

Collimator Settings and Maximum
Amplitudes of Orbit Oscillations at
Beam Dump:
First Look

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Reminder:

Available aperture:	Injection	$\sim 10 \sigma$ (arcs)
	Physics	$\sim 10 \sigma$ (triplet, $\beta^*=0.5$ m)

Collimator settings: (at inj, squeezed top)	Nominal	7 / 8.2 σ (prim/sec)
	Assumed	6 / 7 σ
	Specified	> 5/6 σ

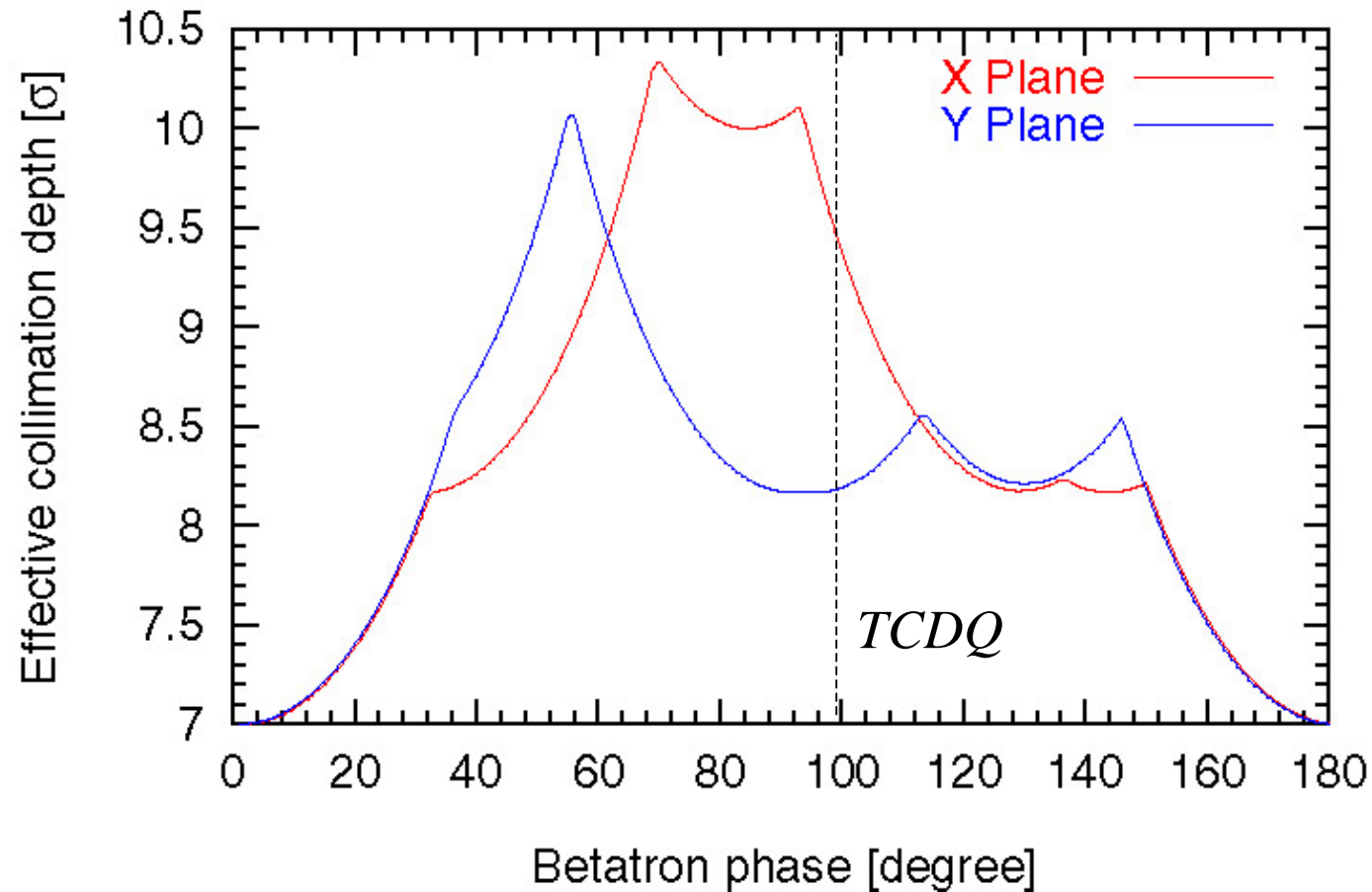
For the dump maybe we should assume nominal settings?

MP Philosophy:

- Error causes beam deterioration
- BLM's see irregular beam loss (when?)
- Beam is dumped within 2-3 turns

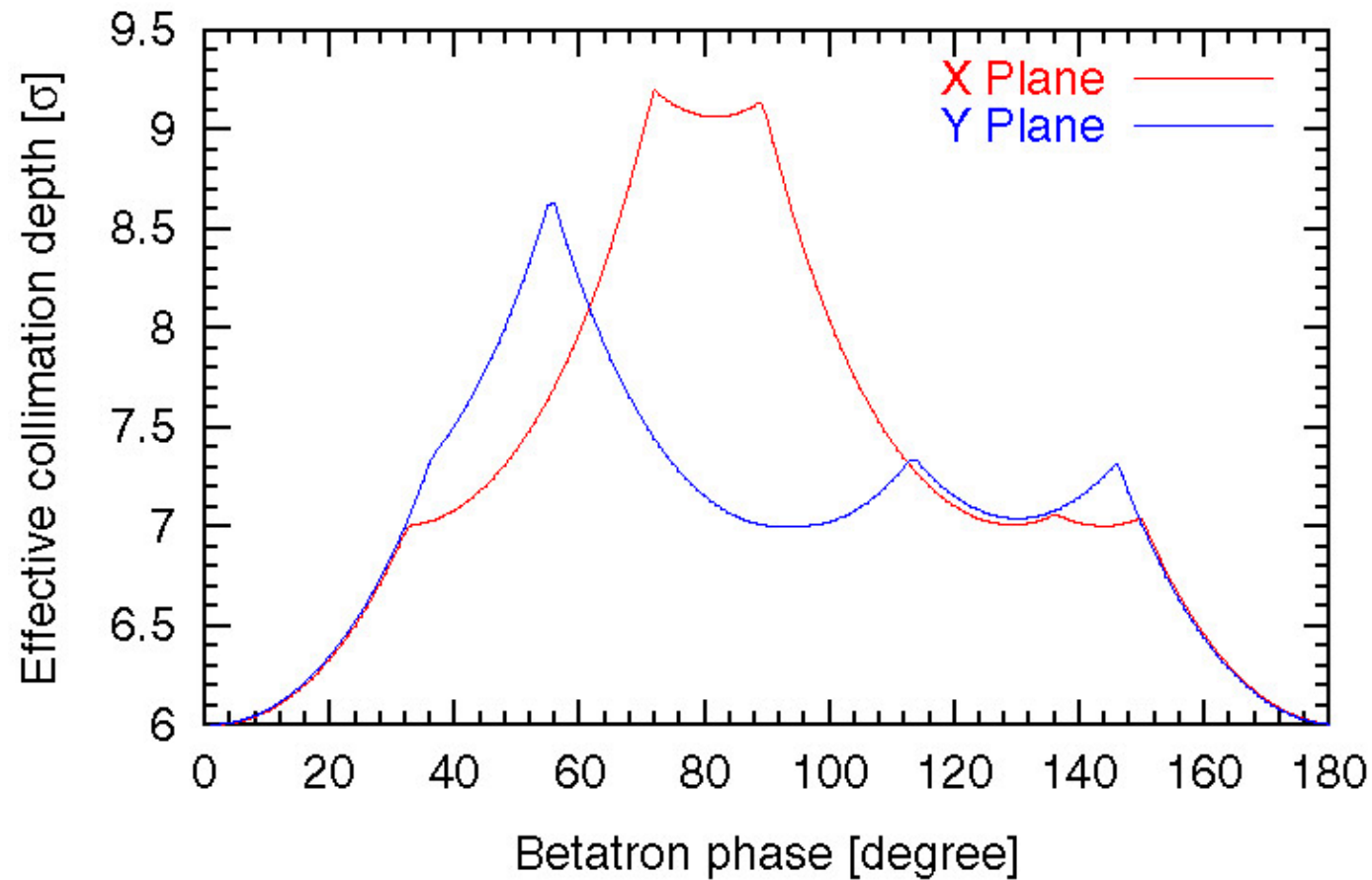
Time scale can be down to 10 turns!

Nominal collimator settings:



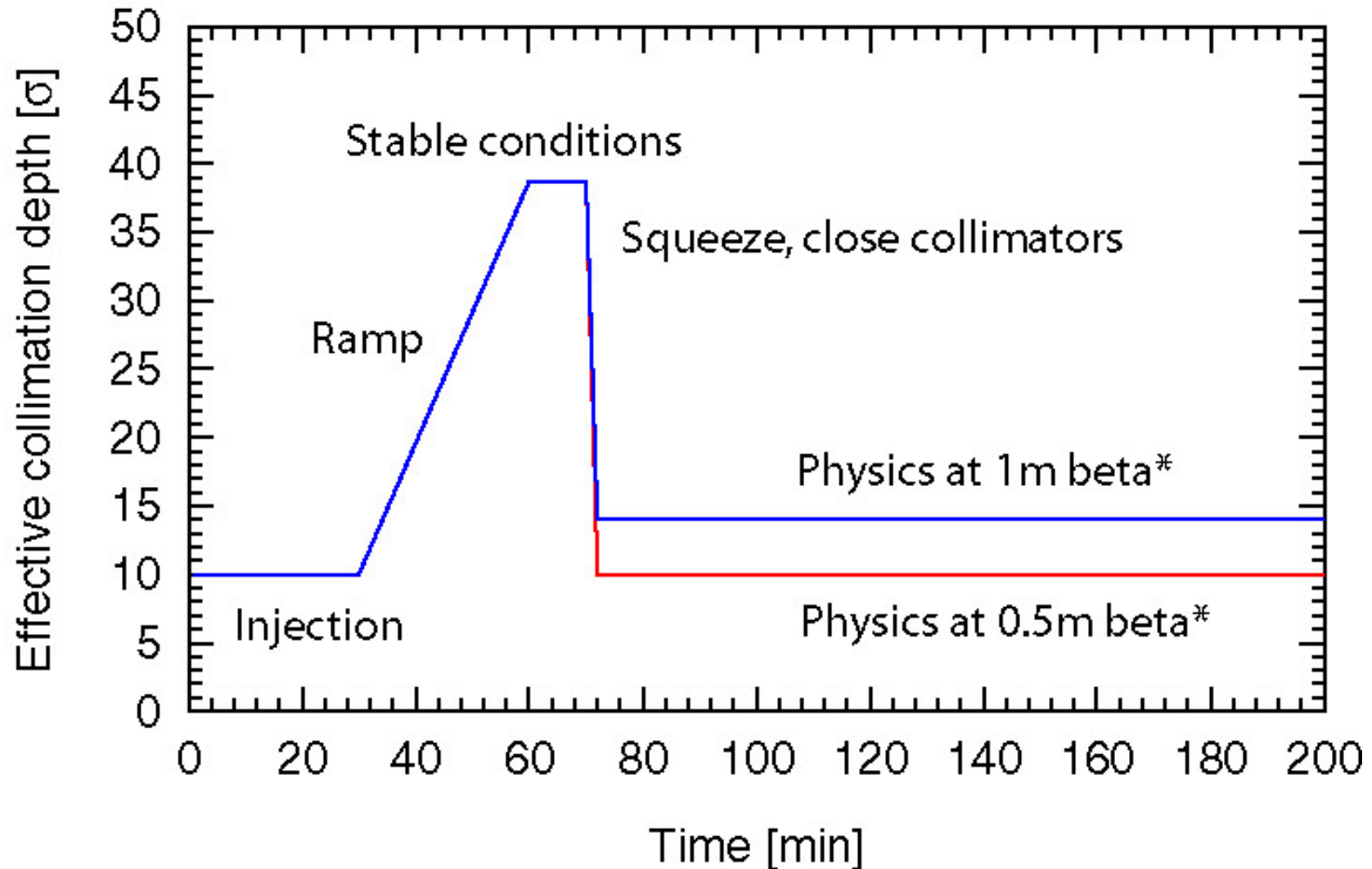
Oscillations can reach up to 10 σ amplitude (just at ring aperture)

Assumed working point for collimators:



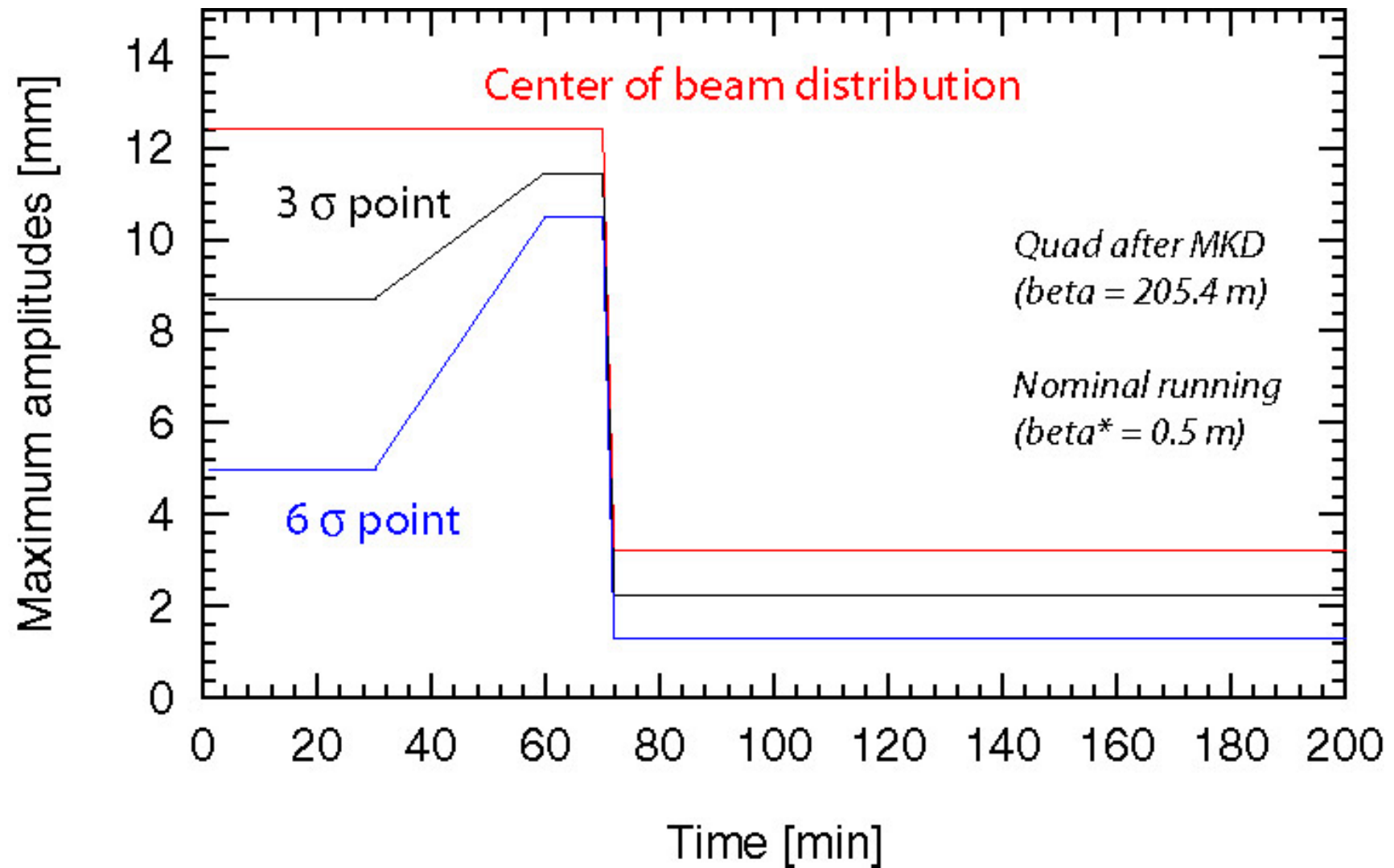
Oscillations can reach up to 9 σ amplitude

Effective collimation depth during cycle:



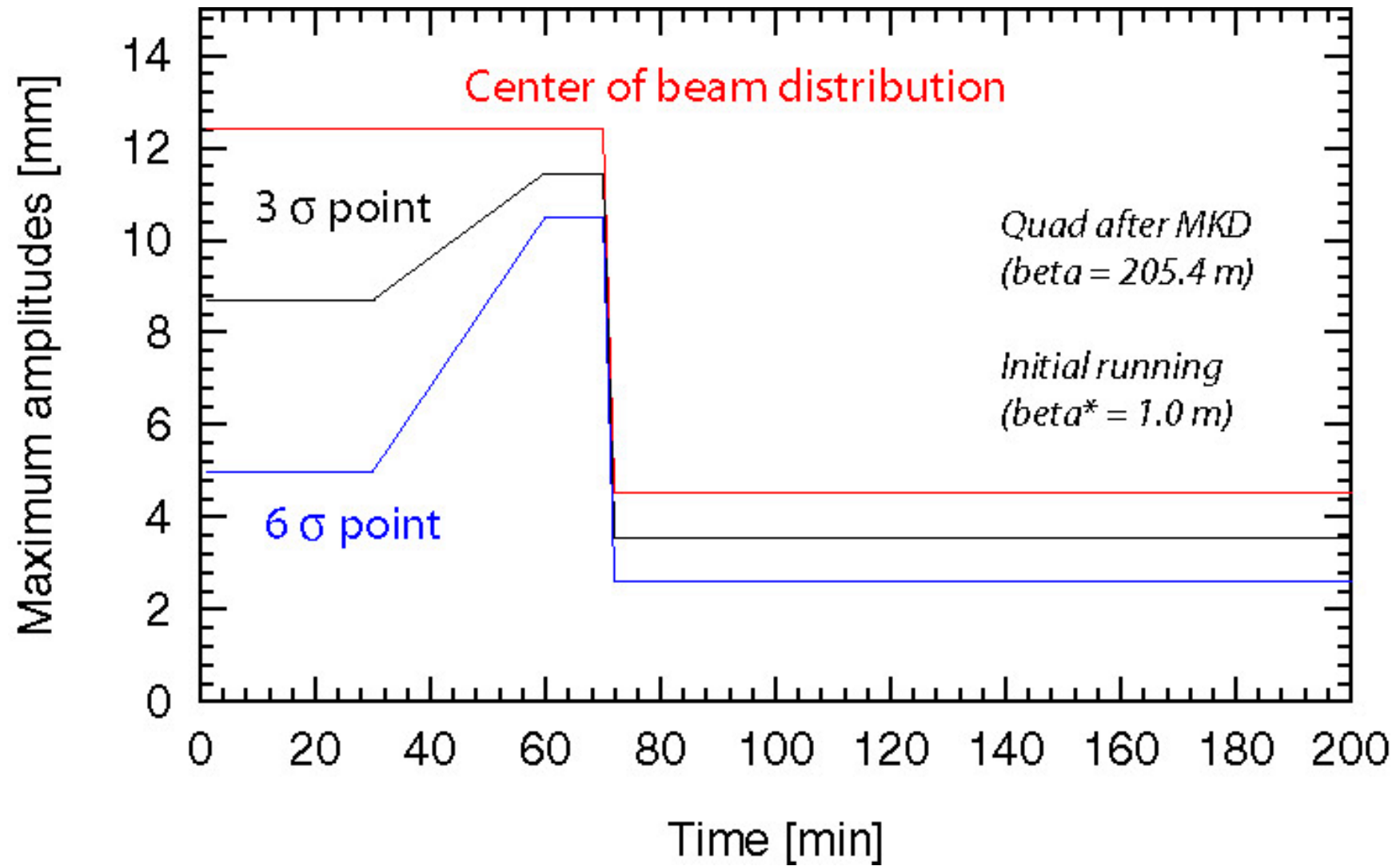
Collimators not closed during ramp: Bigger hole. Avoid tight tolerances during ramp (collimators create secondary/tertiary halo).

Absolute orbit offset at quad after MKD:



When do we detect beam orbit / emittance degradation?

Absolute orbit offset at quad after MKD:



Assuming: Worst phase error
Dump at 3σ point of beam distribution
Allow for relaxed settings with beta* of 1 m
Do not rely on phase advance collimator - MKD

Maximum amplitudes (orbit):

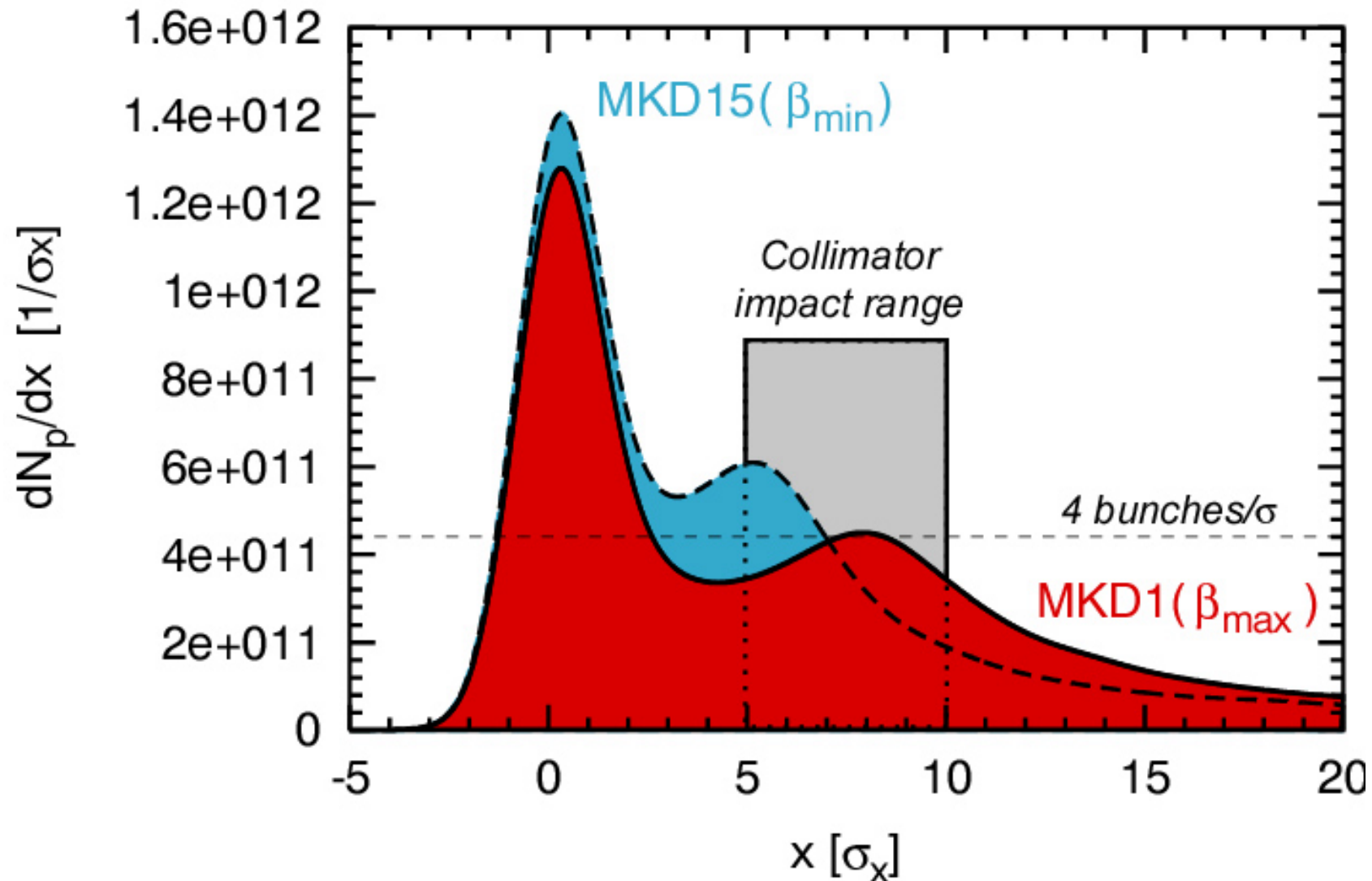
8.7 mm	(injection)
11 mm	(before squeeze)
4 mm	(physics)

-20% for fast oscillations (sample all phases). These offsets can add to static orbit offset (~ 1 mm).

Improvements possible: Add collimators to reduce effective collimation depth from 10.5σ to 8.5σ for nominal collimator settings (20% reduction).

Special case:

Single module pre-fire.



All beam below 10σ can make 1 turn and must be dumped (squeezed case)!

Sigmas at quad:

0.32 mm at injection

1.24 mm at top energy