



# Analysis of S2 Burst Hardware Injections

L. Cadonati, A. Weinstein

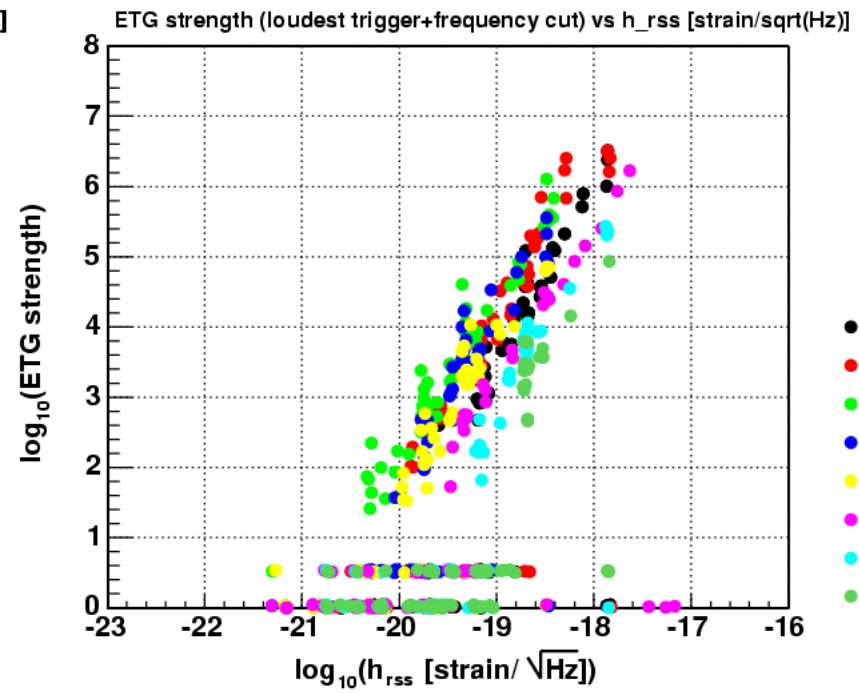
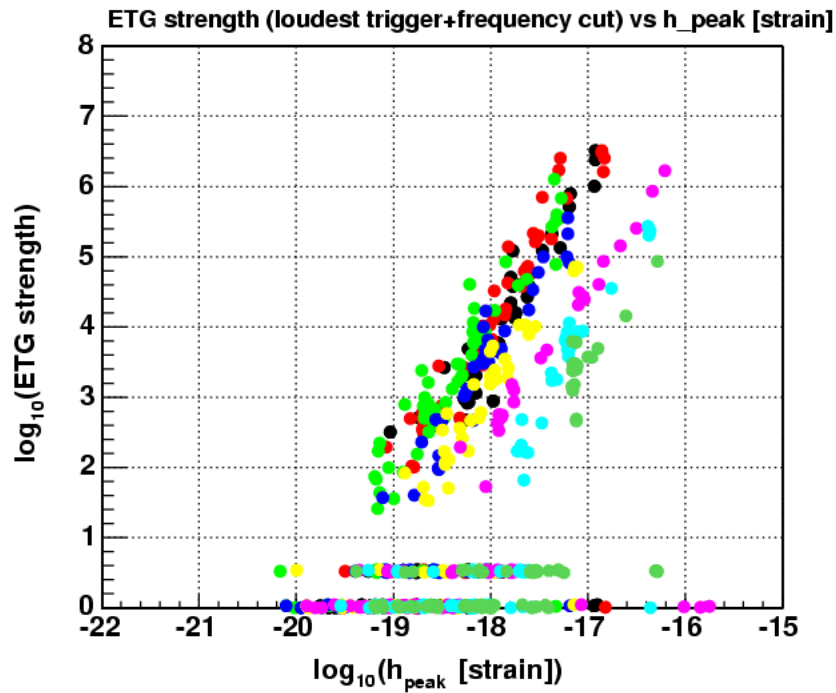
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For details on the injections and the analysis:

- LIGO-G030081-00-Z
- <http://ligo.mit.edu/~cadonati/S2/Inject/S2injections.html>



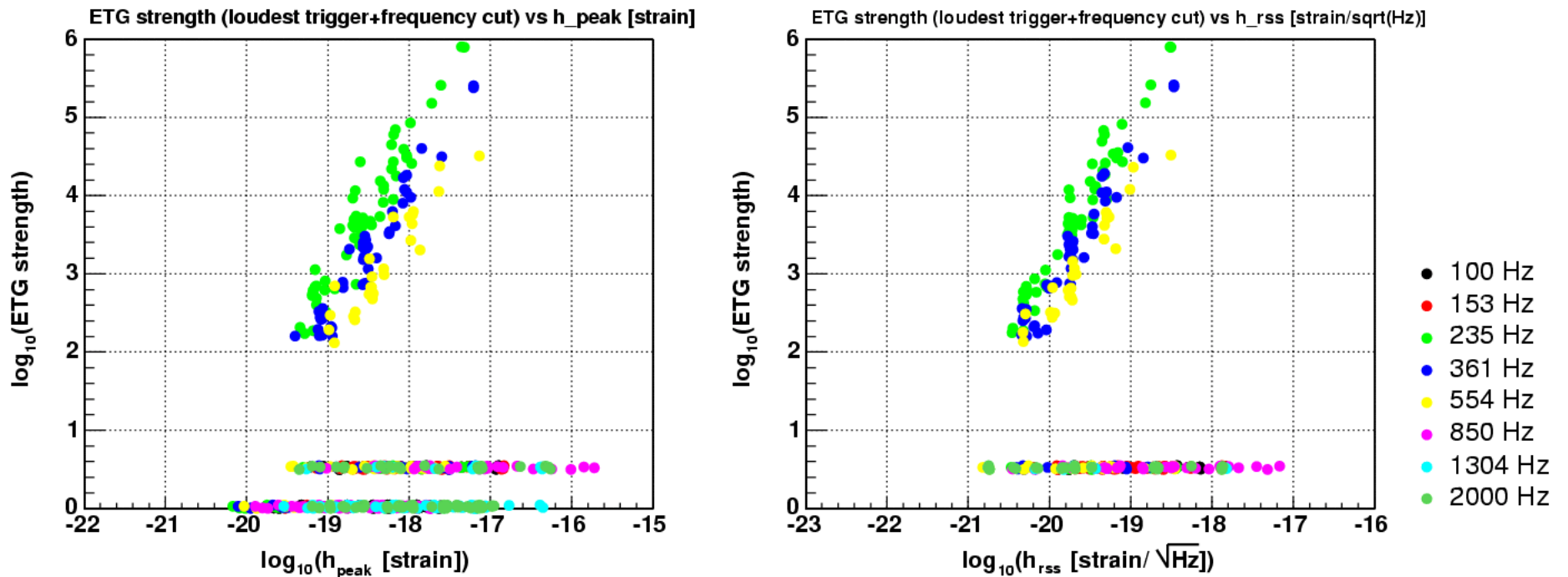
# L1 - TFCLUSTERS



- 100 Hz
- 153 Hz
- 235 Hz
- 361 Hz
- 554 Hz
- 850 Hz
- 1304 Hz
- 2000 Hz



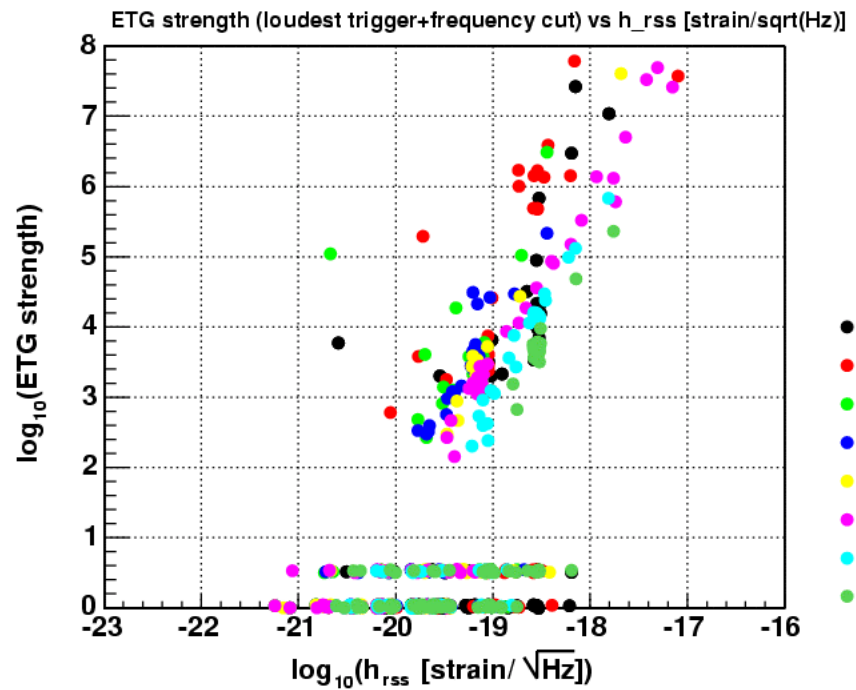
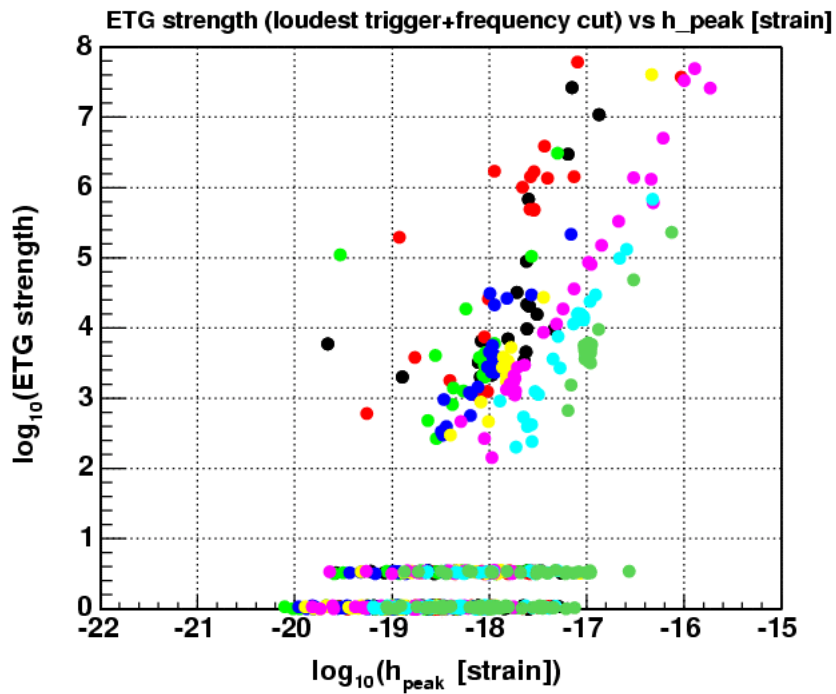
# L1 - POWER



Note: POWER was run only in 160-672 Hz



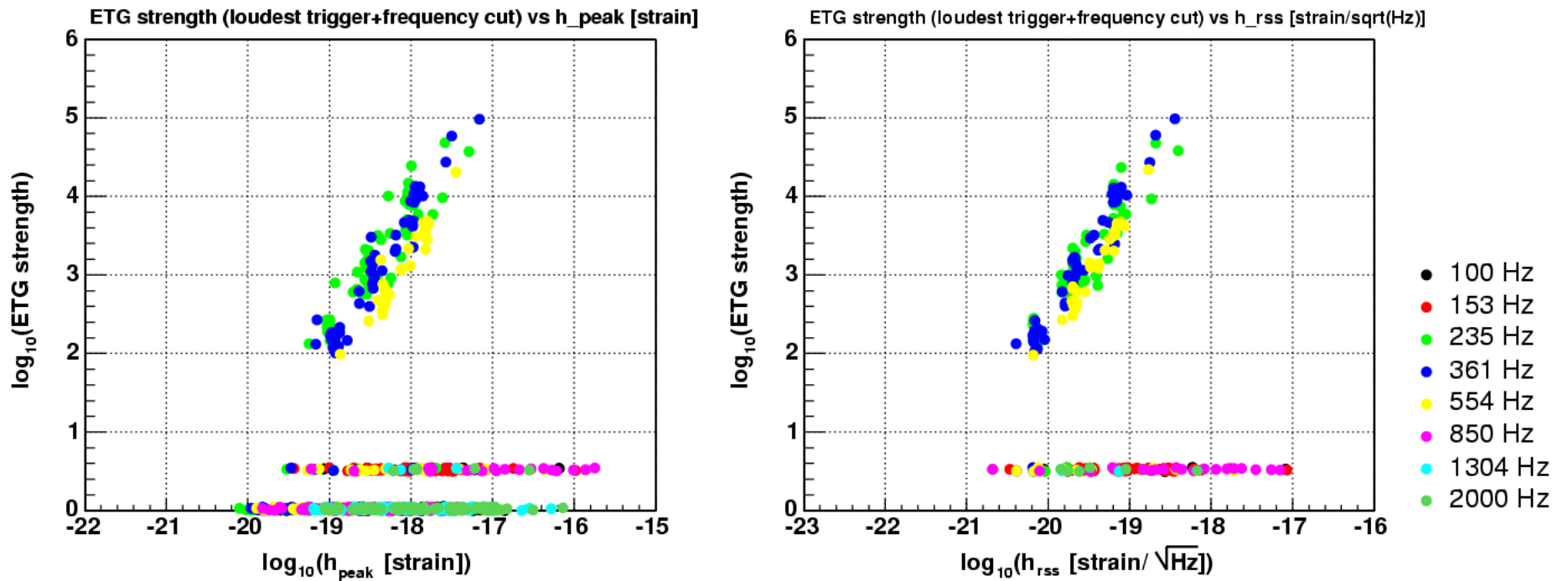
# H1 - TFCLUSTERS



- 100 Hz
- 153 Hz
- 235 Hz
- 361 Hz
- 554 Hz
- 850 Hz
- 1304 Hz
- 2000 Hz

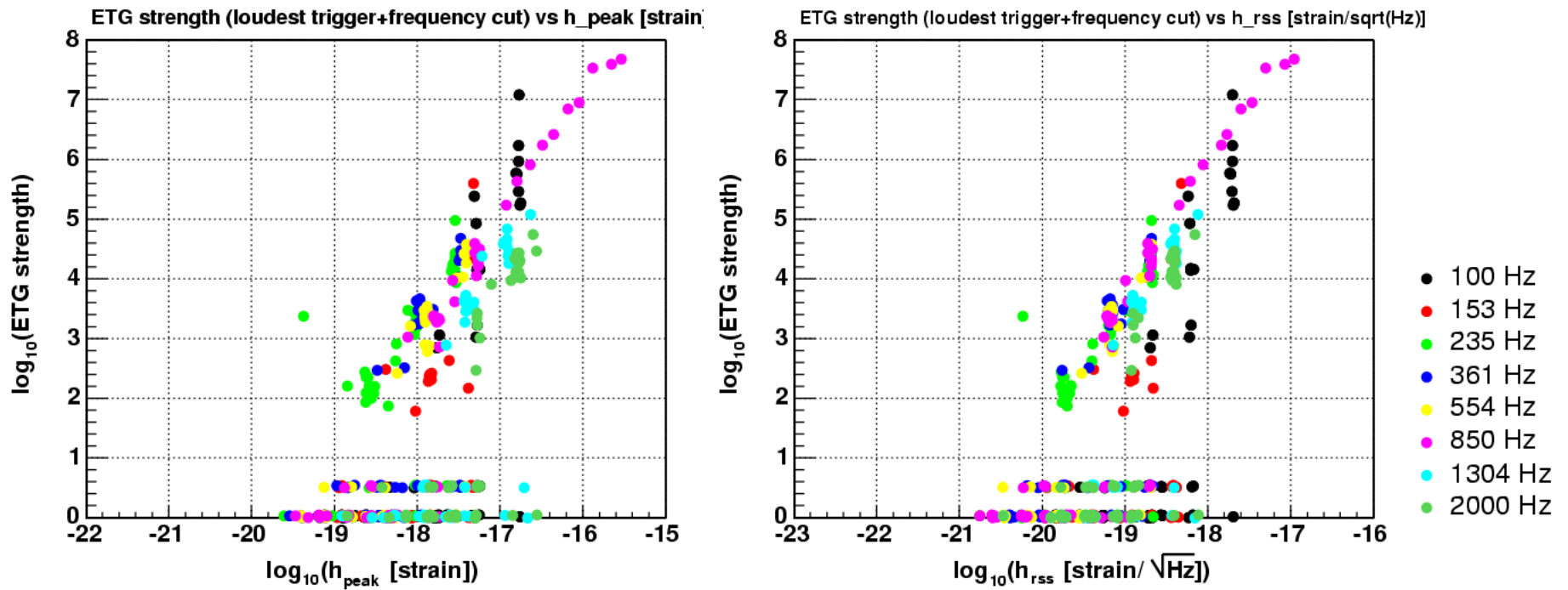


# H1 - POWER



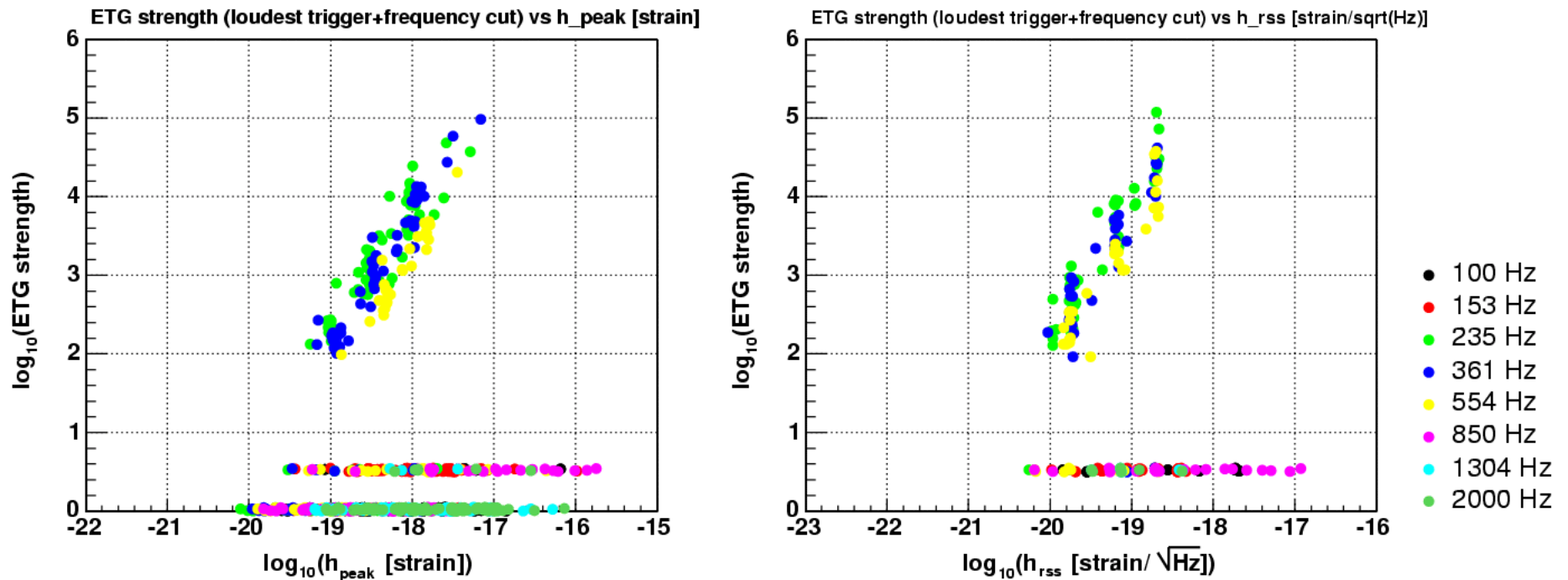
Note: POWER was run only in 160-672 Hz

# H2 - TFCLUSTERS





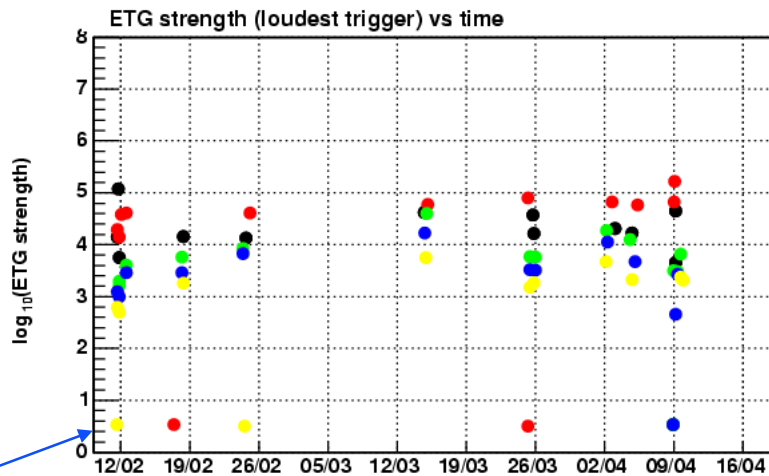
# H2 - POWER



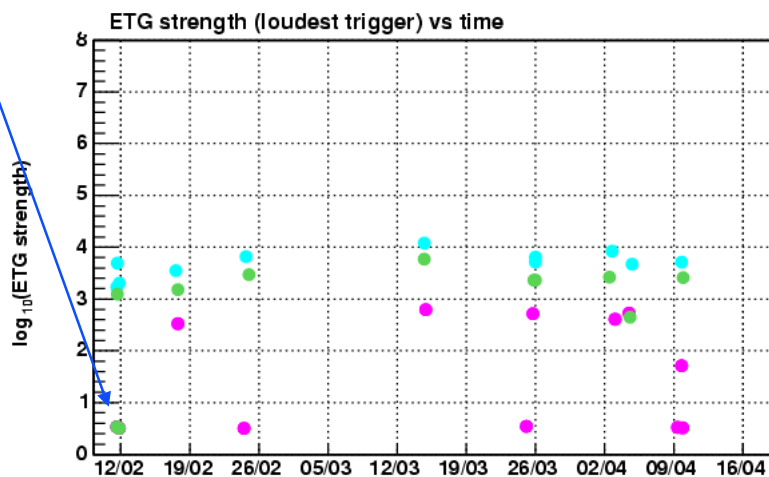
Note: POWER was run only in 160-672 Hz



# L1 stationarity



Failed the frequency cut



- Events injected through S2 run
- Reconstructed with TFCLUSTERS (ONLINE setup - some are missed)
- Signals: sine gaussians at Q=9 and:
  - »  $2 \times 10^{-16}$  m/sqrt(Hz) for 235, 361, 554 and 850 Hz
  - »  $8 \times 10^{-16}$  m/sqrt(Hz) for 100, 150, 1304 and 2000 Hz

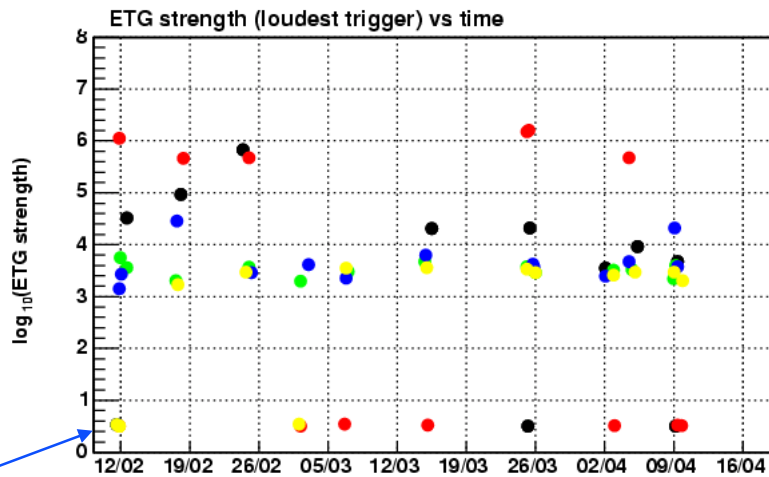
- 100 Hz
- 153 Hz
- 235 Hz
- 361 Hz
- 554 Hz

- 850 Hz
- 1304 Hz
- 2000 Hz

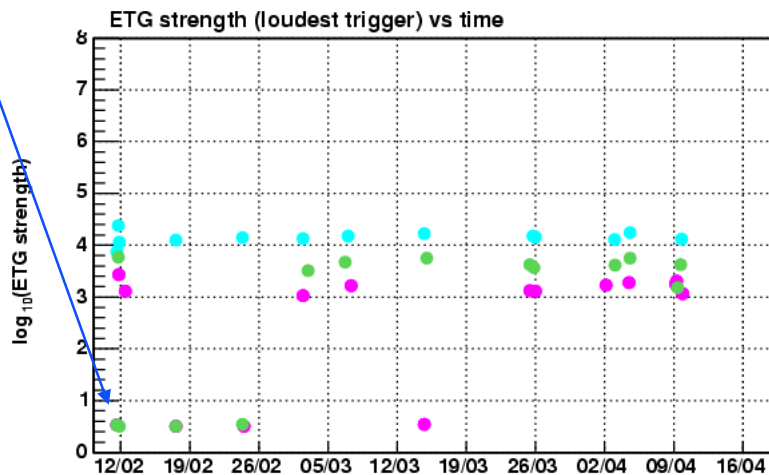




# H1 stationarity



Failed the frequency cut



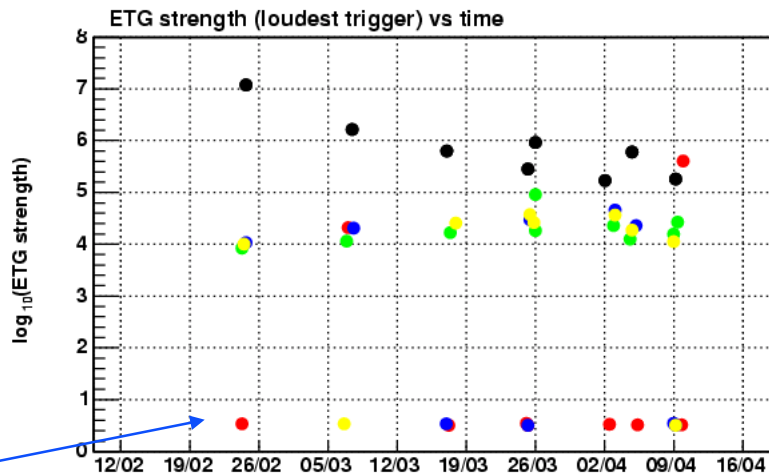
- Events injected through S2 run
- Reconstructed with TFCLUSTERS (ONLINE setup - some are missed)
- Signals: sine gaussians at Q=9 and:
  - »  $2.6 \times 10^{-16}$  m/sqrt(Hz) for 235, 361, 554 and 850 Hz
  - »  $1 \times 10^{-15}$  m/sqrt(Hz) for 100, 150, 1304 and 2000 Hz

- 100 Hz
- 153 Hz
- 235 Hz
- 361 Hz
- 554 Hz

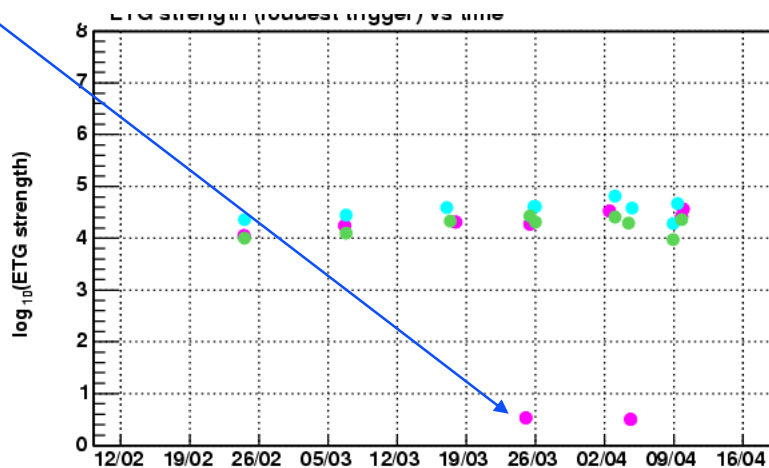
- 850 Hz
- 1304 Hz
- 2000 Hz



# H2 stationarity



Failed the frequency cut



- 100 Hz
- 153 Hz
- 235 Hz
- 361 Hz
- 554 Hz

- Events injected through S2 run
- Reconstructed with TFCLUSTERS (ONLINE setup - some are missed)
- Signals: sine gaussians at Q=9 and:
  - »  $3.8 \times 10^{-16}$  m/sqrt(Hz) for 235, 361, 554 and 850 Hz
  - »  $7.7 \times 10^{-16}$  m/sqrt(Hz) for 150, 1304 and 2000 Hz
  - »  $3.8 \times 10^{-15}$  m/sqrt(Hz) for 100Hz

- 850 Hz
- 1304 Hz
- 2000 Hz

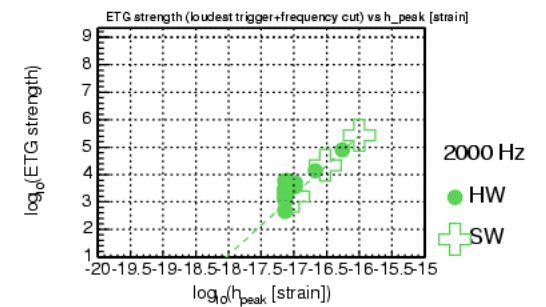
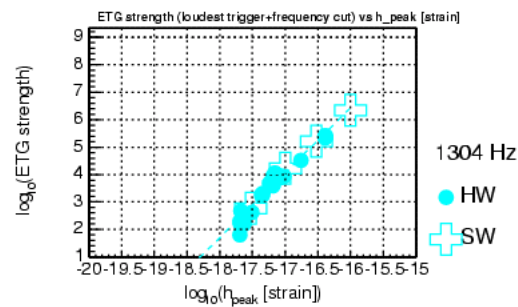
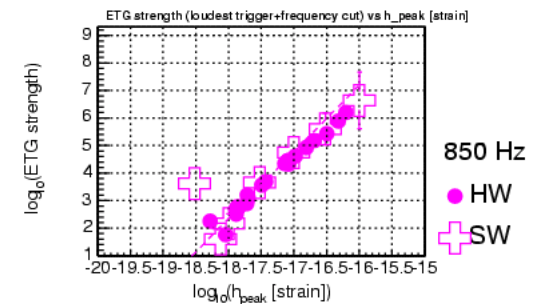
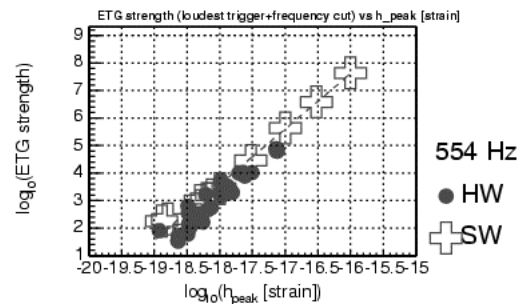
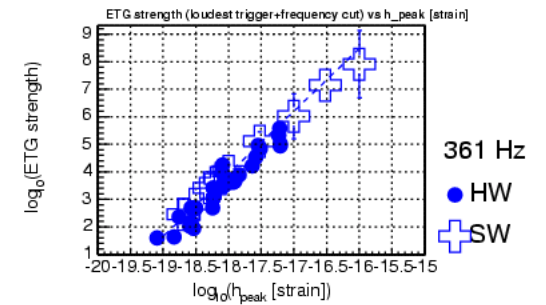
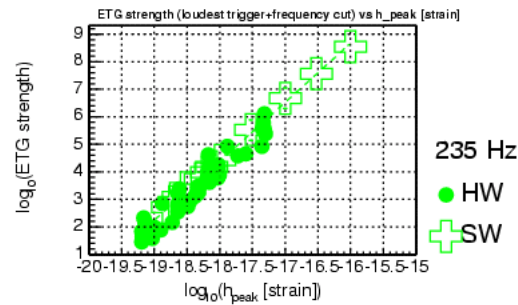
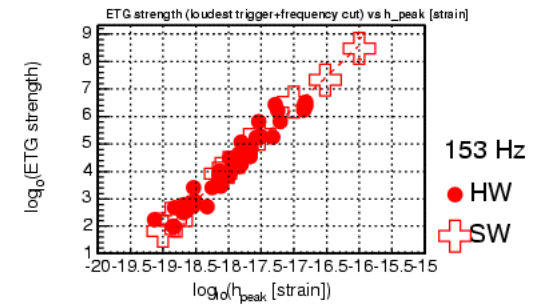
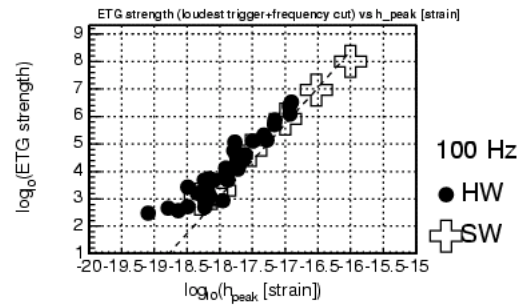


# Hardware-Software comparison

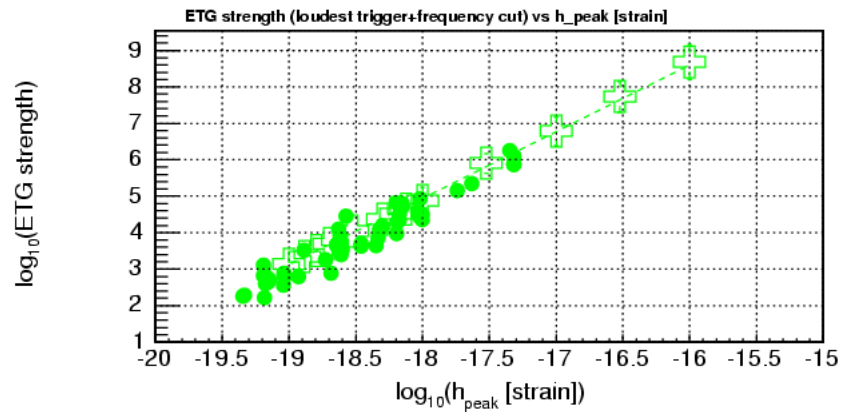
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- Hardware injections:
  - » Q=9 sine gaussians
- Software injections:
  - » Q=9 sine gaussians, at 23 times uniformly distributed in the S2 playground
  - » Calibration taken care of in LDAS (respfilt function in DataCond)
- Qualitative agreement in the ETG response!
  - » At least within a factor 3
- Quantitative assessment in progress
  - » Via fits of response versus  $h_{\text{peak}}$
  - » Will tell us what confidence we can put in the calibration parameter

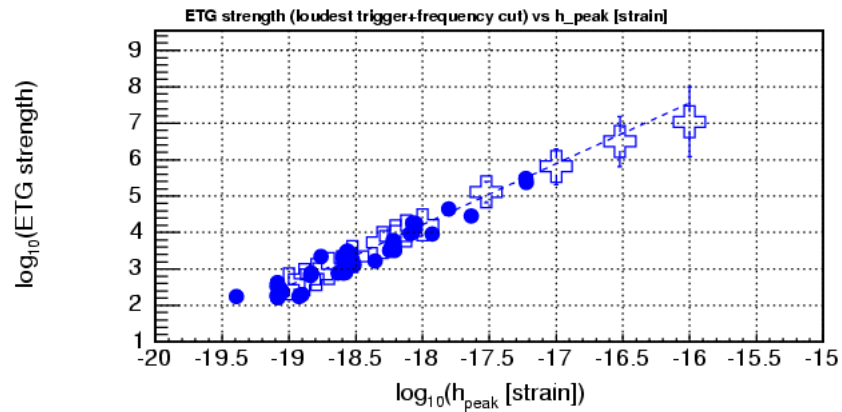
- TFCLUSTERS
- Dots: hardware
- Crosses: software
- Fits and quantitative comparison are in progress



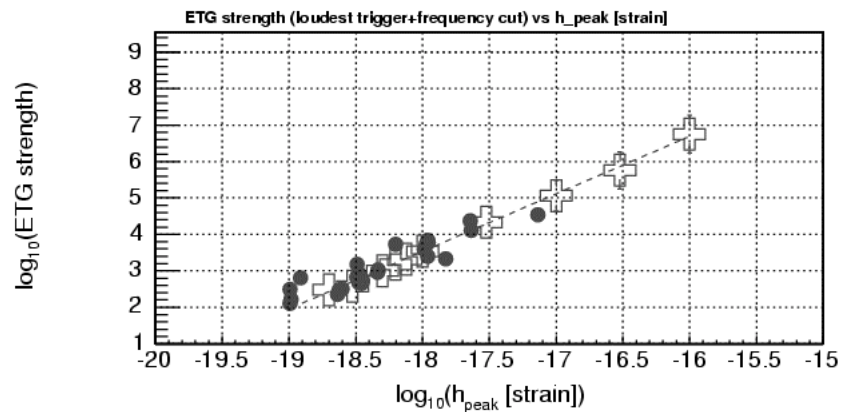
- POWER
- Dots: hardware
- Crosses: software
- Fits and quantitative comparison are in progress



235 Hz



361 Hz



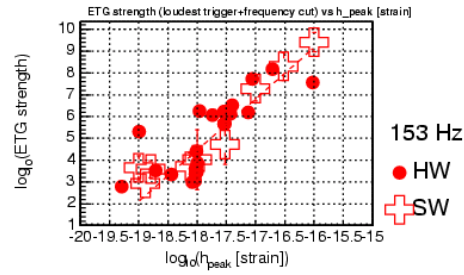
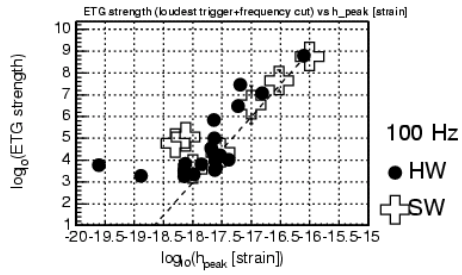
554 Hz



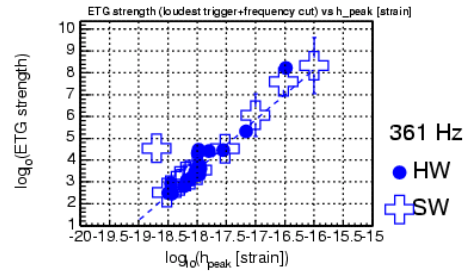
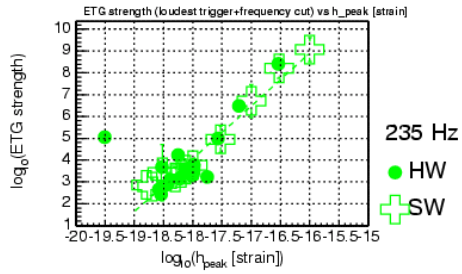
# TFCLUSTERS

# H1

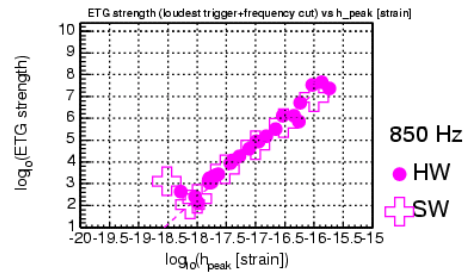
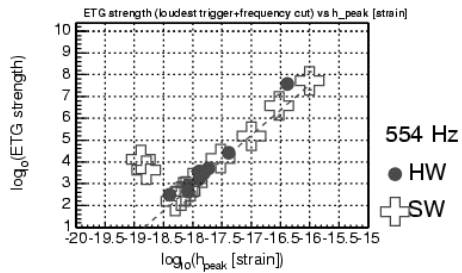
# POWER



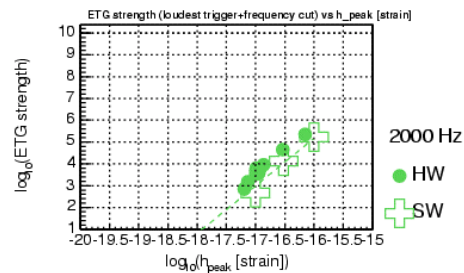
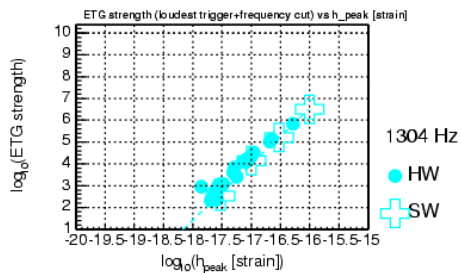
$\log_{10}(\text{ETG strength})$



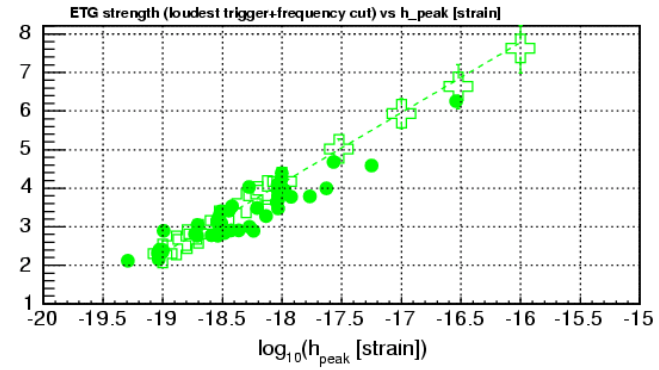
$\log_{10}(\text{ETG strength})$



$\log_{10}(\text{ETG strength})$

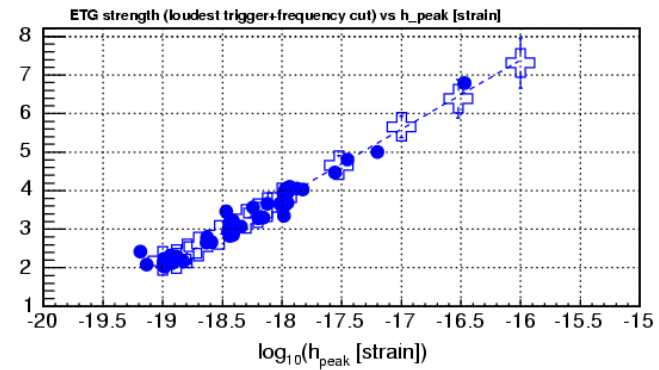


$\log_{10}(\text{ETG strength})$



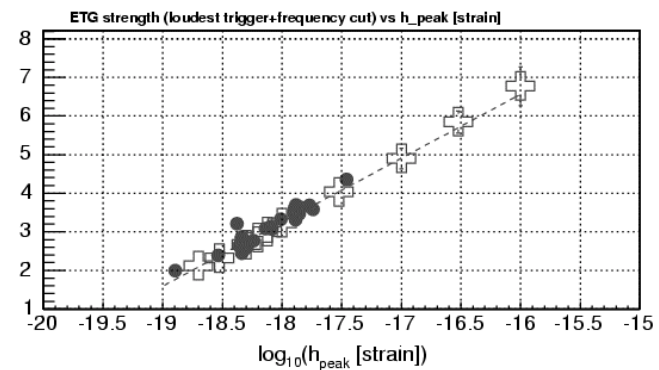
235 Hz

- HW
- + SW



361 Hz

- HW
- + SW



554 Hz

- HW
- + SW



# TFCLUSTERS

# H2

# POWER

