

WP5 Meeting : Introduction



16 T masterplan: 2016-2022

Conductor

Procurement of about 1 t of conductor per year to feed models and demonstrators
Increase of J_c up to FCC target (1500 A/mm^2 @ 4.2 K, 16 T), trim of other properties
Comprehensive electro-mechanical characterization.

FCC Conceptual Design Report (end 2018)

Feed the CDR with one reference option, plus a description of the alternative options.

Models (2016-2020)

ERMC and RMM Models, based on racetrack coils.

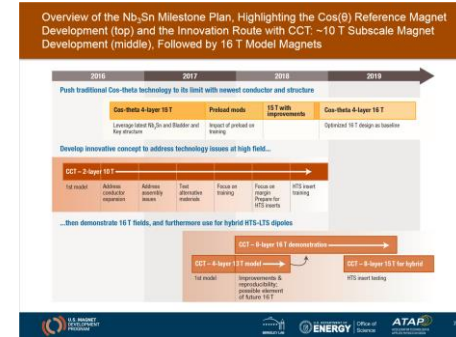
Demonstrators (2018-2022)

Demonstrator Magnets, ideally all «promising» options.

Recent events

US LABS

Though the program is not «yet» fully financed, there is a clear opportunity to have a 16 T US cosinetheta demonstrator developed and tested within 2022. Furthermore, a 15 T demonstrator is already well advanced (test in 2017).



Swiss contribution & PSI

Exploration of a canted cosinetheta option, if promising possible collaboration with US for the manufacture of a model and perhaps even of a 16 T demonstrator.

CEA

Exploring work beyond EuroCirCol for the development of a 16 T demonstrator.

CIEMAT

Exploring work beyond EuroCirCol for the participation to the ERMIC/RMM models and possibly for the development of a 16 T demonstrator.

INFN

Exploring work beyond EuroCirCol for the development of a 16 T demonstrator.

US: The 15 T demonstrator is already well advanced




15 T Dipole Demonstrator: design parameters and work status

Alexander V. Zlobin
US-EuroCirCol video meeting
18 October 2016

US Magnet Development program



The U.S. Magnet Development Program Plan

Final Review Draft and Layout Mockup

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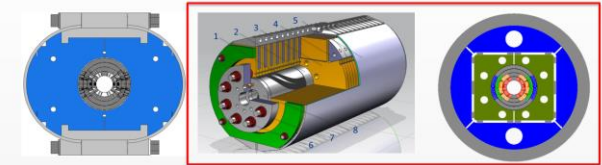
U.S. Magnet Development Program

• FNAL 15 T Dipole demonstrator is the program key milestone for FY17

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Mechanical Structure [2], [3], [5]



- Thin coil-yoke spacer (no collar)
- Mechanical structure:
 - Design 1: SS C-clamps and 20-mm thick skin
 - Design 2: Al I-clamps and 12-mm thick skin
 - Design 1: 50-mm thick Al shell
- Axial support: thick SS rods and end plates
- Cold mass OD < 610 mm (VMFT Dewar limit)

15 T Dipole Demonstrator Status

- Magnet design study phase is complete
- Magnet (design 2) and tooling engineering design is complete
 - Engineering design of design 3 is planned for Q1 FY17
- Tooling and parts procurement is in progress
- L1-L2 cable was developed, fabricated and tested
- L3-L4 cable is available from the 11 T dipole program
- Outer (L3 and L4) and inner (L1 and L2) practice coils are complete
- Coil fabrication has started
- Magnet assembly and first tests are planned for summer 2017

Comparison of Baseline and Alternative Designs

Position in coil	Baseline, Azimuthal Coil Stress, MPa			Al Shell, Azimuthal Coil Stress, MPa		
	Assembly	Cool down	B=15 T	Assembly	Cool down	B=15 T
Pole 1	88	138	9	89	168	3
Pole 2	46	75	21	45	87	21
Pole 3	64	97	36	65	123	37
Pole 4	62	95	62	61	113	63
Mid-plane 1	64	95	153	59	99	149
Mid-plane 2	65	107	127	66	134	127
Mid-plane 3	62	92	153	61	107	153
Mid-plane 4	66	103	153	67	131	157

MAXIMUM EQUIVALENT STRESS IN KEY STRUCTURAL ELEMENTS (MPa).

Structural element	Baseline design			Design with Al shell		
	Assembly	Cool down	B=15 T	Assembly	Cool down	B=15 T
Coil	133	176	168	118	190	165
Yoke	115	353	448	174	308	364
Clamp	118	280	292	-	-	-
Skin	280	404	428	206	339	366

Contact gaps at poles

Al Shell at 15T:
Inner Pole Gap=0.3um (30%)
Layer 3 pole Gap=4um (15%)

Baseline at 15T:
Inner Pole Gap =0um
Layer 3 pole Gap=7um (20%)



What do we expect from this workshop

- a good time in discussing technical and strategical matters
- re-definition/distribution of the tasks considering the new events
- a work-plan to fulfill deliverable 5.2 (Identification of preferred dipole options and cost estimate)
- definition of the scope and time of the next review
- integration of and interaction with other programs
- trimming the channels for sharing information, meetings, events ...

List of tasks of WP5

Task 5.1: Work Package Coordination

Task 5.2: Study accelerator dipole magnet design options

Task 5.3: Develop dipole magnet cost model

Task 5.4: Develop Magnet Conceptual Design

Task 5.5: Conductor studies

Task 5.6: Devise quench protection concept

Task 5.7: Produce Magnet Engineering Design and Manufacturing Folder

This workshop: schedule

MONDAY, 7 NOVEMBER		
15:00 → 15:30	Introduction Speaker: Davide Tommasini (CERN)	30m Room Tesla
15:30 → 15:50	Plan and status for conductor studies within EuroCirCol Speaker: Bernardo Bordini (CERN)	20m Room Tesla
15:50 → 16:30	Coffee break	40m Experimental Hall
16:30 → 17:00	Status of ERM and RMM design Speaker: Susana Izquierdo Bermudez (CERN)	30m Room Tesla
17:00 → 17:20	Plan and status of the review on the past experience with Nb3Sn dipoles Speaker: Daniel Schoerling (CERN)	20m Room Tesla
17:20 → 17:40	Plan and status of the cost model Speaker: Daniel Schoerling (CERN)	20m Room Tesla
17:40 → 18:00	The Swiss contribution – First design considerations of the CCT design Speaker: Bernhard Auchmann (CERN)	20m Room Tesla
18:00 → 22:30	Free evening in Barcelona	4h 30m Room Tesla

This workshop

TUESDAY, 8 NOVEMBER			
09:00	→ 09:30	Cos-theta design Speakers: Massimo Leone Sorbi (Università degli Studi e INFN Milano (IT)), Stefania Farinon (Università e INFN Genova (IT))	🕒 30m 📍 Room Tesla
09:30	→ 09:45	Cos-theta design, discussion	🕒 15m 📍 Room Tesla
09:45	→ 10:15	Block design Speaker: Clement Lorin (CEA/IRFU, Centre d'étude de Saclay Gif-sur-Yvette (FR))	🕒 30m 📍 Room Tesla
10:15	→ 10:30	Block design, discussion	🕒 15m 📍 Room Tesla
10:30	→ 11:00	Coffee break	🕒 30m 📍 Experimental Hall
11:00	→ 11:30	Common-coil design Speaker: Fernando Toral (Centro de Investigaciones Energéticas Medioambientales y Tecnológicas)	🕒 30m 📍 Room Tesla
11:30	→ 11:45	Common-coil design, discussion	🕒 15m 📍 Room Tesla
11:45	→ 12:05	Magnet protection with quench heaters Speaker: Tiina-Mari Salmi (Tampere University of Technology, Finland)	🕒 20m 📍 Room Tesla
12:05	→ 12:35	Circuit protection aspects, CLIQ simulations and STEAM Speaker: Marco Prioli (CERN)	🕒 30m 📍 Room Tesla
12:35	→ 13:00	Discussion on magnet and circuit protection	🕒 25m 📍 Room Tesla
13:00	→ 14:30	Lunch	🕒 1h 30m 📍 Experimental Hall
14:30	→ 16:00	Discussion on strategy	🕒 1h 30m 📍 Room Tesla
16:00	→ 16:30	Coffee break	🕒 30m 📍 Experimental Hall
16:30	→ 18:00	Continuation discussion on strategy	🕒 1h 30m 📍 Room Tesla
20:30	→ 23:30	Banquet	🕒 3h 📍 Arenal Restaurant

FCC Events for 16 T dipole

Frequency (months)	Event
1	FCC-EuroCirCol (video-meeting)
3	FCC-EuroCirCol-US (video-meeting)
12	Annual EuroCirCol meeting
12	EuroCirCol WP5 Review
12	Joint FCC-EuroCirCol-US (Next meeting in US ?)
13	FCC week

Thank you for your attention

