

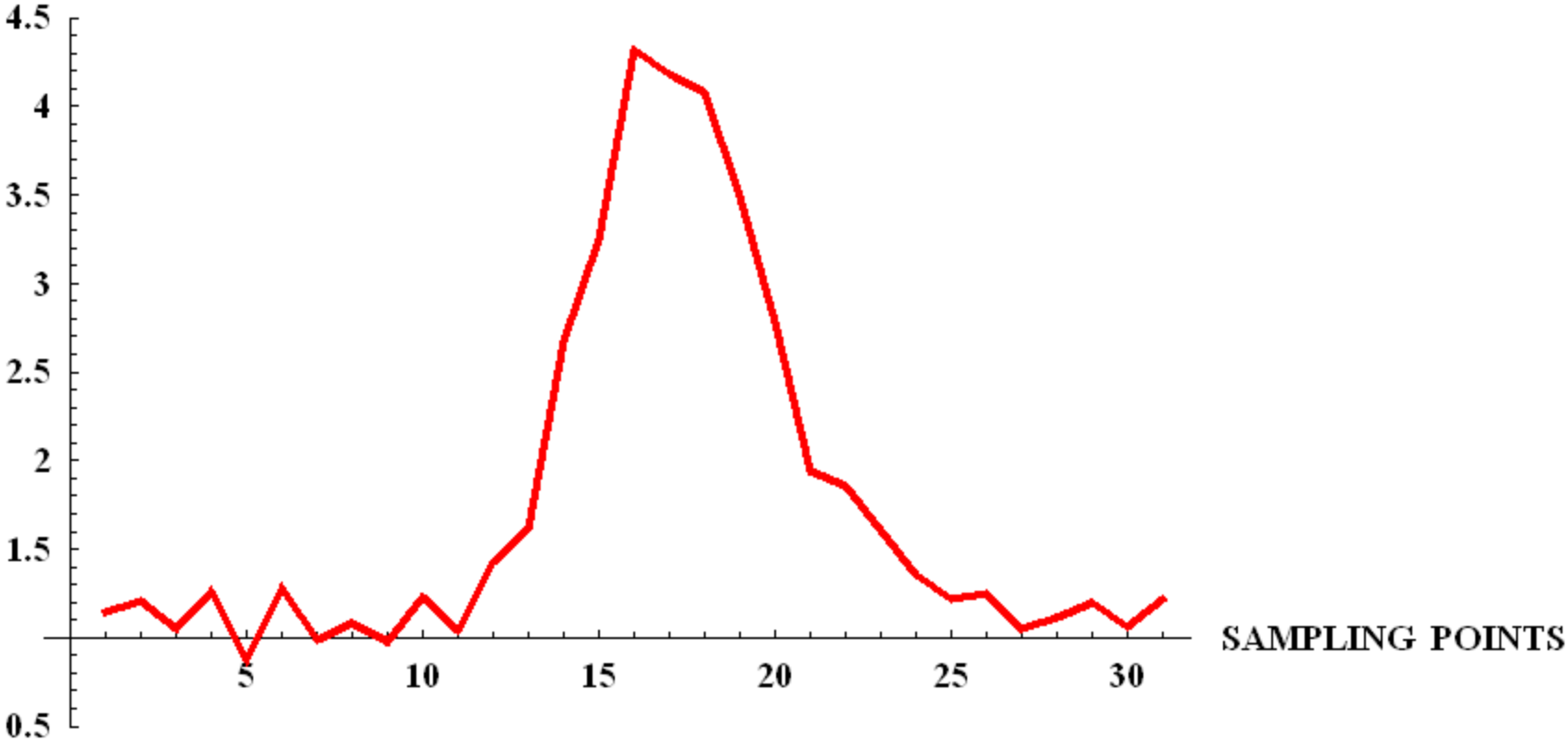
BUNCH SHORTENING WITH THE LHC BEAM ON THE SPS INJECTION FLAT-BOTTOM

Elias Métral and Giovanni Rumolo

- ◆ **Animation of the evolution of the longitudinal bunch profiles**
 - **For the 1st, 35th and 72nd bunches**
 - **Time between the traces = 16.8 s**
 - **Total number of traces per bunch = 38 (the total acquisition time of the coast, COAST6, was $37 \times 16.8 \text{ s} = 10.36 \text{ min}$)**
- ◆ **Reminder: PS controlled experiment in 2003**

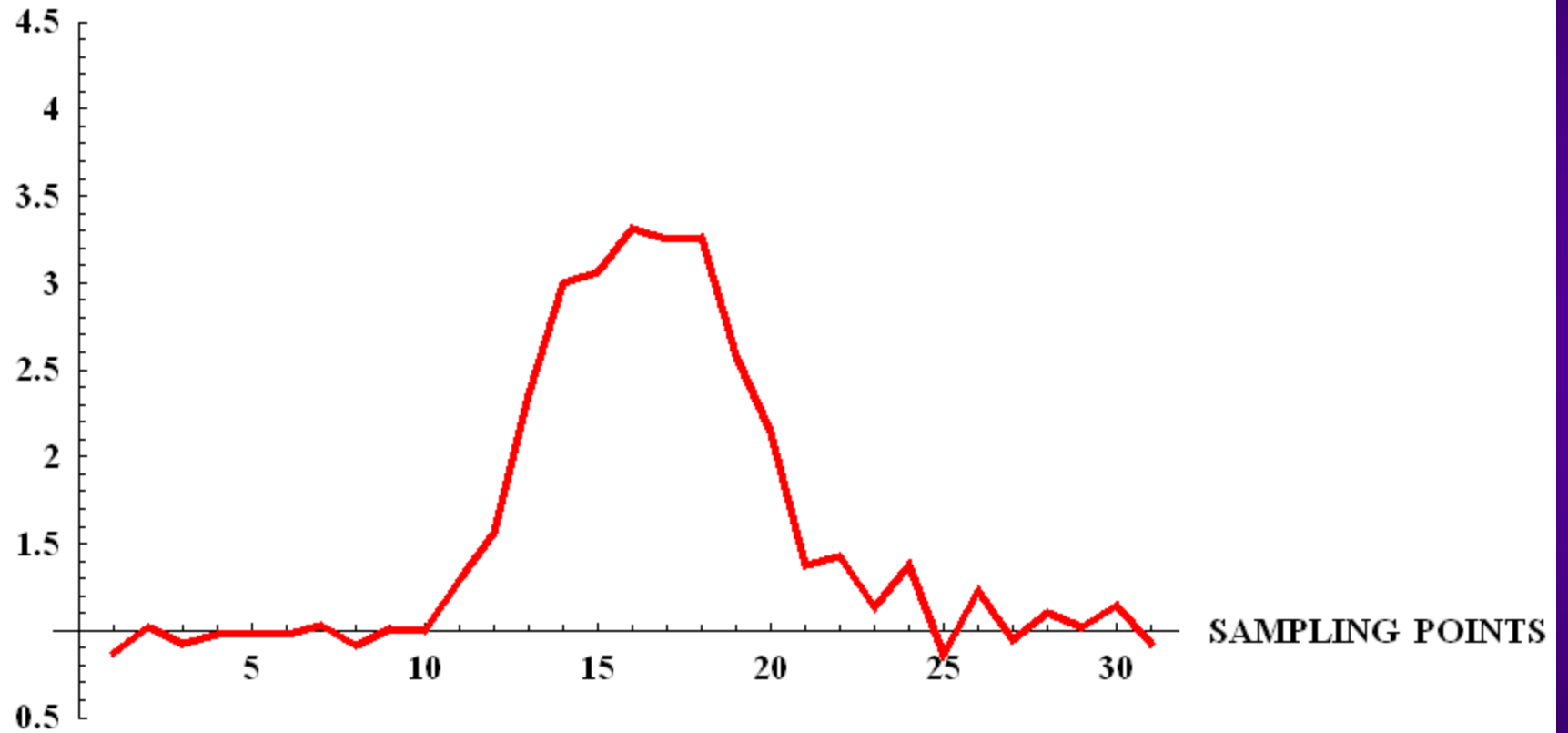
Evolution of the 1st bunch

LONGITUDINAL PROFILE



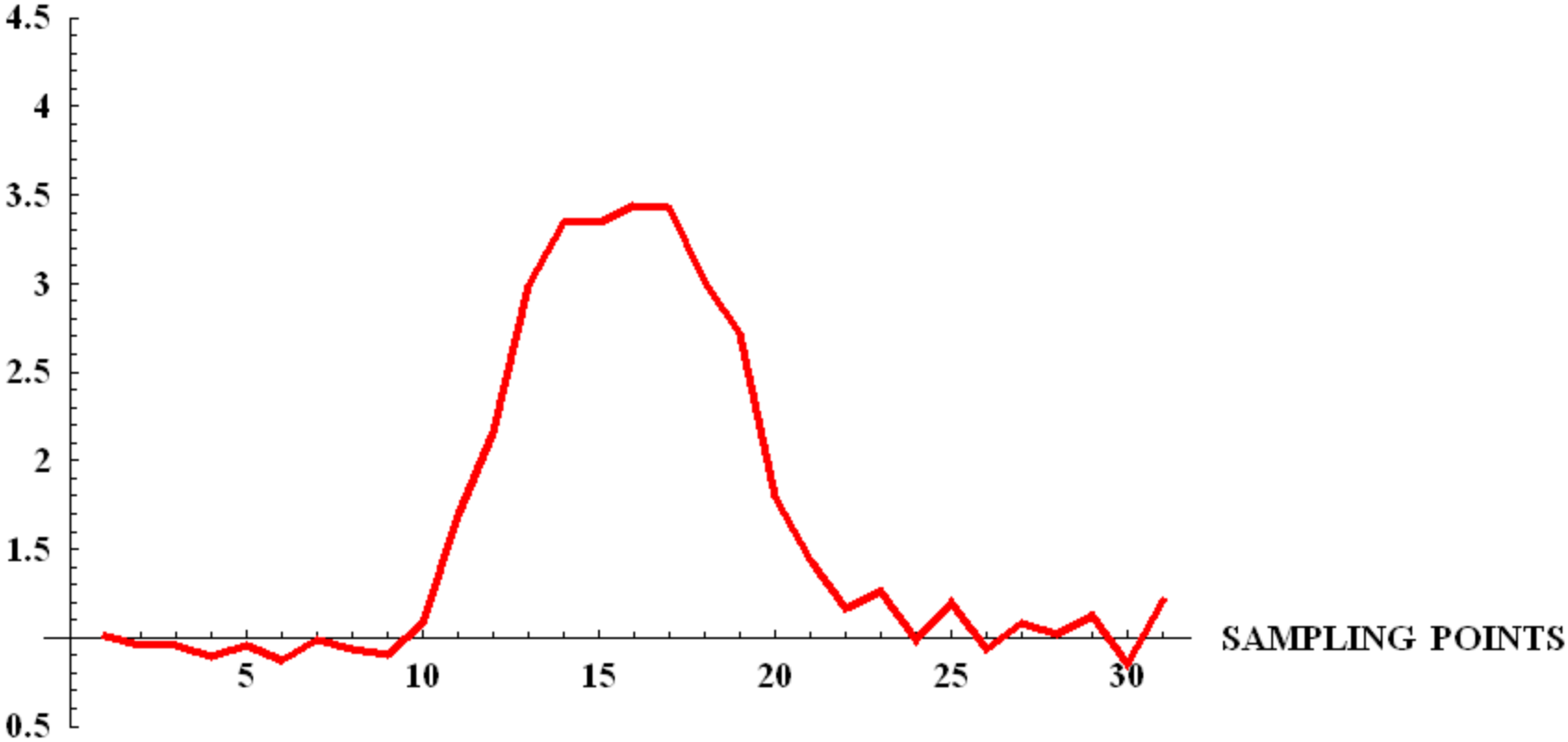
Evolution of the 35th bunch

LONGITUDINAL PROFILE



Evolution of the 72nd bunch

LONGITUDINAL PROFILE



PS controlled experiment in 2003 (1/2)

- ◆ Mechanism anticipated by G. Franchetti & I. Hofmann, which involves
 - Space charge tune spread
 - Nonlinear (octupole) resonance
 - Synchrotron motion

Q_y

Regime of loss-free core-emittance blow-up

2D (x&y)
space charge
tune spread

$$4 Q_x = 25$$

Q_x

Q_y

Regime where continuous loss occurs \Rightarrow Due to longitudinal motion

Particles diffuse
into a halo

Q_x

PS controlled experiment in 2003 (2/2)

