Emittance vs Intensity (~LHC beams)

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LIU injection meeting

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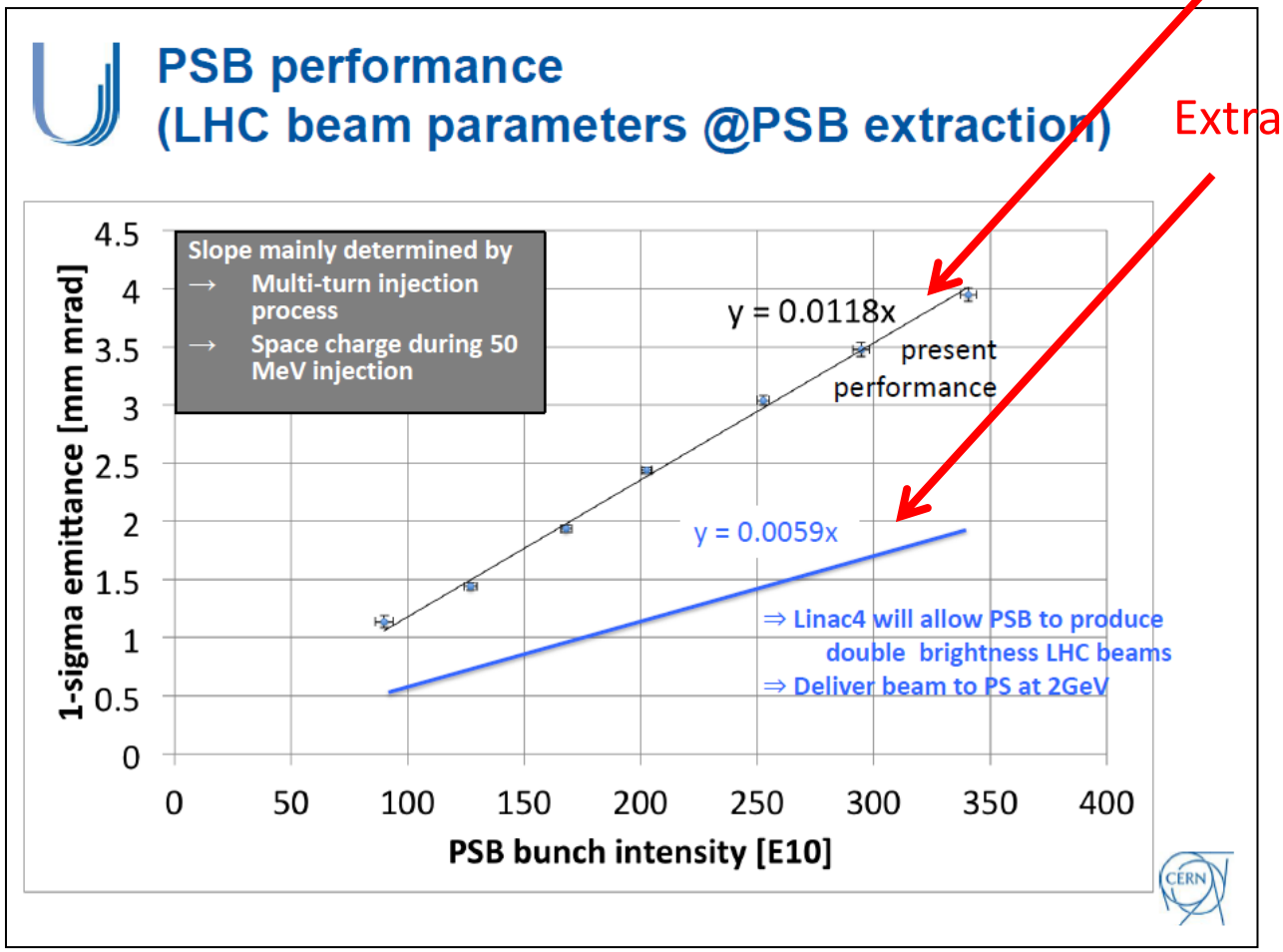
Emittance vs. Intensity curve

- Simulate the curve with Linac4



Measured

Extrapolated ~$\beta\gamma^2$

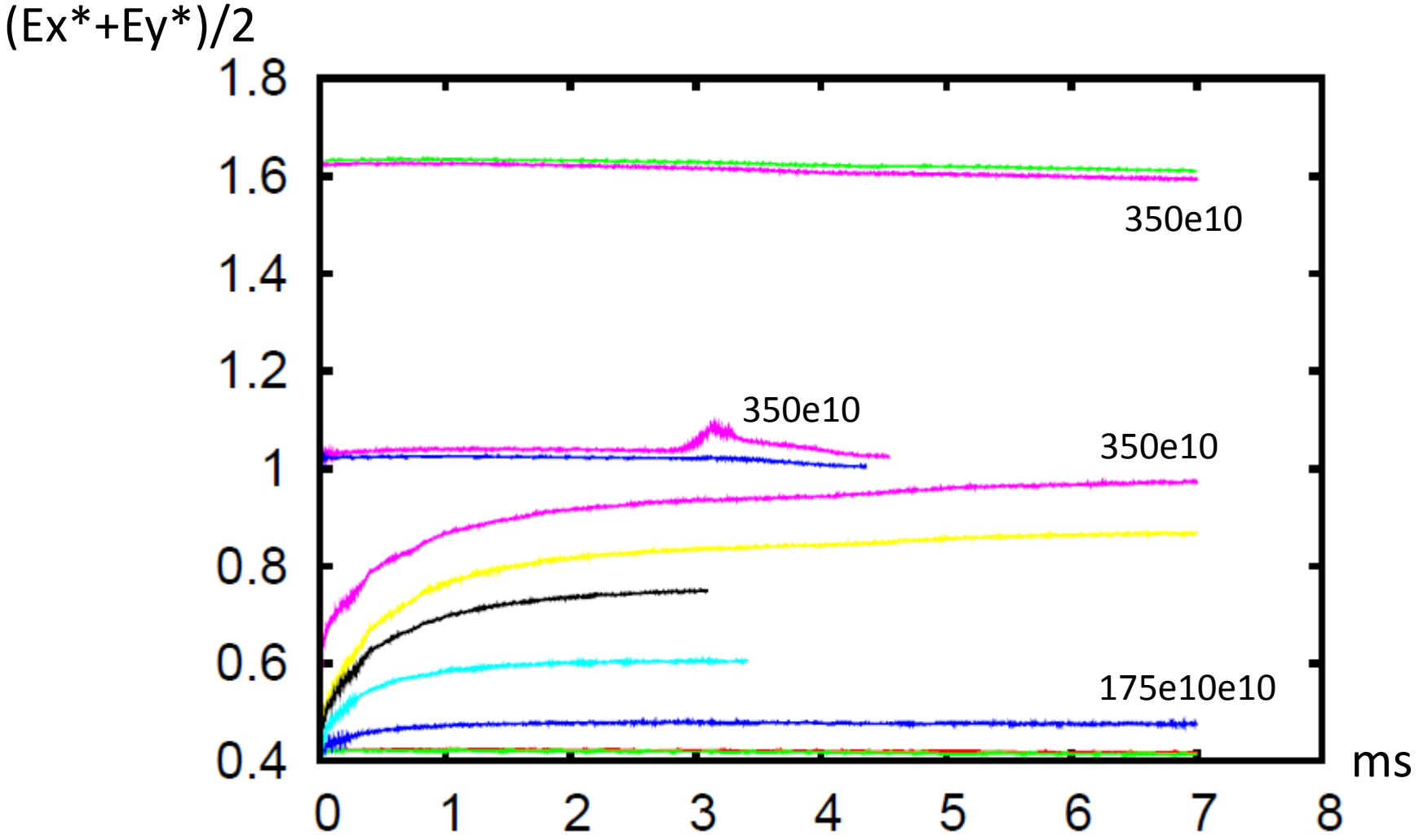
Simulations with PTC-Orbit

- Transversely MATCHED distribution (Gaussian) (*)
  - With a given emittance
  - Scan on the Intensity
  - Scan on the working point
- Let it evolve for ~7ms, during the fall of the chicane bump
- Quadrupolar errors at the BSW + eddycurrents + Compensation QDE3, QDE14 (time varying)
  - Beta-beating (mostly in vertical)
  - Excitation of half-integer
  - Excitation of the integer line

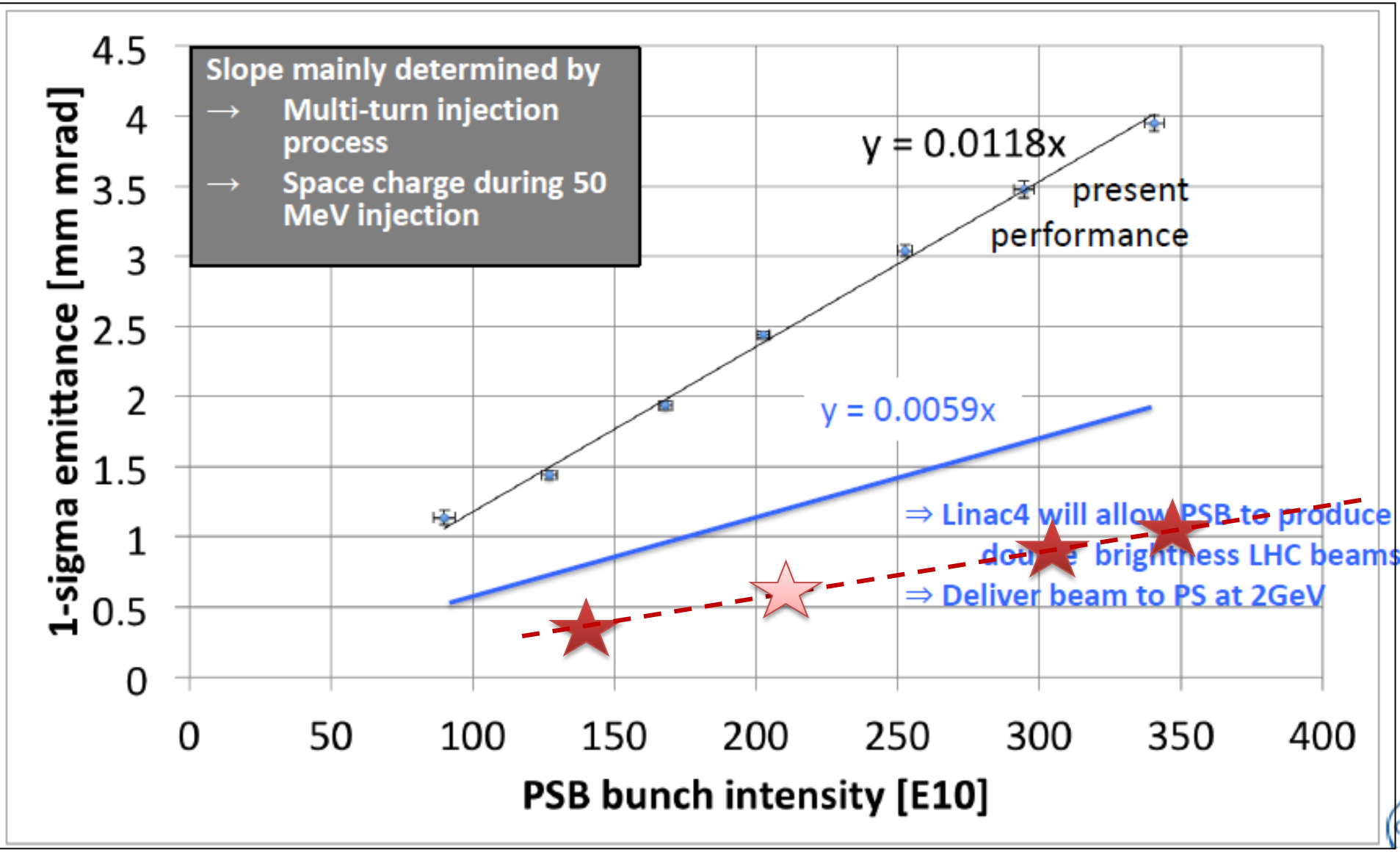
Should be enough… (?)

(*) In longitudinal (for the time being): I let a “rectangular” distribution evolve in an accelerating bucket, h1+h2. NOT YET optimized…

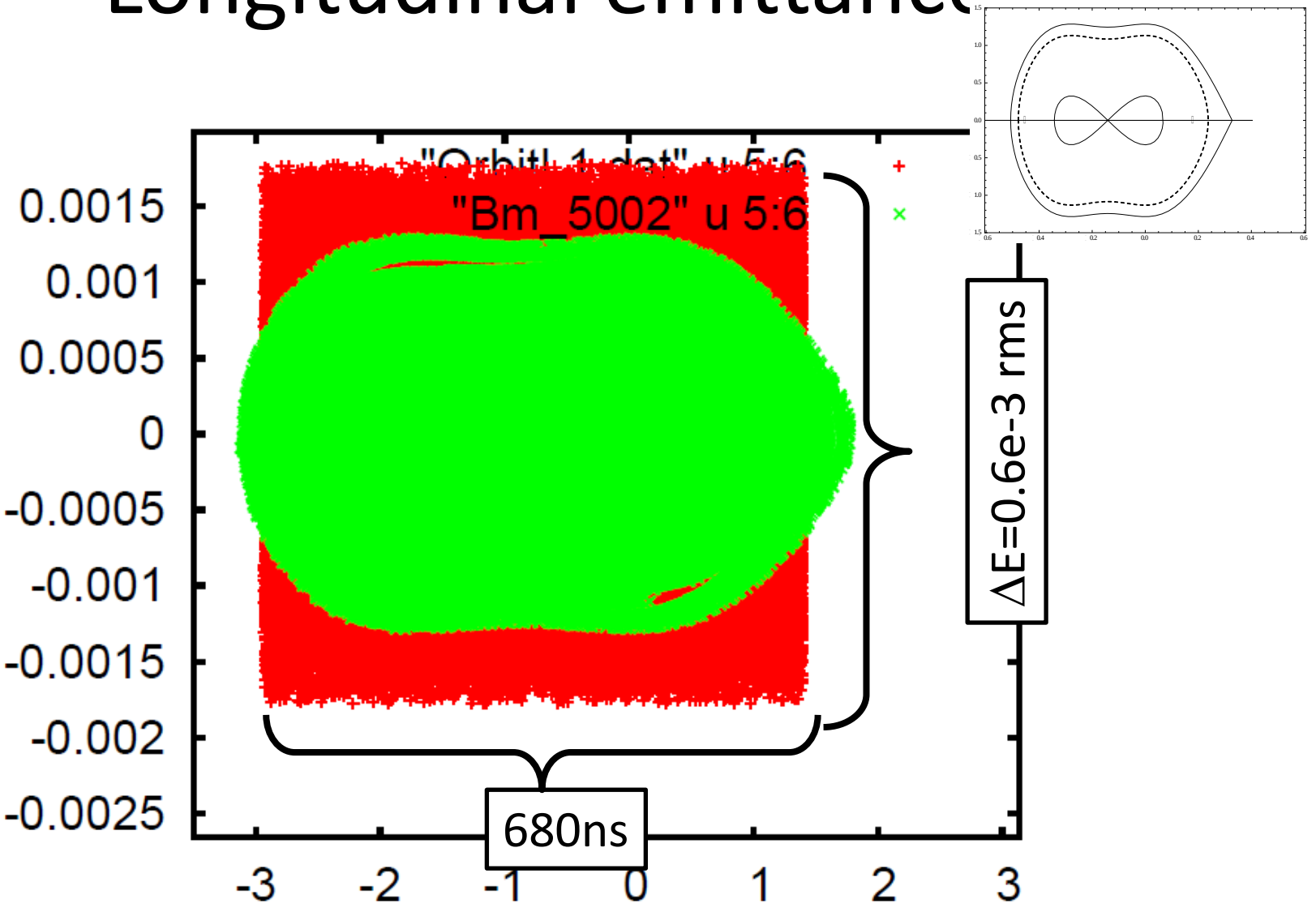
Emittance evolution



…Forgive me for the zoo of lines !!!


Slope mainly determined by
→ Multi-turn injection process
→ Space charge during 50 MeV injection
y = 0.0118x
present performance
y = 0.0059x
⇒ Linac4 will allow PSB to produce double brightness LHC beams
⇒ Deliver beam to PS at 2GeV
1-sigma emittance [mm mrad]
PSB bunch intensity [E10]
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
0
50
100
150
200
250
300
350
400

Longitudinal emittance



Summary

- First ~rough approach
- Assuming no specific L4 intensity, no painting, Gaussian beams.
- Longitudinal emittance should be computed!!!

- Scan on the working point:
  - Expect some gain in the H plane if going far from Qx=4.0
  - It should work since not a conventional MultiTurn inj (losses at septum!).

What does it happen if transverse painting @ different Qx?