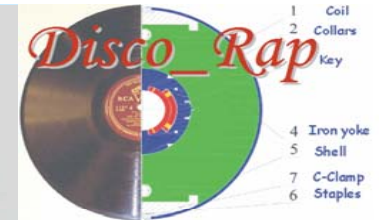


THE TECHNICAL DESIGN REVIEW OF THE SUPERCONDUCTING MODEL DIPOLE FOR FAIR SIS300

CHARGE TO THE REVIEW COMMITTEE

P.Fabbricatore
INFN Genova

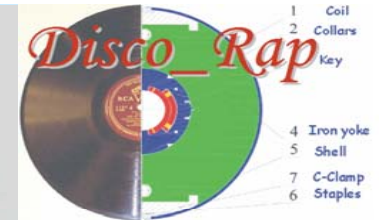
**THE TECHNICAL DESIGN REVIEW OF THE
SUPERCONDUCTING MODEL DIPOLE FOR FAIR SIS300**



Agenda of November 12th

- | | | |
|-------|---|-----------------------|
| 09:00 | Closed meeting of the Review Committee | |
| 10:00 | Welcome from the INFN Genova Director Prof. S.Squarcia and from ASG Superconductor Director Dr. Ing. F.Bressani | |
| 10:15 | Charge to Review Committee | P.Fabbricatore |
| 10:30 | Introductory information about DISCORAP project | P.Fabbricatore |
| 11:00 | The conductor | G.Volpini |
| 12:00 | The magnetic analyses | G.Bellomo |
| 13:00 | Lunch | |
| 13:45 | Visit to the workshop for inspecting the winding tests | |
| 14:30 | Losses | M.Sorbi |
| 15:15 | Coffee break | |
| 15:30 | Mechanical analyses | S.Farinon |
| 16:30 | Thermal analyses | M.Sorbi |
| 17:15 | Quench Protection | M.Sorbi |
| 17:45 | The engineering design of the cold mass | R.Marabotto |
| 18:45 | End of the first day | |
| 20:00 | Dinner at Ristorante Montallegro | |

**THE TECHNICAL DESIGN REVIEW OF THE
SUPERCONDUCTING MODEL DIPOLE FOR FAIR SIS300**

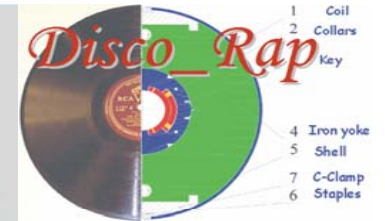


Agenda of November 13th

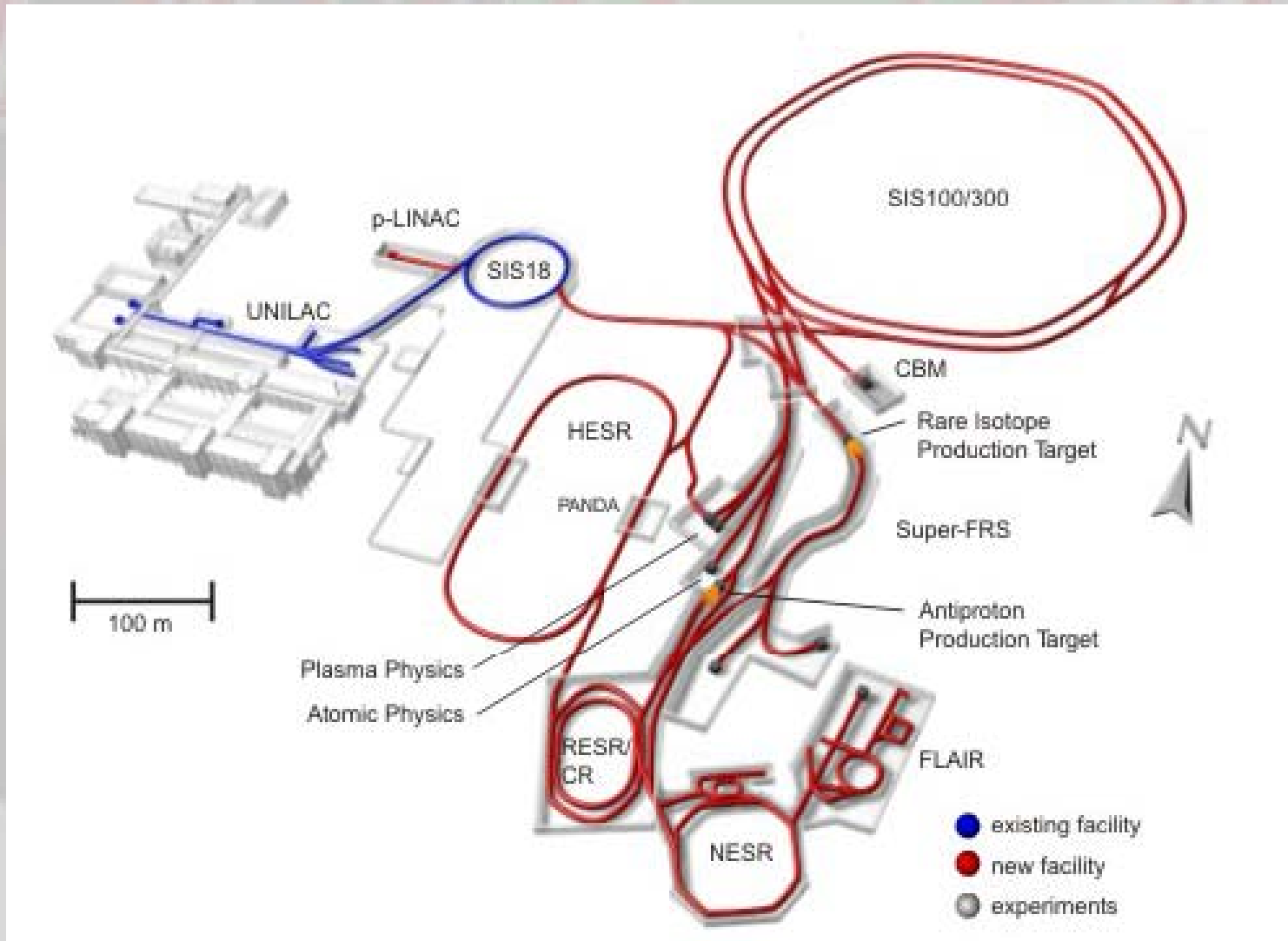
- 09:00 Cryostat issues
- 09:30 R&D activities at GSI-FAIR
- 10:15 Planning and milestones
- 10:30 Coffee break
- 10:45 Restricted meeting of the Review Committee
- 13:00 Lunch
- 14:00 Restricted meeting of the Review Committee
- 15:30 Open session with results of the review
- 16:30 Closure

U.Gambardella
H.Müller
P.Fabbricatore

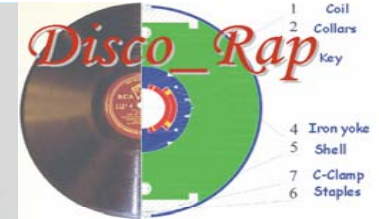
**THE TECHNICAL DESIGN REVIEW OF THE
SUPERCONDUCTING MODEL DIPOLE FOR FAIR SIS300**



Facility for Antiproton and Ion Research

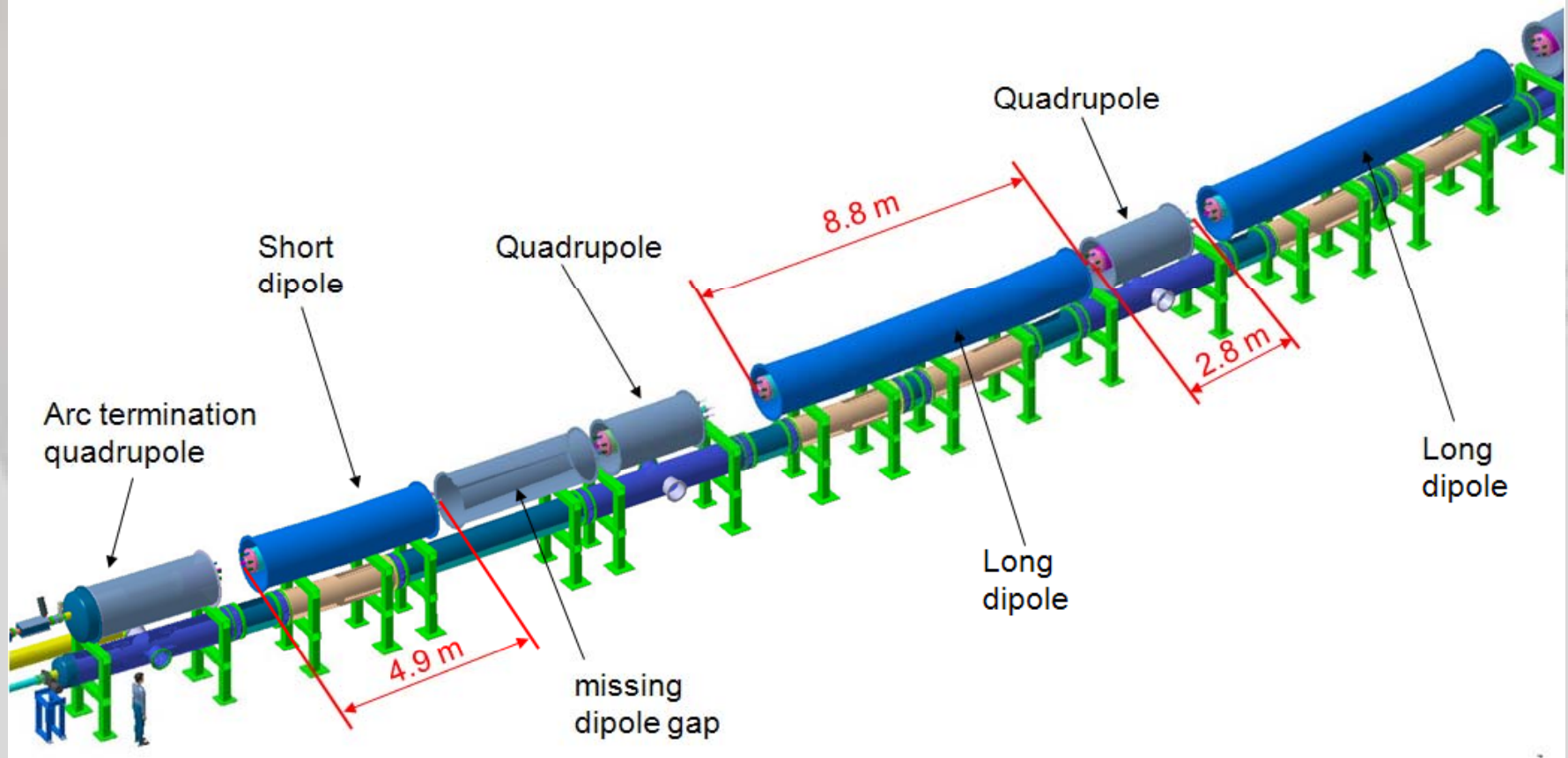


**THE TECHNICAL DESIGN REVIEW OF THE
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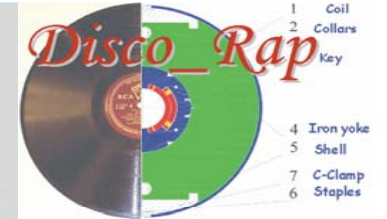


48 long dipoles – Magnetic length 7.89 m
12 short dipoles – Magnetic length 3.94 m

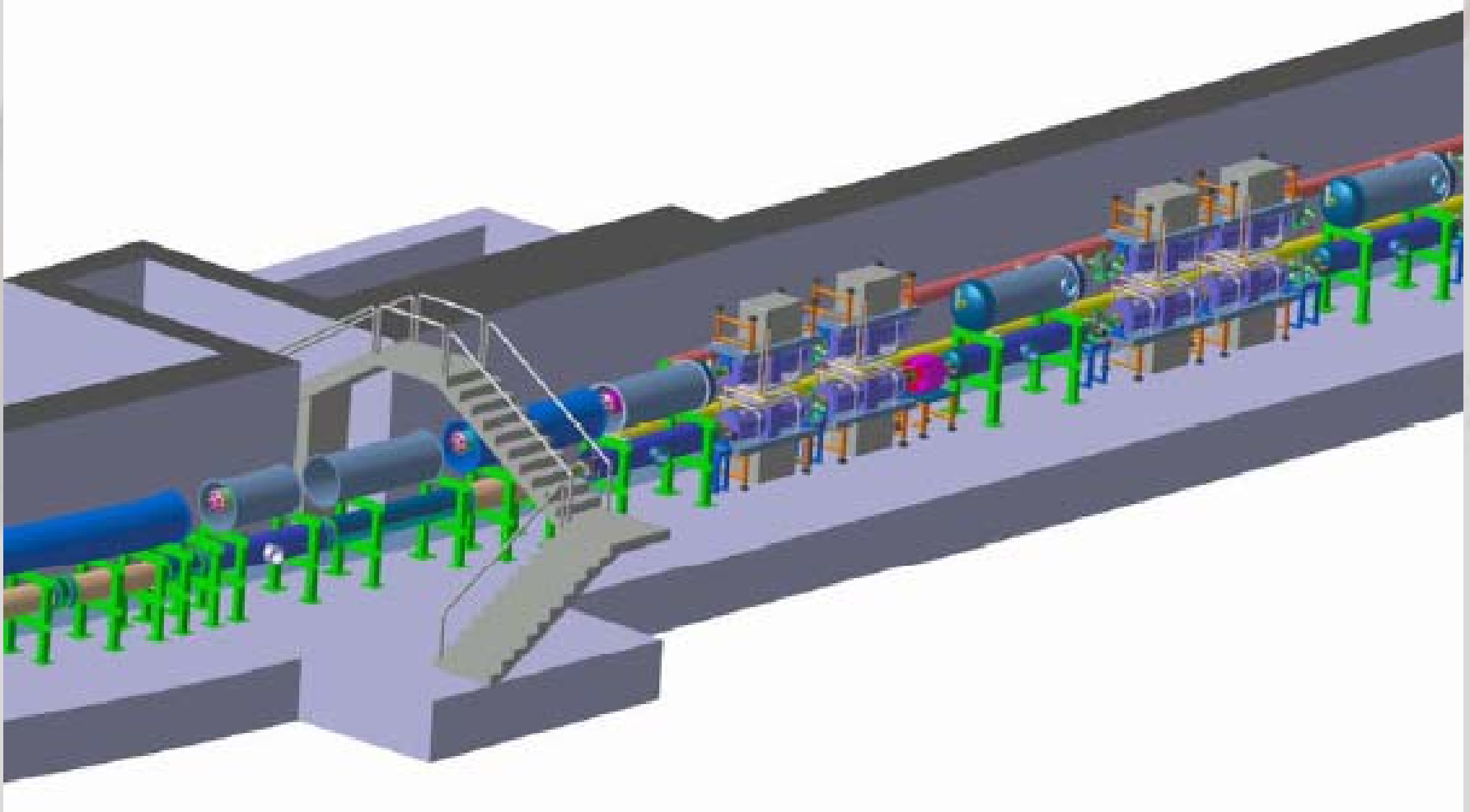
SIS 300 arc cryostat stacked on top of SIS 100

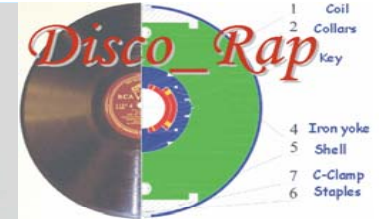


THE TECHNICAL DESIGN REVIEW OF THE SUPERCONDUCTING MODEL DIPOLE FOR FAIR SIS300



The two synchrotrons in the tunnel





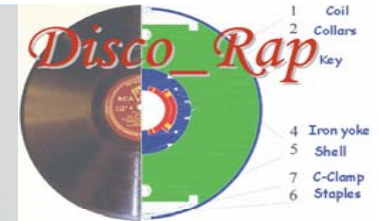
Criticality of SIS300 dipoles: why R&D is needed?

Ac losses depend on **B** and **dB/dt**. The heat generated shall be efficiently removed for **avoiding premature quenching**. The ac losses shall be kept at a minimum level for keeping **the cryogenic costs at an acceptable level**

	Aperture (mm)	B (T)	dB/dt (T/s)	Q (W/m)
LHC	53	8.34	0.0075	0.18
RHIC	80	3.5	0.07	0.35
SIS300	100	4.5	1	<10

The curvature of $R=66.667$ m (sagitta 117 mm) produces a **significant manufacturing complexity** (consider that for reducing ac losses the conductor is quite stiff)

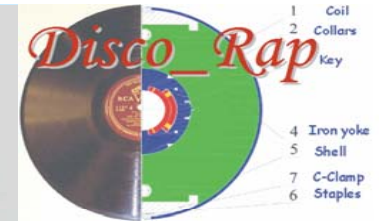
The magnets shall be cycled 10 million times → Design **optimised for fatigue loads**



The R&D DISCORAP

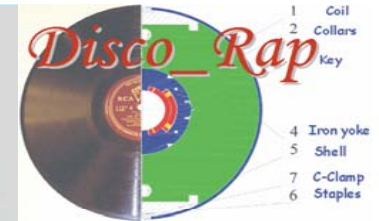
The Italian National Institute of Nuclear Physics (INFN) is performing an R&D activity aimed to develop fast cycled superconducting dipole for FAIR SIS300.

This activity, named DISCORAP (“Dipoli SuperCONDuttori RAPidamente Pulsati”), started in 2006 in accordance with a specific INFN-FAIR Memorandum of Understanding signed by both institutions in December 2006. The aim is to have a complete cold mass model of the short dipole ready in the summer of 2009. After a preliminary test of the cold mass in a vertical cryostat, it will be integrated into a horizontal cryostat for a test series at GSI.



The Technical Design Report

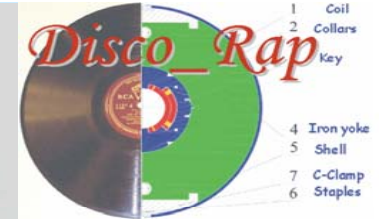
An important milestone has been recently achieved with the completion of both the technical design of the model magnet and of the industrial developments preliminary to the construction of the model. A document was finalized: the TDR, which in draft form has been issued and is now scrutinized.



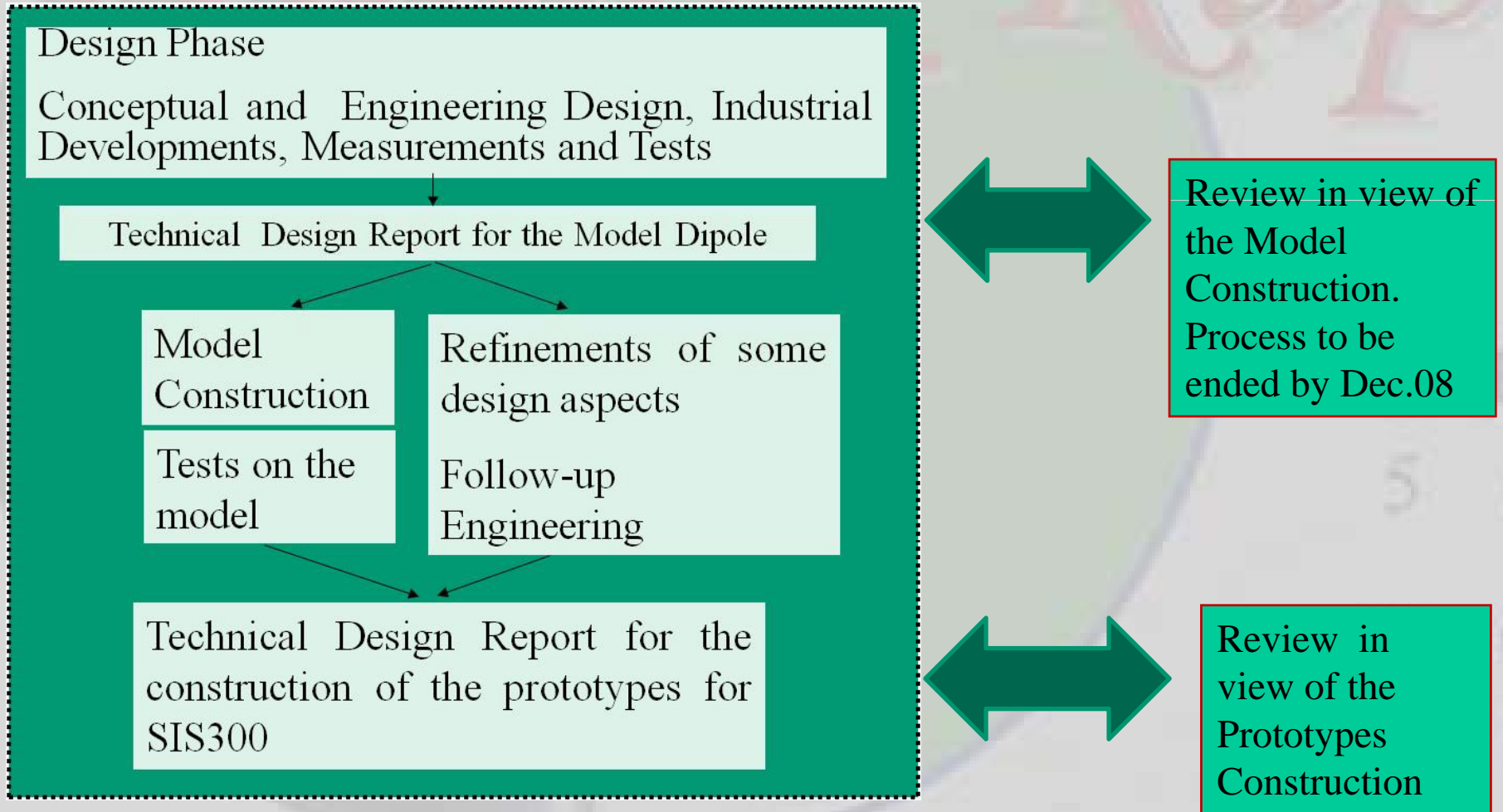
Motivations for this review

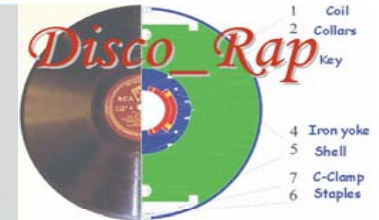
The model magnet represents a test bench in view of the construction of the real fast cycled curved sc dipole magnet for SIS300. If the constructive technologies and the technical solutions adopted for the model are successfully, the next step will be the realization of models/prototypes, preliminary to the mass production.

In this framework, it is important to have an external opinion by experts of the field about the basic technical choices, the lay-out, the materials involved, the analyses done, at this stage of the R&D activities, before the construction of cold mass starts.



Synopsis of DISCORAP





The Review Committee

The Review Committee, called by us, is composed of five recognized experts in the field of superconducting magnets:

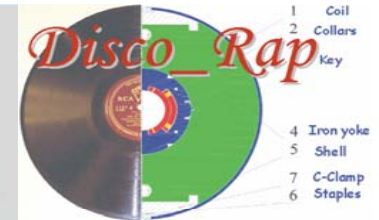
Luca Bottura (CERN)

Shlomo Caspi (LBNL)

Arnaud Devred (ITER)

Lucio Rossi (CERN) acting as chair

Davide Tommasini (CERN).



Five questions to the review committee

The Review Committee has received a draft version of the ***TECHNICAL DESIGN REPORT OF THE SUPERCONDUCTING MODEL DIPOLE FOR FAIR SIS300 (TDR)***.

On the basis of the information given in the TDR and in this review the Review Committee shall answer to the following questions:

- 1) Is the design of the model correct with relation to the required ac operations?
- 2) Is the conductor properly designed?
- 3) Are the FE analyses complete or some aspects are missing?
- 4) Are the preliminary industrial developments exhaustive or further tests are recommended?
- 5) Is the present design a solid basis for finalizing the design of SIS300 dipoles or other possibilities should be investigated before (or during) the construction future prototypes?