

WaveBurst upgrade for S3 analysis

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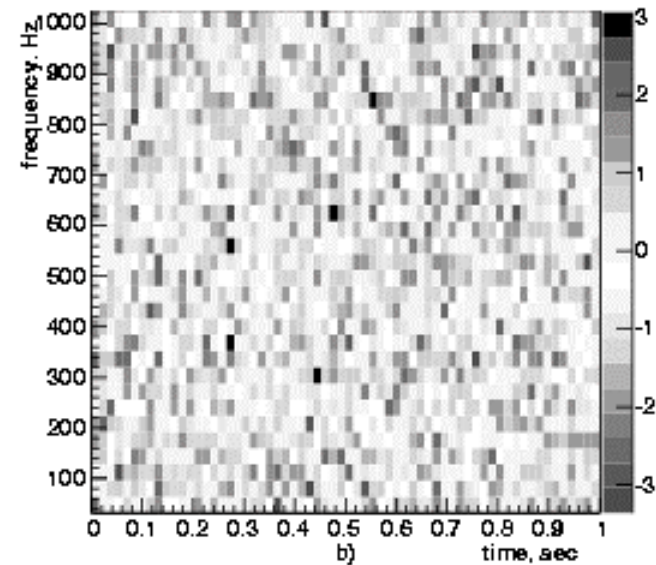
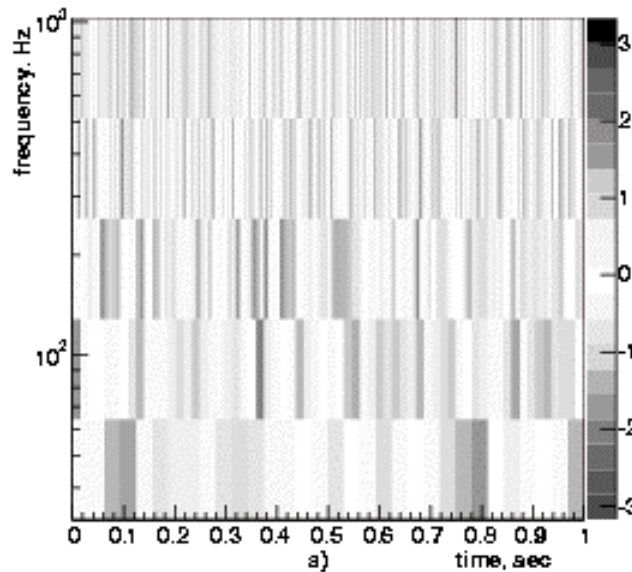
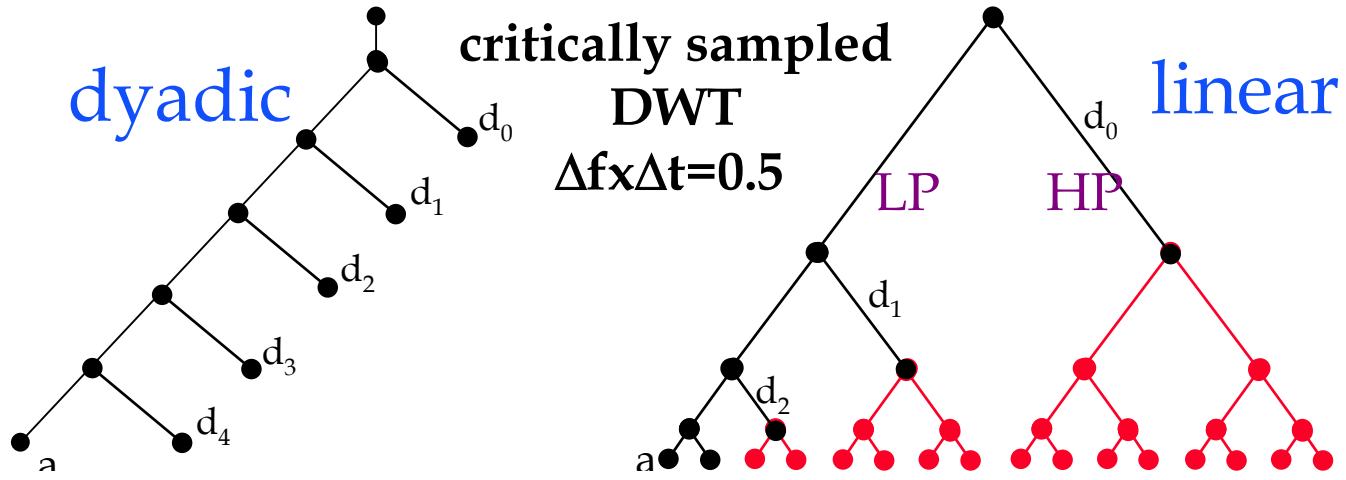
- **Motivation**
- **Multi-resolution analysis**
- **Parameter space**
- **Summary**



- **Implementation of “original” WB algorithm**
 - **add analysis at multiple TF resolutions**
 - **more flexible time shift analysis**
 - **single and multiple detector options**
- **use different analysis environment: DMT+Condor**
 - **make development cycle shorter**
 - **simplify debugging, validation and testing**
 - **reduce data processing time**



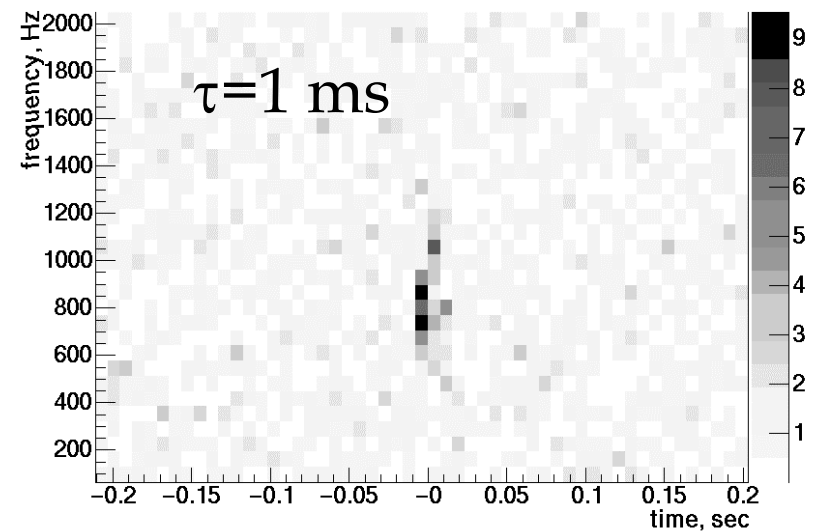
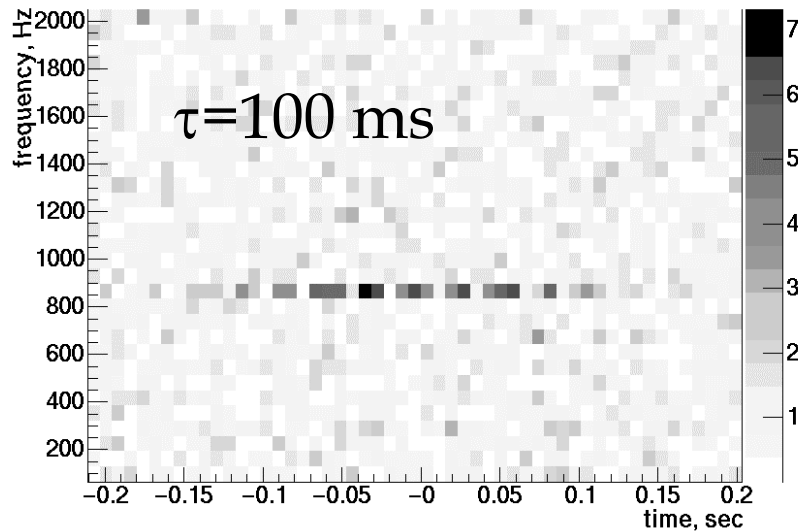
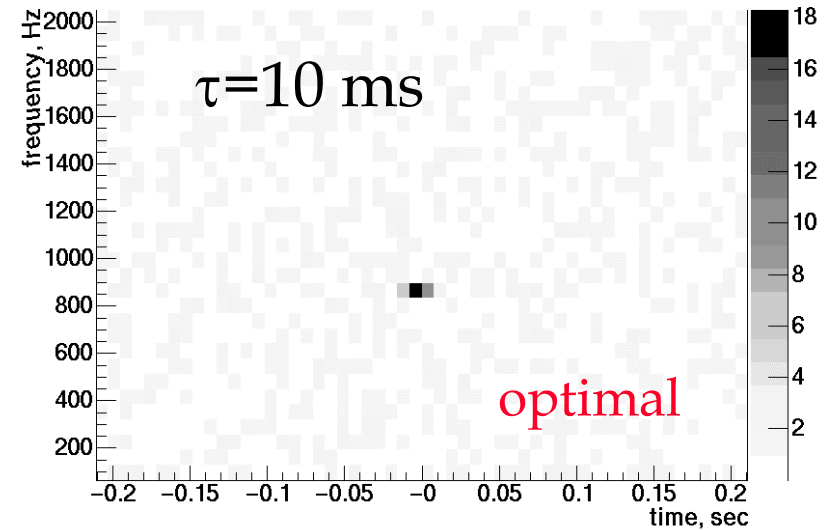
decomposition in basis $\{\Psi_i(t)\}$





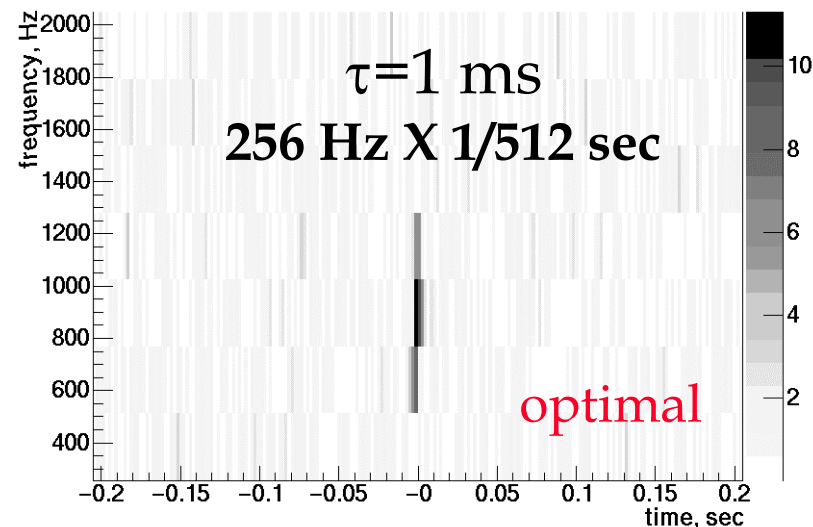
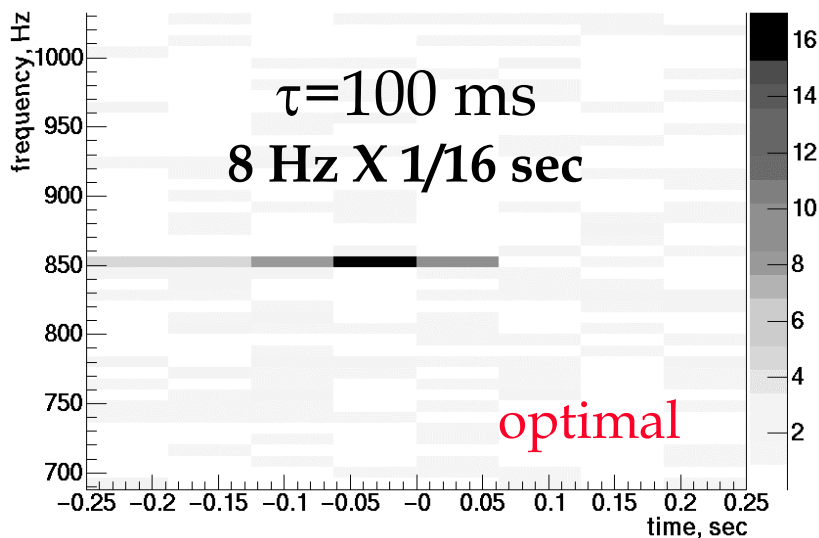
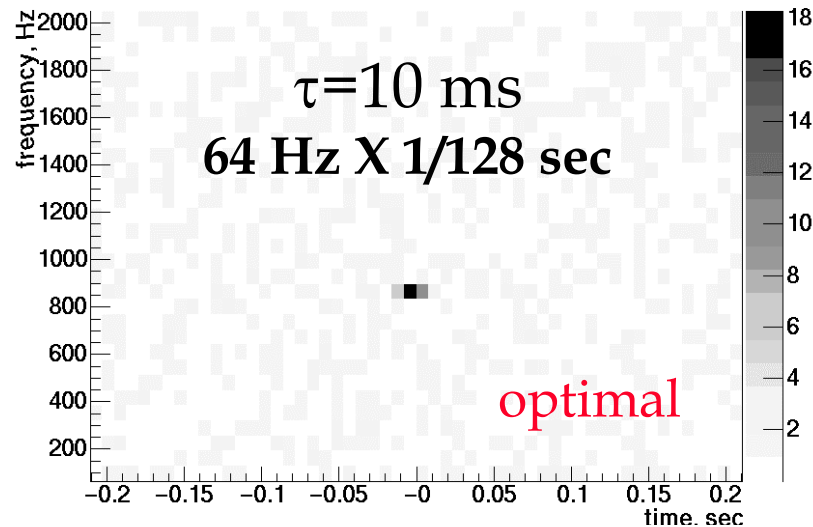
representation of SG 850Hz
with Symlet wavelet

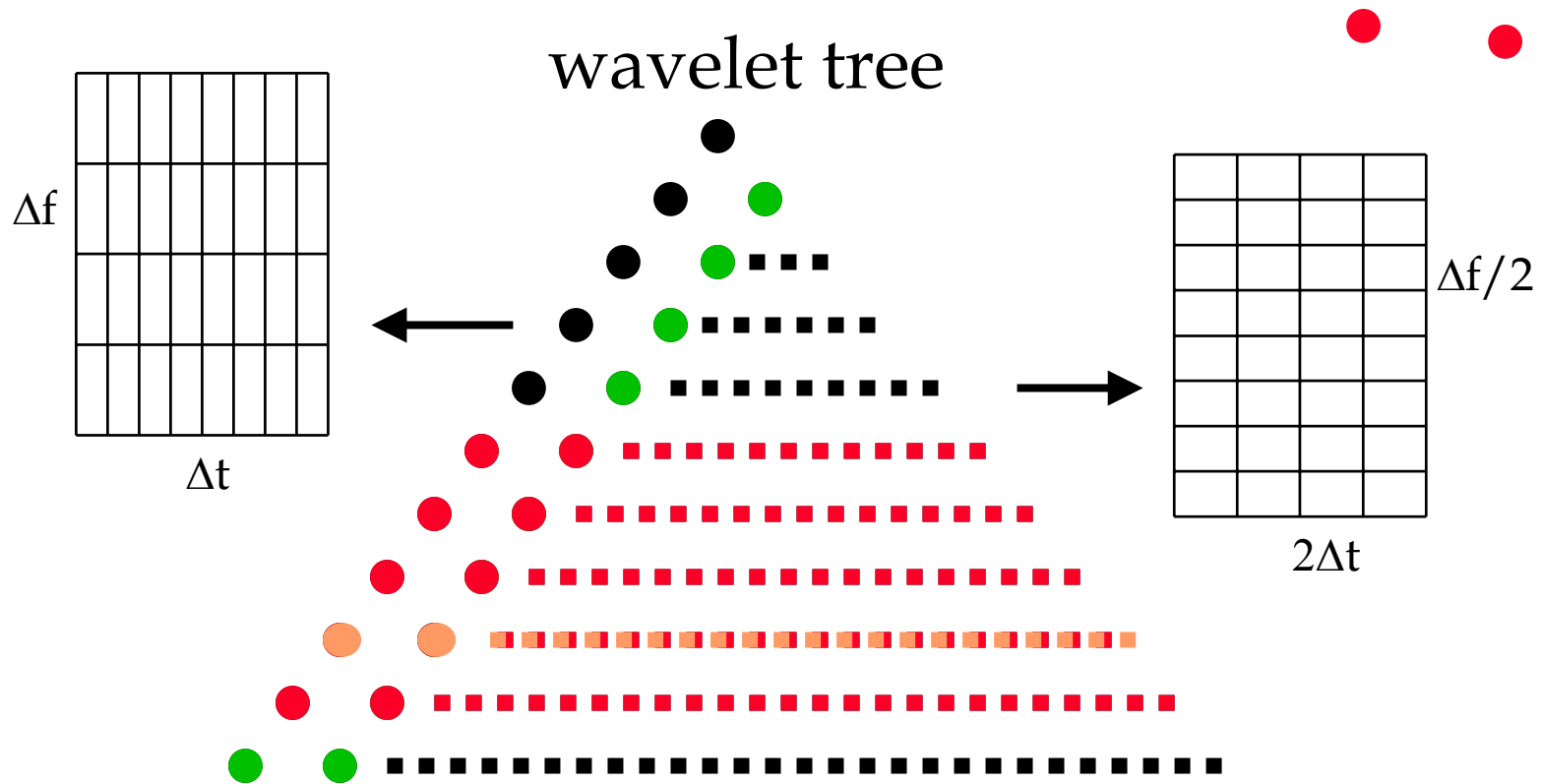
resolution
64 Hz X 1/128 sec





run analysis in a range of TF resolutions
(rotation in larger space)

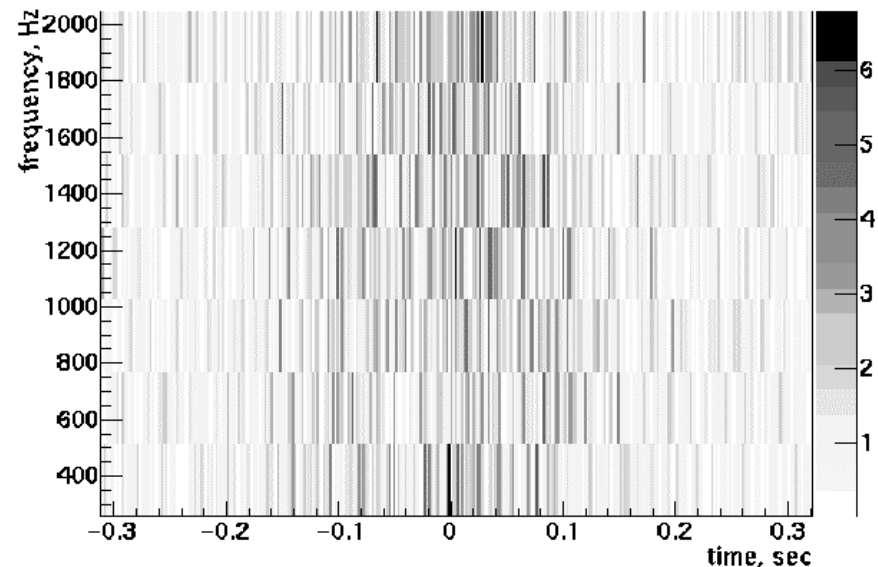
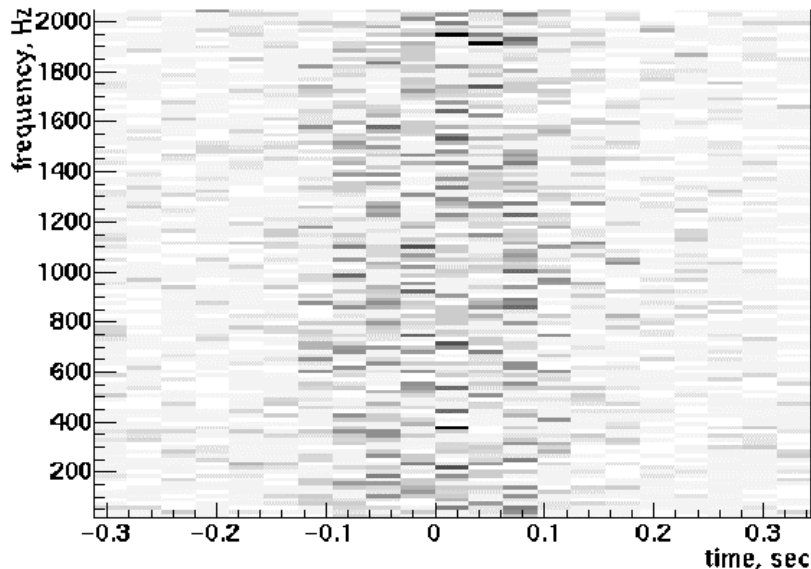
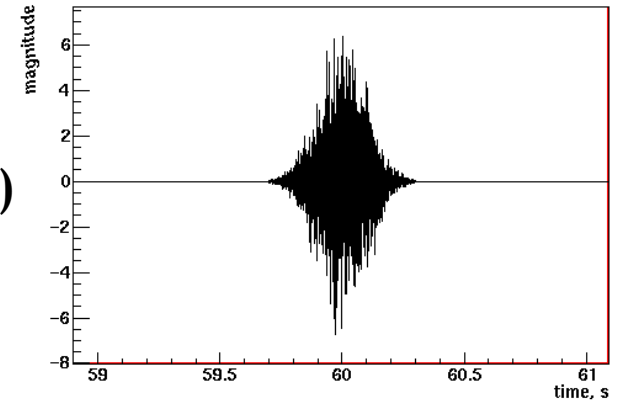




- cover range of resolutions by selecting nodes from wavelet tree.
- select pixels with maximum excess power

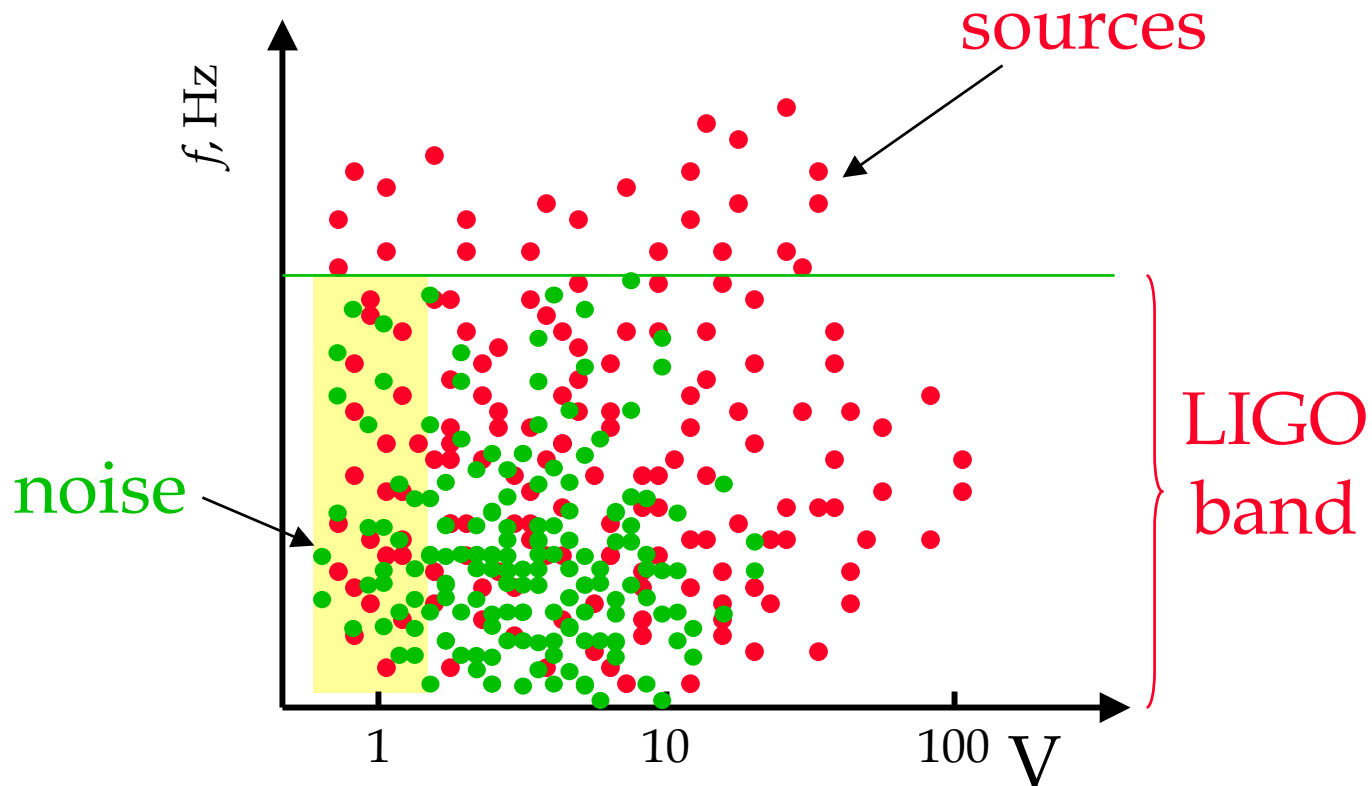


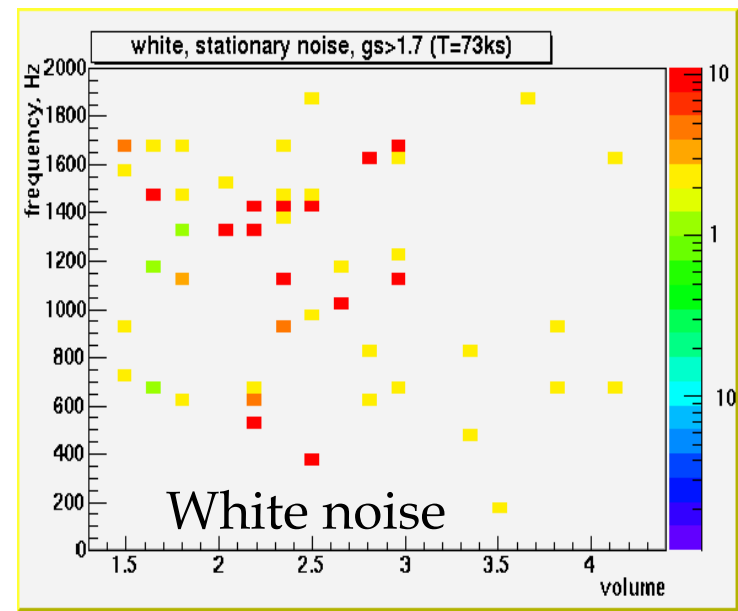
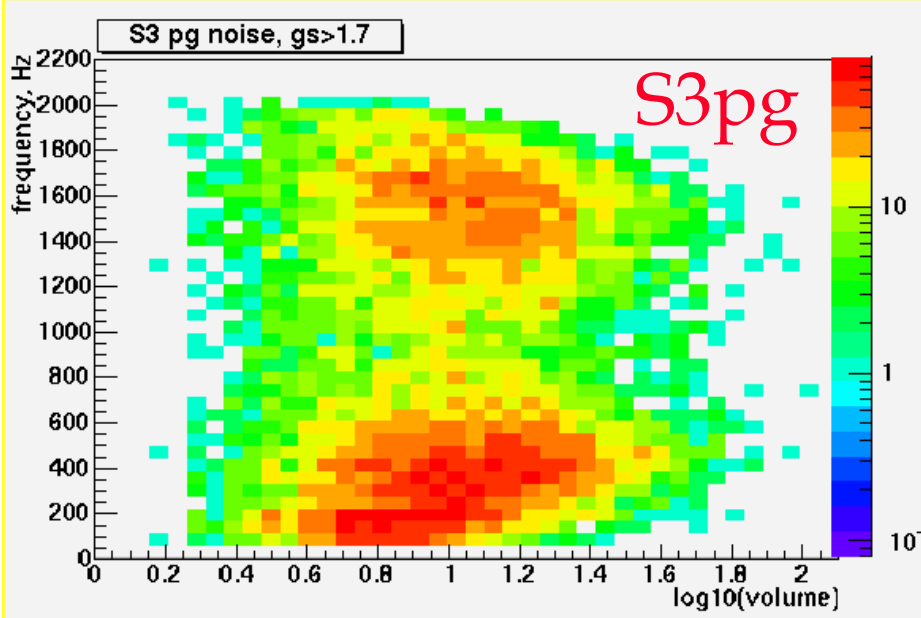
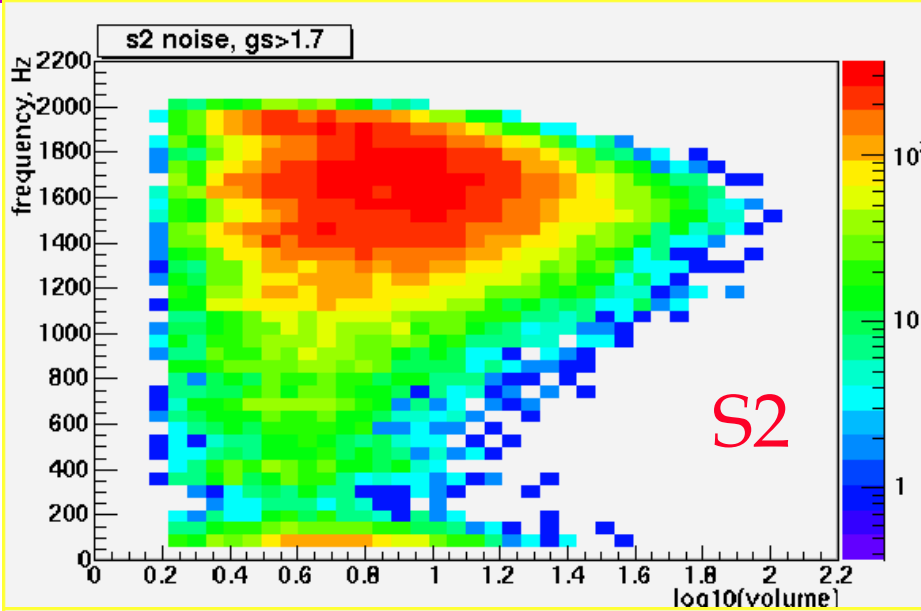
- Signals with large TF volume ?
 - for example windowed white noise.
- need multi-detector pipeline
 - coherent excess power
(model independent, implemented in WB)
 - similarity of waveforms
(r-statistics, can be model dependent)





- “LIGO cheese”: $f_c, \Delta f, \Delta t$ (Lazzarini, Sutton)
- Two-dimensional space: $f_c, V = \Delta f \times \Delta t$
 - A time series sample has volume $r_s/2 \times 1/r_s = 1/2$ (r_s sampling rate)



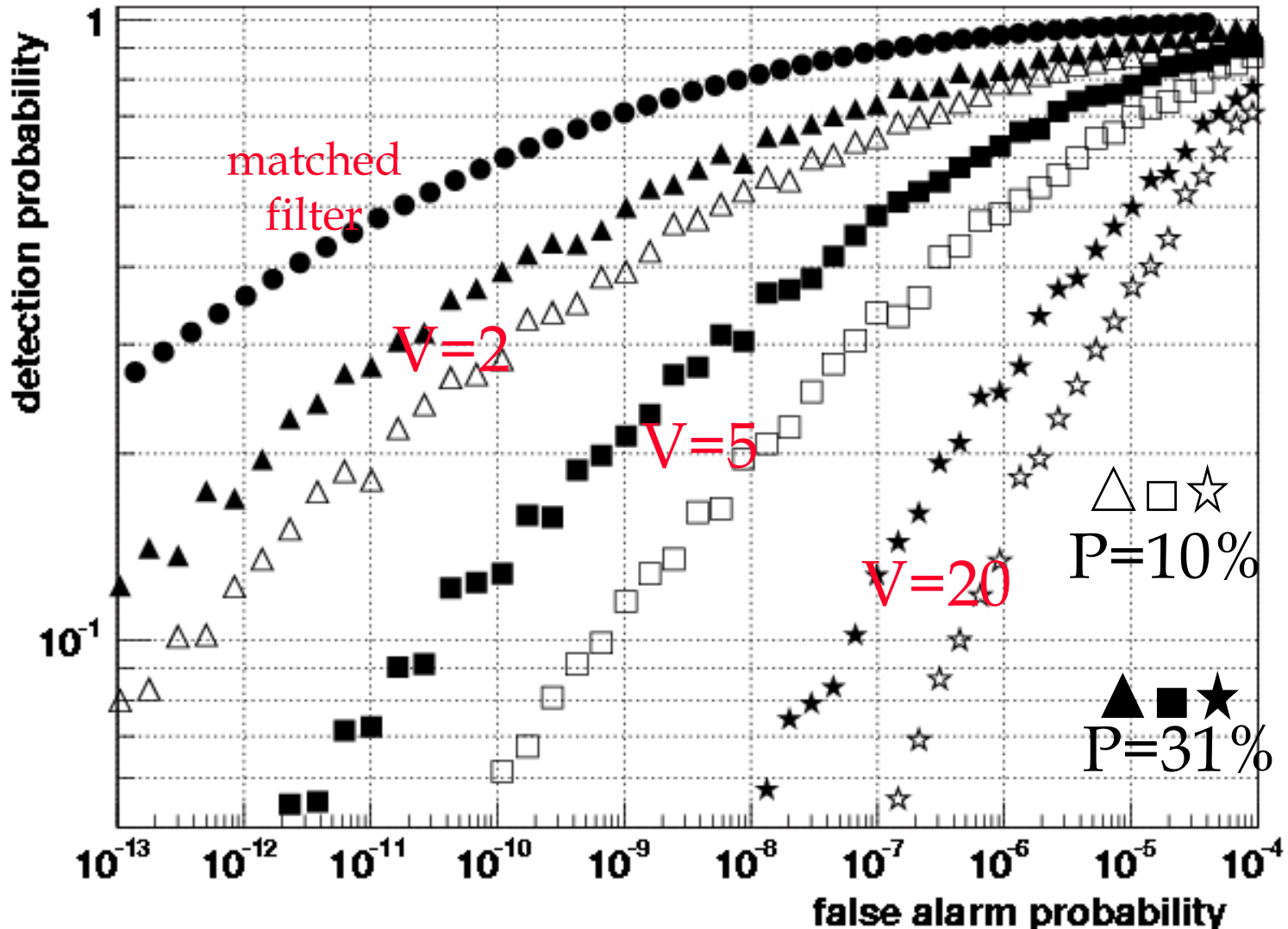


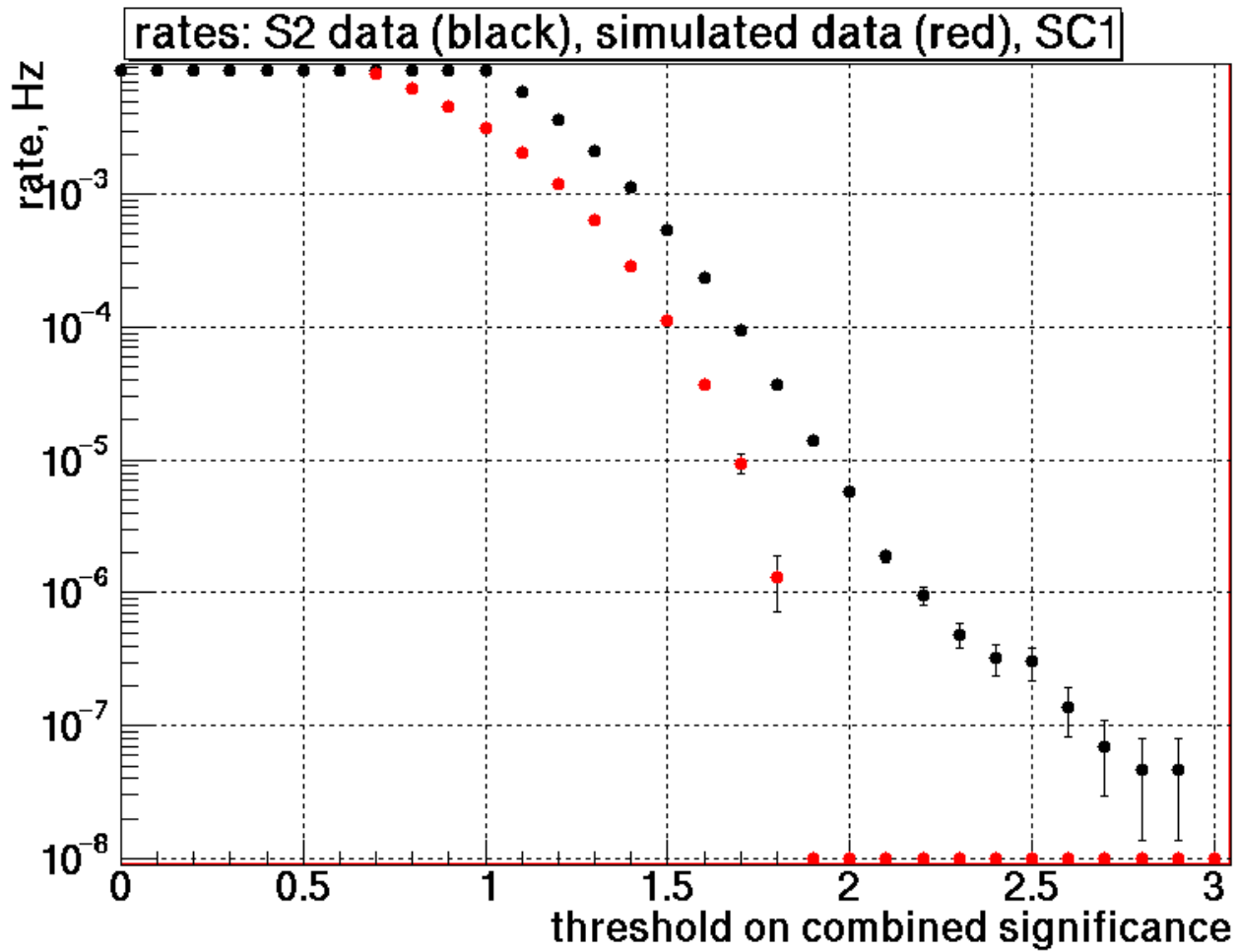
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- Burst signal with SNR 25:

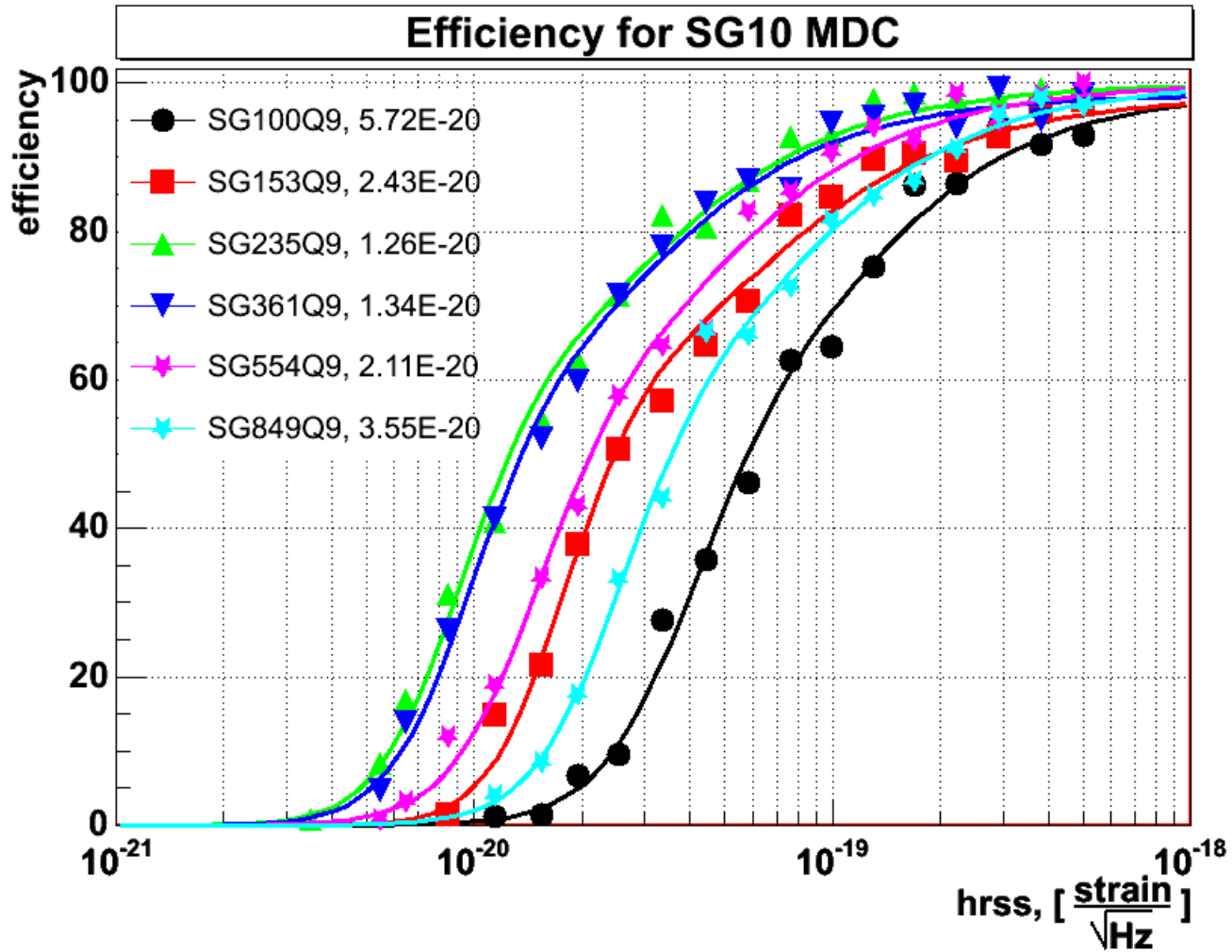
$$\frac{1}{2\pi} \int_{-\infty}^{\infty} \frac{|M(\omega)|^2}{S_n(\omega)} d\omega$$





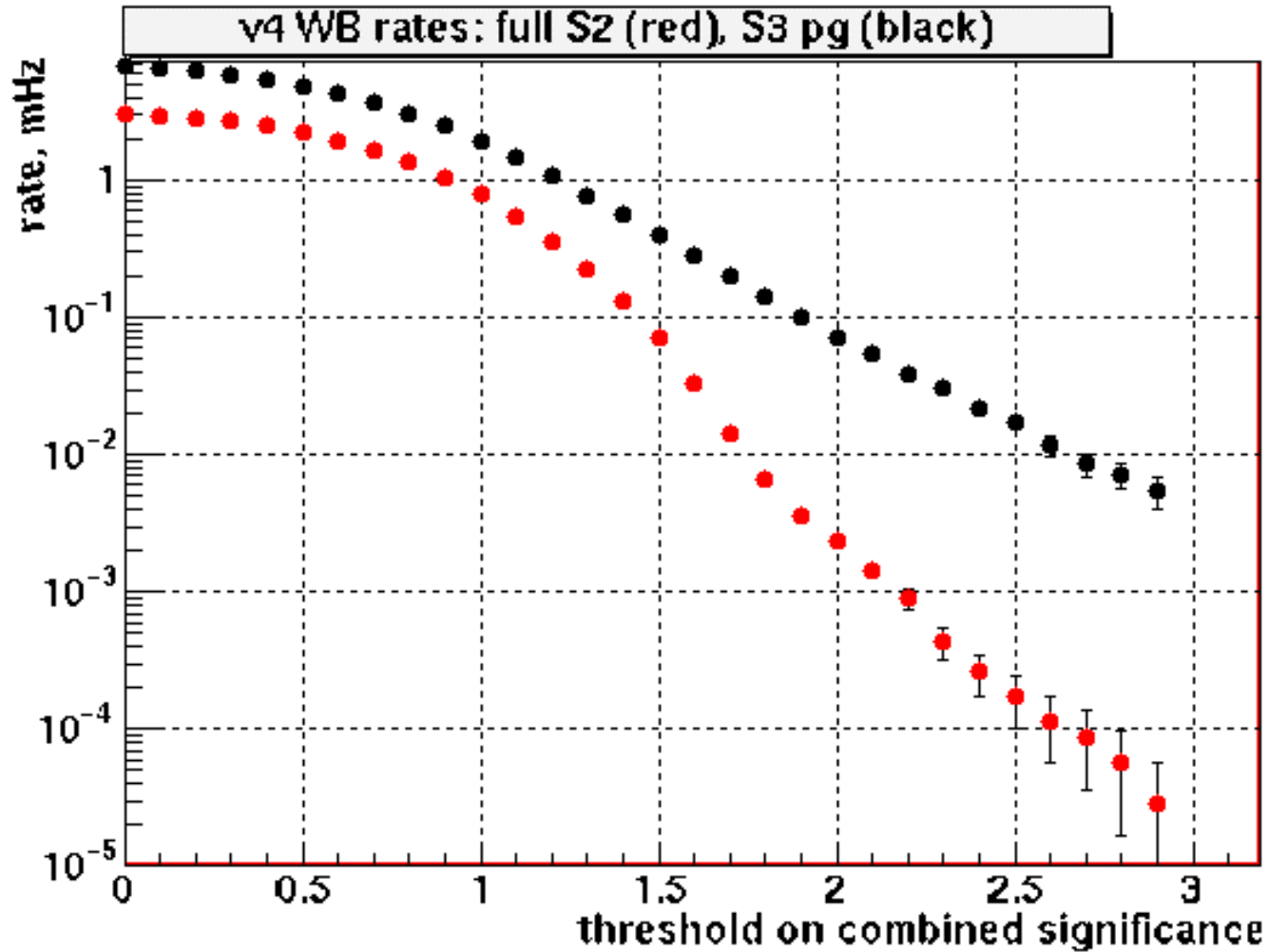


- See Igor's talk



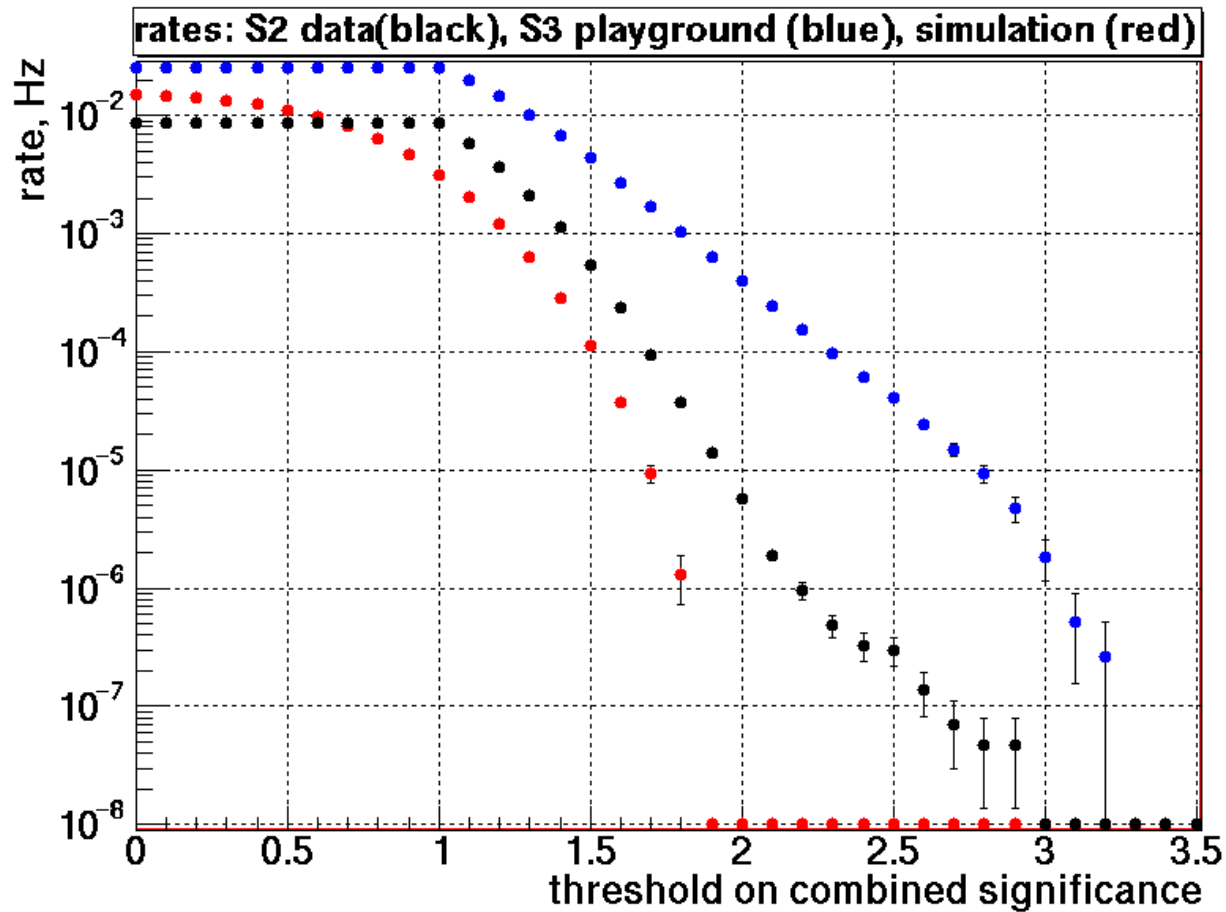


- WB version v3





- WB version v5





- **WaveBurst upgrade**
 - **Implemented multiple TF resolutions**
 - **Sensitivity improvement 20%-100%**
 - **single and multiple detector options**
- **S3 playground studies (both v4 & v5 versions)**
 - **sensitivity & rates**
 - **noise non-stationarity**
 - **resolve S3 analysis issues before next LSC**
- **Preparations for S4**