

Tracking simulations – where we are and what needs to be done

R. Bruce

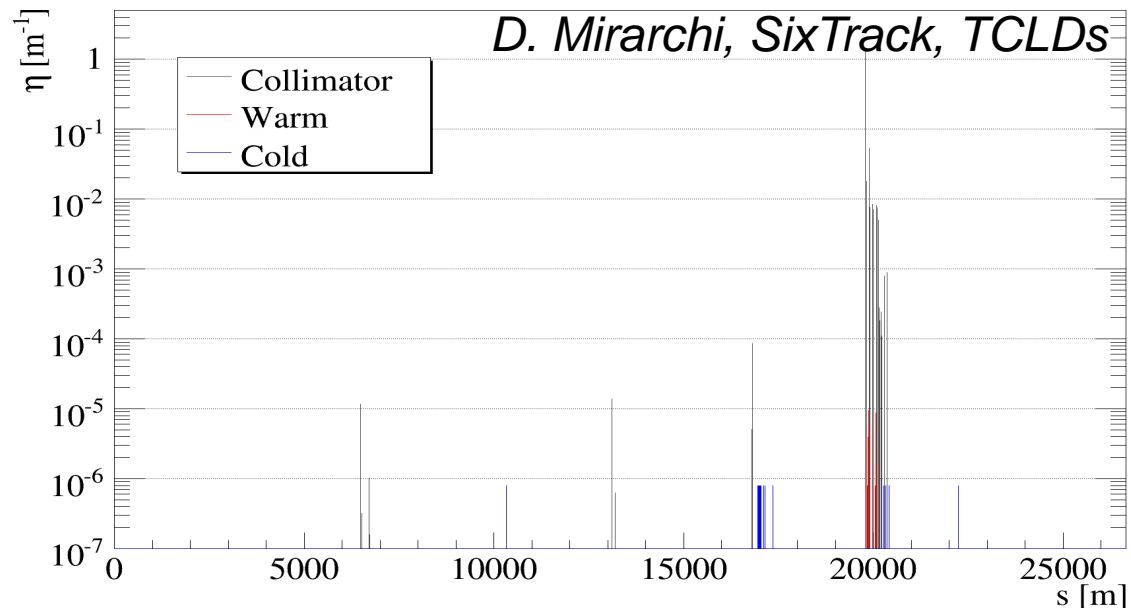
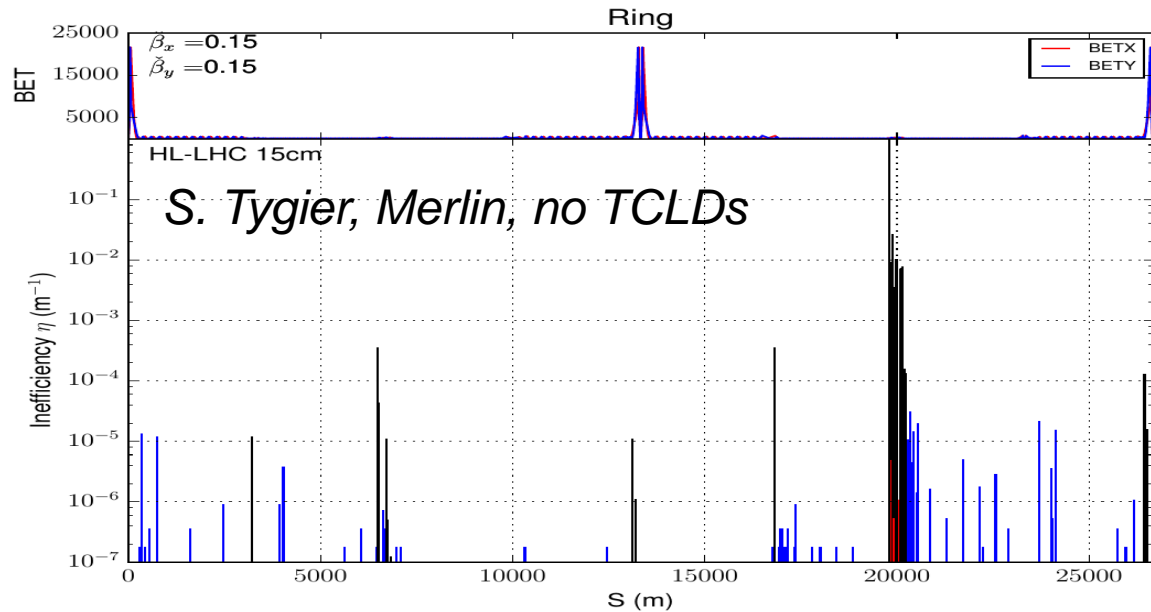
on behalf of task 5.2

Outline

- Selected highlight results from the last year
 - Cleaning
 - Asynchronous beam dump
 - Other studies
- Open points and future plans

Highlights - cleaning simulations

- Cleaning simulations for HL-LHC v1.2 with Merlin and SixTrack (D. Mirarchi, A. Mereghetti, H. Rafique, S. Tygier, A. Valloni)



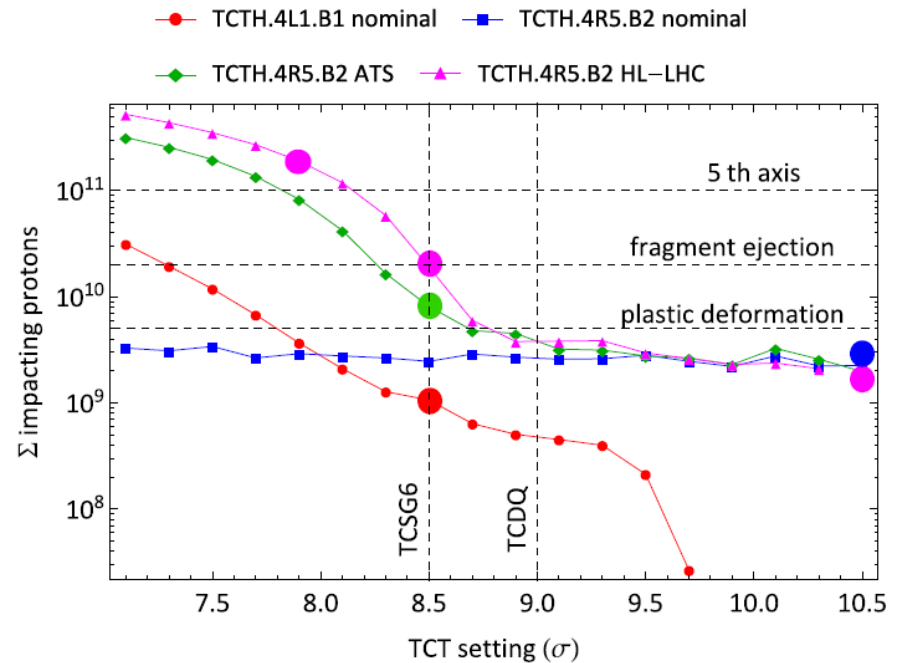
Highlights – cleaning simulations

- Studies of round/flat beams, comparisons TCT4/5 (Talk R. Kwee)
 - Input to FLUKA studies for experimental background
- Systematic investigation of IR losses with different TCT settings and aperture (H. Garcia, IPAC15)
- HL pre-squeeze, intermediate points (talk S. Tygier)
- Cleaning with new low-impedance materials in TCSGs (E. Quaranta et al., IPAC15)

Highlights - asynchronous beam dump

E. Quaranta

- TCT damage limit calculations, with FLUKA and MME (E. Quaranta et al., IPAC15)
- Updated TCT damage limits for HL: P. Gradassi, CWG 8/6/2015



Threshold	MPP 2013	Nominal B2	Nominal B1	HL-LHC B2	ATS 2015 B2
Plastic damage	5.0E09 p	1.2E11 p	4.6E09 p	6.9E09 p	4.0E09 p
Appearance of ejecta	2.0E10 p	7.0E11 p	1.8E10 p	2.6E10 p	3.1E10 p
5th axis compensation limit	1.0E11 p	1.1E12 p	1.4E11 p	1.7E11 p	2.1E11 p

P. Gradassi

Highlights – asynchronous beam dump

- Tracking for inputs to TCT damage limit calculations, to FLUKA and MME (E. Quaranta et al., IPAC15)
 - Updated damage limits for HL: P. Gradassi, CWG 8/6/2015
- Input to FLUKA studies of leakage from TCT to triplet
 - First results for LHC: P. Ortega, CWG 8/6/2015
- HL-LHC v1.2 asynch. dump, with updated simulation setup (E. Quaranta, R. Bruce)
 - Based on new measured waveforms (M. Fraser) and DYNK module (K. Sjobak)
- Studies of allowed aperture at injection and 7 TeV. Results shown this afternoon

Highlights – other studies

- New tracking studies on orbit bumps for BFPP mitigation (J. Jowett, T. Mertens, M. Schaumann)
- Implementation of hollow e-lens in MERLIN (H. Rafique et al., IPAC15)
- Crystal collimation studies for LHC (R. Rossi, D. Mirarchi)

Open points

- Present collection of results gives convincing evidence that our proposed collimation setup for HL will work for most aspects. However, still some open points
- **Transverse integration** of TCT4 and TCLX IR1/5 (A. Rossi)
 - Investigate alternative scenarios. Move TCT4 upstream? Validate any new scenario with tracking
- **TCTs could get close to damage limit during asynchronous beam dump**
 - Less than factor 2 safety margin if latest refined simulation models are used. More details in afternoon talk.
 - Pursue investigations of lighter materials in TCTs for HL-LHC: cleaning and asynch. dump, experimental background
 - WP2: studies of changed phase advance MKD-TCT (S. Fartoukh). Tracking studies to be done if solution found

Future plans

- Active halo control
 - Hollow e-lens (J. Wagner, H. Rafique)
 - Alternative methods with present hardware: ADT method, tune ripple (J. Wagner, H. Garcia)
- Improved halo modeling (H. Garcia)
 - More general halo will allow to simulate more loss scenarios, such as off-momentum cleaning
- Physics debris tracking (D. Mirarchi with input F. Cerutti)
 - Study final multi-turn loss distribution around the ring from elastic and inelastic collisions
- Experimental backgrounds (R. Kwee)
 - Study backgrounds from other sources, such as off-momentum cleaning and cross-talk between experiments