First results on erratic beam dump with detailed dump kicker model

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Model:

15 MKD modules
Kick versus time from E. Vossenberg
Total maximum kick: 0.255 mrad (horizontal)
Beta function [m]:

Beta(15) estimated.

BETA(1) = 532.8	BETA(9) = 358.9
BETA(2) = 510.3	BETA(10) = 340.6
BETA(3) = 486.1	BETA(11) = 320.9
BETA(4) = 464.6	BETA(12) = 303.6
BETA(5) = 441.5	BETA(13) = 285.1
BETA(6) = 421.1	BETA(14) = 268.9
BETA(7) = 399.1	BETA(15) = 252.7
BETA(8) = 379.7	

Phase advance: ~ 4 degree over MKD (neglected)
assume $(n+0.5)\pi$ up to collimator

7 TeV, 0.5 nm emittance, 1.05e11 p/bunch, 25 ns bunch spacing

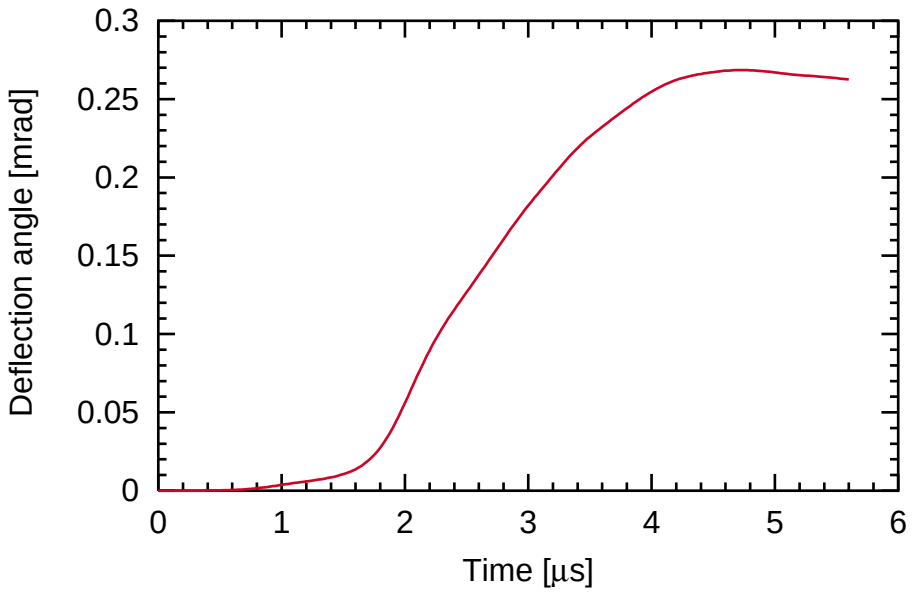
Three failures:

1 module pre-fire + retriggering at max beta
1 module pre-fire + retriggering at min beta
all module pre-fire

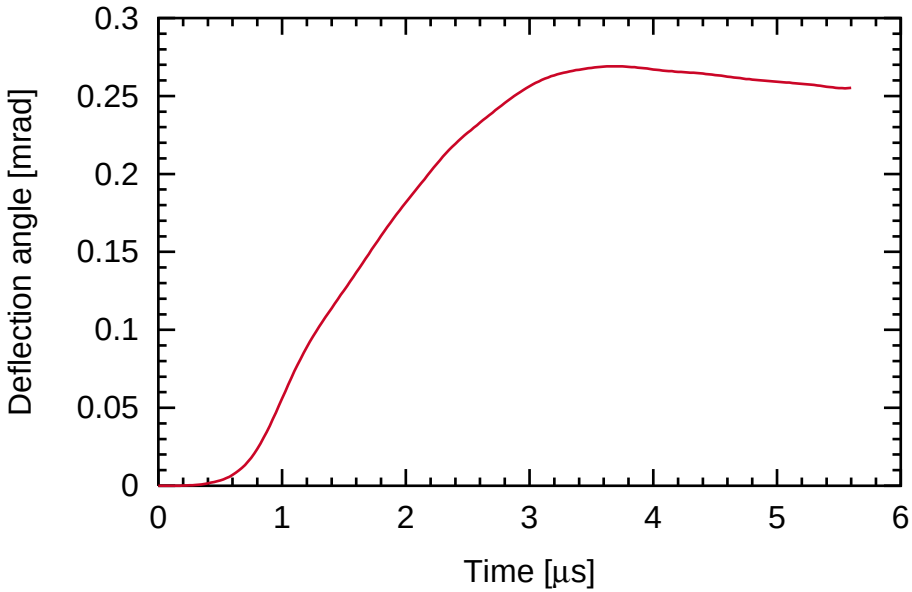
Deflection angle versus time:

Data re-sampled in steps of 25 ns.

1 module pre-fire



all module pre-fire

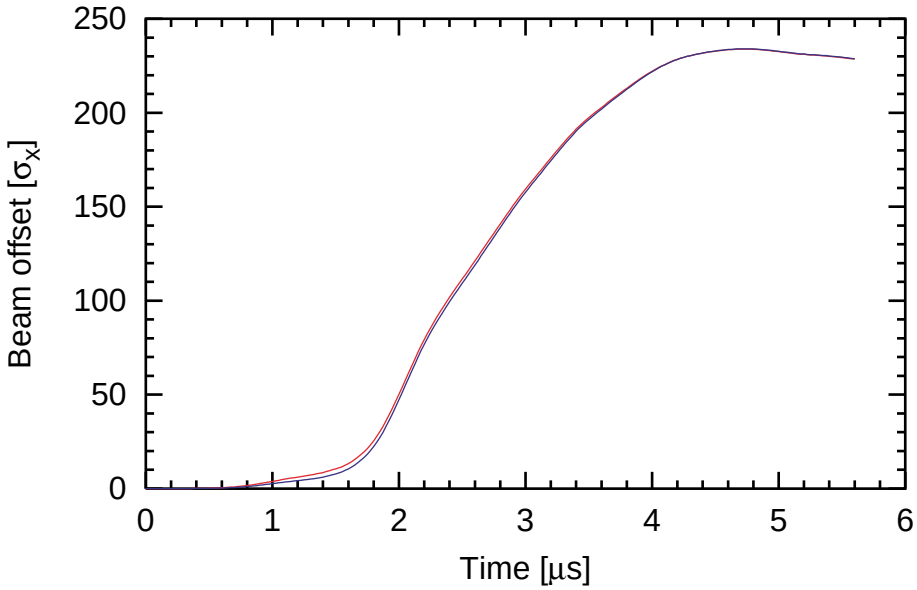


Assume re-triggering delay of 1.05 µs in the following…

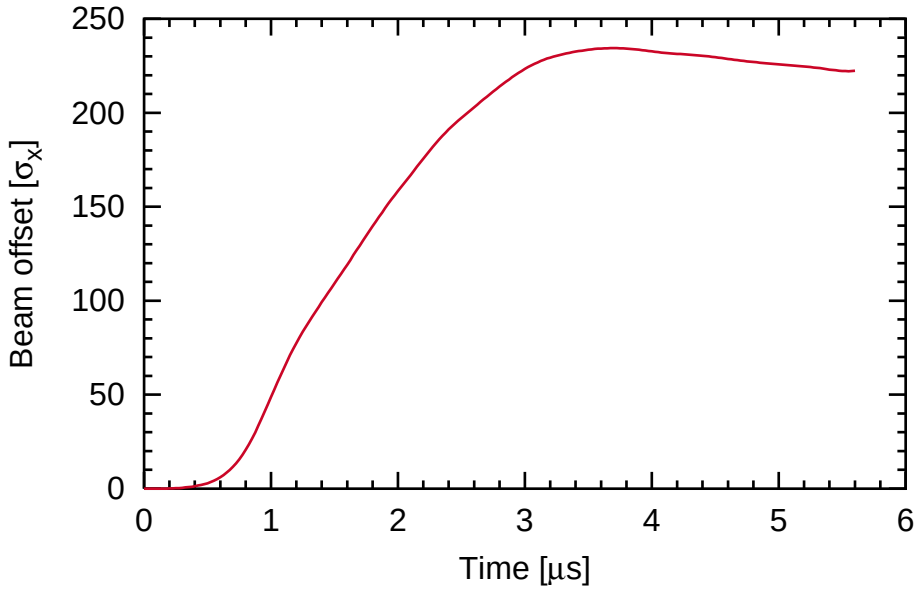
Bunch offset versus time:

Data re-sampled in steps of 25 ns.

1 module pre-fire



all module pre-fire

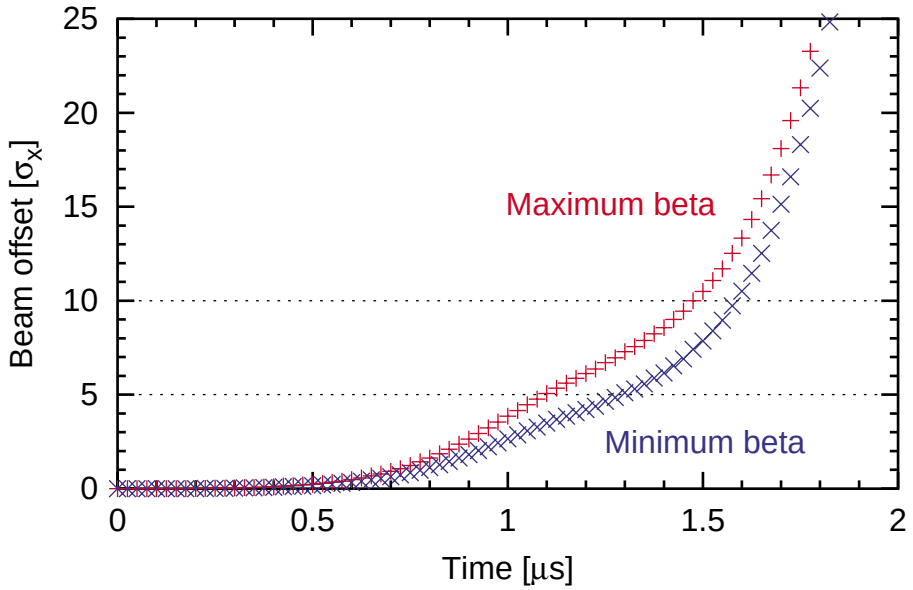


Now the beta function gets into the game…

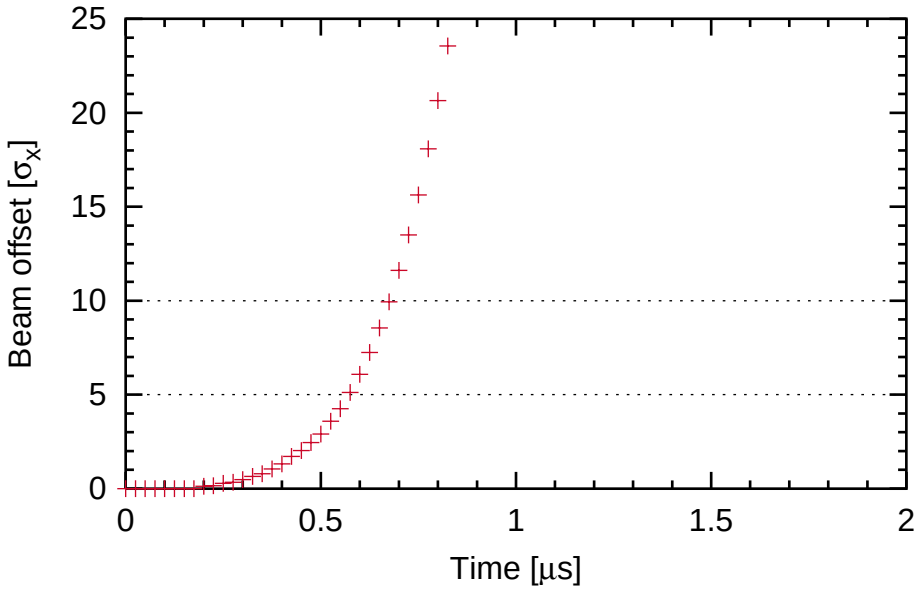
Bunch offset versus time:

Data re-sampled in steps of 25 ns.

1 module pre-fire

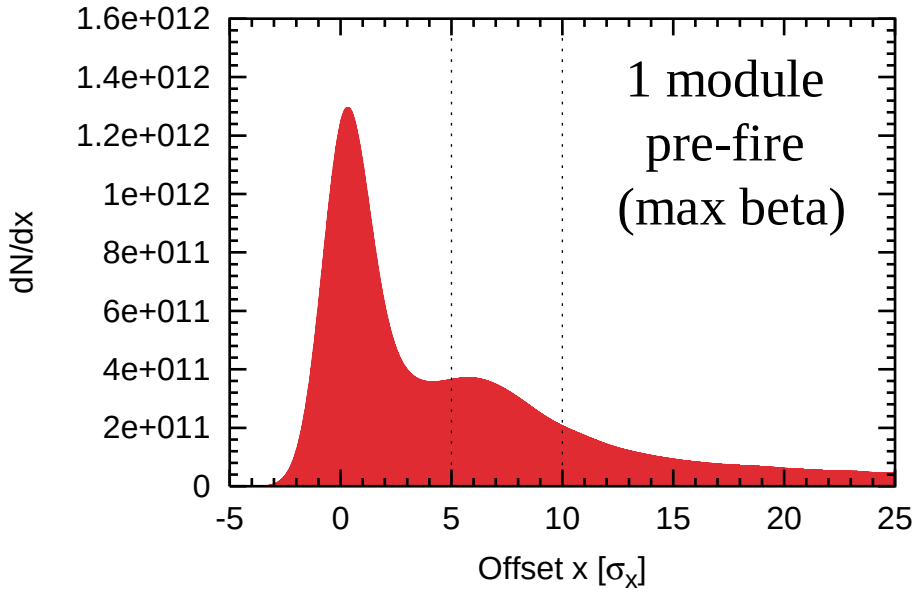


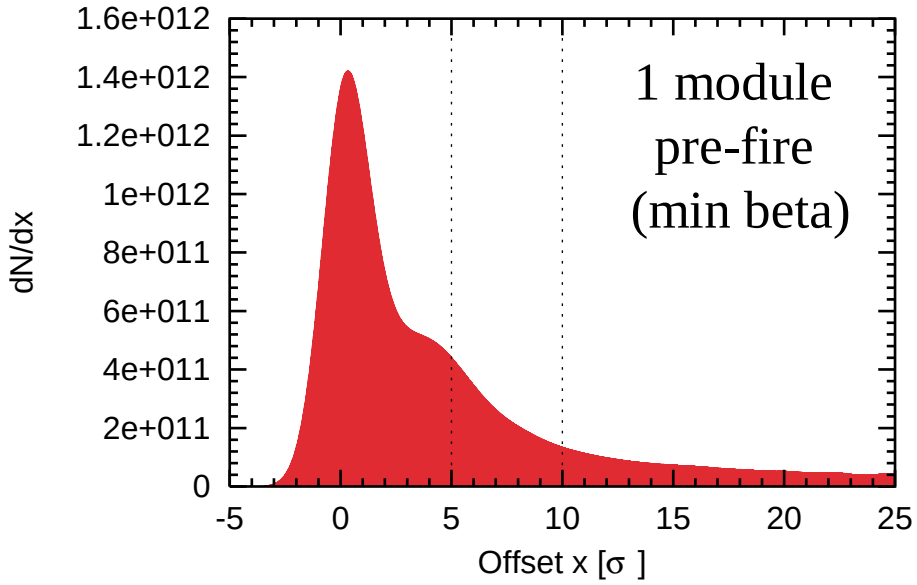
all module pre-fire

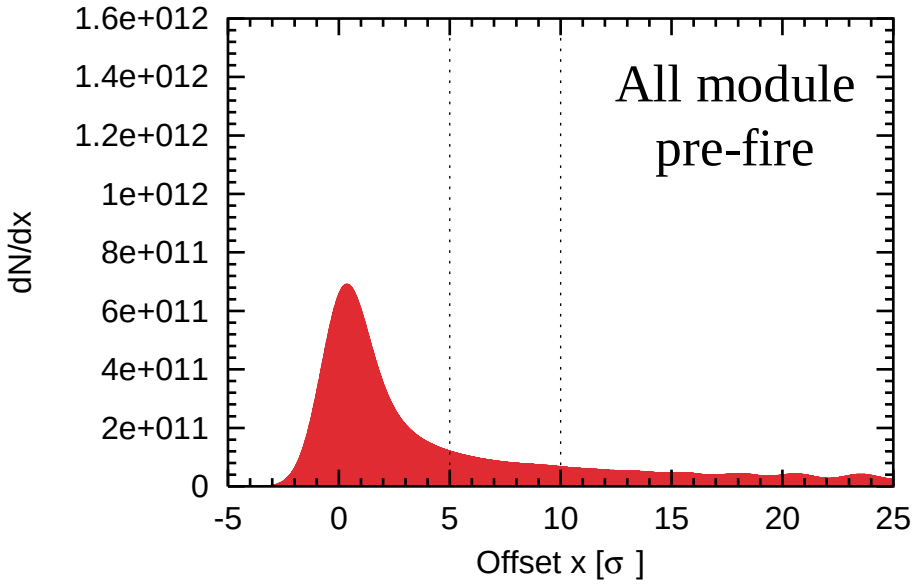


Now the beta function gets into the game…

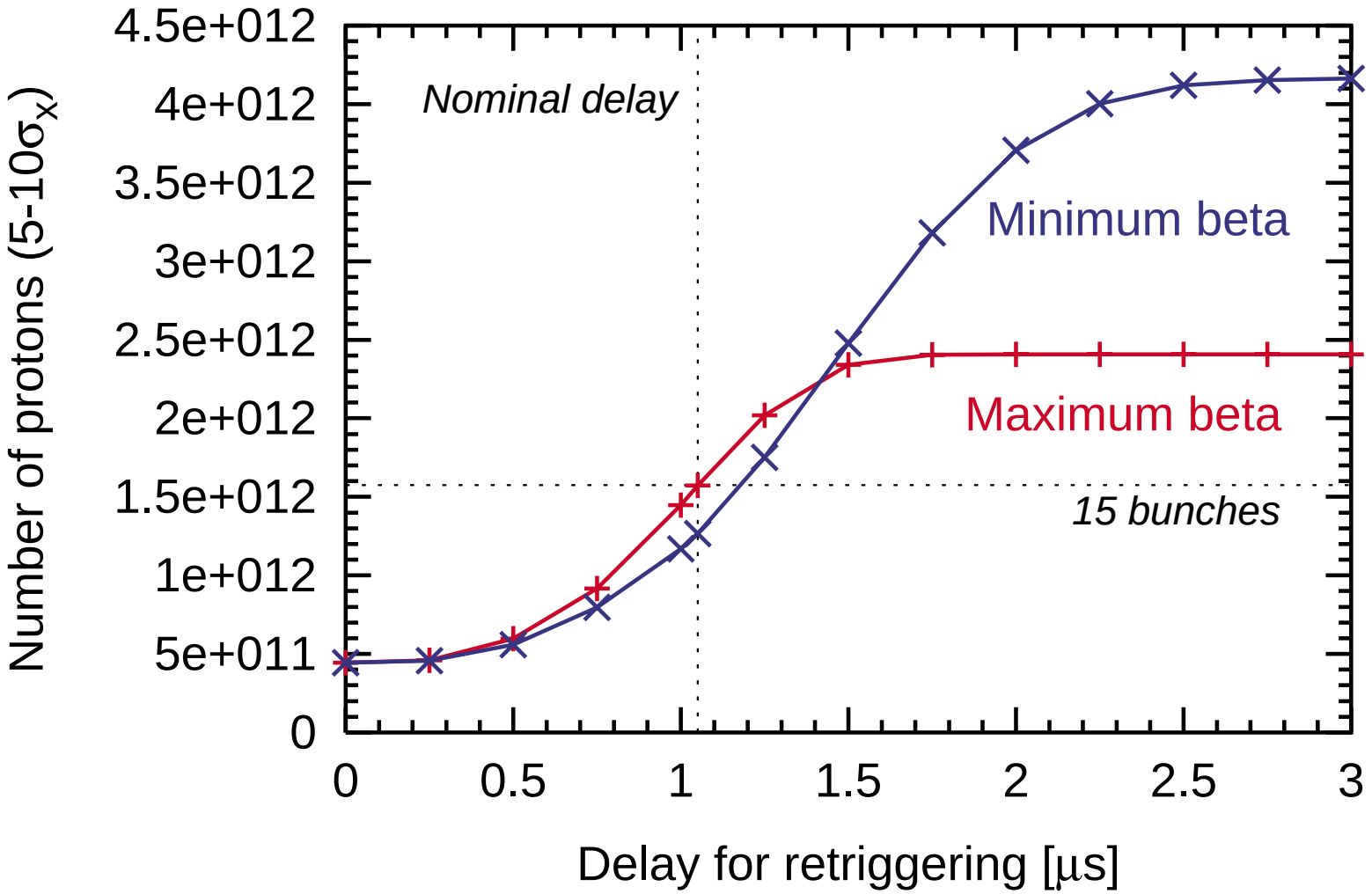
Time-projected proton distribution







Proton impact versus re-triggering delay:



Conclusion:

Detailed dump kicker model implemented.

Preliminary **estimates on erratic dump** (LHC Project Note 277) are

OK for pre-fire of all modules: **5 b** ⟹ **5 b**

poor for pre-fire of 1 module: **6 b** ⟹ **12-15 b**
(re-triggering after 1.05 μs)

Time-projected distributions have been calculated.

Loss of protons on collimators is a **strong function of re-triggering time**.

Functional dependence has been calculated (can we get 0.5 μs?).