HTS magnet program at CERN

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On behalf of the HTS team

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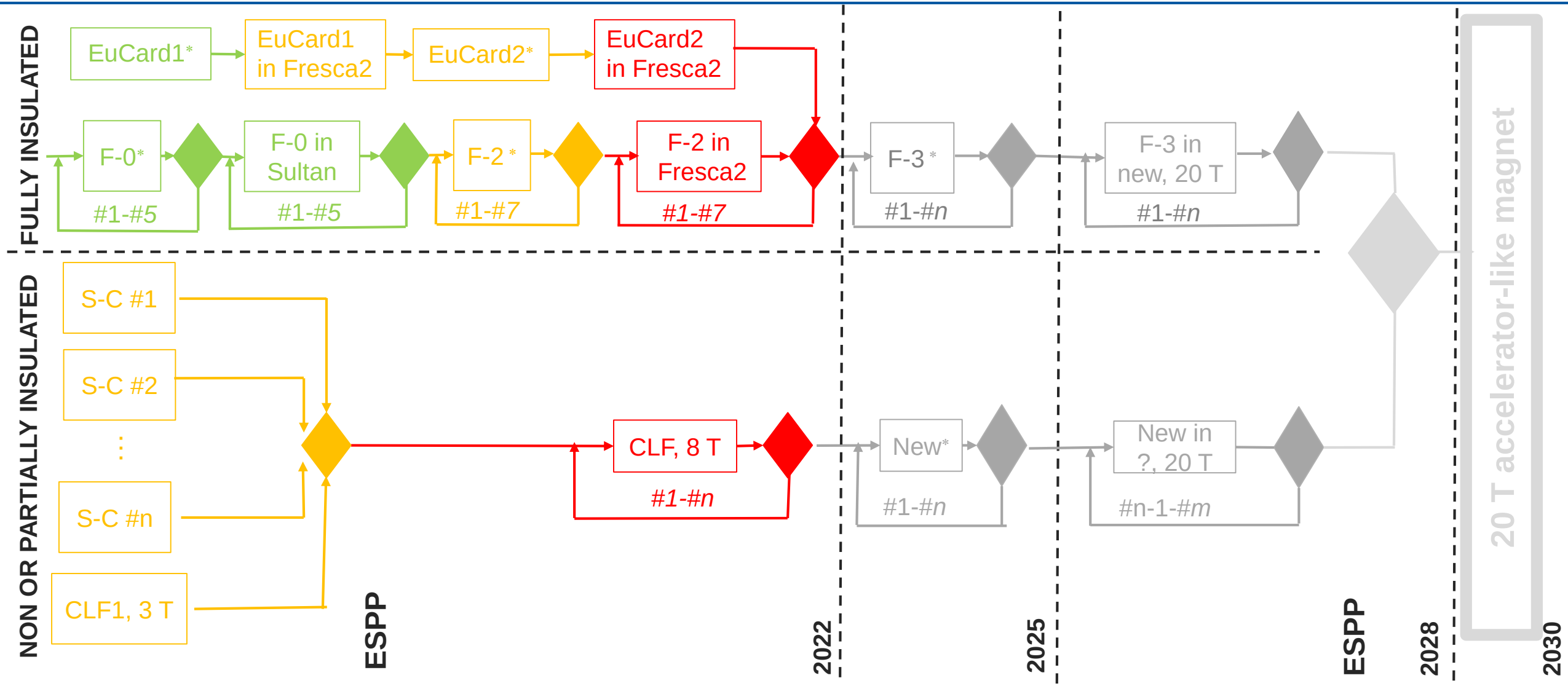
Muon collider magnets - priorities

- Dipoles and combined function magnets for the collider ring: large aperture 150 mm in the US design, large heat load O(500W/m) from the electrons and positrons from the muon decay, shielding required, open midplane maybe interesting
- Quadrupoles for the interaction region. A tentative estimate for the aperture has been 700 mm (!) with 18 T maximum field for a 14 TeV collider -> Feasibility?
- High-field solenoids. As higher the field as higher the performance (luminosity is more or less proportional to this field, as higher the field as smaller the beam emittance) -> Explore the absolute limits
- Fast ramping magnets are needed in the accelerator ring, they have to ramp in a millisecond or so (depending on the collision energy and other parameters). Normal conducting magnets or HTS (if this technology can be developed this far). Large amount of energy has to be cycled between magnets and an energy storage with large efficiency to limit losses (energy cost, heat)
- Other design options are also under considerations, which may require also special (HTS) magnets

Muon collider magnets

- ReBCO tape is at the moment the most promising conductor option. We closely observe the development of BISCO conductor in the US.
- CERN is keen to enter the development of HTS conductor and is currently developing a strategy to do so
- We plan to integrate the specific development of the dipole magnets for the muon collider into the development plan for the 20 T HTS magnet. As a first step, we wish to perform a parametric study to understand the parameter space of these magnets and –in collaboration with beam dynamics experts- to optimize their parameters
- CERN wishes to establish collaborations with partners for the development of solenoids and fast ramping magnets, and interaction region quadrupoles

High-field accelerator magnets for hadron colliders: Flowchart



* Stand-alone test of insert magnets