



Cavity interfaces, handling and transportation

PIP-II technical workshop 2022

July 13th, 2022

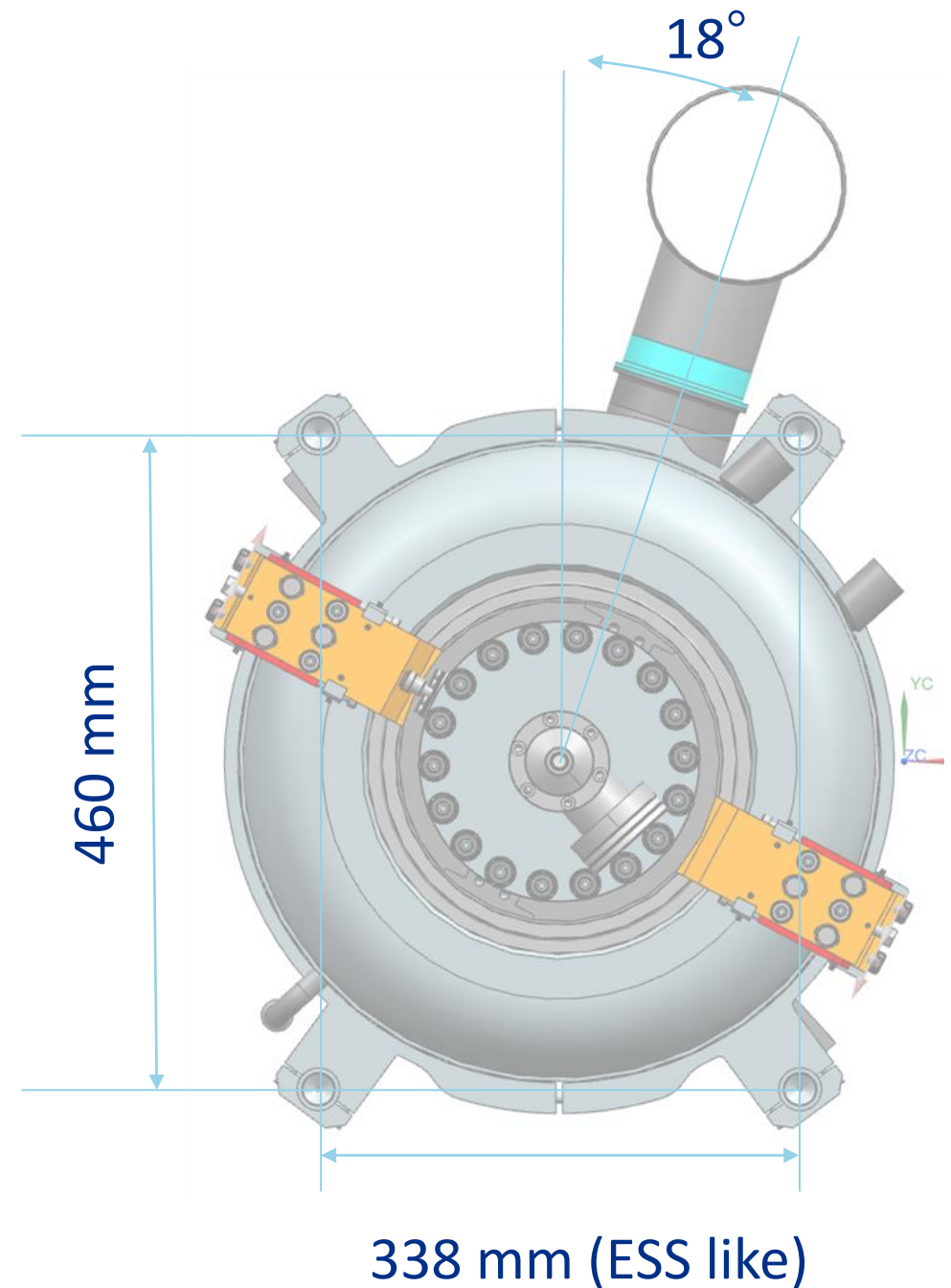
Moving cavities inside labs

ESS frame has a squared 4-rod design (388 x 388 mm).

«Tee» 2-phase pipe will be on the cavity upon VT, this significantly increase the cavity “cross section”.

The external surface of the tank is full of pipes and blocks and it resulted impossible to use the same ESS rod configuration without interferences between parts.

We proposed both for the **naked and jacketed LB650 cavity** to use the very same squared 4-rod frame layout with different collars: mirror-symmetric but not square. (338 x 460 mm).



Moving cavities inside labs

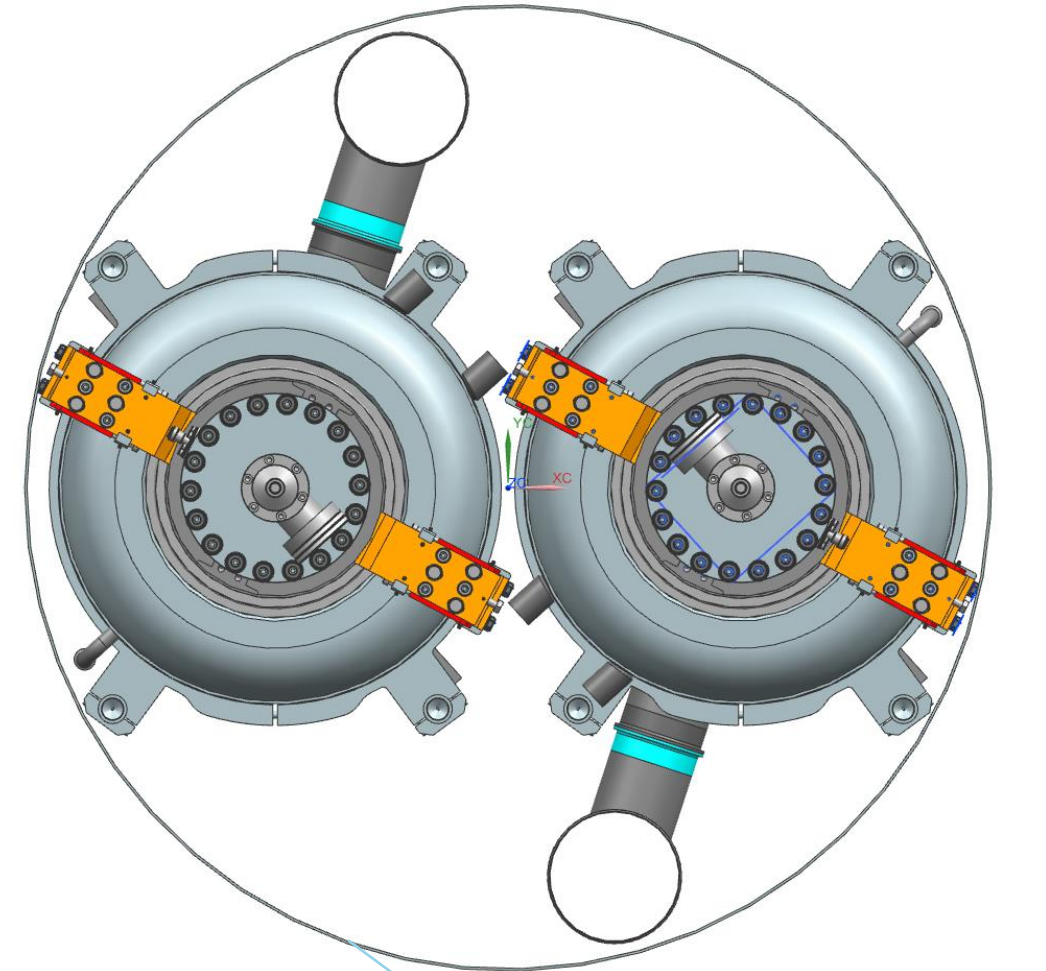
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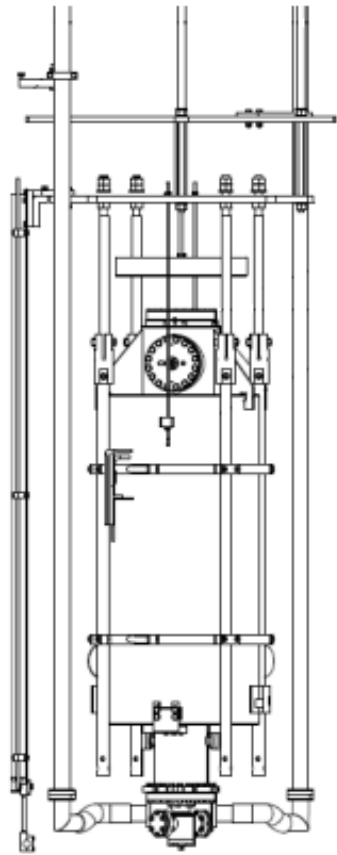
This configuration works good both for LASA (s) and DESY cryostat.



1000 mm diameter
Clearance
(Desy cryostat)

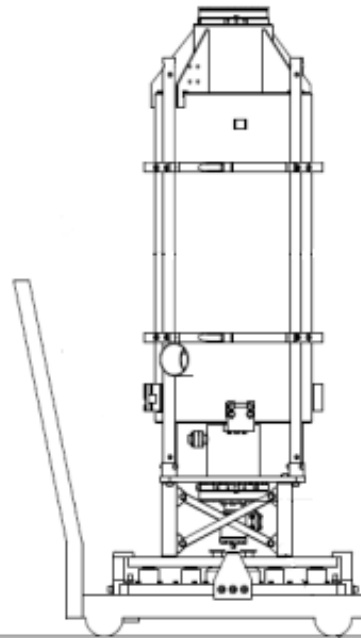
Moving cavities inside labs

Possible layout of tooling (same strategy as ESS)

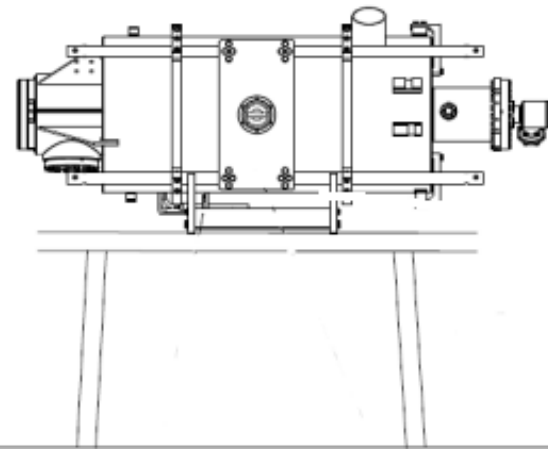


Installation in vertical insert

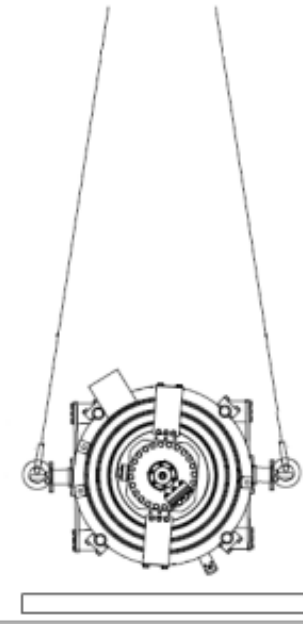
Lifting and positioning with pallet truck



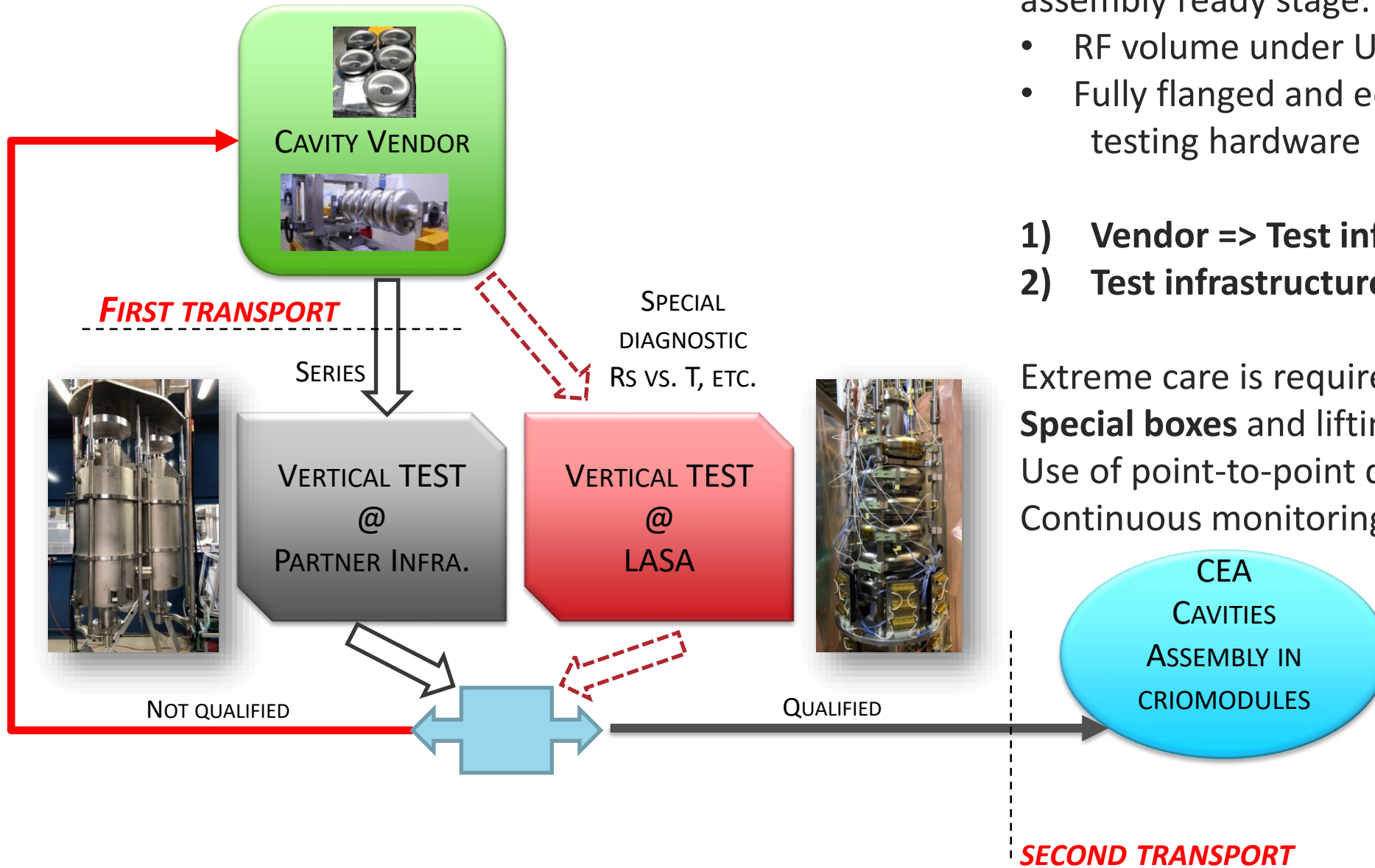
Incoming inspection



Delivery box
Removal with load handling device



Moving cavities through labs



2 sensitive transports with cavity at string assembly ready stage:

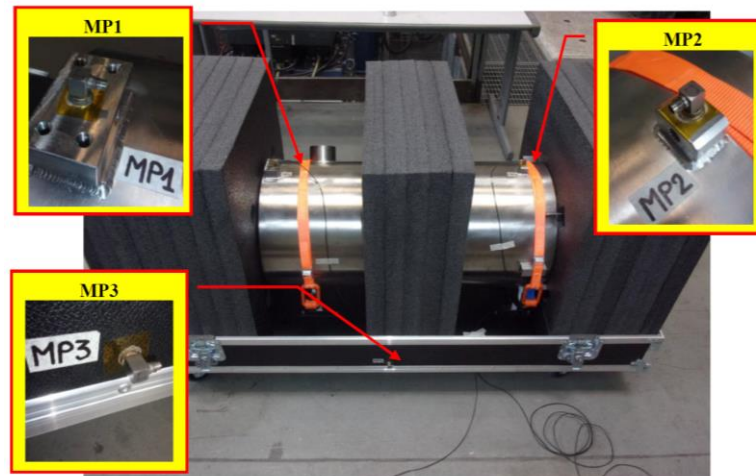
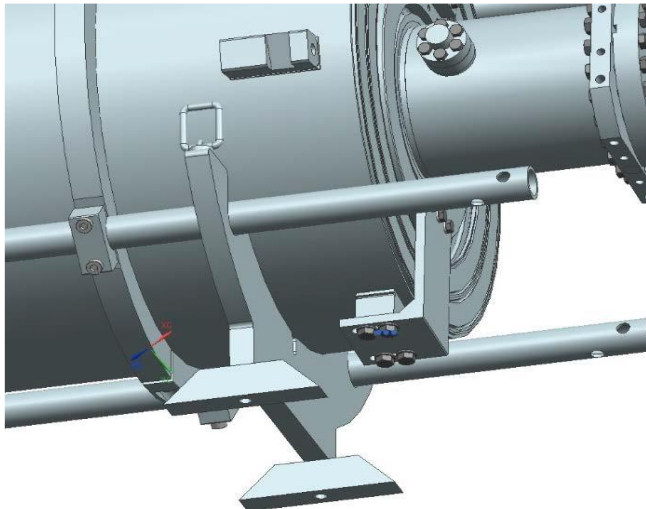
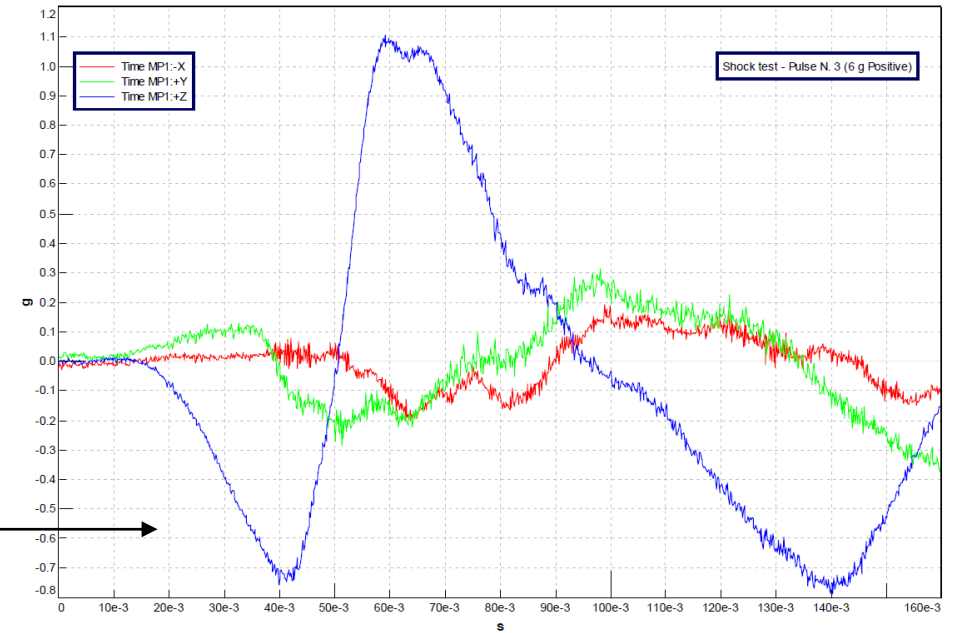
- RF volume under UHV
- Fully flanged and equipped with testing hardware

- 1) **Vendor => Test infrastructure** (on vendor)
- 2) **Test infrastructure => CEA** (on INFN)

Extreme care is required for a safe handling:
Special boxes and lifting tools
 Use of point-to-point dedicated shipment
 Continuous monitoring via shock-loggers

Moving cavities through labs – ESS experience

- Series boxes tested on a vibrating platform
 - Cavity mockup,
 - 2 h duration equivalent to 1600 km road transport
 - Spectral analysis before and after, **single impulse test up to 6 g**
 - Successful results:
 - Modal frequency lowered to 7 Hz (10-15 Hz for EXFEL)
 - 6-8 shock damping factor (2-3 for EXFEL)
 - Identical before/after spectra



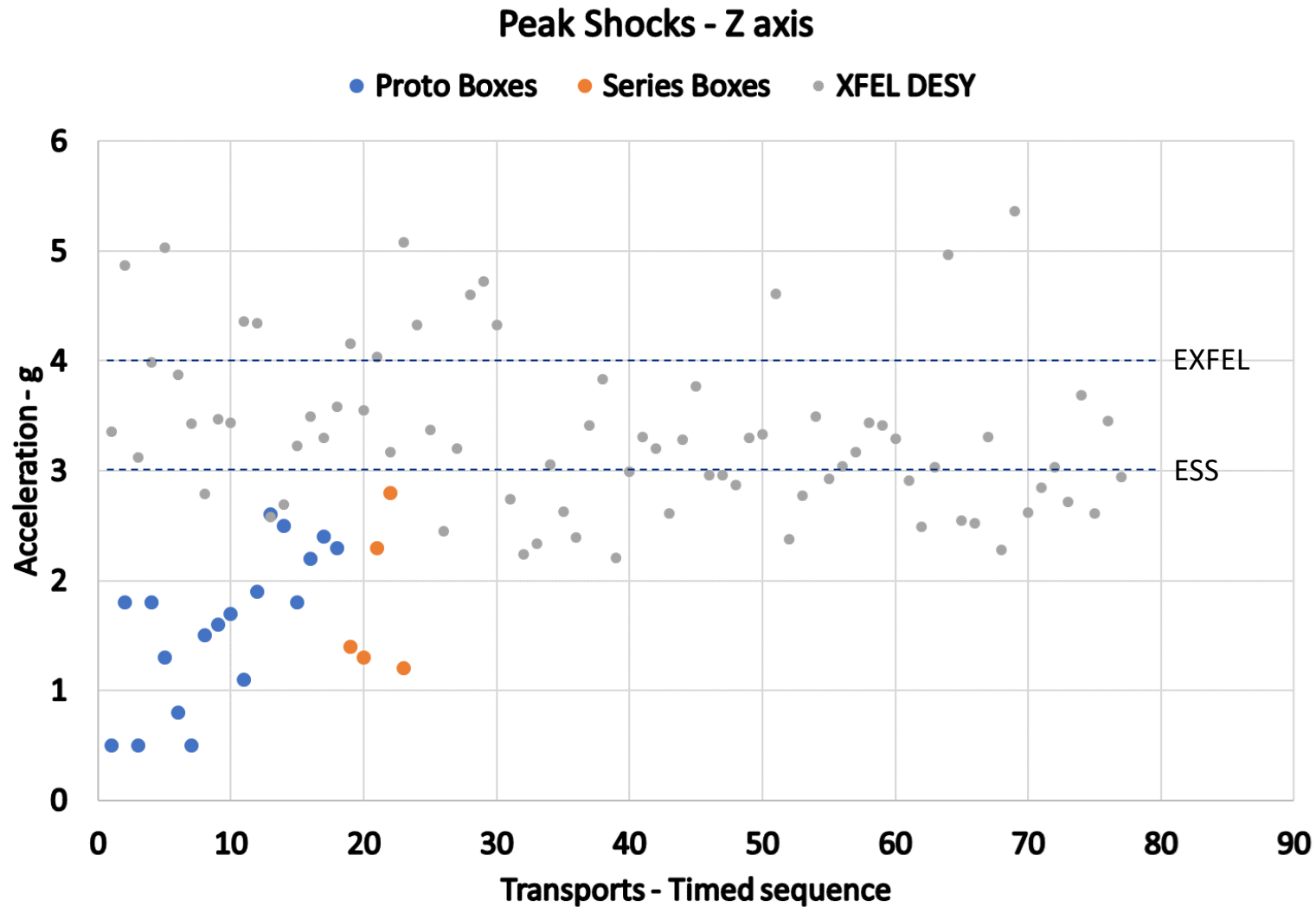
Moving cavities through labs – ESS experience

30 cavities transported so far:

- Av. Z peak 1.6 ± 0.7 g
- Av. X, Y peak 1.0 ± 0.5 g

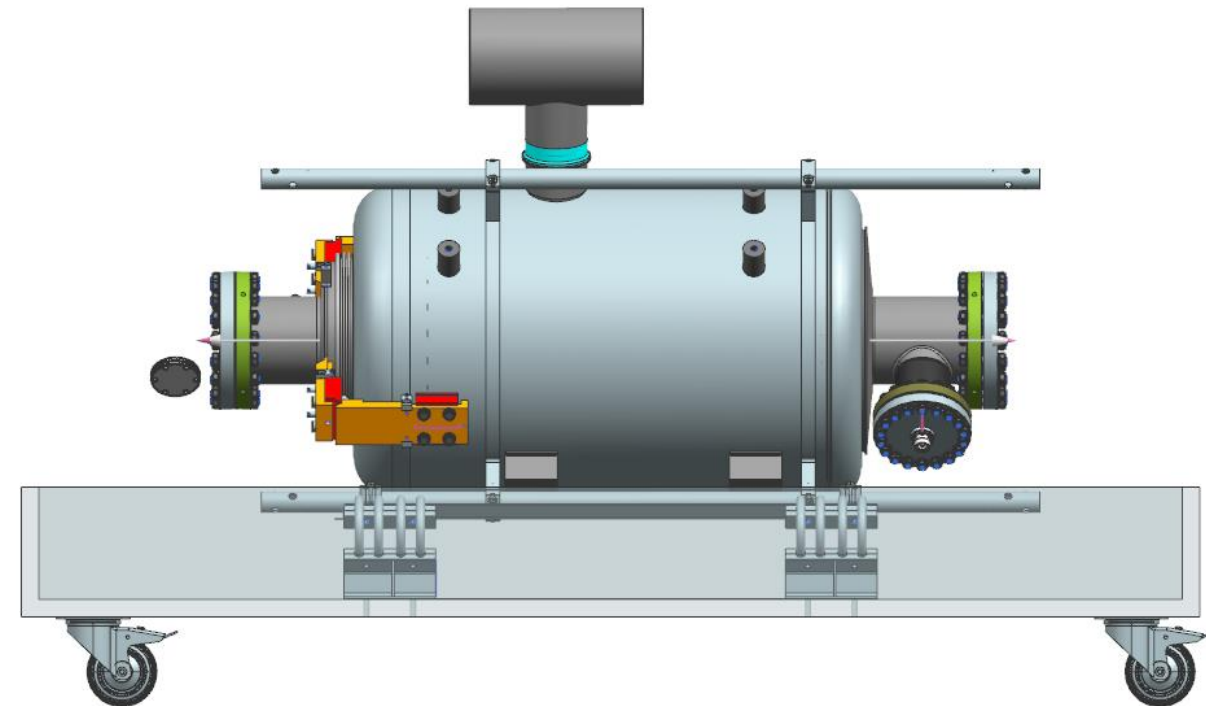
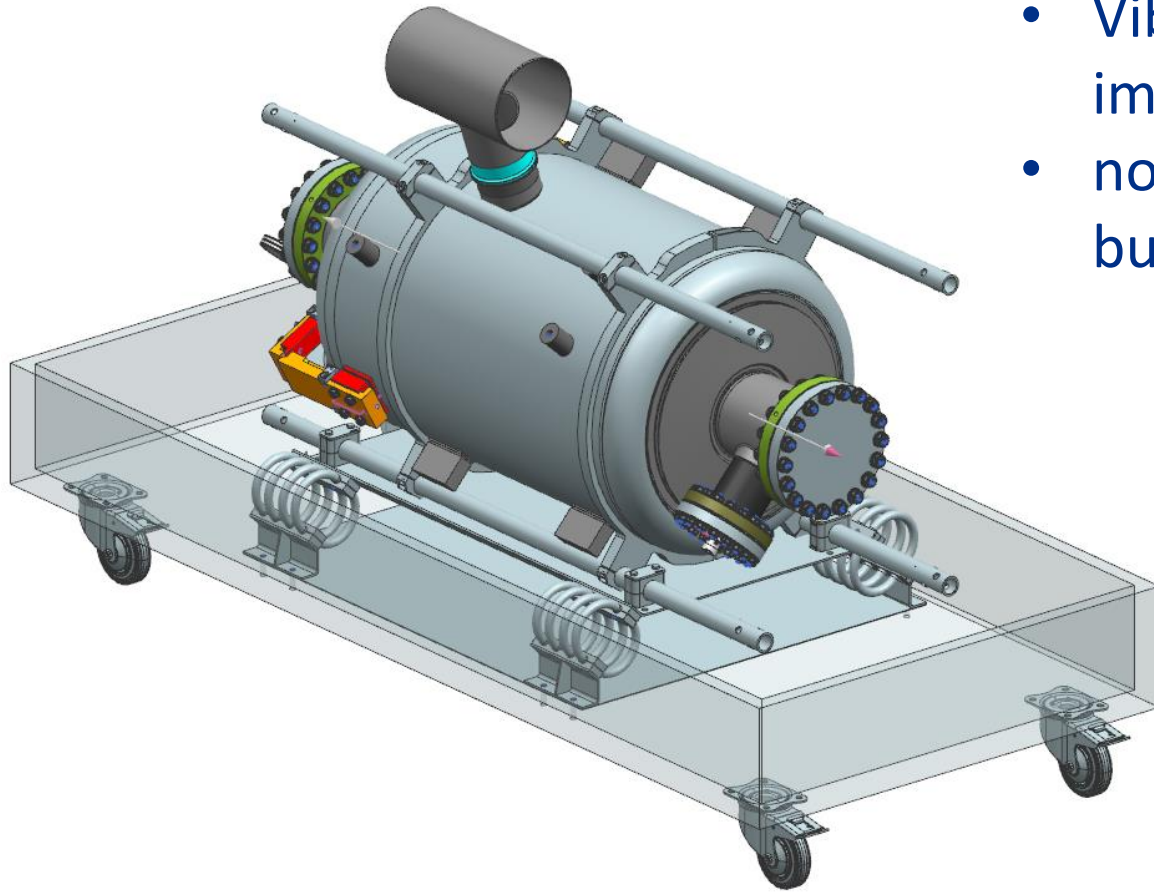
Acceptance levels for ESS:

- -2 g < acc. < 4 g for Z
- -3 g < acc. < 3 g for X, Y



Moving cavities through labs – PIP-II proposal

- Vibration and shock dumping system improved with steel wire dumpers
- no more need of stripes or rubber foam bumpers



Cavity interfaces – ESS experience

112 documents are generated for each cavity, 20 of which (listed in the table) are made readily available to the project (ESS + CEA) by INFN

- Plus two raw text files containing selected numerical data (TM, RF spectrum)
- Only few of these are strictly required by CEA to perform string installation

Template name	Description	Acceptance Level	Issued by
X_M02a	Mechanical check after tuning	AI2	Zanon
Y_M01	Mechanical check of Dressed Cavity	AI3	Zanon
Y_TM01	Transfer measurements	AI3	Zanon
Y_P01	Pressure Test after He-Tank integration	AI3	Zanon
Y_L01	Leak check of volume (I) between the inner He-tank and the outer cavity	AI3	Zanon
Y_L02	leak check of volume (II) inner cavity	AI3	Zanon
Y_F07	FF and RF spectrum after all He-Tank checks (w/o brackets)	AI3	Zanon
Y_ESS27	Final Leak Check after Final 12h HPR	AI3	Zanon
Y_C01	Certificate of Conformity (Zanon)	AI3	Zanon
Y_INC01	Incoming inspection at DESY at the arrival	AI4	DESY
Y_F17	DESY Cold Measurements (VT, RF spectrum, HOM)	AI4	DESY
Y_F18	Final RF spectrum before shipping to CEA (in vacuum)	AI4	DESY
Y_OUT02	Outgoing inspection at DESY before delivery to CEA	AI4	DESY
Y_L03	Leak check of volume (I) between the inner He-tank and the outer cavity after VT	AI4	DESY
Y_REF	Reference frequency (HOR, air, no brack, no frame)	AI5	INFN
Y_PC	List of Parts in Circulation	AI5	INFN
Y_DoI	Declaration of Incorporation	AI5	INFN
Y_INC02	Incoming inspection at CEA at the arrival	AI5	CEA
Y_F19	RF spectrum at CEA at the arrival	AI5	CEA
Y_HO	HandOver document	AI5	ESS

Cavity interfaces

