

KAGRA Detector Characterizationの 開発進捗状況（III）

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Detector Characterization

Data Analysis

Veto info., target veto , Data quality, calibration accu.

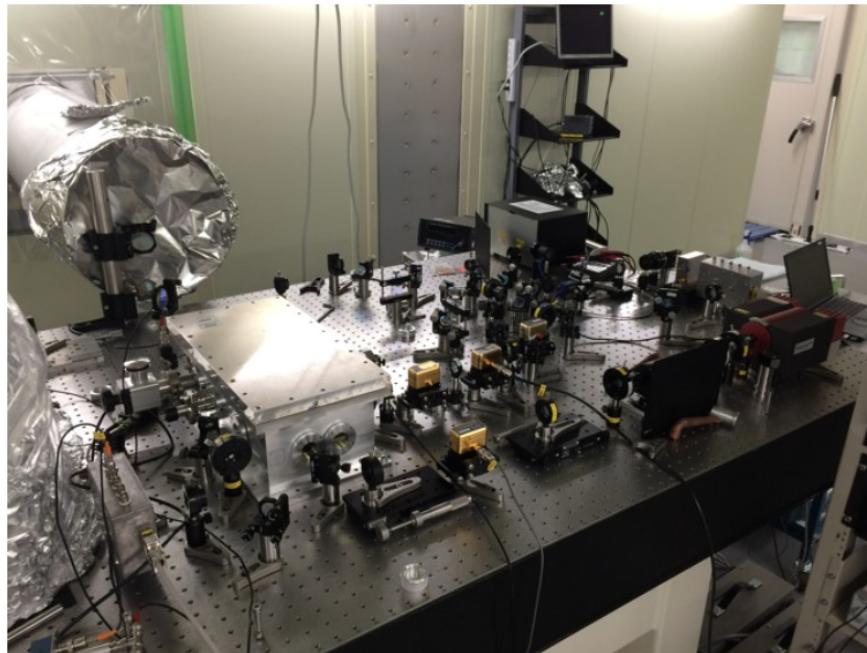
Detector Characterization

PEM, Aux. channels, Online-monitors, diagnostics

Instruments

Detector Characterization

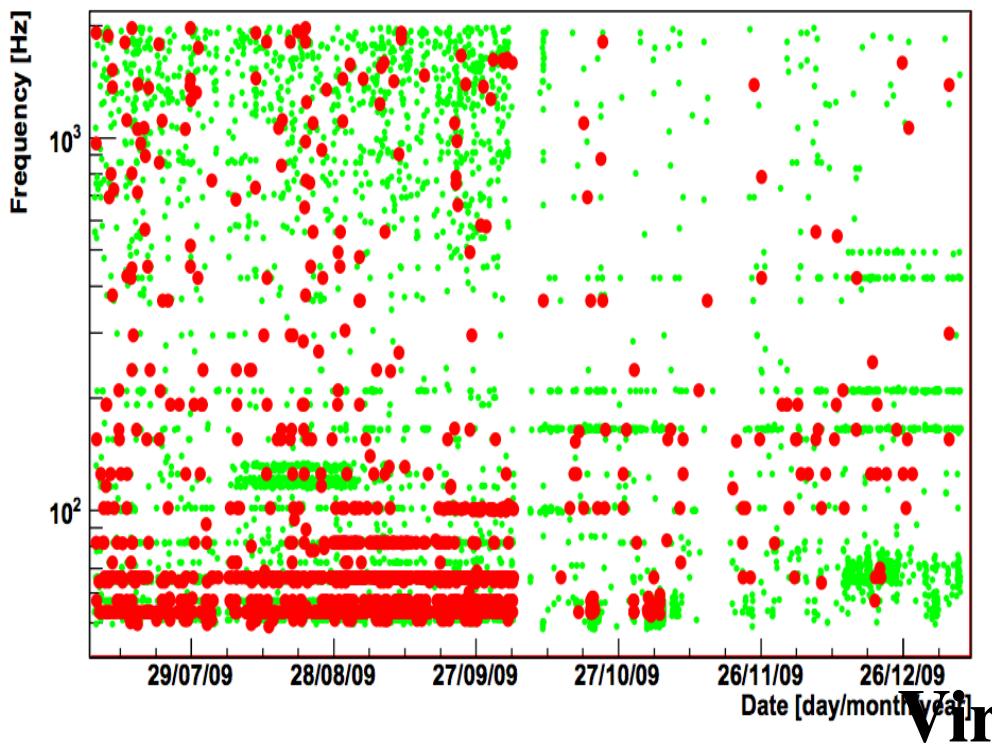
- 望遠鏡が正しく動作しているかどうかを診断
 - 奇妙な発振? Saturation? 雑音レベル?
 - カップルしているチャンネルは? その起源は?
 - 定常性は?



中野 F2F
meeting (2015)

- データの状態や質を評価し、サイエンスを最大化させる。
 - 現在の観測データで見える重力波の距離
 - データに含まれている

重力波望遠鏡の観測データ（例）



SNR>5のイベント
が毎秒1.8個

	Line categories	Number of identified lines
Intrinsic lines	Violin modes	127
	Mechanical resonances	26
	Calibration and control	32
Noise lines	Power line and harmonics	40
	Vibration	24
	Magnetic	-
	Digital	73
	Sidebands	640

Virgo

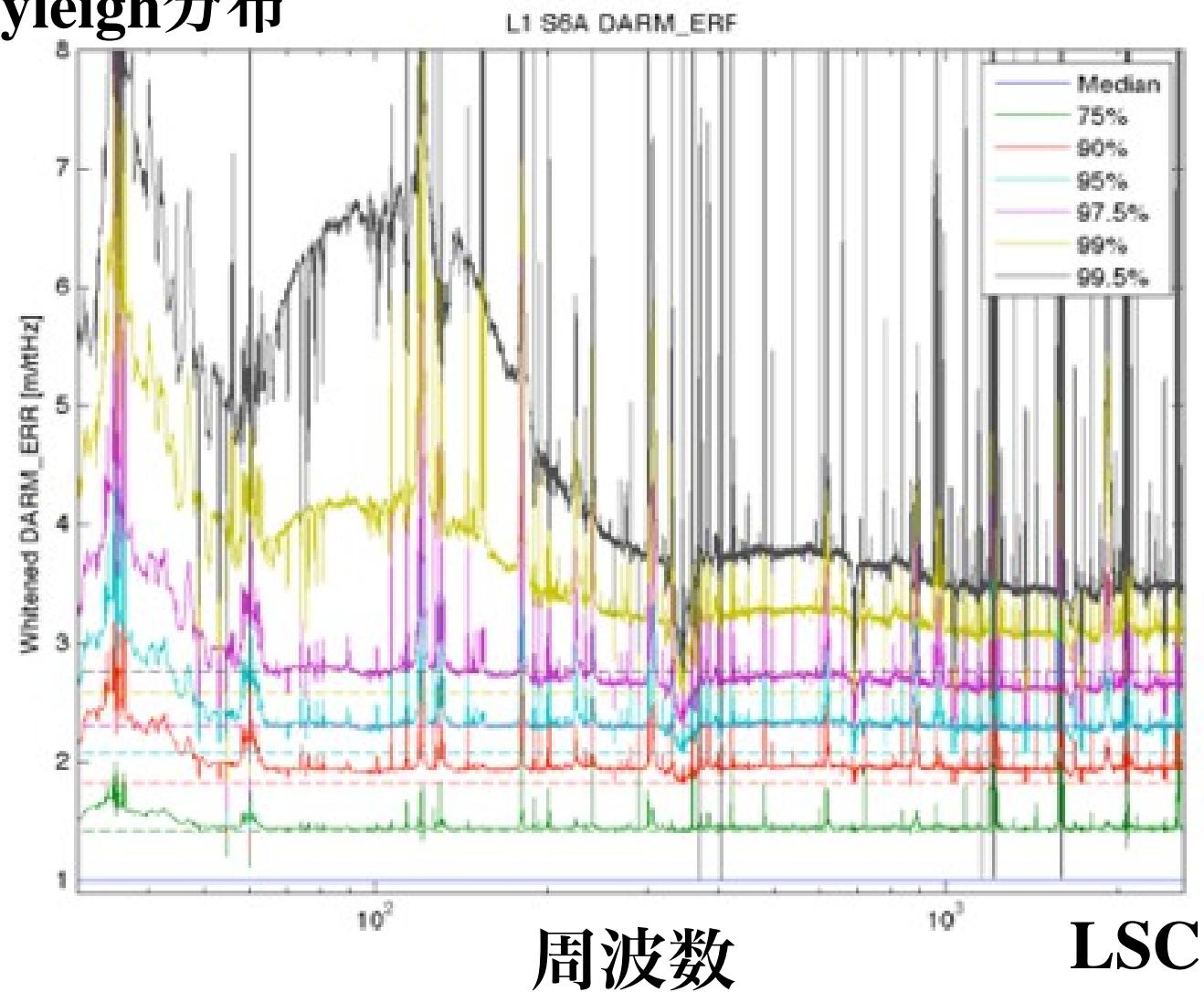
Virgo

1390のラインのうち、起源が特定できたのは960個

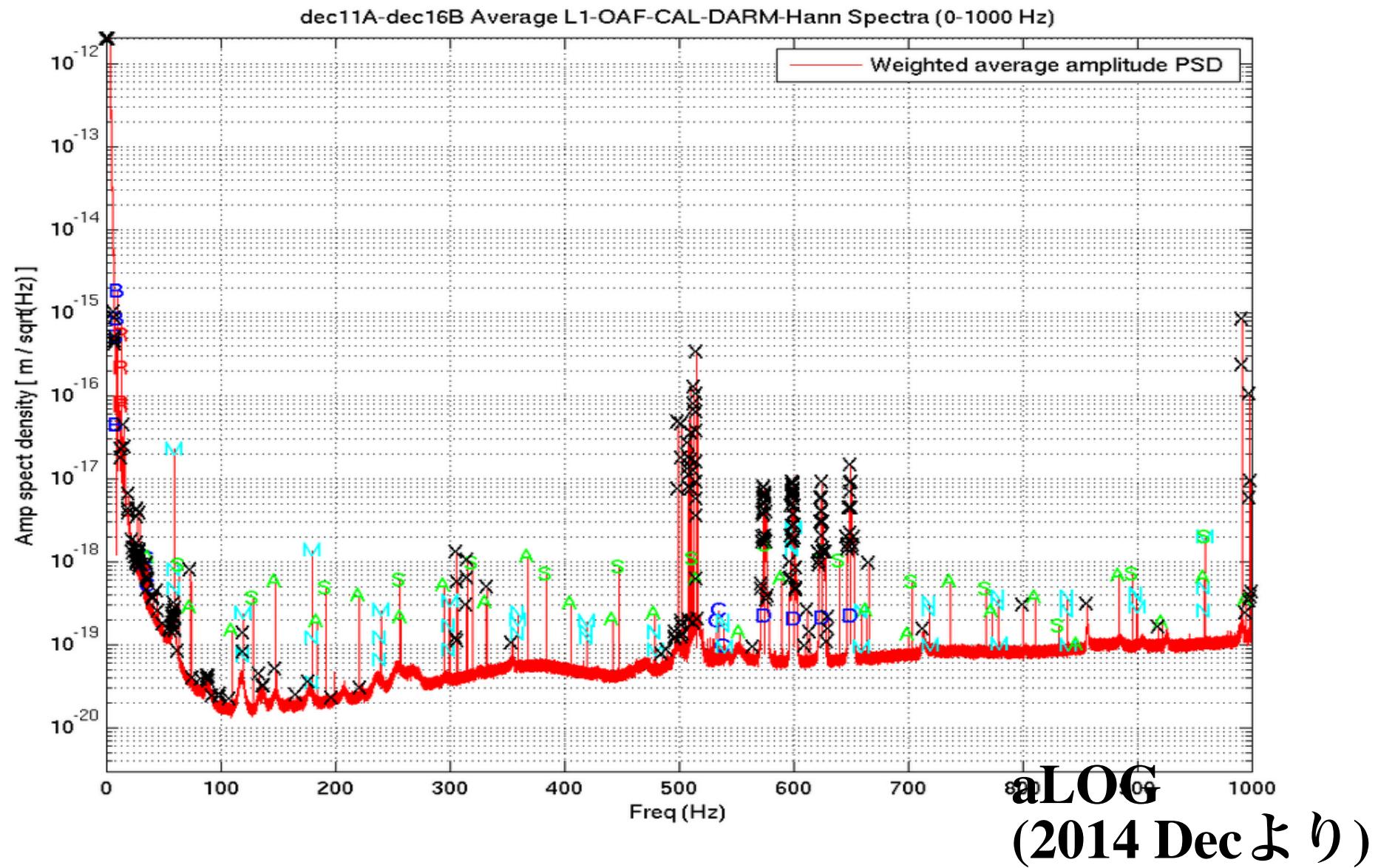
重力波発見を宣言には、こういった起源不明の雑音を特定、除去していかなければならない。

データの（定常、非定常）非ガウス性

Rayleigh分布



ラインのキャラクタリゼーション



進捗状況：システム、ツール

- Glitch Monitor
- Line Finder
- Line Tracking
- Line Removal
- Rayleigh Monitor
- Non-Gaussianity Monitor
- RMS Monitor
- Noise Floor Monitor
- Time-Series Monitor
- Spectrum Monitor
- Spectrogram Monitor
- Sensitivity Monitor
- Range Monitor
 - Inspiral
 - Inspiral-Merger-Ringdown
 - Ringdown
 - Stochastic
- Coherence Finder
- Multiple-channel coherence finder (BruCo)
- Pearson correlation Finder
- NonLinear correlation Finder
- Realtime Quick look webpage
- Daily summary webpage
- GUI Interface
- Web-Base Interface
- Command-line Interface
- Health monitor
- Globally Correlated magnetic noise
- Violin mode
- Multi-channel analysis
- Newtonian noise
 - Effect of water inside the mountain

進捗状況：システム、ツール

相関関係を
調べる

- Glitch Monitor

非定常雑音モニタ

- Line Finder

発振などの
ラインモニタ

- Line Tracking

- Line Removal

- Rayleigh Monitor

- Non-Gaussianity M

ガウス性、定
常性、非ガウ
ス性

- RMS Monitor

- Noise Floor Monitor

- Time-Series Monitor

- Spectrum Monitor

- Spectrogram Monitor

データの様子、
スペクトル

- Sensitivity Monitor

- Range Monitor

- Inspiral

- Inspiral-Merger-Ringdown

- Ringdown

- Stochastic

重力波への感度

- Coherence Finder

- Multiple-channel coherence finder
(BruCo)

- Pearson correlation Finder

- NonLinear correlation Finder

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インター
フェース

- Health monitor

- Globally Correlated magnetic noise

- Violin mode

- Multi-channel analysis

- Newtonian noise

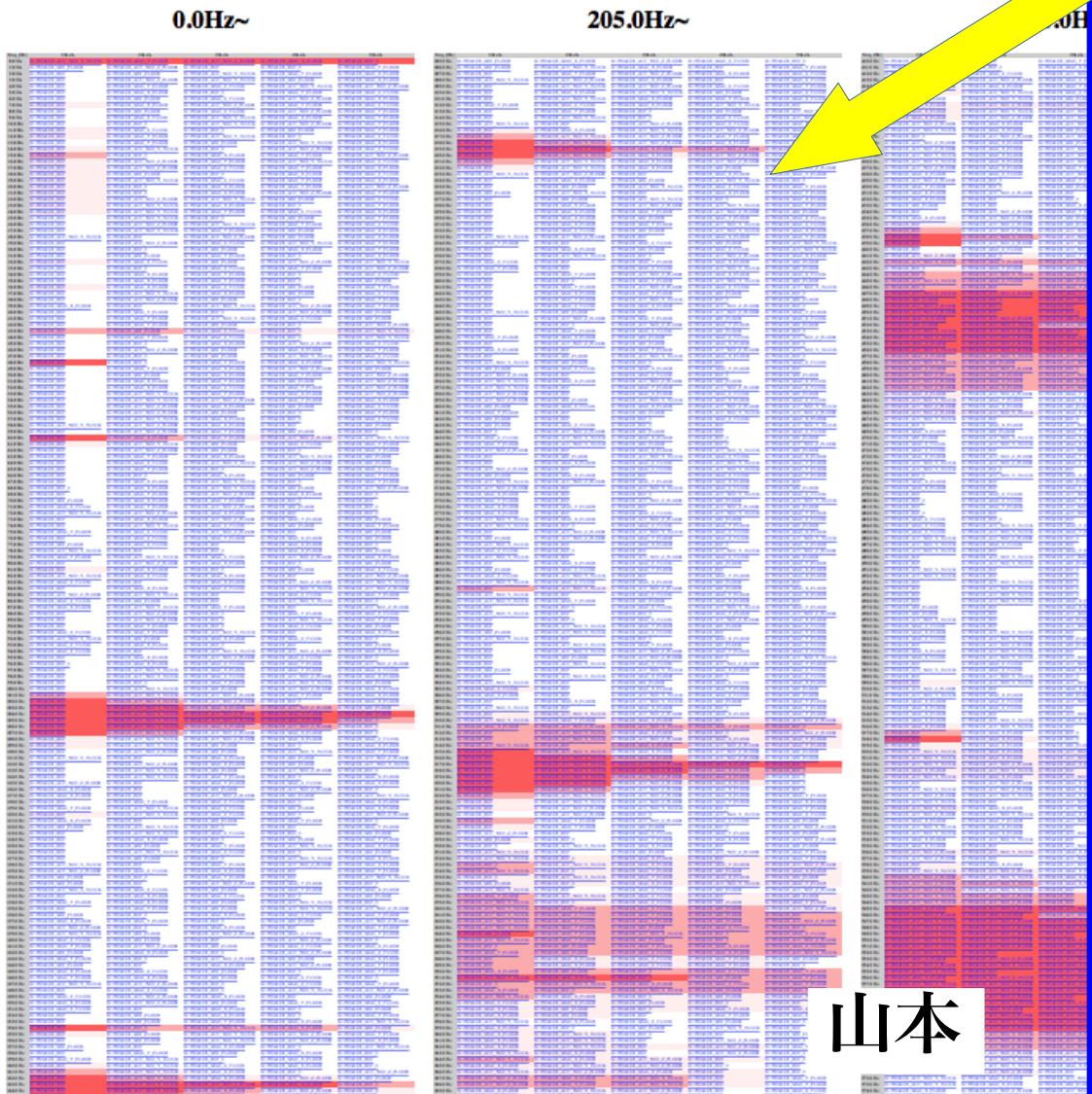
- Effect of water inside the mountain

aLIGOで有効なものを吸収

HasKAL

GPS Time: 1120543424 (2015-07-10 06:03:27 UTC)

Channel: K1:PEM-EX_ACC_NO2_X_FLOOR



- Coherence Finder
- Multiple-channel coherence finder (BruCo) (highlighted)
- Pearson correlation Finder
- NonLinear correlation Finder

- Realtime Quick look webpage
- Daily summary webpage
- GUI Interface
- Web-Base Interface
- Command-line Interface

- Health monitor
- Globally Correlated magnetic noise
- Violin mode
- Multi-channel analysis
- Newtonian noise
 - Effect of water inside the mountain

KAGRA発の評価法を開発

- Glitch Monitor

- Line Finder

- Line Tracking

- Line Removal

- Rayleigh Monitor

- Non-Gaussianity Monitor

- RMS Monitor

- Noise Floor Monitor

- Time-Series Monitor

- Spectrum Monitor

- Spectrogram Monitor

- Sensitivity Monitor

- Range Monitor

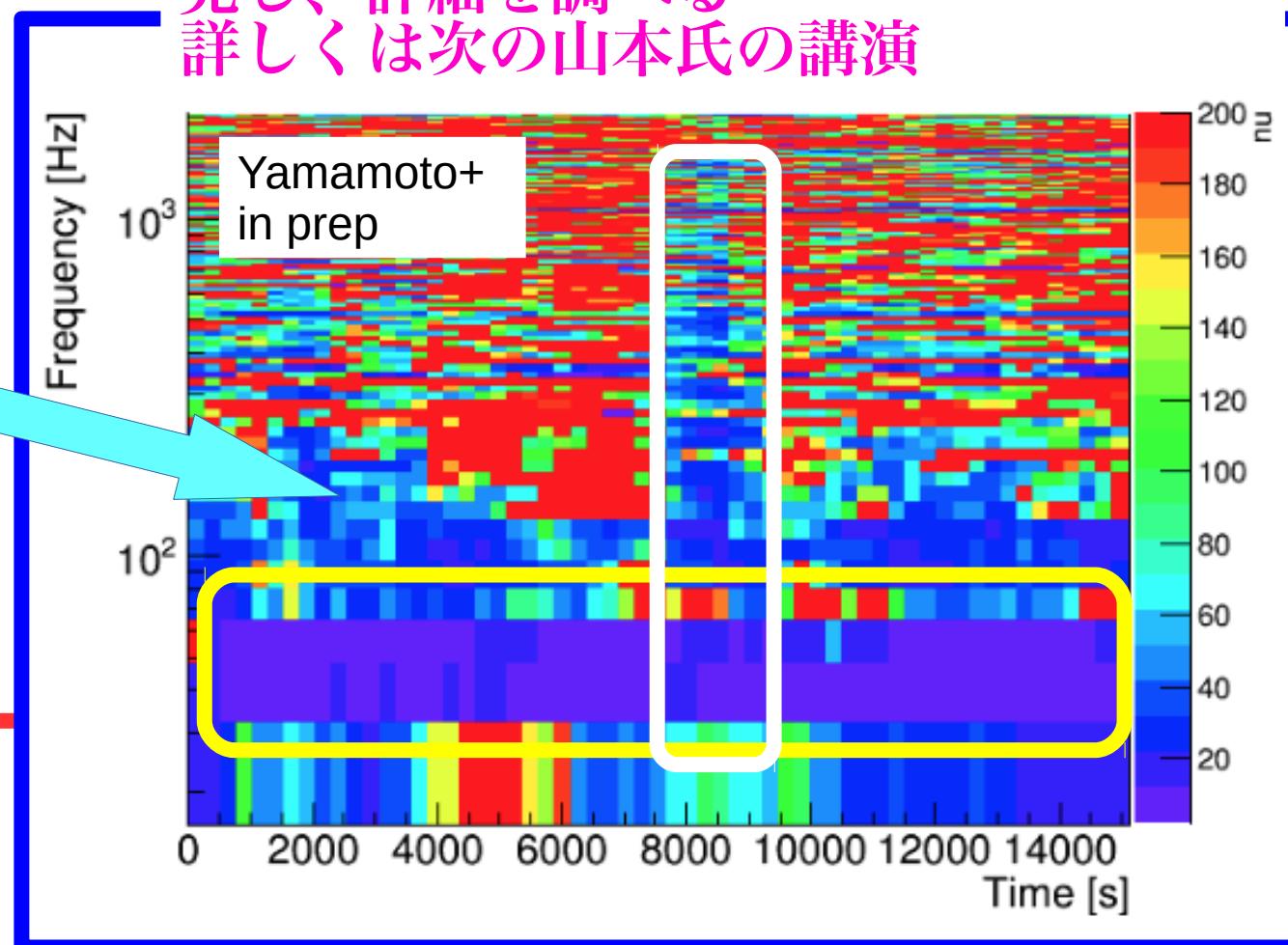
- Inspiral

- Inspiral-Merger-Ringdown

- Ringdown

- Stochastic

定常非ガウス性、数100秒スケールの非ガウス性、それらの周波数依存性を発見し、詳細を調べる
詳しくは次の山本氏の講演



This research has made use of data, software and/or web tools obtained from the LIGO Open Science Center (<https://losc.ligo.org>), a service of LIGO Laboratory and the LIGO Scientific Collaboration. LIGO is funded by the United States National Science Foundation.

KAGRA発の線形でない相関を発見する手法の開発

- Glitch Monitor

- Line Finder

- Line Tracking

- Line Removal

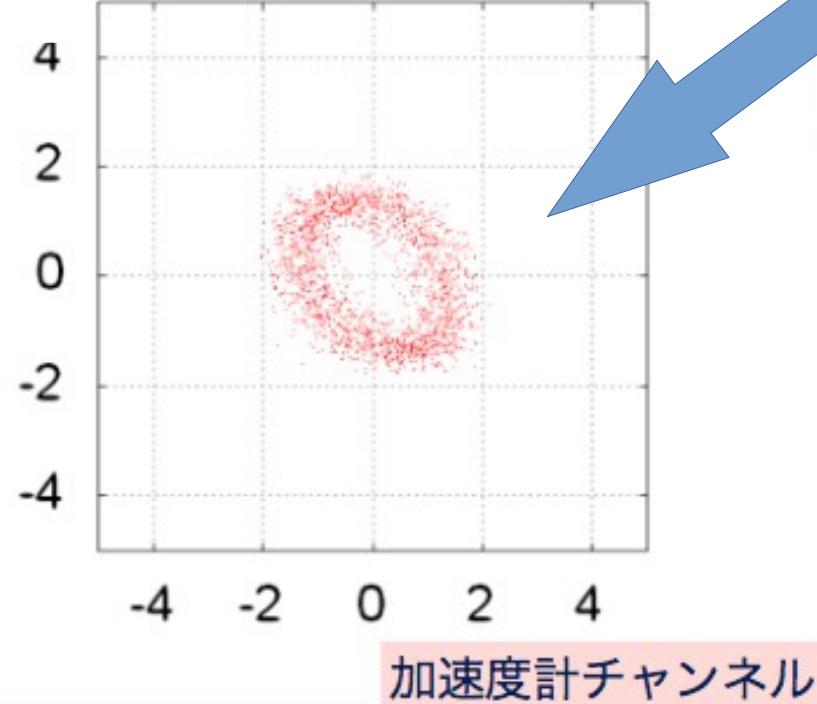
- Rayleigh Monitor

- Non-Gaussianity Monitor

Yuzurihara+
in prep

重力波チャンネル

相関がある時刻



譲原

- Coherence Finder

- Multiple-channel coherence finder
(BruCo)

- Pearson correlation Finder

- NonLinear correlation Finder

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- GUI Interface

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- Health monitor

- Globally Correlated magnetic noise

- Violin mode

- Multi-channel analysis

- Newtonian noise

- Effect of water inside the mountain

enoshima authored 18 hours ago

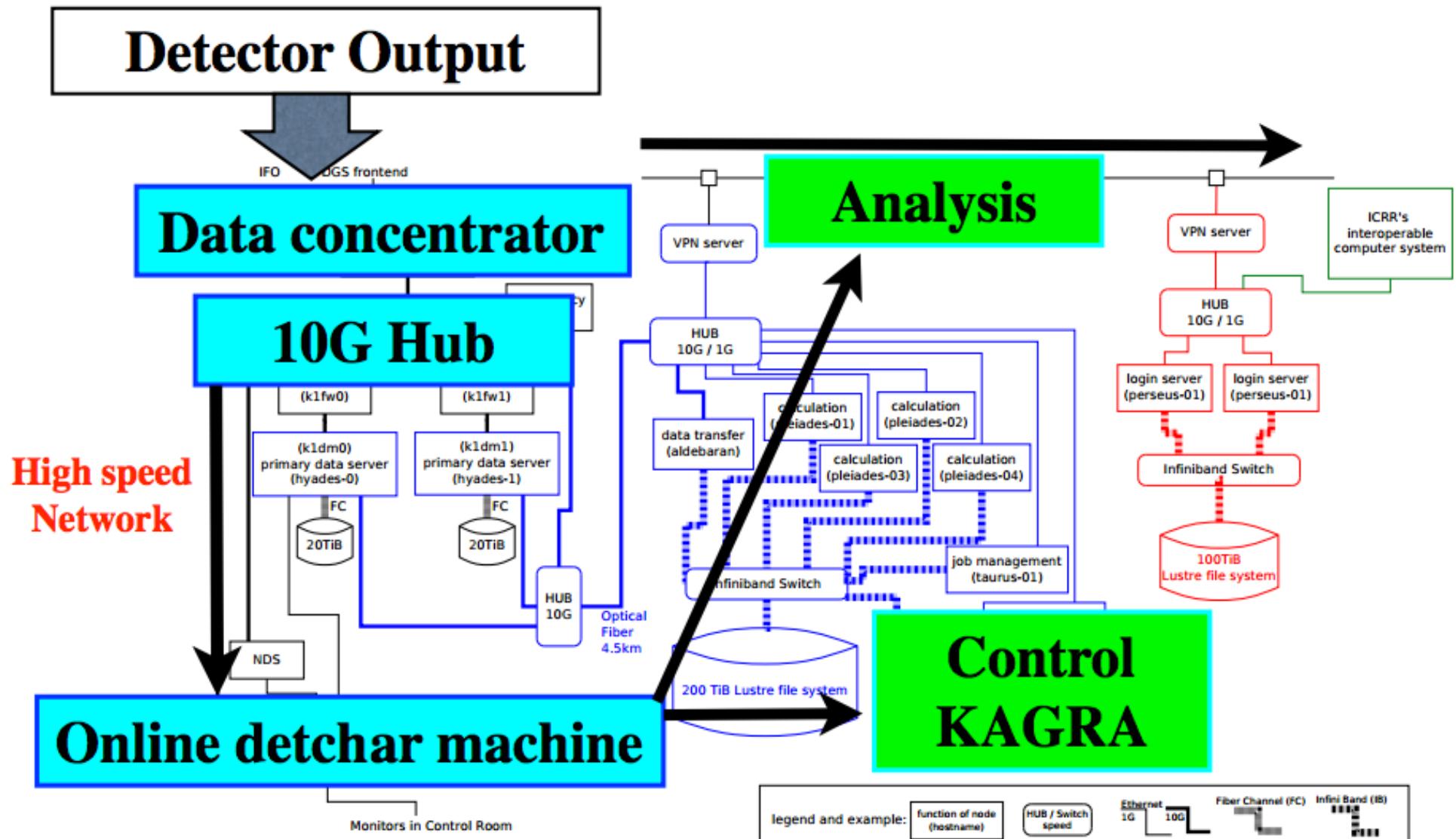
latest commit df515b023e 

..

 Constant	remove haddock header	2 months ago
 DataBaseUtils	added function	2 months ago
 DetectorUtils	small change	22 days ago
 ExternalUtils	bug fixed in DKGLUtils.c	10 days ago
 FrameUtils	remove haddock header	2 months ago
 GUI_Utils	modified GUI for StochMon update	11 days ago
 LineUtils/LineRemoval	modify a sample kagali code	26 days ago
 MathUtils/LinearAlgebra	changed directory structure	3 days ago
 Misc	remove haddock header	2 months ago
 MonitorUtils	RMSMon : modify daily RMSMon and measure running time	9 days ago
 PlotUtils	added new function for spectrogram plot	19 hours ago
 SearchUtils	added SearchUtils	a year ago
 SignalProcessingUtils	added function	18 hours ago
 SimulationUtils	remove unnecessary comment	2 months ago
 SpectrumUtils	remove function runmed and unnecessary comment	2 months ago
 StatisticsUtils	change module name	a year ago
 TimeUtils	added function for converting time	a month ago
 WaveUtils	add dropWaveData, takeWaveData	a year ago
 WebUtils	minor update	10 days ago
 Constant.hs	remove haddock header	2 months ago
 DataBaseUtils.hs	added DataBaseUtils related	3 months ago
 DetectorUtils.hs	added module of modules	a year ago
TimeUtils.hs	added module-setting module	a year ago
WaveUtils.hs	added blank	2 months ago
WebUtils.hs		

<https://github.com/gw-analysis/detector-characterization>

進捗状況：ネットワーク



Realtime Channel Monitor

Kanda

コミッショニングに役立てるために

- Webから各種ツールがすぐ使える
- Webからデータをモニタできる
- スマホからも使える

Past Data Viewer

Date:

GPS Time: 1115097401
 Local Time: 2015 Jan. 01 00:00:00 JST

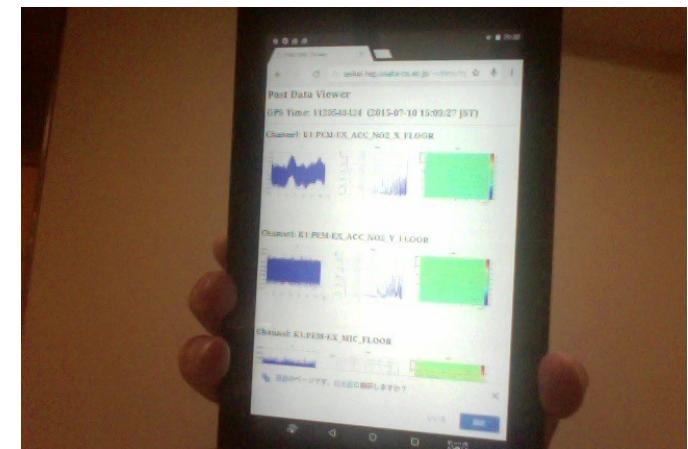
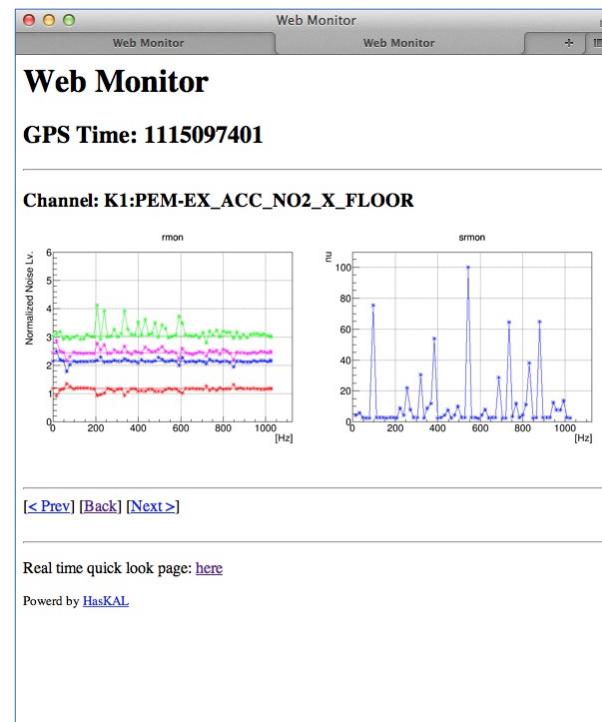
Duration: 32 sec.

Channel:

K1:PEM-EX_ACC_NO2_X_FLOOR
K1:PEM-EX_ACC_NO2_Y_FLOOR
K1:PEM-EX_ACC_NO2_Z_FLOOR
K1:PEM-EX_MAG_X_FLOOR
K1:PEM-EX_MAG_Y_FLOOR

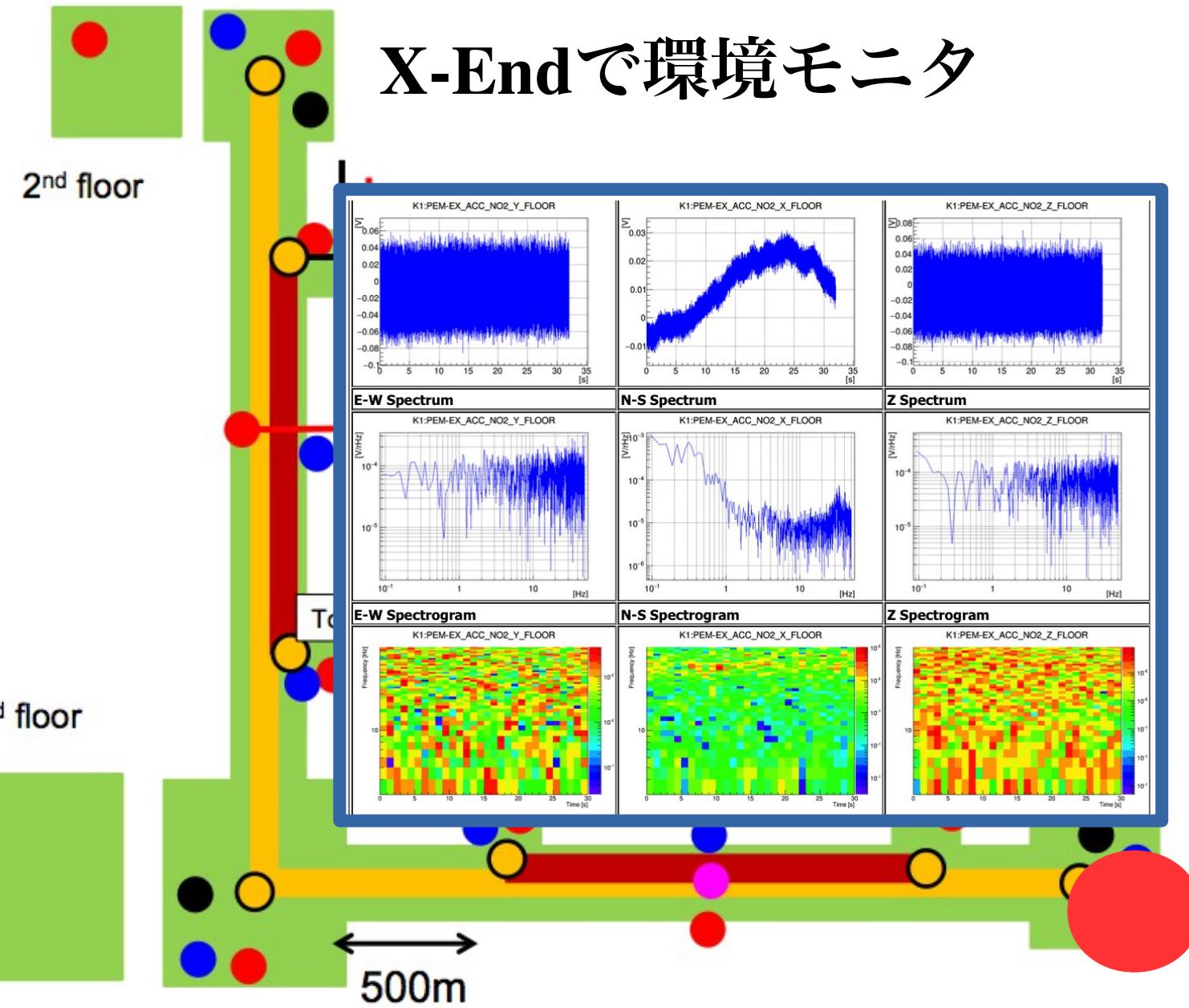
Type:

Time Series
 Spectrum
 Spectrogram



環境モニタ

X-Endで環境モニタ



Next

- **detchar**システムを**online-detchar**計算機に組み込む。（現在その途中）
- サブシステムの**detector characterization**
 - Pre-Stabilized Laserから始まることにな（りそう？）
 - そのほか続々と
- サブシステムDetchar結果をベースとしたシステムティックなデータ評価基準の定義
- 環境雑音の測定