This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under GA No 101004730.

Co-innovation in I.FAST and beyond: the vision of an industrial partner

I.FAST Accelerator-Industry Co-Innovation Workshop

3-4 May 2022 / CERN Globe Geneva

Raffaella Geometrante / Kyma SpA

iFAST

Kyma in I.FAST

- Task 7.2 - Enabling technologies for ultra-low emittance rings
- Task 7.3 - Variable Dipole for the upgrade of the ELETTRA storage ring
- Task 11.3 - Permanent Magnet Quadrupoles & Combined Function Magnets for Ultra Low-Emittance Rings

Task 7.2 - Enabling technologies for ultra-low emittance rings

KIT, DESY, CERN, SOLEIL, DLS, INFN, PSI, KYMA

- **Organisation of general and topical workshops** on the specific technical challenges, **support exchange of staff for visits and common experiments** to **strengthen the networking activity in the accelerator community** on topics related to the major technological challenges faced in the design, construction and operation of ultra-low emittance rings- It is divided in five sub-tasks:

1. Novel injection schemes in small dynamic apertures (PSI, SOLEIL).
2. Advanced magnet concepts (CERN, KYMA) to develop dipoles with longitudinal gradient, permanent magnet (PM) dipole and quadrupole for green facilities with high gradient small apertures magnets, combined PM multipoles (e.g. sextupoles and octupoles) for space saving, PM magnets with a large tuning range, alignment of complex structures.
3. Vacuum systems in small apertures (DLS, SOLEIL, CERN).
4. RF and diagnostics for beam control of ultra-low emittance rings (INFN).
5. Experimental tests (KIT, CERN) to be carried out on the main technical challenges. Impedance, NEG characterization (SOLEIL, DLS, KIT), injection, beam based alignment

First results:

- "**Beam Diagnostics and Dynamics in Ultra-low Emittance Rings**", April 25-29 2022 organized by the Karlsruhe Institute of Technology (KIT), Institute for Beam Physics and Technology (IBPT) - Ref. Akira Mochihashi

Task 7.3 - Variable Dipole for the upgrade of the ELETTRA storage ring

CERN, CIEMAT, ELETTRA, KYMA

Fabrication of a magnet prototype based on an innovative dipole magnet design with longitudinal varying dipole field, including a transverse gradient. The study demonstrated the reduction of horizontal emittance.

First results:

- adaptation of concept used for CLIC damping rings to lattice of ELETTRA 2.0 and optics calculations for the storage ring Multi-Bend Achromat (MBA) cell
  - **“Longitudinally Variable Dipole” / Yannis Papaphilippou / Thu May 5, 09:35**

Next steps:

- magnetic and mechanical design, based on the experience already gained by CIEMAT
- manufacturing by KYMA
  - The prototyping and acceptance tests will shape the industrialisation procedure towards a **series fabrication** of such an innovative magnet device and its full inclusion in the upgrades of ELETTRA and of other synchrotron light sources.

Task 11.3 - Permanent Magnet Quadrupoles & Combined Function Magnets for Ultra Low-Emittance Rings

UKRI, DLS, KYMA

Two prototypes to be designed and built:

1. Permanent Magnet (PM) based quadrupole with parameters suitable for the strong focusing quadrupoles.
2. PM-based combined function magnet with dipole and quadrupole fields.

First results:

- Feasibility study completed and Conceptual Design Ready
  - **“Permanent Magnet Quadrupoles” / Ben Shepherd / Wed May 4, 12:25**

Next steps:

- Final Design Report and Manufacturing drawings
- Financial feasibility and Work plan
- Procurement, Assembly and Magnetic measurements
  - Focus on requirements for **cost-effective series production** of reliable magnets for an operational science facility.

Sum up – BIG YES!

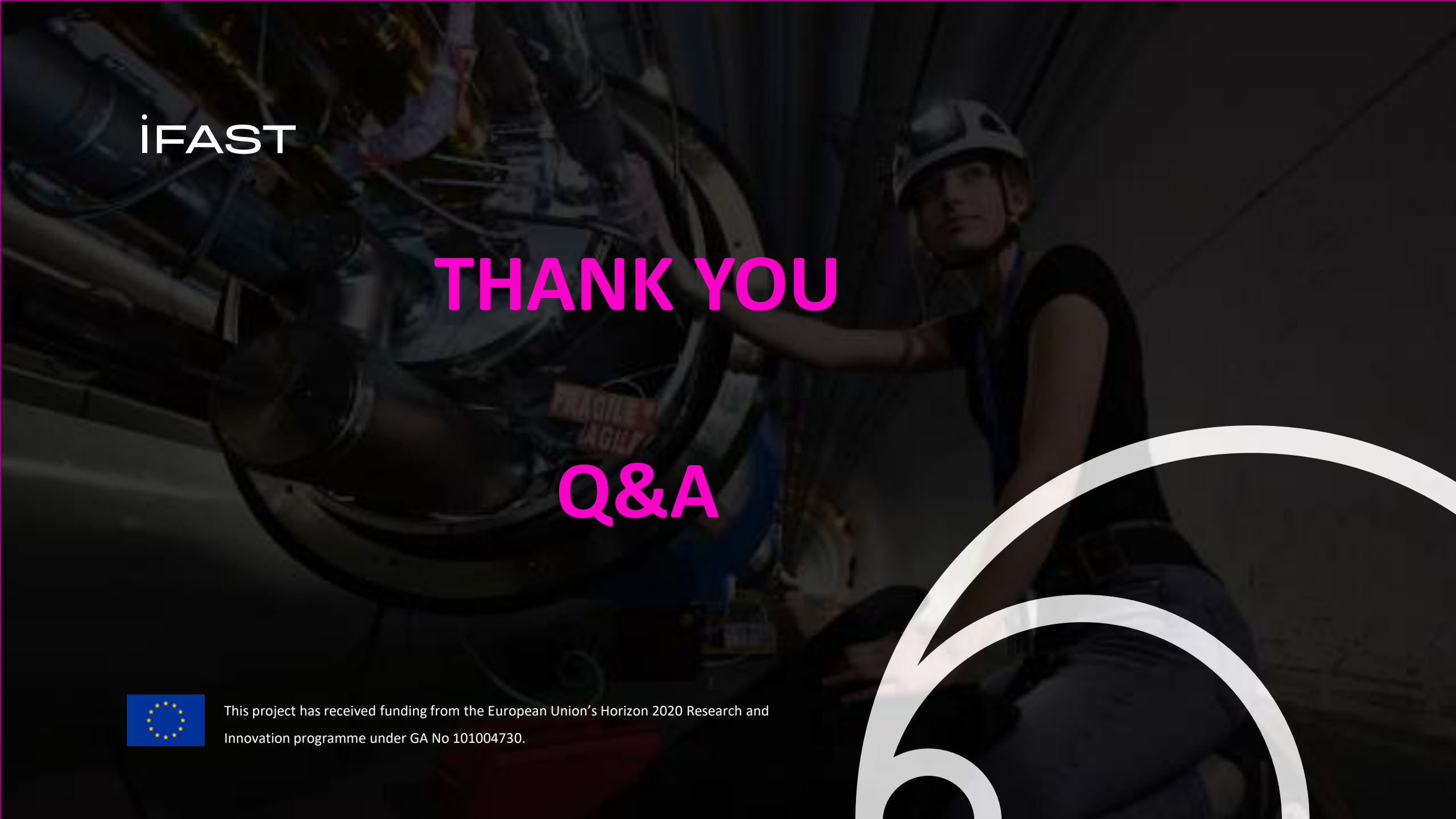
- **general and topical workshops**
- **exchange of staff for visits and common experiments** to **strengthen the networking activity in the accelerator community** on topics related to the major technological challenges
- Importance of labs and industry (expert in prototypes) working together since from the **early stages**
  - Novel technology developments:
    - ✓ from a conceptual idea → product
    - ✓ From a product → serial production
  - Financial feasibility and risk analysis since – COVID teaches how important is to be flexible and adaptable to unexpected situation

How to implement a more effective industry-research institutions co-innovation paradigm?

- ✓ **community and communication** – foster common language and culture
- ✓ Early engagement
- ✓ Serial production
- ✓ **Prototype**: High **risk**, high **cost**, long delivery **time**
- ✓ Effective business model

- ➢ Exchange – secondment programme pillar of any European project / “Knowledge Erasmus”
- ➢ Procurement Tools
- ➢ standardisation / modularization

  European Standard
- ➢ **European Technological Hub** for additive manufacturing and fast prototyping
- ➢ Diverse backgrounds



iFAST

THANK YOU

Q&A

This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under GA No 101004730.