HIGLIGHTS FROM HILUMI LARP COLLABORATION MEETINGS

E. Todesco
CERN, Geneva Switzerland

EU STRATEGY

- EU strategy update [L. Rossi]
  - ***Europe's top priority should be the exploitation of the full potential of the LHC, including the high-luminosity upgrade of the machine and detectors with a view to collecting ten times more data than in the initial design, by around 2030.***
  - To stay at the forefront of particle physics, Europe needs to be in a position to propose an ambitious post-LHC accelerator project at CERN by the time of the next Strategy update, when physics results from the LHC running at 14 TeV will be available. *CERN should undertake design studies for accelerator projects in a global context, with emphasis on proton-proton and electronpositron high-energy frontier machines. These design studies should be coupled to a vigorous accelerator R&D programme, including high-field magnets and high-gradient accelerating structures,*

PROJECT STRUCTURE

	Description	Coordinator	Co-coordinator
WP1	Project Management and Technical Coordination	Lucio Rossi, CERN	Oliver Brüning, CERN
WP2	Accelerator Physics and Performance	Stéphane Fartoukh, CERN	Andy Wolski, UNILIV
WP3	Magnets for Insertion Regions	Ezio Todesco, CERN	GianLuca Sabbi, LBNL
WP4	Crab Cavities	Erk Jensen, CERN	Graeme Burt, UNILAN
WP5	Collimation Project	Stefano Redaelli, CERN	**Robert Appleby, Manchester**
WP6	Cold Powering	Amalia Ballarino, CERN	Francesco Broggi, INFN
WP7	Machine Protection	**Daniel Wollman, CERN**	Jorg Wenninger, CERN
WP8	Collider-Experiment Interface	Helmut Burkhardt, CERN Austin Ball, CMS Marzio Nessi, ATLAS	Daniel Lacarrère, CERN
WP9	Cryogenics	Laurent Tavian, CERN	Rob Van Weelderen, CERN
WP10	Energy Deposition & Absorber	Francesco Cerutti, CERN	Nikolai Mokhov, FNAL
WP11	11 T Dipole Two-in-One for DS	Mikko Karppinen, CERN	Alexander Zlobin, INFN
WP12	Vacuum	Roberto Kersevan, CERN	Mark-Antony Gallilee, CERN
WP13	Beam Diagnostics	Rhodri Jones, CERN	
WP14	Integration & (De-)installation	Sylvain Weisz, CERN	**Paolo Fessia, CERN**
WP15	Hardware Commissioning	Mirko Pojer, CERN	
WP16	High-Energy LHC - Studies	Lucio Rossi, CERN	Frank Zimmermann, CERN
WP17	High-Field Magnets – R&D FRESCA2	Gijs de Rijk, CERN	François Kircher, CEA

New WP14 – Tr. Lines & Kickers – Jan Uythoven - Brennan Goddard, CERN

Technical Coordinator	Herman Schmickler, CERN	
Project Safety Officer	Thomas Otto, CERN	
Deputy TC, QA and Risk Management	Isabel Bejar Alonso, CERN	
FP7 HiLumi LHC Administrative Manager	Svetlomir Stavrev, CERN	
Dissemination and Outreach	Agnes Szeberenyi, CERN	
Administrative Support	Cécile Noels, CERN	**Julia Double, CERN**

OPTICS

- No new elements [S. Fartoukh]
  - Baseline being defined

Equipment to be changed	New (old) Aperture [mm]	Separation [mm] (for 2-in-1)	Performance (T/m, T.m, MV,...)
TAS	60 (34)	n/a	n/a
IT	150 (70)	n/a	140 T/m
D1	160 (80)	n/a	35 → 40 T.m
TAN	82/74 elliptical (52/52)	145	n/a
D2	105 (80)	186	35 → 40 T.m
Crab-cavity	80	194	**12.5 MV**(1) (per beam and IR side)
Q4	90 (70)	194	400→ 500 T/m×m
Q5	70 (56)	194	750 T/m×m

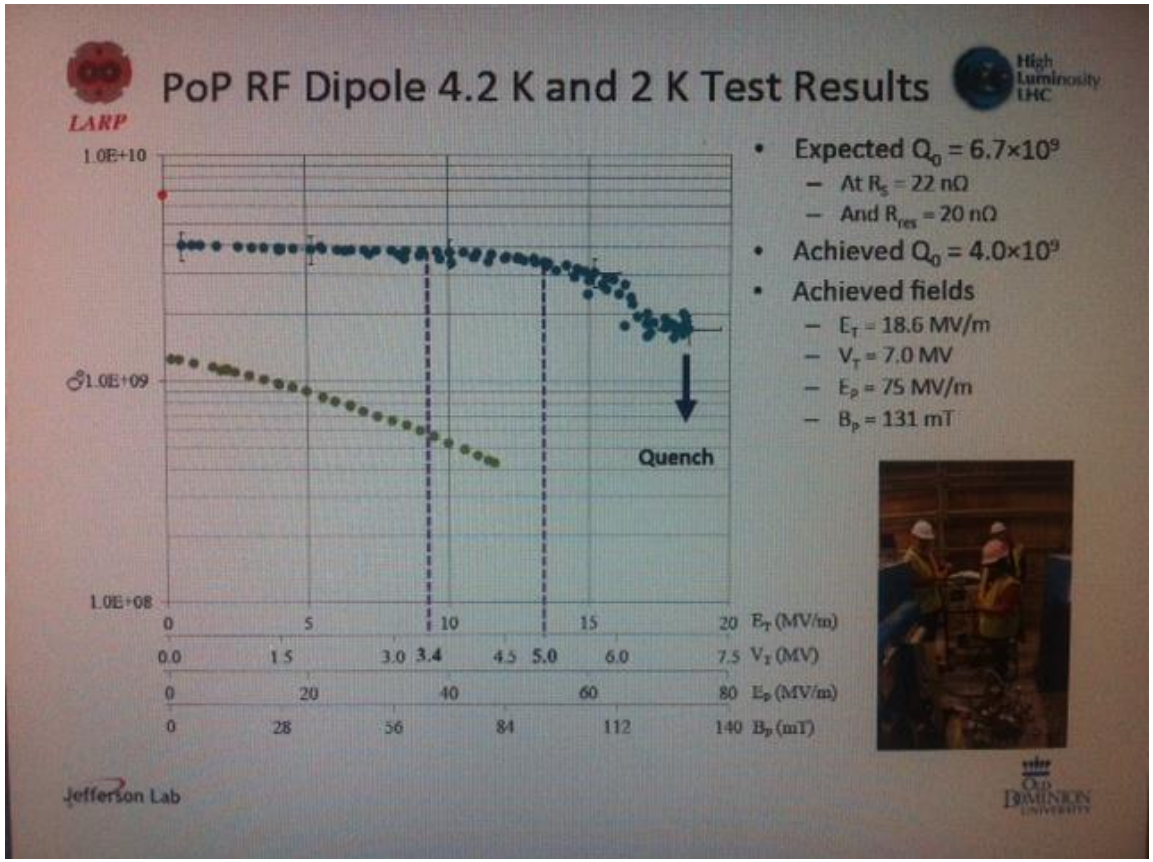
OPTICS

- No new elements [S. Fartoukh]
  - Correctors: who is doing ?

Magnets	Location	Aperture & Type	Int. Strength [T.m] (rectangular spec for nested MCBX)
MCBX2a	IP side of Q2a	150 mm – **Nested HV**	2.5 (X-plane) 2.5 (|| plane)
MCBX2b	nIP side of Q2b	150 mm – **Nested HV**	2.5 (X-plane) 2.5 (|| plane)
MCBX3	nIP side of Q3	150 mm – **Nested HV**	**4.5 (X-plane)** 2.5 (|| plane)
MCBRD	nIP side of D2	2-in-1 @ 105 mm, not nested	**7.0 (X-plane)** 2.0 (||-plane)

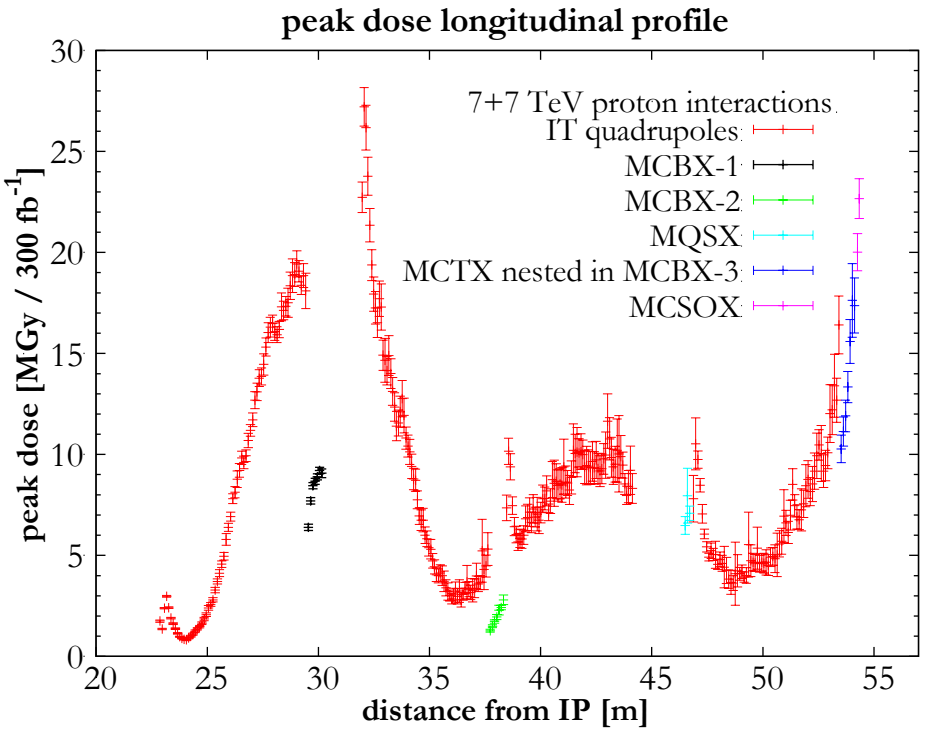
CRAB CAVITIES

- First significant result on crab cavities !!!! [A. Ratti]
  - MV/m reached, smaller quadlity factor but not critical (larger comsumption



ENERGY DEPOSITION

- Simulations on the HL LHC baseline ongoing [N. Mokhov, F. Cerutti, L. Esposito]
- Estimate of present LHC baseline presented
  - 25 MGy on triplet and correctors for 300 fb^{-1}



MAGNET OVERVIEW

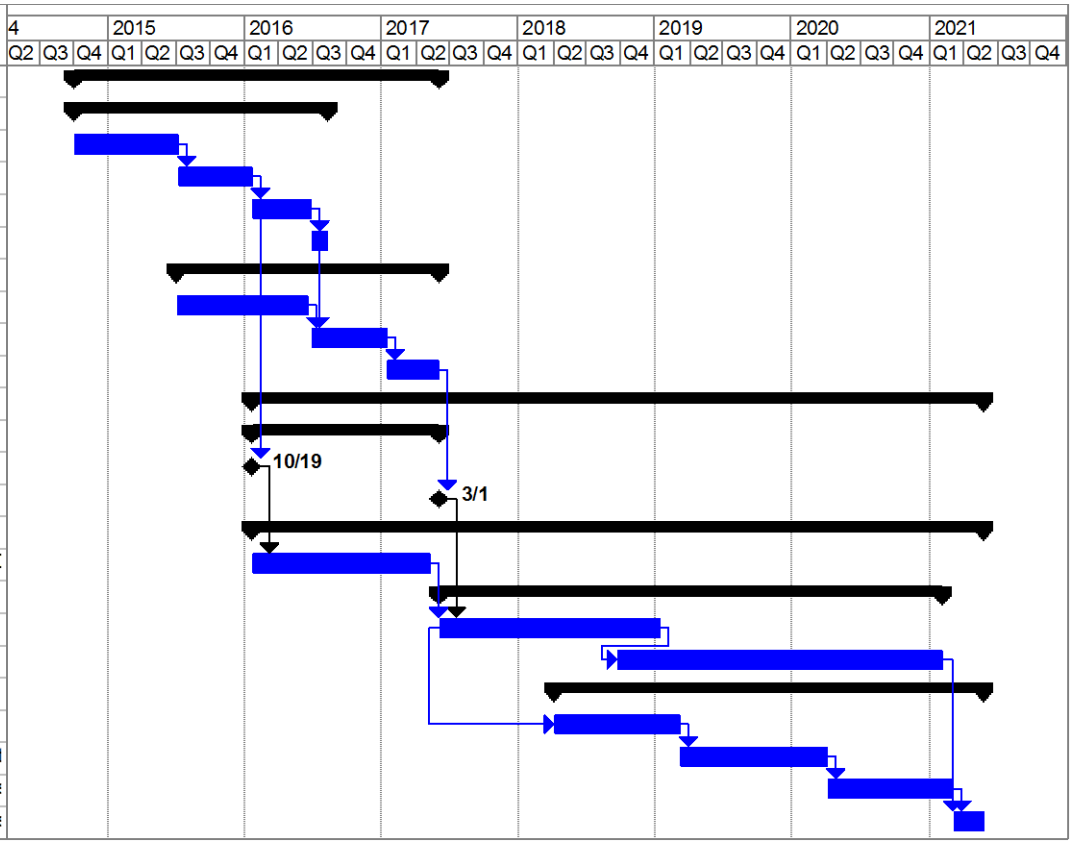
- What core program could give as a contribution ?
  - Proposals of FNAL and LBL
    - Still lot of emphasis on radiation hard – not priority for me
    - FNAL planning test upgrade to be able to test 4 m long magnets

- Discussion on the cable
  - CERN direction: 169 elements, this is a strategic decision
    - Concern of Sabbi: better performance of finer filaments is not proved
      - An analysis of the whole LARP program would be welcome

MAGNET SCHEDULE

- Project schedule for the triplet [G. Sabbi based on Amvrosio and Ferracin work]
  - Prototype still a bit late

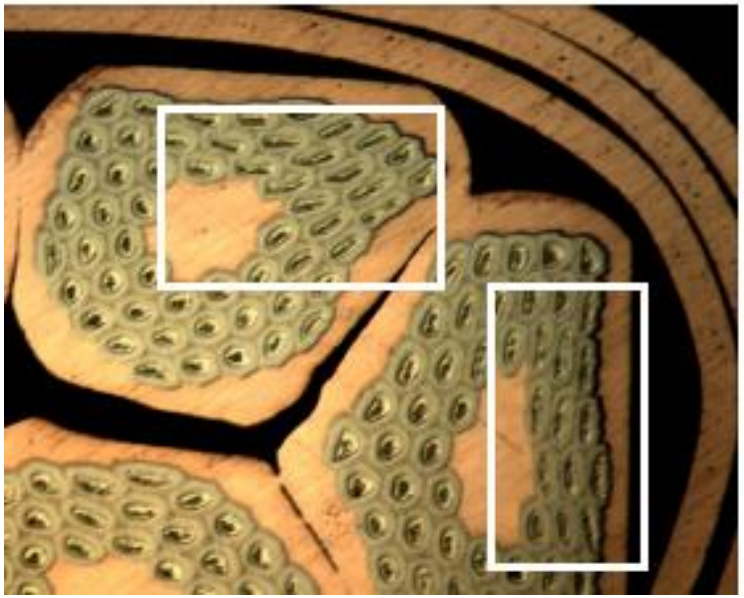
ID	Task Name
1	**Prototype development**
2	**LQXF01 and 01b**
3	LQXF01 Coil Fab (R&D coils #4-7)
4	LQXF01 Assembly, Test, Disassembly
5	LQXF01b Assembly, Test
6	LQXF Disassembly
7	**LQXF02 and 02b**
8	LQXF02 Coil Fab (R&D Coils #8-12)
9	LQXF02 Assembly, Test, Disassembly
10	LQXF02b Assembly, Test
11	**Construction Phase**
12	**Construction approval**
13	CD-2 equivalent
14	Full CD-3
15	**Production (MQXF) Units**
16	Production Tooling, Equipment Procurement, QC
17	**Production Coil Fabrication**
18	Production Coils #1-20
19	Production Coils #21-90
20	**Production Cold Mass Assembly and Test**
21	Production Cold Mass #1-4 Assy and Test
22	Production Cold Mass #5-12 Assy and Test
23	Production Cold Mass #13-18 Assy and Tes
24	Production Cold Mass #19-20 Assy and Tes

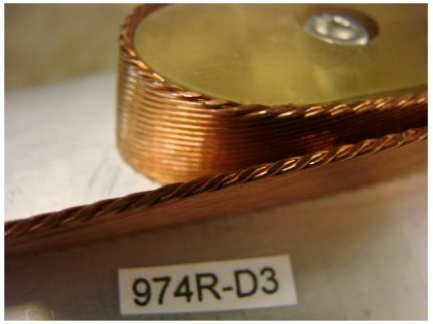


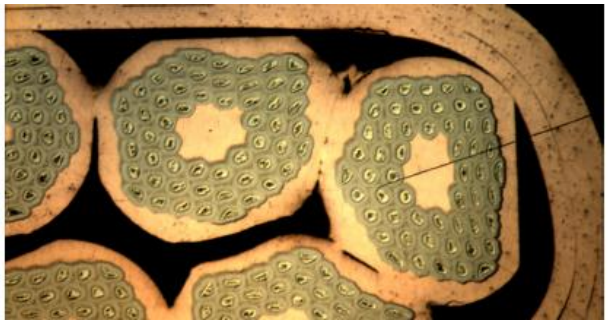
Main project phases: Prototype development | Construction start | Production units | Spare units

QXF CABLE

- Still issues with QXF cable [G. Sabbi based on Amvrosio and Ferracin work]
  - Very critical - Hope to converge soon
  - Deformation of strands
  - Cable stability during winding

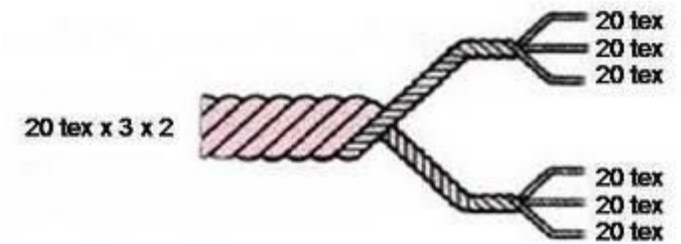


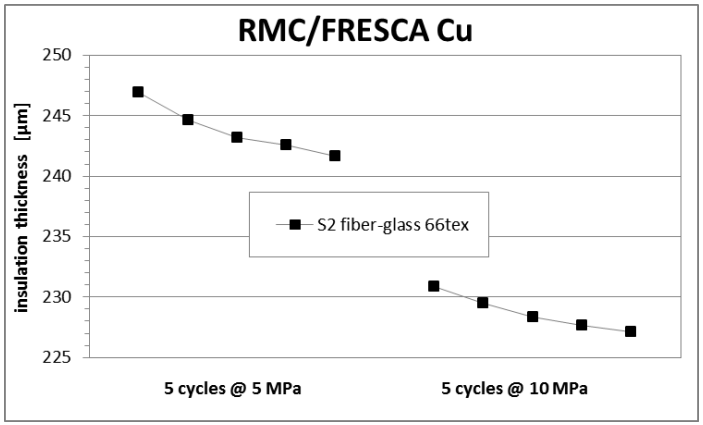


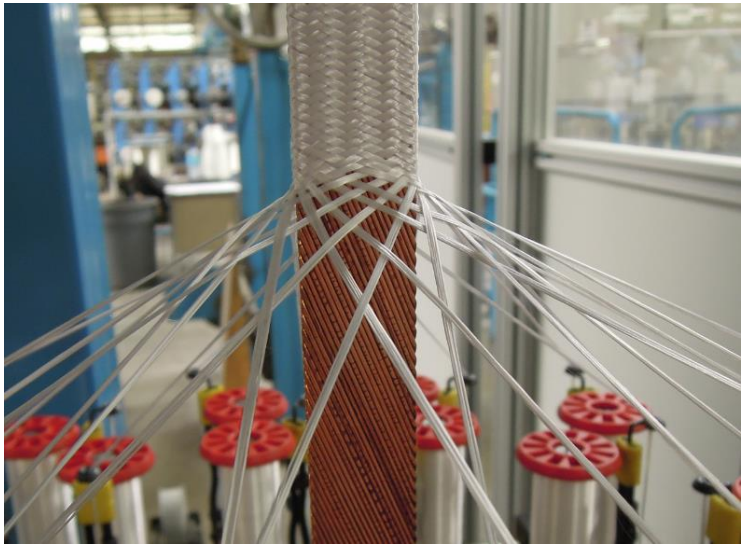


INSULATION

- Braiding insulation studies at CERN [P. Ferracin, J. Munoz]
  - A bit too large with 66 TEX yarn (0.23 mm instead of 0.15 mm target)
  - 33 TEX yarn to test







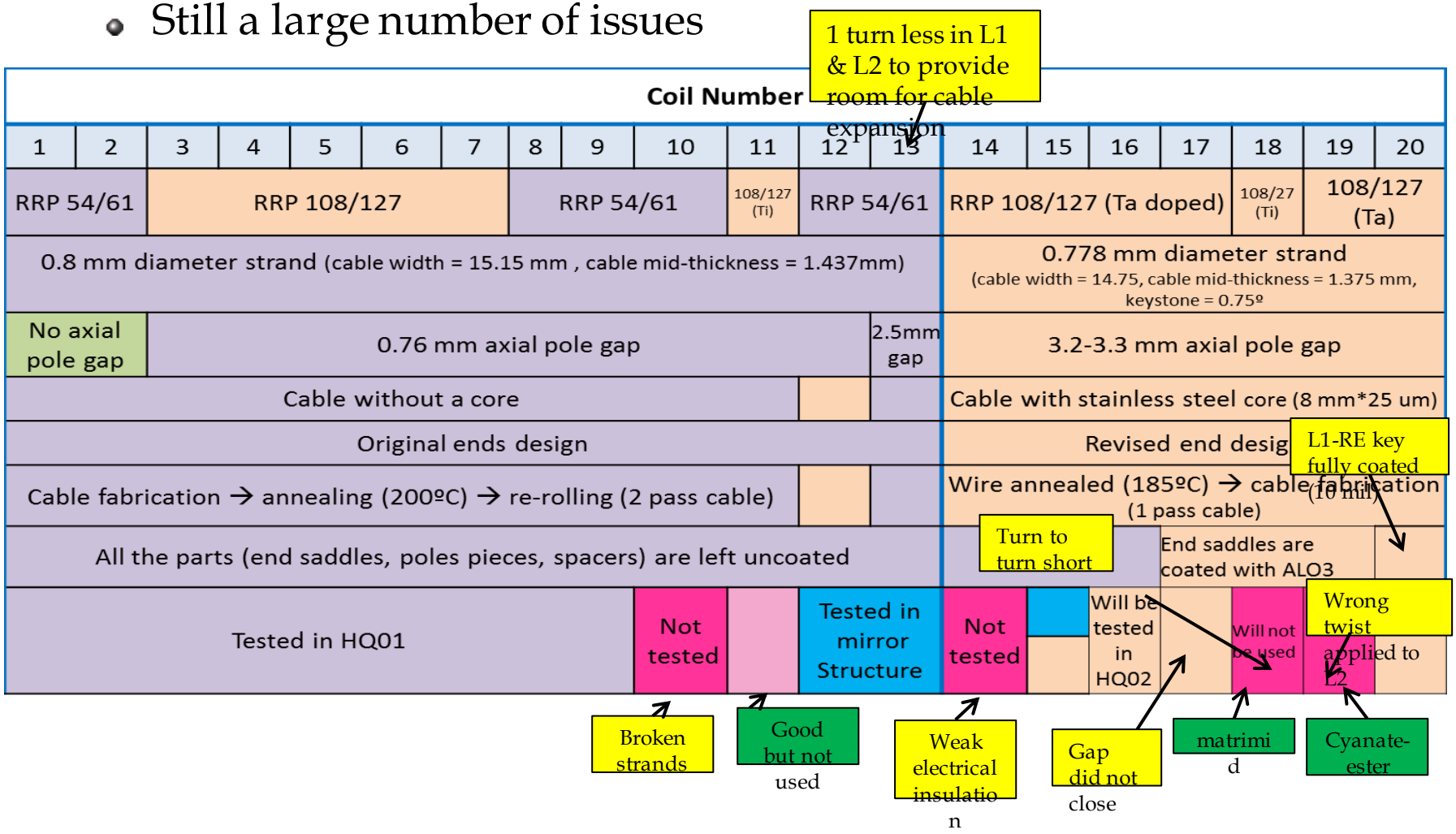
HQ02 STATUS

- HQ02 is being tested now in FNAL
  - First quadrupole with cored cable
  - Please note: in FNAL I<15 kA at 1.9 K, so we will be able to just reach nominal (exactly 15 kA, 80% of short sample) but not reach short sample
    - A test at CERN should be foreseen on the second assembly (July) – first test was given to FNAL since we had to test the MQ

- An HQ03 should be manufactured asap
  - Best way to minimize risks associated to QXF
  - Still debate about who does it: core program / LARP

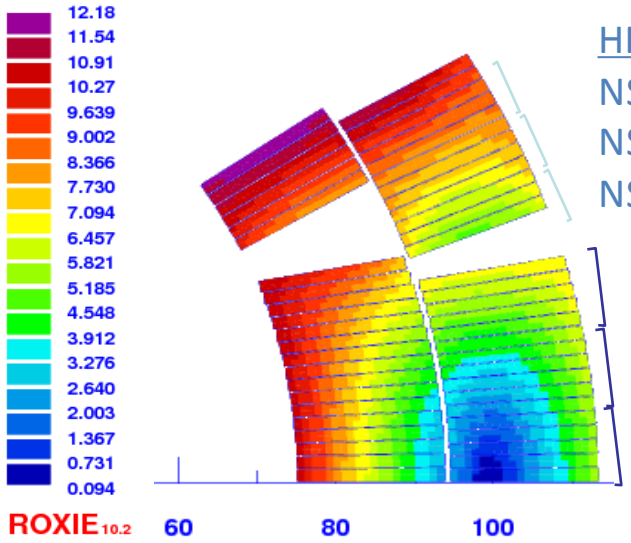
COIL FABRICATION

- HQ coil fabrication being analysed [F. Borgnolutti]
  - Still a large number of issues



QUENCH PROTECTION

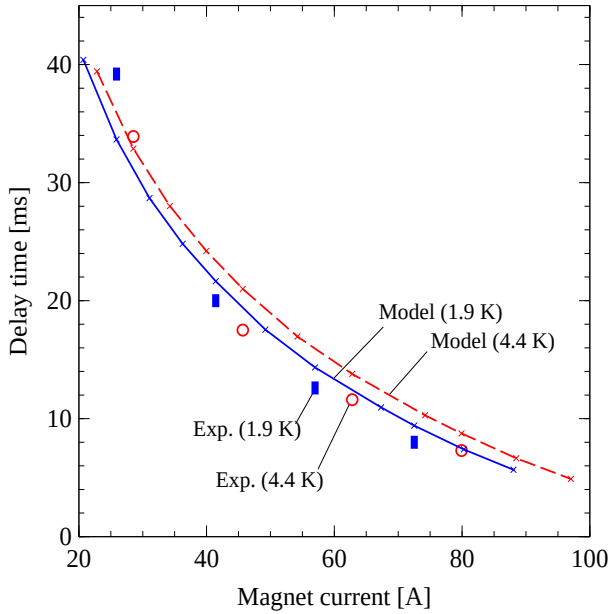
- Hotspot temperature studies [G. Ambrosio, M. Sorbi, T. Salmi et al]
  - Heater design to deliver more heat to lower field areas



HF block
NS1, B = 9.3 T
NS2, B = 7.8 T
NS3, B = 6.9 T

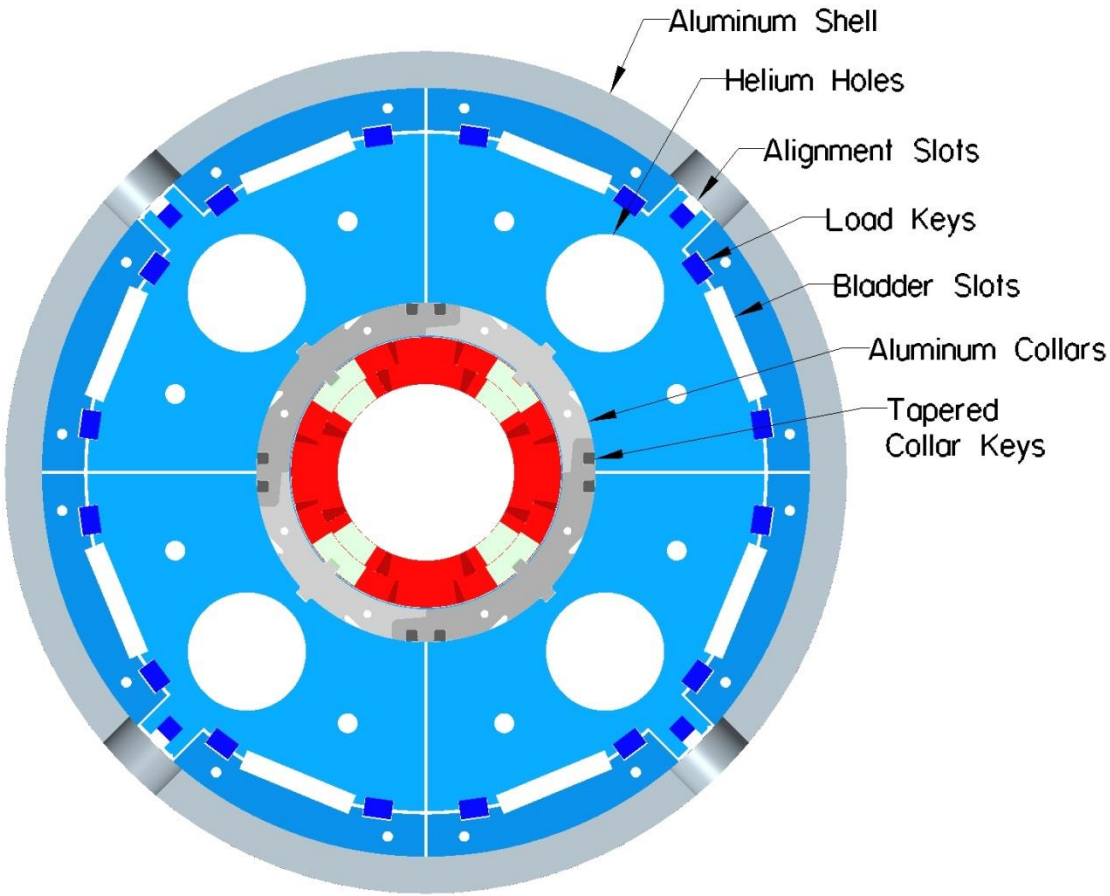
LF block
NS1, B = 6.5 T
NS2, B = 6.0 T
NS3, B = 5.7 T

QXF field [T], I = I_{NOM} = 17320 A



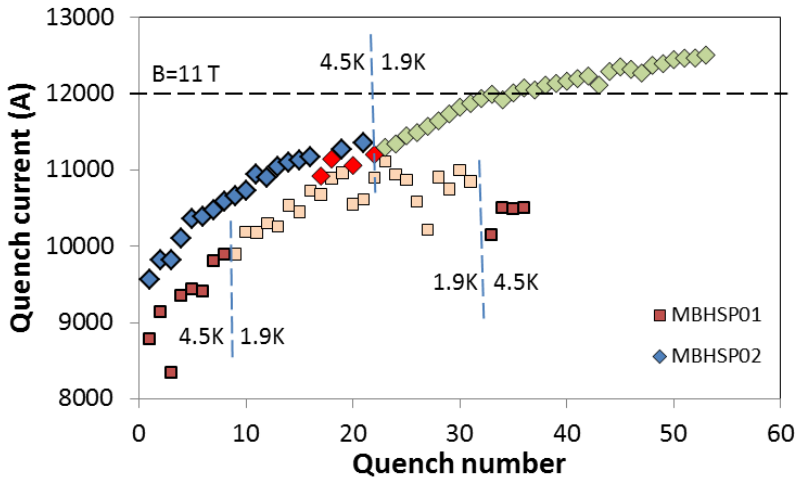
STRUCTURE

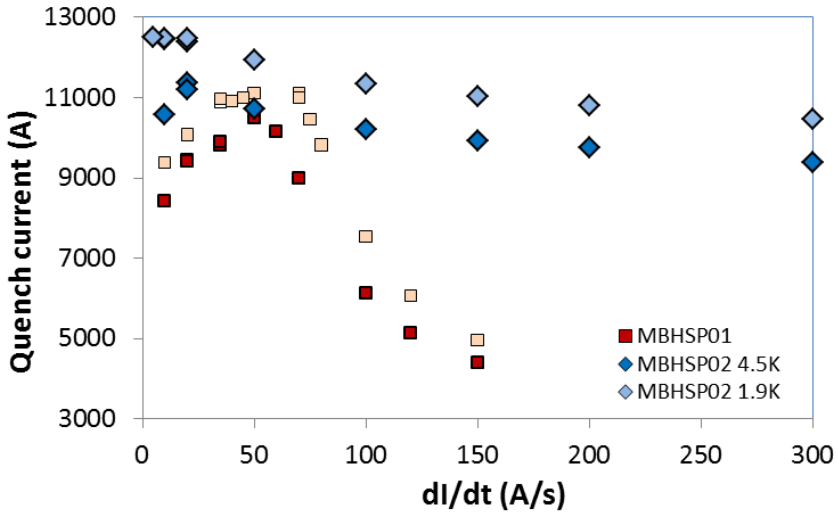
- BNL working on an alternative mechanical structure
  - Appealing, but do we really need to change something that works ?



11 T RESULTS

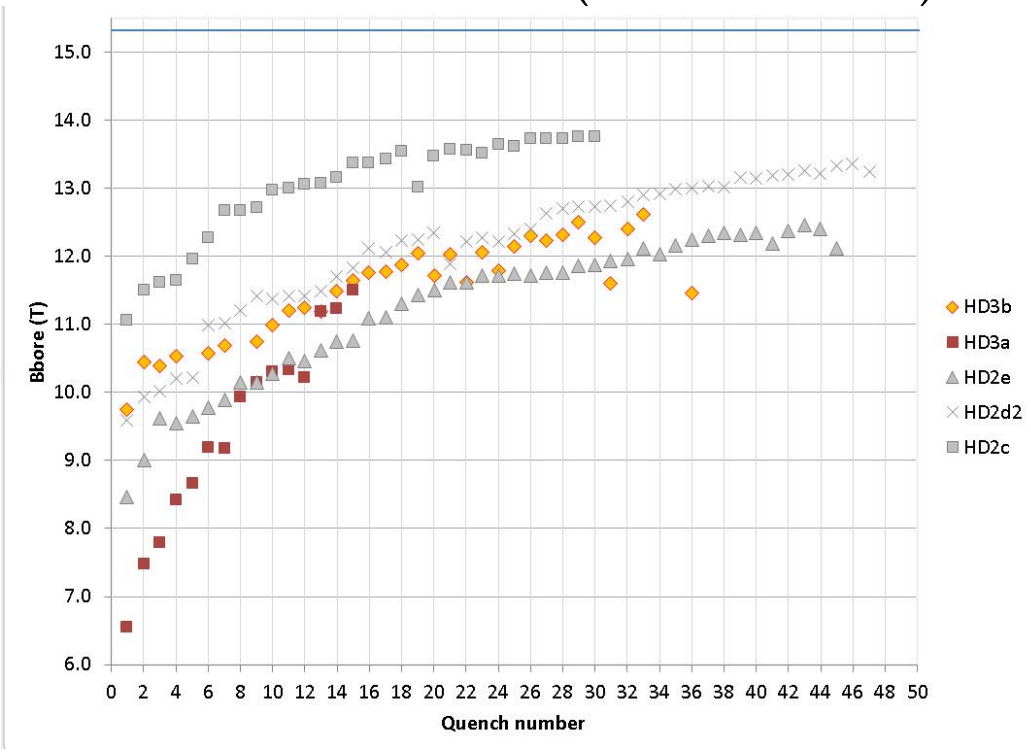
- Core seems to work – much lower ramp rate dependence
  - HSP01 was quenching on plateau at <10 kA
- MBHSP02 better but quenching on plateau at 11 kA
  - Long training (is it the core?)
- Field quality show that core works as expected





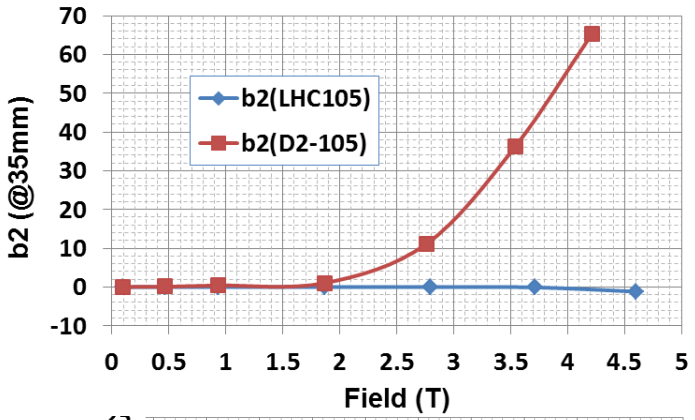
HD3 RESULTS

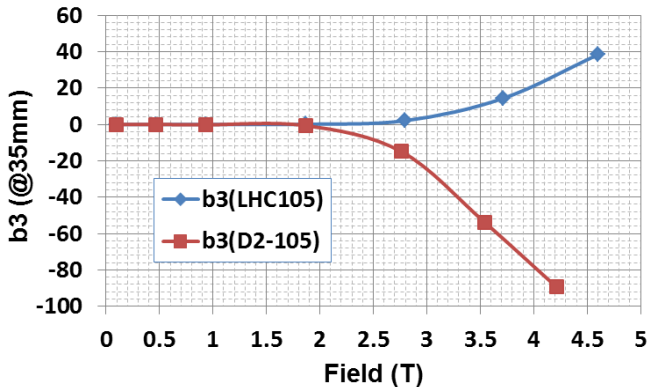
- Went up to 13 kA at 4.5 K (83% of short sample) after 40 quenches
  - Reproducibility of HD2 results – but quenches not in the transition
  - It would be interesting to have results at 1.9 K where the magnet could establish world record (test at CERN?)

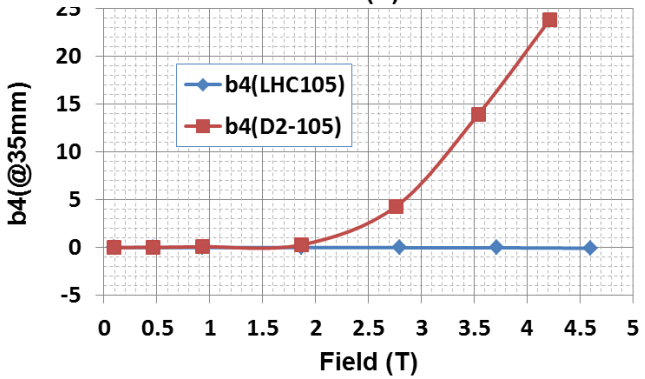


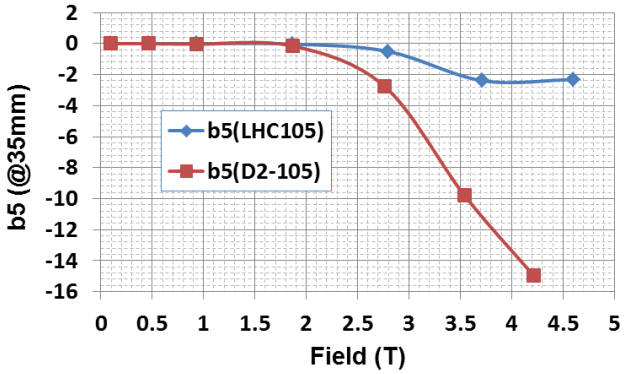
D2 CONCEPTUAL DESIGN

- BNL started the study [R. Gupta]
  - 105 mm aperture, large cross talk (both fields have same direction)
- Hypothesis: 3.5 T operational field, BNL-like coil
  - Large multipoles, to be seen what is tolerable and what to optimize









THANKS !

- Web site

https://indico.fnal.gov/conferenceOtherViews.py?view=standard&confId=6164