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WP13 – Category G

Platforms for clean assembly, alignment and tests of accelerator components

I.FAST 2nd annual meeting– 19 April 2023

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Summary of the facilities

	facility
G1. Platforms for the assembly of complete accelerator modules	CEA Saclay
	CERN
	CNRS IJCLab
	DESY
	Uppsala University
	STFC
G2. RF Power Coupler Conditioning and Testing facilities	CNRS IJCLab
	DESY

CEA Saclay

- Two clean rooms for cavity string assembly
  - 124 NORD (112m^2 class ISO4), semi-automated HPR, for XFEL and ESS cavity strings
  - 124 EST (52m^2 class ISO5), fully-automated HPR, for Spiral2, SARAF, R&D
- Cryomodule test stand next to clean rooms
  - 2K and 4K available
  - Cooling capacity of 80W at 1.8K
  - LN2 for 80K thermal screen
  - EuXFEL, ESS, and SARAF
- Plan
  - New cold box to distribute 4.5 K SCHe for PIPII (40 K thermal screen)

124 EST

124 NORD

Cryomodule test stand

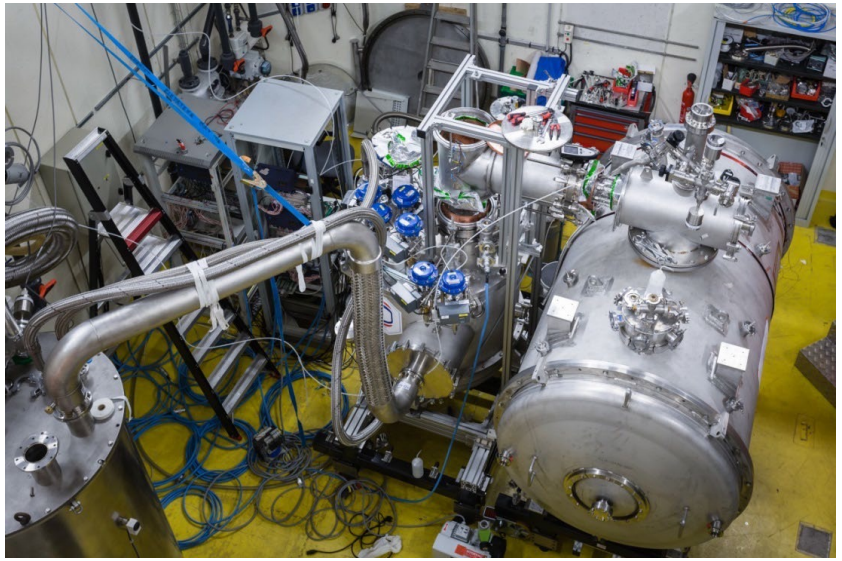
CNRS IJCLab

IJCLab Irène Joliot-Curie Laboratoire de Physique des 2 Infinis

- One clean room for cavity string assembly
  - 45m^2 class ISO4
  - HPR
  - Short cavity string up to 3.5 m
- Cryomodule test stand
  - MINERVA prototype cryomodule
  - Not offered to external users
- Plan
  - ESS cryomodule until mid of 2023

Clean room

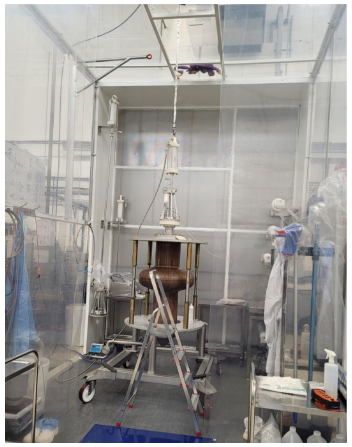
Cryomodule test stand



CERN

- Clean rooms (booth)
  - Bat252: ISO4 & LPR (7 bar) for Nb-coated cavities
  - SM18: ISO2(static)/ISO4(operation) & HPR (100 bar)
- Two horizontal bunkers at SM18
  - M7 HL-LHC crab cavity cryomodules
  - M9 LHC cryomodules, HIE-ISOLDE cryomodules
- Present activities
  - M7 is fully occupied by on-going projects (HL-LHC)
  - M9 is reserved for HIE-ISOLD and LHC spare modules
- Plans
  - New control system in M9
  - HL-LHC crab cavities in coming years
  - Spare HIE-ISOLDE cryomodule
  - Prototype FCC cryomodule (?)

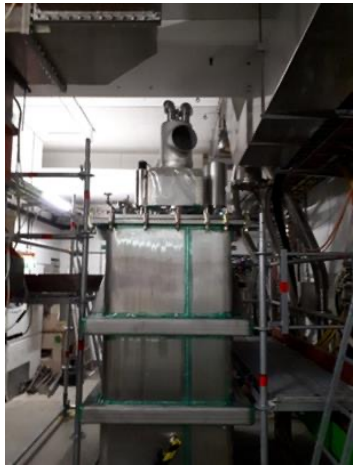
Horizontal clean booths



Clean room

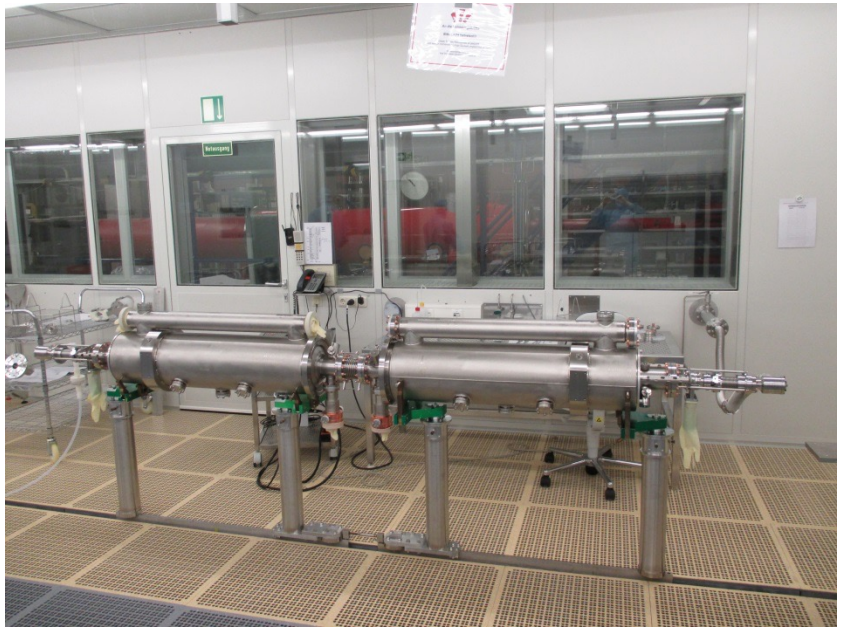
M7

M9



DESY

- Clean rooms
  - 300m^2 ISO4/ISO6
  - BCP, EP, HPR, UHV furnace
  - Mainly for modules with 1.3 GHz 9-cell 8 cavities
- Four cryomodule test stands
  - Originally for EuXFEL modules
  - CMTB: 1.3 GHz modules
  - 3 AMTF test benches
    - One is for 1.3 GHz only
    - Another is optimized for 1.3 GHz & 3.9 GHz module
    - The other is prepared for SRF Gun R&D
- Plans
  - Module test facility is reserved for internal activities at DESY
  - Service contract might be possible



Uppsala

UPPSALA UNIVERSITET

- Cryomodule test stand dedicated to ESS so far
  - WR2300HH waveguides & 6-1/8” coaxial line
  - Valve box dedicated to ESS spoke modules
  - Cooling capacity 90W at 2K
  - 80 K LN2 for cooling thermal screen
- Present activities
  - ESS cryomodule until mid of 2023
  - Conflict with cavity testing projects due to limited cryogenic capacity
- Plans
  - Adaptation for a new project
  - Cryogenic update including a SCHe line (?)

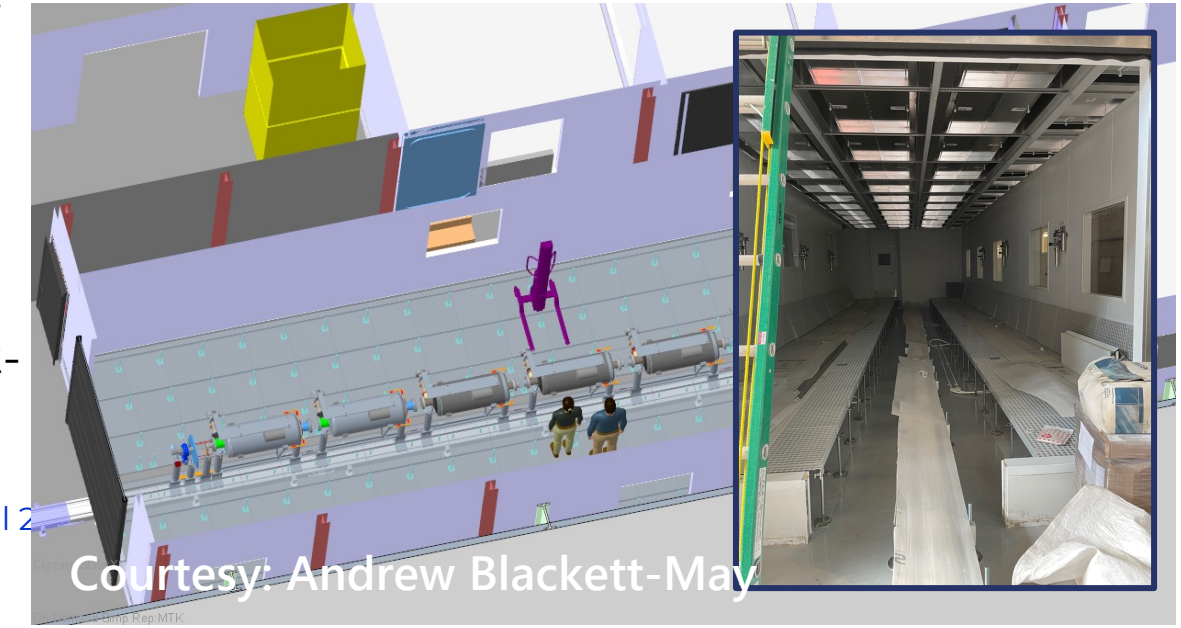
STFC

UKRI Science and Technology Facilities Council

- Present capabilities
  - Two inserts for horizontally mounted cavities
  - One vertical test stand (ϕ1500)
  - Cooling capacity up to 100W at 2K
  - ISO6/5/4 clean rooms with HPR system
  - 704 MHz ESS high-β cavities
  - 650 MHz PIPII high-β cavities
- Present activities
  - HL-LHC crab cavity (RFD) module assembly
  - Major upgrade: clean room (ISO4, 14x4.5m) for PIP-II B650 MHz cavity string integration
- Plans
  - Cryomodule assembly for PIPII
  - New inserts for thin-film cavities of various frequency and geometry
  - Facilitate all development toward X-FEL, short-pulsed neutron source

HL-LHC RFD cavity string

New clean room for PIPII



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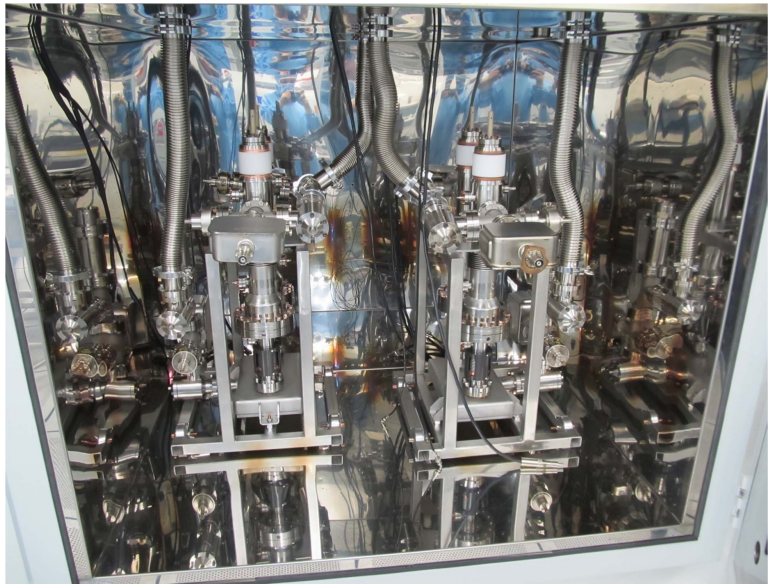
CNRS IJCLab (coupler)

- Clean room for coupler preparation
  - Ultrasonic cleaning (ISO6)
  - Clean assembly (ISO4)
  - Baking up to 200C (ISO5)
- Coupler conditioning bench
  - 1.3 GHz klystron 2 MW and 5 MW pulsed
  - 352 MHz SSA 80 kW CW
- Activities
  - 60 TT3 power couplers for DESY
  - 850 couplers for EuXFEL
  - 40 couplers for ESS spoke cavities
  - Prototype MINERVA spoke cavities
- Plan
  - Cleaning, assembly, and conditioning of series couplers of MINERVA spoke cavities

Coupler baking in clean room

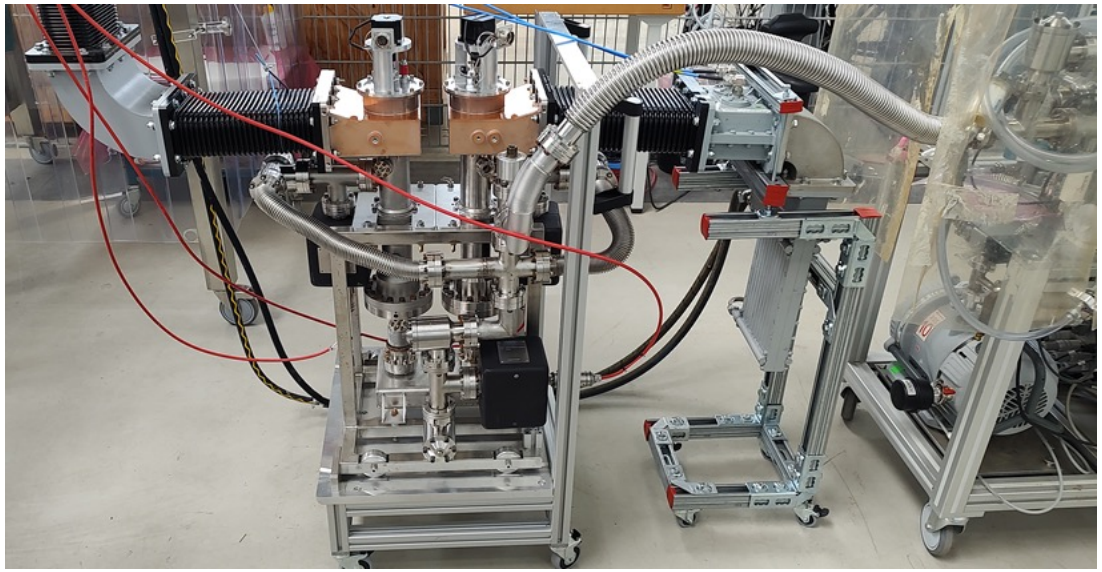


Coupler conditioning bench

DESY (coupler)

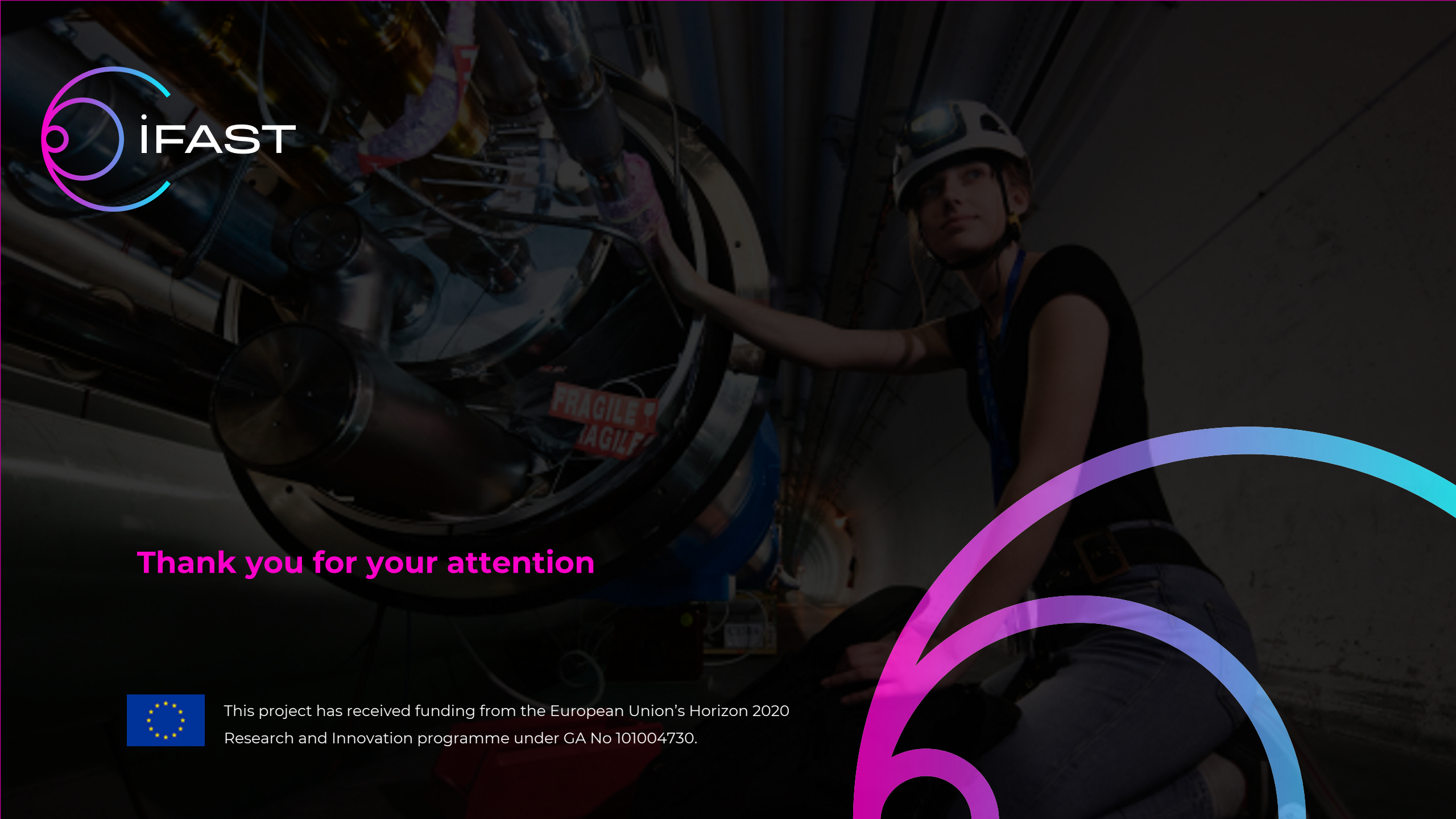
- Coupler conditioning bench at 1.3 GHz
  - 1.3 GHz power coupler of XFEL or FLASH type
  - Pair of coupler on waveguide boxes
  - Klystron 5 MW >1 ms 10 Hz
- Coupler conditioning bench at 3.9 GHz
  - Under preparation

Coupler conditioning bench



Conclusion

- AMICI core team + CERN operates assembly facilities
  - In-house projects, European research projects, American projects
- Large multi-lab projects are more and more based on in-kind contributions
  - Networking laboratories and industries are critical
  - Companies are taking over assembly duties
- AMICI (+CERN) offers services to industry
  - Knowledge and technology transfer



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Thank you for your attention

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backup

Roadmap for the strategic evolution and development of the AMICI TI : in bold, the leaders of the group

Categories	Sub-categories	Partners
A. Facilities for beam tests of accelerator components		UKRI (A. Gleeson) + IFJ-PAN (**D. Bocian** + J. Swakon) + INFN-LNF (A. Liedl)
B. Test stations for magnets	B.1 - Test stations for superconducting magnets	INFN (L. Sabbatini + G. Bisoffi) + CEA (**R. Vallcorba Carbonell**) + CIEMAT (L. Garcia Tabares) + UU (T. Ekelof + T. Bagni)
	B.2 - Test stations for normal conducting magnets	
	B.3 - Magnetic measurement facilities	
C. Test stations for RF equipment	C.1 - Test stations for superconducting cavities	DESY (**H. Weise**) + UU (A. Miyazaki) + INFN (D. Alesini) + CEA (H. Jenhani) + CNRS (W. Kaabi)
	C.2 - Test stations for normal conducting cavities	
D. Test stations for High Power RF components	D.1 - RF wave guides	**UU (D. Dancila)** + KIT (C. Widmann) + CIEMAT (Daniel Gavela)
	D.2 - RF power sources	
	D.3 - Power transistors	
	D.4 - High power amplifiers	
	D.5 - Solid State Power Amplifiers with their combiners and control system	
E. Test stations for mechanical manufacturing and tests (at cryogenic temperatures)	will become a subsection of F (renamed E)	CEA (**R. Vallcorba Carbonell**) + KIT (C. Widmann) + UKRI (A. Gleeson) + IFJ-PAN (Blazej Skoczen)
F. Platform for characterization, treatments and test of materials	F.1 - Thermal treatment platforms	CEA (F. Eozenou) + CIEMAT + **CNRS (W. Kaabi)** + INFN-LNL (G. Bisoffi) + IFJ-PAN (Jaromir Ludwin)
	F.2 - Chemical treatment platforms	
	F.3 - Facilities for surface analyses	
	F.4 - Electromagnetic, mechanical, thermal and associated material characterization Platforms	
G. Platforms for clean assembly, alignment and tests of accelerator components	G.1 - Complete accelerator modules	CEA (H. Jenhani) + CNRS (W. Kaabi) + DESY (**H. Weise**, R. Wichmann) + UU (A. Miyazaki)+ UKRI (A. Gleeson)
	G.2 - RF power couplers	
H. Platforms for Manufacturing, treatments and test of Magnet components for accelerator		**CEA (S. Roux)** + IFJ-PAN (Jacek Swierblewski)