Software for device controlling and data reduction in TAKUMI

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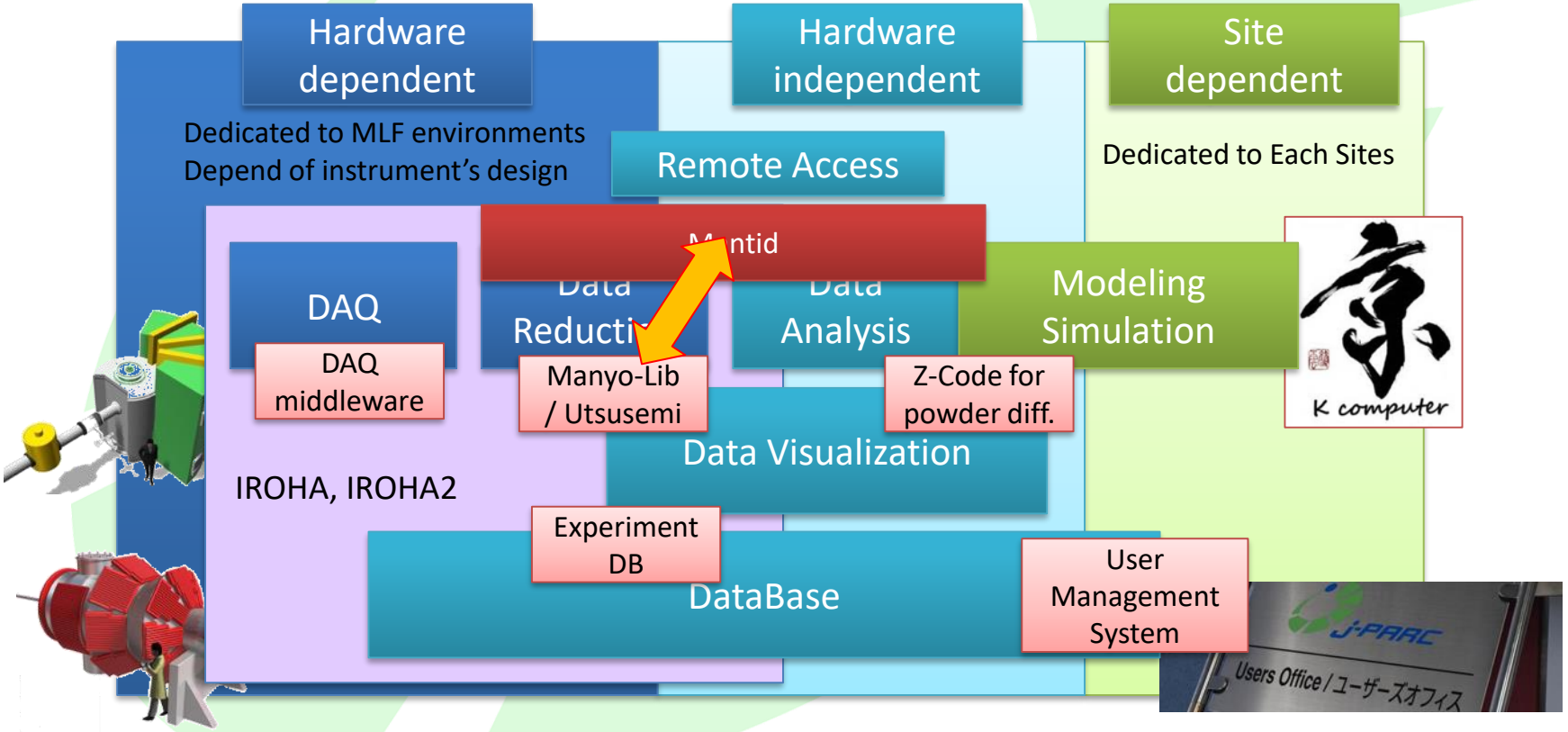
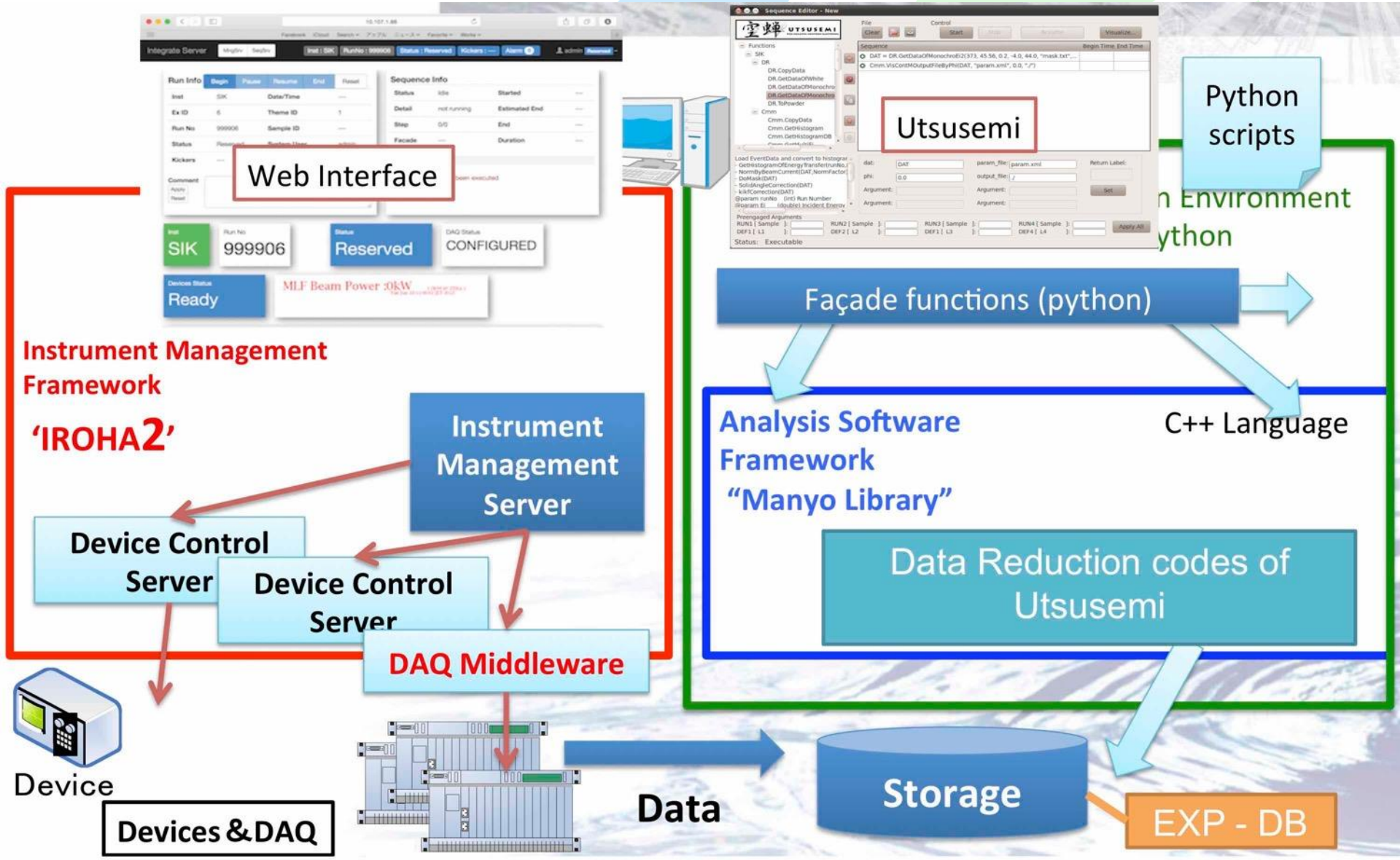
J-PARC Center, JAEA

Components of MLF software

- Hardware dependent software have been developed by MLF



Structure of ‘Instrument Software’

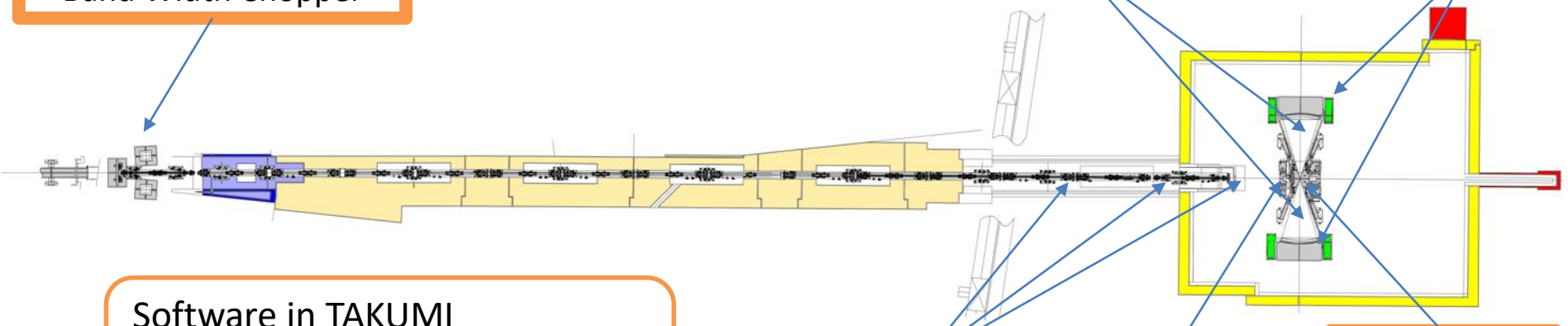


Components & devices in TAKUMI

Band Width Chopper

Radial Collimators

Detectors



Beam Slits

Sample Stage

Sample Env. Devices

Software in TAKUMI

Control

- Meas. Controlling GUI
- IROHA2 Framework
- DAQ middleware
- HiTTs -> loading

Data reduction

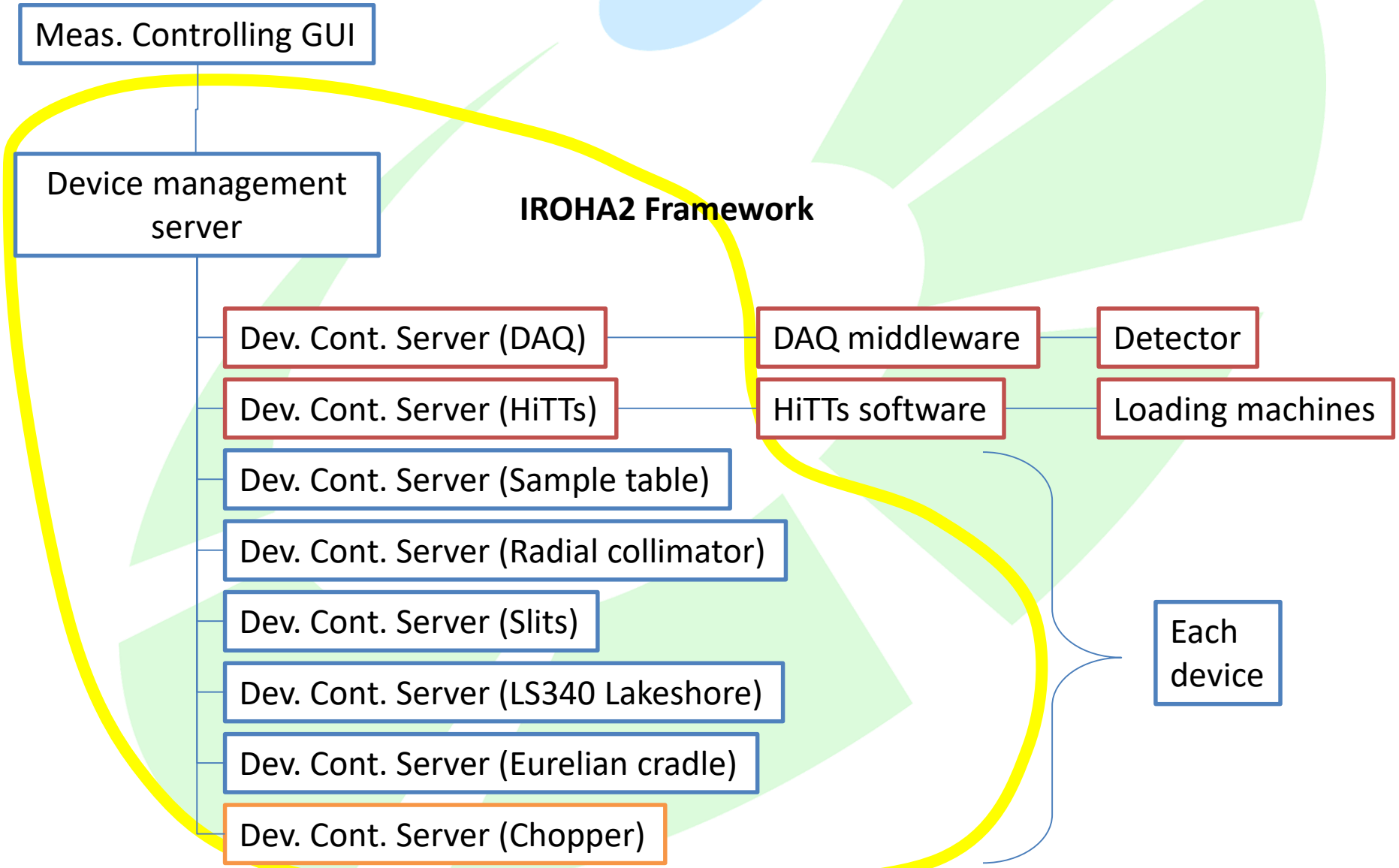
- Emaki-GUI
- Utsusemi
- Manyo-Lib

Loading machine

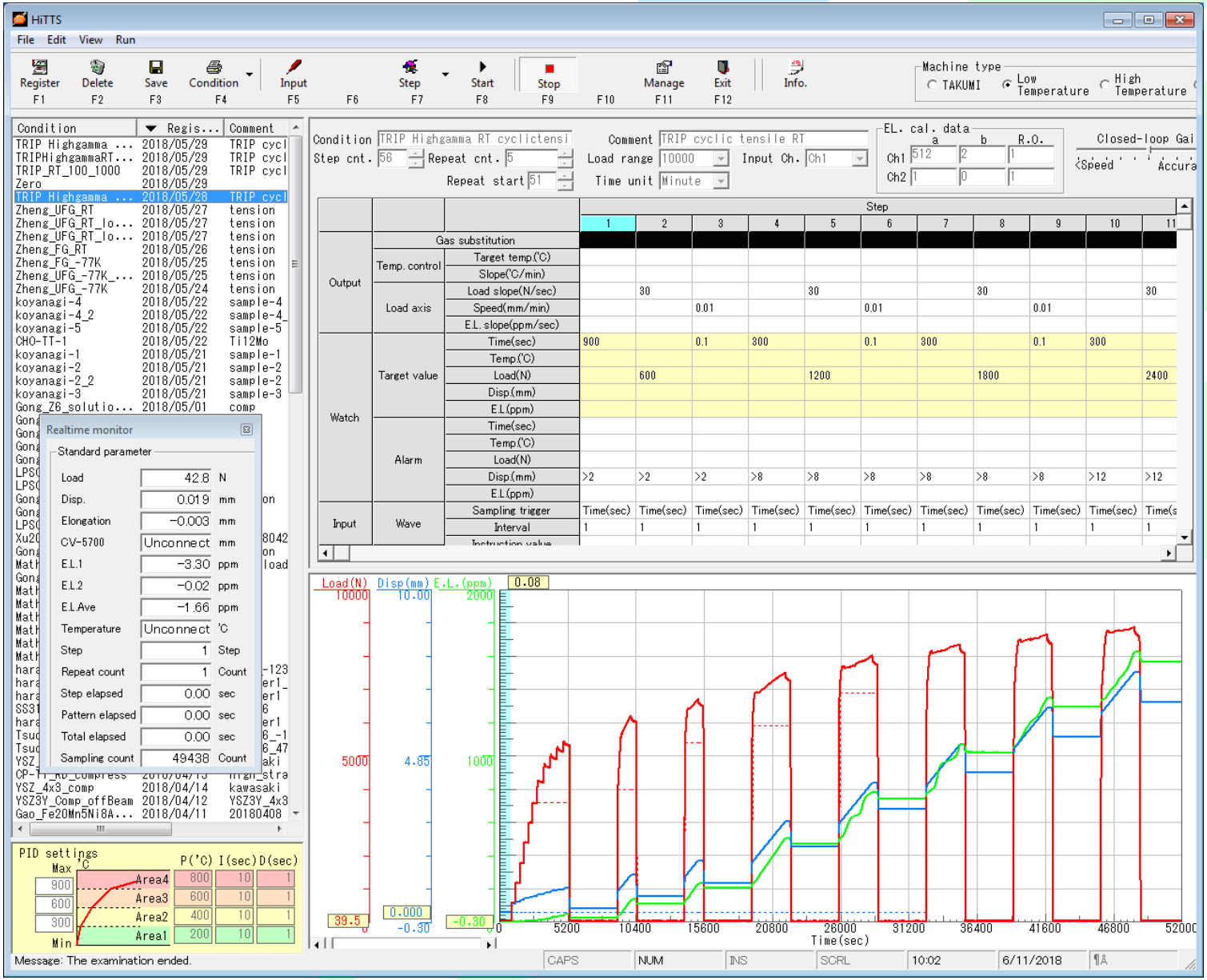
Furnace

Etc.

Structure of software in TAKUMI

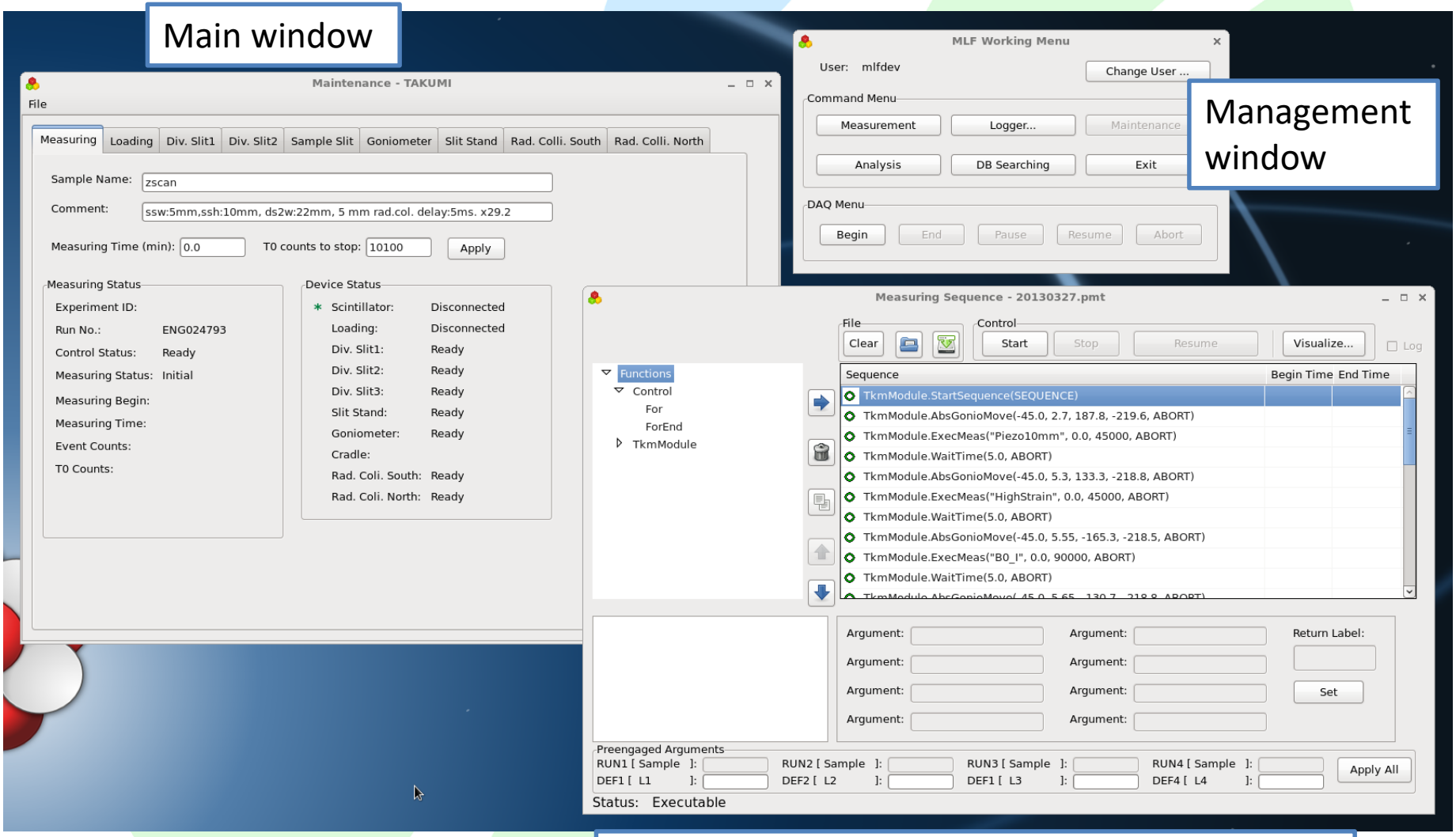


Software for loading machine in TAKUMI
- HiTTS -



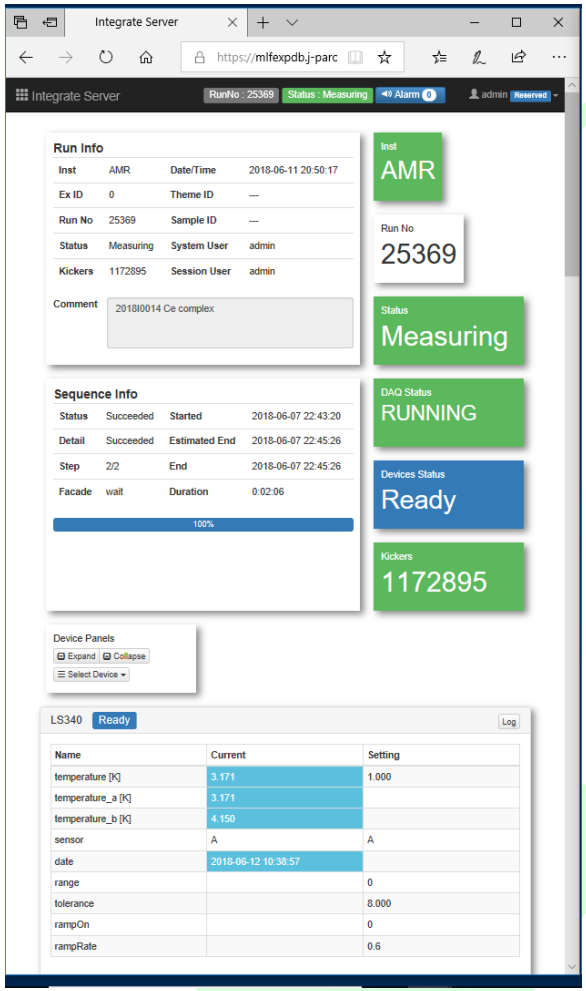
- ✓ Load control
- ✓ Displacement control
- ✓ Strain (extensometer, strain gauge) control
- ✓ Heating
- ✓ Cyclic

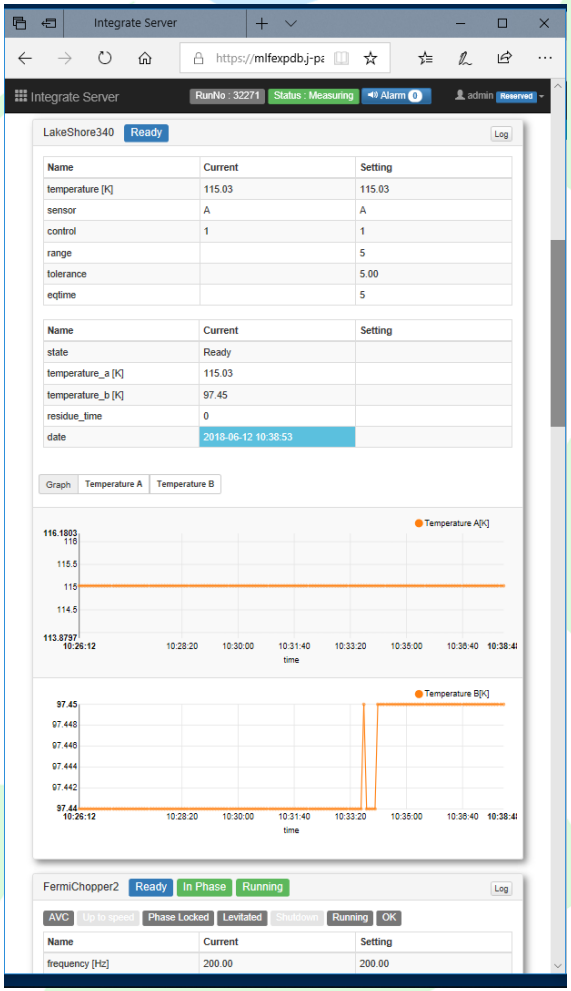
GUI for Device Controlling



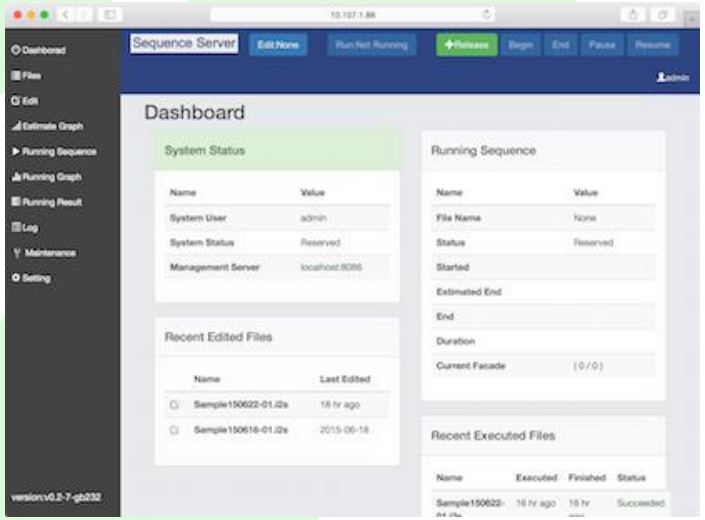
Instrument control from the web browser（IROHA2）

BL01, BL14





IROHA2 Integrated Control Server



IROHA2 Sequence Server

Enable to see the user experimental situations from out site of J-PARC, MLF

Integrate Server - Mozilla Firefox

Management Server | Sequence Server | Microsoft Word - SM... | Integrate Server | scdpcd03--Device Server | scdpcd05--Device Server

192.168.18.25:8089

よく見るページ | IROHA2 | BL18 | CROSS | VMware ESXi

Integrate Server | MngSrv | SeqSrv | Inst : SCD | RunNo : 10113 | Status : Measuring | Kickers : 11175 | Alarm 0 | admin | Reserved

Run Info

Begin | Pause | Resume | End | Reset

Inst	SCD	Date/Time	2018-06-12 10:24:31
Ex ID	0000	Theme ID	---
Run No	10113	Sample ID	---
Status	Measuring	System User	admin
Kickers	11175	Session User	admin

Comment: Kaneko — Apply | Reset

Sequence Info

Status	Succeeded	Started	2018-06-12 09:57:44
Detail	Succeeded	Estimated End	2018-06-12 09:59:54
Step	0/4	End	---
Facade	daq_run	Duration	0:00:00

Inst: SCD

Run No: 10113

Status: Measuring

DAQ Status: RUNNING

Devices Status: Ready

Kickers: 11175

Configuration: PiezoGonio

June 2018

SUN	MON	TUE	WED	THU	FRI	SAT
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

Last updated:06-Mar-2018

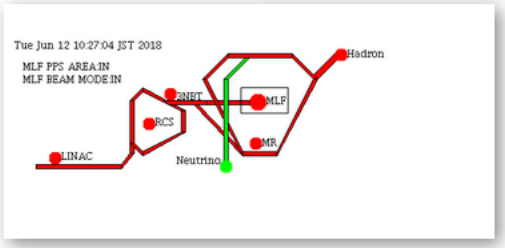
July 2018

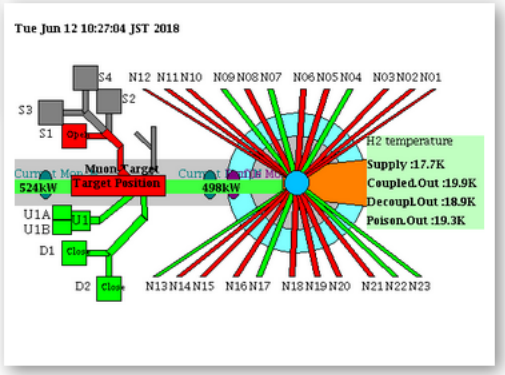
SUN	MON	TUE	WED	THU	FRI	SAT
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Last updated:05-Jun-2018

MLF Beam Power :524kW

Tue Jun 12 10:27:04 JST 2018





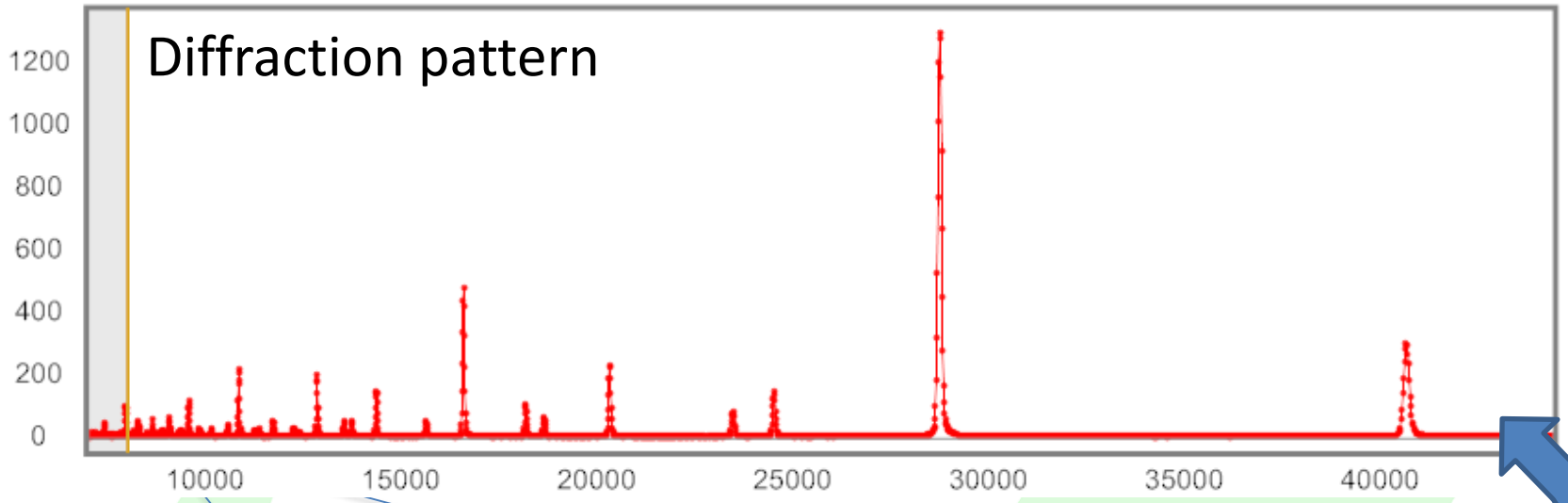
T0 | Ready | Log | Edit

Current	
type	T0
status	Ready
state	Ready
operation	Running

Setting — Apply | Cancel | Reset Fields

frequency [Hz]	50.00	50.00
phase_delay [us]	0.0	0.0
phase_error_tolerance [us]	11.1	11.1

Event data format for data acquisition



Using dedicated software

Pulse ID | Time information ←T0 (pulse) event data

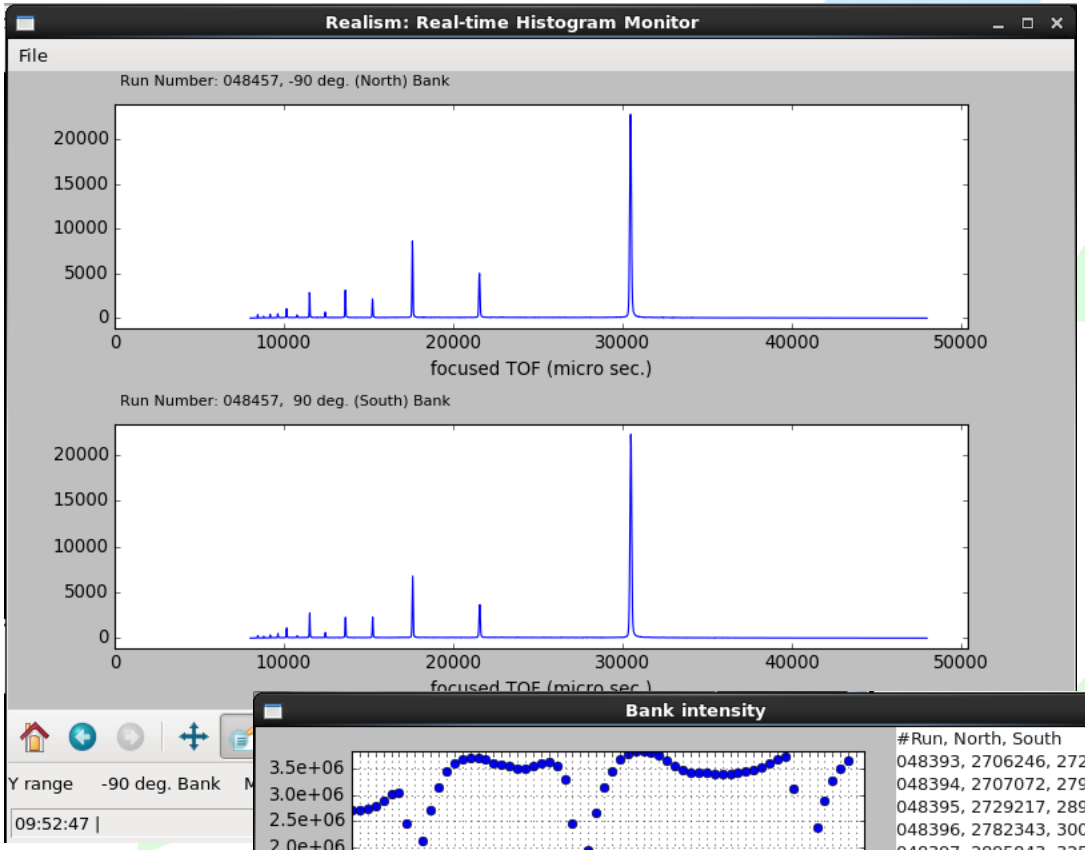
Detected position (pixel) | Time of Flight ←Neutron event data

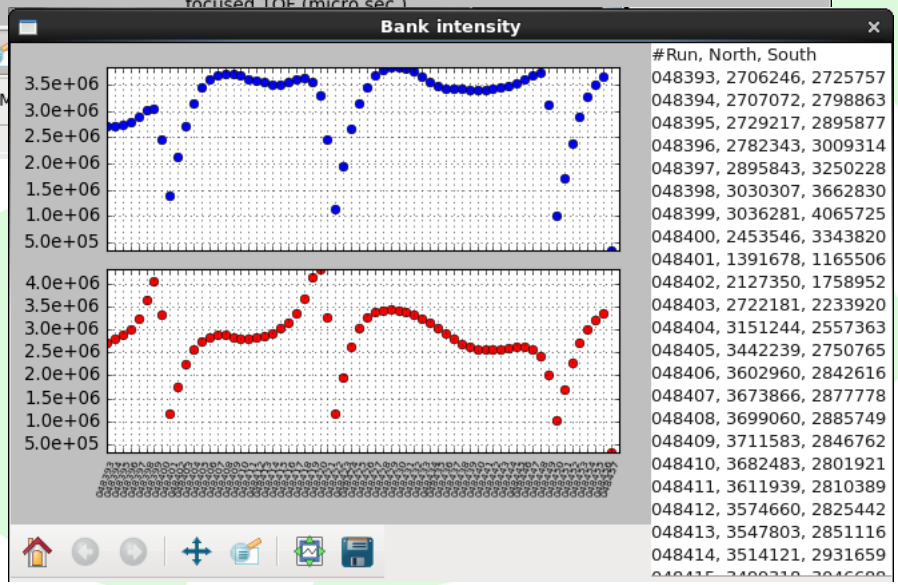
Pulse ID | Time information

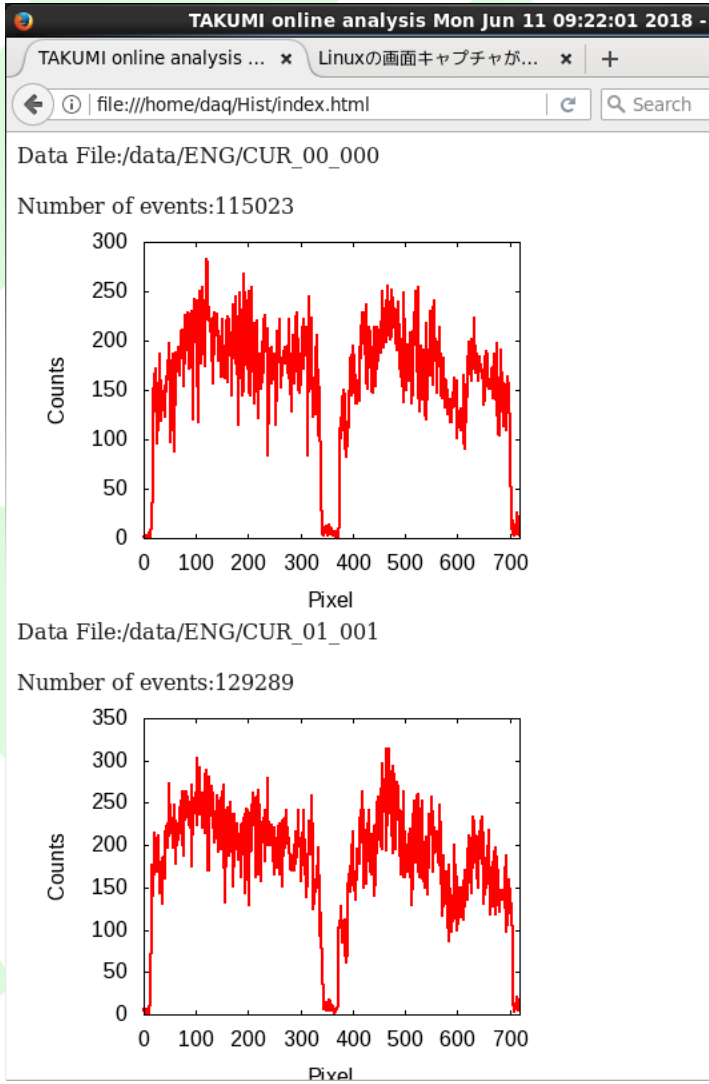
Detected position (pixel) | Time of Flight

Data file recorded in PC

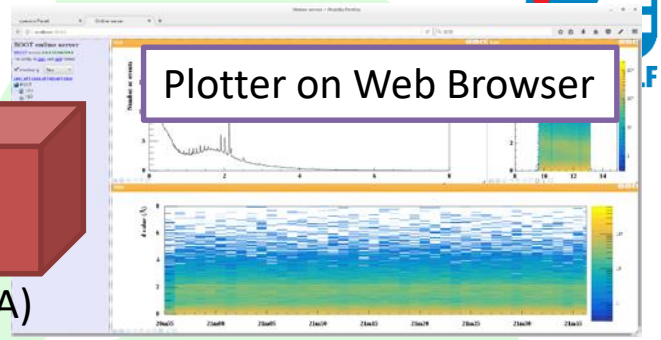
Real time histogram monitor / online monitor





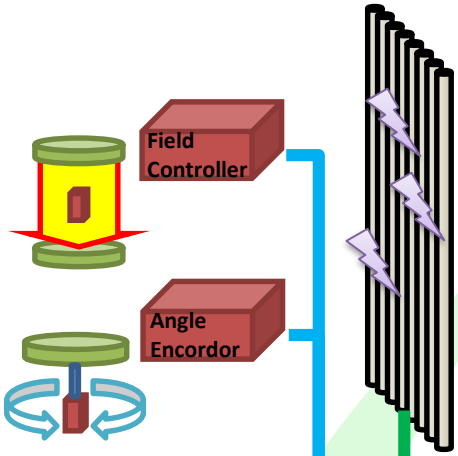


Active LDR systems in MLF



SubscriberPsd (C++)

BL21 (NOVA)



Redis Server

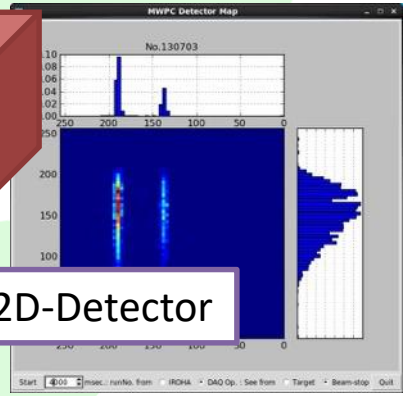
Events

Publisher module (DAQmiddleware)

Data Acquisition System

MWPC On-line Monitor (Python)

BL17 (Sharaku)

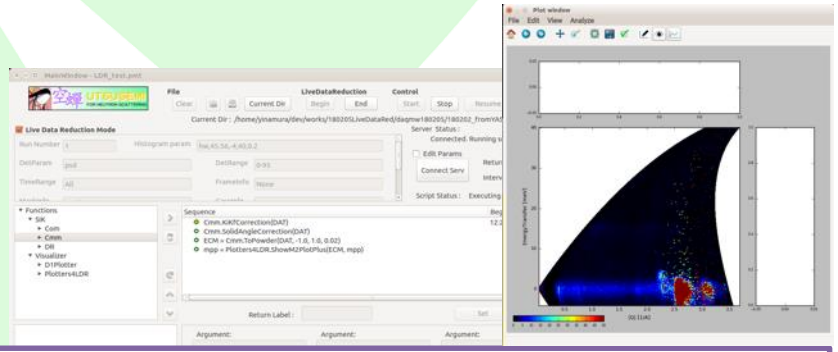


Python Plotter for 2D-Detector

Utsusemi Live Data Reduction (C++, Python)

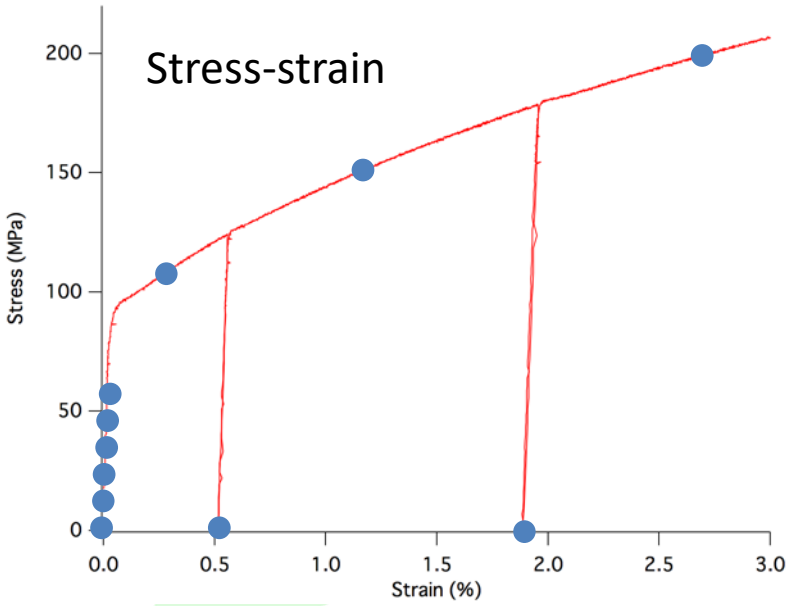
BL01(4SEASONS)

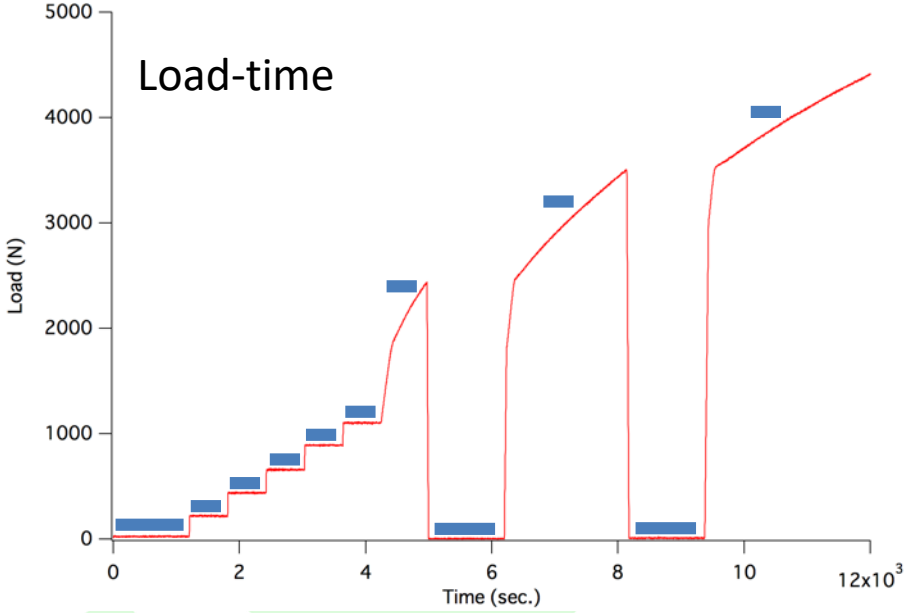
BL14(AMATERAS)



Enable to control a sequence of data reduction commands and to change their parameters during an inelastic measurement

Time division data processing based on sample environment information



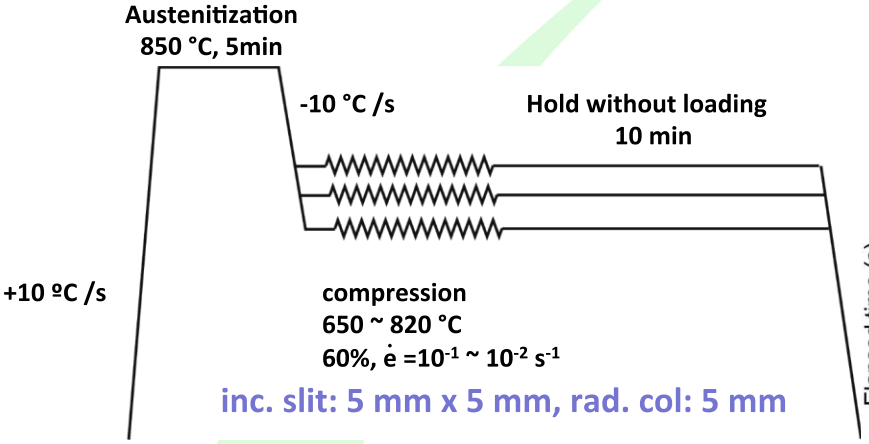


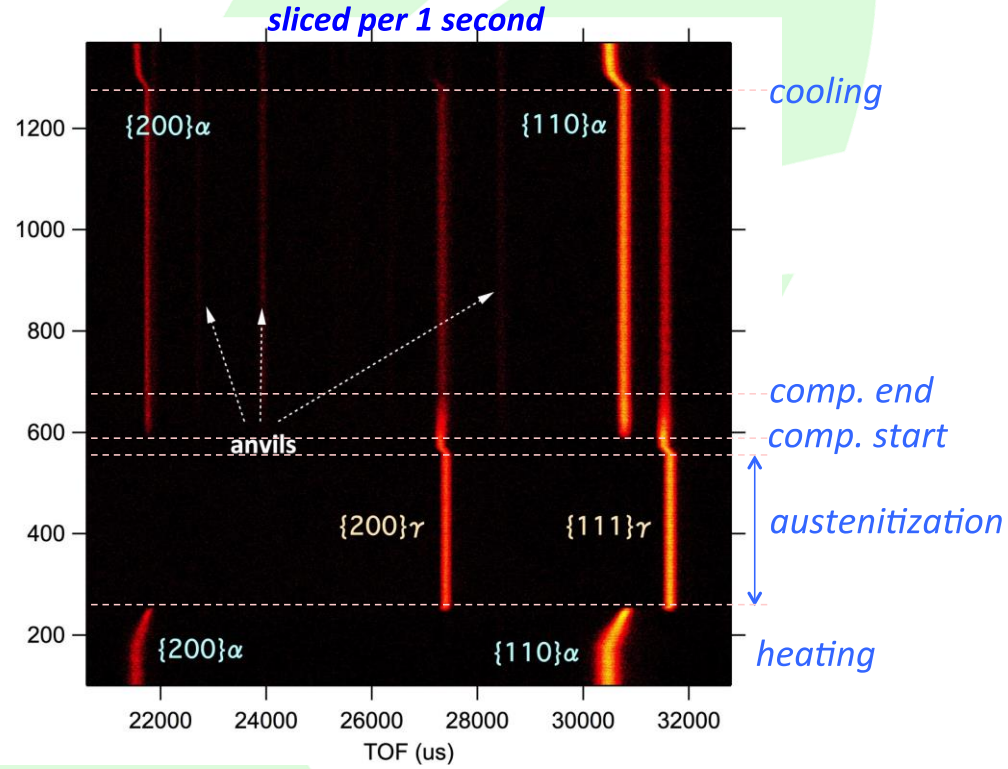
- ✓ Referring to the sample environment information recorded together with the neutron diffraction intensity data and the start time
- ✓ Extract neutron event of time corresponding to desired environmental condition
- ✓ Reduction to diffraction pattern

After completion of the measurement, neutron diffraction patterns divided at arbitrary time width can be created any times.

An example of time division data reduction

In situ measurement during thermo-mechanical treatment



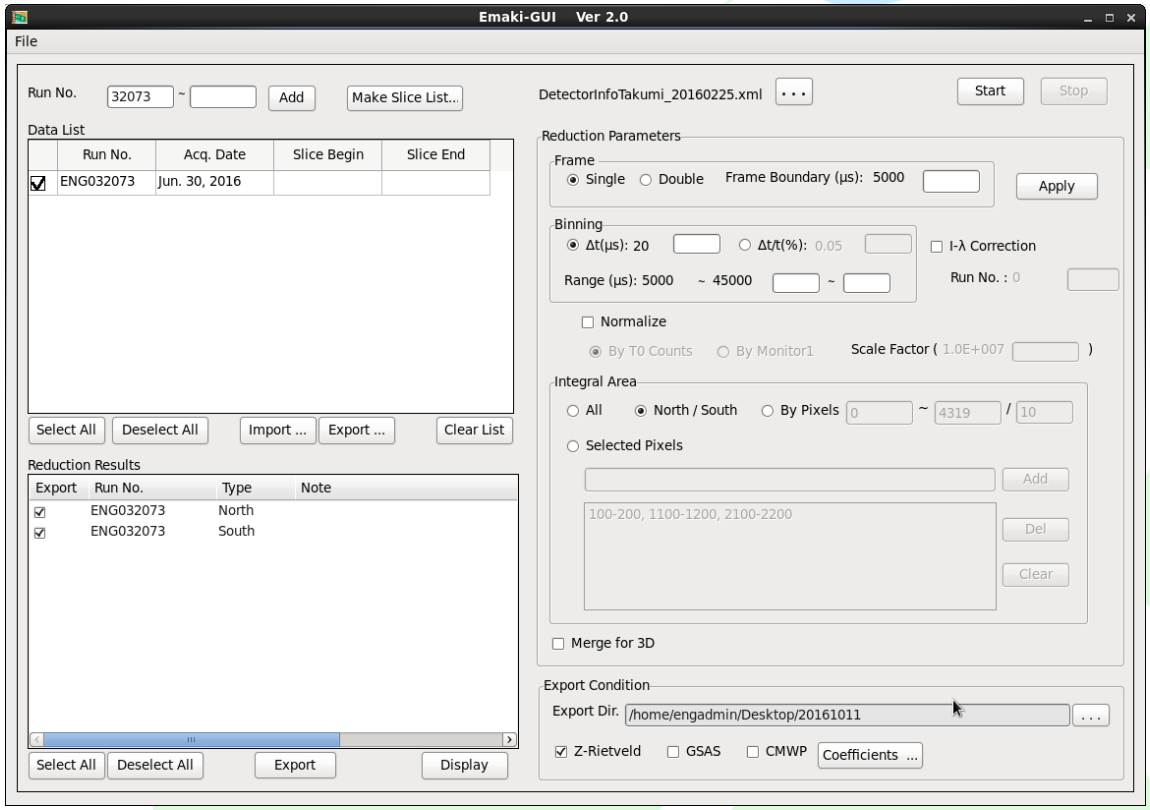


- ✓ Complex pattern of test
- ✓ Setting time division pattern is bit complicated

- Time division for reduction > ~ 1 sec.
- 5x5x5 mm^3 of steel sample
- Beam power: 500 kW

京大：柴田氏

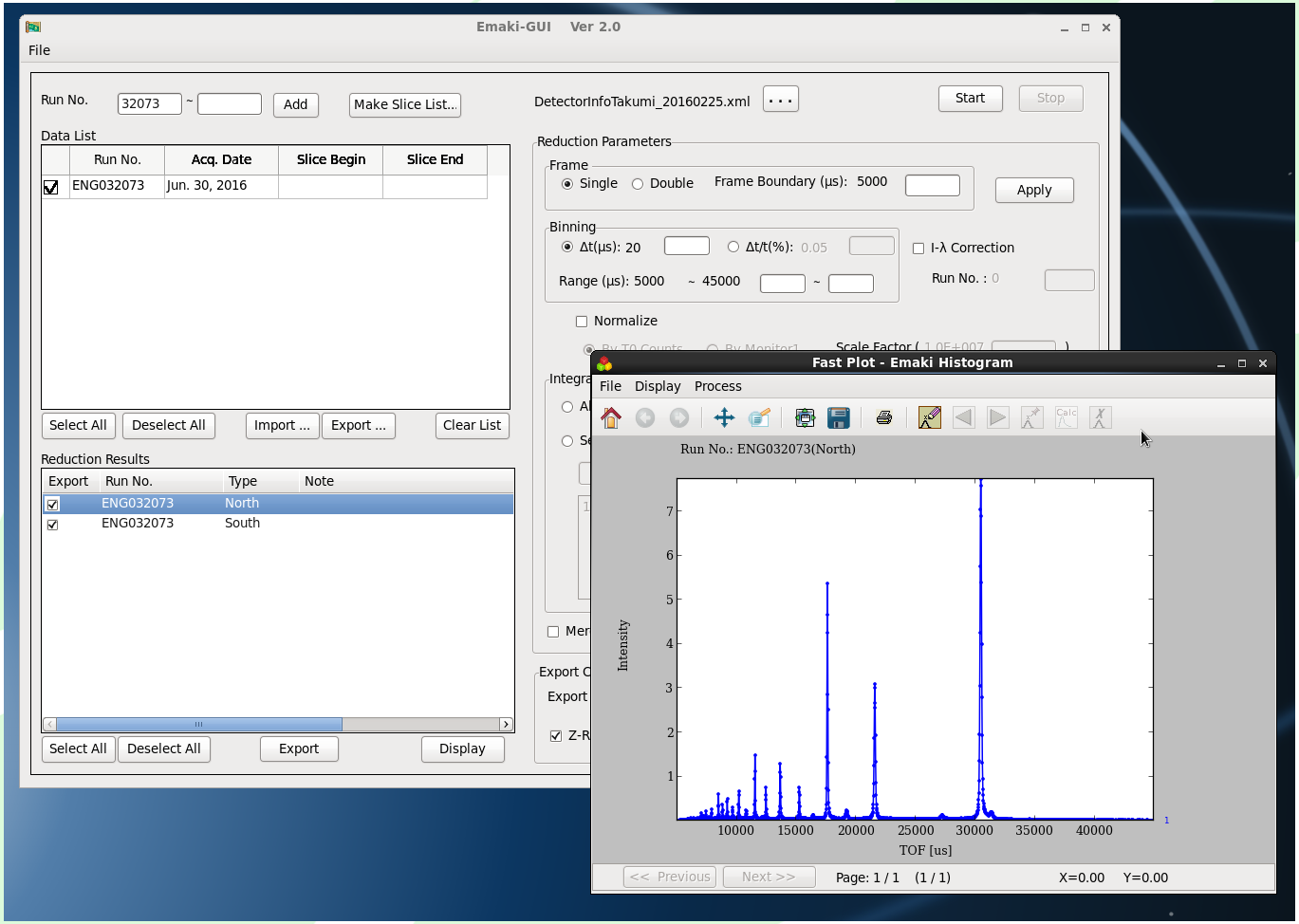
Data reduction software in TAKUMI
Emaki-GUI



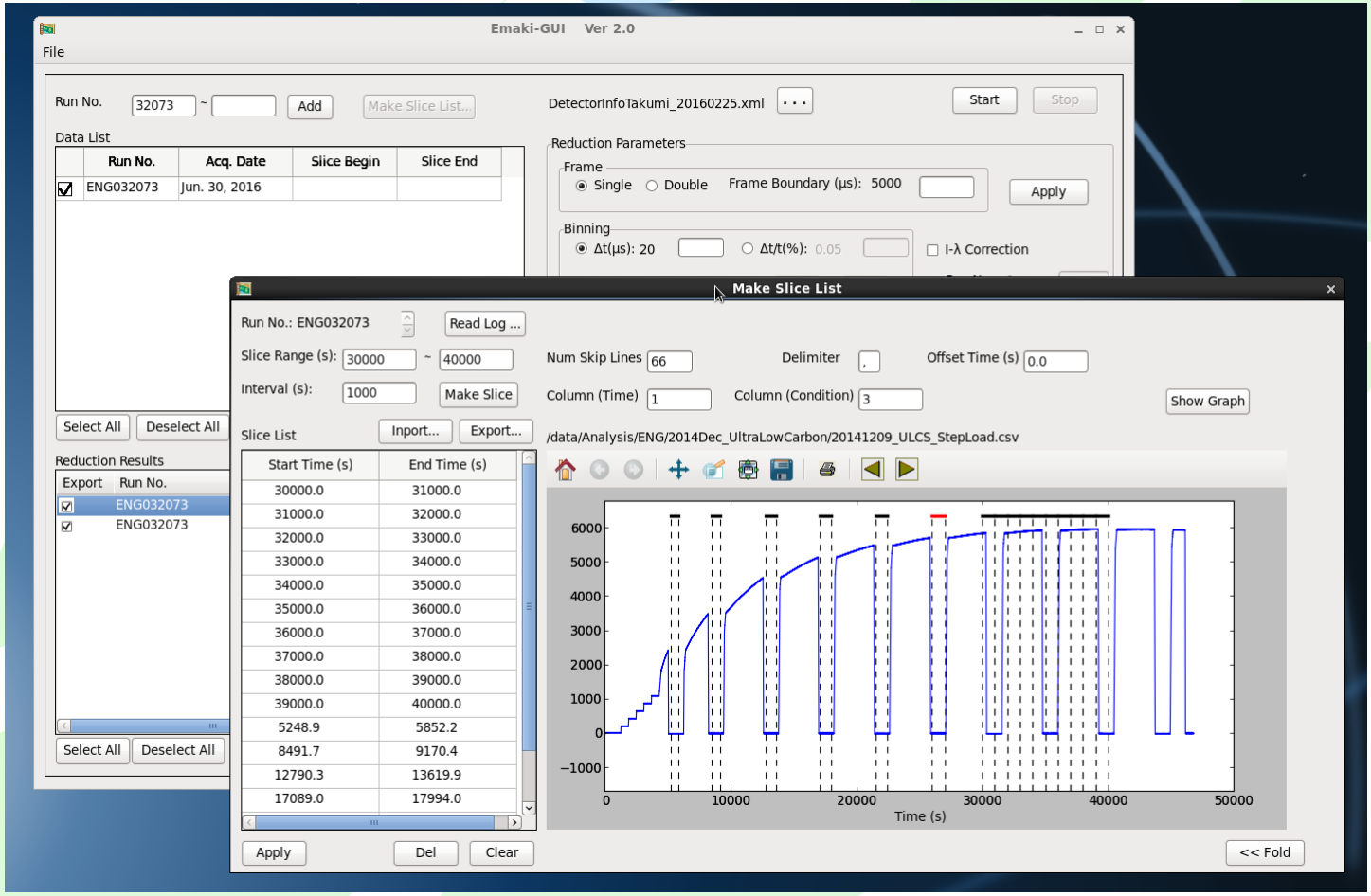
- ✓ Time binning, frame width, phase boundary
- ✓ Normalization:time, spectrum Detector range
- ✓ No need for command entry, script rewriting, etc.
- ✓ Various data format: Rietveld, CMWP

We have developed the windows version and distributed to users with the installer

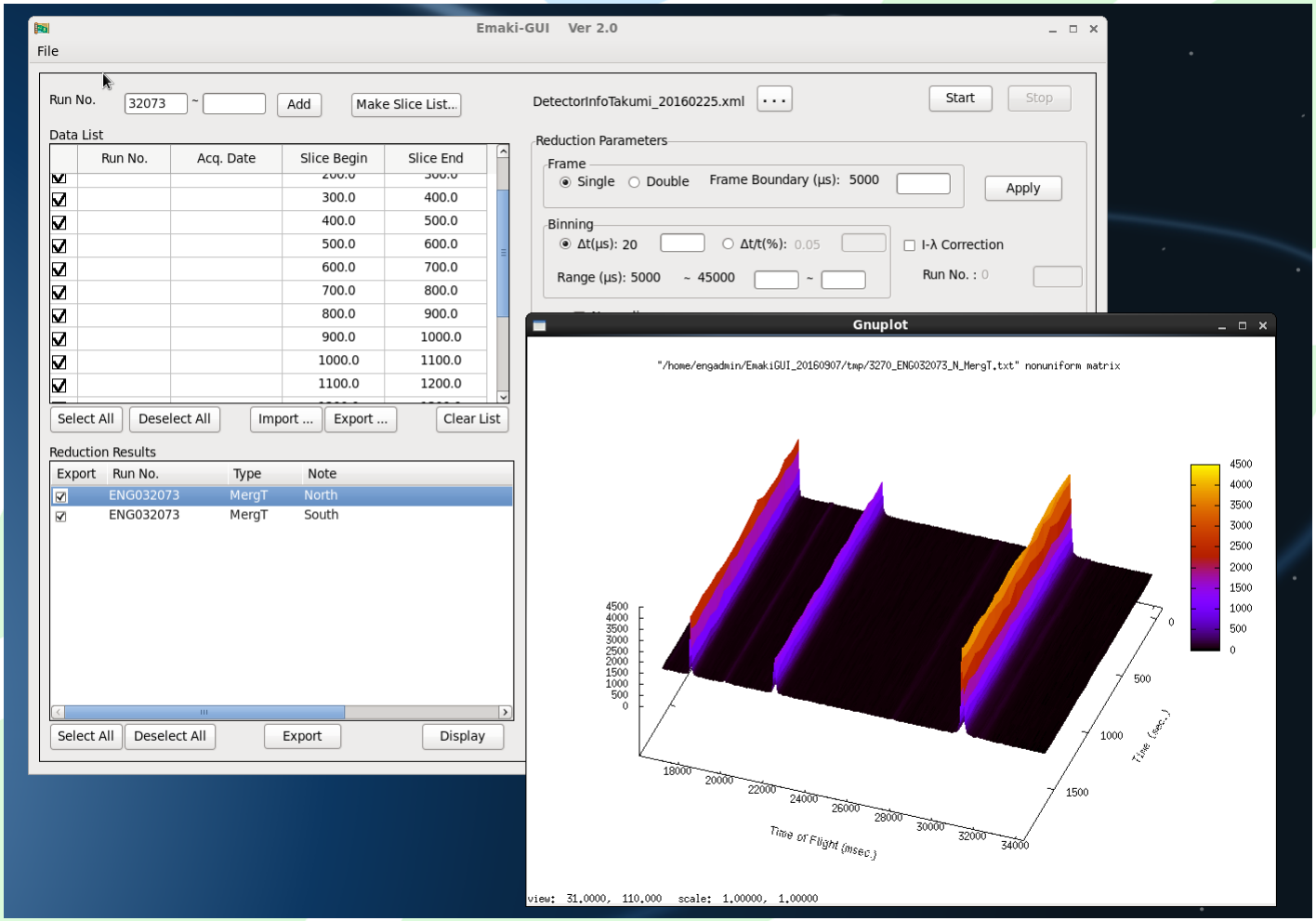
Data reduction software in TAKUMI
Emaki-GUI



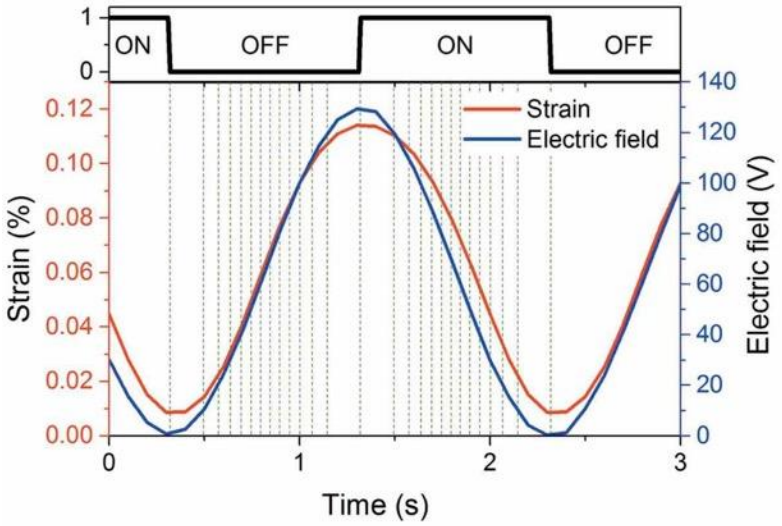
Data reduction software in TAKUMI
Emaki-GUI



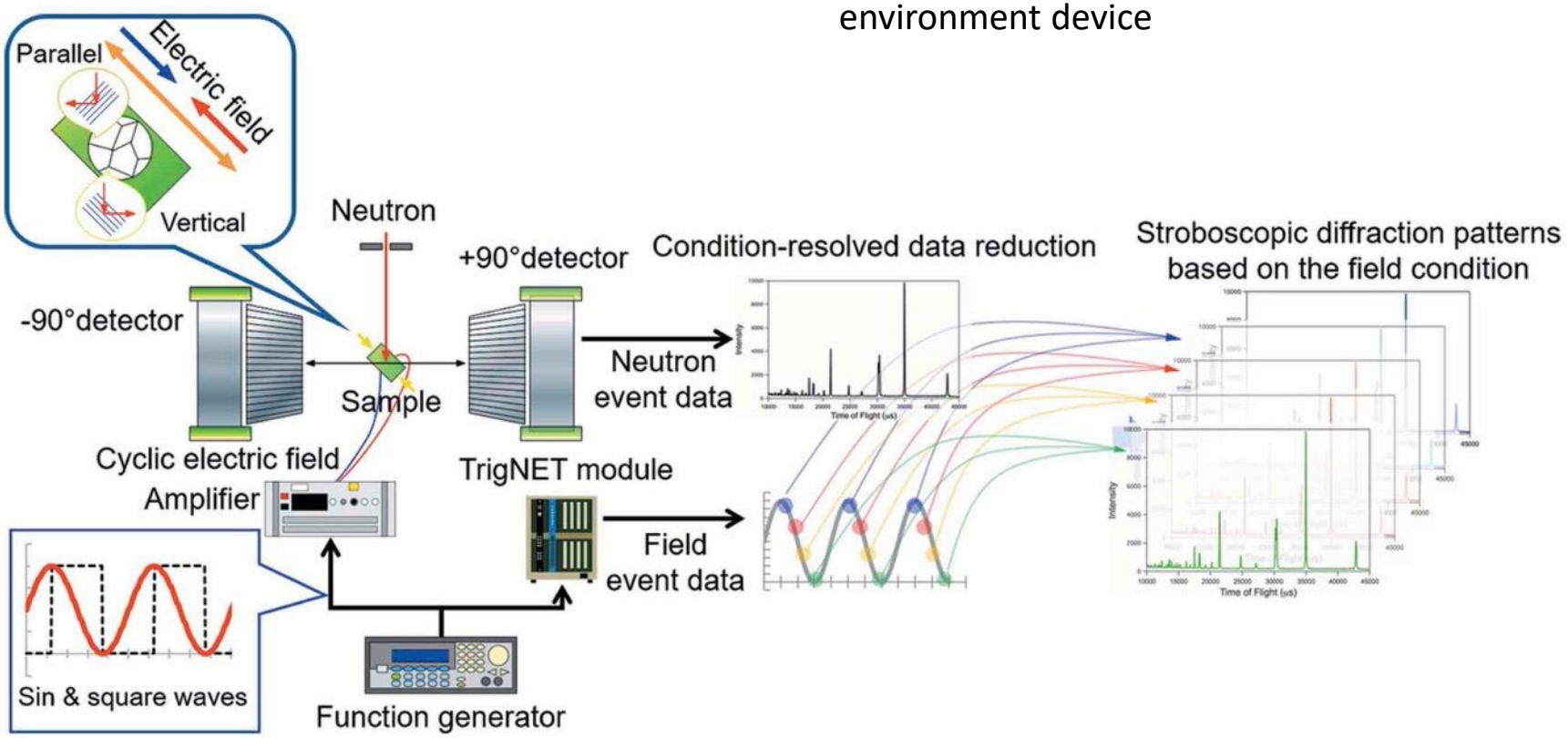
Data reduction software in TAKUMI
Emaki-GUI



Stroboscopic measurement in TAKUMI



- ✓ Analogue data of sample environmental device is also recorded as the event data … using TrigNET module
- ✓ Neutron diffraction data reduction is performed based on the physical properties od sample environment device

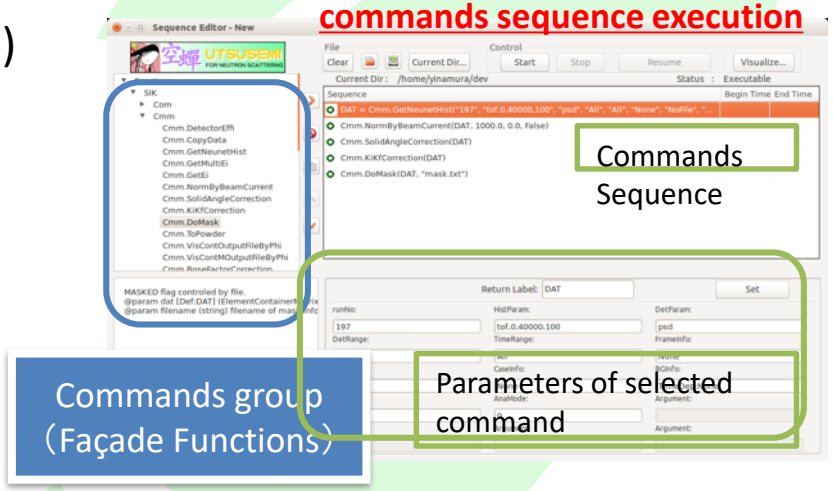


THANK YOU

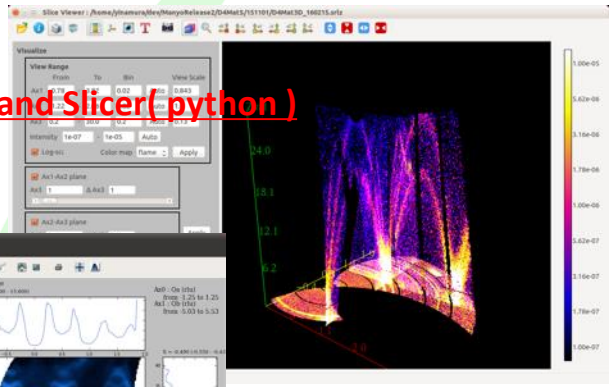
Utsusemi

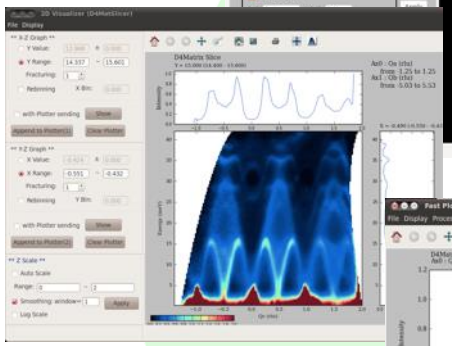
- Histogram data creation and visualization from event-recorded data produced by DAQ system in MLF
- Data Reduction functions
- GUI (Commands execution, visualizations)

"SequenceEditor", commands sequence execution

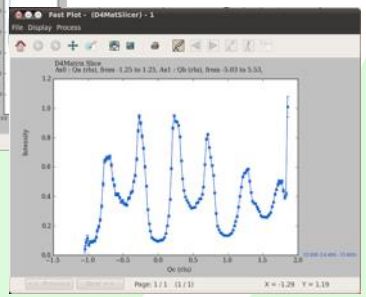


3D Plotter and Slicer(python)



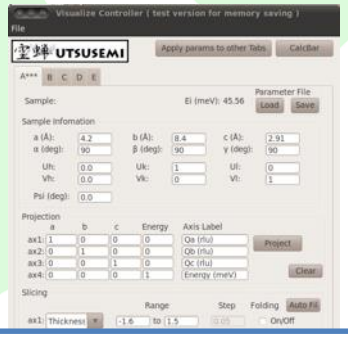


2D plotter (python)



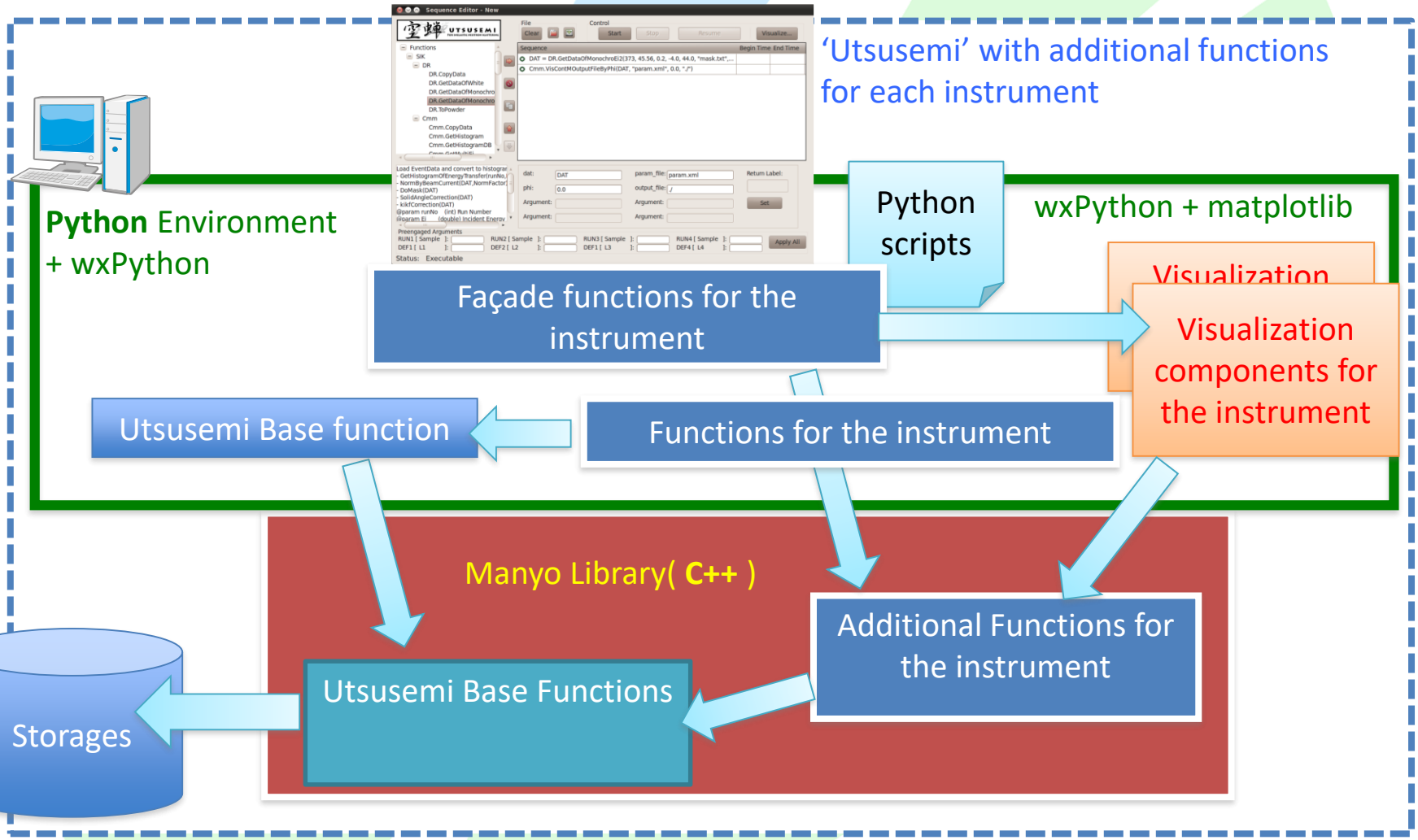
1D plotter (python)

For Inelastic measurement



VisualContM & D4MatSlicer
For single crystal measurements

Structure of Utsusemi



Manyo Library : Software framework provides fundamental and generic functionalities for developing application software for neutron scattering experiments.

J. Suzuki et al. , T. *Nuclear Inst. and Meth. Phys. Res.* **2009**, *600,* 123, doi:10.1016/j.nima.2008.11.104.

Covering Detectors and unit conv.

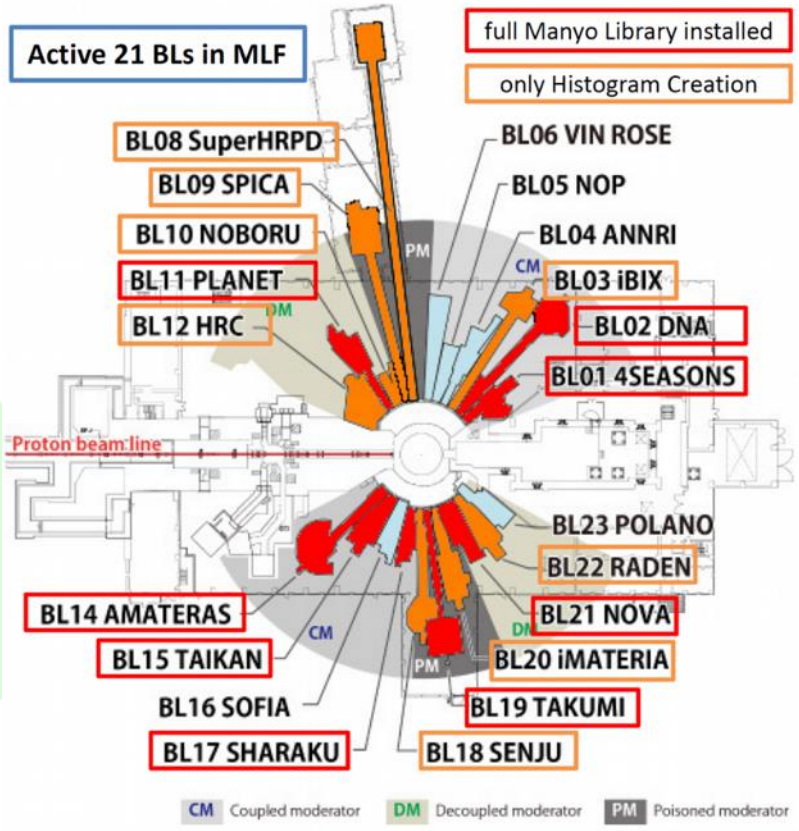
Detector type covered by Utsusemi	
Position Sensitive Detector	1-D detector, U-type detector
Scintillation Detector	1D, 2D

Unit type of axis in Histogram from event data	
TOF [micro-sec]	ΔTOF = const.
TOF [micro-sec]	ΔTOF/TOF = const.
TOF [micro-sec]	ΔTOF = const. with time focusing
TOF [micro-sec]	ΔTOF/TOF = const. with time focusing
Energy Transfer [meV]	Δhw = const.
Energy [meV]	ΔE = const.
Momentum transfer [1/Angstrom]	ΔQ = const.
Wave length [Angstrom]	Δλ = const.
Wave length [Angstrom]	Δλ/λ = const.
d value [Angstrom]	Δd = const.

Used in MLF

Beam Line using Utsusemi functions	
BL01 (4SEASONS)	Inelastic Scattering Spectrometer (direct geometry)
BL02 (DNA)	Inelastic Scattering Spectrometer (indirect geometry)
BL03 (iBIX)	Biological Crystal Diffractometer
BL08 (supserHRPD)	High Reso. Powder Diffractometer
BL09 (SPICA)	Powder Diffractometer
BL11 (PLANET)	High Pressure Diffractometer
BL14 (AMATERAS)	Inelastic Scattering Spectrometer (direct geometry)
BL15 (TAIKAN)	Small and Wide Angle Diffractometer
BL17 (SHARAKU)	Polarized Neutron Reflectometer
BL18 (SENJU)	Single Crystal Neuntron Diffractometer
BL19 (TAKUMI)	Engineering Materials Diffractometer
BL20 (iMATERIA)	Materials Design Diffractometer
BL21 (NOVA)	Total Diffractometer

Status



More Information

Utsusemi Binary Package

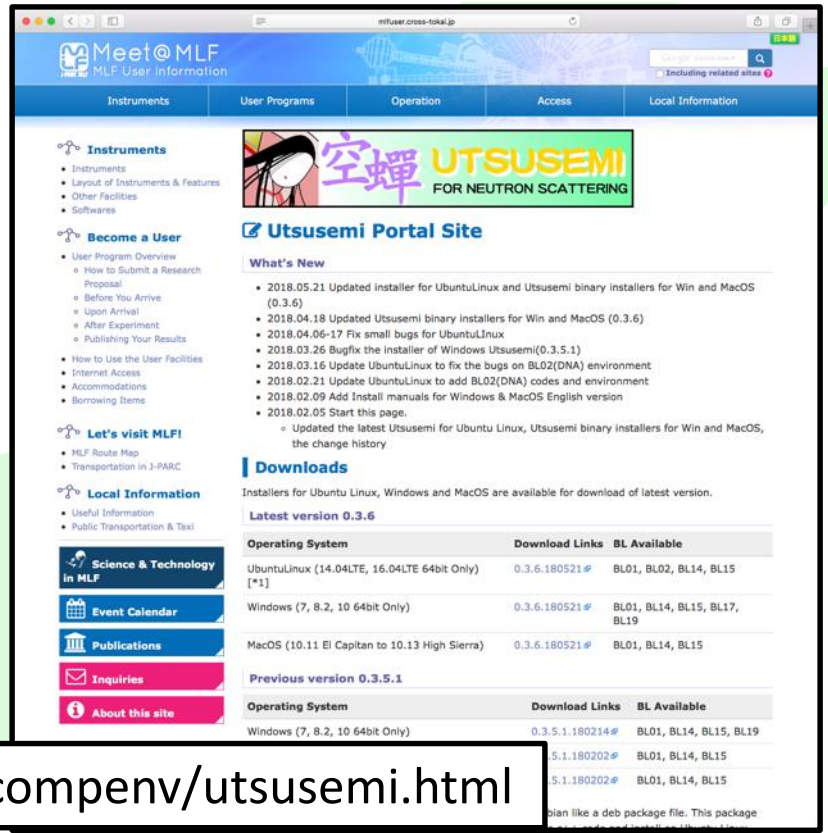
OS	Version
Windows	64bit 7, 8.2, 10
MacOS X, macOS	10.11 (El Capitan), 10.12(Sierra), 10.13(High Sierra)

Portal Site

meet@MLF Utsusemi

Search!

- Download binary package
- Manual (Only Japanese, sorry)
- Update information



http://mlfuser.cross-tokai.jp/ja/compenv/utsusemi.html