



FCC-hh ring design meeting

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- **Introduction**
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- **On-going activities:**
 - **Transfer lines in the ring tunnel**
 - **Optics design of FCC-hh ring**
 - **PA31V2.0**
 - **A dilemma**
 - **HTS coating of beam screen**
 - **Operating temperature of beam screen**

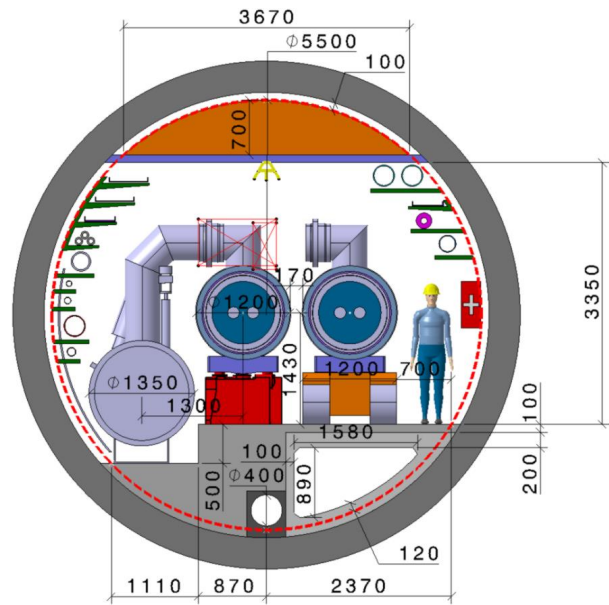
Introduction

- **This new series of meetings is supposed to review current FCC-hh study activities and to exchange information between contributors.**
- **It is supposed to take place every 4-6 weeks (depending on the needs).**
- **The proposed time slot is Thursday between 2pm and 3:30 pm (to avoid clashes with TCC). The date will be selected to avoid clashes with the FCC-ee design study meeting (also on Thursday afternoons).**

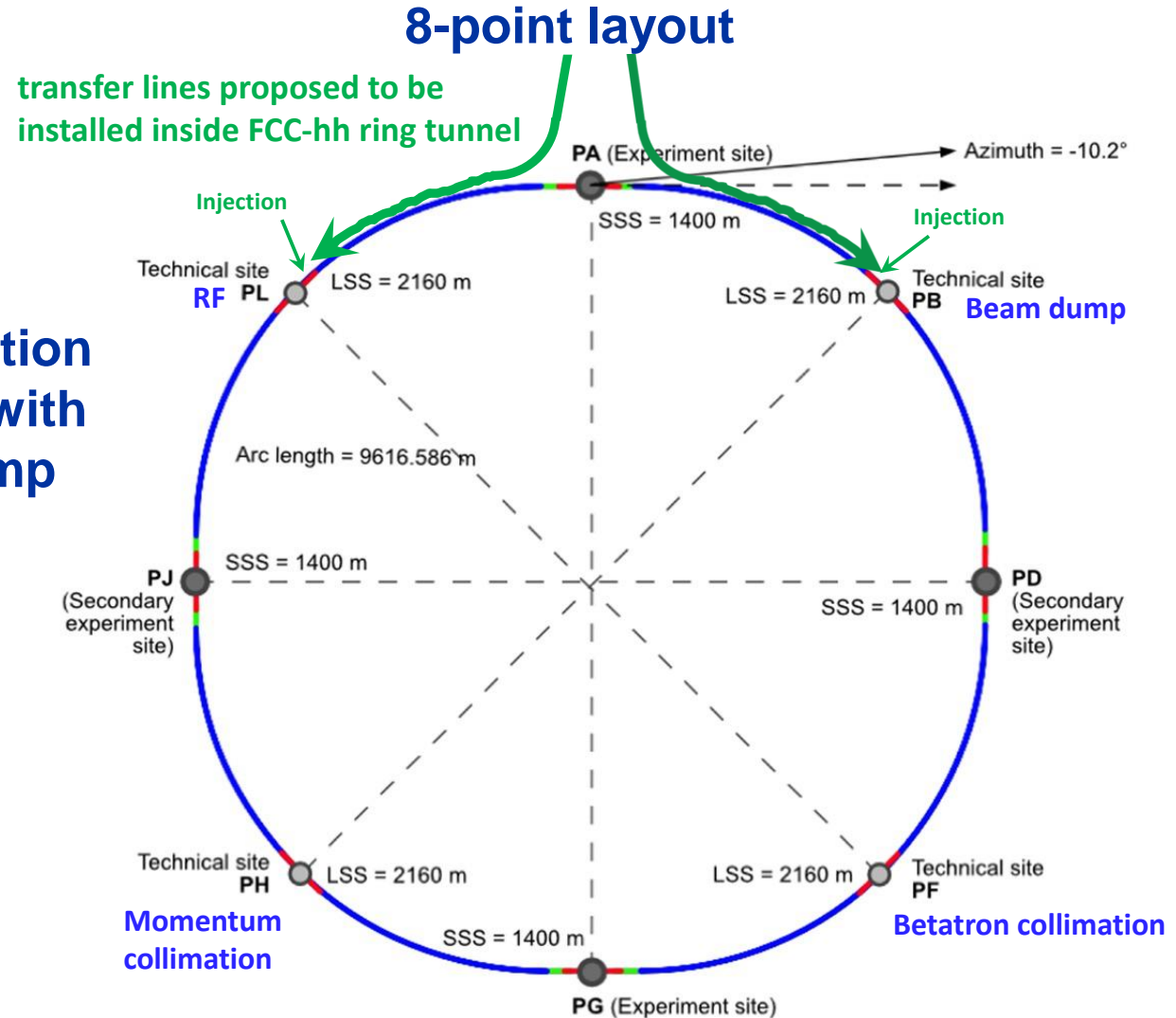
FCC-hh post-CDR ring layout

- two high-luminosity experiments (A & G)
- two other experiments combined with injection (D & J)
- two collimation insertions
 - betatron cleaning (F)
 - momentum cleaning (H)
- extraction insertion (B)
- clean insertion with RF (L)
- compatible with LHC or SPS as injector

**Beam injection
combined with
RF and dump**



**5.5 m inner diameter
(under review)**

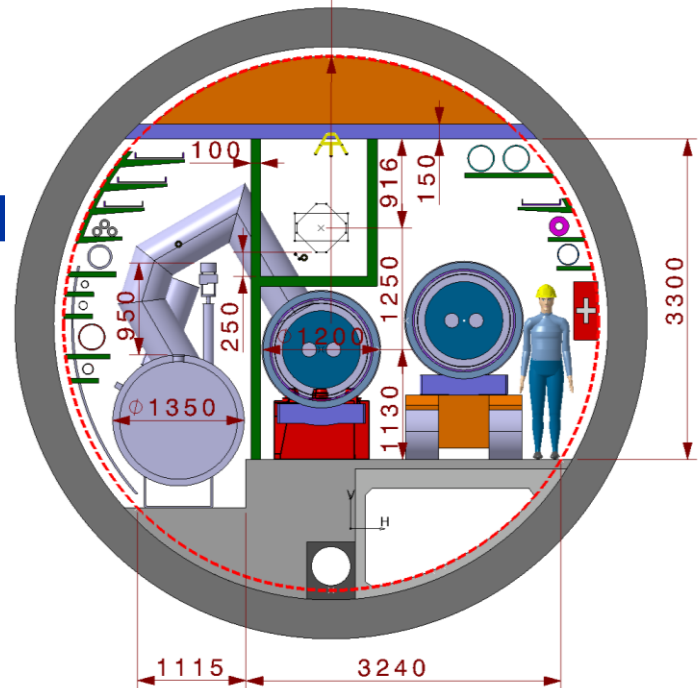
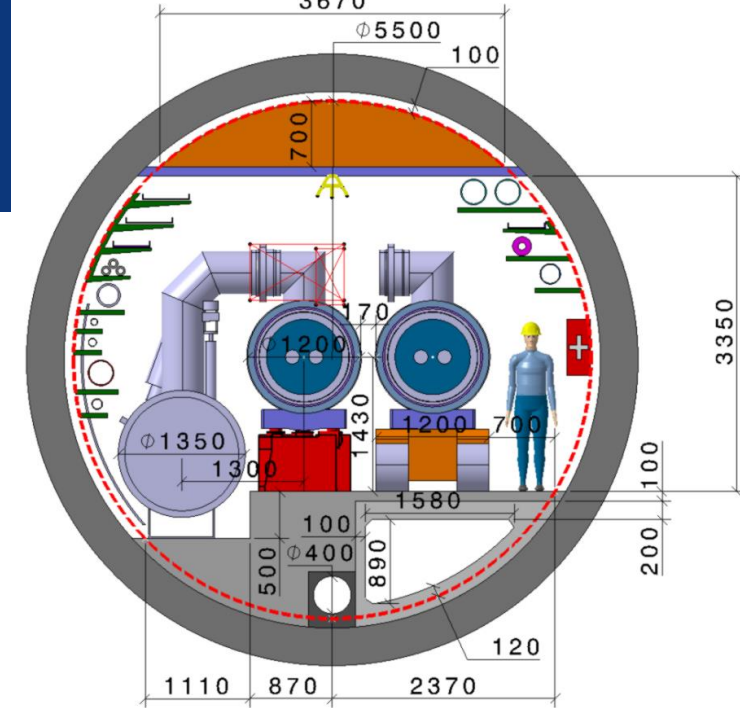


Short-term goals

- **A mid-term review of the FCC study will take place the second half of 2023.**
- **We are supposed to contribute material to a document covering the following aspects:**
 - **Updated FCC-hh layout under the baseline scenario, including the injection lines from the LHC and/or a possible superconducting SPS**
 - **Integration study of the FCC-hh injection lines with the FCC tunnel.**
 - **Completion of the design of the collider optics with new designs for collimation and extraction/dump insertions**
 - **Development of R&D plans, schedule, and deliverables for Nb₃Sn, high-temperature superconducting (HTS) and hybrid magnets for FCC-hh**
- **These aspects should be presented at the 2023 FCC Week.**

On-going activities

- Transfer lines in the ring tunnel
 - Attempt to change the geometry of the jumper
 - Solution found, but it does not seem efficient (complex implementation for a marginal gain in transfer line height).
 - It seems better to leave a gap in the magnets of the transfer line corresponding to the jumper.
 - Magnet design of dipoles and quadrupoles
 - Two options considered: normal-conducting and permanent magnet. Sketch of the designs available.
 - The next step is the finalisation of the design and attempt a costing.



- **Optics design of FCC-hh ring**
 - **IR design**
 - **PB, PL: great progress made, and a design is available for merging with the latest version of the lattice (talks later).**
 - **PF, PH: geometry of the dog-leg reviewed and implemented. Preliminary loss maps produced, activity to be pursued including the collimators in PB.**
 - **Arcs**
 - **Optimisation of the regular cell length.**
 - **Analysis of dispersion suppressors.**
 - **Alternative combined-function optics**
 - **Study damping properties of the lattice and mitigation measures.**

- **New layout**
 - The ring circumference will be shortened by 68 m for matching the harmonic number of FCC-hh and its injector.
 - Placement of the new layout studied and defined by Johannes.
- **V1.0**
 - $L_{\text{cell}} = 215.294$ m; $L_{\text{Circ}} = 91172.686$ m; $N_{\text{cell}} = 42$;
 - $L_{\text{SS}} = 1400$ m; $L_{\text{SS}} = 2160$ m;
 - $\theta_0 = +10.75$ deg; $PA_{\text{lat}} = 46.2466$ deg; $PA_{\text{lon}} = 6.0976$ deg;
- **V2.0**
 - $L_{\text{cell}} = 215.294$ m; $L_{\text{Circ}} = 91104.686$; $N_{\text{cell}} = 42$;
 - $L_{\text{SS}} = 1400$ m; $L_{\text{SS}} = 2143$ m;
 - $\theta_0 = +10.88$ deg; $PA_{\text{lat}} = 46.2467465$ deg; $PA_{\text{lon}} = 6.09718737$ deg;
- After completing the studies for the V1.0 layout, the V2.0 will be built (easy to do).

On-going activities

- **A dilemma: which beam in which aperture in PB?**
 - So far, no arguments found to take a decision...
- **HTS coating of beam screen**
 - Study multipoles generated by HTS layout in dipole and quadrupole external fields.
 - Behaviour during a quench.
- **Operating temperature of the beam screen**
 - Launch a global review of the beam screen operating temperature in view of minimising power consumption.

Any other activity I might have forgotten (or that we should undertake)?

**Thank you for your
attention!**

