ATTRACT (breAkThrough innovaTion pRogrAmme for deteCtor / inrAstructure eCosysTem)

- A proposal has been made to the European Commission (EC) for a dedicated EC-funded program to develop new (ionizing) radiation sensor and imaging technologies for scientific purposes, while addressing also societal challenges in the domains of health, sustainable materials and information and communication technologies (ICT)
- Bringing together the detector R&D communities including physics, research, astronomy, space exploration, nuclear engineering, and medical imaging, and (mostly) Small and Medium sized Enterprises (SME)
- Idea: Additional tool for ERIs to further engage industry and society in their innovation cycles
- Initiators: Aalto University, ESADE and CERN – other ERIs welcome to join! Next ATTRACT meeting in June 19th Brussels

Why?

- The detector R&D community - or communities - have found it difficult in the past to find a suitable EC-programs that facilitate the specific use of radiation detector R&D. The net benefit of these programs has also been questioned (distraction/bureaucracy)
- The detector R&D community (e.g. LHC) has ideas of potential suitability of its technologies in other fields, but limited contacts, mechanisms or resources available to follow it further or make a case
- While waiting for the funding decisions for the upgrading of some of the present physics research facilities to pan out (e.g. LHC detectors at CERN, Phase-2), the experiments could meanwhile make use of complementary R&D funding possibilities offered by the new European Union Horizon 2020 programme
  - http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=excellent-science
- EU is encouraging/pushing researchers to work with European SMEs, which lack the necessary supporting (scientific) infrastructure to boost their innovation efforts…
- … but it is not tailor-made for detector R&D

So Why ATTRACT?

- EC intends to externalize 75% of the financial and project management of the H2020 Programme to external entities
- CERN could be ready to help in administrating this effort, if supported by the detector R&D community at large, and provided the community is willing, together with industry, to govern the process of work program definition, calls and the reviewing (ie. much beyond a “Technology Platform”)
- ATTRACT is a “horizontal” view across EC-funded programs (Health, ICT, energy), instead of program “silos” – H2020 has not (yet) clarified its approach such initiatives

What drives ATTRACT?

- ATTRACT is driven by needs of the detector R&D community to develop next-generation scientific instrumentation related to (ionizing) 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)

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⁻	λ=300nm to 28μm	N, p, γ, light ions (protons to oxygen)	X-rays	e	γ
Max Intensity	12x10 ^{15} 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 > 10^7/cm2 (ps pulses, low repetition rate ~ 1/s)	CT: 10^{8} g/mm^{2}/s, General X-ray: 10^{8} g/mm^{2}/s Angiography: 10^{8} g/mm^{2}/s Mammography: 10^{7} g/mm^{2}/s	20 Mrads	100 μSv/h (~100,000 cts/s)
timing	25ns	4.5 MHz	1us	Sub ns	from 2000 frames/s to 1 frame/hour	Up to MHz (singles rate)	CT: 5000 frames/s General X-ray: - Angiography: 1-60 frames/s Mammography: -	1000 frames/s	
Pixel size (Min)	50x50 um^{2}	10x10um^{2}	50x50 um^{2}	50x50 um^{2}	10μmx10μm	50 um	CT: 1000 mm General X-ray: 150-200 mm Angiography: 150-200 mm Mammography: 85 mm	10x10um^{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 9Kx9K NIR 4Kx4K	40x40 cm2	CT: 10 x 100 cm^{2} (segmented), General X-ray : 43x43 cm^{2} Angiography: 30x40 cm^{2} Mammography: 24x30 cm^{2}	8k x 8k pixels	6 cm^{3}

http://erdit.web.cern.ch/

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
- The right governance structure needs to be established (PPP?)
- The socio-economic research community is expected be asked to help in following and studying ATTRACT to establish guidelines for EC beyond H2020 how to build up and run Innovation Ecosystems, inspired by the open environment and basic research goals of the detector R&D community/ies
- The size of detector R&D related ATTRACT calls could reach ~ 200 funded projects by 2021, or ca. 1% of H2020

Call is announced	• Bottom-up call is announced in different public sites (i.e. EC, CERN, Detectors websites, etc).
Consortia prepare the project proposal	• Project partners form consortia and prepare the project proposal according to the established participation rules. • Executive Office takes a proactive role supporting consortia to build-up project proposals.
Project Proposal submitted	• Project proposals submitted.
Proposals evaluated	• Project proposals are evaluated by an independent panel of experts based on criteria exclusively based on project proposal excellence.
Results sent to project coordinators.	• Results are sent to the coordinators.
Contract negotiations	• Contract negotiations are finalised and the project starts.

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 will need proceed in two ways
  - Top-down: negotiations with the EC (within the EC-CERN MoU framework?)
  - Bottom-up: responding to targeted calls (e.g. ICT34, FET), with help in preparing, submitting and eventually, administrating successful bids
- First dedicated discussions with the EC have started. For this, two documents are being prepared
  - Socio-economic study on the benefits of Open Science/Open Innovation
  - Examples of detector R&D that e.g. LHC experiments would carry out, if adequate EC resources were to be made available. Moreover, examples of their potential use in society would be provided. See ESG as an example
    - http://council.web.cern.ch/council/en/EuropeanStrategy/ESBrochure.pdf

Summary

- ATTRACT is proposal for a dedicated EC-funded program to develop new radiation sensor and imaging technologies for scientific purposes, also addressing societal challenges together with SMEs
- The motivation is to improve the current effectiveness of EC funding for detector R&D
- The role of ERIs in the implementation is crucial
- Discussions with the Commission have started
- Top-down and bottom-up approaches being pursued in parallel