

Simulation of losses from TOTEM

MPP

Yngve Inntjore Levinsen
CERN and Univ. of Oslo

Helmut Burkhardt
CERN

Thanks to F. Ravotti, M. Deile, J. Wenninger, M. Zerlauth
R. Bruce, D. Wollmann, A. Rossi, R. Assmann, J. Barranco Garcia

08. April, 2011



- TOTEM want to run very close to the beam in normal operation
- What impact does this make on machine protection?
- Potential failure scenario: dump kicker prefire -> beam 2 clear path to roman pot(-s).
- General knowledge of loss distributions from RP hits.



- TOTEM want to run very close to the beam in normal operation
- What impact does this make on machine protection?
- Potential failure scenario: dump kicker prefire -> beam 2 clear path to roman pot(-s).
- General knowledge of loss distributions from RP hits.

SixTrack set up to simulate protons hitting TOTEM and then looking at loss maps produced. Results are **preliminary**.

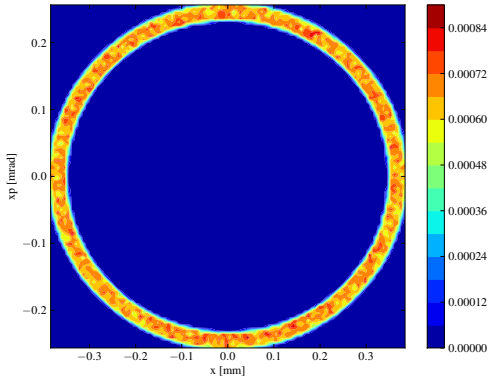


- β^* of 1.5 m in IP5
- Phase advance MKD – RP far station almost exactly $3\pi/2$
- MKD kicking horizontal “inwards” (?) would mean max. amplitude towards the hor. RP which sits on outside of the ring.



SixTrack

- Limited set of materials and shapes possible in SixTrack.
- **No inelastic physics easily available.**
- RP modelled as **5 cm thick copper** inserts, infinite width and height.
- RP (and TCP) set at 6σ .
- Simulating (as a first approximation) a halo at 9.5σ in horizontal plane, with a smear of 1σ .
- Look at protons which start with an impact on a roman pot.



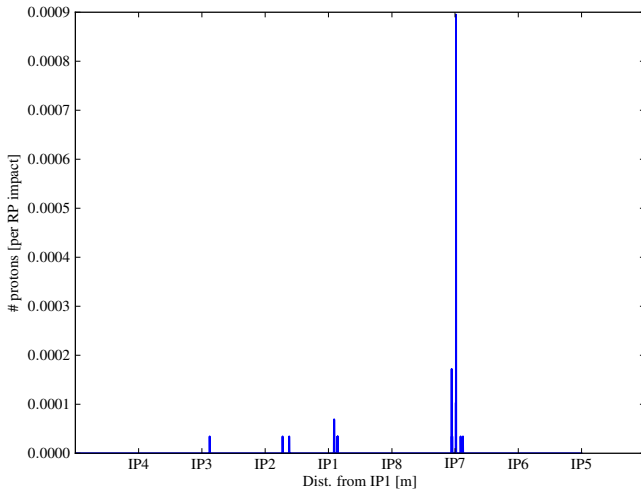
Initial distribution of a halo with a “flat smear” of one σ at IP5.
No distribution in the vertical plane ($[y, y_p] = [0, 0]$ for all particles).



RP	# hits	# inelastic
V.A4	82	26
H.A4	13429	3803
H.B4	9624	2784
V.B4	52	14
H.A6	5060	1457
V.A6	366	101
H.B6	3463	952
V.B6	256	61
Sum	32332	9198 (28%)



Losses on aperture



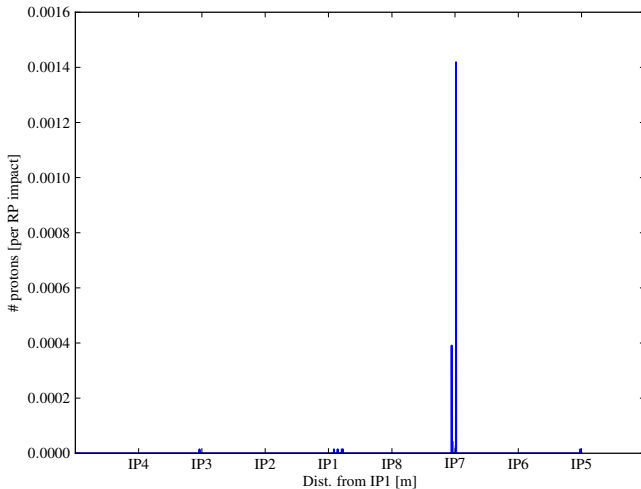


RP	# hits	# inelastic
V.A4	33170	9609
H.A4	36	8
H.B4	27	8
V.B4	23466	6759
H.A6	1738	478
V.A6	10882	3080
H.B6	1555	459
V.B6	6883	1974
Sum	77757	22375 (28%)

(~ double because ver. RP are two-sided)



Losses on aperture





With 0.5 cm thickness of RP instead, we get

an inelastic fraction of 3.8%

This is probably a more realistic...



- Preliminary the simulations do not show large aperture losses.
- Inelastic interactions are ignored here, these will give more local losses.
- Suggestion is to do FLUKA/Geant4 simulations of protons traversing a RP and then insert as initial distribution in SixTrack.