EuCARD HFM

Task 3 : High Field Magnet

Outline

- Task content
- Starting point
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- Future work

- Conclusion

Task content (1/2)

Irfu cea saclay

- Design, build and test a 1.5 m long, 100 mm aperture dipole model with a design field of 13 T using Nb3Sn high current Rutherford cables.

- The Nb3Sn technologies are to be brought together and tested in short models. Several of these technologies (superconducting cable, insulation, coil design, support structures) were partly developed during the FP6-CARE-NED project.

Task content (2/2)

- dipole model as a test bed for large high field accelerator magnets. A 1.5 m long dipole model will be build with an aperture of 100 mm and a design field of 13 T
- the model will afterwards be used to upgrade the superconducting cable test facility FRESCA at CERN from 10 T to 13 T.

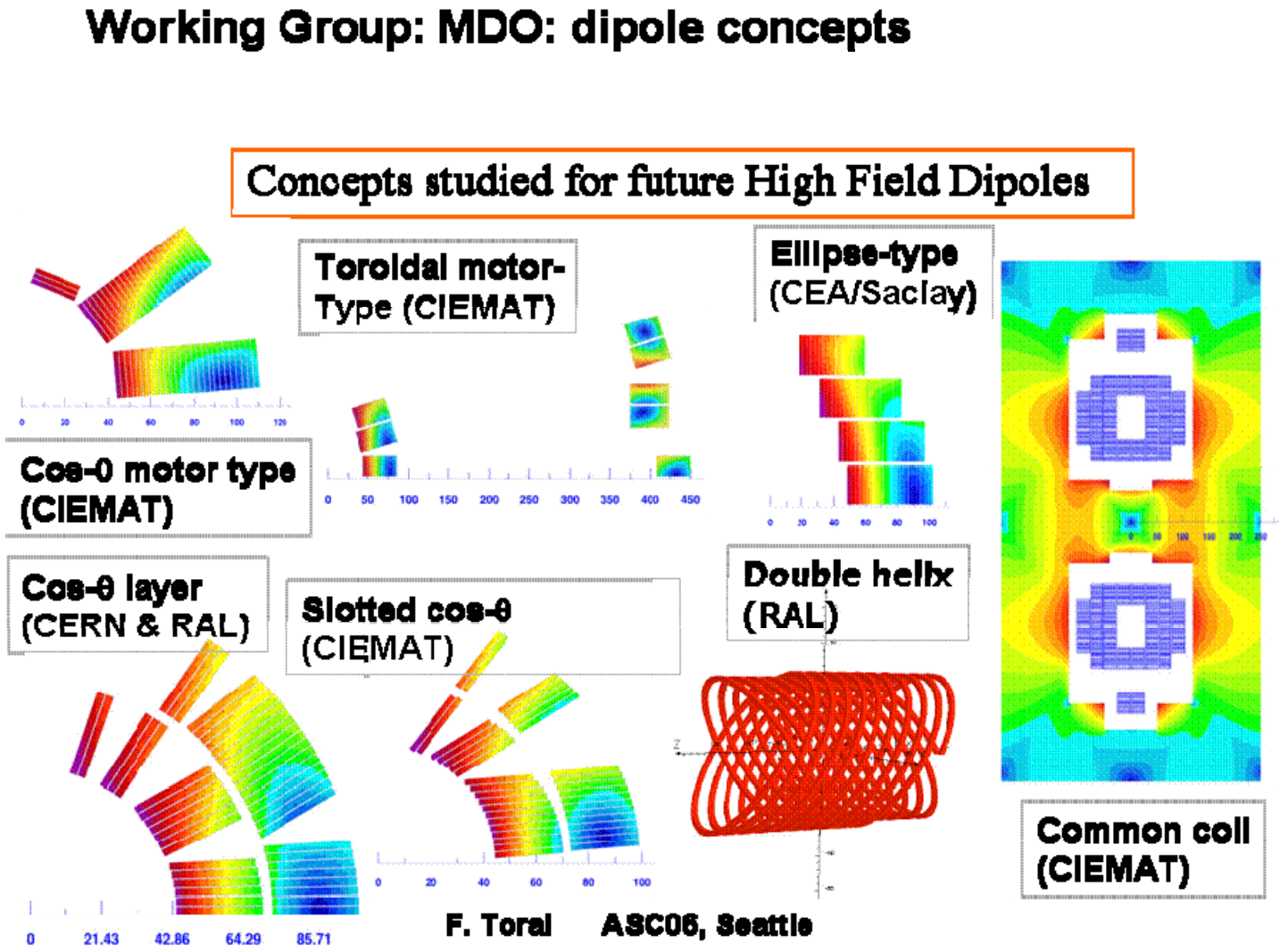
- CEA-DSM and CERN will design together the magnet.
- CERN will do the conductor characterization.
- PWR will lead the thermal design and thermal component tests. CERN and CEA will participate to the task
- CEA-DSM will fabricate the coils and CERN will build the mechanical support structure.
- Combined teams will integrate the coils into the support structure.
- The cryogenic test of the model will be done in the CERN test station

Starting Point (1/2)

Irfu cea saclay

- Part of the development was done during FP6-CARE-NED project :
  - The Heat Transfer Measurements Task : A test facility for heat transfer measurements is available
  - Quench computation :
  - Conductor development : 2500 A/mm^2 @4.2K and 12 T are feasible … but
    - Only one fabricant
    - are 2500 sufficient ?
    - Strand diameter (1,25 mm) OK ?
  - Cable insulation : Polyimide-sized S2 glass fiber tape developped by CCLRC/RAL

Starting point (2/2)



What is expected from other tasks

- Task1 : Coordination and communication:
  - Help in Coordination and communication

- Task 2 : Support studies
  - Even if the model will be used for fresca test facility, the design must be made in view of accelerator magnets → Radiation → choice of materials and Thermal model.
  - Very early input are necessary (start of model design)
  - Validation could come later (but before start of fabrication)

What is expected from other tasks

- Task 3 : …

- Task 4 : Very High Field dipole insert:
  - Mechanical interface
  - Magnetic coupling
    - Field on Nb3Sn Conductor ?
    - Protection

- Other tasks : Nothing

Future work

- Write the model specification
- Collect the existing documentation for the different possible magnetic configurations

T1

- Comparative Study of possible magnetic configurations adjusted to specification , compatibility with conductor development status

T2, T3

T3 - Review

- Decision of the magnetic configuration

Conductor must be determined and its feasability verified

Thermal model = M36

- Start of detailed study 01/01/2010
  - finalize magnetic design
  - Thermal and mechanical design
  - Tooling
  - …..

Conclusions

- The task deliverable is identified, but its characteristics must be specified

- Many magnetic configurations are possible. The first step is to choose one

- Some critical points are identified:
  - Conductor
  - Thermal model
  - Radiation resistant material

- A lot of work is to be done …..

  ….. efficient communication and organisation are necessary