Supporting activities for remote-participation of the LHD experiments

Remote participation support team
(S. Ohdachi)

Goal of the support for the remote participation

- Many collaborator cannot directly visit NIFS from the COVID-19 symptoms. To activate the international/domestic collaboration, our group has been working to build the support framework for the collaborators. Our goals are,

1. Access to the information of the LHD experiments remotely.
   1. Video image of the front screen is shared by Zoom (9:00-21:00 Tue-Friday)
   2. Chat, oral discussion and file sharing are supported by Microsoft Teams. Theme Group.

2. Make the data handling easier.
   1. MyView2 is improved for sharing the plot template file. Plotting of the fundamental parameters becomes much easier. (Kobayashi-san, Emoto-san)
   2. Documents for the diagnostics are updated. (Mukai-san)
   3. Libraries / documents are updated and reorganized. Now, Python3 (Anaconda) is recommended environment since Enthought Canopy is no longer supported.
   4. Kaiseki web is re-built and all (or most) documents are written in English.

3. Lower the hurdle for the newcomer.
   1. Tutorial documents written in English is made.(Fujiwara-san, Takemura-san)

https://www-lhd.nifs.ac.jp/LHD/resouces.html

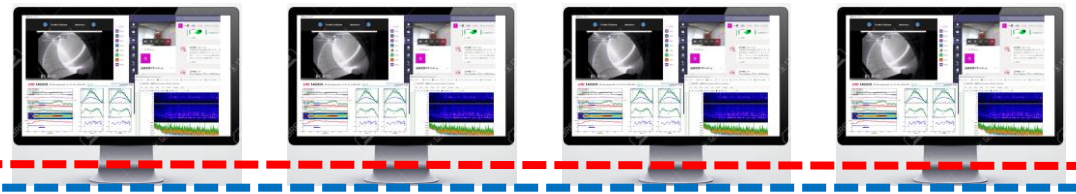Concept of remote participation of LHD Experiments
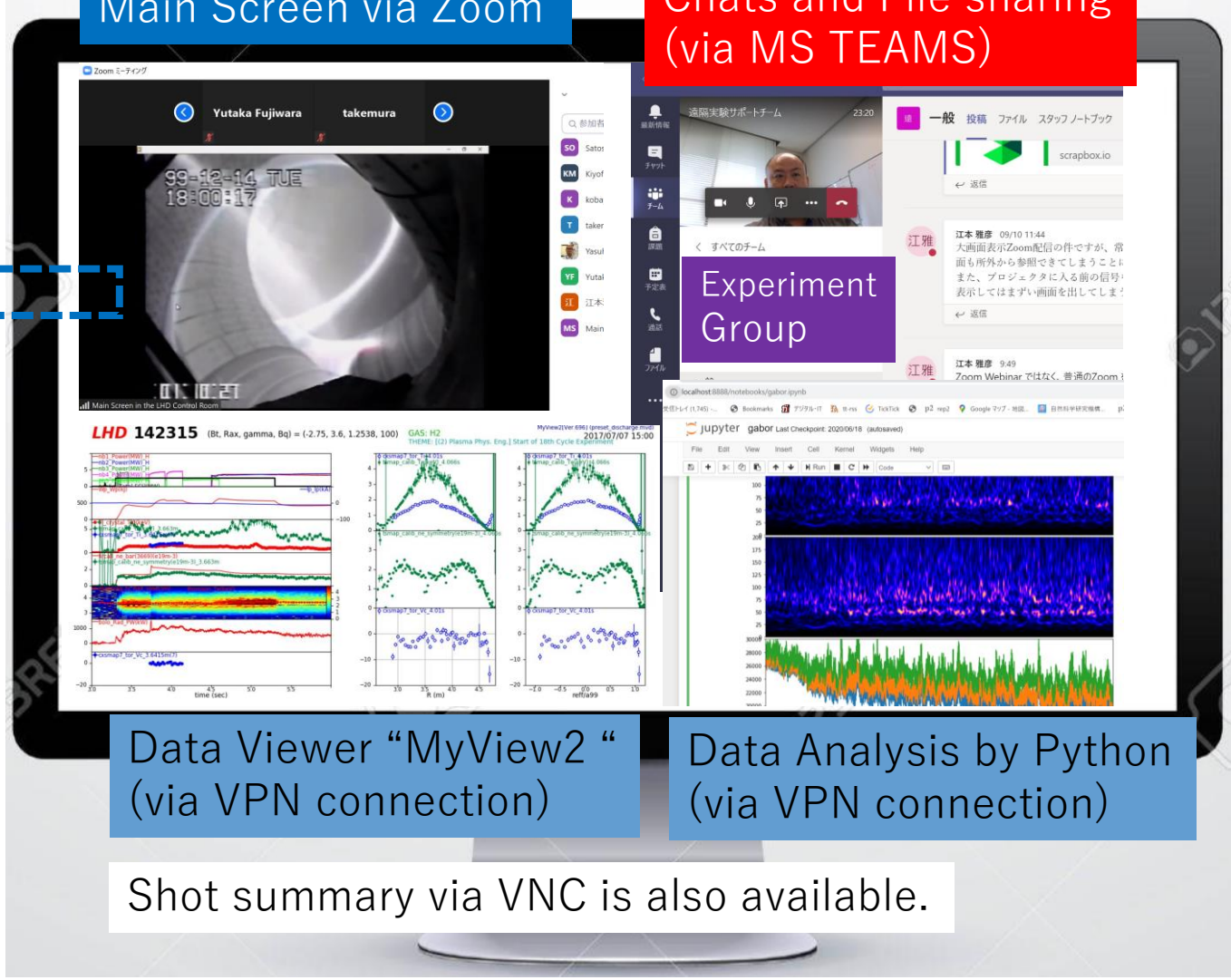
LHD Control Room

Main Screen

Microsoft Teams

Main Screen via Zoom

Chats and File sharing (via MS TEAMS)

Experiment Group

Data Viewer "MyView2" (via VPN connection)

Data Analysis by Python (via VPN connection)

Shot summary via VNC is also available.

Console image of a remote participant of the LHD experiments

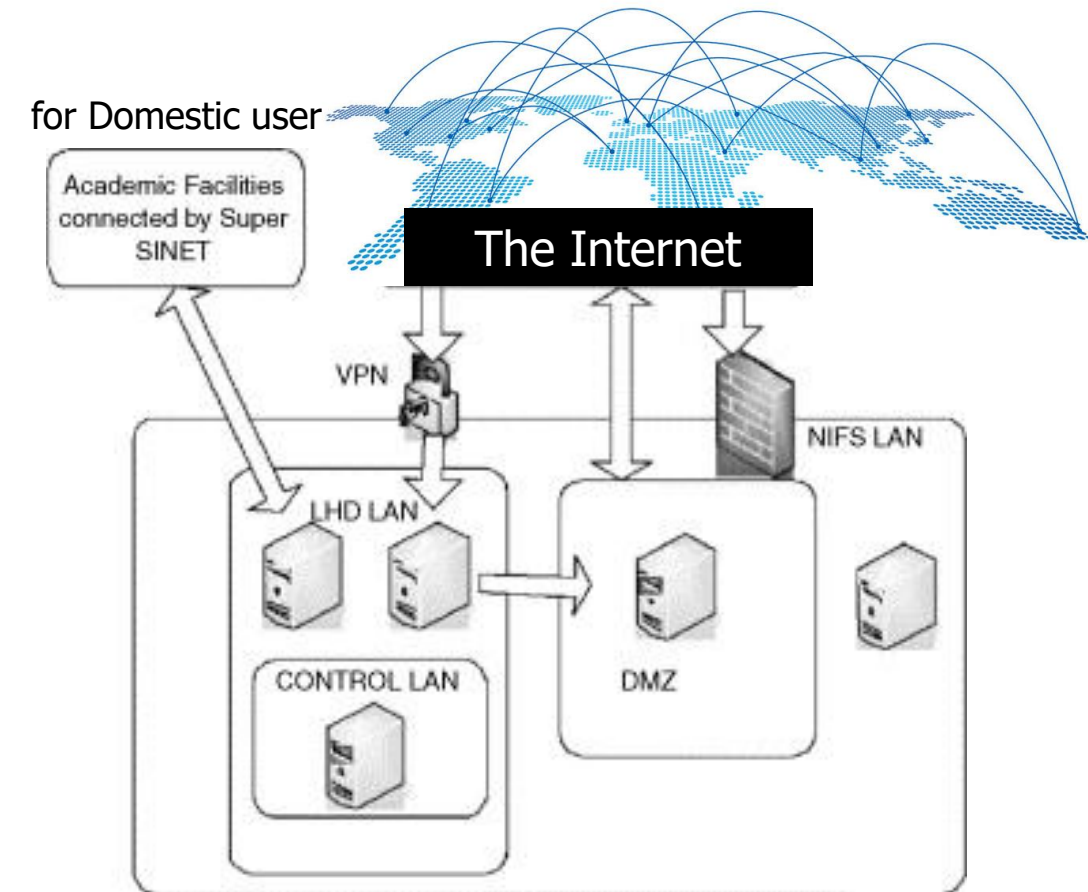# Chat and oral discussion via Teams can be made, while Zoom connection is activated simultaneously

How to use LHD data –short introduction

- network (*.nifs.ac.jp, *.lhd.nifs.ac.jp) issues.

- Raw data and anaylized data

Network of NIFS for LHD experiments.

for Domestic user

Academic Facilities connected by Super SINET

The Internet

VPN

LHD LAN

NIFS LAN

CONTROL LAN

DMZ

- There is firewall between the internet to NIFS lan.

- You can access limited web service, www.lhd.nifs.ac.jp, Zoom connection, Microsoft Teams connection.

- In order to access the experimental data of LHD, you need access the LHD lan using VPN connection.

- LHD data are organized as "Raw-data" and "Analyzed-data".

Data acquisition of the Large Helical Device

- Measured data are digitized by the distributed data acquisition system.

- Data are stored with an index of module name, channel number, and shot number.

  - home> retrieve diagname (modulename) shotno subshotno chno.
    subshotno is defined for long-discharged

- Interface to C, PV-Wave and python exists. Windows, Mac and Linux (RedHat˚) are supported.
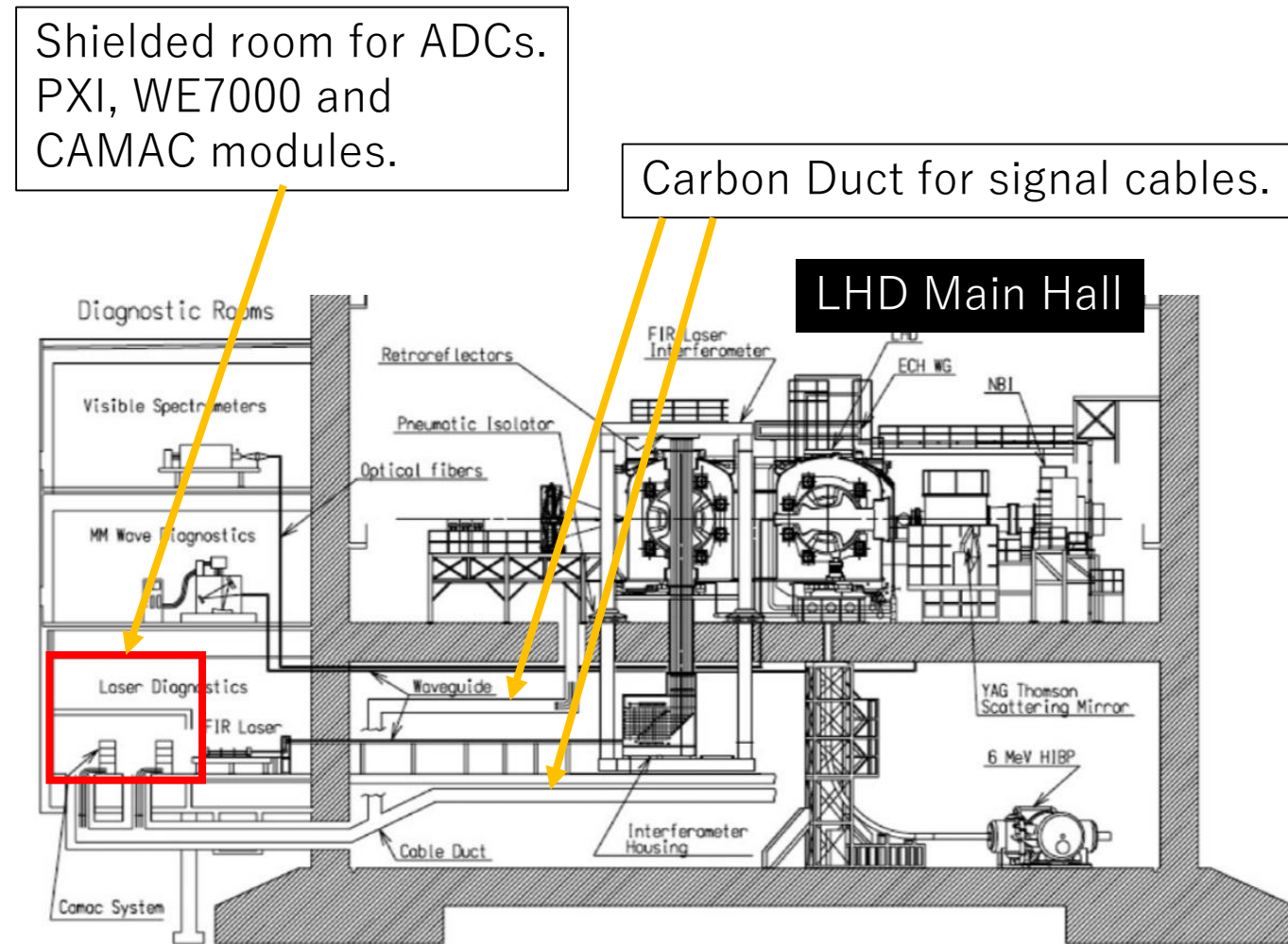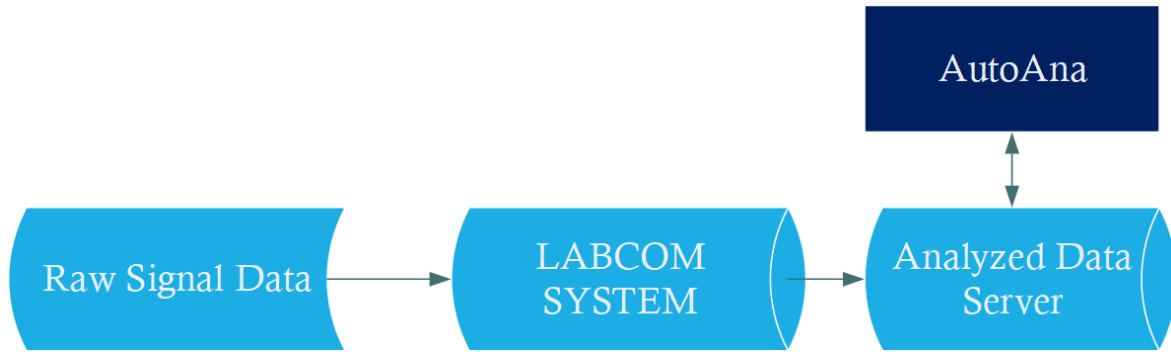
Shielded room for ADCs. PXI, WE7000 and CAMAC modules.

Carbon Duct for signal cables.

LHD Main Hall

Fig. 5. Cross-sectional view of the LHD experimental building.

K. Kawahata el. al., Fus. Sci. Technology **58**(2010), 331

Analyzed Data(Kaiseki data)

- Analyzed data produce automatically after discharges.

- Analyzed text-based data format containing group of signals (e.g. wp, beta-dia, beta-vmec)

- Indexed by shot-no and data-name.

- Interface to PV-WAVE, python, ruby, matlab, fortran etc. are provided.
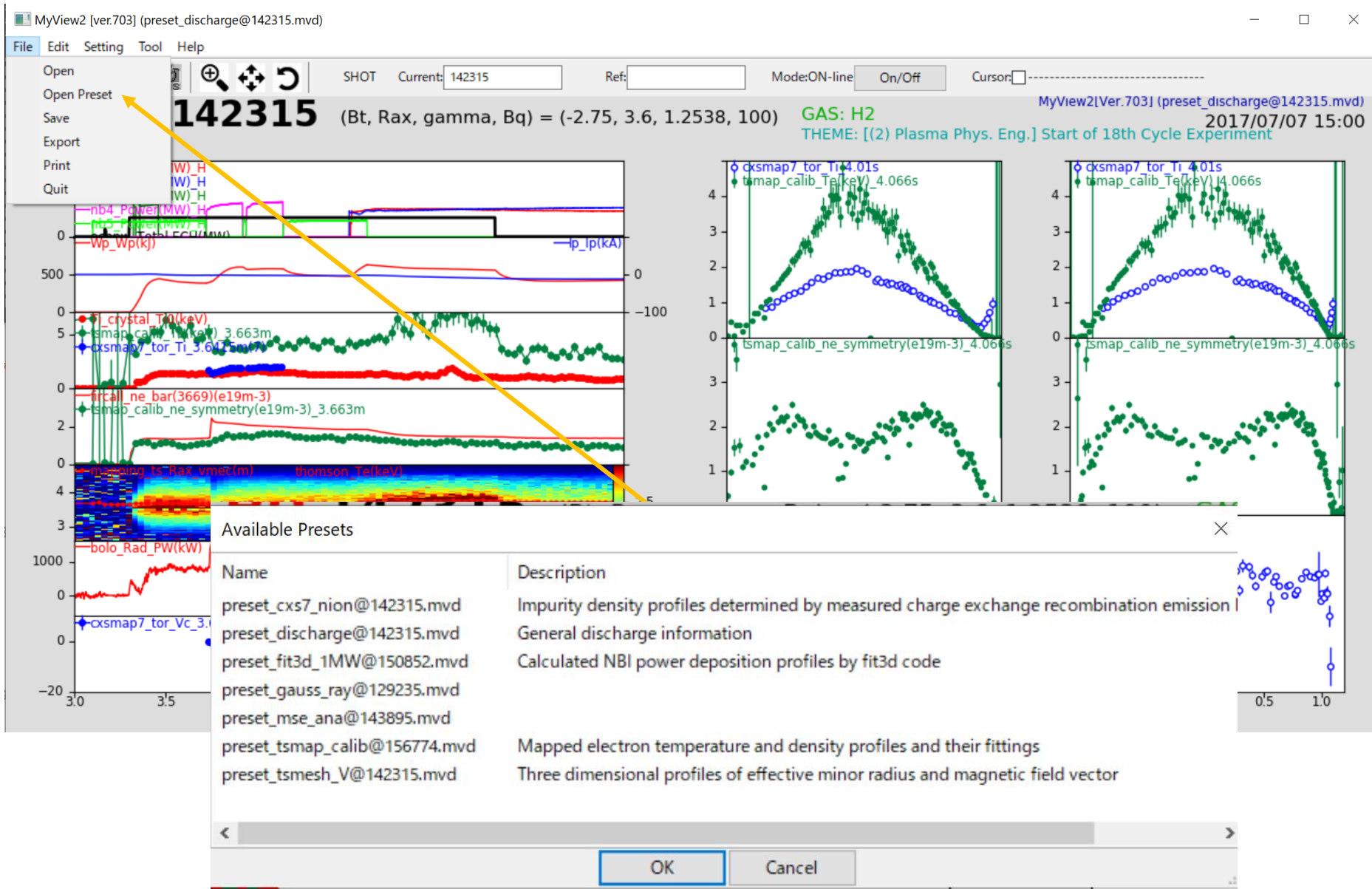
Data Name

Time

Wp, beta-dia, beta-vmec

```
# [Parameters]
# Name = 'wp'
# ShotNo = 160614
# Date = '01/31/2020'
#
# DimNo = 1
# DimName = 'Time'
# DimSize = 138541
# DimUnit = 's'
#
# ValNo = 3
# ValName = 'Wp','<beta-dia>','<beta-vmec>'
# ValUnit = 'kJ','%','%'
# [Comments]
# program : DIANA-D 1-0b
# data from WE7000
#
# Rax[m] = 3.60000, Bt[T] = -1.00000, Gamma = 1.25400, Bq[%] = 100.000
# Wpmax[kJ] = 292.236, <beta-dia>max[%] = 2.24513, <beta-vmec>max[%] = 2.18620
# Start-Time of Integration [sec] = 2.80000
# Integration time[sec] = 6.9270000
#
# CAUTION : This is calculated by using 3D-MHD code
#
# *** DEFINITION ***
# 'DIAMAG. BETA'   : <beta-dia> = 4*mu0/3*Wp/(Bav0^2*Vp0)
#              Vp0  : Plasma volume in vacuum configuration (29.2520 [m^3])
#              Bav0 : averaged toroidal field in vacuum configuration (-0.863460 [T])
# 'REFERENCE BETA' : <beta-vmec> = 4*mu0/3*Wp/(Bt^2*Vp)
# (VMEC BETA)      Vp   : Plasma volume in finite-beta configuration
#              [Assumed pressure profile : P = P0(1-rho^2)(1-rho^8)]
#          Bt   : Operational filed at magnetic axis position (-1.00000 [T])
#
# [data]
 0.000000E+000,-0.000000E+000,-0.000000E+000, 0.000000E+000

 5.000000E-005,-0.000000E+000,-0.000000E+000, 0.000000E+000
```

138541 lines

Available data

- You can check the availability of the analyzed data using an application(GUIcleint) or isearch –s shotno on command prompt.

- Explanation of the diagnostics are located on https://www-lhd.nifs.ac.jp/LHD/TechGuide_Diag.html.

- There are template for fundamental parameters, (neL, ip, wp, etc.) in MyView2 (data viewer) application.

MyView2 (data viewer for LHD data)

- MyView2 and related softwares are updated to use Python 3 (Anaconda is recommended).

- Lecture by Yoshinuma-san will be made.

Summary / Information

- Our team try to supply the three issues for supporting remote participation. Please give us comments for improving the supporting environments.

- PC server for Windows and Linux are also available for limited number of persons due to the limit of the performance of the server. Windows server will be improved. (See, kaiseki-dev.lhd.nifs.ac.jp)

- Seminar for the collaborator (to Japanese colleague, to EU colleague and to US Colleague) will be held on Oct 22nd, 2020 (Zoom: Meeting ID: 954 6658 4673 passcode: 277164)
  - 9:00-10:00 JST (US, Asia and Domestic collaborator)
  - 17:00-18:00 JST (EU, Asia and Domestic collaborator)
    - Ohdachi will give basic information.
    - Yoshinuma-san will give a lecture for MyView2.

- Dryrun for the experiments will be held on
  - Oct 16th 15:00-16:00 JST
  - Oct 23rd 9:30-10:30 JST

Thanks for the cooperation, Emoto-san, Mukai-san, Kobayashi-san, Fujiwara-san (no photo), Takemura-san and Suzuki-san