ERDIT

5th Meeting in Pisa 13-14 April 2015

- What is ERDIT?
- How did it Start?
- Activities
- Scientific Synergy

What is ERDIT?

- A network (or Lobbying Platform) to exchange information concerning research on radiation detection and imaging and to promote the field of research with the European Commission and national funding agencies.

- A COST Action. That is one thing that we are working on

How did ERDIT start?

- Research on radiation detectors is truly multidisciplinary and does not fit into any call of the framework programmes of the European Union
- There are several common challenges in detector development but the different communities tend to work on their own.
- Each community is too small to influence the policies of the European Commission and the national funding agencies.

ERDIT events so far

Initial meeting at CERN in April 2013

- Collect information from the different fields
- Discuss the objectives of ERDIT

Second meeting at IAEA in October 2013

- Present the results of the survey on common challenges
- Information from the European Commission on Horizon 2020
- Discussion on a proposal for a COST action

Third meeting in Freiburg in April 2014

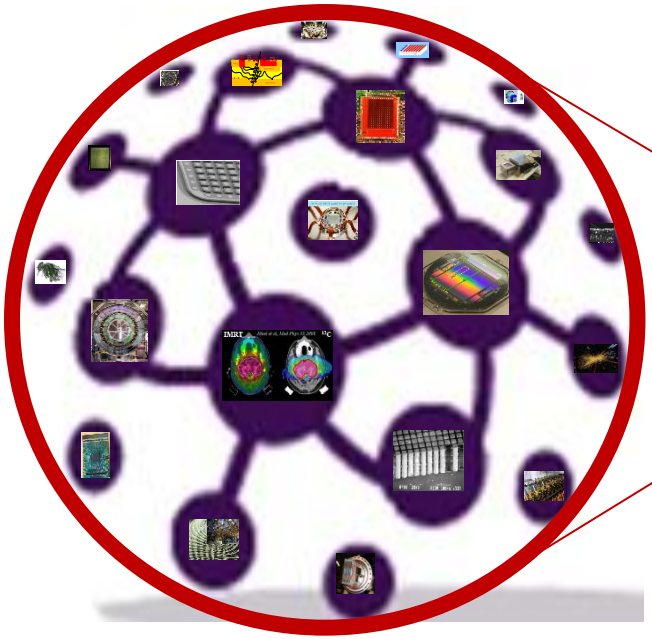
- First open meeting, previous meetings were by invitation only
- First meeting with industrial partners
- First EU proposal discussions cross-field

Fourth meeting in Stockholm in October 2014

- First meeting with dedicated presentation of national networks
- COST Action proposal
- Decision to open the action to other detecting media

ERDIT Scientific Synergy

Radiation Detectors and Imaging Are used in many scientific fields.
Common requirements exist amongst them.



- High Energy Physics
- Synchrotron Applications
- Nuclear Physics
- Spallation Sources
- Fusion Facilities
- Electron Microscopy
- Hadron Therapy
- Medical Imaging
- Astronomy
- High Z Materials, Diamond
- Radiation Monitoring

Contributions from various fields

Experts were invited to report on the Challenges of Radiation Detectors in their field:

Status and challenges for detectors in High Energy	*– Ariella Cattai CERN*
Status and main challenges for detectors in Synchrotron Applications	*- Heinz Grafsma DESY*
Status and challenges for detectors in Nuclear Physics	*- Yacouba Diawara IAEA*
Status and challenges for neutron detectors	*- Richard Hall-Wilton ESS*
Status and main challenges for detectors at fusion facilities	*- Duarte Borba EFDA-JET*
Status and main challenges for detectors in Hadron Therapy	*- Bernd Voss GSI*
Status and main challenges for medical imaging detectors	*– Thilo Michel Erlangen*
Detectors for pre-clinical imaging	*- Nicola Belcari INFN Pisa*
Status and challenges for detectors n electron microscopy -	*Wasi Faruqi , Cambridge University*
Status and main challenges for detectors in Astronomy and Astrophysics	*- Karl-Tasso Knoepfle MPI*
High Z Materials	*- Michael Fiederle , Freiburg Univ. FMF*
Natural Radiation Monitoring	*– Ulrich Stohlker Freiburg Univ.*
Diamond Detectors- applications as radiation sensors and beam monitors	*– Wolfgang Lohmann DESY*
Geant4	*-- John Allison, Manchester*
Real-Time	*-- Patick LeDu In2P3*
Electronics	*--Francsco Forti*

…….

Requirements amongst fields using radiation detectors

	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: 10^9 $g/mm^2/s$, 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

Goals of Today's meeting

- Joining forces between all fields, especially in the areas where the requirements overlap, would create a critical mass and structure the European research area in an important topic of research and development that has a very broad range of applications.
    - Listen to more presentations on key techniques and technologies crucial for imaging detectors
- Continue the work started last year on the "Formal" structure of the Network. Discuss the status of the COST Action and plan B in case of failure
- Discuss ATTRACT options and the Network "RoadMap"