Super LHC preparation
WP7 – Critical Injector R&D

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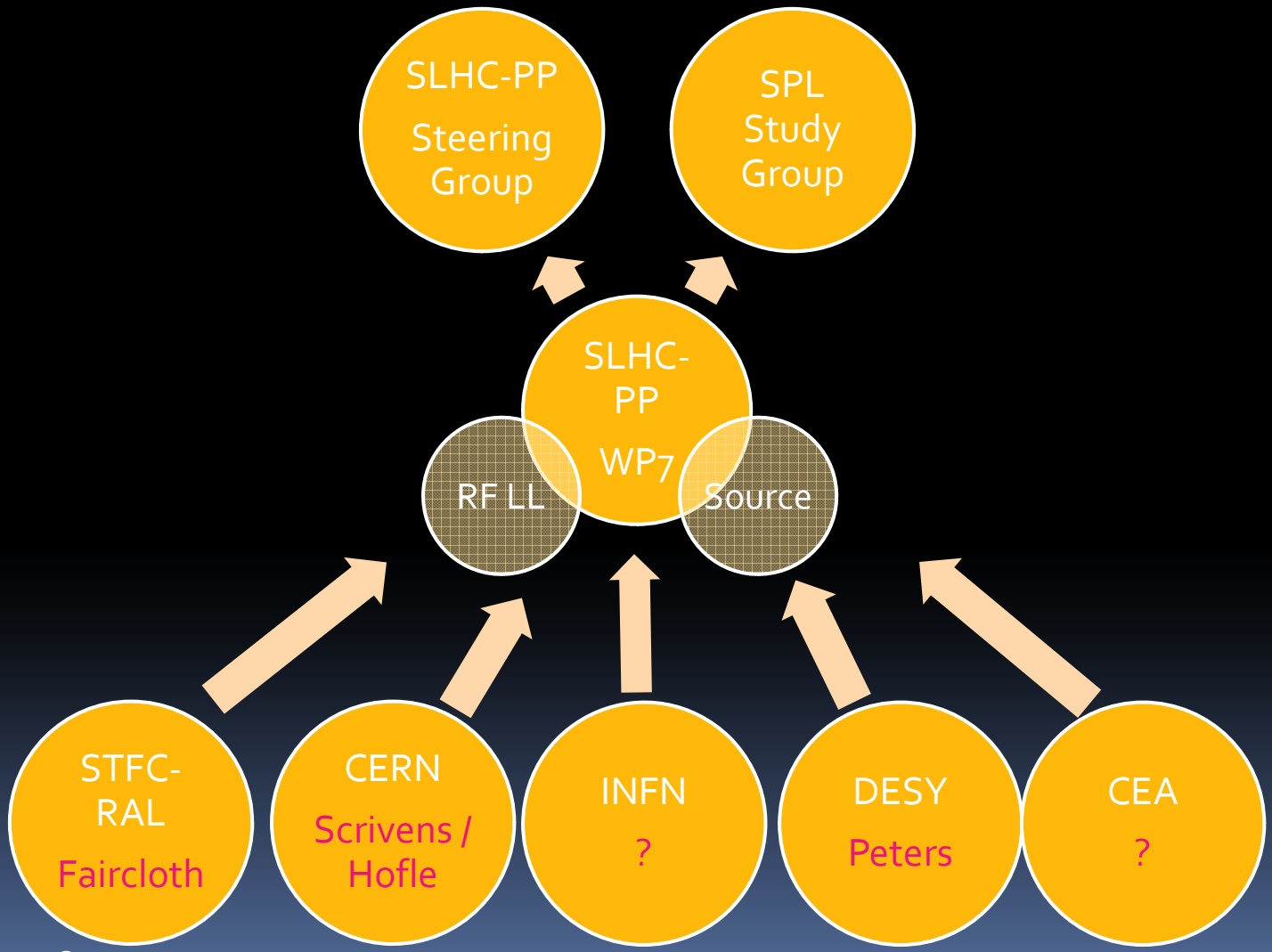
Structure


SLHC-PP
Steering Group
SPL Study Group
SLHC-PP
WP7
RF LL
Source
STFC-RAL
Faircloth
CERN
Scrivens / Hofle
INFN
?
DESY
Peters
CEA
?

Overview of deliverables

Deliverables

task 7.1 - Development towards an H- source for the SPL

7.1.1 Finite element thermal study of the Linac4 design source at the final duty factor R M12

7.1.2 Design of a high duty factor plasma generator R M18

7.1.3 Construction of the plasma generator and subsystems (e.g. 2Hz RF generator, hydrogen gas injection and pumping) D M30

7.1.4 Plasma generation and study of the thermal and vacuum conditions R M36

What was discussed – task 1

- Linac 4 is the first stage of SPL. The ion source for Linac 4 is a 2MHz RF driven H- source.
- SPL requires a increase in rep-rate from 2 -> 50Hz.
- No H- source has shown such performance with high reliability.
- Construction of the plasma generator of a 2MHz, 50Hz 2MHz source.
- First issue will be thermal constraints. Model these on the existing design, and see the mitigate the effects at higher power.
- Second issue is gas flow.

What was discussed – task 1

- STFC-ISIS reported on the work done on the ISIS Penning source.
- Model of thermal loads, including radiative and active cooling.
- Measurements made on contact resistance heat transfer between elements.
- ISIS could increase the average power into their source, but very simple modifications.
- Transient analysis also showed the surface heating in the discharge pulse, which can explain the source intensity droop.

Overview of deliverables

task 7.2 - Field stabilisation in pulsed superconducting low beta (v/c) accelerating structures

7.2.1 In depth characterisation of the two tuners plus cavities developed in the frame of the “HIPPI” JRA , FP6 (tuner/cavity characteristics) R M12

7.2.2 Design of RF system architecture including modeling of RF components, simulation of the RF system and simulation of beam dynamics of the full Linac; RF system and high power modulator specifications R M18

7.2.3 Production of a prototype electronic system and other elements for a full system demonstration; Definition of demonstration procedure P M30

7.2.4 Full test and validation of RF system. Final report D M36

What was discussed – task 2

- Presentation of Superconducting Proton Linac project. Low Power SPL (LPSPL) would be the first stage, to deliver a beam to PS2 and then SLHC.
- 2 superconducting cavity types (β=0.65 and β=1 foreseen). Low level RF requires 0.5% and 0.5 degrees stability, along the pulse.
- Imperative to know more about the sources of regular variations and instabilities. (Loretz force detuning, microphonic vibrations, beam intensity variations, klystron ripples…)
- Knowing all these instabilities requires the final SPL! Real aim is the study SC cavity (from INFN, tests at CEA, under CARE-HIPPI), and show that its instabilities can be compensated.
- The SPL low level RF would be based on the LHC RF system.
- Treating multiple cavities with one klystron, and one feedback system is an unknown!

What was discussed – task 2

- Beam simulations are needed, but the mnapower is outside of this task. This needs more definition about the requirements.
- The INFN cavity and tuner should be moves to CEA-Salcay in the next months, and mounted in a cryostat ready for test.
- CERN should purchase a 704MHz klystron for the future RF test area. But it may not be available in time to treat within this project.