Drifting Lines Correlation Analysis

Frequencies identified

- Noise Trend –
  - 89.5± 1, 83.5±0.7, 63.4±0.4 Hz
- Residuals
- Top 50 correlated Channels

Conclusion

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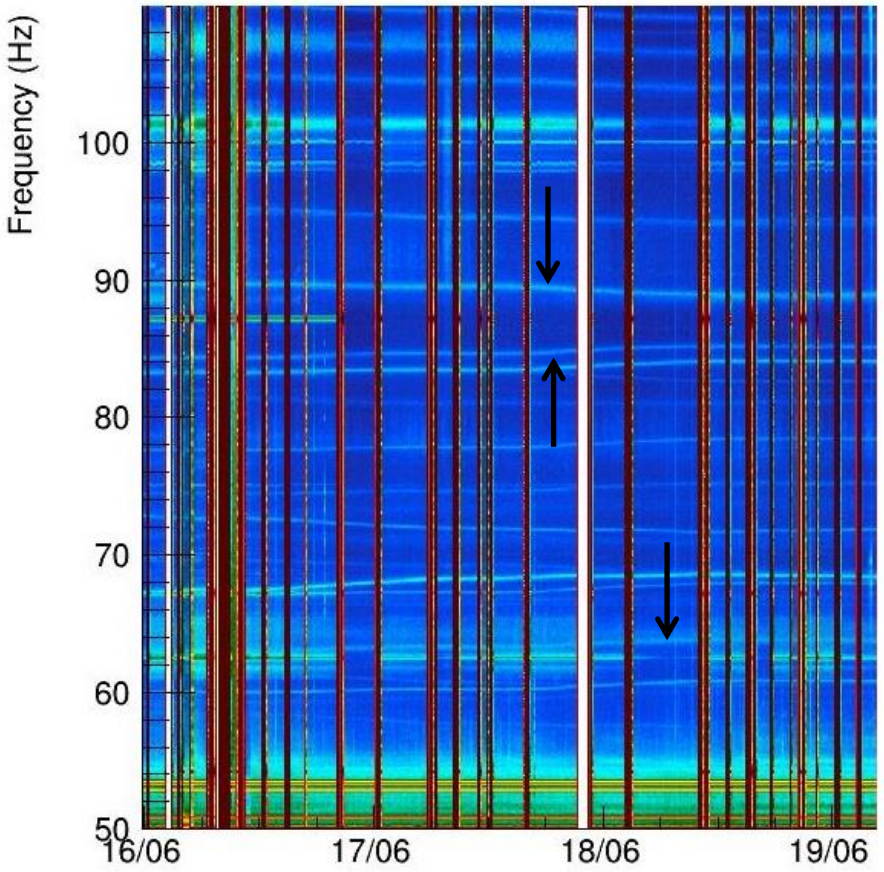
Noise frequencies

3 noise lines (arrows in the figure) which show a drift in the peak frequency as a function of time, are identified for performing the correlation analysis with the trend channels (≤1 Hz).



Spectrogram of V1:spectro_LSC_DARM_300_100_0_0

start=1181605776.000000 (Thu Jun 15 23:49:18 2017 UTC)

Parameters:

GPS Start = = 1181691498 (June 16, 23:38:00 UTC)

GPS End = 1181839844 (June 18, 16:50:26 UTC)

Investigation method

The time evolution of the peak frequency of the identified noise band is extracted.

The time series of the peak frequency is then correlated with all trend channels.

Top 50 channels that show correlation with the noise trend are identified.

Frequency bands analyzed

- 88.5 - 90.5 Hz
- 82.8 – 84.2 Hz
- 63.0 – 63.8 Hz

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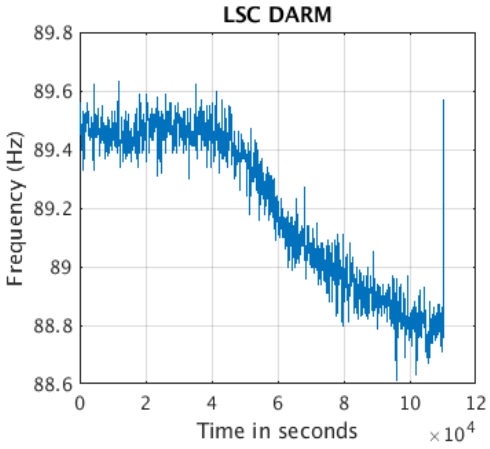
Frequency Band 1 – Top 10 correlated trend channels

Noise in this frequency band shows a drift in frequency from 89.4 Hz at start to 88.7 Hz.



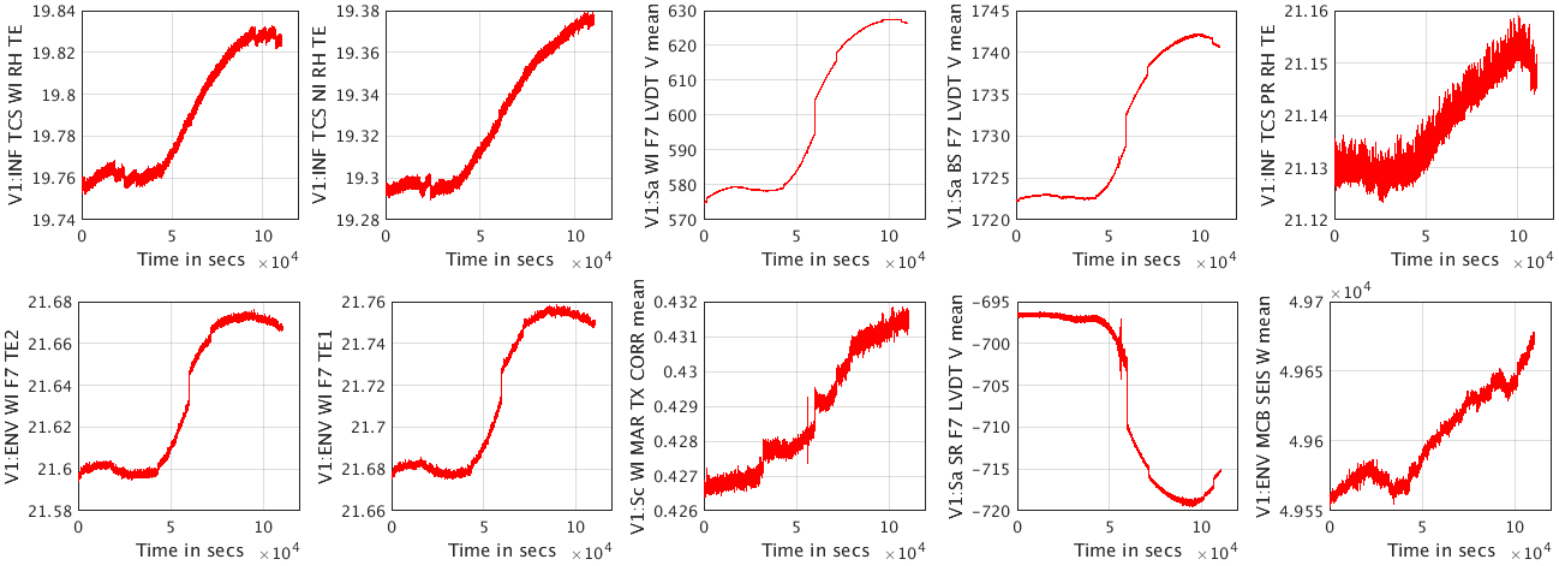
Parameters:

GPS Start = = 1181691498 (June 16, 23:38:00 UTC)

GPS End = 1181839844 (June 18, 16:50:26 UTC)

Note – All the periods of the ITF unlock was removed, and the data was made continuous

All the top 50 correlated channels can be obtained here.



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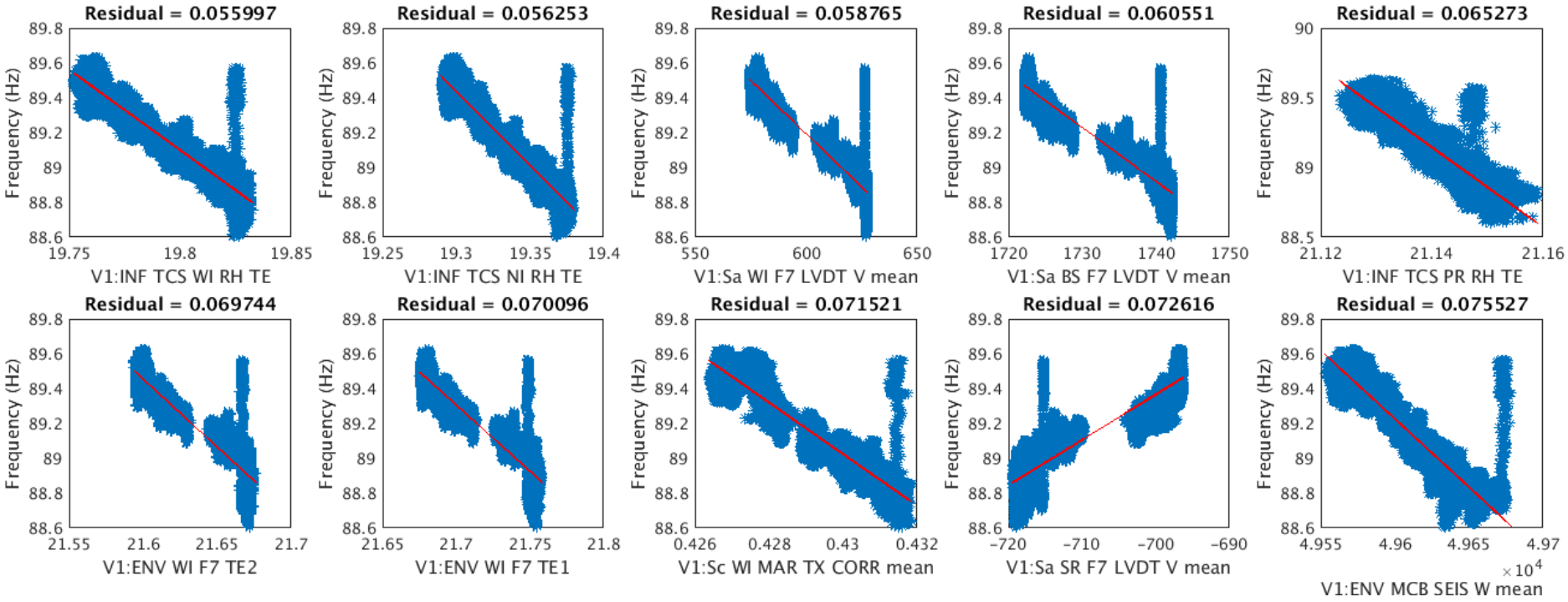
Frequency Band 1 – Top 10 channels residual

Figure below shows a scatter plot of the peak frequency vs the trend channel data for a period of ≈ 110000 s. A minimum normalized residual of 0.056 was achieved amongst all channels.



Notes:

9 out of the top 10 channels show a negative correlation between the frequency drift and the trend data.

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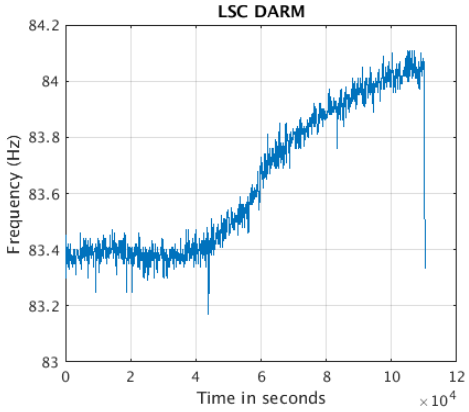
Frequency Band 2 – Top 10 correlated trend channels

Noise in this frequency band shows a drift in frequency from 83.40 Hz at start to 84.0 Hz.



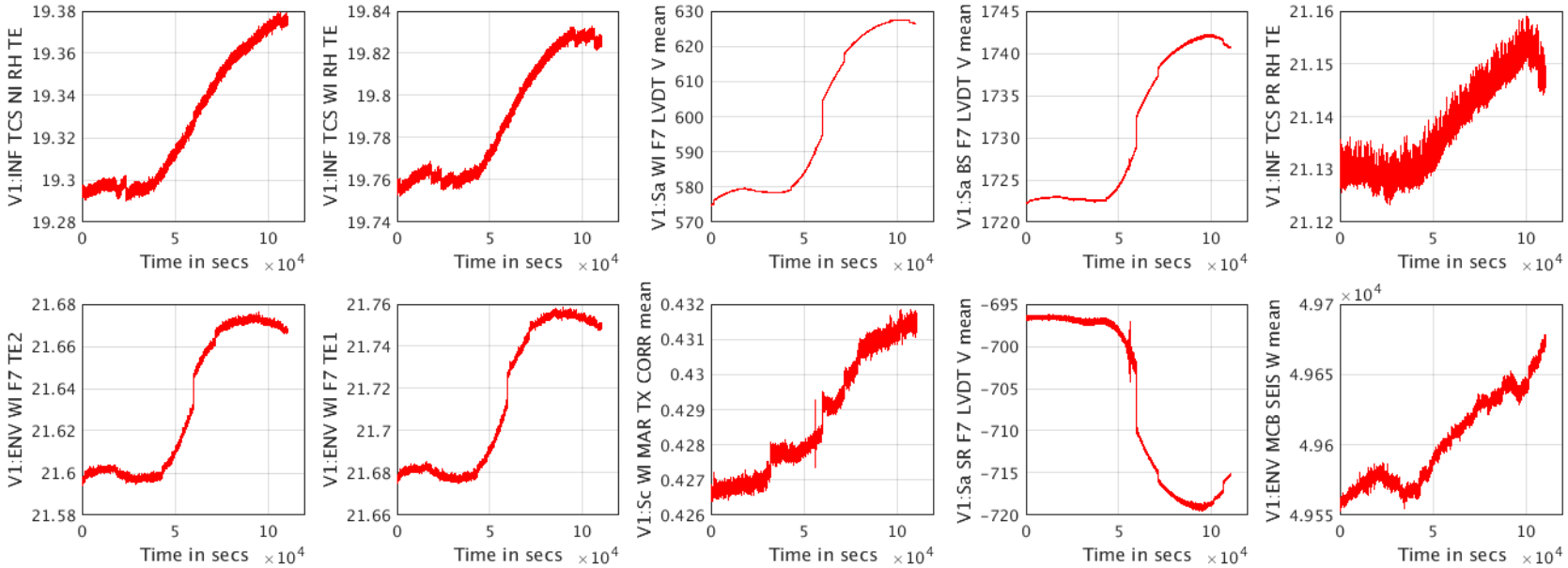
Parameters:

GPS Start = = 1181691498 (June 16, 23:38:00 UTC)

GPS End = 1181839844 (June 18, 16:50:26 UTC)

Note – All the periods of the ITF unlock was removed, and the data was made continuous

All the top 50 correlated channels can be obtained here.



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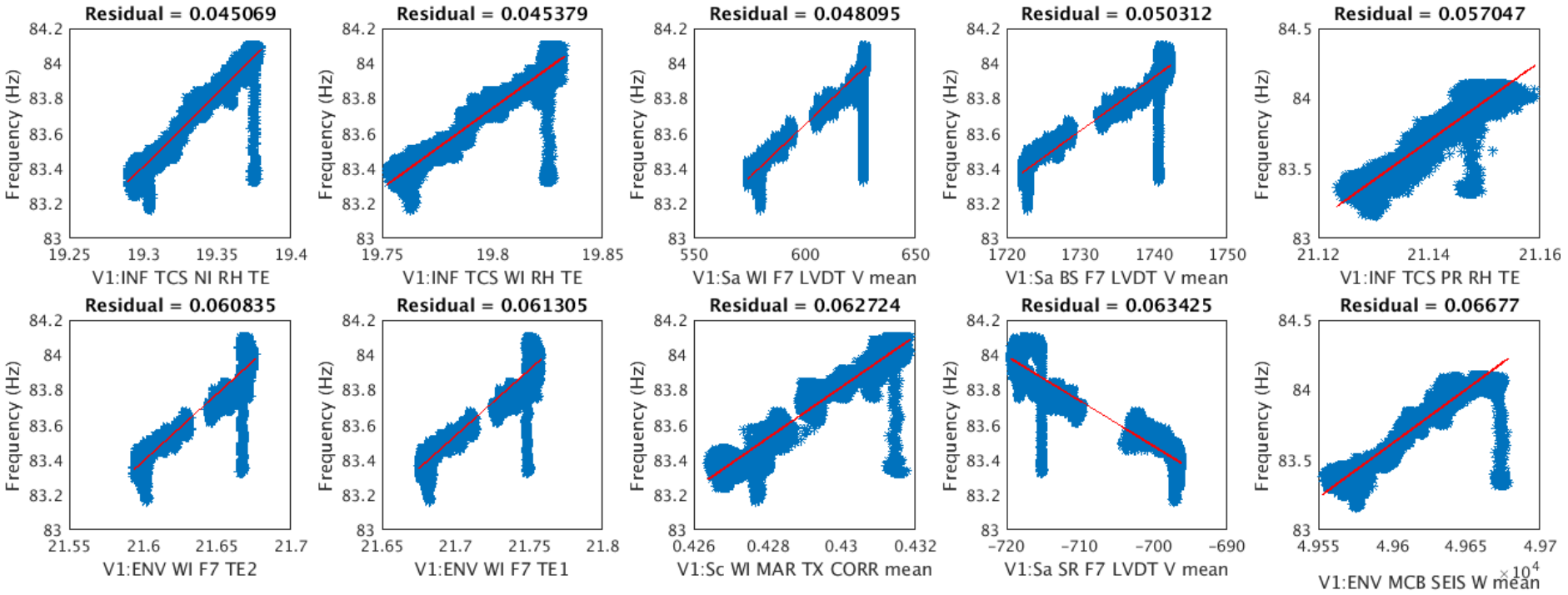
Frequency Band 2 – Top 10 channels residual

Figure below shows a scatter plot of the peak frequency vs the trend channel data for a period of ≈ 110000 s. A minimum normalized residual of 0.045 was achieved amongst all channels.



Notes:

9 out of the top 10 channels show a positive correlation between the drift in frequency and the trend data.

This noise trend is just opposite with the trend observed for the 89.5 Hz noise.

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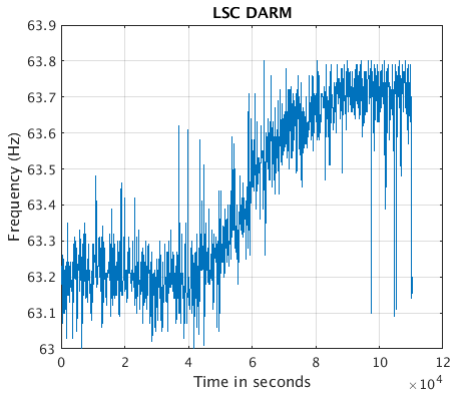
Frequency Band 3 – Top 10 correlated trend channels

Noise in this frequency band shows a drift in frequency from 63.0 Hz at start to 63.8 Hz.



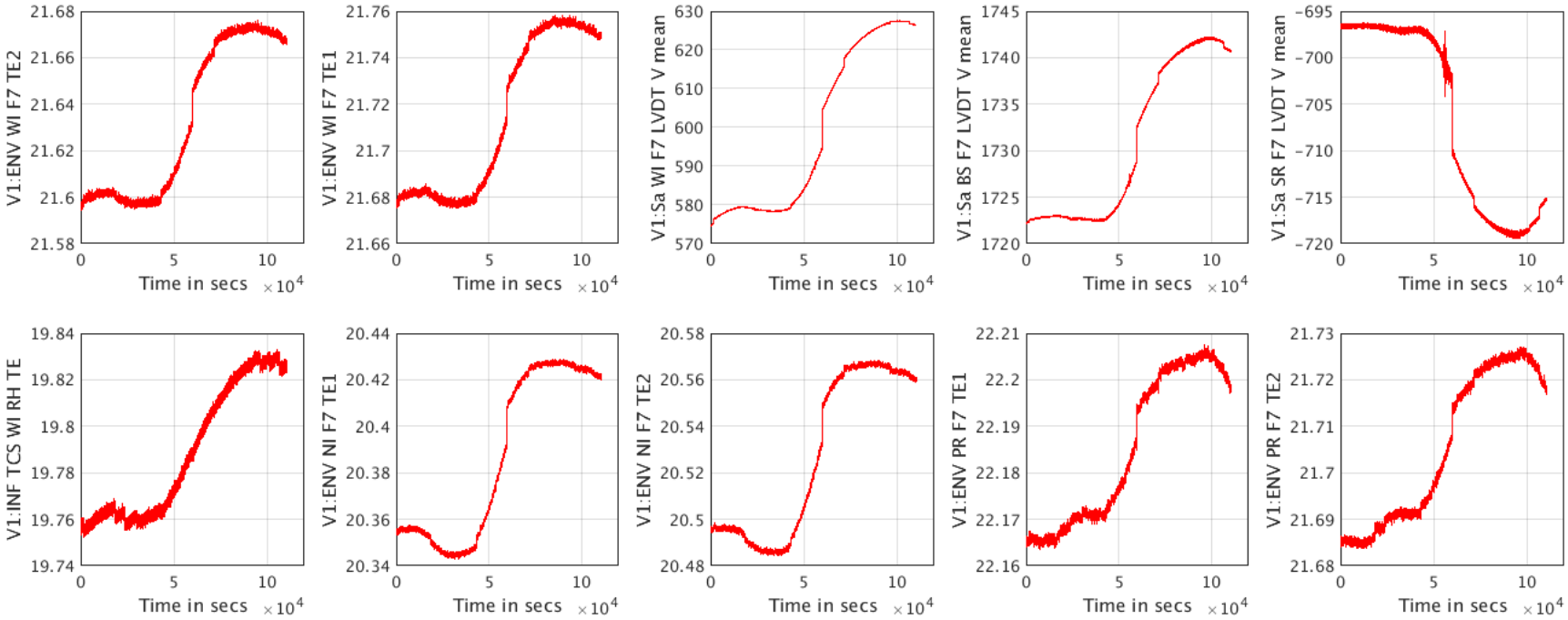
Parameters:

GPS Start = = 1181691498 (June 16, 23:38:00 UTC)

GPS End = 1181839844 (June 18, 16:50:26 UTC)

Note – All the periods of the ITF unlock was removed, and the data was made continuous

All the top 50 correlated channels can be obtained here.



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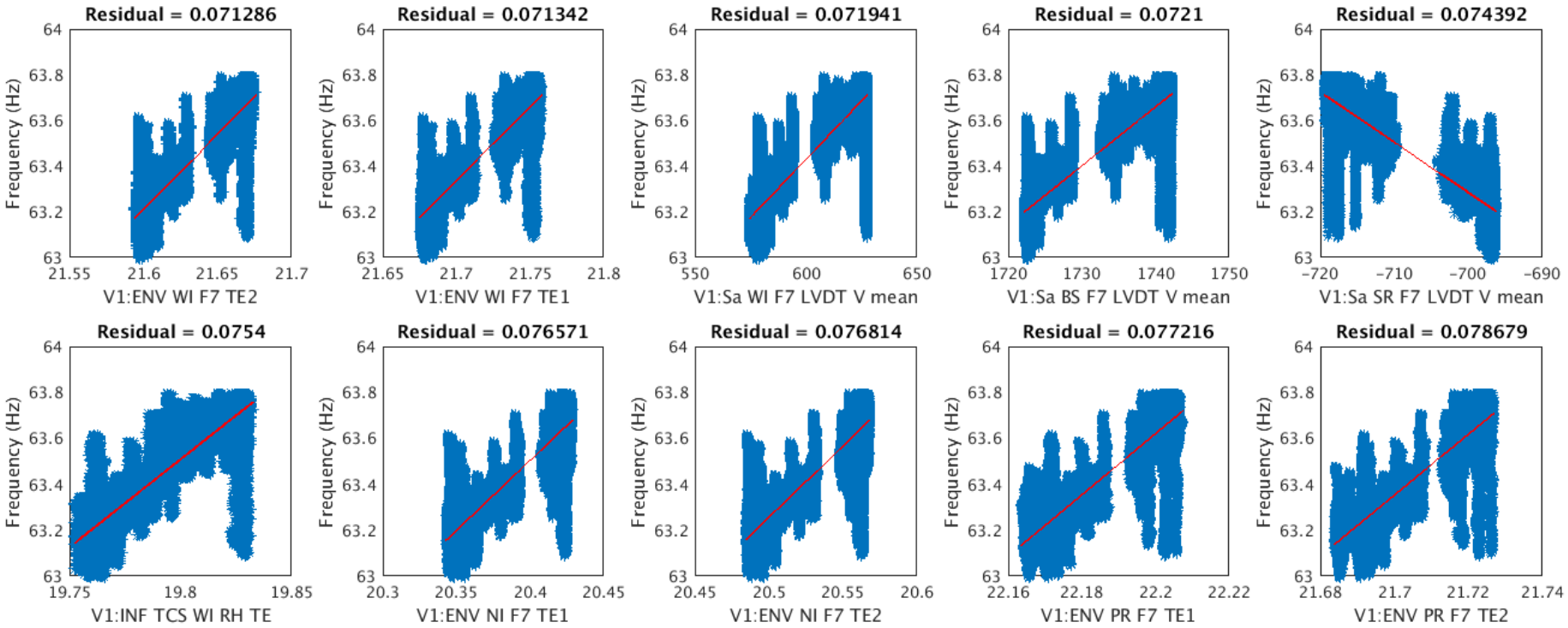
Frequency Band 3 – Top 10 channels residual

Figure below shows a scatter plot of the peak frequency vs the trend channel data for a period of ≈ 110000 s. A minimum normalized residual of 0.071was achieved amongst all channels.



Notes:

A higher residual is observed when compared to the last two frequency bands.

The peak frequency extracted in the desired frequency brand exhibits a high frequency noise, which is the reason for the weaker correlation.

Conclusions

- Noise in the 3 frequency bands have 17 out of 20 channels in common to which they are correlated, and the noise source seems to be the same.

F = 89.5 Hz	F = 83.5 Hz	F = 63.4 Hz
'V1:INF_TCS_WI_RH_TE'	'V1:INF_TCS_NI_RH_TE'	'V1:ENV_WI_F7_TE2'
'V1:INF_TCS_NI_RH_TE'	'V1:INF_TCS_WI_RH_TE'	'V1:ENV_WI_F7_TE1'
'V1:Sa_WI_F7_LVDT_V_mean'	'V1:Sa_WI_F7_LVDT_V_mean'	'V1:Sa_WI_F7_LVDT_V_mean'
'V1:Sa_BS_F7_LVDT_V_mean'	'V1:Sa_BS_F7_LVDT_V_mean'	'V1:Sa_BS_F7_LVDT_V_mean'
'V1:INF_TCS_PR_RH_TE'	'V1:INF_TCS_PR_RH_TE'	'V1:Sa_SR_F7_LVDT_V_mean'
'V1:ENV_WI_F7_TE2'	'V1:ENV_WI_F7_TE2'	'V1:INF_TCS_WI_RH_TE'
'V1:ENV_WI_F7_TE1'	'V1:ENV_WI_F7_TE1'	'V1:ENV_NI_F7_TE1'
'V1:Sc_WI_MAR_TX_CORR_mean'	'V1:Sc_WI_MAR_TX_CORR_mean'	'V1:ENV_NI_F7_TE2'
'V1:Sa_SR_F7_LVDT_V_mean'	'V1:Sa_SR_F7_LVDT_V_mean'	'V1:ENV_PR_F7_TE1'
'V1:ENV_MCB_SEIS_W_mean'	'V1:ENV_MCB_SEIS_W_mean'	'V1:ENV_PR_F7_TE2'
'V1:ENV_PR_F7_TE1'	'V1:ENV_PR_F7_TE1'	'V1:ENV_SR_F7_TE1'
'V1:ENV_PR_F7_TE2'	'V1:ENV_PR_F7_TE2'	'V1:INF_TCS_NI_RH_TE'
'V1:ENV_NI_F7_TE1'	'V1:EDB_CfgChange_mean'	'V1:ENV_SR_F7_TE2'
'V1:ENV_NI_F7_TE2'	'V1:ENV_NI_F7_TE1'	'V1:INF_TCS_PR_RH_TE'
'V1:EDB_CfgChange_mean'	'V1:ENV_NI_F7_TE2'	'V1:DQ_BRMSMon_THR_LSC_DARM_LINE_568_570_LSC_DARM'
'V1:Daq_FdWRawStol_dirTimeSpam'	'V1:Daq_FdWRawStol_dirNfiles'	'V1:Sc_WI_MAR_TX_CORR_mean'
'V1:Daq_FdWRawStol_dirNfiles'	'V1:Daq_FdWRawStol_dirTimeSpam'	'V1:ENV_MCB_SEIS_W_mean'
'V1:ENV_SR_F7_TE1'	'V1:ENV_SR_F7_TE1'	'V1:Sc_WI_F7_TX_mean'
'V1:ENV_SR_F7_TE2'	'V1:ENV_SR_F7_TE2'	'V1:SBE_SIB2_ACT_F0H2raw_mean'