



NEURAPID

NEUtron RAPId Diagnostics



Unità INFN-Milano

Andrea Pola	(0.3), RU, Responsabile Locale
Davide Bortot	(0.5), Dottorando
Maria Vittoria Introini	(0.5), Borsista
Michele Lorenzoli	(0.3), Dottorando

Background

In the framework of the NESCOFI@BTF project (2011-2013) two different detection systems able to perform a real time measurement of neutron spectra from eV to GeV were studied and developed: CYSF (Cylindrical spectrometer) e SP² (spherical spectrometer)



CYSP (directional response)

- 7/8 thermal neutron detectors;
- 7/8 electronic chains in parallel (pulse mode);
- Continuous digital acquisition in data-streaming mode;



SP² (isotropic response)

- 31 thermal neutron detectors;
- 2 multichannel electronic chains in parallel (pulse mode);
- Continuous digital acquisition in data-streaming mode;



Application Fields



(i) LASER-BASED neutron production

Diagnostics

Response: directional

Requirements:

- Capability of measuring with **ultra fast pulsed fields** (shot duration: ~ fs).
- Sensitivity $< 100 \text{ cm}^{-2} / \text{shot}$

Radiation protection/area monitoring

Response: isotropic

Requirements:

- Capability of measuring “**dose per shot**”.
- Sensitivity $< 50 \text{ nSv} / \text{shot}$

(ii) COSMIC RAYS MEASUREMENTS

Response: directional

Requirements:

- High sensitivity to measure **fluxes down to $0.1 \text{ cm}^{-2}\text{s}^{-1}$** .

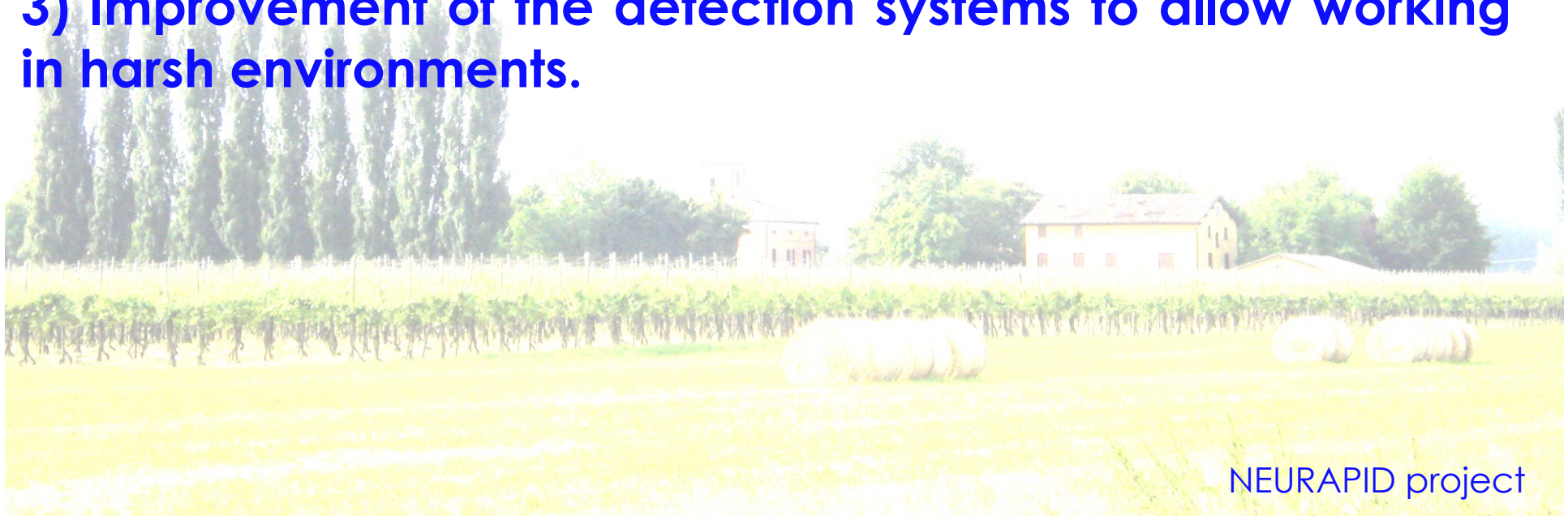
NEURAPID project



NEURAPID Mission: detector performances

To do:

- 1) Study and develop of thermal sensors with adequate fluence response;
- 2) Study and characterization of simple and fast acquisition systems;
- 3) Improvement of the detection systems to allow working in harsh environments.





2014: Study of thermal neutron sensors



1) Development and characterization of large area semiconductor detectors sensitized to thermal neutrons (LATND)

- high fluence response to thermal neutrons;
- low cost;

But...

- high junction capacitance
- slow response;
- large dimensions;
- ...

2) Development and characterization of doped plastic scintillators coupled to small semiconductor detectors (SSTND)

- high fluence response to thermal neutrons;
- Fast response;
- small dimensions;

But...

- expensive;
- photon sensitive;
- ...



KEEP UP THE GOOD WORK!



NEURAPID project