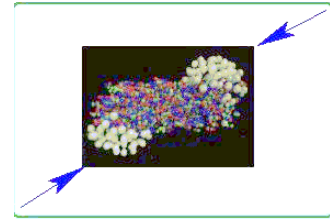


High Energy
High Intensity
Hadron Beams

CARE-HHH Network: First Quarterly Report 2005
F. Ruggiero and W. Scandale, 30 April 2005



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In the first quarter of 2005 the activity of CARE-HHH was mostly devoted to fill the planned deliverable but also to introduce additional networking aspects aiming at the optimal use of the existing European hadron accelerator facilities in CERN and GSI. The list of tasks accomplished is given below in chronological sequence.

Overall CARE-HHH Network activities in the First Quarter 2005

- 14/01/2005: Meeting at CERN between Accelerator Experts and representatives of ATLAS and CMS Physicists to discuss LHC Upgrade issues. A interactive discussion on the following topics started:
 - Possible scenarios for the reduction of β^* ,
 - Possible scenarios to increase the number of bunches and discussion on the expected consequences for the experimental apparatus and on cost effectiveness aspects,
 - Possible scenarios to compensate long range beam-beam, with a specific discussion on the idea of using a split-wall chamber to shield the AC long range beam-beam in the common pipe close to the LHC Interaction Points,
 - Request of help from the Experiments to study the effect of radiations in an upgraded version of the inner triplet quadrupoles,
 To dial with the follow up of the treated items a stable forum of discussion, called LUMIUP, with periodic meeting was created.

- 03/02/2005: A seminar summarising the outcomes of the HHH-2004 workshop was organised at CERN, in the frame of the regular AB department seminars. A joint talk was presented by W. Scandale and F. Zimmermann with the title *LHC Upgraded Taking Shape - Highlights of HHH-2004: "Beam Dynamics in Future Hadron Colliders and Rapidly Cycling Synchrotrons"*. An audience of more than 50 experts assisted to the seminar.

- 17-18/02/2005: meeting held at CERN on the design and the prototyping of a fast-ramping superconducting pulsed dipole. About 20 experts from CERN, GSI and INFN attended the meeting. discussing the following items:
 - Possible dipole specifications either for the construction of SIS 300 at GSI or for the upgrade of the SPS at CERN;
 - Investigation on the possibility to develop a common prototyping program;
 - Possible wire and cable specifications;
 - Creation of an informal working group, named PMWG, for the follow up of the future R & D, see the web site <http://pmwg.web.cern.ch/PMWG/>;

- Request to CEA-Saclay experts to join the newly created PMWG with the aim of extending the investigations to the design and the prototyping of fast-ramped superconducting pulsed quadrupoles. The offer has been accepted.
- 02/03/2005: CARE-HHH coordination meeting at CERN to review the HHH Network strategy, the sequence of future HHH events and the distribution of the P&M resources between the HHH working packages. The main issues treated were:
 - Review of alternative options,
 - Review of realistic milestones and project phases,
 - Discussion on possible time-table for the LHC luminosity Upgrade as requested by the CERN management;One of the outcomes of the meeting was the identification of a few tentative milestones for future LHC machine studies, listed here:
 - 2005/2006: installation and test of a beam-beam long range compensation system at RHIC to be validated with colliding beams;
 - 2006/2007 new experiment for crystal collimation at the CERN-SPS;
 - 2006: installation and test of Crab cavities at KEKB to validate higher beam-beam limit and higher luminosity with large crossing angles;
 - 2007: if KEKB test successful, installation and test of Crab cavities in a hadron machine to validate low RF noise and emittance preservation.
- 3-4/03/2005: a CARE-HHH-AMT workshop was organized at CERN on *Beam-Generated Heat Deposition and Quench Levels*. More than 80 specialists attended it. The main topics were:
 - Study of the stability margin for the SC focusing triplet at the ultimate luminosity level;
 - Validation of the SC quadrupole design for the LHC luminosity upgrade;
 - Thermal transfer and superconducting stability;
 - Thermal models and their validation through experiments;
 - Comparison of codes for the simulation of thermal effects;
 - Experience on quench level from LHC magnet operation and test at CERN, and from beam and magnet operation at other laboratories in the world;
- 7-8/03/2005: CARE-HHH-APD mini-workshop ‘CC-2005’ on *Crystal Collimation in Hadron Colliders* held at CERN. The program and presentations are stored in the web site <http://care-hhh.web.cern.ch/CARE%2DHHH/CrystalCollimation/>. About 80 specialists attended it. The main topics were:
 - Review of the beam cleaning requirements;
 - Review of crystal extraction experiments in circular accelerators;
 - Experience with crystals at the various colliders;
 - Crystal production, technologies and experimental procedures;
 - Crystal simulation;
 - Discussion on a proposal of a new experiment of crystal extraction and collimation at the CERN-SPS.
- March-April 2005: visit of Peter McIntyre to CERN as HHH-AMT consultant for about four weeks. The main outcomes of the collaboration were:
 - 18/03/2005: seminar at CERN ‘Recent Advances in Collider Technology’;

- 21&30/03/2005: discussions at CERN on (i) advanced SC magnet technology and design, (ii) radiation resistant dipole to be used in dipole-first IR design; (iii) chromaticity correction for quadrupole-first IR design; (iv) LHC energy tripler using hybrid SC magnets; (v) possible counter-measures against electron cloud; (see also: <http://care-hhh.web.cern.ch/care-hhh/meetings.htm>);
- 04/04.2005 seminar at CERN ‘Novel Magnet Technology for the LHC Upgrade’;
- 14/04/2005 seminar at CERN ‘LHC Energy Tripler’;
- 15/04/2005 seminar at CERN ‘Novel Method to Avoid e-cloud Limitation in the LHC’;
- 18&20/04/2005 seminars in CEA-Saclay and Dipartimento di Fisica, Milano on ‘LHC Energy Tripler’;
- 22-23/03/2005: CARE-HHH-AMT Topical Meeting at CERN on *Insulation and Impregnation Techniques*. About 70 specialists were present. The main topics were:
 - SC conductor insulation;
 - Insulation of metallic parts;
 - Insulation of inter-layers;
 - Resin composition;
 - Radiation resistance;
 - Fibre filling and sizing;
 - Heat transfer properties.
- 30/03-02/04/2005: invited talk of W. Scandale at the conference IFAE-05 in Catania ‘LHC Status and Possible Upgrade’;
- 05-06/04/2005 CARE steering committee held at CERN: F. Ruggiero presented the status of CARE-HHH.
- 06-08/04/2005: US-LARP Collaboration Meeting in Port Jefferson, USA. Web site http://www.agsrhichome.bnl.gov/LARP/050406_danfords/. The main item of discussion was the ‘technical and resource loaded plans for FY06 and FY07’.
- 07-08/04/2004: invited talk of F. Ruggiero on ‘LHC Upgrade, R&D and Impact on LHC detectors’ at the mini-workshop on Future High Energy Accelerators, CPPM, Marseille, France. Web site <http://maretude.in2p3.fr/cdsagenda/fullAgenda.php?ida=a0523>.
- April 2005: the proceedings of the workshop HHH-2004 have been completed and made available for publication as CARE and CERN Yellow Report, see: http://care-hhh.web.cern.ch/CARE-HHH/HHH-2004/Proceedings/proceedings_hhh2004.htm;
- April 2005: a paper, written by W. Scandale and F. Zimmermann, summarising the outcome of the HHH-2004 workshop, was published in the April 2005 issue of the CERN-Courier.
- April 2005: the Proceedings of the 1st CARE-N3-ABI networking meeting (held in Aumühle, 22-23/06/2004) on “Trajectory and Beam position measurements using digital techniques”, have been published (see CARE-Conf-04-024-HHH). The Proceedings of

the 2nd CARE-HHH-ABI networking meeting (held in Lyon, 1-2/12/2004) on “DC current transformers and beam-lifetime evaluations” will follow soon, with the reference CARE-Conf-04-023-HHH.

- April 2005: Preliminary discussions with M. Klein (DESY) and J. Dainton (Un. Liverpool) about "QCD-explorer": colliding ~1 TeV proton (or ion) beam from Tevatron or Super-SPS with 20-75 GeV electron beam from ILC or CLIC (first stage).
- April 2005: submission of the following NEST proposals:
 - ‘ECOMAG’ for the Fast SC pulsed magnet for GSI and LHC injector upgrade: CERN (Scandale), GSI (Moritz), INFN (Volpini, Fabbriatore), CEA/Saclay (Rifflet);
 - ‘Electron model of FFAG’, CERN (marginally) involved for LHC accelerator complex upgrade: UK(CCLRC-Lancaster-Liverpool-Oxford)-CERN-CEA/Saclay
 - ‘Eurodip’, a possible extension of NED: CERN-CEA/Saclay-CIEM;

Planning of Future CARE-HHH workshops in 2005

- CARE-HHH-APD Workshop on "Scenarios for the LHC luminosity upgrade", Arcidosso, 31/08-3/09/2005. Topics: (i) optical designs and luminosity performance for alternative IR layouts (dipole first vs quadrupole first (Nb-Ti or Ni₃Sn) vs ironless magnet at very low β^* , (ii) beam-beam compensation schemes and machine-experiment interface), (iii) machine and magnet parameters for high energy injectors: lattice, magnet aperture, injection and extraction for new ring in the ISR tunnel, super-SPS with new transfer lines, or booster ring in the LHC tunnel.
- US-LARP mini-Workshop on "LHC IR upgrade", FNAL, end September 2005 Topics: (i) heat deposition and magnet quench limits, (ii) TAS/TAN integration and follow-up of HHH-2004 workshop, (iii) feasibility of large crossing angles and CRAB cavities in hadron storage rings, (iv) beam-beam compensation schemes.
- Joint HHH-BENE-HIPPI Workshop on Rapid Cycling Synchrotrons and Low Energy injectors, September 2005 at CERN,
- CARE-HHH-AMT Workshop on SC Pulsed Magnets for Accelerators, Frascati, end October 2005, Topics: (i) define set of agreed parameters for the development of SC magnets ranging from low field, continuously pulsed (typically 2 T peak, 4 T/s, 100 mm aperture, 10^8 cycles) to medium field, high-duty cycle magnets for storage and booster rings (typically 6 T peak, 1 T/s, 80 mm aperture, 10^6 cycles), (ii) translate requirements into specifications for performance of strand, cable, magnet and auxiliaries, (iii) define R&D required to achieve the above specifications and (iv) produce a tentative road-map for a procurement and prototyping activity.

Table 2: List of meetings, workshops and events (co)organized by the Activity during 2005

Date	Title/subject	location	Main organizer	Number of participants	Comments and Web site
14 Jan	1 st LUMIUP meeting	CERN (CH)	HHH-coordinators	7	Discussion on LHC luminosity upgrade scenarios. http://care-hhh.web.cern.ch/care-hhh/Meetings/LHCUG20050114.txt
3 Feb	AB seminar	CERN (CH)	AB-seminar-coordinator	About 50	<i>LHC Upgraded Taking Shape - Highlights of HHH-2004: "Beam Dynamics in Future Hadron Colliders and Rapidly Cycling Synchrotrons"</i> W. Scandale (part I), F. Zimmermann (part II)
17-18 Feb	1 st PMWG meeting	CERN (CH)	HHH-coordinators	About 20	Pulsed Magnet Working Group meeting. http://pmwg.web.cern.ch/PMWG/
2 Mar	CARE-HHH coordination meeting	CERN (CH)	HHH-coordinators	5	Review of the HHH activity http://care-hhh.web.cern.ch/care-hhh/Meetings/CAREHHHcoordintationmeeting02032005.txt
3-4 Mar	2 nd HHH-AMT workshop	CERN (CH)	HHH-AMT (WP1) coordinators	About 80	Review of thermal effects induced by beam on SC magnets. http://amt.web.cern.ch/amt/
7-8 Mar	2 nd HHH-APD mini-workshop	CERN	HHH & HHH-APD (WP3) coordinators	About 80	Review of crystal assisted extraction and collimation in circular accelerators. http://care-hhh.web.cern.ch/CARE%2DHHH/CrystalCollimation/
Mar & Apr	Meeting with and seminars by P. McIntyre	CERN (CH)	HHH-coordinators	From 2 to 80	http://care-hhh.web.cern.ch/care-hhh/meetings.htm
22-23 Mar	3 rd HHH-APD workshop	CERN (CH)	R. Maccaferri (CERN) & S. Gourlay (NLBL)	About 80	Review of insulation in SC magnets. http://amt.web.cern.ch/amt/
30 Mar – 2 Apr	IFAE 2005	Catania (I)	Ad hoc committee of INFN Catania	About 100	Review High Intensity physics experiments. http://cms.ct.infn.it/ifae/
5-6 Apr	CARE steering committee	CERN (CH)	CARE-coordinators	About 20	Trajectory and Beam position measurements using digital techniques http://care-hhh.web.cern.ch/care-hhh/events/CARE-HHH-ABI-Aumuehle-Agenda.htm
6-8 Apr	US-LARP collaboration meeting	Port Jefferson (USA)	US-LARP-coordinators	About 60	Financial issues for FI2006 and FY 2007 http://www.agrhichome.bnl.gov/LARP/050406_danfords/
7-8 Apr	Mini-workshop on Future Hadron Acc.	Marseille (F)	Ad hoc organizing committee	About 30	Issues related to future hadron colliders; http://maretude.in2p3.fr/cdsagenda/fullAgenda.php?ida=a0523

Table 3: List of talks to workshops and conferences made by HHH members and which are about (or include) activities carried within HHH

#	Subject	Speaker/Lab	Event	Date	Talk Web site	CARE-Conf
1	LHC Upgrade	W.Scandale & F. Zimmermann /CERN	AB seminar	03/02/2005		
2	Collider Technologies	P. Mcinthyre /CARE expert	AT seminar	18/03/2005		
3	Magnet Technologies	P. Mcinthyre /CARE expert	AT seminar	04/04/2005		
4	LHC Energy Tripler	P. Mcinthyre /CARE expert	AT seminar	14/04/2005		
5	Cure for e-cloud	P. Mcinthyre /CARE expert	AT seminar	15/04/2005		
6	LHC Energy Tripler	P. Mcinthyre /CARE expert	Seminar in Dip. di Fisica di Milano	18/04/2005		
7	LHC Energy Tripler	P. Mcinthyre /CARE expert	CEA/Saclay seminar	20/04/2005		
8	LHC Upgrade	W. Scandale /CERN	IFAE 2005	31/03/3005		
9	HHH status report	F. Ruggiero /CERN	CARE-steering committee	06/04/2005		
10	LHC Upgrade	F. Ruggiero /CERN	CPMP meeting /Marseille	07/04/2005		

Table 5: Temporary staff hiring

#	Lab	Job Type	Duration	Work subject	Status

Table 6: Status of the lowest Sub tasks level in the WP which are supposed to have started according to the MS project breakdown in Annex 1

WBS #	Title	Original begin date (Annex 1)	Original end date (annex1)	Estimated Status	Revised end date
General	MS: annual HHH meeting				
	HHH coordination meeting (ID8)	T1-2005	T2-2005	100 %	
WP1-AMT	MS: AMT topical meeting on Insulation and Impregnation Techniques	T1-2005	T1-2005	100 %	On time: T1-2005
	MS: AMT workshop on Beam Generated heat and Magnet Quench Level	T1-2005	T1-2005	100 %	On time: T1-2005
	Web-based database for SC cable and magnets	T3-2004	T4-2006	10 %	Delayed to T4-2007
	MS: specific meeting on database	T2-2005	T2-2005	0 %	Delayed to T4-2005
	ID: first report on web based database	T2-2005	T2-2005	0 %	Delayed to T4-2005
	Catalogue of numerical codes for AMT1 and AMT4	T1-2004	T1-2004	20 %	Delayed to T4-2005
	Comparison of codes for AMT1 and AMT4	T1-2004	T2-2004	20 %	Delayed to T2-2005
	Identifications of main limiting issues	T2-2004	T4-2004	20 %	Delayed to T2-2005
	ID: Proceedings of the first topical workshop on superconductors	T1-2005	T1-2005	100 %	On time: T1-2005
	ID: report on AMT organization and conductor development	T1-2005	T1-2005	80 %	Delayed to T3-2005
	Comparative studies of alternatives using low field magnets for AMT2 and AMT3	T3-2004	T4-2004	30 %	Delayed to T3-2005
	Identification of general issues relevant for magnet design for AMT5	T3-2004	T4-2004	10 %	Delayed to T4-2005

	Review of the development in US and for ITER on conductors and magnet technology relevant for AMT1 and AMT2	T1-2005	T1-2005	90 %	Delayed: T3-2005
	Comparative studies for alternatives using low field magnets for AMT2 and AMT3	T4-2004	T2-2005	20 %	Delayed to T4-2005
	Determination of scaling law for magnets and cryogenic cost for AMT5	T4-2004	T2-2005	20 %	Delayed to T3-2005
	MS: preliminary report on scaling law for magnets and cryogenic cost for AMT5	T2-2005	T2-2005	20%	Delayed to T4-2005
WP2-ABI	ID: proceedings of the first ABI topical workshop	T1-2005	T1-2006	100 %	On time: T1-2005
	ID: proceedings of the second ABI workshop	T2-2005	T3-2005	90 %	On time: T2-2005
WP3-APD	Comparison of alternative synchrotron and IR design	T1-2004	T2-2004	75 %	Delayed to T3-2005
	ID: proceedings of the first APD workshop	T1-2005	T1-2005	100 %	On time: T1-2005
	Second topical workshop	T1-2005	T1-2005	100 %	On time: T1-2005
	MS: general APD meeting	T2-2005	T2-2005	0 %	

Table 7: Status with respect to the interim reports and deliverables to be done in 2005 according to the MS project breakdown

WBS #	Title	Due date in Annex 1	Status	Revised delivery date
General	-	-	-	
WP1-AMT				
15	MS: AMT topical meeting on Insulation	T1-2005	100 %	T1-2005
16	ID: proceedings if the first AMT topical workshop on superconductors	T1-2005	100 %	T1-2005
17	ID: report on AMT organization and conductor development	T4-2004	80 %	T2-2005
19	MS: AMT topical meeting on Beam loss induced thermal effects	T1-2005	100 %	T1-2005
WP2-ABI				
W3-APD				
48	MS: proceedings of the first topical APD workshop	T1-2005	100 %	T1-2005
49	ID: meeting on simulation code bench marks	T1-2005	0 %	T3-2005

NOTE: The development of the web-based database for SC cables and magnets has been slow down. The main reason of the delay is that the budget to hire a dedicated fellow was not yet available in T1-2005.

Table 8: Status of the expenditures per participant and activity (in €)

participants	Integrated cost for permanent staff in 2004		Integrated cost for permanent staff in 2004		Integrated cost for equipment in 2004		Integrated cost for consumable in 2004		Integrated cost for travel in 2004	
	engaged	spent	engaged	spent	engaged	spent	engaged	spent	engaged	spent
01. CEA									2756.00	2756.00
04. GSI									3261.00	3261.00
05. DESY									2367.00	2367.00
10. INFN									5930.00	1893.00
11. TEU										
15. WUT									614.00	614.00
16. CSIC									2340.00	2340.00
17. CERN									26142.00	20637.00
19. PSI										
20. CCLRC									761.00	761.00

Table 9 Gantt table of the HHH Network progress in 2004

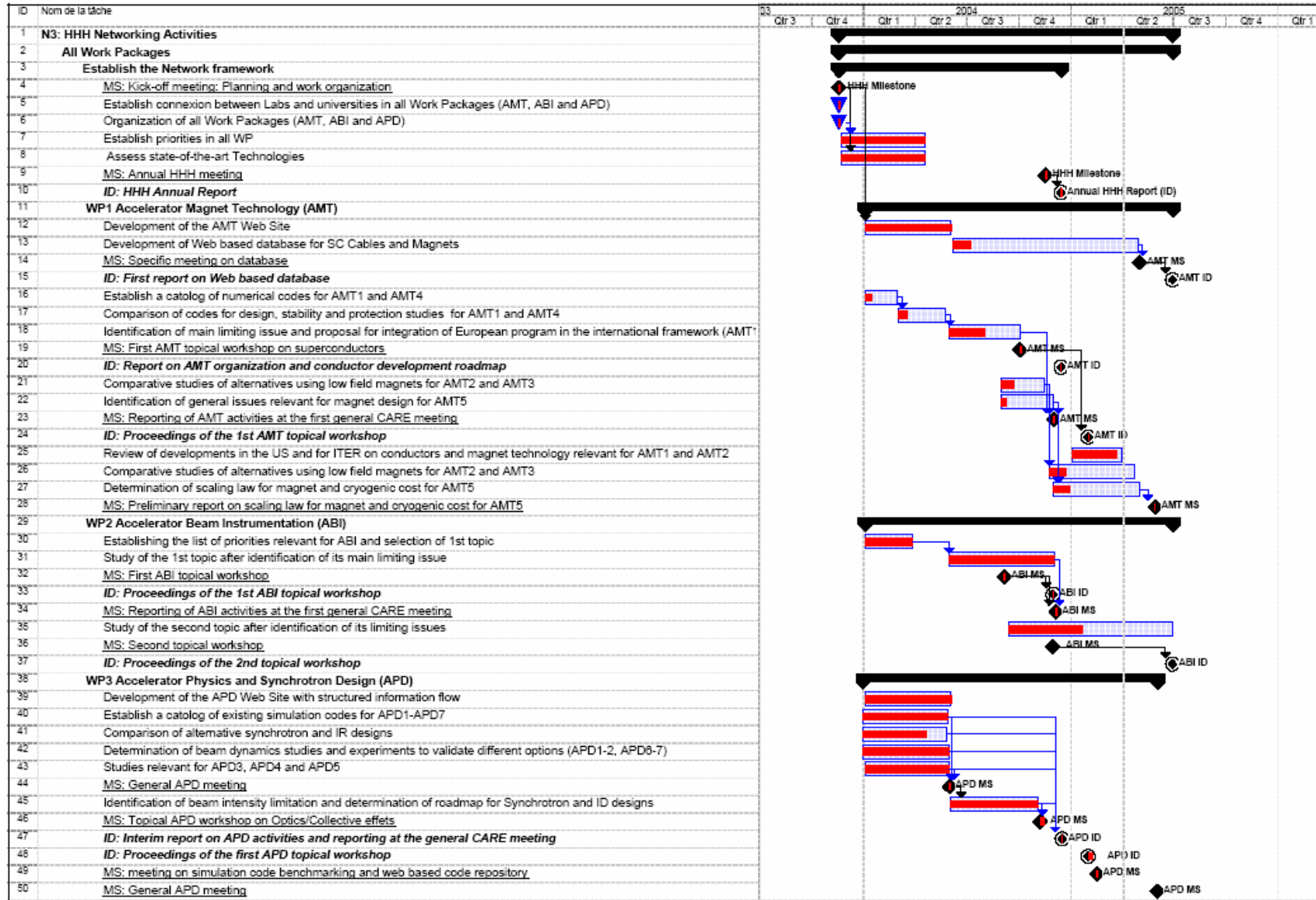


Table 10 Gantt table of the HHH Network progress expected in the next 18 months

