(TG2) Turbulence Topical Group Report

Oct. 28, 2022 (A. Shimizu)

Date: Oct. 27, 2022
Time: 9:53 - 18:45
Shot#: 181695 – 181862 (167 shots)

Prior wall conditioning: D2
Divertor pump: OFF
Gas puff: D2
Pellet: Impurity pellet (C)
NBI#(1, 2, 3, 4, 5)=gas(H, H, H, D, D)=P(3.9, 3.5, 3.9, 5.6, 7.1)MW

ECH(77GHz)=ant(5.5-Uout (or 1.5U), 2-OUR)=P(703, 792)kW
ECH(154GHz)=ant(2-OLL, 2-OUL , 2-OLR)=P(120, 799, 825)kW
ECH(56GHz)=ant(1.5U)=P(-)kW
ICH(3.5U, 3.5L, 4.5U, 4.5L)=P(-, -, -, -)MW
Neutron yield integrated over the experiment = 3.1 x10^{16}

Topics

1. Non-diffusive counter-gradient electron thermal transport during off-axis ECH (T. Tsujimura)
2. Phase space tomography for MHD burst event (T. Kobayashi)
3. New spectroscopic diagnostic system with APDCam (W. Hu)

Non-diffusive counter-gradient electron thermal transport during off-axis ECH

T. Tsujimura

Experimental conditions:

(R_{ax}, B_t, γ, B_q) = (3.60 m, CCW 2.75 T, 1.2538, 100.0%)

Motivation:

- Investigation of non-diffusive counter-gradient electron thermal transport during off-axis ECH

Experiment:

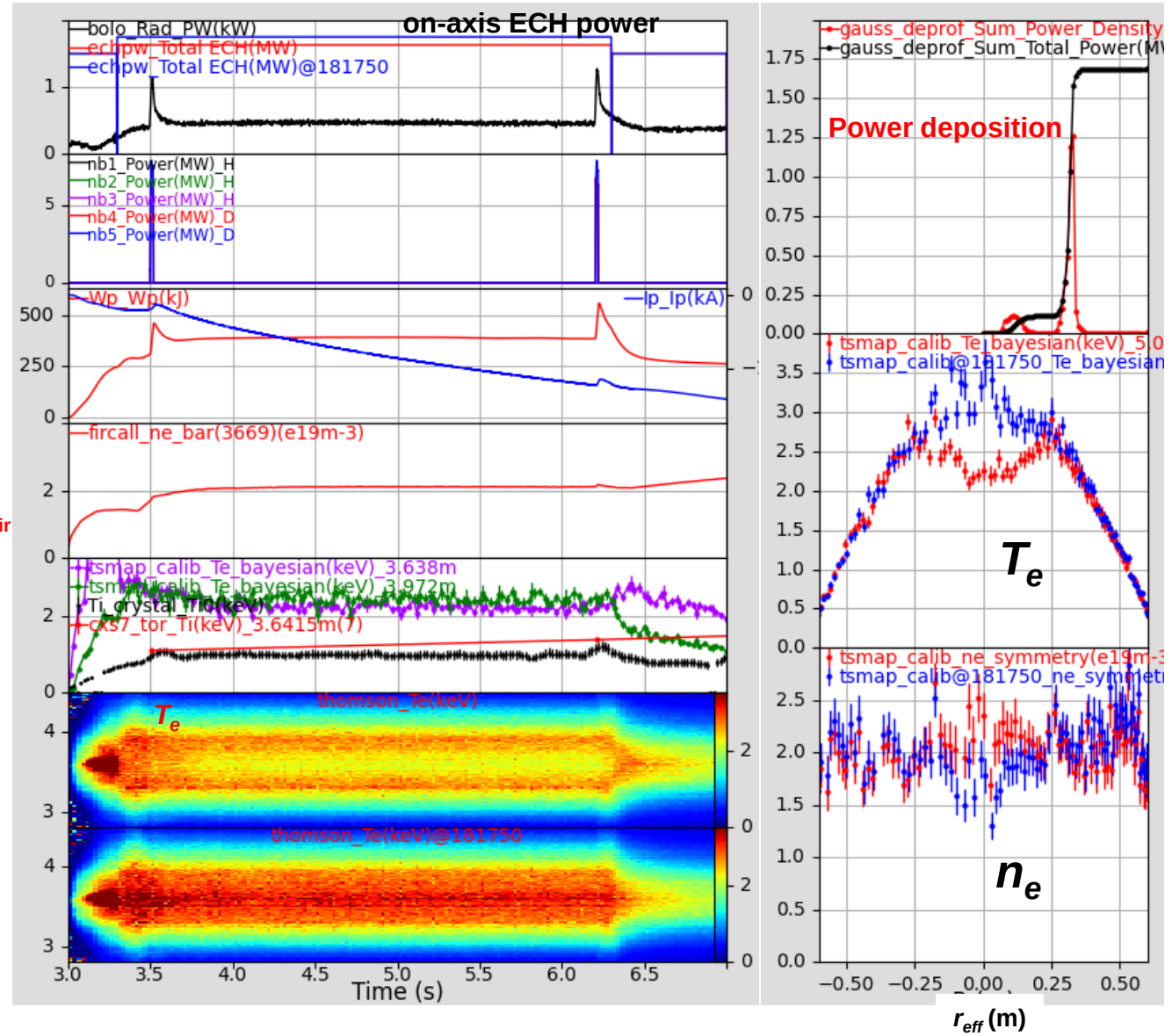
- Off-axis ECH with 1.6 MW at r_{eff} ~ 0.3 m
- On-axis ECH with 0.1 MW at r_{eff} ~ 0.1 m

Result:

- Quasi steady-state hollow T_e profiles with off-axis ECH alone
- Sustained longer than energy confinement time
- Clear non-diffusive behavior associated with outward heat convection
- Peak T_i profiles and relatively flat n_e profiles
- Peaked T_e profiles with on-axis ECH superimposed
- Steady-state hollow T_e profiles could not be obtained under on-axis ECH with much lower power than off-axis ECH power

Only off-axis ECH: #181749

On- & off-axis ECH: #181750



Non-diffusive electron thermal transport during off-axis ECH

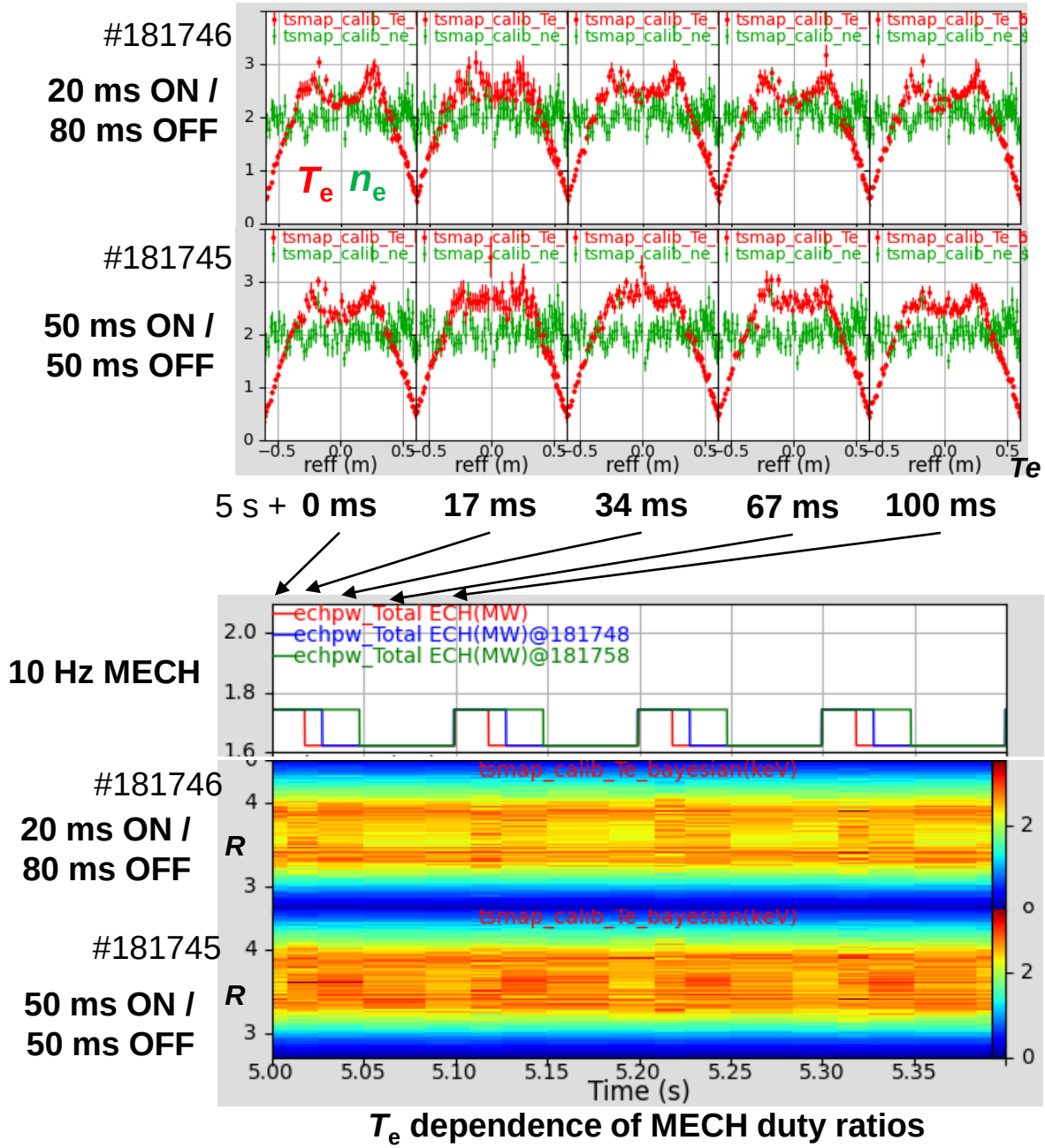
T. Tsujimura

Experiment:

- Off-axis ECH with 1.6 MW at r_{eff} ~ 0.3 m during 3 s
- On-axis MECH with 0.1 MW at r_{eff} ~ 0.1 m during 3 s

Result:

- Sustained hollow T_e profiles during MECH for 20:80 duty ratio (#181746)
  - ∇T_e at ~0.2 m between the two deposition radii was always positive during MECH
- T_e profile changed to flat or mildly peaked during MECH ON for 50:50 duty ratio (#181745)
- Density scan from 2x to 3x10^{19} m^{-3}
  - Hollow profiles could not be obtained at < 2x10^{19} m^{-3}
- Non-diffusive non-local counter-gradient transport properties will be investigated in dynamic transport analysis
- Turbulence measurements with PCI and high-k BS were performed, which will be analyzed in detail



T_e dependence of MECH duty ratios

Phase space tomography for MHD burst event (T. Kobayashi et al)

Shot #: 181773 - 181862

Experimental conditions: (R_{ax}, Polarity, B_t, γ, B_q) = (3.6/3.55 m, CCW, 2.75/2.7887 T, 1.2538, 100 %)

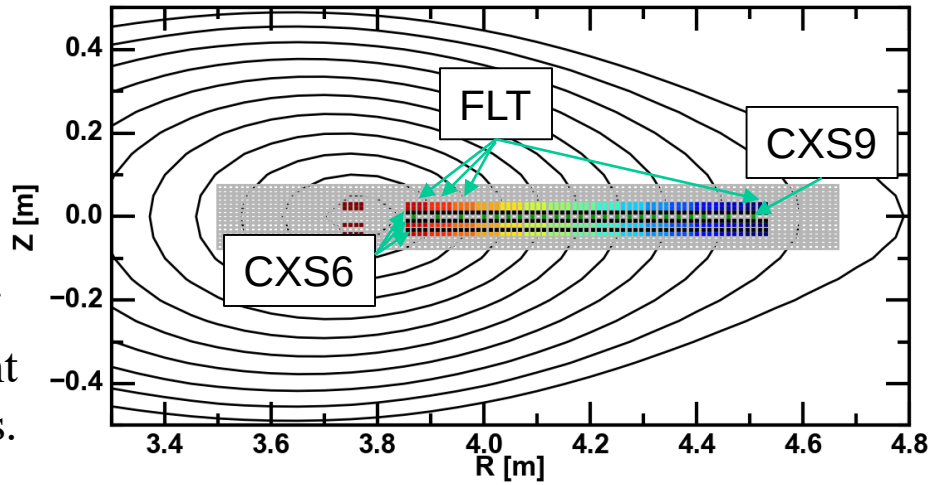
Motivation and objective: To attempt phase-space tomography for MHD burst event

Results:

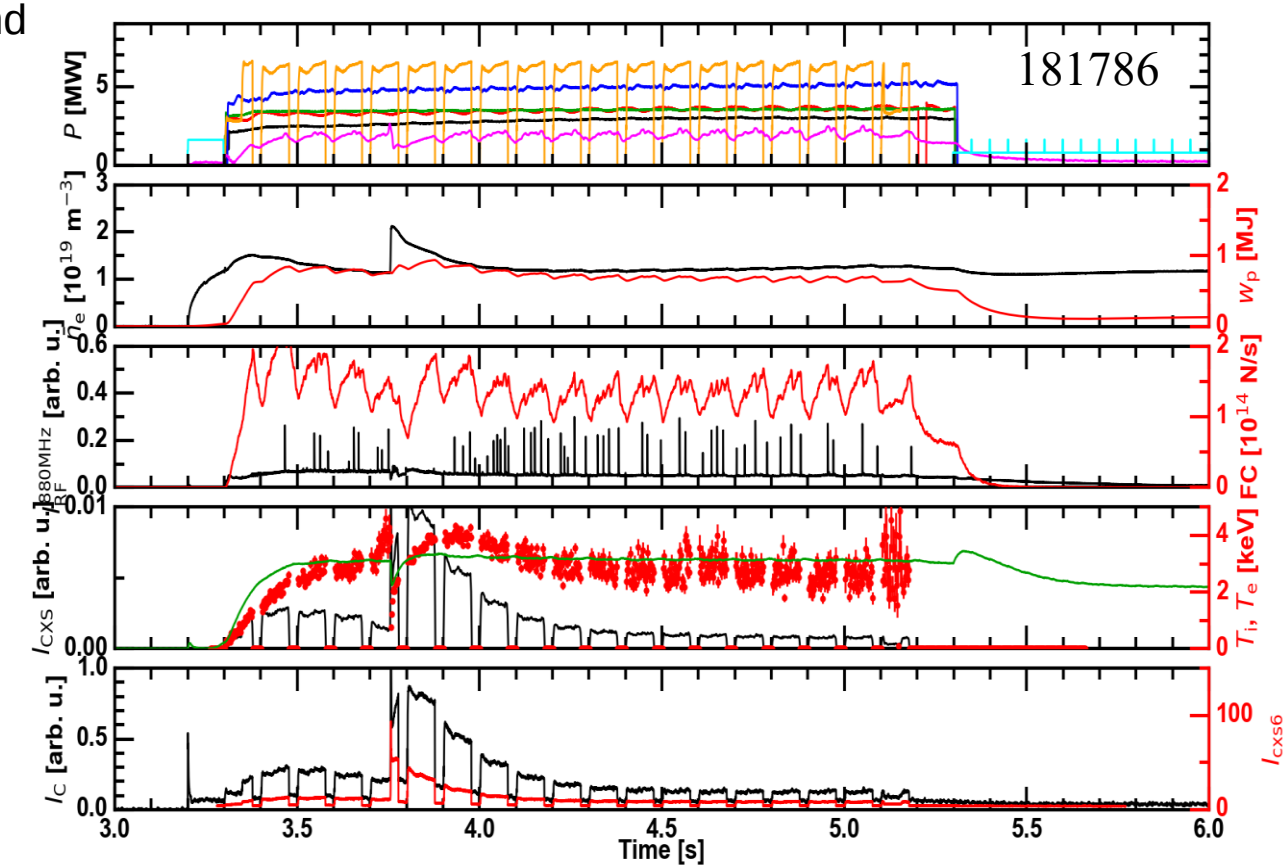
- Aiming at tomographically reconstructing a phase-space structure, three different setts of data having different integration directions in time, real-space, and velocity-space were measured.

T. Kobayashi+, submitted to NJP (2022)

- Spatially integrated data with resolutions in velocity-space and time were obtained by CXS6 with radially elongated LOS.
- Velocity space integrated data with resolutions in real-space and time were obtained by a fast impurity emission intensity measurement system (FLT).
- Time integrated data with resolutions in real-space and velocity-space were obtained by CXS9.
- Tongue MHD events were successfully reproduced.

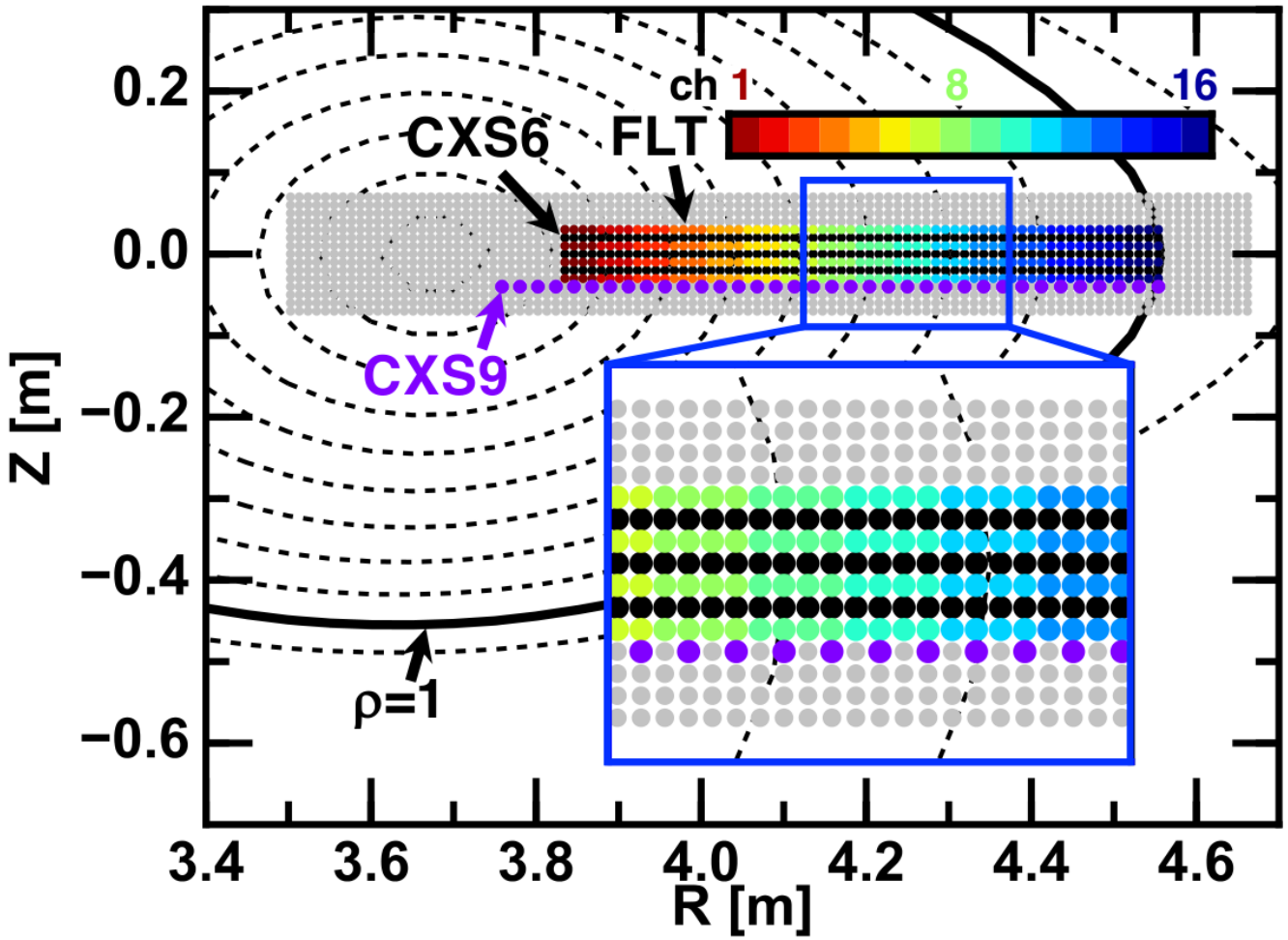


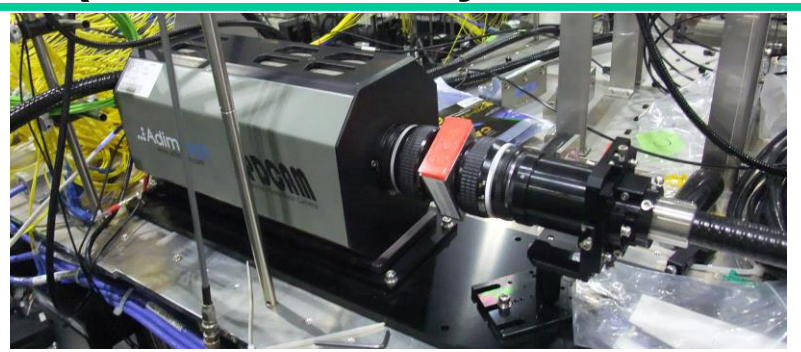
LOS of different systems.

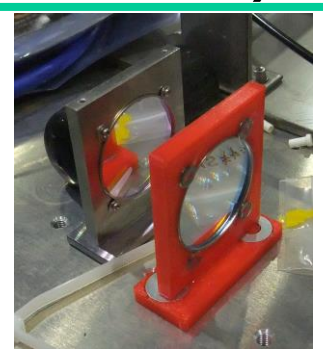


Time evolution of a discharge with tongue events.

New spectroscopic diagnostic system with APDCam (W. Hu, T. Kobayashi and M. Yoshinuma)







Specifications:

- 16 Ch of APDCam sample at 200 kHz from 3.0 to 8.0 s.
- R-range 3.5 ~ 4.6 m.
- Stable measurement from shot #181695.
- Selectable interference filter:
  - '529-imp-C'
  - '643-NBI1-BES'
  - '667-NBI2-BES'

Usage:

- Diagnostic name of eg file: lhdbesapd4_raw
- Data files and figures available on LHD-LAN website:
  - http://apdcam1g.lhd.nifs.ac.jp/