

Impact on type 3 erratic on collimation – initial considerations

(work in progress)

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Acknowledgement:

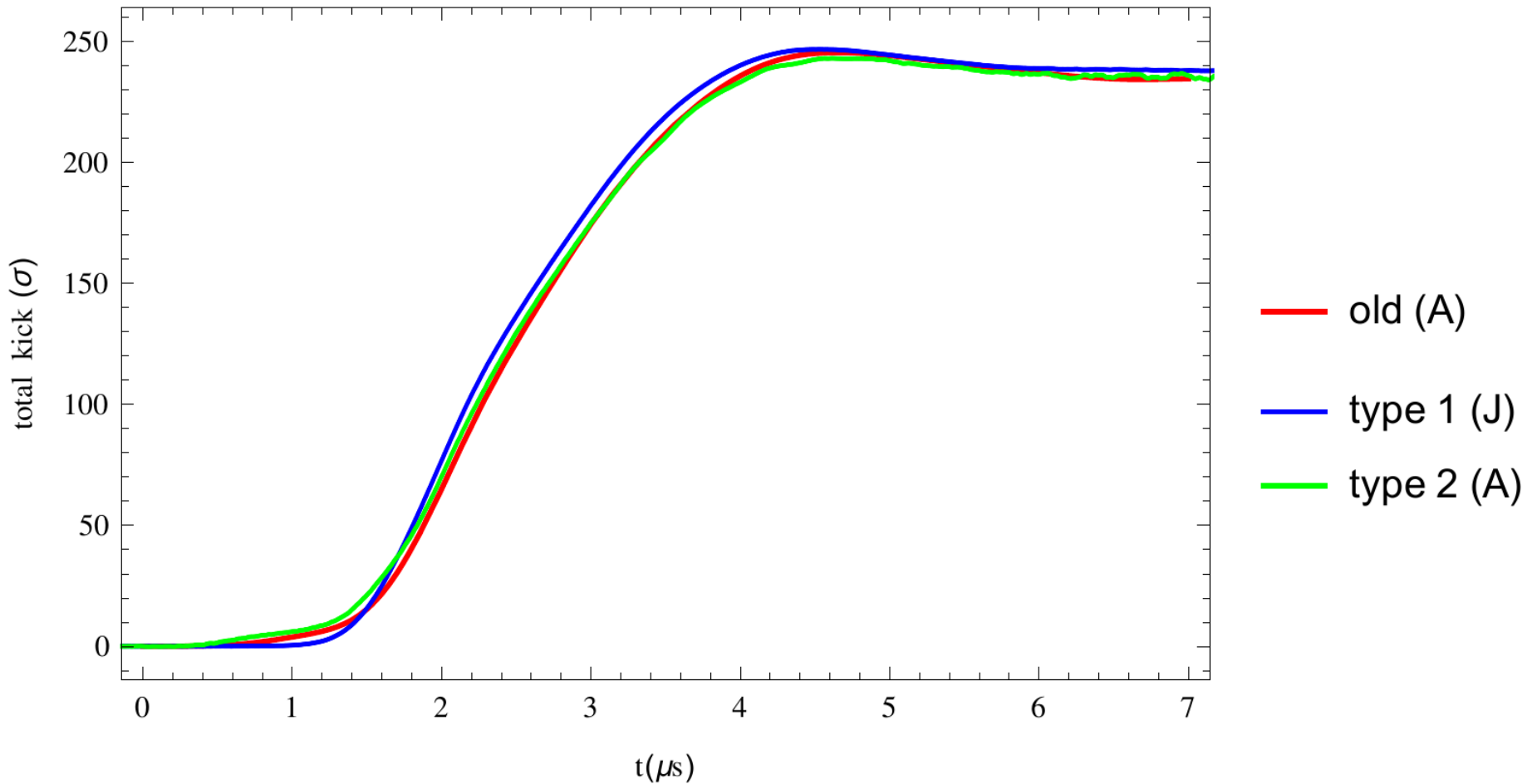
W. Bartmann, C. Bracco, M. Fraser, V. Senaj

Introduction

- Different types of MKD erratics risk to send mis-kicked beam on sensitive equipment (magnets, tungsten collimators etc)
 - Risk of material damage – need sufficient margins
 - Imposes limitations on collimation hierarchy and ultimately on LHC performance reach
- So far, erratic type 2 considered as worst case
 - Data provided by M. Fraser used to set kicks of MKDs in various tracking studies (2016, HL-LHC) to assess risk of damage
 - Most critical due to larger re-triggering time than assumed previously: it takes longer to pass the zone of dangerous kicks

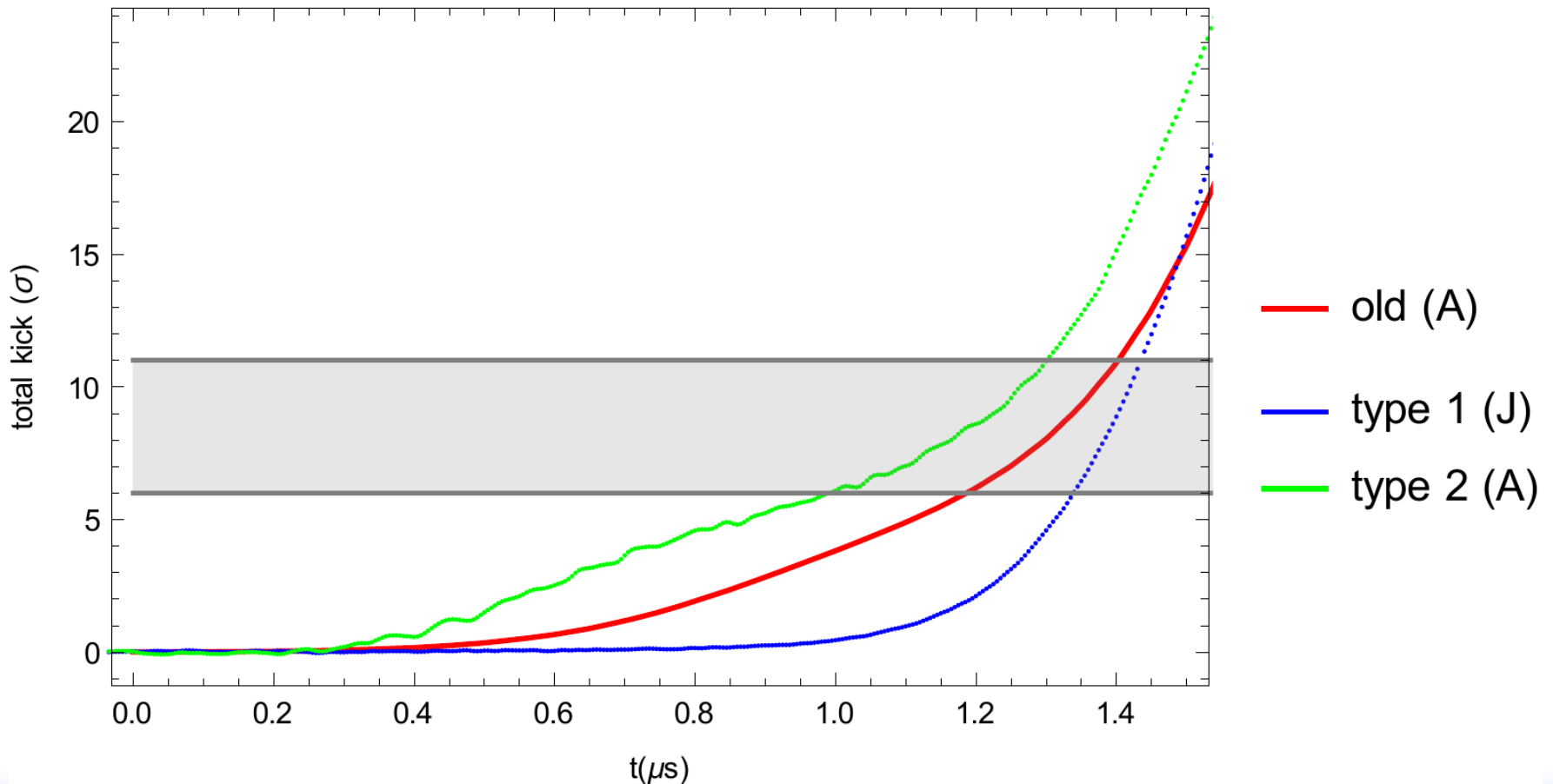
Total kicks (σ)

- Reminder: previously studied scenarios



Zoom

- Assume TCDQ takes everything above 10-11 σ . Below $\sim 6 \sigma$ nothing can be hit
- Type 2 spends more time in dangerous region. Most critical!

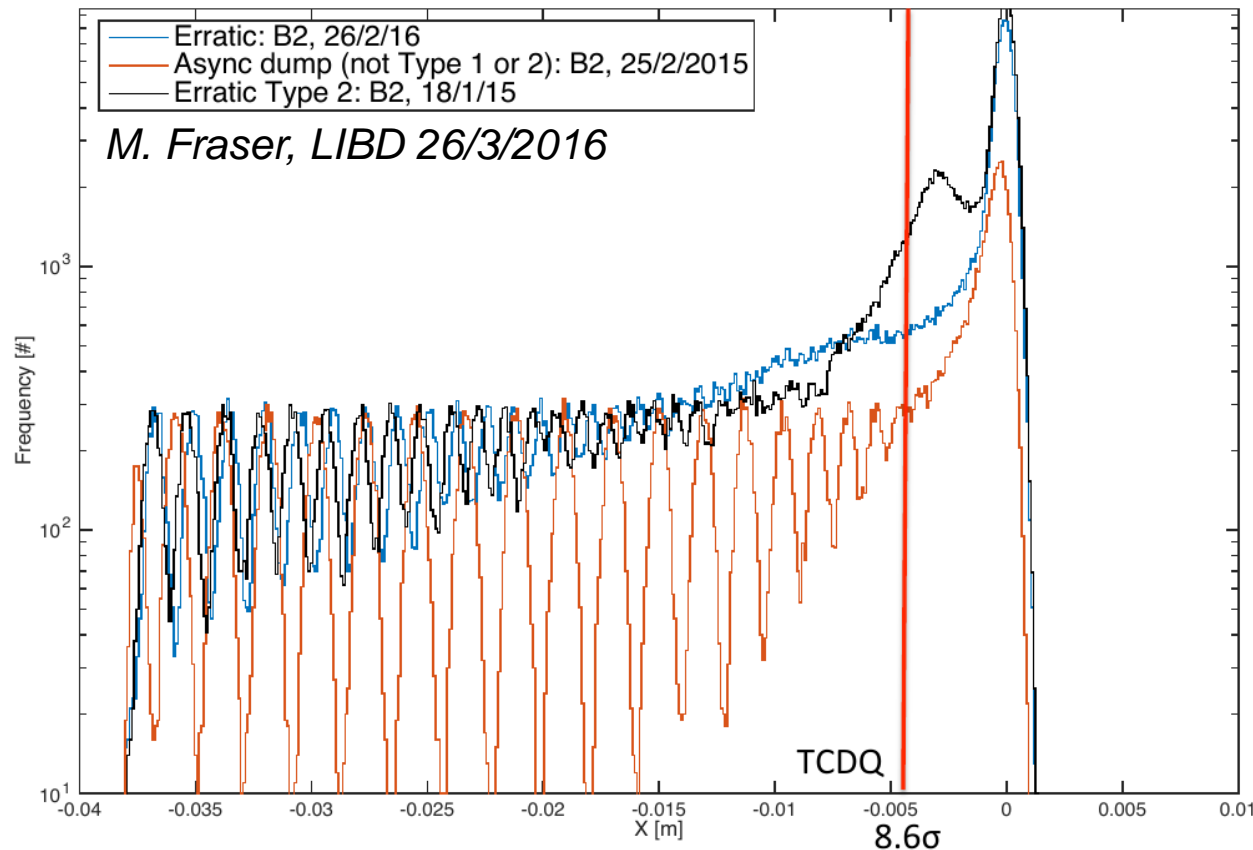


Type 3 - initial check

- What about the new type 3?
- Ttype 3 erratic presented in detail by M. Fraser and V. Senaj at LIBD, 15/3/2016
- Several events considered
 - Event occurred in the LHC 26/2/2016: 3 kickers fired simultaneously
 - Later events triggered later in lab
- Initial consieration: If 3 kickers fire, the initial rise of total kick should be *faster*, meaning it's less critical for collimation

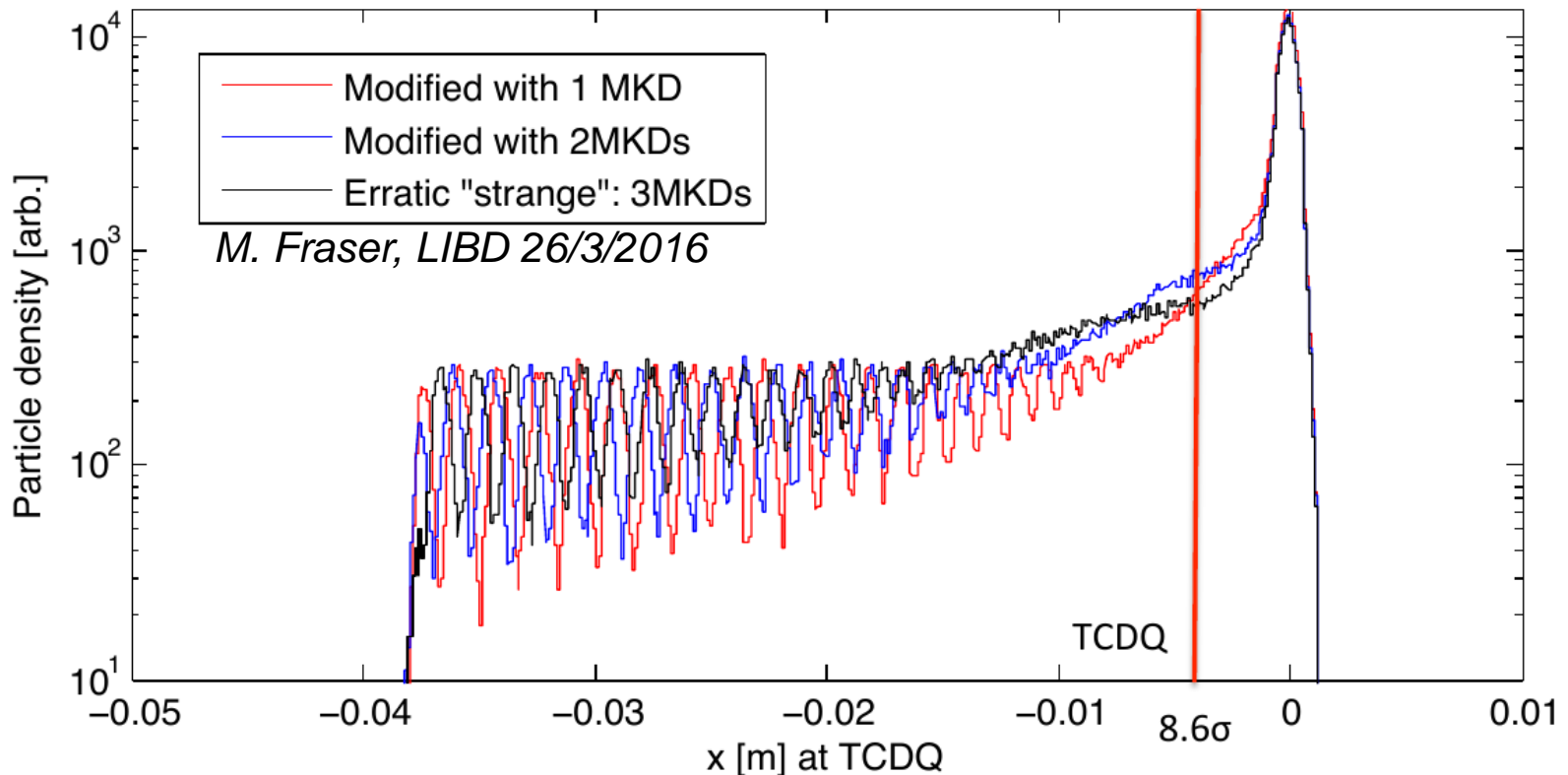
Type 3 from 26/2/2016

- Results from M. Fraser, LIBD 15/3/2016: Indeed lower beam distribution around the TCDQ opening than with type 2
- No implication of this event on collimation studies and no need for further study



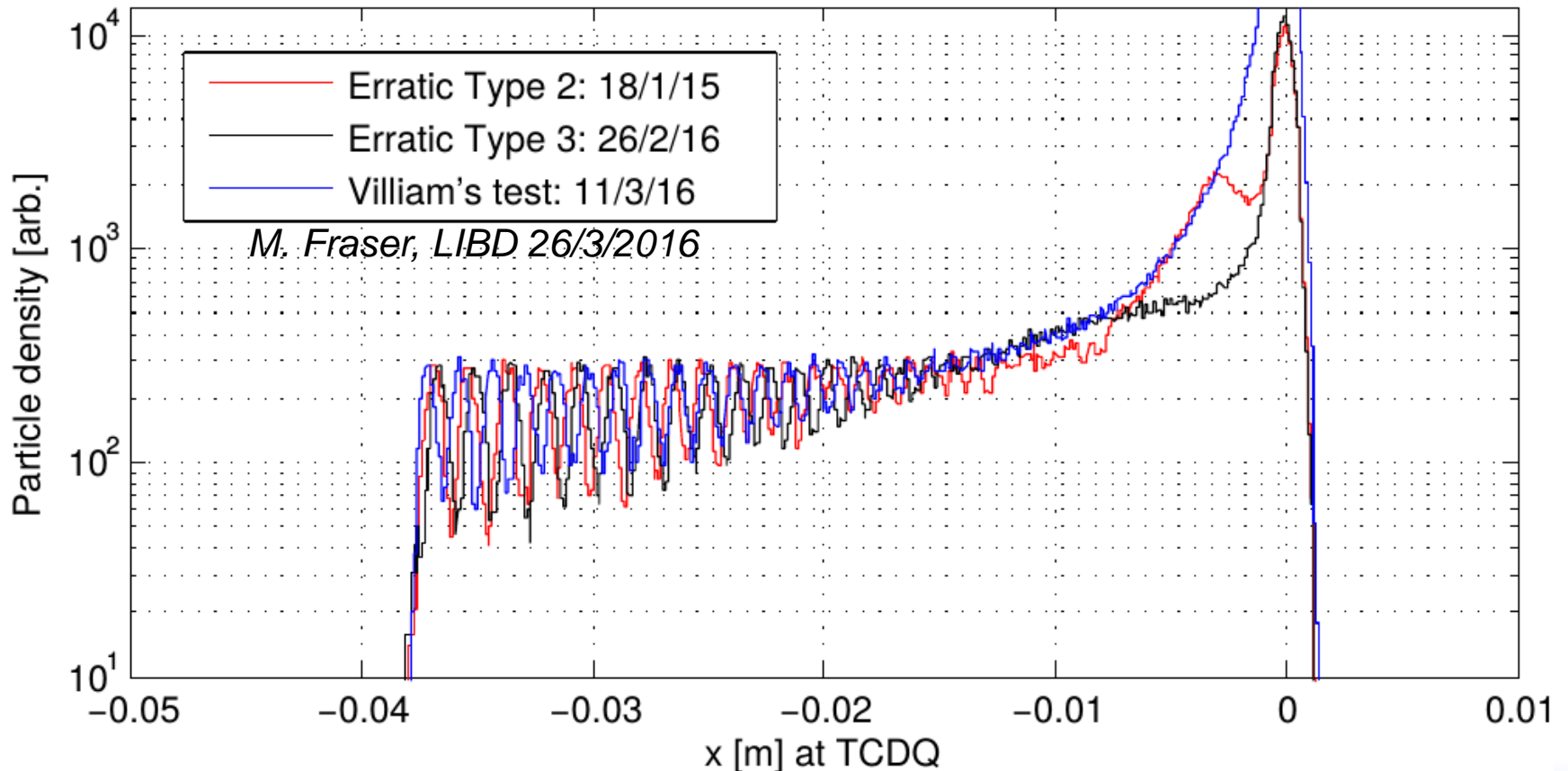
Other possible type 3 events

- Possibility of only one kicker firing instead of 3 (LIBD 26/3)
 - Small increase seen around TCDQ opening, but still significantly better than Type 2
 - No implications for collimation



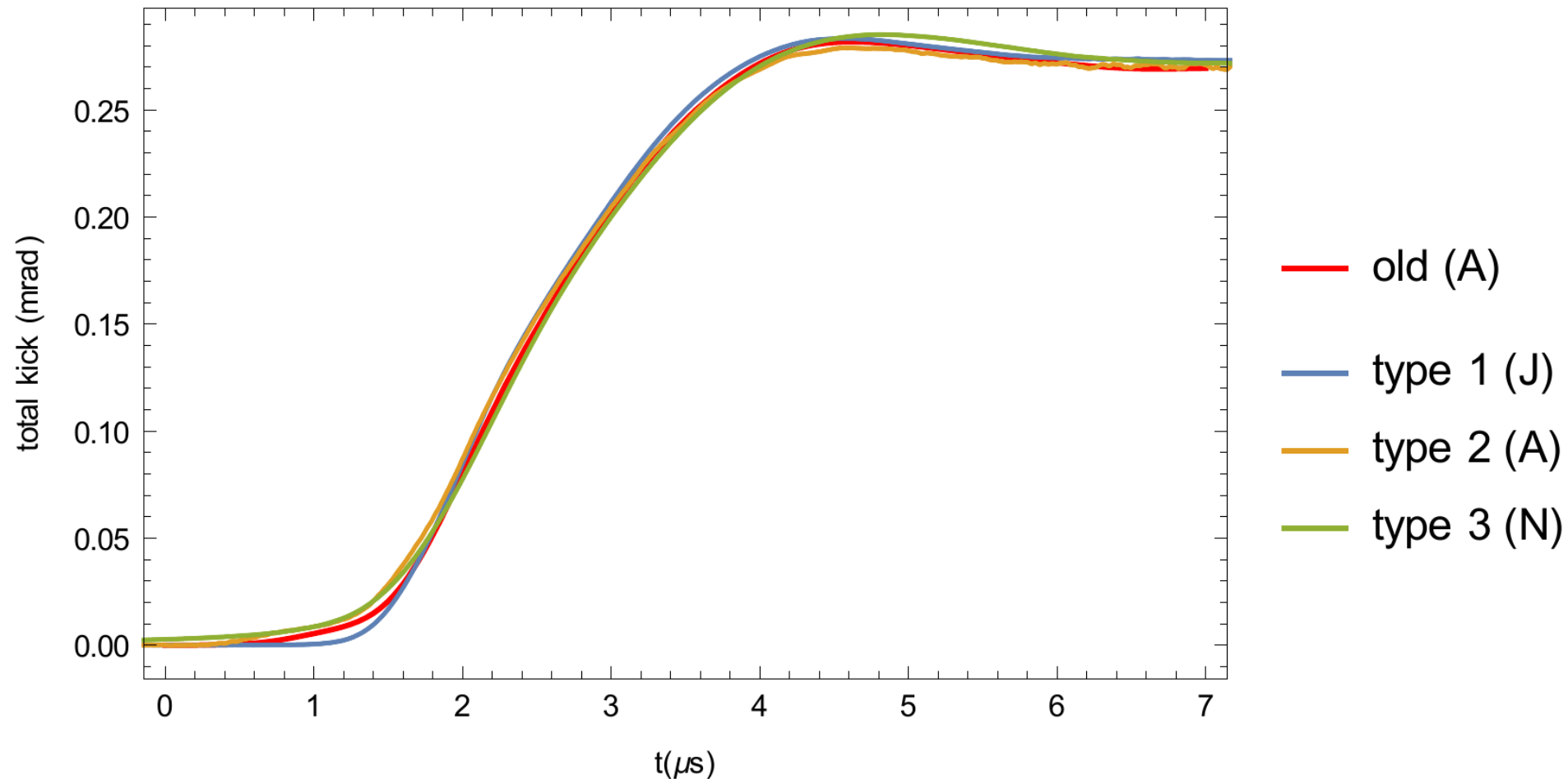
Erratic triggered in lab

- Additional event triggered in lab (V. Senaj)
- One kicker firing, very long re-triggering time.
 - Potentially much more critical for collimation



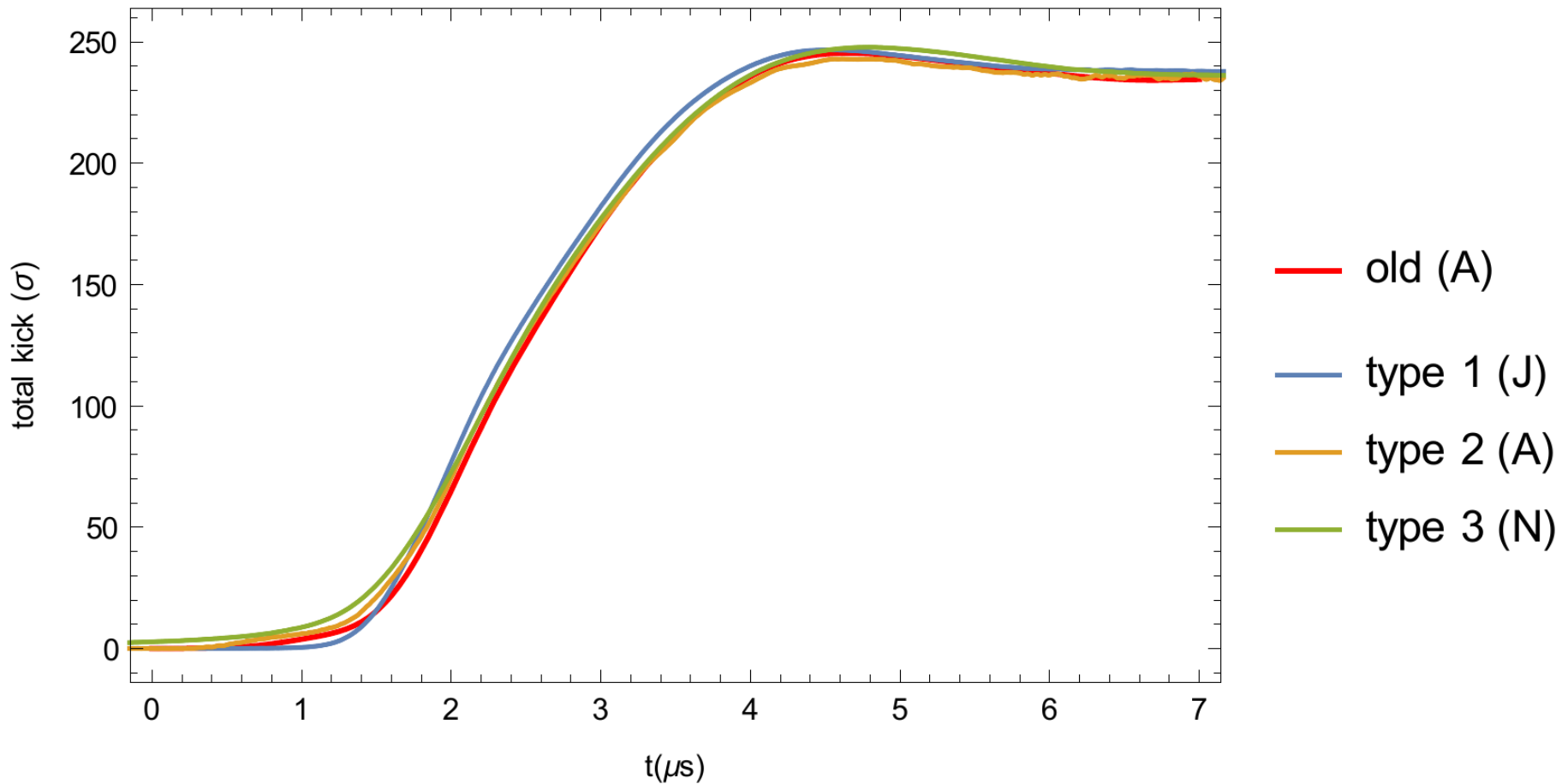
Received kicks in mrad

- Data obtained from M. Fraser for lab event for further studies
- Comparing total kick of all MKDs for different types of erratic



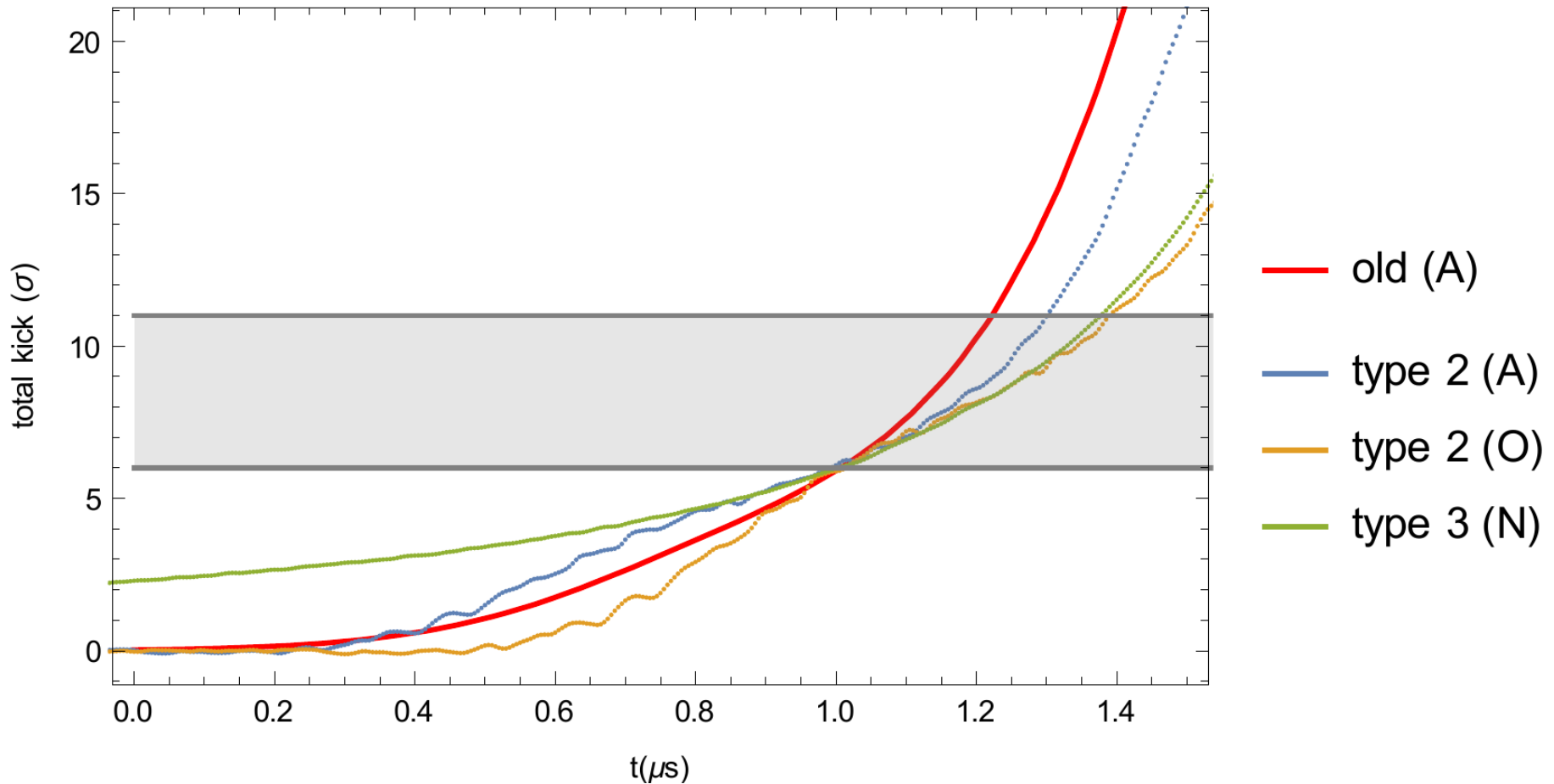
Kicks in σ

- More intuitive for assessing where different losses go: normalize by σ at each MKD



Zoom at the beginning

- Time-shifted curves: all reach 6σ at the same time
- The more time spent in the gray zone, the worse for collimation



Observations

- Type 2 is worse than the old ideal waveform
- Kicker 0 going first is worse than kicker A (different β -function at the kickers)
- The lab event with type 3 has a very slow initial rise
 - A lot of beam is kicked at very small amplitudes
 - Probably not critical for TCTs or aperture, but it might be worth to study further the impacts on the IR7 collimators
- Between 6σ and 12σ , the type 3 kick is very similar to type 2
 - Expect similar impacts on TCTs and aperture
 - Could be slightly worse if shifted to kicker 0, but only small difference expected

Conclusions

- New type 3 erratic in most cases less critical than type 2
- Type 3 event triggered in lab
 - more beam kicked at very small amplitudes => potentially more critical for IR7 collimators. To be studied further
 - Very similar amount of beam kicked in interval 6σ -- 12σ => no impact expected on losses on TCTs and machine aperture