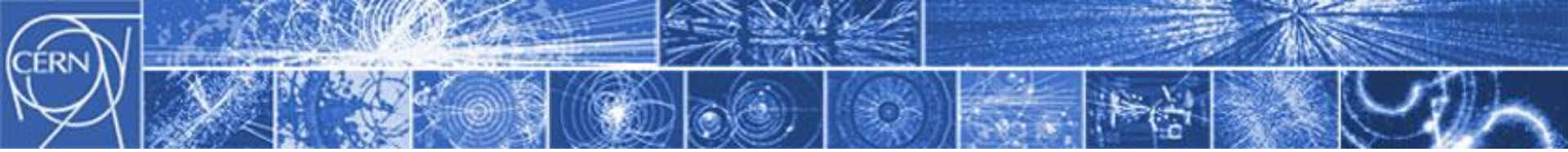


Update on ATTRACT (breAkThrough innovaTion pRogrAMme for deteCtor / inrAstructure eCosysTem)

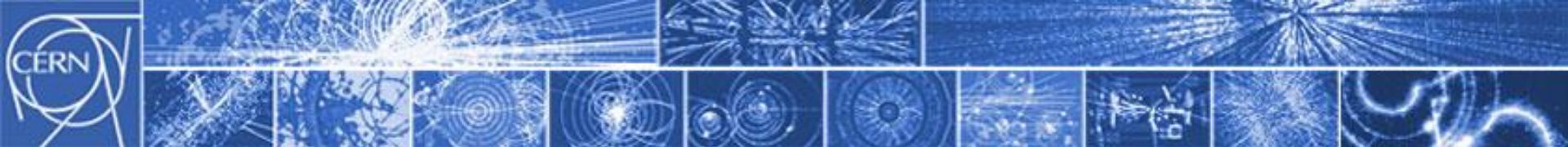
- ATTRACT is a proposal for an EU-funded R&D programme as part of H2020 for sensor, imaging and related computing (ICT) development
- Its purpose is to demonstrate the value of European Research Infrastructures to industry and society, while maintaining the scientific missions of the ERIs
- Initiated by Aalto University (Helsinki), ESADE (Barcelona) and CERN, its Interest Group currently includes more than 35 institutions (www.attract-eu.org)





Motivation

- The detector R&D community - or communities – through Research Infrastructures are currently planning large upgrades for the scientific instruments
- Examples: CERN's LHC accelerator and detectors; new ESO telescopes, ESRF beamline facilities, ESS ...
- While waiting for the upgrade/construction budget decisions, the instrumentation communities proceed with their (limited) R&D means to solve remaining, related technical challenges
- Challenge: How to keep this R&D engine running (in Europe)?



What drives ATTRACT?

- ATTRACT is driven by needs of the detector R&D community to develop next-generation scientific instrumentation related to radiation sensors and imaging
- Examples
 - Astrophysics, astronomy
 - Electron microscopy
 - Fusion physics
 - Nuclear physics, including neutrons
 - Nuclear safety
 - Medical physics, imaging
 - Particle physics (HEP)
 - Synchrotron radiation physics
- Example of sources of R&D topics for ATTRACT
 - ERDIT Technology Platform (“Roadmap” for radiation sensor & imaging technologies)



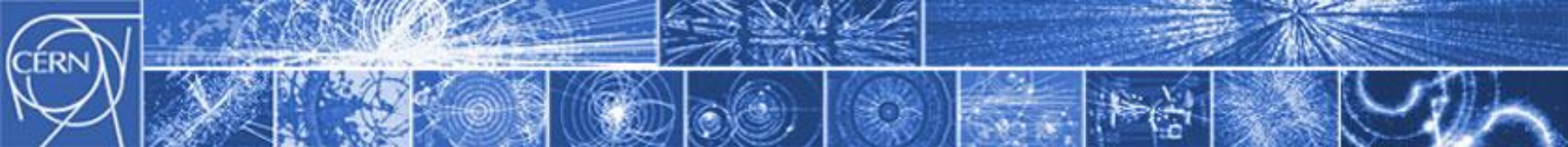
Example of scientific needs

Requirements amongst fields using radiation detectors

ERDIT

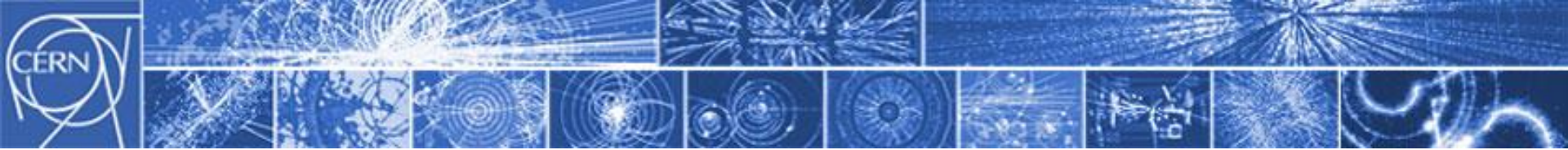
	HEP	SYNC	Neutron ESS	Beam monitoring	Astronomy	Hadron Therapy	Medical Imaging Pre-clinical Imaging	Electron Microscopy	Environmental radiation monitoring IAEA
Radiation type	p, n, γ	X-rays	n	p, n, γ , e^-	$\lambda=300\text{nm}$ to $28\mu\text{m}$	N, p, γ , light ions (protons to oxygen)	X-rays	e	γ
Max Intensity	$12 \times 10^{15} \text{ ncm}^{-2}$	2700 pulses	10^8 ncm^{-2}	10^{17} ncm^{-2} (p, n) 10MGy (e^-)	from 1 photon/hour/pixel to $1E9$ photons/s/pixel	conventional accelerator up to 10^{10} ions/s Laser $> 10^{17}/\text{cm}^2$ (ps pulses, low repetition rate $\sim 1/\text{s}$)	CT: $10^8 \text{ g/mm}^2/\text{s}$, General X-ray: $10^8 \text{ g/mm}^2/\text{s}$ Angiography: $10^8 \text{ g/mm}^2/\text{s}$ Mammography: $10^7 \text{ g/mm}^2/\text{s}$	20 Mrads	100 $\mu\text{Sv/h}$ ($\sim 100,000 \text{ cts/s}$)
Timing	25ns	4.5 MHz	1 μs	Sub ns	from 2000 frames/s to 1 frame/hour	Up to MHz (single rate)	CT: 3000 frames/s General X-ray: - Angiography: 1-60 frames/s Mammography: -	1000 frames/s	
Pixel size (Min)	$50 \times 50 \mu\text{m}^2$	$10 \times 10 \mu\text{m}^2$	$50 \times 50 \mu\text{m}^2$	$50 \times 50 \mu\text{m}^2$	$10 \mu\text{m} \times 10 \mu\text{m}$	50 μm	CT: 1000 mm General X-ray: 150-200 mm Angiography: 150-200 mm Mammography: 85 mm	$10 \times 10 \mu\text{m}^2$	
Spectral resolution	yes	yes	no	yes	no, moderate possible with APD	yes	Today: not used, Future: yes	yes	$< 1.5\%$ @ 662 keV
Detector size (max)	2500m^2 (ILC cal)		80m^2	100 cm^2	Optical $9\text{K} \times 9\text{K}$ NIR $4\text{K} \times 4\text{K}$	$40 \times 40 \text{ cm}^2$	CT: $10 \times 100 \text{ cm}^2$ (segmented), General X-ray: $43 \times 43 \text{ cm}^2$ Angiography: $30 \times 40 \text{ cm}^2$ Mammography: $24 \times 30 \text{ cm}^2$	$8\text{k} \times 8\text{k}$ pixels	6 cm^2

<http://erdit.eu/>



How ATTRACT?

- ATTRACT builds upon the collaborative spirit of open science and innovation
- The detector R&D community/ies and industry (SME) are expected by EC to get themselves organized for common governance structures and guidelines; to run the program and launch open, competitive calls
- Two-step process
 - “Mini” ATTRACT or a Demonstrator; comprising some five competitive calls, 10 funded projects (25-50 ME)
 - “Maxi” ATTRACT, possibly beyond H2020, ~ 200 projects?
- The right governance structure needs to be established
 - “Mini” expected to be handled as a standard H2020 project
 - “Maxi” expected to follow a Framework Partnership Agreement (FPA) model?
- Interested parties will be invited to participate and contribute to the Program Working Groups defining the scope of the call(s). Possible topics: sensors; new substrate materials; read-out electronics; TDAQ and related processing; integration...
- The socio-economic research & education community is expected to be asked to help in creating new industrial ideas, cross-fertilization across funded projects using student teams etc.



ATTRACT FPA (Strategic Concept) Core Project Funded by EC

Convergence



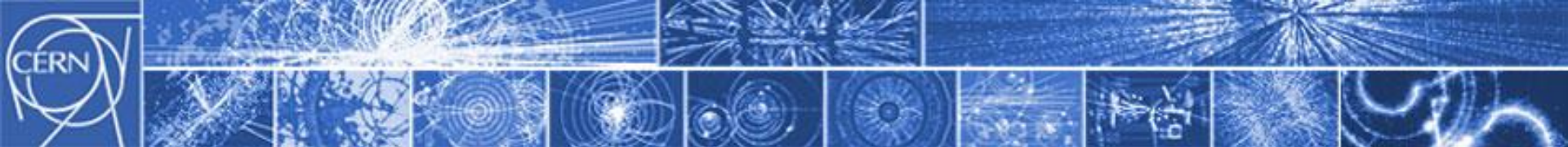
ICT



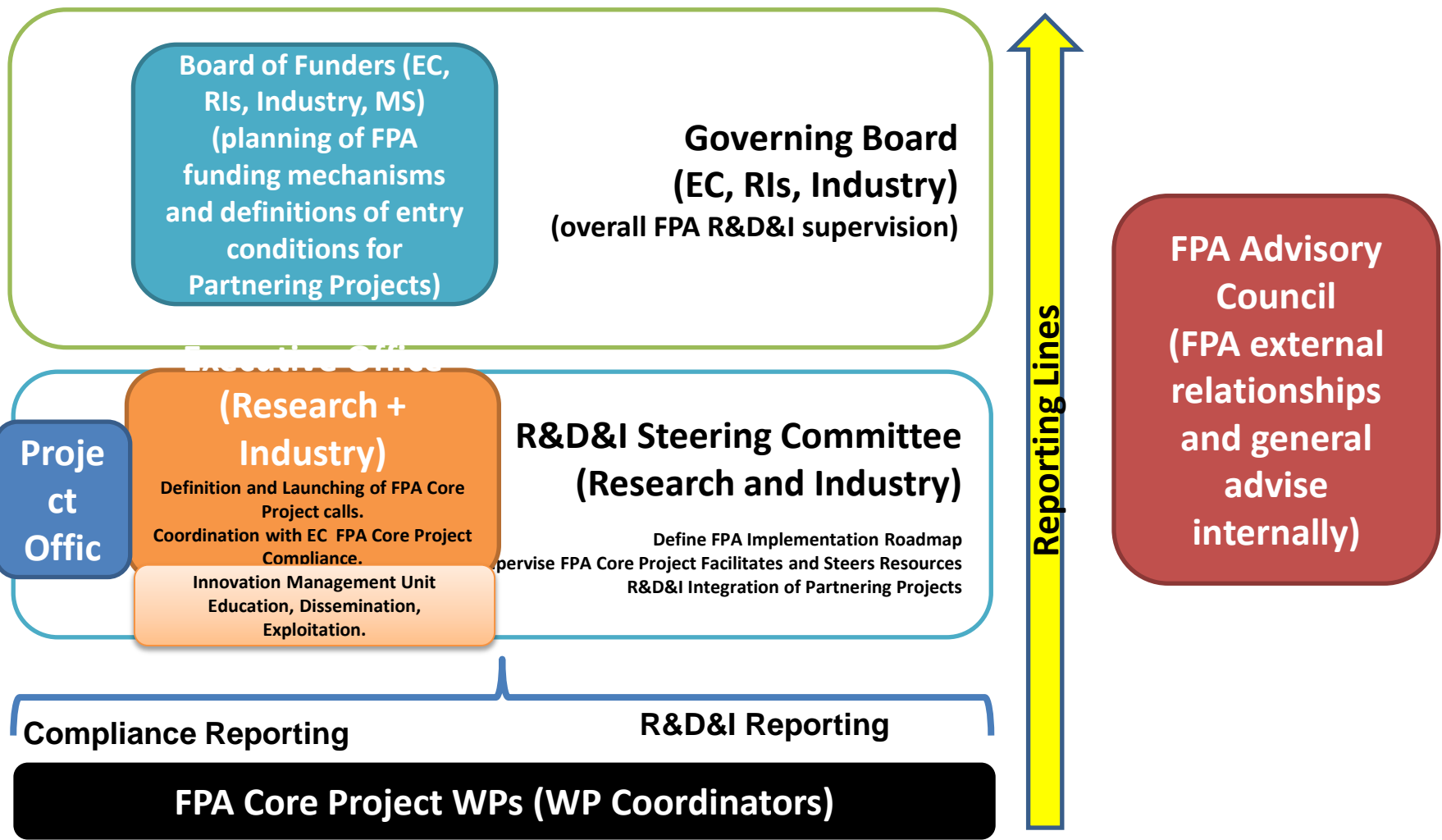
Convergence

SP: Sub Programme

Conceptual structure for the elaboration of a roadmap and implementation plan



ATTRACT FPA potential governing and management structure



Executive Office

Project Office

(Research + Industry)

Definition and Launching of FPA Core Project calls.
Coordination with EC FPA Core Project Compliance.
Innovation Management Unit
Education, Dissemination, Exploitation.

R&D&I Steering Committee (Research and Industry)

Define FPA Implementation Roadmap
Supervise FPA Core Project Facilitates and Steers Resources
R&D&I Integration of Partnering Projects

Governing Board (EC, RIs, Industry)
(overall FPA R&D&I supervision)

Board of Funders (EC, RIs, Industry, MS)
(planning of FPA funding mechanisms and definitions of entry conditions for Partnering Projects)

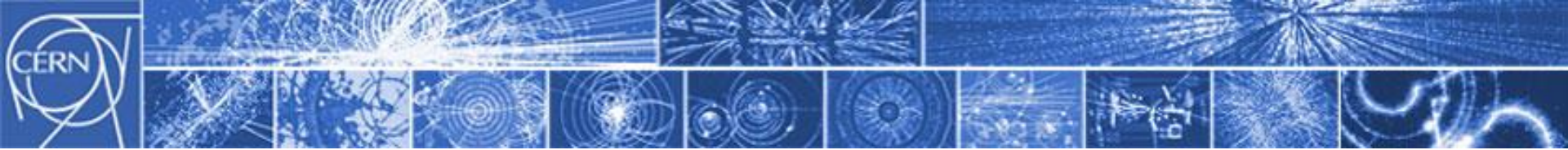
FPA Advisory Council
(FPA external relationships and general advise internally)



Compliance Reporting

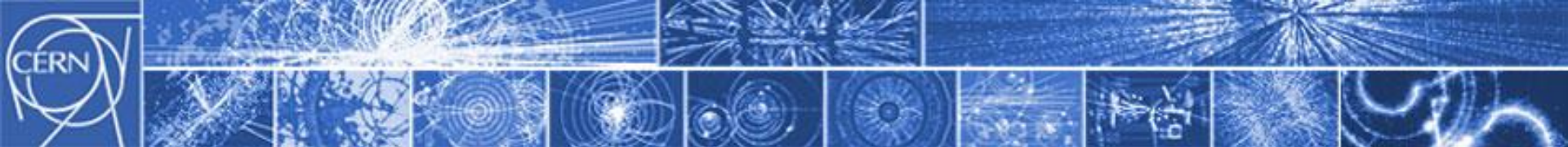
R&D&I Reporting

FPA Core Project WPs (WP Coordinators)



When ATTRACT?

- H2020 Program is defined and (basically) approved. ATTRACT does not easily “fit” in it, not at least in the planned calls in 2014-2015
- Therefore, ATTRACT proceeds in two ways
 - Top-down: negotiations with the EC to launch special calls for 2016
 - Bottom-up: responding to targeted calls (e.g. ICT34, FET), with help in preparing, submitting and eventually, administrating successful bids
- Discussions with the EC have started
 - “Mini” calls could be published by late 2015/early 2016
 - “Maxi” framework will take longer to put in place; a Coordination Support Action (CSA) could be envisaged as a inter-mediate step for preparing the Governance structures



Next Steps

- Inform and encourage the detector R&D community at large to get involved in Working Groups that will be launched next year to define the work programme and calls for “mini”-ATTRACT
- Set up an Advisory Committee to start working on “mini” governance and an Independent Scientific Committee to set up the program definition, calls, review process etc.
- Submit a Coordination and Support Action (CSA) proposal to EC next year to start working on, while gaining experience from the “mini”, towards “maxi”
- Would AIDA collaborators be interested in joining?