Updates on the Stamp-pem Pipeline

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What is Stamp-pem?

- Online data analysis tool for performing bulk coherence calculations in parallel

- Physical environment monitoring of ligo subsystems

- Noise Identification at the detector sites

Subsystem List

- Calibrated h(t)
- Length sensing and control
- Length sensing and control: In-air photodiodes and CARM (Commissioning)
- Length sensing and control: slow
- Arm Length Stabilization
- Alignment Sensing and Control
- Alignment Sensing and Control: slow
- Photon Calibrator
- Hydraulic (External) Pre Isolator
- Input Mode Cleaner
- Input Mode Cleaner: Commissioning
- Internal Seismic Isolation : BSC ISI ST1 T240s
- Internal Seismic Isolation : optics table GS13s
- Internal Seismic Isolation : ground motion STS2s
- Output Mode Cleaner
- Output Mode Cleaner: slow
- Output Mode Cleaner: Commissioning

- Physical Environment Monitoring: Accelerometers
- Physical Environment Monitoring: Low frequency microphones
- Physical Environment Monitoring: Magnetometers
- Physical Environment Monitoring: Mains voltage monitors
- Physical Environment Monitoring: Microphones
- Physical Environment Monitoring: Radio frequency receivers
- Physical Environment Monitoring: Seismometers
- Physical Environment Monitoring: STS2 vault seismometer
- Physical Environment Monitoring: Tilt monitors
- Pre Stabilized Laser
- Pre Stabilized Laser: Commissioning
- Suspensions: Optical levers
- Suspension: OSEMs
- Suspension: Noise Monitors
- Suspension: Noise Monitors : slow
- Thermal Compensation

Over 1000 channels in the ligo-channel-list!

Online Pipeline

- Calculate coherence, CSD/(PSD1*PSD2), of all subsystems in the ligo-channel-list specified in your config file against darm

- Produces a webpage with a total coherence matrix, Bruco-style table, and separate tabs for each individual subsystem coherence plot

- Bruco-style table shows top 20 most coherent channels and SNR at half Hertz intervals from 0.5 – 1024 Hz

- Errors are caught during each run and automatically reported with a set frequency(optional)

Webpage: Bruco Table

Frequency	1 most coherent	2 most coherent	3 most coherent	4 most coherent
0.5	H1:OMC-ASC_Y2_I_OUT_DQ: 0.31403	H1:SUS-ETMY_L3_OPLEV_PIT_OUT_DQ: 0.22047	H1:SUS-ETMX_L3_OPLEV_YAW_OUT_DQ: 0.20497	H1:SUS-ITMY_L3_OPLEV_PIT_OUT_DQ: 0.20441
1.0	H1:OMC-ASC_Y2_I_OUT_DQ: 0.76145	H1:SUS-ETMY_M0_DAMP_P_IN1_DQ: 0.69754	H1:SUS-BS_M1_DAMP_V_IN1_DQ: 0.6724	H1:OMC-PZT2_MON_AC_OUT_DQ: 0.61453
1.5	H1:OMC-ASC_Y2_I_OUT_DQ: 0.87441	H1:SUS-ETMY_L2_WIT_Y_DQ: 0.8495	H1:SUS-ITMX_M0_DAMP_V_IN1_DQ: 0.78295	H1:SUS-ETMY_M0_DAMP_T_IN1_DQ: 0.77547
2.0	H1:OMC-ASC_Y2_I_OUT_DQ: 0.52724	H1:LSC-ASAIR_B_RF90_I_ERR_DQ: 0.4768	H1:LSC-DARM_OUT_DQ: 0.46175	H1:SUS-ETMY_L2_WIT_Y_DQ: 0.43829
2.5	H1:SUS-ETMY_L1_WIT_L_DQ: 0.80218	H1:OMC-ASC_Y2_I_OUT_DQ: 0.76003	H1:SUS-ETMY_M0_DAMP_L_IN1_DQ: 0.59641	H1:LSC-SRCL_IN1_DQ: 0.55603
3.0	H1:OMC-ASC_Y2_I_OUT_DQ: 0.91076	H1:SUS-ETMY_L1_WIT_L_DQ: 0.87878	H1:SUS-ETMY_M0_DAMP_L_IN1_DQ: 0.81197	H1:SUS-ETMY_M0_DAMP_P_IN1_DQ: 0.54496
3.5	H1:OMC-ASC_Y2_I_OUT_DQ: 0.98325	H1:SUS-ETMY_L1_WIT_L_DQ: 0.7762	H1:SUS-ETMY_M0_DAMP_L_IN1_DQ: 0.69619	H1:PEM-EX_MAG_VEA_FLOOR_Y_DQ: 0.43145
4.0	H1:OMC-ASC_Y2_I_OUT_DQ: 0.99348	H1:SUS-ETMY_L1_WIT_L_DQ: 0.82433	H1:SUS-ETMY_M0_DAMP_L_IN1_DQ: 0.3623	H1:SUS-ITMX_L2_WIT_L_DQ: 0.22781
4.5	H1:OMC-ASC_Y2_I_OUT_DQ: 0.94292	H1:SUS-ETMY_L1_WIT_L_DQ: 0.77587	H1:ASC-X_TR_B_YAW_OUT_DQ: 0.52657	H1:ASC-Y_TR_A_NSUM_OUT_DQ: 0.52618
5.0	H1:OMC-ASC_Y2_I_OUT_DQ: 0.09091	H1:ASC-X_TR_B_YAW_OUT_DQ: 0.05166	H1:ASC-Y_TR_A_NSUM_OUT_DQ: 0.05106	H1:ASC-X_TR_A_PIT_OUT_DQ: 0.03964
5.5	H1:OMC-ASC_Y2_I_OUT_DQ: 0.84023	H1:ASC-Y_TR_A_YAW_OUT_DQ: 0.60813	H1:ASC-X_TR_A_PIT_OUT_DQ: 0.60334	H1:ASC-X_TR_B_YAW_OUT_DQ: 0.57993

Webpage: Bruco Table to Identify Noisy Channels

Main Voltage Monitors vs
H1:GDS-CALIB_STRAIN

4th most coherent
channel (EBAY_1) at
60 Hz (SNR = 0.99334)

5th most coherent
channel (EBAY_3) at 60
Hz (SNR = 0.99333)

Physical Environment Monitoring: Mains voltage monitors 1, 13366 averages
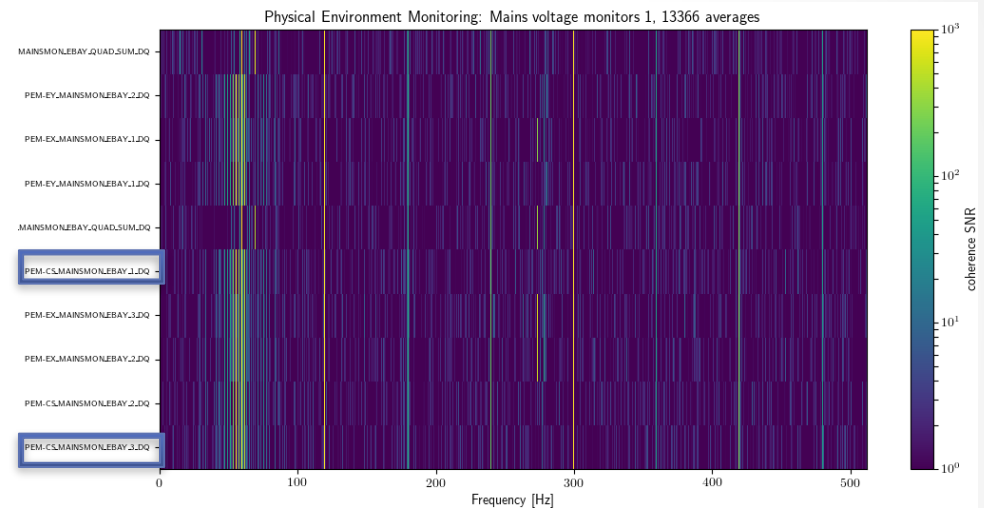
	4 most coherent	5 most coherent
59.5	H1:SUS-ETMY_L3_OPLEV_PIT_OUT_DQ: 0.03505	H1:PEM-EY_ACC_ISCTEY_TRANS_X_DQ: 0.03501
60.0	H1:PEM-CS_MAINSMON_EBAY_1_DQ: 0.99334	H1:PEM-CS_MAINSMON_EBAY_3_DQ: 0.99333
60.5	H1:PEM-EX_MAINSMON_EBAY_1_DQ: 0.06393	H1:PEM-CS_MAINSMON_EBAY_1_DQ: 0.06393

- Rich Ormiston

Currently Running at LLO and LHO!

- Visit the [LLO webpage](#) and [LHO webpage](#) to get an overview on run data

- Data can be sourced at (for LLO and LHO clusters)
  - **/home/stochastic/stamppemtest**

- Still need to run some catch-up times
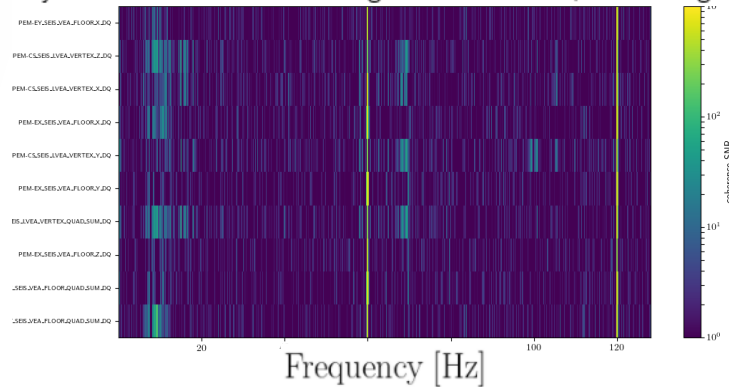
Selectively Query Database

- Choose subsystems and gps start / end times of interest and generate coherence matrices without rerunning the pipeline
- One command line argument
- Outputs data, png's, and webpage with Bruco-style table and individual subsystem coherence matrices
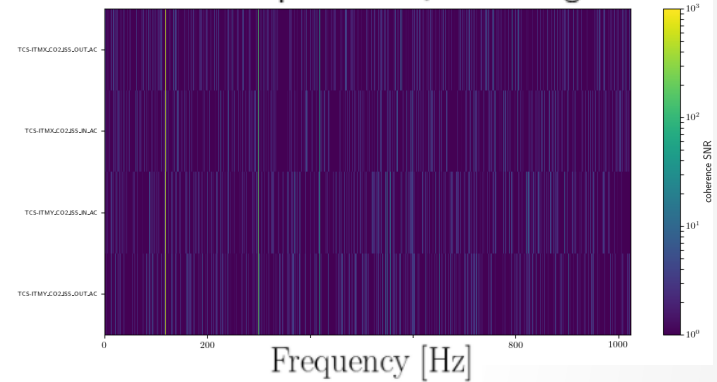- Docs page
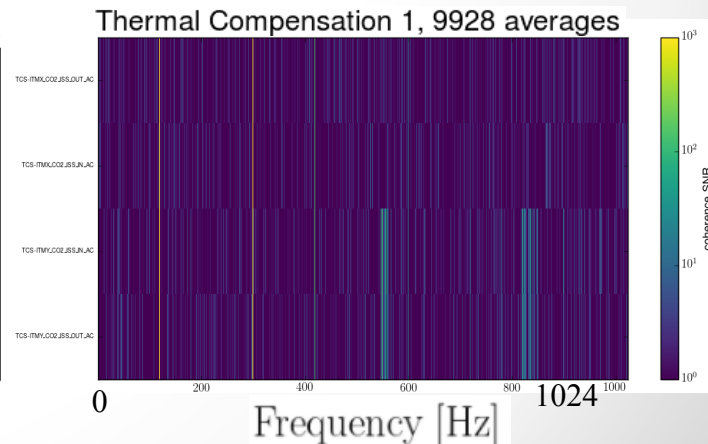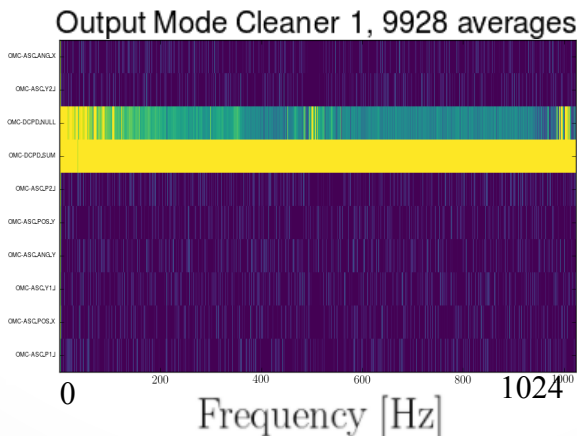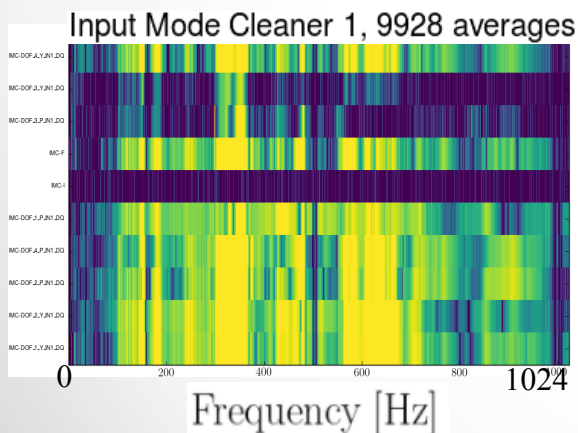
Selectively Query Database cont…

1 hour query

vs.

16 hour query

Physical Environment Monitoring: Seismometers 1, 718 averages
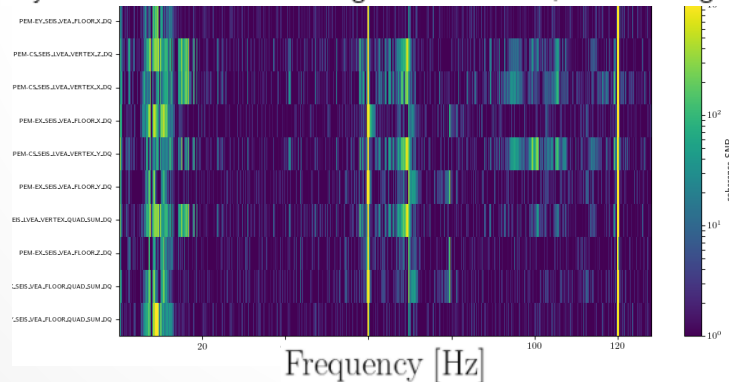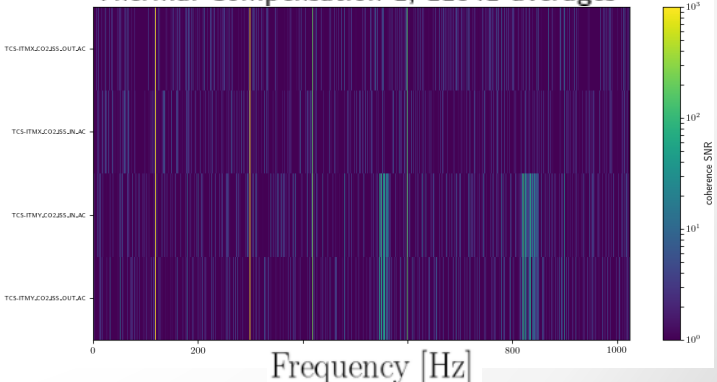
Thermal Compensation 1, 718 averages

Physical Environment Monitoring: Seismometers 1, 11341 averages
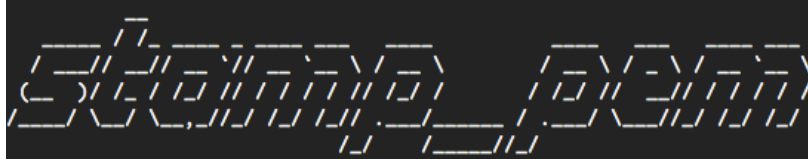
Thermal Compensation 1, 11341 averages

QDB Example

- 6 Subsystems

- 1,800 sec. analysis

- ~41 sec. runtime

```
(stamp_pem_ve) (wa)~   run-active-segs -i "/home/rich.ormiston/config_files/ini_files/H1.ini" \
-s 1169510418 -e 1169512218 --subsystem "Physical Environment Monitoring: Seismometers 1" \
"Input Mode Cleaner 1" "Thermal Compensation 1" "Input Mode Cleaner 2" "Output Mode Cleaner 2" \
"Output Mode Cleaner 1"

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   ___ / /____ _ ____ ___   ____     ____   ___ ____ ___
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/____/\__/\__,_//_/ /_/ /_// .___/  / .___/ \___/_/ /_/ /_/
                          /_/      /_/

Finding active segments: | 100%

Active segments for flag H1:DMT-ANALYSIS_READY:1
in adjusted window (1169510418, 1169510418)
Start              End              Duration
1169510418         1169512218       1800
.....................................
Total                               1800

Calculating coherence for Physical Environment Monitoring: Seismometers 1...
Calculating coherence for Input Mode Cleaner 1...
Calculating coherence for Thermal Compensation 1...
Calculating coherence for Input Mode Cleaner 2...
Calculating coherence for Output Mode Cleaner 2...
Calculating coherence for Output Mode Cleaner 1...
Writing data...
Done
Building webpage...
Loading data for Input Mode Cleaner 1...
Loading data for Input Mode Cleaner 2...
Loading data for Output Mode Cleaner 1...
Loading data for Output Mode Cleaner 2...
Loading data for Physical Environment Monitoring: Seismometers 1...
Loading data for Thermal Compensation 1...
Done creating coherence table...sorting it now...
Done with coherence table...rendering it now...
Total run time: 41.37 sec
(stamp_pem_ve) (wa)~
```
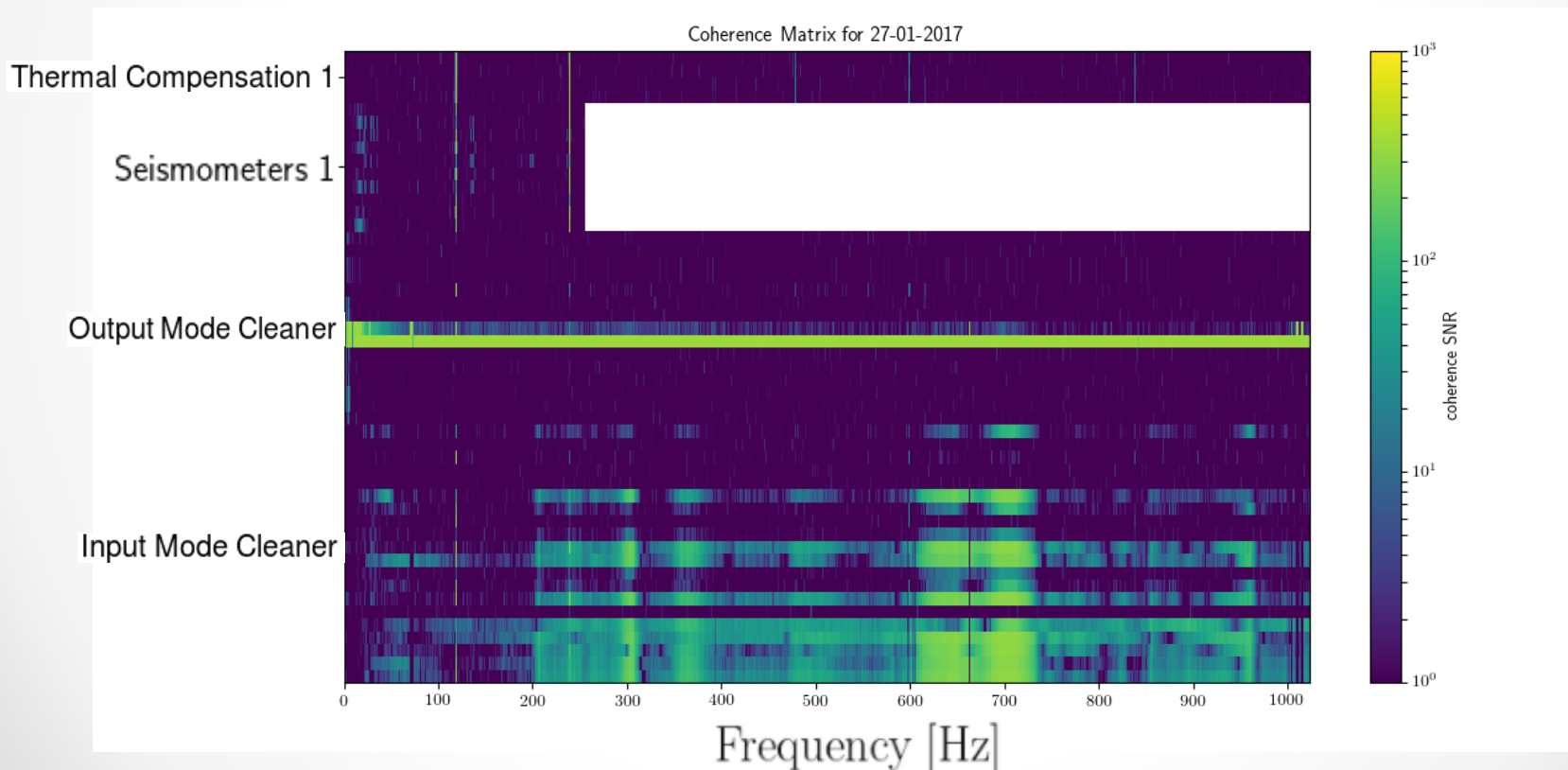
QDB Example cont…

- Combined coherence matrix plot on front page of output webpage
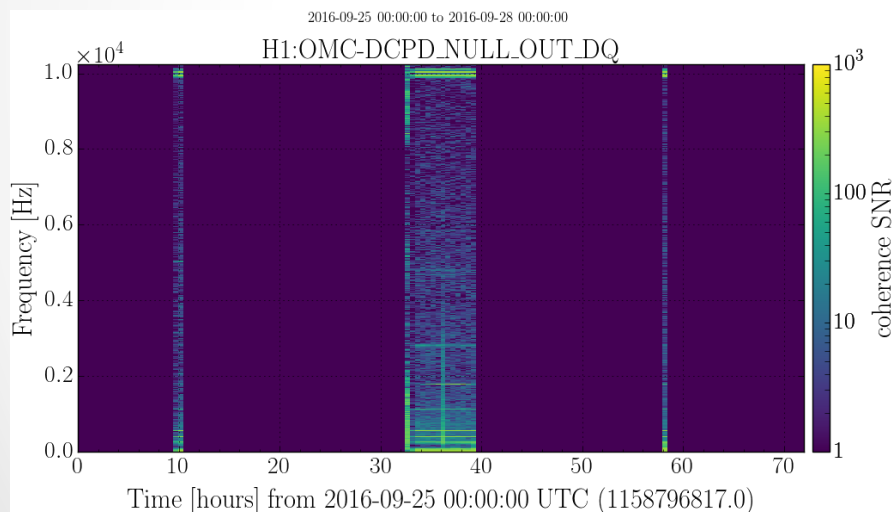- Shows noise sources across multiple subsystems

Coherence Matrix for 27-01-2017
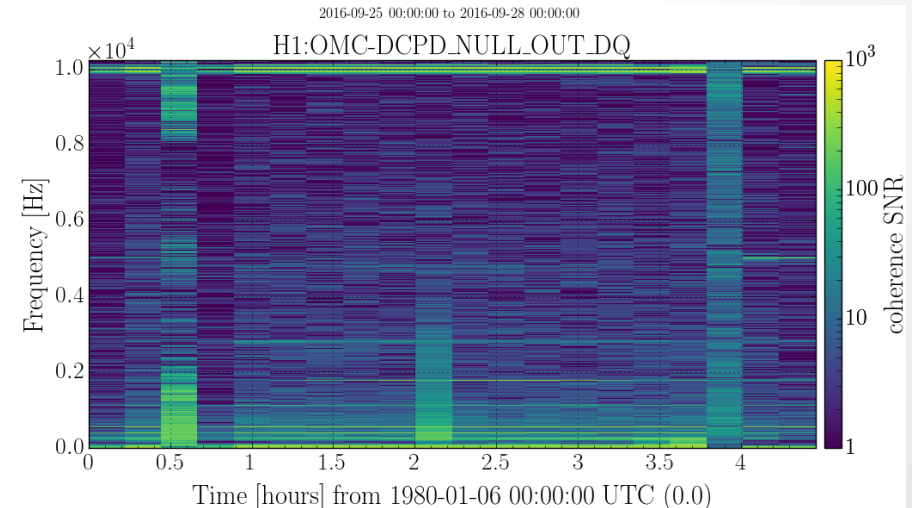
Query Data from Pipeline

With Python

- Return PEMCoherenceSegment Object or a GwPy Segment

From command line

- Plot frequency vs time (for long times)
- Remove unlocked times

Include zeroes for times when not locked

Cut times when not locked

Installing Stamp-pem

- We recommend installing it in a virtual environment on your account and fortunately, this is simple.

- Run the bash script on the [documentation page](#) to build the V.E and install stamp-pem on top

- Run the AutoConfig.py in the top level directory

- Source your copy before running
  - source /home/albert.einstein/opt/stamp_pem_soft/bin/activate

OR

- source stamppem from stochastic without installing a local copy
  - source /home/stochastic/opt/stamp_pem_soft/bin/activate

Coming soon…

- Interactive coherence matrices (sort by channel, frequency or SNR) with "hover" info

- Real time job monitoring on the webpages

- Alerts for odd behavior

- Be sure to check the Announcements page for details

Summary

- [Stamp-pem](#) provides an easy way to do bulk coherence calculations between arbitrary channels, subsystems and gps times

- Selective querying of the pipeline data adds flexibility and better noise characterization information while keeping runtimes low

- Querying the online database allows for coherence calculations over long times (with or without unlocked segments)

- We are running on the stochastic account at LHO and LLO. Source pipeline data (on each cluster) at /home/stochastic/stamppemtest

- Install your own copy or source the stochastic account on the clusters by typing
  - source /home/stochastic/opt/stamp_pem_soft/bin/activate

- More features in the near future! (Check [Announcements](#))

Links

- Stamp-pem documentation
  - https://ldas-jobs.ligo.caltech.edu/~rich.ormiston/stamp-pem/docs/_build/html/

- Selective Querying
  - https://ldas-jobs.ligo.caltech.edu/~rich.ormiston/stamp-pem/docs/_build/html/tutorial/QueryDatabase.html

- Query Online Database
  - https://ldas-jobs.ligo.caltech.edu/~rich.ormiston/stamp-pem/docs/_build/html/online_pipeline/online_pipeline.html

- LHO & LLO clusters online data
  - /home/stochastic/stamppemtest/

- LHO webpage
  - https://ldas-jobs.ligo-wa.caltech.edu/~stochastic/stamppemtest/HTML/day/20170205/

- LLO webpage
  - https://ldas-jobs.ligo-la.caltech.edu/~stochastic/stamppemtest/HTML/day/20170310/