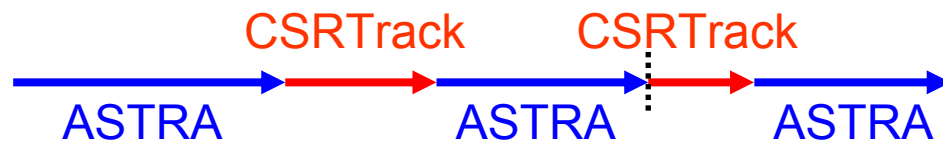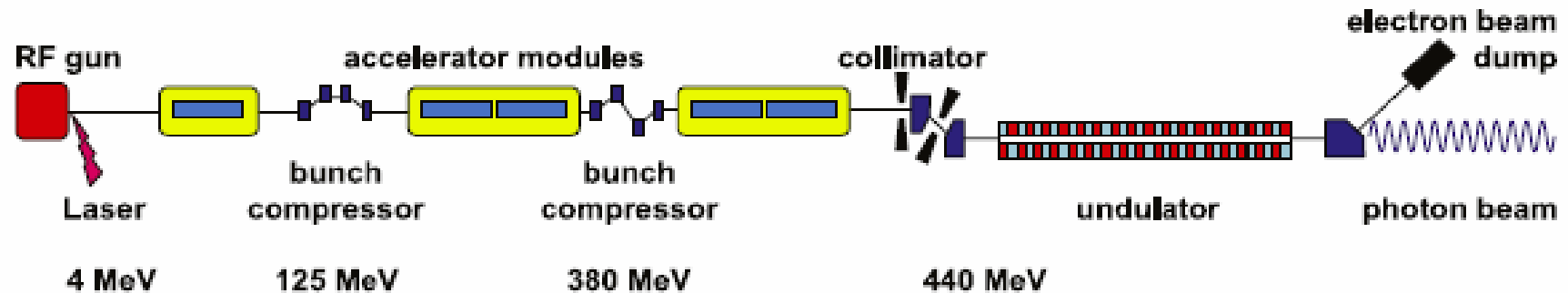# New VUV-FEL Simulation results

27.3.2006 Bolko Beutner

Motivation

- Goal : Observation of CSR Effects with LOLA

- Idea :
    - Use BC3 to achieve higher peak current and have a less complicated situation
    - Over-Compression in BC3 to reduce Space Charge Effects behind BC3

Start to LOLA simulations
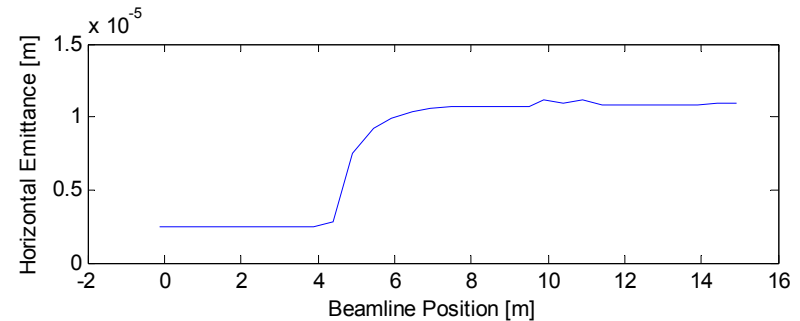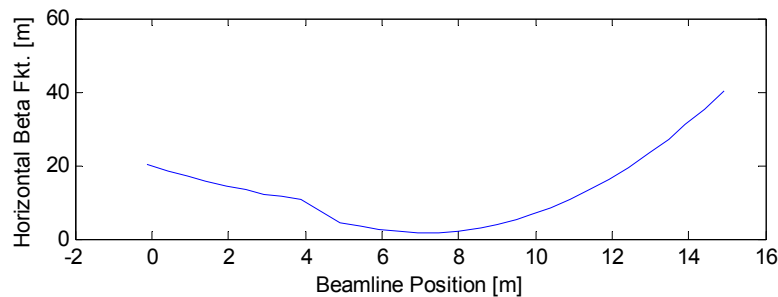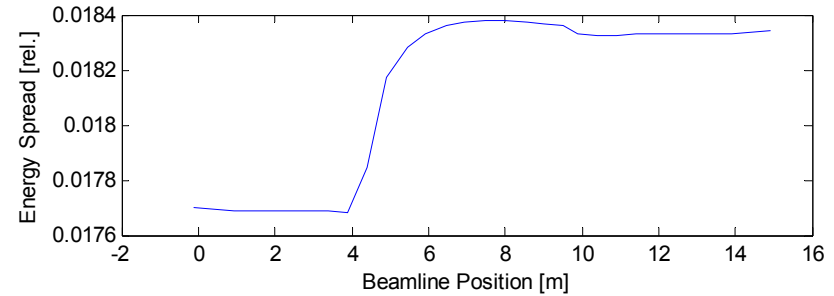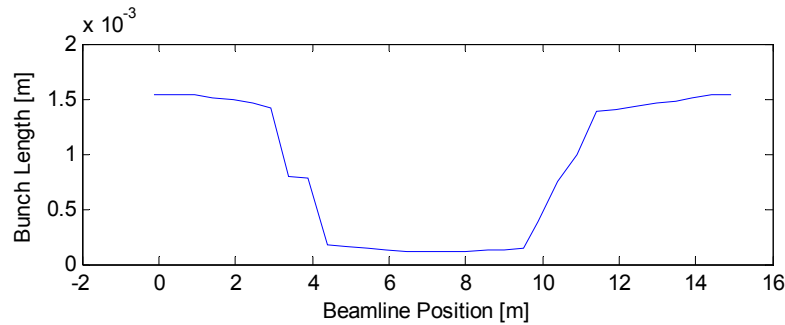

ACC1 :   on crest

ACC23 : maximum compression -28deg
        simulations with -40deg

BC3:   R = 5.3 m
         R_{56}=-0.099369

Bunch Charge :   2nC
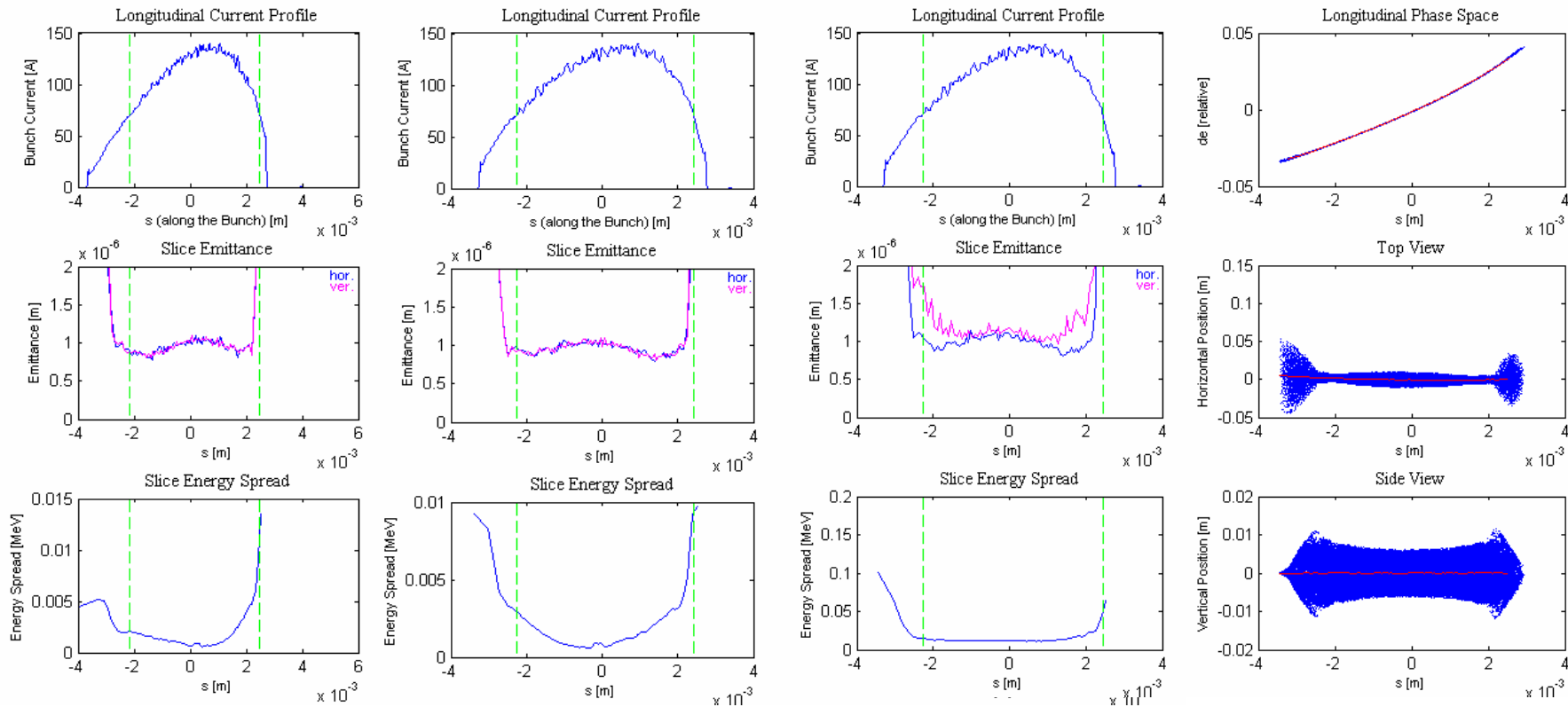
Bunch Length :   1,5 mm

Evolution along BC3
at -40deg off crest

At 40 deg off crest the bunch length after BC3 is the same as before. The Bunch is longitudinal flipped.

Energy spread and emittance growth indicates small interaction Region at the 3rd Dipole of BC3.
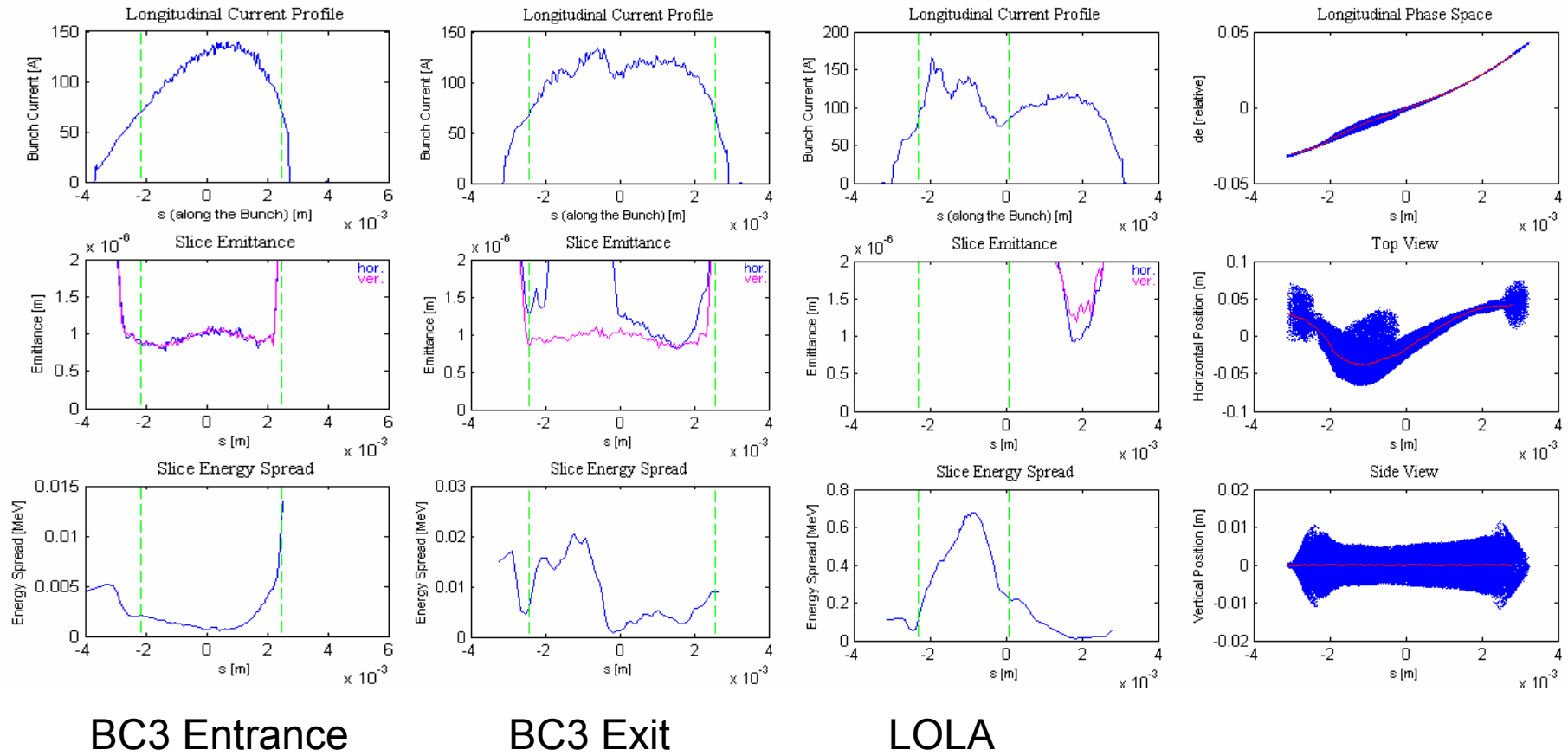
s2e without CSR

BC3 Entrance   BC3 Exit   LOLA

s2e with CSR

BC3 Entrance   BC3 Exit   LOLA

Interpretation

- Numerical Errors?
  - Results are stable under changes of tracking step width and smoothing parameters.
  - Always the same initial (BC3 entrance) Particle Distribution were used.
- Physics
  - CSR energy modulations at the Spike lead to longitudinal density changes. These longitudinal density modulations are the transported to the tail of the bunch in BC3.
  - Due to longitudinal Space Charge these Modulations are amplified.

Next Steps

- Use of different initial particle distributions
- Space Charge Effects within BC3 (Greens Function Method, ASTRA?)
- Scans of R, Phase, Charge.
- Complete ASTRA simulations (including CSR)

- Measurements at LOLA
  - Comparison of on crest and ~40 deg case