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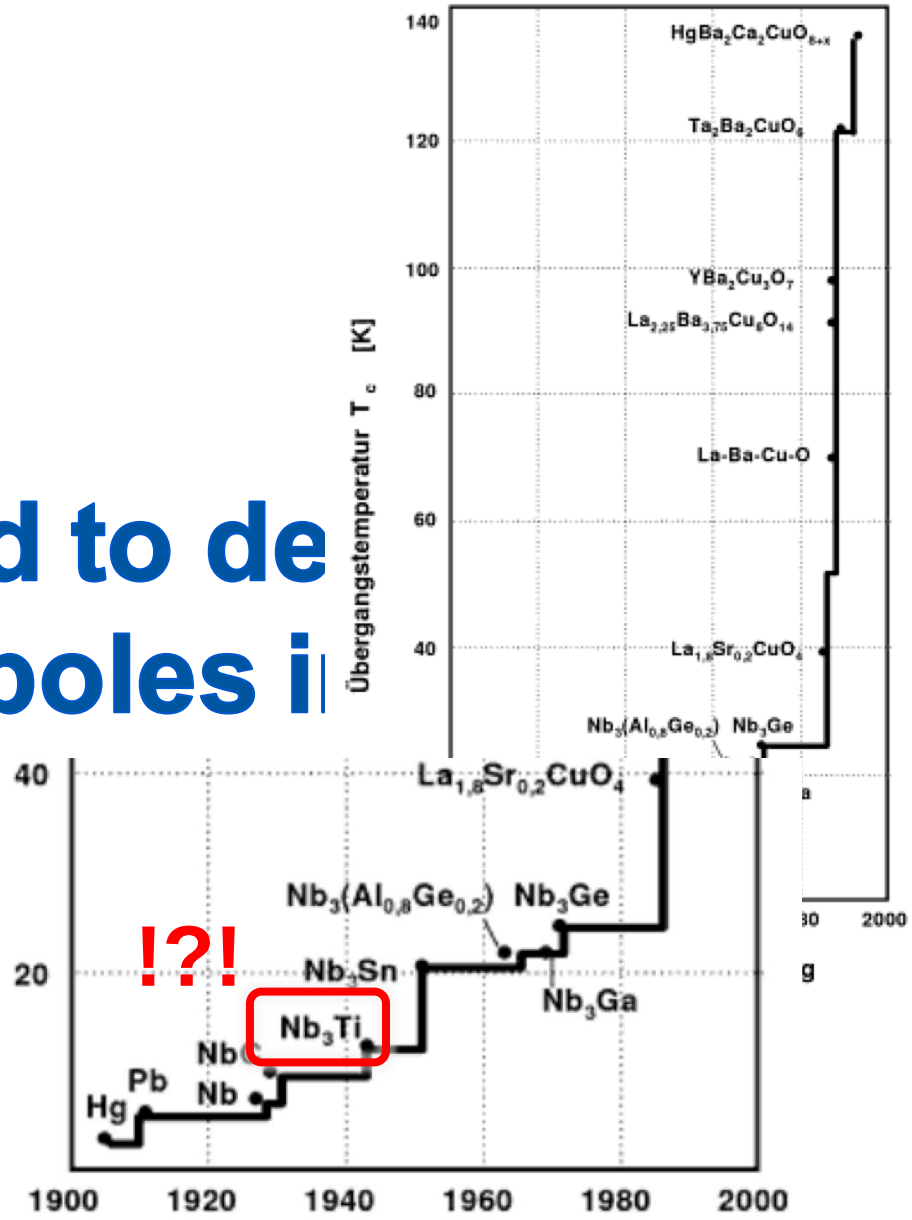
LHC Collimation Review 2013

CERN, May 30th-31st, 2013

What do we need to de
to have ~~Nb_3Ti~~ dipoles i
Nb_3Sn

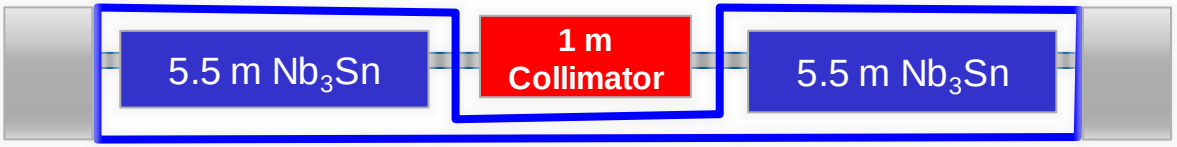


Outline

- What do we need to decide now to have Nb_3Sn dipoles in LS2 ?
- Short answer
  - We need to decide now
- Long
  - What do we need by LS2
  - Critical issues
  - Magnet production and integration schedule
  - A proposal

Amount

- The "*warm-collimator-in-the-middle*" option is the preferred one (see talk of V. Parma)

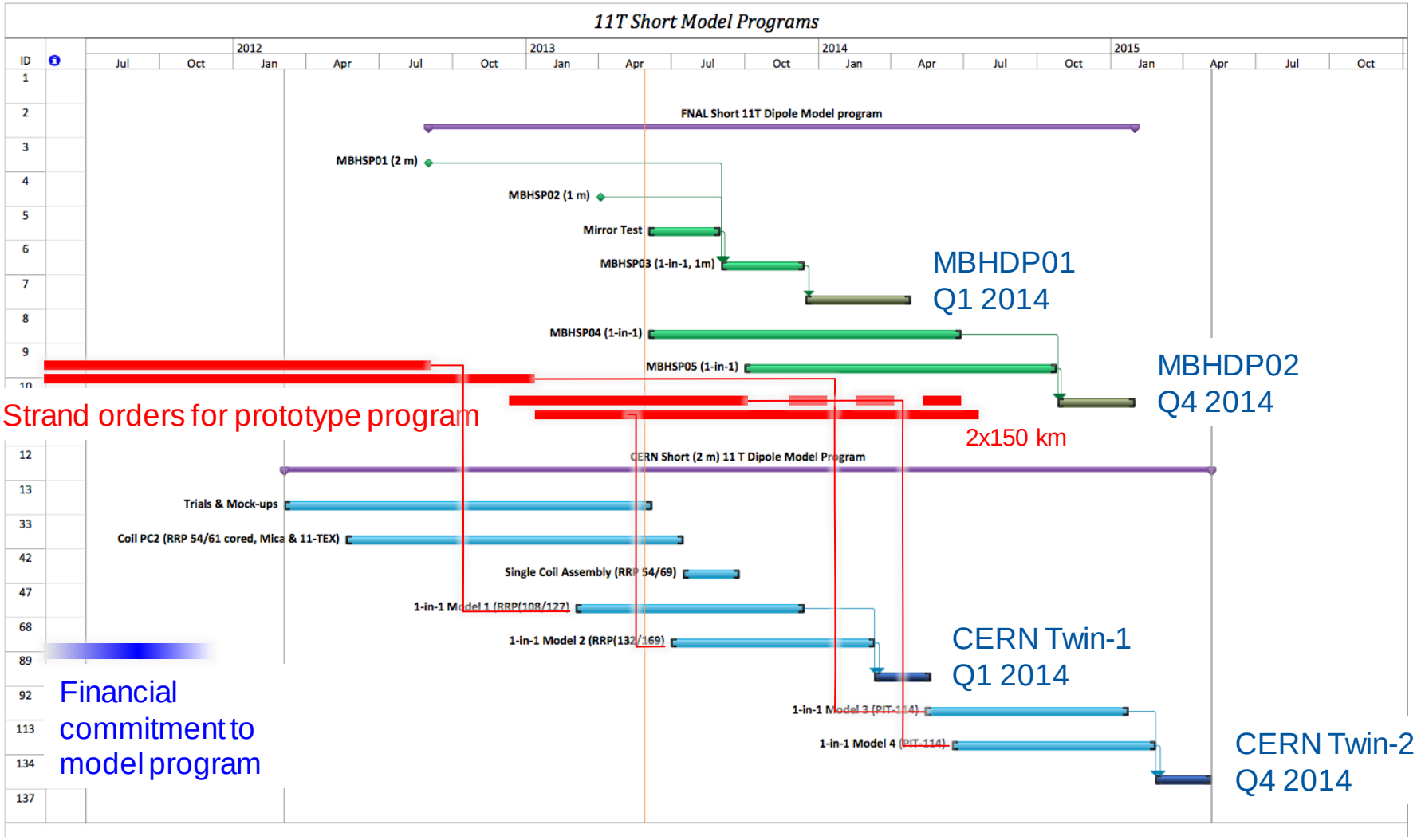


- Each collimator requires an integrated cryo-unit with two 5.5 m long 11 T dipoles and a warm slot
- A few units (e.g. 2 units) could be produced with existing or planned tools
- Larger production (e.g. 10 units) requires additional production lines
- **Q: How many cryo-units are *reasonably* required ?**

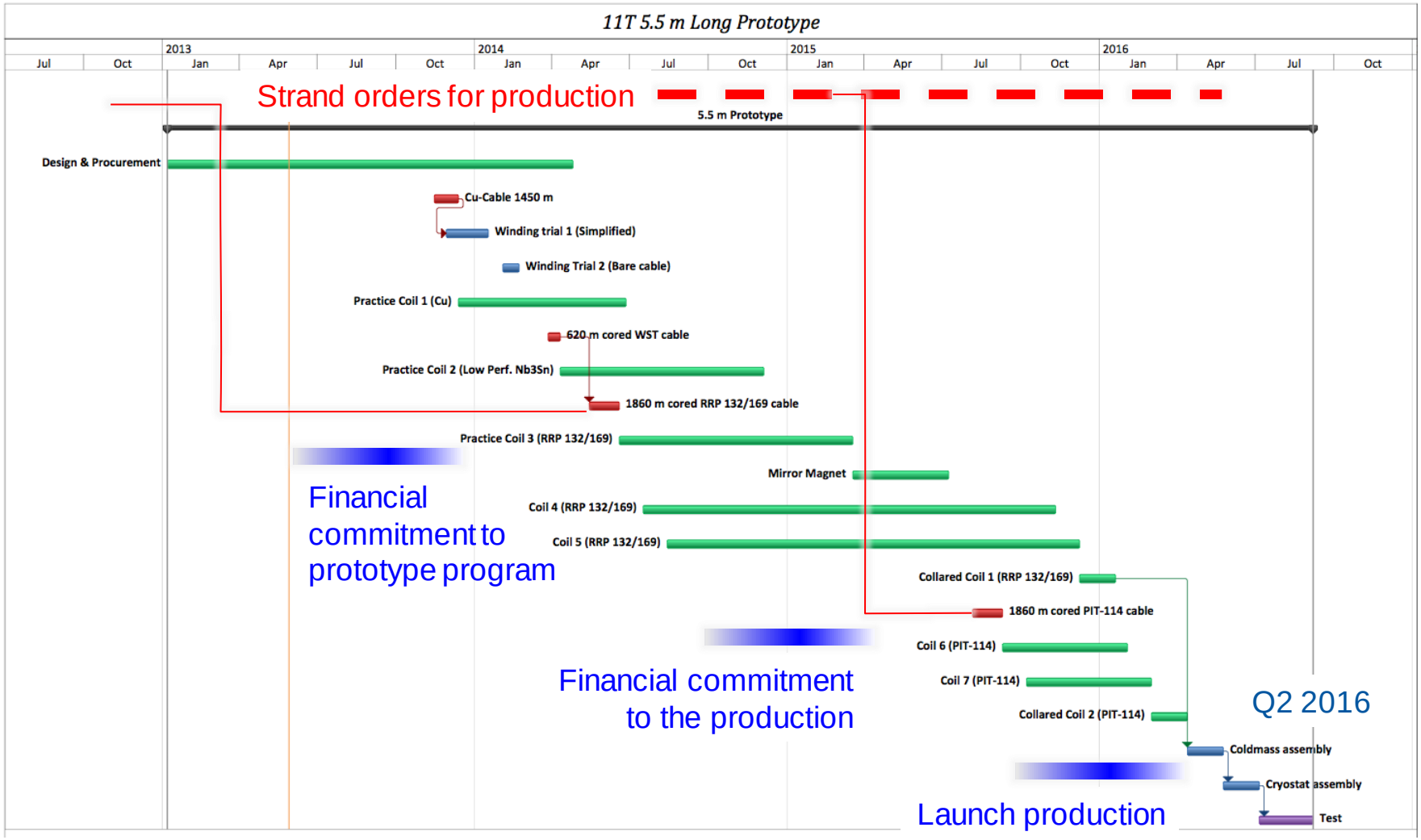
Critical issues

- 11 T performance and accelerator quality (see talk of M. Karppinen)
  - Field (quench level, ramp-rate dependence, steady state operation) – model and prototype programs
  - Quality (geometry, filaments, need for correctors) – magnet and wire *R&D*
- Integration and W/C transitions (see talk of V. Parma)
  - Minimum length required for the components – conceptual integration design
  - Need for supplementary equipment (e.g. current leads for trim power supply) – interface to beam optics and results from model program

Plan for short models (see talk of M. Karppinen)



Plan for prototypes (see talk of M. Karppinen)



Integration (see talk of V. Parma)

- Conceptual study required to validate the pile-up of dimensions, and fit the 15.660 m slot of a standard dipole (complete by end 2013)
- Start engineering design by end 2013
  - Detailed design of cryo-unit (Q1 2014 to Q2 2015)
  - Tooling, parts, first prototype integration (Q1 2015 to Q4 2016)
  - Cryo-unit prototype validation test by end 2016

Key events

- Within the next 6 months:
  - Conceptual integration study
  - Financial commitment to the prototype program
    - Cold-mass design and tooling
    - Test cryostat (if needed) and test equipment
    - Industry WP's placed
  - Prepare follow-up strand orders
- Beginning 2015:
  - Finalize the need for cryo-units **(!?!)**
  - Launch final strand production
  - Major tooling commissioned
- Beginning 2016:
  - Place industry contracts (as appropriate) and launch production **based on the available tooling (prototype program)**

A proposal

- The model and prototype program for a cryo-unit with 11 T dipole and warm collimator is on-going
  - Details on objectives, status and plans in the two talks by M. Karppinen and V. Parma
  - Target is a 11 T twin aperture prototype test (5.5 m) and integration prototype by 2016
- Final commitment for the production of LS2 units must come by beginning 2016
- By that time, production for LS2 will only be possible on a scale comparable to the prototype program
- Target (today) production (by LS2) of the minimum reasonable number of units that would be necessary in the period LS2-LS3, compatibly with the prototype tooling
  - Minimum risk of waste
  - Maximum impact for the magnet program

Questions

- What we would like to know:
  - How many cryo-units/IR's ?
  - Which locations ?
- What we do need to know:
  - What is the minimum reasonable number of cryo-units necessary to avoid intensity limitations after LS2 ? (is this compatible with the 11 T program ?)
  - Is a "standard dipole" cryo-unit with room for approximately 1 m warm collimator jaws suitable for all locations and all scenarios ?

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