First look at slow case

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Slow losses

Beam lifetime: 0.2 h
Loss rate: 4.1e11 p/s
            3.6e7 p/turn
Loss in 10 s: 4.1e12 p
            1.4 %

Assume drift: 0.3 sig/s
               2.7e-5 sig/turn
               5.3 nm/turn (sigma = 200 micron)

Simulate: 10 s
          112360 turns (1.1e5)
          1.1e5 turns
          4.1e12 p

Representation: 360 p/turn (1p represents 1e5 real p)
                 40e6 p*turn (if 360 generated just-in-time per turn)

Impossible to track with 1 p (sim) per 1e5 p (real). If each particle stays 100 turns: 100 times above CPU limit.

New PC set up. This will help… But not enough…
Break problem down:

One approach

1. Generate particles from $6\sigma$ to $(6 + 5\text{ nm}/\sigma)\sigma$.

2. Track until all particles are lost ($\sim 1000$ turns), applying $5\text{ nm/turn}$ outward drift.

3. Save impact distribution on primary (integrated or per turn? time resolution?).

4. Assume all $1.1e5$ turns have the same loss signature. Multiply impact distribution by $\sim1.1e5$.

This approach requires good statistics (much more than 360 particles), especially as we are interested in the edge scattering! Lengthy again!

Use the same material in our code and FLUKA (particle absorption must agree)!

Use the same length!

Define input case in detail or easy way to scale to other materials?
**Most simple case:**

1) Al/Cu system

2) Beam jaw angle aligned:

- Angle is about 17.6 µrad

3) About 600 turns to absorb all particles!

Particles are roughly perpendicular to the face of the jaw!
**Length of interaction:**

Most particles traverse the full 0.2 m length of the Al jaw!
Number of turns after interaction before particle is absorbed:

Average survival: **5.8 turns** (primary collimator)

*About 75% of particles have inelastic interaction in primary jaw!*
Transverse impact parameter

Almost all particles impact with

\[ y \leq 0.2 \ \mu m \]

Surface phenomenon!

Linear scale:
Tool is ready to produce input:

Define cases for FLUKA…

• C system 0.2 m / 1.0 m

• Impact at primary (emittance drift)

• Impact at secondary (orbit drift)

• Impact coordinates of particles in coordinate system of the jaw?