FROM RESEARCH TO INDUSTRY

TASK 10.3 : 5T HTS DIPOLE MAGNET DESIGN AND CONSTRUCTION

Kick off meeting WP 10

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14/06/2013

TASK 10.3 OBJECTIVES

Subtask 10.3.1 HTS accelerator magnet design

- Explore magnet concepts suitable for HTS cable and ribbon based conductors providing magnetic field of accelerator quality in view of the 20 T HE-LHC dipole.
- Compare saddle winding design with block winding design. Study the maximum attainable stress level in both magnetic configurations.
- Adapt the protection scheme of superconducting magnet to the use of HTS conductor.

Subtask 10.3.2 Bi-2212 magnet developments

- Design and manufacture a prototype magnet using Bi2212 cable. This prototype will be intended to manage the wind and react manufacturing operation and to determine the highest stress allowable on such a cable.
- Bi-2212 dipole prototype must be designed to achieve 5T alone, or 20T as an insert, or to measure the limiting stresses on this material.

Subtask 10.3.3 YBCO magnet developments

- Design and manufacture an accelerator like prototype magnet using YBCO tape based conductor carrying at least 5kA at 4.2 K and 20 T.
- Study field homogeneity and current redistribution in the ribbon based conductor.
- Develop and test thin (5-30 µm) insulation systems compatible with coil epoxy impregnation.

TASK 10.3 DELIVERABLE AND MILESTONES

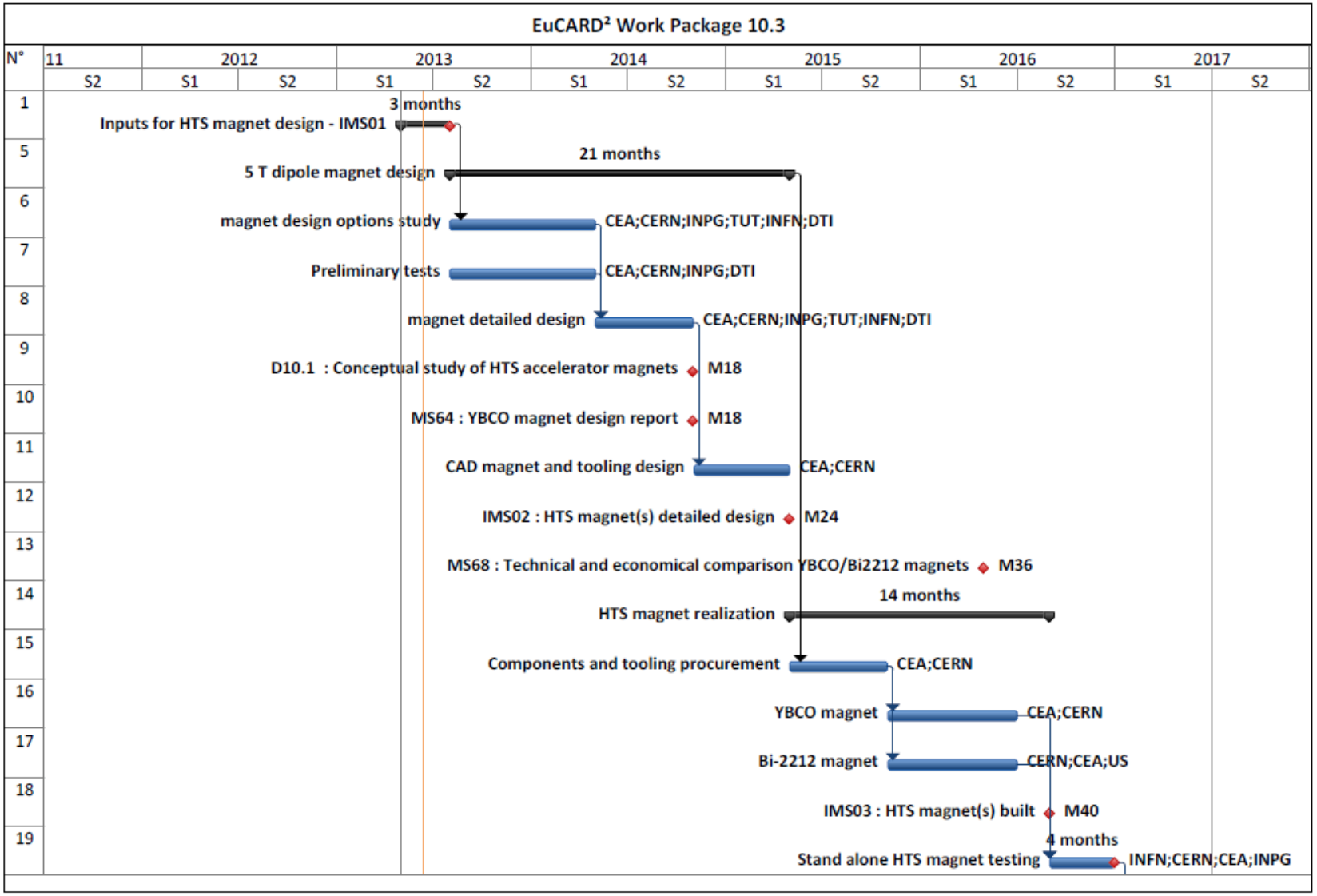
EuCARD² Deliverable and milestones

D10.1	Conceptual study of HTS accelerator magnets (report) *The report must contain all key elements of the novel magnet design, considering electromagnetics, mechanical, thermal, stability and protection aspects.*	M18	31/10/2014
MS64	YBCO magnet design report	M18	31/10/2014
MS68	Technical and economical comparison YBCO/Bi2212 magnets	M36	30/04/2016

Internal milestones proposal

IMS01	Inputs for magnet HTS design - HTS dipole constraints - Bi2212 conductor objectives - YBCO conductor objectives	M3	31/07/2013
IMS02	HTS magnet(s) detailed design	M24	30/04/2015
IMS03	HTS magnet(s) built	M40	31/08/2016
	→ *D10.4 for task 10.4 : Magnet Cold test*	*M44*	*31/12/2016*

SCHEDULE PROPOSAL



PARTICIPANTS (FROM BUDGET FILES)

Beneficiary short name (all costs in €)	Person-Months on Task 10.3	Consumable and prototype direct costs	Travel direct costs
CERN	24	150 000	12 000
CEA	34	150 000	8 000
INPG	19	12 000	4 000
INFN	4		2 000
TUT	10		10 000
DTI	8	20 000	4 000
Total:	99	332 000	40 000

TASK 10.3 PARTIPANTS LIST 1/2

CEA

- Maria Durante, maria.durante@cea.fr, HTS magnets, link with Tasks 10.2 and 10.4
- Philippe Fazilleau, philippe.fazilleau@cea.fr, design, protection studies
- Mélanie Devaux, melanie.devaux@cea.fr, design options studies, magnet realization
- Jean-Michel Rey, j-m.rey@cea.fr, design option studies
- 2 engineers for electromagnetics and mechanical design, tbd
- *For information : Jean-Michel Rifflet, jean-michel.rifflet@cea.fr*

CERN

- Glyn Kirby , Glyn.Kirby@cern.ch, overview structural assembly ideas, main CERN contact
- Jeroen Van Nugteren, jeroen.van.nugteren@cern.ch, PhD, coil optimization

INP Grenoble

- Pascal Tixador, main INPG contact
- Arnaud Badel arnaud.badel@grenoble.cnrs.fr
- John Himbele johnnyhimbele@hotmail.com, PhD starting next September

TASK 10.3 PARTIPANTS LIST 2/2

INFN Milano

- Giovanni Volpini, giovanni.volpini@mi.infn.it, main INFN contact
- Massimo Sorbi, massimo.sorbi@mi.infn.it, protection studies

Tampere University of Technology, TUT

- Antti Stenvall, antti.stenvall@tut.fi, main TUT contact
- Erkki Härö, erkki.haro@tut.fi, PhD

Danish Technological Institute, DTI

- Nikolaj Zangenberg, nzg@dti.dk, technical responsible, main DTI contact
- 1 coating/insulation expert tbd
- *For information : John O. Mortensen, jhm@dti.dk*

WP10.3 CONTRIBUTIONS

Institute	CEA	CERN	INPG	TUT	DTI	INFN
Contact	Maria Durante	Glyn Kirby	Pascal Tixador	Antti Stenvall	Nikolaj Zangenberg	Giovanni Volpini
Activities	Design and construction of YBCO made coil, development of proper technology Participation to design of Bi-2212 coil	Design and support to construction of the YBCO Design and construction of Bi-2212 coil in the collaboration with USA, development of proper technologies System for magnetic measurement evaluation	Design of HTS coils Analysis of e.m. behavior Development of technology (small coils for investigation, tests under high fields)	Modeling of HTS coil both YBCO and Bi-2212 Quench analysis and protection evaluation	Development of insulation technology for YBCO conductor Fabrication and test of samples and then of all tapes/cable Study of extension to Bi-2212	Quench computation Link to testing boundary conditions

NEXT STEPS

To start magnet design options studies we need :

- to know the objectives for YBCO and Bi-2212 **conductors** as a starting point for magnet design options
- to define the **parameter list** for the magnet(s)
- to define **preliminary tests** necessary to validate possible design options (modulus measurements, bending tests, Ic measurements under compression, joints configuration, ..)

- **An initial phase of studies of magnet configurations should start this summer.**
- We would like to organize a **brainstorming meeting** (face-to-face or video) before the end of July. The objective is to share and discuss our ideas and experiences on HTS magnets and produce a state of the art picture, with a set of magnet configuration options to be studies in the following months.
- Please let us know your availability for a video conference **between July 18th and July 25th**.

THANKS FOR YOUR ATTENTION

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