Schedule for QUBIC

For Technological Demonstrator (T.D.)

And

For Final Instrument (F.I.)

Target Schedule

Sub-systems		Delivered...		Delivery date for...	
		By	To	T.D.	F.I.
Detection chain and 1K box		APC	APC	03/2017	09/2017
	TES Detectors	CSNSM	APC	12/2016	06/2017
Calibration sources		APC	APC	04/2017	Cf. TD
Simulations, Instrument Design, Data Analysis		APC	QUBIC	Completed	12/2016 for design
Optics Group					
	Filters	Cardiff	Roma / APC	12/2016	04/2017
	Horns (RF design)	Manchester	APC	Completed	Completed
	Horns (fabrication)	Milano	APC	Completed	11/2016
	Horns (tests)	Milano-Bicocca	APC	11/2016	05/2017
	Optical simulations	Maynooth	QUBIC	Completed	12/2016
	HWP	Cardiff	Roma	12/2016	Cf. TD
	Switches (RF design)	Cardiff	QUBIC	Completed	11/2016 (chokes)
	Switches (general design)	APC	Milano	Completed	12/2016
	Switches (fab + assembly + slow control + test)	Milano-Bicocca	APC	10/2016	03/2017
	Full Beam Source	Roma	APC	04/2017	Cf. TD
	Polarizer & Dichroic	Cardiff	APC	01/2017	05/2017
	Baffling	Roma	APC	05/2017	Cf. TD
	Combiner test	Roma	APC	04/2017	07/2017
	Mirrors (fabrication + tests)	Milano-Bicocca	APC	09/2016	05/2017
	Carbon Fiber Lamps	LAL		01/2017	Cf. TD
Cryostat & cryogenics		Roma	APC	04/2017	08/2017
	Cryogenic HWP Rotator	Roma	Roma	11/2016	Cf. TD
	1K and Sub-K Fridges	Manchester	Roma / APC	01/2017	Cf. TD
	Cryogenics Maintenance	CNEA CAB	QUBIC	-	Start 2018
Overall Slow control & Data Storage of Raw Data		IRAP	QUBIC	11/2016	Cf. TD
Mount		GEMA	On site	-	03/2018
Logistics & Site Development		IAR / ITEDA	On site	-	10/2017
Assembly, Integration and test of QUBIC module		APC	QUBIC	12/2017	04/2018
	Calibration and test of integrated instrument	LAL	QUBIC	12/2017	04/2018

blocking points and schedule

- Issues of funding related to the choice of the site
- Decisions of PNRA
- Decisions of INFN
- Delays in design of certain subsystems or interfaces
- Some uncertainties for some subsystems
- What time is needed for integration / test at ROMA and APC

Strategy to keep in line with target schedule

- **The achievement in 2017 of a tested Technical Demonstrator is our absolute priority**
- The goals of this T.D. are (sorted by order of priority) :
  - Demonstrate our ability to design / manufacture / test sub-systems (in reduced quantities or in smaller dimensions)
  - Demonstrate our capacities to integrate and test these sub-systems into a coherent system
  - Demonstrate the functionality of this system
  - Demonstrate performances (in T.D. or on separate installation)
- The consequences of a successful demonstration will be:
  - Better credibility of the instrument / project / teams with respect to our authorities / funding agencies
  - Learning period before manufacturing and integration of F.I.
    - problems occurring during T.D. phase will be discovered and solved before F.I. phase
    - Procedures will be tested
    - Time will be saved for F.I. phase
    - Level of technical risks will be decreased

Strategy to keep in line with target schedule for T.D.

- We have to find strategies to fulfill the above goals in order to keep in line with schedule for :
  - Only 256 pixels
    - Less parts → Less spending and time needed
    - No need for Dichroic
  - Dispatch simultaneous fabrication of parts into different workshop / companies
    - Ex : fab of 1K box / focal plane
  - If not easy / fast to demonstrate in T.D., performances could be demonstrated on a separate Breadboard Model
    - Ex : Superconducting inductances may not be installed on T.D., but a separate SQUID board may be equipped and tested in dilution cryostat in APC in order to measure the nominal level of noise

Strategy to keep in line with target schedule for T.D.

- PNRA-parts, when to be used for T.D. only, **have to be used without re-manufacture them**
  - 8x8 Horns
  - 8x8 Switches
  - Small mirrors
  - Cryostat
- INFN funding is much lower than requested / expected
  - Put priority on T.D. with respect to F.I.
  - Do not use INFN money for a new F.I. cryostat !
    - If T.D. is successful we will try to put pressure on PNRA in order to keep it
    - If T.D. is successful we will have more arguments with French / Italian funding agencies

Strategy to keep in line with target schedule for T.D.

- Infrastructure modifications / purchasing of testing items may be time consuming
  - This is why we ask you to think about it **now** (Annex 3)

- High voltage (380 V) power
- Cold water
- Liquid or gaseous N2 / He
- Compressed air
- Clean air laminar flow / clean room / conditioned air
- Assembly Hall
- Mechanical workshop
- IT network or Wifi
- Chemicals

- ESD equipments
- Crane or heavy handling systems
- Metrology systems (Faro, MMT, Laser…)
- VNA
- Calibration source
- Mount (or fake)
- Vacuum systems (including degassing)
- Acquisition systems
- Computers / data acq. systems
- Electrical test with probe station

Strategy to keep in line with target schedule for F.I.

- Cryostat may be the main issue
  - Keep in touch with PNRA / funding agencies
  - Keep tracks of detailed design / 2D drawings issues of T.D. cryostat in order to save time if one needs to fabricate a replica

ATRIUM and Documentation

- Already on ATRIUM :
  - GED QUBIC / Management / Schedule ATRIUM-130096
    - Detailed schedule (in Microsoft Project format)
    - Target schedule (.doc)
    - Rationale for Integration and test (in Vision and PDF formats)
  - GED QUBIC / Management / PBS and WBS
    - ATRIUM-121577 Work Breakdown Structure (with an without Steering Committee) (in pdf and Vision formats)
    - ATRIUM-130097 Product Breakdown Structure (extract from the TDR)
  - GED QUBIC / Management / Deliverables – project documents / QUBIC TDR ATRIUM-77537

- Are these documents definitive ?
  - For sure no

- Should we update the status of the document from “in project” to “validated” ?
  - PBS, WBS, TDR are validated (but new versions may be released in the future)
  - Schedule is still an work document

- Missing documents from other sub-systems ?
  - **Regular confirmation / update of schedule from everyone (cf template of slides : status of operation, inputs needed, time needed to do., compliant with target schedule…)**

- Future documents to be downloaded by you ?
  - update of above documents

Budget (excluding salaries) for T.D. + F.I.

- To be compiled with your contributions
- Do not forget the testing / assembly tools and equipment.

Manpower

- To be compiled with your contributions

- Reminder : Each laboratory supplying a sub-system should send people in ROMA and / or APC for integration / functional tests / calibration phases for help and assistance.

Risks analysis

- List up to three major risks that can impact performances, schedule, costs for the delivery of your sub-systems.
  - Delays for T.D on some subsystems or for testing phase.
  - Delays in cryostat for F.I.

- Mitigation strategy
  - Have Bredboards if needed
  - Allocate Funds and Time on the T.D. as the top priority
  - Prepare documentation for all steps of testing during design and fabrication → know what will be tested / when / where / with what