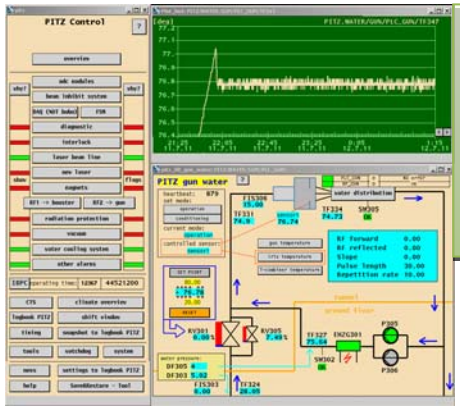
PITZ related tasks for summer students 2011

PPS, 19.07.2011

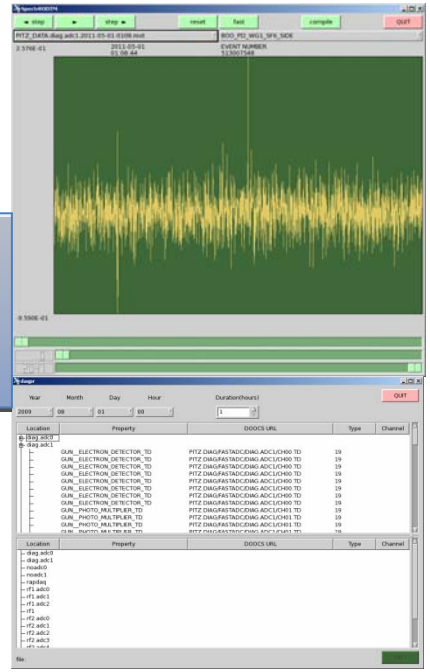
The stability of the RF gun phase for different operating conditions

Main aims:

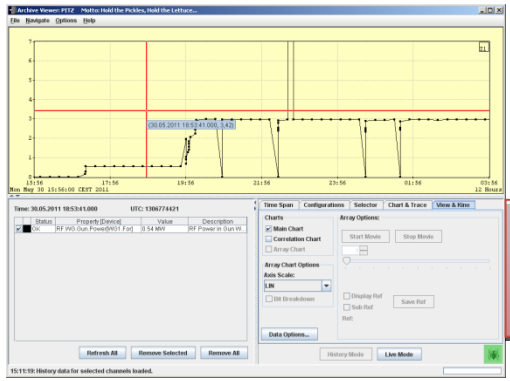
1. Extracting information from repository.
2. Data analysis.
3. Determination of the best working conditions.



GUI (Graphical user interface)



DAQ (Data Acquisition System)

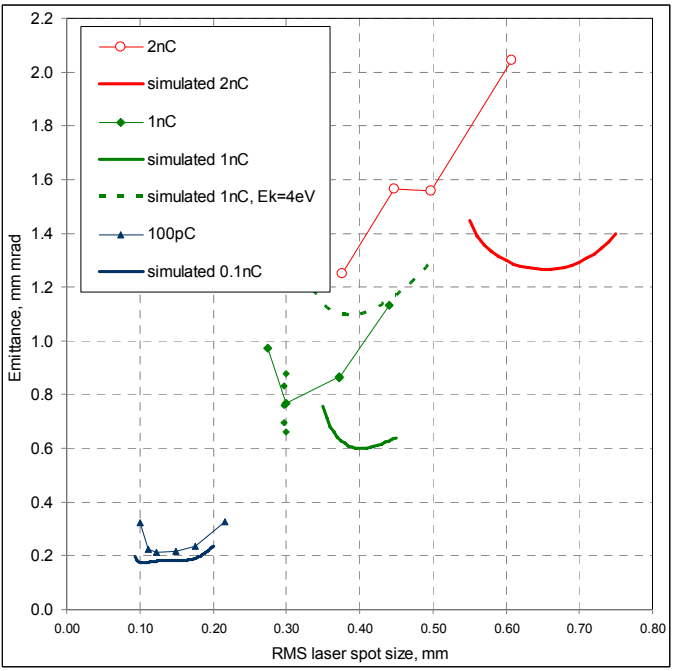


Archive Viewer TINE

contact person: Igor Isaev

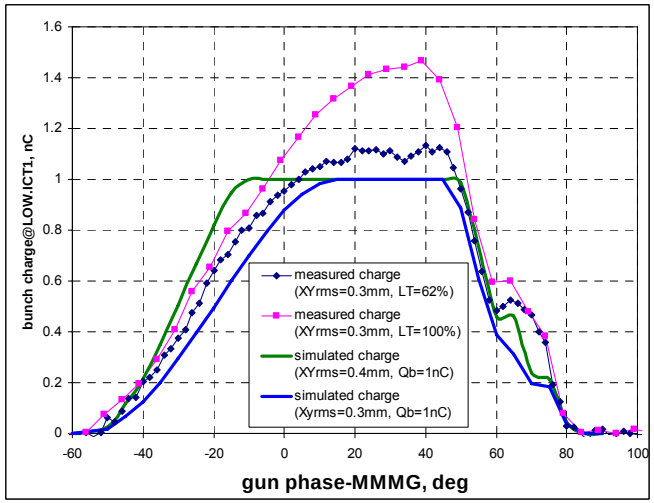
Detailed simulations of the measured emission characteristics

Measured and simulated emittance

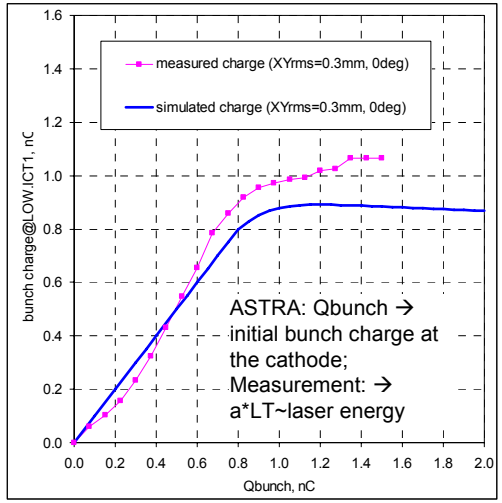


Reasons of the discrepancy? ➔ **emission**

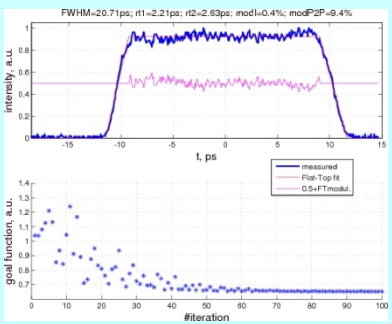
Measured and simulated Schottky scans

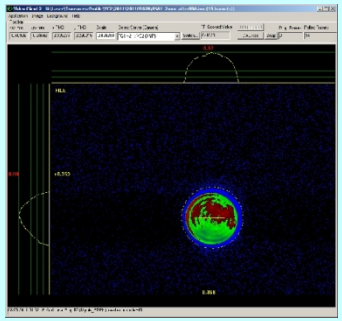


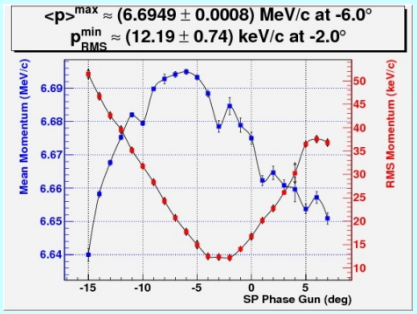
Measured and simulated laser energy scan



Measurements 08.05.2011N:



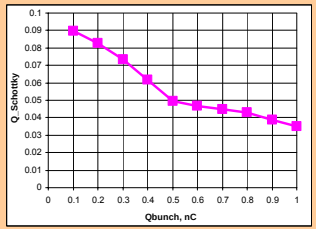




ASTRA simulations to be done:

Fit the measured Schottky (x2) scans applying ASTRA parameters: (Q0; Q_Schottky; Q_STR_SCHOTTKY)

$$Q = Q_0 + Srt\_Q\_Schottky \cdot \sqrt{E} + Q\_Schottky \cdot E$$

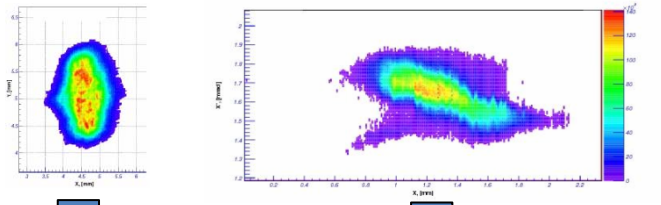


(Qbunch;Q_Schottky) to produce 1nC at the phase ϕ*

Preliminary!

contact person: MK, MO

Beam halo treatment in the measured data



X-projection ≠ X-projection

$$\left(X_{rms}^{EMSY}\right)^2 = (1-\mu)\sigma_{x0}^2 + \mu\sigma_{xh}^2$$

Core-halo model

$$F(x,x') = F_{halo}(x,x') + F_{core}(x,x')$$

$$\mu = \frac{\iint F_{halo}(x,x')dxdx'}{\iint F(x,x')dxdx'} = \frac{Q_{halo}}{Q_{total}} << 1$$

Measured emittance scale procedure

$$\varepsilon_{nosc} = \beta\gamma\sqrt{\langle x^2\rangle\langle x'^2\rangle - \langle xx'\rangle^2} \Rightarrow \varepsilon_{sc} = \varepsilon_{nosc}\cdot SF$$

$$SF = \frac{X_{rms}^{EMSY}}{\sigma_{x0}} \Rightarrow ? \Rightarrow SF_{cor}^2 = \frac{\varepsilon_{nx}^2}{\varepsilon_{nosc}^2} = \frac{SF^2}{1-\rho_0^2}\left\{1+\eta^2-\mu\right\} - \frac{\rho_0^2}{1-\rho_0^2}\left[1+\xi\eta-\mu\right]^2$$

Expected output:
Matlab script(s) to be applied to the measured data

Tasks:
- Check the model
- Script to read/convert imc-files into Matlab objects
- Step-by-step implementation
  - Halo parameter μ estimation
  - Halo divergence η estimation (using MOI)
  - Corrected scale procedure implementation

contact person: MO MK

Tomography measurements: programming

C/C++ development

- There is some huge amount of code used to build a GUI for tomography (~ 15k lines)
  - input parameters
  - data taking and analysis…
- Part of it is redundant
- Task: decrease the (redundant) amount of code, functionality stays as it is

- Requirements: C/C++, ROOT
- Provided: code and algorithms, Makefiles

contact person: Galina Asova