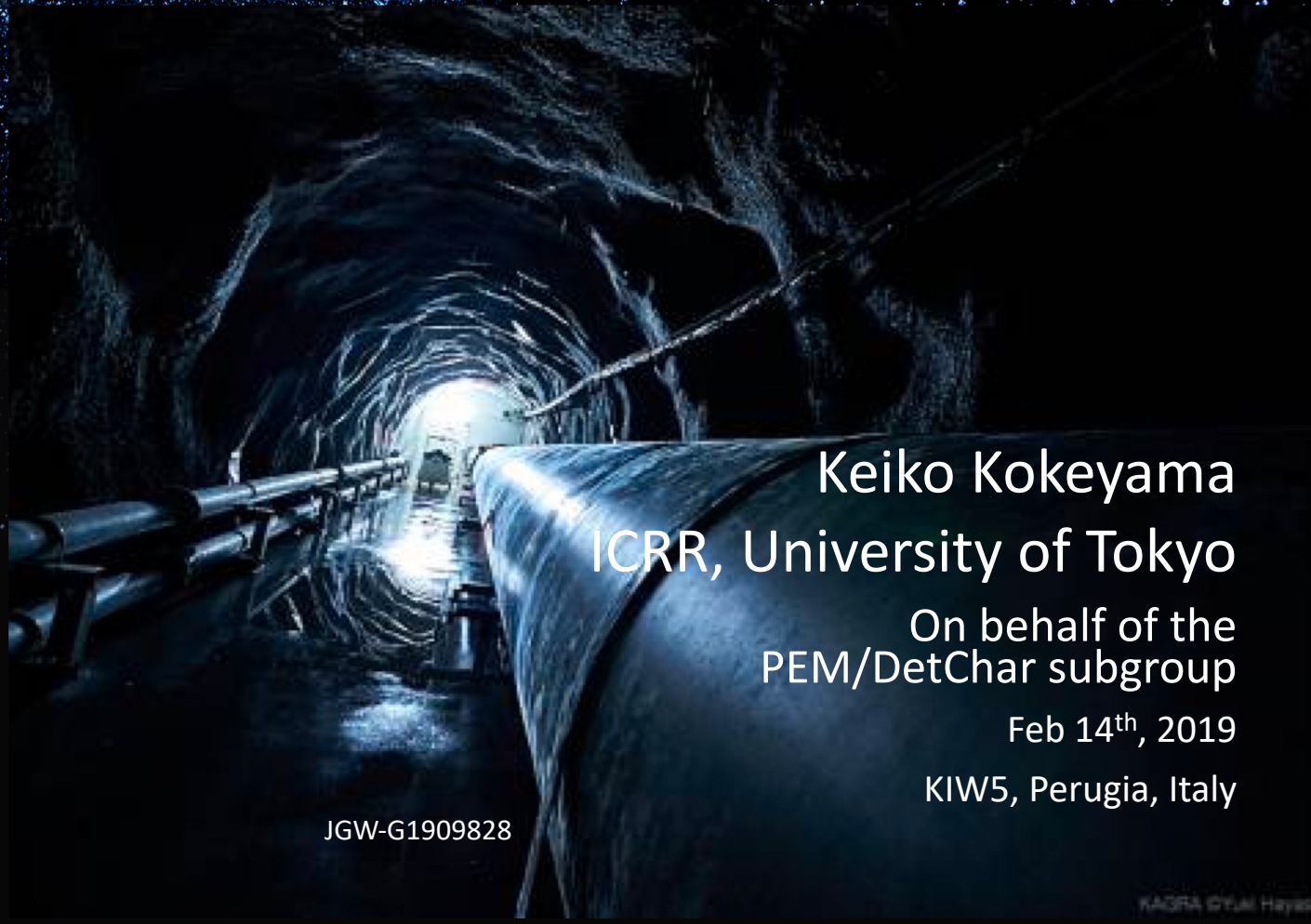
Status and prospects of the KAGRA detector characterization



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Contents

- Goal of Detector Characterization (detchar)
- Motivation to do Detchar
- Recent Progress
  - PEM
  - Detchar Tools (LIGO-VIRGO, KAGRA, KGWG)
- To do list for O3

Goals of (KAGRA) Detchar

Understand the ifo behavior, and

1. Provide the data quality information to the data analysis based on the ifo status
2. Feedback to the hardware for the noise hunting

Motivation

Our ultimate questions is…

Does this series of h(t) channel have the GW signal?

But…

2nd gen Interferometer is so complex!

What GPS time segment to analyze?

When was the ifo operating?

How is the data quality?

Not everyone can easily access to these information!

Motivation

Our ultimate questions is…

Does this series of h(t) channel have the GW signal?

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What GPS time segment to analyze?

When was the ifo operating?

How is the data quality?

Not everyone can easily access to these information!
It's nice to have flags indicating the data quality

Role of Detector Characterization

Interferometer is so complex!

Detector Characterization

What GPS time segment to analyze?

When was the ifo operating?

How is the data quality? :
Is this data segment noisy or not? Glitchy or not? Line noise?

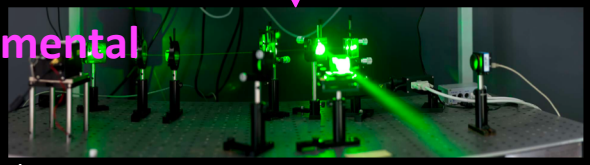
If noisy or glitchy, what's the source?
How is it coupled to h(t)?

What channel to see to know the status?

When is good to analyze data,
when not?

What channels to see for veto analysis?

Experimental



Data Analysis

How to answer these questions?

- Collect environmental information

- Provide the summary of each subsystem status

- Provide monitor tools to know the ifo status
- Provide software to find glitches, lines
- Provide channel info
- Study the correlation between external disturbances to h(t)
- **Combine these info and provide the data quality info**

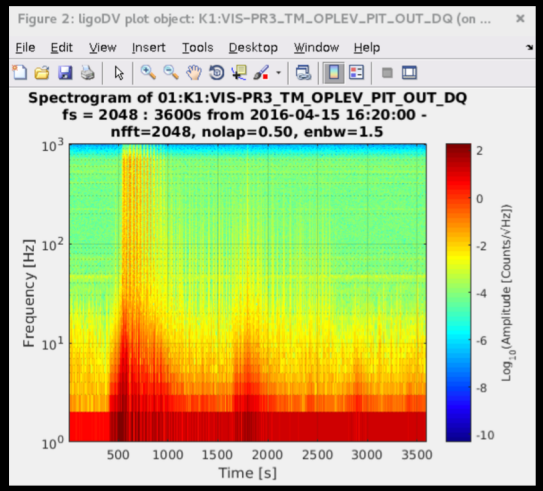
Recent Progress (PEM)

- Environmental monitors→ See, PEM talk by Yokozawa

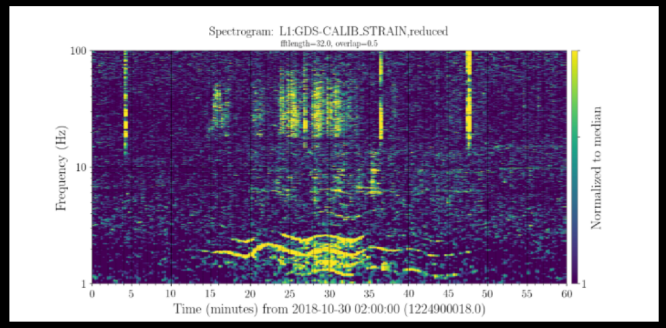
Recent Progress (Tools)

With a lot of help from VIRGO and LIGO

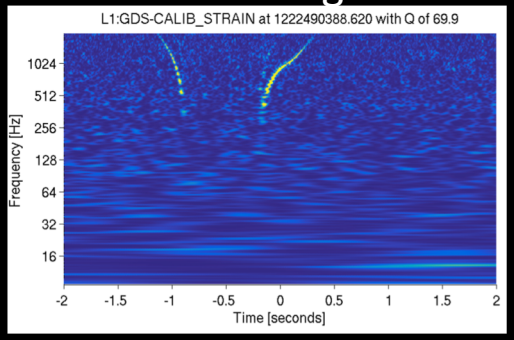
- Installed tools
  - Summary pages (interferometer status)
  - ligoDV
  - Omicron (glitch finding)
- Being installed or to be installed
  - Siesmon (earthquake arrival prediction)
  - Omega-scan (glitch finding) – visualization
  - NoEMi / Fscan (line finding) - database for lines
  - ligoDV-web
  - iDQ and machine learning (Korean colleagues → Young-min's talk)



Earthquake seen by ligoDV

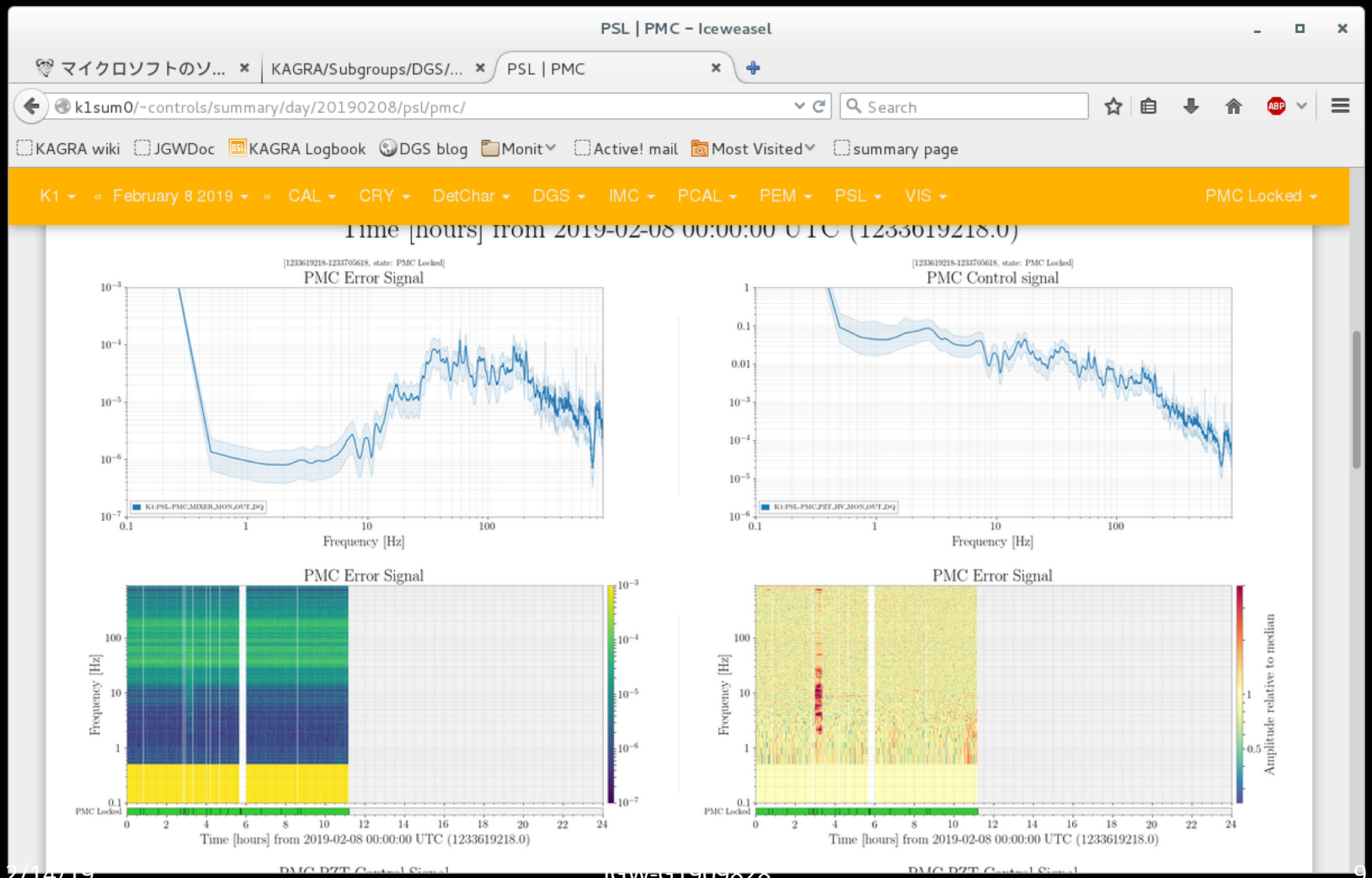


LIGO's scattered light noise

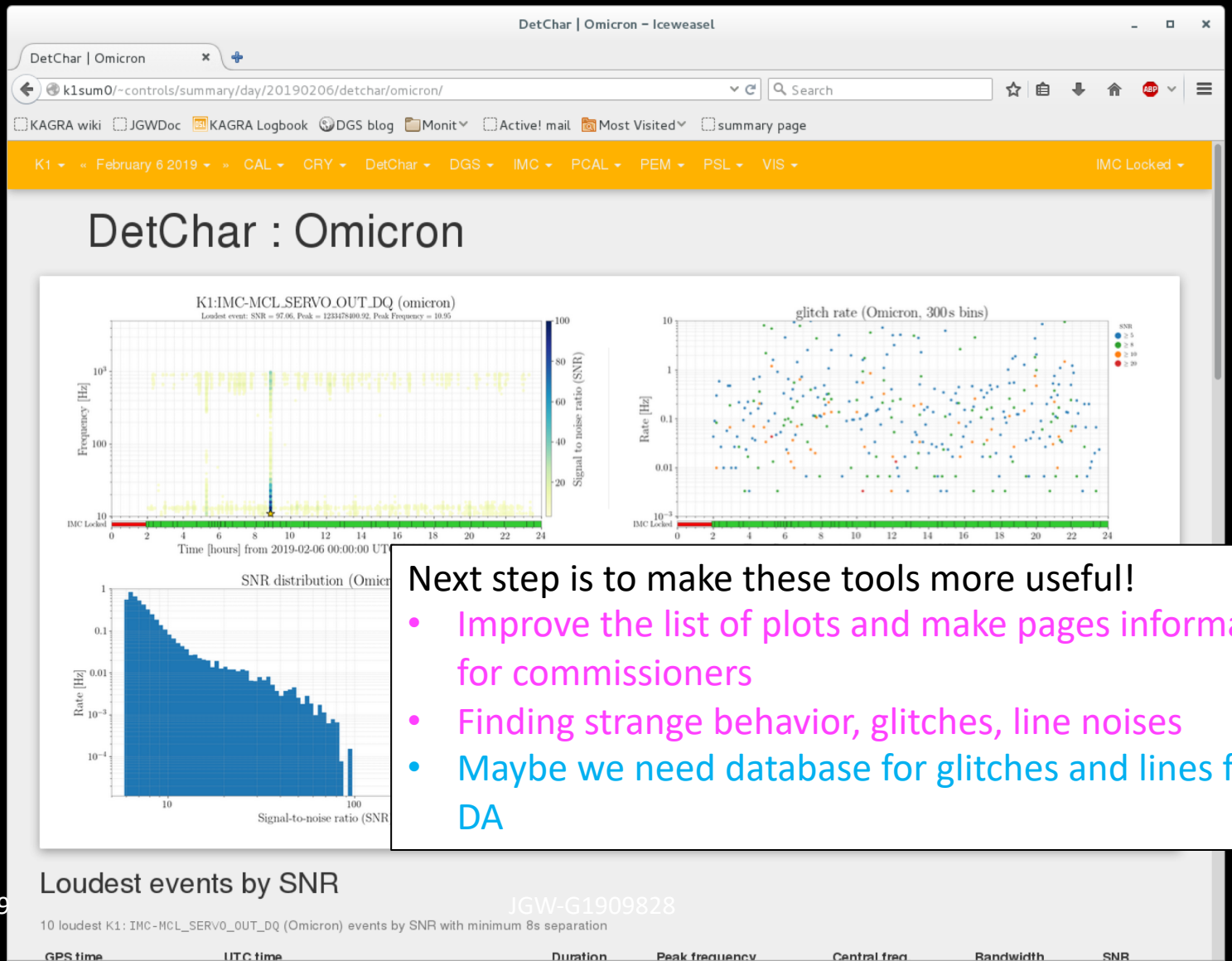


LIGO's whistle noise

Summary Pages



Summary Pages – Glitch monitors



Next step is to make these tools more useful!

- Improve the list of plots and make pages informative for commissioners
- Finding strange behavior, glitches, line noises
- Maybe we need database for glitches and lines for DA

Recent Progress (Tools)

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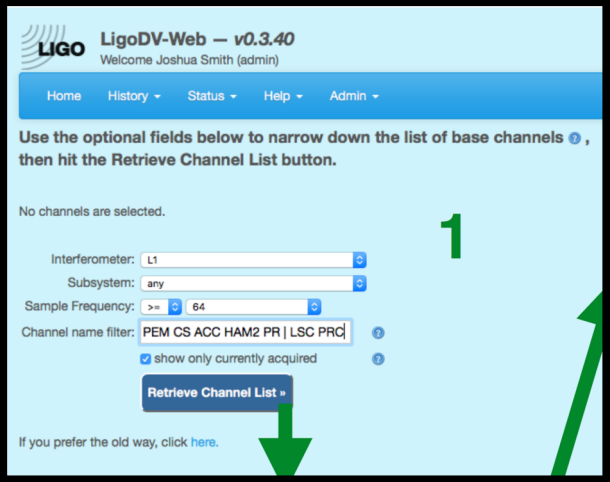
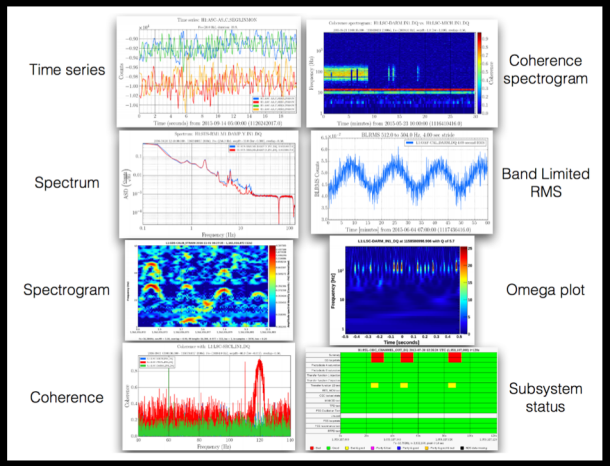
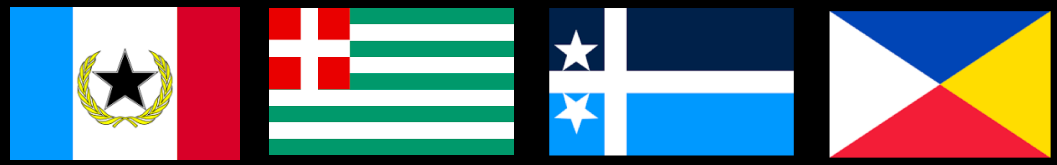
ligoDV web





Data Quality Information

- Still under discussion how to generate and provide the detector state information (data quality flags, DQ flags)



  - What to do about the database for the DQ flags
  - How to provide the online DQ flags (for low latency DA) in which the DQ flags need to be in the frames
  - Quick solution maybe SDF files of the real time system and guardian information, but probably not enough?
  - How to align with VIRGO-LIGO?

We need to decide soon and prepare for O3!!

Summary

- DetChar (software & PEM) are progressing towards O3
- Need to use the tools efficiently

- Need to decide how to provide the DQ flags
- We will keep talking to VIRGO and LIGO