



CERN and KEK cooperation for a high intensity beam facility at J-PARC

Input thanks to Simone Gilardoni, Marco Calviani (Sources, Targets and Interactions GL/DGL)

KEK-CERN Committee, 7th December 2023

CERN-J-PARC/KEK workshop

Plan next CERN-J-PARC/KEK workshop next year (2024), in Japan

- As possible dates we would target around fall 2024.
- Previous workshop was 2018 at CERN

| Thursday, 10 October 2019 | |
|----------------------------------|-------------------------------------|
| 08:45 | Introduction from CERN |
| 08:50 | Introduction to workshop |
| 09:00 | CERN J-PARC collaboration until |
| 09:10 | Introduction to J-PARC accelerators |
| 09:30 | J-PARC neutrino beam line upgrade |
| 09:50 | Introduction to CERN accelerators |
| 10:10 | COFFEE BREAK |
| 10:30 | Beam monitor upgrade plan |
| 10:55 | CERN Beam instrumentation (with |
| 11:20 | J-PARC RF upgrade plan - Masahito |
| 11:45 | RF feedbacks to suppress |
| 12:05 | Beam dynamics for high brightness |

| | |
|-------|-------------------------------------|
| 13:20 | Presentation ABT (Injection, |
| 13:40 | Operation experience T2K target |
| 14:05 | Target material development |
| 14:30 | Tritium production |
| 14:55 | COFFEE BREAK |
| 15:15 | J-PARC MR beam dump |
| 15:40 | Beam intercepting devices (dumps, |
| 16:00 | T2K Neutrino Horn upgrade plan |
| 16:25 | J-PARC beam line beam monitor |
| 16:50 | Experimental areas (HIRADMAT, NA, |
| 17:10 | H- sources (ABP) |
| 17:30 | Experimental activities at CERN for |
| 17:50 | Discussion |

| Friday, 11 October 2019 | |
|--------------------------------|---|
| 09:00 | Radiation effect on electronics at |
| 09:20 | R2E (CHARM, good practice) |
| 10:15 | Visit to LHC Point 6 - LHC Beam Dump (TDE) |
| 15:15 | Visit to HiRadMat Facility |

As follow-up of the last one we had R2E (Radiation to Electronics), some BI activities, a first contact for the H- sources, and contact for Monte-Carlo activities.

Possible areas of interest for CERN

Helium vessels for target areas

High intensity (kW-MW) beam instrumentation

Materials under irradiation updates (noted we have RaDIATE already ongoing (Radiation Damage In Accelerator Target Environments (RaDIATE) collaboration, led by Fermilab)

Beam windows with high power beams

New Finemet material development for RF cavities

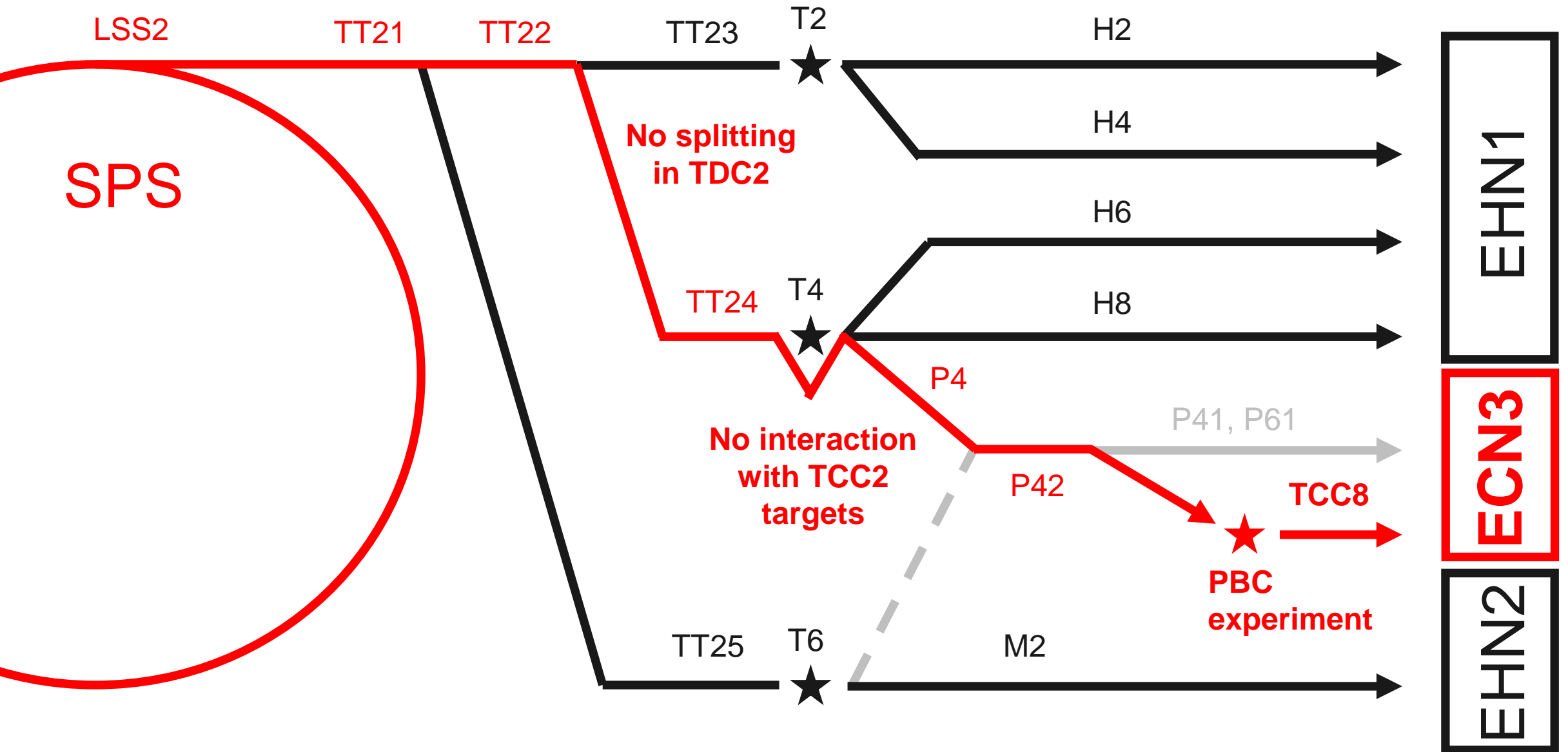
Machine modelling - space charge, high intensity beams beam dynamics

Monte-Carlo codes for beam-matter interaction - we are starting now a collaboration with JAEA for PHITS (Particle and Heavy Ion Transport code System) – the Japanese equivalent of FLUKA

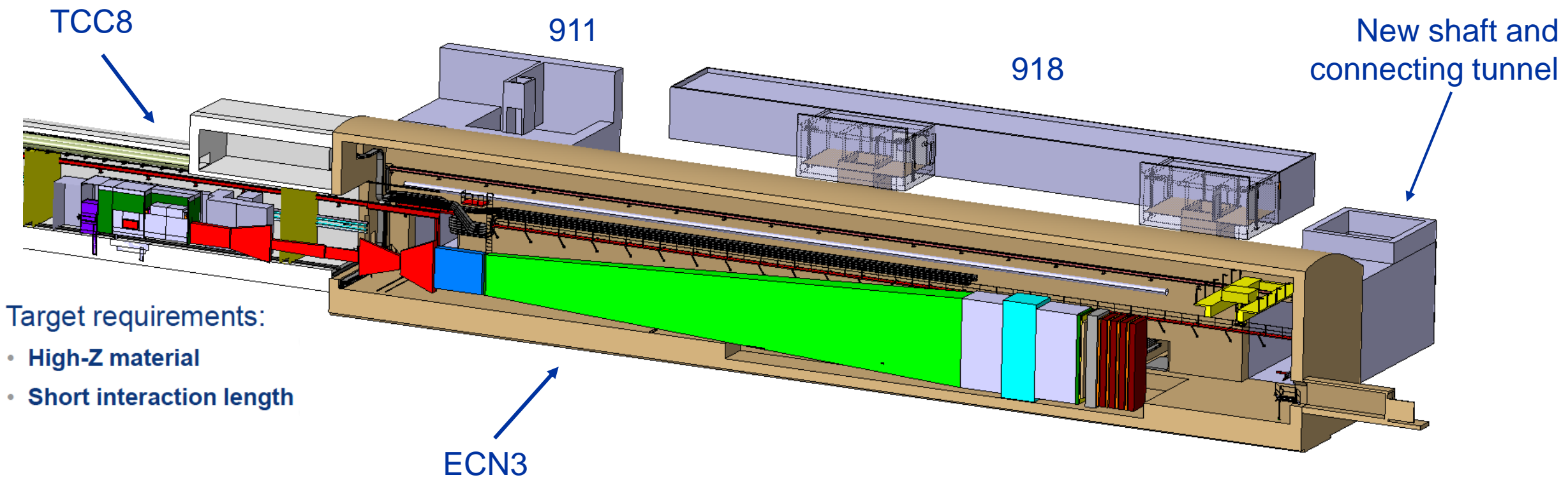
High power slow extraction

Operation of superconducting combined function magnets

ECN3 Dedicated Beam Delivery Scenario



ECN3 Study: BDF/SHiP



In view of ECN3: everything concerning the management of the target maintenance/replacement

At J-PARC

If the Research Board decision is for an experiment with a **high-Z target**, there is a significant common interest with the J-PARC Hadron Hall, both for current experiments as well as for COMET, including **development of target materials together**.

Moreover, we are actively starting an informal discussion with the target team there (they have an indirectly cooled gold target but are looking forward to a rotating W/Cu bonded device).

Use of **structural beryllium for beam window** of the hadron hall target, which is of great interest for us as we are taking – independently! – the same route.

At KEK

Recently we were there with Yamamoto-san – we discussed with the Enomoto-san & colleagues responsible for the SuperKEKB positron source and for the development of the ILC source.

Quite advanced work, but we would bidirectionally profit from each other work. They are investigating WCu bonding, and our work with HIPing of various materials – including Cu/SS (TIDVG5) and refractories (BDF/SHiP) would be quite beneficial.

Moreover, we would like to investigate W/Cu HIP bonding, of interest for the BDF/SHiP (if selected) as well as for FCCee and fusion (already in contact with Luca and the FTCU).

SuperKEKB – important lessons for FCC-ee..

SuperKEKB - impact on the design considerations for FCC-ee

Collimators: the mechanism causing the damage to the collimators not understood, but if it is the one mentioned with Fireballs, it could be equivalent to the UFOs we have in the LHC, and it could have an impact on the FCC-ee too.

Collimator design and damage: it would be good to dig further on that. Marco's team is already in contact. Would be nice to have one jaw to cut open...

Non-linear collimators: a first, would be good to see how they work in real life.

Collider operation: Operating an e⁺e⁻ collider with top up and short lifetime

Crab waist: something to be followed

Heating of the vacuum chamber at the IP due to SR/Bremsstrahlung moving the final focusing quads