EuCARD^2 WP 10.2 HTS Conductor

EuCARD^2 Kick-off at CERN

14th June 2013

Task 2 - objectives

- Design prototype and produce **HTS cables**, in unit length (order of 50 m) and quantity (order of 5 UL) sufficient for coil winding (1 magnet per material option)
- Improve the performance of the two candidate HTS materials (BSCCO-2212 and YBCO), with targets suitable for a 5 T accelerator grade insert in a 15 T background magnet. Produce at least 10 kg of each material at target performance
- Characterize electrical and mechanical properties of the basic materials and cables. Assist material R&D through advanced analytical and imaging techniques

Task 2 – targets and metrics Wires/Tapes

parameter	units	targets
J_E (20 T, 4.2 K)	(A/mm^2)	600
J_E (15 T, 4.2 K)	(A/mm^2)	675
J_E (12 T, 4.2 K)	(A/mm^2)	800
σ (I_C) within a unit length	(%)	10
M(1.5 T, 10 mT/s)	(mT)	300(1)
Range of $\sigma_{transverse}$	(MPa)	100
Range of $\varepsilon_{longitudinal}$	(%)	±0.3
Unit length	(m)	100

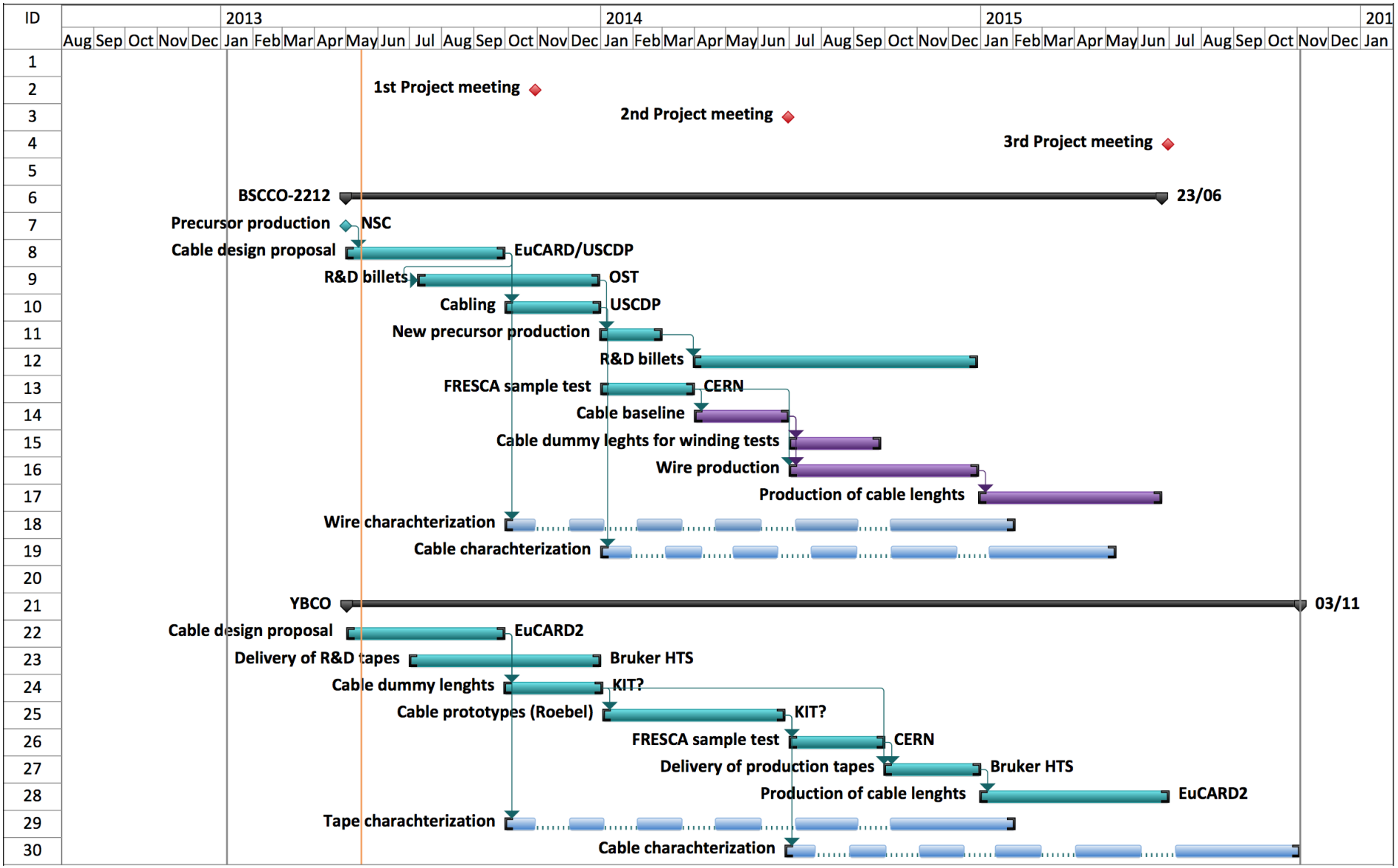
(1) ball-park estimate, depends on the magnet design, to be fixed as a result of the magnet test

Task 2 – targets and metrics
Cables

parameter	**units**	**targets**
I_C (20T, 4.2 K)	(kA)	10
Provisional width	*(mm)*	*10*(2)
Provisional thickness	*(mm)*	*1.5*(2)
Effective contact resistance	($\mu\Omega$)	5(3)

(2) depends on the cable and magnet design, scope of the cable design group
(3) ball-park estimate, depends on magnet design, to be fixed as a result of the magnet test

Plan


ID
2013
2014
2015
Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan
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1st Project meeting
2nd Project meeting
3rd Project meeting
BSCCO-2212
23/06
Precursor production
NSC
Cable design proposal
EuCARD/USCDP
R&D billets
OST
Cabling
USCDP
New precursor production
R&D billets
FRESCA sample test
CERN
Cable baseline
Cable dummy leghts for winding tests
Wire production
Production of cable lenghts
Wire charachterization
Cable charachterization
YBCO
03/11
Cable design proposal
EuCARD2
Delivery of R&D tapes
Bruker HTS
Cable dummy lenghts
KIT?
Cable prototypes (Roebel)
KIT?
FRESCA sample test
CERN
Delivery of production tapes
Bruker HTS
Production of cable lenghts
EuCARD2
Tape charachterization
Cable charachterization

Major milestones

- October 2013: Cable design (baseline)
- March-June 2014: Cable validation tests
- December 2014: YBCO tape and BSCCO wire production completed
- June 2015: Cable delivery for magnet winding

Cable Design Group

- Review cable options for both high-field HTS materials
- Propose cable layout and dimensions
- Provide initial analysis of cable performance
  - Expected critical current, critical current density, dependence on field
- Finalize a plan for testing of materials and cables

A1: nominate participants from the beneficiaries and associated laboratories

Testing – ideas for a work-split

- Wires and tapes
  - High field Ic: Grenoble, Geneva (Bruker ?)
  - Strain dependence of Ic: Geneva, Twente
  - Stress dependence of Ic: Geneva
  - Angular dependence of Ic: Grenoble
  - Magnetization: CERN (Bruker ?)
  - Material analysis: CERN@ESRF
- Cables
  - High field Ic: CERN, Twente
  - Stress dependence of Ic: CERN, Twente
  - Cable magnetization and loss: Twente, Southampton
  - Mechanical properties (and Ic ?): Karlsruhe

Interface matters

- Insulation schemes
  - High-temperature withstand (BSCCO)
  - Compatibility of impregnation with basic material (YBCO)
- Quench detection and protection

A2: decide which Task in the WP deals with these matters as the responsible for the work