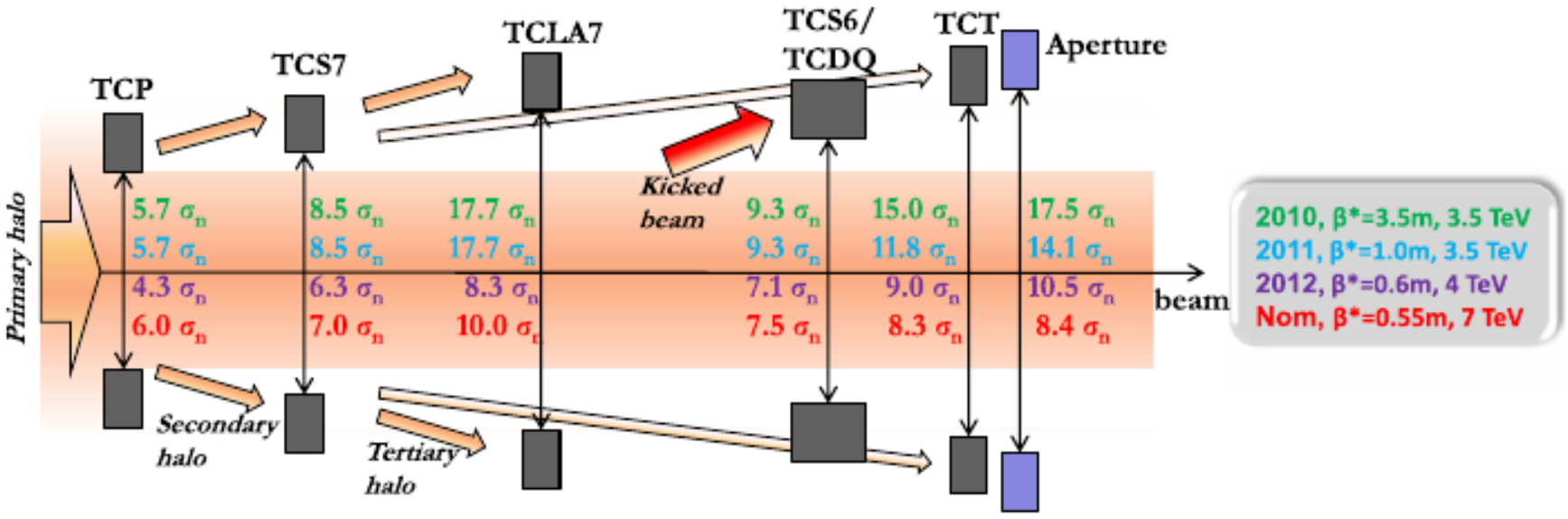
First thoughts on triplet loss scenarios

R. Bruce, A. Mereghetti, S. Redealli

Triplet protection

- Thanks to the collimation system, rather difficult to hit the triplet with direct impacts
- In standard operation with correct collimation hierarchy: triplet should only see showers from upstream TCT
- This talk: first brainstorming on what losses we could actually have in triplet during LHC operation



High losses in standard operation

- High beam losses could occur due to e.g. instabilities or resonances
- Leakage to TCT, shower goes to triplet
  - Simulation method:
    - Collimation tracking gives hits on TCTs, to be forwarded to FLUKA
    - Similar studies done for experimental background and asynch dump
  - Do not expect that these losses should be dangerous for the triplet – probably lower priority

High losses with misaligned TCT

- Drifts in orbit and optics could change the effective TCT opening
- More open TCT exposes the triplet. Could have the proton leakage from IR7 lost in the triplet
- low probability: we try to protect against this scenario with margins in the collimation hierarchy
- Simulation method:
  - Identify TCT opening that exposes the triplet
  - Collimation tracking to provide hits of beam protons on the triplet aperture, to be forwarded to FLUKA

Orbit bump

- An orbit bump could by mistake be implemented using the MCBX, which doesn't change the orbit at the TCT but brings the beam closer to the triplet
- At a certain amplitude beam could be scraped directly at the triplet
- Protection with any interlocks?
- Simulation method
  - Match suitable orbit bump (MADX)
  - Tracking simulation or direct sampling to provide hits of beam protons on the triplet aperture, to be forwarded to FLUKA

Triplet fully exposed during MD / commissioning

- During certain commissioning steps or MDs, collimators are opened
- Triplet could be exposed on purpose (e.g. aperture measurement) or by mistake (e.g. optics measurement)
- In this configuration, beam losses could occur
- Typically very low intensity, pilot(s), but direct beam losses could occur on triplet without any collimator in between
- Simulation method
  - Tracking / sampling of impacts directly on the triplet aperture, to be forwarded to FLUKA

Summary

- Proposed scenarios for triplet losses
  - High losses in standard operation
  - High losses with misaligned TCT
  - Orbit bump
  - Triplet fully exposed during MD / commissioning
- At the moment, inputs exist only for the first case
  - Some time needed to produce inputs for other cases
  - Timescale?
- Any realistic scenario missing?
  - Could think of combined failure modes, which are more unlikely than the ones proposed here