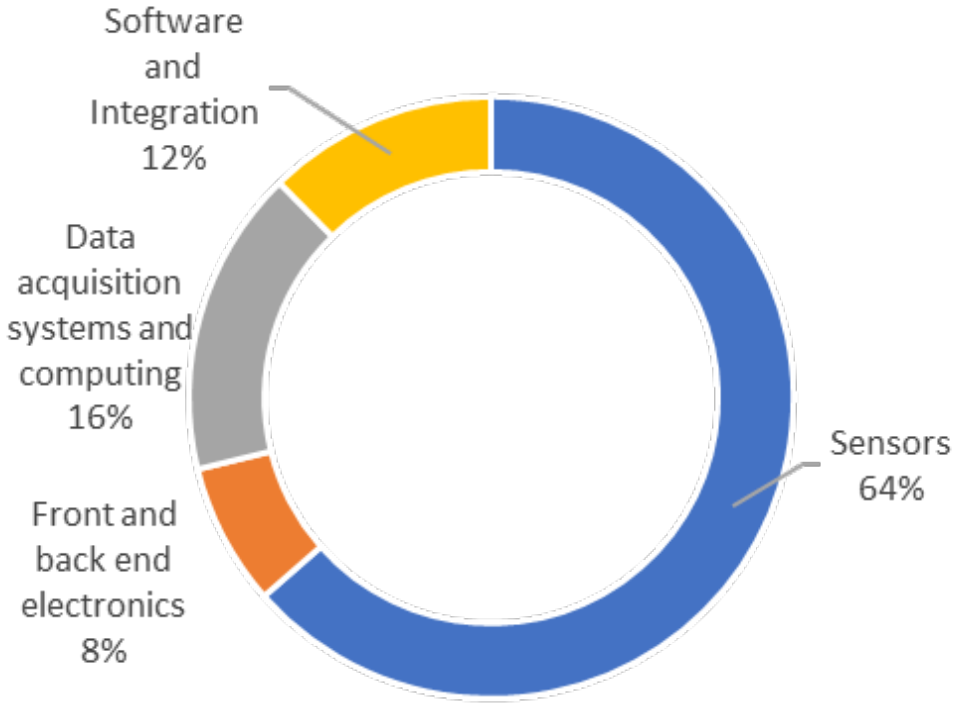
ATTRACT URANIA

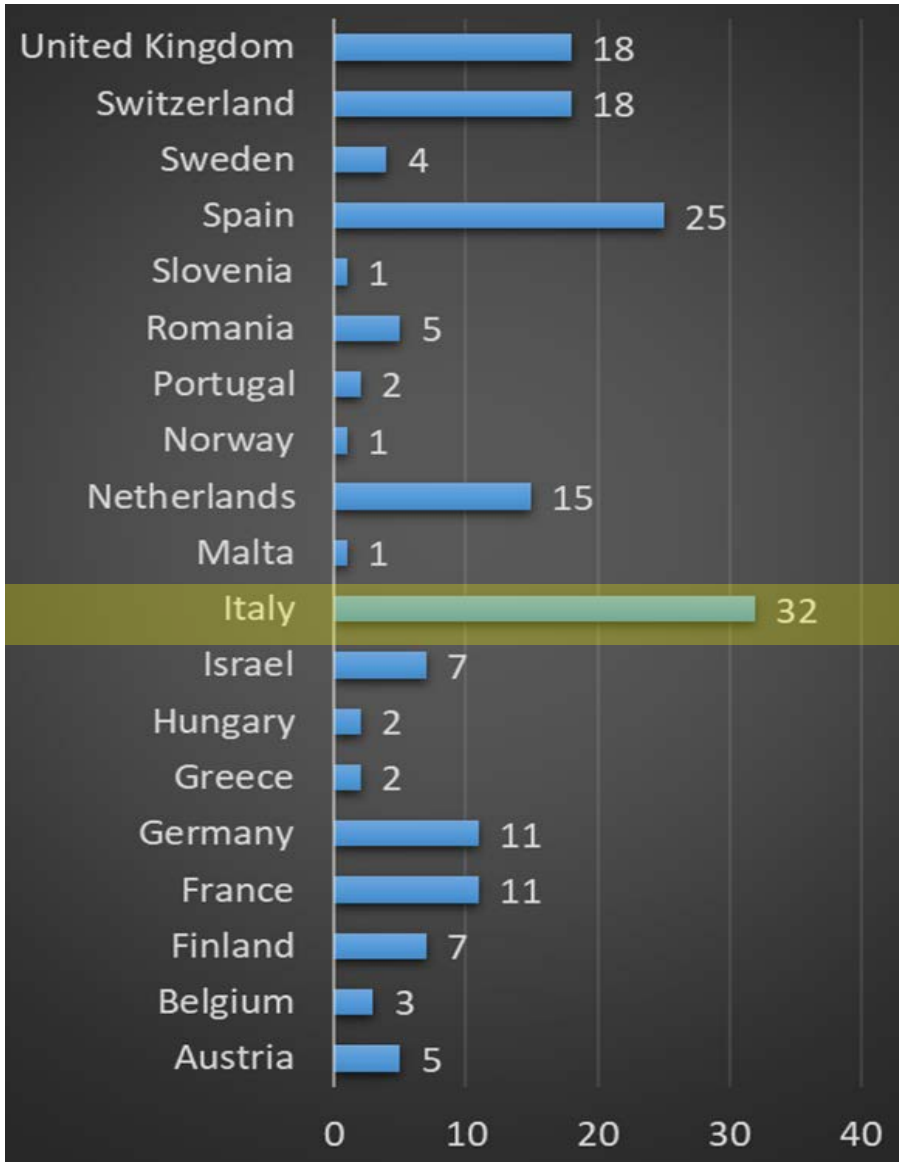
G. Cibinetto – INFN Ferrara

Idea Collaboration Meeting – Bologna, June 13-14, 2019

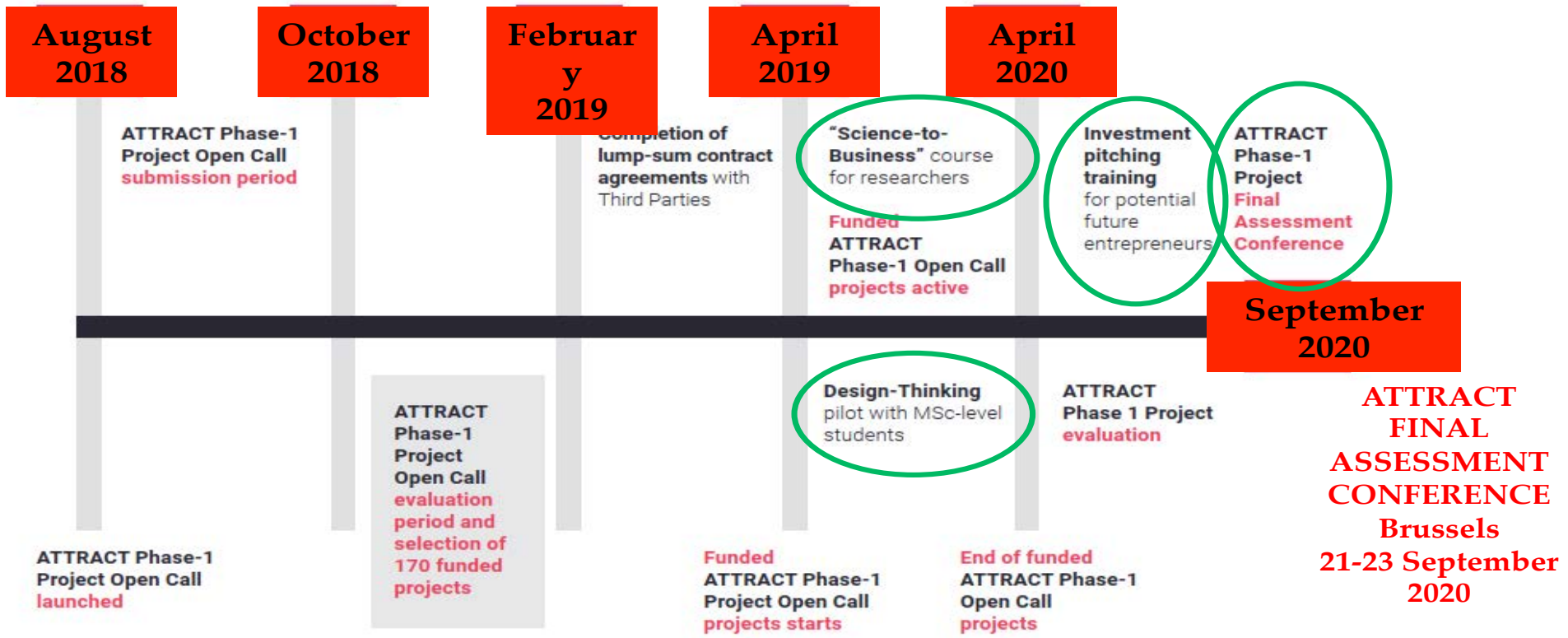
ATTRACT PROJECTS

- ***achieve breakthroughs in technology that shift the state-of-the art.***
- *address demanding* ***challenges*** *in both* ***science and societal needs.***



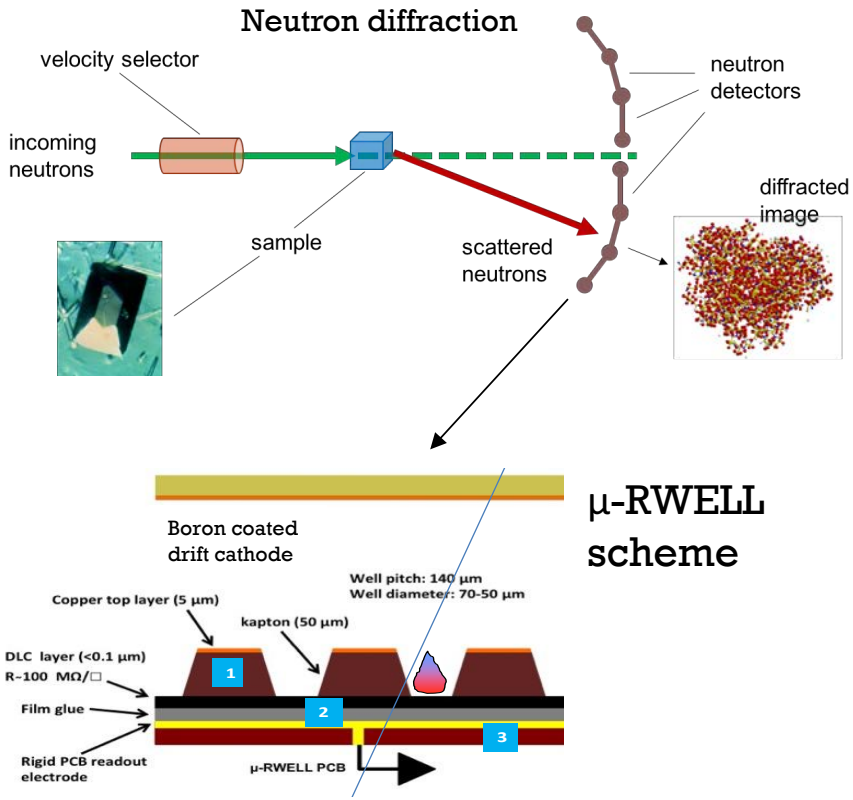


ATTRACT TIMELINE



u-RWELL Advanced Neutron Imaging Apparatus (uRANIA)

The Idea is to develop an innovative detector for diffractive neutron imaging based on micro-Resistive WELL (μ-RWELL) technology: a compact, spark-protected, single-amplification stage Micro-Pattern Gas Detector.



μ-RWELL scheme

It could have applications in grain mapping of structural and functional materials, characterization of protein crystals at spallation sources and neutrons detection in general.

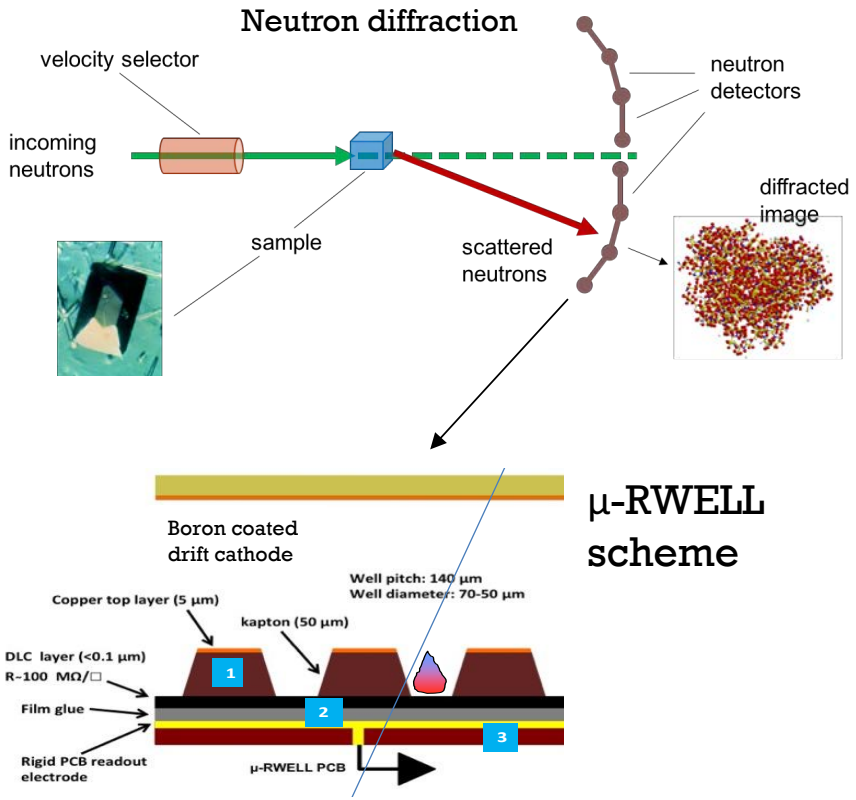
Our project is coordinated by INFN **and the partners are** Lunds Universitet, ELTOS SpA and TECHTRA sp.zo.o

We plan to liaise with Research Infrastructure European Spallation Source.

Contact email cibinetto@fe.infn.it

u-RWELL Advanced Neutron Imaging Apparatus (uRANIA)

The Idea is to develop an innovative detector for diffractive neutron imaging based on micro-Resistive WELL (μ-RWELL) technology: a compact, spark-protected, single-amplification stage Micro-Pattern Gas Detector.



μ-RWELL scheme

Boron coated cathode to convert thermal neutrons

$$^{10}\bar{B} + {}^{1}n \rightarrow {}^{7}Li + \alpha$$

The alpha particle is then reconstructed in the 6 mm gap of the u-RWELL

- **microTPC clusterization to improve space resolution**
- **cathode design critical for efficiency**

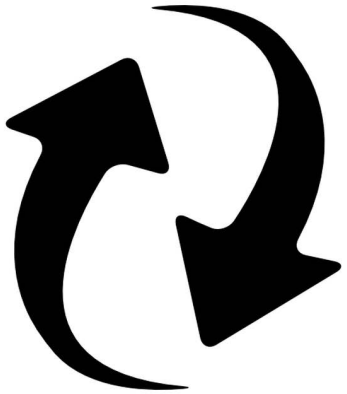
PROJECT IMPLEMENTATION

The project will be subdivided into the following tasks:

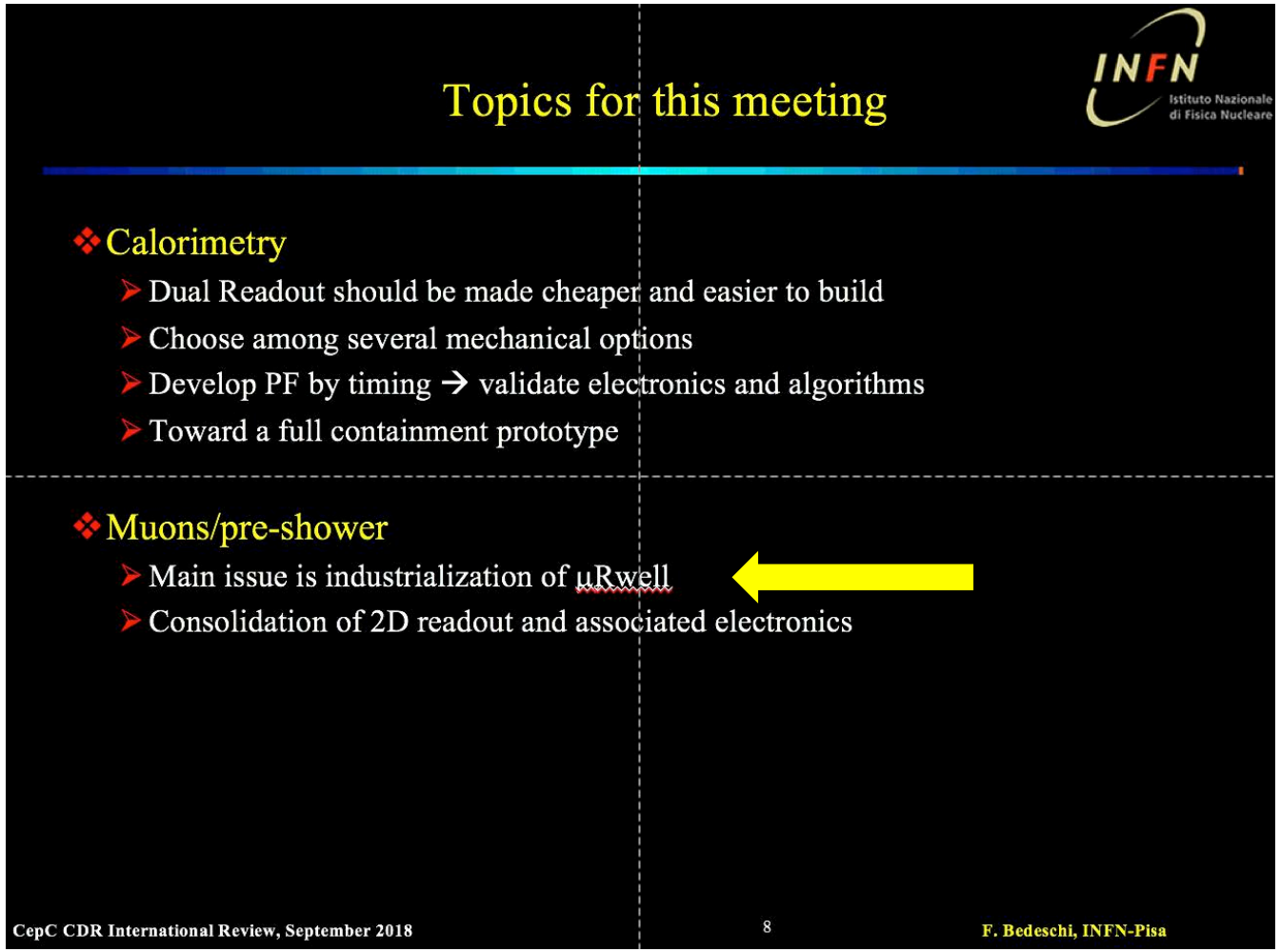
- ***Task 0:*** *detector simulation and design simulation*
- **Task 1:** detector design & prototype construction (PCB, DLC deposition, amplification stage, Cathode preparation w/Boron-deposition, QC/QA, electronics integration) - M1-7
- **Task 2**: optimization and industrialization of the production processes in collaboration with selected industrial partners (ELTOS, TECHTRA) - M1-12
- **Task 3:** prototype characterization
  - with X-rays (charge collection, gain, rate capability) - M8
  - with alpha and neutron sources (conversion efficiency, charge collection) – M9-10
- **Task 4:** development, test and tuning of reconstruction algorithms - M1-9
- **Task 5:** test with thermal neutrons, data analysis and publication of the results – M11-12

INTERSECTIONS

uRANIA



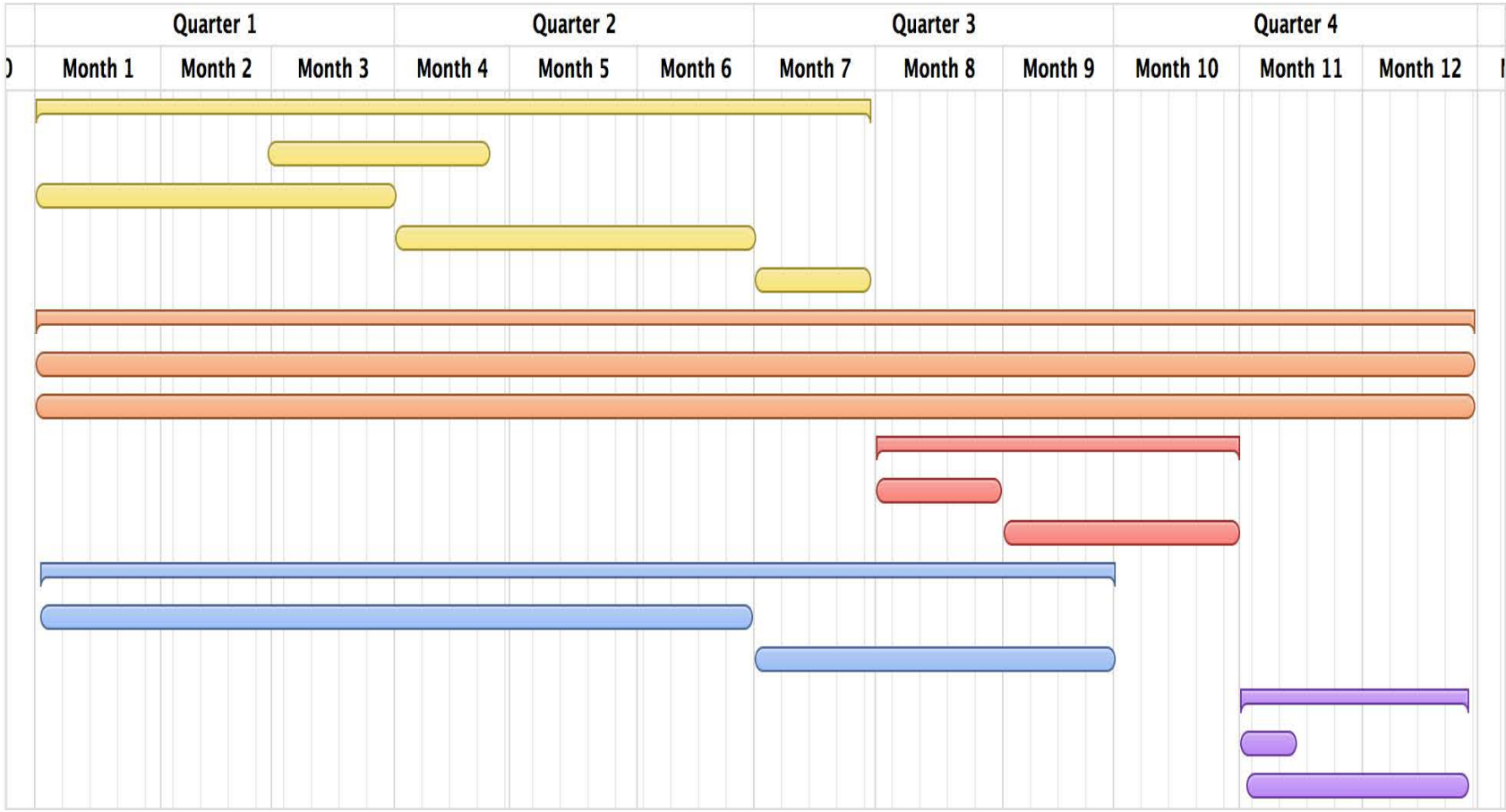
Idea



PROJECT TIMELINE

Task

- 1) Task 1: detector design and prototype construction
  - 1.1) Cathode construction [LU]
  - 1.2) PCB design [LNF]
  - 1.3) Prototype construction and assembly [LNF]
  - 1.4) Electronics integration and test [FE]
- 2) Task 2: optimization and industrialization of production
  - 2.1) at ELTOS [ELTOS,BO,LNF]
  - 2.2) at Techtra [Techtra,LNF]
- 3) Task 3: prototype characterization
  - 3.1) with X-rays (charge collection, gain, rate capability) [LNF]
  - 3.2) with neutron source (conversion efficiency, ...) [LU,LNF,BO]
- 4) Task 4: development of reconstruction algorithms
  - 4.1) development of clusterization software (cc+uTPC) [FE]
  - 4.2) test of the algorithms with mips and neutrons [FE]
- 5) Task 5: prototype test with thermal neutron
  - 5.1) test beam at PSI [ALL]
  - 5.2) data analysis and dissemination of the results [ALL]



DELIVERABLES

mandatory deliverables

Final Public Summary of the Project	Scientific Journal-type article	Poster
• PDF format. • Max. 2000 characters with spaces.	• Main project results • Methodology • Not necessarily published in any journal.	• To be exhibited at the ATTRACT Final Assessment Conference

- a μ-RWell prototype with Boron-10 cathode fully characterized for diffractive neutron imaging

SUMMARY

- The uRANIA project is a virtuous example of co-funding of the Idea activities.

- Clearly it adds some more work to the group

  but it opens the technology to new applications

  and enlarge/enforce partnerships and collaborations