

## *The problems + agenda*

### •The problems:

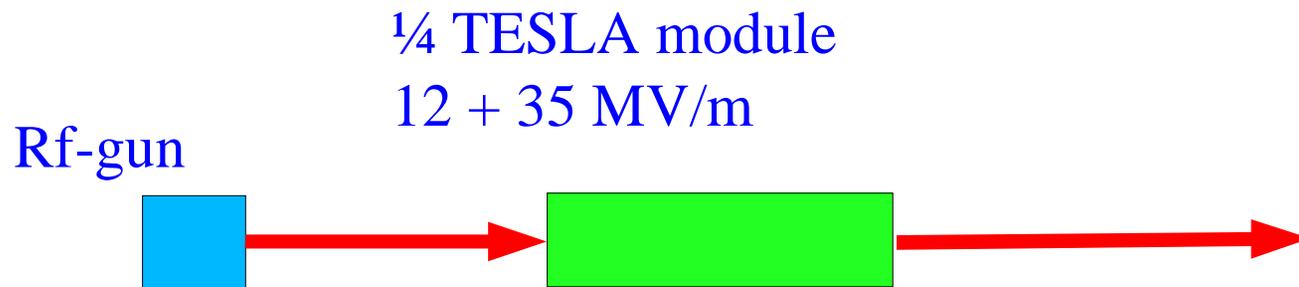
- Longitudinal profile:
  - bandwidth fluctuations
  - Short term fluctuation is the killer especially since we cannot quantify (measure) on a shot-to-shot basis
- Transverse non uniformity:
  - Essentially related to  $2x\omega$  crystals
  - Maybe easy fix: relay imaging transport line (N Barov), micro lens array (P. Piot interacting with H. Tomizawa of Spring-8)

### •Agenda:

- Some specs (P. Piot)
- Recent measurement on oscillator (J. Santucci)
- Proposed upgrade for the laser system (N. Barov)
- Discussion + how to proceed (All)

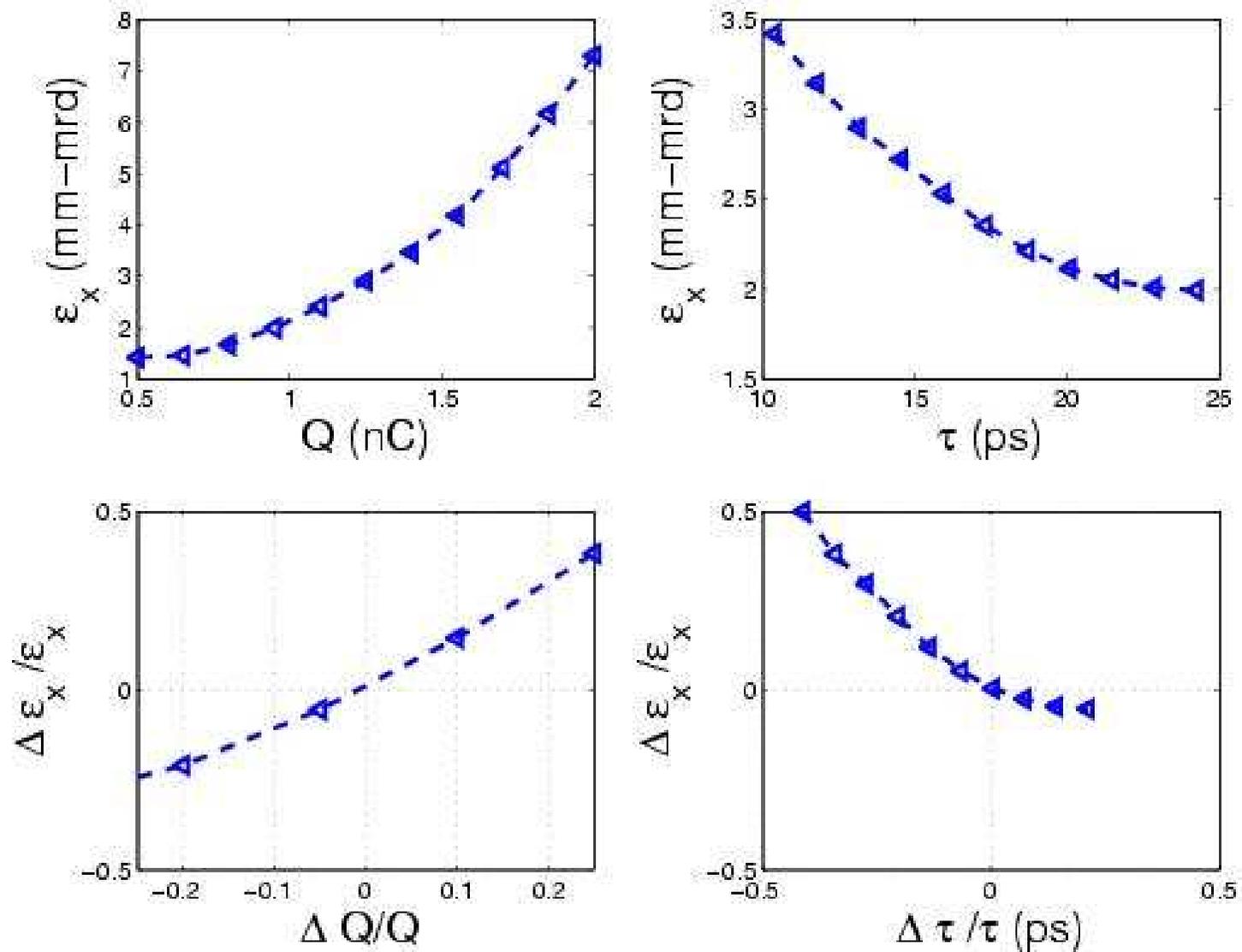
## *Laser for A0 future upgrade(s)*

- Consider A0 after energy upgrade + some optimizations
- Consider the academic case of a 20 ps uniform laser, with 0.75 rms spot size on the cathode (close to TTF-2/XFEL working point parameters) –  $E=40$  MV/m on cathode
- Nominal emittance about 2 mm-mrad at 1 nC
  
- Look at charge/length fluctuations around the nominal parameters



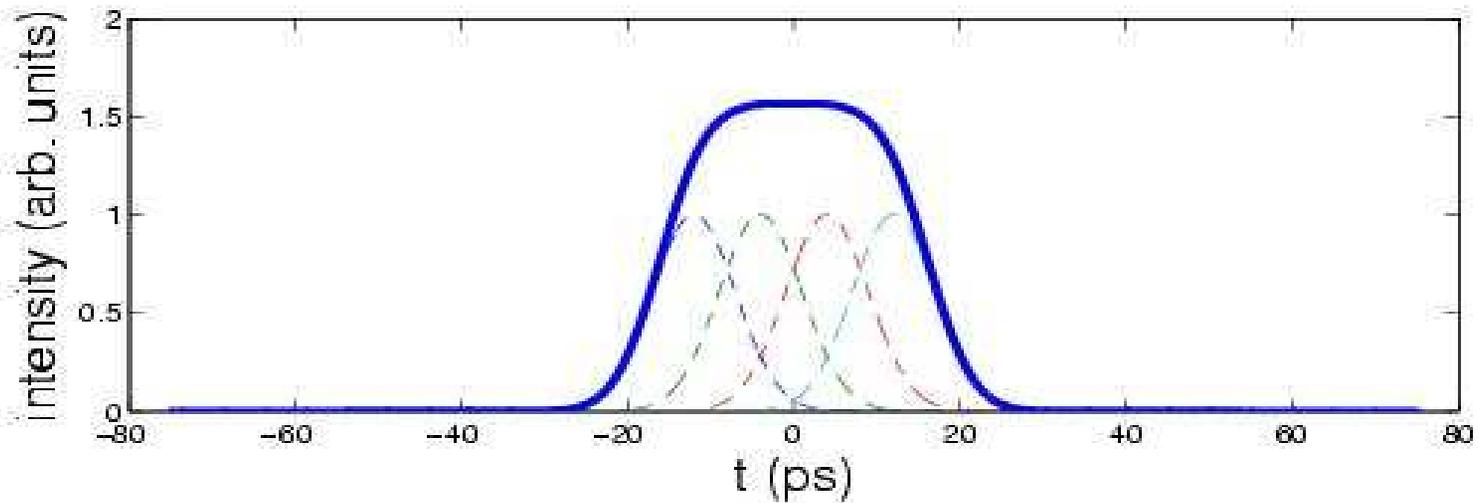
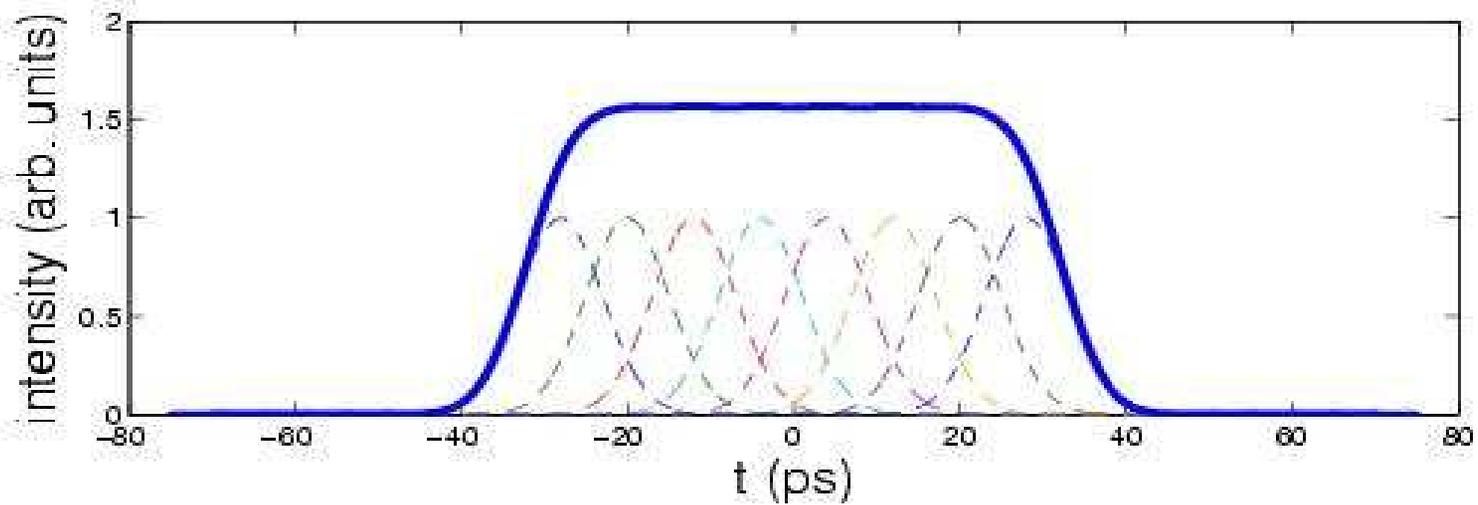
Really should do error studies using a Monte-Carlo

## *Influence of charge/pulse length fluctuations*



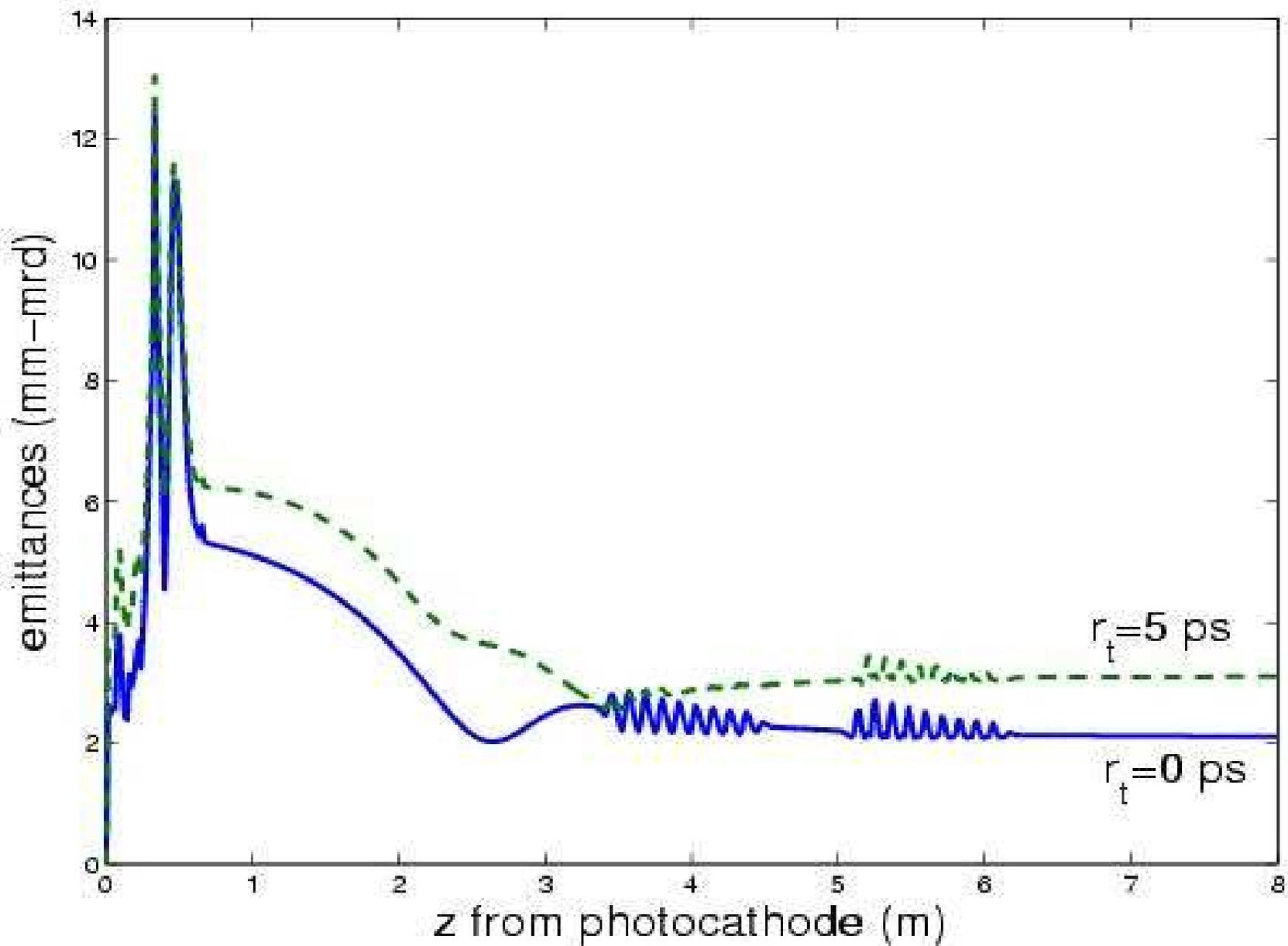
- Currently rms  $Q$ -fluctuation: 15-20 %  $\Rightarrow$   $\varepsilon$  fluctuation: -/+ 25 %
- No idea about length fluctuation but measured 2.5 to 5 ps

*Real life not a “squared” pulse but stacked*



- If UV pulse is 5 ps stacking 4/8 pulses will give 10/20 ps flat top but rising time  $\sim 5$  ps

## *Influence of rising time*



## *Some comments + questions*

### •Pulse length

- We should try to have the possibility later to get a rise times smaller than 5 ps
- Nevertheless  $\tau=5$  ps should support some interesting Physics, i.e looking at the emittance blow-up in the head/tail of the bunch using the 3.9 Ghz deflecting mode cavity
- At the moment does anybody has a clear understanding on how map the oscillator  $\Delta\omega$  on UV laser pulse length?

### •Charge:

- Would be nice to maintain charge fluctuation at the 5 % level (used to be commonly achieved at DESY TTF-1)

### •Transverse uniformity:

- Need to be cured also but is independent of oscillator ?