

Extension of integrated transport analysis suite, **TASK3D-a**

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for integrated transport code group, NSRP
with close collaboration with LHD Experiment group

Systematic understandings

Model
Validation

Given conditions
Transport models, Sources,,,

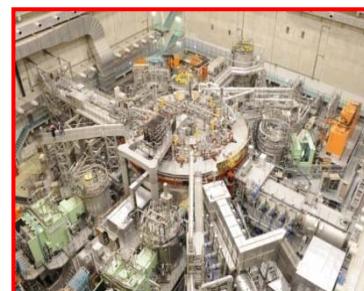
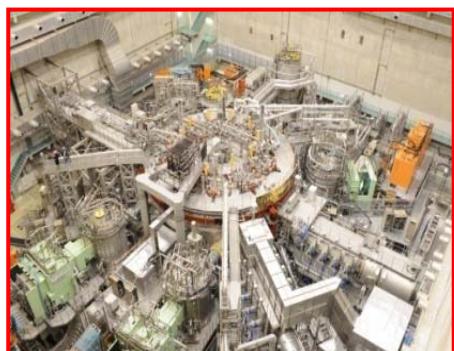
TASK3D-a
(Analysis of LHD
experiment)

common
modules

TASK3D-p
(Predictive analysis)

Experimental condition
Profiles, Heating,,,

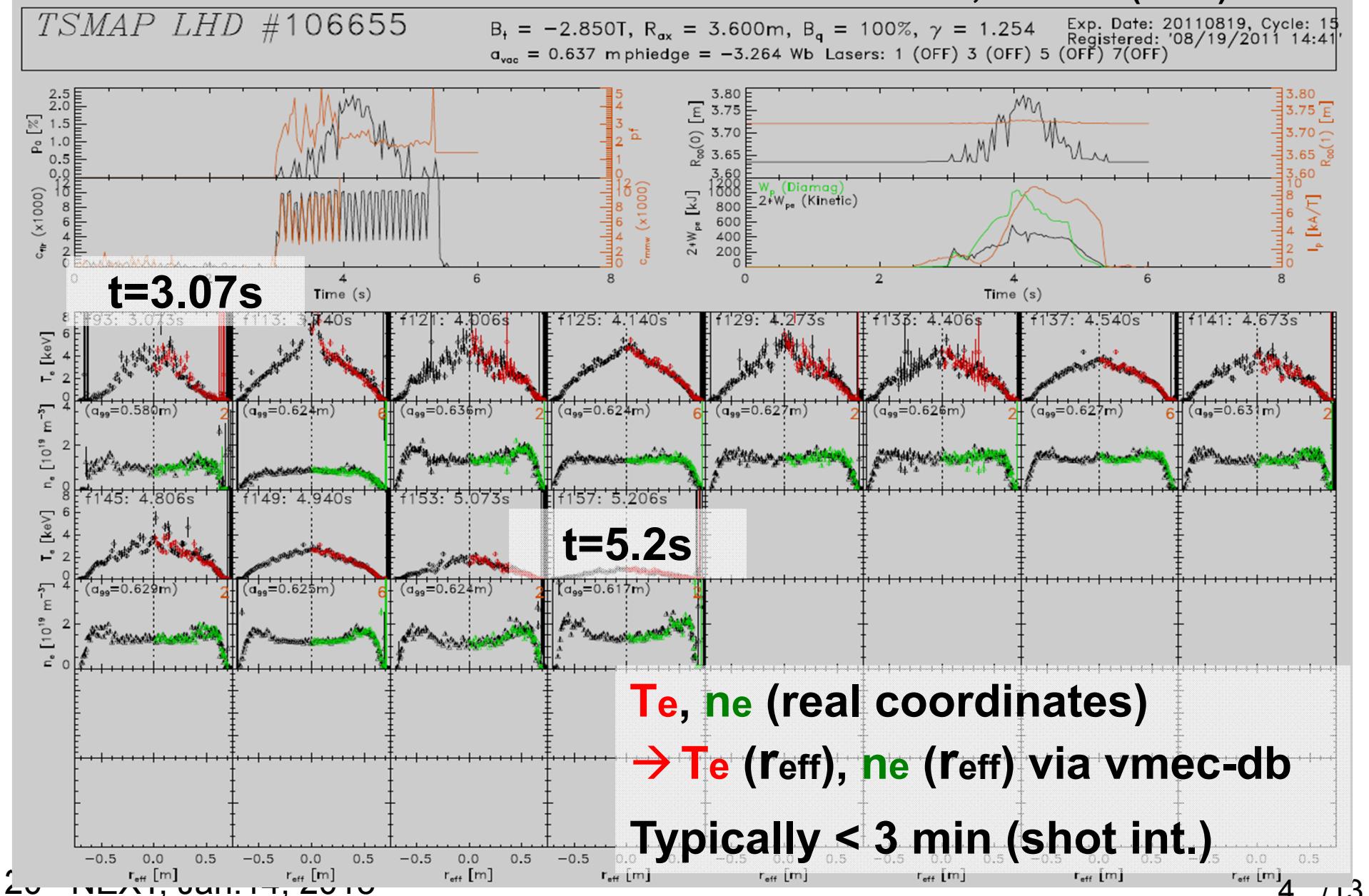
- Extension of high-performance plasmas in LHD
- FFHR-d1 design, ,,,



- “3D” blocks (**modules** for “3D” physics)
- Piling Up -> making shape (**integration**)
- bright colors (**friendly and productive collaboration**)

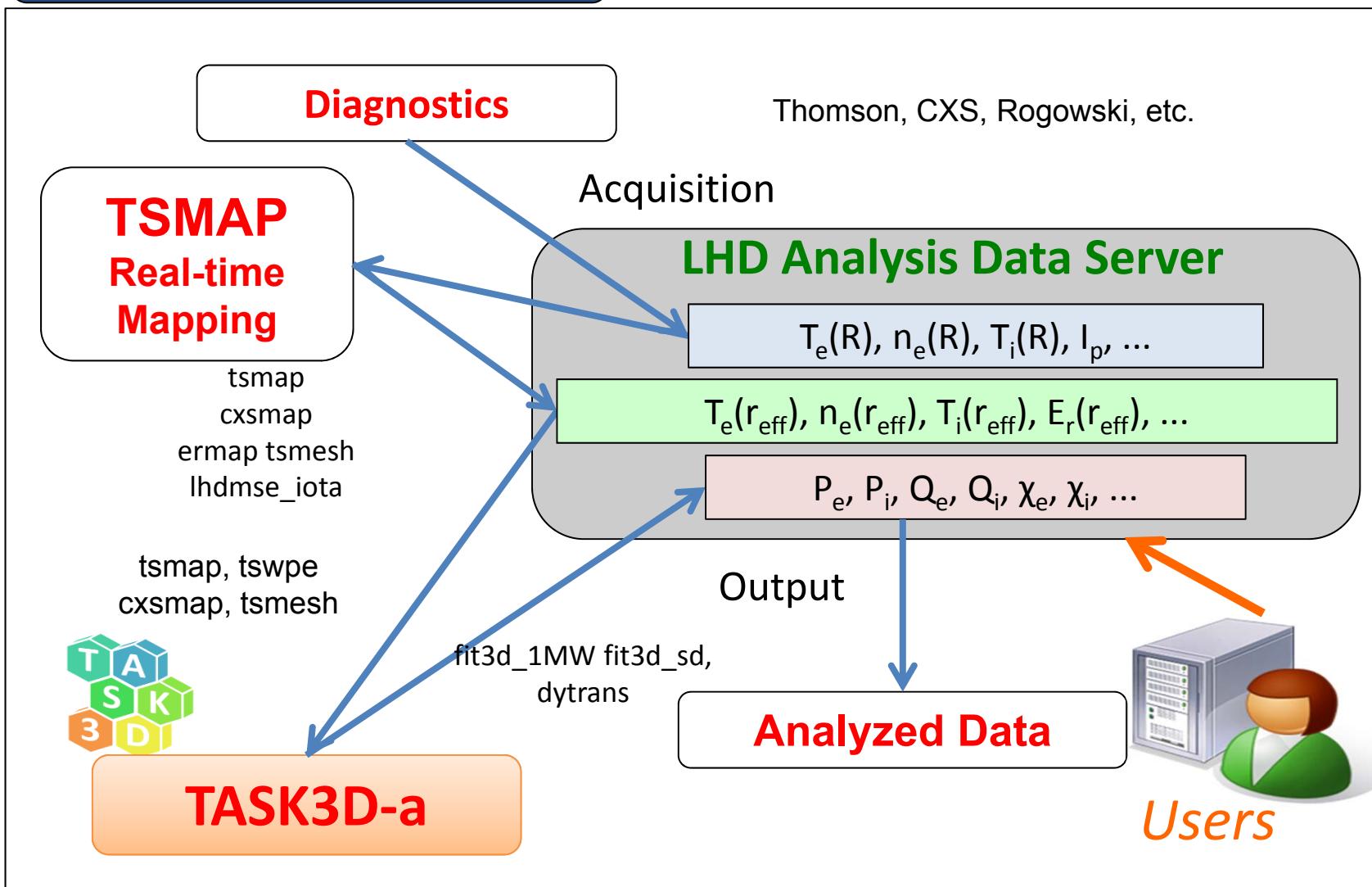


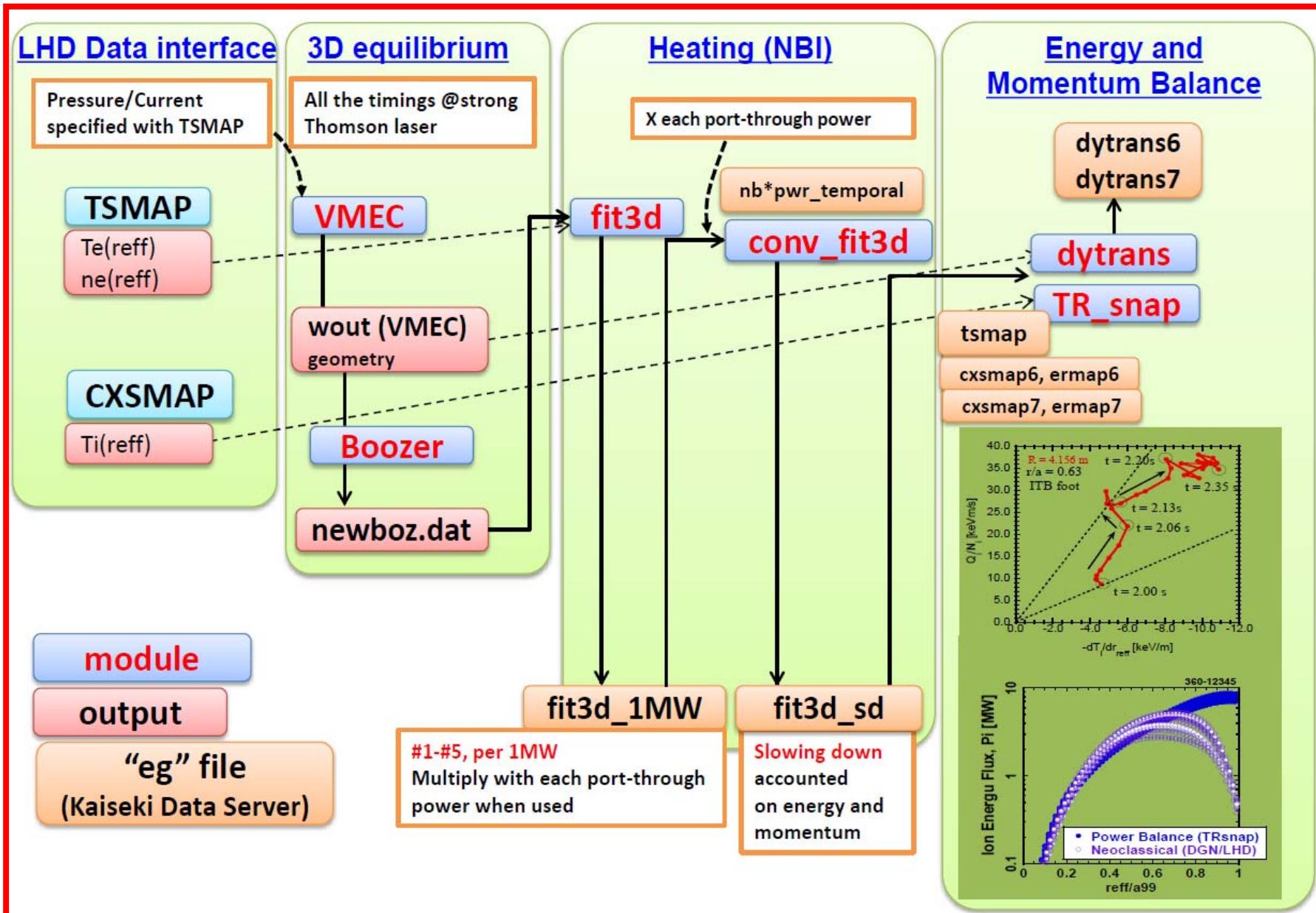
C.Suzuki, PPCF 55(2013)014016



Enhanced interaction between TASK3D-a and LHD Experiment Data

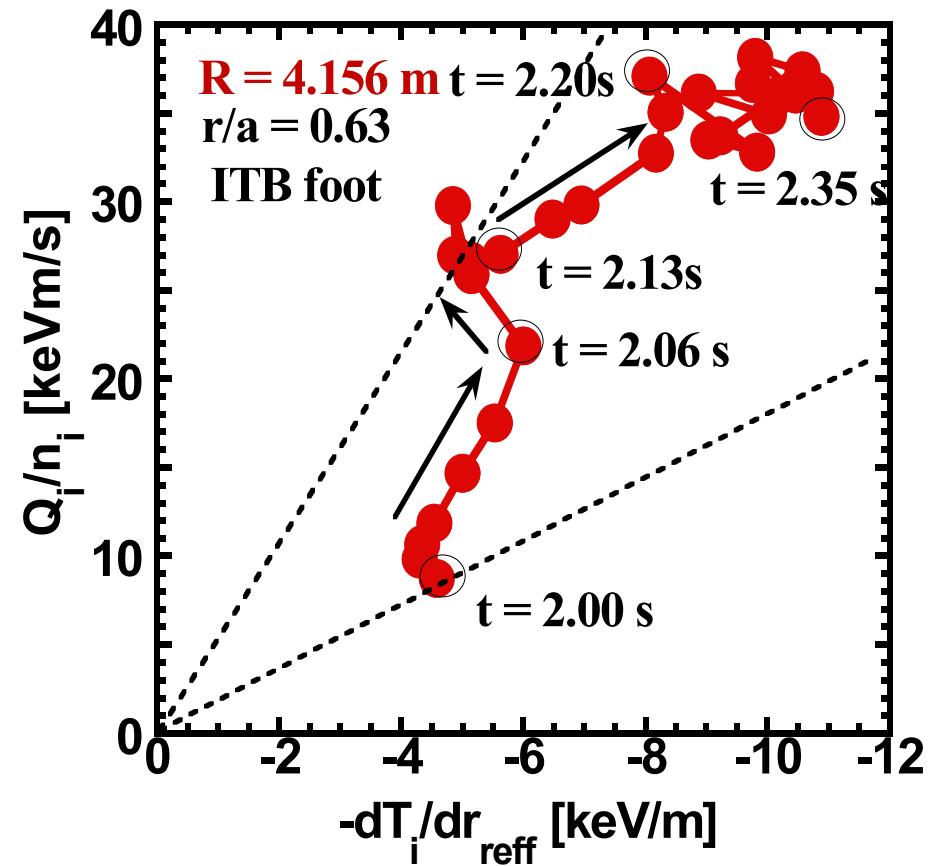
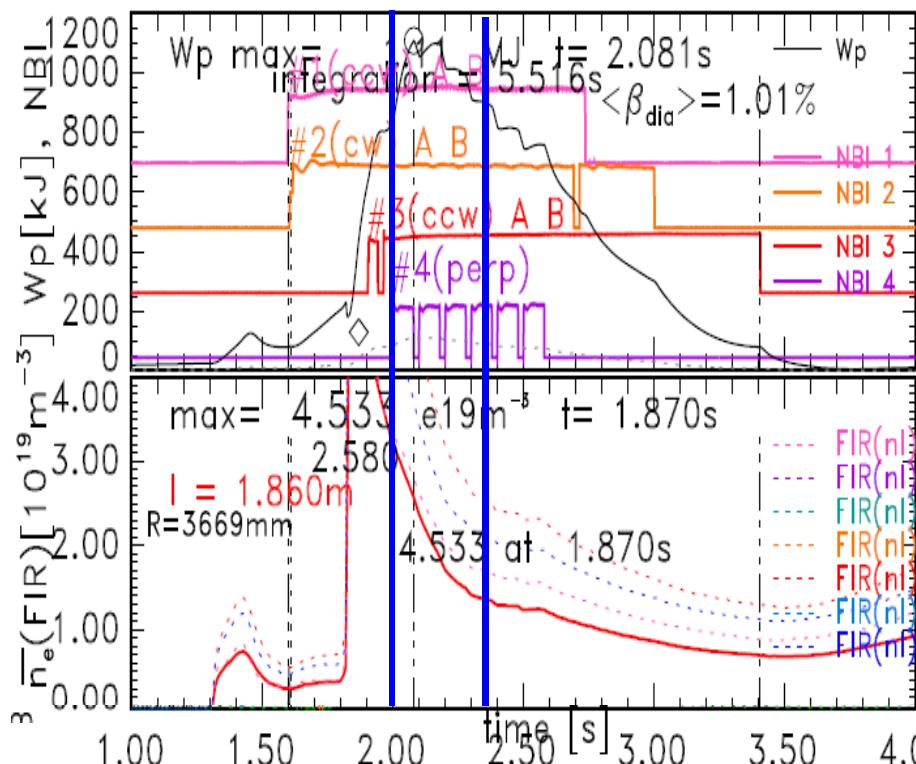
Data Integration





- Gateway established : **tsmap-task3d.lhd.nifs.ac.jp**
 - ✓ open to collaborators
 - ✓ no need to download the suite nor set-up the environment in your own computer
- Standard usage :
 - ✓ simply “**go, #shot**”
 - ✓ not depend on who to run the suite
- Output: **eg** file format (on **LHD Data Server**)
 - ✓ accessible from collaborators

Number of analysis-cases can be significantly enhanced
 → Systematic understandings, accurate discussion



timing can be identified for the confinement improvement

go-a02, XXXXXX(shot#), options

aurora
Core neutrals

**Data for ISH-CDB
Database format**

- τ_E
- dimensionless parameters
(v^* , ρ^* , β^* , etc...)

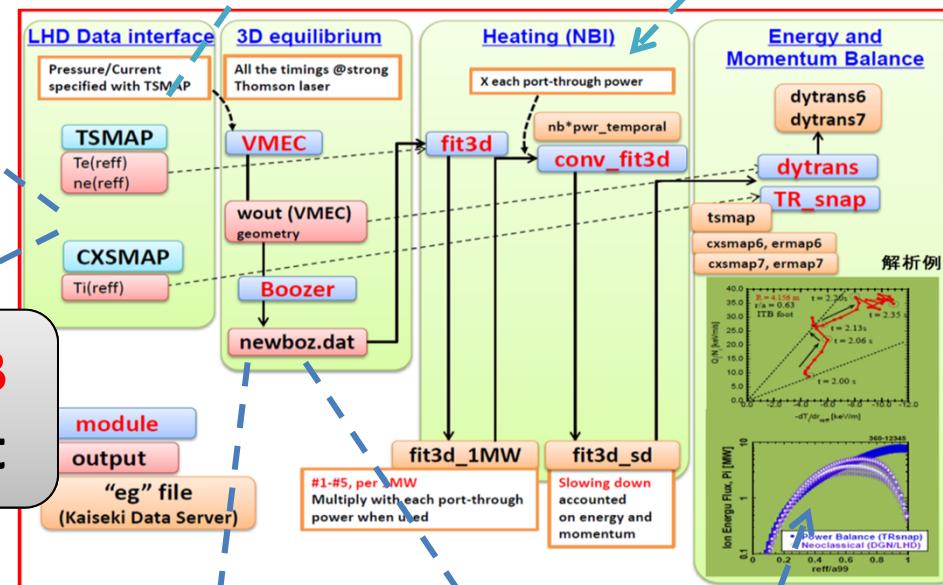
giota

Σ_{eff} etc, configuration dependence

20th NEXT, Jan.14, 2015

TRAVIS

- ECH deposition profile
- ECCD current



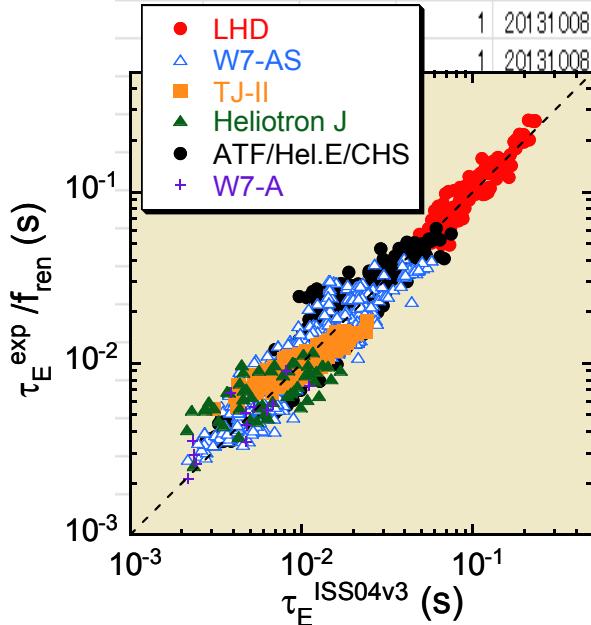
GSRAKE

- Neoclassical diffusion flux
- Ambipolar Er

ishcdb

Data submission to Stellarator-Heliotron Confinement Database

comment	stellarator	sdtset	shear	indic	up date	shot_date	shot#	seq#	itime(s)	phase	A	Z	A_beam	Rgeo(m)	Rax(m)	Bq(%)	gamma	iE
	LHD	1	1	20131008	20101208	101950			3.05		1	1	1	3.721	3.6	100	1.2538	
	LHD	1	1	20131008	20101208	101950			3.15		1	1	1	3.721	3.6	100	1.2538	
	LHD	1	1	20131008	20101208	101950			3.25		1	1	1	3.721	3.6	100	1.2538	
	LHD	1	1	20131008	20101208	101950			3.35		1	1	1	3.7209	3.6	100	1.2538	
	LHD	1	1	20131008	20101208	101950			3.45		1	1	1	3.7229	3.6	100	1.2538	
	LHD	1	1	20131008	20101208	101950			3.55		1	1	1	3.7248	3.6	100	1.2538	
	LHD	1	1	20131008	20101208	101950			3.65		1	1	1	3.7259	3.6	100	1.2538	
	LHD	1	1	20131008	20101208	101950			3.75		1	1	1	3.7264	3.6	100	1.2538	
	LHD	1	1	20131008	20101208	101950			3.85		1	1	1	3.7263	3.6	100	1.2538	
	LHD	1	1	20131008	20101208	101950			3.95		1	1	1	3.7321	3.6	100	1.2538	
	LHD	1	1	20131008	20101208	101950			4.05		1	1	1	3.7284	3.6	100	1.2538	
	LHD	1	1	20131008	20101208	101950			4.15		1	1	1	3.7289	3.6	100	1.2538	
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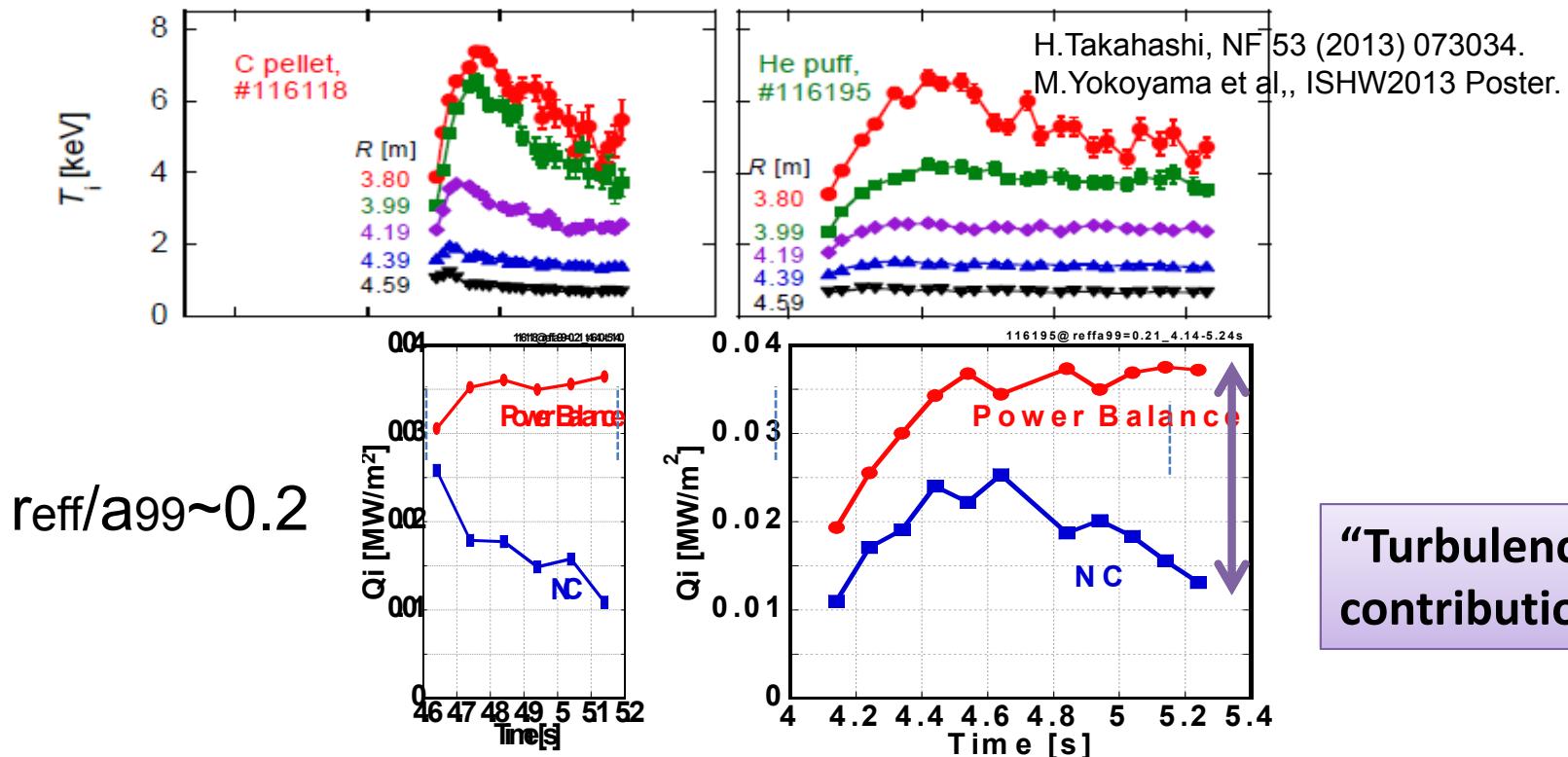


→ Extension of Stellarator-Heliotron Scaling
including forthcoming W7-X results

GSRAKE

C.D.Beidler, and W.D.D'haeseleer, PPCF 37 (1995) 463

- Estimates of Neoclassical diffusion flux, ambipolar Er
 - Routine Comparison to “Experimental” Energy Balance
- ***“Turbulence” Contribution***



Can be utilized for validation of turbulent transport simulation



Heating

NBI

hfreya

fit3d

conv_fit3d

ECH

travis

**Equilibrium/
Profiles**

eg files

vmech

newboz

a01

transport

dytrans

dynamic transport

trsnap

SS energy balance

GSRAKE

NC diffusion/
ambipolar Er

database

giota

ish-cdb

**Direct/indirect
implementation**

Plasma flow

penta

sfincs

fotrec-3d

EP/AE

ae3d

delta5d

Edge Physics

EMC3/EIRENE



“Numerical LHD” will be pursued through the extension of TASK3D-a



- **TASK3D** has been programmatically developed as “extension” of TASK (Prof. Fukuyama) to LHD Plasmas
- **TASK3D-a** has been steadily extended, to make wide-range physics analyses of LHD plasmas, and provide unified basis for several simulation codes ~~ “**Numerical LHD**” is foreseen
- Extension of **TASK3D-a** will facilitate code-validation activities upon LHD plasmas, and then will be the firm basis for **TASK3D-p on the way to “Numerical Helical Reactor”**.