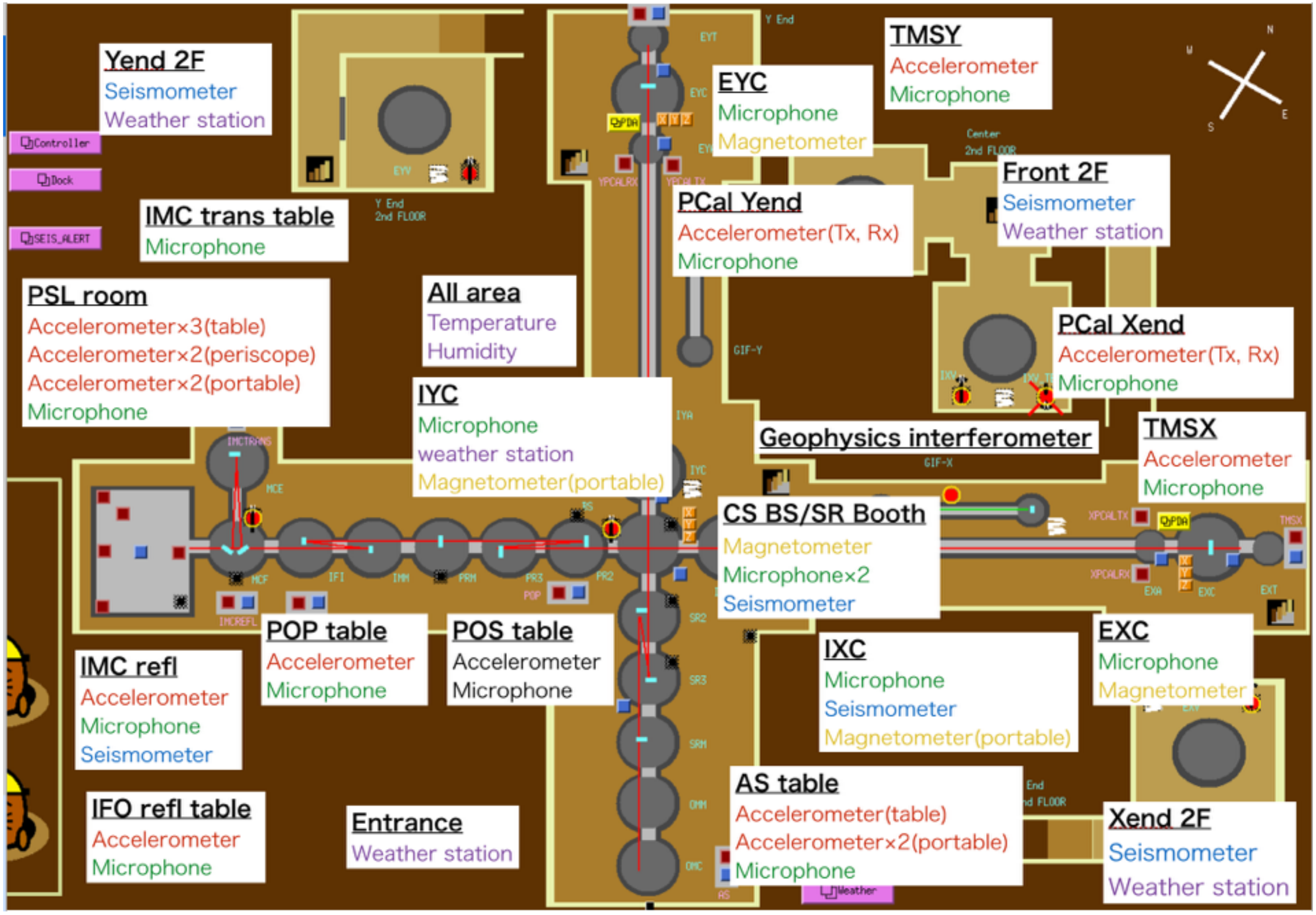
Short report from PEM subsystem

Commissioning meeting
2019/10/01 T.Yokozawa

PEM status


Yend 2F
Seismometer
Weather station
IMC trans table
Microphone
PSL room
Accelerometer×3(table)
Accelerometer×2(periscope)
Accelerometer×2(portable)
Microphone
All area
Temperature
Humidity
IYC
Microphone
weather station
Magnetometer(portable)
EYC
Microphone
Magnetometer
TMSY
Accelerometer
Microphone
PCal Yend
Accelerometer(Tx, Rx)
Microphone
Front 2F
Seismometer
Weather station
PCal Xend
Accelerometer(Tx, Rx)
Microphone
Geophysics interferometer
TMSX
Accelerometer
Microphone
CS BS/SR Booth
Magnetometer
Microphone×2
Seismometer
IMC refl
Accelerometer
Microphone
Seismometer
POP table
Accelerometer
Microphone
POS table
Accelerometer
Microphone
IXC
Microphone
Seismometer
Magnetometer(portable)
EXC
Microphone
Magnetometer
IFO refl table
Accelerometer
Microphone
Entrance
Weather station
AS table
Accelerometer(table)
Accelerometer×2(portable)
Microphone
Xend 2F
Seismometer
Weather station

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

---

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

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
2. **Selection, installation and mainten**

   From JGW-E1808401

   Status talk (JGWDoc9295)
   - FY2018 : 5/28 Exp. Chief me
   - FY2019 : 4/21 F2F / 6/21 I

Monitoring & Summary Pa

KAGRA Daily Summary page	Time
Yuzu Summary page	Time
Bruco Summary page	autom
Atotsu Weather Station	Weath
Kamioka weather	Lightn
Vacuum monitor	Vacuu
CryoCon	Temp
Screen Captures	Scree
Line database	KAGR

Sensor & Channel Informa

PEM Sensor List	place, hardwea
	ACC / MIC / M
PEM MAP	Location map f
ADC port list	ADC port list o
Portable channel list	ADC channels
Chromebook PEM	Completely sta

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)
2. **Selection, installation and maintenance of PEMs in KAGRA detector a** re are

From JGW-E1808401

Status talk (JGWDoc9295)

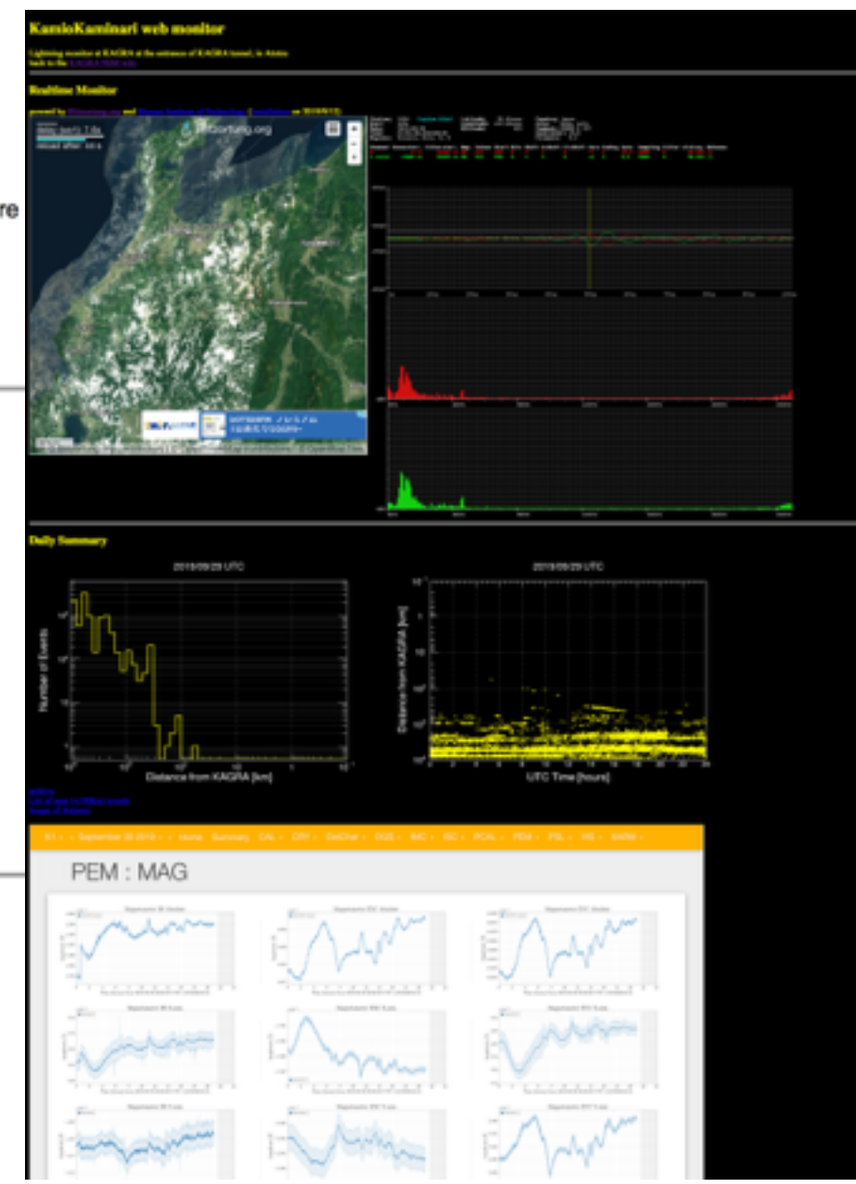
- FY2018 : 5/28 Exp. Chief meeting / 6/29 KIW4 / 8/26 F2F /
- FY2019 : 4/21 F2F / 6/21 KIW6 / 8/24 F2F / 9/10 TAUP /

Monitoring & Summary Pages

KAGRA Daily Summary page	Time series of the trend data (mean, max, m
Yuzu Summary page	Time series, Ampritude spectrum, Spectrogl
Bruco Summary page	automated Bruco every 10 minutes only dur
Atotsu Weather Station	Weather information at the entrance of KAG
KamioKaminari	Lightning sensror at the entrance of KAGRA
Vacuum monitor	Vacuum prressure of the KAGRA beam duc
CryoCon	Temperature in cryogenic system
Screen Captures	Screen Captures of PCs in KAGRA control r
Line database	KAGRA Line database managed by spread

Sensor & Channel Information

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



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 da

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 J
- 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)
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
KamioKaminari	Lightning sensror at the entrance of KAGRA tunnel, in Atotsu (supported by
Vacuum monitor	Vacuum prressure of the KAGRA beam duct
CryoCon	Temperature in cryogenic system
Screen Captures	Screen Captures of PCs in KAGRA control room
Line database	KAGRA Line database managed by spread sheet

Sensor & Channel Information

PEM Sensor List	place, hardweare, and digital system information for PEM sensors	Channel Name De
	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	

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

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 a
2. **Selection, installation and maintenance of PEMs in KAGRA det**

   From JGW-E1808401

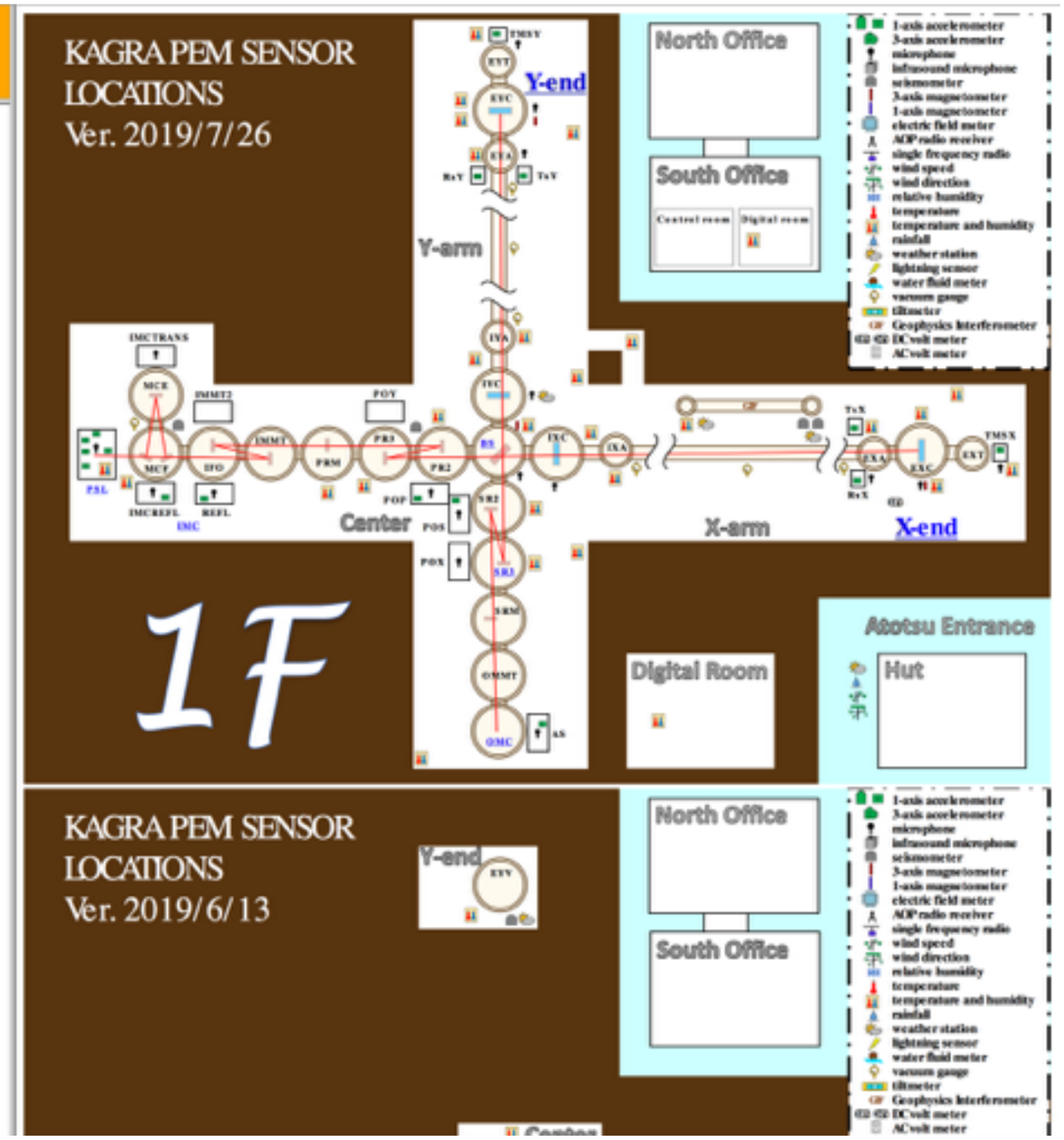
   Status talk (JGWDoc9295)
   - FY2018 : 5/28 Exp. Chief meeting / 6/29 KIW4 / 8/26 F
   - FY2019 : 4/21 F2F / 6/21 KIW6 / 8/24 F2F / 9/10 TA

Monitoring & Summary Pages

KAGRA Daily Summary page	Time series of the trend data (mean,
Yuzu Summary page	Time series, Ampritude spectrum, Sp
Bruco Summary page	automated Bruco every 10 minutes c
Atotsu Weather Station	Weather information at the entrance
KamioKaminari	Lightning sensror at the entrance of
Vacuum monitor	Vacuum prressure of the KAGRA bea
CryoCon	Temperature in cryogenic system
Screen Captures	Screen Captures of PCs in KAGRA c
Line database	KAGRA Line database managed by

Sensor & Channel Information

PEM Sensor List	place, hardweare, and digital system informat ACC / MIC / MAG / SEIS / ONDTR / WEATHE
PEM MAP	Location map for the fixed PEM sensors
ADC port list	ADC port list of PEM in KAGRA digital system
Portable channel list	ADC channels for portavle sensors
Chromebook PEM	Completely stand-alone portable PEM using Chromebook



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
2. **Selection, installation and maintenance of PEMs in KAGRA detector are th**

   From JGW-E1808401

   Status talk (JGWDoc9295)
   - FY2018 : 5/28 Exp. Chief meeting / 6/29 KIW4 / 8/26 F2F / 12/5
   - FY2019 : 4/21 F2F / 6/21 KIW6 / 8/24 F2F / 9/10 TAUP / 9/19

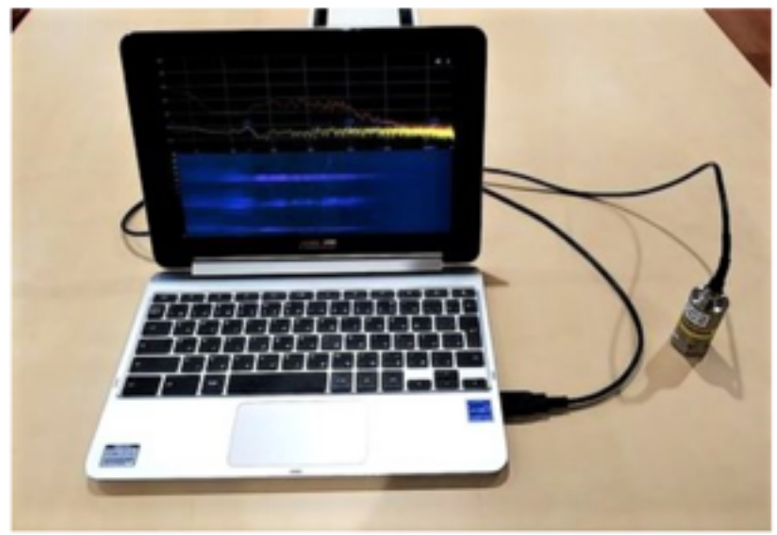
Monitoring & Summary Pages

KAGRA Daily Summary page	Time series of the trend data (mean, max, min fo
Yuzu Summary page	Time series, Amplitude spectrum, Spectroglam,
Bruco Summary page	automated Bruco every 10 minutes only during n
Atotsu Weather Station	Weather information at the entrance of KAGRA t
KamioKaminari	Lightning sensror at the entrance of KAGRA tunn
Vacuum monitor	Vacuum prressure of the KAGRA beam duct
CryoCon	Temperature in cryogenic system
Screen Captures	Screen Captures of PCs in KAGRA control room
Line database	KAGRA Line database managed by spread shee

Sensor & Channel Information

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

Chromebook portable PEM system



ASUS Chromebook Flip C101PA

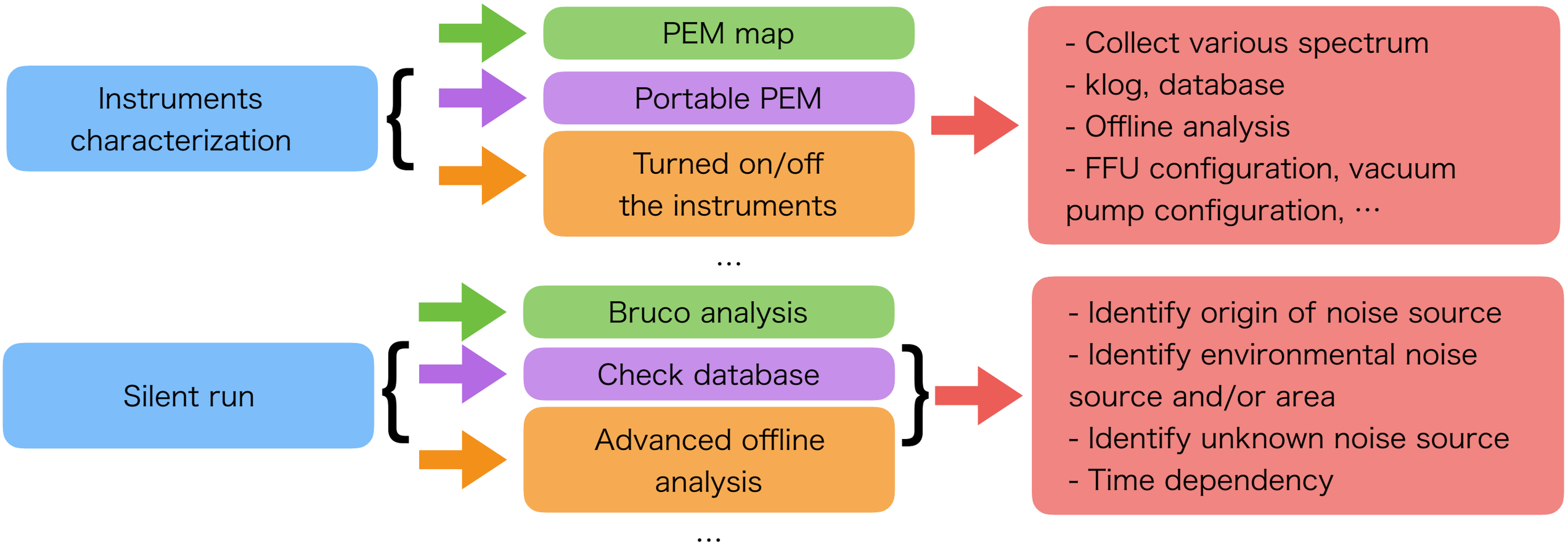
- https://www.asus.com/jp/2-in-1-PCs/ASUS-Chromebook-Flip-C101PA/
- amazon.co.jp

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
-

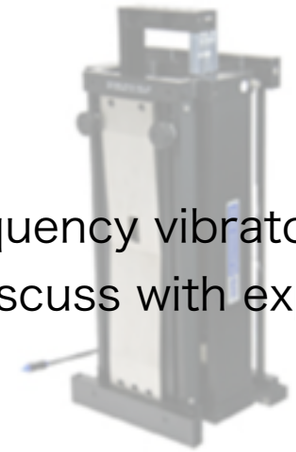
Noise identification strategy PEM



- Identify origin of noise source
  - Discussion in the daily commissioning meeting -> hunting or save to the database or apply the PEM injection for more characterization
- Identify environmental noise source and/or area
  - Portable PEM or PEM injection and identify the origin of the noise source -> Identify
- Identify unknown noise source
  - Discuss the strategy in this case
- Time dependency (glitch, special line, amplitude variable line, stationarity, ⋯)
  - Make the monitor for them

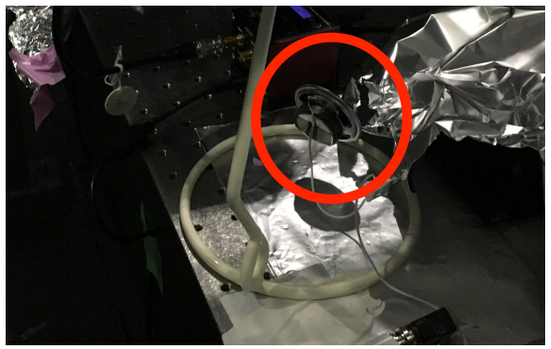
PEM injection

- Vibration : Shaker, impulse hummer, …

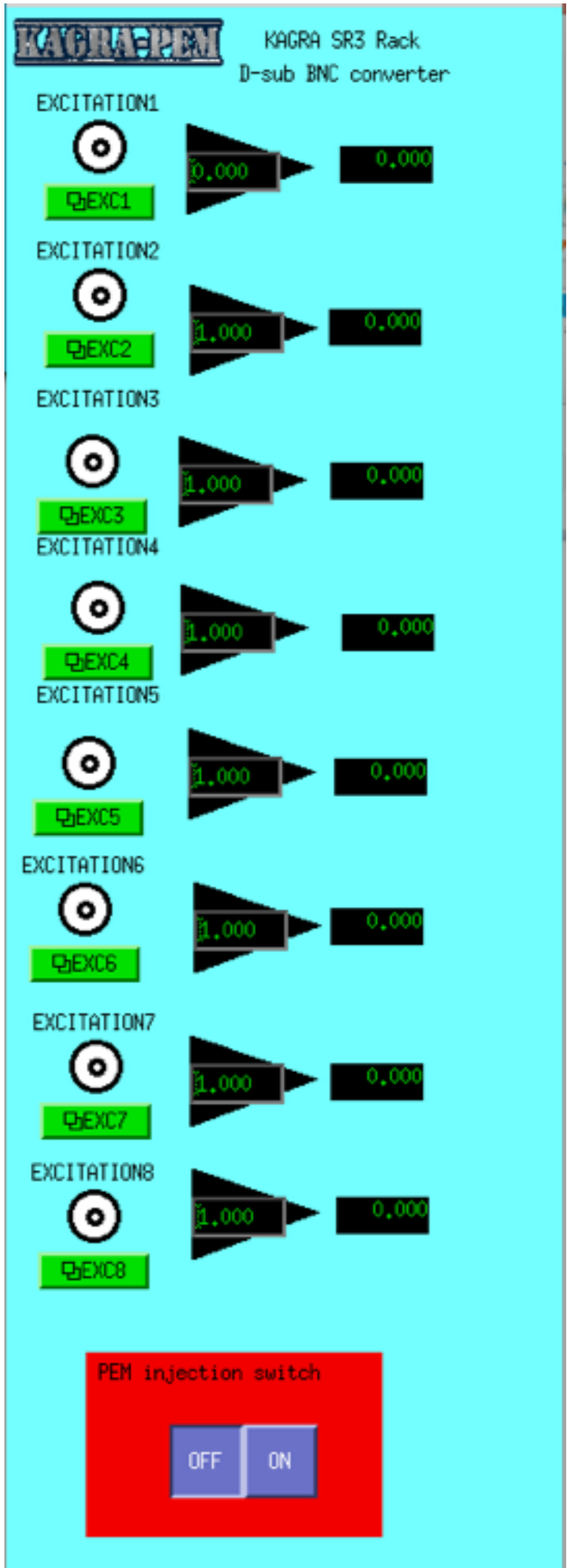


Low frequency vibrator
I want to discuss with expert

- Sound : Speakers, …



- Magnetic field : Coil, …



Backups

PEM status

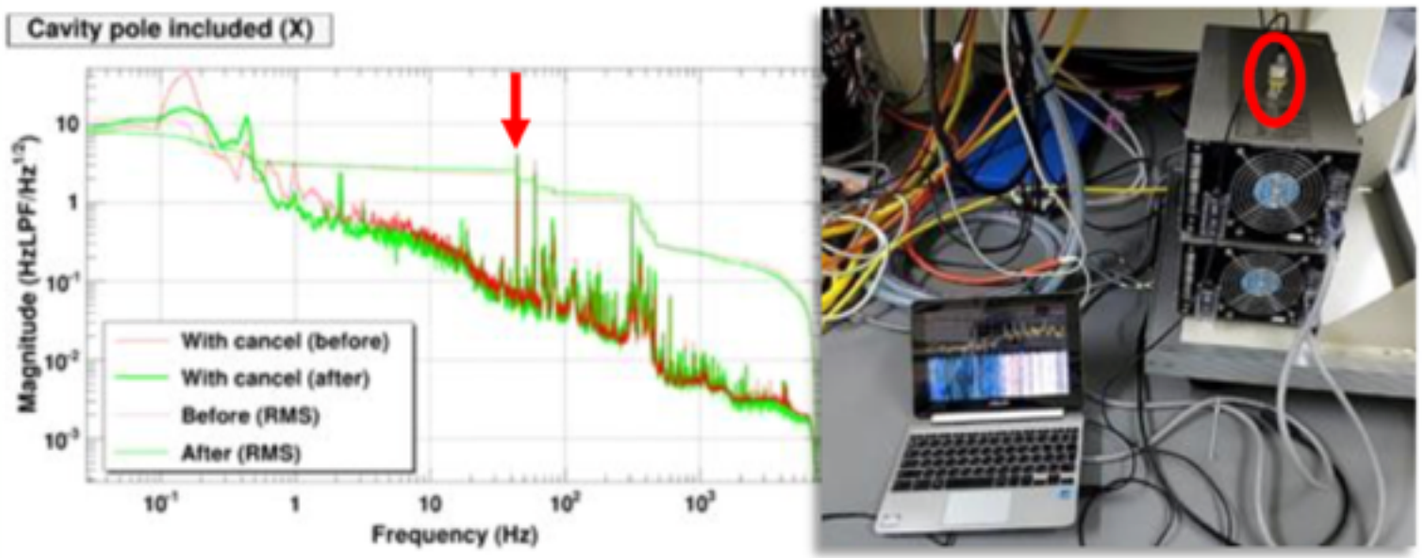
http://gwwiki.icrr.u-tokyo.ac.jp/JGWwiki/KAGRA/Subgroups/PEM

- Noise hunting with portable PEM project
  - portable PEM https://gwdoc.icrr.u-tokyo.ac.jp/cgi-bin/DocDB/ShowDocument?docid=10447
  - Noise hunting http://gwwiki.icrr.u-tokyo.ac.jp/JGWwiki/KAGRA/Subgroups/PEM/Meeting/190820/Agenda?action=AttachFile&do=view&target=PEM190820_yokozawa.pdf
  - Tried to turn on and off to some instruments (Vacuum pump, Cleaning funs,)
  - Bruco analysis
- Lightning study(Washimi)
  - See in next page
- Preparing the PEM injection
  - Main topics in next Virgo-KAGRA meeting
- Lock loss analysis using PEMs and earthquake
- KAGRA Line database(very basic version)
  - See in next page

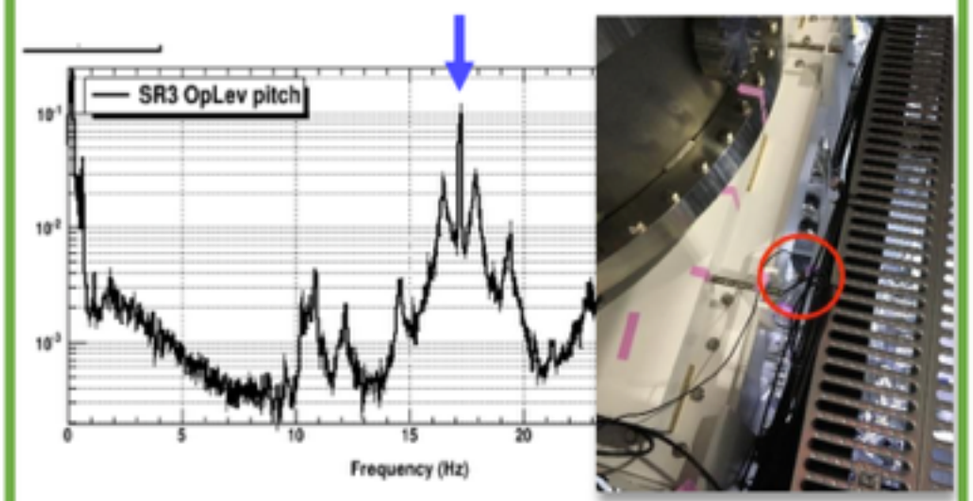
- Today topic
  - Virgo status and October commissioning(Federico or Irene) and KAGRA visitor tasks

- Hunted noises by portable PEMs!

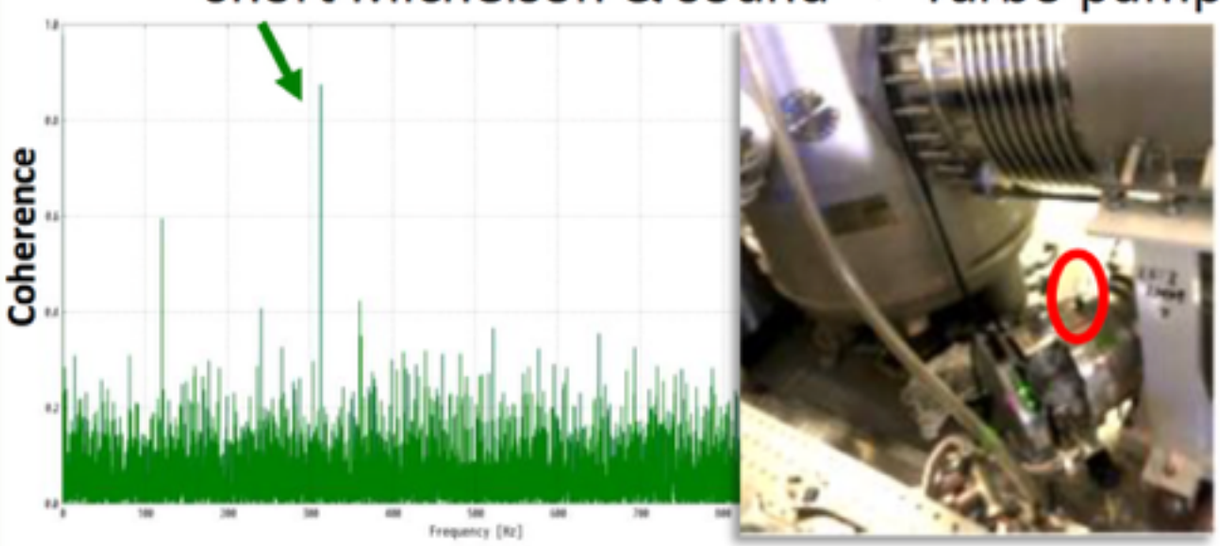
44Hz line in ALS => Vibration of 24V DC in PSL room



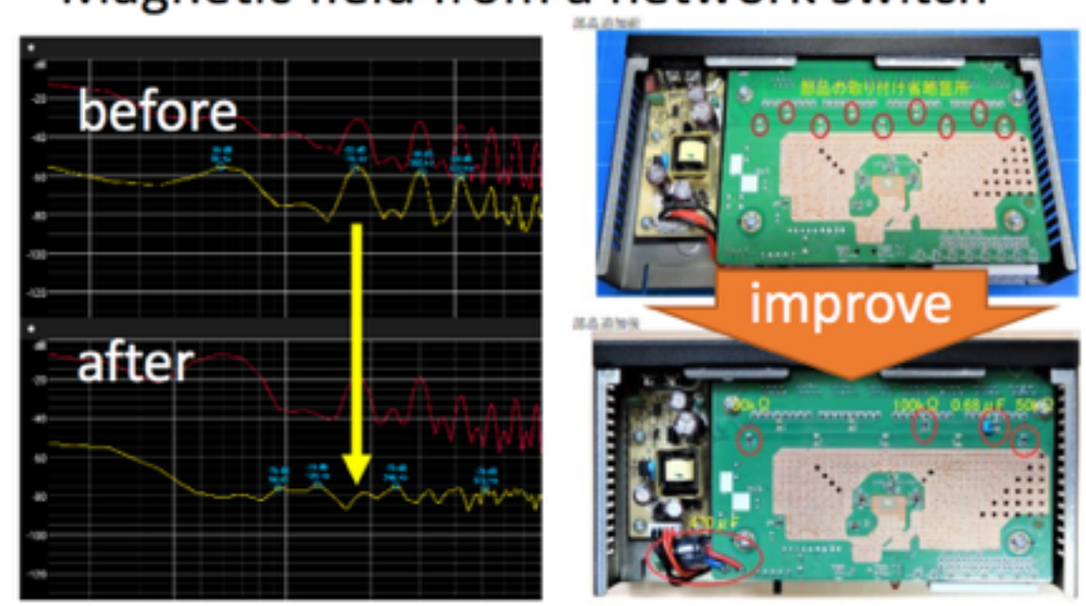
17Hz line in Signal Recycling Cavity
=> Fan Filter and cables



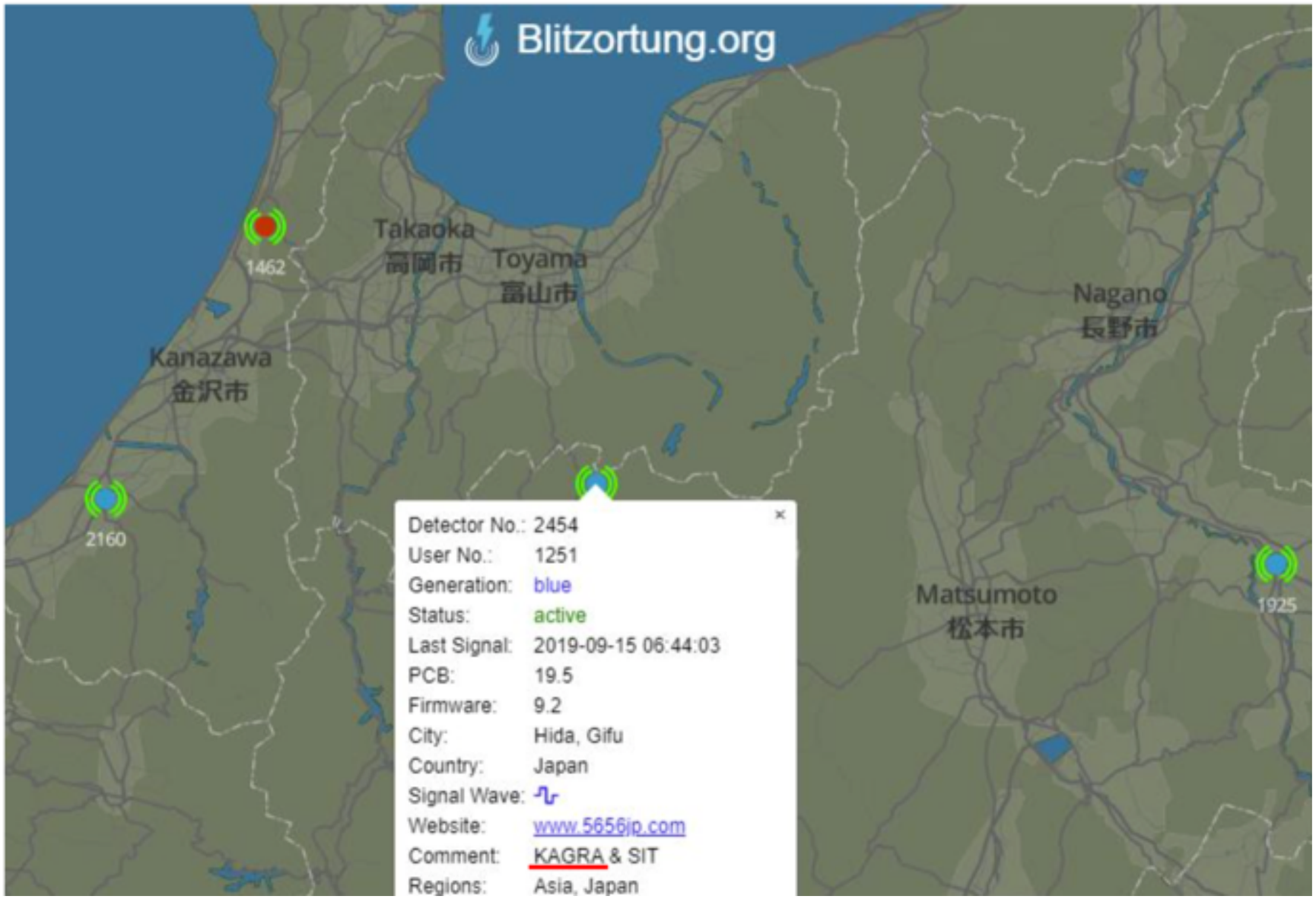
312.5Hz Coherence between
short Michelson & sound => Turbo pump



Magnetic field from a network switch



- Lightning monitor report
  - Please ask Washimi-san directory.



- Web-based KAGRA line database

https://www.icrr.u-tokyo.ac.jp/~yokozawa/KAGRA_line_database/index.html

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

KAGRA line database v1

ファイル 編集 表示 挿入 表示形式 データ ツール アドオン ヘルプ

100% 閲覧のみ

Date

	A	B	C	D	E	F	G	H	I	J	K
2	2019/09/16 4:42:07	PSL room	variable amplitude	9942	This line was already remov	24V power supply	Takaaki Yokozawa	44.2	0.1	Portable ACC	
3	2019/09/16 4:42:39	PSL room	variable amplitude	9942	This line was already remov	24V power supply	Takaaki Yokozawa	45.7	0.1	Portable ACC	
4	2019/09/16 4:46:46	IMMT1-PRM	Stationary	10109	Large vibration from the gas Only this vacuum pump outp Not only vibration but sound	Vacuum pump	Takaaki Yokozawa	312.5	0.1	Portable ACC, MIC	
5	2019/09/16 4:47:51	All area	Stationary	10109	Rotating frequency of the vc	Vacuum pump	Takaaki Yokozawa	460	0.1	Portable ACC	
6	2019/09/16 4:50:01	SRM	unknown	10109	Unknown coherence with SI	unknown	Takaaki Yokozawa	7.5	0.05	Bruco	
7	2019/09/16 4:50:34	SRM	unknown	10109	Unknown coherence with SI	unknown	Takaaki Yokozawa	9.81	0.05	Bruco	
8	2019/09/16 4:50:46	SRM	unknown	10109	Unknown coherence with SI	unknown	Takaaki Yokozawa	10.19	0.05	Bruco	
9	2019/09/16 4:51:26	OMC, OMMT	unknown	10109	Unknown coherence with O	unknown	Takaaki Yokozawa	374.2	0.05	Bruco	
10	2019/09/16 4:52:06	PSL	unknown	10109	Coherent with PSL ACCs bu	unknown	Takaaki Yokozawa	43.6	0.05	Bruco	
11	2019/09/16 4:52:18	PSL	unknown	10109	Coherent with PSL ACCs bu	unknown	Takaaki Yokozawa	111.9	0.05	Bruco	
12	2019/09/16 4:52:29	PSL	unknown	10109	Coherent with PSL ACCs bu	unknown	Takaaki Yokozawa	112.6	0.05	Bruco	
13	2019/09/16 4:52:49	PSL	unknown	10109	Coherent with PSL ACCs bu	unknown	Takaaki Yokozawa	223.75	0.05	Bruco	
14	2019/09/16 4:56:57	SRs	unknown	10210	SR suspension mechanical	SR mechanical	Takaaki Yokozawa	5	0.05	model prediction	
15	2019/09/16 4:57:04	SRs	unknown	10210	SR suspension mechanical	SR mechanical	Takaaki Yokozawa	11	0.05	model prediction	
16	2019/09/16 4:57:12	SRs	unknown	10210	SR suspension mechanical	SR mechanical	Takaaki Yokozawa	16	0.05	model prediction	
17	2019/09/16 4:57:19	SRs	unknown	10210	SR suspension mechanical	SR mechanical	Takaaki Yokozawa	50	0.05	model prediction	
18	2019/09/16 5:00:32	FFU	Stationary	10209	Coherence between SRCL a	SR3	Takaaki Yokozawa	17.2	0.05	ACCs, oplev	
19	2019/09/16 5:01:13	unknown	Stationary	10209	Coherence between SRCL a	SR3	Takaaki Yokozawa	29.75	0.05	ACCs, oplev	
20	2019/09/16 5:01:35	unknown	Stationary	10209	Coherence between SRCL a	SR3	Takaaki Yokozawa	35.5	0.05	ACCs, oplev	
21	2019/09/16 5:02:50	whole area	Stationary	10231	Vibration by gauge pumps (	Vacuum pump	Takaaki Yokozawa	450	0.05	Portable ACC	
22	2019/09/16 5:03:55	whole area	Stationary	10231	Reduced by turned off the v	Vacuum pump	Takaaki Yokozawa	465	0.05	Portable ACC	
23	2019/09/16 5:04:38	PSL room	Stationary	10231	ACC PSL room. Disappear	Vacuum pump	Takaaki Yokozawa	115.5	0.05	Portable ACC	
24	2019/09/16 5:04:44	PSL room	Stationary	10231	ACC PSL room. Disappear	Vacuum pump	Takaaki Yokozawa	141	0.05	Portable ACC	
25	2019/09/16 5:04:50	PSL room	Stationary	10231	ACC PSL room. Disappear	Vacuum pump	Takaaki Yokozawa	165	0.05	Portable ACC	
26	2019/09/16 5:07:53	unknown	--	10234	detected by BSm SRs oplev	BS SRs	Takaaki Yokozawa	10.9	??	Bruco	
27	2019/09/16 6:43:39	unknown	--	10235	Coherence with CS magnet	BS IP ACC	Takaaki Yokozawa	14	??	Bruco	
28	2019/09/16 6:43:55	unknown	--	10235	Coherence with CS magnet	BS IP ACC	Takaaki Yokozawa	22.5	??	Bruco	
29	2019/09/16 6:44:04	unknown	--	10235	Coherence with CS magnet	BS IP ACC	Takaaki Yokozawa	29.7	??	Bruco	
30	2019/09/16 6:44:37	unknown	--	10235	Coherence with CS magnet	BS IP ACC	Takaaki Yokozawa	42.25	??	Bruco	
31	2019/09/16 6:44:55	unknown	--	10235	Coherence with CS magnet	BS IP ACC	Takaaki Yokozawa	58.3	??	Bruco	
32	2019/09/16 6:45:24	unknown	--	10235	Coherence with CS magnet	BS IP ACC	Takaaki Yokozawa	93	??	Bruco	
33	2019/09/16 6:45:56	unknown	--	10235	Coherence with CS magnet	BS oplev	Takaaki Yokozawa	104	??	Bruco	
34	2019/09/16 6:46:08	unknown	--	10235	Coherence with CS magnet	BS oplev	Takaaki Yokozawa	107	??	Bruco	
35	2019/09/16 6:46:24	unknown	--	10235	Coherence with CS magnet	BS oplev	Takaaki Yokozawa	109	??	Bruco	
36	2019/09/16 6:46:32	unknown	--	10235	Coherence with CS magnet	BS oplev	Takaaki Yokozawa	115	??	Bruco	
37	2019/09/16 6:47:20	unknown	--	10235	Coherence with CS magnet	ITMX and ITMY yaw	Takaaki Yokozawa	128.3	??	Bruco	
38	2019/09/16 6:47:28	unknown	--	10235	Coherence with CS magnet	ITMX and ITMY yaw	Takaaki Yokozawa	256.7	??	Bruco	
39	2019/09/16 6:48:02	unknown	--	10235	Coherence with CS magnet	Ground?	Takaaki Yokozawa	233.3	??	Bruco	
40	2019/09/16 6:48:46	Vacuum pump	--	10235	Maybe vibration from the PF	PR2 POP	Takaaki Yokozawa	313.5	??	Bruco	
41	2019/09/16 6:49:13	Vacuum pump	--	10235	Sound issue	?	Takaaki Yokozawa	435.4	??	Bruco	
42	2019/09/16 6:49:19	Vacuum pump	--	10235	Sound issue	?	Takaaki Yokozawa	525	??	Bruco	
43	2019/09/16 6:50:35	Vacuum pump	--	10245	There is large magnetic fiek	magnetic field	Takaaki Yokozawa	84	??	Portable Mag	
44	2019/09/16 6:53:01	unknown	Suddenly appear and	10303	46.6Hz first discovered from	Type-A suspension	Takaaki Yokozawa	46.6	??	oplev	
45	2019/09/16 6:54:47	all area	??	10313	We measured with turning c	roots pump	Takaaki Yokozawa	285	??	accelerometer	
46	2019/09/16 6:55:58	PSL room	??	10390	Observed with the PSL roor	??	Takaaki Yokozawa	41.2	??	accelerometers	
47	2019/09/16 6:56:07	PSL room	??	10390	Observed with the PSL roor	??	Takaaki Yokozawa	23.9	??	accelerometers	
48	2019/09/16 6:56:15	PSL room	??	10390	Observed with the PSL roor	??	Takaaki Yokozawa	46.2	??	accelerometers	