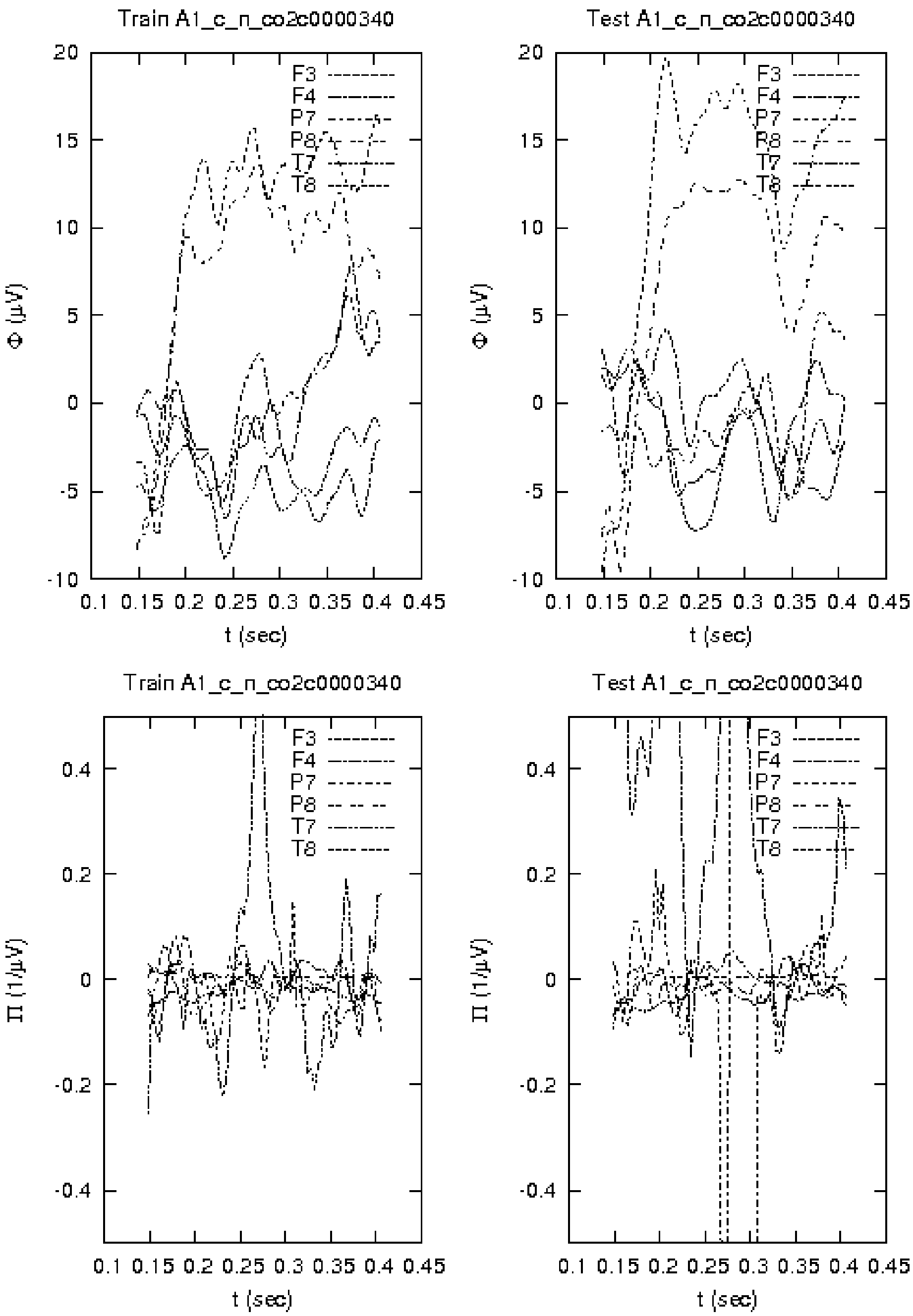
FIG. 107.

EEG

Both plots resemble each other strongly; with most apparent difference of an increase in positive amplitude of approximately 5 µV in P7 towards beginning of epoch, then decreasing back down below +10 µV at about t=0.35, then regaining positive amplitude at end of epoch nearly matching Train. Also, F4 and T8 show a leveling off of amplitude as epoch progresses in Test.

CMI

Most waveforms appear fairly clustered about origin; with remainders exhibiting strong amplitude. T8 exhibits sinusoidal and strong amplitude, beginning near 0.12 1/µV then decreasing to sharp trough, then repeating with fairly regular intervals, showing as distinct peaks in the positive domain of Train. The behavior of this wave is similar in Test, with main difference it starts as negative transient. There is a cluster of several strong negative sharp troughs appearing in Test at around t=0.31.



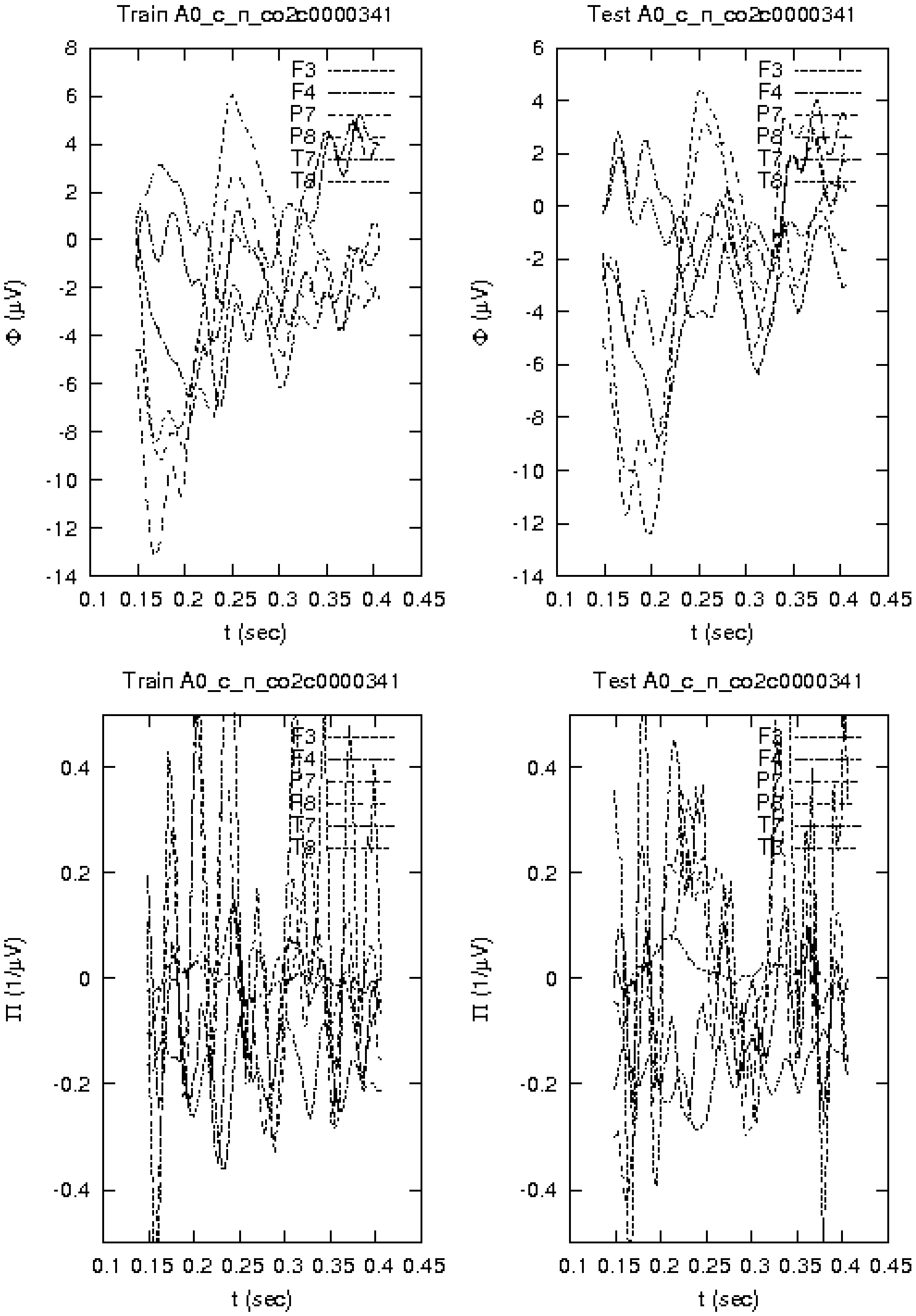
EEG

CMI
There is a very evident clustering of low amplitude waveforms about the origin in both plots. T7 stands out as a positive, sharp peaked transient in Train. In Test, greater volatility of more waveforms appears. T7 is significantly greater in positive amplitude, leaving the upper bounds multiple times. P7 gains severe positive and negative amplitude; appearing as a highly volatile transient near t=0.25 and again at t=0.3.

FIG. 108.

A0 vs. A1

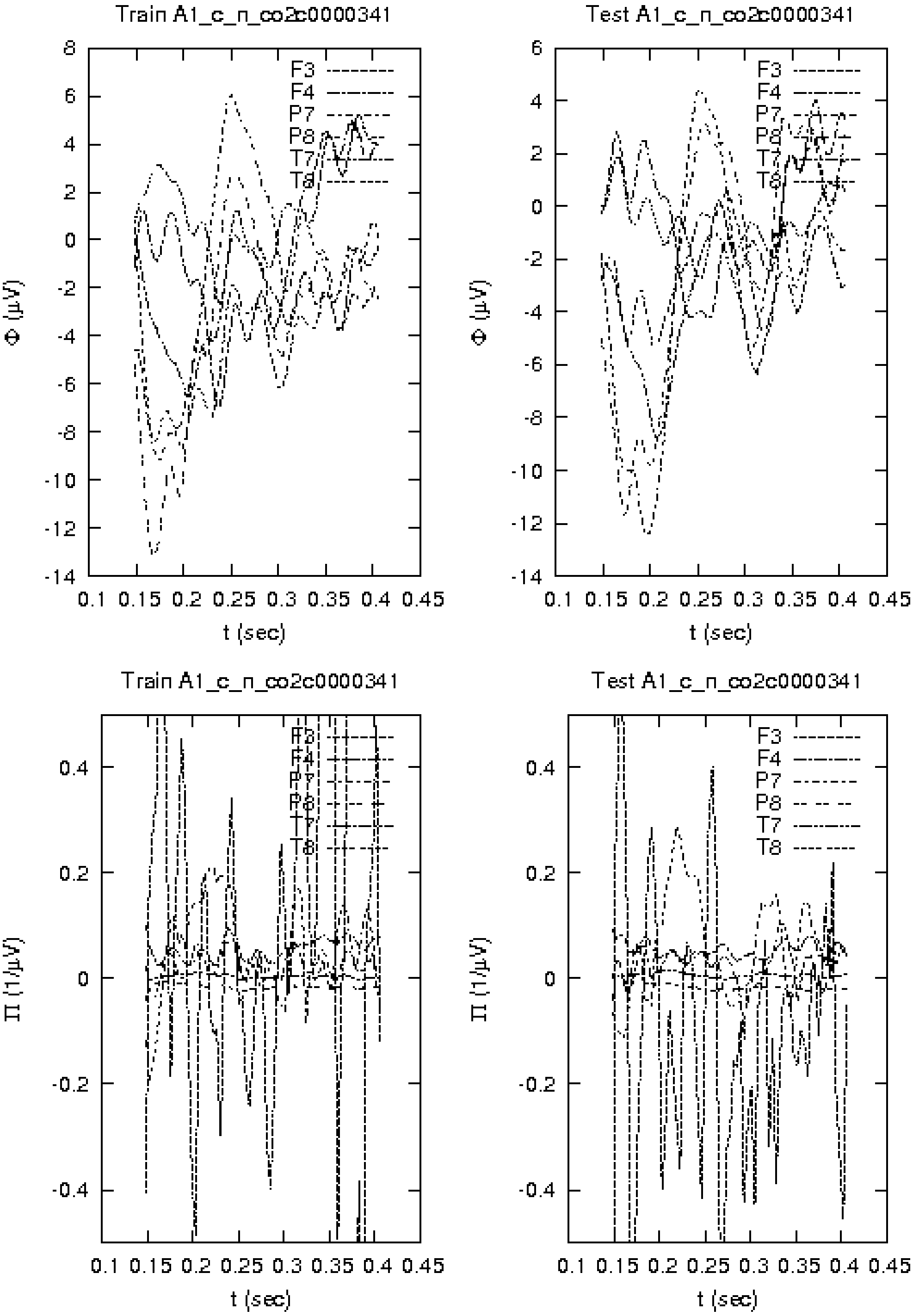
After applying **A**, the most noticeable difference is a calming of all waveforms about the origin; yet a few still volatile waveforms remain in Test; however, the number of peaks and valleys have been significantly reduced after applying **A** with these volatile waveforms.



EEG
Train and Test are both following a sinusoidal envelop with a slightly increasing trend. The overall dynamics is calm, with gentle oscillations; Test waveforms are more synchronous. Around t=0.23 there's great synchrony for a steep increase of all signals. In the final part of the time range, Train has two higher signals separated from the others, making a transient, while for Test the waveform tend to cross and mix. Amplitude range are analogous for both graphs.

CMI
Both Train and Test have intense oscillations, more pronunciated in their positive peaks. Train has sharper peaks, while Test structures are a bit more irregular and sometimes smoother. Both graphs show a positive peak gap after t=0.25, Test having this region a little bit more forward in the time range. Test also shows an empty internal region for t in [0.2, 0.25], since all signals there tend to stay on high positive or negative amplitudes. Both graphs show a constant trend.

FIG. 109.



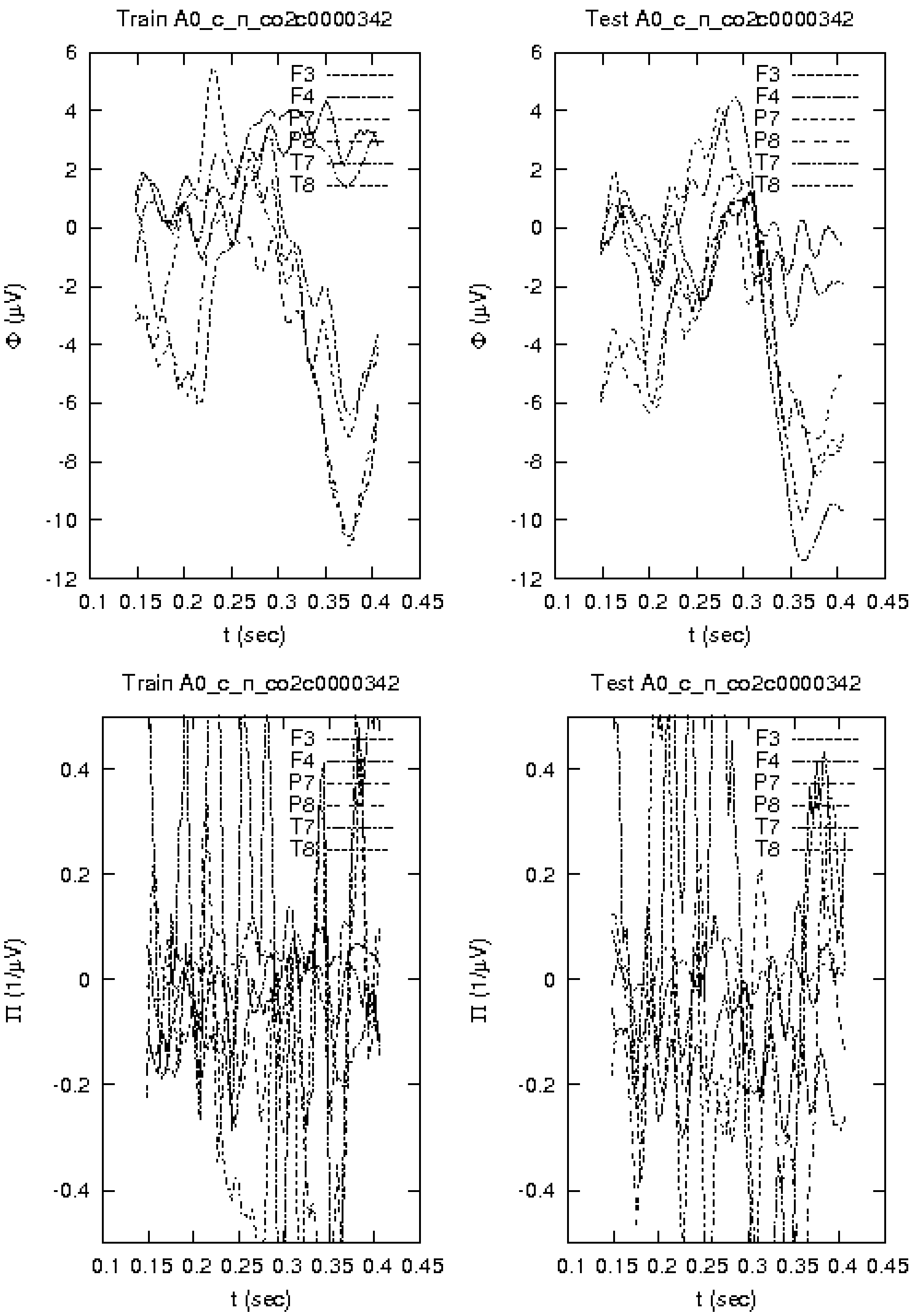
CMI

Train and Test have very well separated and sharp peaks; in the first half of the time range there's quite a number of them under and above the horizontal y=0 axis (above the axis there are also some peaks aggregating in larger structures); in the second half of the time range, Train has more activity over the axis, while Test has its greatest peaks in the negative region (although it preserves some waveforms also above the axis). Both graphs have constant trend.

FIG. 110.

A0 vs. A1

Passing from A0 to A1 results in an overall reduction of noise, with many of the peaks of the upper region sharper although lower in amplitude. Negative amplitudes tend instead to augment after **A** application, and the lower part of the graphs looks very little similar to the A0 version, which is smoother and with a stronger oscillating character.



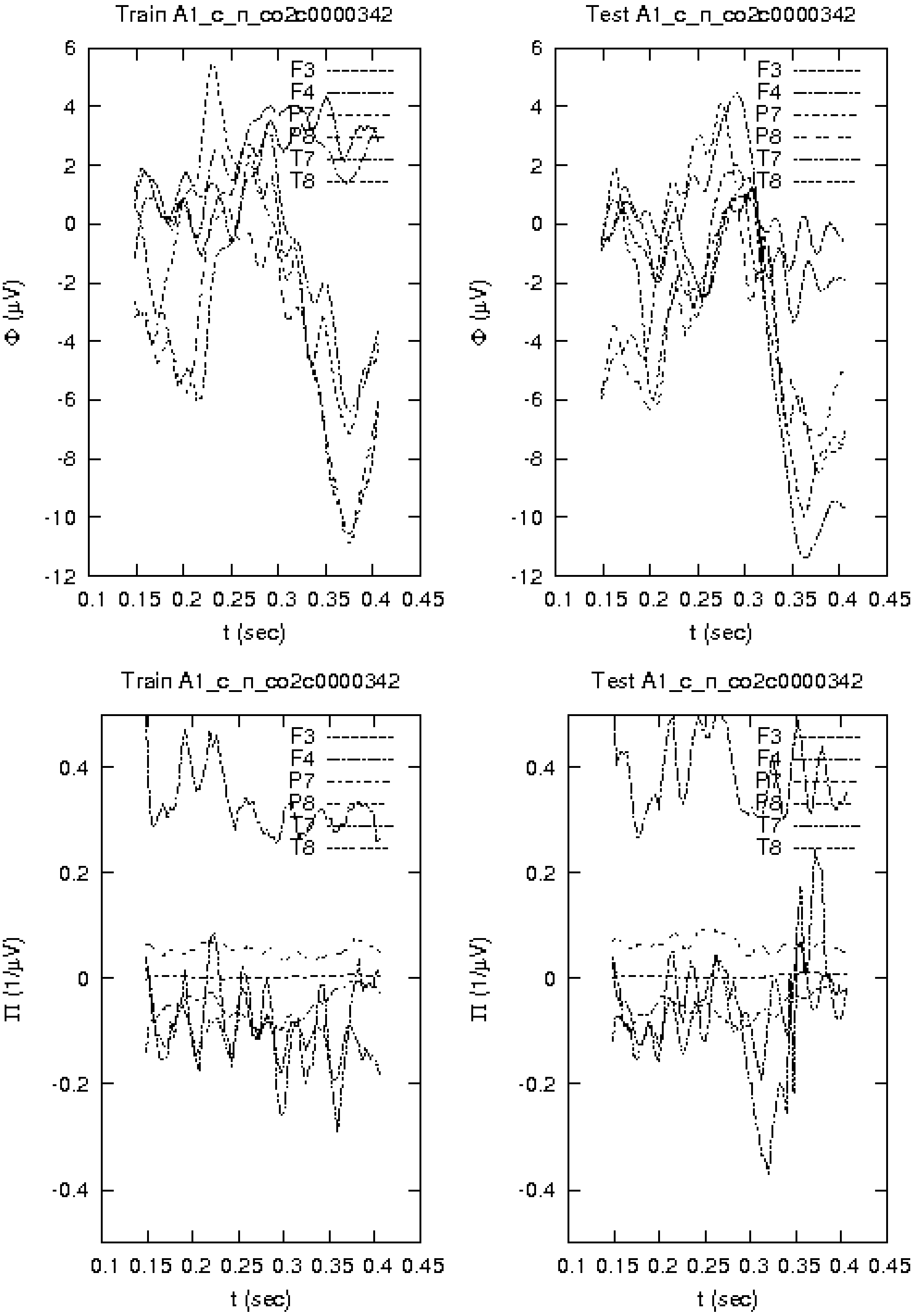
EEG

Train shows a symmetric and smooth behaviour, with an ondulatory envelop embracing most of it signals. After t=0.3 a transient of two signals separates from the group and keeps constant (although with oscillations), while the remaining waveforms follow, after t=0.3, a decreasing trend. Test show a very similar behavior, having just the transient with lesser values(now negative), and stronger superposition and symmetry of the signals in the decreasing slope.

CMI

Train has a very noisy silhouette with with intense peaks. In the lower half of the graph, the amplitued of peaks increases with time. Positive peaks are regular. Many signs of signal superposition around the central horizontal axis and in the last two positive peaks after t=0.35. Test shows more irregularities in the positive peaks, which vary in amplitude, distribution and aggregation. The negative ones are more uniform than in train. Both graphs show constant trend.

FIG. 111.

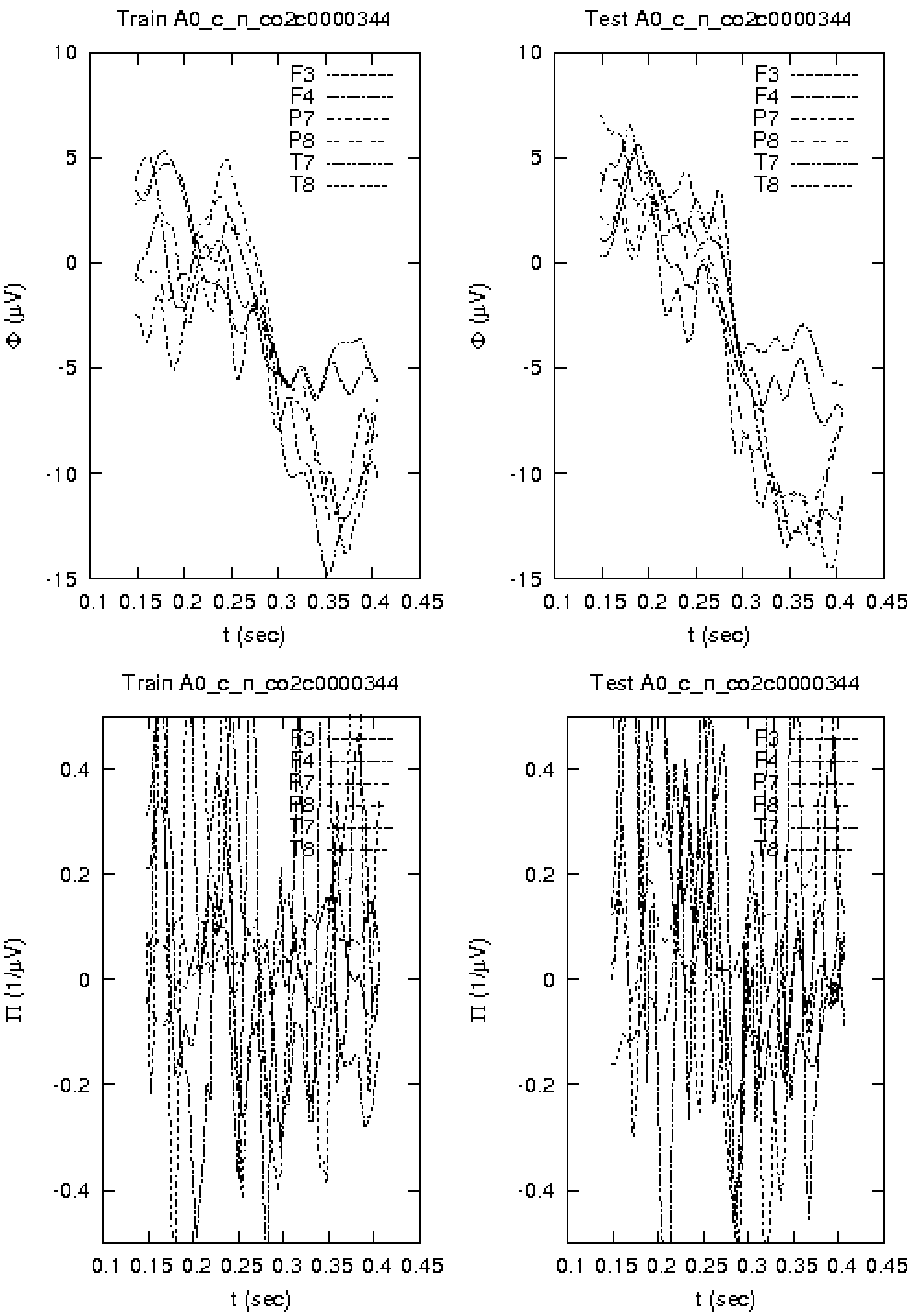


CMI
In Train, most of the signals are strictly bound together in oscillations around the horizontal y=-0.1 axis, with regular peaks and constant trend. A single wave keeps at a higher amplitude throughout all the time range. In Test, peaks are sharper and the lower group oscillations, although remaing constant in trend, have increasing amplitude as time passes.

FIG. 112.

A0 vs. A1

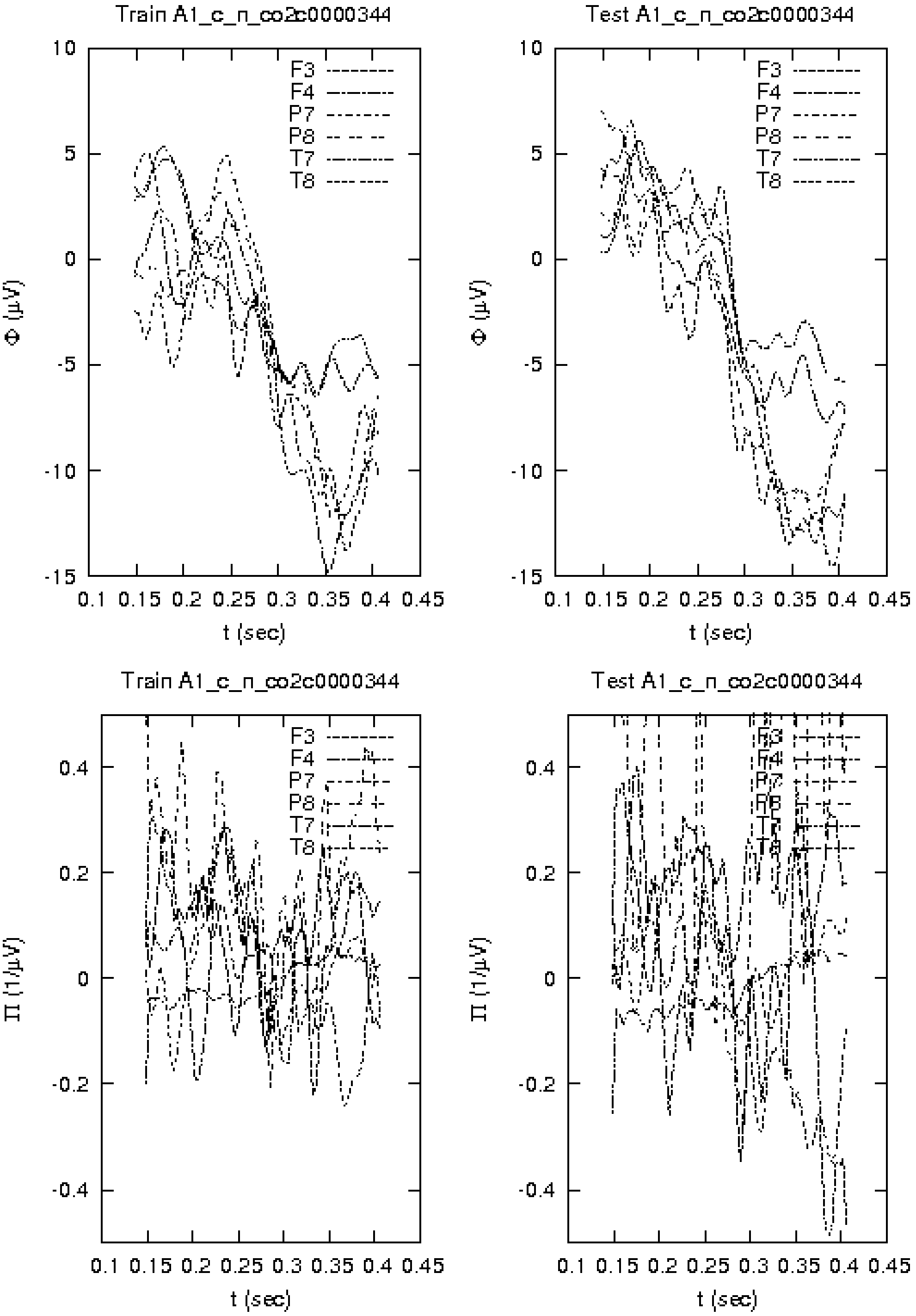
A application seems to bring one of the A0 waveforms (the one with high positive peaks) in a more compact version, detached from the others, on high amplitude values. The other waveforms appear more limited and cleaned from noise, centering around the horizontal axis at y=-0.1. The overall A1 silhouettes look like a simplified resumee of the A0 graphs.



EEG
Both Train and Test follow a roughly sinusoidal envelop with decreasing trend: after a positive amplitude tranche in the first half of the time range, an almost symmetric one appears with negative values. Amplitude ranges are equivalent. There are week signs of symmetry, in that some signals are in phase for some of their oscillations. Peaks in Train are a little fatter, while the ones in Test are more fine-grained. At t=0.3 Train has a clear transient from its two highest signals.

CMI
The signals here look very noisy, with strong oscillations, many peaks that exceed the bounding box limits and many crossings that limit the graph cleanliness. Test has more traces of signal superposition. Its negative peaks tend also to go lower, while for Train and Test the positive ones are pretty similar. For Test the crossings in the central horizontal band are more intense, while for Train that part of the graph is a little less intense and quite more readable, although not terse.

FIG. 113.



CMI
Train shows almost regular activity, with more pronunciated positive peaks and constant trend. Test looks more irregular, with sharper peaks which vary in amplitude and frequency of aggregation, making an overall structure which differs a bit from the picture of Train. In the final part of the time range Test has divergence of signals, which tend to amplify. This actually happens also for Train, but it's less evident. Test has various positive peaks exceeding the bounding box limits.

FIG. 114.

A0 vs. A1

Application of A makes all peaks more compact and better distinguished, although in the A1 versions of the graphs there are some cases of signal superposition. Test keeps having signals that exceed the picture upper limits, but they are more rare. The overall result appears more synchronic and less noisy.

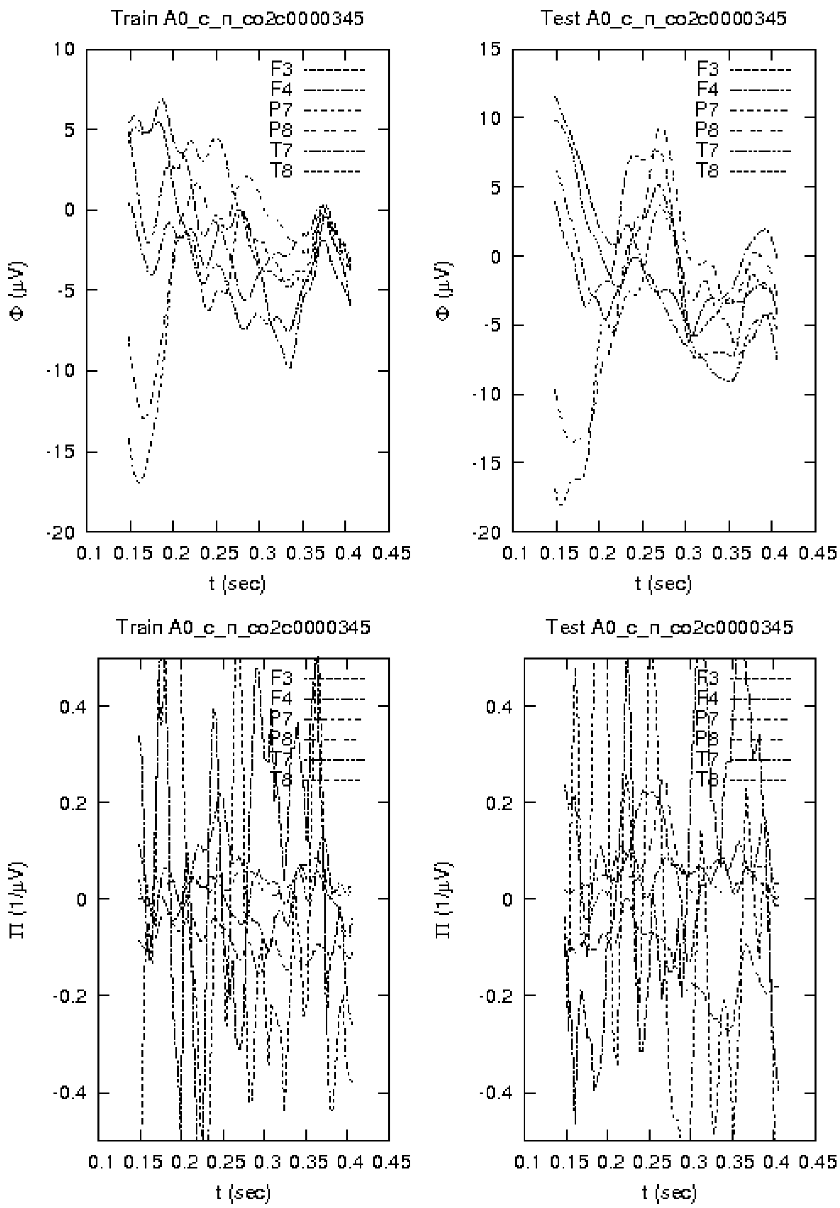


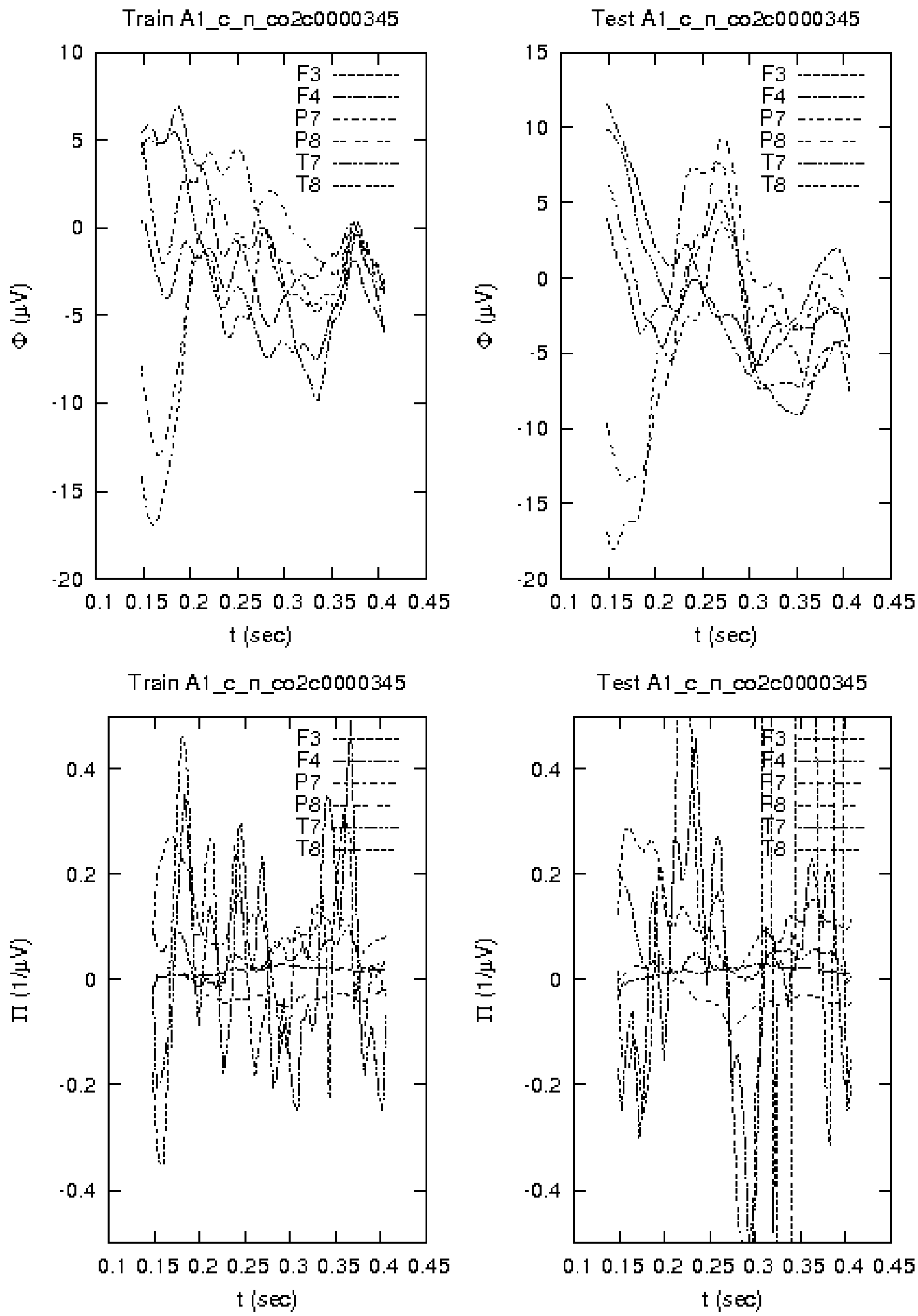
FIG. 115.

EEG

Both plots fairly resemble each other overall; but Test shows increased amplitude of approximately +5 µV in 4 signals at beginning of epoch. All signals tend to cluster together towards end of epoch in both plots. Further, two distinct peaks of all signals are apparent in Test; roughly in middle and end of epoch. There appears to be overall synchrony across all signals in both plots.

CMI

Four waveforms appear fairly clustered about origin; with remainders exhibiting strong amplitude and sinusoidal behavior in both plots. Test appears to show an increase in amplitude across all waveforms.



EEG

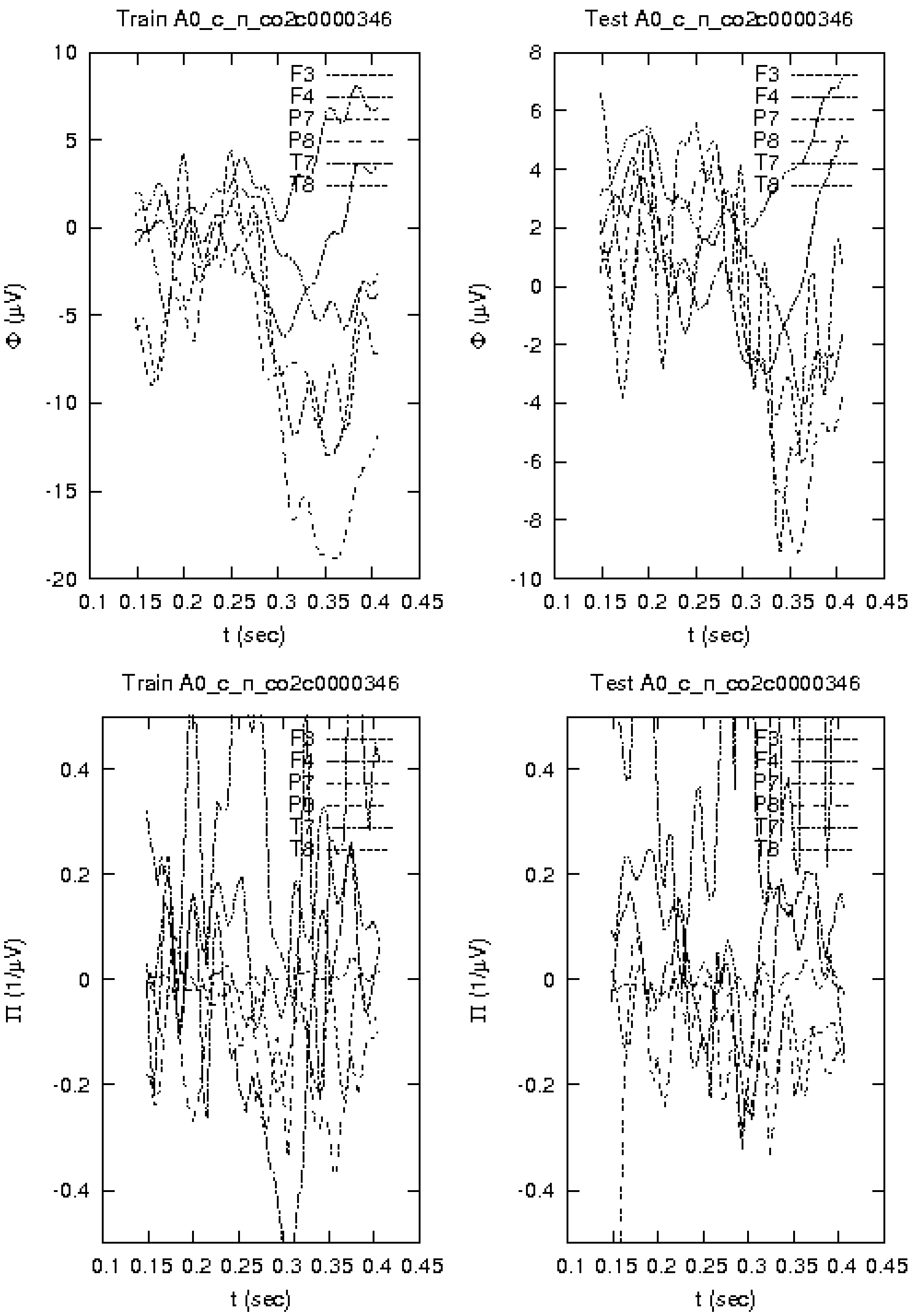
CMI

F4 is nearly flat about origin. F3 also exhibits low, mostly positive amplitude and sinusoidal behavior, with P8 making up the third, calm wave in this group showing mostly negative amplitude. Remaining wave forms are noisier, with greater amplitude but noticeable peaks and troughs. Amplitude is increased in Test; with a noticeable severe trough of several waves near t=0.3. Interestingly, the cluster of waves near origin is similar between the two plots.

FIG. 116.

A0 vs. A1

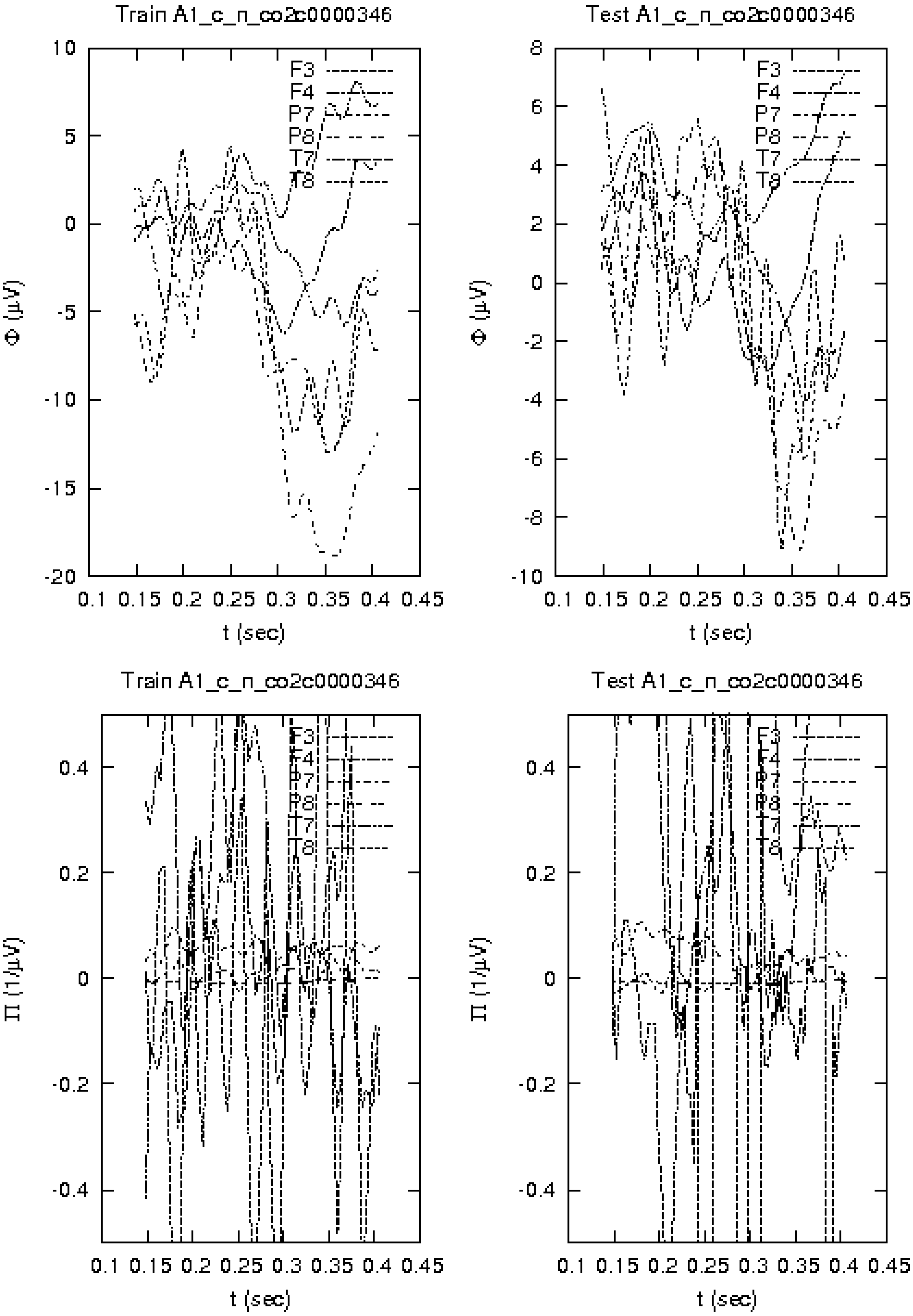
After applying **A**, the most noticeable difference is a reduction in amplitude across most waves; with the most profound differences visible in the Train plots. However; in Test, **A** seems to introduce a stronger negative peak in several waveforms beginning near t=0.28; and severe positive peaks appear towards the end of the epoch in two waveforms as well.



EEG
Train and Test have similar figures, with a compacted envelop of signals which broadens in the second half of the time range. In Train there seems to be more symmetry in signals, which tend more to superimpose, while in Test there are more intersection and low scale conflicts. A transient of two separated and higher waveforms emerges in both graphs after t=0.33.

CMI
Train and Test have figures with the upper part richer in high peaks. The lower half is more noisy in Test, while in Train it shows a single, greater negative peak. Most of the peaks keep inside the bounding box limits. Both graphs have a constant trend.

FIG. 117.

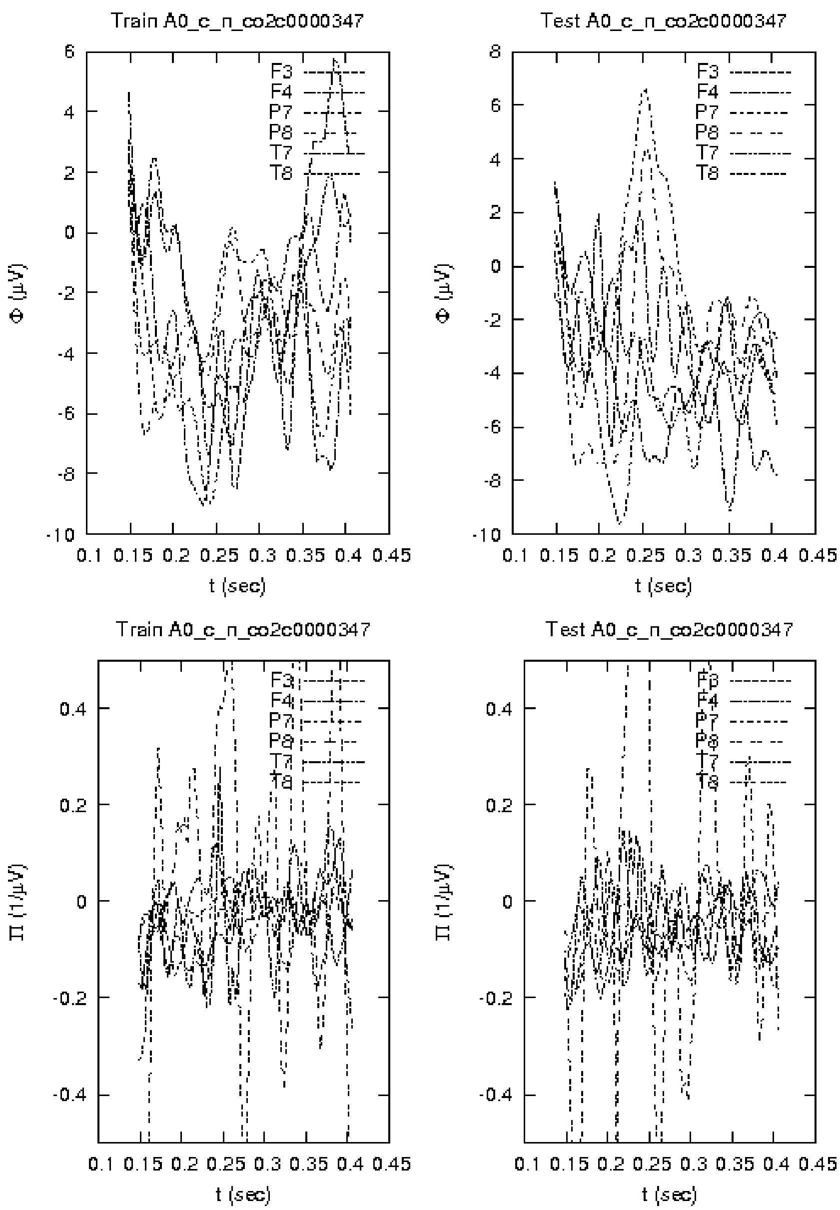


CMI
Train and Test have many high amplitude peaks, altogether with a group of signals which keep compact around the horizontal y=0 axis. Train peaks are more separated and sharp, while in Test they look wider and a little less numerous. Test shows more signs of signal superposition. It has also a negative peak gap for t in [0.3, 0.37].

FIG. 118.

A0 vs. A1

A application seems to split the morphology of A0 waveforms into several separated but similar peaks of activity, both for Train and Test. The A0 versions where rather empty in their lower halves, while the A1 figures have them filled with negative peaks.



EEG
Train has a positive transient at around t=.37. Test exhibits a peak of two waveforms around t=.26; extending to +6 µV. Graphs resemble each other at beginning of epoch; then Train trends downwards while Test shows the isolated peaks near the middle of the epoch, with Train finishing more wider and positive. Test shows a clustering of all signals at end of epoch.

CMI
Four waveforms appear clustered about origin; with remainders exhibiting strong amplitude and sinusoidal behavior in both plots. Test appears to show an increase in amplitude across all waveforms. The negative transient at end of epoch in Train vanishes in Test.

FIG. 119.

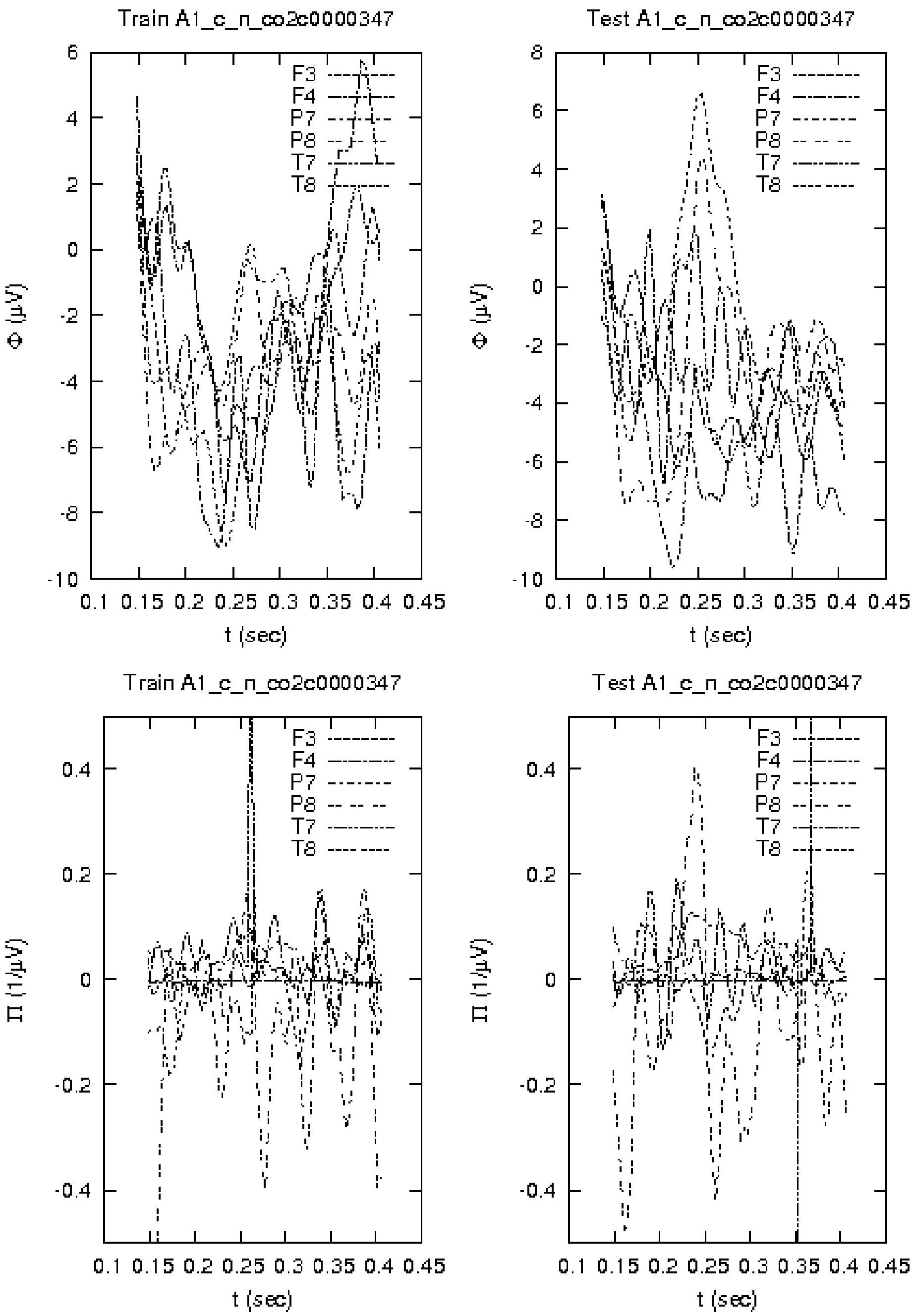


FIG. 120.

EEG

CMI

F4 is nearly flat; with most of the waveforms also clustered tightly about origin. P8 oscillates predominately in the negative domain, with a positive transient present around t=.23 in Test. There is a sharp, positive transient peak in T7 at t=.26 in Train; with the same waveform exhibiting both a severe negative transient after t=.35, then a severe positive transient at approximately t=.37 in Test.

A0 vs. A1

After applying **A**, the most noticeable difference is a tighter compaction of waves about the origin, with F3 almost flat and remainder of this cluster is mostly positive, with clearer peaks discernible. For the other waves, **A** seems to have a clipping effect in the positive domain; significantly reducing several peaks. While in Train, **A** has introduced a sharp, positive transient in T7 near t=.27, and the aforementioned negative then positive severe transients as the epoch progresses in the same wave (T7).

Appendix B

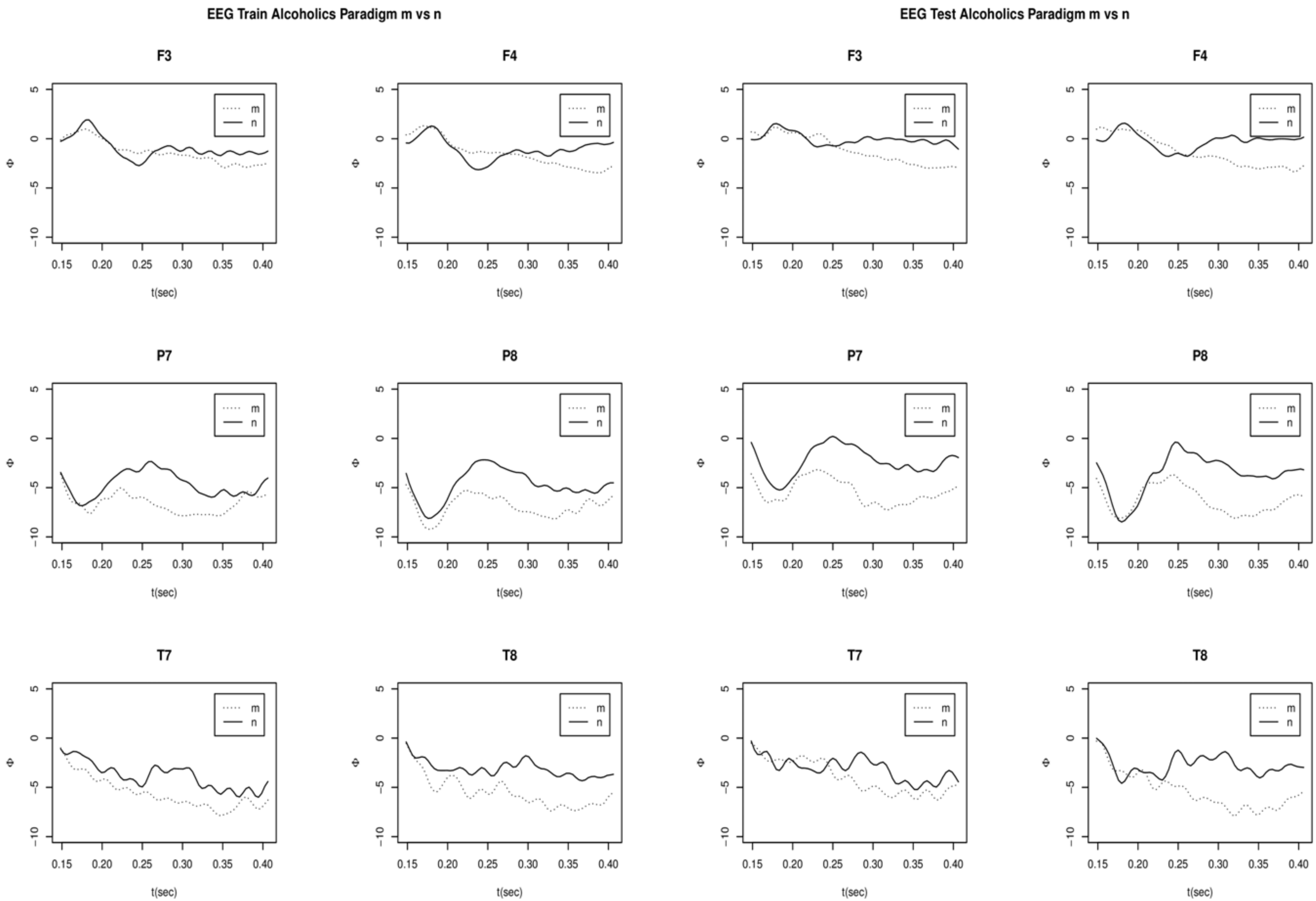


Fig. 1

Appendix B

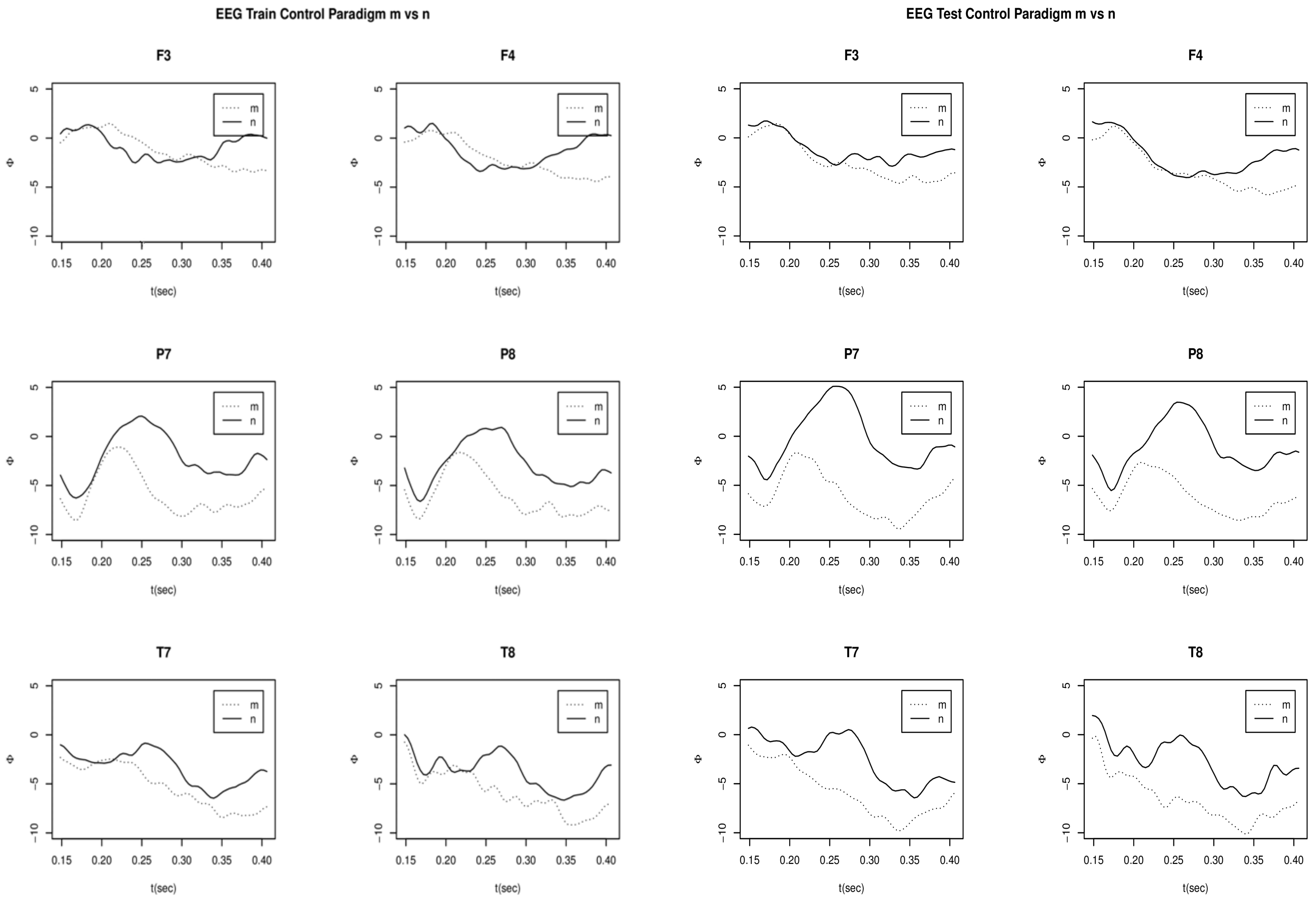


Fig. 2

Appendix B

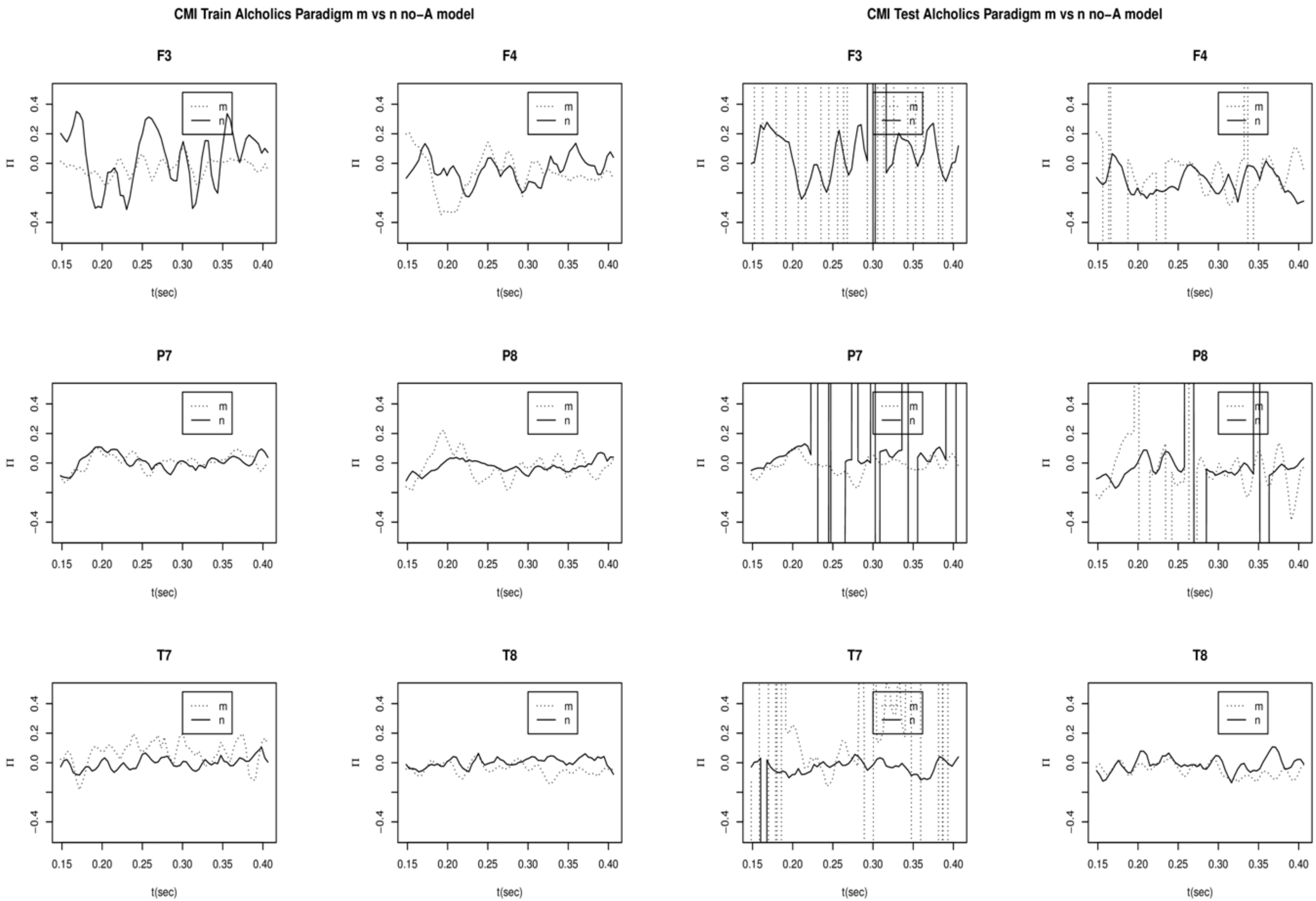


Fig. 3

Appendix B

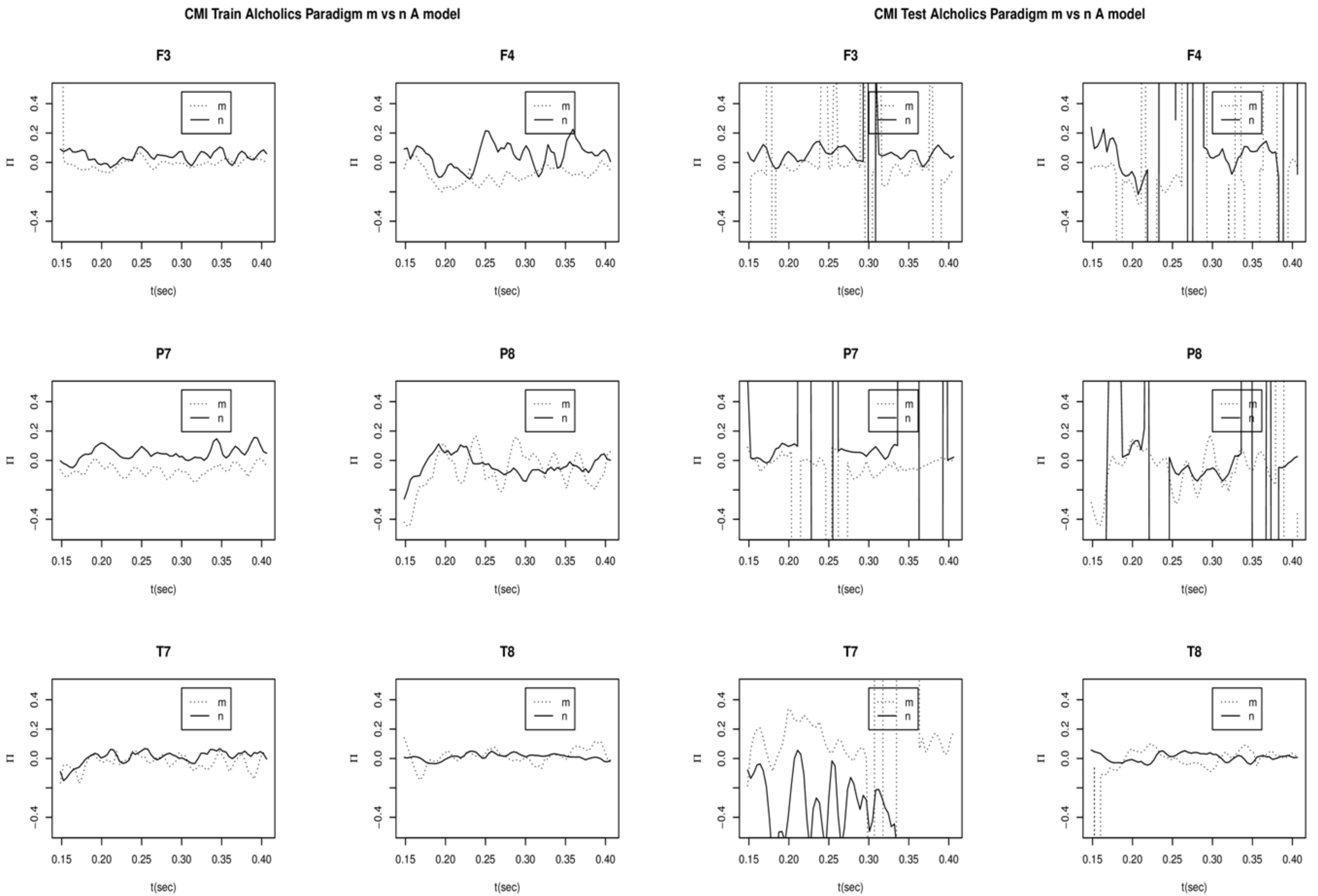


Fig. 4

Appendix B

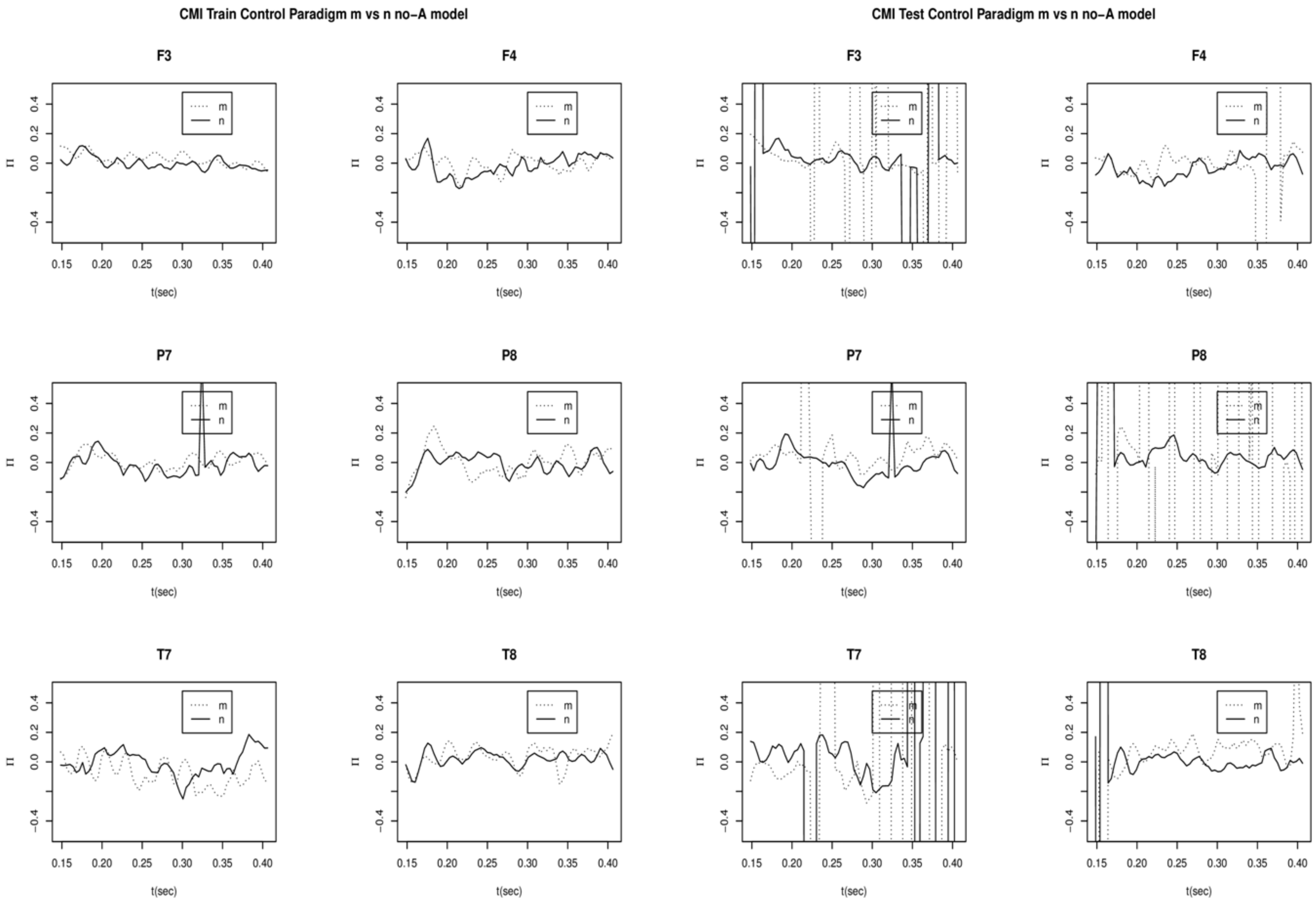


Fig. 5

Appendix B

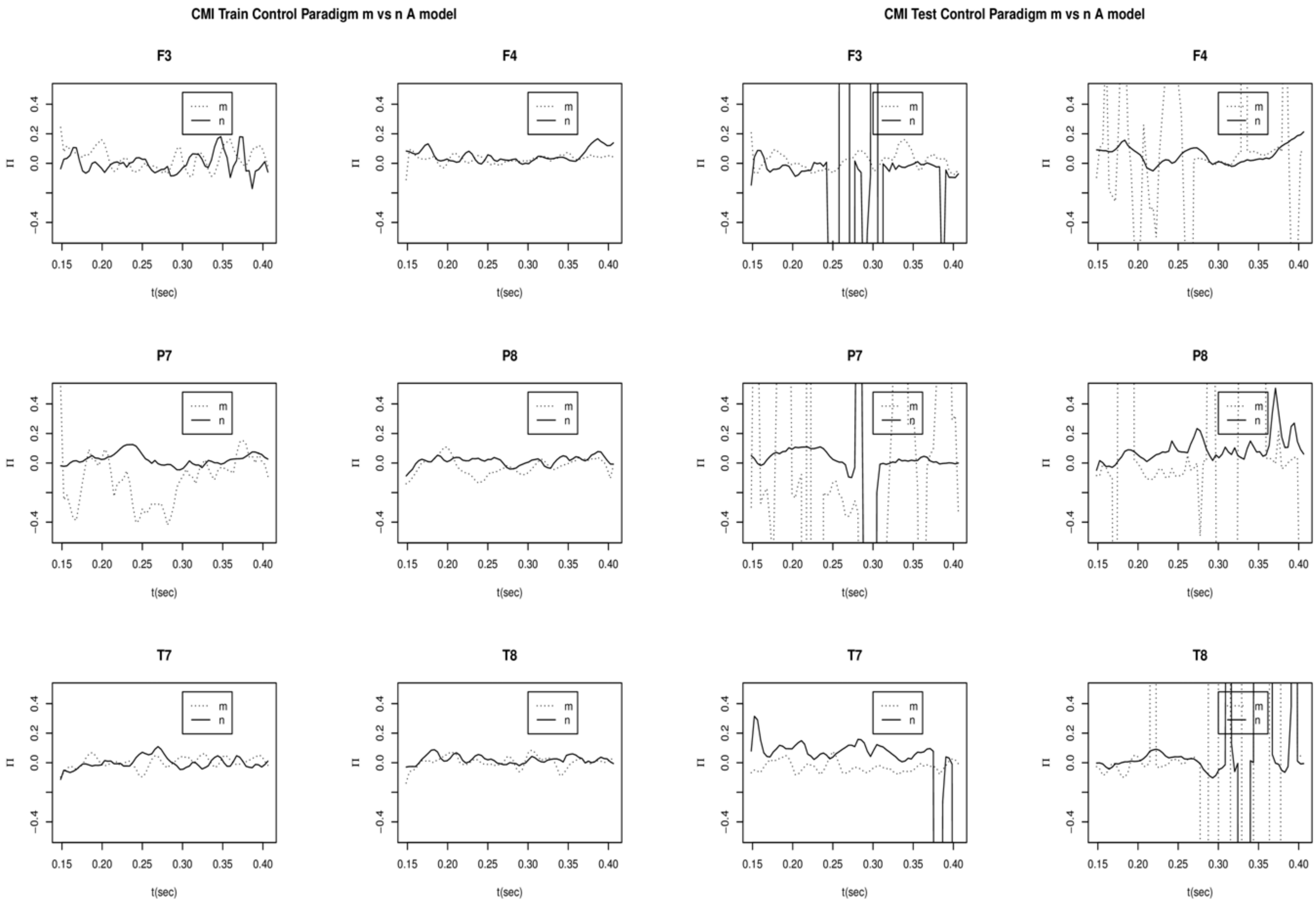


Fig. 6

Appendix C

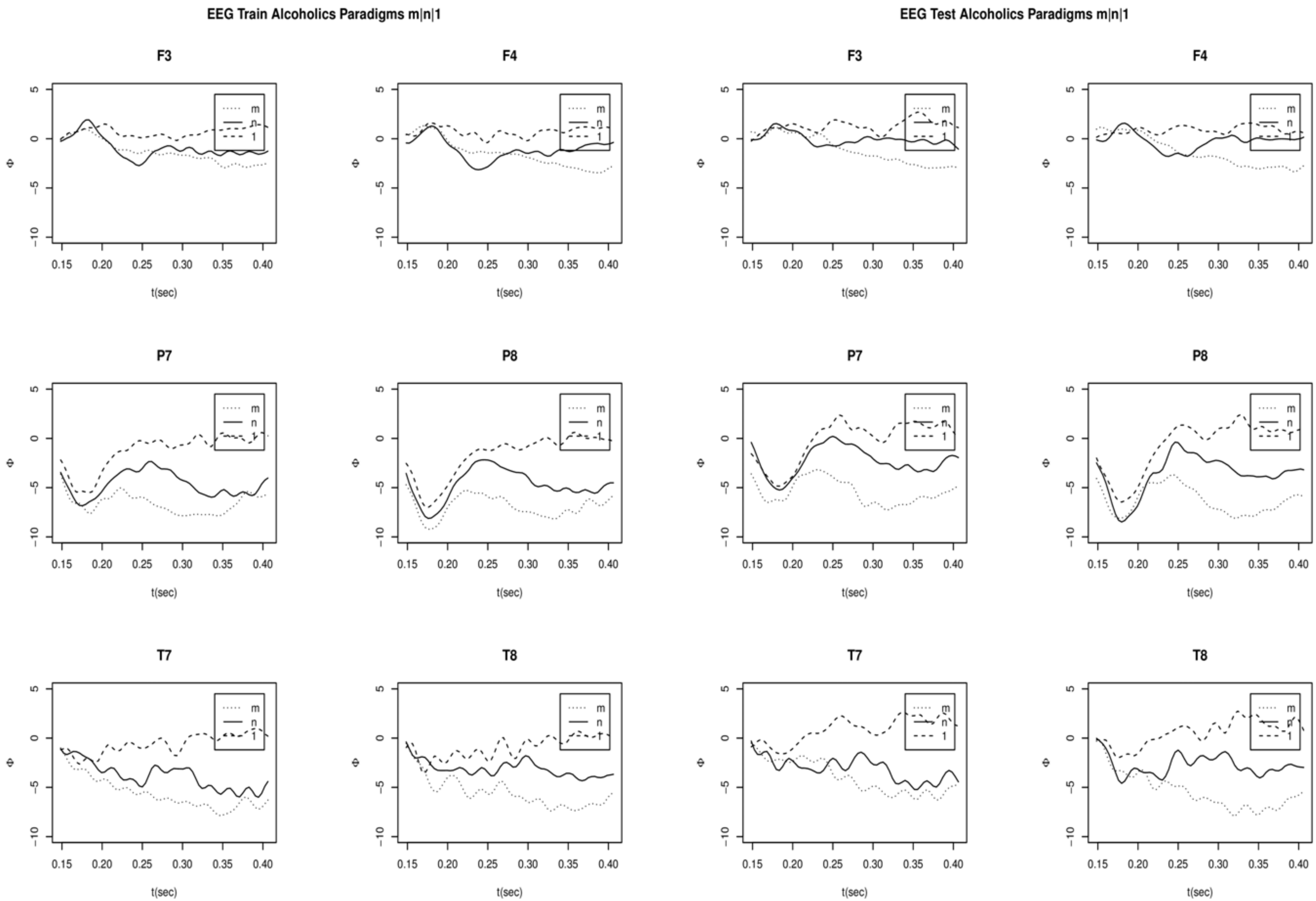


Fig. 1

Appendix C

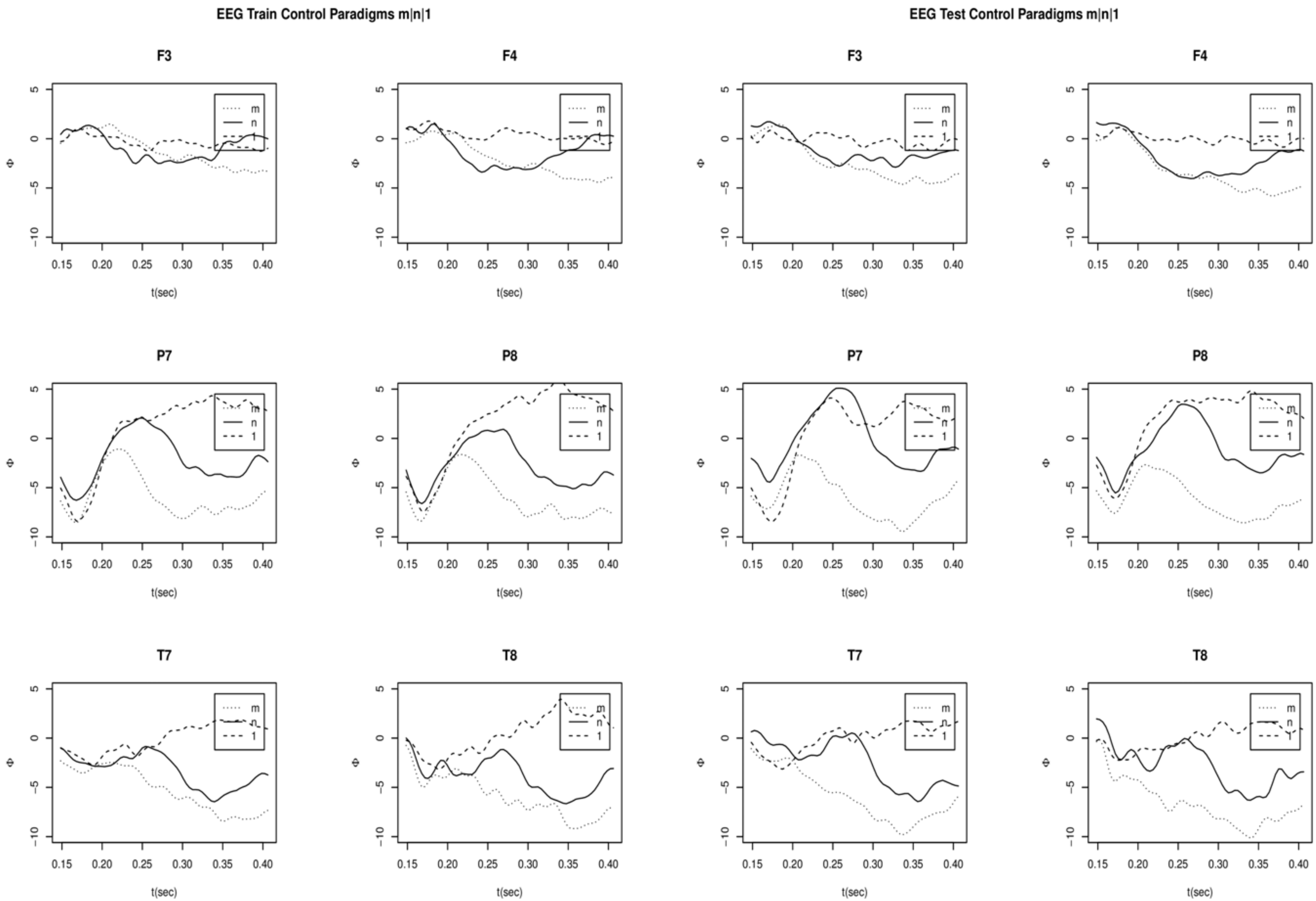


Fig. 2

Appendix C

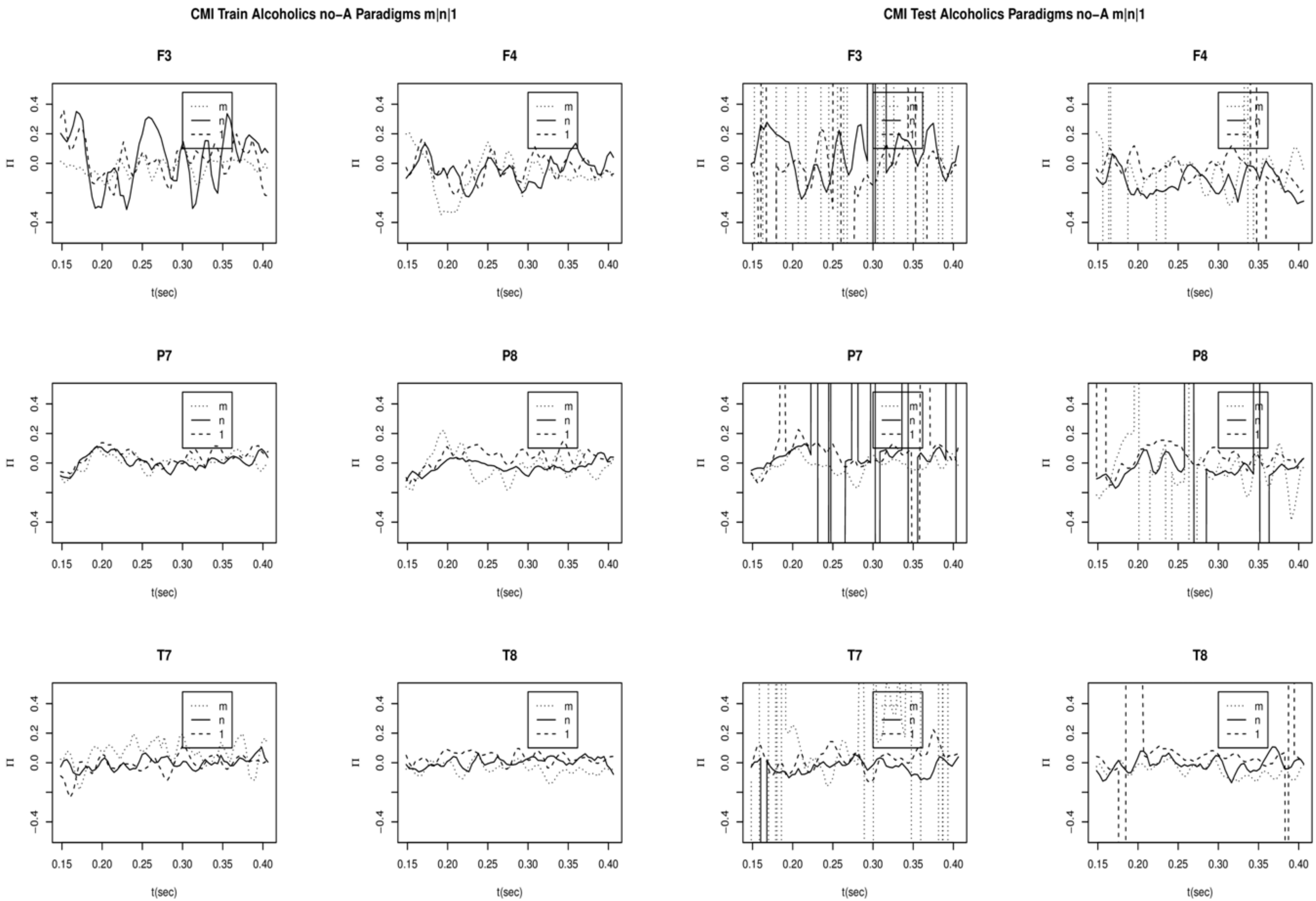


Fig. 3

Appendix C

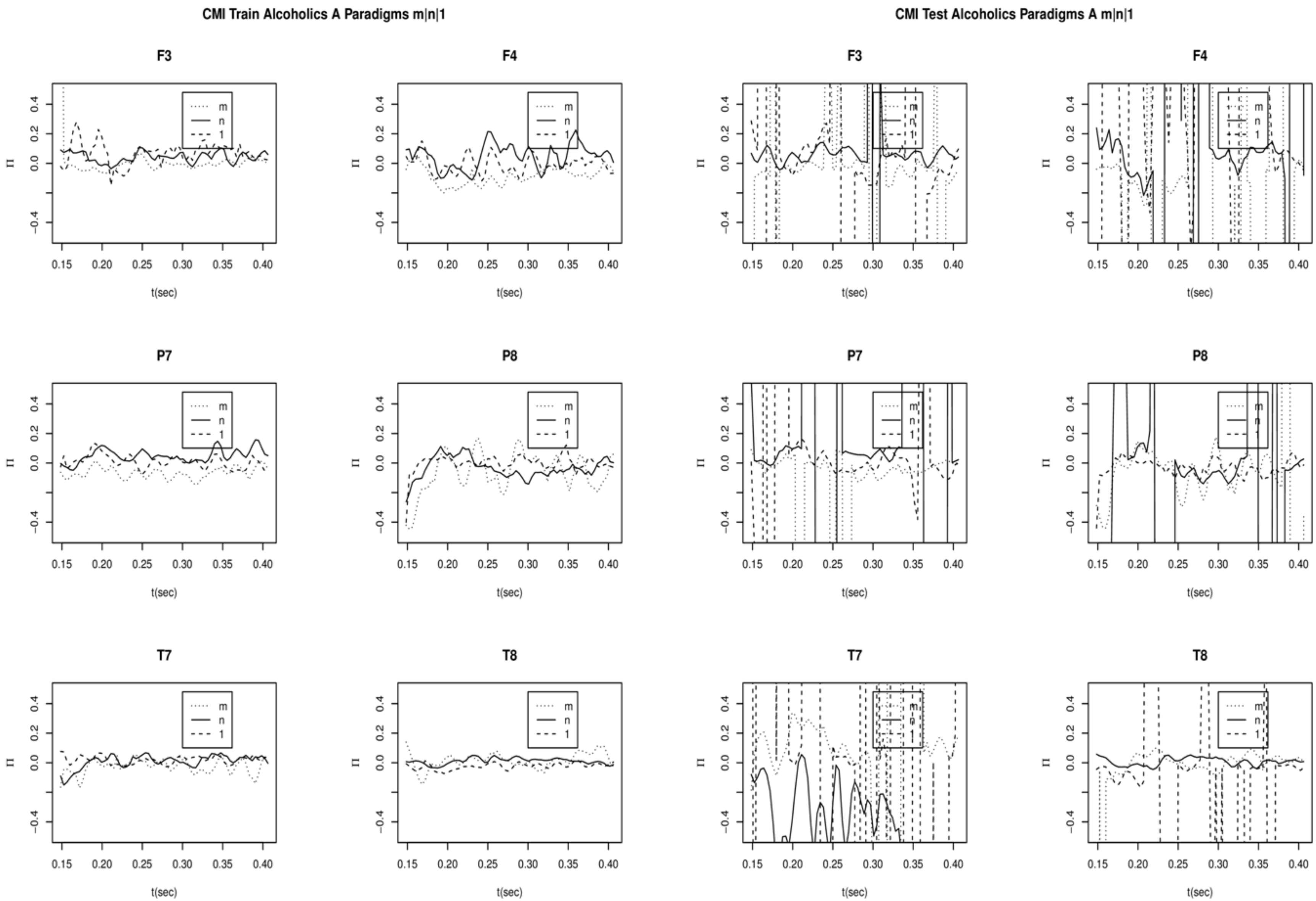


Fig. 4

Appendix C

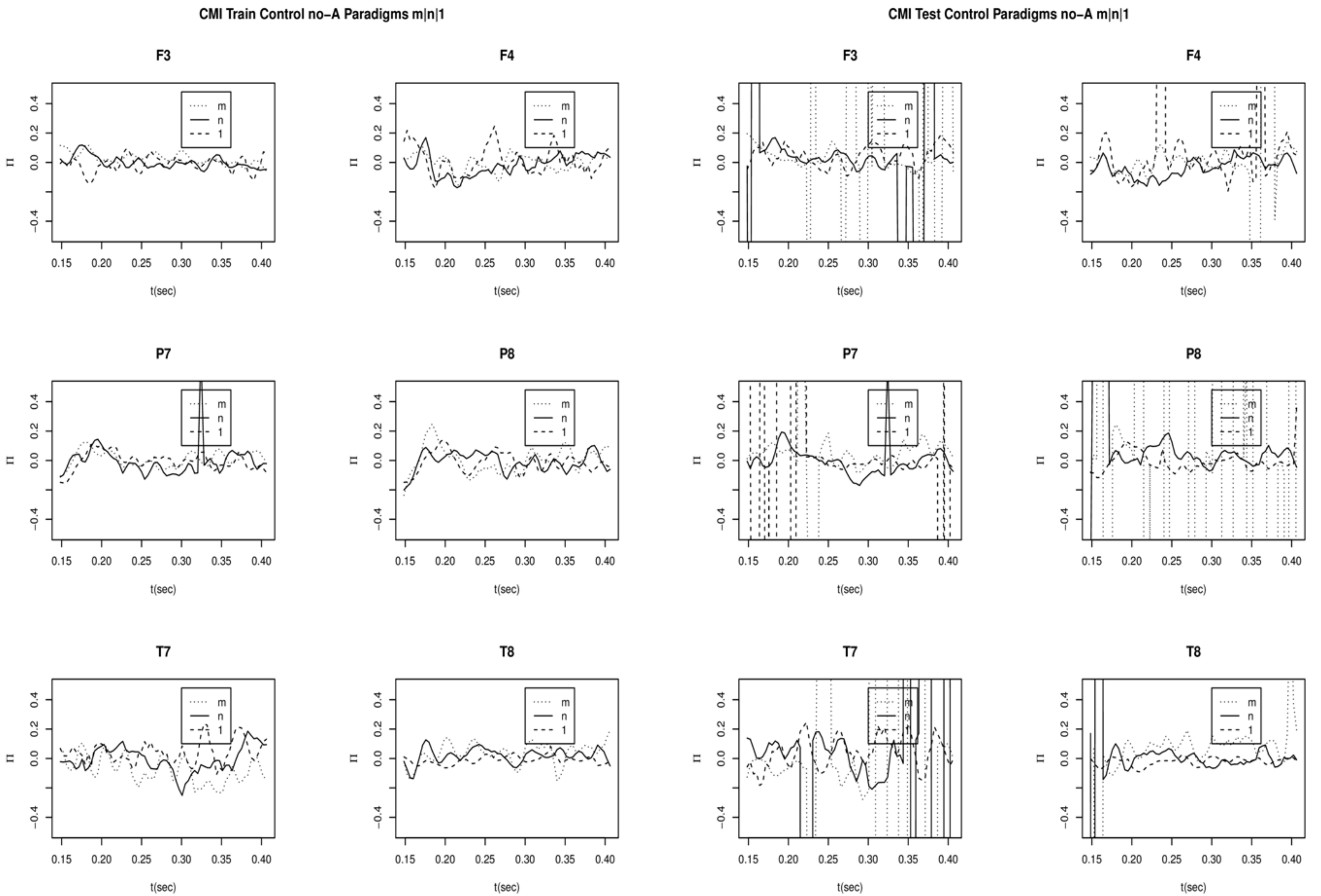


Fig. 5

Appendix C

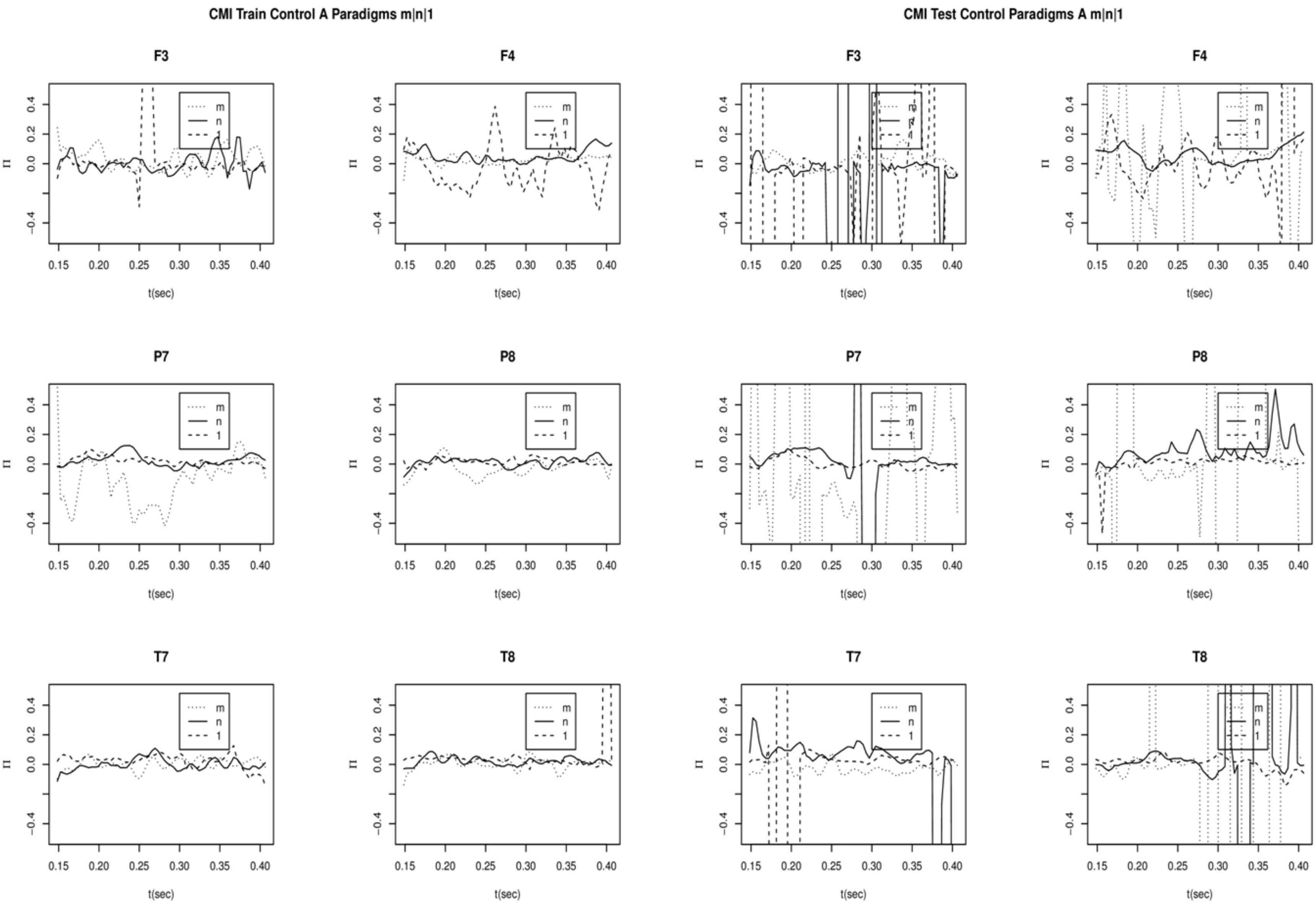


Fig. 6

Appendix D

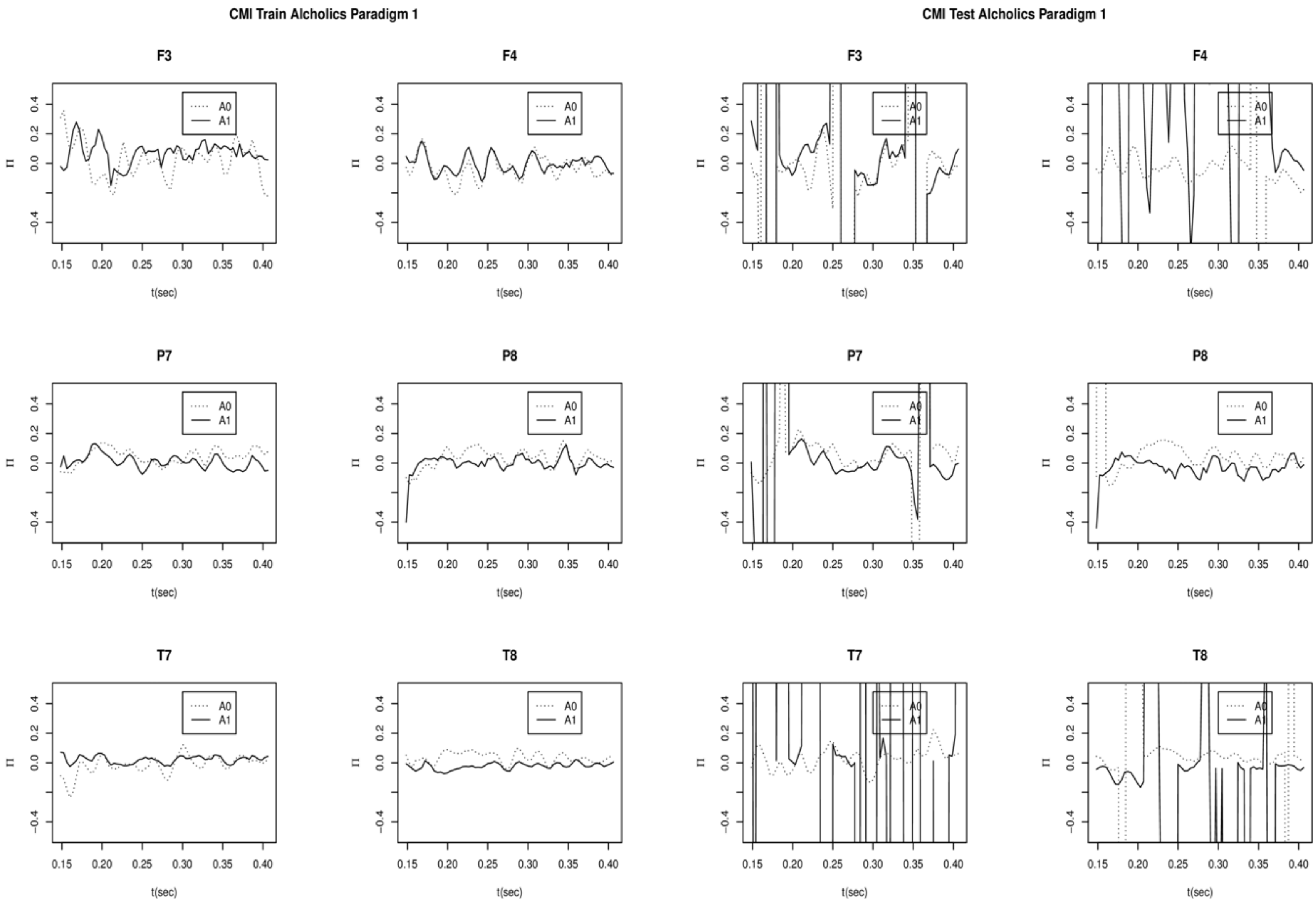


Fig. 1

Appendix D

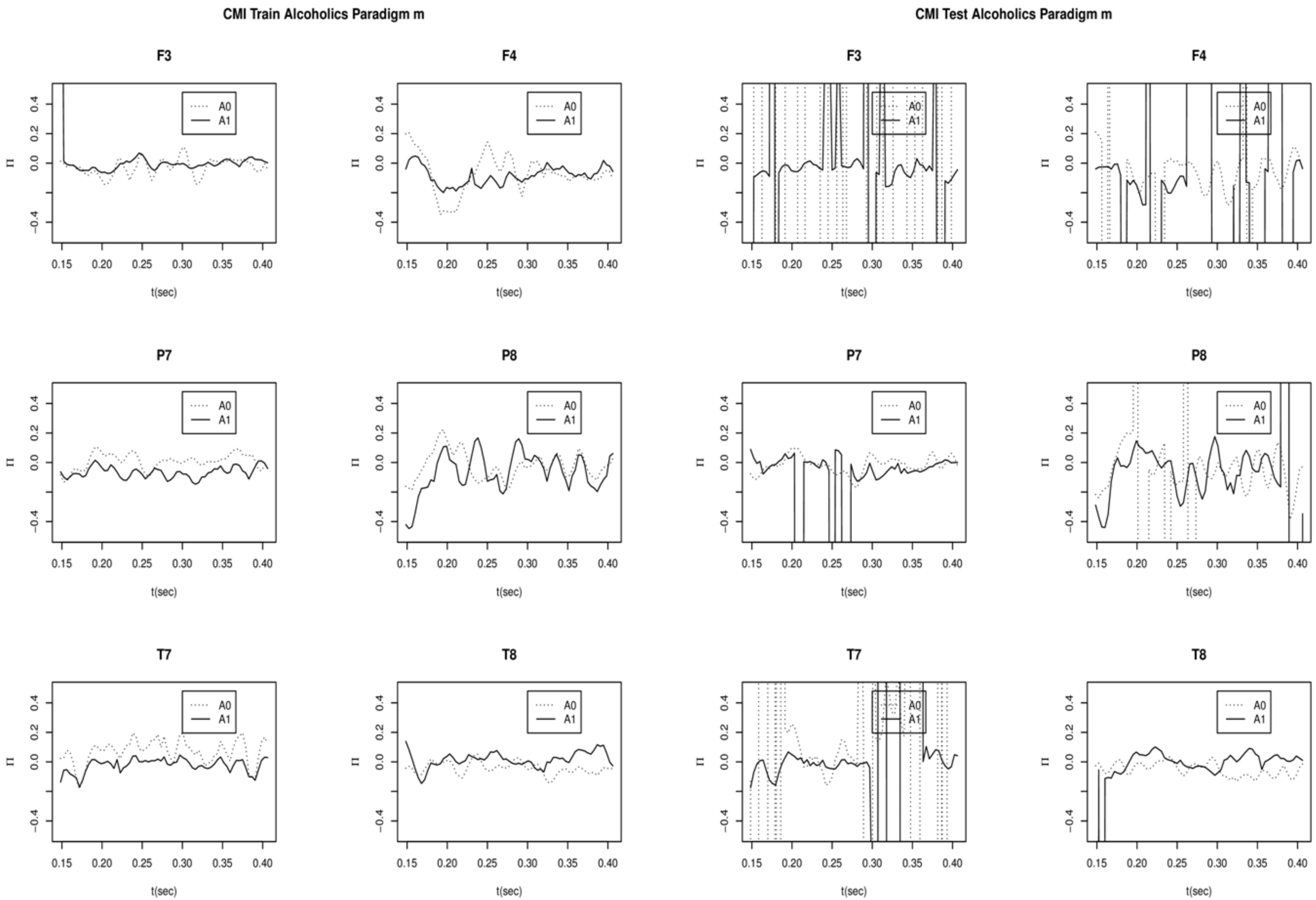


Fig. 2

Appendix D

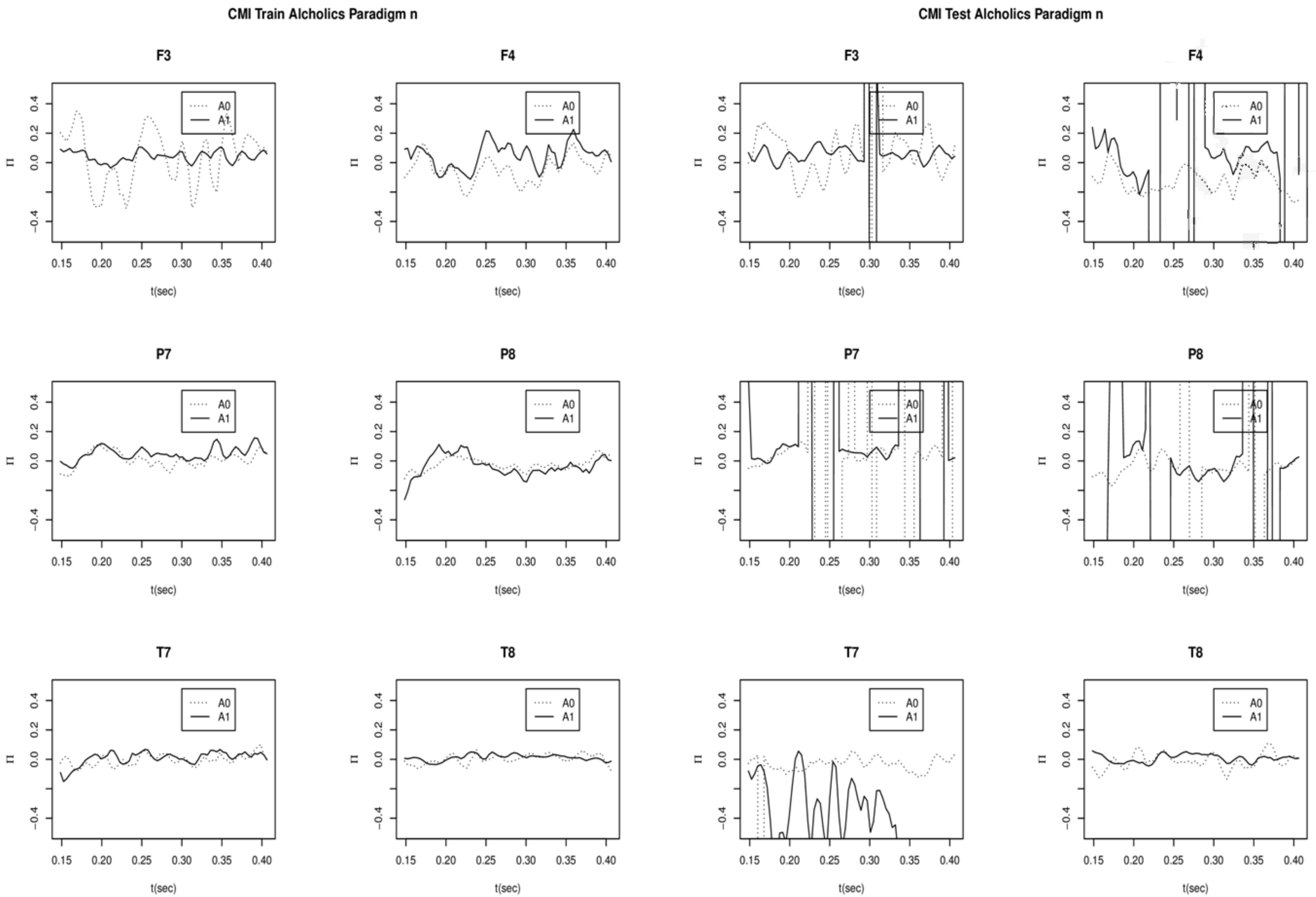


Fig. 3

Appendix D

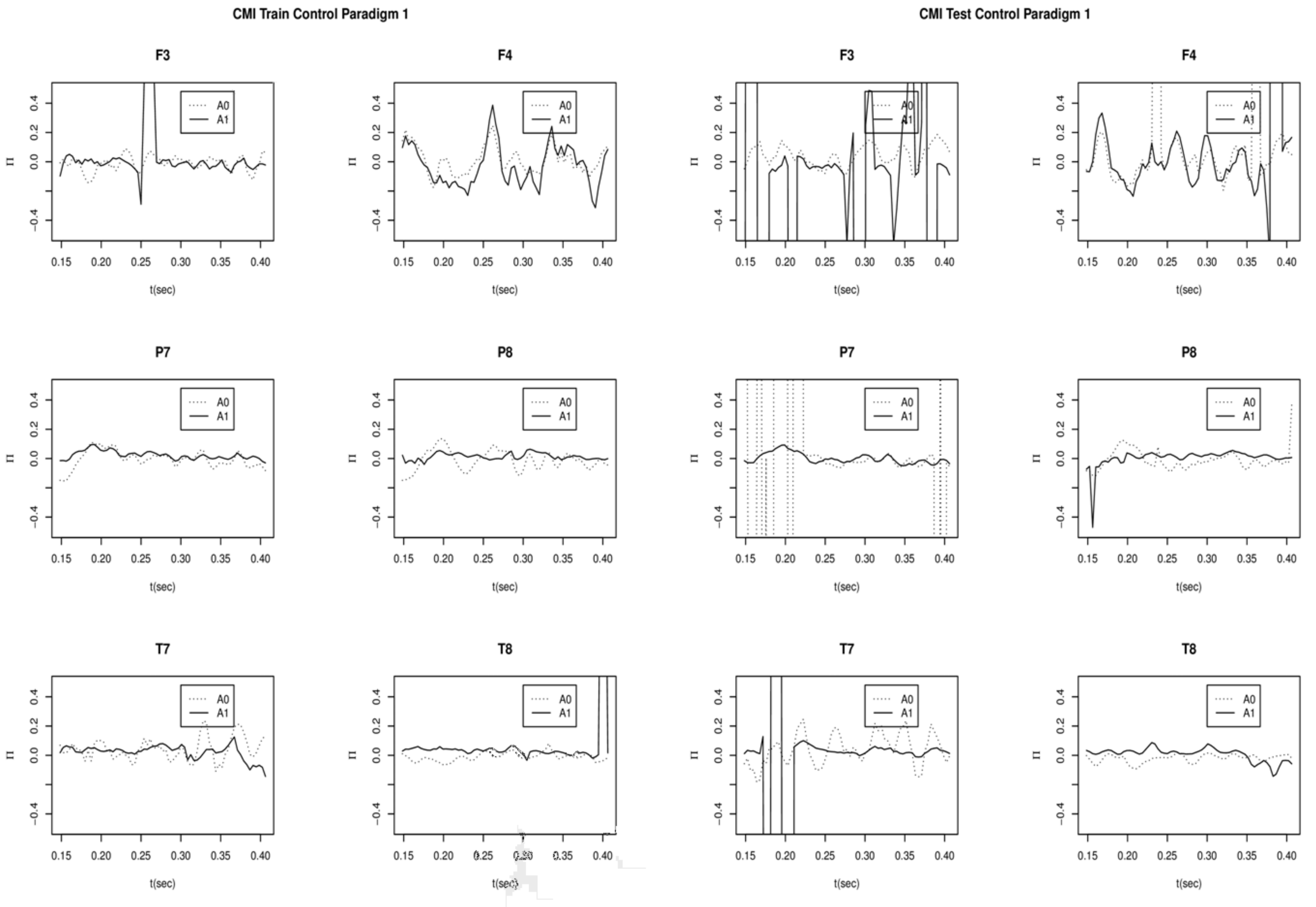


Fig. 4

Appendix D

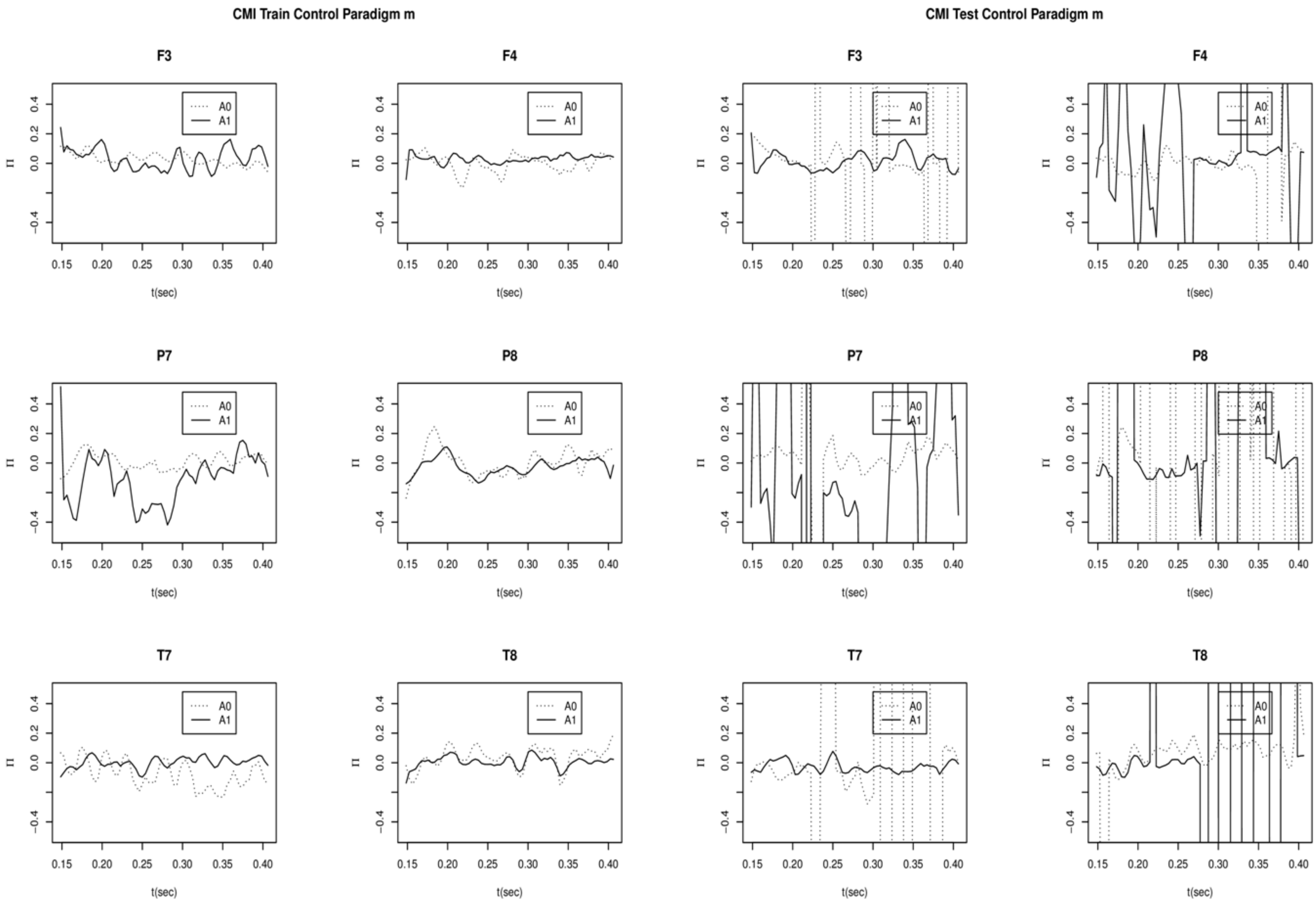


Fig. 5

Appendix D

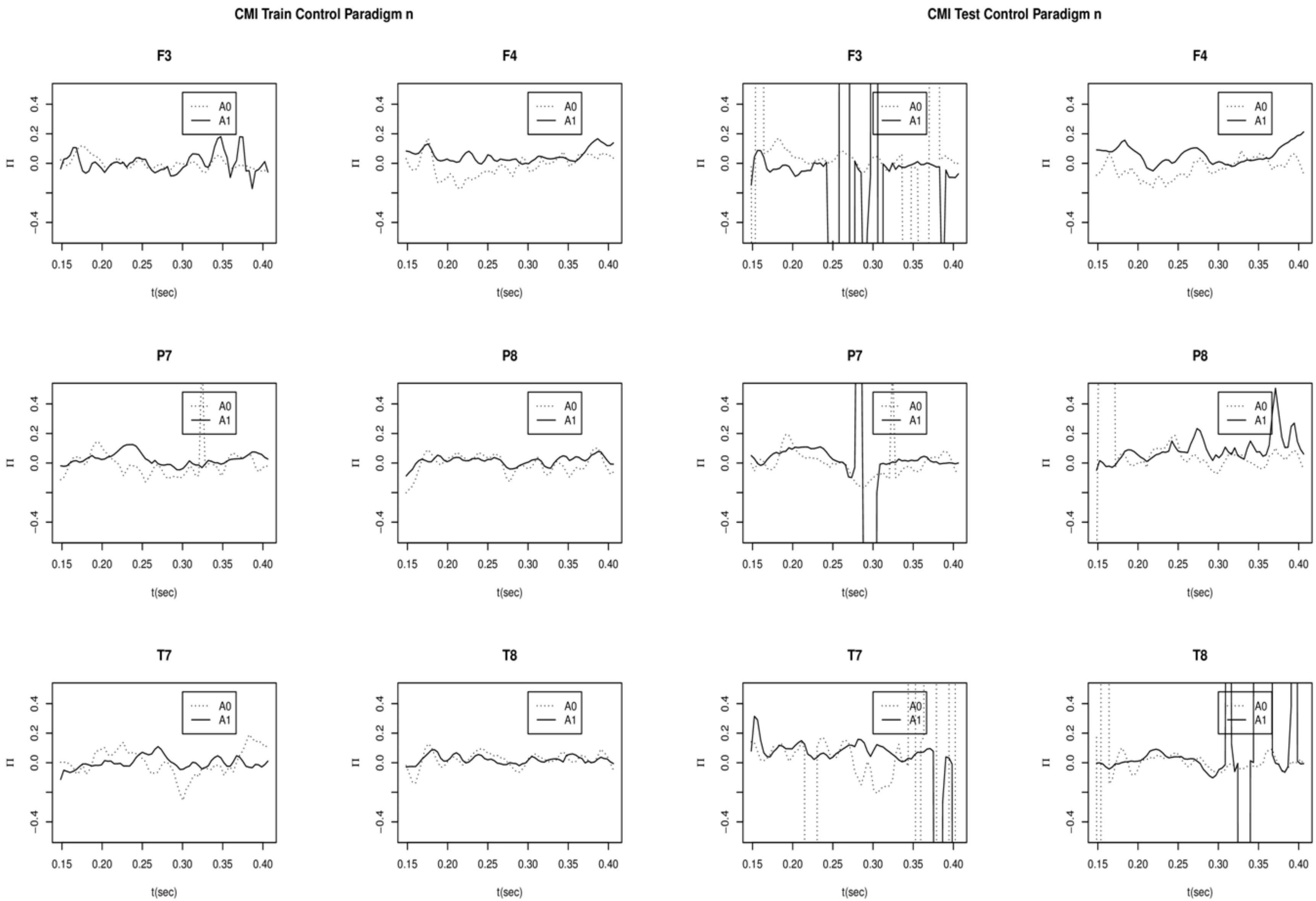


Fig. 6

Appendix E

m vs n

Key: Levels of Perceived Improvement

strong	moderate	slight	unknown	worse

m vs n **alcoholics**

	F3	F4	P7	P8	T7	T8
Train	1,2,3	improved separation: 1, 5	improved separation: 1	Slightly improved: 1, 5	decreased separation;however m is “appropriately reduced” in relation to n; slightly improved synchrony end of epoch:5,2	Worse: -1
Test	A profoundly reduces noise/amplitude of m, and reduces amplitude of n as well; while preserving the sharp transients in n at approx. t=.30. The reduced portions of m show distinct separation; consistently less in value and synchronous. 2,3,6	A significantly increases amplitude in both signals; leaving the domain frequently. Synchrony is introduced; however, from beginning of epoch to approx. t=.22, and n appears greaeter than n; positive change in morphology: -4, 2,5	three distinct, severe negative transients introduced with A in m. amplitude increased in n; however in calm parts of both signals, slight separation is observed with m being reduced: -6, 1	m signal appears much more organized and sinusoidal with A for most of epoch with the volatility removed, then severe amplitude/volatility introduced at last part of epoch. Severe increase in amplitude introduced with A to n in first part of epoch; middle severe sinusoidal wave present in the no-A has vanished. Morphology similar for last part of epoch but with increased amplitude. -4	profound reduction in volatility and noisiness of m overall, with remaining extreme oscillations at approx. two thirds through epoch, then again settling down. n exhibits profoundly different morphology with A, changing from relatively flat save for initial sharp negative transient present in no-A. The signal morphs into a much more sinusoidal, though overall skewed to negative domain then vanishing as epoch progresses. synchrony is introduced between the two signals in the A model for majority of epoch.:1,6,2,5	Worse: -1,-6,-5

control

	F3	F4	P7	P8	T7	T8
Train	increase in amplitude as epoch progresses in both paradigms:5,4	Greater separation; though slight. Improved slight morphology: 1,5	wave at the end of epoch. Sharp positive transient introduced at start of epoch.5,1,3,4, -6	-3, 1,5	quenched	quenched
Test	m is profoundly stabilized with the removal of all volatile activity; yet retaining a distinct, oscillating morphology. n has largely been clipped on either side of the severe volatility, yet very amplified in the middle with introduced volatility absent in no-A.:6	an overall smoothing of n; however significant amplification of m, yet not severe… can observe most of the signal remains in the bounds; resulting in greater separation of signal.1,3	very prominent and amplified sinusoid introduced near middle of epoch in n, transient removed from no-A. m is amplified and appears to be shifted downwards.1, 5	marked improvement in both signals, revealing more distinct morphology. Greater synchrony and separation can be easily discernible.1, 6,2,3,4	significant reduction in amplitude and noise in both signals towards end of epoch; nearly eliminating the volatility. separation observed in no-A retained.3,6	roughly a reversal of the two signals; interestingly, with significantly greater amplitude and three prominent peaks appear towards end of epoch in m. Additional very high in amplitude and sinusoidal behavior introduced in same period of epoch for m. strong, volatile sinusoid removed from n at beginning of epoch. Inconclusive

alcoholics vs. control

	F3	F4	P7	P8	T7	T8
Train	A increases amplitude (oscillation) in n and m towards end of epoch in control; while profoundly decreasing or flattening of n and less so m in alcoholic group yet introducing separation; However, a sharp positive transient is introduced at the start of the epoch in the alcoholic plot with the A model. 5, 1,3,4	a greater separation of signals in alcoholic group with A model. control is further "calmed" with A; bringing both signals towards origin, magnifying differences between the two groups.	Main observable difference is the A model shows strong separation of m to negative domain during first half of epoch in control group; which contrasts with the even separation of signals introduced by A in the alcoholic group. Also, A removes sharp positive transient in the n paradigm in control.	A increases signals in the alcoholic group; while simultaneously decreasing signals in control; causing further disparity between the two.	A flattens and merges the paradigms in both groups; lessening visible differences than with no-A.	A flattens and merges the paradigms in both groups; lessening visible differences than with no-A.
Test	m signal cleaner in both groups; resulting in a closer discernment between the two groups.	significant amplification introduced in m and n for alcoholic group, and m for control. this results in significantly observable differences in the morphologies of both paradigms between a|c after A applied. of note, n is slightly "cleaned" of noise in control after A; while retaining overall morphology.	signal appears to be amplified overall in both groups; retaining some features of morphology after A; and introducing greater separation and discernment between a and c groups.	significant reduction in noise and introduction of clear separation in control; combined with increased amplification of n in alcoholic group.	profound changes in morphology and increased separation in alcoholic group. While the control group experiences a cleaner signal while retaining the separation and synchrony. Interestingly, m and n are transposed between the alcoholic and control groups with the A model; yet both demonstrating greater synchrony than no-A.	inconclusive

Appendix F

No-A vs A

Key: Levels of Perceived Improvement			
strong	moderate	unknown	worse

Paradigm 1

alcoholics

	F3	F4	P7	P8	T7	T8
Train	shows most disparity, with the waves out of phase in beginning of epoch. A model somewhat levels out yet with slightly greater activity or noisy signal; but again less amplitude.	inconclusive	A is shifted slightly down from no-A; but very synchronous (retains morphology).shift downwards mirrors EEG closer.	A is shifted slightly down from no-A; but very synchronous (retains morphology).shift downwards mirrors EEG closer.	seem to be quenched more with A.	seem to be quenched more with A
Test	show very similar morphology; though profound amplification from Train; which is even greater in **A**.	signals are very disparate in amplitude; **A** having profoundly more; though they appear loosely synchronous; readily apparent at end of epoch.	show very similar morphology; though profound amplification from Train; which is even greater in **A**.	signals opposite phase at beginning of epoch; resume synchrony as time progresses, with A having an overall slightly negative shift of entire signal and slightly greater noise.	signal greatly amplified and very volatile, oscillatory behavior introduced; though this just may mean A model increases sensitivity of measurement; which could be a positive attribute..	signal greatly amplified and very volatile, oscillatory behavior introduced; though this just may mean A model increases sensitivity of measurement; which could be a positive attribute..

control

	F3	F4	P7	P8	T7	T8
Train	A introduces sharp transient spike near t=.25, signals lack synchrony	waves synchronous, with slightly increased positive and negative amplitude; or overall slight amplification.	very slightly calmer; yet retaining synchrony	A quenches signal; loss of synchrony	A quenches signal for most of epoch, then amplifies and diverges towards negative domain	sharp transient peak introduced at end of epoch, deadening of signal
Test	A profoundly amplifies signal; though intermittently returning to calmer periods and observable synchrony in-between.	signal appears filtered and cleaner, with some transients introduced at end of epoch; though morphology of non-volatile parts of signal remain intact.	all sharp transients filtered; while retaining morphology to non-volatile parts of no-**A** signal. Possible over clipping of signal though.	sharp negative transient introduced at beginning of epoch, flatter and very little synchrony.	severe, amplified sinusoid near beginning of epoch, then strongly quenched rest of epoch.	unremarkable; signals just share very little amplitude nor synchrony.

alcoholics vs. control

	F3	F4	P7	P8	T7	T8
Train	similar morphology; though only moderately so in alcoholics group; with significantly quenched;or reduced, amplitude. tight synchrony in control, with slight dampening effect again, but sharp transient spike introduced near t=.25	alcoholic group signal is shifted negatively with A model; though synchronous. control shows slight amplification which is counter to general behavior of A. Loosely comparing to EEG, this is negative behavior.	inconclusive	inconclusive	inconclusive	inconclusive
Test	signal shifted from slightly above no-A to slightly below in control, mirroring EEG somewhat; though profoundly more volatile in control than no-A; no-A is calmer in control than in alcoholic group.	**A** appears to profoundly filter the signal in a positive way; clipping volatility yet retaining morphology in the control group; and greatly amplifying the signal itself and also differences in the alcoholic group.	**A** appears to profoundly filter the signal in a positive way; clipping volatility yet retaining morphology in the control group; and greatly amplifying the signal itself and also differences in the alcoholic group.	inconclusive	increase in amplitude of no-**A** in control; severe sinusoid present at beginning of epoch in A model	**A** exhibits severe amplification and volatility in alcoholic Test; while in control **A** alters the morphology yet slightly shifts the signal into positive domain, then ends with downward trend; separate from no-**A**. The signals are generally transposed between alcoholic and test.

Appendix F

alcoholics

Paradigm m	F3	F4	P7	P8	T7	T8
Train	signal appears over quenched; with sharp positive transient introduced.	signal retains trough, and continues it further, finishing very slightly above the no-A signal; significant change in morphology.	very synchronous, though A offsets entire signal with a negative shift.	A offsets beginning of epoch more to negative domain; paralleling EEG.	very synchronous, though A offsets entire signal with a negative shift.	signal introduces positive descent at beginning of epoch; yet offset further into positive domain as epoch progresses; against EEG trend
Test	signal is already extremely volatile, though A brings back features and periods of severely reduced yet not deadened activity.	synchrony observed, though signal severely amplified intermittently and frequently.	very synchronous, with the exception of 3 severe negative troughs introduced.	most volatile spikes are removed, though morphology is closer to EEG;however, positive transient introduced.	severe volatility filtered overall, Synchrony can be observed when signal not volatile.	negative transient introduced at very beginning, signals slightly synchronous then diverging; though still centered about origin.

control

	F3	F4	P7	P8	T7	T8
Train	slight increase in amplitude; slightly synchronous	calming effect; slightly synchronous	A affects signal strongly, introducing strong troughs and somewhat greater frequency	signal is slightly calmed; and slight trough introduced.	signal calmed, retains synchronous behavior.	signal calmed slightly, shifted negatively, synchronous with no-A.
Test	signal profoundly filtered of volatility; yet synchrony is observed to be retained when discernible.	some synchrony evident, though A introduces strong amplification.	signal is severely amplified; and while synchrony is observable, those pieces of the signal have been offset significantly to the negative domain; resembling EEG trend.	no-A signal is so severely volatile it is difficult to tell synchrony..can see traces, though A appears to strongly filter and improve the signal.	signal appears strongly filtered; with all volatile transients removed, though amorphous.	signal shows synchrony in beginning, then is severely amplified rest of epoch; returning to origin at very end, with sharp positive transient introduced near t=.22

alcoholics vs. control

	F3	F4	P7	P8	T7	T8
Train	inconclusive	control signal quenched	increased negative trough in control	control signal calmer	inconclusive	signal calmed in control
Test	much calmer in control with transients clipped	indeterminate	severely amplified and offset to negative domain in control; mirroring EEG. Negative troughs introduced in alcoholics with A as well.	signal cleaner in both cases after A; significantly more amplification in c; though not chaotic.	significantly calmer in c with removed volatility; though possibly over filtered in c	morphologies similar in a, though negative transient introduced with A, in control, synchrony observed in beginning of epoch with removed sharp transient trough, though added sharp transient peak then signal becomes severely amplified; then prompt returns to the origin at end of epoch.

Appendix F

alcoholics

Paradigm n	F3	F4	P7	P8	T7	T8
Train	signal significantly reduced in amplitude; slight synchrony observed.	synchronous, slight offset to positive domain.	inconclusive	signal information increased with A.	inconclusive	inconclusive
Test	signal calmed and brought more evenly about axis, sharp transient preserved.	signal severely amplified in some portions; and shifted into positive axis; though synchrony is observed.	inconclusive	inconclusive	signals exhibit profoundly different morphologies; with no-A largely calm and sinusoidal except for early sharp negative transient which is removed by A. the A signal almost entirely shifted to negative domain then vanishing as epoch progresses; yet is not noisy… sinusoidal behavior very clear and not volatile.	inconclusive

control

	F3	F4	P7	P8	T7	T8
Train	synchronous, with slight amplification towards end of epoch.	inconclusive	signals slightly synchronous and fairly compact, with the sharp transient peak filtered out.	inconclusive	perhaps over-filtering	inconclusive
Test	inconclusive; morphologies dissimilar	differences slight and irregular, shifted positive overall.	inconclusive	Initial severe positive transient removed, synchronous behavior observed through rest of epoch, with moderate amplification into the positive domain.	synchrony observed in beginning, with sharp negative transient removed, and ending with sharp negative troughs;volatile activity in no-A model clipped from positive domain and one transient clipped from negative domain.	inconclusive

alcoholics vs. control

	F3	F4	P7	P8	T7	T8
Train	A model seems to deaden signal in a; which no-A model revealed significantly increased amplitude compared to c. increased amplitude introduced at end of epoch in control	application of A separates signal further into positive domain in a, and flattens it in c; magnifying differences between a|c.	inconclusive	inconclusive	inconclusive	inconclusive
Test	more volatile yet more synchronous in c to no-A; magnifying difference between a|c.	profoundly calmer in control; yet profoundly amplified in a; magnifying difference.	profoundly fewer volatile waves in c.	perceived improvement in c with initial transient removed from A model; amplified strongly in a.	a signals as previously described, with c signal "cleaner" from A model.	fairly flat and similar in a; A model introduces pronounced oscillations towards end of epoch in c; clipping transients in beginning though. Portions of alcoholic data are amplified overall

Appendix G

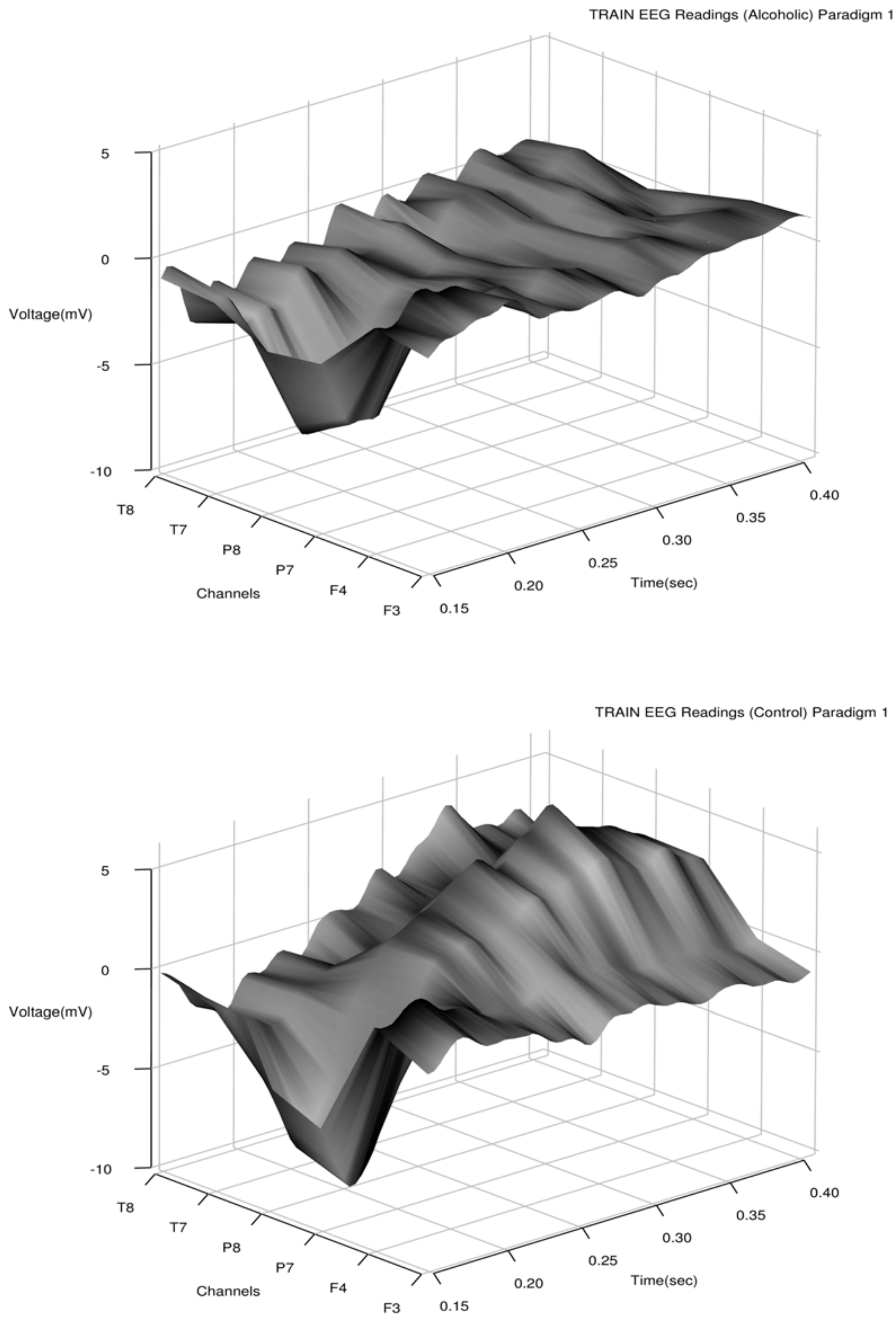


Fig. 1

Appendix G

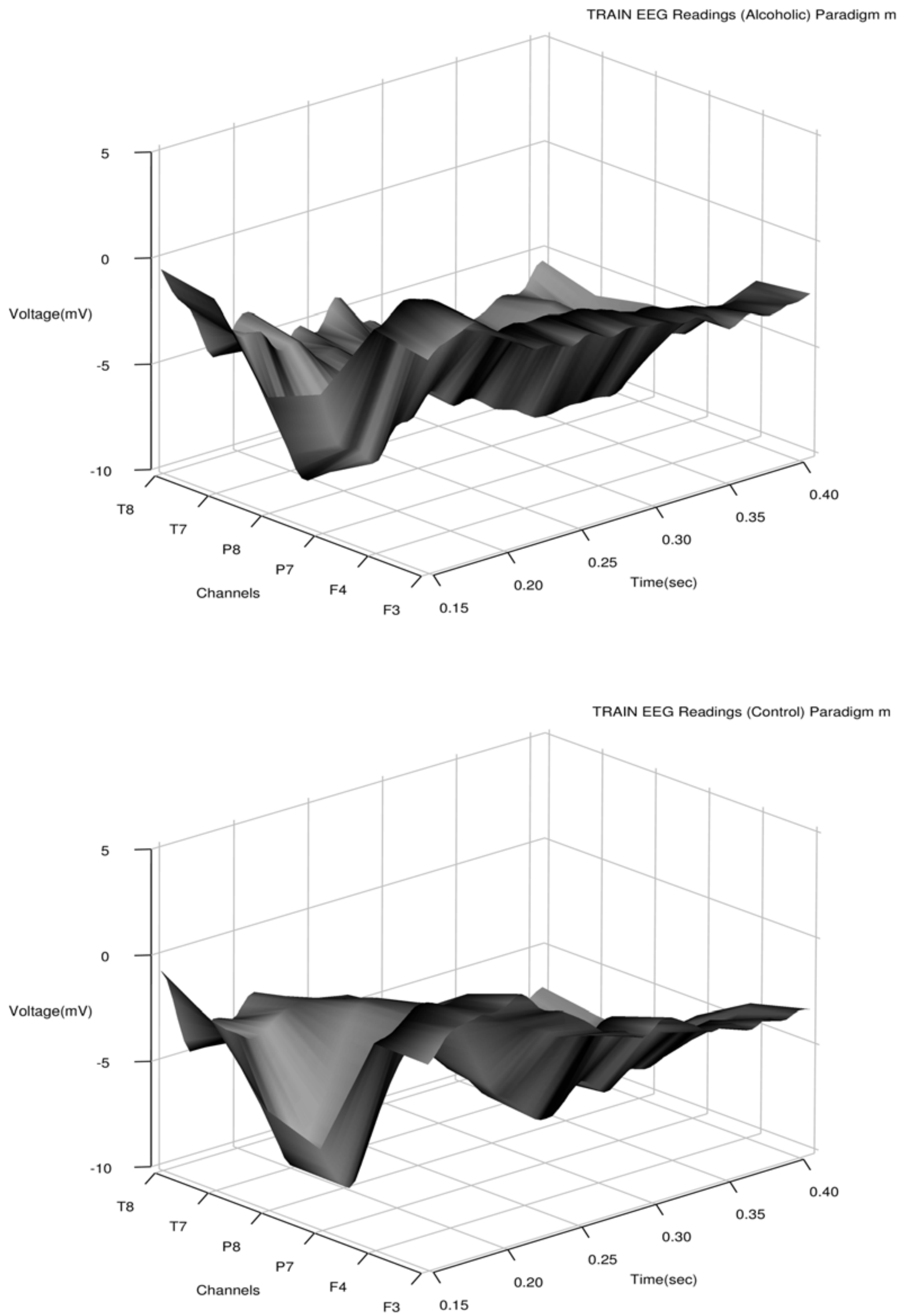
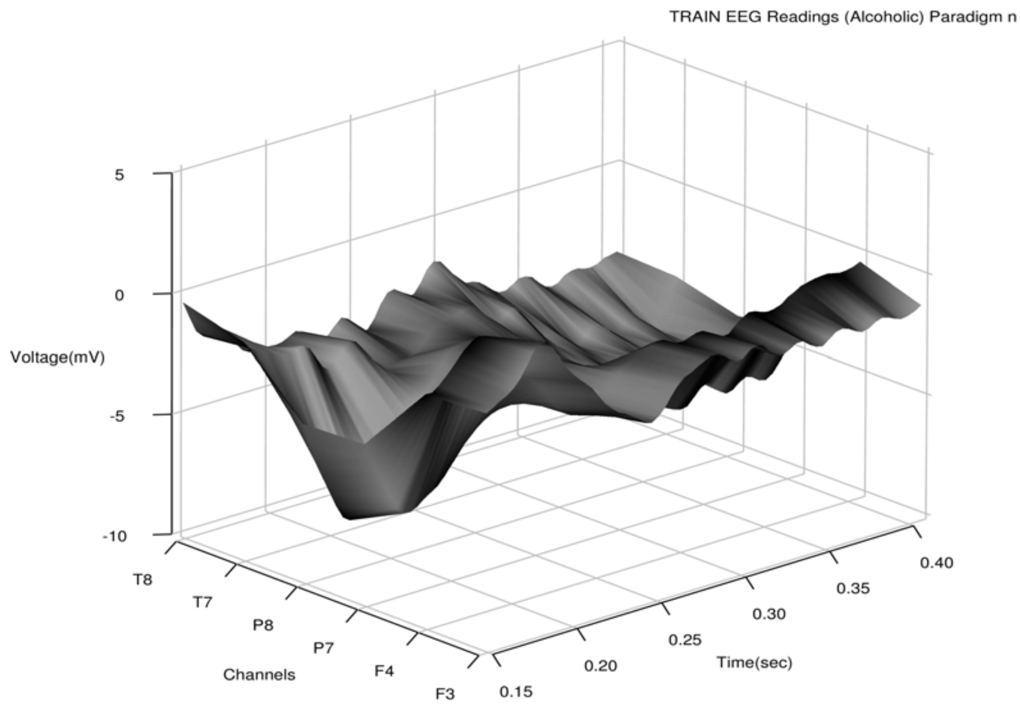


Fig. 2

Appendix G



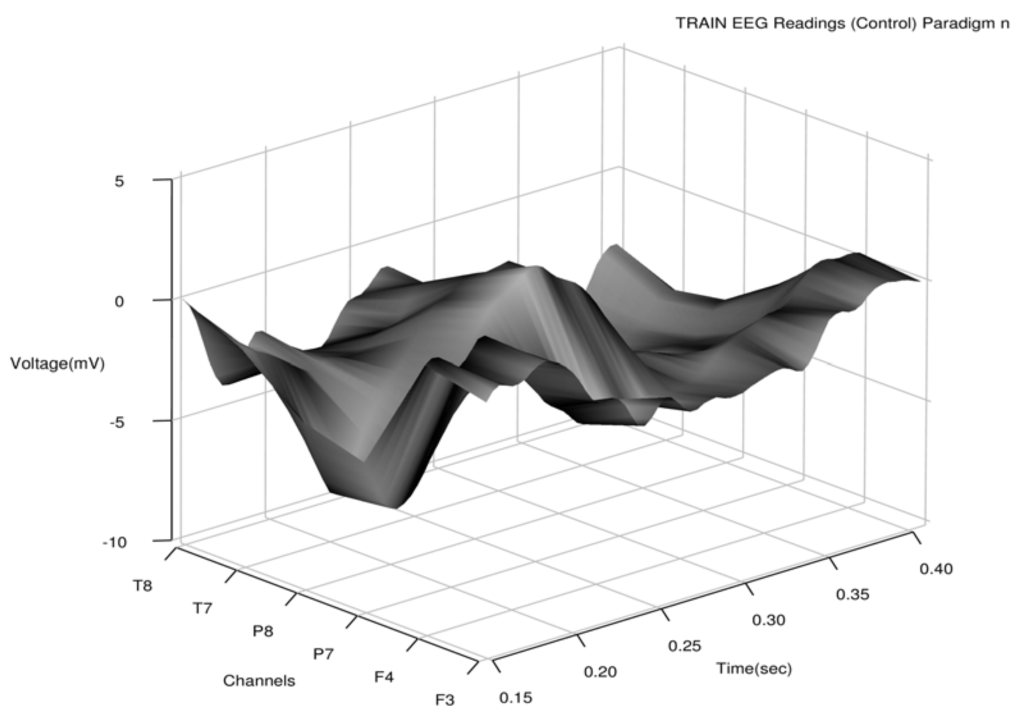
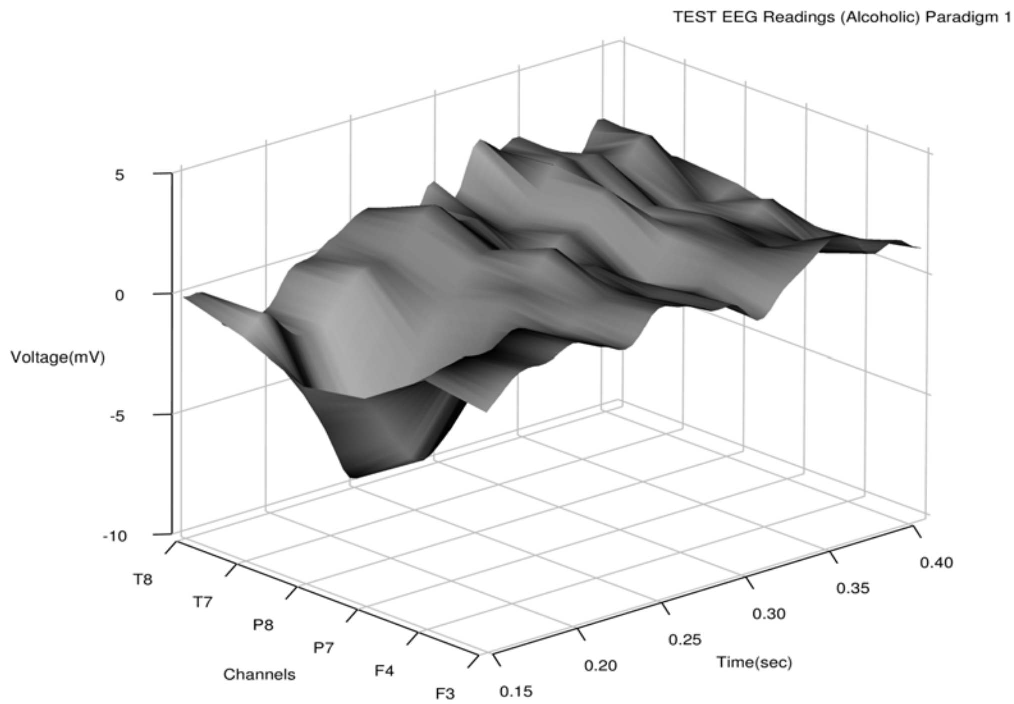


Fig. 3

Appendix G



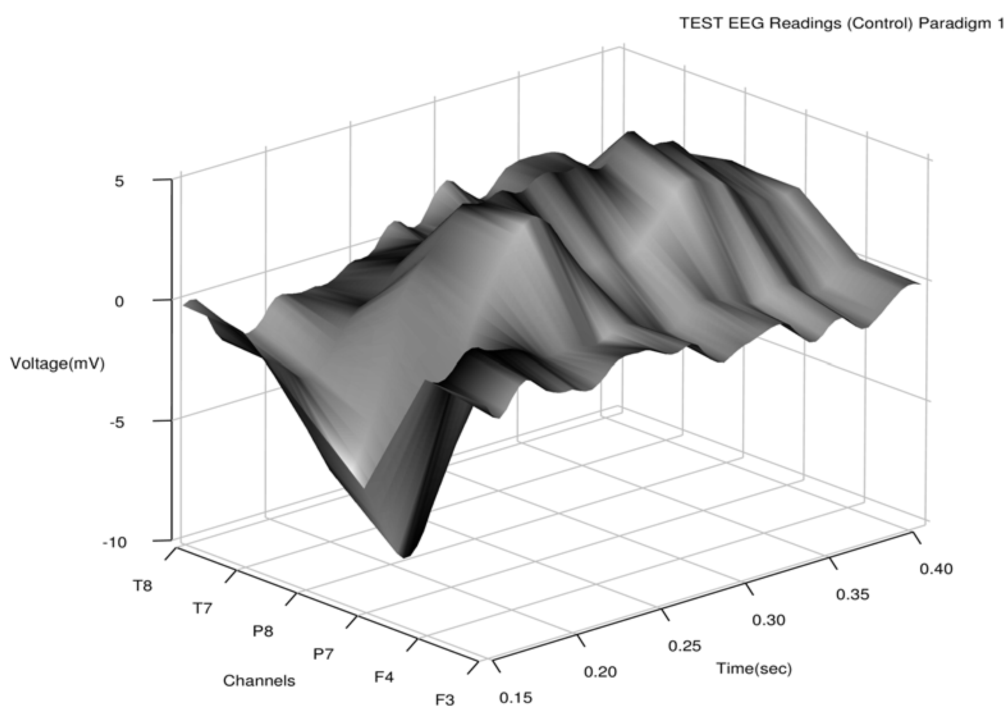
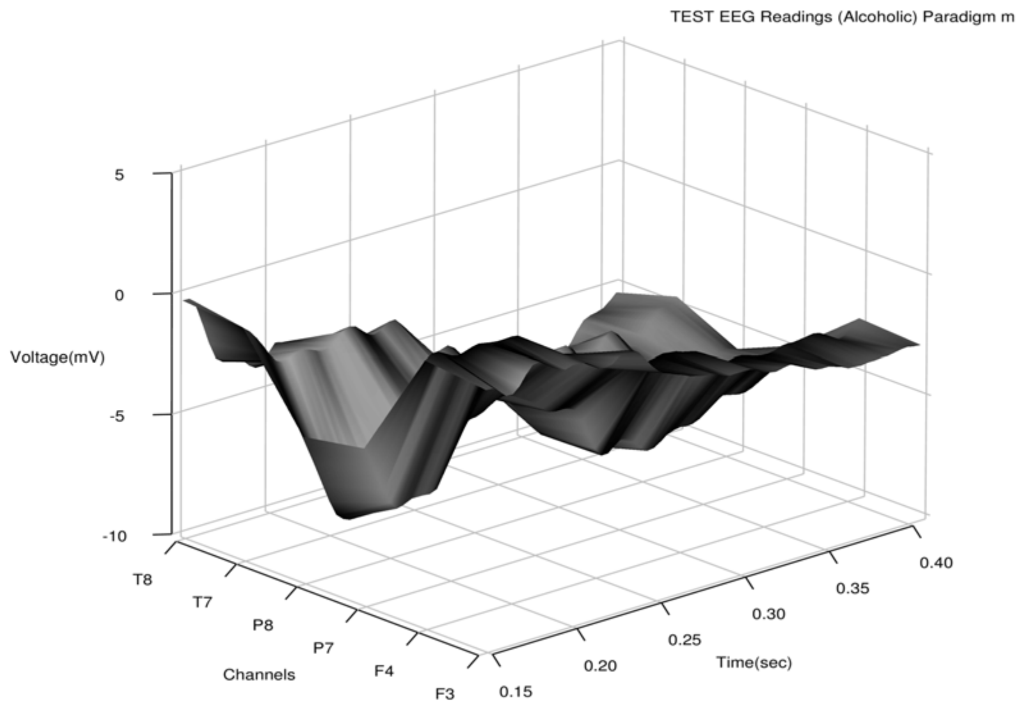


Fig. 4

Appendix G



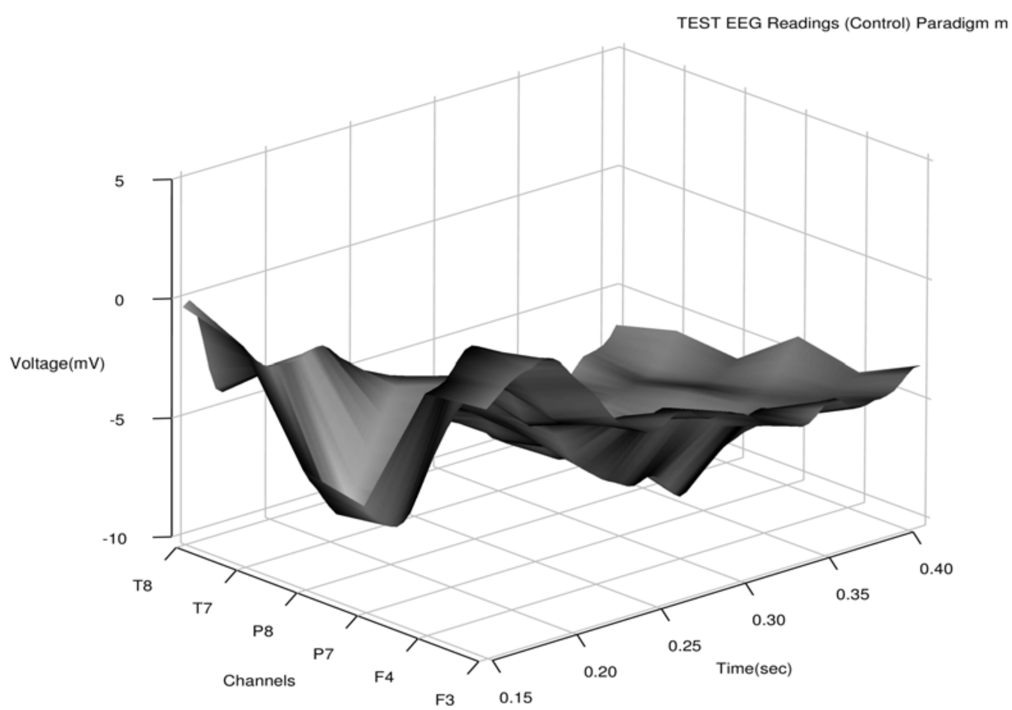


Fig. 5

Appendix G

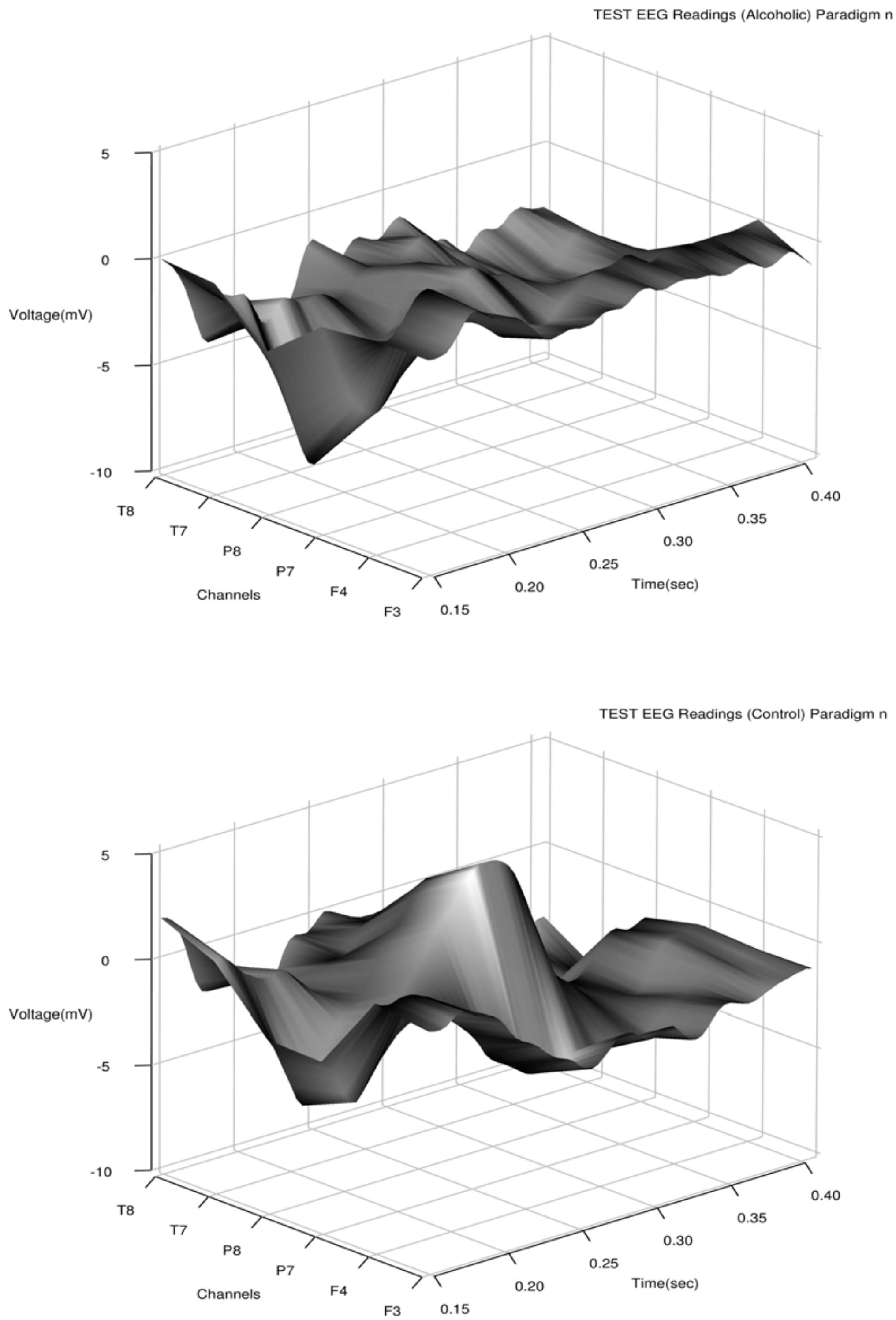
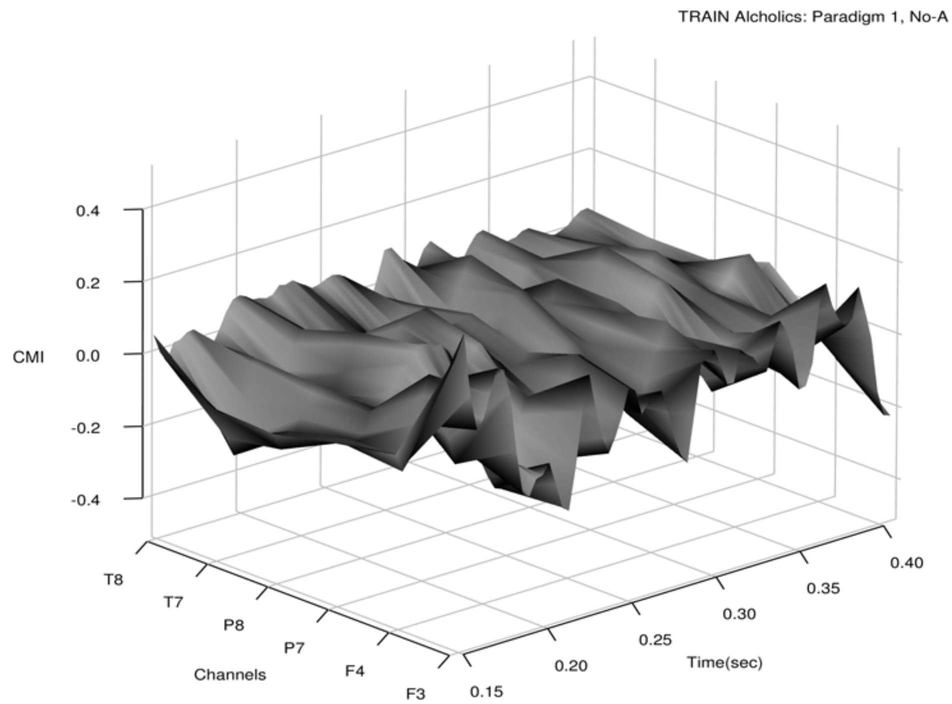


Fig. 6

Appendix G



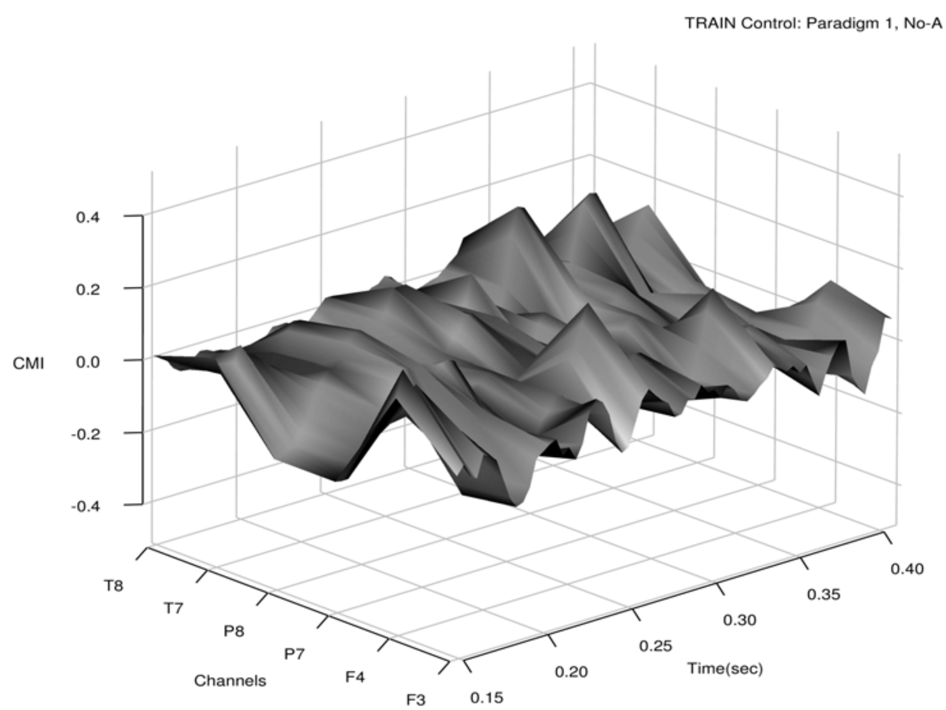


Fig. 7

Appendix G

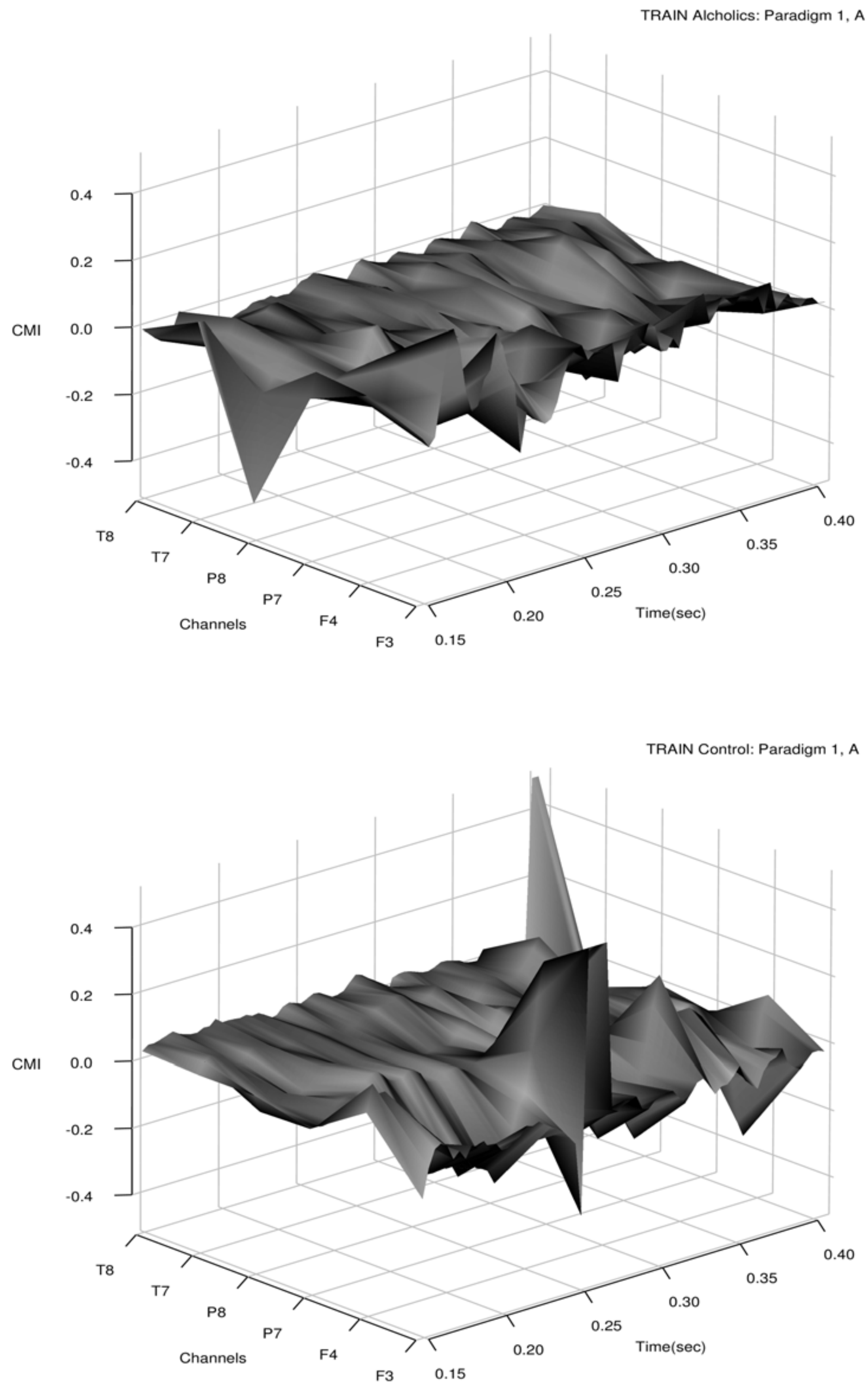
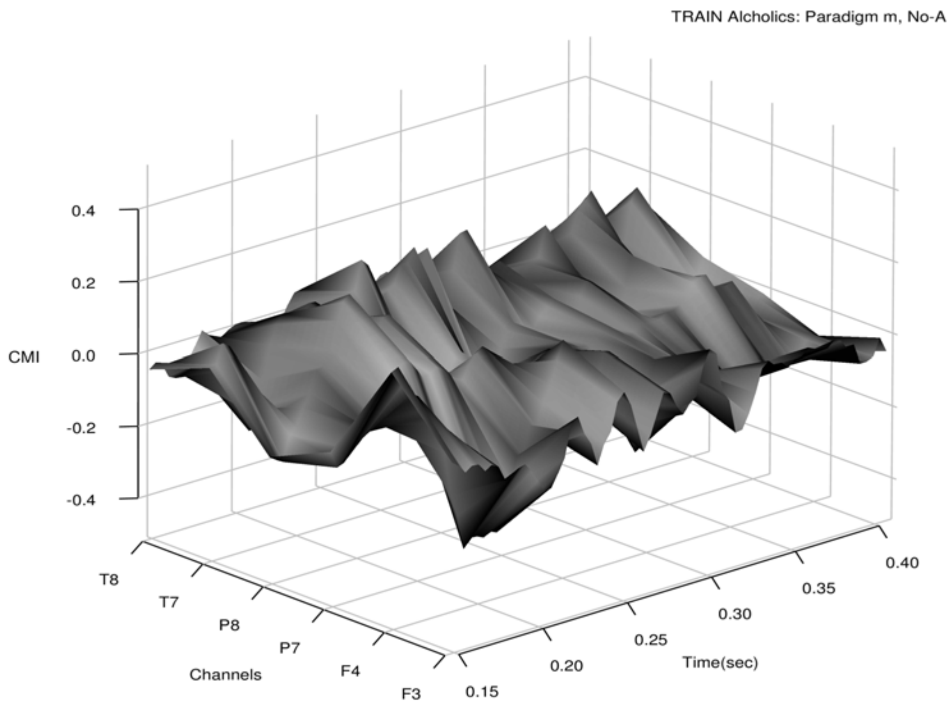


Fig. 8

Appendix G



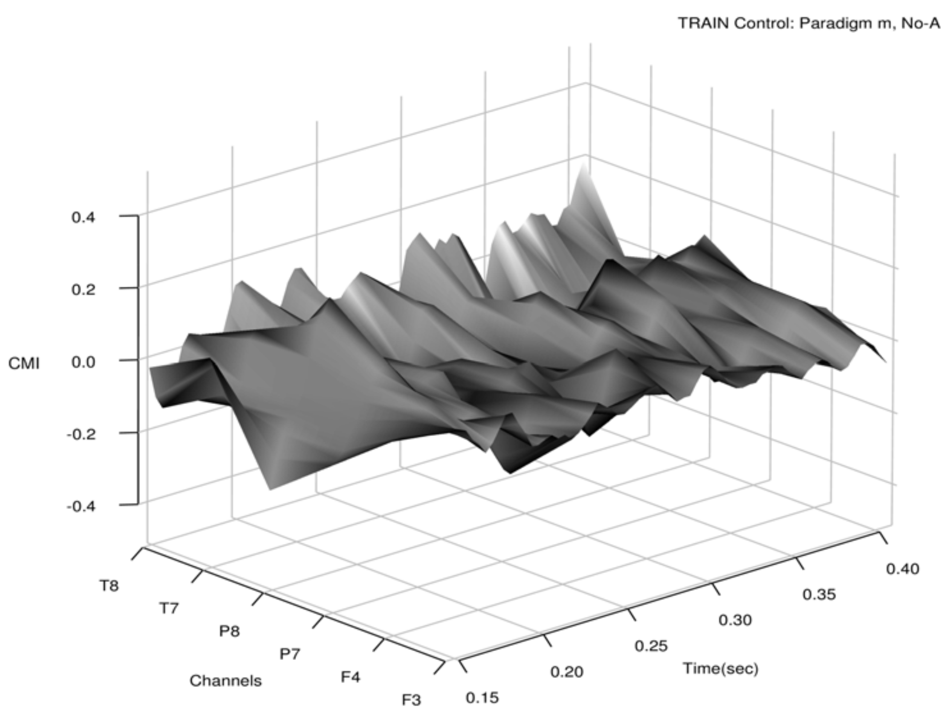


Fig. 9

Appendix G

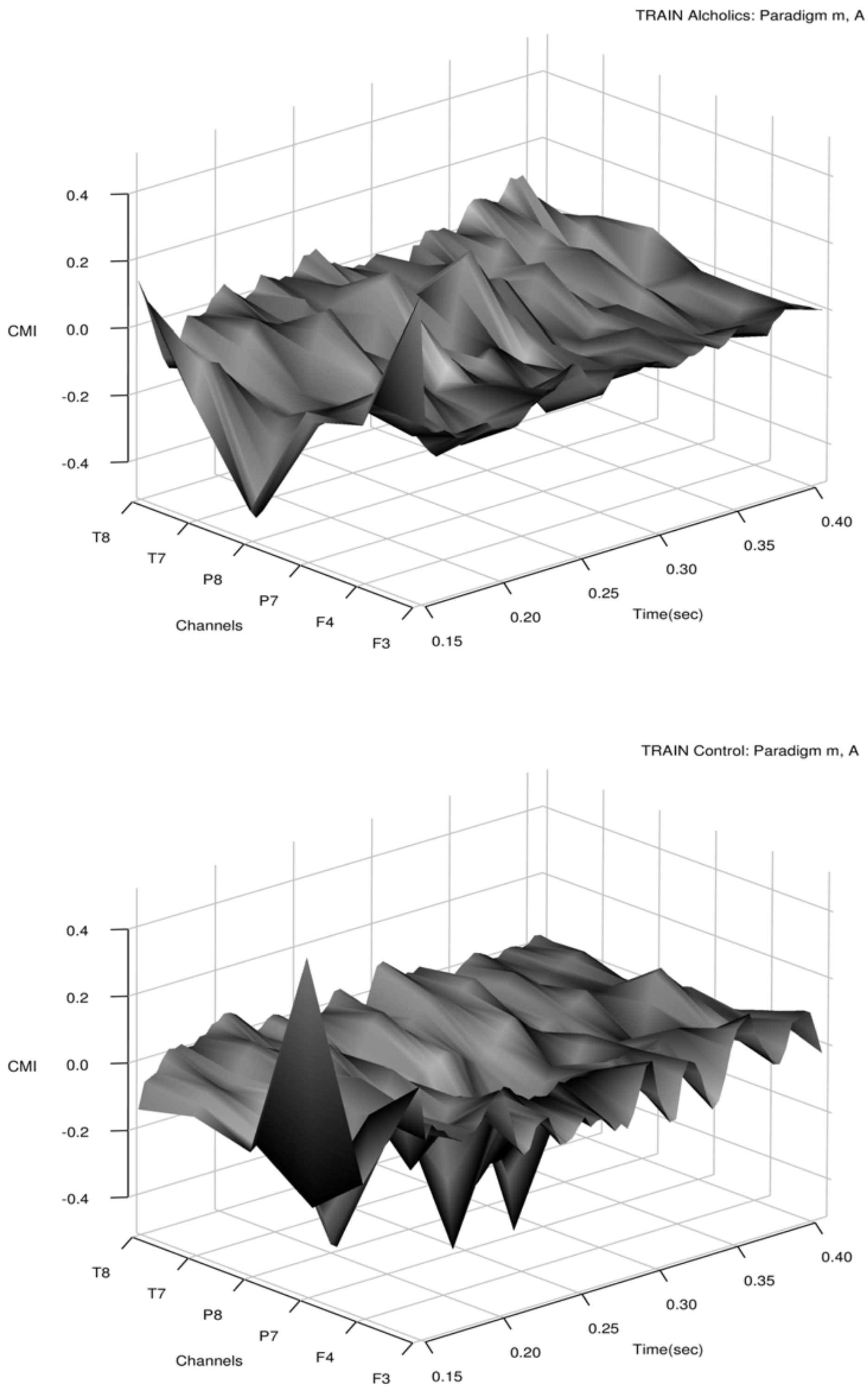
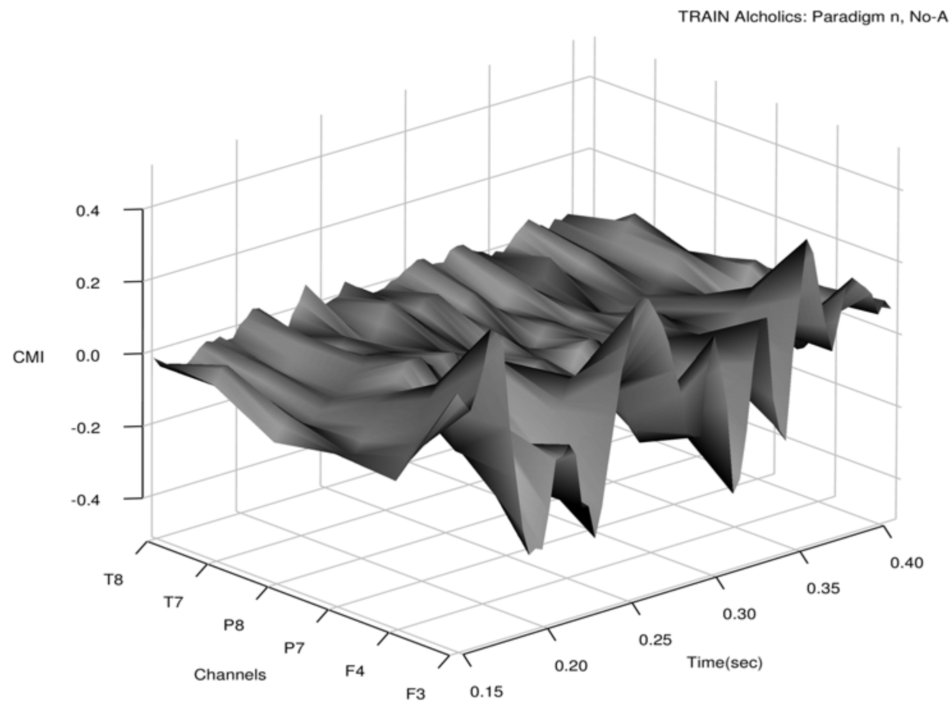


Fig. 10

Appendix G



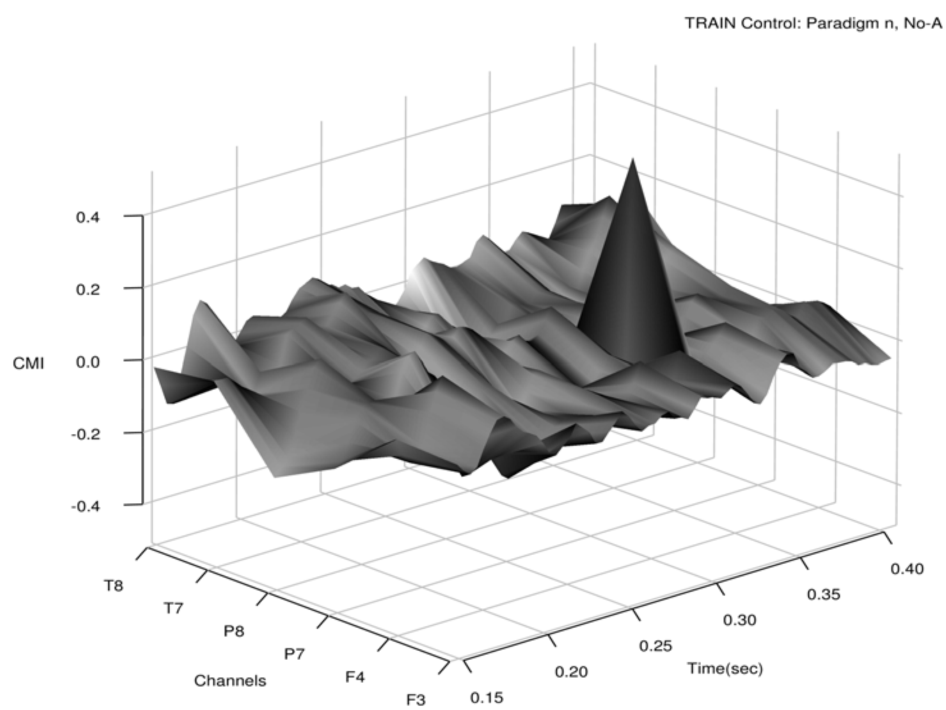


Fig. 11

Appendix G

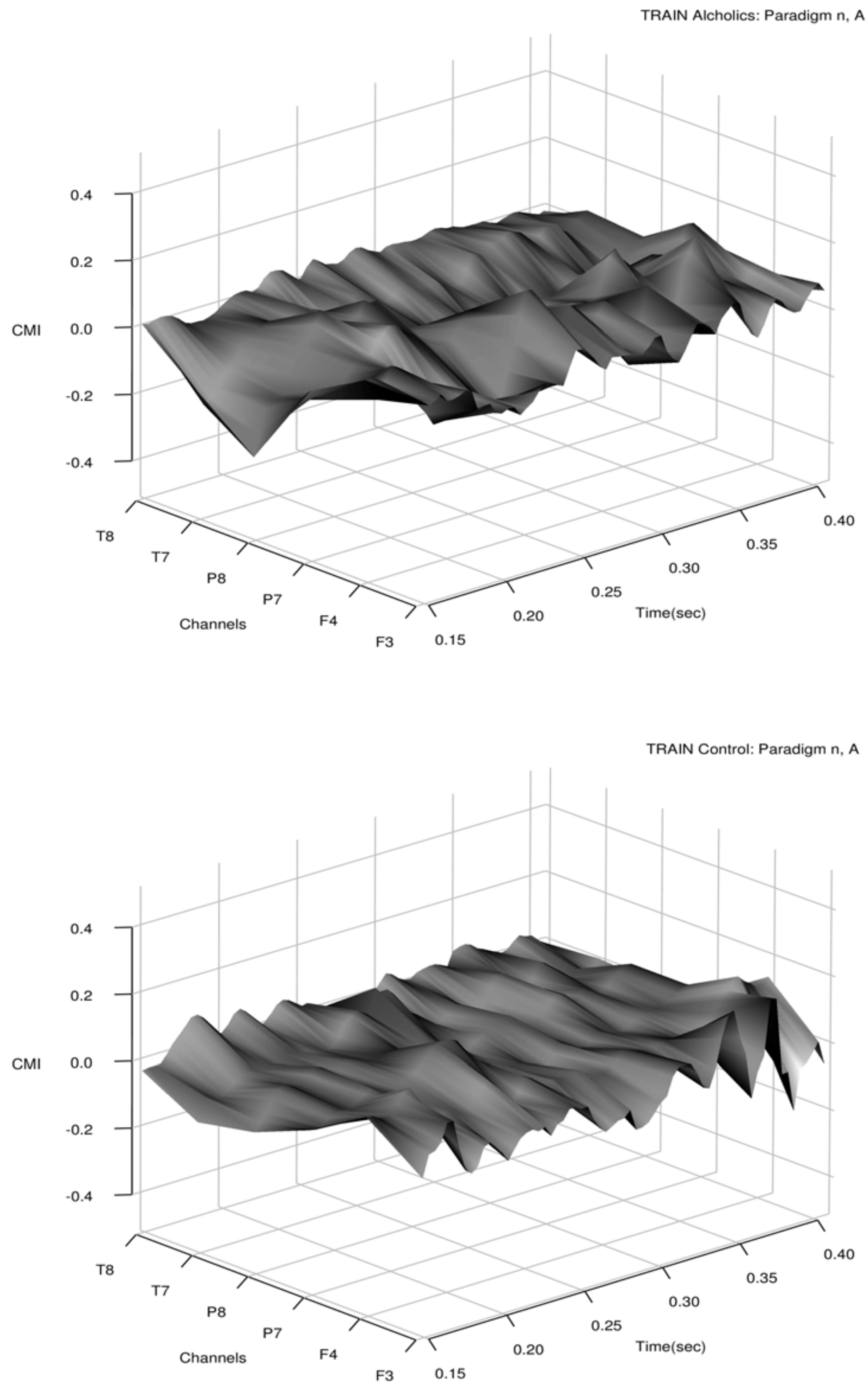
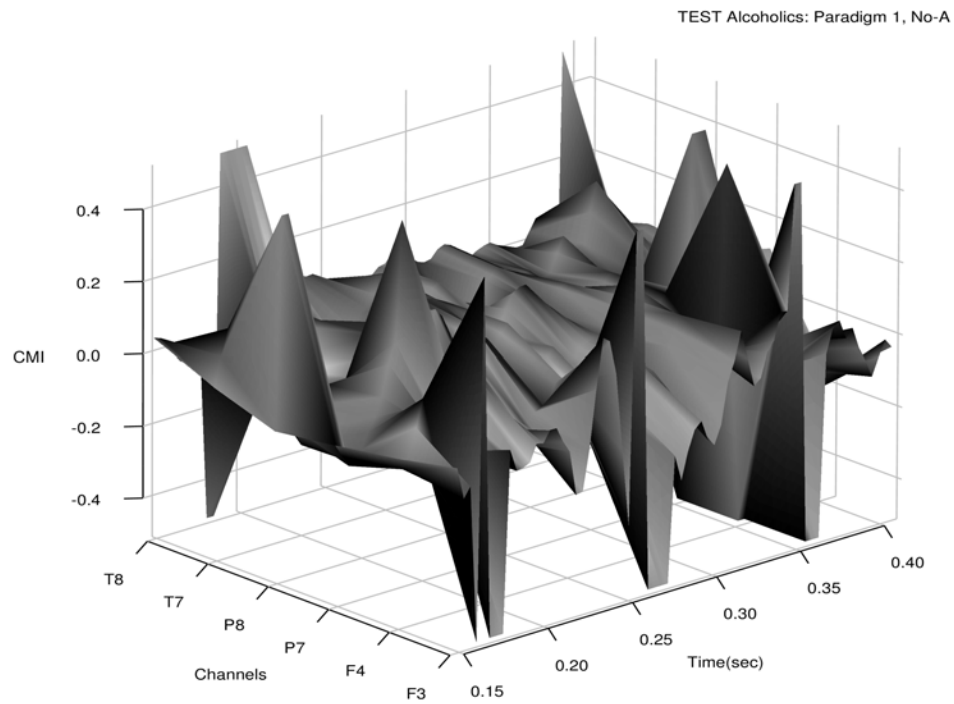


Fig. 12

Appendix G



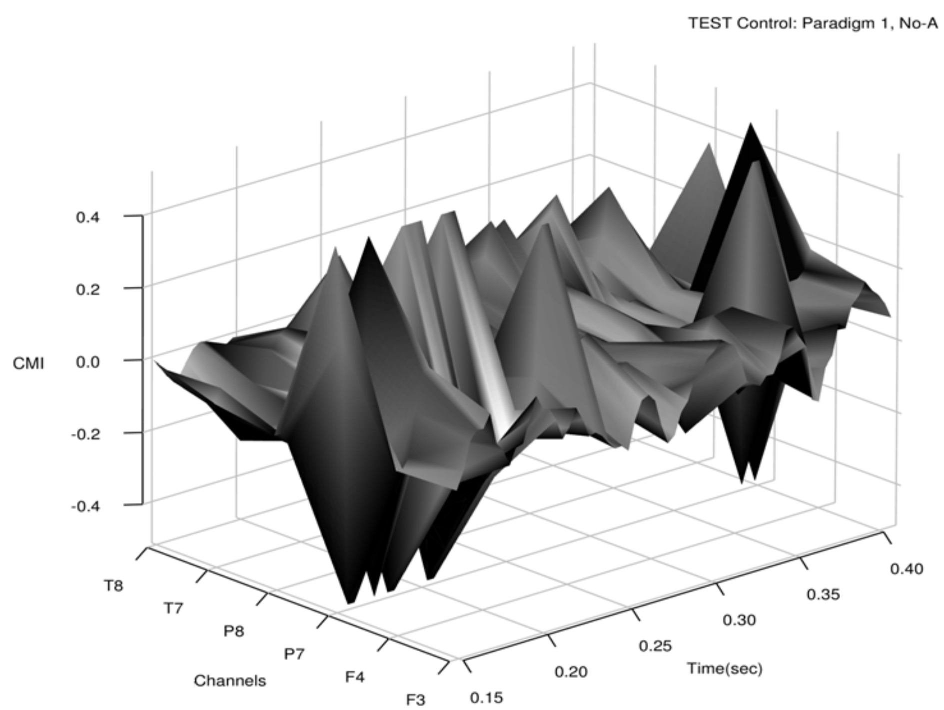
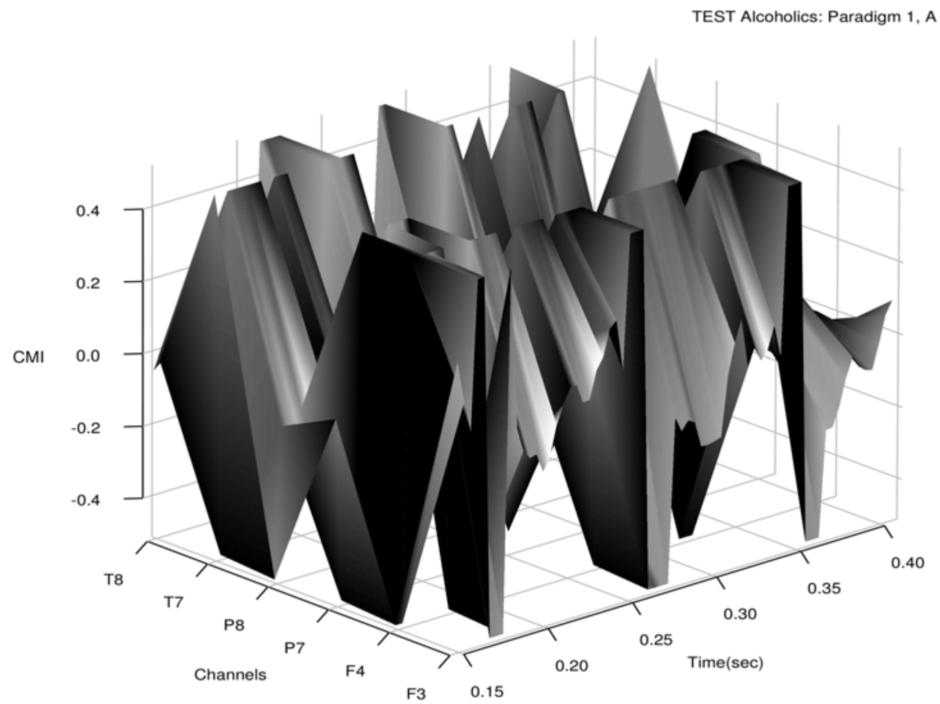


Fig. 13

Appendix G



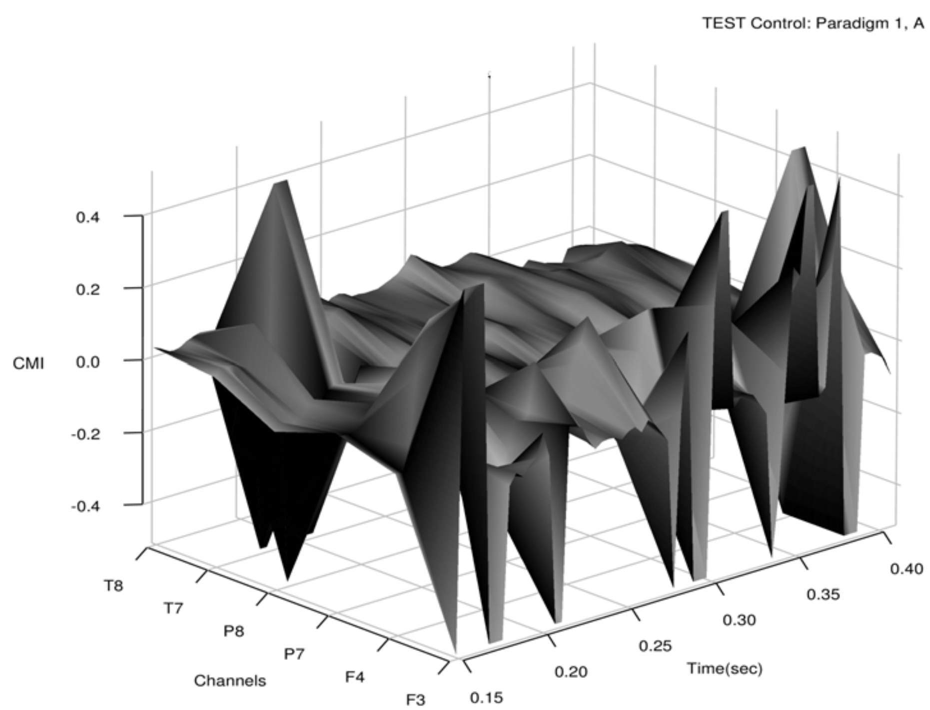


Fig. 14

Appendix G

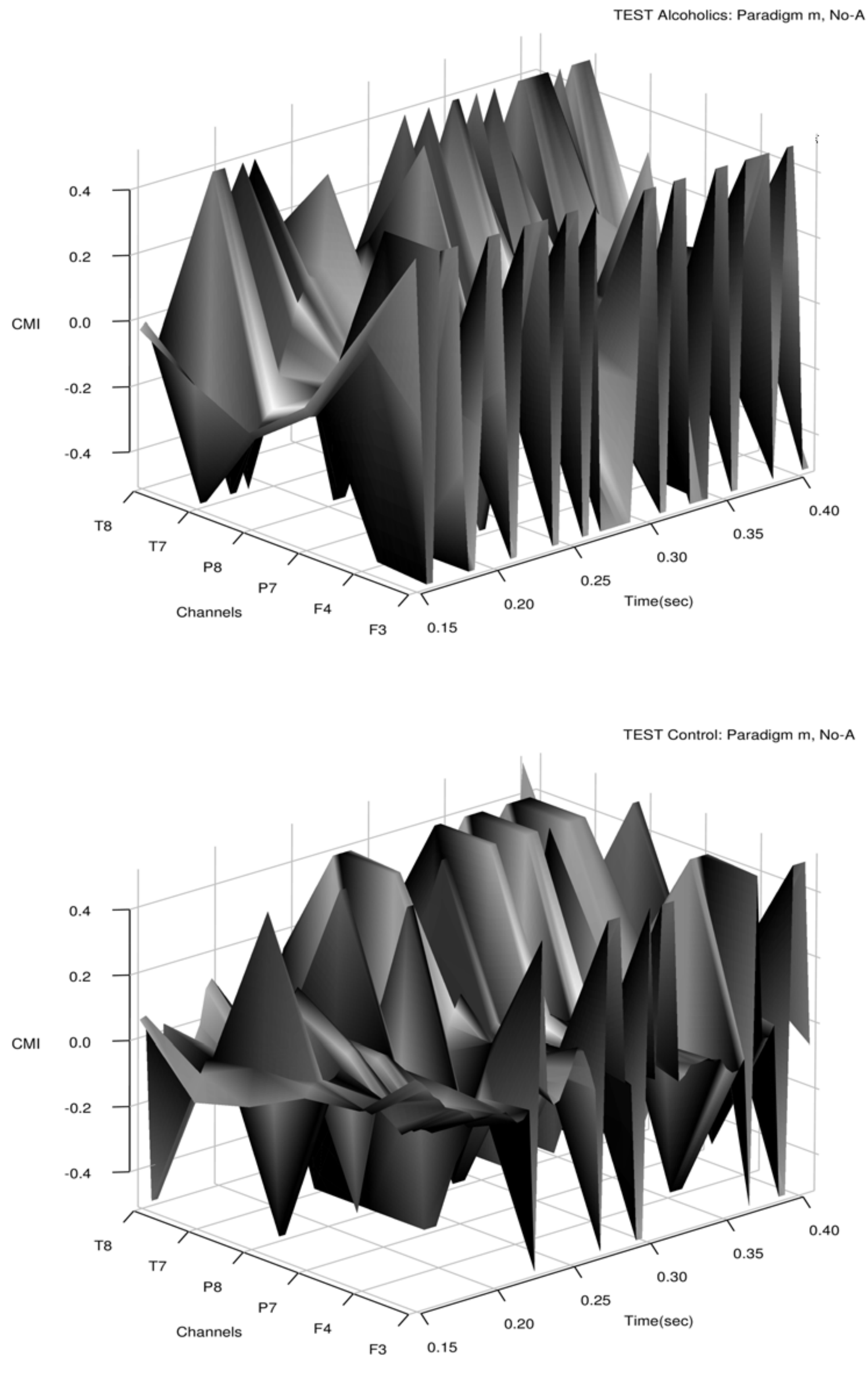
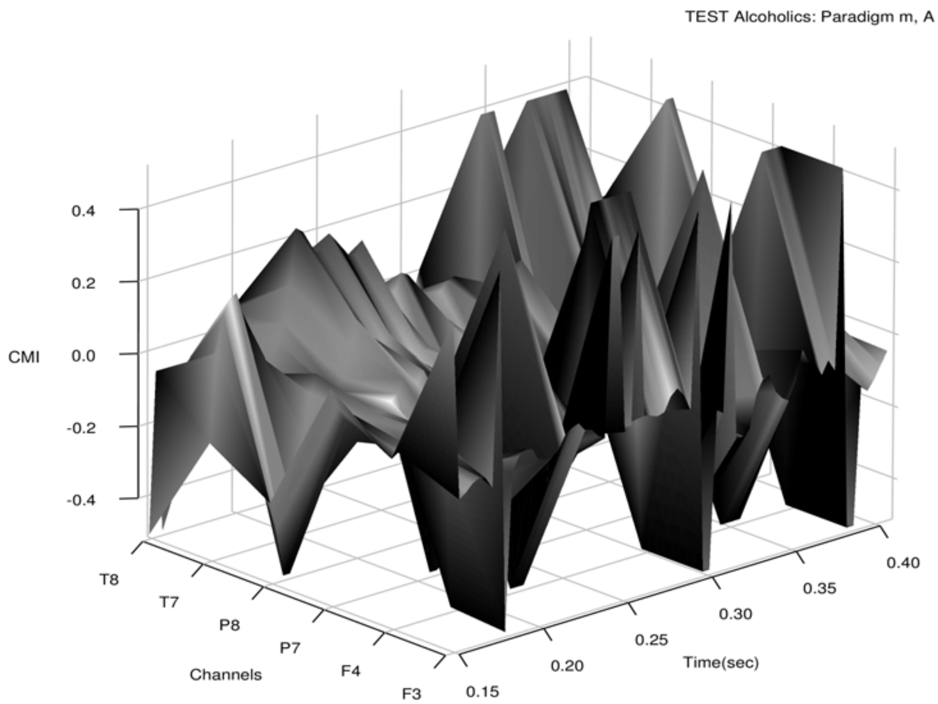


Fig. 15

Appendix G



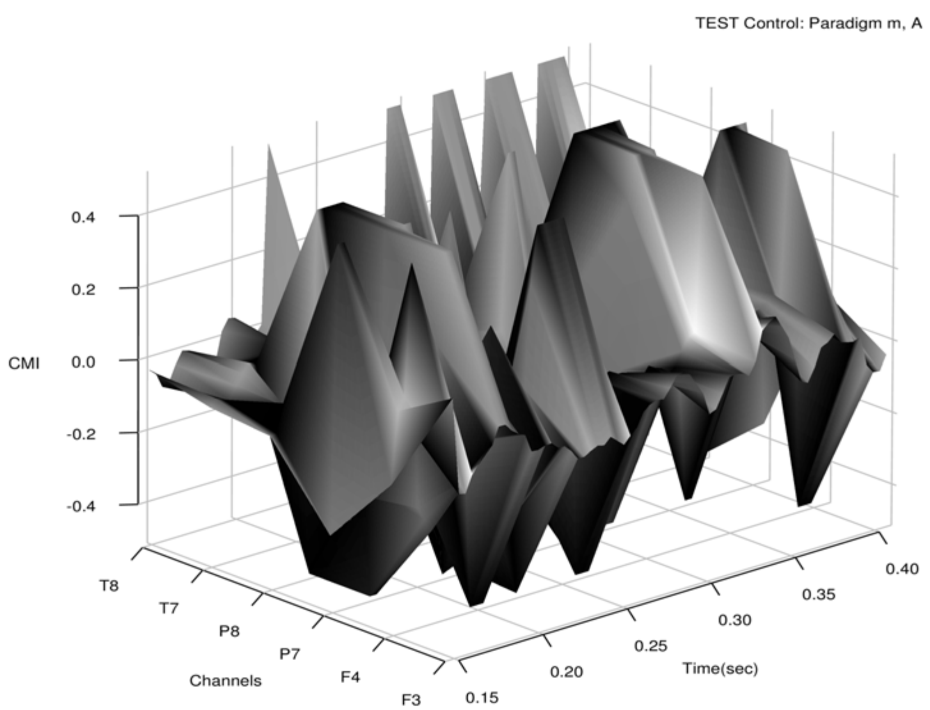
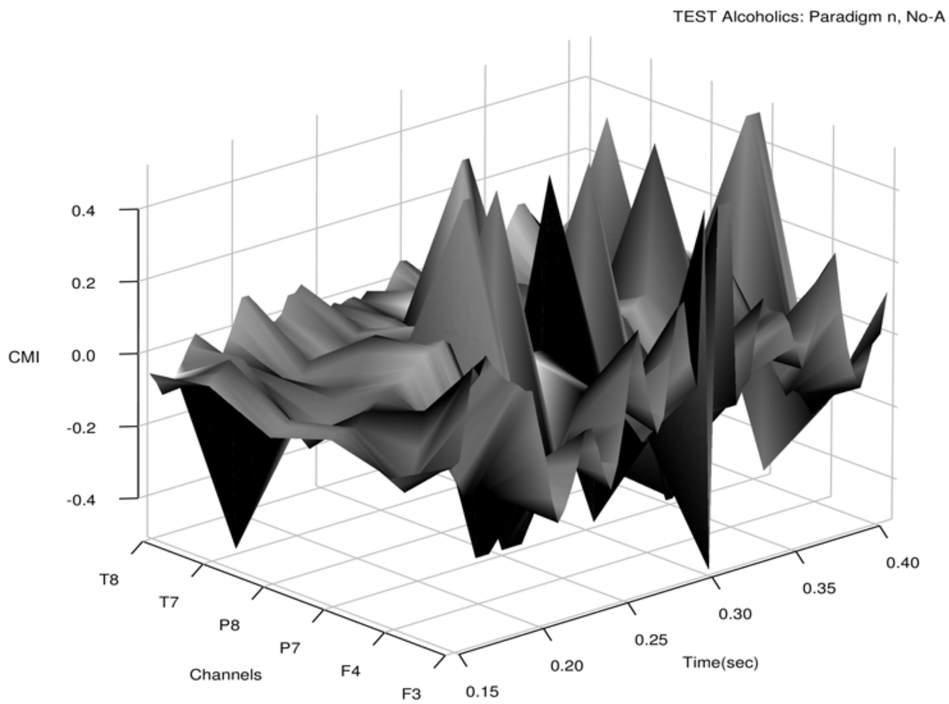


Fig. 16

Appendix G



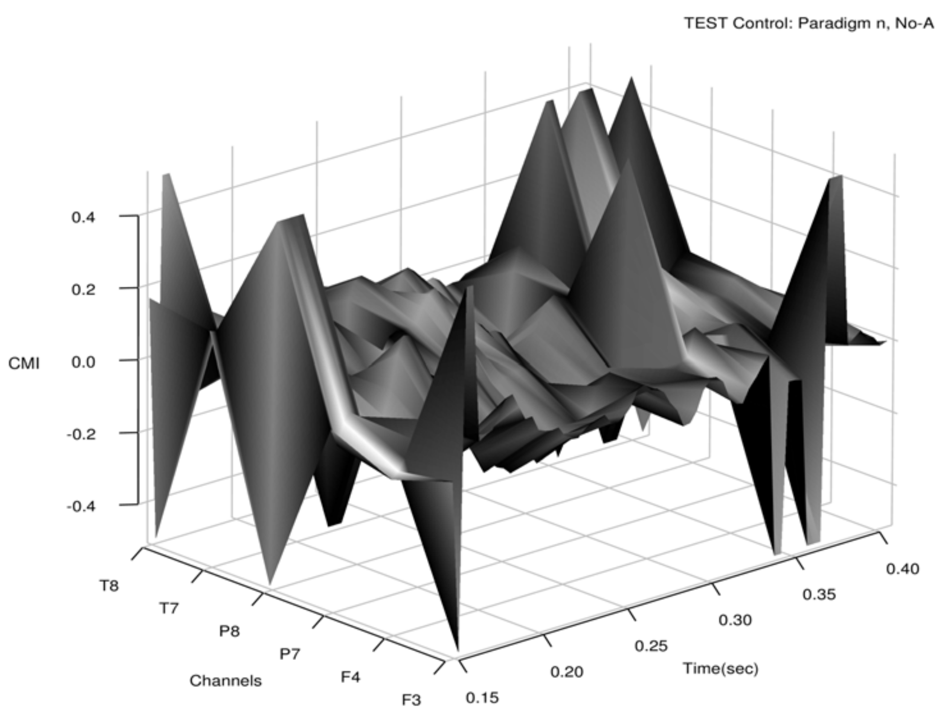
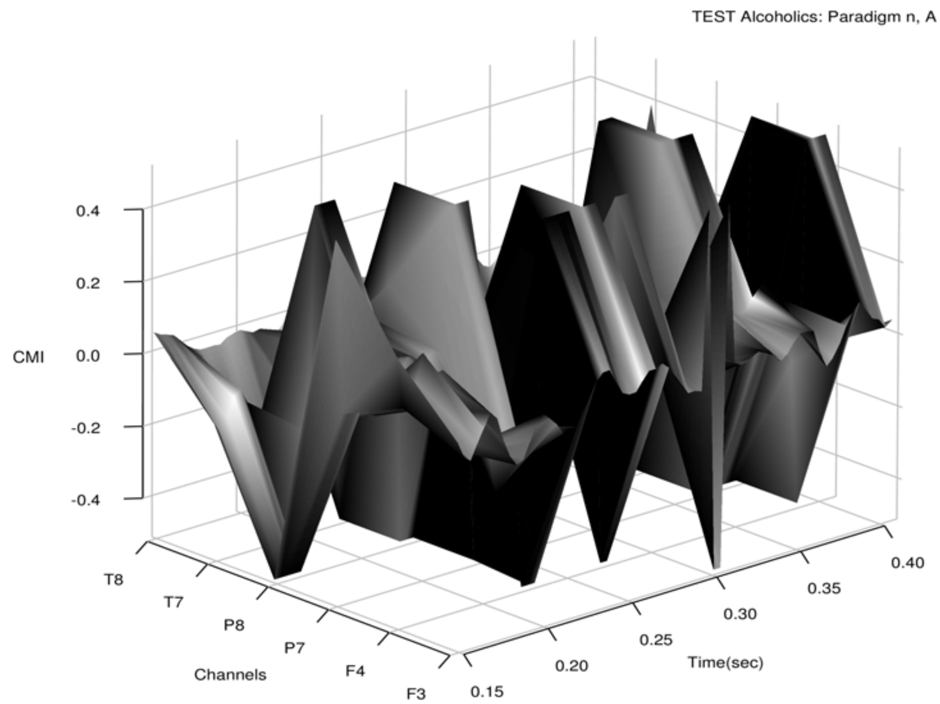


Fig. 17

Appendix G



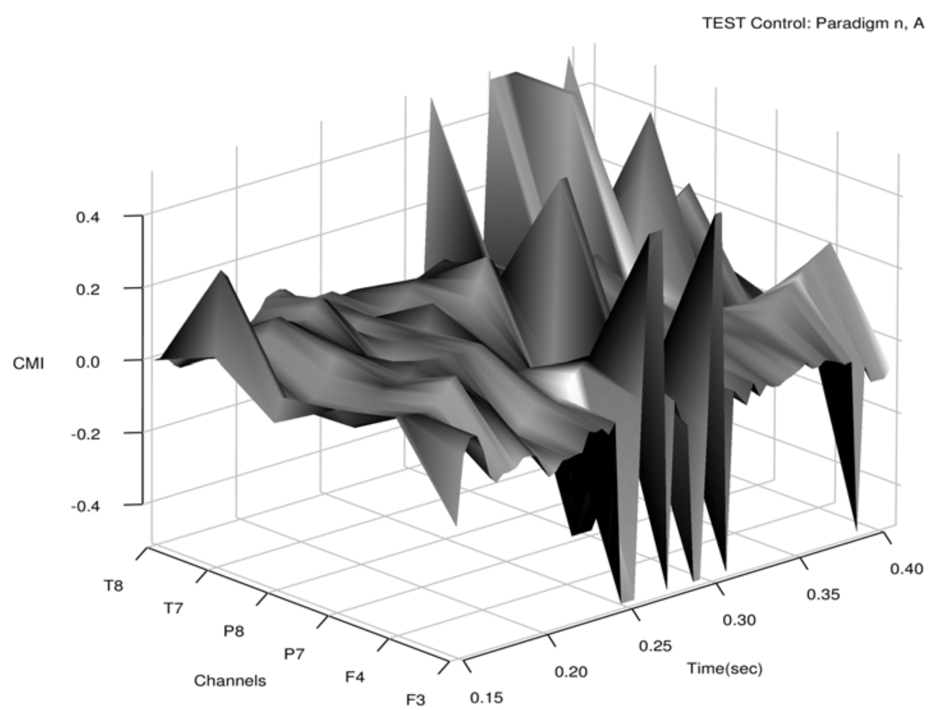
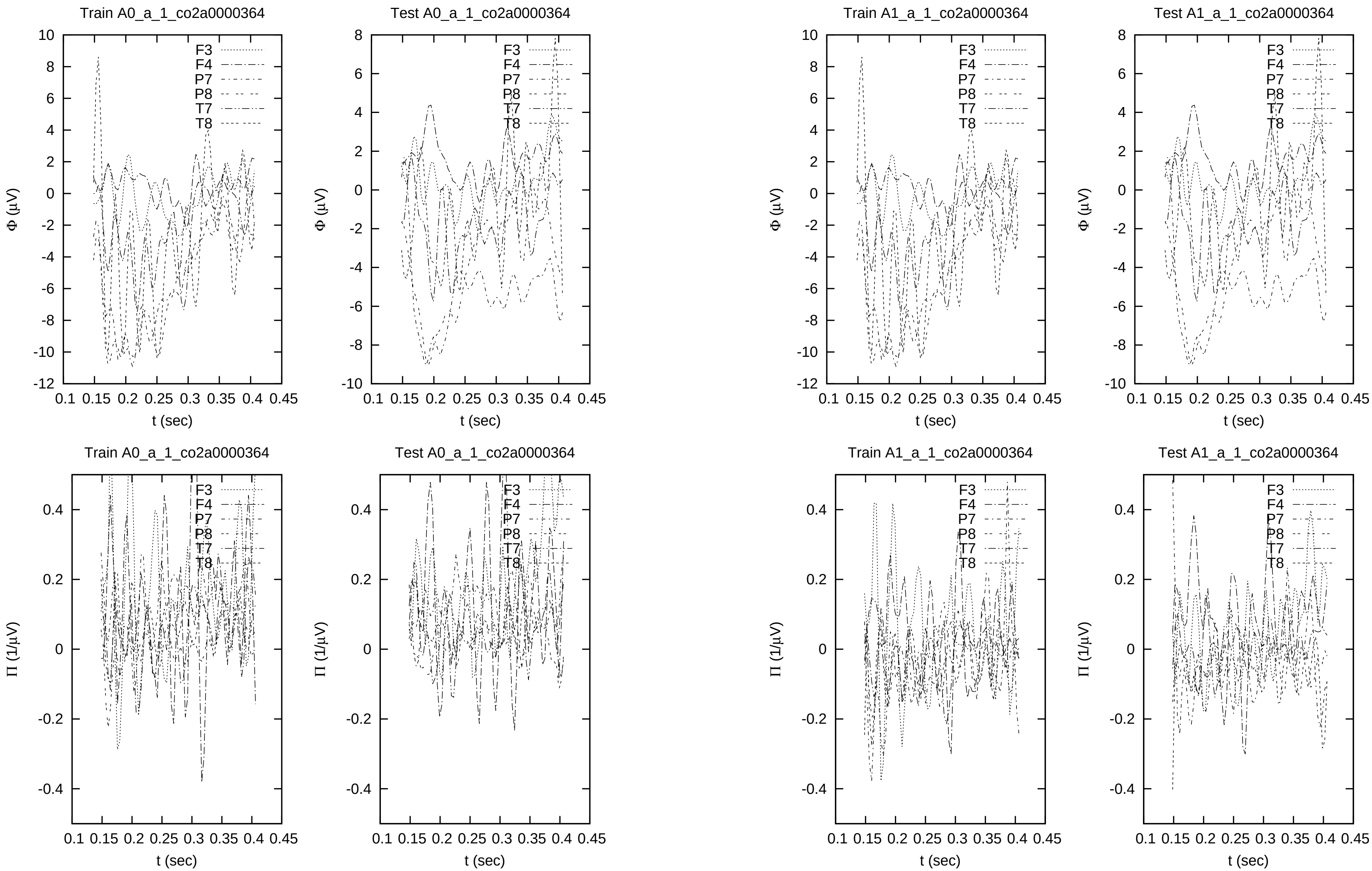


Fig. 18



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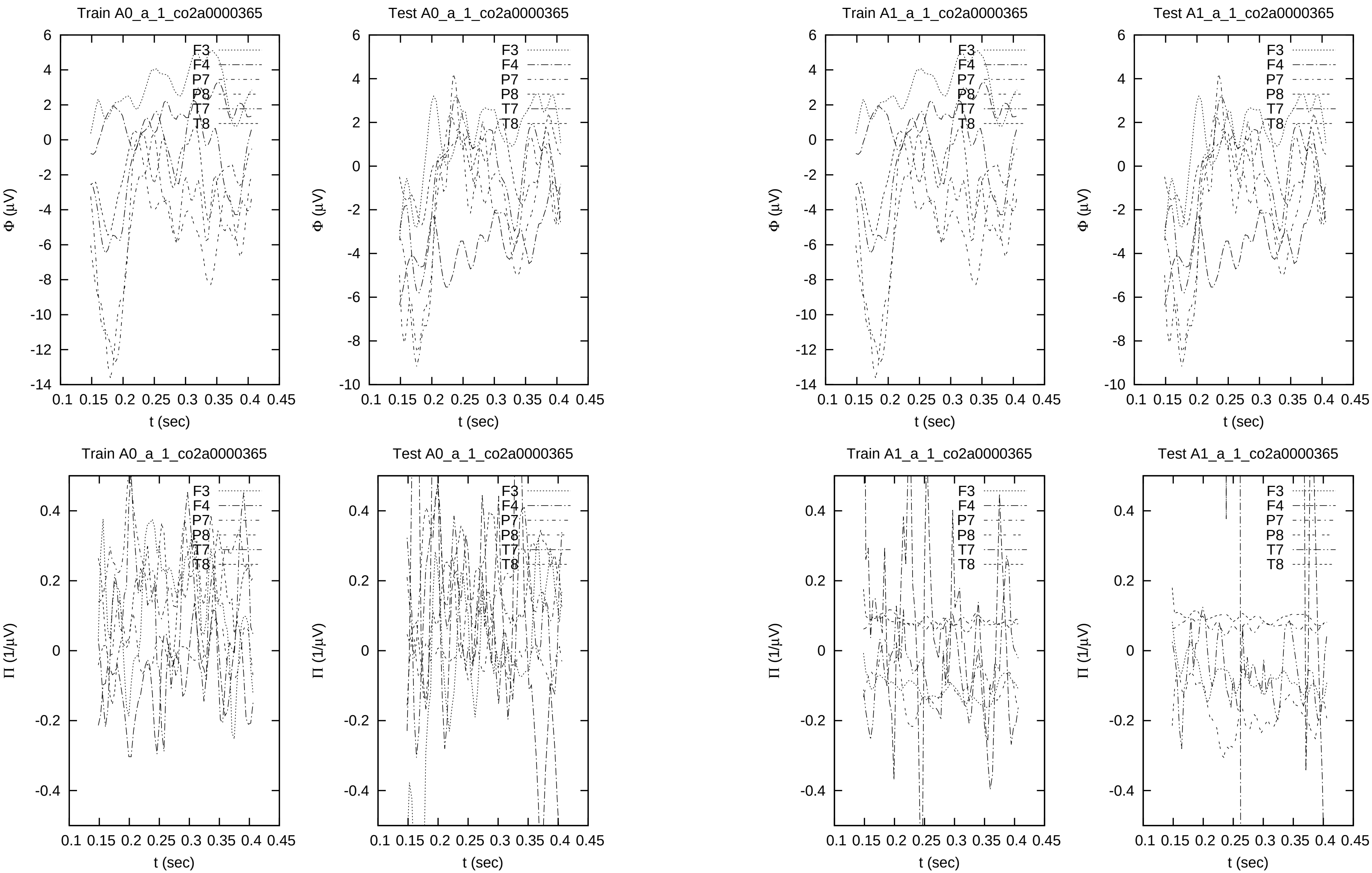
Test A0_a_1_co2a0000364
Train A1_a_1_co2a0000364
Test A1_a_1_co2a0000364
F3
F4
P7
P8
T7
T8
Φ (μV)
Π (1/μV)
t (sec)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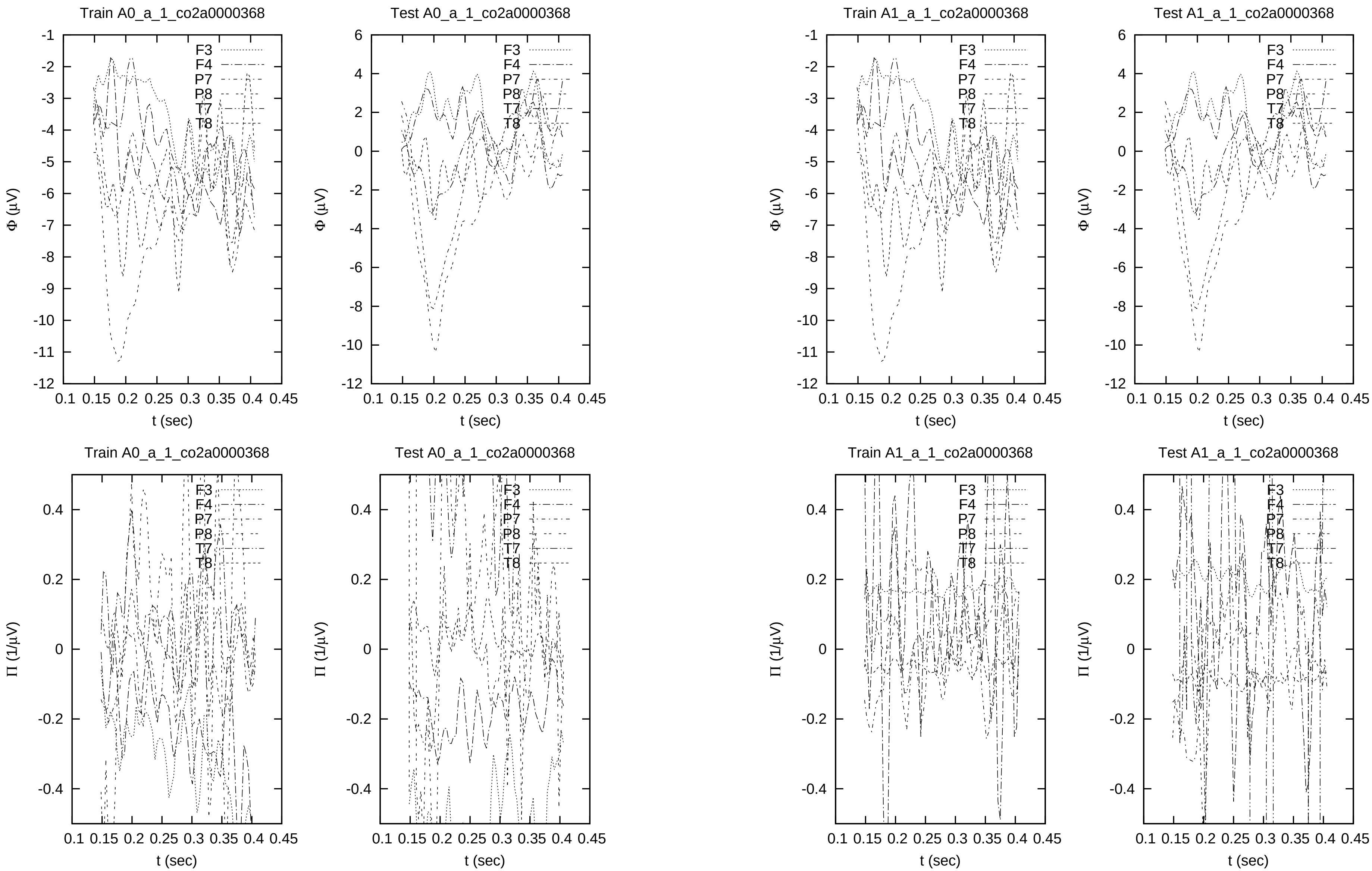
Test A0_a_1_co2a0000365
Train A1_a_1_co2a0000365
Test A1_a_1_co2a0000365
Φ (µV)
Π (1/µV)
t (sec)
F3
F4
P7
P8
T7
T8



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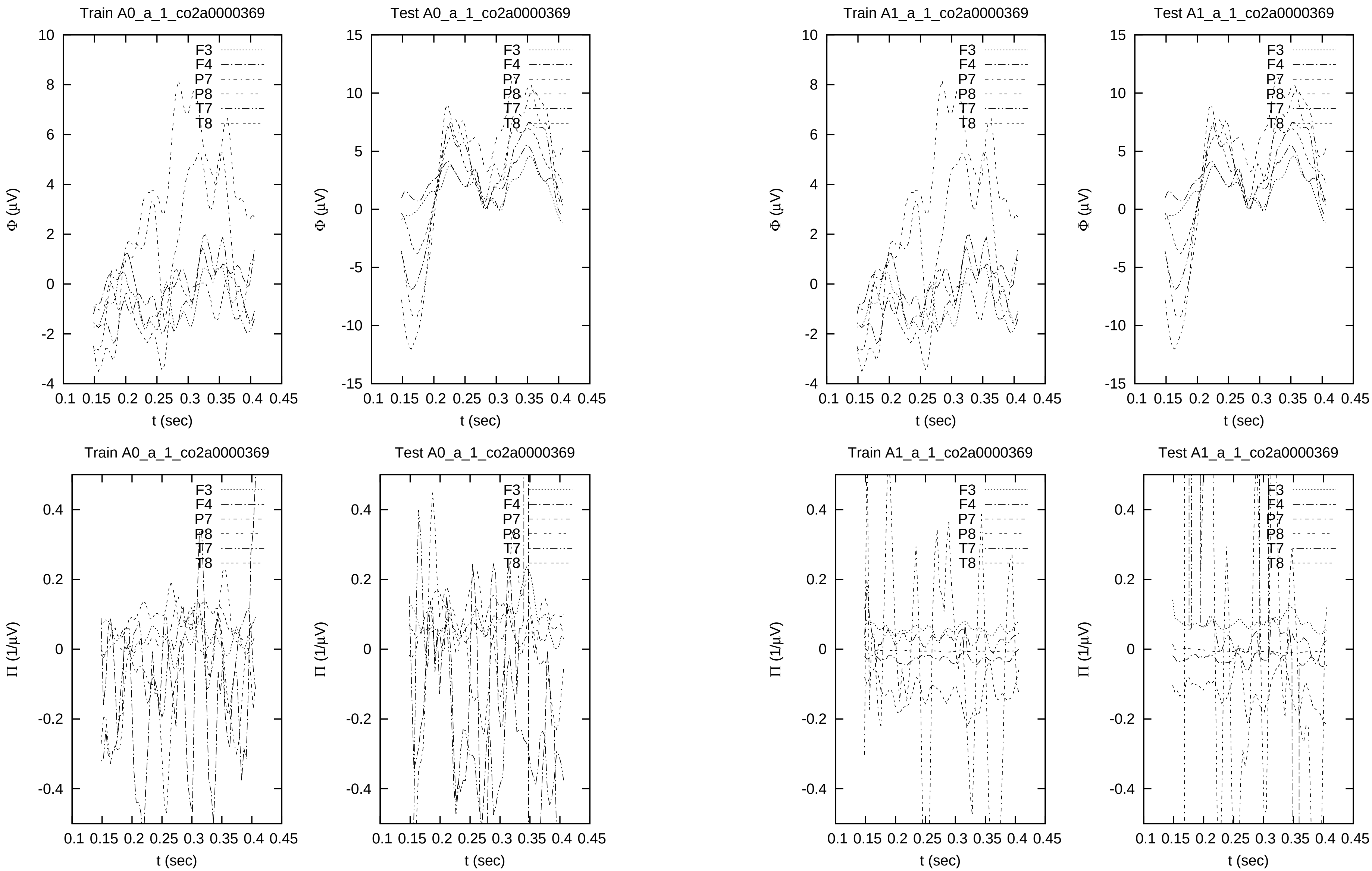
Test A0_a_1_co2a0000368
Train A1_a_1_co2a0000368
Test A1_a_1_co2a0000368
Φ (µV)
t (sec)
Π (1/µV)
F3
F4
P7
P8
T7
T8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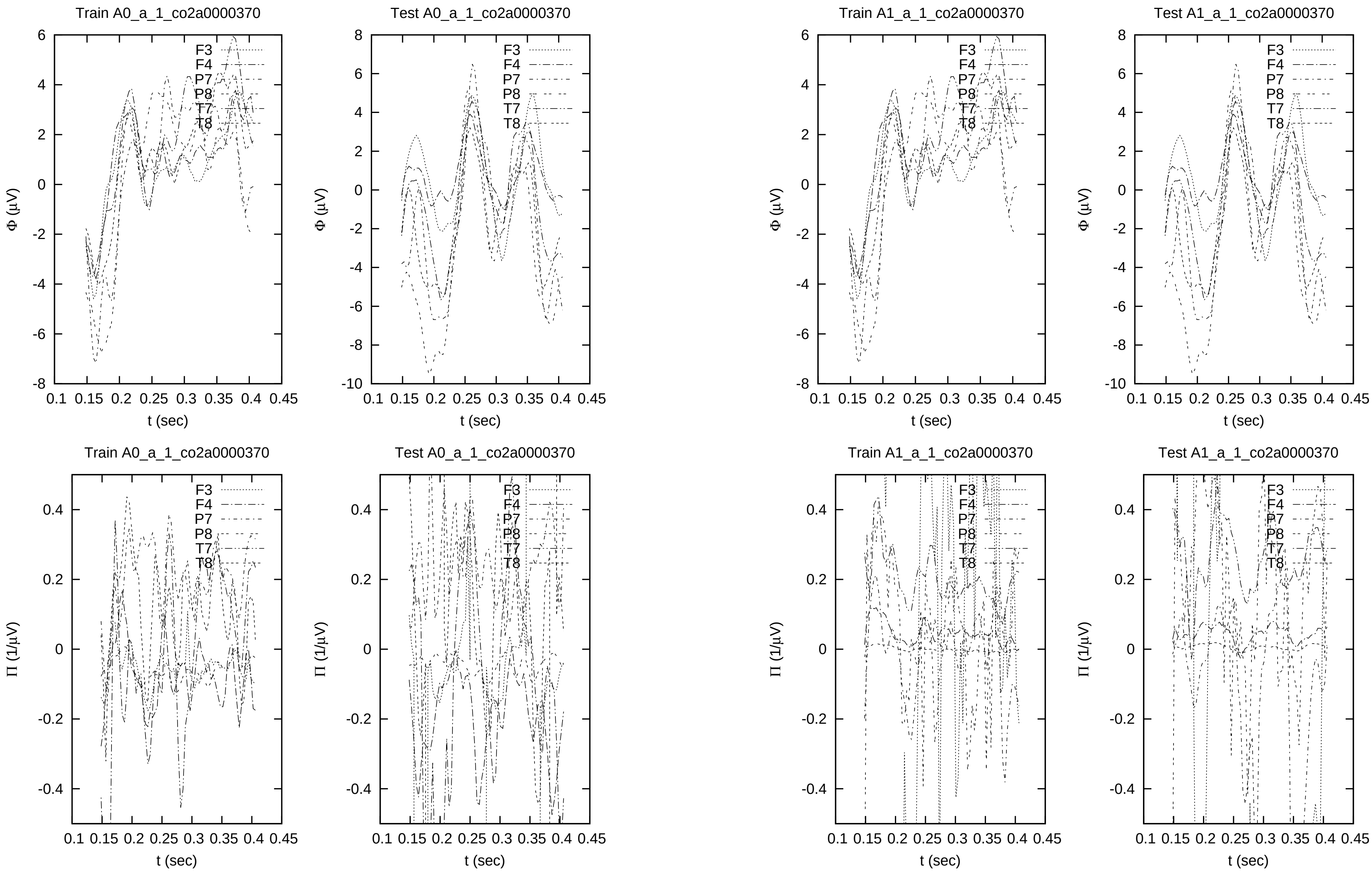
Train A1_a_1_co2a0000369
Test A1_a_1_co2a0000369
F3
F4
P7
P8
T7
T8
Φ (μV)
Π (1/μV)
t (sec)
10
8
6
4
2
0
-2
-4
15
5
-5
-10
-15
0.4
0.2
-0.2
-0.4
0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45



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Train A1_a_1_co2a0000370
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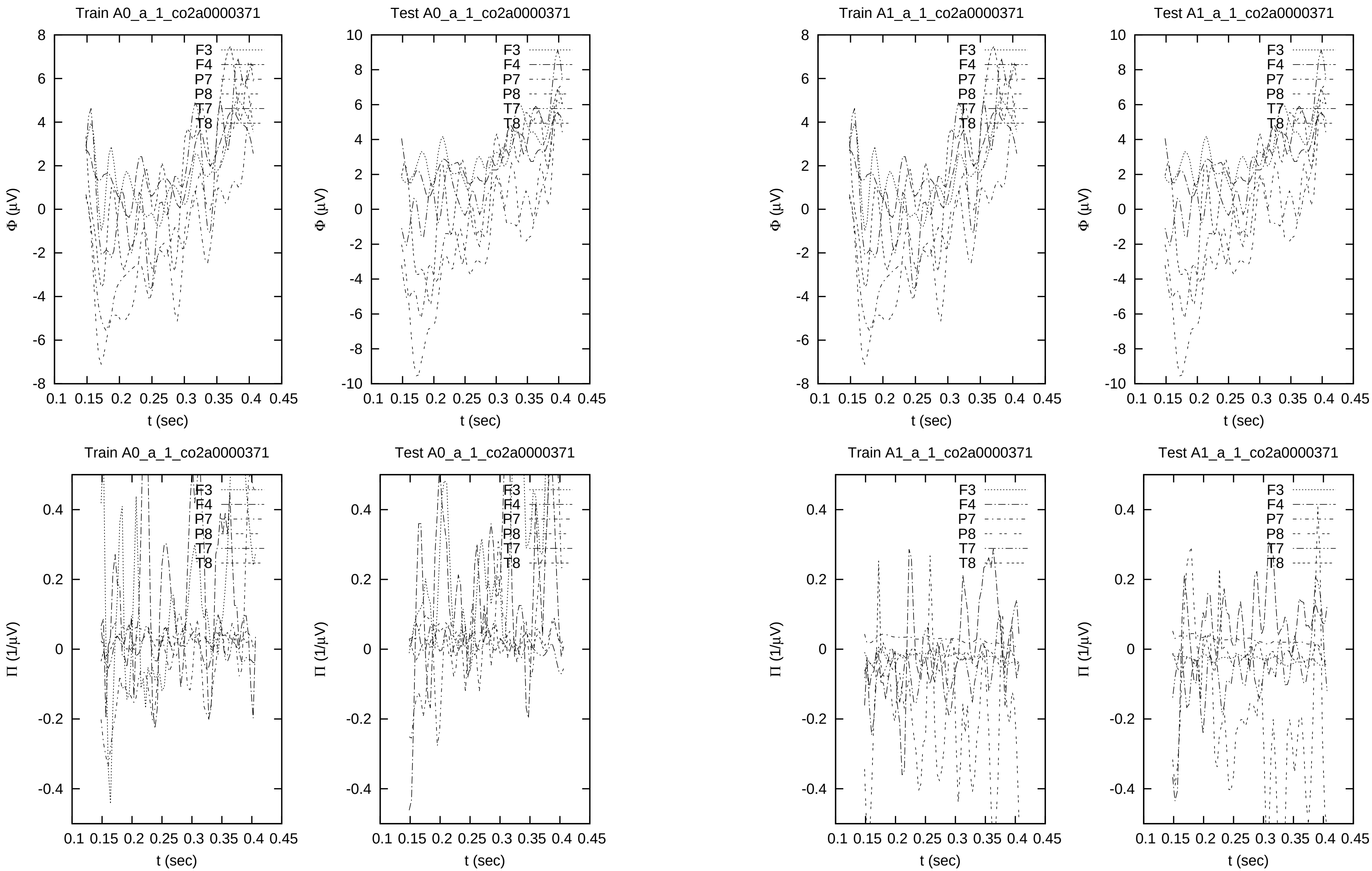
F3
F4
P7
P8
T7
T8
Φ (μV)
Π (1/μV)
t (sec)



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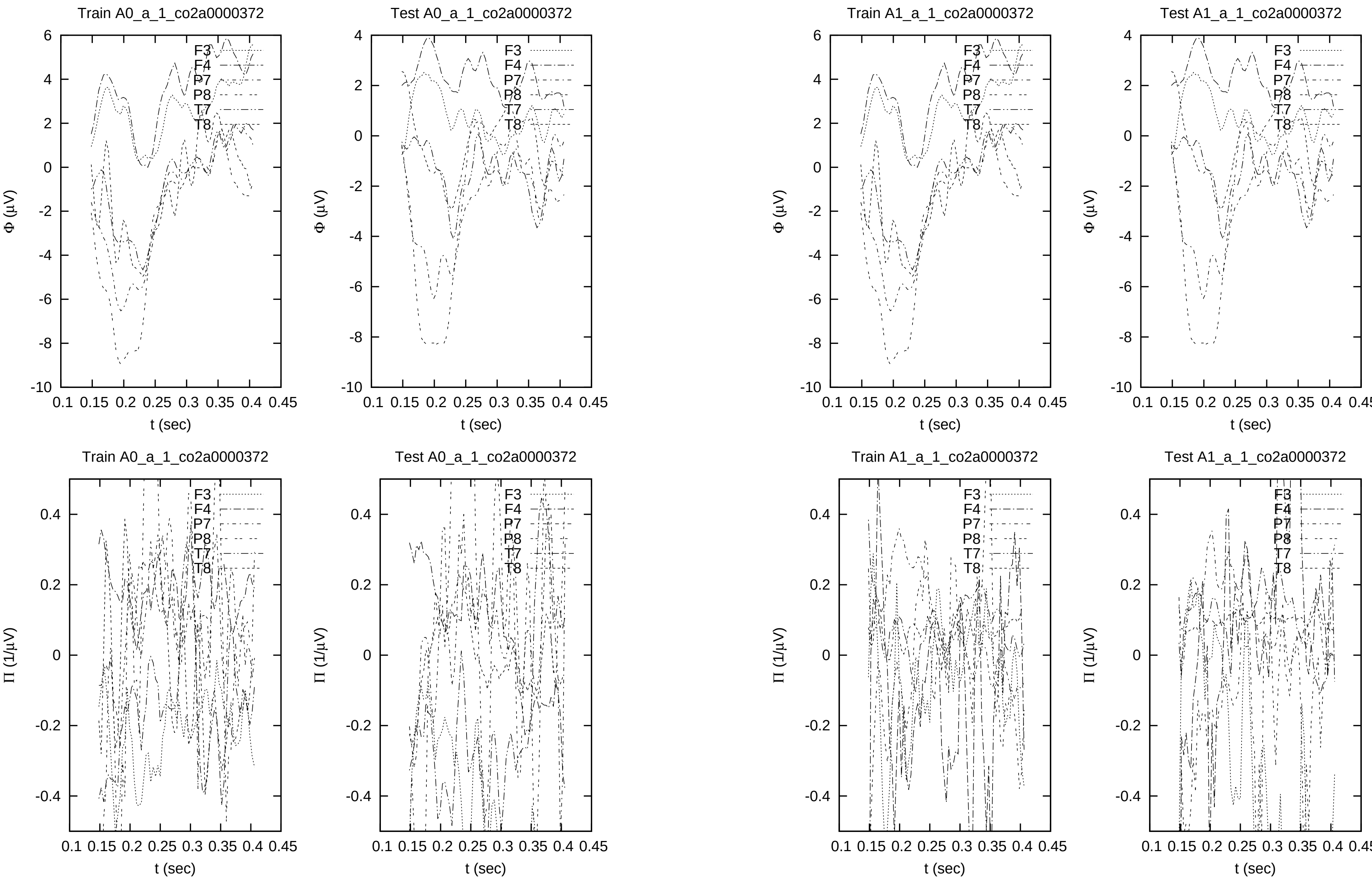
P8
T7
T8
Φ (μV)
Π (1/μV)
t (sec)



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Test A1_a_1_co2a0000372
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P7
P8
T7
T8
Φ (μV)
Π (1/μV)
t (sec)
6
4
2
0
-2
-4
-6
-8
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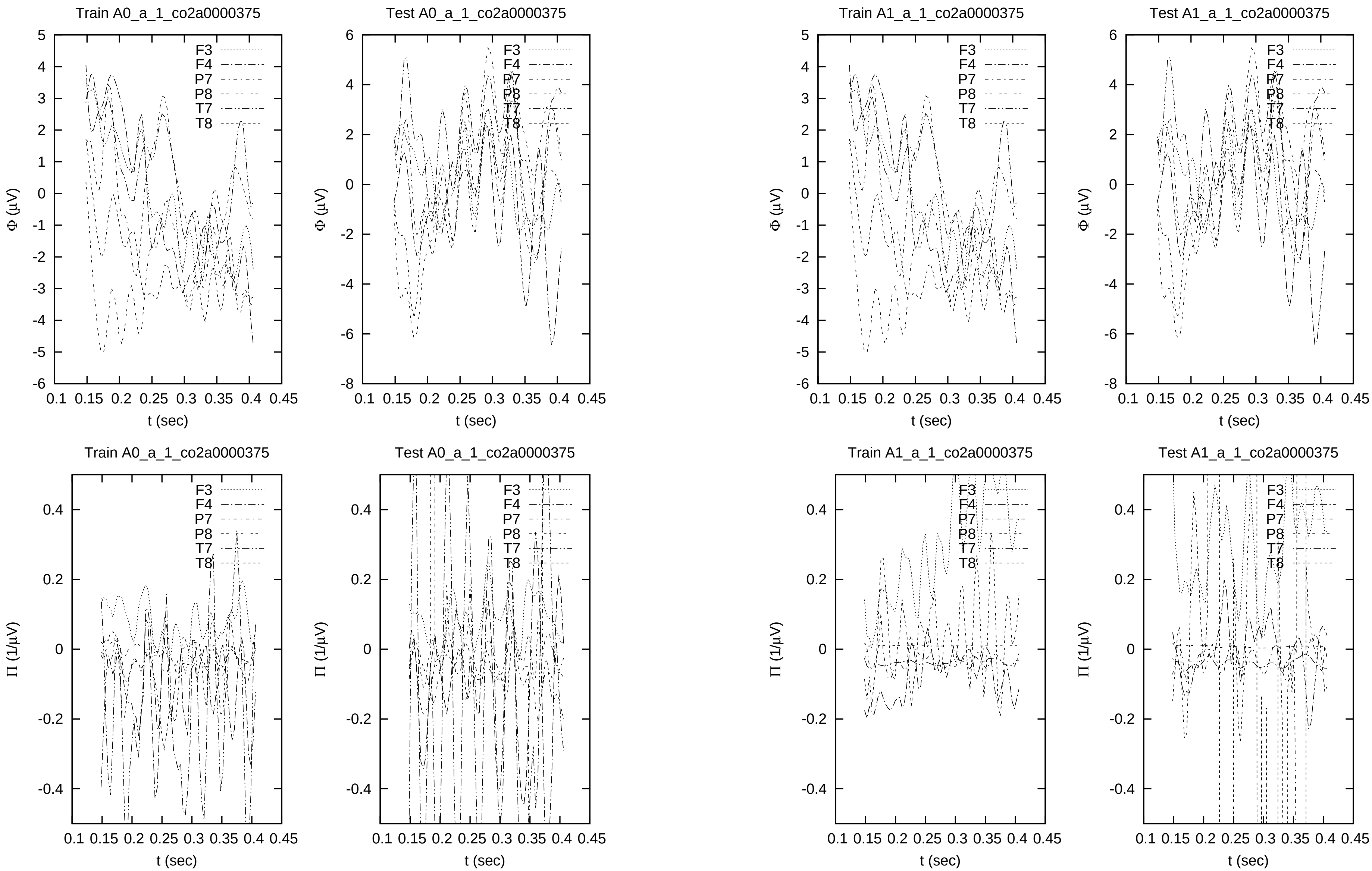
0.4
0.2
-0.2
-0.4
0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45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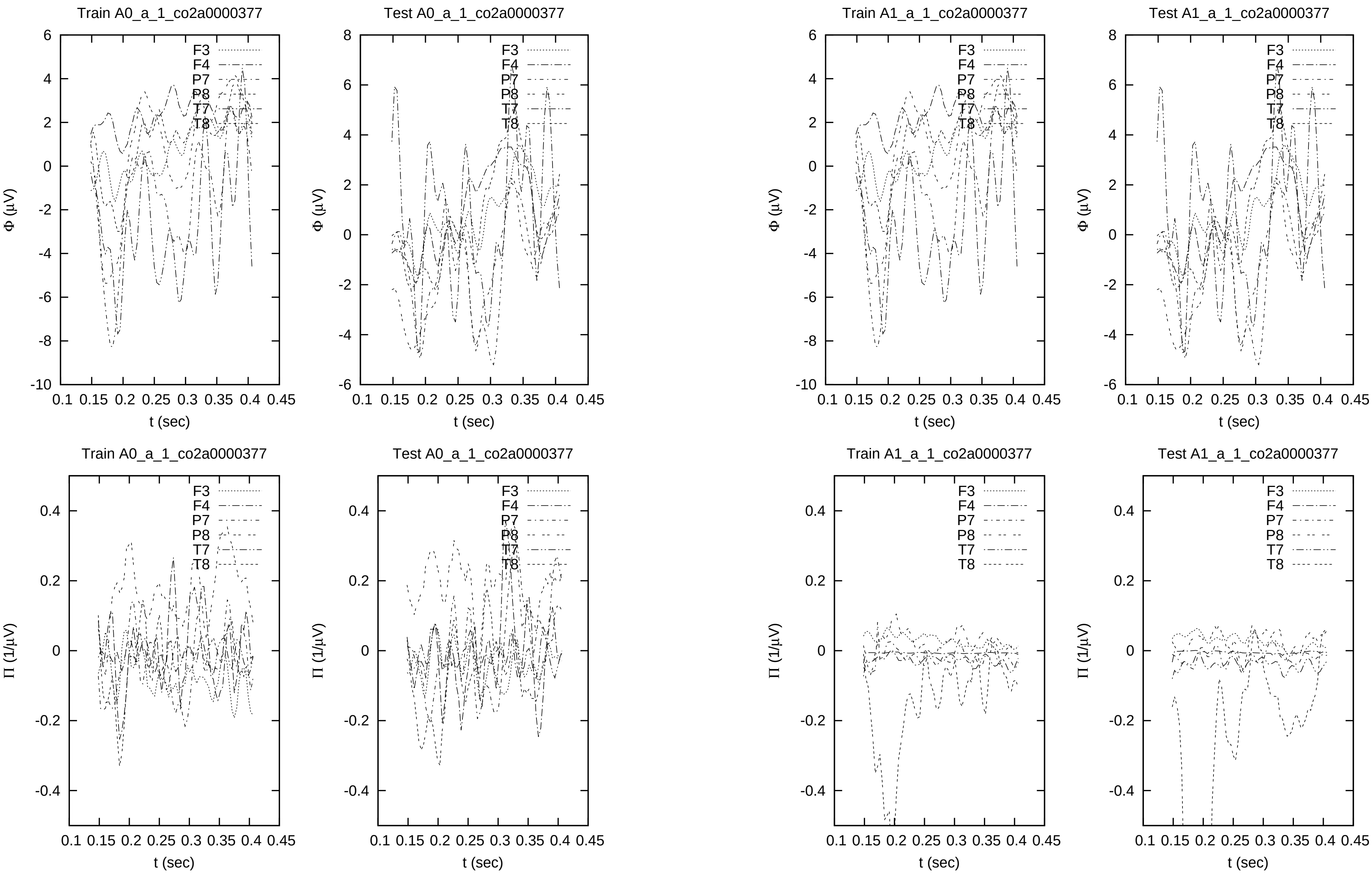
Train A1_a_1_co2a0000375
Test A1_a_1_co2a0000375
F3
F4
P7
P8
T7
T8
Φ (μV)
Π (1/μV)
t (sec)



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F4
P7
P8
T7
T8
Φ (µV)
t (sec)
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4
2
0
-2
-4
-6
-8
-10
0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45
Test A0_a_1_co2a0000377
F3
F4
P7
P8
T7
T8
Φ (µV)
t (sec)
8
6
4
2
0
-2
-4
-6
0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45
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F4
P7
P8
T7
T8
Φ (µV)
t (sec)
6
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2
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-2
-4
-6
-8
-10
0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45
Test A1_a_1_co2a0000377
F3
F4
P7
P8
T7
T8
Φ (µV)
t (sec)
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6
4
2
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-2
-4
-6
0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45
Train A0_a_1_co2a0000377
F3
F4
P7
P8
T7
T8
Π (1/µV)
t (sec)
0.4
0.2
0
-0.2
-0.4
0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45
Test A0_a_1_co2a0000377
F3
F4
P7
P8
T7
T8
Π (1/µV)
t (sec)
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0.2
0
-0.2
-0.4
0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45
Train A1_a_1_co2a0000377
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F4
P7
P8
T7
T8
Π (1/µV)
t (sec)
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0.2
0
-0.2
-0.4
0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45
Test A1_a_1_co2a0000377
F3
F4
P7
P8
T7
T8
Π (1/µV)
t (sec)
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-0.2
-0.4
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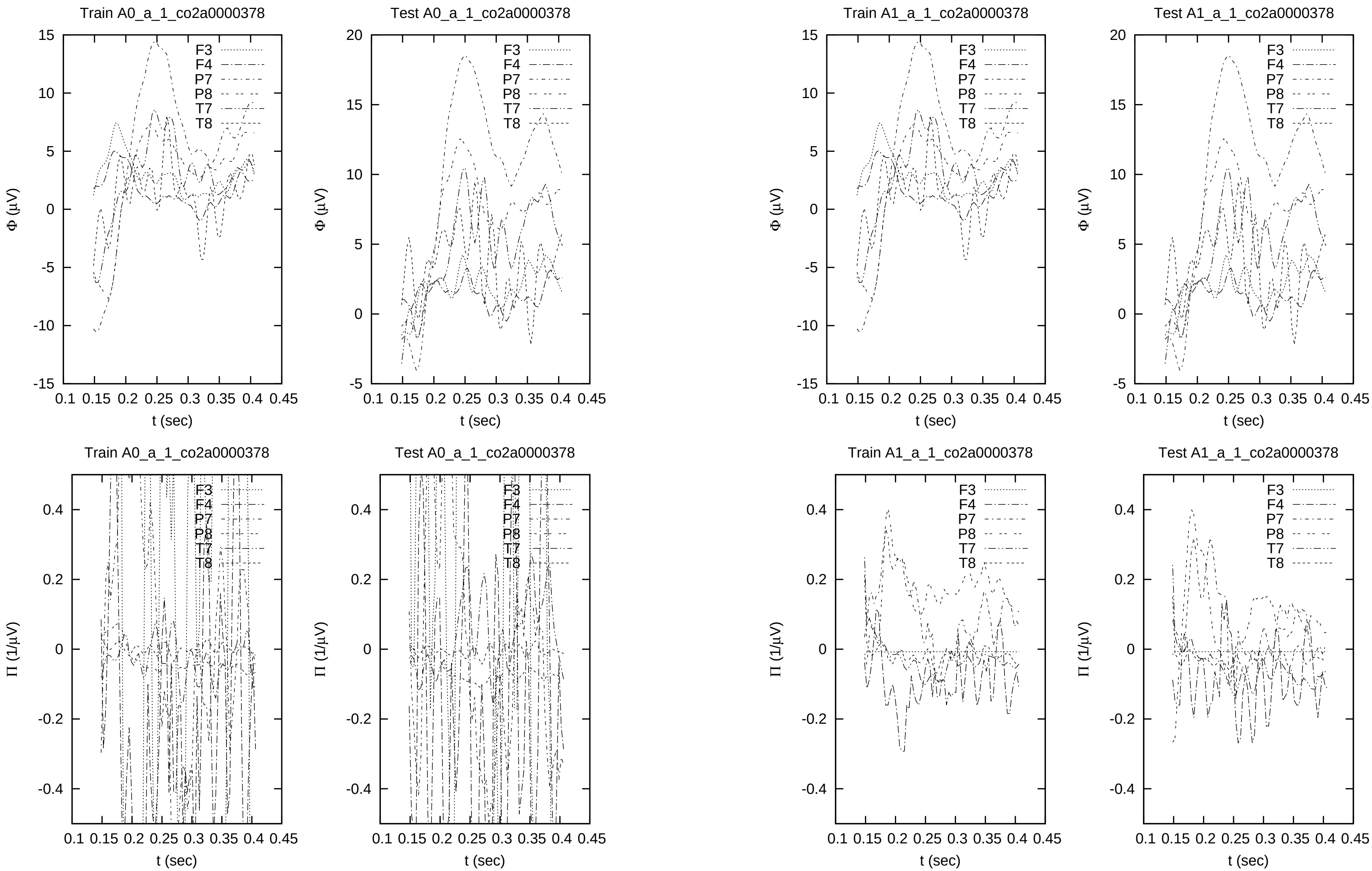
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Test A0_a_1_co2a0000378
Train A1_a_1_co2a0000378
Test A1_a_1_co2a0000378
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F4
P7
P8
T7
T8
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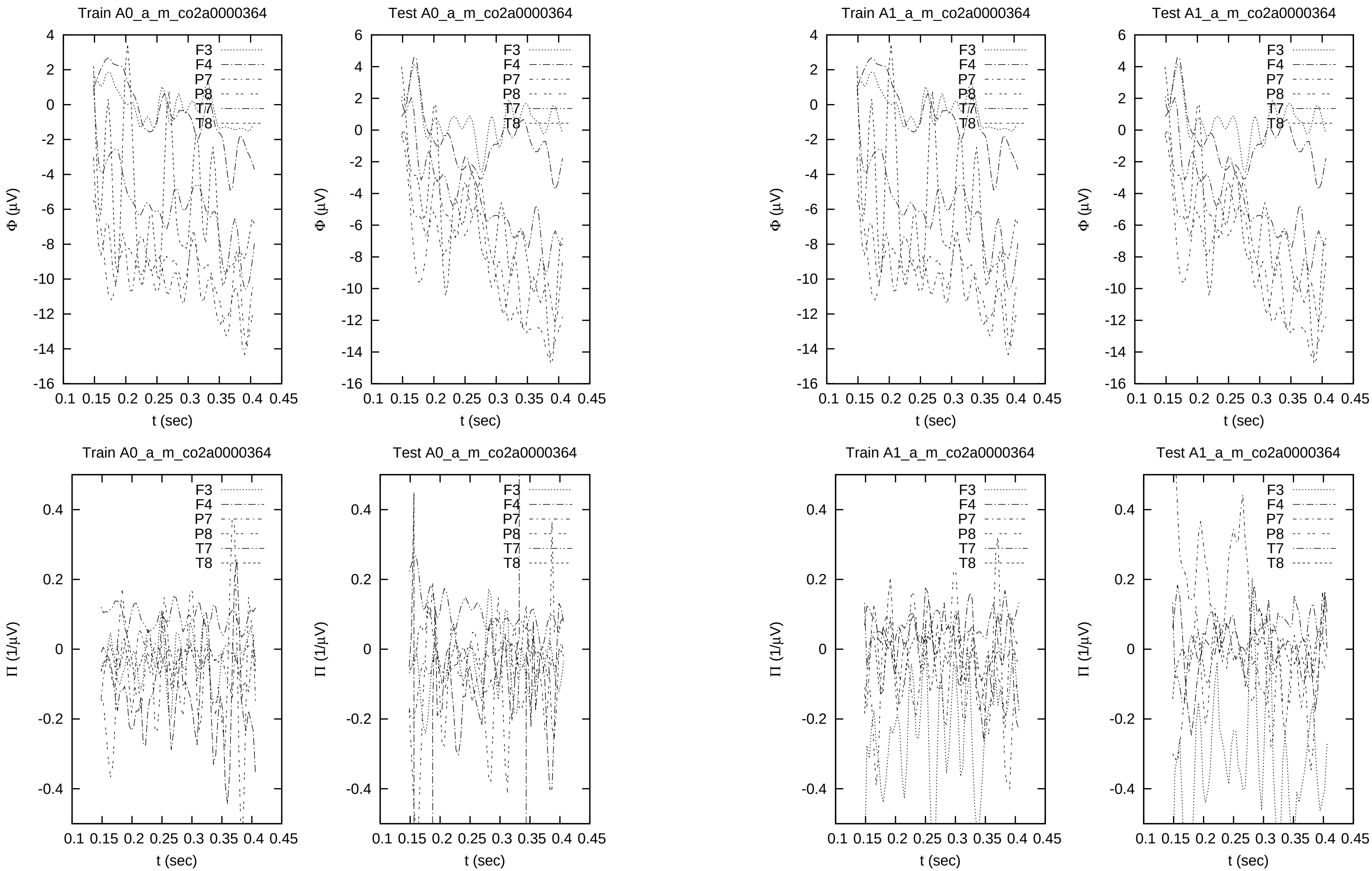
Π (1/μV)
t (sec)



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Π (1/μV)
t (sec)
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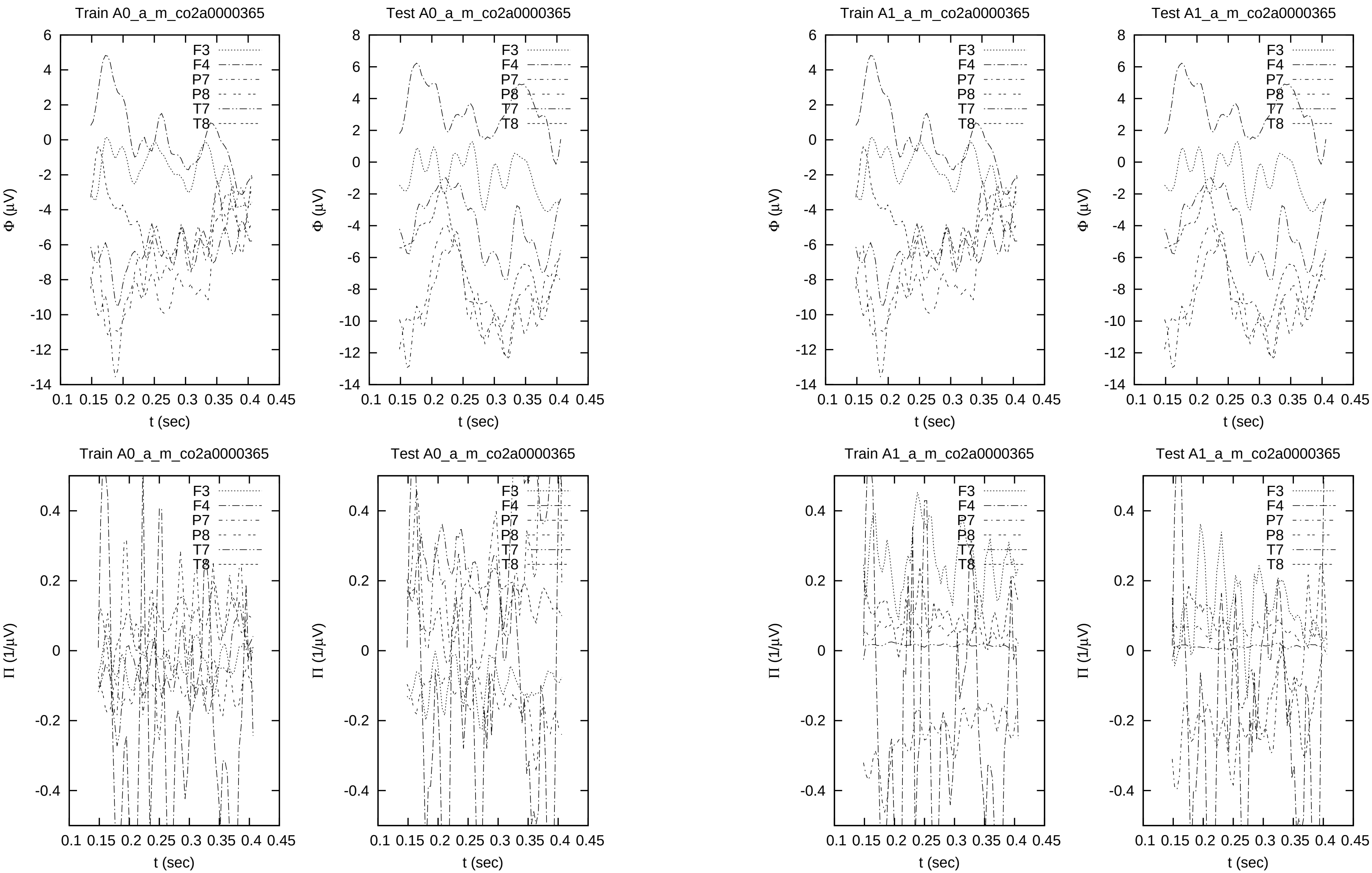
P8
T7
T8



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Train A1_a_m_co2a0000365
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F4
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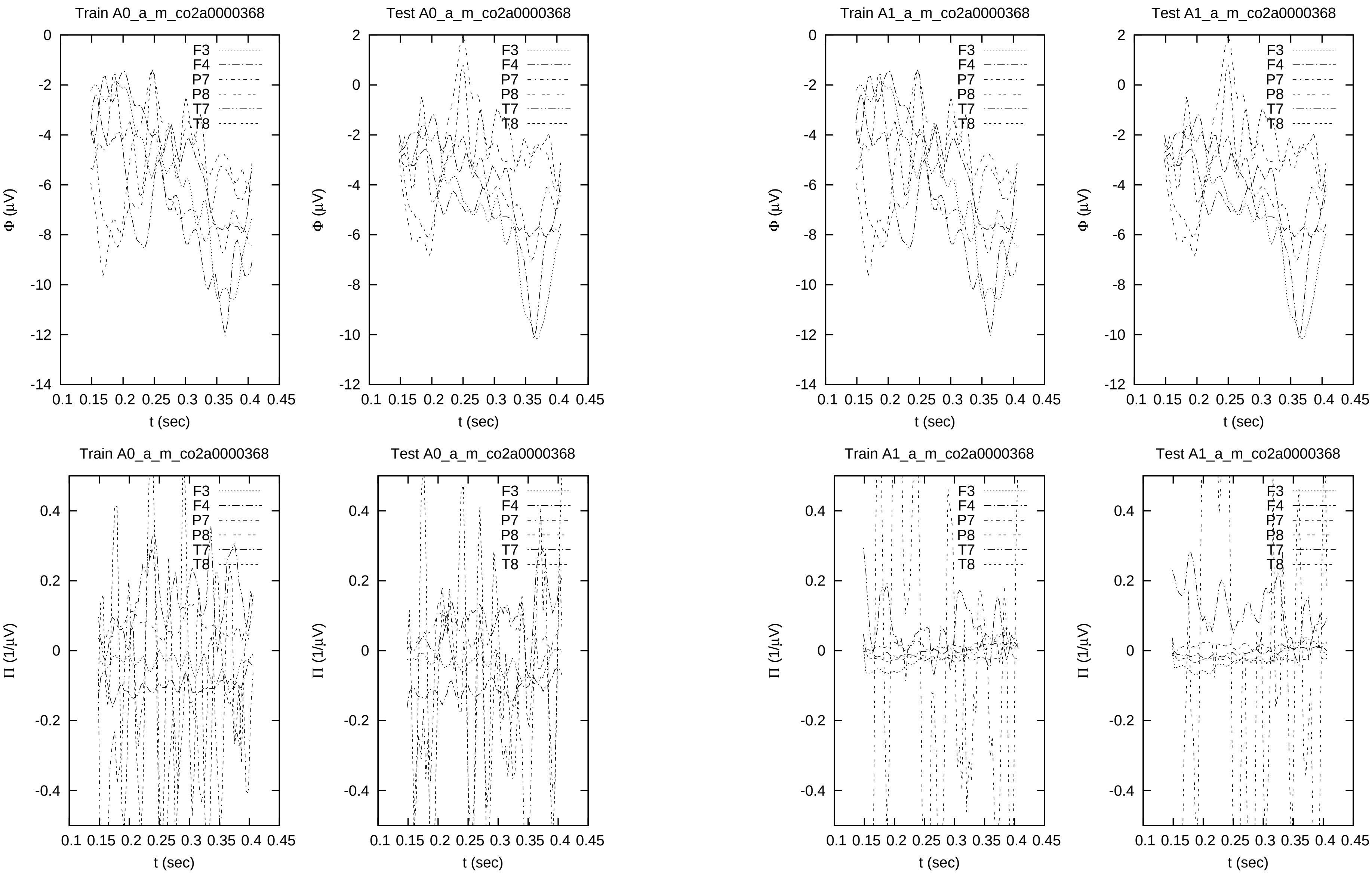
P8
T7
T8
Φ (μV)
Π (1/μV)
t (sec)



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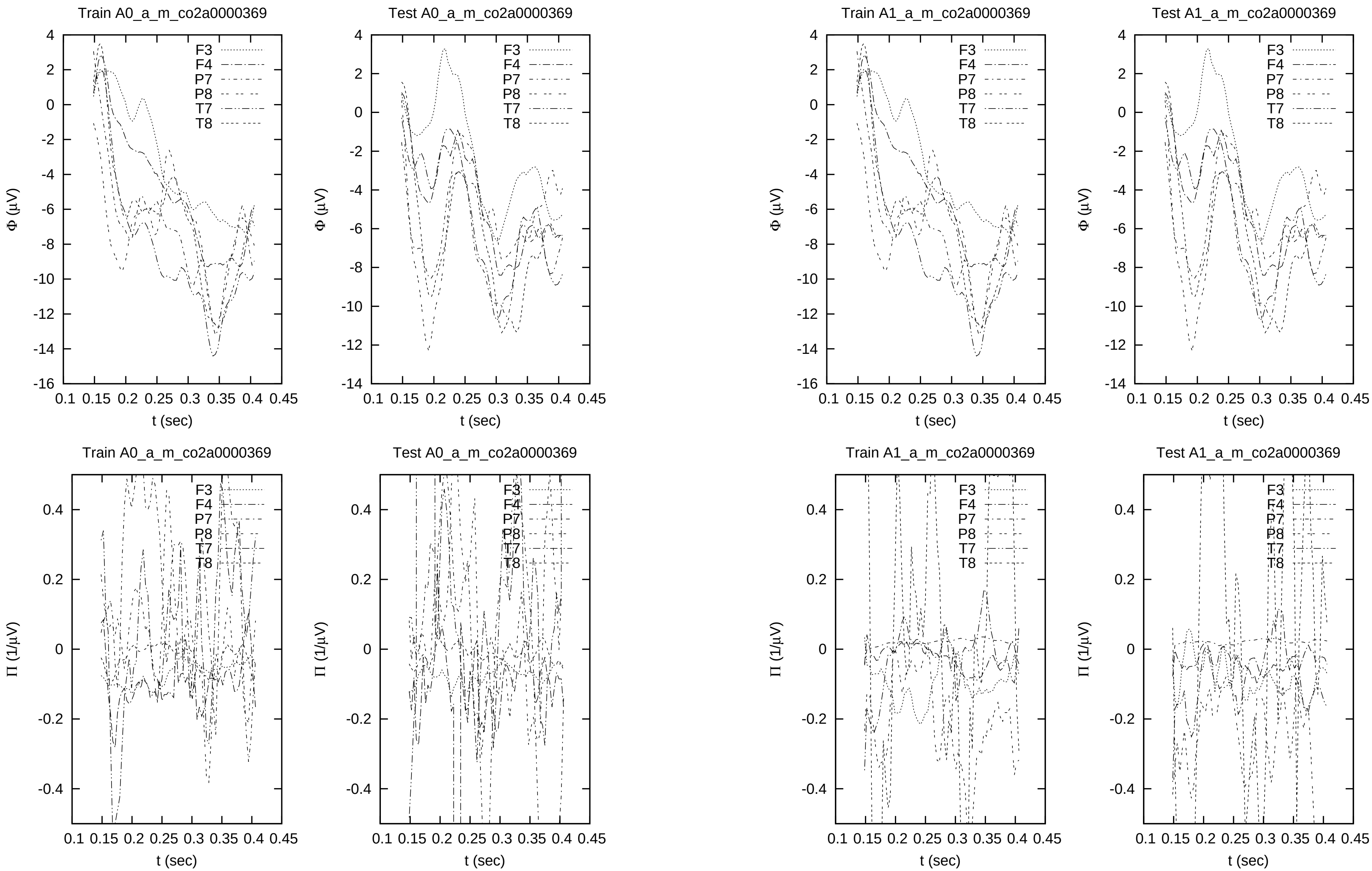
Φ (μV)
Π (1/μV)
t (sec)
F3
F4
P7
P8
T7
T8



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Train A1_a_m_co2a0000369
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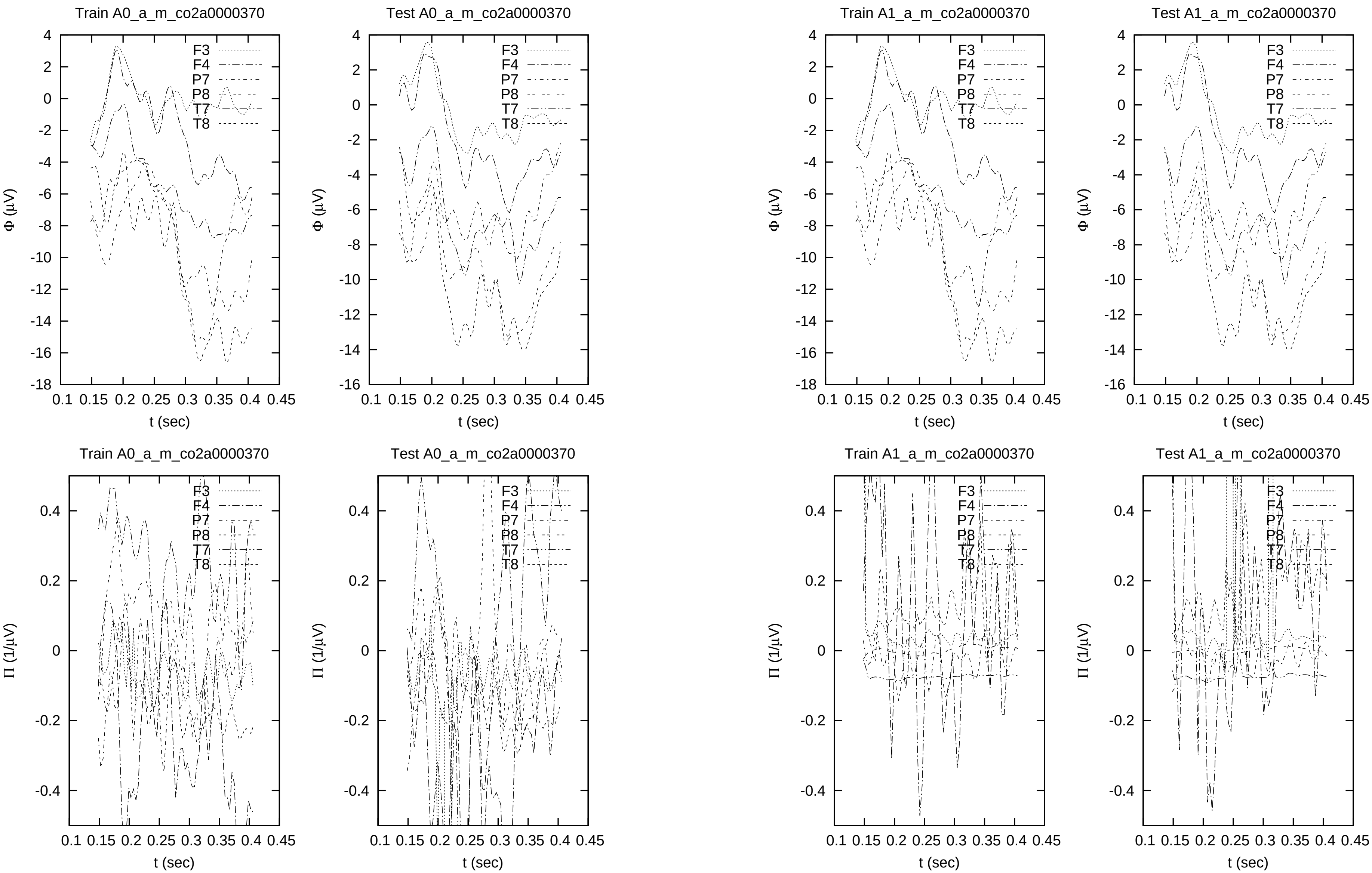
T8
Φ (μV)
Π (1/μV)
t (sec)



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Test A1_a_m_co2a0000370
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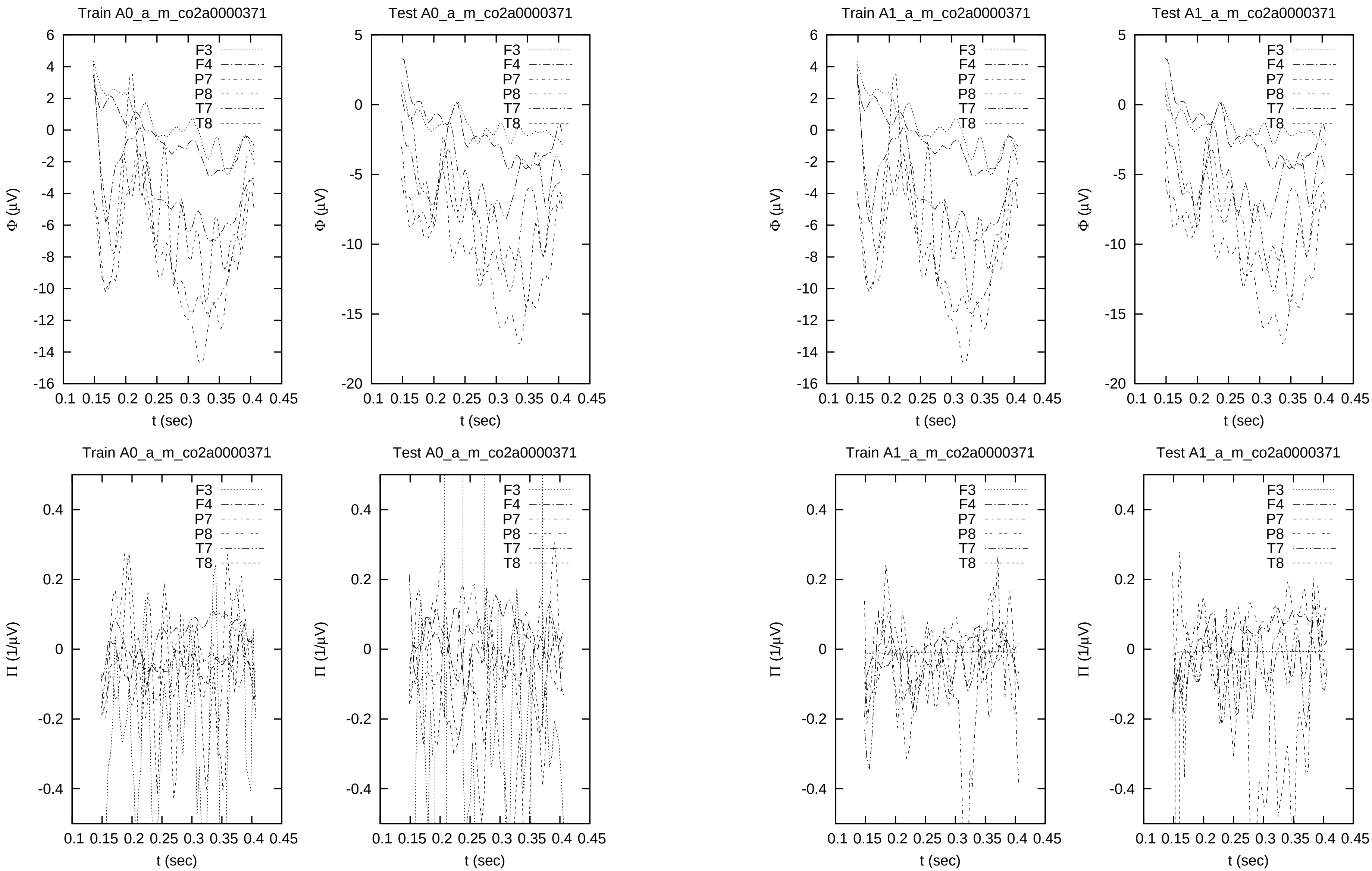
Π (1/µV)
t (sec)
F3
F4
P7
P8
T7
T8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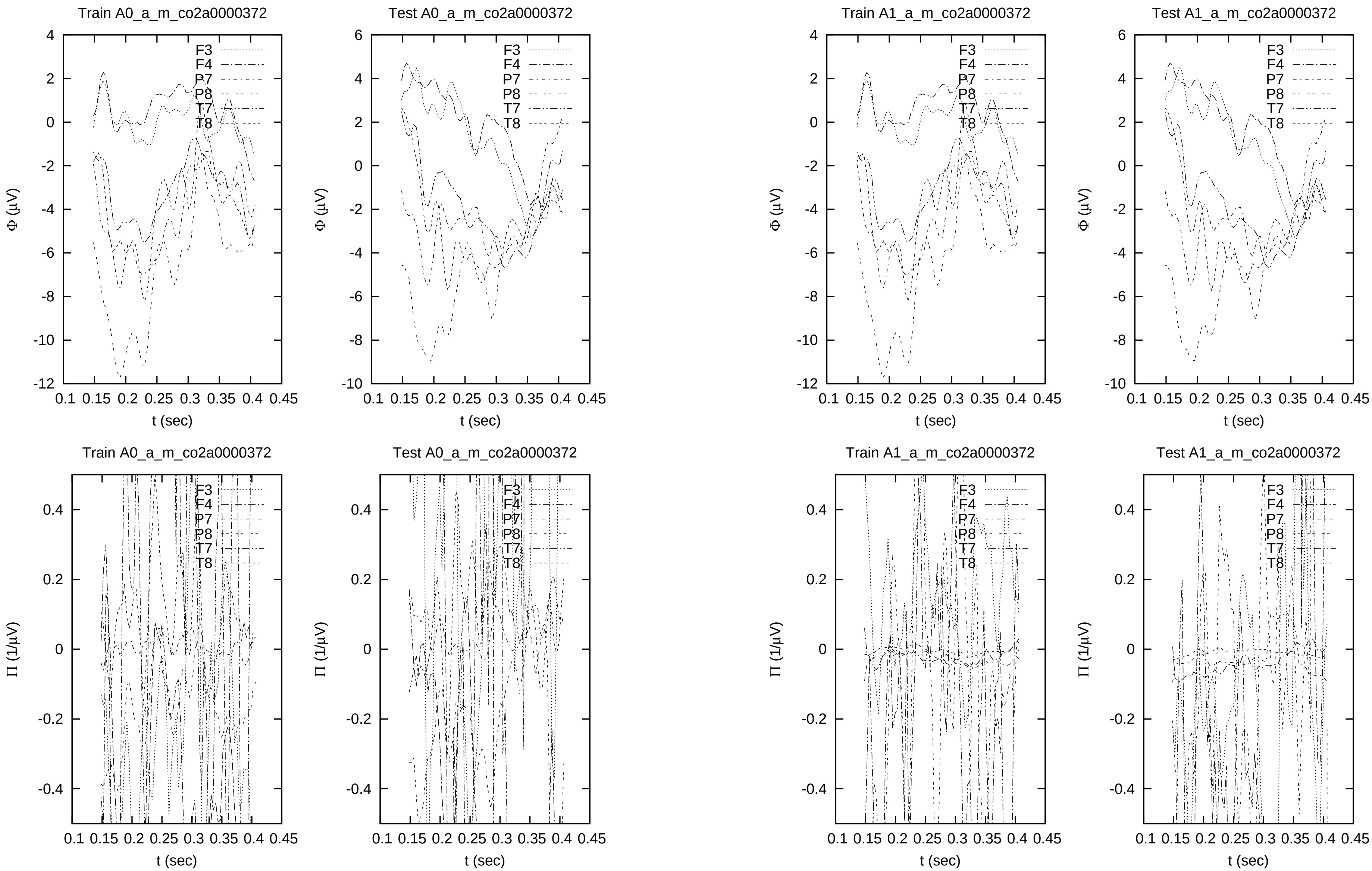
F4
P7
P8
T7
T8
Φ (µV)
Π (1/µV)
t (sec)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Train A1_a_m_co2a0000372
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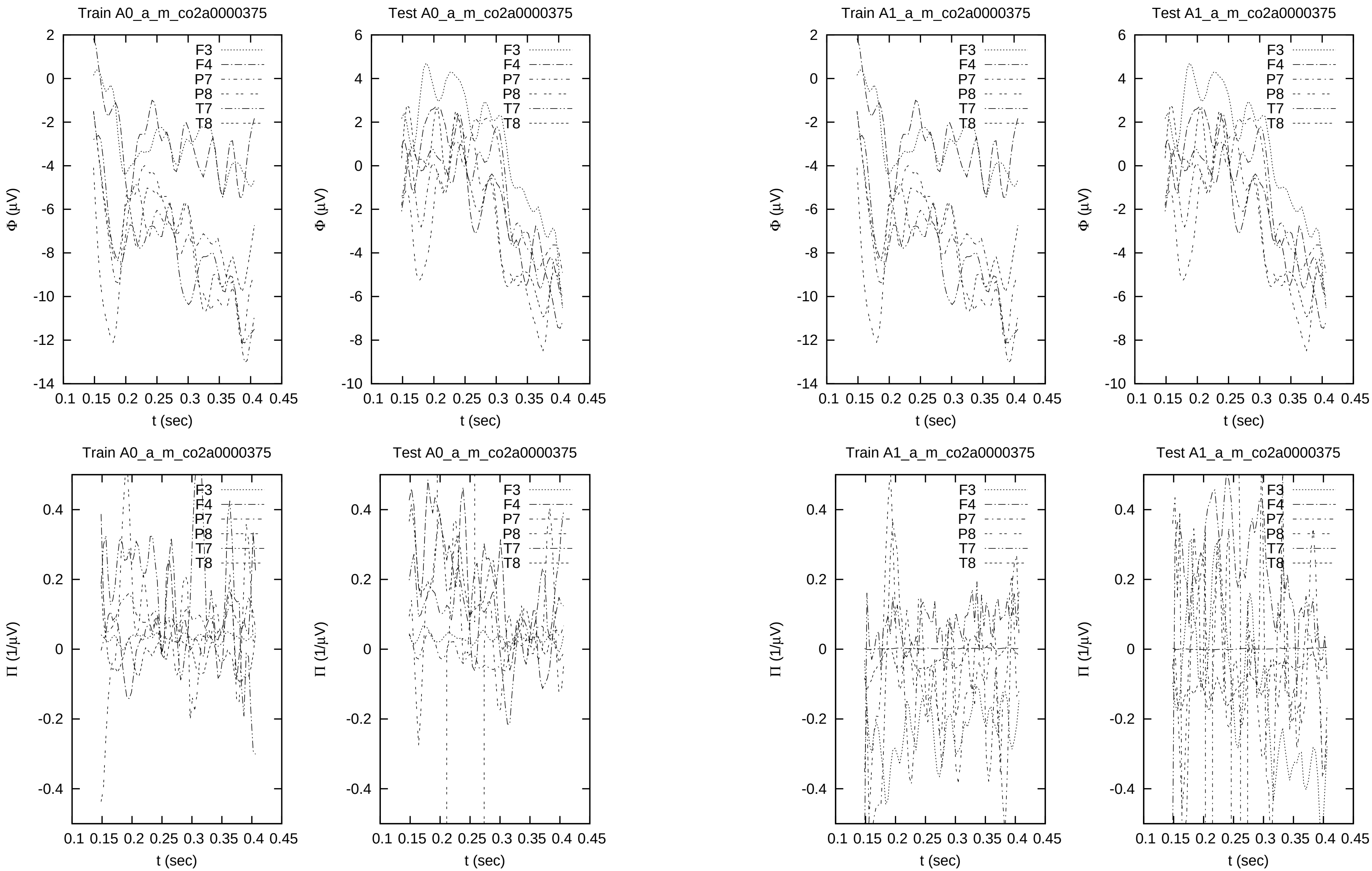
Π (1/μV)
t (sec)



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Train A1_a_m_co2a0000375
Test A1_a_m_co2a0000375
Train A0_a_m_co2a0000375
Test A0_a_m_co2a0000375
Train A1_a_m_co2a0000375
Test A1_a_m_co2a0000375
F3
F4
P7
P8
T7
T8
Φ (μV)
Π (1/μV)
t (sec)
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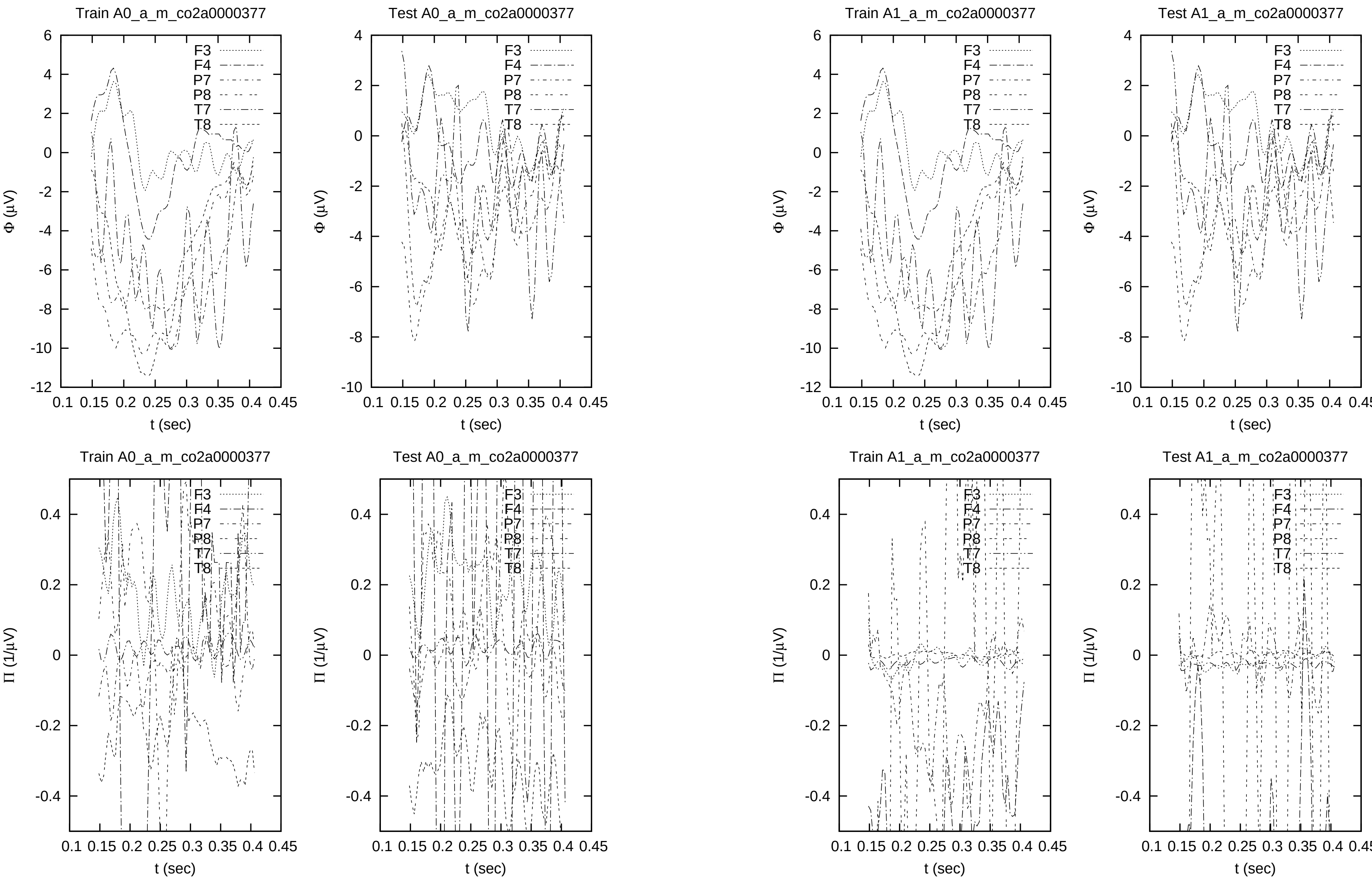
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Test A0_a_m_co2a0000377
Train A1_a_m_co2a0000377
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Π (1/μV)
t (sec)
F3
F4
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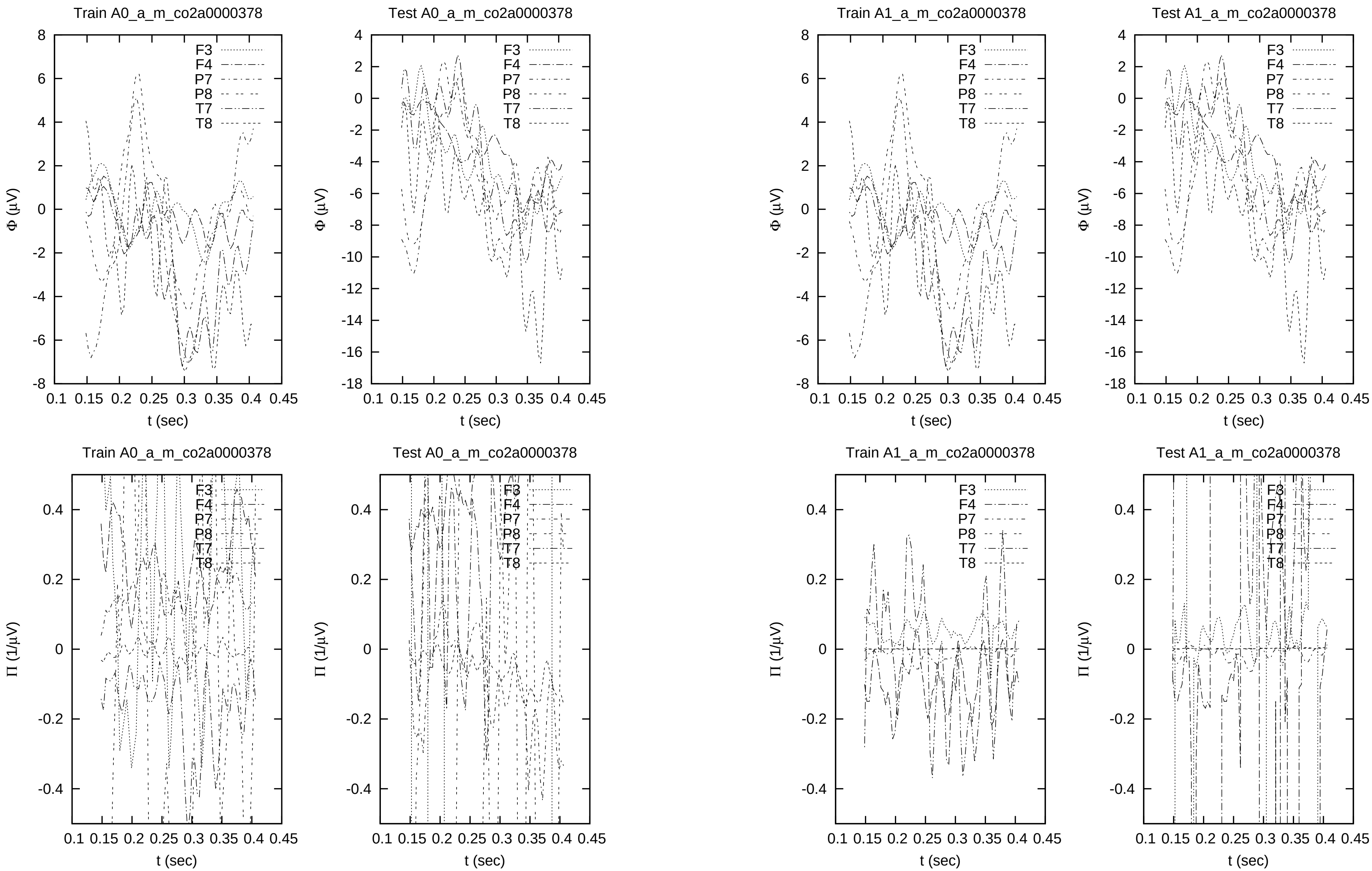
P8
T7
T8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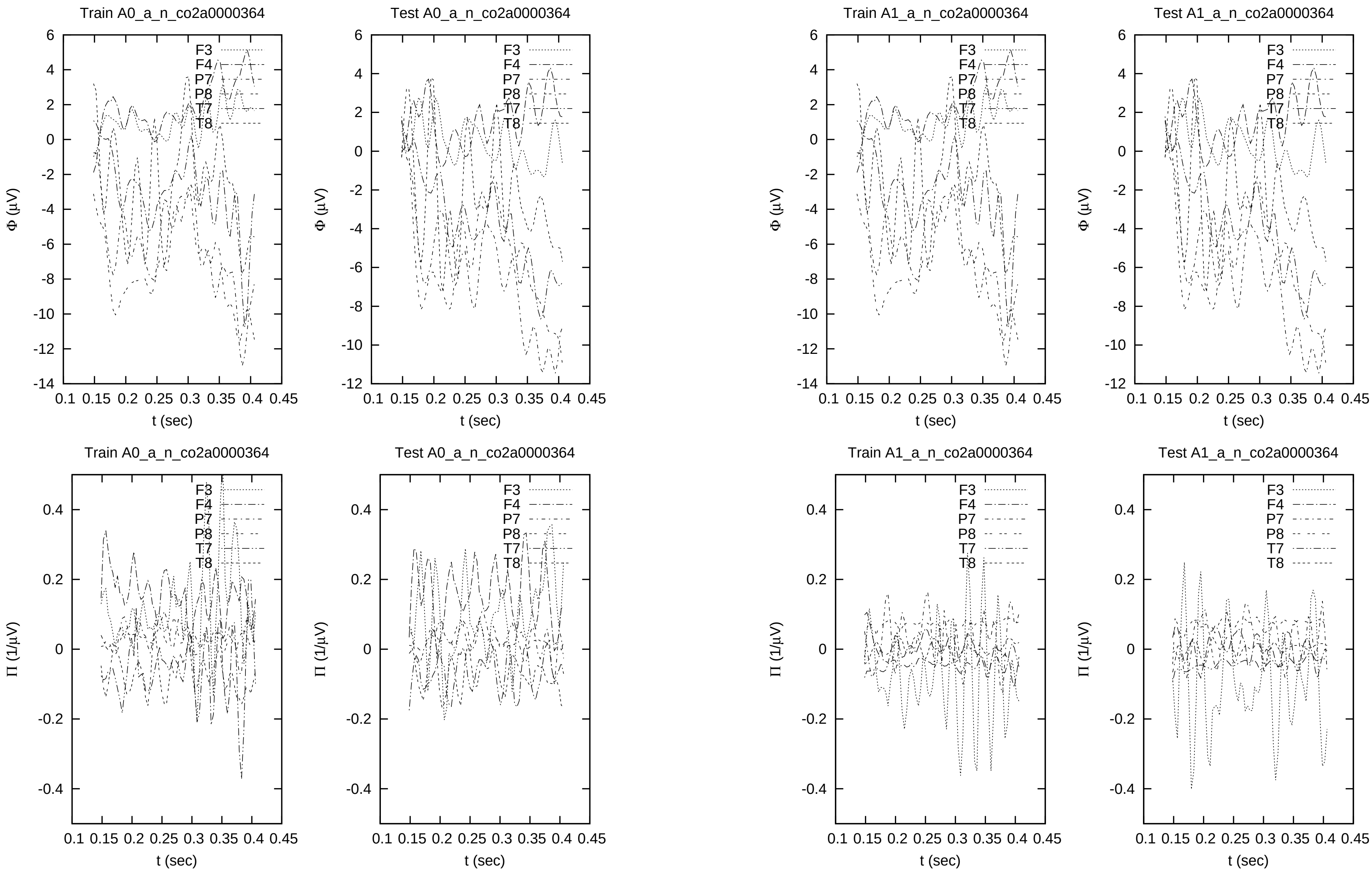
P8
T7
T8



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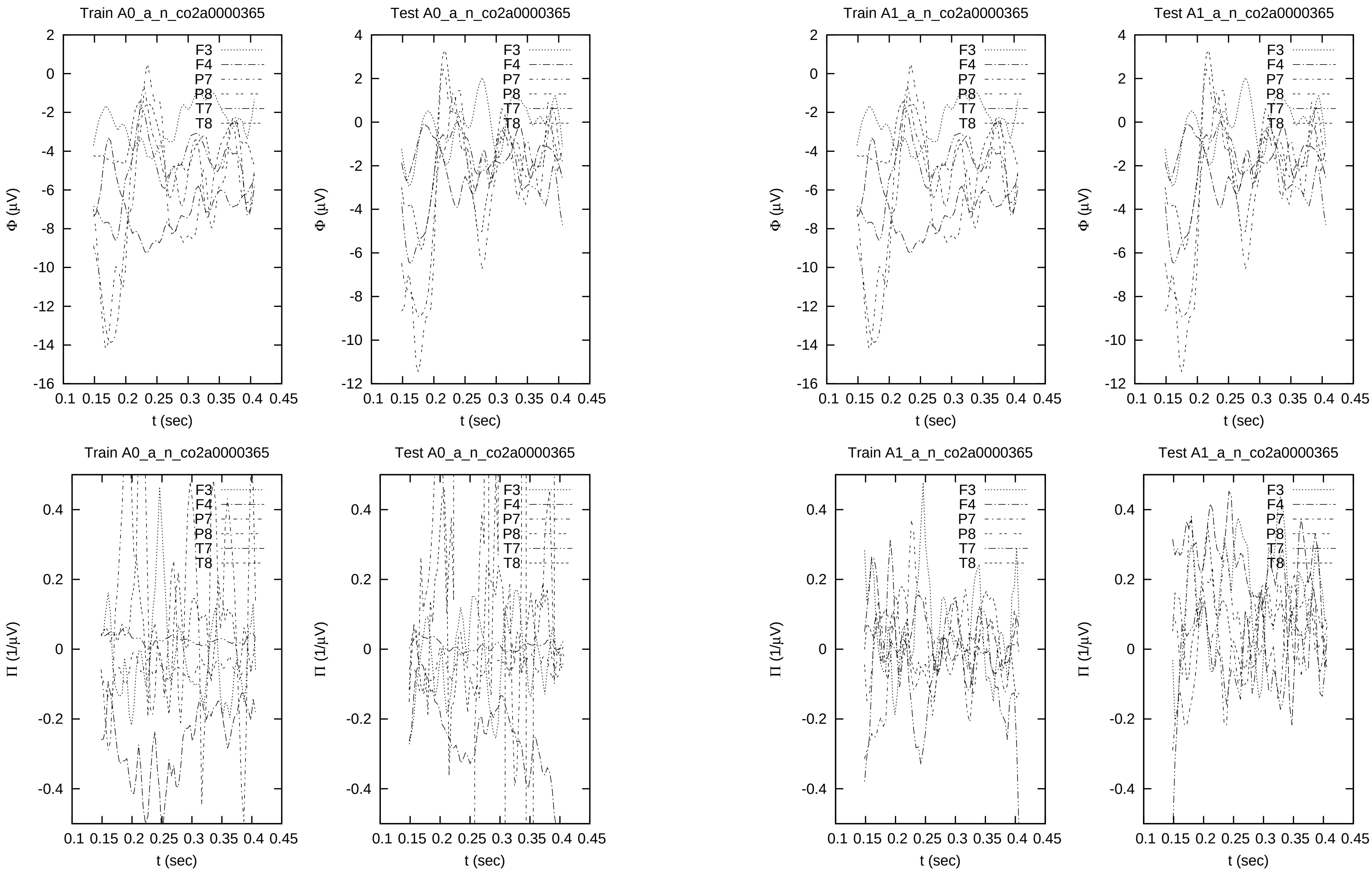
F4
P7
P8
T7
T8
Φ (µV)
Π (1/µV)
t (sec)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Test A1_a_n_co2a0000365
F3
F4
P7
P8
T7
T8
Φ (µV)
Π (1/µV)
t (sec)
0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45
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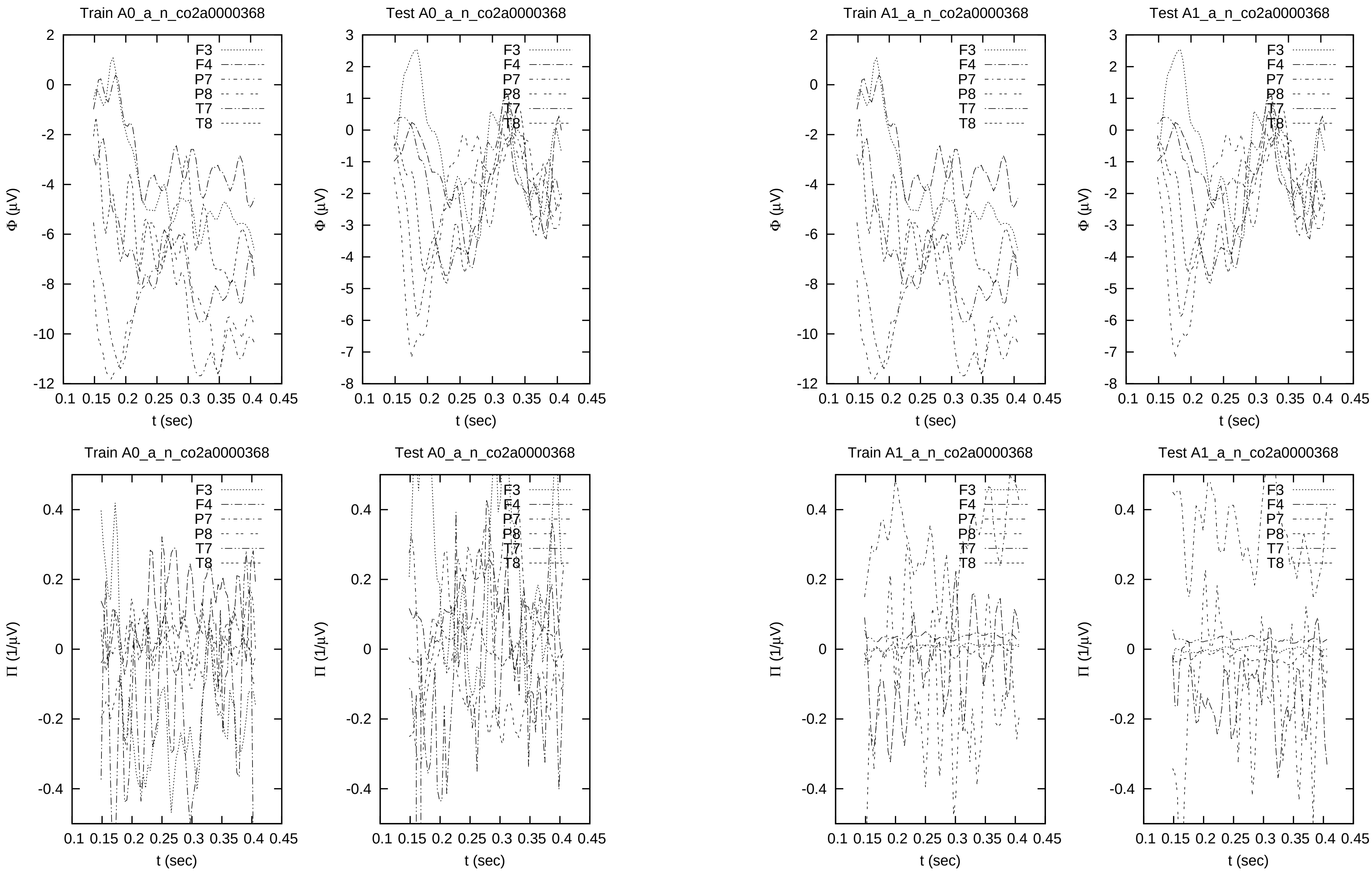
4 2 0 -2 -4 -6 -8 -10 -12
0.4 0.2 0 -0.2 -0.4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Train A1_a_n_co2a0000368
Test A1_a_n_co2a0000368
Φ (µV)
Π (1/µV)
t (sec)
F3
F4
P7
P8
T7
T8
0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45
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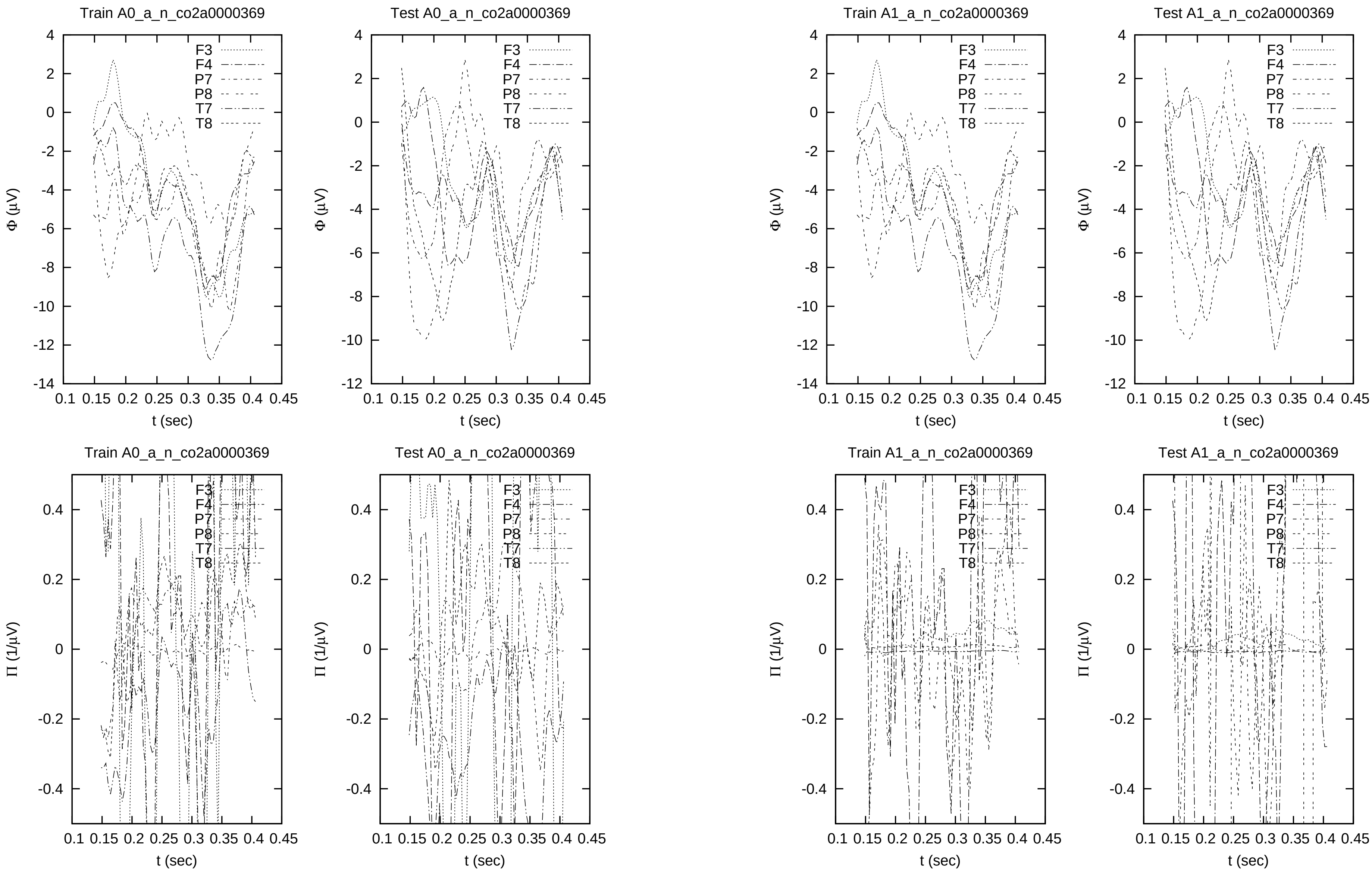
0.4 0.2 0 -0.2 -0.4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Test A0_a_n_co2a0000369
Train A1_a_n_co2a0000369
Test A1_a_n_co2a0000369
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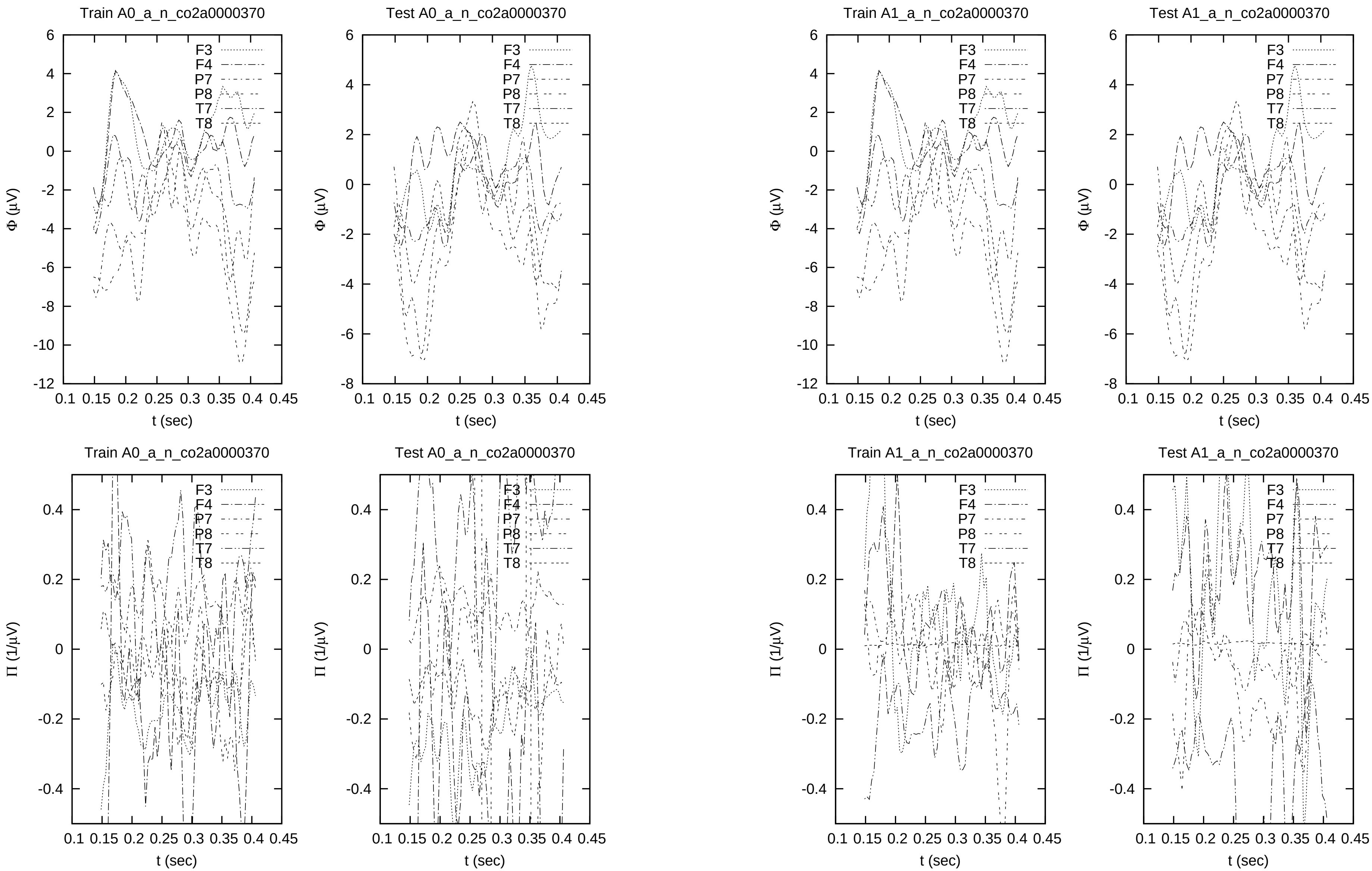
F4
P7
P8
T7
T8
Φ (μV)
Π (1/μV)
t (sec)



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Train A1_a_n_co2a0000370
Test A1_a_n_co2a0000370
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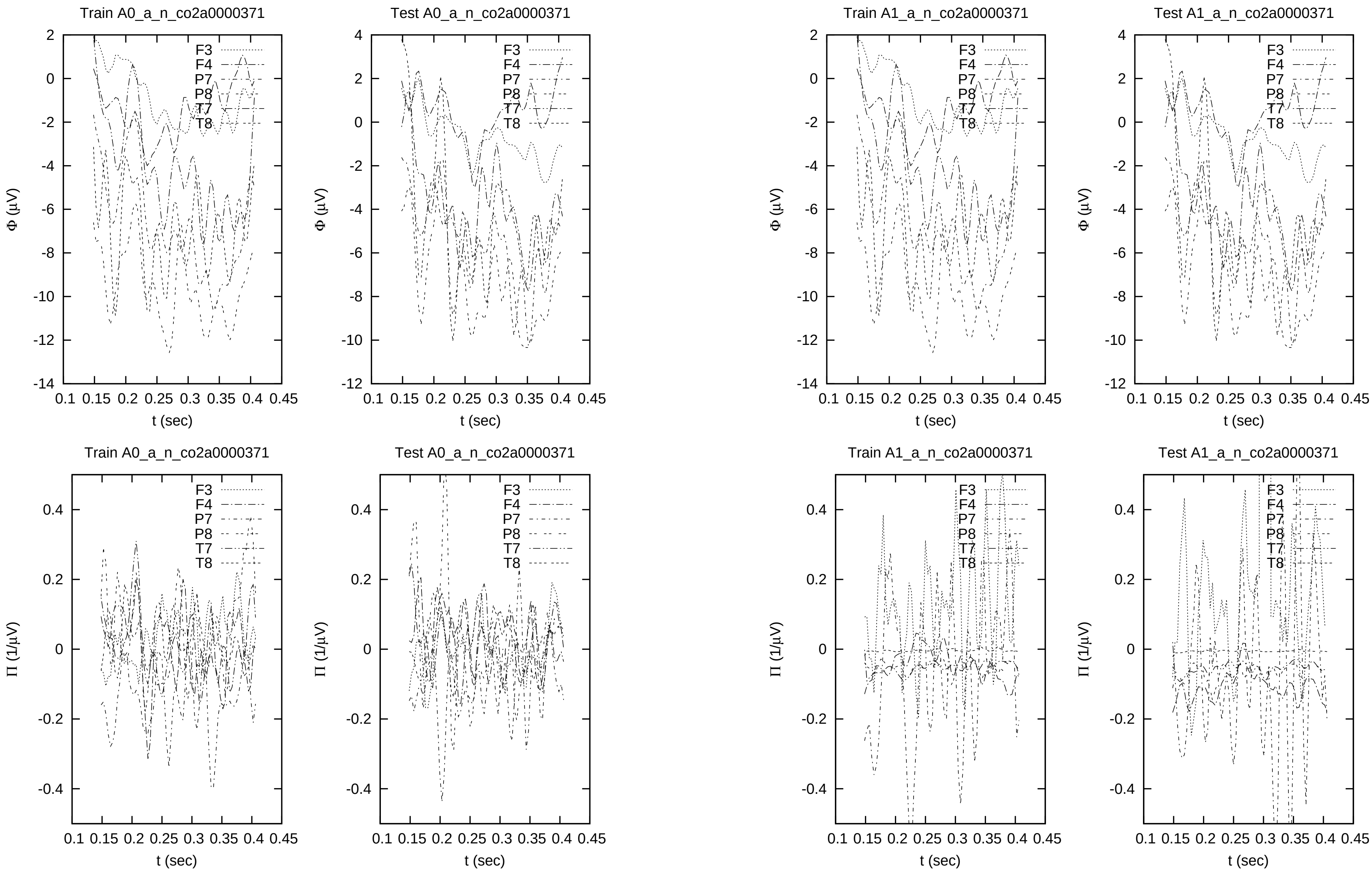
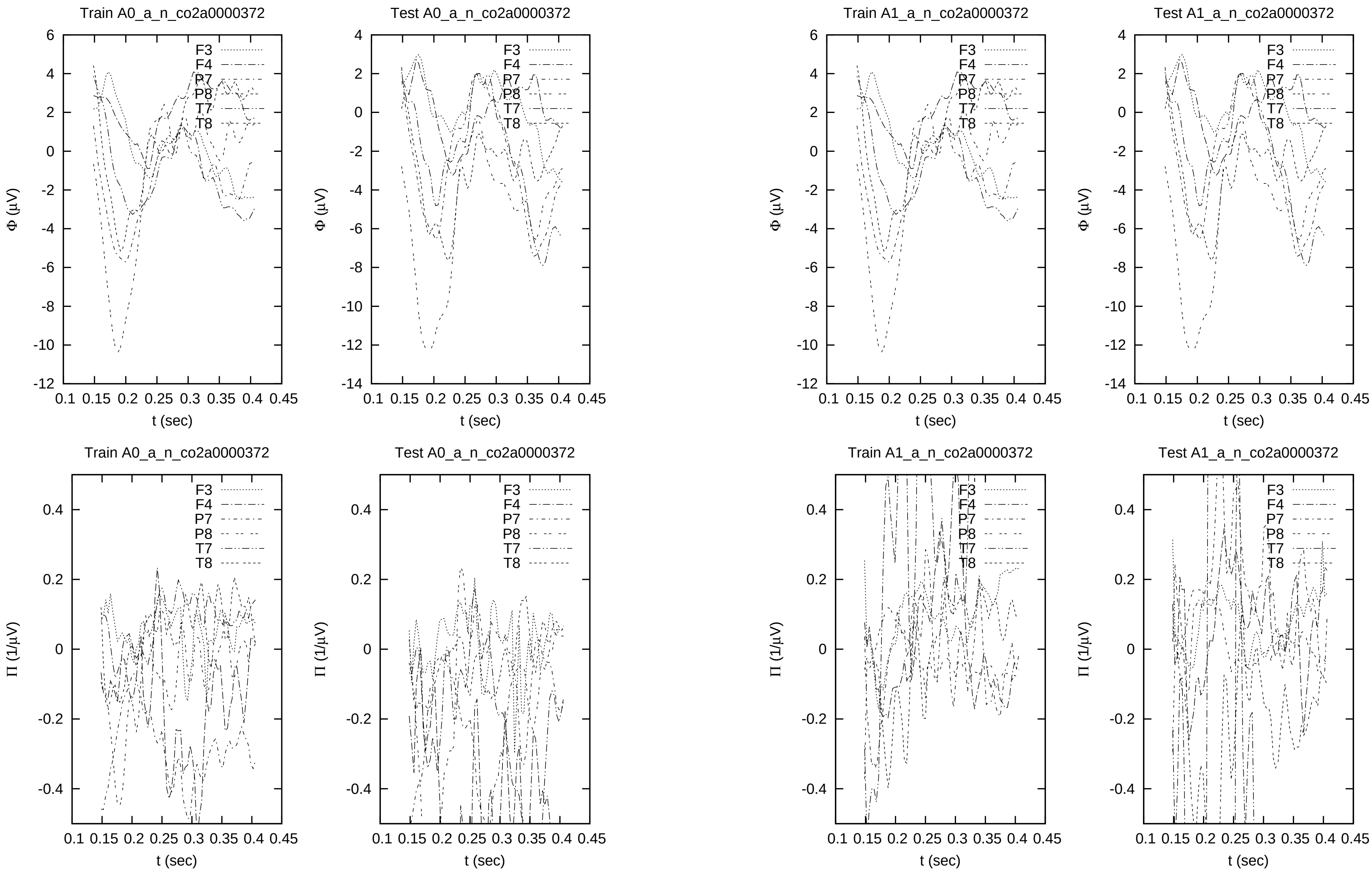
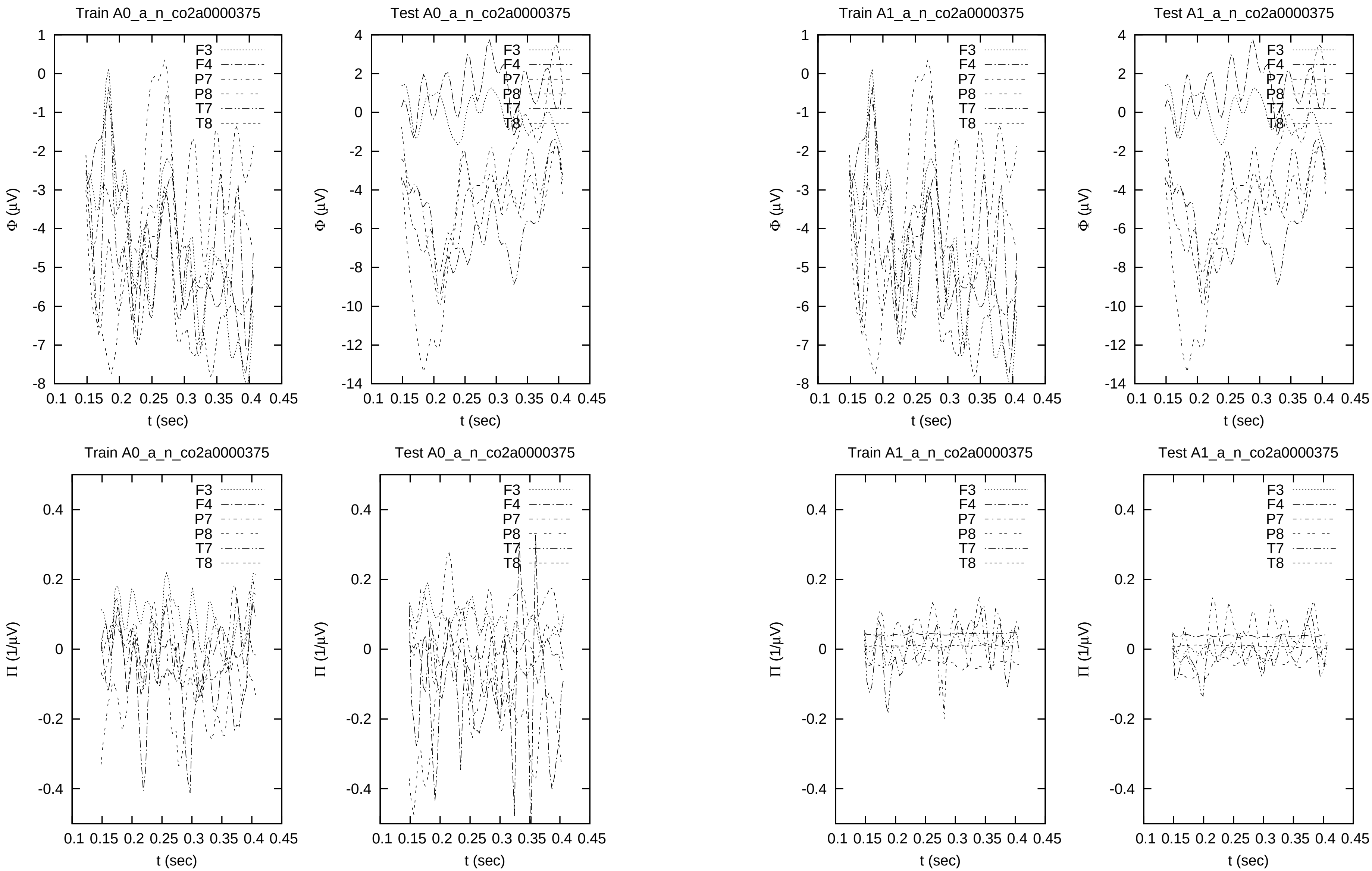
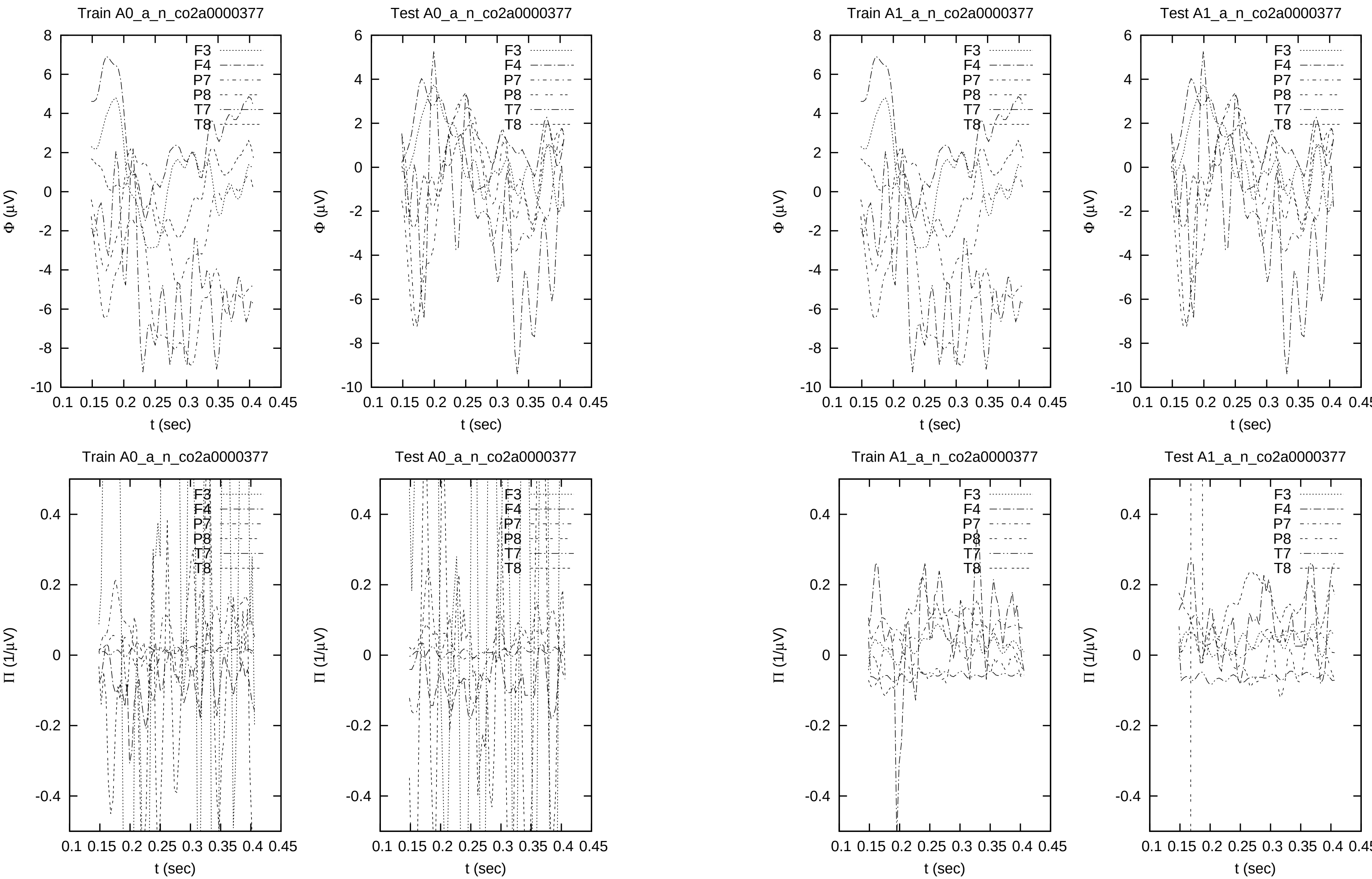
P7
P8
T7
T8

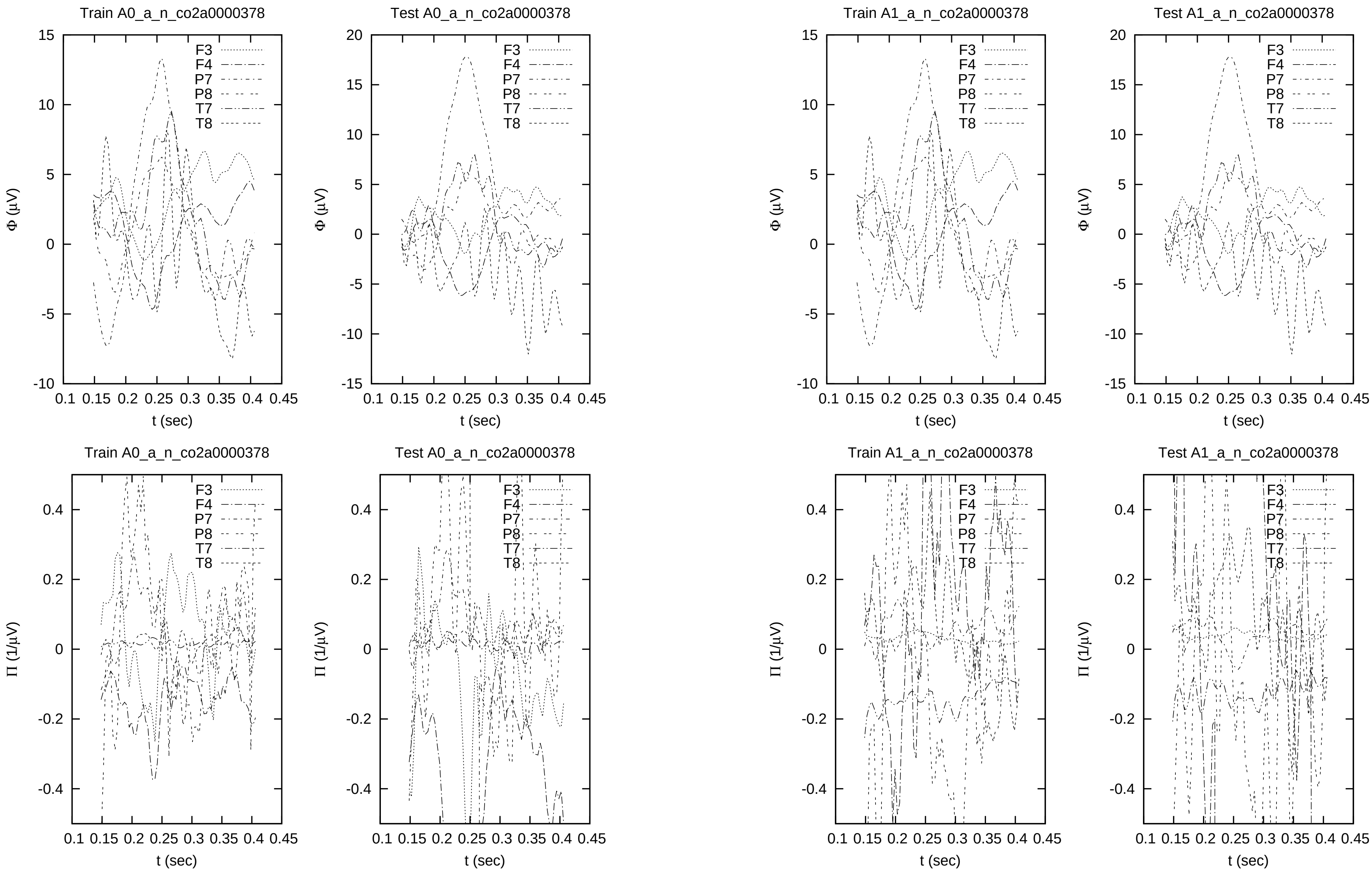

Train A0_a_n_co2a0000371
Test A0_a_n_co2a0000371
Train A1_a_n_co2a0000371
Test A1_a_n_co2a0000371
F3
F4
P7
P8
T7
T8
Φ (μV)
Π (1/μV)
t (sec)


Train A0_a_n_co2a0000372
Test A0_a_n_co2a0000372
Train A1_a_n_co2a0000372
Test A1_a_n_co2a0000372
F3
F4
P7
P8
T7
T8
Φ (μV)
Π (1/μV)
t (sec)

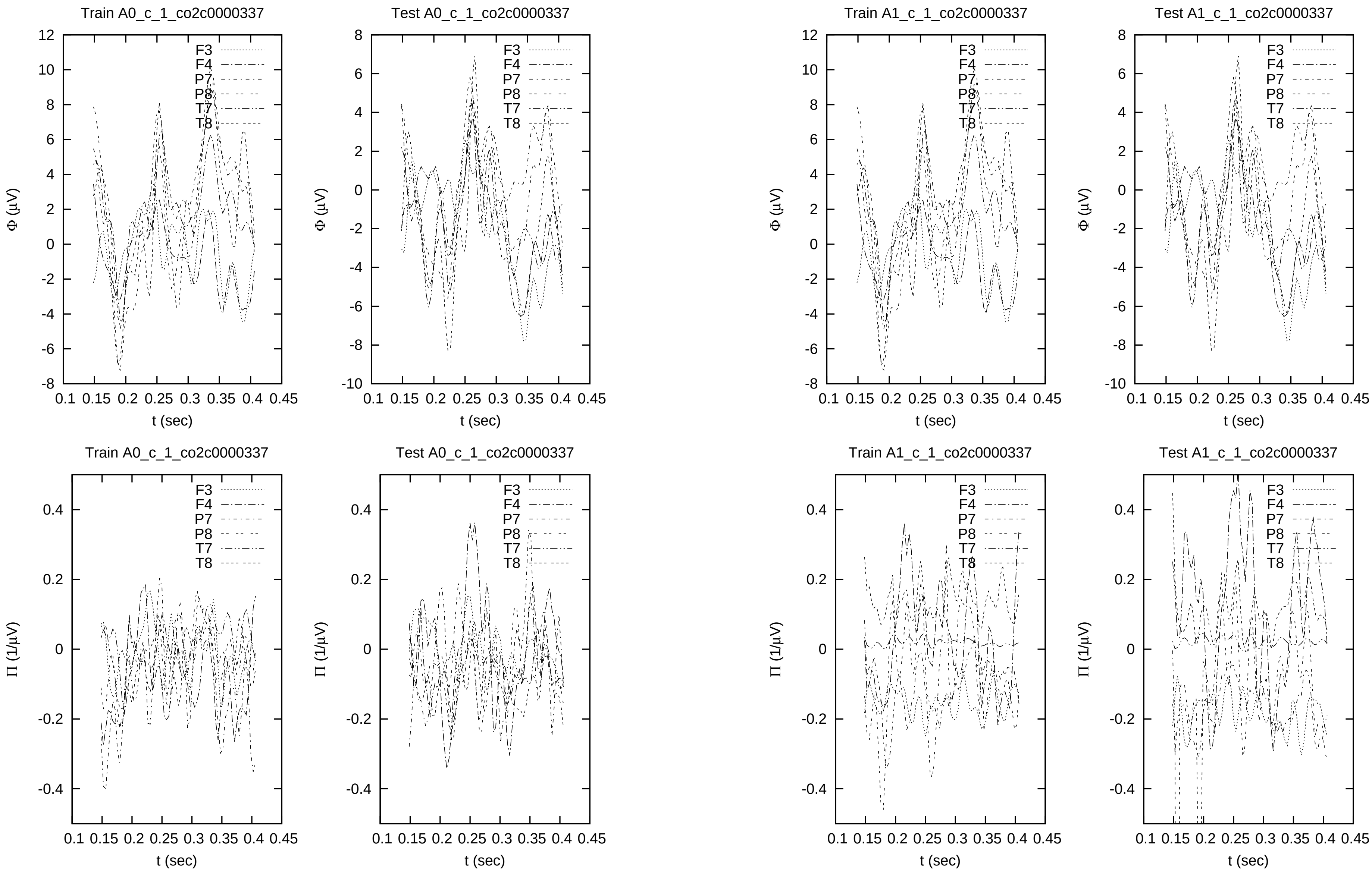

Train A0_a_n_co2a0000375
Test A0_a_n_co2a0000375
Train A1_a_n_co2a0000375
Test A1_a_n_co2a0000375
Φ (μV)
Π (1/μV)
t (sec)
F3
F4
P7
P8
T7
T8
0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45
1 0 -1 -2 -3 -4 -5 -6 -7 -8
4 2 0 -2 -4 -6 -8 -10 -12 -14
0.4 0.2 0 -0.2 -0.4



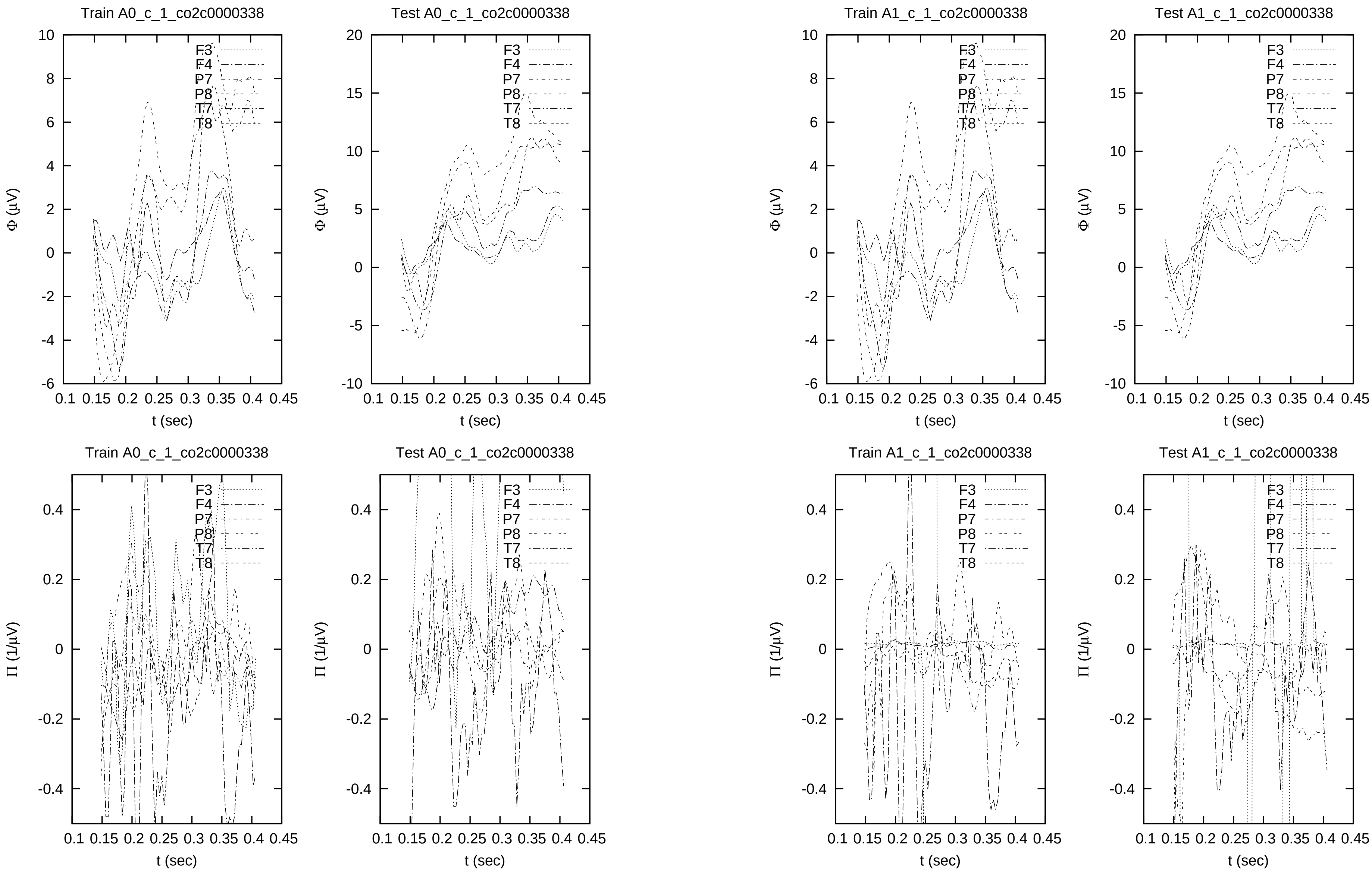
Train A0_a_n_co2a0000377
Test A0_a_n_co2a0000377
Train A1_a_n_co2a0000377
Test A1_a_n_co2a0000377
F3
F4
P7
P8
T7
T8
Φ (µV)
Π (1/µV)
t (sec)



Train A0_a_n_co2a0000378
Test A0_a_n_co2a0000378
Train A1_a_n_co2a0000378
Test A1_a_n_co2a0000378
F3
F4
P7
P8
T7
T8
Φ (μV)
Π (1/μV)
t (sec)



Train A0_c_1_co2c0000337
Test A0_c_1_co2c0000337
Train A1_c_1_co2c0000337
Test A1_c_1_co2c0000337
F3
F4
P7
P8
T7
T8
Φ (μV)
Π (1/μV)
t (sec)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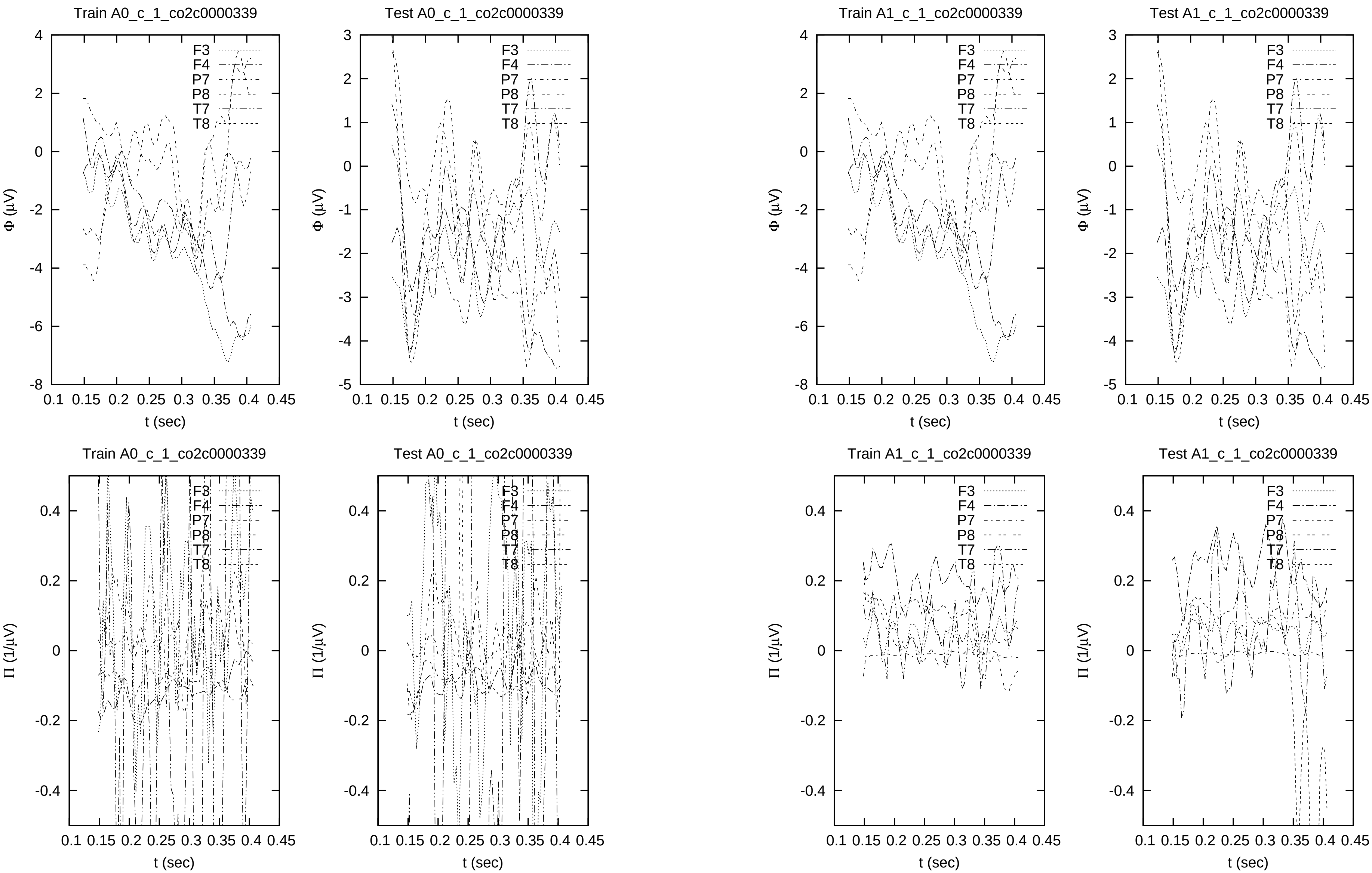
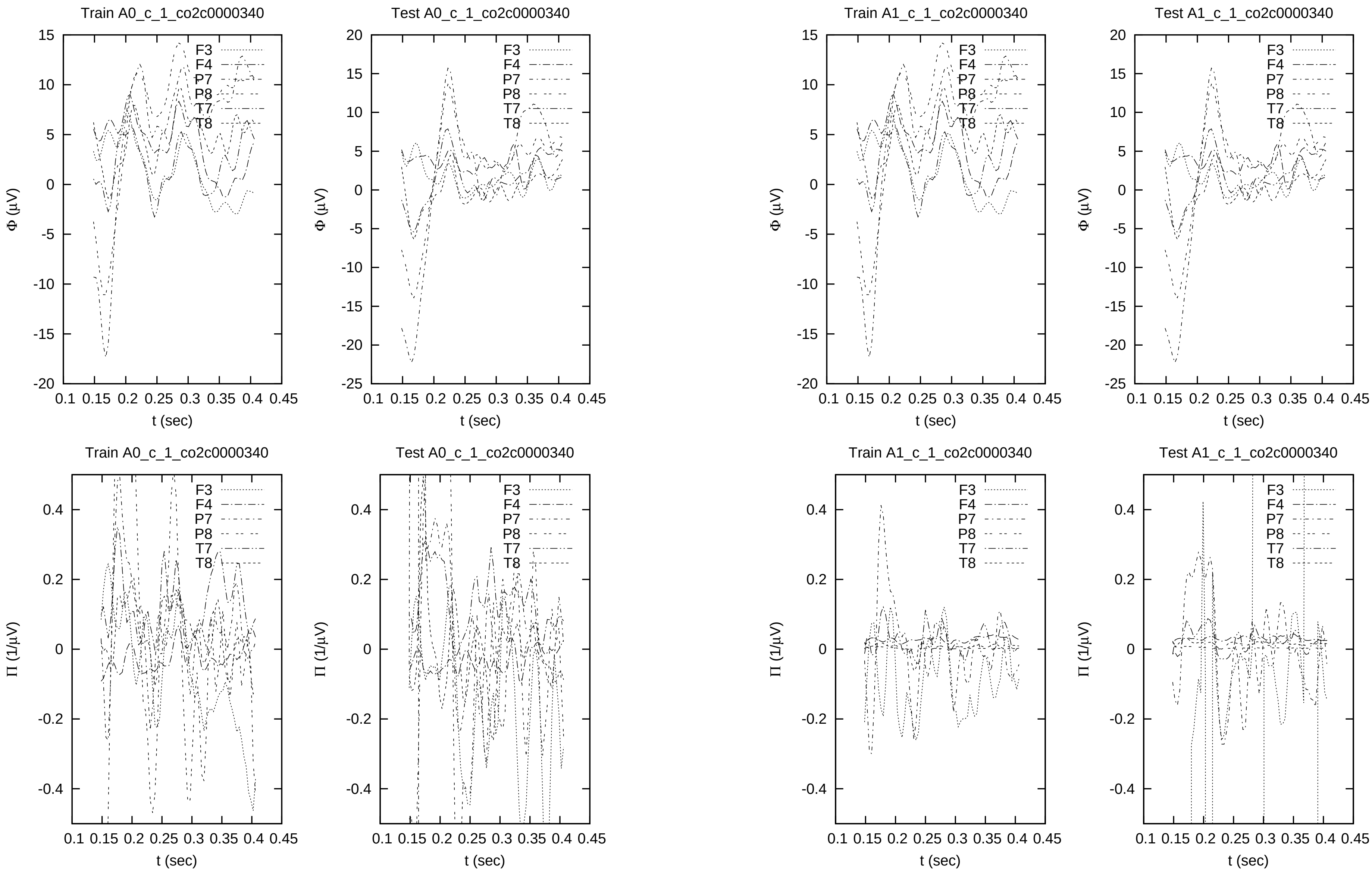
Test A0_c_1_co2c0000338
Train A1_c_1_co2c0000338
Test A1_c_1_co2c0000338
Φ (μV)
Π (1/μV)
t (sec)
F3
F4
P7
P8
T7
T8
0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45


Train A0_c_1_co2c0000339
Test A0_c_1_co2c0000339
Train A1_c_1_co2c0000339
Test A1_c_1_co2c0000339
F3
F4
P7
P8
T7
T8
Φ (μV)
Π (1/μV)
t (sec)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Test A0_c_1_co2c0000340
Train A1_c_1_co2c0000340
Test A1_c_1_co2c0000340
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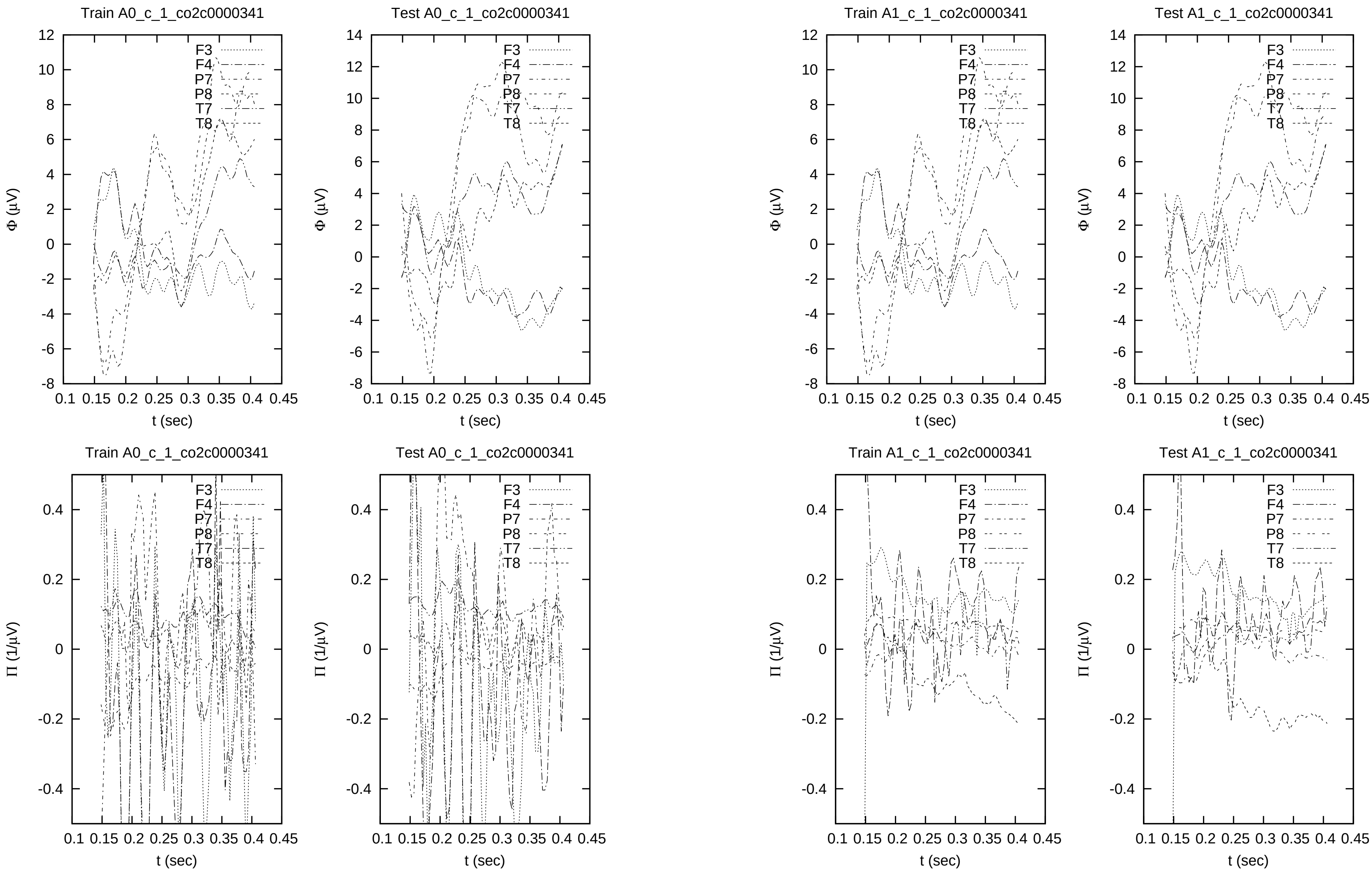
T7
T8
Φ (μV)
Π (1/μV)
t (sec)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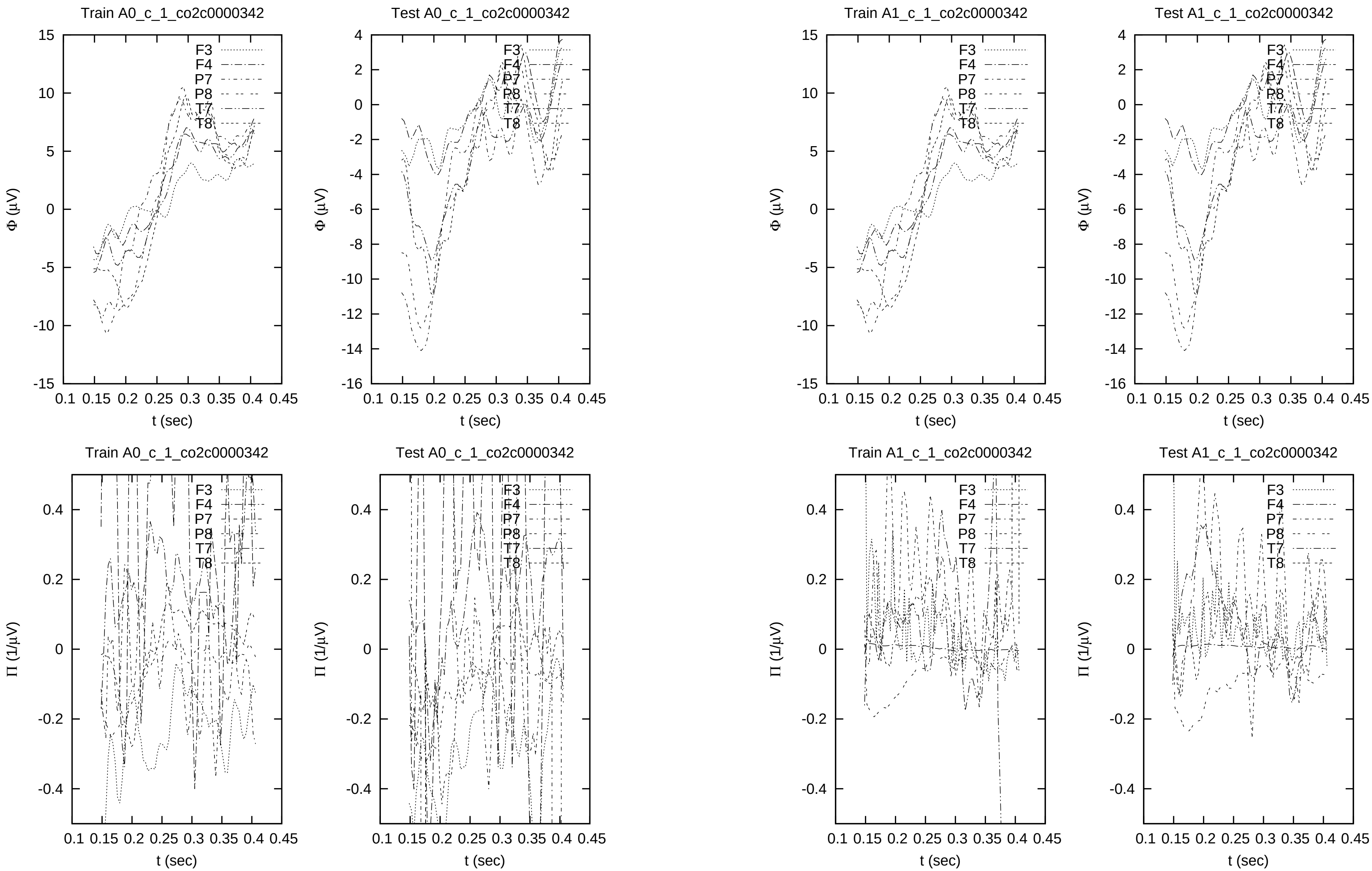
Test A0_c_1_co2c0000341
Train A1_c_1_co2c0000341
Test A1_c_1_co2c0000341
Φ (μV)
Π (1/μV)
t (sec)
F3
F4
P7
P8
T7
T8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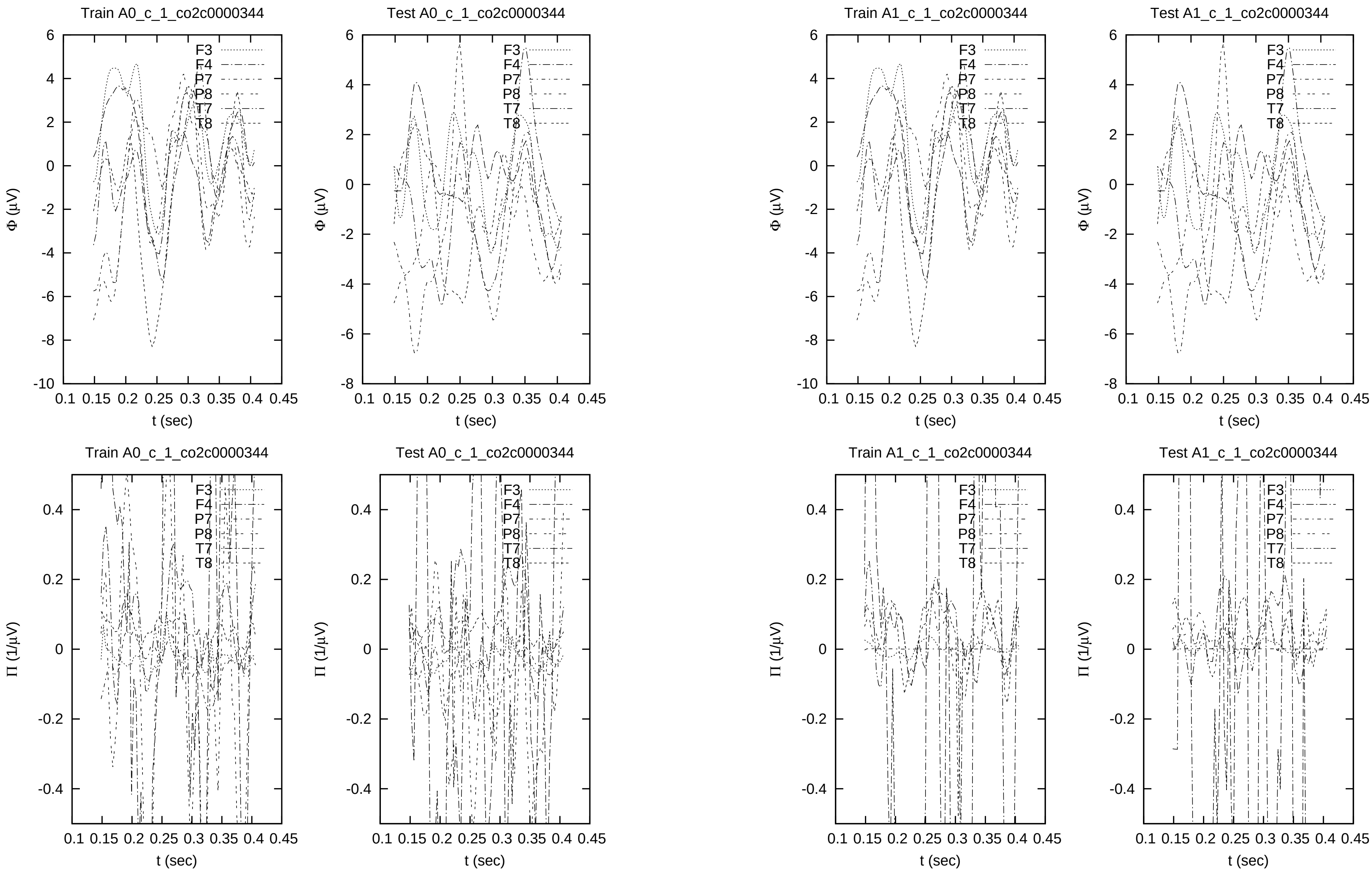
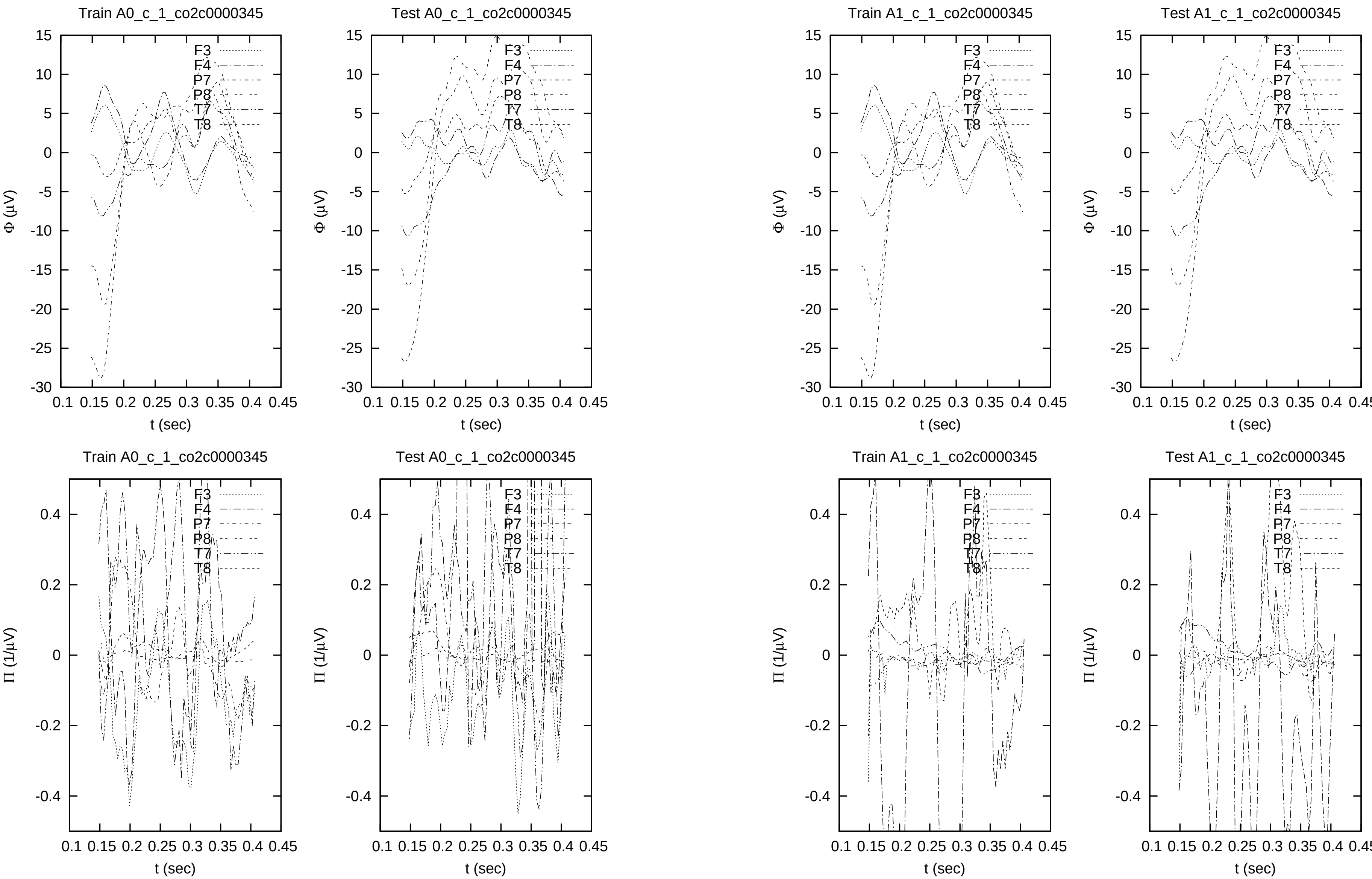
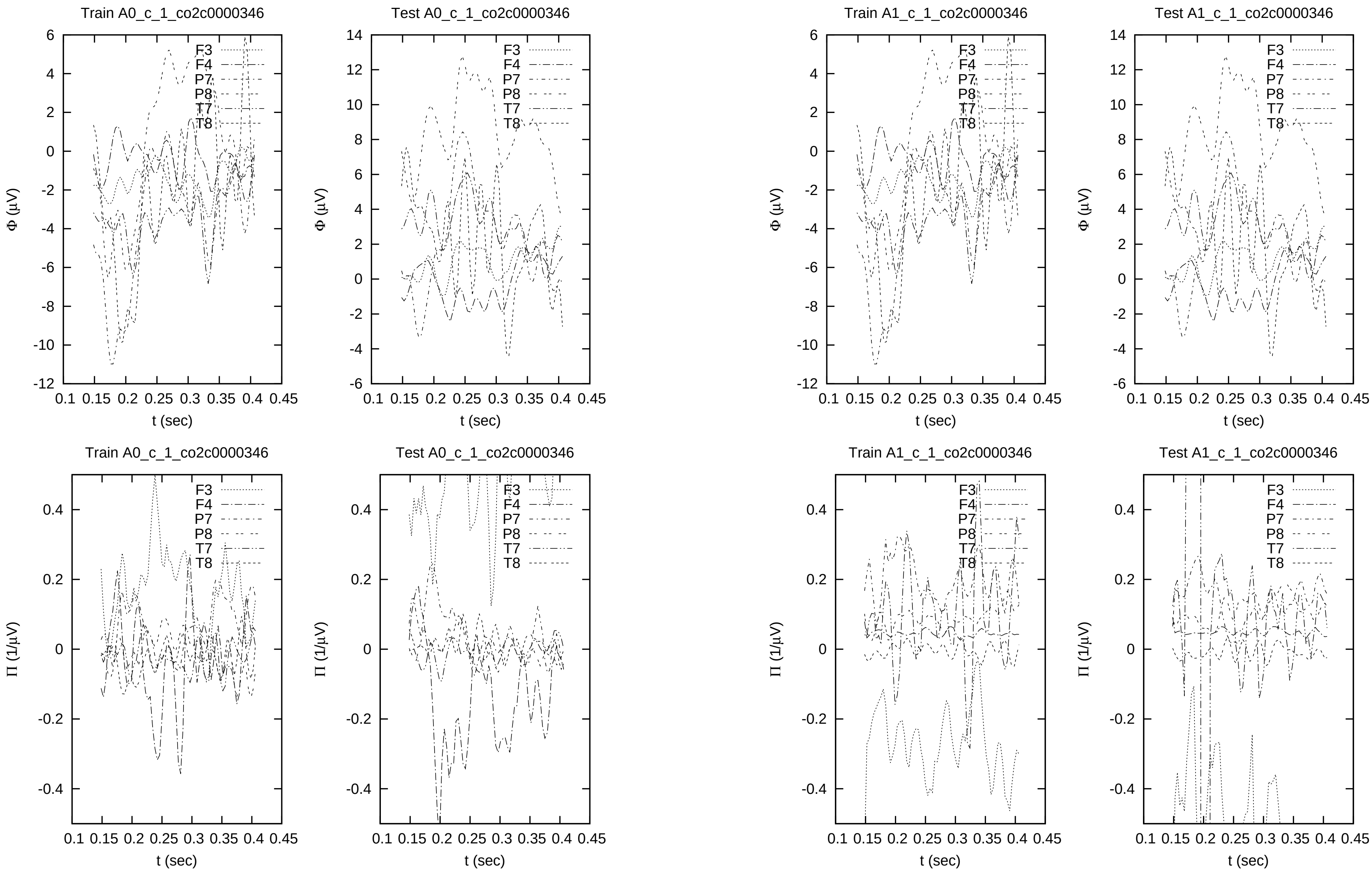
Test A0_c_1_co2c0000342
Train A1_c_1_co2c0000342
Test A1_c_1_co2c0000342
F3
F4
P7
P8
T7
T8
Φ (µV)
Π (1/µV)
t (sec)



Train A0_c_1_co2c0000344
Test A0_c_1_co2c0000344
Train A1_c_1_co2c0000344
Test A1_c_1_co2c0000344
F3
F4
P7
P8
T7
T8
Φ (µV)
Π (1/µV)
t (sec)


Train A0_c_1_co2c0000345
Test A0_c_1_co2c0000345
Train A1_c_1_co2c0000345
Test A1_c_1_co2c0000345
F3
F4
P7
P8
T7
T8
Φ (µV)
Π (1/µV)
t (sec)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Test A0_c_1_co2c0000346
Train A1_c_1_co2c0000346
Test A1_c_1_co2c0000346
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Π (1/µV)
t (sec)
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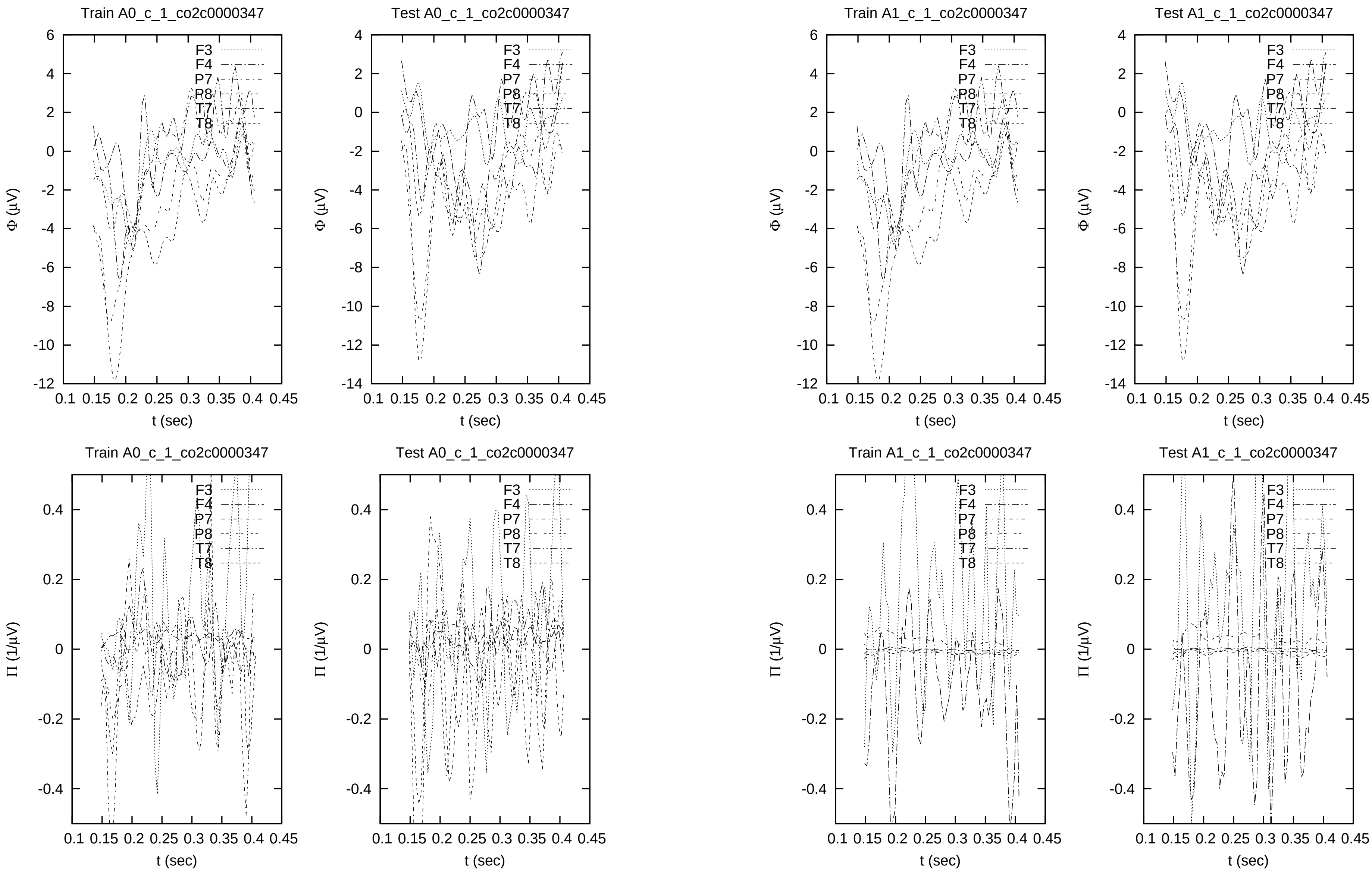
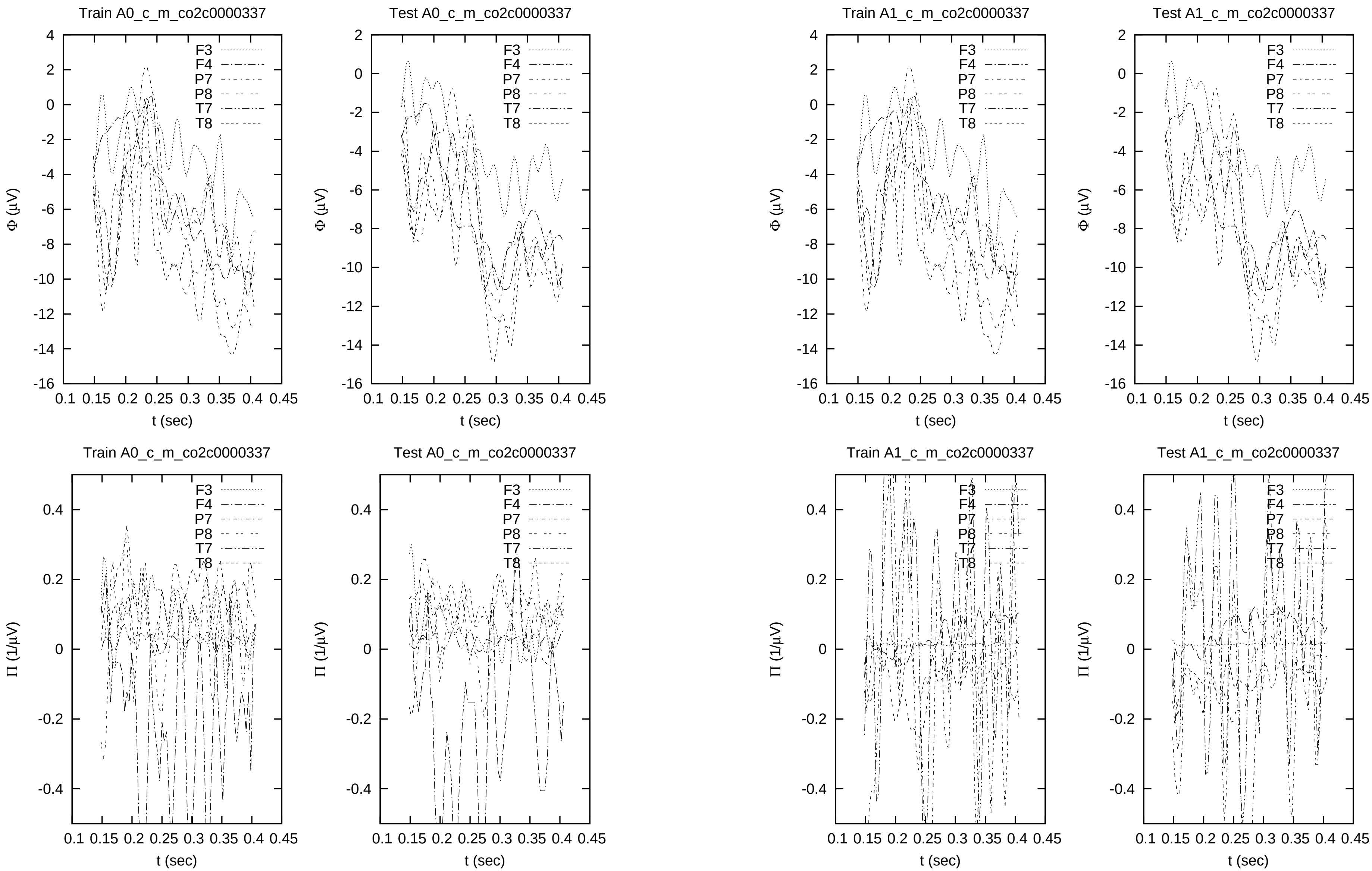
P7
P8
T7
T8



Train A0_c_1_co2c0000347
Test A0_c_1_co2c0000347
Train A1_c_1_co2c0000347
Test A1_c_1_co2c0000347
Φ (μV)
t (sec)
F3
F4
P7
P8
T7
T8
Train A0_c_1_co2c0000347
Test A0_c_1_co2c0000347
Train A1_c_1_co2c0000347
Test A1_c_1_co2c0000347
Π (1/μV)
t (sec)
F3
F4
P7
P8
T7
T8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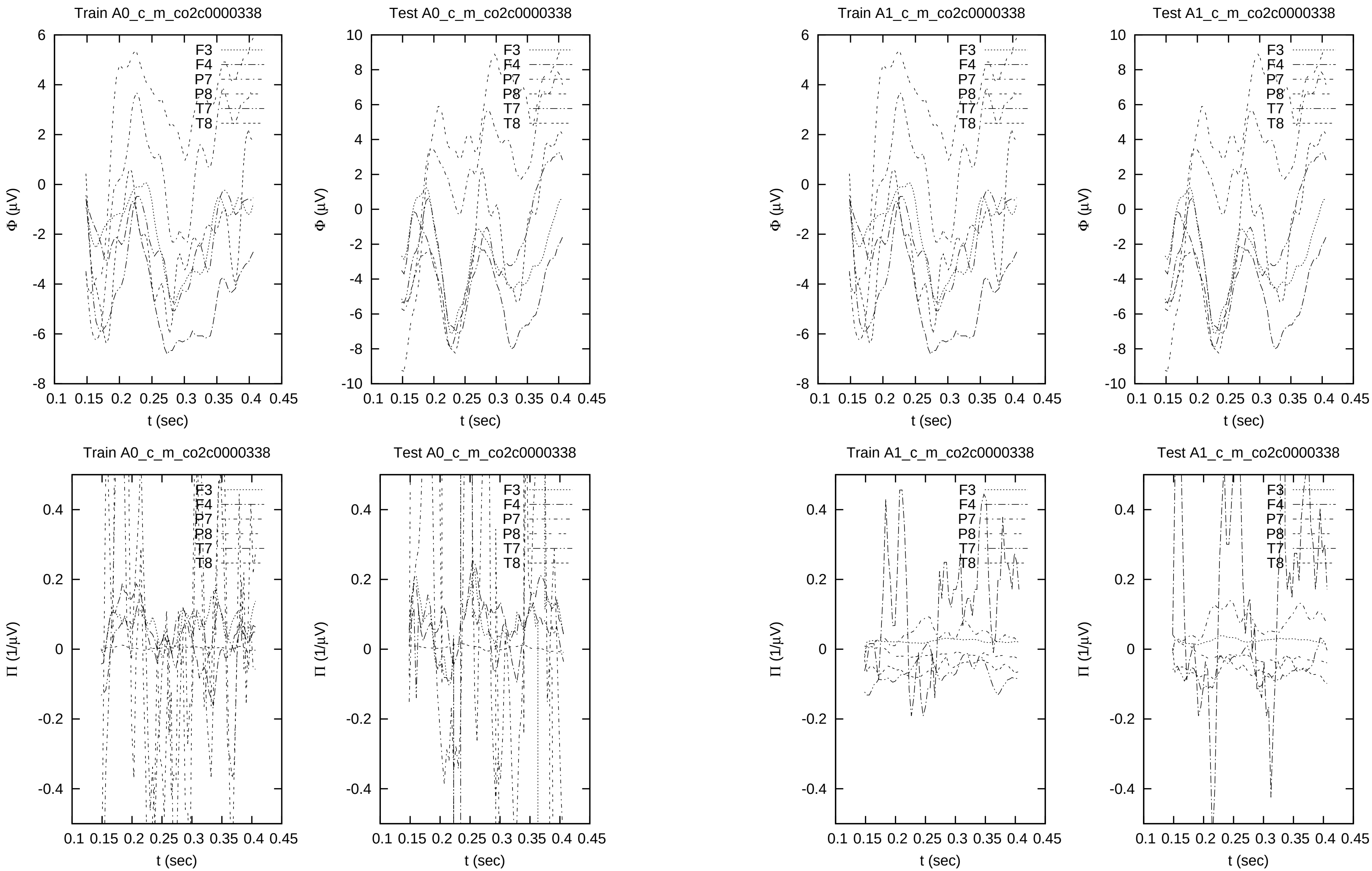
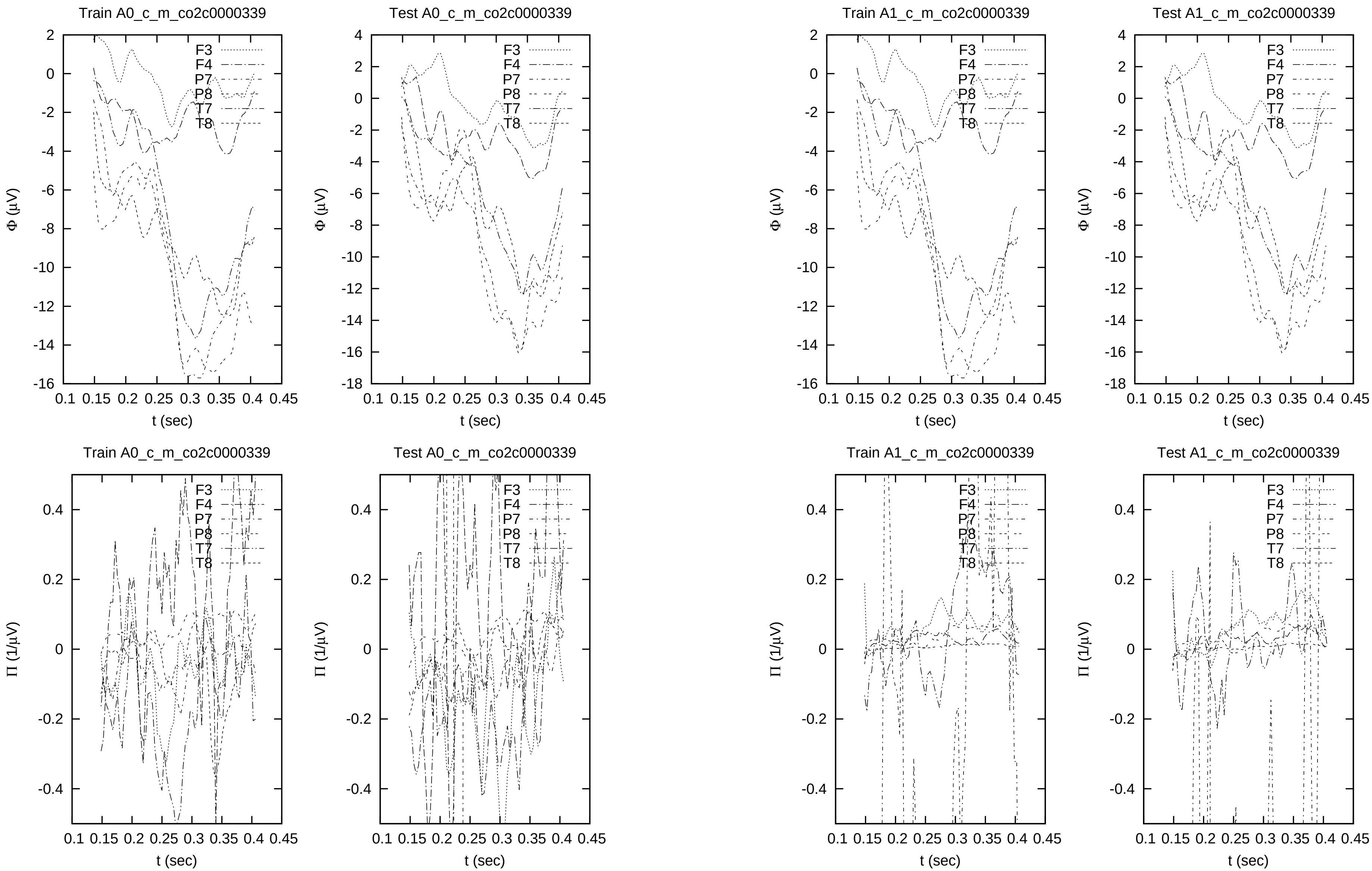
Test A0_c_m_co2c0000337
Train A1_c_m_co2c0000337
Test A1_c_m_co2c0000337
Φ (µV)
Π (1/µV)
t (sec)
F3
F4
P7
P8
T7
T8


Train A0_c_m_co2c0000338
Test A0_c_m_co2c0000338
Train A1_c_m_co2c0000338
Test A1_c_m_co2c0000338
F3
F4
P7
P8
T7
T8
Φ (µV)
Π (1/µV)
t (sec)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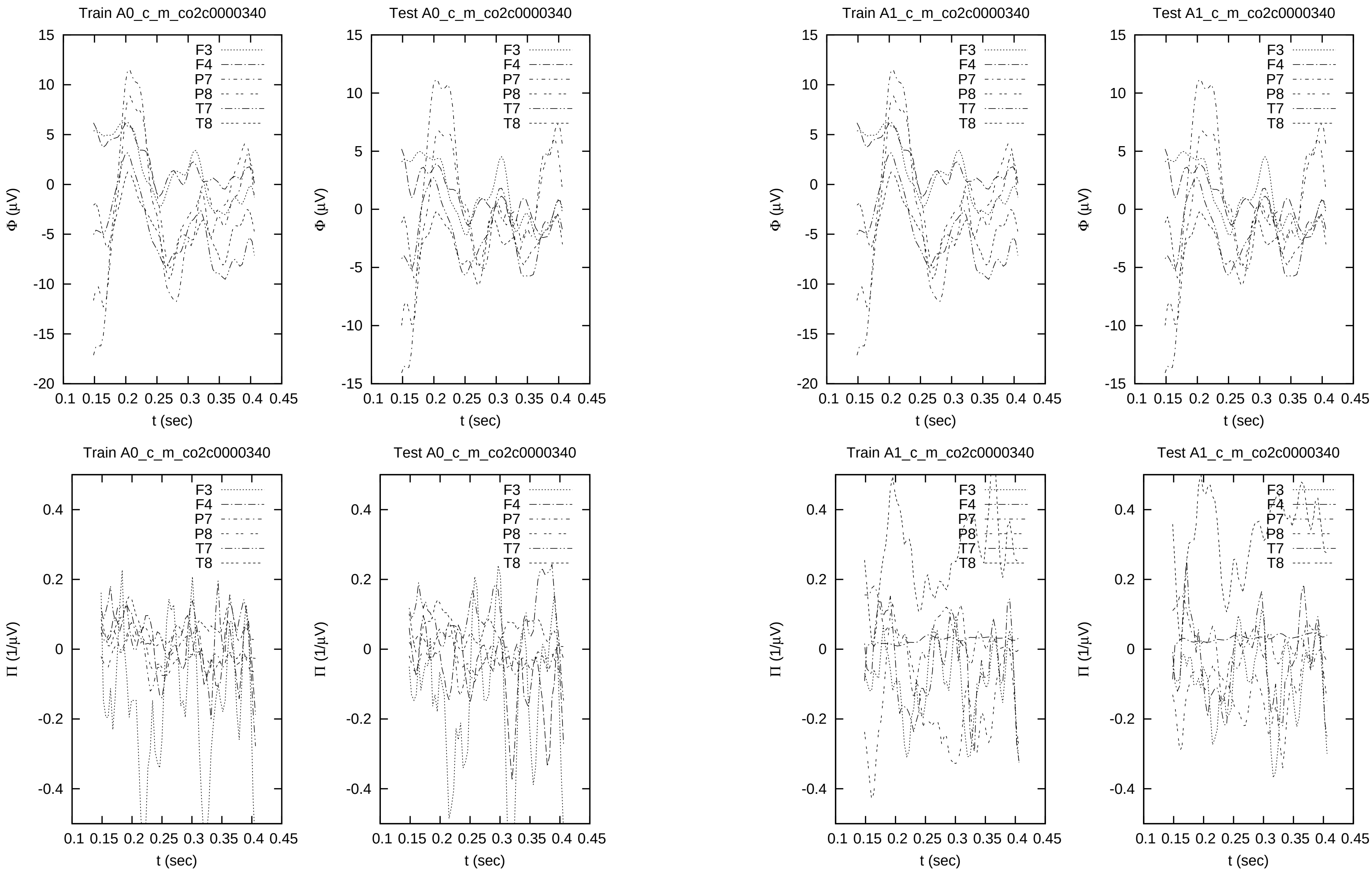
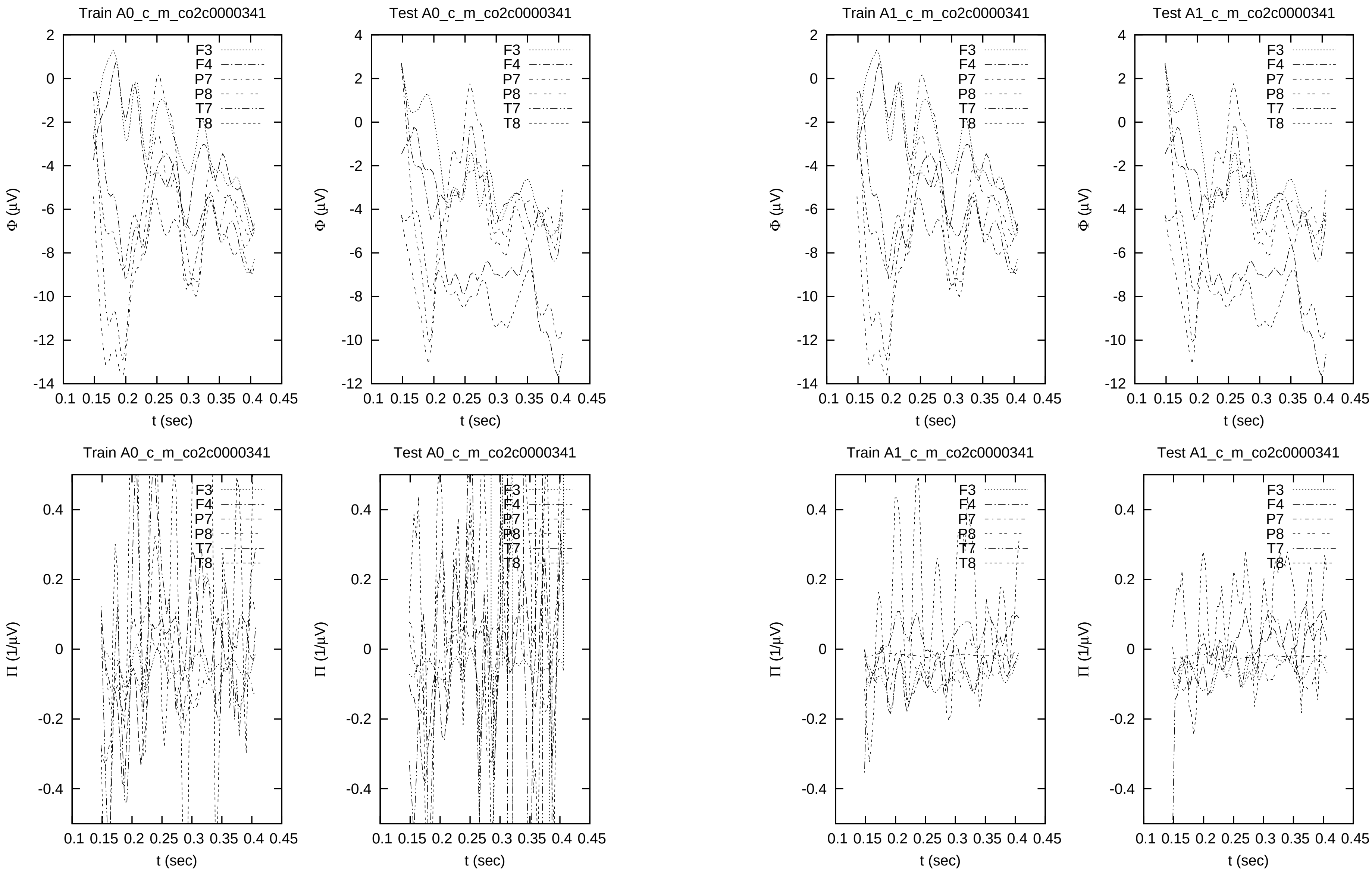
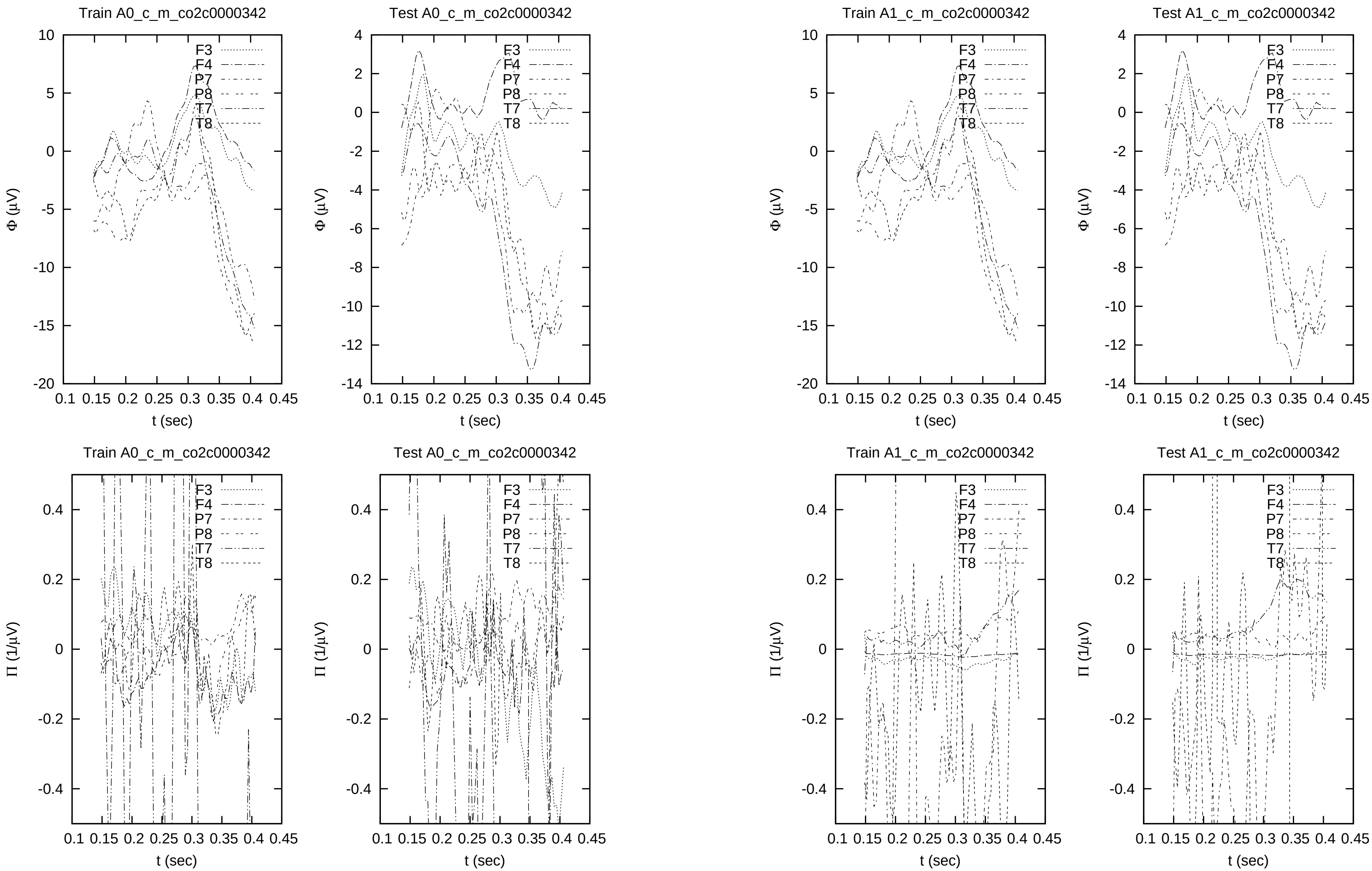
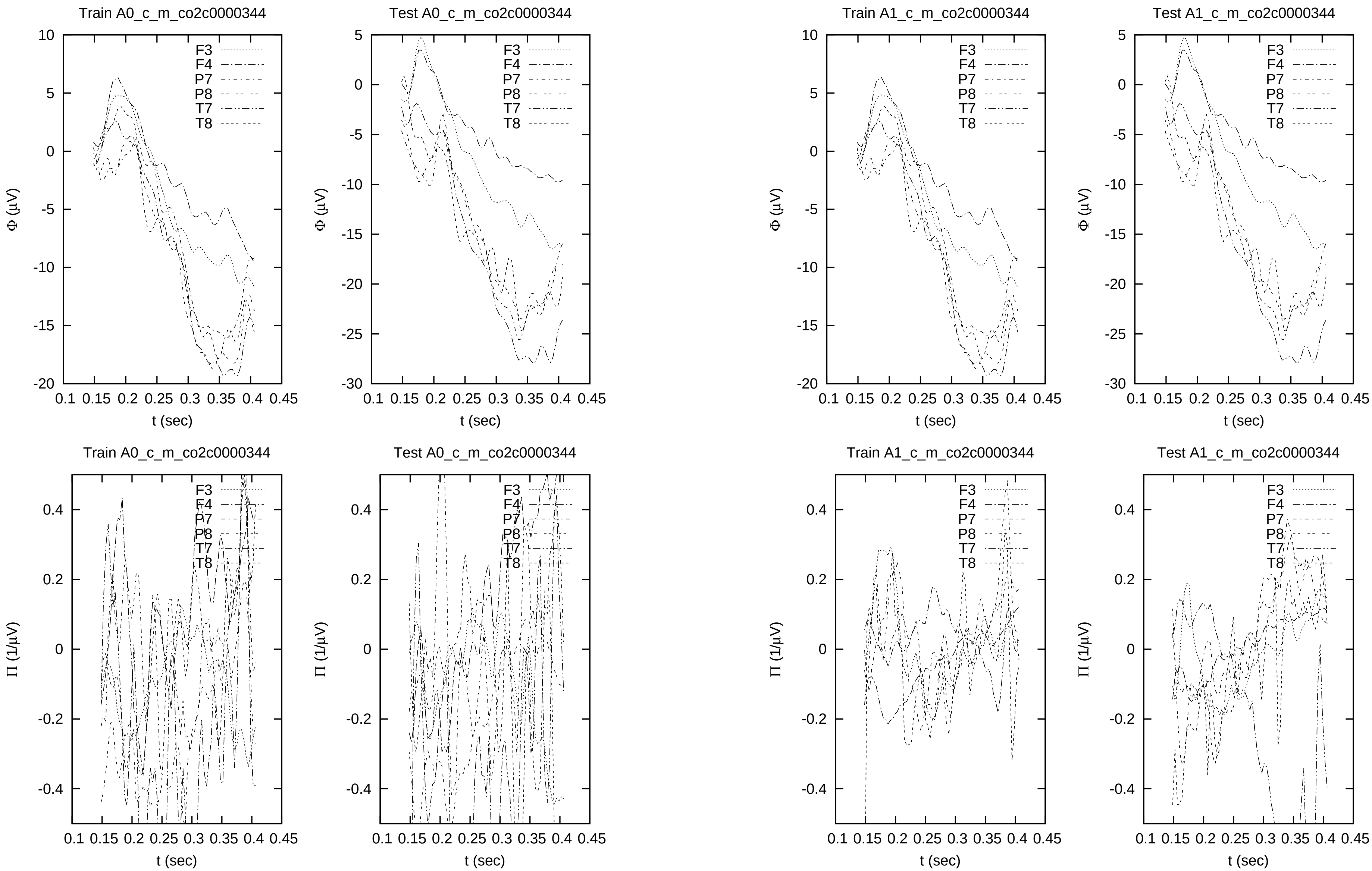
Test A0_c_m_co2c0000339
Train A1_c_m_co2c0000339
Test A1_c_m_co2c0000339
F3
F4
P7
P8
T7
T8
Φ (μV)
Π (1/μV)
t (sec)


Train A0_c_m_co2c0000340
Test A0_c_m_co2c0000340
Train A1_c_m_co2c0000340
Test A1_c_m_co2c0000340
Φ (µV)
Π (1/µV)
t (sec)
F3
F4
P7
P8
T7
T8

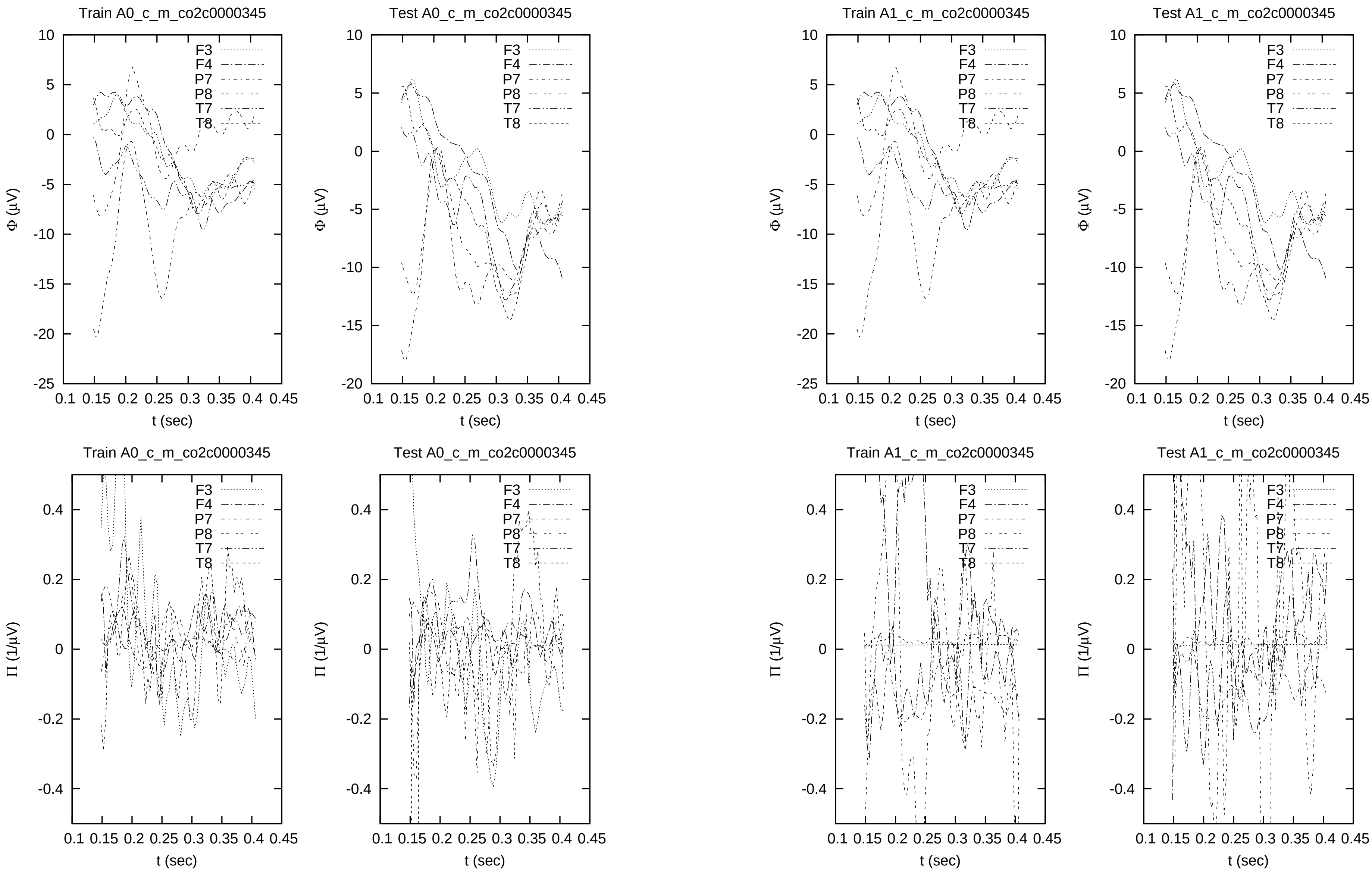


Train A0_c_m_co2c0000341
Test A0_c_m_co2c0000341
Train A1_c_m_co2c0000341
Test A1_c_m_co2c0000341
Φ (μV)
Π (1/μV)
t (sec)
F3
F4
P7
P8
T7
T8

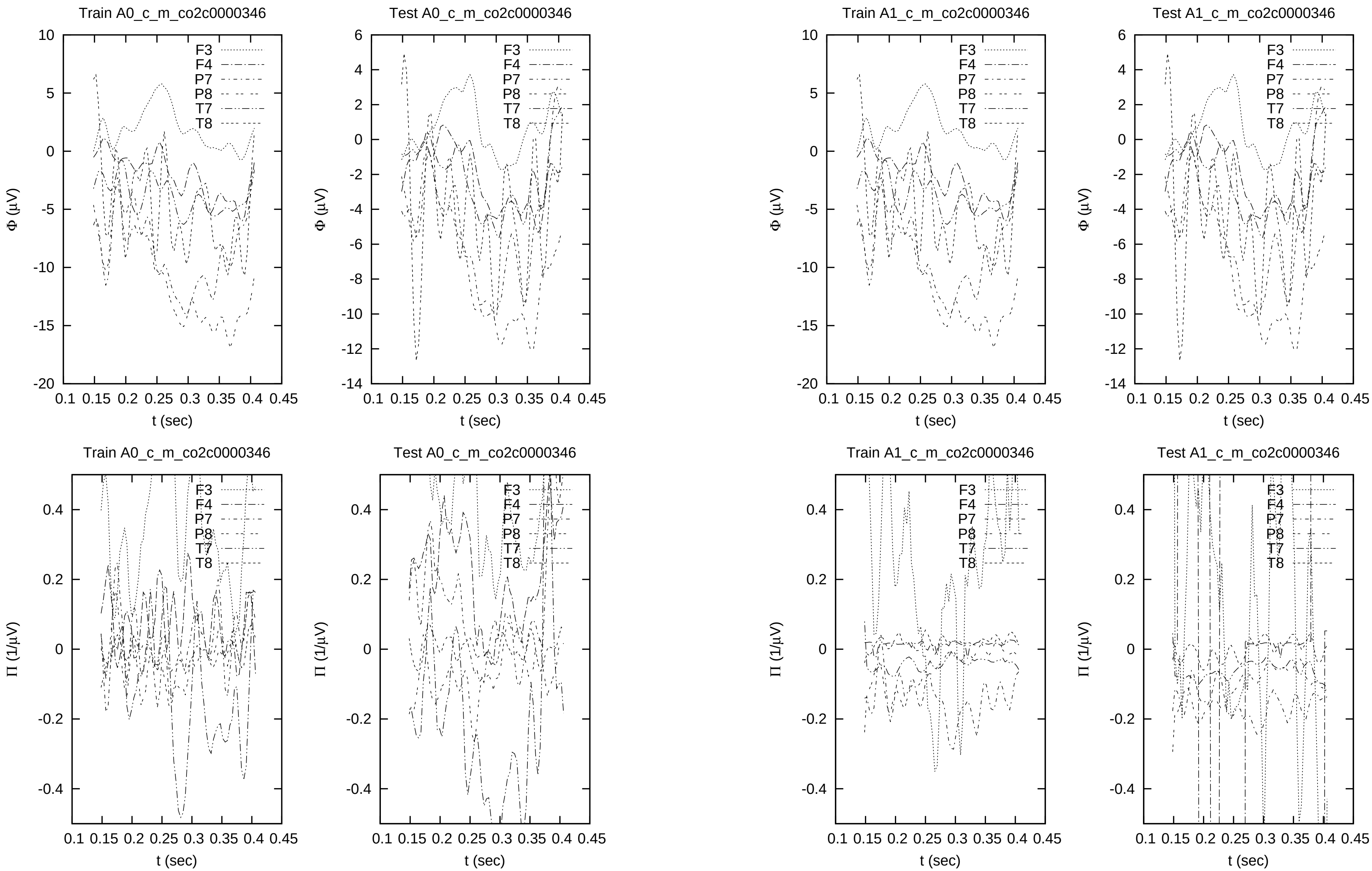

Train A0_c_m_co2c0000342
Test A0_c_m_co2c0000342
Train A1_c_m_co2c0000342
Test A1_c_m_co2c0000342
F3
F4
P7
P8
T7
T8
Φ (µV)
Π (1/µV)
t (sec)

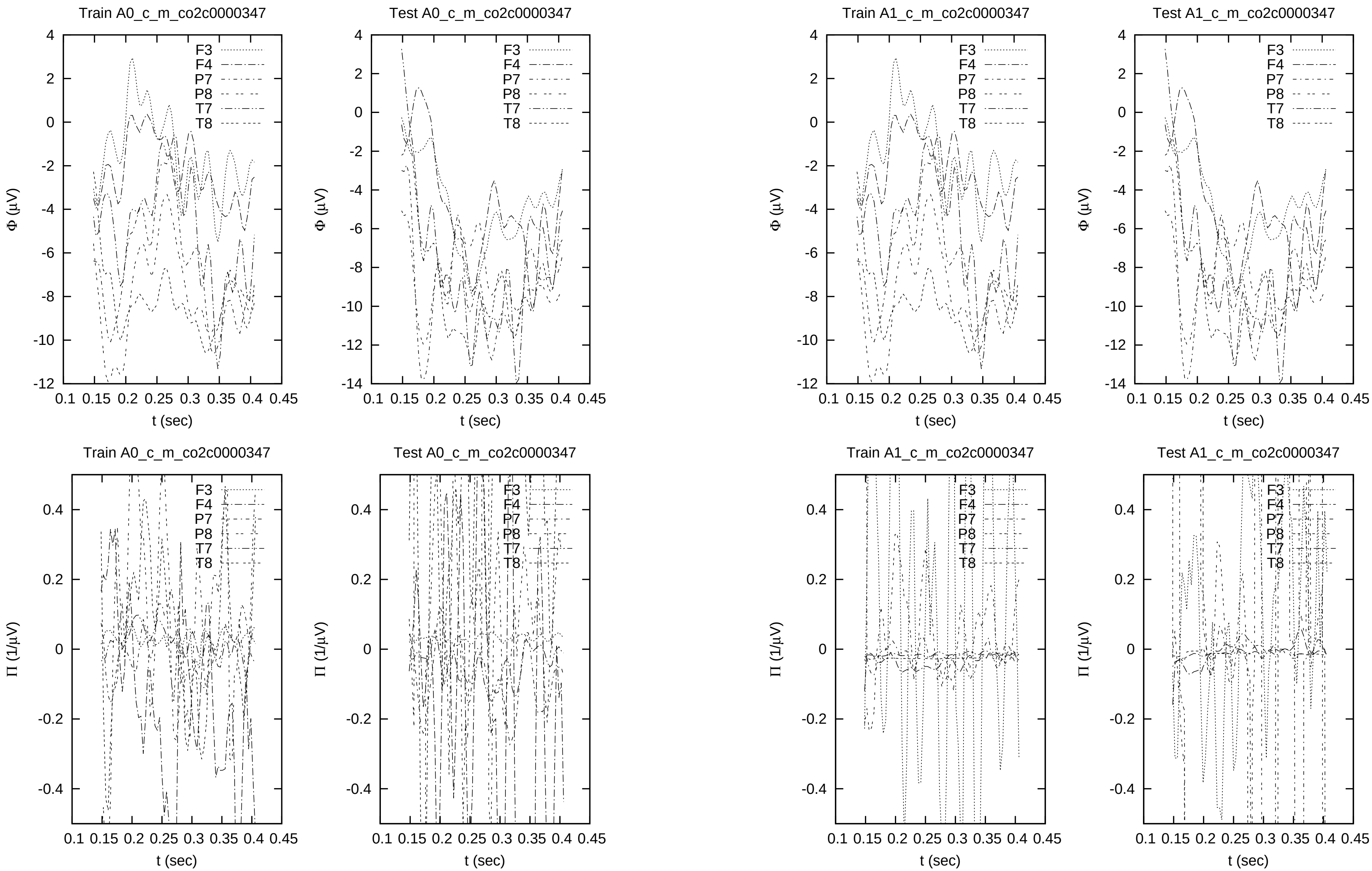


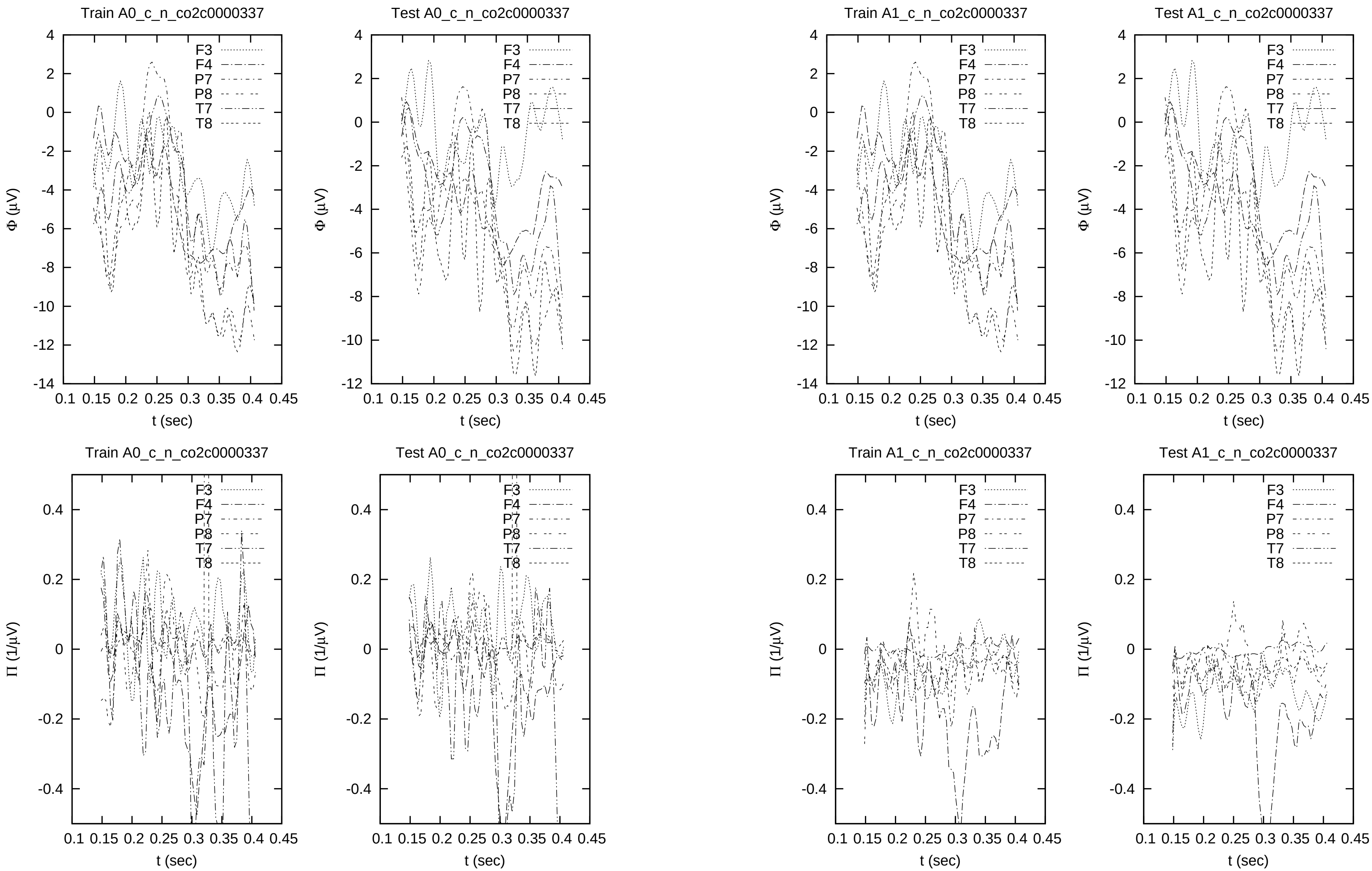
Train A0_c_m_co2c0000344
Test A0_c_m_co2c0000344
Train A1_c_m_co2c0000344
Test A1_c_m_co2c0000344
F3
F4
P7
P8
T7
T8
Φ (μV)
Π (1/μV)
t (sec)



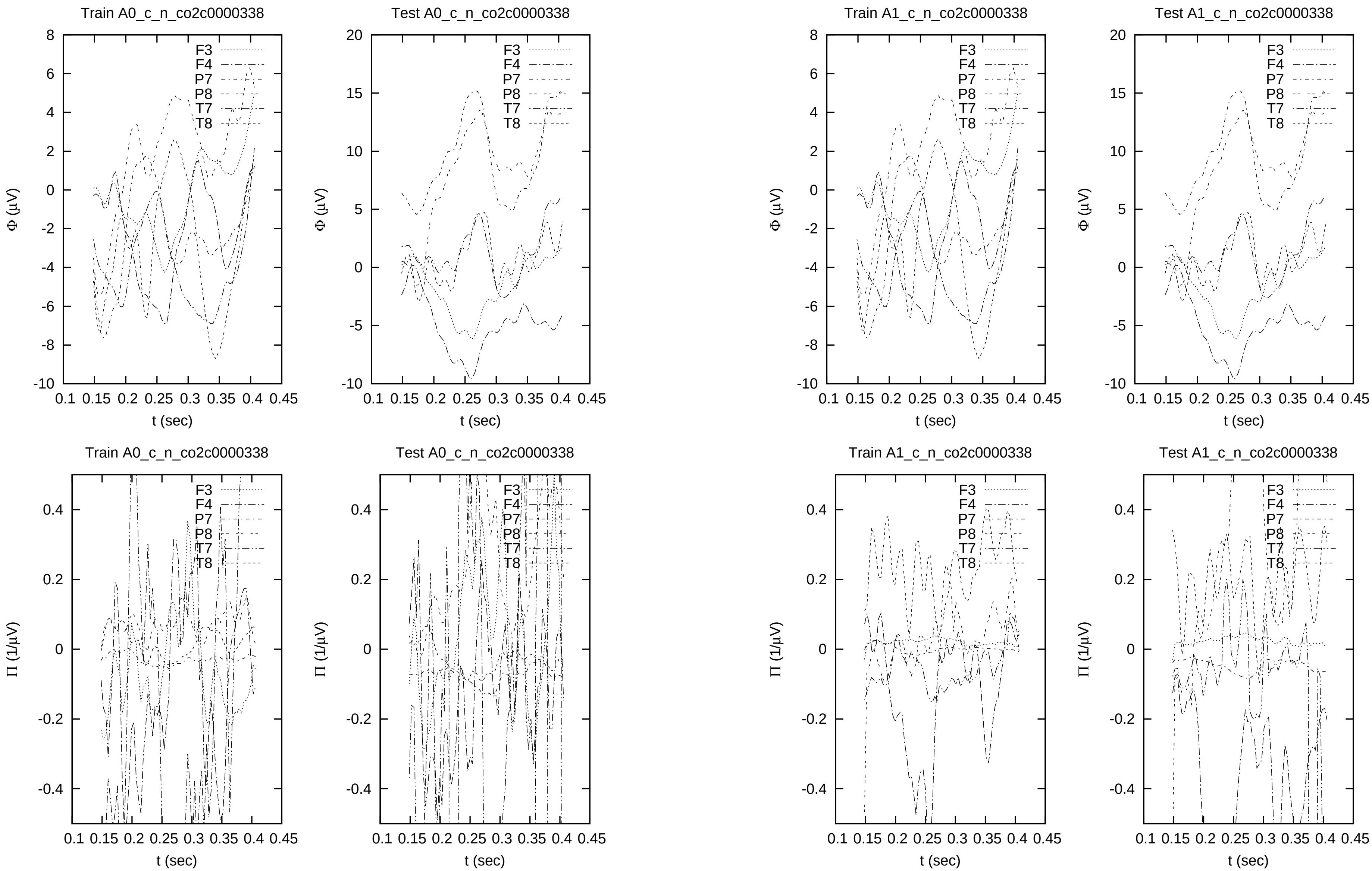
Train A0_c_m_co2c0000345
Test A0_c_m_co2c0000345
Train A1_c_m_co2c0000345
Test A1_c_m_co2c0000345
F3
F4
P7
P8
T7
T8
Φ (µV)
Π (1/µV)
t (sec)


Train A0_c_m_co2c0000346
Test A0_c_m_co2c0000346
Train A1_c_m_co2c0000346
Test A1_c_m_co2c0000346
F3
F4
P7
P8
T7
T8
Φ (μV)
Π (1/μV)
t (sec)


Train A0_c_m_co2c0000347
Test A0_c_m_co2c0000347
Train A1_c_m_co2c0000347
Test A1_c_m_co2c0000347
F3
F4
P7
P8
T7
T8
Φ (μV)
t (sec)
Train A0_c_m_co2c0000347
Test A0_c_m_co2c0000347
Train A1_c_m_co2c0000347
Test A1_c_m_co2c0000347
Π (1/μV)
t (sec)



Train A0_c_n_co2c0000337
Test A0_c_n_co2c0000337
Train A1_c_n_co2c0000337
Test A1_c_n_co2c0000337
F3
F4
P7
P8
T7
T8
Φ (µV)
Π (1/µV)
t (sec)
0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45
4 2 0 -2 -4 -6 -8 -10 -12 -14
0.4 0.2 0 -0.2 -0.4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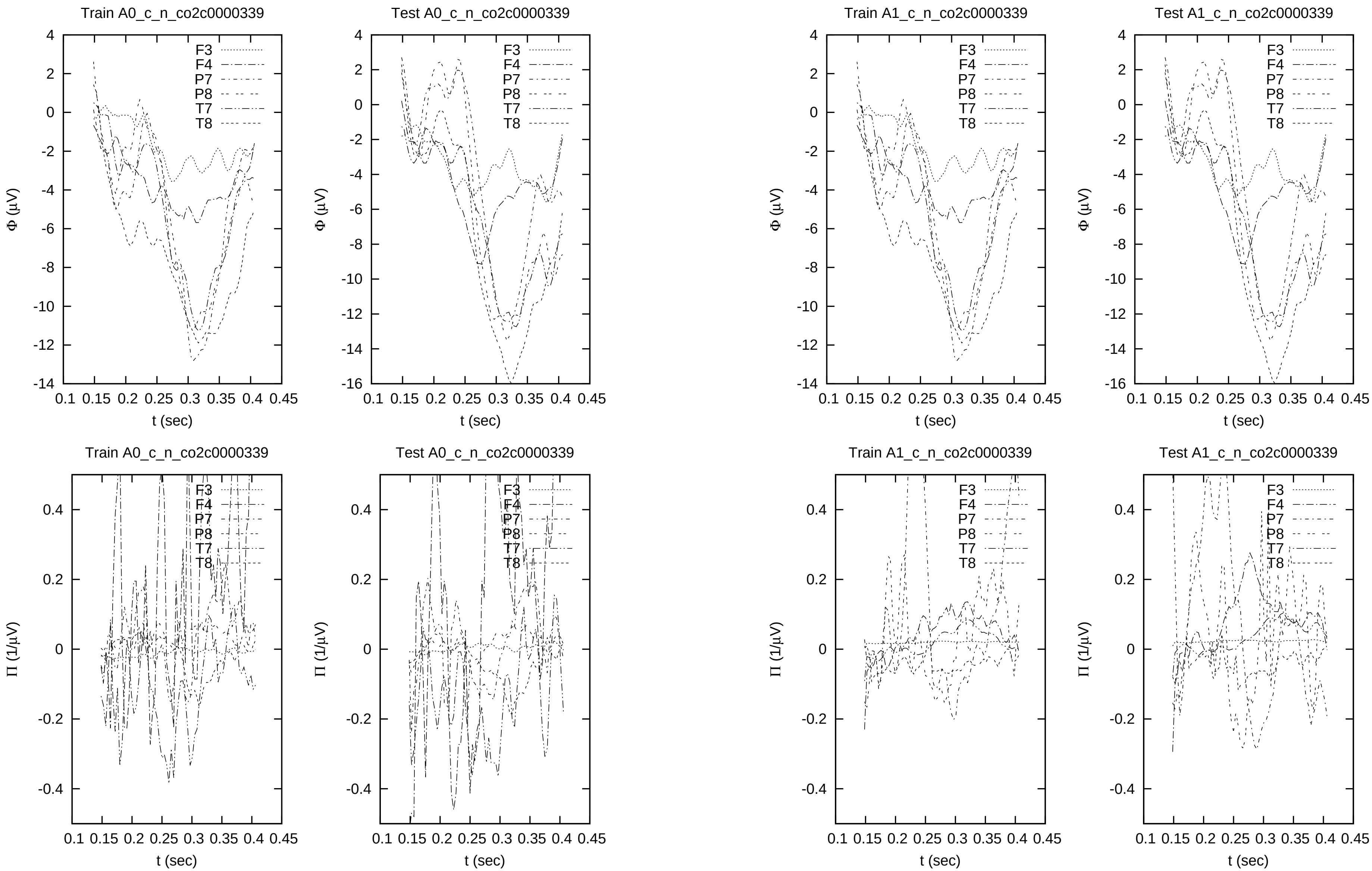
Test A0_c_n_co2c0000338
Train A1_c_n_co2c0000338
Test A1_c_n_co2c0000338
Φ (μV)
t (sec)
Train A0_c_n_co2c0000338
Test A0_c_n_co2c0000338
Train A1_c_n_co2c0000338
Test A1_c_n_co2c0000338
Π (1/μV)
t (sec)
F3
F4
P7
P8
T7
T8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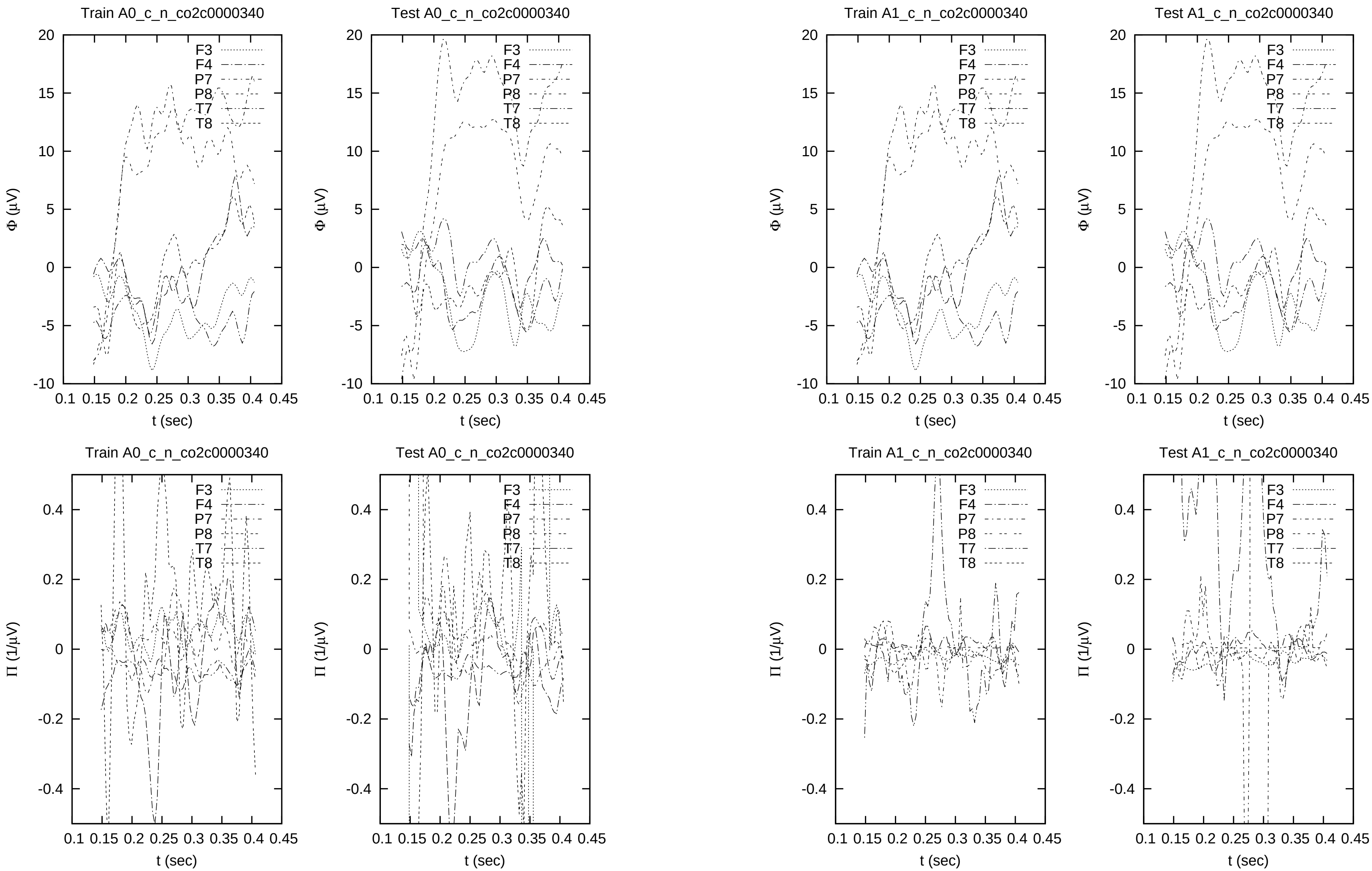
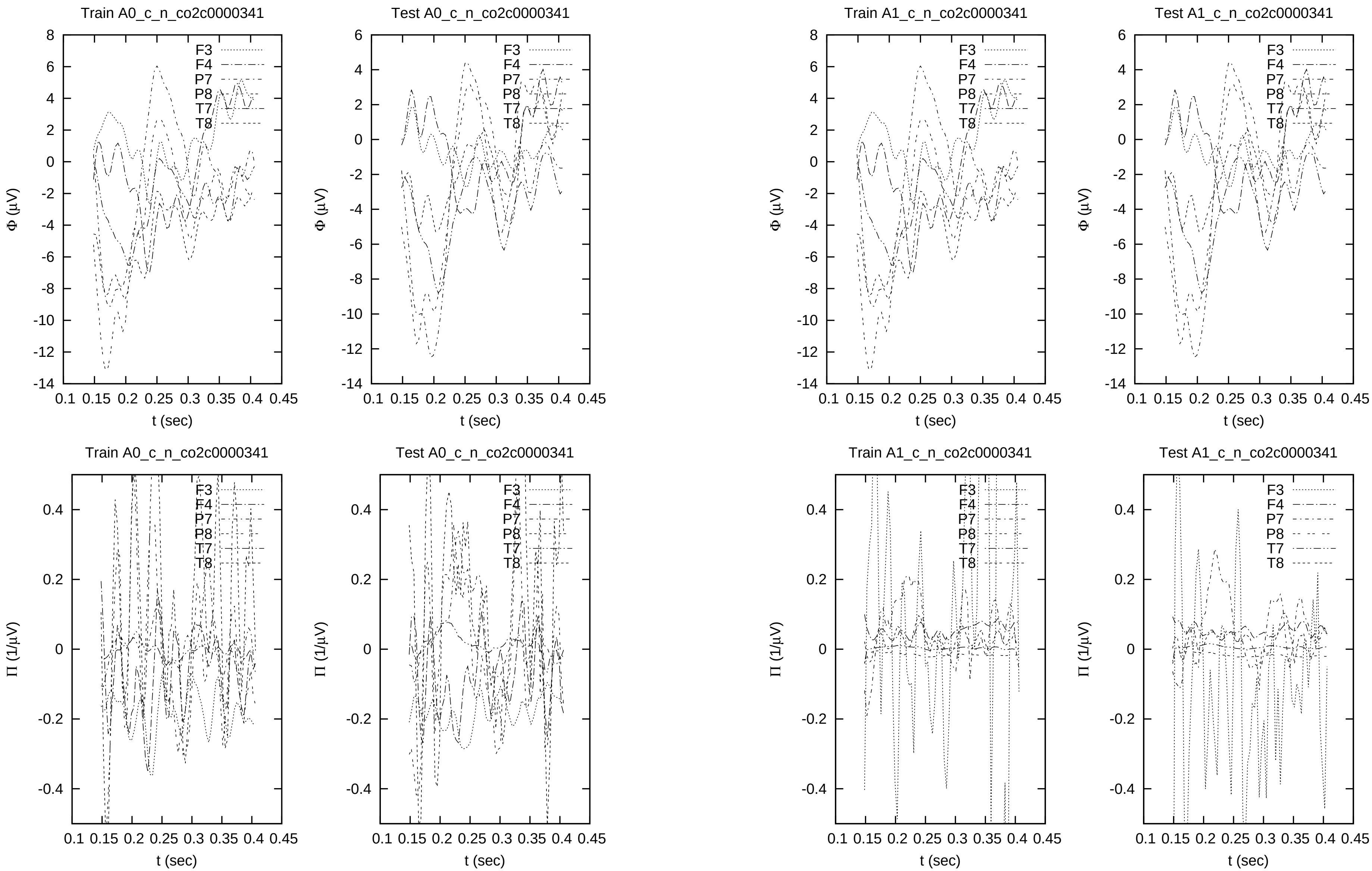
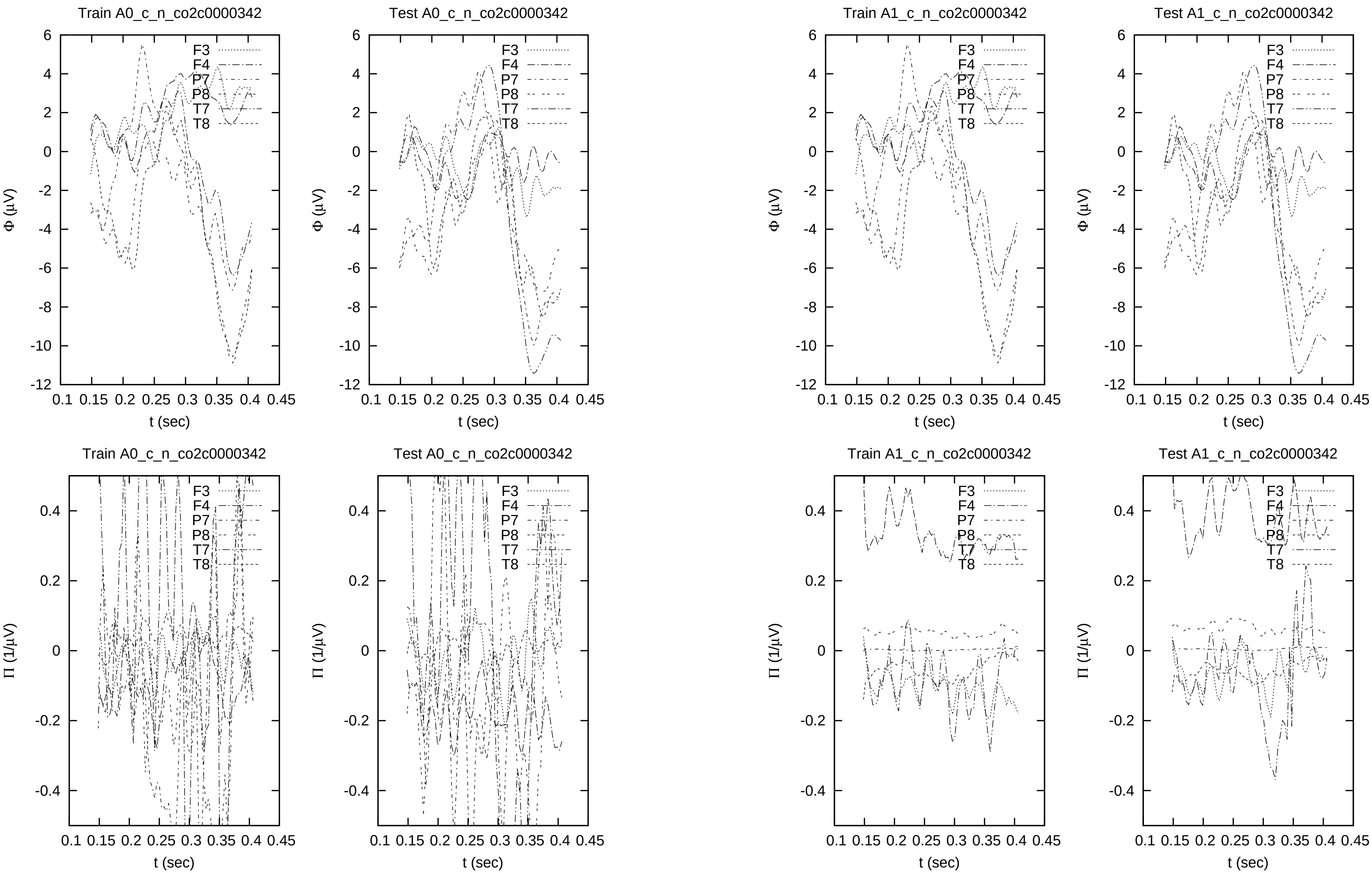
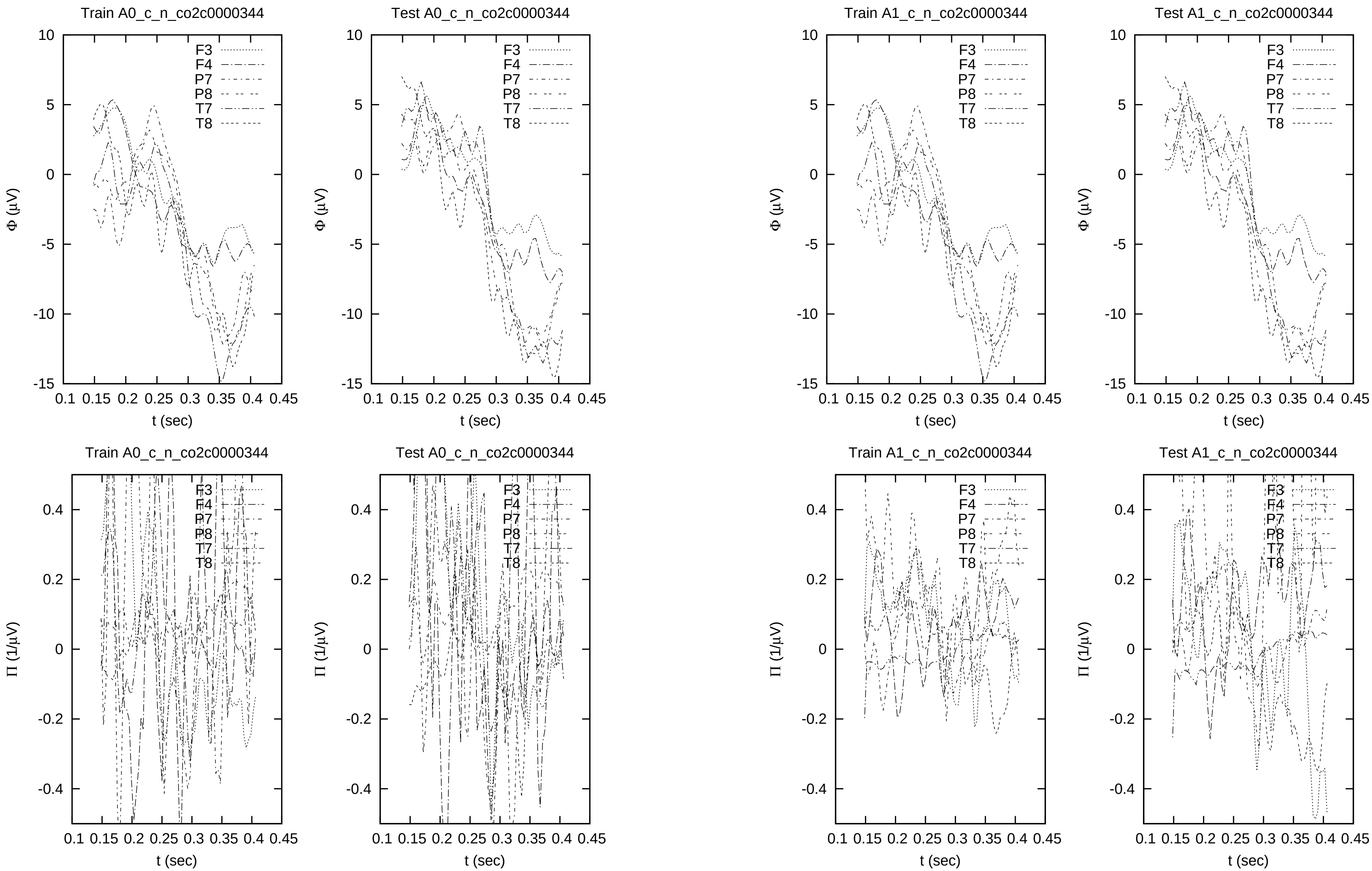
Test A0_c_n_co2c0000339
Train A1_c_n_co2c0000339
Test A1_c_n_co2c0000339
Φ (µV)
Π (1/µV)
t (sec)
F3
F4
P7
P8
T7
T8
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
0.4
0.2
-0.2
-0.4
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45

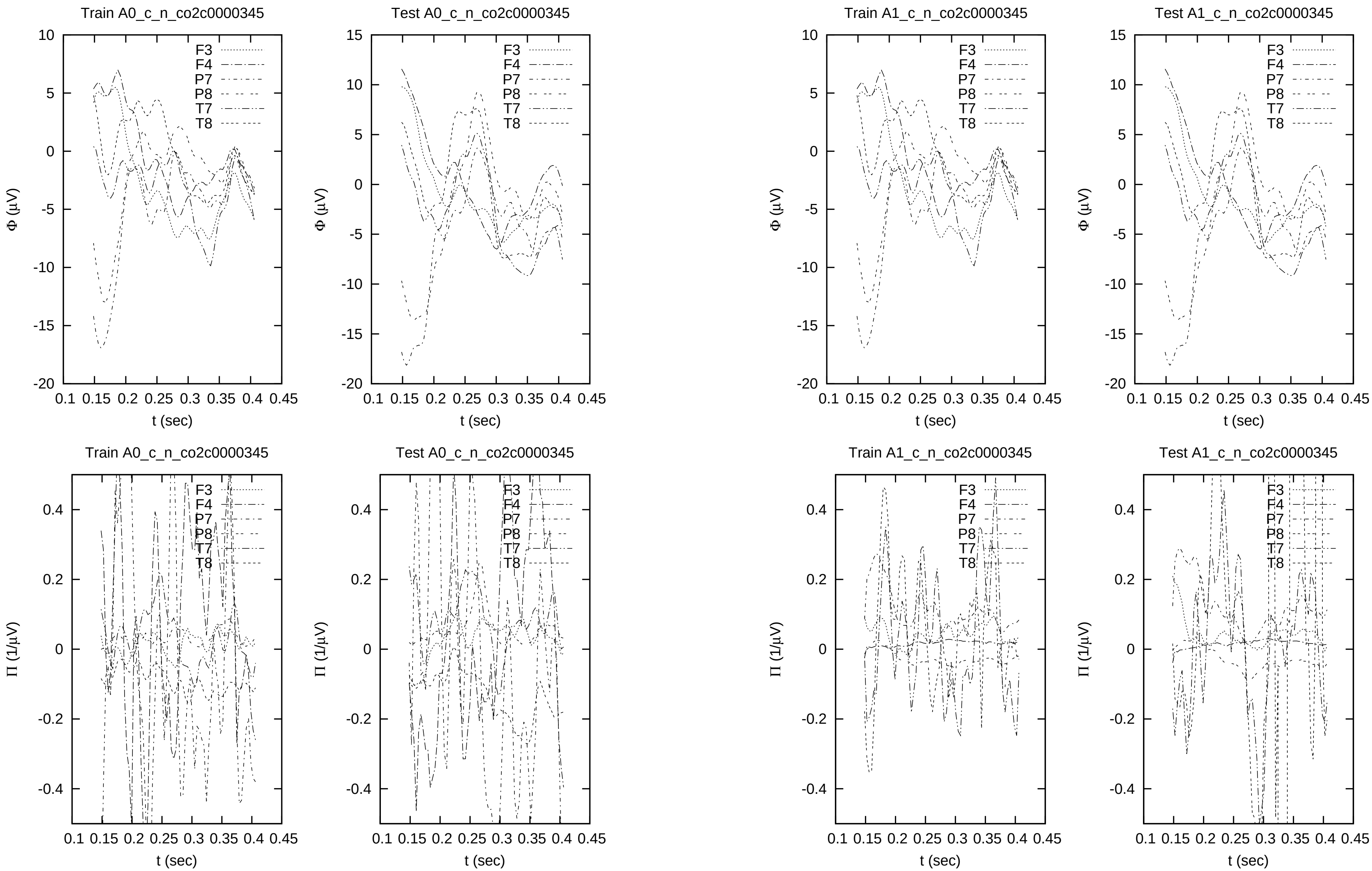

Train A0_c_n_co2c0000340
Test A0_c_n_co2c0000340
Train A1_c_n_co2c0000340
Test A1_c_n_co2c0000340
F3
F4
P7
P8
T7
T8
Φ (μV)
Π (1/μV)
t (sec)


Train A0_c_n_co2c0000341
Test A0_c_n_co2c0000341
Train A1_c_n_co2c0000341
Test A1_c_n_co2c0000341
Φ (µV)
Π (1/µV)
t (sec)
F3
F4
P7
P8
T7
T8

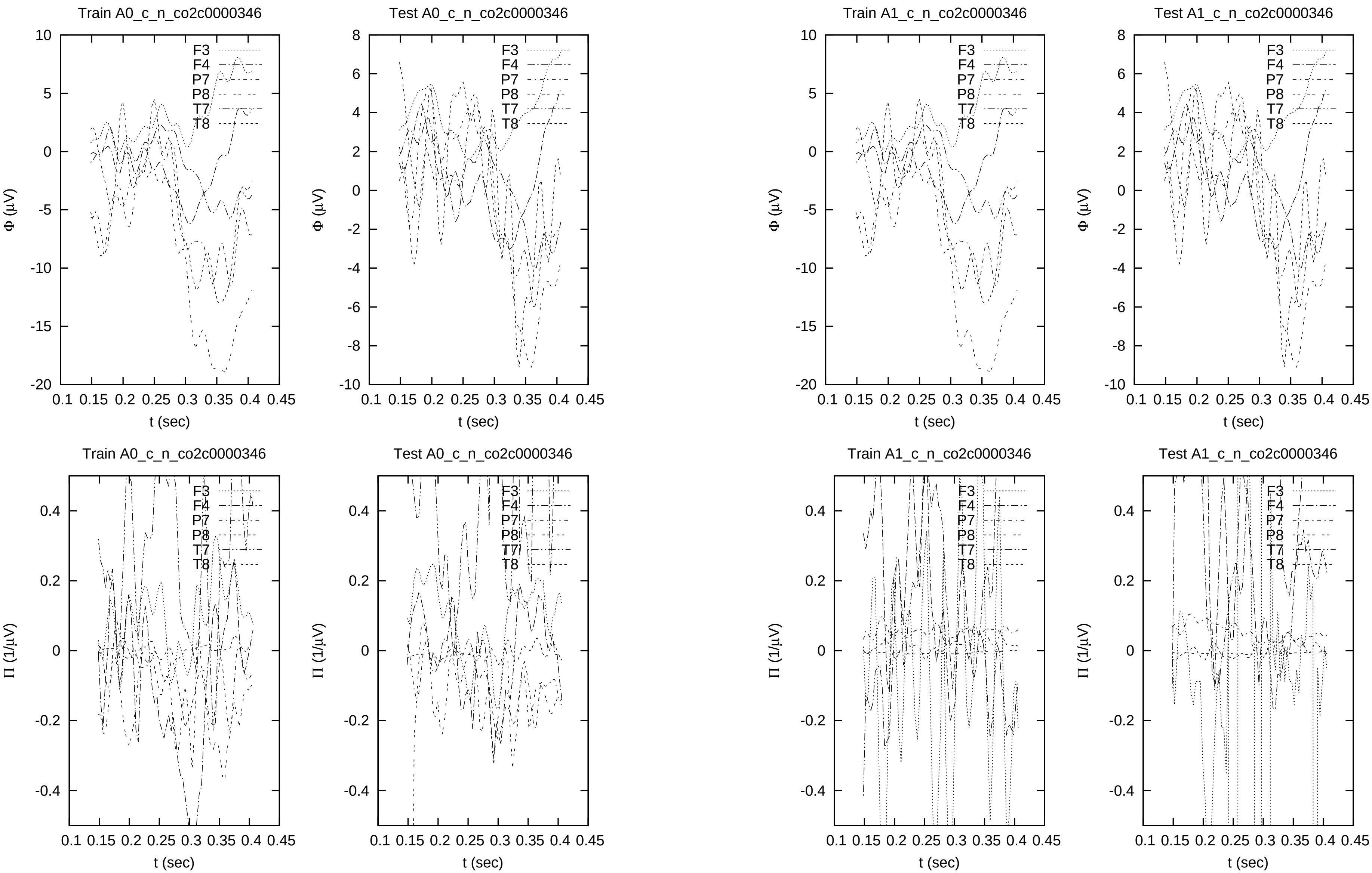


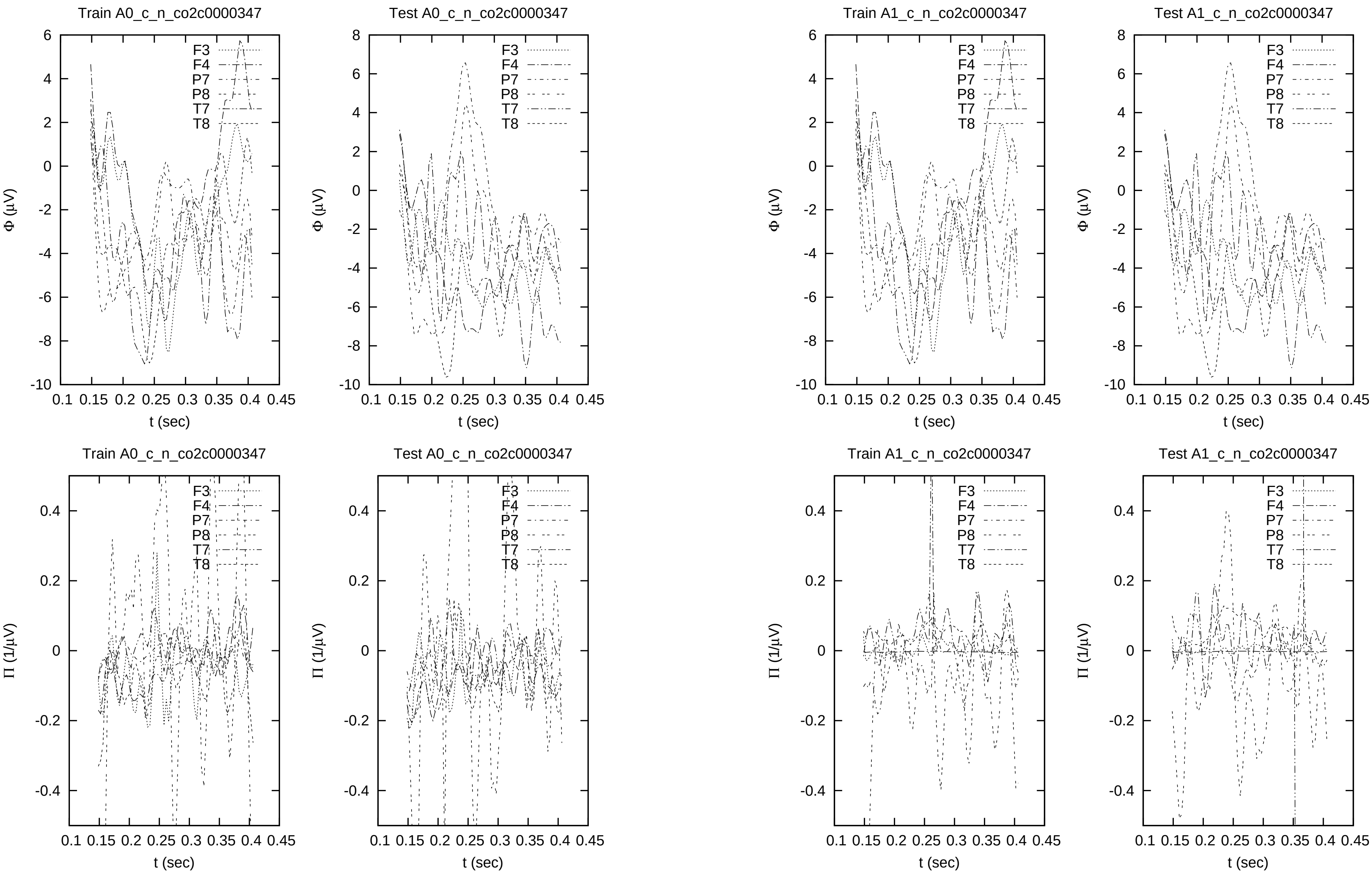
Train A0_c_n_co2c0000342
Test A0_c_n_co2c0000342
Train A1_c_n_co2c0000342
Test A1_c_n_co2c0000342
Φ (μV)
6
4
2
0
-2
-4
-6
-8
-10
-12
0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45
t (sec)
F3
F4
P7
P8
T7
T8
Π (1/μV)
0.4
0.2
0
-0.2
-0.4


Train A0_c_n_co2c0000344
Test A0_c_n_co2c0000344
Train A1_c_n_co2c0000344
Test A1_c_n_co2c0000344
F3
F4
P7
P8
T7
T8
Φ (μV)
Π (1/μV)
t (sec)
10
5
0
-5
-10
-15
0.4
0.2
0
-0.2
-0.4
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45



Train A0_c_n_co2c0000345
Test A0_c_n_co2c0000345
Train A1_c_n_co2c0000345
Test A1_c_n_co2c0000345
F3
F4
P7
P8
T7
T8
Φ (μV)
Π (1/μV)
t (sec)
0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45


Train A0_c_n_co2c0000346
Test A0_c_n_co2c0000346
Train A1_c_n_co2c0000346
Test A1_c_n_co2c0000346
Φ (μV)
Π (1/μV)
t (sec)
F3
F4
P7
P8
T7
T8



Train A0_c_n_co2c0000347
Test A0_c_n_co2c0000347
Train A1_c_n_co2c0000347
Test A1_c_n_co2c0000347
F3
F4
P7
P8
T7
T8
Φ (μV)
Π (1/μV)
t (sec)