21 June 2005

CARE/JRA4: Status Report of the 1st Quarter of 2005
Title: Next European Dipole (NED)

Coordinator: A. Devred (CEA & CERN), Deputy: A. den Ouden (TEU)

Participating Laboratories and Institutes:

Institute (Participant Number)	Acronym	Country	Coordinator	Scientific Contact	Associated to
CCLRC-RAL (20)	CCLRC	GB	P. Norton	D.E. Baynham	
CEA/DSM/DAPNIA (1)	CEA	F	R. Aleksan	A. Devred	
CERN (17)	CERN	CH	G. Guignard	D. Leroy	
CIEMAT (16)[a)]	CIEMAT	S	A. Faus-Golfe	F. Toral	CSIC
INFN/Milano-LASA (10)	INFN-Mi	I	S. Guiducci	G. Volpini	INFN
INFN/Genova (10)	INFN-Ge	I	S. Guiducci	P. Fabbricatore	INFN
Twente University (11)	TEU	NL	A. den Ouden	A. den Ouden	
Wroclaw University (15)	WUT	PL	M. Chorowski	M. Chorowski	

[a)] New collaborator with respect to CARE Annex I.

Main Objectives: Research and Development on high performances Nb_3Sn cables and high field magnets design and manufacturing to push the technology beyond present LHC limits.

Cost:

Total Expected Budget	Allocated EU Funding
2093 k€	**980 k€**

OUTLINE

1 MANAGMENT

Table 1.a: List of participants and of their implication in the NED Work Packages (**C**: Coordination, X: Participation). The overall management is carried out by CEA.

Number	Participant	WP1 M&C	WP2 TSQP	WP3 CD	WP4 IDI	WG MDO[a)]
1	**CEA**	**C**	X	X	X	X
10	**INFN**	X	**C**	X		
	INFN-Ge	X		X		
	INFN-Mi	X	**C**	X		
11	**TEU**	X		X		
15	**WUT**	X	X			
16	**CSIC**	X				**C**
	CIEMAT	X				X
17	**CERN**	X		**C**		X
20	**CCLRC**	X	X		**C**	X
	CCLRC-RAL	X	X		**C**	X

[a)] The Working Group on Magnet Design and Optimisation (WGMDO) is an extension of scope with respect to CARE Annex 1.

Table 1b: Calendar of meetings, workshops and events (co)organized by NED or with NED contributions in 2004.

NA/JRA Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CARE steering meeting		**23 Paris**				**24-25 Warsaw**					**5 Hamburg**	
NED steering meeting	**8 CERN**		**25 CERN**				**8 CERN**			**28-29 Saclay**		
NED ESAC meeting			**24 CERN**									
HHH network meeting			**22-24 WAMS Archamps**								**8-12 HHH CERN**	
Participation to meetings of other collaborations												
US-LARP						**17-18 LAPAC FNAL**						
Conferences & workshops with activity contrib.												
EPAC'04							**5-9 Lucerne**					
ASC'04										**3-8 Jacksonville**		

Table 1b (Cont.): Calendar of meetings, workshops and events (co)organized by NED or with NED contributions in 2005.

NA/JRA Activity	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
CARE steering meeting				**5-6 CERN**					**5-6 Paris**		**21-25 CERN**	
NED steering meeting	**20 CERN**			**14 CERN**			**7 WUT**				**CERN**	
NED ESAC meeting											**CERN**	
HHH/AMT meeting			**3-4 Beam Loss CERN 22-23 Insulation CERN**						**26-27 Tooling CERN**	**24-28 ECOMAG Frascati**		
Participation to meetings of other collaborations												
US-LARP						**1-2 Review FNAL**						
Conferences & workshops with activity contrib.												
PAC'05					**16-20 Knoxville, TN**							
SPIE								**28-02 Warsaw**				
CEC/ICMC'05								**29-02 Keystone, CO**				
EUCAS'05									**11-15 Vienna**			

Table 1c: List of meetings, workshops and events (co)organized by or pertinent to NED in 2004.

Date	Title /Subject	Location	Main Organizer	Number of Participants	Comments and Web Site
Jan 8	NED SC	CERN	CEA&CERN	10	http://lt.tnw.utwente.nl/project.php?projectid=9
Mar 22-24	WAMS	Archamps	CERN	100	http://amt.web.cern.ch/amt/events/workshops/WAMS2004/wams2004_index.htm
Mar 24	NED ESAC	CERN	CEA&CERN	15	http://lt.tnw.utwente.nl/project.php?projectid=9
Ma 25	NED SC	CERN	CEA&CERN	12	http://lt.tnw.utwente.nl/project.php?projectid=9
May 19	NED WGCC	CERN	TEU	7	http://lt.tnw.utwente.nl/project.php?projectid=9
May 19	NED WGMDO	CEA	CEA	9	http://lt.tnw.utwente.nl/project.php?projectid=9
Jul 8	NED SC	CERN	CEA&CERN	15	http://lt.tnw.utwente.nl/project.php?projectid=9
Oct 28	NED WGCC	CEA	TEU	7	http://lt.tnw.utwente.nl/project.php?projectid=9
Oct 29	NED SC	CEA	CEA	23	http://lt.tnw.utwente.nl/project.php?projectid=9
Nov 8-11	CARE-HHH	CERN	CERN	50	http://care-hhh.web.cern.ch/care-hhh/
Dec 17	NED WGMDO	CIEMAT	CIEMAT	7	http://lt.tnw.utwente.nl/project.php?projectid=9

Table 1c (Cont.): List of meetings, workshops and events (co)organized by or pertinent to NED in 2005.

Date	Title /Subject	Location	Main Organizer	Number of Participants	Comments and Web Site
Jan 20	NED SC	CERN	CEA&CERN	22	http://lt.tnw.utwente.nl/project.php?projectid=9
Feb 2	NED WGCC	LASA	INFN-Mi	6	http://lt.tnw.utwente.nl/project.php?projectid=9
Mar 3-4	HHH Beam Losses	CERN	CERN	50	http://care-hhh.web.cern.ch/care-hhh/
Mar 22-23	HHH/AMT Insulation	CERN	CERN	25	http://amt.web.cern.ch/amt/
Apr 13	NED WGMDO	CERN	CIEMAT	8	http://lt.tnw.utwente.nl/project.php?projectid=9
Apr 14	NED SC	CERN	CEA&CERN	18	http://lt.tnw.utwente.nl/project.php?projectid=9
May 3	NED WGCC	CERN	TEU	8	http://lt.tnw.utwente.nl/project.php?projectid=9
Jun 14	NED WGMDO	CCLRC	CIEMAT	11	http://lt.tnw.utwente.nl/project.php?projectid=9
Jul 7	NED SC	WUT	CEA&CERN		

Table 1d: List of milestones and deliverables due in 2004.

Deliverable Number	Milestone Number	Name	Work Package/Task Number	Delivered by	Planned (in months)	Achieved (in months)	EDMS Number
1		Final Report on Wire and Cable Specifications	CD/3.3	CERN	6	6	475443
	1	Report on Specifications for Conductor Insulation	IDI/4.2	CCLRC	6	7	548037V5
	2	Report on Definition of the Test Programme for Conductor Insulation[a)]	IDI/4.3&4.4	CCLRC&CEA	7	10	548038V2
	3	Status Report on Conductor Development[b)]	CD/3.4	CERN	-	3	Restricted Access
2		Design Report on 15 T Dipole Magnet	CD/3.2	CERN	12	13	555826
	4	Interim Report on Quench Protection	TSQP/2.3	INFN-Mi	12	13	555756

[a)] Scope of report has been extended to include test programme on innovative insulation (Task 4.4).

[b)] The milestone entitled “First Results on Wire Development” that was due on 30 June 2005 has been split into two “Status Reports” due on 15 December 2004 and 15 December 2005.

Table 1d (Cont.): List of milestones and deliverables due in 2005.

Deliverable Number	Milestone Number	Name	Work Package/Task Number	Delivered by	Planned (in months)	Achieved (in months)	EDMS Number
3		Report on Heat Transfer Facility Commissioning[a)]	TSQP/2.2	CEA&TEU	3		
4		Report on Quench Computation	TSQP/2.3	INFN-Mi	6		
	5	Status Report on Conductor Development[b)]	CD/3.4	CERN	-		
	6	Interim Report on Heat Transfer Measurements	TSQP/2.2	CEA	9		

[a)] Report has been delayed, pending delivery of the Cryostat to CEA (foreseen in July 2005).

[b)] As already mentioned, the milestone entitled “First Results on Wire Development” that was due on 30 June 2005 has been split into two “Status Reports” due on 15 December 2004 and 15 December 2005.

2 DISSEMINATION

2.1 List of talks

Table 2.1: List of review talks given by NED Collaborators in 2004.

#	Title	Speaker and lab	Location	Date
1	NED Status Report	A. Devred (CEA&CERN) and T. Taylor (CERN) on behalf of the NED Collaboration	KEK, Tsukuba, Japan	9 March 2004
2	Next European Dipole (NED) Overview	A. Devred (CEA&CERN) on behalf of the NED Collaboration	Journées de l'Association Française de Froid, Belfort, France	25 May 2004
3	Next European Dipole (NED) Overview	A. Devred (CEA&CERN) on Behalf of the NED Collaboration	Department Of Energy (DOE), Washington, DC, USA	16 June 2004
4	Status of the Next European Dipole (NED) Activity of the Coordinated Accelerator Research in Europe (CARE) Project	A. Devred (CEA&CERN) on Behalf of the NED Collaboration	Applied Superconductivity Conference, Jacksonville, FL	6 October 2004

Table 2.1 (Cont.): List of review talks given by NED Collaborators in 2005.

#	Title	Speaker and lab	Location	Date
1	Next European Dipole (NED) Overview	A. Devred (CEA&CERN) on behalf of the NED Collaboration	CERN	4 February 2005
2				
3				
4				

2.2 List of papers

Table 2.2: List of papers issued by NED collaborators in 2004.

#	CARE document type and number	Title	Author(s) and Lab(s)	Reference	Date
1	N/A	High field accelerator magnets beyond LHC	A. Devred (CEA&CERN)	*Proceedings of the 2003 IEEE Particle Accelerator Conference*, IEEE Catalogue 03CH37423, pp. 146–150, 2003	2003
2	N/A	High field accelerator magnet R&D in Europe	A. Devred (CEA&CERN), D.E. Baynham (CCLRC), L. Bottura (CERN), M. Chorowski (WUT), P. Fabbricatore (INFN-Ge), D. Leroy (CERN), A. den Ouden (TEU), J. M. Rifflet (CEA), L. Rossi, O. Vincent-Viry (CERN), G.Volpini (INFN-Mi)	*IEEE Trans. Appl. Supercond.*, Vol. 14 No. 2, pp. 339-344, 2004	2004
3	Conf-04-005-HHH	Performance limits and IR design of a possible LHC luminosity upgrade based on NbTi SC magnet technology	F. Ruggiero, O. Brüning, R. Ostojic, L. Rossi, W. Scandale, T. Taylor (CERN), A. Devred (CEA&CERN)	*Proceedings of the 2004 European Particle Accelerator Conference*, pp. 608-610, 2004	2004
4	Conf-04-020-NED	Status of the Next European Dipole (NED) Activity of the Coordinated Accelerator Research in Europe (CARE) Project	A. Devred (CEA&CERN), B. Baudouy (CEA), D.E. Baynham (CCLRC), T. Boutboul (CERN), S. Canfer (CCLRC), M. Chorowski (WUT), P. Fabbricatore, S. Farinon (INFN-Ge), H. Félice (CEA), P. Fessia (CERN), J. Fydrich (WUT), M. Greco (INFN-Ge), J. Greenhalgh (CCLRC), D. Leroy (CERN), P. Loverige (CCLRC), F. Michel (CEA), L. R. Oberli (CERN), A. den Ouden (TEU), D. Pedrini (INFN-Mi, J. Polinski (WUT), V. Previtali (CERN), L. Quettier, J. M. Rifflet (CEA), J. Rochford (CCLRC), F. Rondeaux (CEA), S. Sanz (CIEMAT), S. Sgobba (CERN), M. Sorbi (INFN-Mi), F. Toral-Fernandez (CIEMAT), R. van Weelderen (CERN), P. Védrine (CEA), O. Vincent-Viry (CERN), G. Volpini (INFN-Mi)	To appear in the Proceedings of the Applied Superconductivity Conference, Jacksonville, FL, October 3–8, 2004	2004
5	Conf-04-020-NED	Future accelerator magnet needs	A. Devred (CEA&CERN), S. Gourlay (LBNL), A. Yamamoto (KEK)	To appear in the Proceedings of the Applied Superconductivity Conference, Jacksonville, FL, October 3–8, 2004	2004

Table 2.2 (Cont.): List of papers issued by NED collaborators in 2005.

#	CARE document type and number	Title	Author(s) and Lab(s)	Reference	Date
1		Insulation Development for the Next European Dipole	S J Canfer, E Baynham, R J S Greenhalgh (CCLRC)	To be presented at CEC/ICMC'05, Keystone, CO, Aug 29-Sep 2, 2005	2005
2		Pressurized He II cryostat for Next European Dipole cable insulation heat transfer measurements	M. Chorowski, J. Polinski (WUT), Baudouy, F. Michel (CEA), R. van Weelderen (CERN)	To be presented at CEC/ICMC'05, Keystone, CO, Aug 29-Sep 2, 2005	2005
3		Status of the Next European Dipole (NED) Activity of the Coordinated Accelerator Research in Europe (CARE) Project	A. Devred (CEA&CERN), on belhalf of the NED Collaboration	To be presented at EUCAS'05, Vienna, Austria, Sep 11-15, 2005	2005
4		Study of the protection system for the cosine-theta Nb3Sn prototype of the NED dipole	V. Granata, M. Sorbi, G.Volpini, D. Zamborlin (INFN-Mi)	To be presented at MT'19, Genova, Italy. Sep18-23, 2005	2005
5		Critical current measurements on Niobium-Tin conductors for the NED project	A. den Ouden (TEU), T. Boutboul (CERN), D. Pedrini (INFN-Mi), V. Previstali (CERN), L. Quettier (CEA), G. Volpini (INFN-Mi)	To be presented at MT'19, Genova, Italy. Sep 18-23, 2005	2005
6		Nano and micro mechanical study of Nb3Sn wires for the Next European Dipole (NED)	S. Farinon (INFM-Mi), S. Sgobba (CERN), C. Scheuerlein (CERN), P.A. Steinmann (EIAJ)	To be presented at MT'19, Genova, Italy. Sep 18-23, 2005	2005
7		Comparison of 2-D Magnetic and Mechanical Designs of Selected Coil Configurations for the Next European Dipole	F. Toral (CIEMAT), S. Sanz (CIEMAT), A. Devred (CEA&CERN), P. Védrine (CEA), H. Felice (CEA), J. Rochford (CCLRC), P. Loveridge (CCLRC), P. Fessia (CERN)	To be presented at MT'19, Genova, Italy. Sep 18-23, 2005	2005
8		Magnetization measurements of Nb3Sn wires for the Next European Dipole (NED)	M. Greco (INFN-Ge), P. Fabbricatore (INFN-Ge), C. Ferdeghini (INFM, Università di Genova), U. Gambardella (INFN-LNF).	To be presented at MT'19, Genova, Italy. Sep 18-23, 2005	2005

3 RESOURCES

3.1 Additional Staff Hiring

Table 3.1: Temporary Staff Hiring.

#	Lab	Job Type	Duration	Work subject	Status
1	INFN-Mi	Fellow	6 months	Quench protection computation (supervisor: G. Volpini)	Hired (251104)
2	WUT	Fellow	7 months	Cryostat design (supervisor: M. Chorowski)	Hired (171104)
3	WUT	Fellow	7 months	Cryostat design (supervisor: M. Chorowski)	Hired (171104)
4	CEA	Postdoc	1 year	Heat transfer measurement (supervisor: B. Baudouy)	Fall 2005
5	CEA	Postdoc	1 year	Innovative insulation development (supervisor: F. Rondeaux)	Fall 2005

3.2 Budget

Table 3.2a: Estimated budget for the first 18 months (January 1st 2004 to June 30 2005).

JRA4	Participant (cost model)	Permanent Staff including indirect cost (Euros)	Additional Staff including indirect cost (Euros)	Durable Equipment including indirect cost (Euros)	Consumables and Prototyping including indirect cost (Euros)	Travel including indirect cost (Euros)	Expected costs including indirect cost (Euros)	Direct cost	Subcontract	Indirect cost	Requested funding (Euros)
1	CEA (FC)	199,000	5,000	0	65,000	8,000	277,000	179,000	0	98,000	43,000
10	INFN (AC)	0	15,000	0	7,000	11,000	33,000	27,500	0	5,500	22,000
11	TEU (FC)	36,000	0	0	5,000	4,000	45,000	28,000	0	17,000	18,000
15	WUT (AC)	0	8,500	0	39,500	4,000	52,000	47,495	24,968	4,505	52,000
17	CERN (AC)	0	0	0	400,000	0	400,000	400,000	400,000	0	400,000
20	CCLRC (FC)	135,000	138,000	0	40,000	4,000	317,000	167,000	0	150,000	45,000
	Grand total	**370,000**	**166,500**	**0**	**556,500**	**31,000**	**1,124,000**	**848,995**	**424,968**	**275,005**	**580,000**

Table 3.2b: Executed budget for the first 12 months (January 1st 2004 to December 31st 2004).

JRA4	Participant (cost model)	Permanent Staff including indirect cost (Euros)	Additional Staff including indirect cost (Euros)	Durable Equipment including indirect cost (Euros)	Consumables and Prototyping including indirect cost (Euros)	Travel including indirect cost (Euros)	Expected costs including indirect cost (Euros)	Direct cost	Subcontract	Indirect cost	First received payment (Euros)
1	CEA (FC)	157,537			19,724	10,063	187,324	118,745	0	68,579	32,250
10	INFN (AC)	0	2,784	0	5,258	3,203	11,245	9,370	0	1,874	16,500
11	TEU (FC)	27,578	0	0	1,553	2,093	31,224	17,739	0	13,485	12,490
15	WUT (AC)	0	2,191.58	0	26,655.81	1,416.05	30,263.44	29,548	25,968	716	38,994
17	CERN (AC)	0	0	0	91,906	0	91,906	91,906	91,906	0	300,000
20	CCLRC (FC)	71,151	0	0	11,026	8,130	90,307	48,802	0	41,505	33,750
	Grand total	**256,262**	**4,975**	**0**	**156,123**	**24,905**	**442,265**	**316,106**	**117,874**	**126,159**	**433,984**

Table 3.2c: Requested budget for the next 18 months (January 1st 2005 to June 30 2006).

JRA4	Participant (cost model)	Permanent Staff including indirect cost (Euros)	Additional Staff including indirect cost (Euros)	Durable Equipment including indirect cost (Euros)	Consumables and Prototyping including indirect cost (Euros)	Travel including indirect cost (Euros)	Expected costs including indirect cost (Euros)	Direct cost	Subcontract	Indirect cost	Requested funding (Euros)
1	CEA (FC)	358,116	41,667	0	92,500	24,000	516,283	0	0	516,283	45,000
10	INFN (AC)	0	15,000	0	25,750	7,000	47,750	39,792	0	7,958	47,750
11	TEU (FC)	139,334	0	0	30,000	4,500	173,834	105,693	0	68,141	69,534
15	WUT (AC)	0	6,308	0	12,844	2,584	21,736	18,113	0	3,623	21,736
17	CERN (AC)	0	0	0	350,000	0	350,000	350,000	350,000	0	350,000
20	CCLRC (FC)	274,000	0	0	33,300	16,500	323,800	163,967	0	159,833	26,250
	Grand total	**771,450**	**62,975**	**0**	**544,394**	**54,584**	**1,433,403**	**677,565**	**350,000**	**755,838**	**560,270**

4 STATUS OF THE WORK

4.1 Work Package 1: Management and Communication (M&C)

2004 Summary

The NED Steering Committee (SC) has met four times (8 January, 25 March, 8 July and 29 October), while the NED External Scientific Advisory Committee (ESAC) has met once (24 March) and has produced a report.

The NED work breakdown structure has been implemented by E. Deluncige (CERN) into the CERN Engineering Data and Management Service (EDMS):
https://edms.cern.ch
under CERN/AT Department/CARE. This service is used to release, circulate, track and store documents. Access is restricted to members of the NED collaboration (as identified in EDMS 547908).

A dedicated web page has been set up by A. den Ouden (TEU):
http://lt.tnw.utwente.nl/project.php?projectid=9
The webpage is updated regularly with all information pertinent to the NED JRA and is accessible by the general public.

Detailed implementation plans of the three technical Work Packages (Thermal Studies and Quench Protection or TSQP, Conductor Development or CD, and Insulation Development and Implementation or IDI) have been established and launched and all collaborators have started their activities. In addition, the Activity scope has been extended, thanks to the setting up of a Working Group on Magnet Design and Optimization (WGMDO), supported by CCLRC and by additional resources from CEA, CERN and CIEMAT, a CARE Associated Laboratory who has decided to join the NED collaboration.

Three status reports have been produced

- 2nd quarter of 2004: EDMS 548027
- 3rd quarter of 2004: EDMS 548028
- Yearly report for 2004: EDMS 548030V4

2005 Summary

The NED Steering Committee (SC) has met two times (20 January and 14 April) and is scheduled to meet a 3rd time on 7 July at WUT.

It is foreseen to present a total of 8 papers (7 contributed and 1 invited) to the 2005 conferences pertinent to NED.

4.1.1 Activity Coordination

The NED JRA is coordinated by A. Devred (CEA&CERN), helped by A. den Ouden (TEU).

The following actions have been carried out and/or are foreseen

- ✓ 19–21 November 2003: participation of A. Devred (CEA&CERN) and A. den Ouden (TEU) to CARE Kick Off meeting at CERN
- ✓ 13 January 2004: visit of A. Devred (CEA&CERN) to INFN-Ge
- ✓ 16 January 2004: visit of P. Védrine (CEA) and A. Devred (CEA&CERN) to CIEMAT
- ✓ 27 January 2004: visit of A. Devred (CEA&CERN) to TEU
- ✓ 13 February 2004: A. Devred (CEA&CERN), P. Lebrun and L. Rossi (CERN) to INFN-Mi
- ✓ 23–24 February 2004: participation of A. Devred (CEA&CERN) to 1st CARE Steering Committee and Dissemination Board meetings in Paris, France
- ✓ 19 March 2004: visit of F. Rondeaux and P. Védrine (CEA), A. Devred (CEA&CERN) to CCLRC
- ✓ 22–24 March 2004: participation to Workshop on Accelerator Magnets Superconductor (WAMS) organized within the framework of AMT Work Package of HHH Network Activity
- ✓ 13 April 2004: visit of A. Devred (CEA&CERN) and M. Pojer (CERN) to INFN-Ge
- ✓ 2–3 June 2004: visit of B. Baudouy and F. Michel (CEA), A. Devred (CEA&CERN), R. Van Weelderen (CERN) to WUT
- ✓ 24–25 June 2004: participation of A. Devred (CEA&CERN) and A.den Ouden (TEU) to 2nd CARE Steering Committee and Dissemination Board meetings in Warsaw, Poland
- ✓ 24 August 2004: visit of M. Chorowski (WUT) to CEA/Saclay
- ✓ 2–5 November 2004: participation of A. Devred (CEA&CERN) to 1st CARE general meeting at DESY
- ✓ 11-12 November 2004: participation of a number of NED collaborators to the HHH/AMT network meeting organised at CERN.
- ✓ 3-4 March 2005: participation of a number of NED collaborators to the HHH meeting on Beam-Generated Heat Deposition and Quench Levels in LHC Magnets organised at CERN.
- ✓ 22-23 March 2005: participation of a number of NED collaborators to the HHH/AMT meeting on Insulation & Impregnation Technique organised at CERN.

4.1.2 Meetings

4.1.2.1 Steering Committee Meetings

The oversight of the NED JRA is ensured by a Steering Committee (SC) made up of

- E. Baynham (CCLRC)
- A. Devred (CEA&CERN), Chairman
- D. Leroy (CERN)
- J.M. Rifflet (CEA)
- G. Volpini (INFN-Mi)
- A. den Ouden (TEU), Secretary

SC meetings are held every three months. Available copies of the presentations and minutes of the meetings have been loaded into EDMS and are posted on the NED website.

The following actions have been carried out and/or are foreseen

- ✓ 8 January 2004: meeting at CERN
  participants: E. Baynham (CCLRC), A. Devred (CEA&CERN), D. Leroy, L. Oberli and O. Vincent-Viry (CERN), P. Fabbricatore (INFN-Ge), G. Volpini (INFN-Mi), A. den Ouden (TEU)
  special guests: L. Rossi (CERN), H. ten Kate (CERN&TEU)
  agenda+talks: EDMS 548032; also available on NED website
- ✓ 25 March 2004: meeting at CERN
  participants: B. Baudouy and J.M. Rifflet (CEA), A. Devred (CEA&CERN), D. Leroy and R. van Weldeeren (CERN), F. Toral (CIEMAT), G. Volpini (INFN-Mi), E. Baynham and S. Canfer (CCLRC), A. den Ouden (TEU)
  special guests: A. Yamamoto (KEK), S. Gourlay (LBNL)
  agenda+talks: EDMS 548033; also available on NED website
- ✓ 8 July 2004: meeting at CERN
  participants: E. Baynham and S. Canfer (CCLRC), A. Devred (CEA&CERN), F. Rondeaux and P. Védrine (CEA), T. Boutboul, D. Leroy, L. Oberli, V. Previtali, O. Vincent-Viry, R. van Weldeeren (CERN), P. Fabbricatore and S. Farinon (INFN-Ge), M. Sorbi (INFN-Mi), A. den Ouden (TEU)
  special guests: –
  agenda+talks: EDMS 548034; also available on NED website
- ✓ 29 October 2004: meeting at CEA/Saclay
  participants: S. Canfer (CCLRC), A. Devred (CEA&CERN), H. Felice, L. Quettier, J.M. Rifflet, F. Rondeaux, P. Védrine (CEA), T. Boutboul, D. Leroy, L. Oberli, V. Previtali, R. van Weldeeren (CERN), M. Greco (INFN-Ge), D. Pedrini, M. Sorbi, G. Volpini (INFN-Mi), A. den Ouden (TEU), M. Chorowski, J. Polinski (WUT)
  special guests: R. Aleksan (CPPM), P. Debu, M. Durante (CEA), B. Adamowicz (Kryosystem)
  agenda+talks: 548035; also available on NED website
- ✓ 20 January 2005: meeting at CERN
  participants: S. Canfer, E. Baynham (CCLRC), A. Devred (CEA&CERN), F. Michel, J.M. Rifflet (CEA), T. Boutboul, P. Fessia, D. Leroy, L Oberli, D. Richter, W. Scandale, C. Scheuerlein, N. Schwerg, S Sgobba (CERN),

P. Fabbricatore, S. Farinon, M. Greco (INFN-Ge), F. Broggi, V. Granata, M. Sorbi, G. Volpini (INFN-Mi), A. den Ouden (TEU)
agenda+talks: 548036; also available on NED website

✓ 14 April 2005: meeting at CERN
participants: S. Canfer, E. Baynham (CCLRC), A. Devred (CEA&CERN), T. Boutboul, L Oberli, C. Scheuerlein, R. Schmidt, S Sgobba, R. Van Weldeeren (CERN), F. Toral (CIEMAT), S. Farinon, M. Greco (INFN-Ge), V. Granata, M. Sorbi, G. Volpini (INFN-Mi), A. den Ouden (TEU), S. Petrowicz, M. Chorowski (WUT)
agenda+talks: 575731

⇒ next meeting: 7 July 2005 at WUT

4.1.2.2 External Scientific Advisory Committee Meetings

The NED JRA Coordinator is assisted by an External Scientific Advisory Committee (ESAC). The charges and composition of the committee are defined in EDMS 548039. The committee is made up of

- J.L. Duchateau (CEA)
- P. Lebrun (CERN)
- L. Rossi (CERN)
- R.M. Scanlan (formerly LBNL, retired)
- J.B. Strait (FNAL), Chairman
- H.H.J. ten Kate (CERN&TEU)

The following actions have been carried out and/or are foreseen

✓ 24 March 2004: first meeting at CERN
agenda: EDMS 548039; presentations available on NED website

✓ 29 March 2004: first ESAC report (EDMS 548041)
agenda+talks: 548035; also available on NED website

⇒ next meeting: fall of 2005

4.2 Work Package 2: Thermal Studies and Quench Protection (TSQP)

2004 Summary

The fabrications of the cryostat and of the cryogenic modules of the Heat Transfer Facility are proceeding as planned under the supervision of WUT and the hardware is expected to be delivered to CEA in January/February 2005.

After completing a literature survey of relevant material properties (EDMS 555753), INFN-Mi has carried out detailed quench computations based on the 88-mm-aperture, $\cos\theta$-layer design chosen as a reference for NED in conclusion of Task 3.2. The computations, summarized is an interim report (EDMS 555756), deal with two magnet lengths (1 m and 5 m) and include the effect of quench protection heaters.

2005 Summary

Some delays have been encountered in the manufacturing of the cryostat and of the cryogenic modules. Preliminary reception tests were held at WUT during the 3rd week of April, which revealed some problems, which are now being fixed. Another round of reception tests will be held at WUT in June/July 2005. As a result the commissioning of the facility at CEA is now scheduled for September 2005 and the delivery of the commissioning report will be delayed until October 1st.

Quench computations have been carried out for a 10-m-long magnet relying on the 88-mm-aperture, $\cos\theta$ layer design, and work has started on a 160-mm-aperture, $\cos\theta$ slot design. Also, a comparative evaluation of different quench codes has been undertaken. The final report on this Task should be delivered as planned (30 June 2005).

4.2.1 TSQP WP coordination

The TSQP Work Package is articulated around two main tasks: Heat Transfer Measurements (2.2) and Quench Computation (2.3). Task 2.2 is coordinated by B. Baudouy (CEA), while Taks 2.3 is coordinated by G. Volpini (INFN-Mi). The Task Leaders report to the NED Steering Committee and, ultimately, to the NED/JRA Coordinator.

4.2.2 Heat Transfer Measurements

The following actions have been carried out and/or are foreseen

4.2.2.1 Drafting of Test Facility Specifications

- ✓ 28 January 2004: preparatory meeting at CEA/Saclay
  participants: B. Baudouy, P. Chesny, B. Hervieu, F. Michel and J.M. Rifflet (CEA), A. Devred (CEA&CERN)
- ✓ 27 February 2004: programme proposal issued by B. Baudouy (CEA; EDMS 548123)
- ✓ March 2004: review of programme proposal by P. Lebrun and D. Leroy (CERN) and approbation by SC meeting
- ✓ 4 May 2004: cryostat specification issued by B. Baudouy, B. Hervieu and F. Michel (CEA; EDMS 548129V1)

- ✓ May 2004: specification submitted for review to P. Lebrun and R. Van Weelderen (CERN) and M. Chorowski (WUT)
- ✓ 8 June 2004: final cryostat specification issued by B. Baudouy, B. Hervieu and F. Michel (CEA; EDMS 548129V2)

Sub-Task completed

4.2.2.2 Cryostat Design and Fabrication

- ✓ 3 June 2004: preparatory visit to Kryosystem (Poland) participants: B. Baudouy, F. Michel (CEA), A. Devred (CEA&CERN) R. van Weelderen (CERN), M. Chorowski, J. Fydrych and J. Polinski (WUT), B. Adamowicz, G. Michalski and G. Strychalski (Kryosystem)
- ✓ July 2004: start of technical design at WUT
- ✓ July 2004: start of tendering procedure
- ✓ 10 August 2004: redefinition of WUT budget allocation
- ✓ August 2004: contract attribution to Kryosystem
- ✓ 29 Ooctober 2004: Production Readiness Review at CEA Saclay participants: B. Baudouy, F. Michel (CEA), R. van Weelderen (CERN), M. Chorowski, J. Polinski (WUT), B. Adamowicz (Kryosystem) report: EDMS 548154)
- ✓ 17 November 2004: hiring of Grzegorz Michalski and Maciej Matkowski at WUT (additional staff; till 30 June 2005)
- ✓ Early April 2005: completion of manufacturing
- ✓ 20-22 April 2005: preliminary reception tests at WUT, in participants: B. Baudouy and F. Michel (CEA) and of M. Chorowski and J. Polinski (WUT)
  Test report: EDMS 587176
- ✓ 2 May 2005: set of recommendations issued by B. Baudouy, F. Michel (CEA) and A. Devred (CEA&CERN) – EDMS 587176
- ✓ 6 May 2005: report on mechanical design study issued by M. Chorowski and J. Polinksi (WUT) – EDMS 592247
- ✓ 12 May 2005: first status report on repairs issued by M. Chorowski and J. Polinksi (WUT) – EDMS 592246
- ✓ Comments on status report issued by B. Baudouy and F.Michel (CEA) – EDMS 593633
- ✓ 3 June 2005: second status report on repairs issued by M. Chorowski and J. Polinksi (WUT) – EDMS 592246
- ✓ 3 June 2005: second version of report on mechanical design study issued by M. Chorowski and J. Polinksi (WUT) – EDMS 592247V2
- ⇒ June/July 2005: second round of reception tests at WUT
- ⇒ July 2005: shipment to CEA/Saclay

4.2.2.3 Cryogenic Module Design and Fabrication

- ✓ 22 June 2004: design specifications issued by B. Baudouy and F. Michel (CEA; EDMS 548139, based on design study reviewed in EDMS 548137)
- ✓ 1st July 2004: call for tender issued by F. Michel (CEA)
- ✓ 15 July 2004: reception of answers to call for tender
- ✓ 17 September 2004: purchase requisition to be issued by F. Michel (CEA)
- ✓ 10 October 2004: contract awarded to Kryosystem.
- ✓ Early April 2005: completion of manufacturing

- ✓ Early May 2005: WUT has instructed Kryosystem to manufacture a second heat exchanger.
- ⇒ June 2005: completion of manufacturing and replacement in cryostat

4.2.2.4 Facility Integration and Qualification

Not started

4.2.2.5 Measurements and Analyses

Not started

4.2.3 Quench Protection Computation

The following actions have been carried out and/or are foreseen

- ✓ 5 March 2004: draft computation programme issued by M. Sorbi and G. Volpini (INFN-Mi; EDMS 555747)
- ✓ March 2004 SC meeting: discussion of computation programme
- ✓ April–June 2004: compilation of material properties (EDMS 555753)
- ✓ June-October 2004: first computation on baseline (88-mm-aperture, $\cos\theta$, layer design) magnetic configuration
- ✓ November-December 2004: extended computation on baseline magnetic configuration
- ✓ 25 November 2004: hiring of Valeria Granata by INFN-Mi (additional staff for 6 months)
- ✓ 3 February 2005: first version of interim report (EDMS 555756; EU milestone)
  authors: V. Granata, M. Sorbi, G. Volpini, D. Zamborlin (INFN-Mi)
- ✓ 13 April 2005: second version of interim report (EDMS 555756V2)
  authors: V. Granata, M. Sorbi, G. Volpini, D. Zamborlin (INFN-Mi)
- ⇒ 30 June 2005: final report (INFN-Mi); EU deliverable

Table 4.2a: Status of the lowest Sub-Tasks level in the TSQP WP (as of 21 June 2005).

WBS #	Title	Original begin date (Annex 1)	Original end date (Annex 1)	Estimated Status	Revised end date
2.1	TSQP WP Coordination				
2.2	Heat Transfer Measurements				
2.2.1	Drafting of Test Facility Specifications	1 January 2004	31 March 2004	Completed	8 June 2004
2.2.2	Cryostat Design and Fabrication	1 April 2004	31 Dec. 2004	Being modified	June/July 2005
2.2.3	Cryogenic Module Design and Fabrication	1 April 2004	31 Dec. 2004	Being rebuilt	June/July 2005
2.2.4	Facility Integration and Qualification	1 January 2005	31 March 2005	Not started	-
2.2.5	Measurements and Analyses	1 April 2005	31 Dec. 2006	Not started	-
2.3	Quench Protection Computation	1 April 2004	30 June 2005	80 %	On time

Table 4.2b: Status with respect to the milestones and deliverables due in the TSQP WP (as of 21 June 2005).

WBS #	Title	Responsible Lab(s)	Due date in Annex 1	Status	Revised delivery date
2.2.4	Report on Heat Transfer Facility Commissioning (deliverable)	CEA and WUT	1 April 2005	Not started	30 September 2005
2.2.5	Interim Report on Heat Transfer Measurements (milestone)	CEA	31 December 2005	Not started	31 March 2006
2.2.5	Final Report on Heat Transfer Measurements (deliverable)	CEA	31 December 2006	Not started	-
2.3	Interim Report on Quench Protection (milestone)	INFN-Mi	31 December 2004	Completed	13 April 2005
2.3	Final Report on Quench Protection (deliverable)	INFN-Mi	30 June 2005	Ongoing	-

4.3 Work Package 3: Conductor Development (CD)

2004 Summary

CERN has investigated two different magnetic designs, referred to as $\cos\theta$ layer design and $\cos\theta$ block design and has considered 3 apertures: 88 mm, 130 mm and 160 mm. These investigations, described in a report (EDMS 555826), led to the definition of wire and cable parameters used as a basis for conductor specifications. The 88-mm-aperture, $\cos\theta$ layer design has been chosen as a baseline for NED (EDMS 555825).

After writing comprehensive wire and cable specifications and a detailed technical questionnaire (EDMS 475443), CERN has carried out a call for tender and has selected Alstom/MSA, in France, and ShapeMetal Innovation (SMI), in the Netherlands, to be the main wire and cable contractors. The two companies have established a development plan, which has been agreed upon by CERN, and have started the procurements of raw materials.

A Working Group on Conductor Characterization (WGCC) made up of representatives from CEA, CERN, INFN-Mi, INFN-Ge and chaired by A. den Ouden (TEU) has been set to oversee the wire I_C and magnetization measurements. The Working Group has initiated a cross-calibration of the various test facilities that will be used to perform these measurements.

An effort has been launched to develop an FE mechanical model of un-reacted wires so as to simulate the effects of cabling and derive optimum billet layout. This model requires a detailed knowledge of the properties of the materials that make up the wire in its cold work state at the end of production.

2005 Summary

Both industrial sub-contractors have received their raw materials and have started to assemble and transform small billets to study the influence of salient design and process parameters. The first batch of strands are expected this Summer.

The cross-calibration program launched by the Working Group on Conductor Characterization has proven more difficult than anticipated. Two rounds of “virgin” test wires have been circulated among the various labs and have pointed out a number of problems and discrepancies which are being resolved. The next step will be to circulate and characterize “deformed” test wires to simulate cabling degradation.

Measurement campaigns have been launched to determine in situ on a wire sample what are the material properties (Young’s modulus, Yield Strength, UTS…) in the cold work state of the wire at the end of production. A first table of properties has been agreed upon (EDMS 567375) and will be used to study the behavior of two types on internal wire (EDMS 548087 and 575661).

4.3.1 CD WP coordination

The CD Work Package is articulated around three main poles: conductor development (encompassing Tasks 3.2, 3.3, 3.4 and 3.6), conductor characterization (encompassing Tasks 3.5 and 3.7), and mechanical studies (extension of scope with respect to CARE Annex I, initiated by INFN-Ge and partially supported by CERN).

The conductor development pole is coordinated by D. Leroy (CERN). A working Group on Conductor Characterization (WGCC), chaired by A. den Ouden (TEU) has been set up to coordinate the conductor characterization efforts, while S. Farinon (INFN-Ge) is the principal investigator on the mechanical model. The Pole Coordinators report to the NED Steering Committee and, ultimately, to the NED/JRA Coordinator.

4.3.2 Design of a 15 T Dipole Magnet

The following actions have been carried out

- ✓ September 2003–July 2004: preliminary design computations carried out by O. Vincent-Viry (CERN) under D. Leroy supervision (CERN)
- ✓ November 2003: report on 2D magnetic induction analytical calculation issued by O. Vincent-Viry (CERN; EDMS 431540)
- ✓ January 2004 SC meeting: first presentation of preliminary design computations by O. Vincent-Viry (CERN)
- ✓ 4 May 2004: meeting at CEA to review magnetic configurations and choice of 88-mm-aperture, $\cos\theta$ layer, baseline design (EDMS 555825) participants: H. Félice, L. Quettier, J.M. Riflet, P. Védrine (CEA), A. Devred (CEA&CERN), D. Leroy and O. Vincent-Viry (CERN)
- ✓ 2 August 2004: seminar at CERN by O. Vincent-Viry (CERN) on preliminary magnet designs

$\Rightarrow$ Early February 2005: final report (CERN; 555826); EU deliverable

Sub-Task near completion

4.3.3 Specifications on Wire and Cable

The following actions have been carried out

- ✓ 11 May 2004: first draft specification issued by D. Leroy (CERN) and communicated to A. Devred (CEA&CERN)
- ✓ 14 May 2004: first draft reviewed by A. Devred (CEA&CERN)
- ✓ 18 May 2004: second draft specification issued by D. Leroy and communicated to A. Devred (CEA&CERN) and A. den Ouden (TEU)
- ✓ 1 June 2004: third draft specification issued by D. Leroy and communicated to NED SC
- ✓ 4 June 2004: Specification Committee Meeting at CERN participants: T. Boutboul, P. Bryant (Chairman), P. Lebrun, D. Leroy, L. Oberli, L. Rossi (CERN), H.H.J. ten Kate (CERN&TEU)]
- ✓ 18 June 2004: final specification and technical questionnaire issued by D. Leroy (CERN; EDMS 475443); EU deliverable

Sub-Task completed

4.3.4 Wire Development

The following actions have been carried out and/or are foreseen

- ✓ 12 December 2003: preparatory visit to Alstom/MSA, France
  participants: A. Devred (CEA&CERN), D. Leroy, T. Boutboul and L. Oberli (CERN)]
- ✓ 15 December 2003: preparatory visit to European Advanced Superconductors (EAS, Germany)
  participants: A. Devred (CEA&CERN), D. Leroy and L. Oberli (CERN) + SMI representative
- ✓ 27 January 2004: preparatory visit to ShapeMetal Innovation (SMI, The Netherlands)
  participants: A. Devred (CEA&CERN), D. Leroy, T. Boutboul, and A. Unervick (CERN) + EAS representatives
- ✓ 21 June 2004: call for tender issued to Alstom/MSA, EAS, Outokumpu Copper (OK Cu, Finland), Outokumpu SI (OKSI, Italy) and SMI
- ✓ 20 August 2004: meeting at CERN with SMI and EAS to prepare answer to call for tender
- ✓ 23 August 2004: meeting at CERN with OK to prepare answer to call for tender
- ✓ 24 August 2004: meeting at CERN with Alstom to prepare answer to call for tender
- ✓ 6 September 2004: tenders' opening at CERN; selection of Alstom/MSA and SMI
- ✓ 24 September 2004: sending of orders to CERN Finance Division
- ✓ 15 November 2004: contracts' signature by Alstom/MSA and SMI
- ✓ 15 December 2004: first progress reports issued by Alstom/MSA and SMI (restricted access)
- ✓ 17 May 2005: visit of T. Boutboul, D. Leroy, L. Oberli (CERN) to Alstom/MSA
- ⇒ week of June 27: visit of CERN staff to SMI
- ⇒ Summer 2005: delivery of first batch of wires
- ⇒ 15 December 2005: second progress reports issued by Alstom/MSA and SMI
- ⇒ 30 September 2006: final wire production; EU deliverable

4.3.5 Wire Characterization

The following actions have been carried out and/or are foreseen

4.3.5.1 Definition of Measurement Procedures

- ✓ March 2004: setting up of Working Group on Conductor Characterization (WGCC), chaired by A. den Ouden (TEU)
  WGCC charges and composition: EDMS 548084
- ✓ 19 May 2004: first Working Group meeting at CERN
  participants: L. Quettier (CEA), V. Previtali (CERN), P. Fabbricatore and M. Greco (INFN-Ge), D. Pedrini, G. Volpini (INFN-Mi), A. den Ouden (TEU)

Talks: EDMS 567255

- ✓ June 2004-October 2004: first round of test wires for cross-calibration purposes
- ✓ 28 October 2004: second Working Group meeting at CEA
  participants: L. Quettier (CEA), V. Previtali, T. Boutboul (CERN), M. Greco (INFN-Ge), D. Pedrini, G. Volpini (INFN-Mi), A. den Ouden (TEU)
- ✓ November 2004-January 2005: second round of test wires for cross-calibration purposes
- ✓ 22 February 2005: third Working Group meeting at INFN-Mi
  participants: L. Quettier (CEA), A. Devred (CEA&CERN), T. Boutboul and V. Previtali (CERN), M. Greco and P. Fabbricatore (INFN-Ge), D. Pedrini, G. Volpini (INFN-Mi)
  Talks and Minutes: EDMS 576267
- ✓ 3 May 2005: fourth Working Group Meeting at CERN
  participants: L. Quettier (CEA), T. Boutboul, D. Leroy, L. Oberli (CERN), M. Greco (INFN-GE), D. Pedrini, G. Volpini (INFN-Mi), A. den Ouden (TEU)
  Talks: EDMS 593632
- ⇒ May-June 2005: third round of test wires for cross-calibration purposes (includes deformed wires by rolling)
- ⇒ 30 June 2005: end of cross-calibration program
- ⇒ 31 December 2004: first interim report on wire characterization; EU milestone
- ⇒ 31 December 2005: second interim report on wire characterization; EU milestone
- ⇒ 31 October 2006: final report on wire characterization; EU deliverable

4.3.5.2 Wire I_C Measurements

4.3.5.2.1 Wire I_C Measurements at CEA

- ⇒ June 2004-June 2005: cross-calibration program

4.3.5.2.2 Wire I_C Measurements at INFN-Mi

- ⇒ June 2004-June 2005: cross-calibration program

4.3.5.2.3 Wire I_C Measurements at TEU

- ⇒ June 2004-June 2005: cross-calibration program

4.3.5.3 Wire Magnetization Measurements at INFN-Ge

- ✓ 21 January 2004: preparatory meeting at CERN
  participants: A. Devred (CEA&CERN), D. Leroy (CERN) and P. Fabbricatore (INFN-Ge]
- ✓ 23 March 2004: first report on preliminary measurements issued by P. Fabbricatore and M. Greco (INFN-Ge)
- ✓ 23 March 2004–13 April 2004: review of preliminary measurements by A. Devred (CEA&CERN) and D. Leroy (CERN)
- ⇒ June 2004-June 2005: participation to cross-calibration program defined by WGCC

4.3.6 Cable development and manufacturing

Not started

4.3.7 Cable Characterization

Not started

4.3.8 Mechanical Studies

These studies are an extension of scope with respect to CARE Annex I and are supported by additional resources provided by INFN-Mi and CERN.

The following actions have been carried out and/or are foreseen

- ✓ 28 January 2004: parameters of mechanical model for 19-subelement, internal tin wire issued by A. Devred (CEA&CERN; EDMS 548087)
- ✓ 30 January 2004: mesh proposal issued by S. Farinon (INFN-Ge)
- ✓ Early February 2004: review of mesh proposal by A. Devred (CEA&CERN), D. Leroy (CERN) and C. Verwaerde (Alstom/MSA)
- ✓ 25 March 2004: informal discussion of preliminary computation results participants: A. Devred (CEA), D. Leroy (CERN), S. Farinon (INFN-Ge), C. Verwaerde and P. Mocaer (Alstom/MSA)]
- ✓ 9 June 2004: meeting at CERN to review material properties and discuss computation results
  participants: A. Devred (CEA&CERN), T. Boutboul, P. Fessia, D. Leroy and S. Sgobba (CERN), S. Farinon and R. Musenich (INFN-Ge), P. Loverage (CCLRC)
- ✓ 7 July 2004: meeting at CERN to review material properties and discuss computation results
  participants: A. Devred (CEA&CERN), T. Boutboul, P. Fessia, L. Oberli M. Pojer and S. Sgobba (CERN), P. Fabbricatore and S. Farinon (INFN-Ge)
- ✓ September 2004: first contract issued to EIAJ to perform nano-indentation measurements on an un-reacted, internal-tin wire cross-section
- ✓ 14 October 2004: visit to EIAJ, Le Locle (CH)
  participants: T. Boutboul, C. Scheuerlein, S. Sgobba (CERN)
  trip report: EDMS 520095
- ✓ 29 October 2004: first report issued by EIAJ on nano-indentation measurements (EDMS 548100)
- ✓ 11 November 2004: meeting at CERN to review nano-indentation measurements performed at EIAJ
  participants: A. Devred (CEA&CERN), T. Boutboul, P. Fessia, D. Leroy, L. Oberli, V. Previtali, D. Richter and S. Sgobba (CERN), P. Fabbricatore and S. Farinon (INFN-Ge)
- ✓ 11 November 2004: first report issued by C. Scheuerlein (CERN) on micro-hardness measurements at CERN (EDMS 548116)
- ✓ 22 November 2004: meeting at CERN to review micro-hardness measurements
  participants: A. Devred (CEA&CERN), T. Boutboul, C. Scheuerlein, S. Sgobba and W. Scandale (CERN)
- ✓ 15 February 2005: second report issued by C. Scheuerlein (CERN) on micro-hardness measurements at CERN (EDMS 567297)

- ✓ 15 February 2005: meeting at CERN to update table of material properties to be used in FE model
  participants: A. Devred (CEA&CERN), T. Boutboul, D. Leroy, C. Scheuerlein, S. Sgobba (CERN)
- ✓ 17 February 2005: report issued by T. Boutboul (CERN) on RRR measurements at CERN (EDMS 567365)
- ✓ 22 February 2005: table of material properties issued by S. Sgobba and C. Scheuerlein (CERN; EDMS 567375)
- ✓ 23 March 2005: note issued by T. Boutboul and L. Oberli (CERN) defining new parameters of internal tin wire (EDMS 575661)
- ✓ April 2005: second contract issued to EIAJ to perform nano-indentation measurements on a longitudinal cross-section of an un-reacted, internal-tin wire
- ✓ 9 May 2005: first version of report on UTS measurements at CERN issued by C. Scheuerlein (CERN; EDMS 567375)
- ✓ 6 June 2005: second version of report on UTS measurements at CERN issued by C. Scheuerlein (CERN; EDMS 567375V2)
- ⇒ next discussion: at the July 7 Steering Committee meeting

Table 4.3a: Status of the lowest Sub-Tasks level in the CD WP (as of 21 June 2005).

WBS #	Title	Original begin date (Annex 1)	Original end date (Annex 1)	Estimated Status	Revised end date
3.1	CD WP Coordination				
3.2	Design of a 15 T Dipole Magnet	1 January 2004	31 Dec. 2004	99%	January 2005
3.3	Specifications on Wire and Cable	1 April 2004	30 June 2004	Completed	On time
3.4	Wire Development	1 July 2004	30 June 2006	Started	30 September 2006
3.5	Wire Characterization				
3.5.1	Definition of Measuring Procedures	1 January 2005	30 June 2005	70%	On time
3.5.2	Ic measurements at CEA	1 July 2005	30 June 2006	Started	31 October 2006
3.5.3	Ic measurements at INFN-Mi	1 July 2005	30 June 2006	Started	31 October 2006
3.5.4	Ic measurements at TEU	1 July 2005	30 June 2006	Started	31 October 2006
3.5.5	Wire Magnetization Measurements	1 July 2005	30 June 2006	Started	31 October 2006
3.6	Cable Development	1 July 2005	31 Dec. 2006	Not started	15 December 2006
3.7	Cable Characterization	1 October 2005	31 Dec. 2006	Not started	-
3.8	Mechanical Studies[a)]	1 January 2004	31 Dec. 2005	33%	-

[a)] Extension of scope with respect to CARE Annex I.

Table 4.3b: Status with respect to the milestones and deliverables due in the CD WP (as of 21 June 2005).

WBS #	Title	Responsible Lab(s)	Due date in Annex 1	Status	Revised delivery date
3.2	Design Report (deliverable)	CERN	31 December 2004	99%	January 2005
3.3	Final Report on Wire and Cable Specifications (deliverable)	CERN	30 June 2004	Completed	On time
3.4	Progress Report on Wire Development (milestone)	CERN	30 June 2005[a)]	Completed Not started	15 December 2004 15 December 2005
3.4	Production of Final Wire (deliverable)	CERN	30 June 2006	Not started	30 September 2006
3.5	Intermediate Results on Wire Characterization (milestone)	CEA, INFN-Ge, INFN-Mi, TEU	31 December 2005	Started	-
3.5	Final Report on Wire Characterization (deliverable)	CEA, INFN-Ge, INFN-Mi, TEU	30 June 2006	Not started	31 October 2006
3.6	Production of Final Cable (deliverable)	CERN	31 December 2006	Not started	15 December 2006
3.7	Final Report on Cable Performances (deliverable)	TEU	31 December 2006	Not started	-

[a)] The CARE Annex I milestone entitled “First Results on Wire Development” that was due on 30 June 2005 has been split into two “Status Reports” due on 15 December 2004 and 15 December 2005.

4.4 Work Package 4: Insulation Development & Implementation (IDI)

2004 Summary

CCLRC and CEA have written an engineering specification for the NED conductor insulation (EDMS 548037) and a coordinated Test Programme for the conventional and innovative insulations (EDMS 548038).

CCLRC has started investigations on glass fiber sizings and epoxy resin fillers and is developing an experimental set up to perform fracture tests.

The start of the work on Innovative Insulation at CEA (Task 4.4) has been delayed, pending the hiring of a technician to support the activity of the chemistry laboratory.

2005 Summary

Screening testing of candidate materials for Conventional Insulation has progressed well. CCLRC has developed a standardised laminate production system and relies on three tests for screening: (1) inter-laminar fracture test, (2) short-beam shear test and (3) electrical breakdown test. The standard laminates leave sufficient material for radiation testing.

Furthermore, glass fibre sizing has been identified as key to practical manufacturing. Currently, glass fibre tape is de-sized before winding and is fragile. Sizing has also proved to have a bearing on mechanical and electrical performance. CCLRC has identified an improved sizing material, which is a commercial polyimide made by Hydrosize, NC, USA. JPS Glass, SC, USA, has provided samples of S-glass and quartz fibre fabric with the Hydrosize polyimide sizing, and CCLRC has performed mechanical and electrical tests after exposing the glass to a typical Nb_3Sn heat treatment cycle. The polyimide-sized S-glass is the only material that meets the insulation specification after heat treatment. CCLRC is now investigating what happens to the sizing material during heat treatment in different atmospheres using FT-IR (Fourier Transform Infra-Red Spectroscopy).

The work on the Innovative Insulation is still on hold pending the hiring of a technician in the chemistry lab at CEA, which has been further delayed until the Fall of 2005. To compensate this delay, it has been decided to use part of the EU funding to hire a postdoc at CEA.

4.4.1 IDI WP Coordination

The IDI Work Package is coordinated by E. Baynham (CCLRC). The conventional Insulation Task (4.3) is headed by S. Canfer (CCLRC) while the Innovative Insulation Task (4.4) is headed by F. Rondeaux (CEA). The Work package and Task Leaders report to the NED Steering Committee and, ultimately, to the NED/JRA Coordinator.

4.4.2 Specifications' Drafting

The following actions have been carried out

- ✓ 6 May 2004: draft specifications issued by S. Canfer (CCLRC)
- ✓ 11 May 2004: conference call on insulation specifications

- ✓ participants: S. Canfer and J. Greenhalgh (CCLRC), F. Rondeaux (CEA), A. Devred (CEA&CERN), A. den Ouden (TEU)
- ✓ 11 May 2004: Version 2 of specifications issued by S. Canfer (CCLRC; EDMS 548037V1)
- ✓ 25 May 2004: Version 2.2 of specifications issued by S. Canfer (CCLRC; EDMS 548037V2)
- ✓ 1 June 2004: Version 2.3 of specifications issued by S. Canfer (CCLRC; EDMS 548037V3)
- ✓ 23 June 2004: Version 2.3b of specifications issued by S. Canfer (CCLRC; EDMS 548037V4)
- ✓ 16 July 2004: final specifications (EDMS 548037V5); EU milestone

Sub-Task completed

4.4.3 Conventional Insulation

The following actions have been carried out and/or are foreseen

- ✓ 27 July 2004: first draft of conventional insulation Test Programme (EDMS 548038V1)
- ✓ 12 August 2004: second draft of conventional insulation Test Programme
- ✓ 27 October 2004: final insulation Test Programme (including Test Programme for innovative insulation; EDMS 548038V2); EU milestone
- ✓ 30 September 2004: completion of Literature Survey (Sub-Task 4.3.1)
- ✓ 30 November 2004: completion of Tooling Preparation (Sub-Task 4.3.2)
- ✓ 31 December 2004): completion of Component Supply (Sub-Task 4.3.3)
- ⇒ 1 January 2005 – 30 September 2005: Iterative Tests (Sub-Task 4.3.4)
- ⇒ 1 October 2005 – 31 December 2005: Data Analysis (Sub-Task 4.3.5)
- ⇒ 1 July 2005 – 30 June 2006: Irradiation Tests (extension of scope with respect to CARE Annex I)
- ⇒ 30 June 2006: final report on conventional insulation; EU deliverable

4.4.4 Innovative Insulation

The following actions have been carried out and/or are foreseen

- ✓ 6 May 2004: preparatory meeting at CEA
- ✓ participants: J.M. Rifflet, F. Rondeaux and P. Védrine (CEA), A. Devred (CEA&CERN); conclusions of this meeting are reported above
- ✓ 30 August 2004: first draft of innovative insulation Test Programme
- ✓ September 2004: final innovative insulation Test Programme (added to EU milestone on conventional insulation Test Programme)
- ⇒ 1 January 2005 – 31 December 2005: Tape Weaving Trial (Sub-Task 4.4.1)
- ⇒ 1 January 2005 – 30 June 2006: Characterization Tests (Sub-Task 4.4.2; scope has been modified with respect to CARE Annex I)

⇒ 30 June 2006: final report on innovative insulation; EU deliverable

Table 4.4a: Status of the lowest Sub-Tasks level in the IDI WP (as of 21 June 2005).

WBS #	Title	Original begin date (Annex 1)	Original end date (Annex 1)	Estimated Status	Revised end date
4.1	IDI WP Coordination				
4.2	Specifications' Drafting	1 April 2004	30 June 2004	Completed	22 July 2004
4.3	Conventional Insulation				
4.3.1	Literature Survey	1 July 2004	30 Sept. 2004	Completed	On time
4.3.2	Tooling Preparation	1 October 2004	30 October 2004	Completed	31 Dec. 2005
4.3.3	Component Supply	1 October 2004	31 Dec. 2004	Completed	On time
4.3.4	Iterative Tests	1 January 2005	30 Sept. 2005	50%	-
4.3.5	Data Analysis	1 October 2005	31 Dec. 2005	Not started	-
4.3.6	Irradiation tests[a)]	1 July 2005	30 June 2006	Not started	-
4.4	Innovative Insulation				
4.4.1	Tape Weaving Trial	1 July 2004	31 Dec. 2004	Not started	30 June 2006
4.4.2	Characterization Tests[b)]	1 July 2004	30 June 2005	Not started	31 Dec. 2006

[a)] Extension of scope with respect to CARE Annex I.

[b)] Modification of scope with respect to CARE Annex I.

Table 4.4b: Status with respect to the milestones and deliverables due in the IDI WP (as of 21 June 2005).

WBS #	Title	Responsible Lab(s)	Due date in Annex 1	Status	Revised delivery date
4.2	Report on Specifications for Conductor Insulation (milestone)	CCLRC	30 June 2004	Completed	22 July 2004
4.3&4.4	Report on Definition of the Test Programme (milestone)[a)]	CCLRC&CEA	31 July 2004	Completed	27 October 2004
4.3	Report on Conventional Insulation (deliverable)	CCLRC	31 December 2005	Not started	30 June 2006
4.4	Report on Innovative Insulation (deliverable)	CEA	30 June 2005	Not started	31 Dec. 2006

[a)] Scope of report has been extended to include test programme on innovative insulation (Task 4.4).

4.5 Working Group on Magnet Design and Optimization (WGMDO)

2004 Summary

CCLRC, CEA, CERN and CIEMAT have decided to join forces in order to create an informal Working Group on Magnet Design and Optimization (WGMDO), whose charges and composition are defined in EDMS 547882.

The Working Group is made up of

- H. Félice (CEA)
- P. Fessia (CERN)
- P. Loveridge (CCLRC)
- J. Rochford (CCLRC)
- S. Sanz (CIEMAT)
- F. Toral-Fernandez (CIEMAT), Technical Secretary
- P. Védrine (CEA), Chairman

This Working Group is an extension of scope with respect to CARE Annex 1. It is supported by CCLRC (whose contribution foreseen to Task 3.2 has been shifted to this end) and by additional resources from CEA, CERN and CIEMAT.

The Working Group has agreed on a common set of design parameters for a high field dipole magnet and has selected a number of magnetic configurations to be studied and compared. The comparison will be carried out in three steps: 1) comparison of 2-D magnetic designs, 2) comparison of 2-D mechanical designs and 3) comparison of 3-D designs. Each partner has chosen one or two configurations and has started to work on 2-D magnetic design.

2005 Summary

The partners of the Working Group have more or less completed their 2-D magnetic designs and have started to work on 2-D mechanical design. A comparison of 2-D magnetic designs will be presented at MT19.

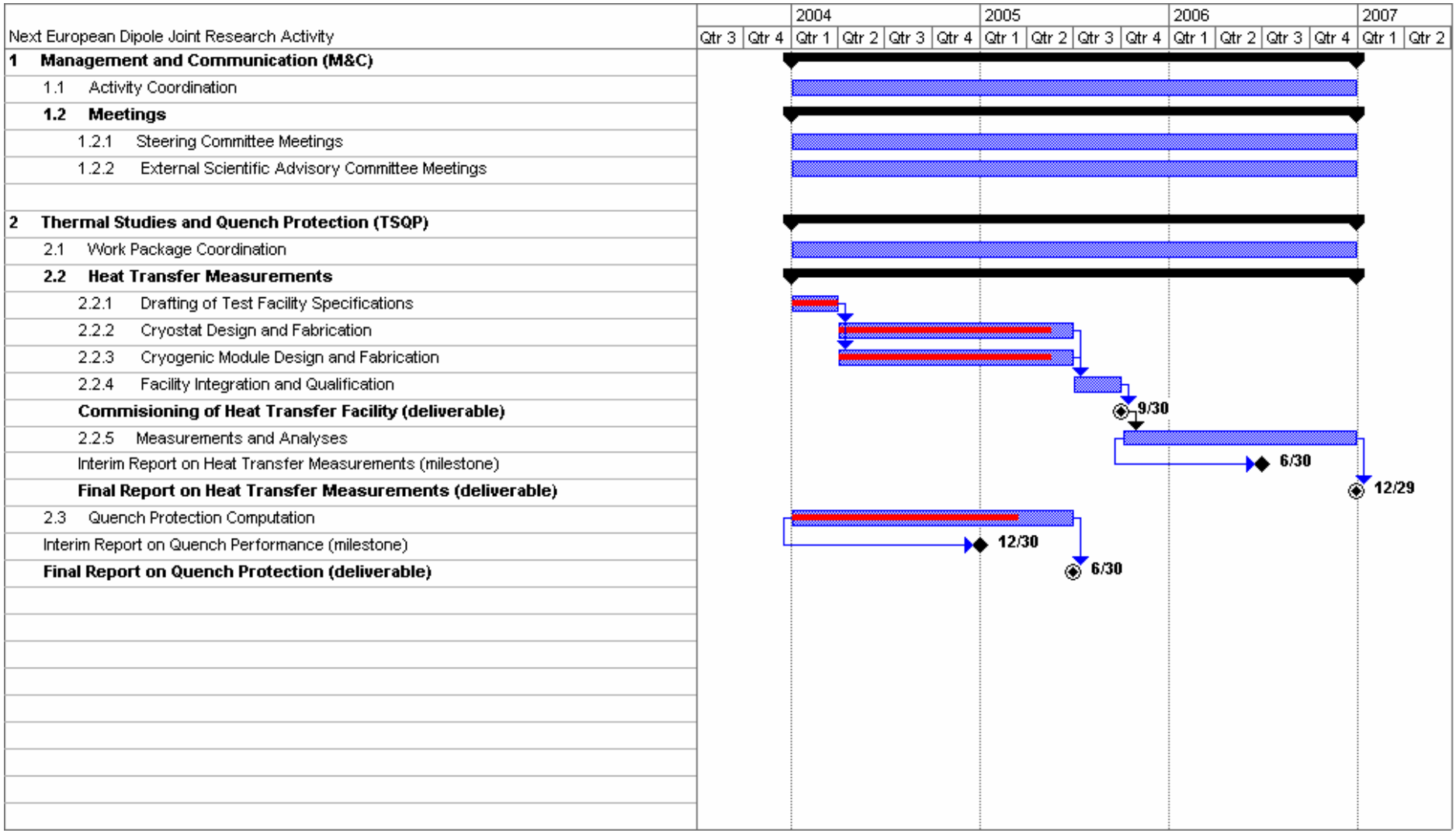
Further electromagnetic computations are being carried out at CERN on the baseline, $\cos\theta$, layer design to evaluate and derive compensation schemes for the effects of iron saturation and persistent magnetization currents

The following actions have been carried and/or are foreseen

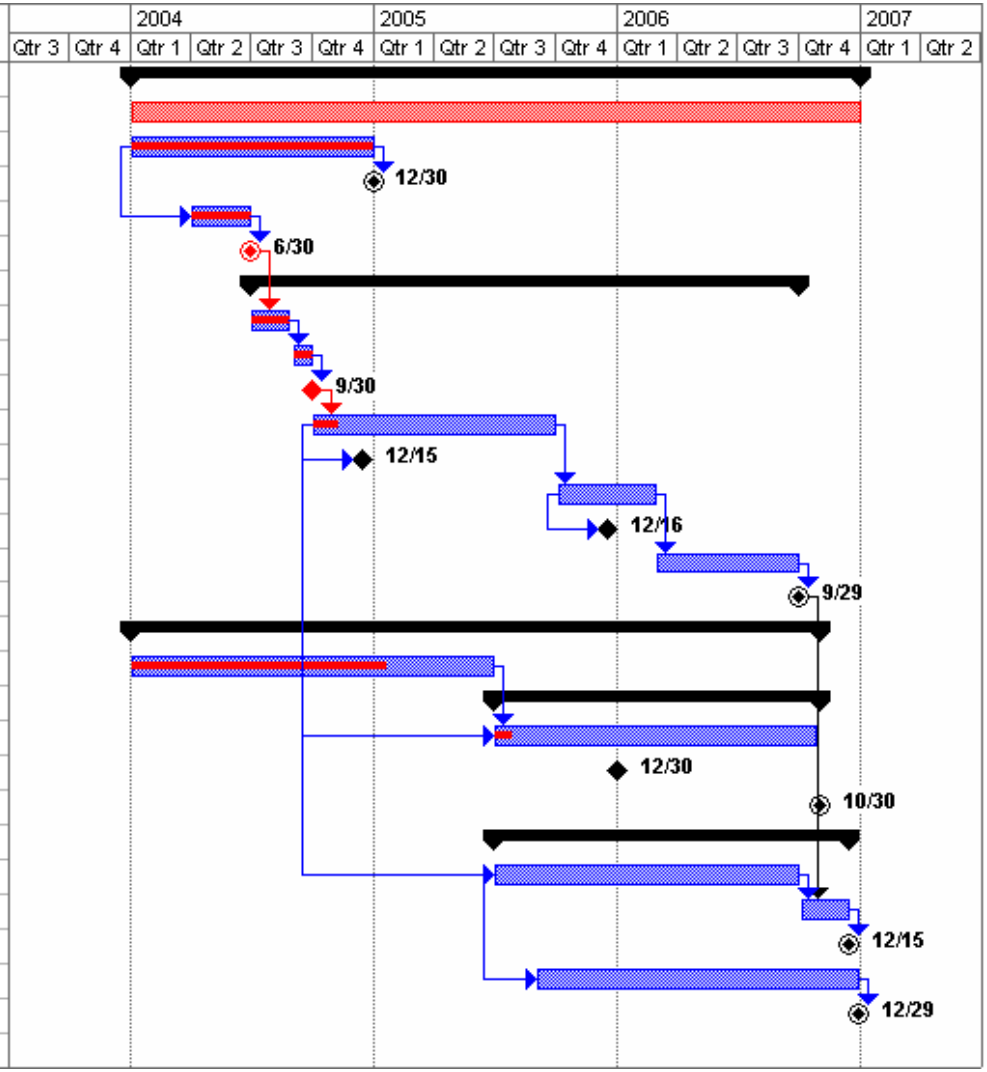
- ✓ 19 May 2004: brainstorming session at CEA/Saclay
  participants: H. Felice, L. Quettier and P. Védrine (CEA), A. Devred, (CEA&CERN), P. Fessia (CERN), S. Sanz and F. Toral (CIEMAT), P. Loveridge and J. Rochford (CCLRC)
  preparatory document: EDMS 547883
  minutes: EDMS 547884
- ✓ 23 November 2004: meeting at CERN to discuss CCLRC computations on NED baseline (88-mm-aperture, $\cos\theta$, layer) design
  participants: D.E. Baynham and P. Loveridge (CCLRC), A. Devred, (CEA&CERN), D. Leroy (CERN)

- ✓ 17 December 2004: WGMDO meeting at CIEMAT to review 2-D magnetic designs
  participants: P. Loveridge, J. Rochford (CCLRC), H. Felice, P. Védrine (CEA), A. Devred (CEA&CERN), S. Sanz, F. Toral (CIEMAT)
  talks and minutes: EDMS 547885
- ✓ 27 January 2005: visit of P. Loveridge (CCLRC) to CEA to discuss FE modelling
  participants: P. Loveridge (CCLRC), M. Ségréti and P. Védrine (CEA), A. Devred (CEA&CERN)
- ✓ 13 April 2005: meeting at CERN to discuss CCLRC progress on NED baseline (88-mm-aperture, $\cos\theta$, layer) design
  participants: E. Baynham, P. Loveridge (CCLRC), A. Devred (CEA&CERN), P. Fessia and M. Pojer (CERN)
- ✓ 13 April 2005: WGMDO meeting at CERN
  participants: E. Baynham, P. Loveridge, J. Rochford (CCLRC), H. Félice (CEA), A. Devred (CEA&CERN), P. Fessia, N. Schwerg (CERN), S. Sanz and F. Toral (CIEMAT)
  talks and minutes: EDMS 581911
- ✓ 14 June 2005: WGMDO meeting at CCLRC to review progress on 2-D magnetic and mechanical designs
  participants: E. Baynham, S. Canfer, C. Densham, J. Greenhalgh, P. Loveridge, J. Rochford, (CCLRC), H. Félice (CEA), A. Devred (CEA&CERN), N. Schwerg (CERN), S. Sanz and F. Toral (CIEMAT)
  talks and minutes: EDMS 600861
- ⇒ 23 June 2005: meeting at CERN to discuss CCLRC progress on NED baseline (88-mm-aperture, $\cos\theta$, layer) design
- ⇒ November 2005: first look at 3-D configurations

5 APPENDIX 1: UPDATED IMPLEMENTATION PLAN (GANTT CHART) FOR THE NED/JRA AS DESCRIBED IN THE TECHNICAL ANNEX OF CARE CONTRACT (EDMS 548031)

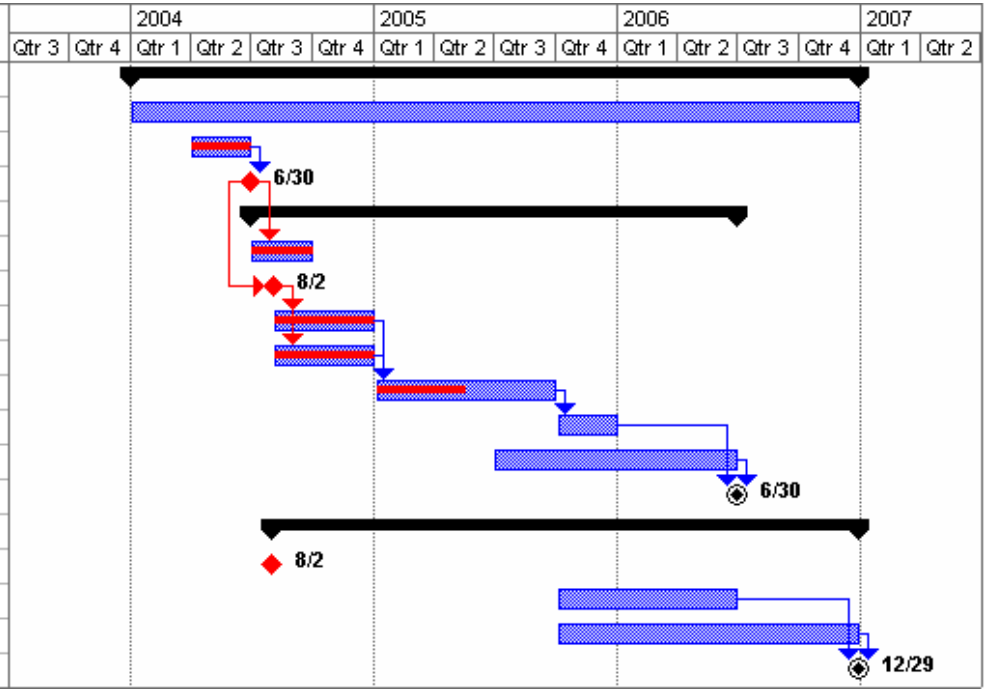


Next European Dipole Joint Research Activity
3 Conductor Development (CD)
3.1 Work Package Coordination
3.2 Cable Definition from Field Computations of a 15 T Dipole Magnet
Design of a 15T Dipole Magnet (deliverable)
3.3 Specifications' Drafting
Specifications on Wire and Cable (deliverable)
3.4 Wire Development
3.4.1 Call for tender
3.4.2 Contracts preparation
Contract Signature
3.4.3 Step 1
Progress Report (milestone)
3.4.4 Step 2
Progress Report (milestone)
3.4.5 Final production
Final Wire Production (deliverable)
3.5 Wire Characterization
3.5.1 Definition of Measuring Procedures
3.5.2 Wire Ic Measurements
3.5.3 Wire Magnetization Measurements
Interim Report on Wire Characterization (milestone)
Final Report on Wire Characterization (deliverable)
3.6 Cable Development
3.6.1 Cabling Trial
3.6.2 Final Production
Final Cable Production (deliverable)
3.7 Cable Characterization
Report on Cable Performance (deliverable)



NB: the CARE Annex I milestone entitled “First Results on Wire Development” that was due on 30 June 2005 has been split into two “Status Reports” due on 15 December 2004 and 15 December 2005.

Next European Dipole Joint Research Activity
4 Insulation Development and Implementation (IDI)
4.1 Work Package Coordination
4.2 Specifications' Drafting
Report Specifications for Conductor Insulation (milestone)
4.3 Implementation Study of Conventional Solution
4.3.1 Litterature Survey
Definition of the Test Programme (milestone)
4.3.2 Tooling Preparation
4.3.3 Component Supply
4.3.4 Iterative Tests
4.3.5 Data Analysis
4.3.6 Irradiation Tests
Report on Conventional Insulation (deliverable)
4.4 Implementation Study of Innovative Solution
Definition of the Test Programme
4.4.1 Tape Weaving Trial
4.4.2 Characterization Tests
Report on Innovative Insulation (deliverable)



NB:

- Task 4.3.6 is an extension of scope with respect to CARE Annex I,
- The scope of Task 4.4.2 has been modified with respect to CARE Annex I.