Analysis of aperture measurements

C. Alabau Pons, M. Giovannozzi, G. Mueller,
S. Redaelli, F. Schmidt, R. Tomás

LCU meeting (09-02-2010)

LHC aperture measurements

	Horizontal
Beam 2	+8 / -7 nom sigma MQY.5R6 MQ.11R6 / MQY.4L6 MQY.5R6 MQM.6L8

n1 computed with:
- measured optics
- nom apert and tol
- c.o. = meas ref orbit

n1 computed with:
- measured optics
- nominal aperture
- no tolerances
- meas optics
- c.o. = ref orbit + diff(x_meas,x_nom)

Beam envelope computed with the measured optics and $\varepsilon_{x,n}$= 15.0 umrad

x-h-r-h_{prof}

x meas orbit + 3sig env

n1 nominal (4 mm c.o.)

	polarity	x_nom (m)	x measured orbit (m)	x 3σ envelope (m)	x measured total (m)	x ref orbit (m)	n1 nom	n1 model	n1 meas	n1meas - n1 model (%)
MQY.4L6	+1	0.027358	0.016000	0.012000	0.028000	0.0000	7.93	9.90	10.25	3.5
MQY.5R6	+1	0.027290	-0.013000	0.014000	0.027000	0.0020	7.99	7.74	8.17	5.6
MQM.6L8	+1	0.020779	-0.012000	0.009000	0.021000	-0.0030	8.42	8.87	9.57	7.9
MQ.11R6	+1	0.020404	-0.005000	0.008000	0.013000	0.0030	8.52	8.52	4.81	-43.5

No reliable measurement

LHC aperture measurements

MQ.11R6.B2

Phase of the free oscilation (degrees)	meas orbit (mm) (positive amplitudes)	meas orbit (mm) (negative amplitudes)
0	9	-2
30	0	5
60	-6	10
90	-7	13
120	-6	14
150	-5	11

losses were noted at phase 150, but it is not the maximum amplitude achieved during the measurements

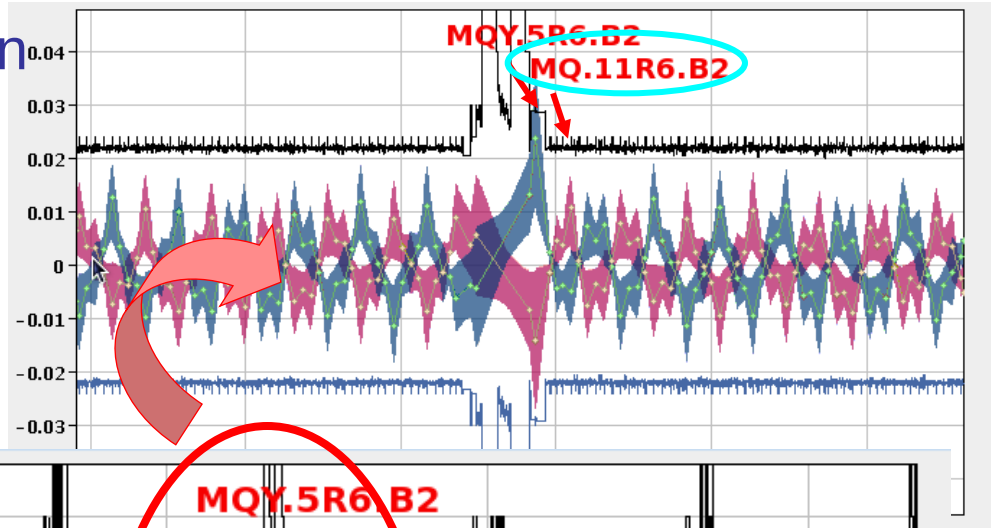
Possible emittance growth during the measurements

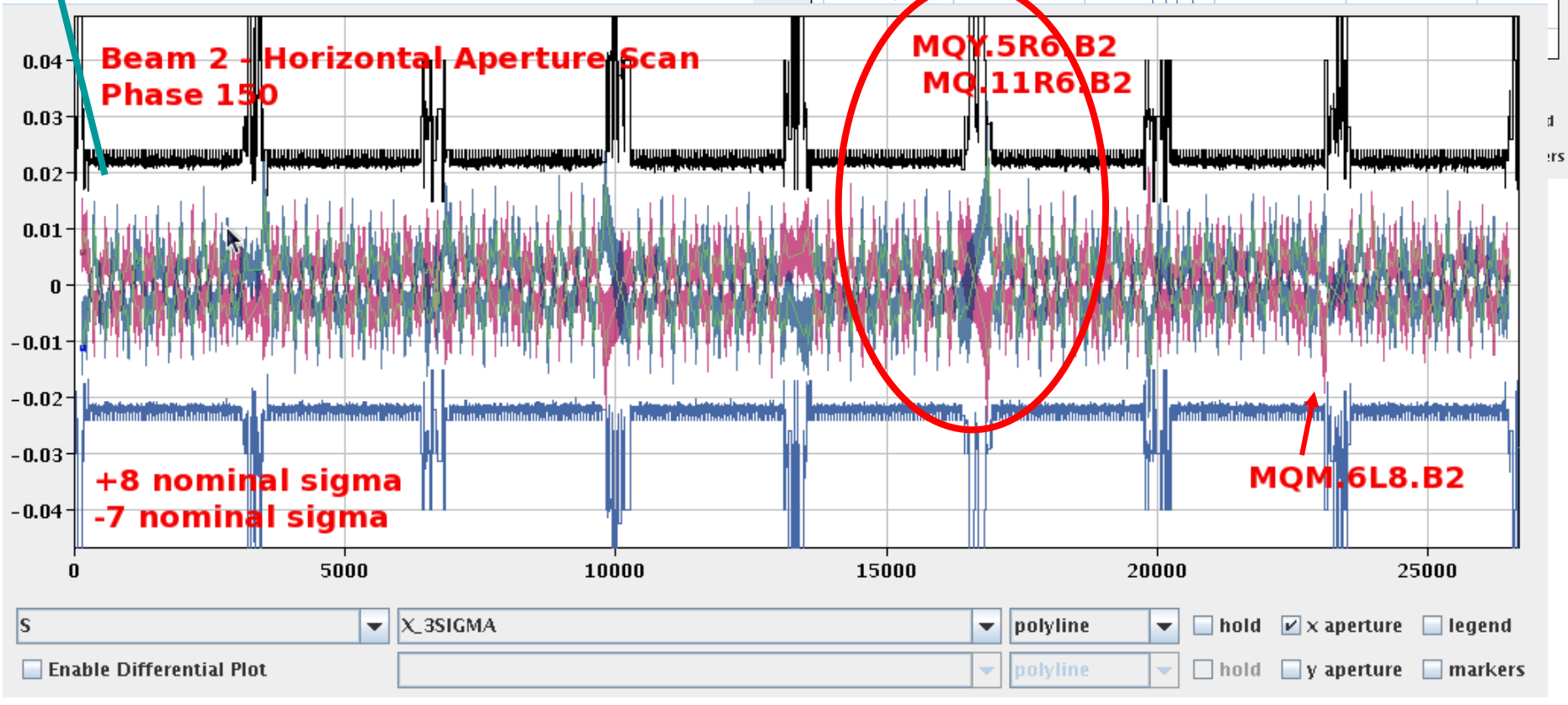
LHC aperture measurements

Beam 2 – Horizontal aperture scan

Beam envelope added (3 σ) computed with the measured optics and

$\varepsilon_{x,n}$= 12.7 umrad





Conclusions

- No evidence of bottlenecks

- Measurement procedure reviewed:
  → need to have systematic emittance measurement for each aperture scan