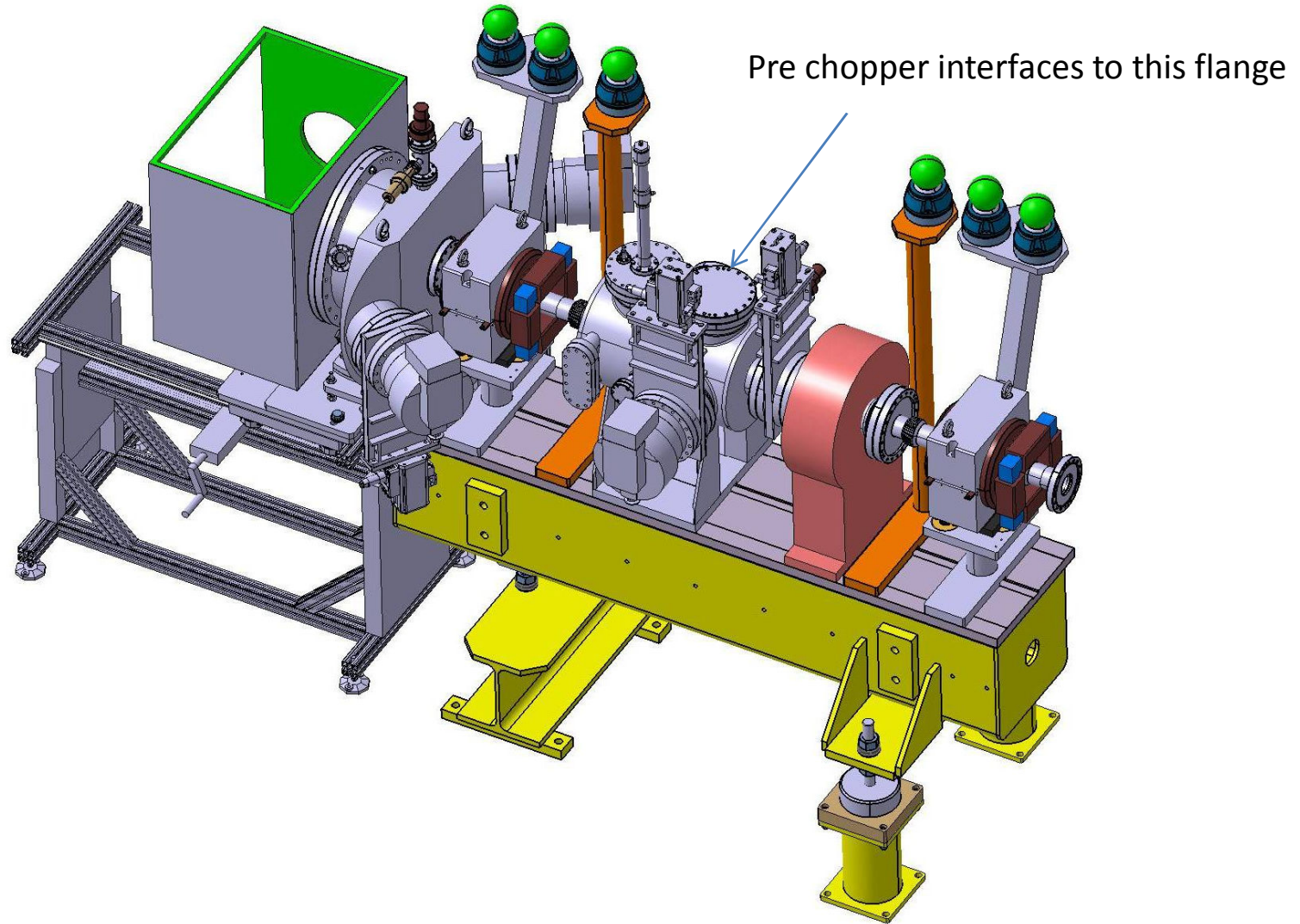Linac4 prechopper (45keV chopper)

- Initial reason for developing: Remove the long rise time of the beam from the source from the RFQ (initially it was understood that the source has a rise time >50us).

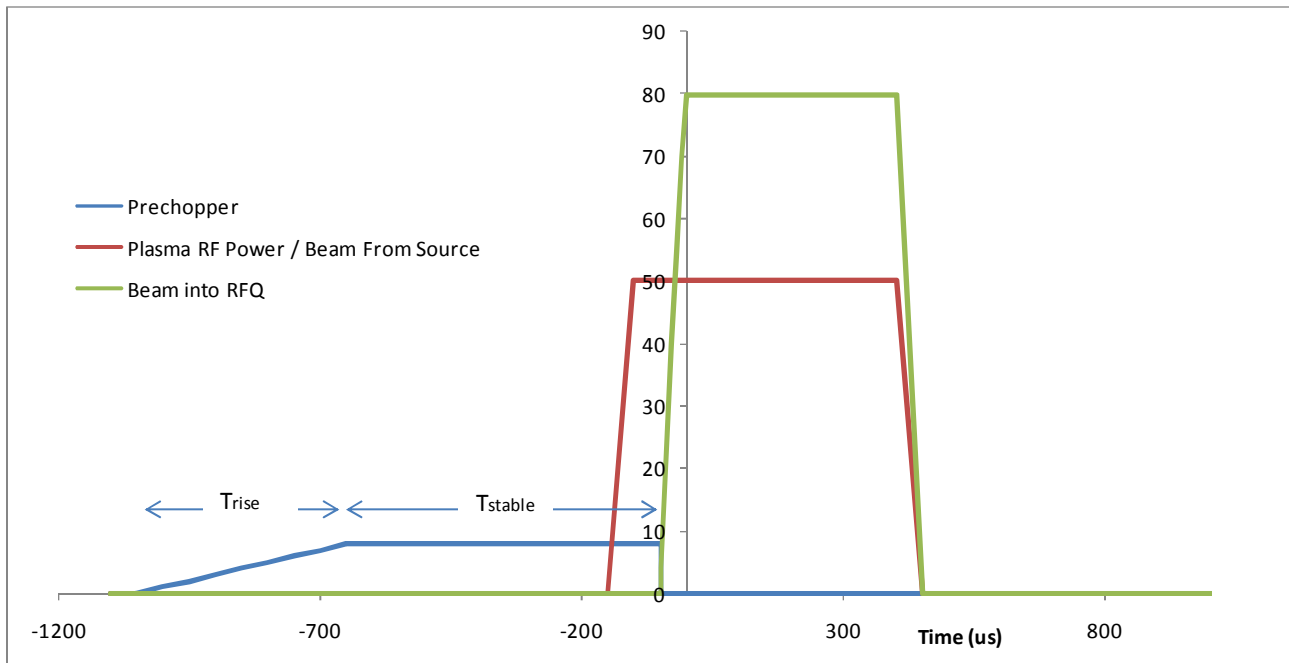- *New requests: Sharpen the beam head and tail in order to avoid losses in the head/tail dump.*

Linac4 prechopper (45keV chopper)
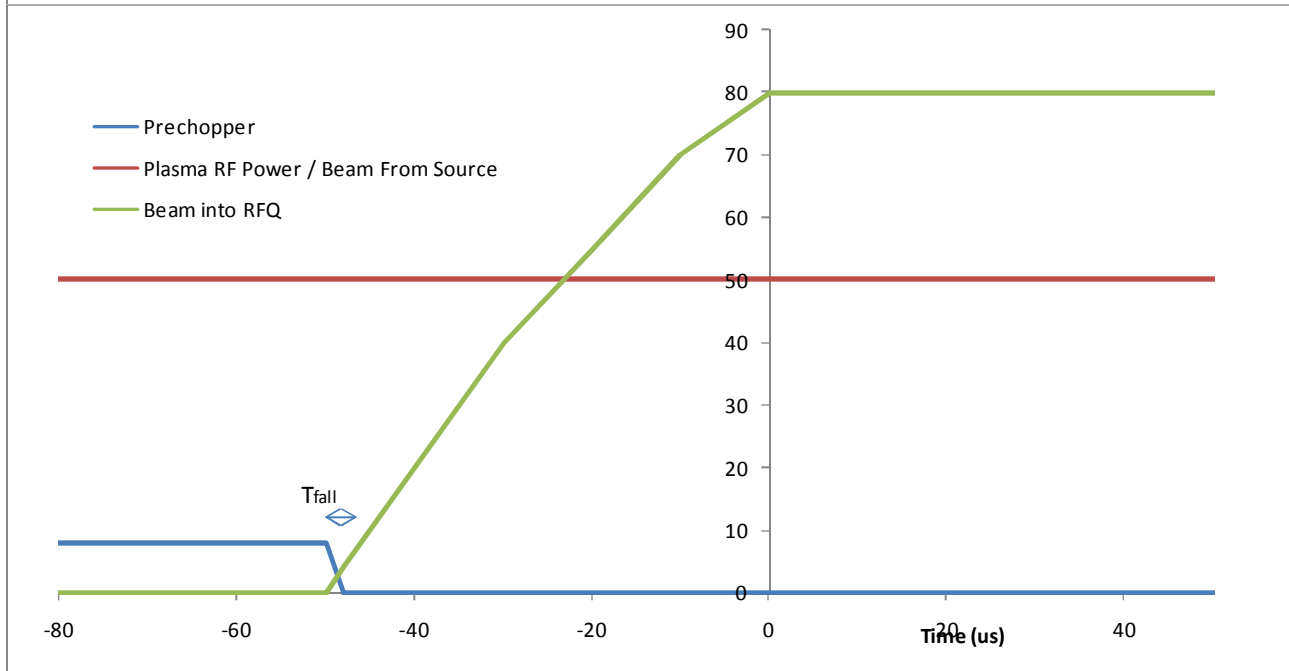
Pre chopper interfaces to this flange
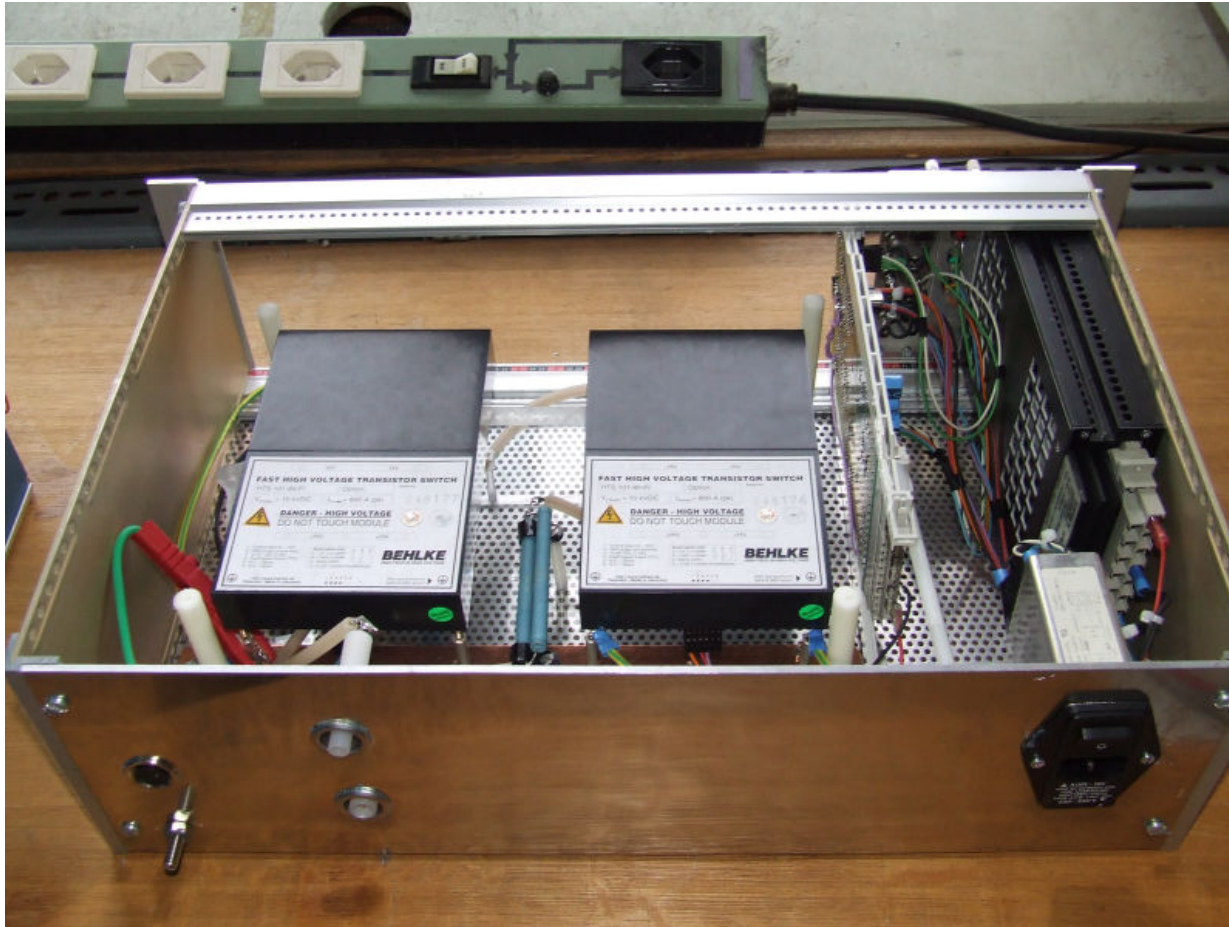
Sketch of design
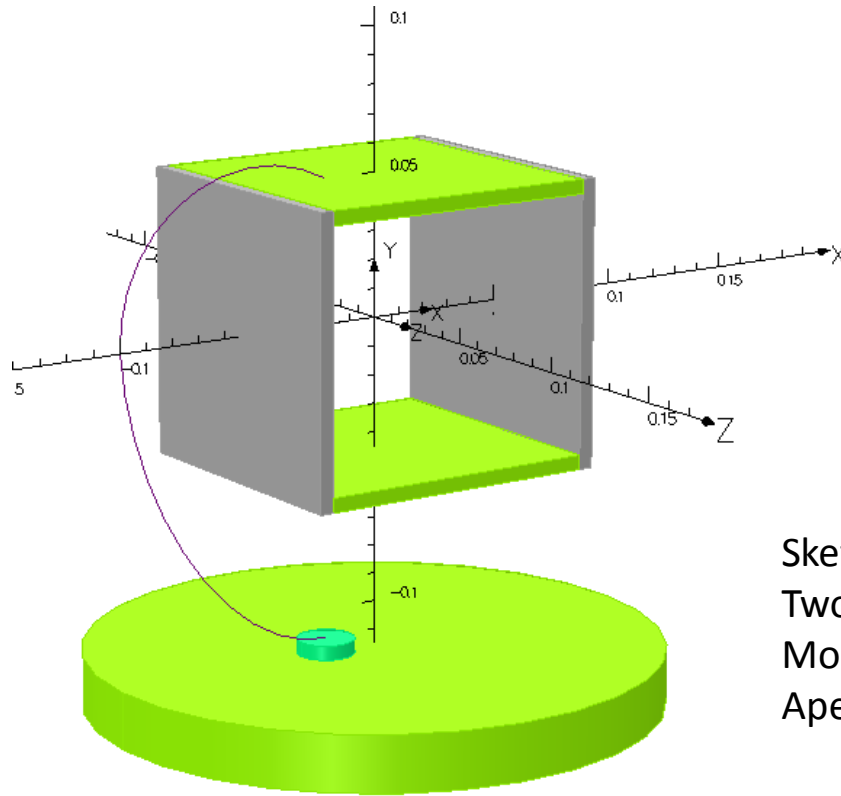
Sketch of the pre-chopper
Two plates, one grounded, one polarised.
Mounted directly on flange.
Aperture, length, gap = 100mm.

Principle of the timing scheme

Driver was built by Pakistani electrical engineer (arrived "suddenly").

The main parameters of the driver have been set to:
Vmax < 10kV (variable)
Trise < 1ms
Tfall < 2us (to 99%)
Tstable < 1ms (based on trigger)
Max rep rate 2Hz. External triggered.
Flat top stability < 2%

(not yet proved to give the specified parameters)

Why not faster?

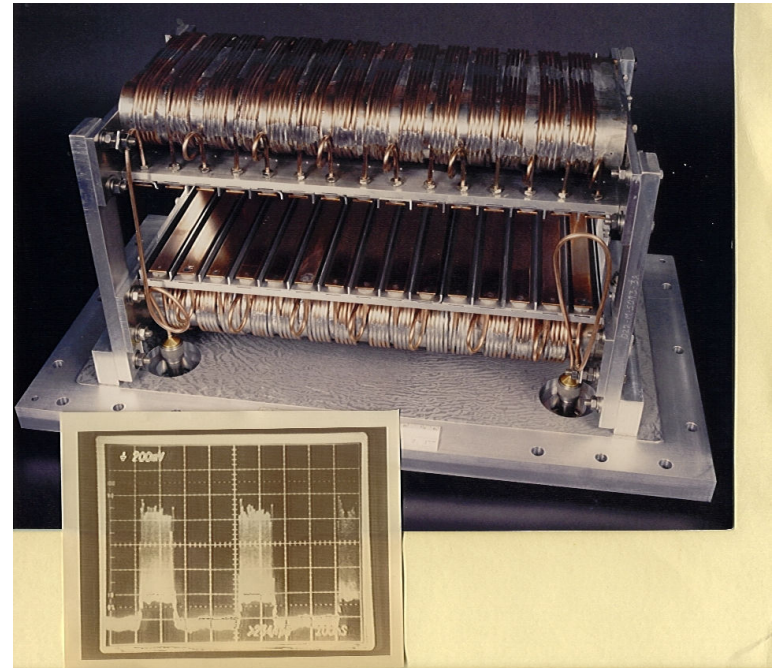Space charge compensation takes time to form and stabilise the beam.

Characteristic time for this is: $t = 1/n\sigma v$
(σ=x-section for H2 -> H2+ with H- projectile, v=projectile velocity, n=gas density)

BNL built a 10ns LEBT chopper, but the beam rise time was still ~50us.

Extinction ratio:
Needs to be measured with the RFQ.

Summary:

- The chopper plates are only conceptually designed.

- The prototype driver was built for chopping the head.

- The beam rise time will still be ~30 us.

- The driver will need rebuilding for additional tail chopping (~15kchf + 3 man months).