Riccardo Bartolini, DESY

I.FAST Period 1 Review, 09.02.2023

WP7: high brightness accelerators for light sources

- *Scope: WP7 pursues the R&D on new technical solutions for the design and construction of **accelerator-based light sources,** exceeding the performance of present machines. The research embraces both **storage ring based synchrotron light sources** and **free electron laser driven by Linacs.***
- *Fostering **networking** **activities** building on the previous EU networks funded within the ARIES and EuCARD2 projects (Task 7.2) Supporting **R&D and prototypes** on cutting edge technological aspects, critical in the construction of new, compact, and sustainable accelerators (Tasks 7.3-7.4-7.5).*

WP7/Task 7.2: ultra low emittance ring

- *Organise general and topical workshops on the technology enabling the design and construction of future ultra-low emittance rings*
- *support exchange of staff for visits and common experiments*
- *produce progress reports on the status of the R&D in the technology areas of relevance for ultra low emittance rings.*

- ***Novel injection schemes*** *(PSI, SOLEIL). Fast switches for fast pulsers and fast kickers or stripline. Strong involvement with industrial partners*
- ***Advanced magnet concepts*** *(CERN, KYMA) develop permanent magnet (PM) dipole and quadrupole for green facilities for space saving and sustainability.*
- ***Vacuum systems in small apertures*** *(DLS, SOLEIL, CERN): feasible ultra-vacuum systems based on small radius pipes, NEG coating and new surface treatments.*
- ***RF and diagnostics*** *for beam control of ultra-low emittance rings (INFN) to develop feedback systems, orbit stability, harmonic cavities, diagnostics for ultra-small beam size.*
- ***Experimental tests*** *(KIT, CERN) on the major technical challenges: impedance; NEG characterization (@SOLEIL, DLS, KIT); injection; beam based alignment of complex combined function magnets*

Courtesy A. Mochihaschi (KIT)

Summary of activities in P1

- *Regular meetings scheduled for Task. 7.2 chaired by A. Mochihashi (KIT)*

Three workshops already organized:

- *10th-11th May 2021 (DESY/Virtual): Miniworkshop on girders and alignment (Virtual / DESY) ~80 participants https://indico.desy.de/event/30022/*
- *25th-29th April 2022 (KIT): Beam diagnostics and dynamics in low emittance rings ~80 participants https://indico.scc.kit.edu/event/2592/overview*
- *26th-29th June 2022 (ALBA): 3rd workshop on low emittance ring design ~60 participants https://indico.cells.es/event/1072/*

Workshop support and preparation:

- *26th-29th April 2023 (DESY): support for the Pulse POwer for Kicker System (PulPOKS)*
- *May/June 2023 (University of Saloniki) : 9th general workshop ultra low emittance rings*
- *September 2023 (ALBA): Permanent magnet based solution for low emittance rings (joint with LEAPS)*

Next topical workshops identified on booster injectors and feedback systems

Courtesy A. Mochihaschi (KIT)

WP7 Task 7.2: milestones and deliverables

D7.1	Final report on the development of high brightness electron beams for light sources	7.1	UOXF	R	PU	48
D7.2	Report on enabling technology for ultralow emittance ring	7.2	KIT	R	PU	45
D7.3	Longitudinally variable bend prototype fabrication	7.3	CERN	DEM	PU	40
D7.4	Mechanical realization and low power RF test of the two RF guns	7.4	INFN	DEM	PU	38
D7.5	Construction of the XLS accelerating structure pre-prototype.	7.5	ELETTRA-ST	DEM	PU	24
D7.6	Construction of the XLS accelerating structure full prototype.	7.5	ELETTRA-ST	DEM	PU	36

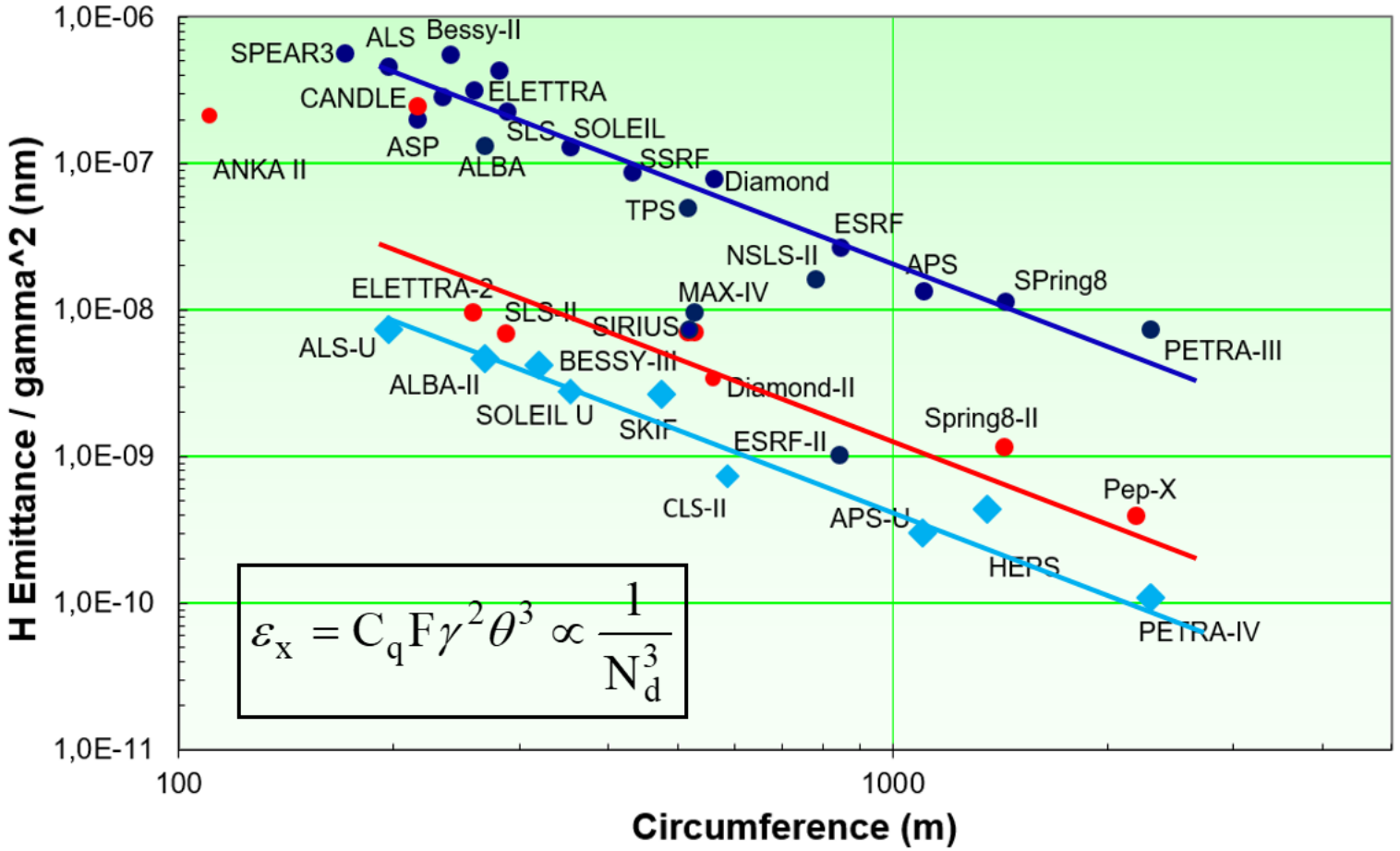
MS25	General workshop on Task7.2 activity summary	7.2	42	Indico page
MS26	Magnet specifications based on optics calculations for ELETTRA. Magnetic and mechanical design including fabrication drawings	7.3	24	Report
MS27	Prototype acceptance tests	7.3	46	Report
MS28	Electromagnetic and mechanical design of the two guns	7.4	24	Report
MS29	High-power test stand setup and final results of the high-power tests	7.4	46	Report
MS30	Construction and RF tests of CompactLight accelerating structure prototype	7.5	21	Prototype in operation

Tasks	Description	Year 1												Year 2												Year 3												Year 4													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
WP7	High Brightness Accelerators for light sources																																																			
7,1	Coordination and communication																																																D			
7,2	Enabling technologies for ultra-low emittance rings																																										M			D						
7,3	Variable Dipole for the upgrade of the ELETTRA storage ring																							M																	D						M			
7,4	Very high gradient RF Guns operating in the C-band RF technology																							M															D						M			
7,5	CompactLight Prototype Accelerating Structures																					M		D												D												

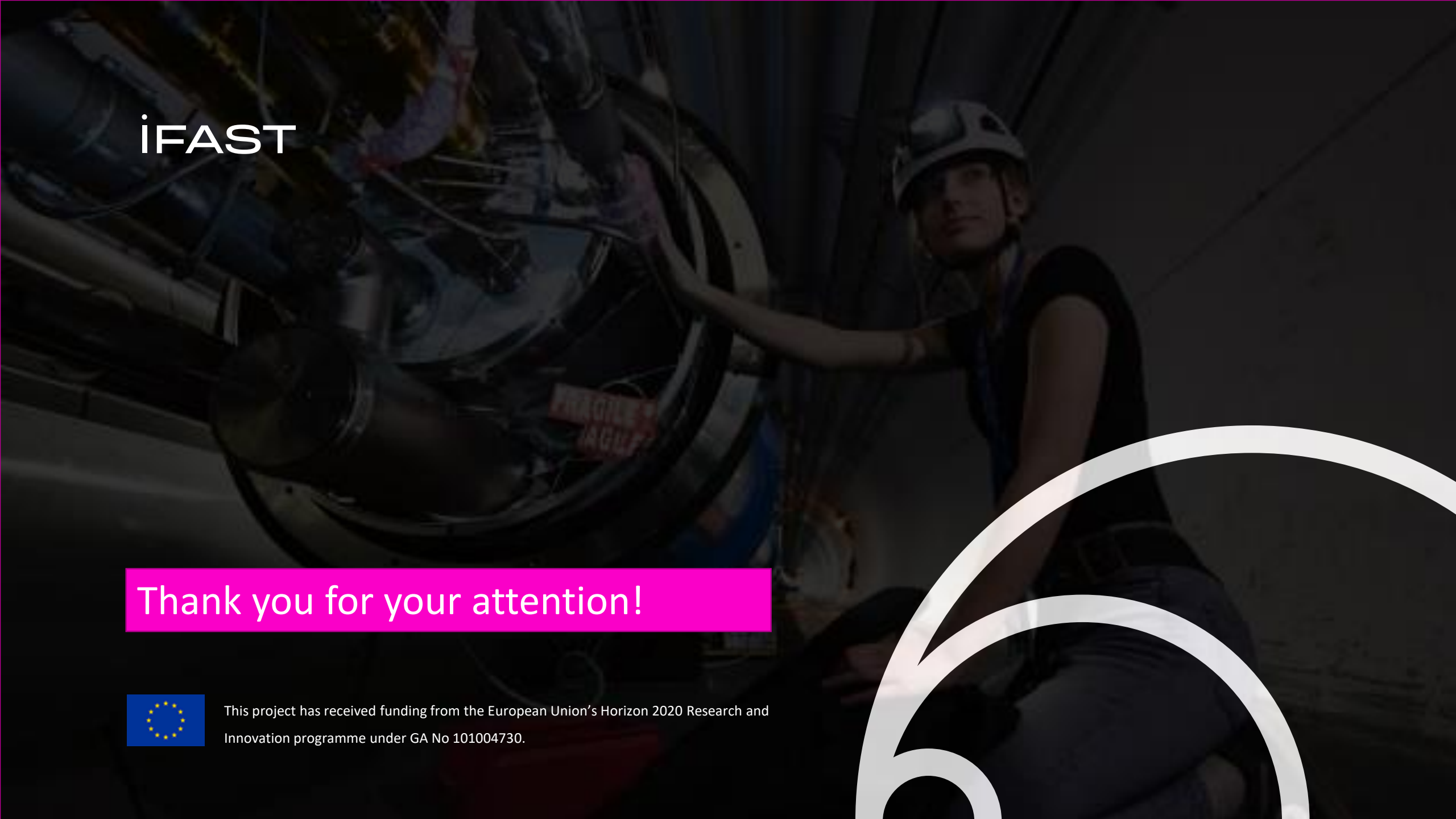
Other tasks covered in next talks by Y. Papahilippou, D. Alesini (and G. D'Auria)

Relevance of objectives and impact

- *The WP7 in Task 7.2 will continue to foster and disseminate the latest development in accelerator technology of ultra low emittance rings serving a large and ever growing community in EU (and worldwide)*



PETRA III	1300 pm
PETRA IV	20 pm



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Thank you for your attention!

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