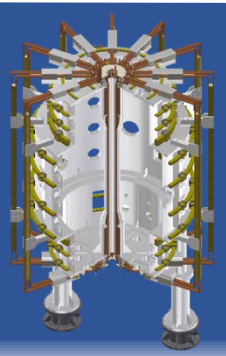
NUCLEAR ENGINEERING
서울대학교 공과대학 원자핵공학과



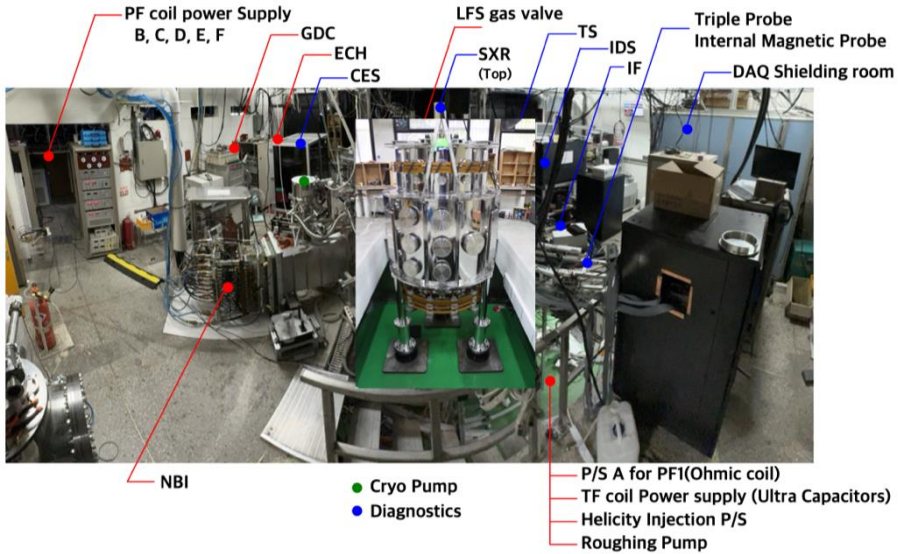
Data Mapping Status of VEST Tokamak

Hong-Sik Yun[1], Sunjae Lee[1], Laurent Jung[2], Jong-Kyu Park[1*], and VEST Team

[1]Department of Nuclear Engineering, Seoul National University, Korea
[2]KFE, Korea
(contact: peppertonic18@snu.ac.kr,
**corresponding: jkpark@snu.ac.kr)*

ITER Machine Mapping Workshop. Monday Morning Session
Mar 16. 2026

Motivation and Strategy for IMAS Integration in VEST

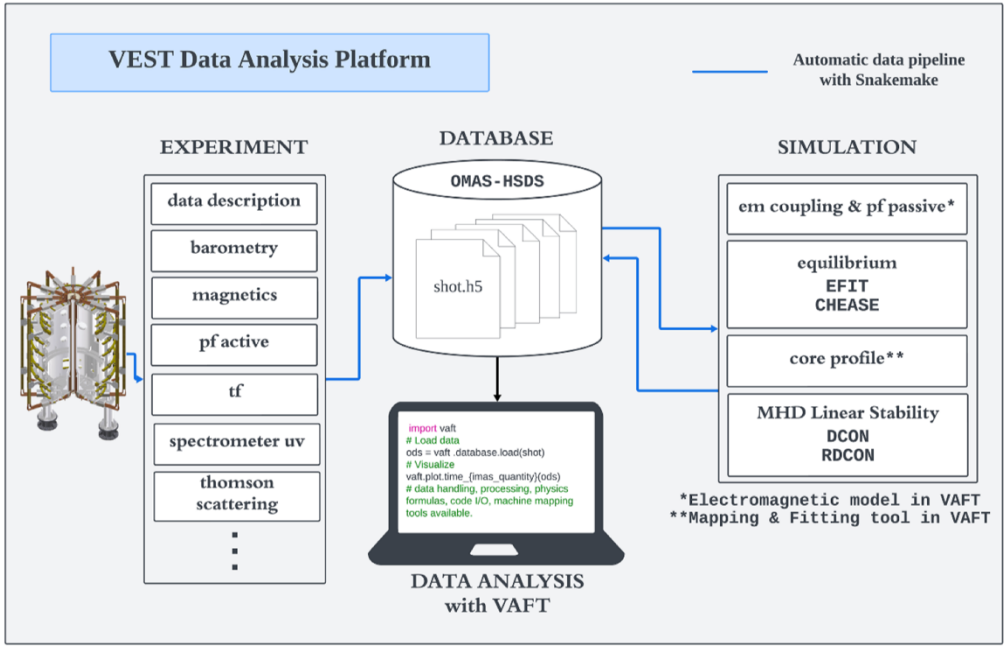


Experimental Parameters	To Date
$B_T\ [T]$	< 0.18
$R_{maj}\ [m]$	0.25-0.4
A	-1.3
$I_P\ [MA]$	< 0.26
$I_N\ [MA/mT]$	< 5
l_i	0.3-0.55
κ	1.4-1.6
τ_{pulse} [ms]	< 35

- VEST is A university-scale Spherical Tokamak (ST) at Seoul National University, Korea.
  - **Requirements**: IMAS standardization with database & automated workflows & analysis tools
  - **Challenge**: As a student-led facility, limited manpower for development & management
    - ➢ **Strategy**: developing a centralized platform aligned with IMAS via open-source tools.

VEST Data Analysis Platform Architecture

- Integrated Open-Source Ecosystem
  - **OMAS** (3rd party python API for IMAS by GA)
  - **HSDS** (remote HDF5 database w/ REST API)
  - **Snakemake** (Reproducible workflow manager)
  - **EFIT**, **CHEASE**, **GPEC**, **OMFIT classes** (Fusion Codes)
- Core Components
  - **Automated Pipeline**
  - **IMAS Database** (OMAS-HDF5 backends)
  - **Unified Library** (named **VAFT**)
- VAFT Library facilitates
  - **Remote Database Access**
  - **Machine Mapping**: Native-to-IDS conversion
  - **Code I/O**: input IDSs → Code → output IDSs
  - **Data Processing & Visualization**
  - **Example data & workflows & notebooks**
    - ➢ Open-source on GitHub, install by pip, public DB



Additional Information & data can be found from

- My Paper [Hong-Sik Yun et al 2025 Plasma Phys. Control. Fusion 67 115021]
- VAFT GitHub Repository (github.com/VEST-Tokamak/vaft)

Available IDSs

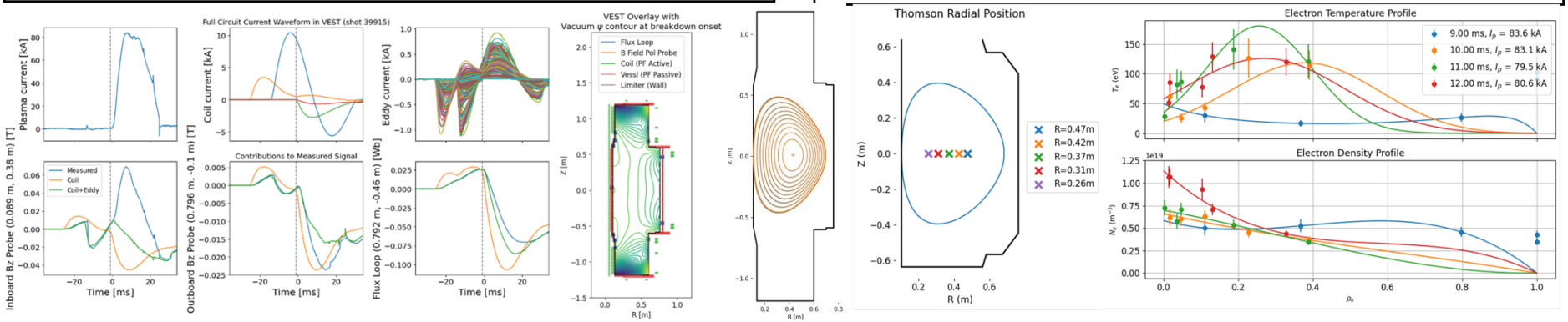
Experimental data

- dataset_description (machine, pulse)
- magnetics (ip, diamagnetic_flux, flux_loop, b_field_pol_probe)
- tf
- pf_active
- barometry (pressure)
- spetrometer_uv (line of H-alpha, C-II/III, O-I/II)
- thomson_scattering

Modelling data

- wall
- em_coupling*
- pf_passive (vessel and I_{eddy})
- equilibrium (magnetic EFIT)
- core_profiles (electron only)
- mhd_linear (δW, Δ' from DCON/RDCON)*

*Omitted in the sample



- DD version is 3.41.0
- VEST DB automatically stores error-free pulses #38000–#45000 as OMAS ODS HDF5 format
- A sample IMAS NetCDF file is uploaded to INDICO with the presentation

Potential Agendas

- Connecting with IMAS-compatible Tools
  - Integrating VEST data into the broader IMAS code ecosystem
  - Testing data querying, visualization, and physics workflows
- Cross-Machine Benchmarking & Standardization
  - Cross-verifying machine mapping and workflow management methodologies with other tokamaks
- Equilibrium Reconstruction Workflow Optimization
  - Addressing magnetic EFIT accuracy and convergence issues
    - Refining raw signal processing, validity check, EM modeling, and EFIT namelist settings
- FAIRification
  - Implementing metadata update schemes for derived quantities and data verification process
    - Populating summary and dataset_fair IDSs
    - Standardizing unique identifiers and flags (e.g., ids_properties, code, {diagnostics.data}.validity)
  - API Compatibility & Data Dictionary Upgrade
    - Streamlining data exchange between OMAS and IMAS and their connected workflows
    - Converting the Data Dictionary (DD) from version 3.40.1 to 4.1.1