

## The beam test results of coupled cavities system (from June 11<sup>th</sup> to June 13<sup>th</sup>)

The beam test of the coupled cavities system was performed from June 11<sup>th</sup> to June 13<sup>th</sup>. The good results were obtained on deflection angle and transient time as expected. Much more beam test is also necessary for further investigated of the coupled cavities running.

### 1. Beam size and profile measurement

Similar with the single cavity beam test, the beam size and profile at the position of scraper were measured with scraper and CT3. Figure 1 show the beam profile and Figure 2 show the beam density which derived from beam profile measurement.

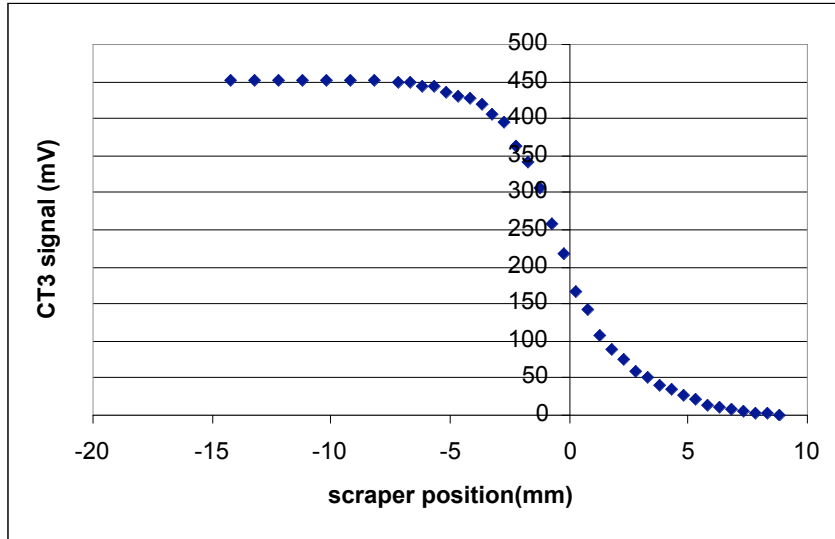


Figure1 The beam profile measured by CT3 and scraper with (Q4=120A)

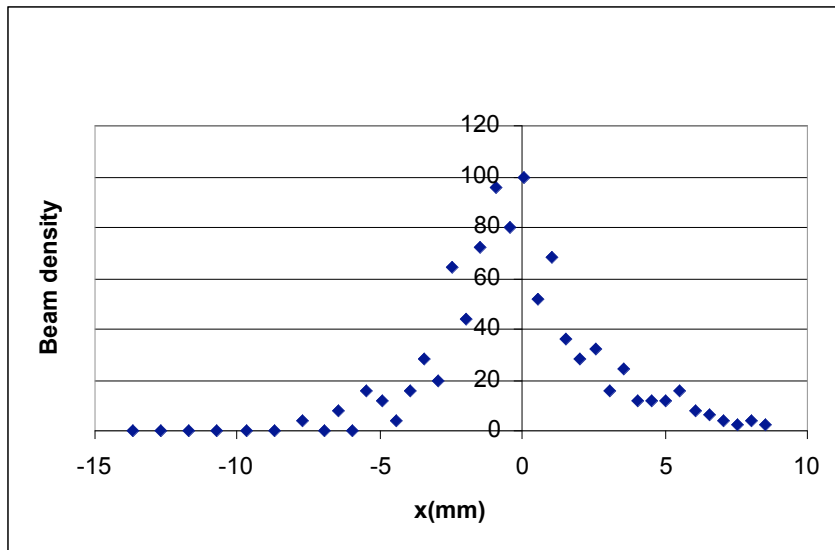


Figure 2 Beam density derived from measurement of profile.

## 2. The dependence of the deflection effect on the chopper power and phase

Figure 3 show the dependence of the displacement at the position of the scraper of the chopped beam vs. sqrt(power).

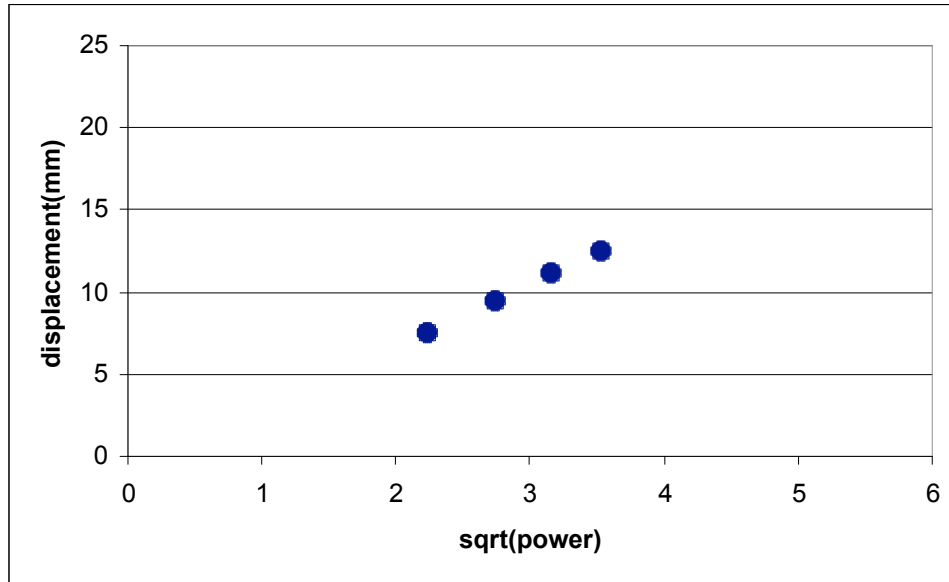


Figure 3. Dependence of displacement on chopper power

In case of 5mA, if the chopper power is set to 18kW, to stop all chopped beam and not influence the unchopped beam, the tolerance of chopper phase shifting from peak is  $\pm 25^\circ$ , and if the chopper is set to full power, the tolerance becomes  $\pm 46^\circ$ .

## 3. Chopping effect

Tuning the optics of MEBT and let unchopped beam no lost, then measure the beam size, measured beam size is 6.7mm. Set the scraper to 32mm, and full chopper power, measure the chopping effect. Figure 4 to Figure 8 are the waveforms obtained from CT3, FCT, FC, Scraper and BPM8.

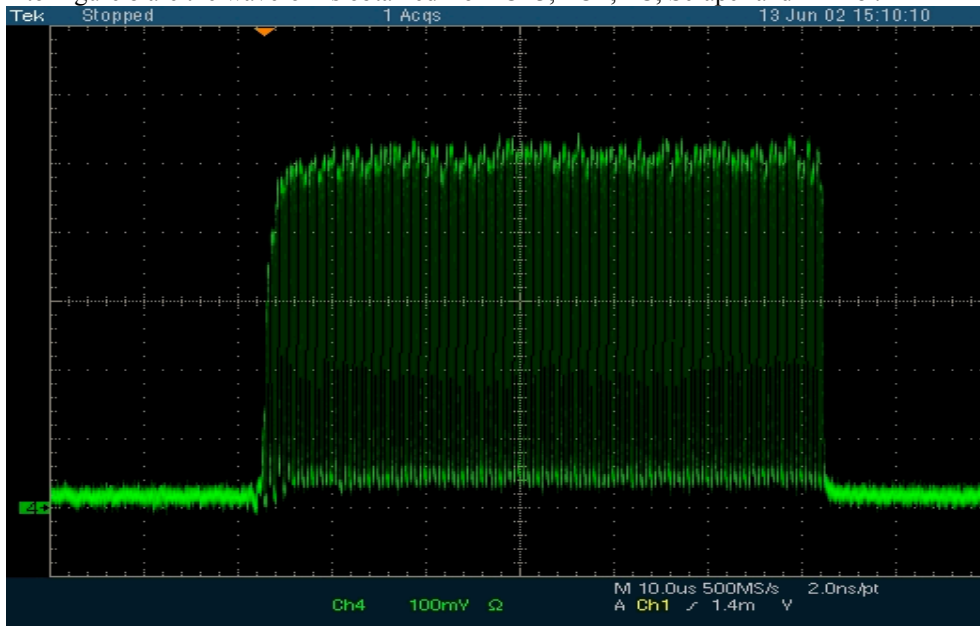


Figure 4 CT3 wave form

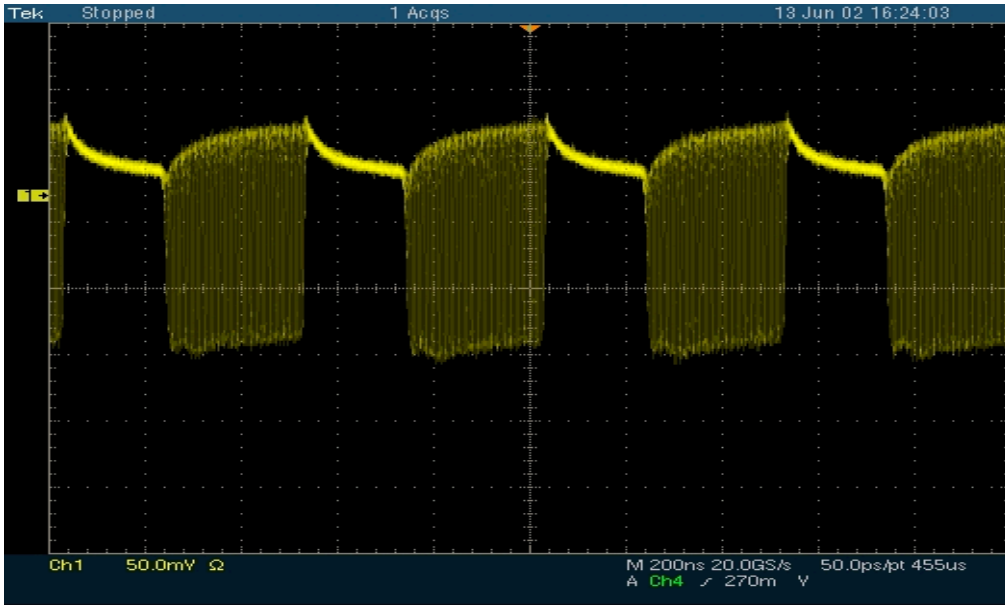


Figure 5 FCT waveform

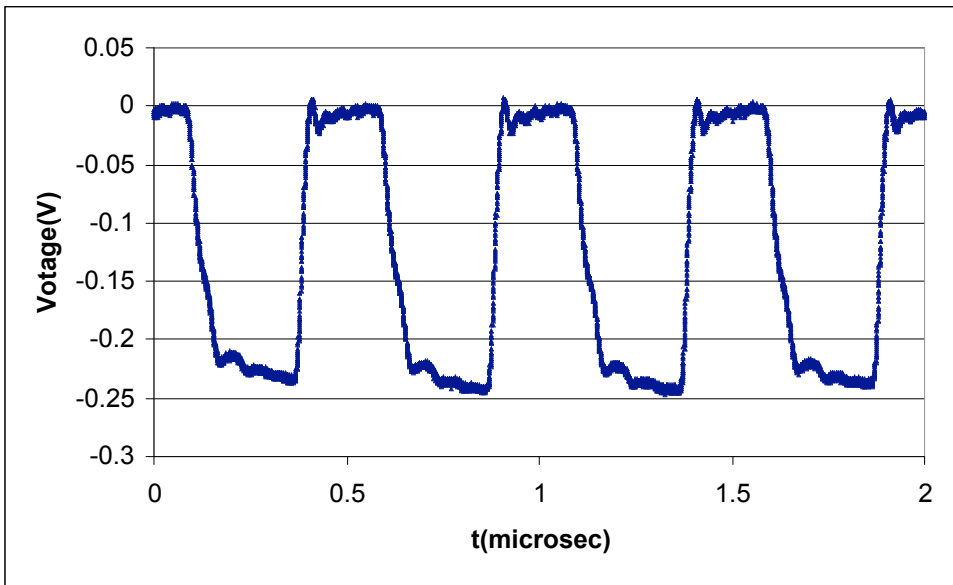


Figure 6 FC waveform

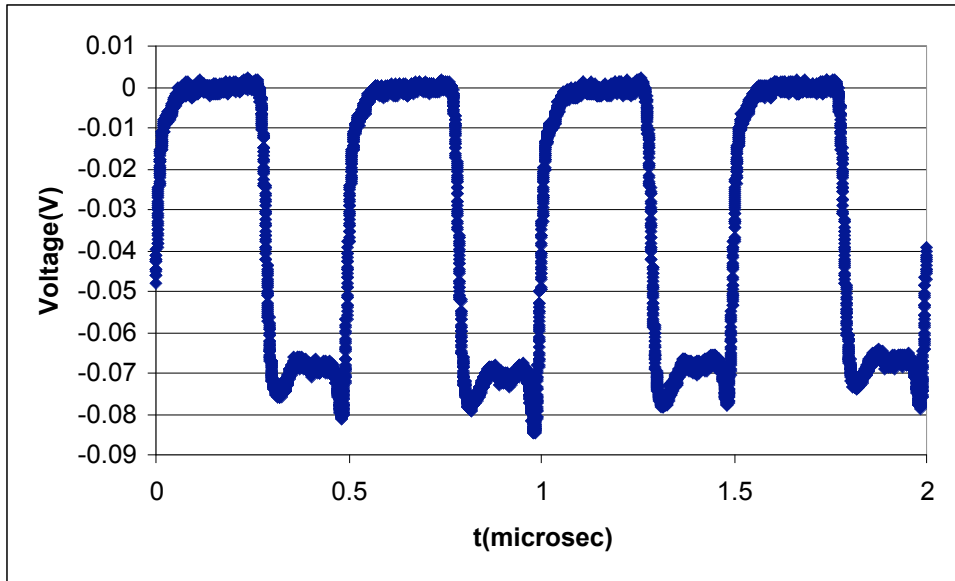


Figure 7 Scraper Waveform

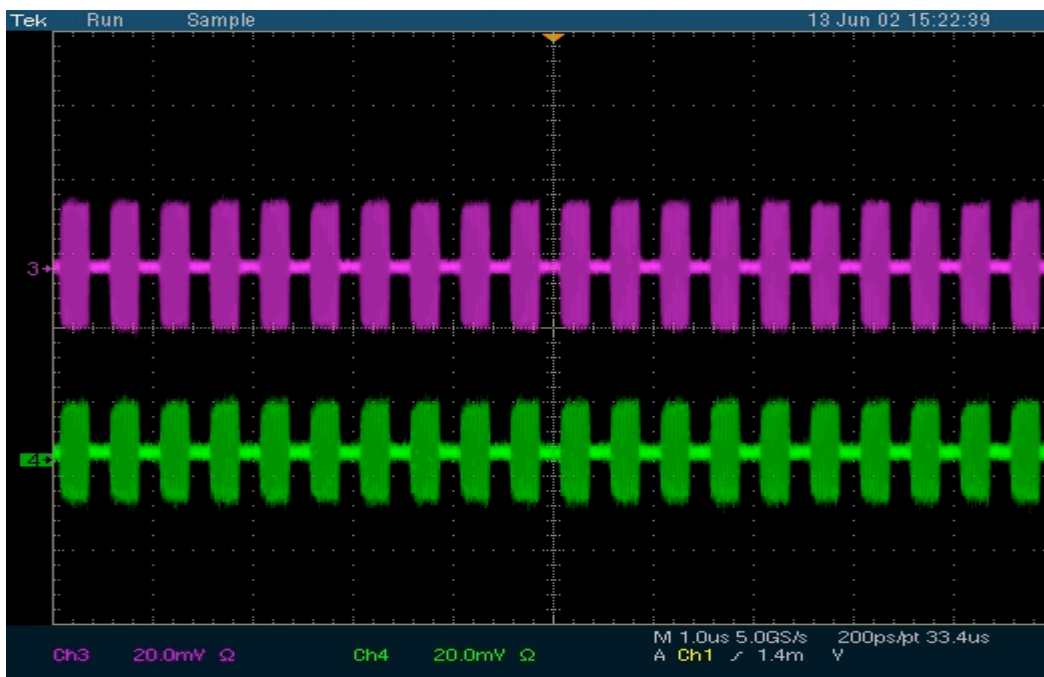


Figure 8. Chopped beam structure from BPM8.

#### 4. Transient time of chopper

The beam structure of the rise and fall time of chopper are measured by FCT and BPM8. The results shows that the rise and fall time is around 10ns (about 4 periods).

(1) Rise time

Figure 9 and 10 show the beam structure during the rise time obtained by BPM8 and FCT

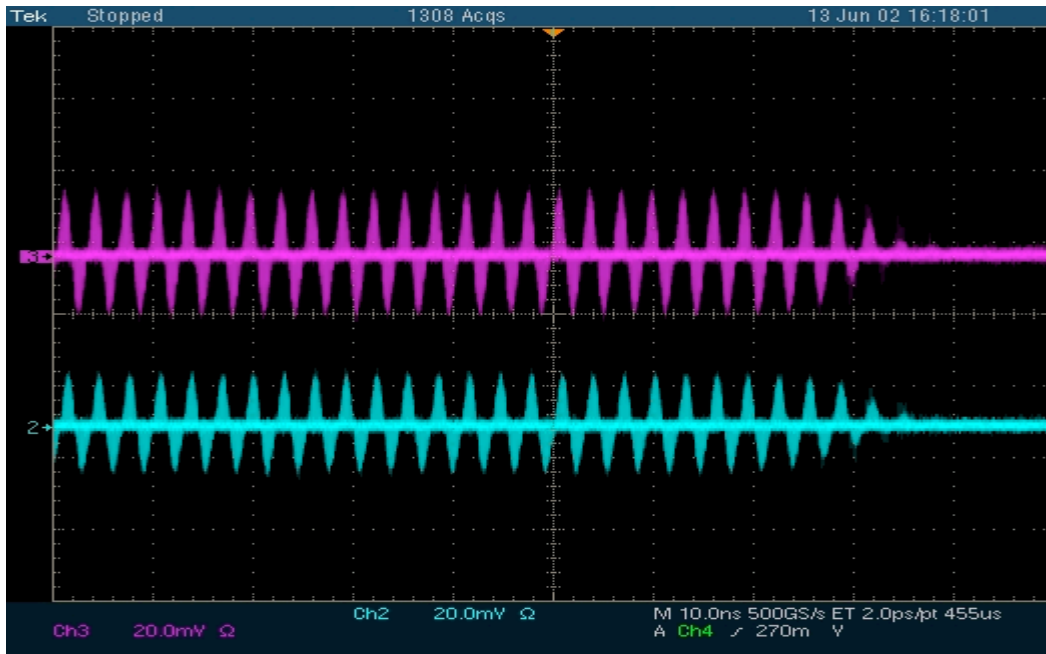


Figure 9 Beam structure during rise time of chopper measured with BPM8

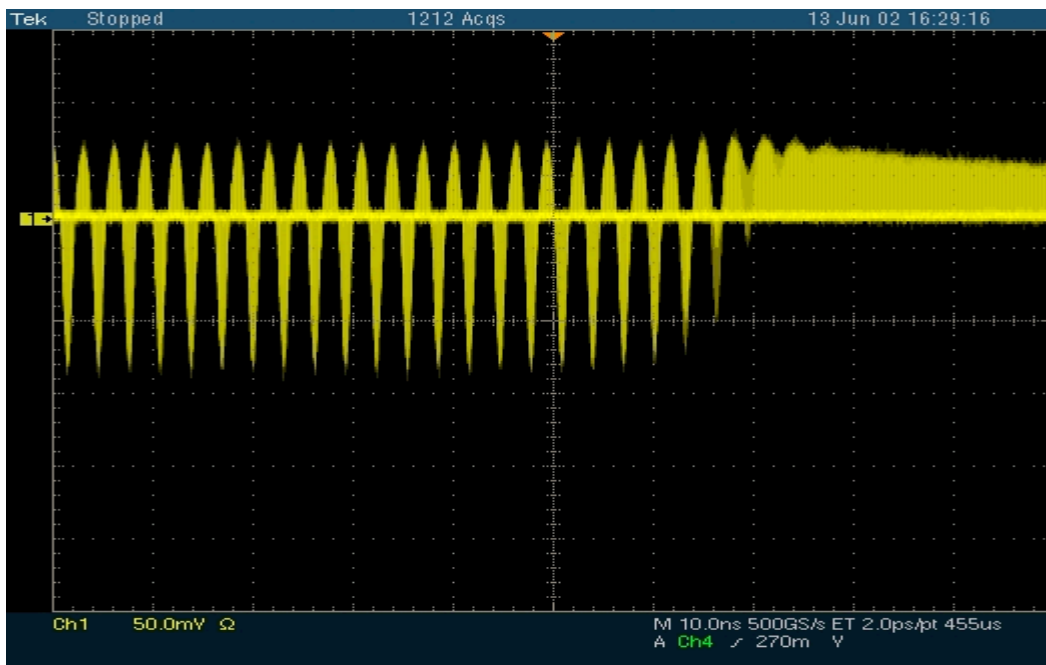


Figure10 Beam structure during rise time of chopper measured with FCT

(2) Fall time

Figure 11 and 12 show the beam structure during the rise time obtained by BPM8 and FCT.

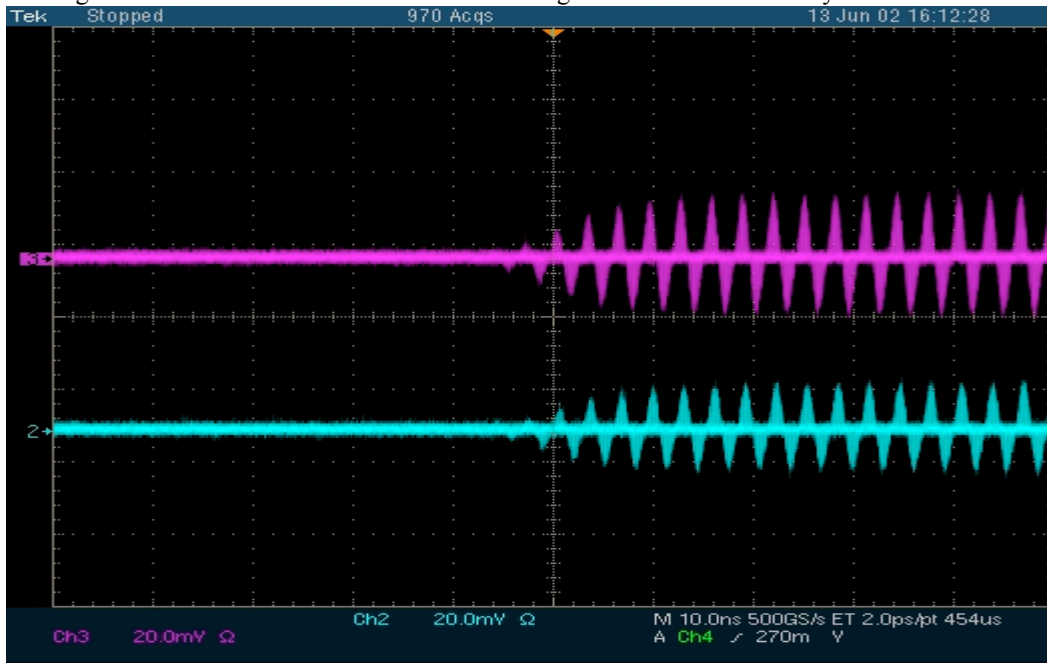


Figure 11 Beam structure during fall time of chopper measured with BPM8

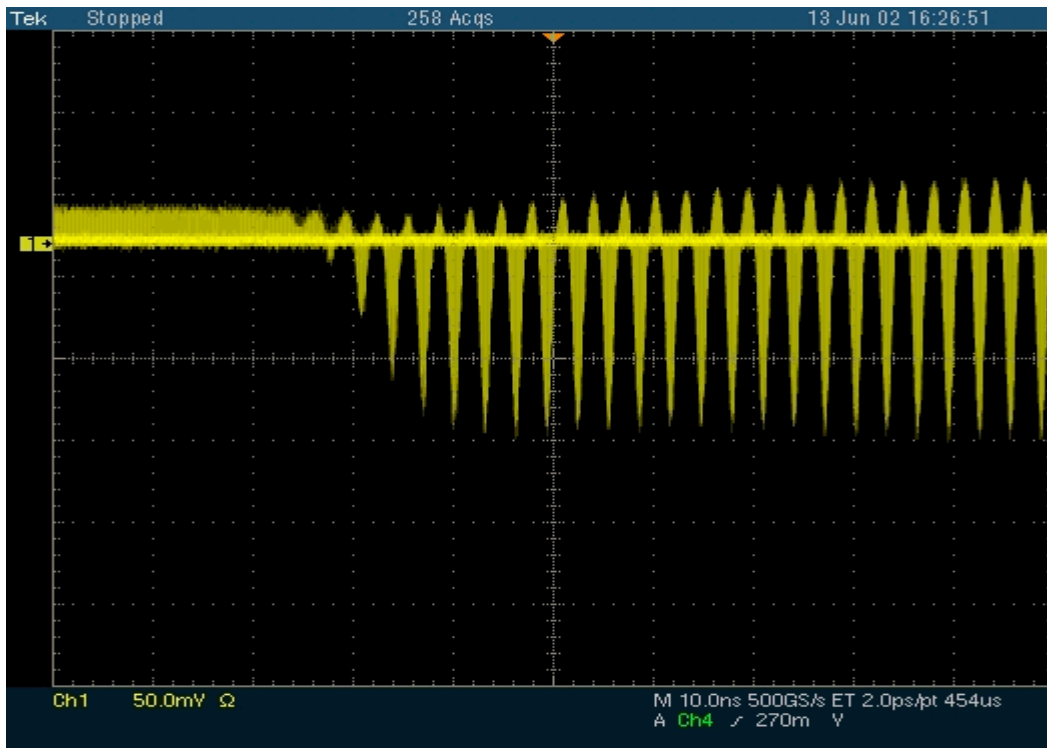


Figure 12 Beam structure during fall time of chopper measured with FCT

5. Short pulse

Figure 13 show the beam structure with large chopping ratio (short beam pulse). The chopper power is 5kW.

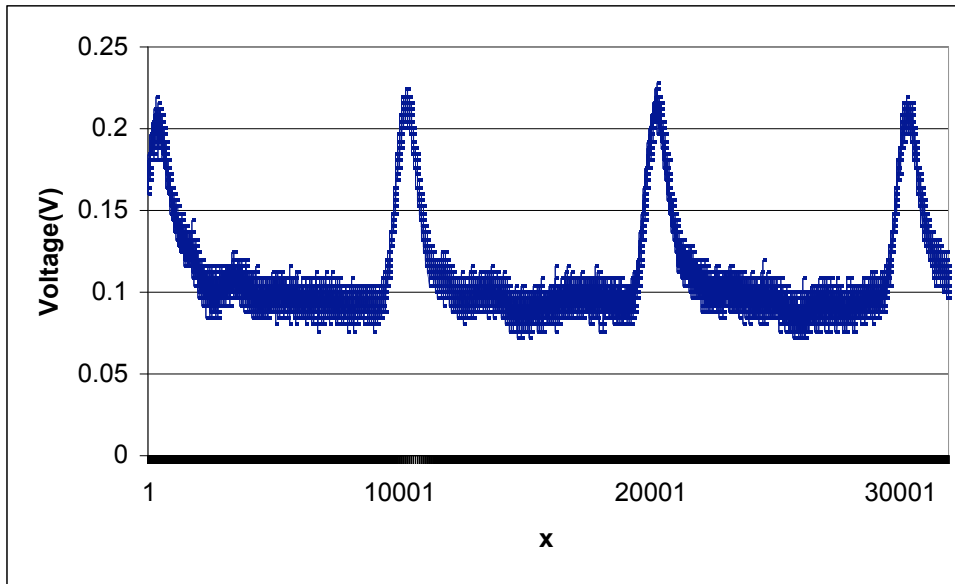


Figure 13 Short pulse beam structure measured by CT3

6. Simulation results with the same optics as the beam test

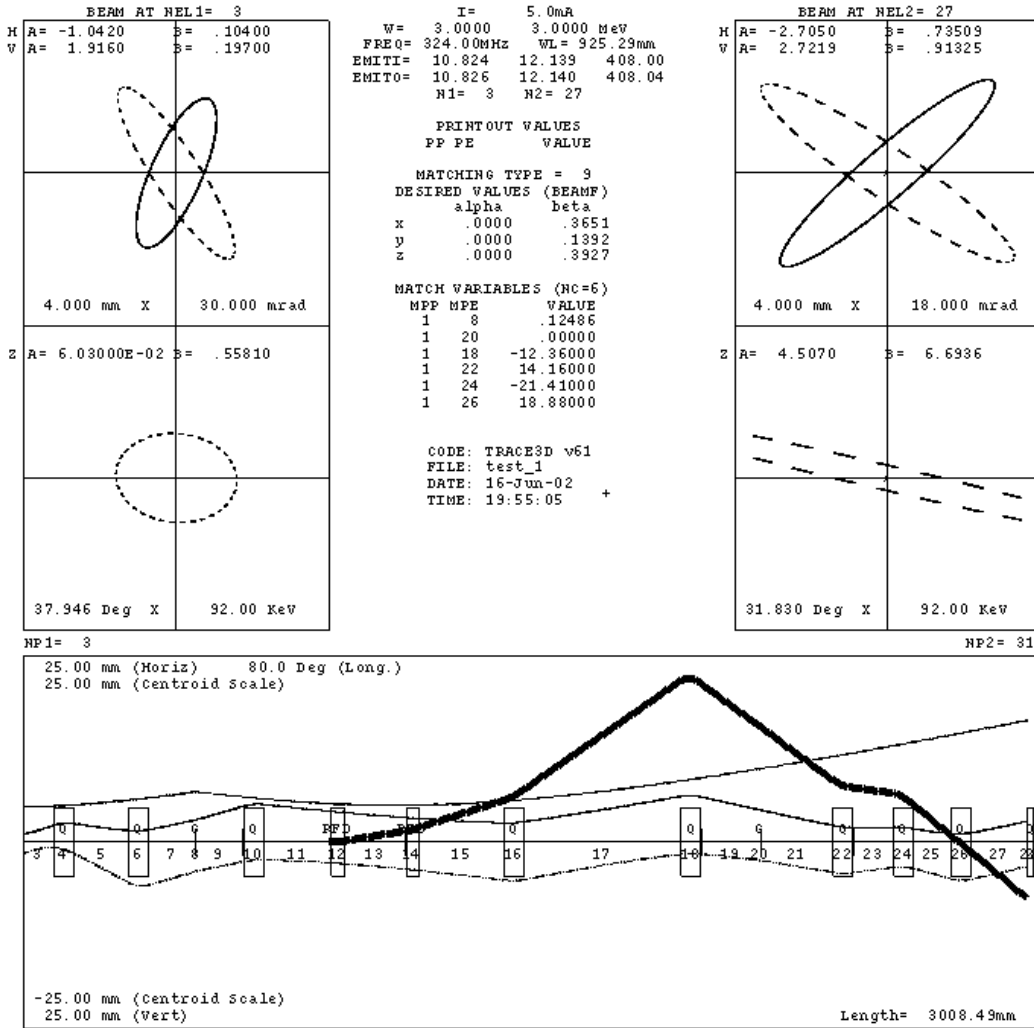


Figure 14 The trace3D results using twiss parameter measured at exit of RFQ



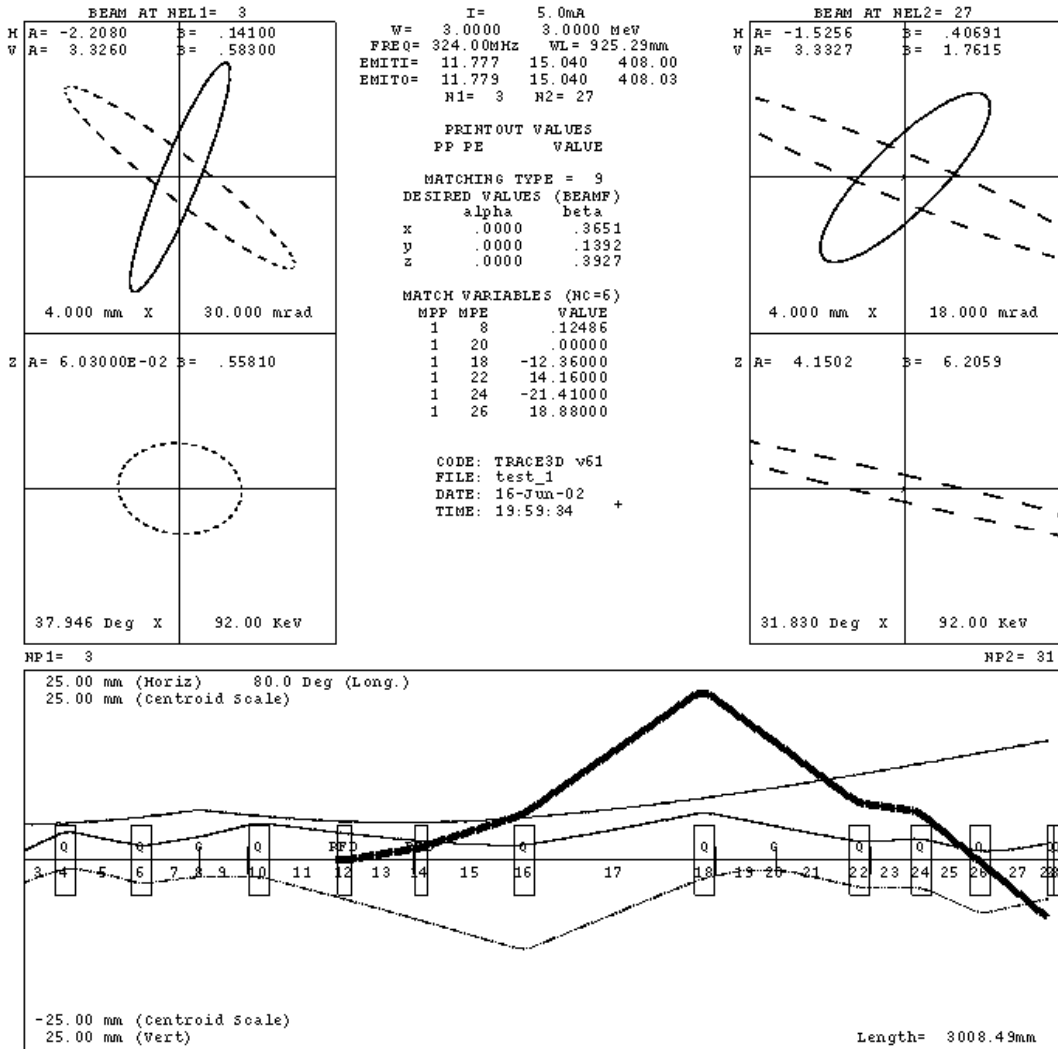


Figure 15 The trace3D results using twiss parameter measured at exit of MEBT