**Coherence Analysis Result for the 56.8406Hz Comb**

According to [Keith's post](https://alog.ligo-wa.caltech.edu/aLOG/index.php?callRep=28364) on July 12,

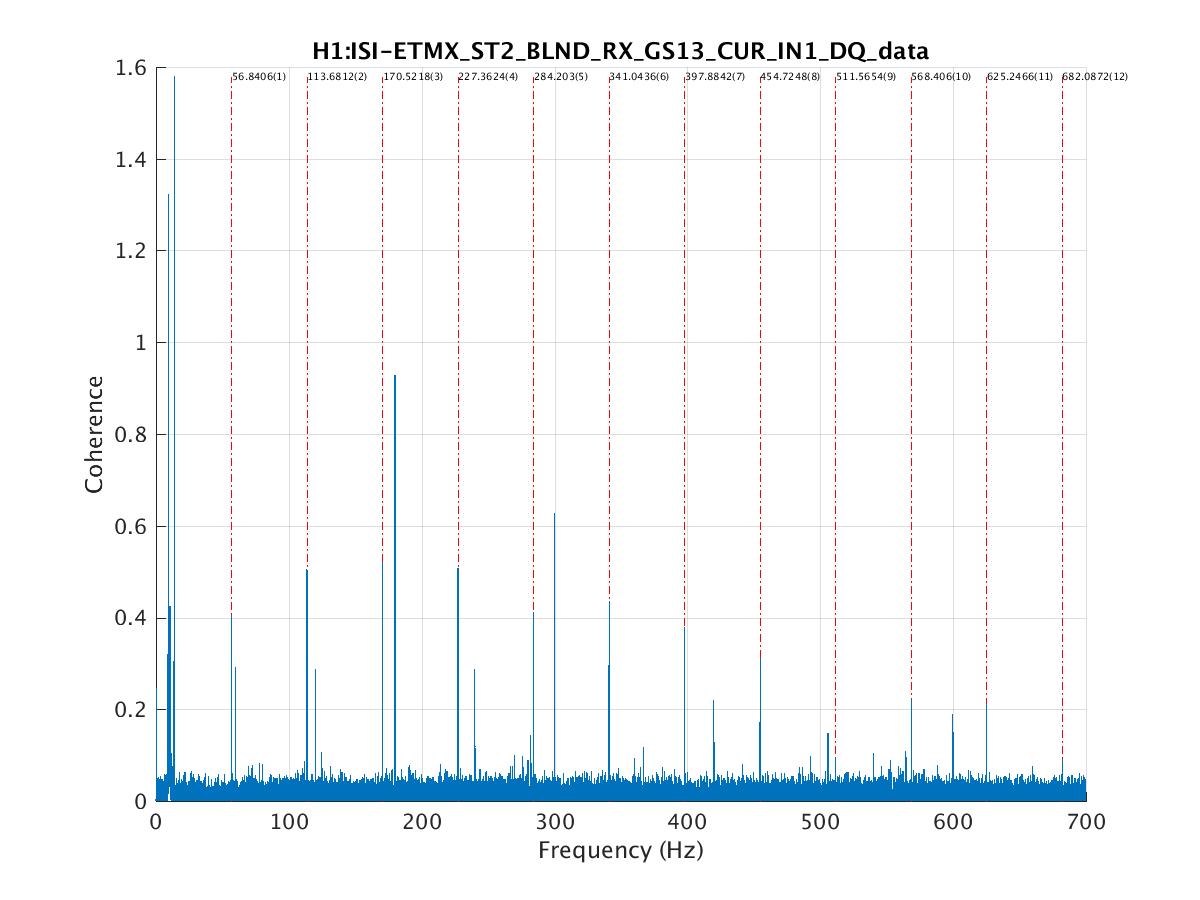
“There is a ‘new’ 56.8406-Hz comb visible to its 11th harmonic at ~625.25 Hz, which in hindsight I can see was buried in the O1 spectrum...pervasive in ISI, SUS and PEM channels at the corner station and both end stations.”

I analyzed this observation with coherence tool and here are the results. The same structure is found to be significant in 35 channels in ER9, distributed in ISI, SUS, PEM and LSC subsystems. Among all the 35 channels, 22 of them does not have a range up to its 11th harmonic, 625.25 Hz. The channels are listed at the end.

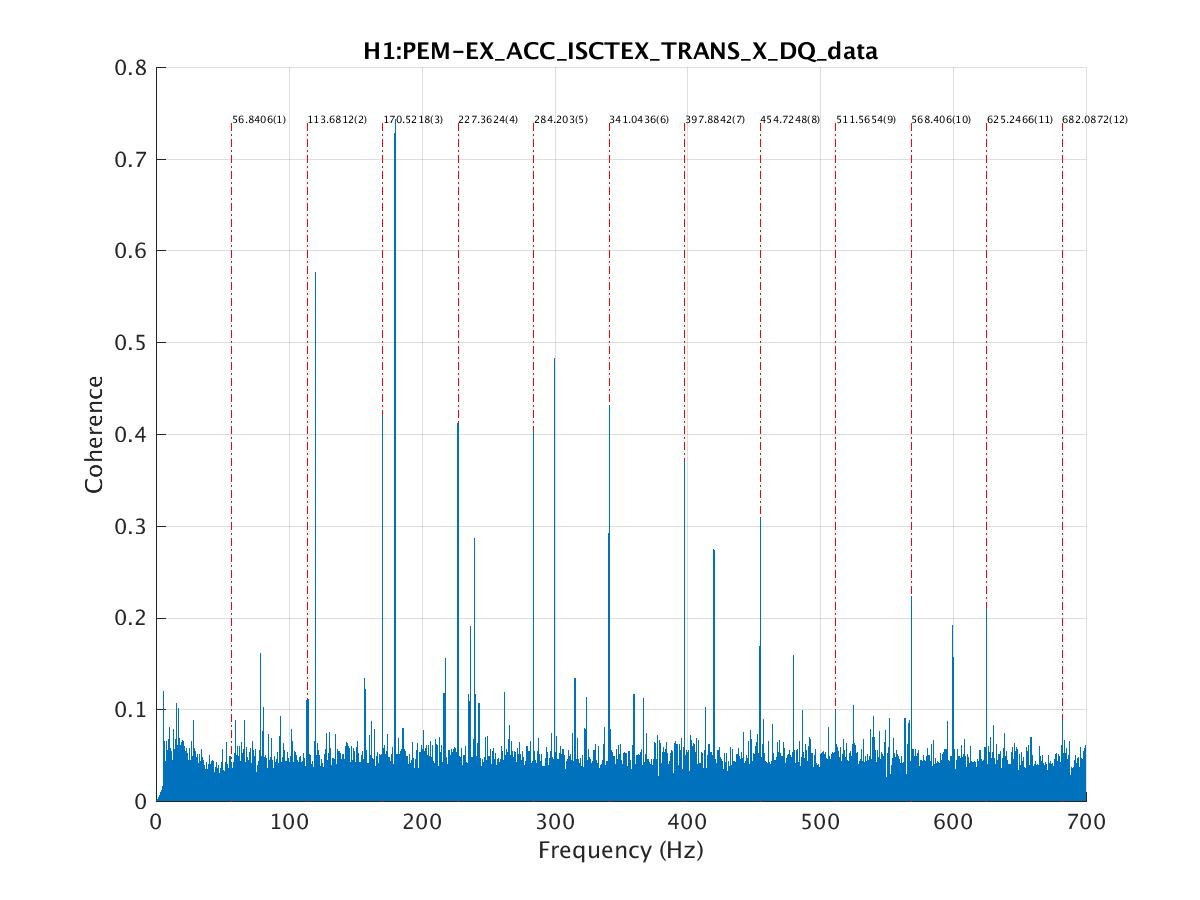
Here are a few interesting observations:

* The 9th harmonic at 511.56Hz is the weakest in most channels, sometimes buried in noises.
* In some PEM channels, there are missing lines at low frequency (< 200 Hz) and high frequency (> 500 Hz).
* In PEM and ISI channels, there seems to be another comb structure with a frequency slightly larger than 56.8406Hz coexists. That one is usually most significant at its third harmonics.
* Generally, the structure is more clearly seen in LSC, SUS and ISI channels

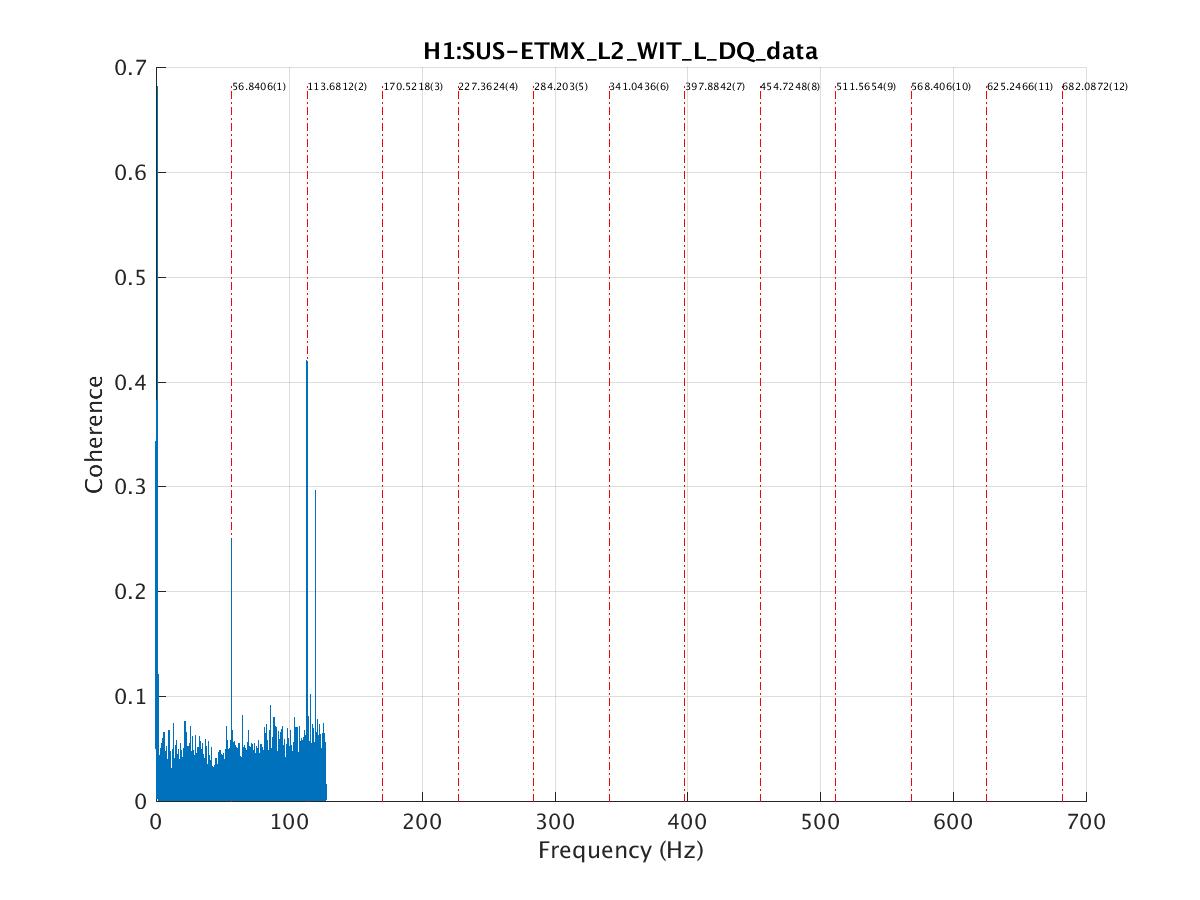
**Sample plots from each subsystem:**



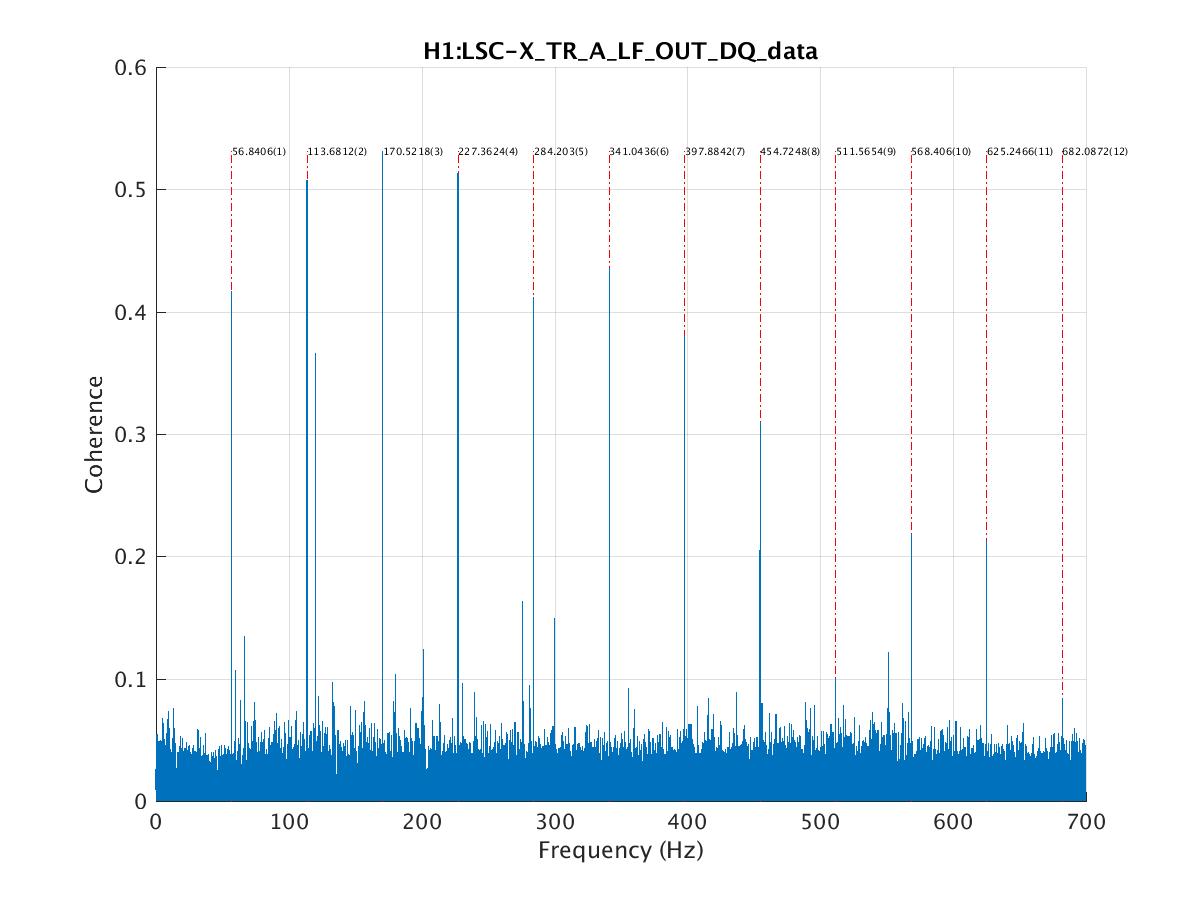
Here we can see the 56.8406Hz comb structure exists with its 9th harmonic weakest.



PEM channels have more noises and, as in ISI channels, the other comb structure coexists.



SUS channels do not have enough range up its 11th harmonic but we can see its first and second harmonic here.



There is only one channel from LSC but the structure is very clear.

**Channels List:**

H1:ISI-ETMX\_ST2\_BLND\_RX\_GS13\_CUR\_IN1\_DQ\_data

H1:ISI-ETMX\_ST2\_BLND\_RY\_GS13\_CUR\_IN1\_DQ\_data

H1:ISI-ETMX\_ST2\_BLND\_RZ\_GS13\_CUR\_IN1\_DQ\_data

H1:ISI-ETMX\_ST2\_BLND\_X\_GS13\_CUR\_IN1\_DQ\_data

H1:ISI-ETMX\_ST2\_BLND\_Y\_GS13\_CUR\_IN1\_DQ\_data

H1:ISI-ETMX\_ST2\_BLND\_Z\_GS13\_CUR\_IN1\_DQ\_data

H1:LSC-X\_TR\_A\_LF\_OUT\_DQ\_data

H1:PEM-EX\_ACC\_BSC9\_ETMX\_Y\_DQ\_data

H1:PEM-EX\_ACC\_BSC9\_ETMX\_Z\_DQ\_data

H1:PEM-EX\_ACC\_ISCTEX\_TRANS\_X\_DQ\_data

H1:PEM-EX\_ACC\_VEA\_FLOOR\_Z\_DQ\_data

H1:PEM-EX\_MIC\_VEA\_MINUSX\_DQ\_data

H1:PEM-EX\_MIC\_VEA\_PLUSX\_DQ\_data

\* Not Enough Range \*

H1:ISI-ETMX\_ST1\_BLND\_Y\_T240\_CUR\_IN1\_DQ\_data

H1:ISI-ETMX\_ST1\_BLND\_Z\_T240\_CUR\_IN1\_DQ\_data

H1:ISI-GND\_STS\_ETMX\_X\_DQ\_data

H1:ISI-GND\_STS\_ETMX\_Y\_DQ\_data

H1:PEM-EX\_MAINSMON\_EBAY\_1\_DQ\_data

H1:PEM-EX\_MAINSMON\_EBAY\_2\_DQ\_data

H1:PEM-EX\_MAINSMON\_EBAY\_3\_DQ\_data

H1:PEM-EX\_SEIS\_VEA\_FLOOR\_X\_DQ\_data

H1:PEM-EX\_SEIS\_VEA\_FLOOR\_Y\_DQ\_data

H1:SUS-ETMX\_L1\_WIT\_Y\_DQ\_data

H1:SUS-ETMX\_L2\_WIT\_L\_DQ\_data

H1:SUS-ETMX\_L2\_WIT\_P\_DQ\_data

H1:SUS-ETMX\_L2\_WIT\_Y\_DQ\_data

H1:SUS-ETMX\_M0\_DAMP\_L\_IN1\_DQ\_data

H1:SUS-ETMX\_M0\_DAMP\_P\_IN1\_DQ\_data

H1:SUS-ETMX\_M0\_DAMP\_T\_IN1\_DQ\_data

H1:SUS-ETMX\_M0\_DAMP\_V\_IN1\_DQ\_data

H1:SUS-ETMX\_M0\_DAMP\_Y\_IN1\_DQ\_data