NURESAFE WP1.4
HIGHER-RESOLUTION VVER MSLB

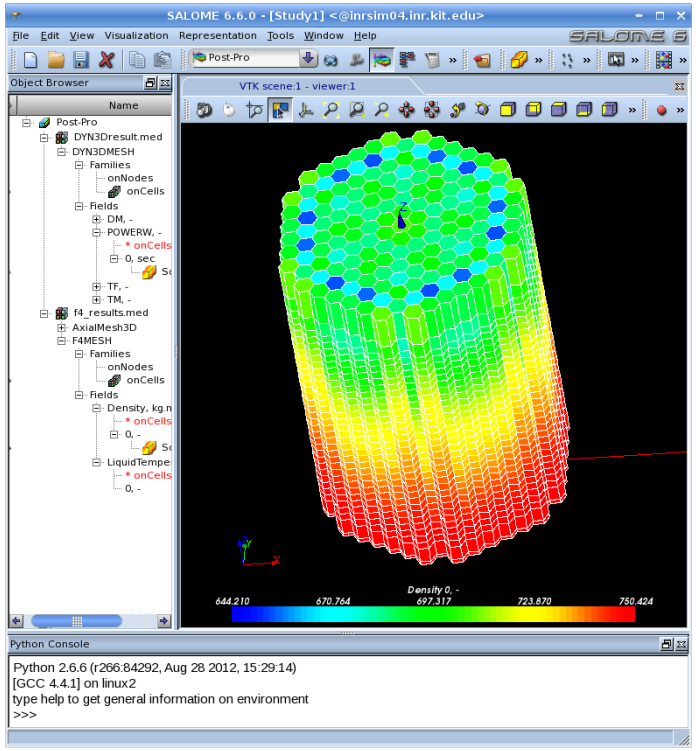
Results for the nodal based scenarios using DYN3D and COBAYA3 (with the compact library)

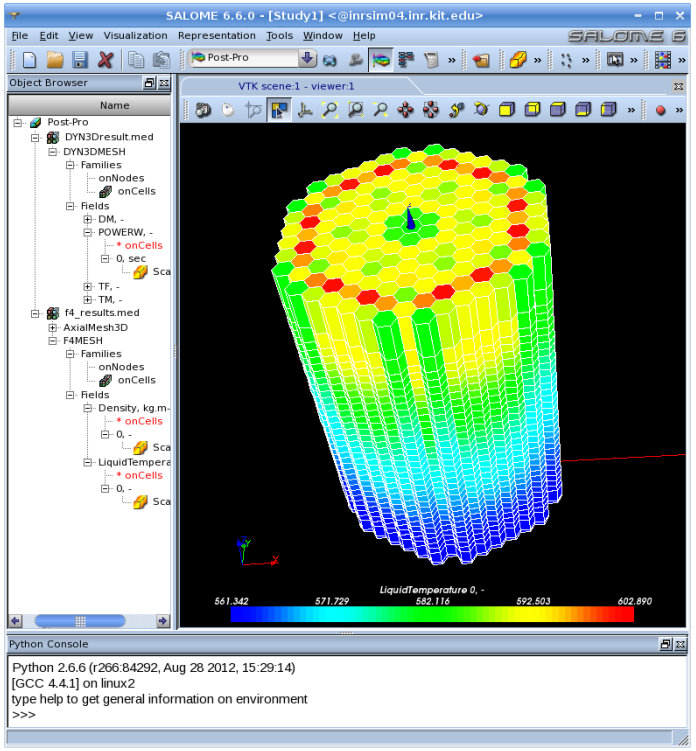
J. Jimenez, S. Sanchez Cervera

Presented by J. Jimenez

Outline

- Results obtained for different scenarios with DYN3D and COBAYA3 using the compact library.
- Hot channel calculation using SCF was done.
- Conclusion and Outlook





Introduction

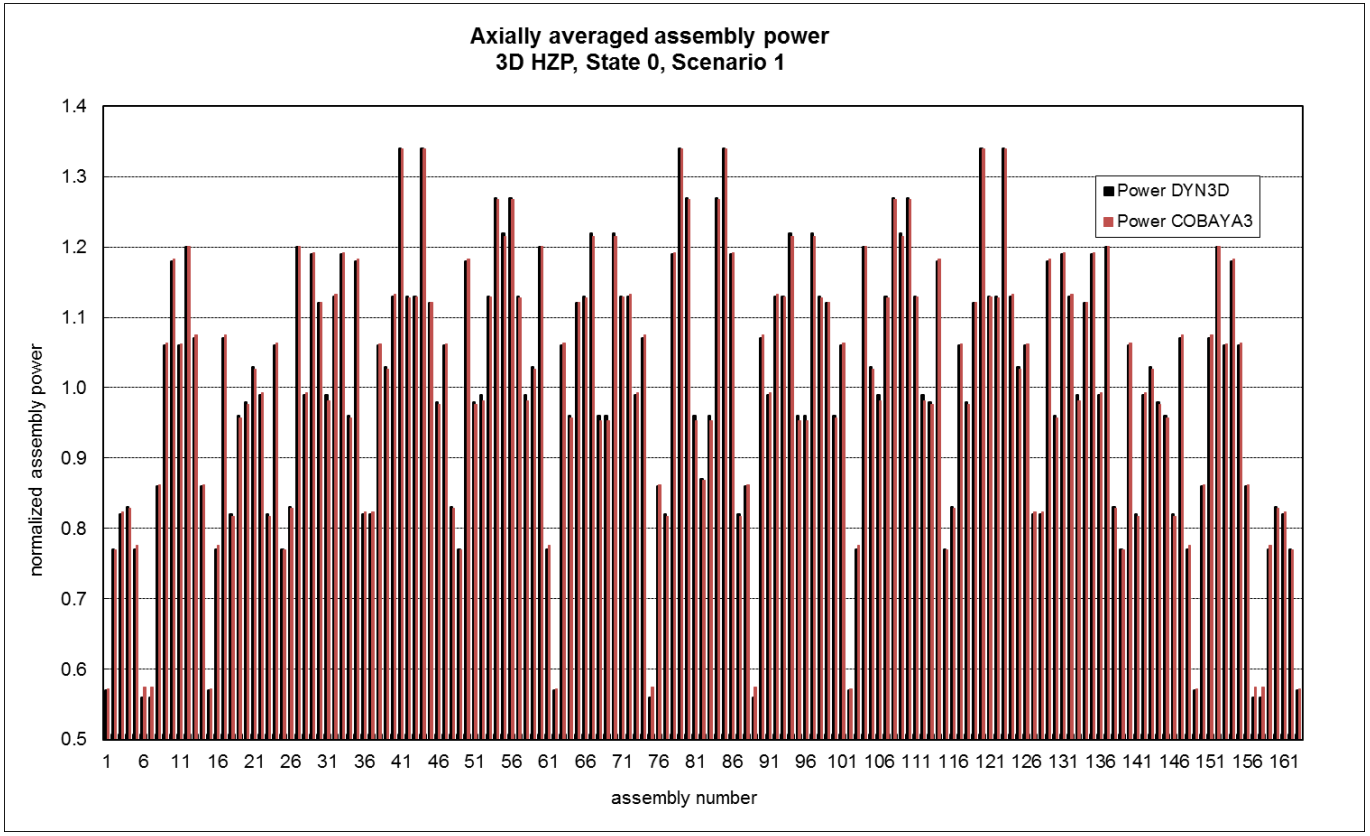
- **Coupling scripts as well as the input decks have been uploaded in the svn repository and can be found there.** **https://www-svn-corpus.cea.fr/nuresafe/SAT/TEST**
- **All the results will be reported within the corresponding deliverable.**
- **Progress has been done at nodal level and the goals are closer to be achieved:**
- **Pending:**
  - Still some issues with the EXTENDED XS library for DYN3D
  - Coupling of COBAYA3/COBRA-TF.
    - Preliminary results using COBRA-IIIc were computed.
  - Simulation of the proposed transient scenario.
    - Time dependent boundary conditions have been already added to the deck.inp

https://www-svn-corpus.cea.fr/nuresafe/SAT/TEST/RESSOURCES/data/cobratf/VVER-1000/transient

Results using the COMPACT library

State 0, Scenario 1, HZP

	K_{eff}	F_{xy}	F_z	F_Q
DYN3D	1.028537	1.3417	2.9704	4.4586
COBAYA3	1.028758	1.3377	2.9944	4.4826



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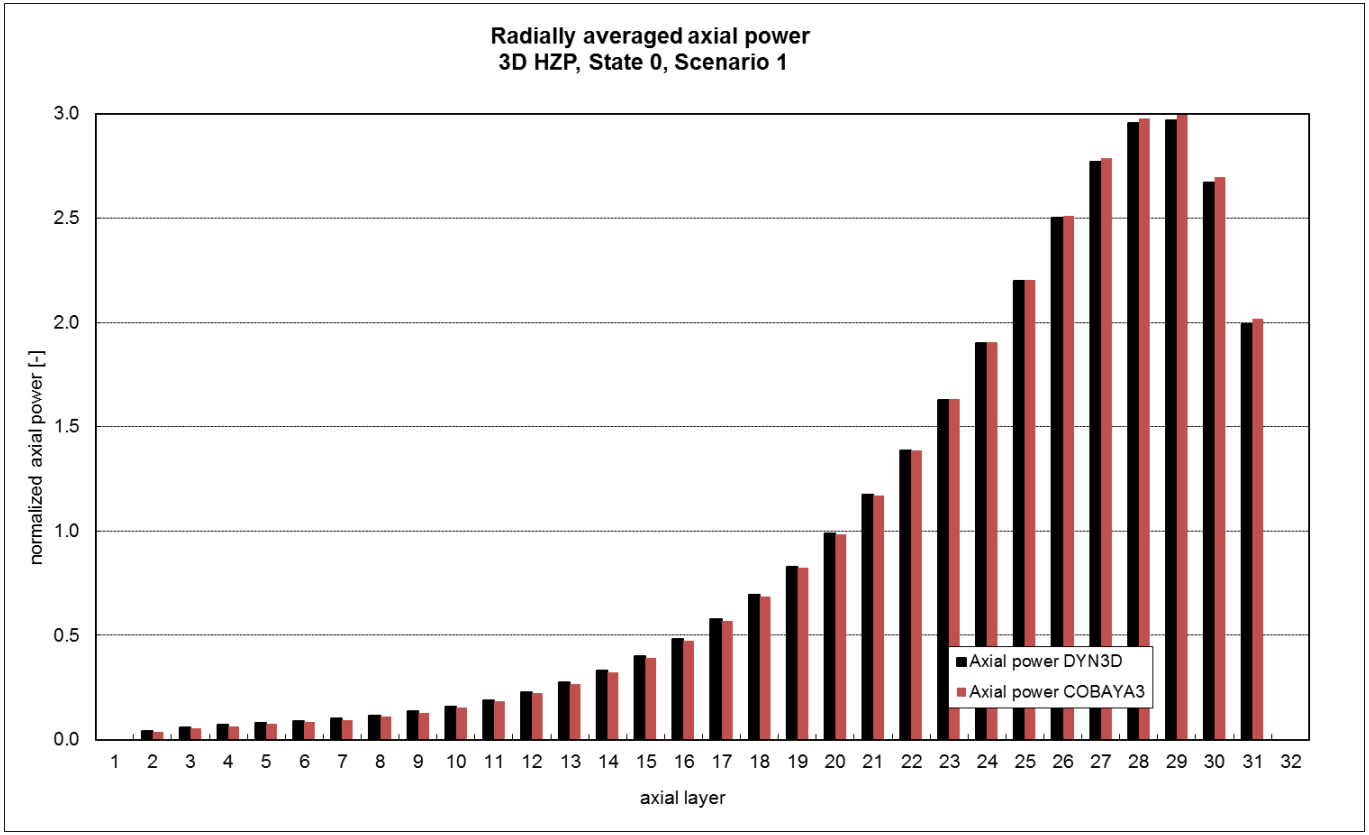
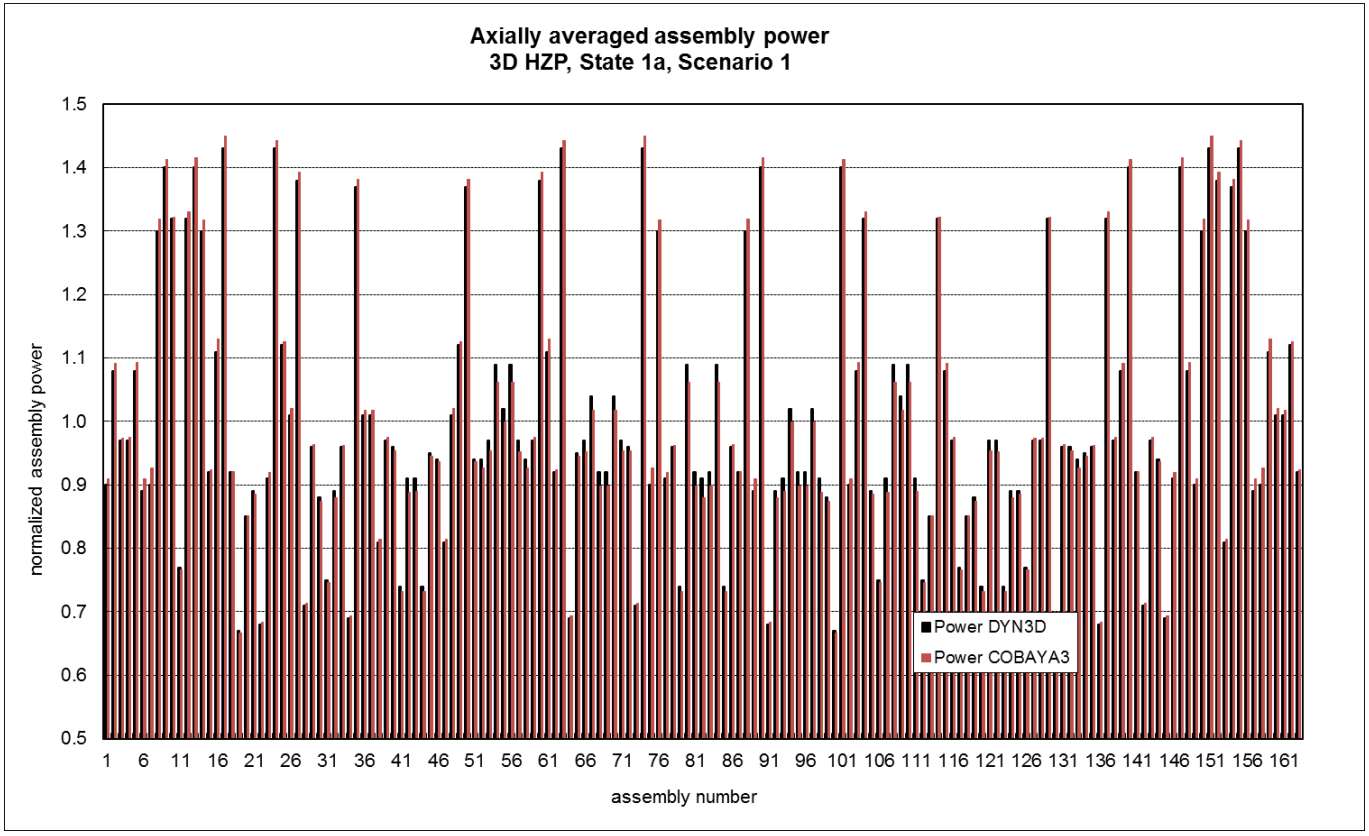


State 1a, Scenario 1, HZP

	K_{eff}	F_{xy}	F_z	F_Q
DYN3D	0.991076	1.4317	1.9478	2.9579
COBAYA3	0.991516	1.4524	2.0131	3.0907



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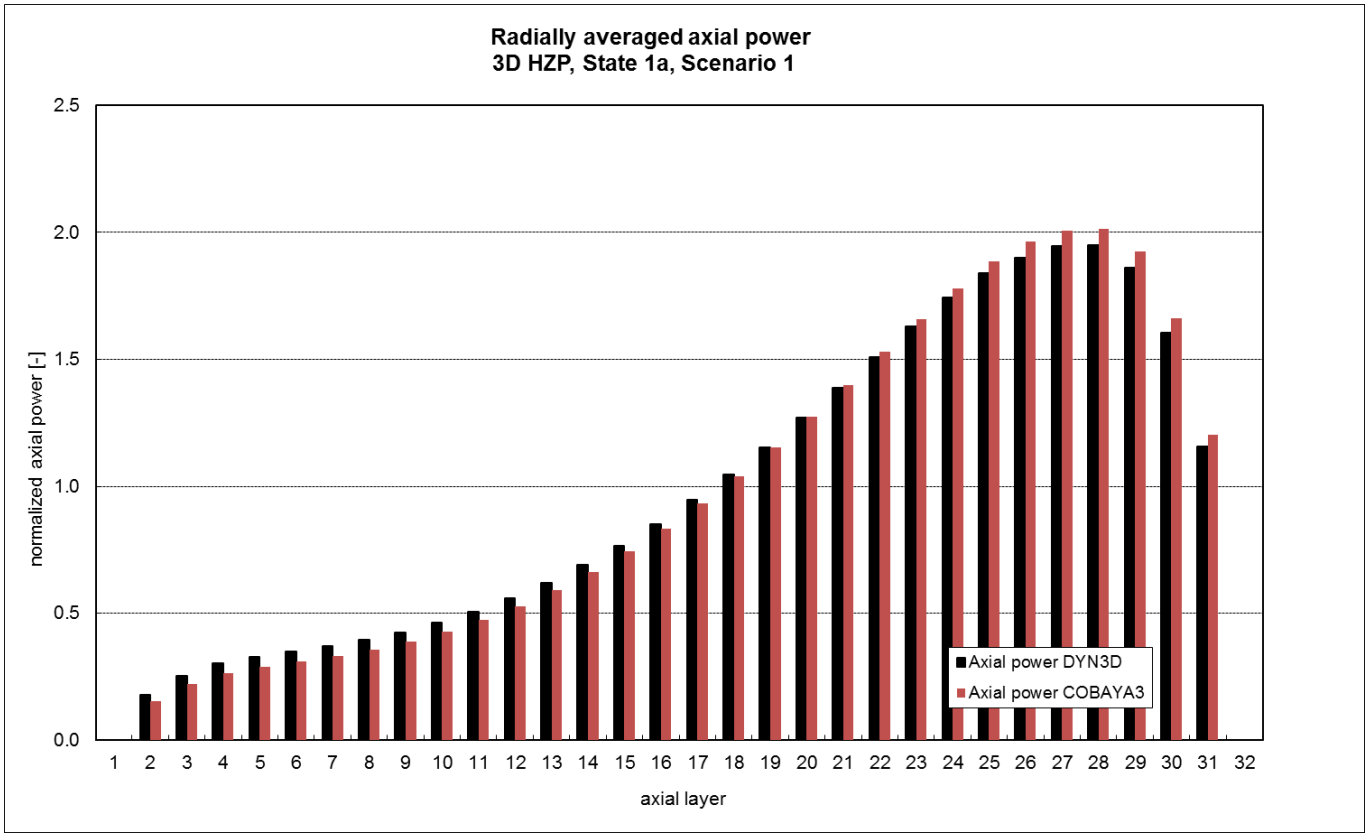
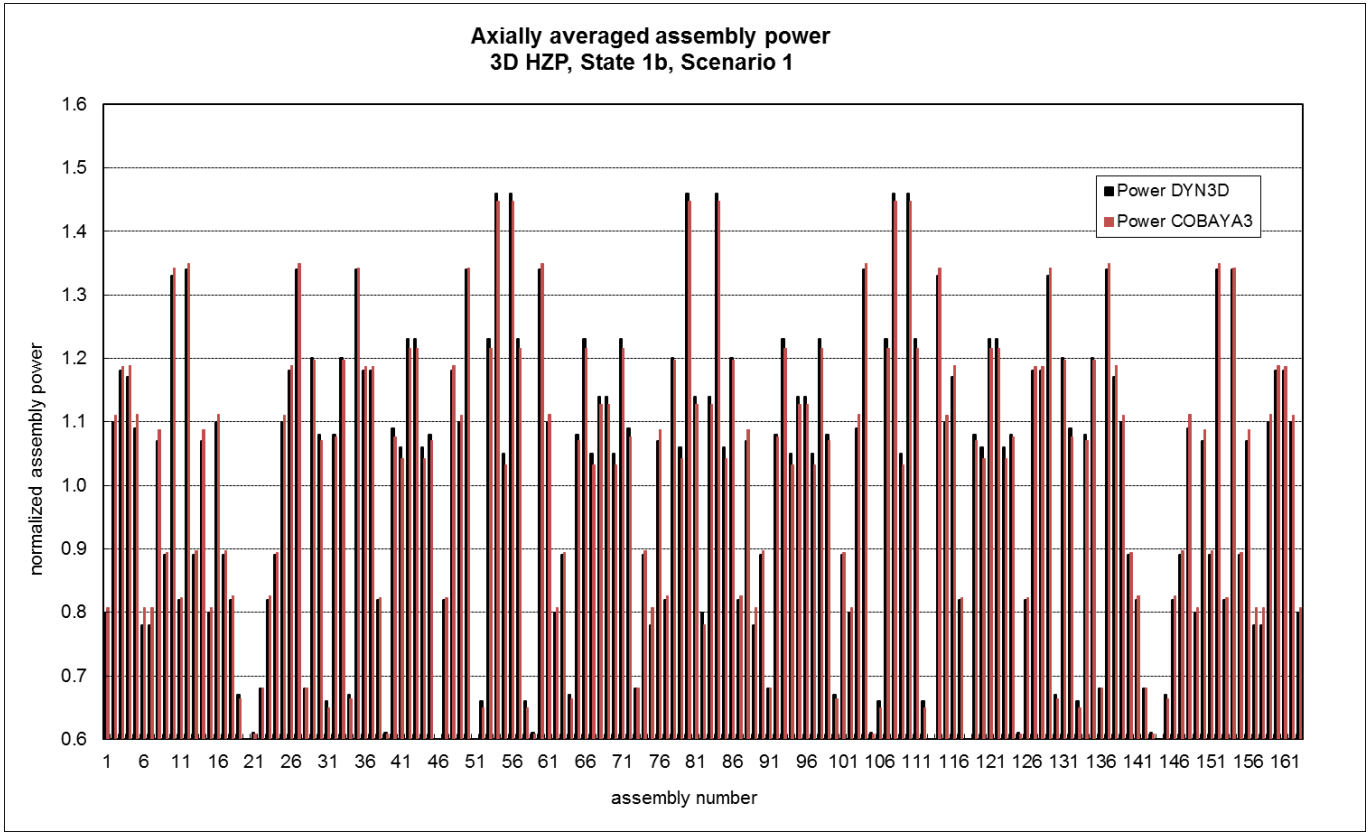


State 1b, Scenario 1, HZP

	K_{eff}	F_{xy}	F_z	F_Q
DYN3D	0.951282	1.4649	2.706	4.832
COBAYA3	0.951701	1.4553	2.7159	4.8



State 1b, Scenario 1, HZP

	K_{eff}	F_{xy}	F_z	F_Q
DYN3D	0.951282	1.4649	2.706	4.832
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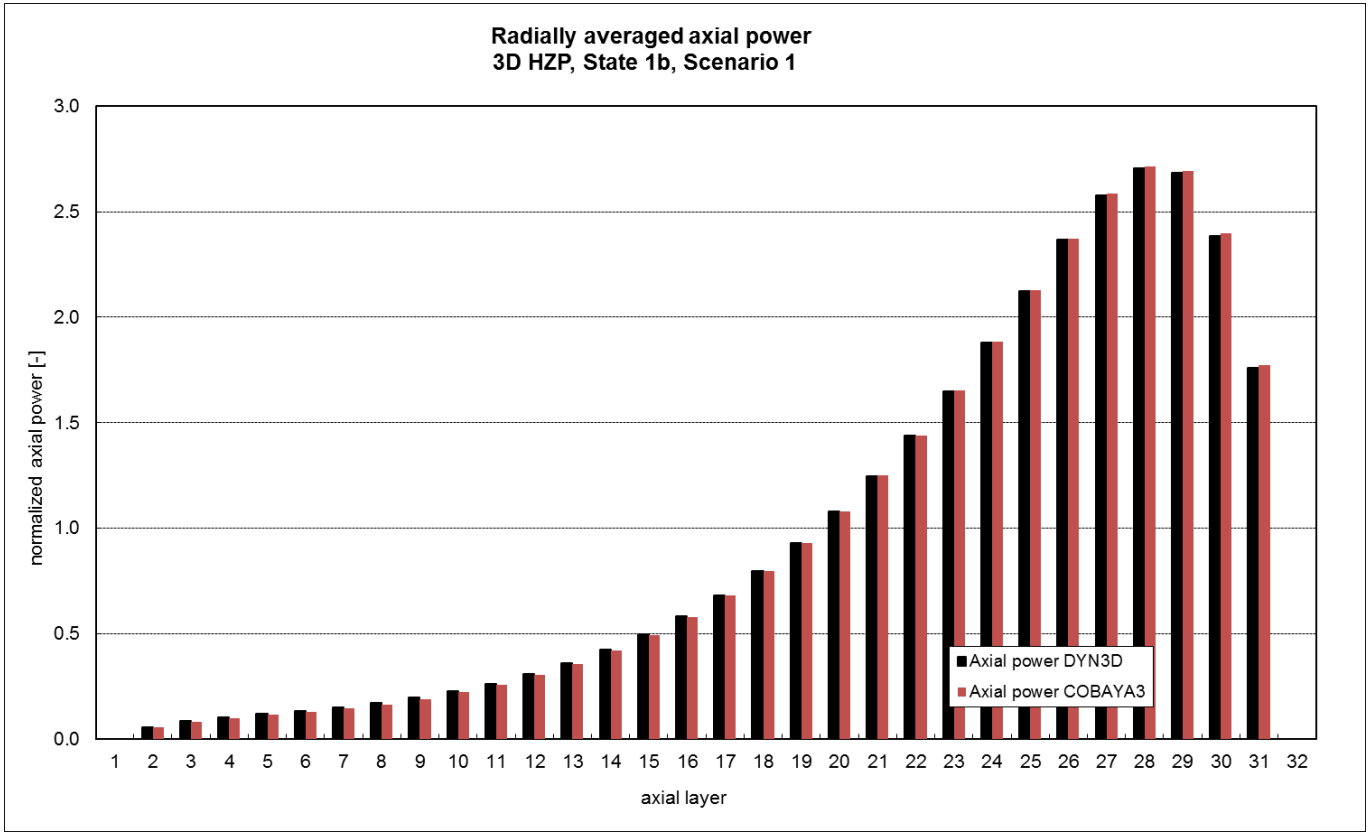
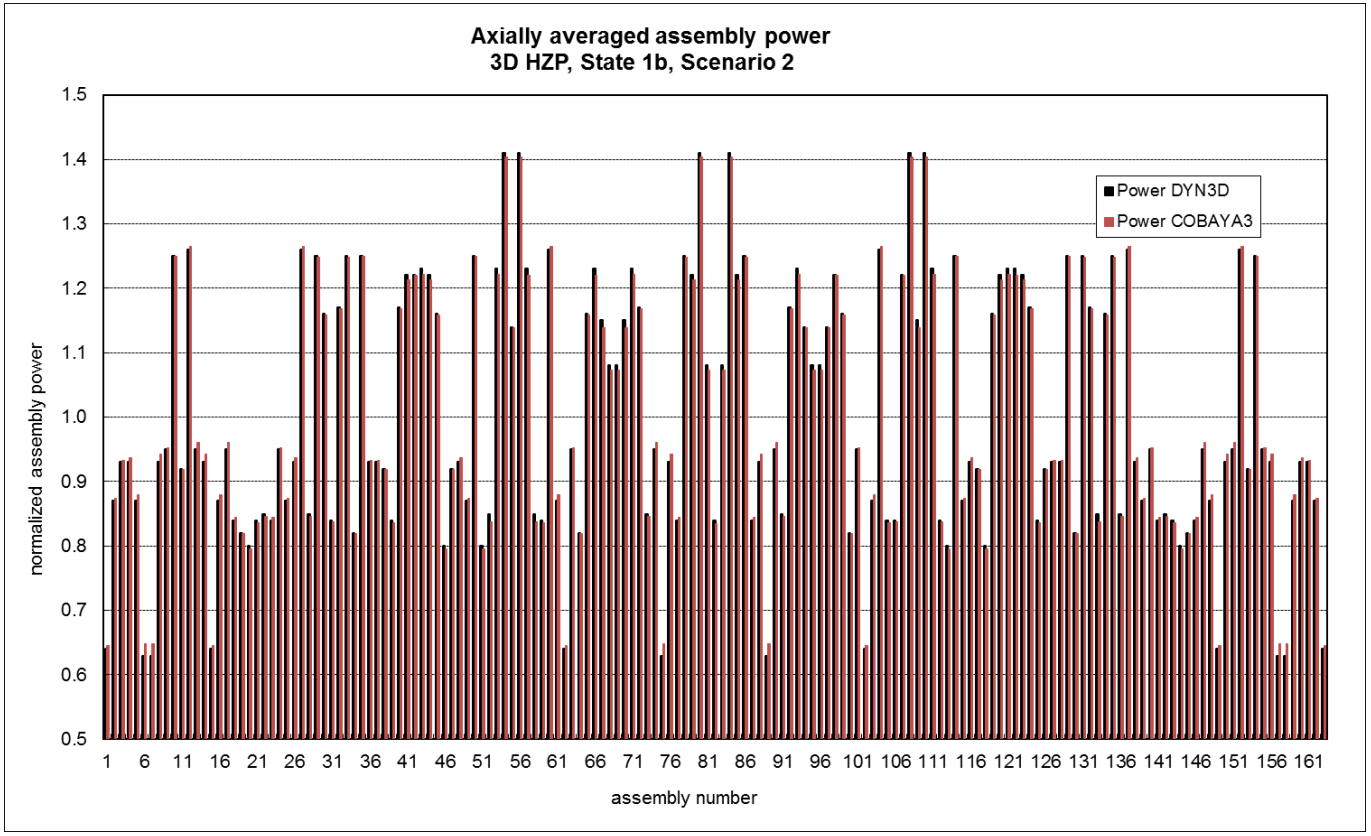


State 1b, Scenario 2, HZP

	K_{eff}	F_{xy}	F_z	F_Q
DYN3D	1.000611	1.4106	2.8427	4.5707
COBAYA3	1.000793	1.4107	2.8677	4.592



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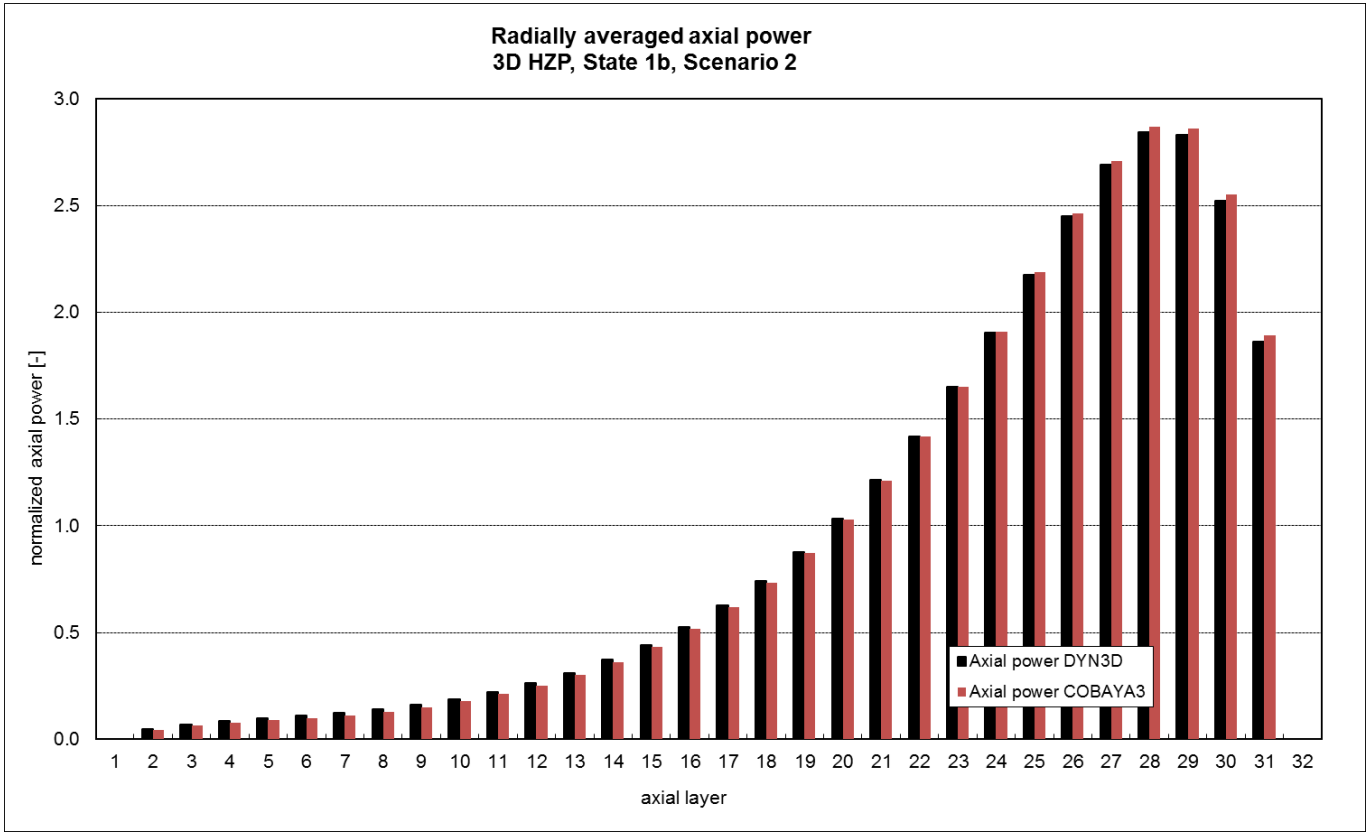
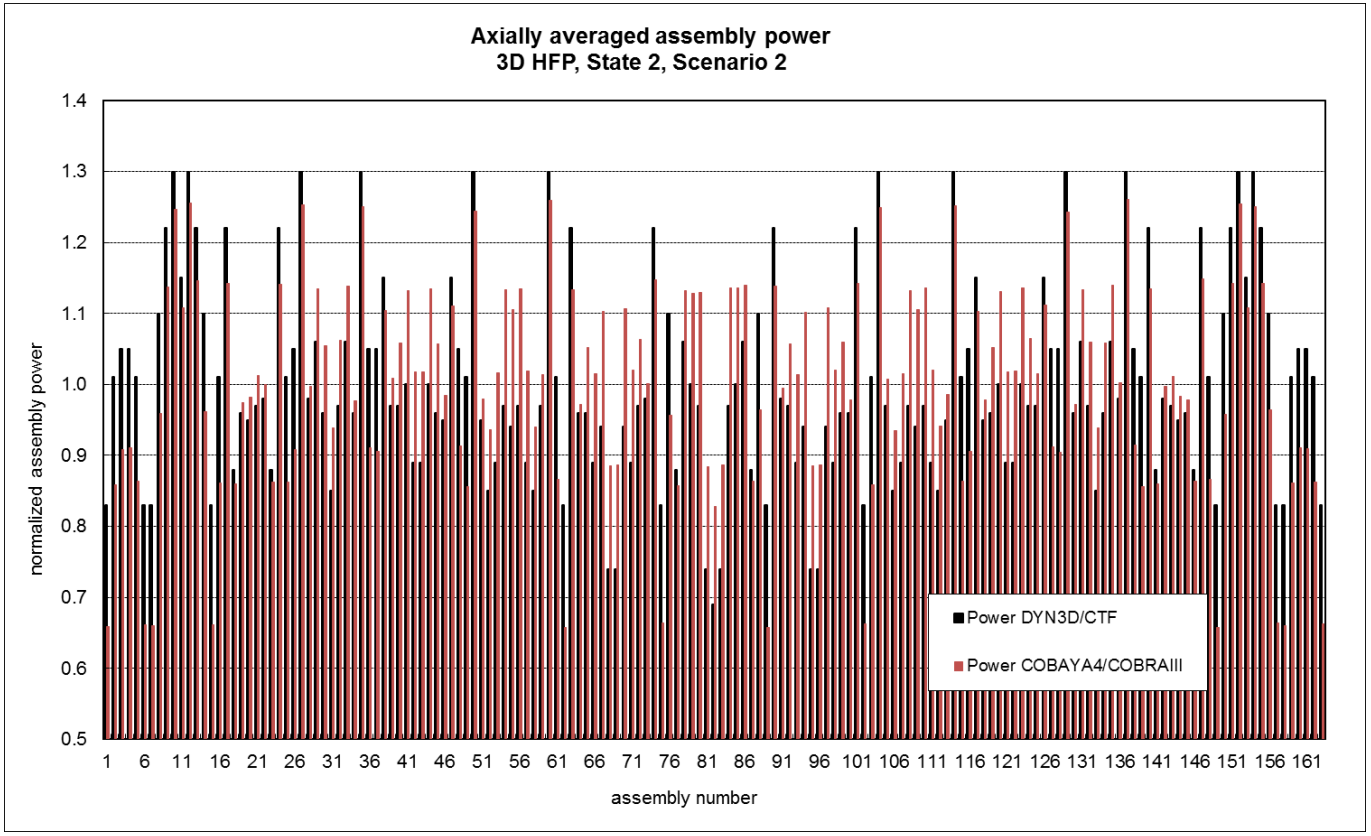


State 2, Scenario 2, HFP

	K_{eff}	F_{xy}	F_z	F_Q
DYN3D	1.001291	1.3035	1.1398	1.4592
COBAYA3	0.996372	1.2605	1.2585	-



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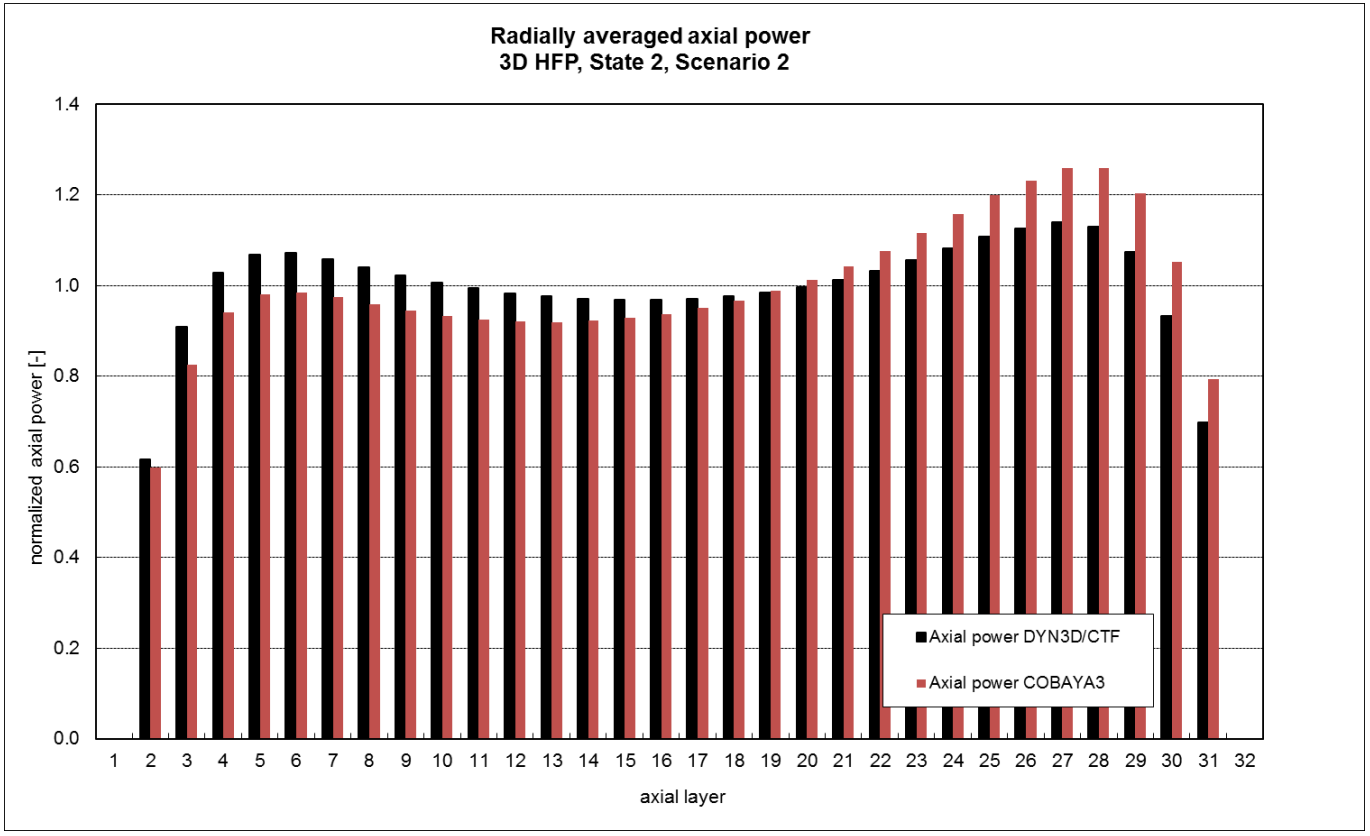
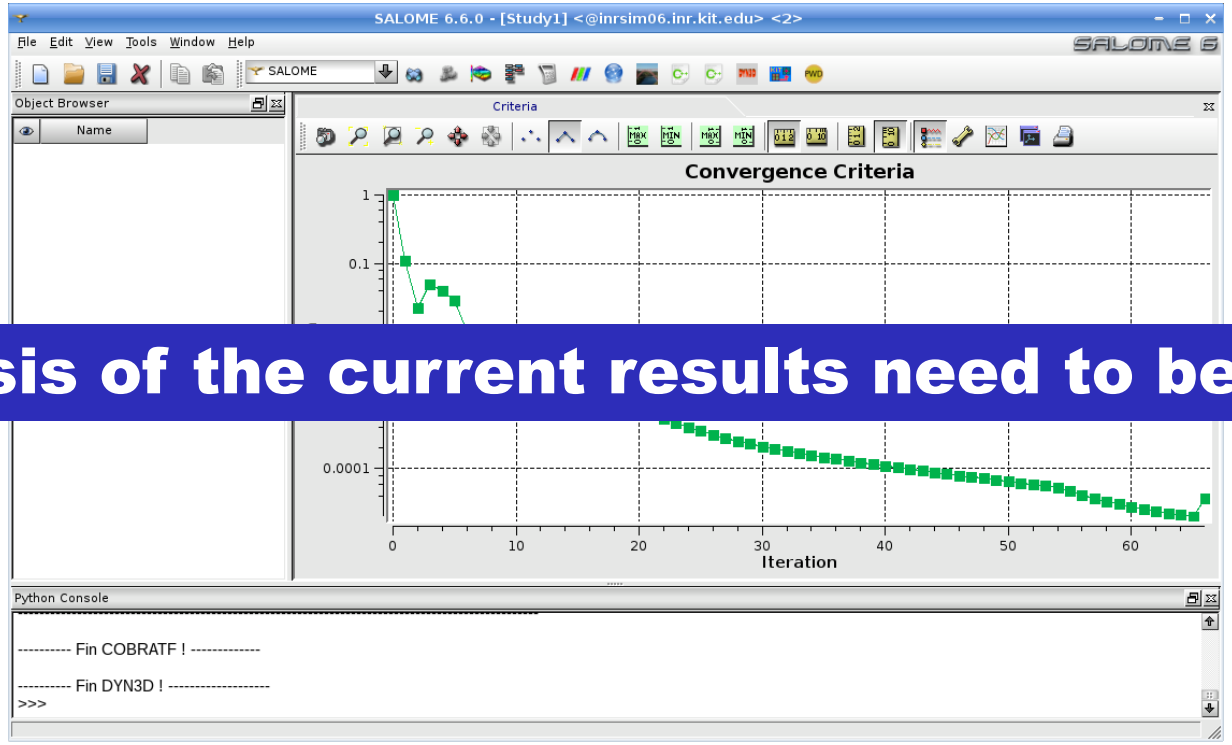


State 2, Scenario 2, HFP DYN3D within SALOME

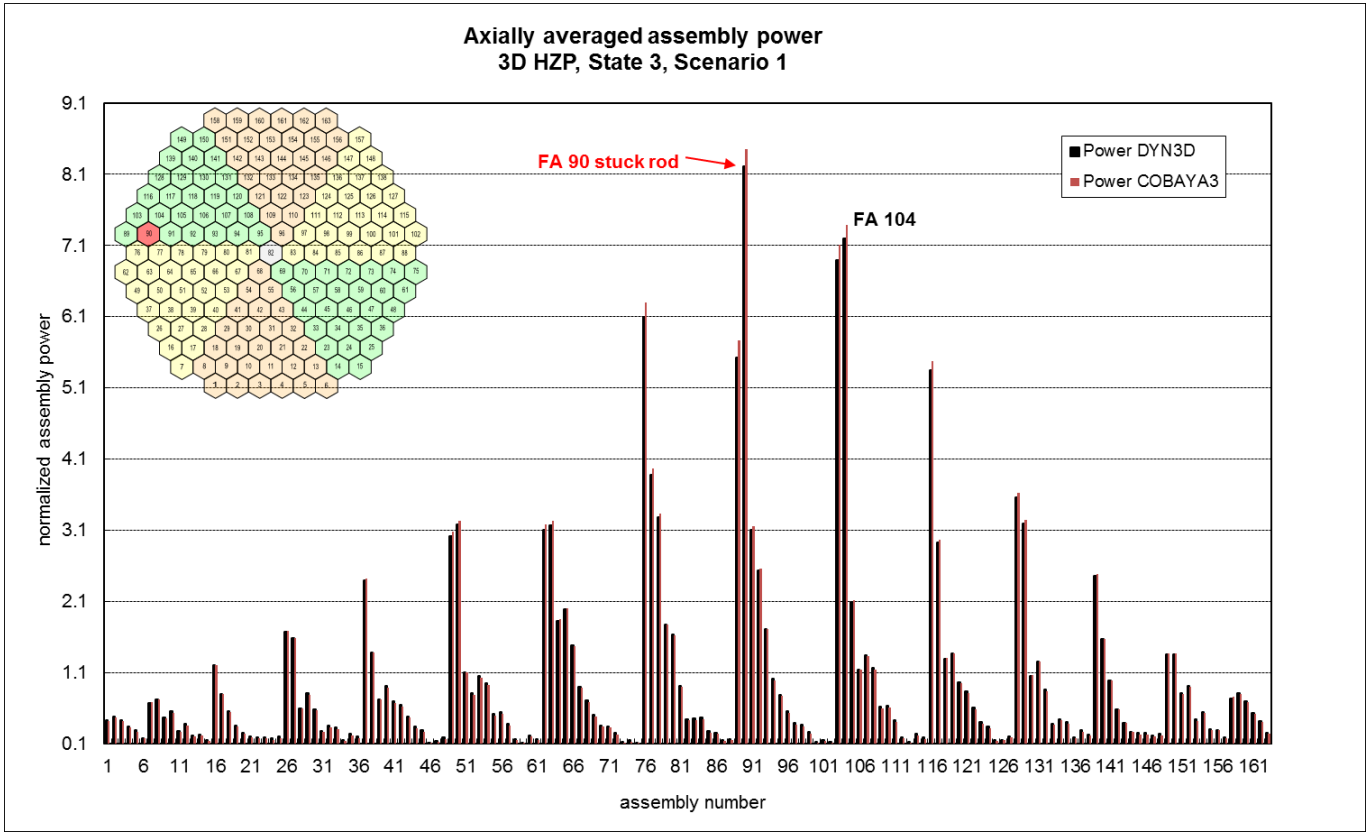
State	TH Code	K_{eff}	F_{xy}	F_z	F_Q	Av. Dop. Temp. [K]	Av. Mod. Dens. [kg/m^3]	Av. Mod. Temp. [K]
2	COBRA-TF	1.00129	1.3035	1.1398	1.4592	-	-	-
	FLICA	1.00752	1.3157	1.1986	1.4859	-	-	576.25
	SCF	1.00425	1.3070	1.1742	1.4527	842.56	713.93	578.79



Analysis of the current results need to be done

State 3, Scenario 1, HZP

	K_{eff}	F_{xy}	F_z	F_Q
DYN3D	0.959901	8.2071	2.2996	17.0034
COBAYA3	0.960693	8.4983	2.3208	17.8343



State 3, Scenario 1, HZP

	K_{eff}	F_{xy}	F_z	F_Q
DYN3D	0.959901	8.2071	2.2996	17.0034
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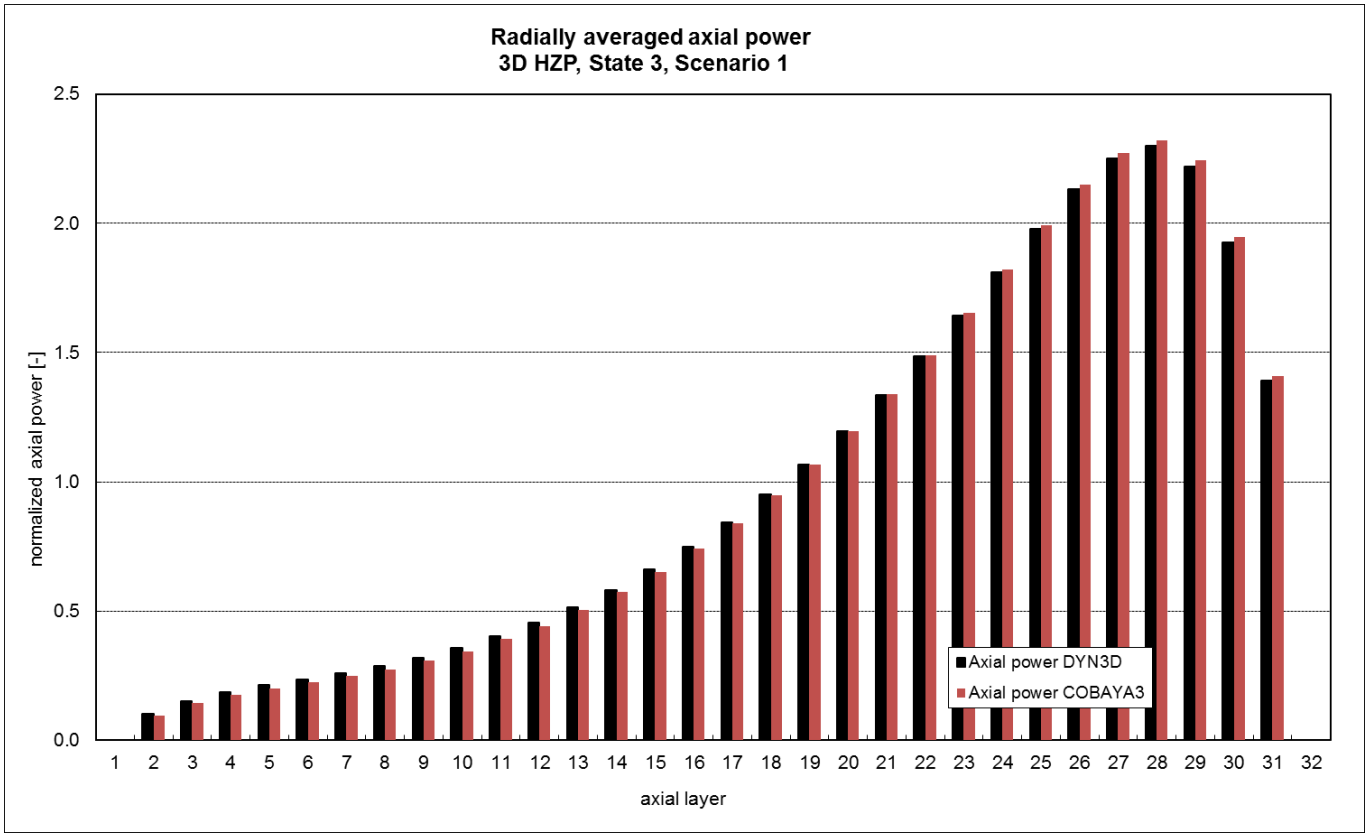
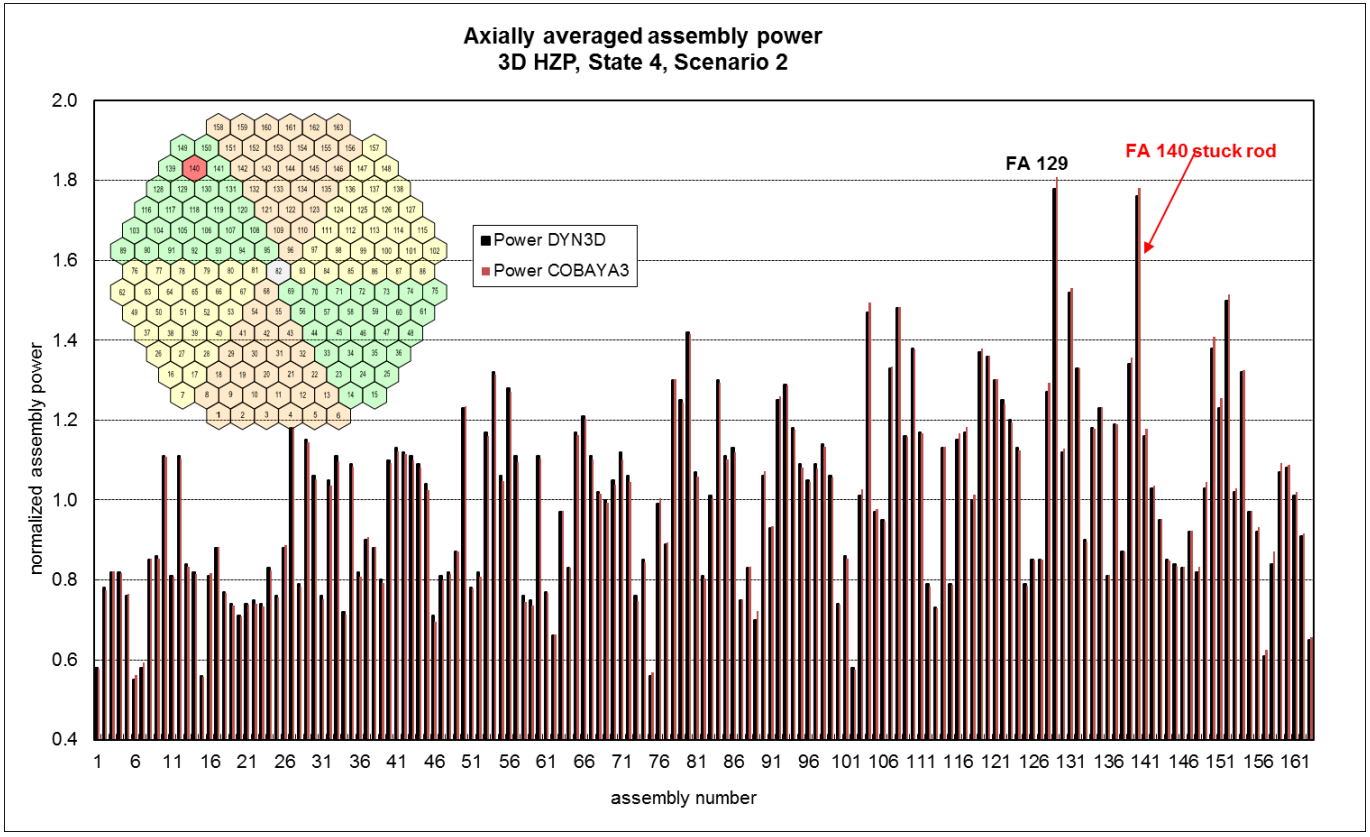


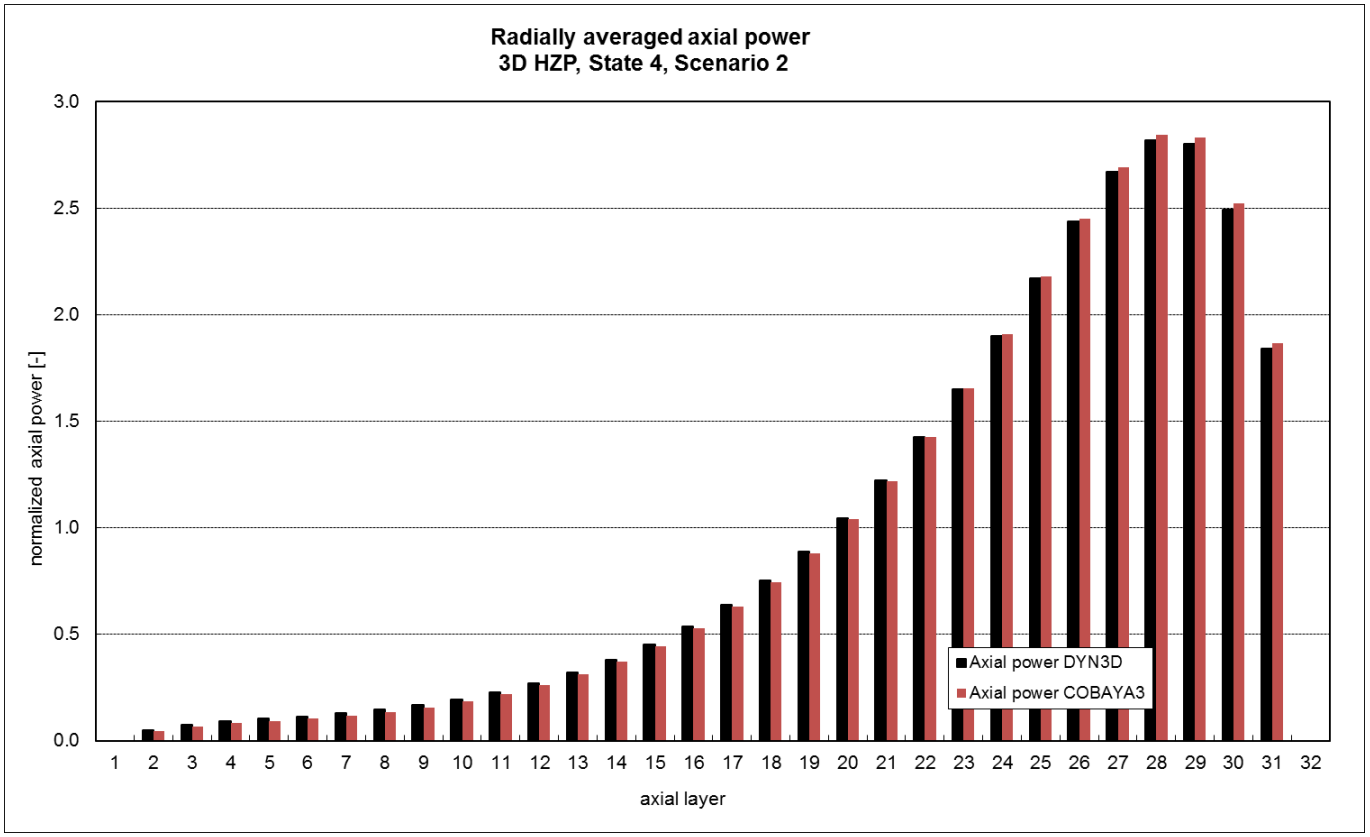
State 4, Scenario 2, HZP

	K_{eff}	F_{xy}	F_z	F_Q
DYN3D	1.001254	1.7848	2.8174	4.7463
COBAYA3	1.001445	1.7985	2.843	4.791



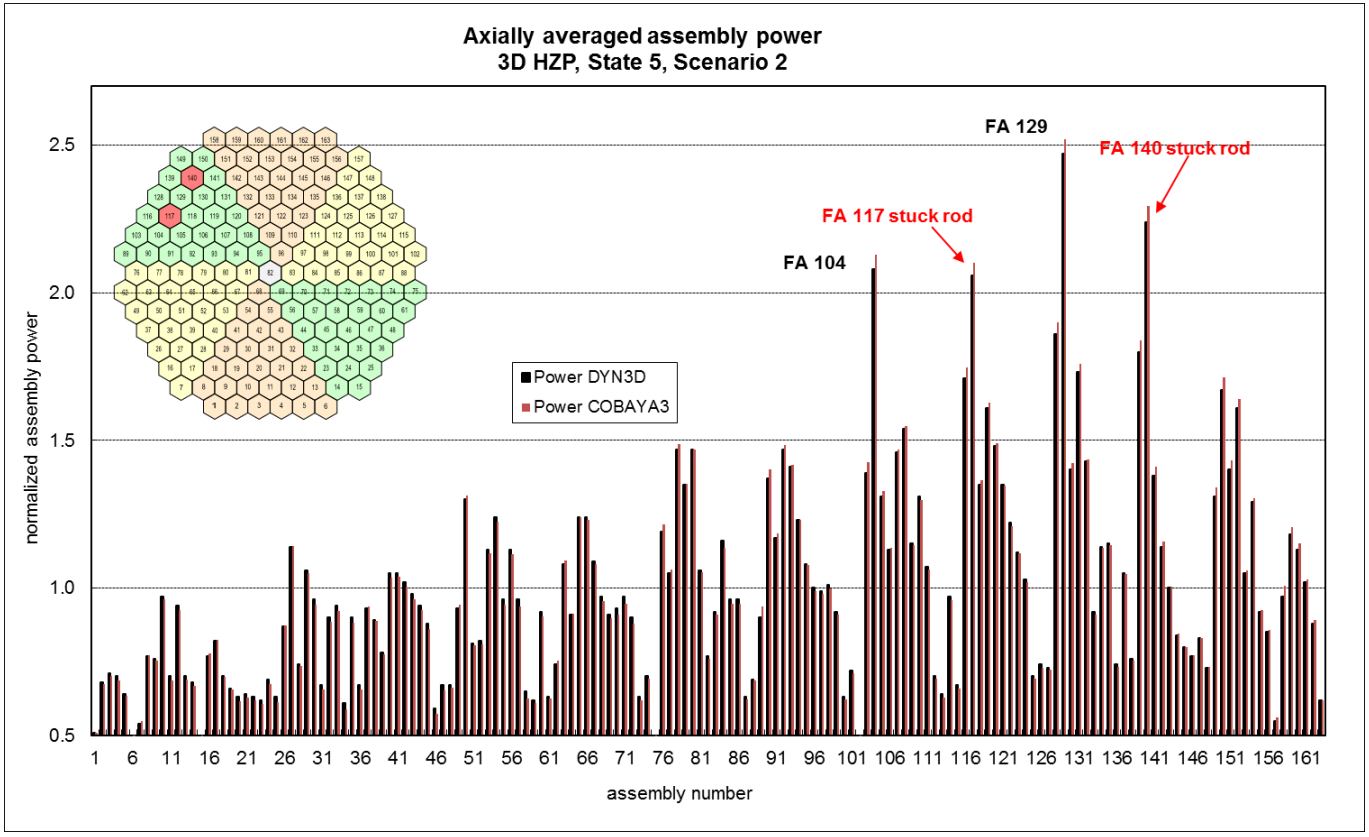
State 4, Scenario 2, HZP

	K_{eff}	F_{xy}	F_z	F_Q
DYN3D	1.001254	1.7848	2.8174	4.7463
COBAYA3	1.001445	1.7985	2.843	4.791



State 5, Scenario 2, HZP

	K_{eff}	F_{xy}	F_z	F_Q
DYN3D	1.002236	2.4661	2.7943	6.1993
COBAYA3	1.002442	2.5056	2.8076	6.3482



State 5, Scenario 2, HZP

	K_{eff}	F_{xy}	F_z	F_Q
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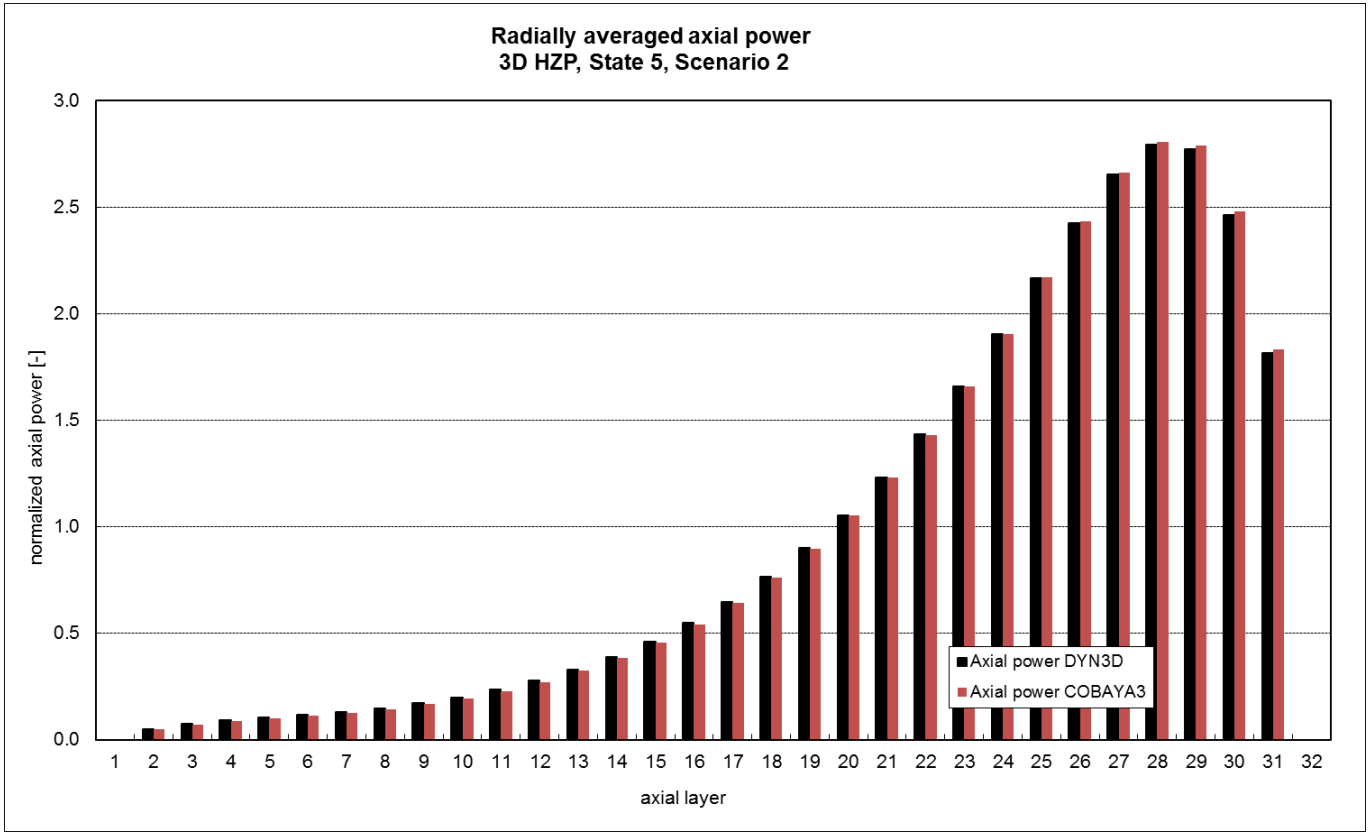


Issues with the EXTENDED library

Issues with the EXTENDED library

- **Before the previous SP1 meeting:**

- **New XS library provided (10.2014) for the nodal level. DYN3D needs some modifications in order to read the new library:**
  - Regarding the structure of the XS files, some blocks need to be skipped and some others need to be moved to a different position. There are some magnitudes which have now TH dependence and that needs to be reflected internally in the calls to the interpolators, like Lambdas and Betas. (**Reported by KIT 10.2014**)
  - This implementation work will be done at KIT.
  - DYN3D 2G latest version of the source used in SALOME delivered **to KIT 13.2.2015 from HZDR**.
    - Source revision 818 from svn HZDR repository.

Issues with the EXTENDED library

- **After the last SP1 meeting**
  - A newer version (v2.04) of the extended library was released (**13.3.2015**) with changes in the format.
  - xs_v2.04_Extended_ntab2.lib

– 1. The TH dependence is not in the same order:

  T Fuel,K T Mod.,K Mod.Dens,kg/m3 Boron ppm.

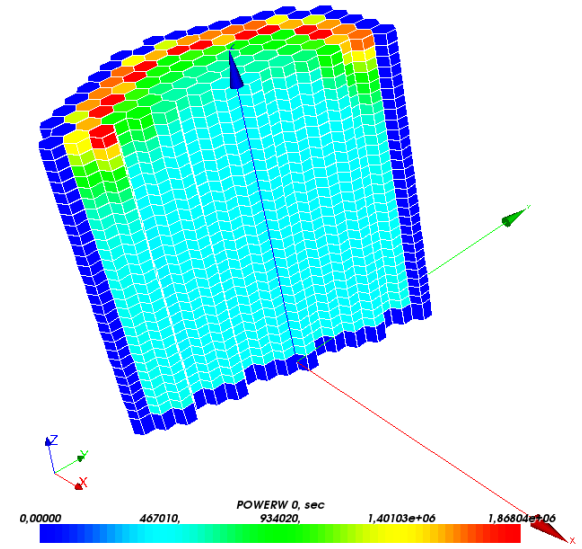
  Mod Dens Boron ppm Fuel Temp Mod Temp

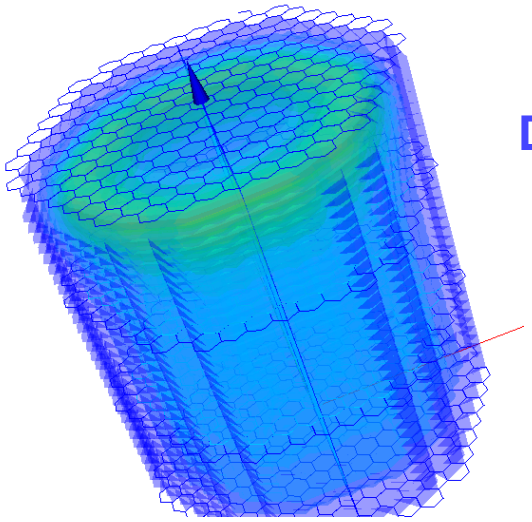
– 2. The IDF are now sorted differently, now it comes first all the surfaces for Group 1 and then all the surfaces for Group 2 [S1 (G1 G2) S2 (G1 G2) S3 (G1 G2)]. In the previous file, it was, first surface 1 with the 2 groups, then surface 2 and then surface 3 [G1 (S1 S2 S3) G2 (S1 S2 S3)].

– 3. The kinetic parameters are also changed. Now Betas come before the lambdas and the **lambdas does not have TH dependence but the Betas does**.

Issues with the EXTENDED library

- **After the last SP1 meeting**
  - Another version was release the **19.3.2015** fixing the kinetics parameters. Revision v2.10.
    - xs_v2.10_ntab2_JSe_sc1.lib
    - xs_v2.10_ntab2_JSe_sc2.lib
  - DYN3D reading subroutines were readapted and first results were produced. Preliminary results were wrong.





DYN3D r818 + IQWS 29

Power displaced to the top of the core in the axial layer 29 and 30.

Issues with the EXTENDED library

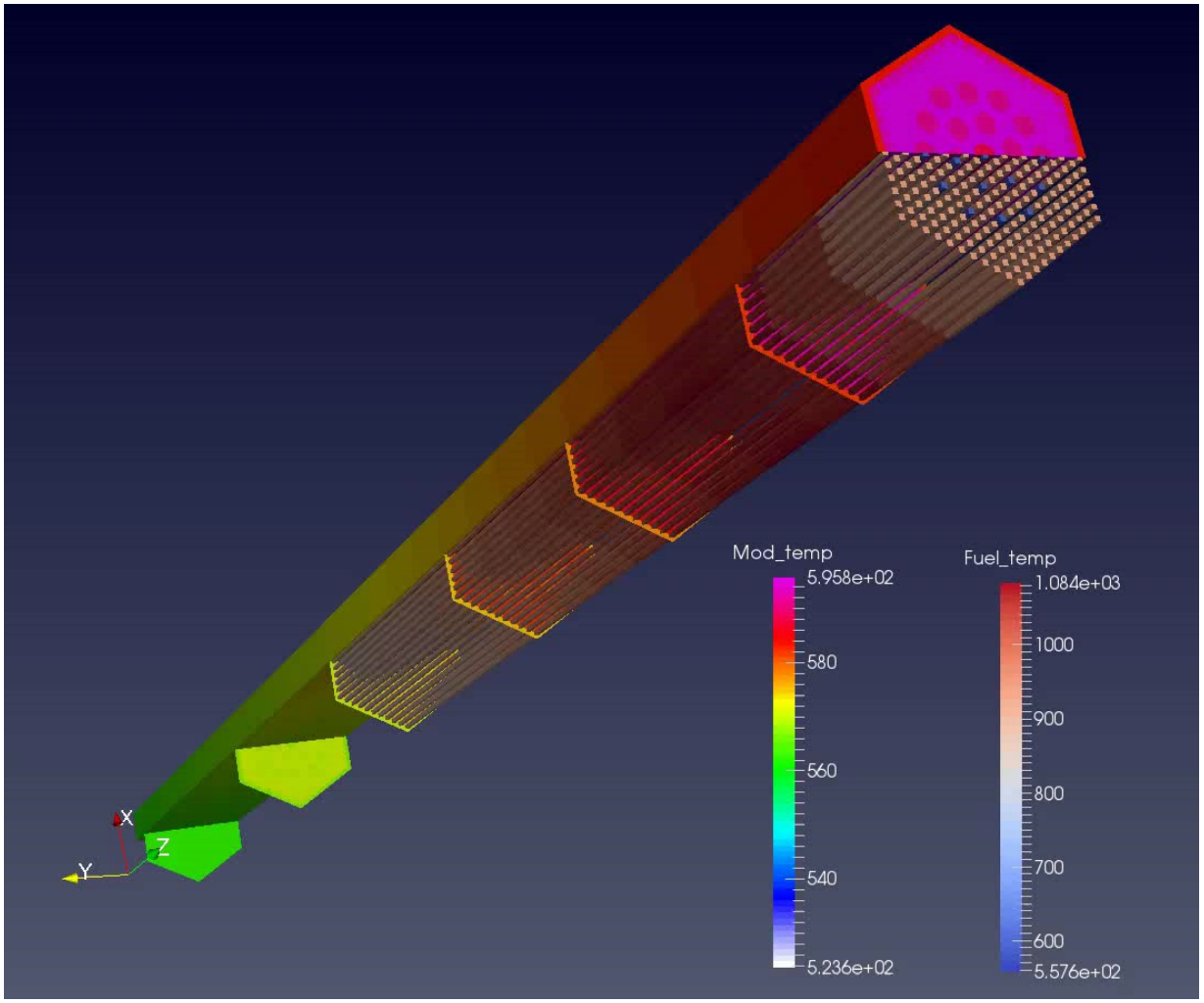
- **Additional WP1.4 meeting in Madrid (19.5.2015)**
- **The 5.6.2015 a new release of the extended library is done**
  - xs_v2.11_initial_format_sc1.lib
  - xs_v2.11_initial_format_sc2.lib
- **UPM has produced results using the last version of the extended library with and without IDF.**
- **A comparison between COMPACT and EXTENDED format was prepared by UPM and will be presented in this meeting.**
- **Those new libraries in the so called "initial format" are not readable by DYN3D r818 + IQWS 29**

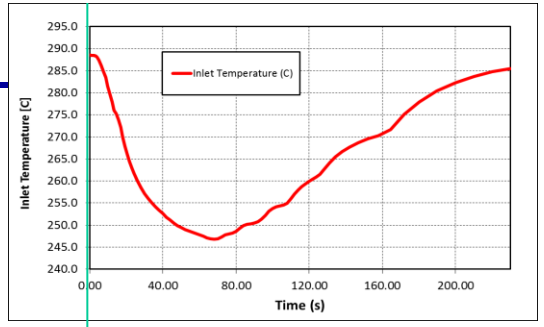
Hot Channel calculation with SUBCHANFLOW

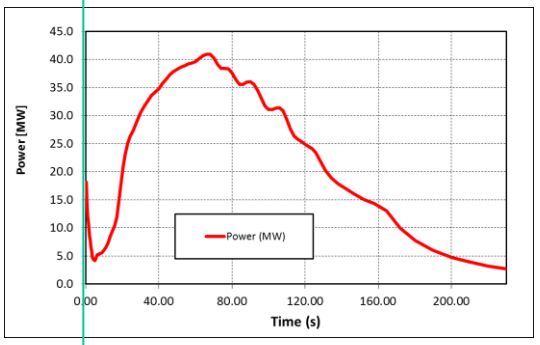
KIT contribution at subchannel level

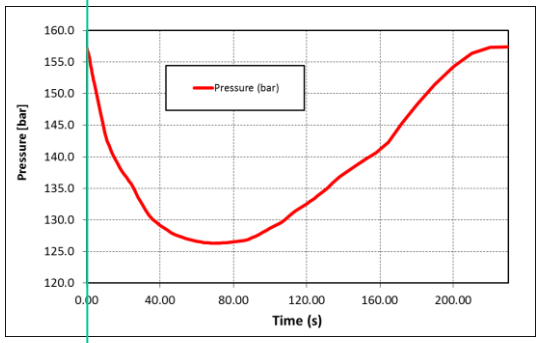
SUBCHANFLOW HOT CHANNEL BUNDLE BC PROBLEM

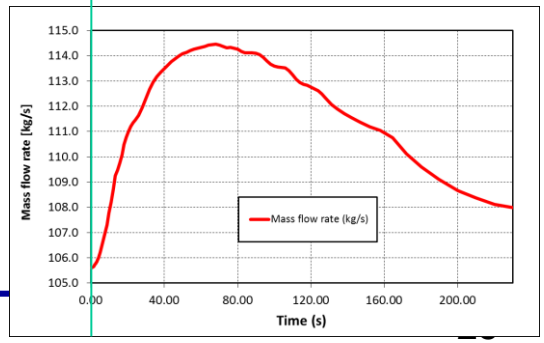
Coolant and fuel Doppler (0.7 T_s+0.3 T_c) temperature











Conclusion and Outlook

- Good results obtained with the COMPACT format of the library.
- HZP results showed good agreement between COBAYA3 and DYN3D.

FUTURE WORK

- Re-adapt DYN3D to the new EXTENDED library format and proceed with the simulations.
- Perform coupled solutions for the steady states and transient for both libraries.

THANKS FOR YOUR ATTENTION