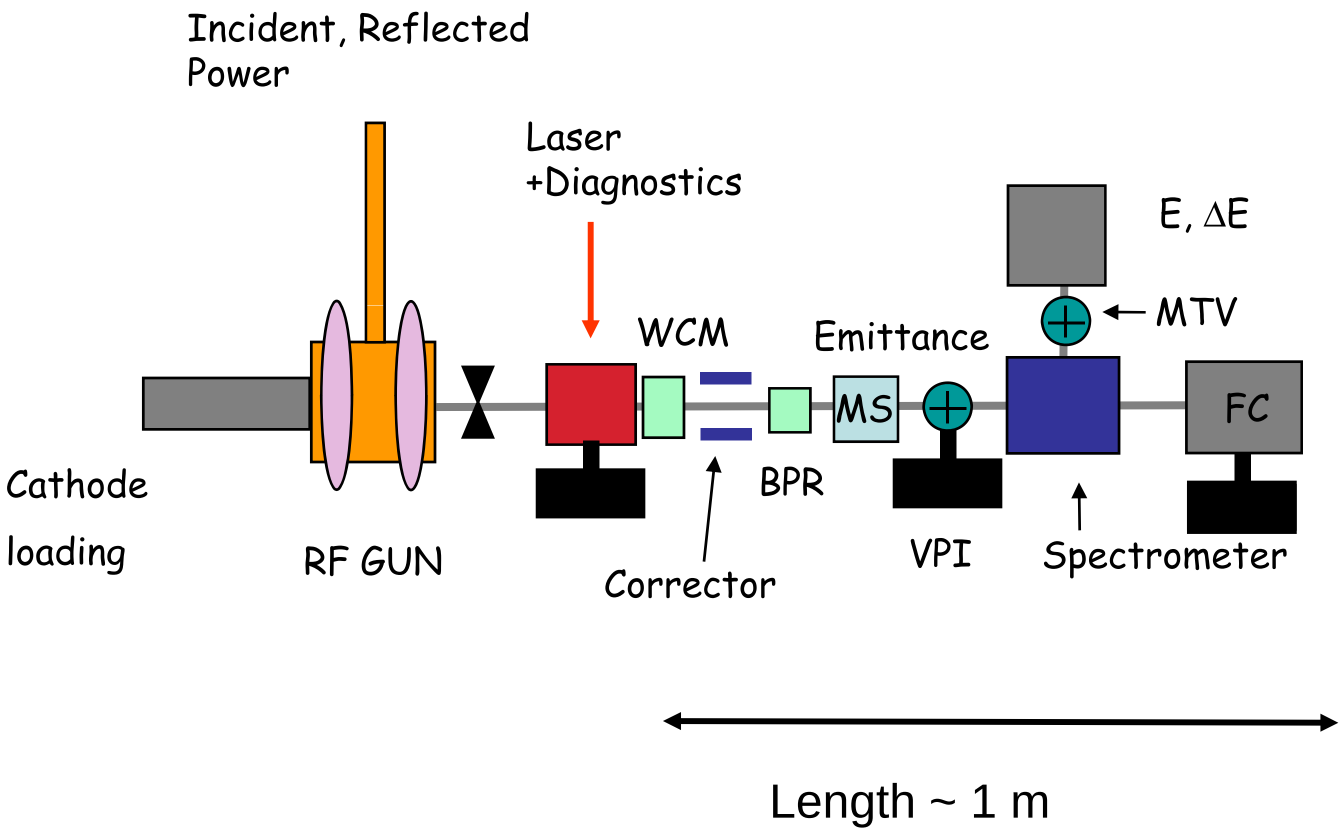
Measurements planned with the photo injector in CTFII

Status

- Waiting
- Installation of the diagnostic beam line is being finished up
- Study of the integration into CTF3 done (EPAC 2006-paper)

RF GUN Test in CTF II



Beam parameters

E = 5.6 MeV

ΔE = 1 % ?

Q = 2.3 nC

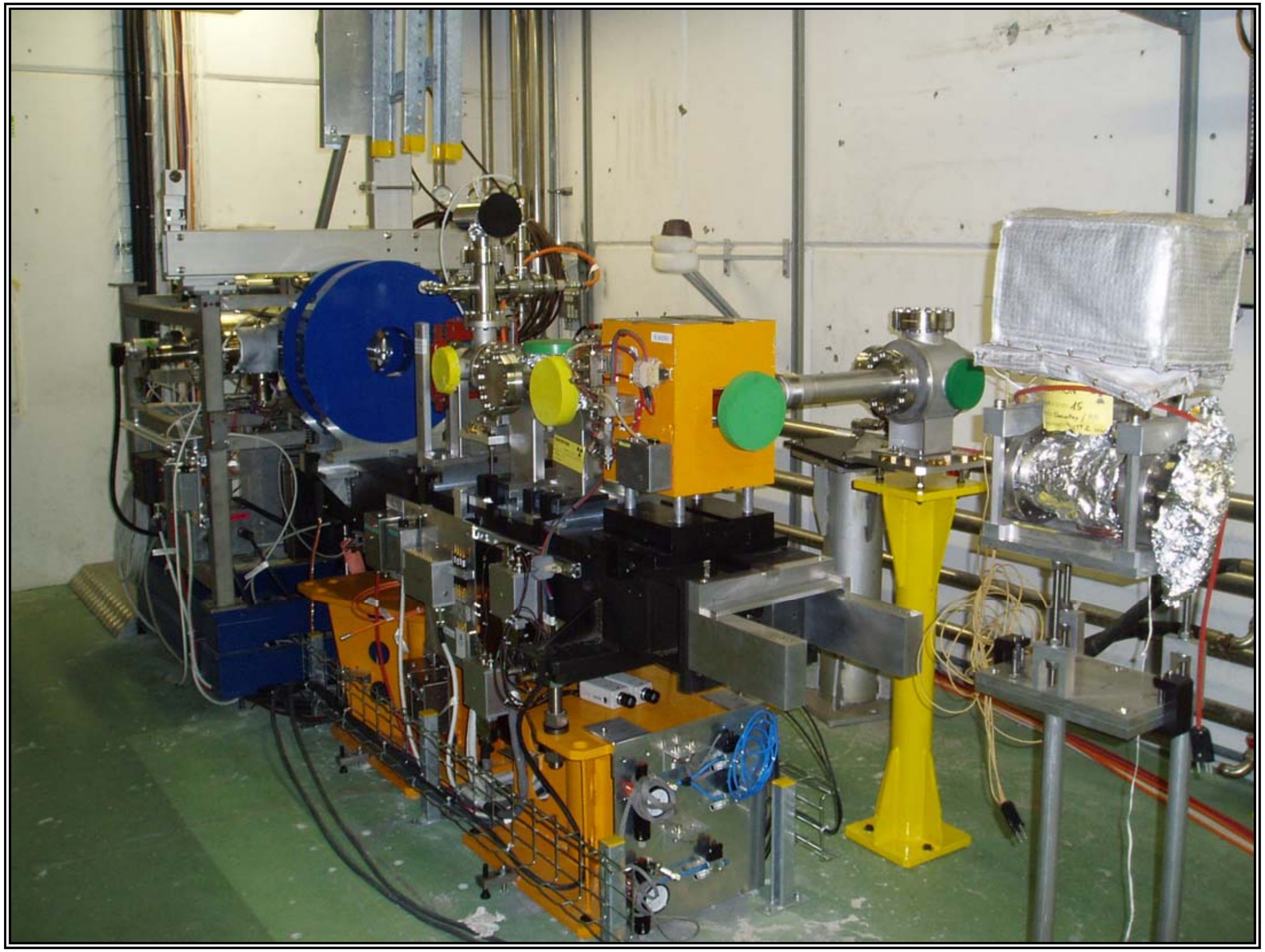
T_p = 1.5 μs (1.5 GHz)

ε_N = 20 mm mrad

σ_z = 10 ps

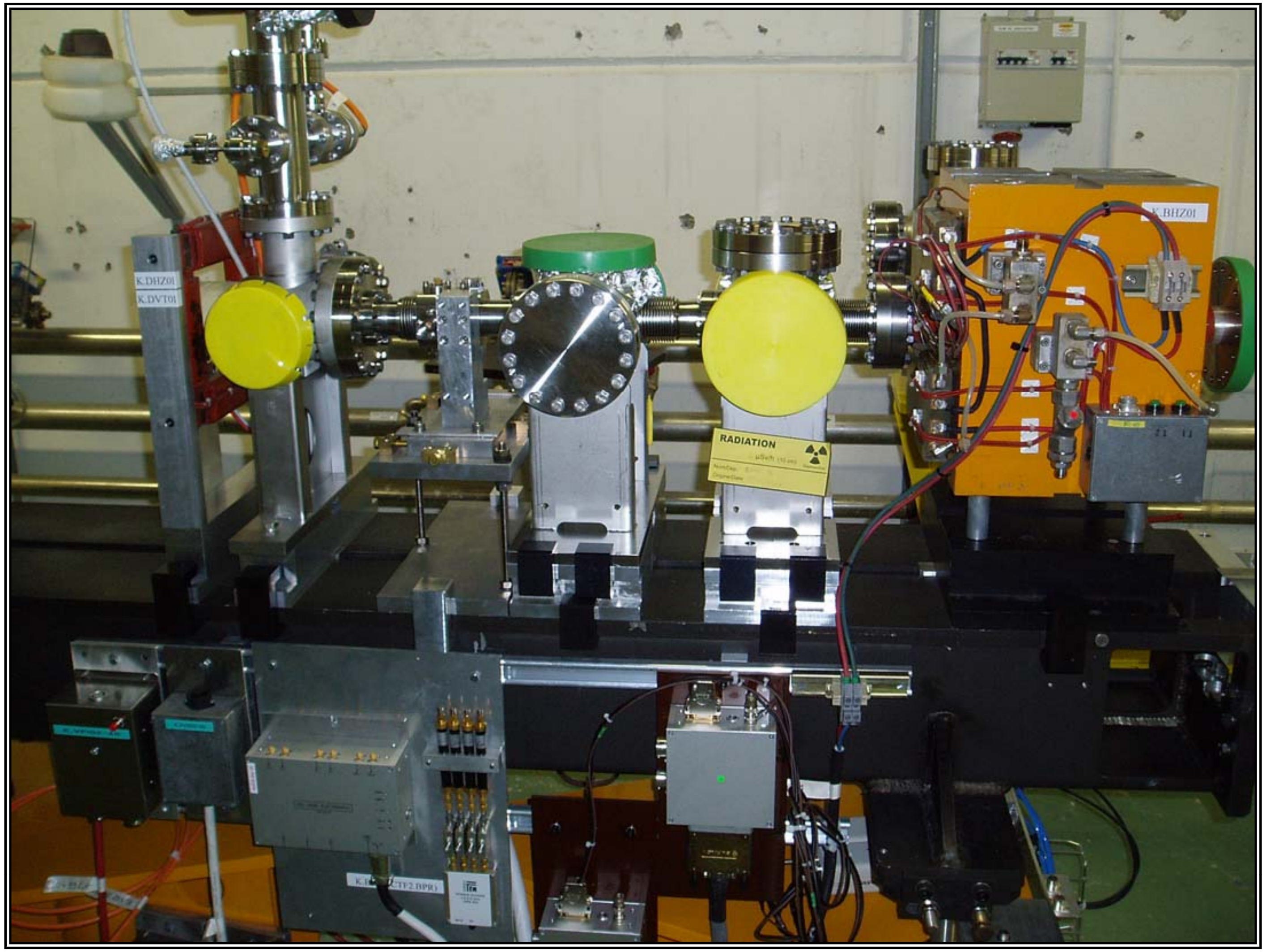
N ~ 2000 bunches !

RF GUN Test in CTF II

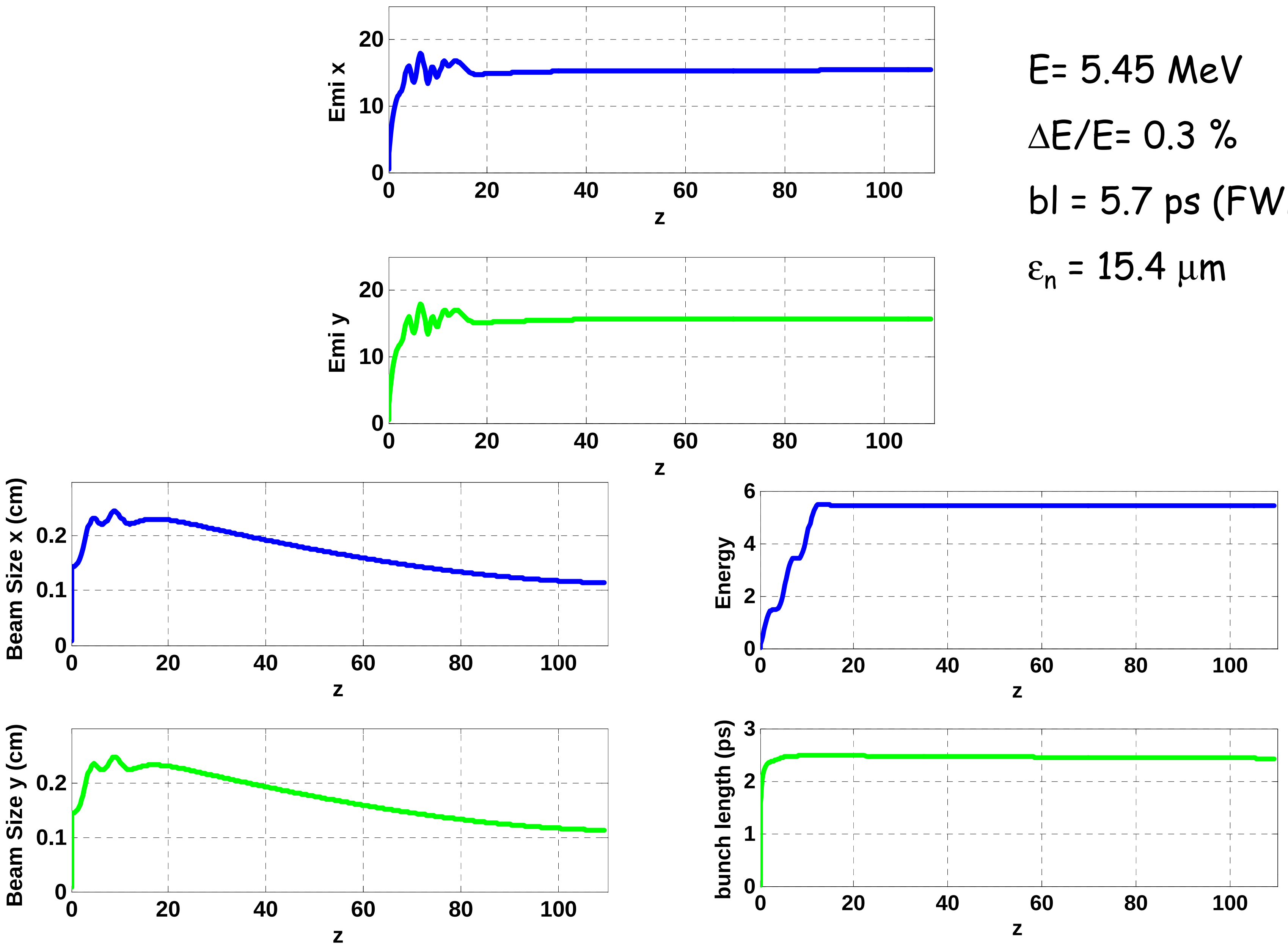


Philosophy: use existing parts and operate with CTF3 controls and data acq.

Diagnostic section in CTF II



RF GUN CTF2 , Simulations 25 deg



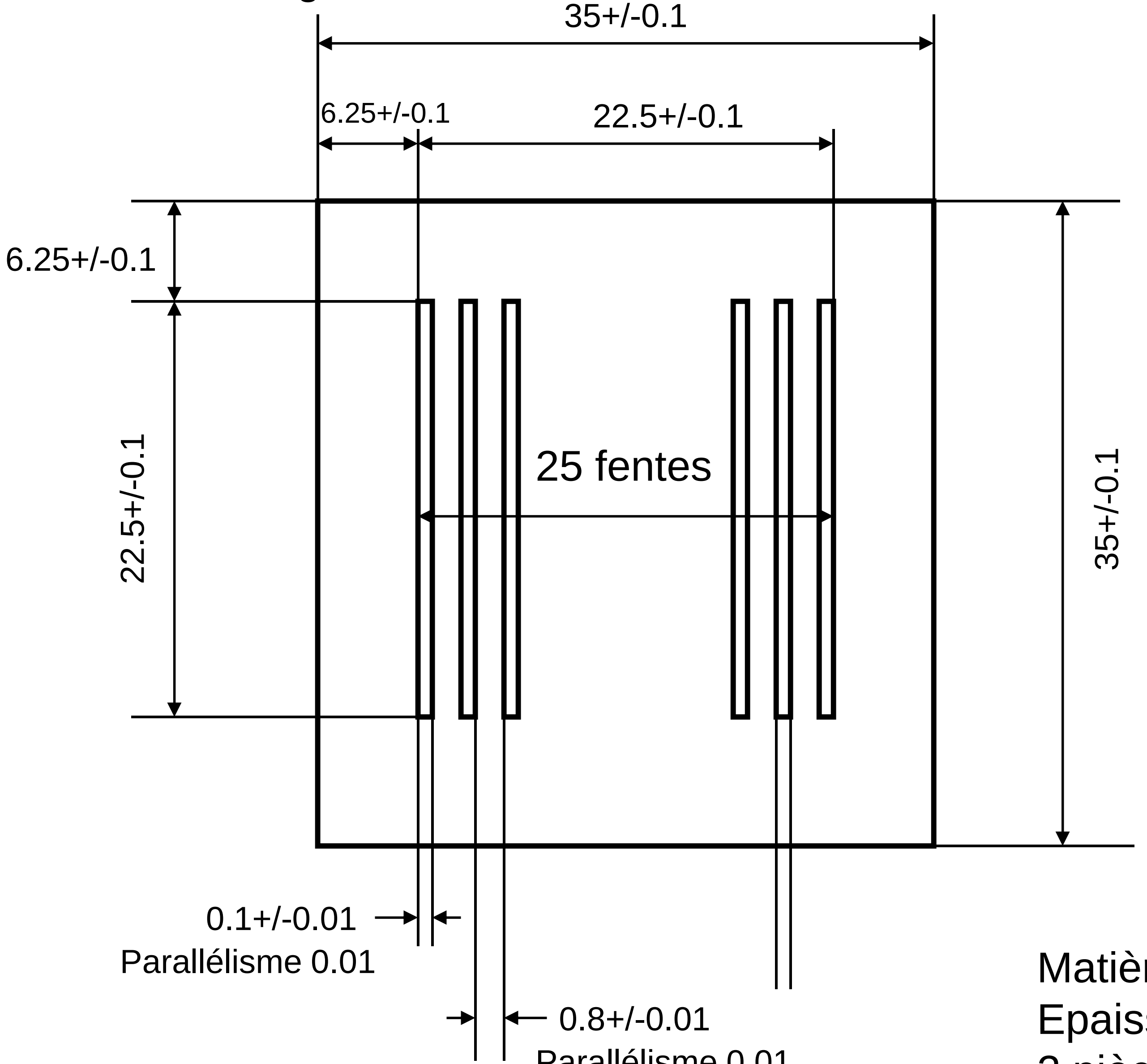
E= 5.45 MeV

$\Delta E/E$= 0.3 %

bl = 5.7 ps (FWHM)

ε_n = 15.4 μm

Fentes en tungstène



<u>Tungsten slit mask:</u>

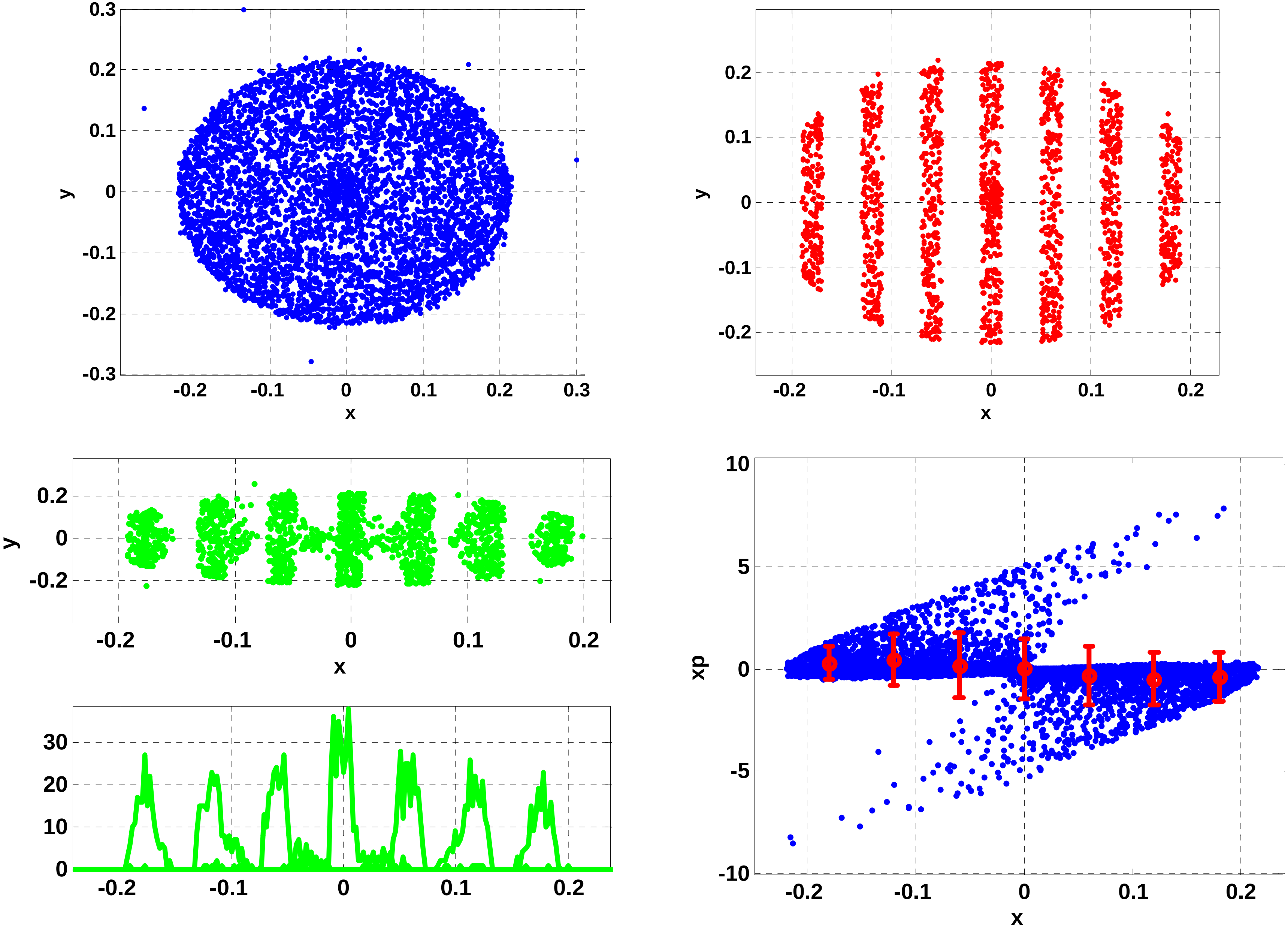
2 mm thick

0.1 mm slit width

0.8 mm distance

Matière: tungstène (fourni)
Epaisseur: 2 mm
2 pièces à réaliser

RF GUN CTF2 , Emittance Measurement



Desirable Measurements

- Beam current and position
  (fast WCM, BPR and Faraday Cup)
- Energy and energy spread, if possible time resolved
  (Spectrometer with OTR screen and a low power segmented dump)
- Emittance, if possible along the train
  (multi slit with OTR and ceramic screen,
  use of gated camera in principle possible)
- relative bunch length with wake field signal (BPR)
- use of a streak camera for longitudinal profile

Studies

- Study and verify single bunch beam parameters as a function of rf-parameters, laser parameters and focusing
  Establish best working point !
- Add bunches and investigate stability of beam parameters along the train
- Study rf pulse compression, velocity bunching and emittance compensation for future CTF3 installation, CLIC and general interest
- 3 GHz and 1.5 GHz beams
- Verification of the phase switch for CTF3

Comments

- Diagnostic session well advanced and should be ready for commissioning once the gun is available
- Emittance measurements will need some care and study
- Hired a doctoral student Öznür Mete to study the photo injector beam dynamics in detail
- Scheduling conflicts with drive beam commissioning have to be sorted out

Integration of the PHIN - Photo injector into CTF3

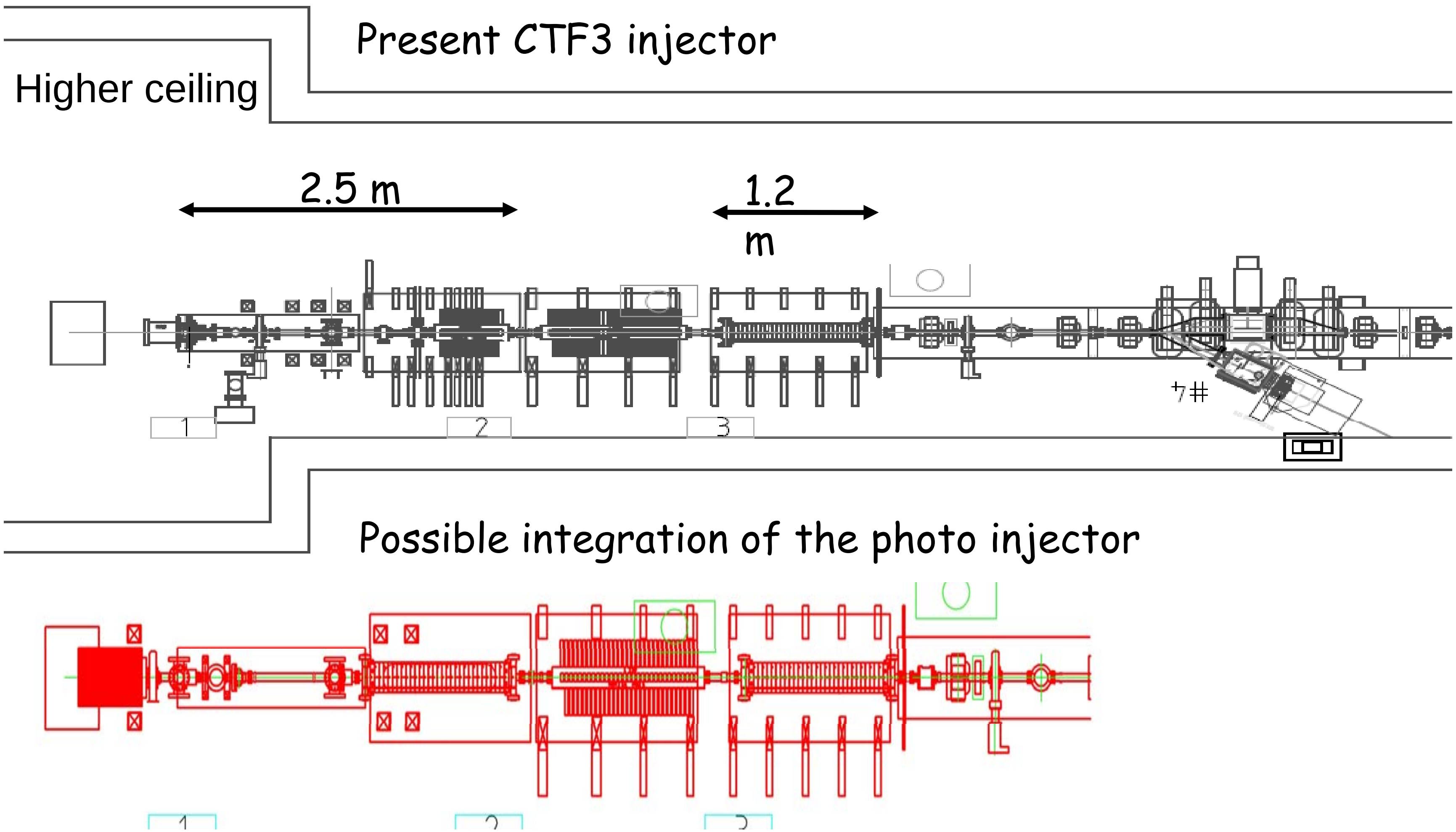
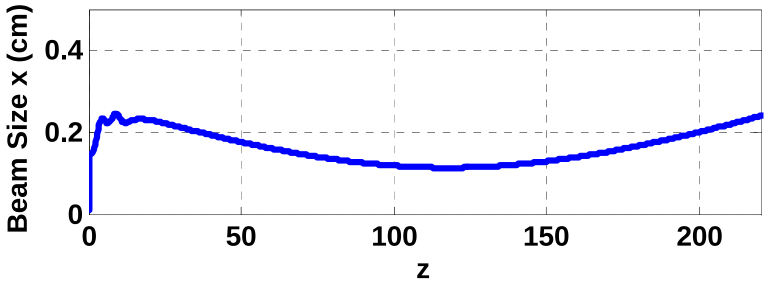
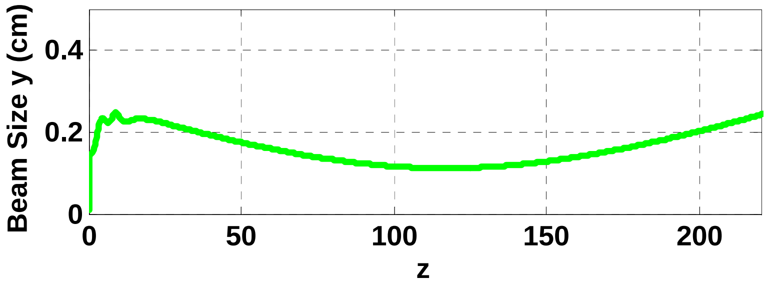


Photo injector integration

Option 1: rf-gun + 2 m drift to the first structure



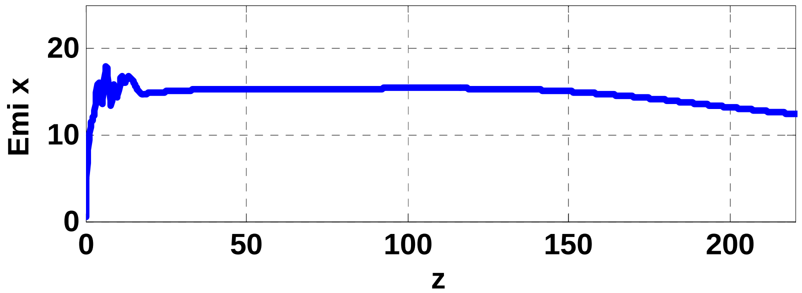


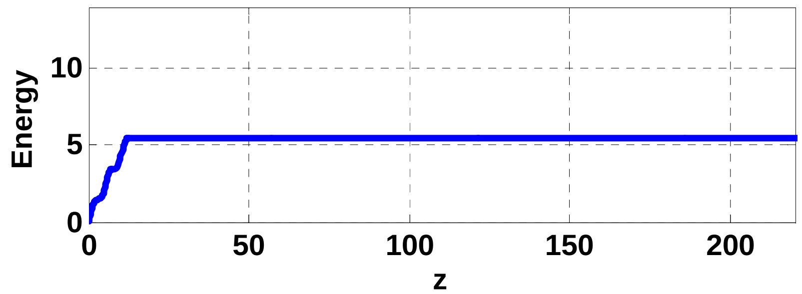
E= 5.4 MeV

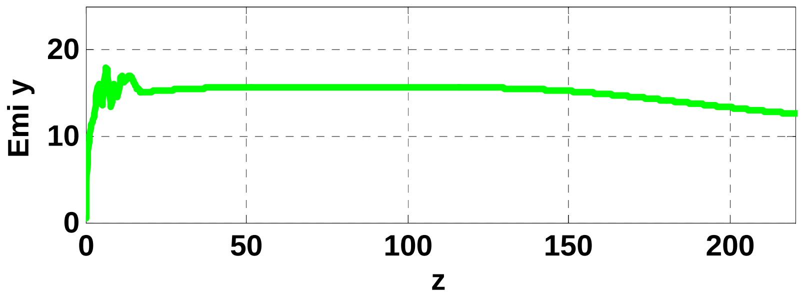
ΔE/E= 0.2 %

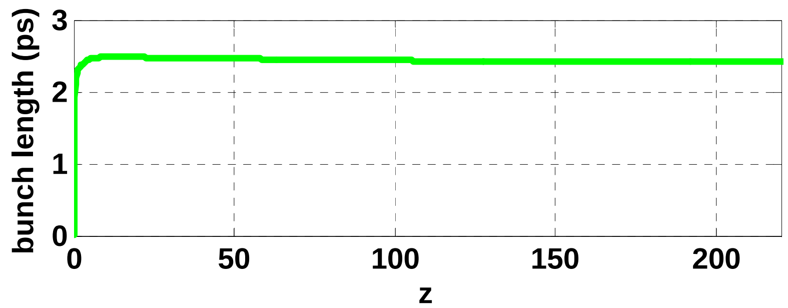
bl = 5.7 ps (FWHM)

ε_n = 11.9 μm

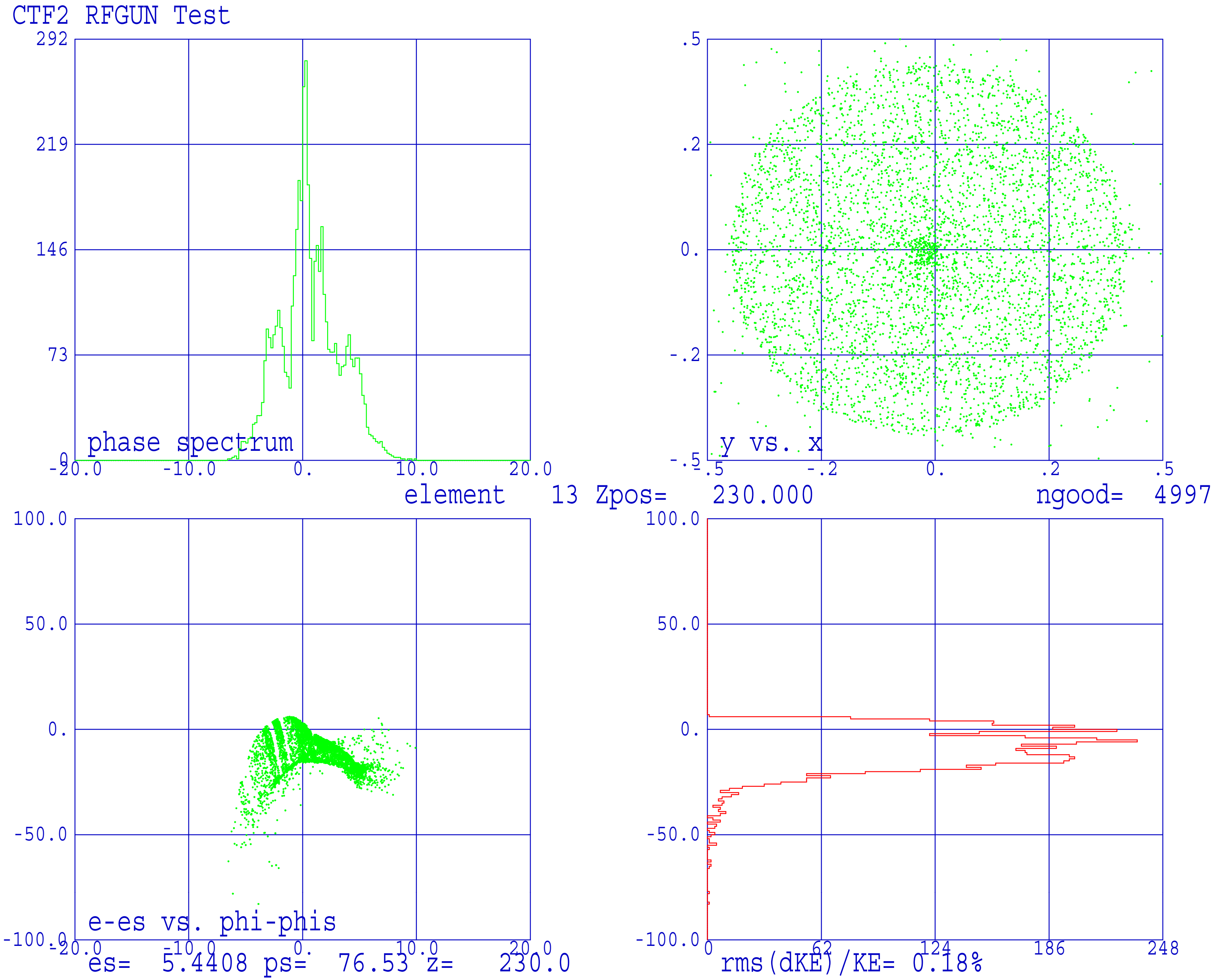








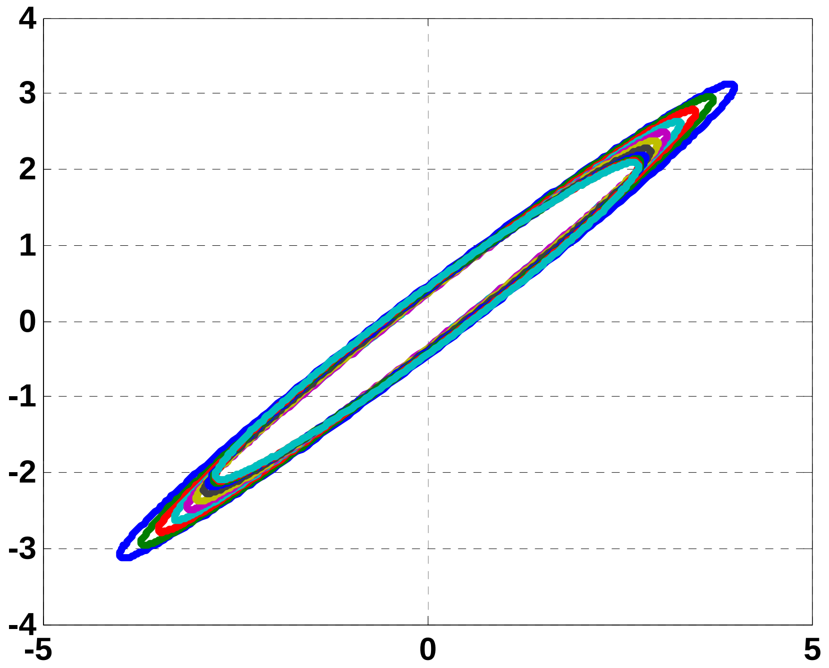
RF GUN in CTF3 , nothing for 2 meters



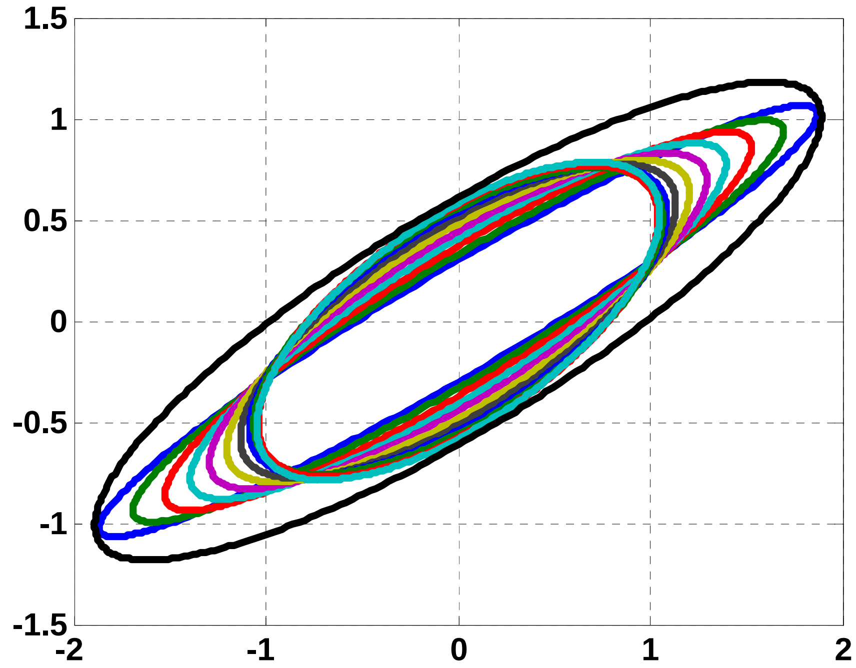
RF GUN with phase sag due to pulse compressor

Output phase space variation (horizontal)

Gun only



After one structure



Emittance: 1.8*Max = 30

RF GUN in CTF3 with velocity bunching

Phase: -25 / -90 deg

Energy:7.1 MeV

ΔE/E: 2.8 %

Bunch length: 2.0 ps

Emi: 14.6 μm