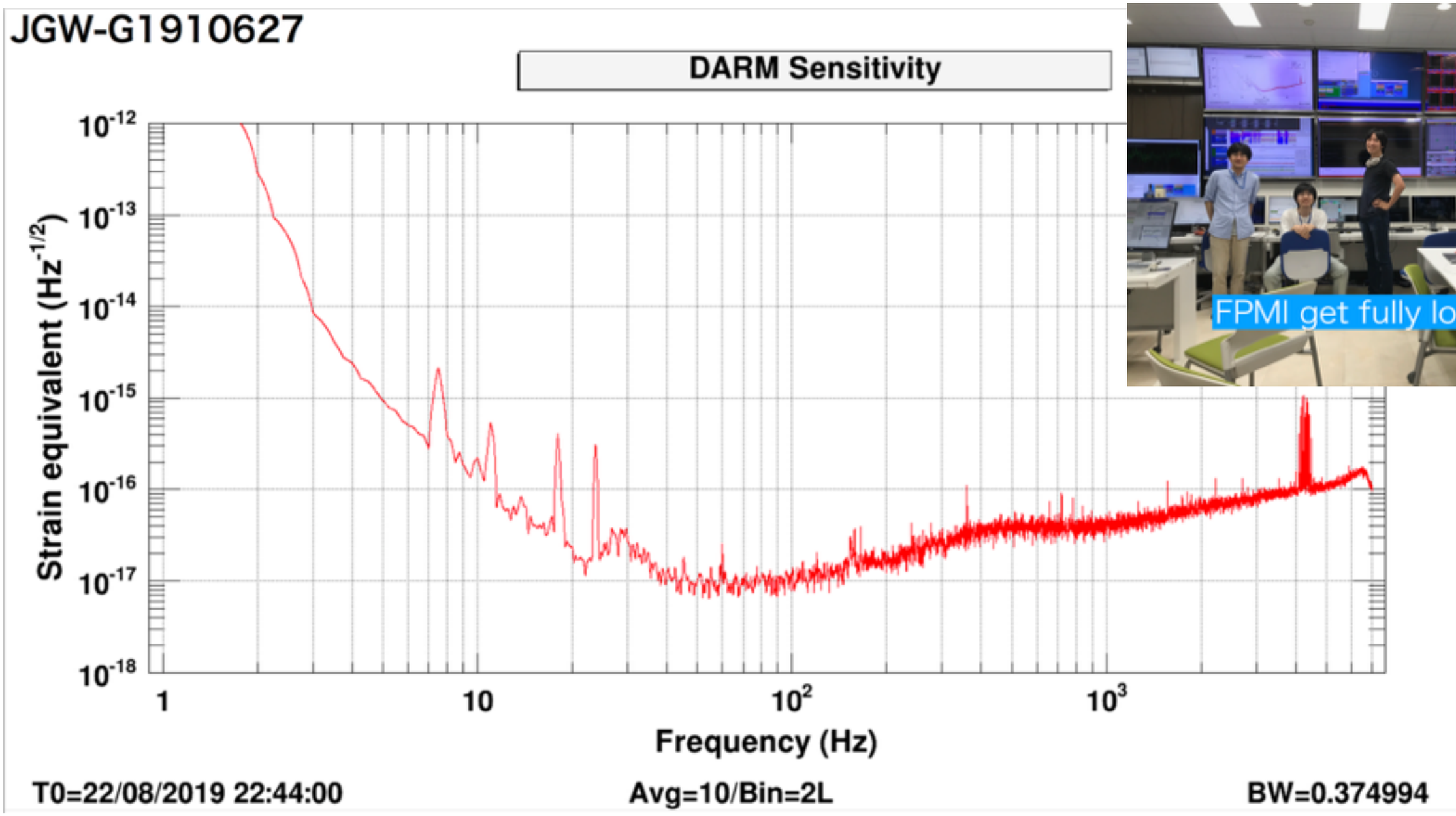
PEM meeting
KAGRA status & PEM activities

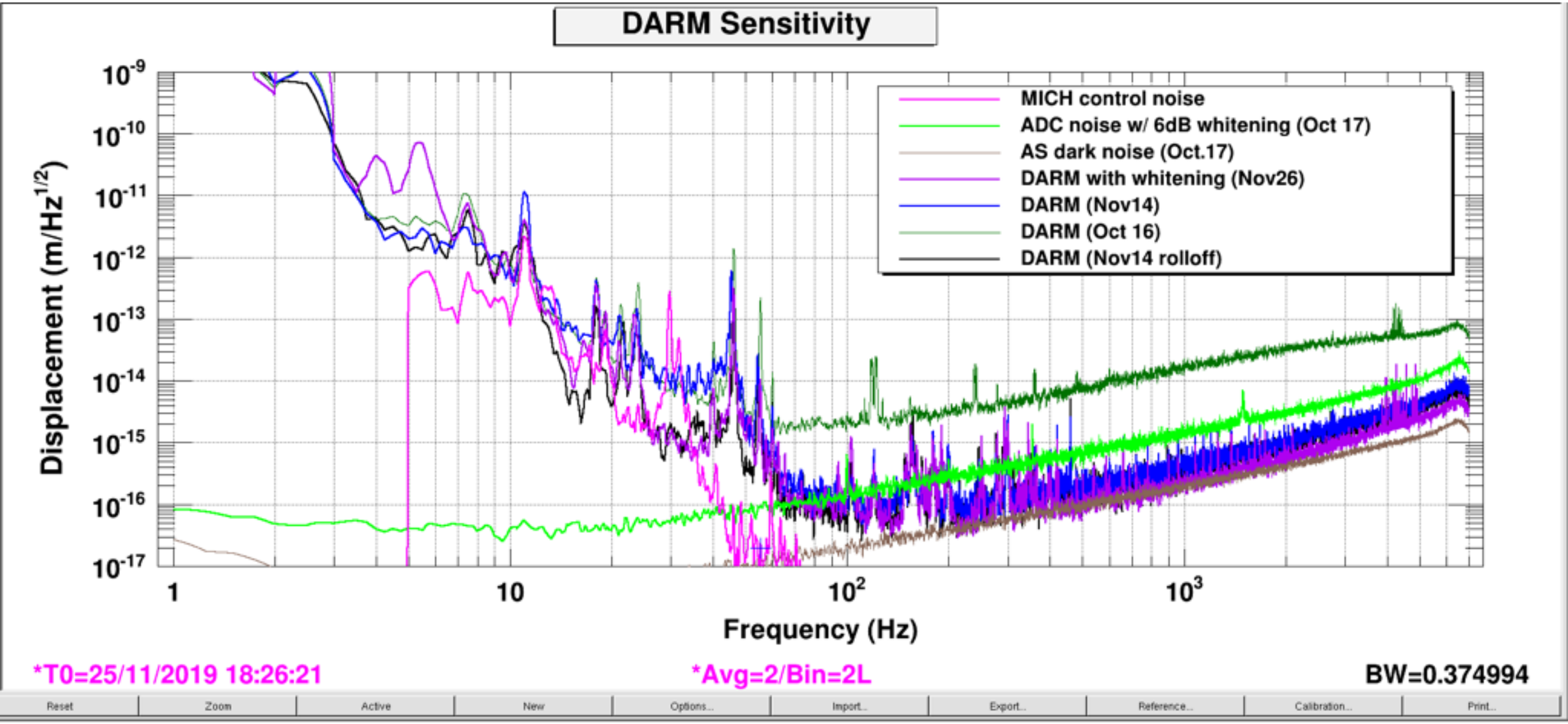
PEM meeting
2019/11/26 T.Yokozawa

History of KAGRA

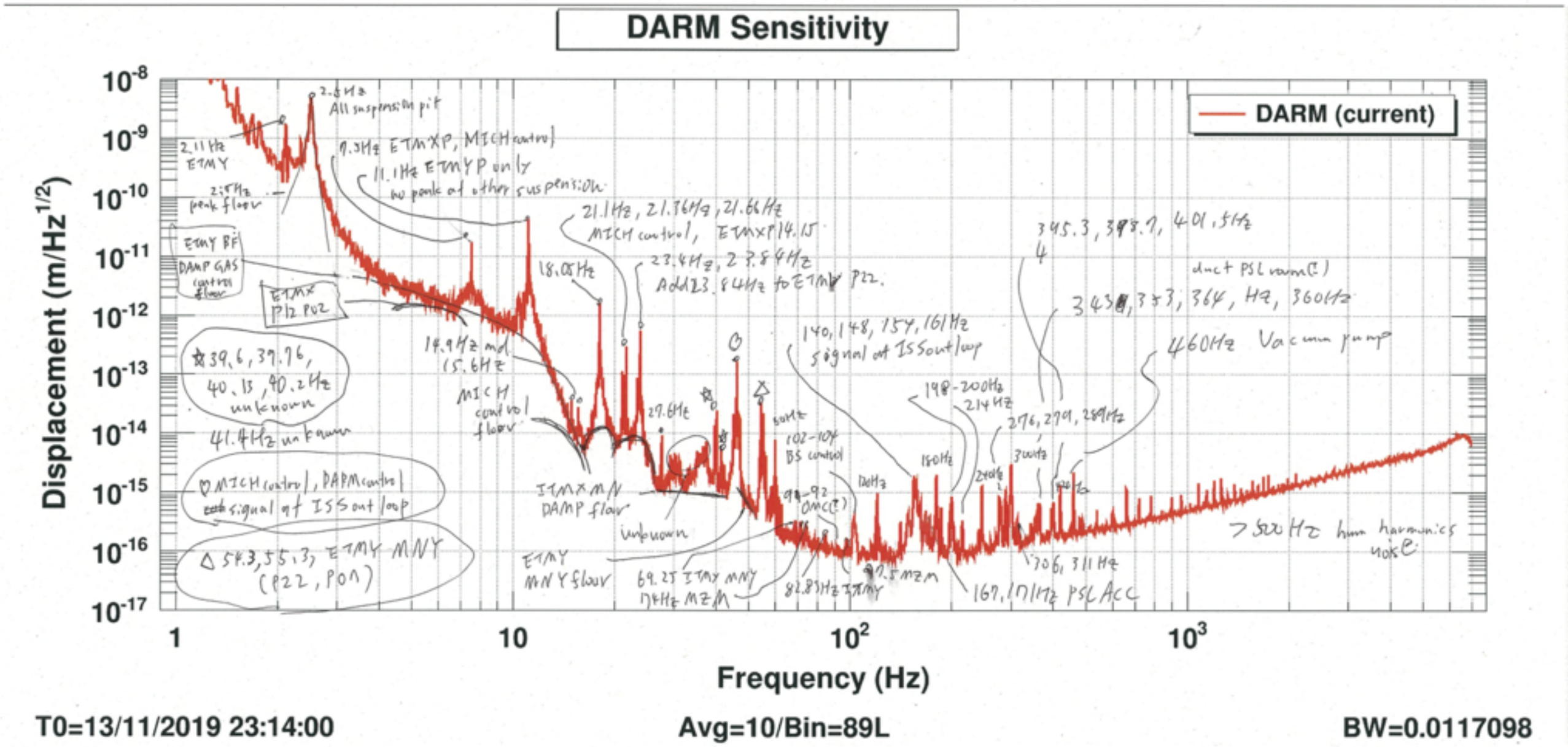
- 23rd Aug. First FPMI locked!
- ~30th Sep. DRFPMI lock trial
- 1st Oct.~ Start Noise hunting
  - Tweaking the control, ASC, ADS implementation, ISS control loop, noise budget, …



Sensitivity curve (26th Nov., 2019)



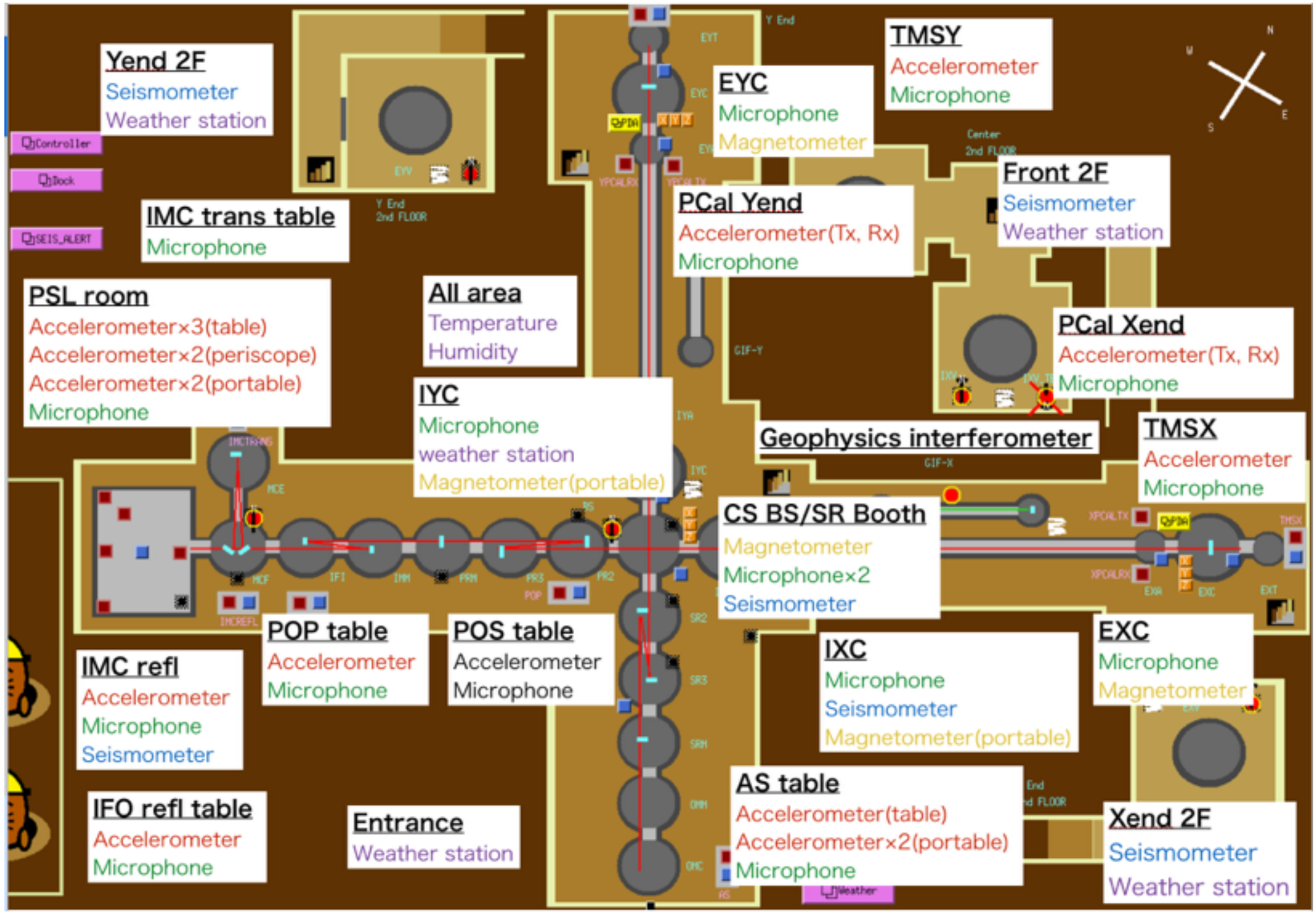
Noise investigation (13th Nov., 2019)



History of KAGRA PEM

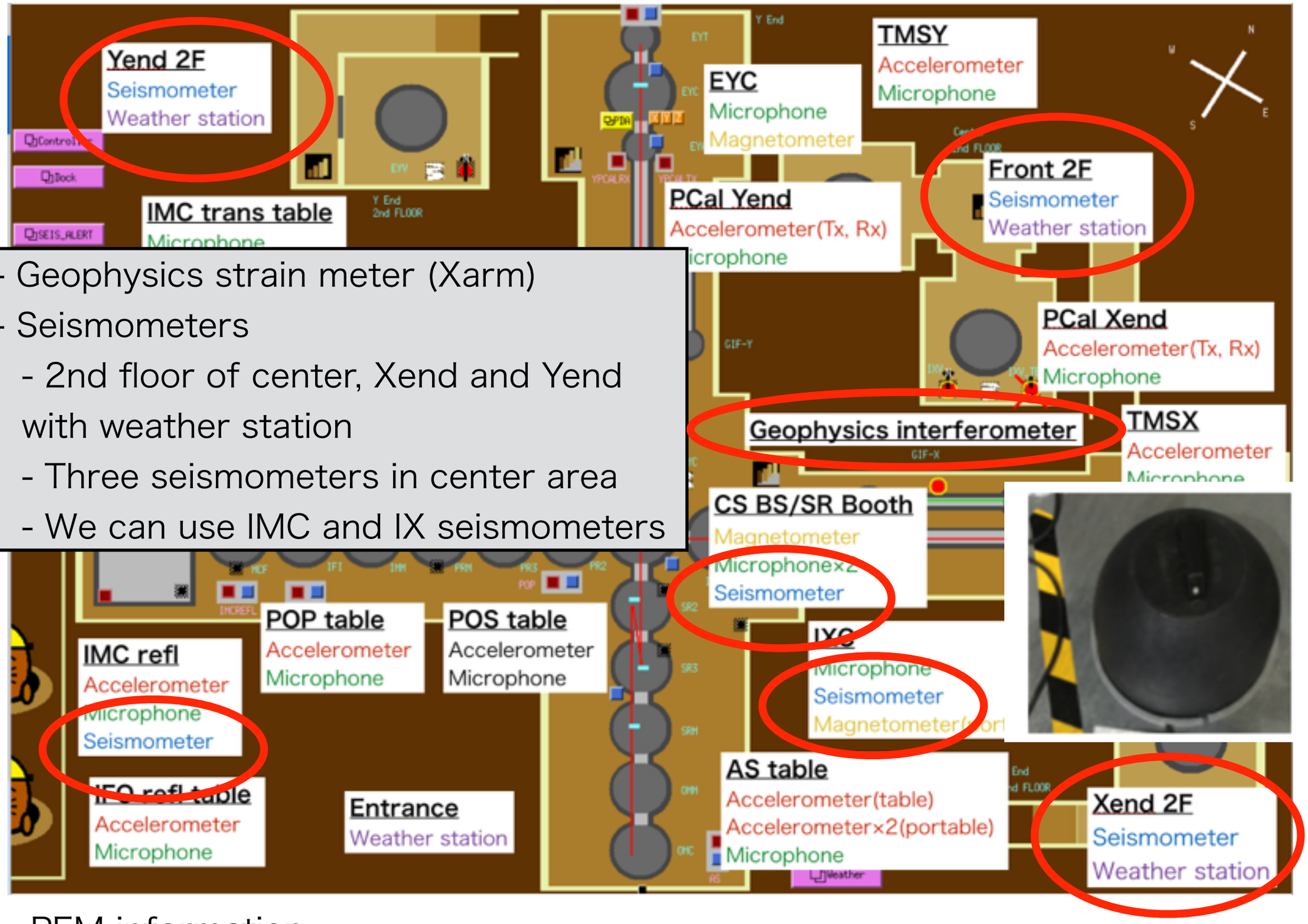
- Jun. 2018 : TY started activities as the PEM subsystem
- Oct. 2018 : Completed the 1st PEM installation
- Nov. 2018 : KK, TYs visited LIGO Livingston and worked with Anamaria
- Dec. 2018 : Acoustic and Magnetic field map generation
- Jan. 2019 : Washimi-san became KAGRA member and start PEM activities
- Jan. 2019 : PEM channel name definition changed
- Feb. 2019 : TY went to Italy for KAGRA international workshop
- Feb. 2019 : Kaihotsu-san, Mori-san(Toyama Univ.) and Fujikawa-san(Niigata Univ.) graduation thesis
- Mar. 2019 : Washimi-san visited LIGO Hanford and discussed with Robert
- May 2019 : Virgo PEM team visited KAGRA
- Jun. 2019 : Completed the 2nd PEM installation
- Jun. 2019 : Portable PEM project started (explain later)
- Aug. 2019 : Completed the PEM installation toward the O3 run
- Oct. 2019 : Washimi-san and Sugimoto-san visited Virgo and worked with Federico and Irene
- Nov. 2019 : Anamaria, Federico, Irene, Francesca, Camilla visited KAGRA
- Today : L-V-K PEM meeting

PEM map



- PEM information
  - KAGR wiki (http://gwwiki.icrr.u-tokyo.ac.jp/JGWwiki/KAGRA/Subgroups/PEM)
  - PEM map web (https://www.icrr.u-tokyo.ac.jp/~washimi/KAGRA/PEM/PEMmap/)

PEM installation



- Geophysics strain meter (Xarm)
- Seismometers
  - 2nd floor of center, Xend and Yend with weather station
  - Three seismometers in center area
  - We can use IMC and IX seismometers

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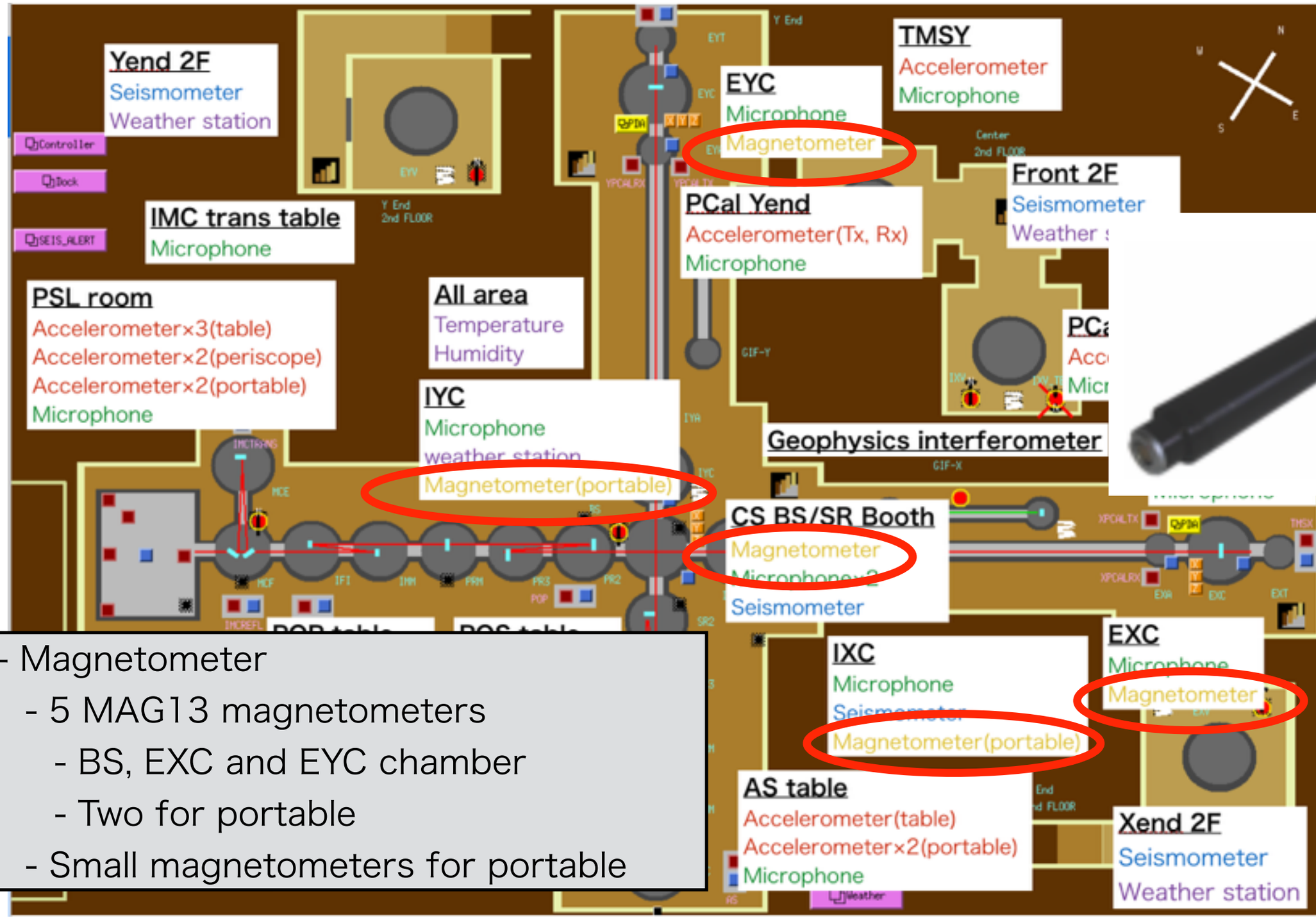

- Magnetometer
  - 5 MAG13 magnetometers
    - BS, EXC and EYC chamber
    - Two for portable
  - Small magnetometers for portable

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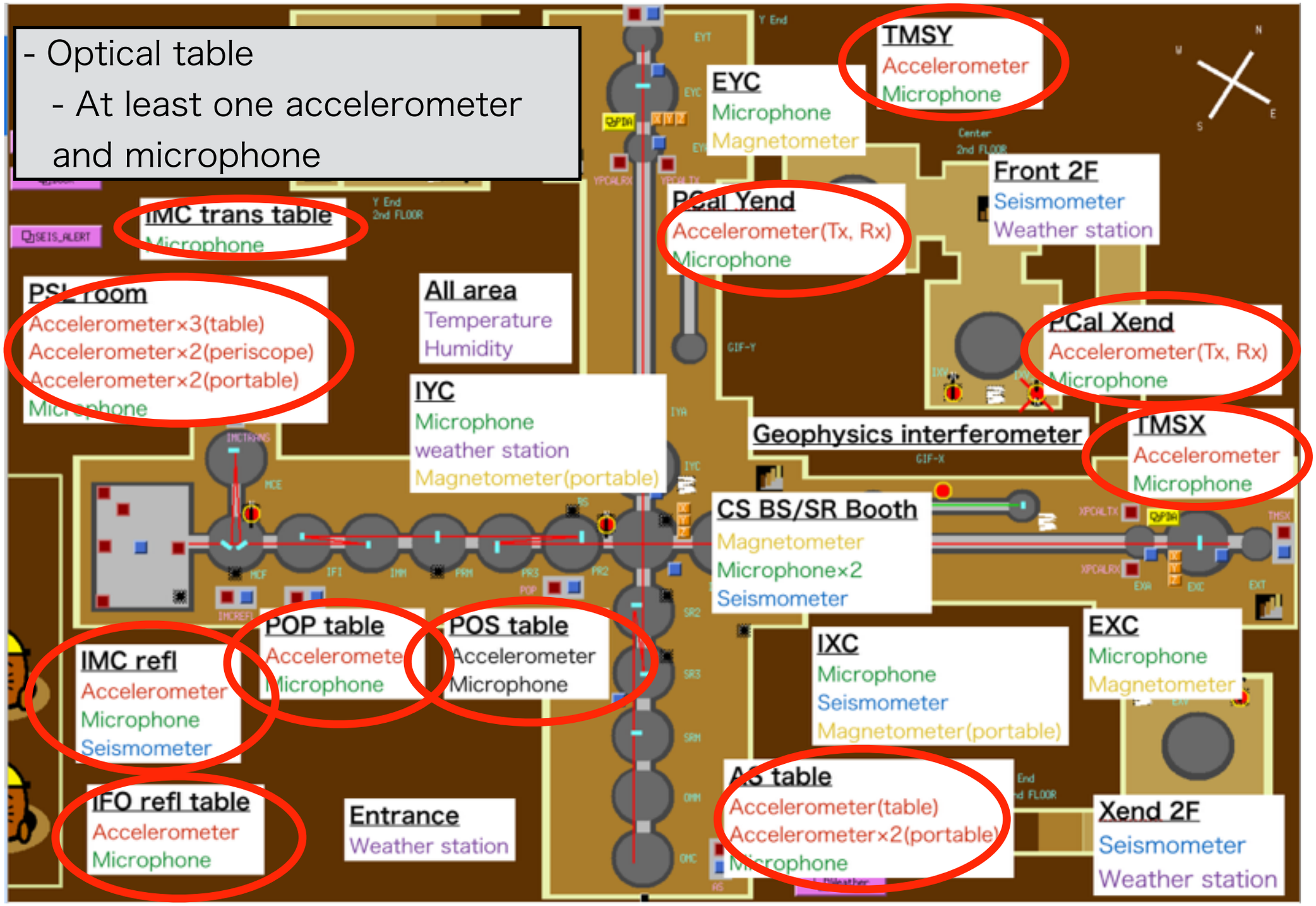

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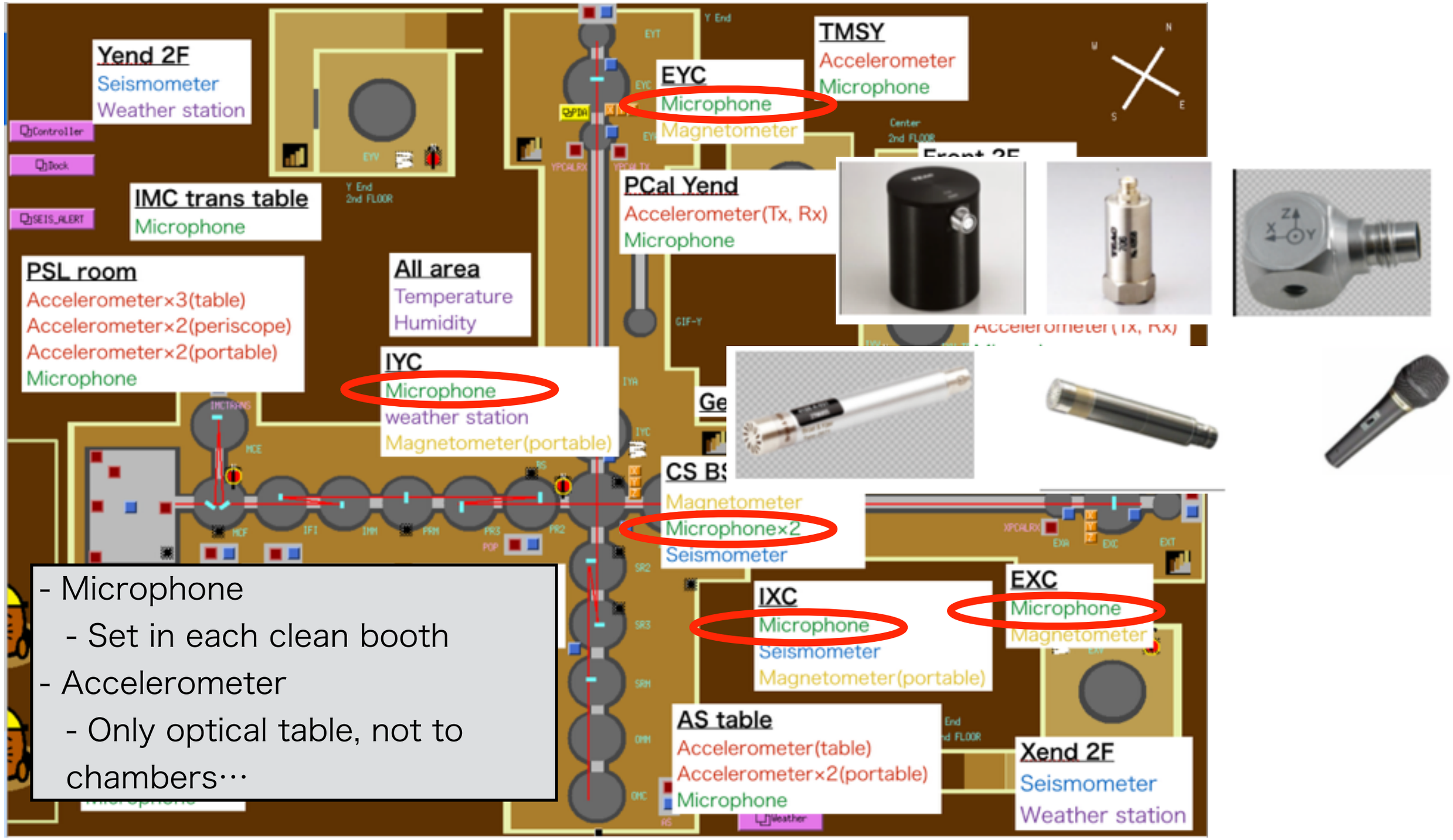

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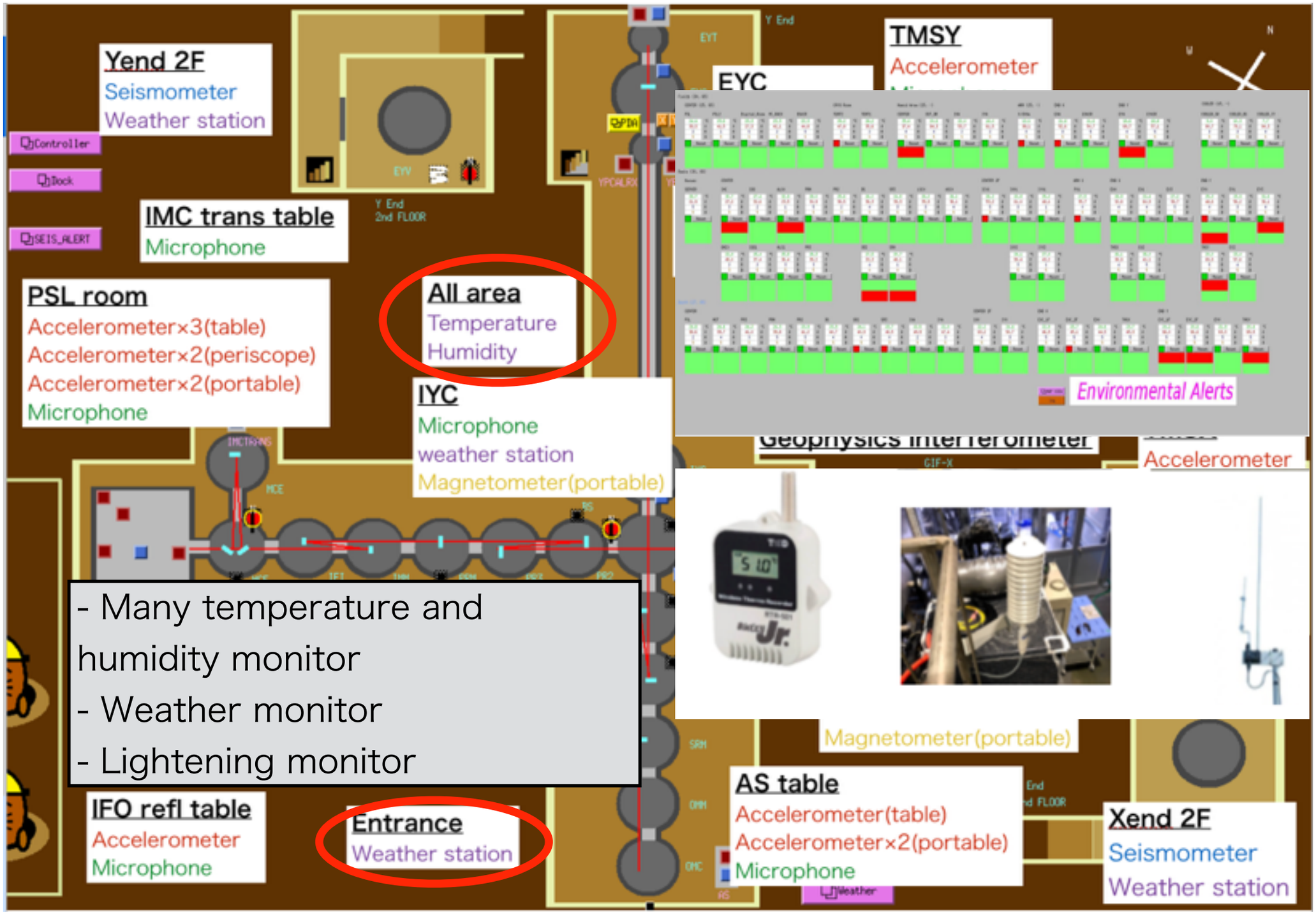

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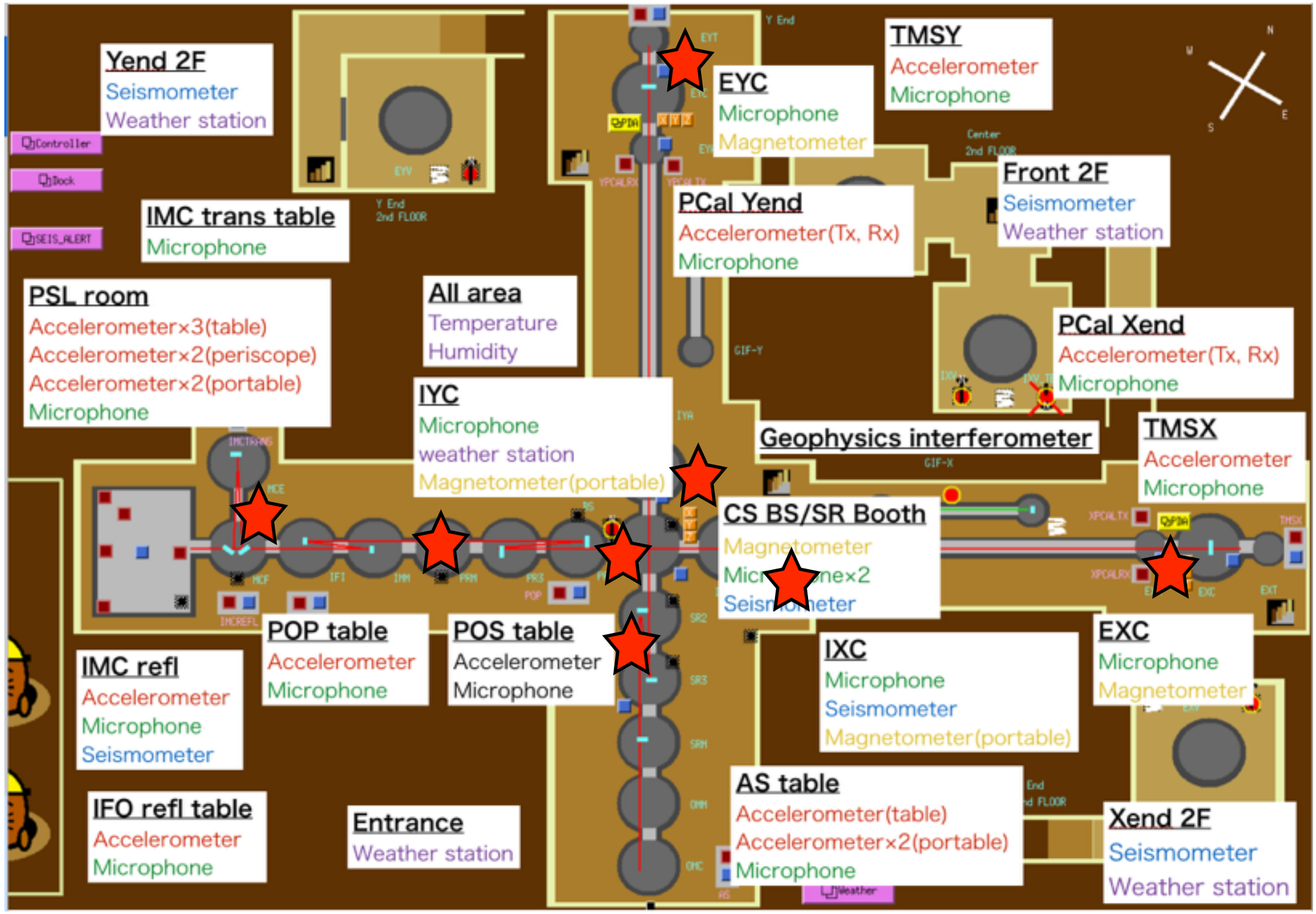
ADCs for portable PEM



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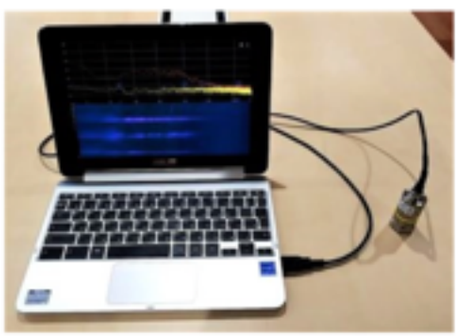
Portable PEMs

- Several accelerometers and microphones
  - Permanently stetted in PSL and AS table
- Two magnetometers

new item of PEM : **Chromebook** Flip C101PA(ASUS company)



- In order to search the noise **efficiently**, we introduced a 10-inch small notebook computer Chrome book.
- Measure the environmental noises(sound, vibration, magnetic field etc..) using USB port sensor.
- It can be measured **without KAGRA data acquisition system** ,**without cabling**.
- Battery-powered measurement is possible **without a power source**.
  ⇨ There are no restrictions on the measurement location,**Measure environmental noise anywhere**.
- We use Google Android app for measurement.
  (ex) Real-time spectrum analyzer, Function generator, sound recorder
- PEM data can be saved as an audio file and can be analyzed offline with GWpy.

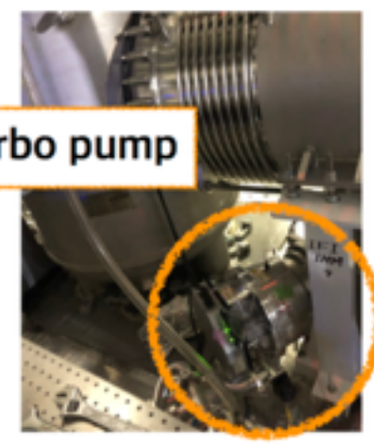
Omnidirectional microphone
UMIK-1(miniDSP company)
frequency range:20~20kHz

accelerometer
333D01(Digiducer company)
frequency range:2~8kHz

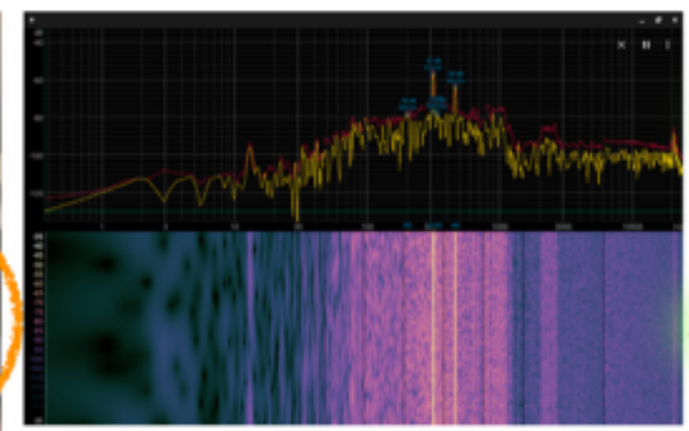
Unidirectional microphone
K053(FIFINE company)
frequency range:50~16kHz

Magnetometer(single axis)
MI-CB-1DM(AICHI MI company)
frequency range:DC~10kHz

USB microphone



turbo pump



Spectrum

Spectrogram

- Shaker injection

Agenda of L-V-K PEM meeting

- KAGRA detector status & Update of the KAGRA PEM from last meeting (Yokozawa)
- Status of Environmental noise hunting in KAGRA (Washimi)
- Brief summary of the DetChar activity(Kozakai)
- Seismic motion measurement(Francesca)
- Status of the PEM injection in KAGRA (TTanaka)
- others

Backups

PEM status

http://gwwiki.icrr.u-tokyo.ac.jp/JGWwiki/KAGRA/Subgroups/PEM

Physical Environment Monitors (PEM) Subgroup

Contents

Definition and scope

1. PEM is sensing system to check the detector health, noise source and h(t) data quality
2. **Selection, installation and maintenance of PEMs in KAGRA detector are the main tasks** so that the data necessary for commissioning procedure are collected.
   From JGW-E1808401

Status talk (JGWDoc9295)

- FY2018 : 5/28 Exp. Chief meeting / 6/29 KIW4 / 8/26 F2F / 12/5 F2F / 2/14 KIW5 / 3/14 JPS
- FY2019 : 4/21 F2F / 6/21 KIW6 / 8/24 F2F / 9/10 TAUP / 9/19 JPS

Monitoring & Summary Pages

KAGRA Daily Summary page	Time series of the trend data (mean, max, min for each sec)	manual
Yuzu Summary page	Time series, Ampritude spectrum, Spectroglam, and Glithc plots	
Bruco Summary page	automated Bruco every 10 minutes only during nightly silent run	
Atotsu Weather Station	Weather information at the entrance of KAGRA tunnel, in Atotsu	memo
KamioKaminari	Lightning sensror at the entrance of KAGRA tunnel, in Atotsu (supported by SIT)	
Vacuum monitor	Vacuum prressure of the KAGRA beam duct	IP list
CryoCon	Temperature in cryogenic system	
Screen Captures	Screen Captures of PCs in KAGRA control room	
Line database	KAGRA Line database managed by spread sheet	Post form

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Sensor & Channel Information

PEM Sensor List	place, hardweare, and digital system information for PEM sensors	Channel Name Definition
	ACC / MIC / MAG / SEIS / ONDTR / WEATHER / VAC	
PEM MAP	Location map for the fixed PEM sensors	on k1sum0
ADC port list	ADC port list of PEM in KAGRA digital system	IP list
Portable channel list	ADC channels for portavle sensors	
Chromebook PEM	Completely stand-alone portable PEM using Chromebook	

PEM status

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Screen Captures	Scree
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Sensor & Channel Informa

PEM Sensor List	place, hardwea
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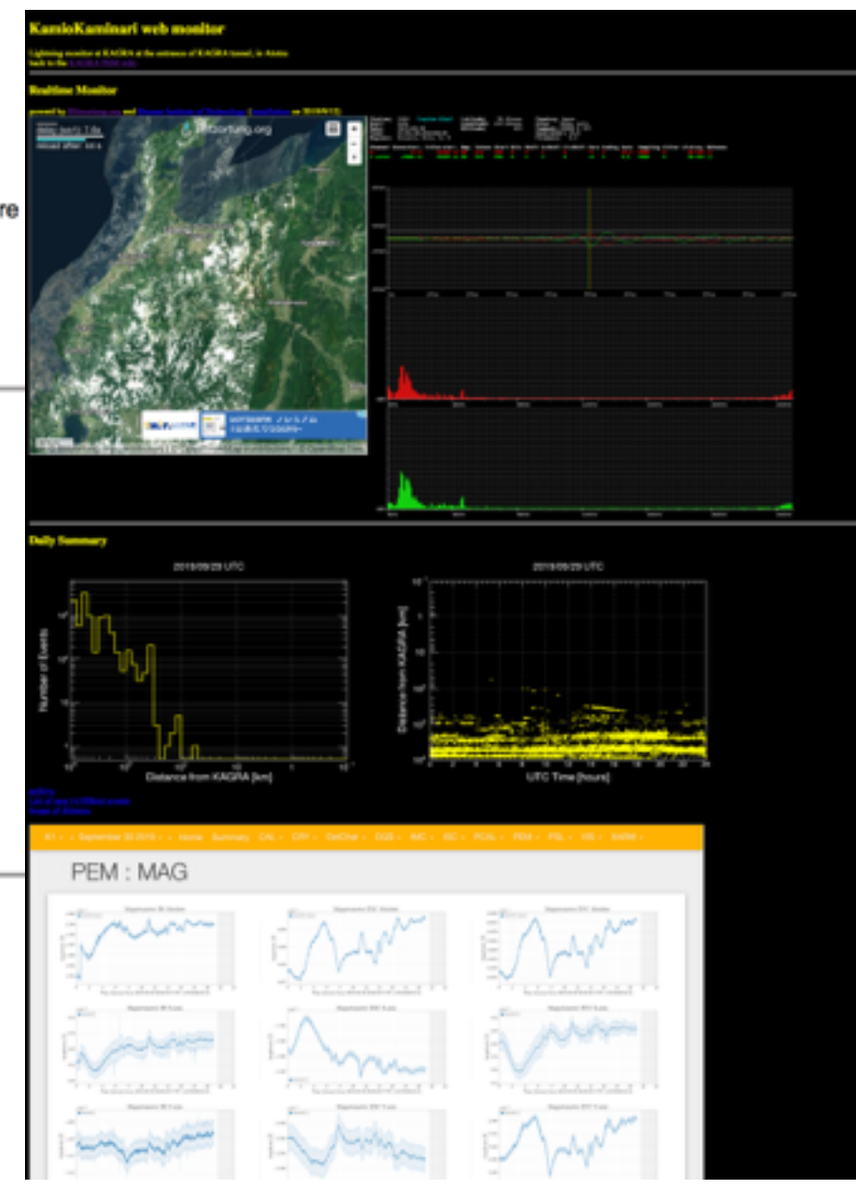

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Please fill the information for the KAGRA line database.

1. Fill your name
   Your Name
2. Fill the line frequency [Hz]
   ex) 44.2
3. Fill the line width[Hz]
   ex) 0.1
4. Fill the line source
   ex) 24V power supply
5. Fill the line source location
   ex) PSL room
6. Fill the device to find the line
   ex) Portable ACC
7. Fill the stationarity(amplitude, frequency, width)
   ex) Variate the amplitude
8. Fill the klog ID
   ex) 9942
9. Notes/comments

Submit

You can see the result in KAGRA Line database.

KAGRA Line DataBase v.1.0 2019/09/15 by T.Yokozawa

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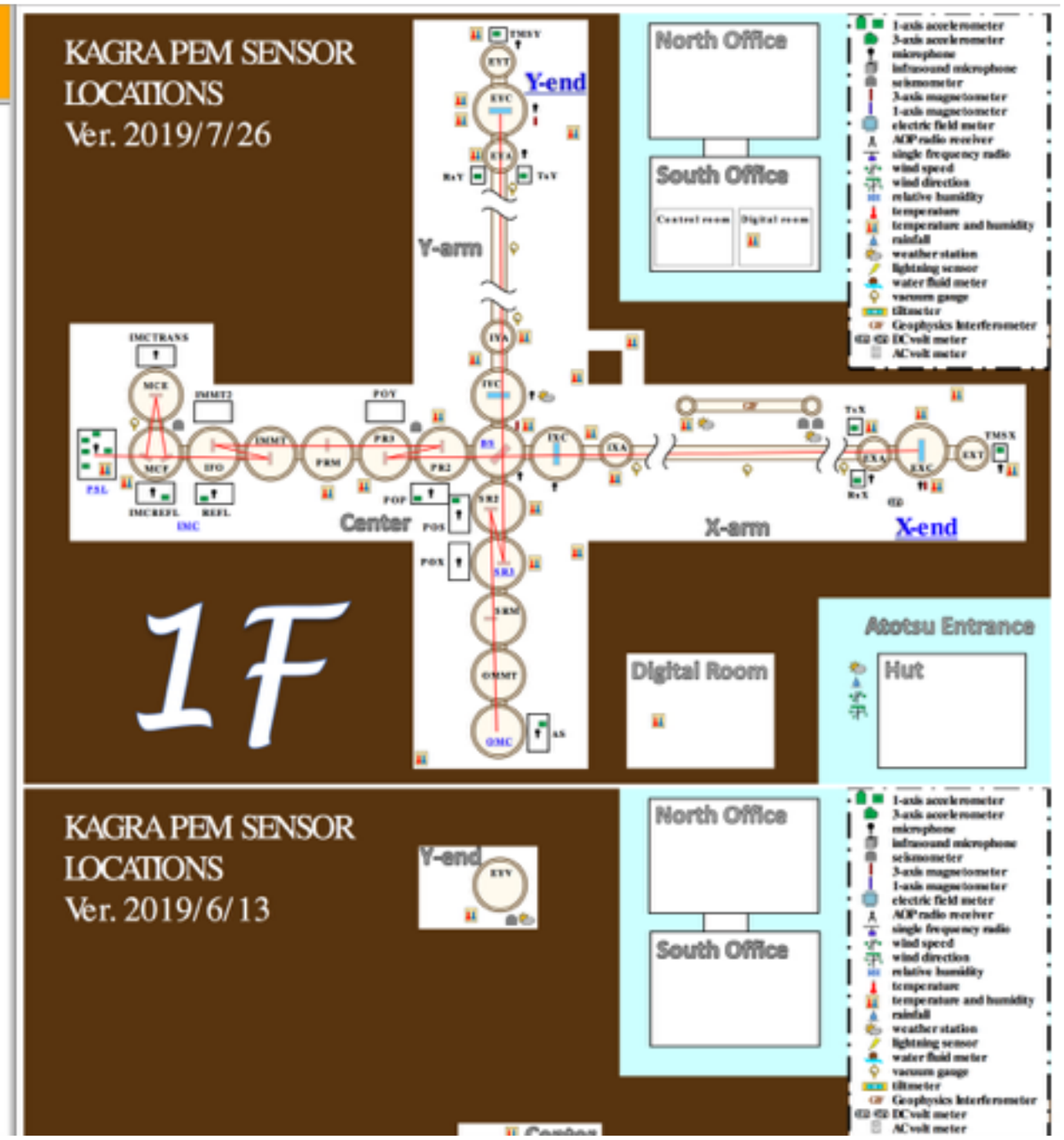

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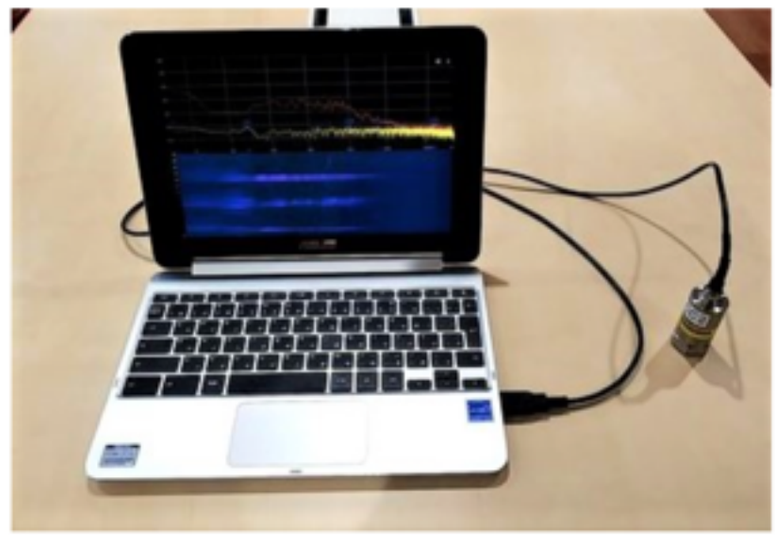
Chromebook portable PEM system



ASUS Chromebook Flip C101PA

- https://www.asus.com/jp/2-in-1-PCs/ASUS-Chromebook-Flip-C101PA/
- amazon.co.jp

2019 Aug. F2F meeting Poster : Best poster award!

Merit

- lightweight(890g) and compact, but enough screen size(10inch)
  - Lightest model in the market, enough spec even though 2017 version.
- Fast boot
- ~9hour battery, ~50% battery charge with 1hour
- Accept the google app. (Android app.)
  - Compare with windows and mac, there are many useful free application of the spectrogram and so on.
  - They can use in the smart phones and tablets, but ...
- Because of the PC, we can use the keyboard(clam shell)
- We can use the terminal and can access to the k1ctr client PCs
  - medm, diaggui, dataviewer
- Cheap(40,000-50,000 yen) and
-