



JT-60SA FILD Project Update

WPSA General Meeting (04-05-2022)

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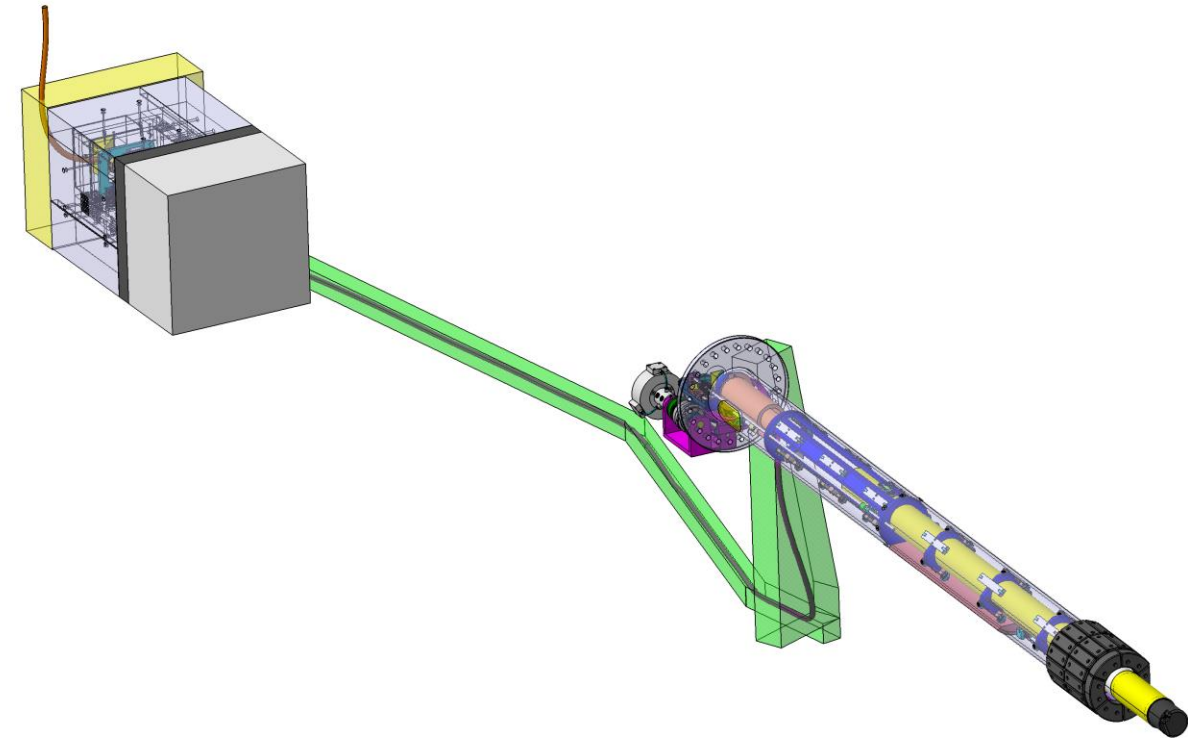
Acknowledgements: T. Nakano, H. Hiroto, S. Sumida



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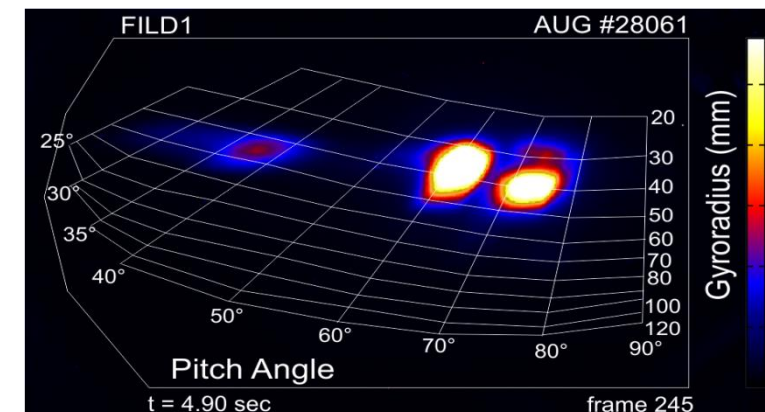
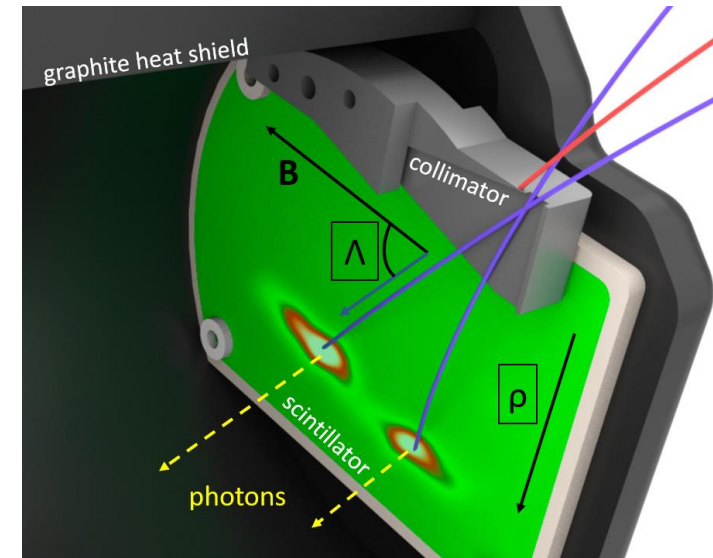
- Brief description of FILD
- Review of 2021 and 2022 progress
- Plans for 2022 and overall schedule



FILD measures fast ions escaping from plasma

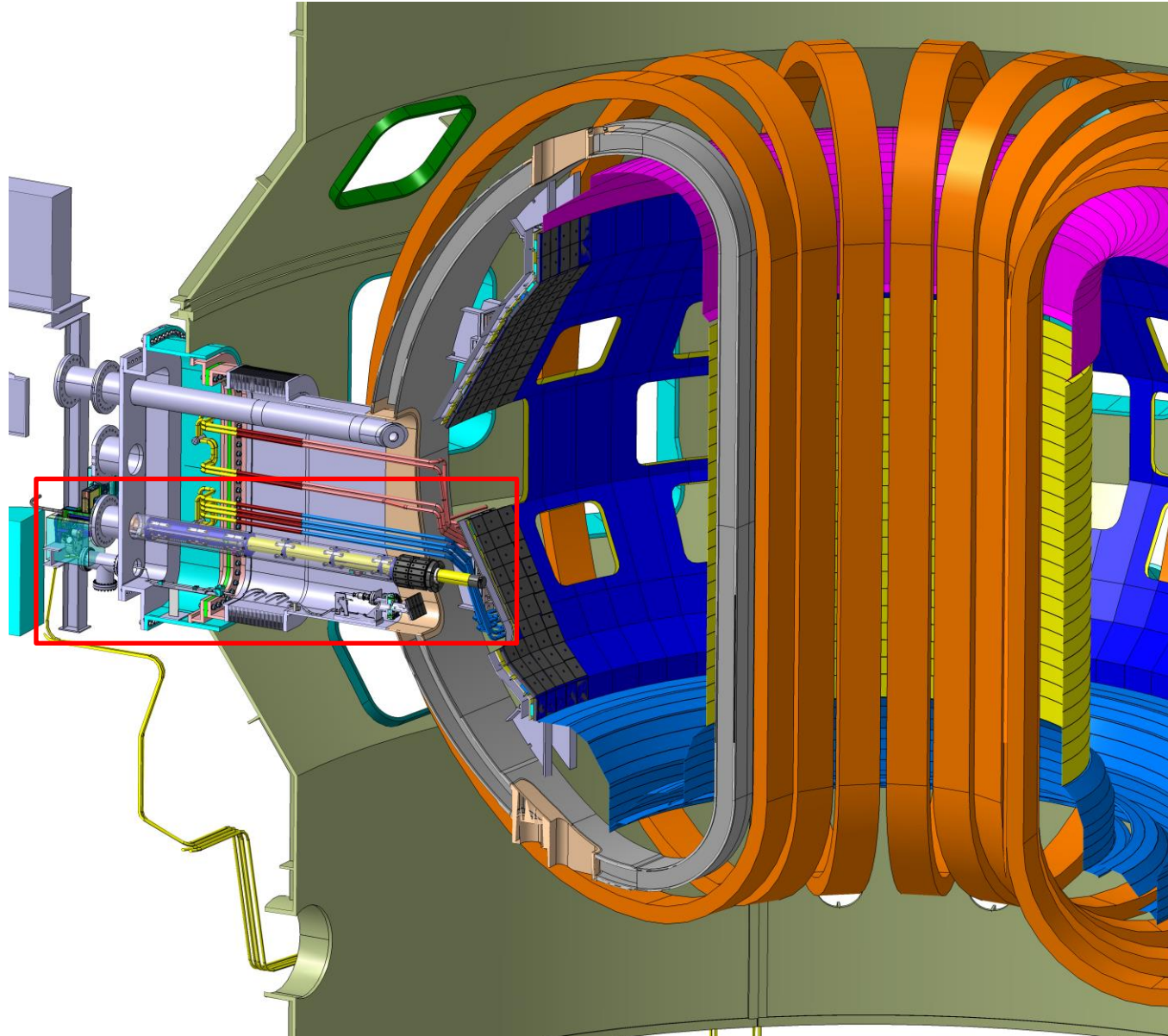


- FILD used in mostly all major devices to study fast ions losses
- Works as a magnetic spectrometer collimating and dispersing ions onto a scintillator plate
- Strike points on the scintillator plate depend on particle gyroradius and pitch-angle
- FILD provides local time-resolved energy and pitch angle measurements of escaping ions
- Allows studying transport mechanisms provoking fast ions losses

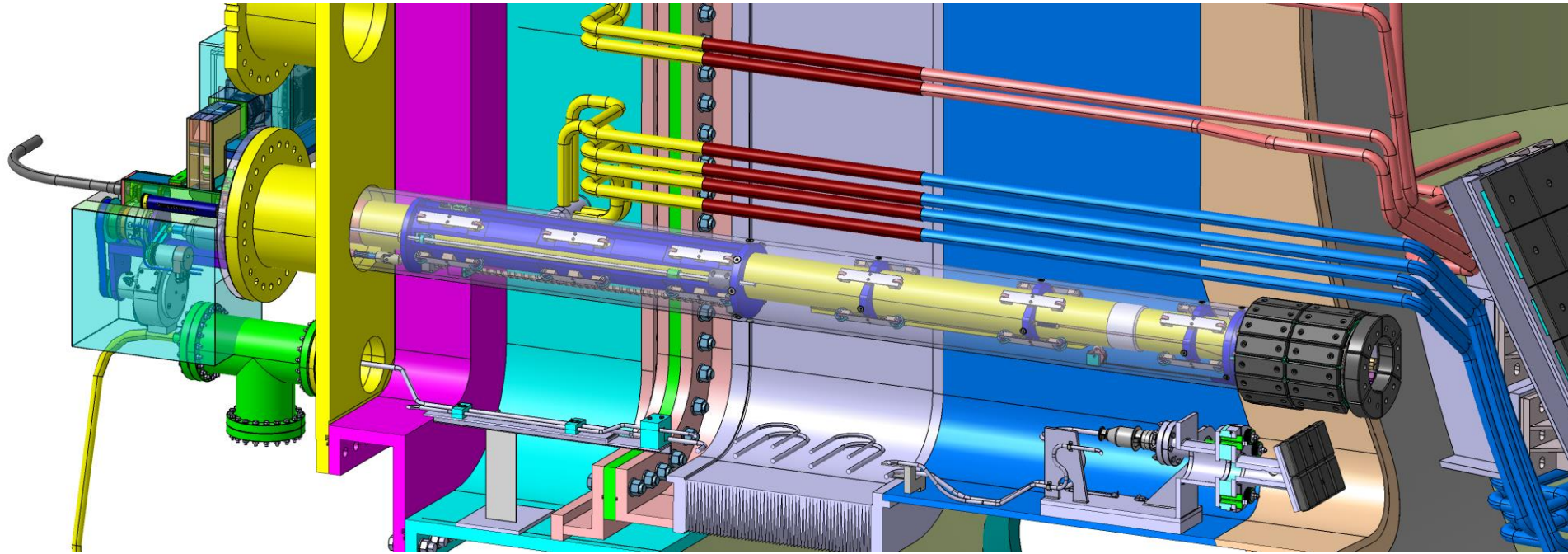


M. Garcia-Munoz, RSI 80 053003 (2009)

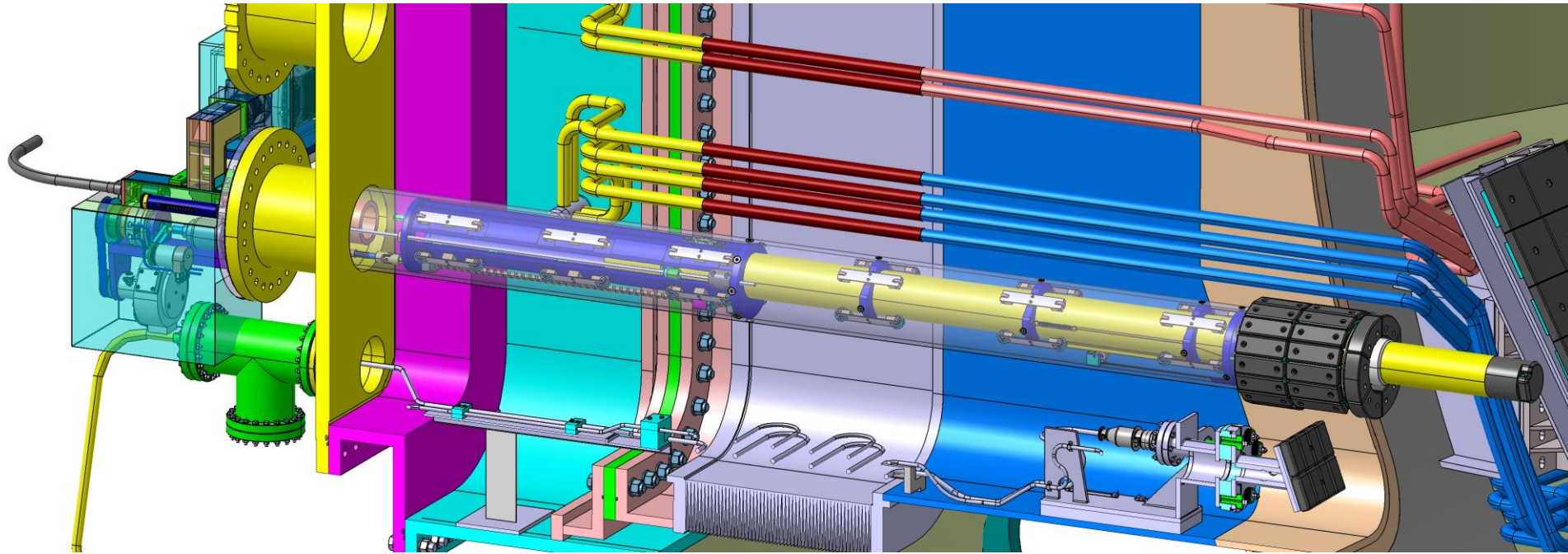
FILD located at equatorial port in Sector 15, slightly below midplane (M/E-2 Diagnostic)



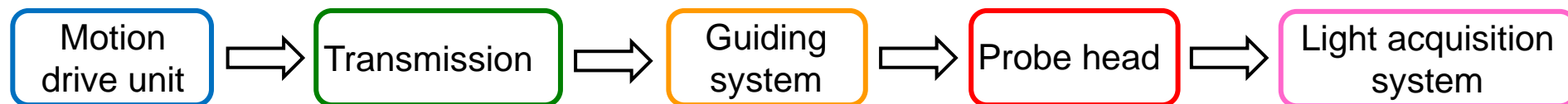
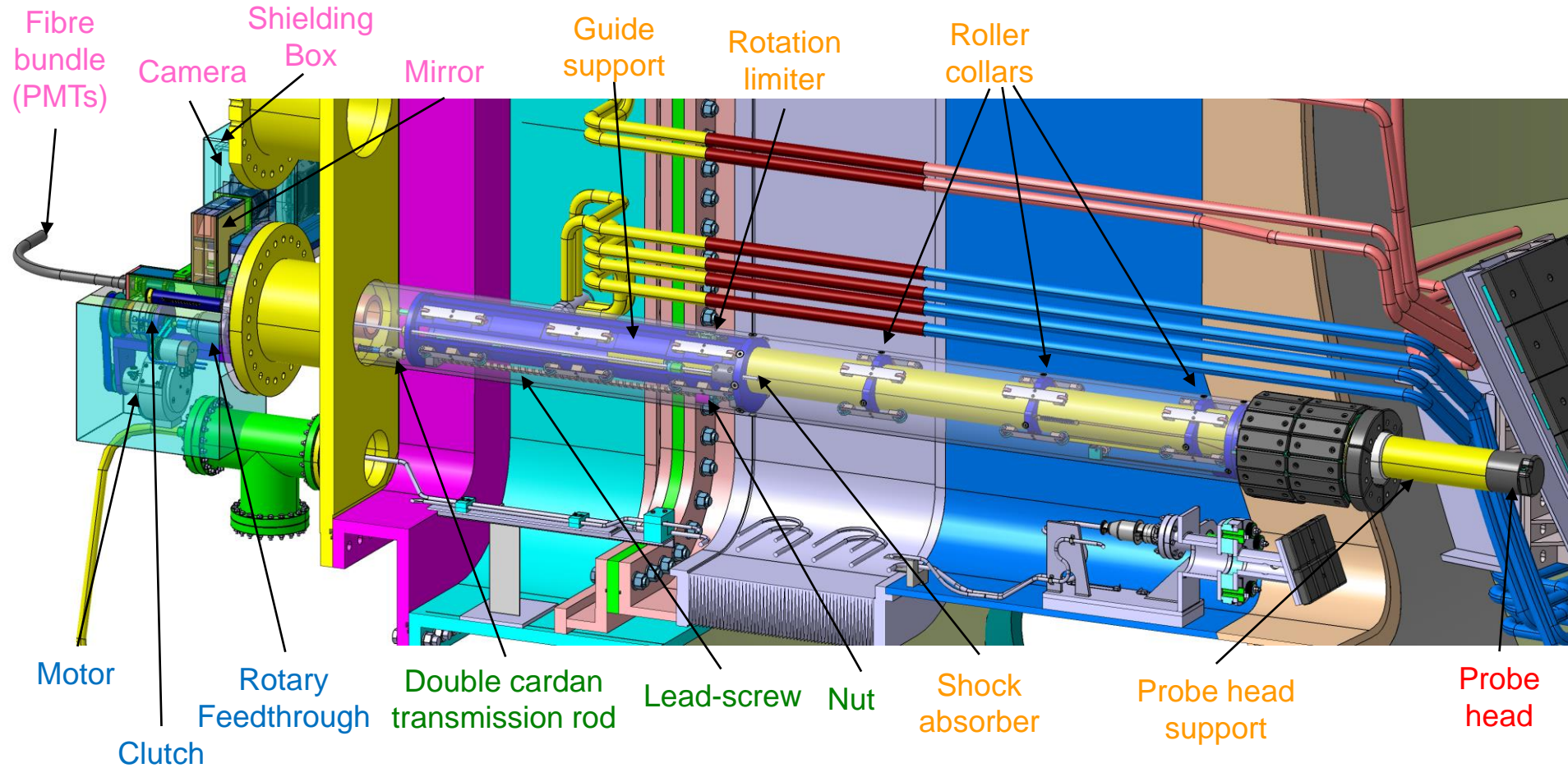
FILD displaces 0.7m stroke moving between parking and measuring positions



FILD displaces 0.7m stroke moving between parking and measuring positions



FILD divided into 5 main sub-systems



FILD subject to 3 Design Review Meetings in 2021: Significant progress in design

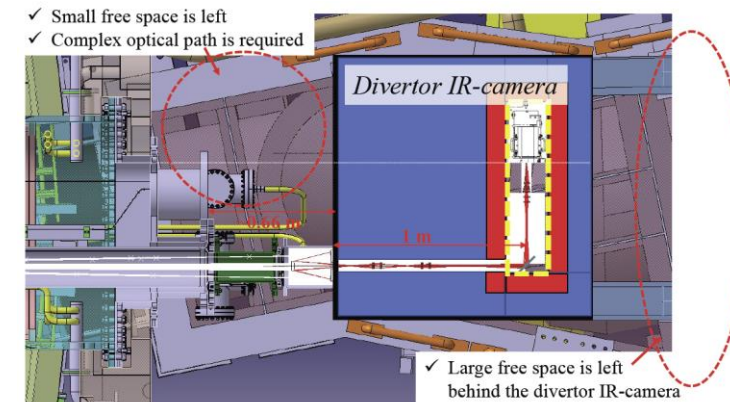


- **DRM01 (01/2021):**
 - Focused on mechanical design and analysis
 - Lots of discussions and some important changes in design
- **DRM02 (07/2021):**
 - Review of updated design and analysis (post-DRM01) + PA
 - Comments on ex-vessel mechanical design (CAD clashes, weight attached to PP flange, pneumatics, connections/grounding, ...)
- **DRM03 (11/2021):**
 - Overview of design and analysis
 - Review of DRM02 actions (completed, ongoing and future)
 - Conceptual design mature enough to move to detailed design phase (discussions needed before start manufacturing)
 - PA reviewed, agreed and uploaded to DMS for signature
 - Comments on camera shielding box (N&G protection)

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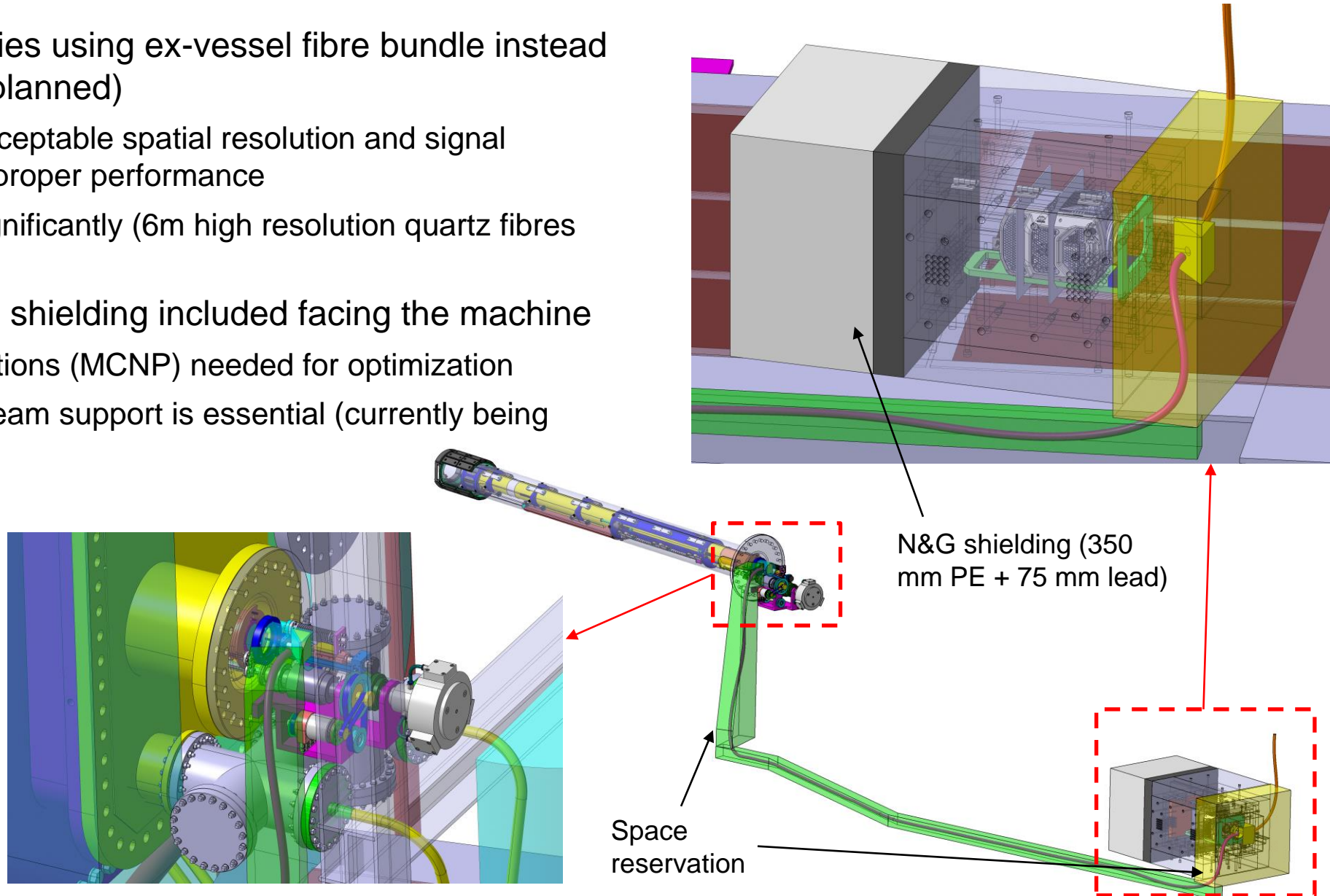
QST recommendation for camera shielding box

- Recommended shielding too thick
- Significant change in ex-vessel layout
- PA signature in stand-by until ex-vessel design complete

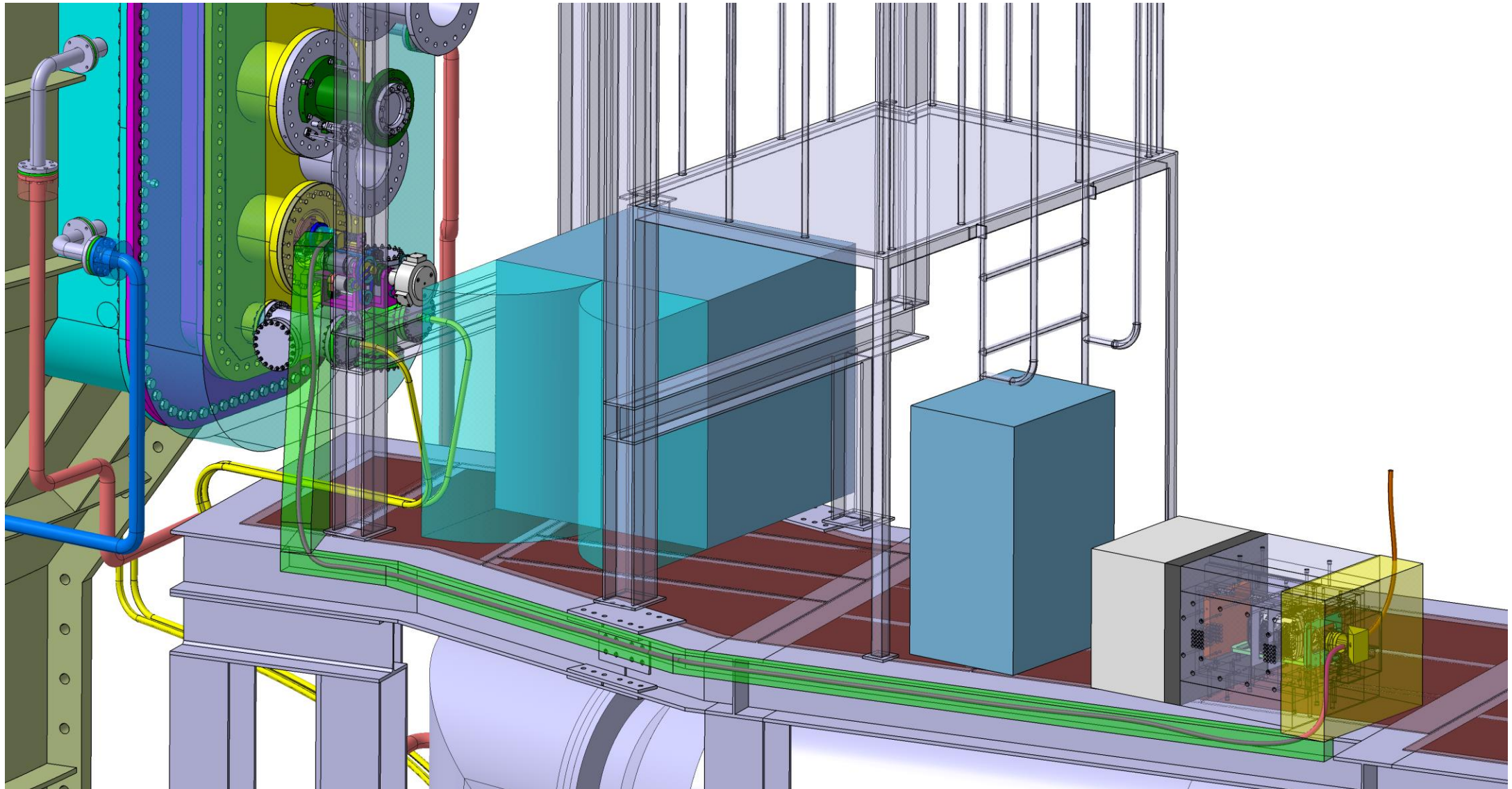
New ex-vessel layout agreed after several iterations with QST during 2022



- Updated design implies using ex-vessel fibre bundle instead of lenses (originally planned)
 - Allows keeping acceptable spatial resolution and signal intensity for FILD proper performance
 - Cost increases significantly (6m high resolution quartz fibres needed)
- Recommended N&G shielding included facing the machine
 - Neutronics simulations (MCNP) needed for optimization
 - WPSA Neutrons team support is essential (currently being defined)



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Plans for 2022 and overall schedule



- N&G shielding design ongoing: neutronics analysis to be performed following specific rules being defined by QST (to be launched in the upcoming weeks)
- Iteration with QST on mechanical design needed to:
 - Complete final design
 - Start manufacturing phase by end of year
- New funding scheme for FILD being defined between EUROfusion and F4E:
 - Hardware to be funded by F4E
 - Manpower to be funded by EUROfusion
 - Expected to be launched during Q3/2022

	2022	2023	2024	2025	2026
PA signature	♦				
Final design	■				
Tenders		■			
Procurement		■			
Accept. tests			■		
Delivery to Naka			♦		
Installation				■ ME-2	
Commissioning					■ OP-3