FIRST RESULTS OF THE 2006 COLLIMATOR IMPEDANCE MEASUREMENTS IN THE SPS

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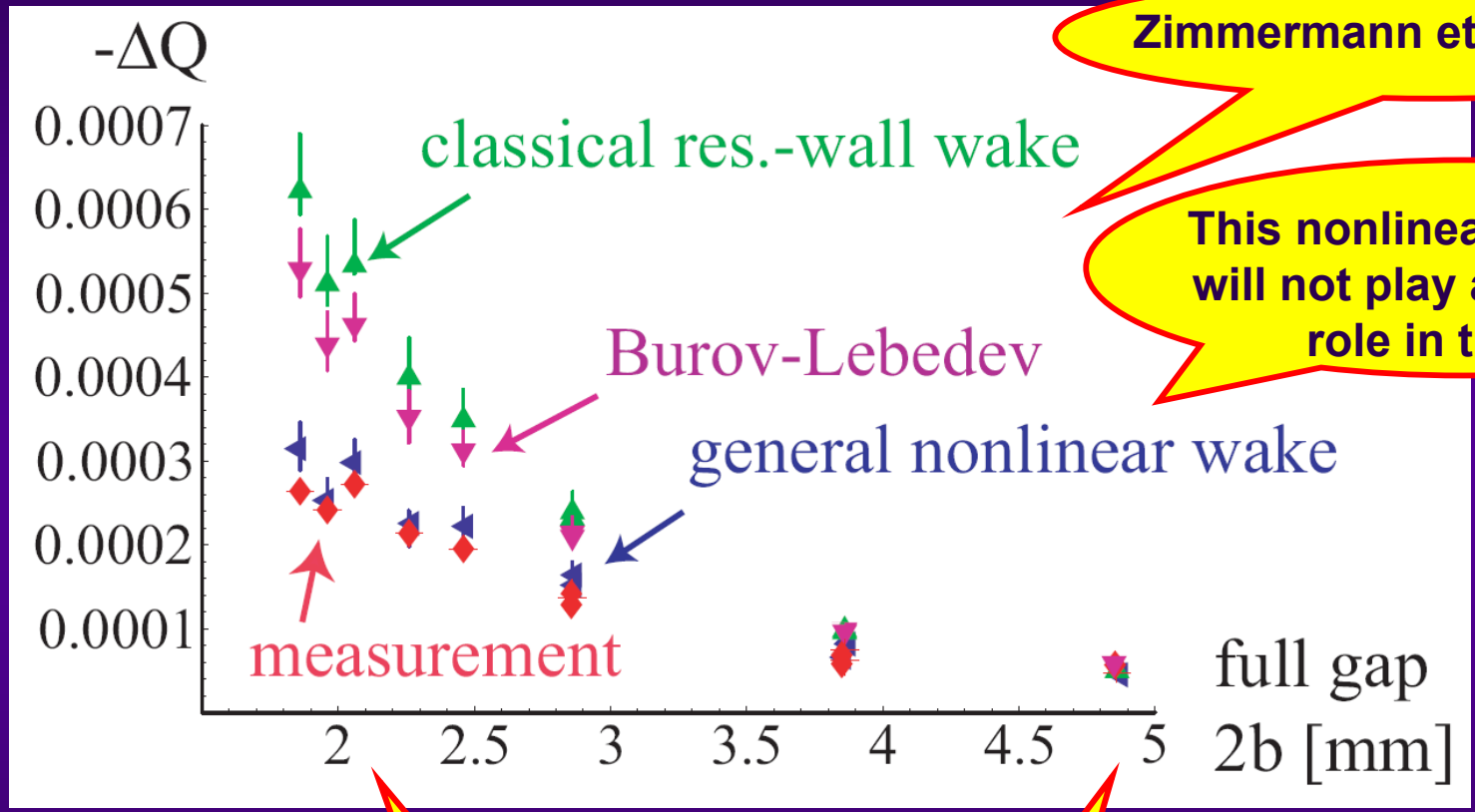
- **Motivation for these MDs**
  - **A new physical regime is predicted for the resistive-wall impedance of the LHC collimators**
- **2004 result**
  - **Coherent tune shift with a single bunch $\Rightarrow$ Im (Z_x)**
- **2006 (preliminary) results**
  - **Coherent tune shift with a single bunch $\Rightarrow$ Im (Z_x)**
  - **Instability rise-time with 72 bunches $\Rightarrow$ Re (Z_x)**

Done also with 1 jaw only $\Rightarrow$ NEW!

$\Rightarrow$ NEW!

REVIEW OF THE 2004 RESULT



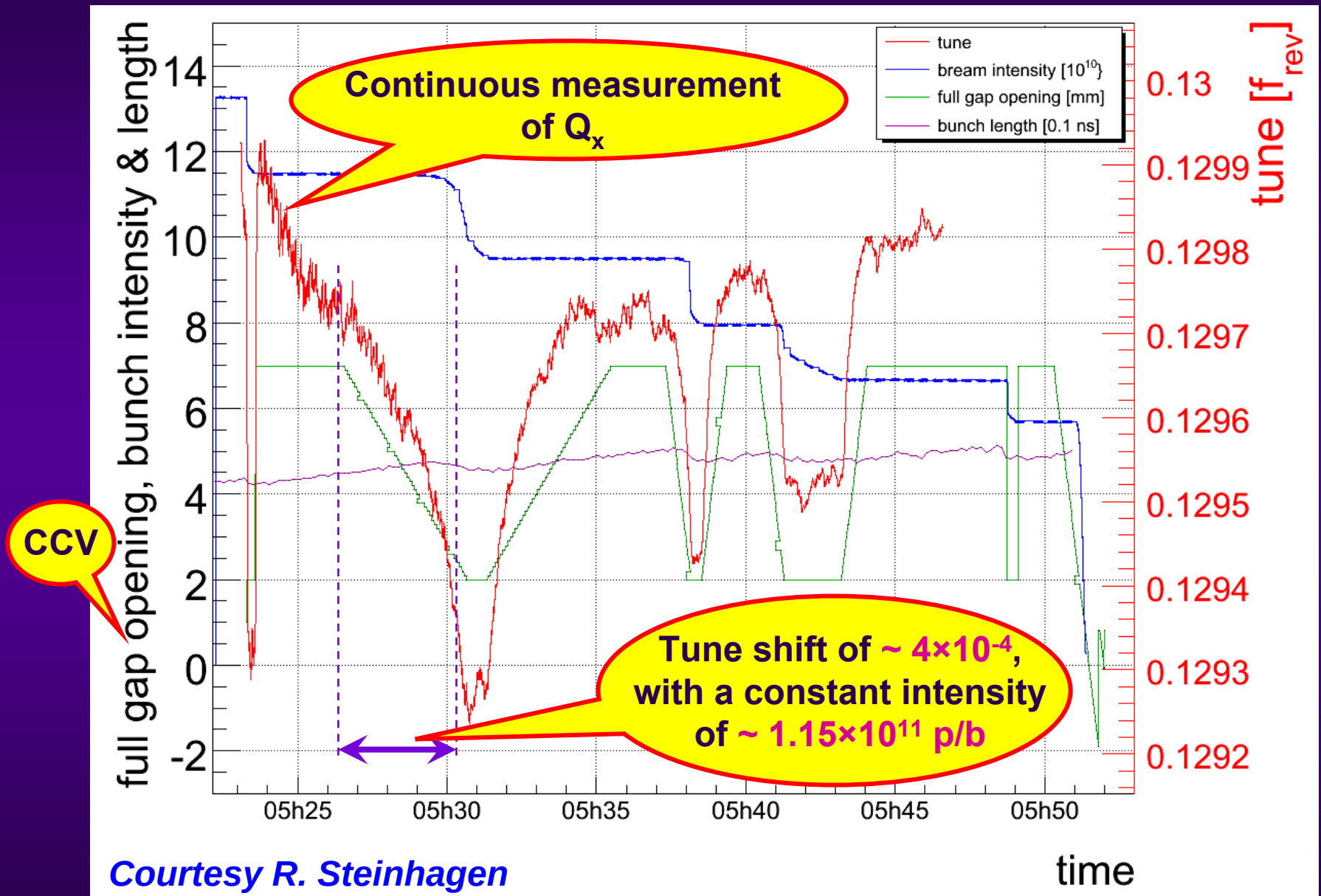
Zimmermann et al., EPAC06

This nonlinear wake of FZ will not play an important role in the LHC

~ 6×10^{10} p/b

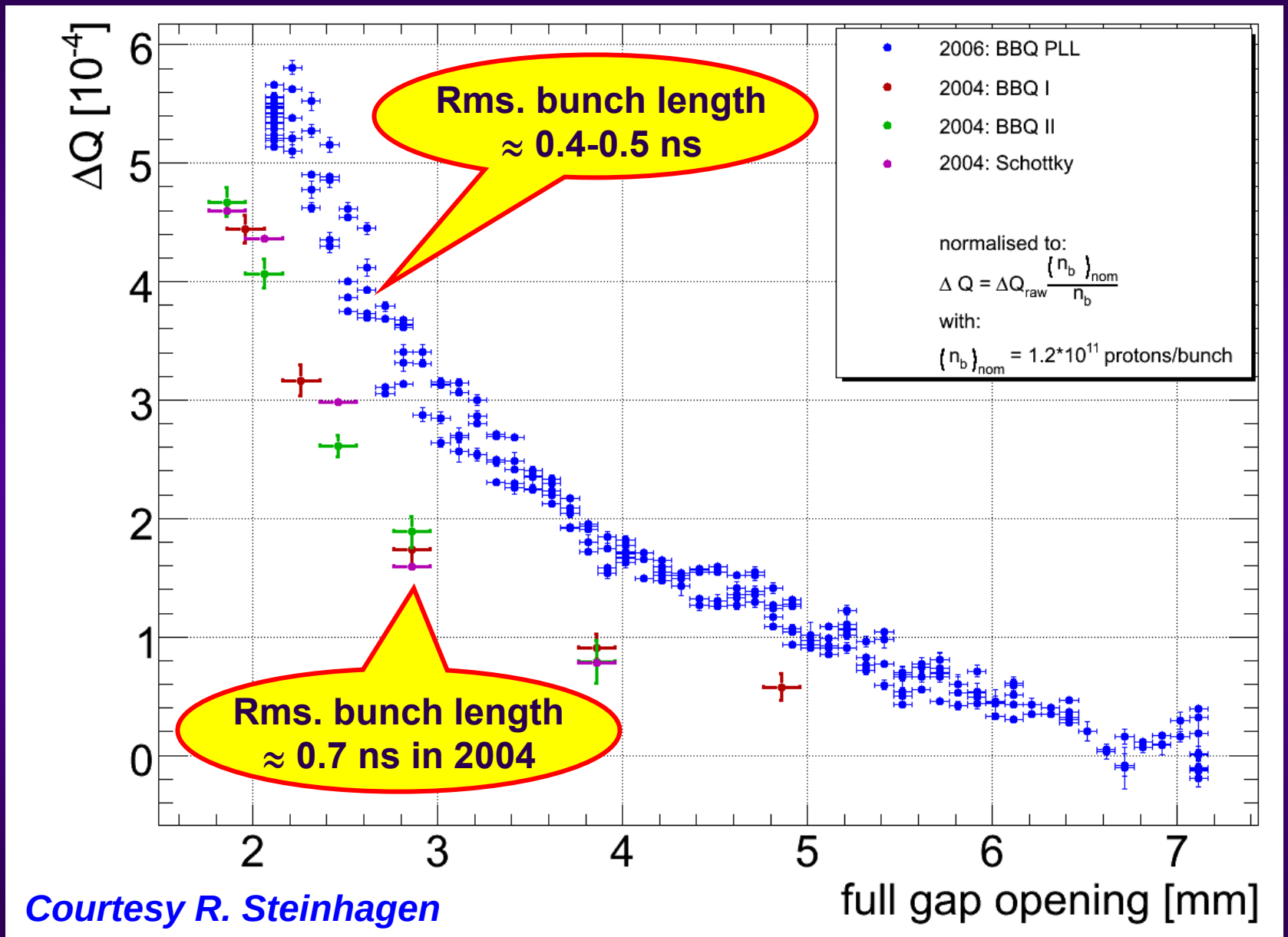
~ 10×10^{10} p/b

2006 COHERENT TUNE SHIFT with a single bunch ⇒ Im (Z_x) (1/3)



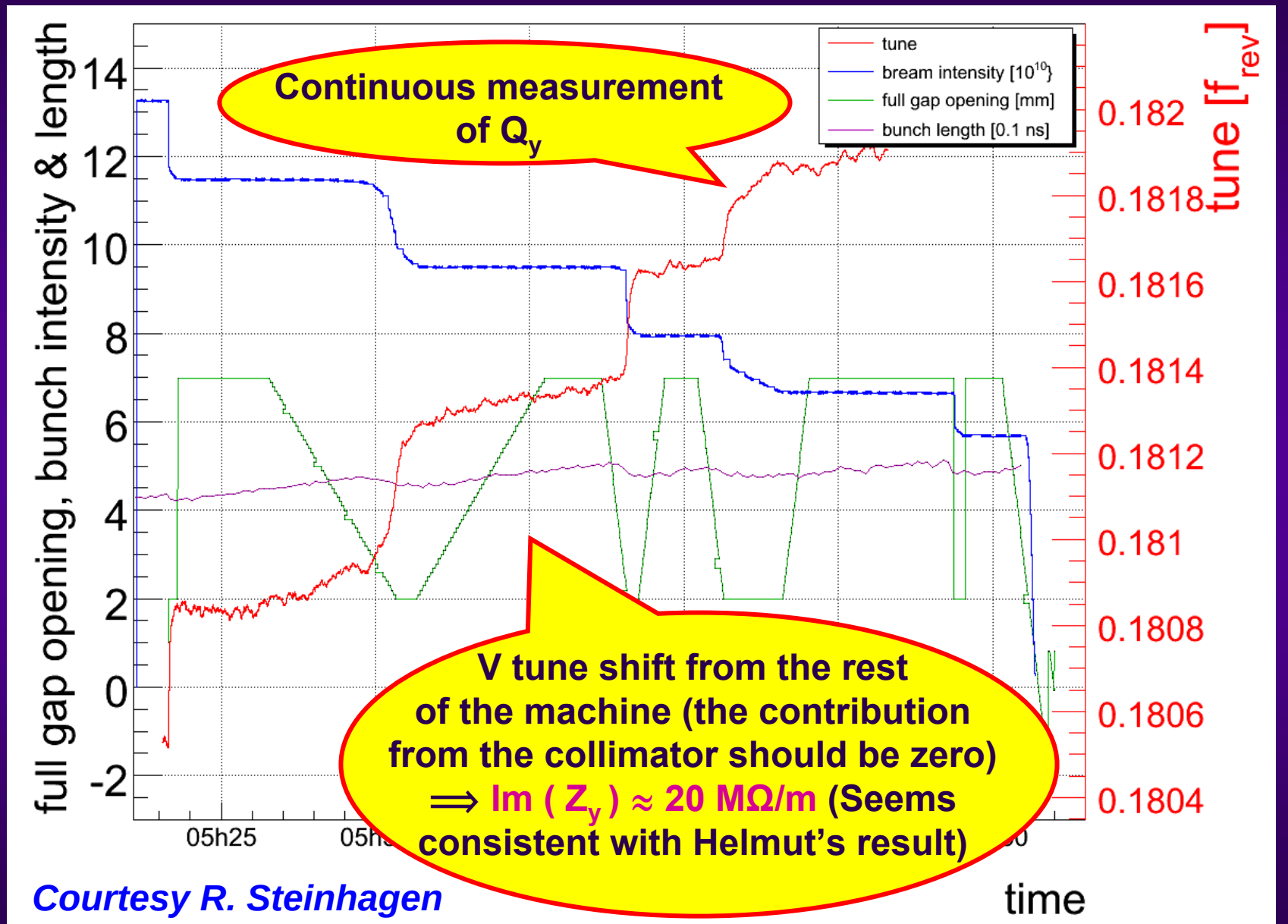
Courtesy R. Steinhagen

2006 COHERENT TUNE SHIFT with a single bunch ⇒ Im (Z_x) (2/3)



Courtesy R. Steinhagen

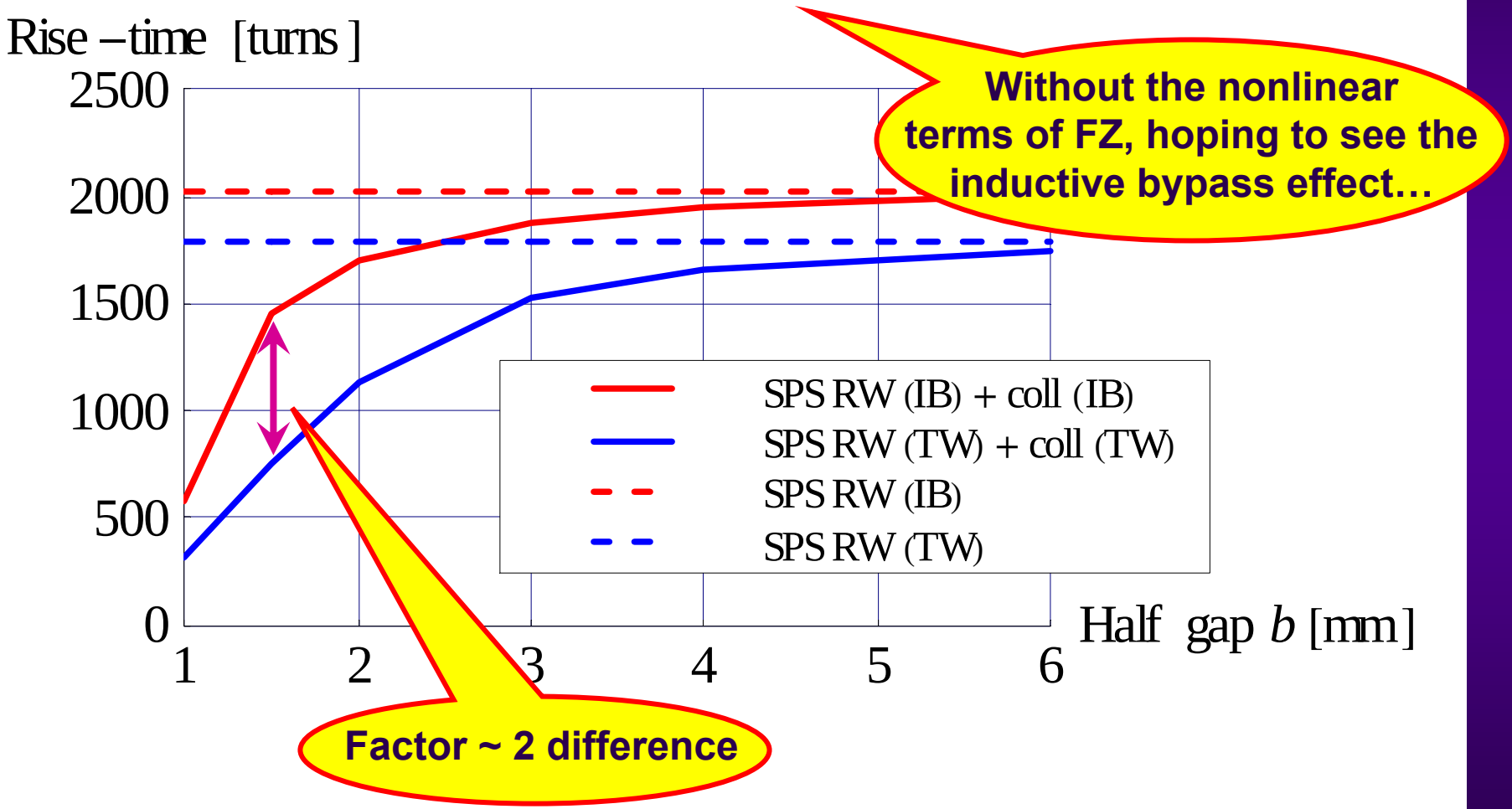
2006 COHERENT TUNE SHIFT with a single bunch ⇒ Im (Z_x) (3/3)



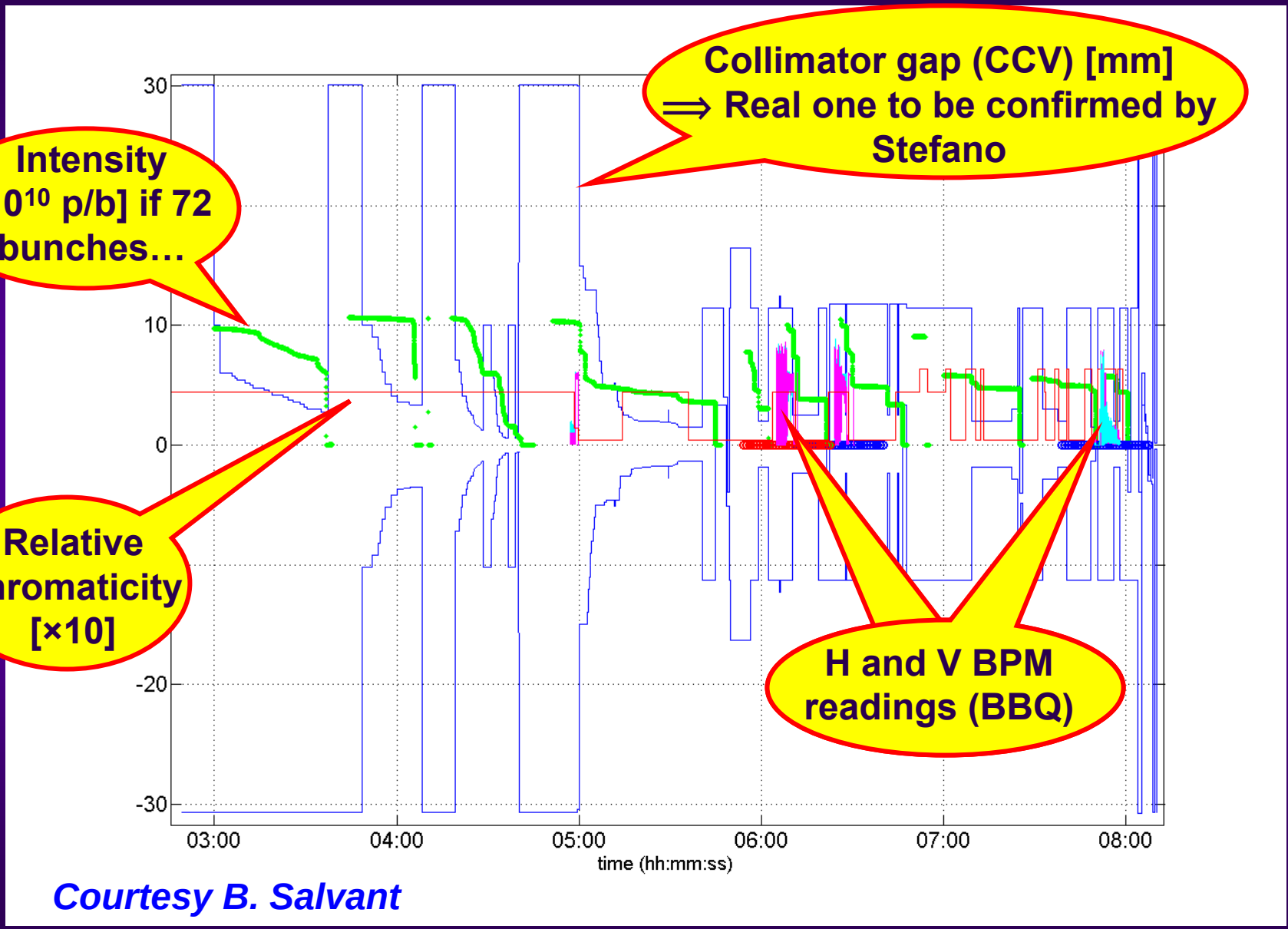
Courtesy R. Steinhagen

INSTABILITY RISE-TIME with 72 bunches ⇒ Re (Z_x)

Summary of the predicted rise-times (in SPS turns) for 1 batch of 72 bunches (1.15×10^{11} p/b) at 270 GeV/c (See APC 13/10/06)



MEASUREMENTS (1/24)

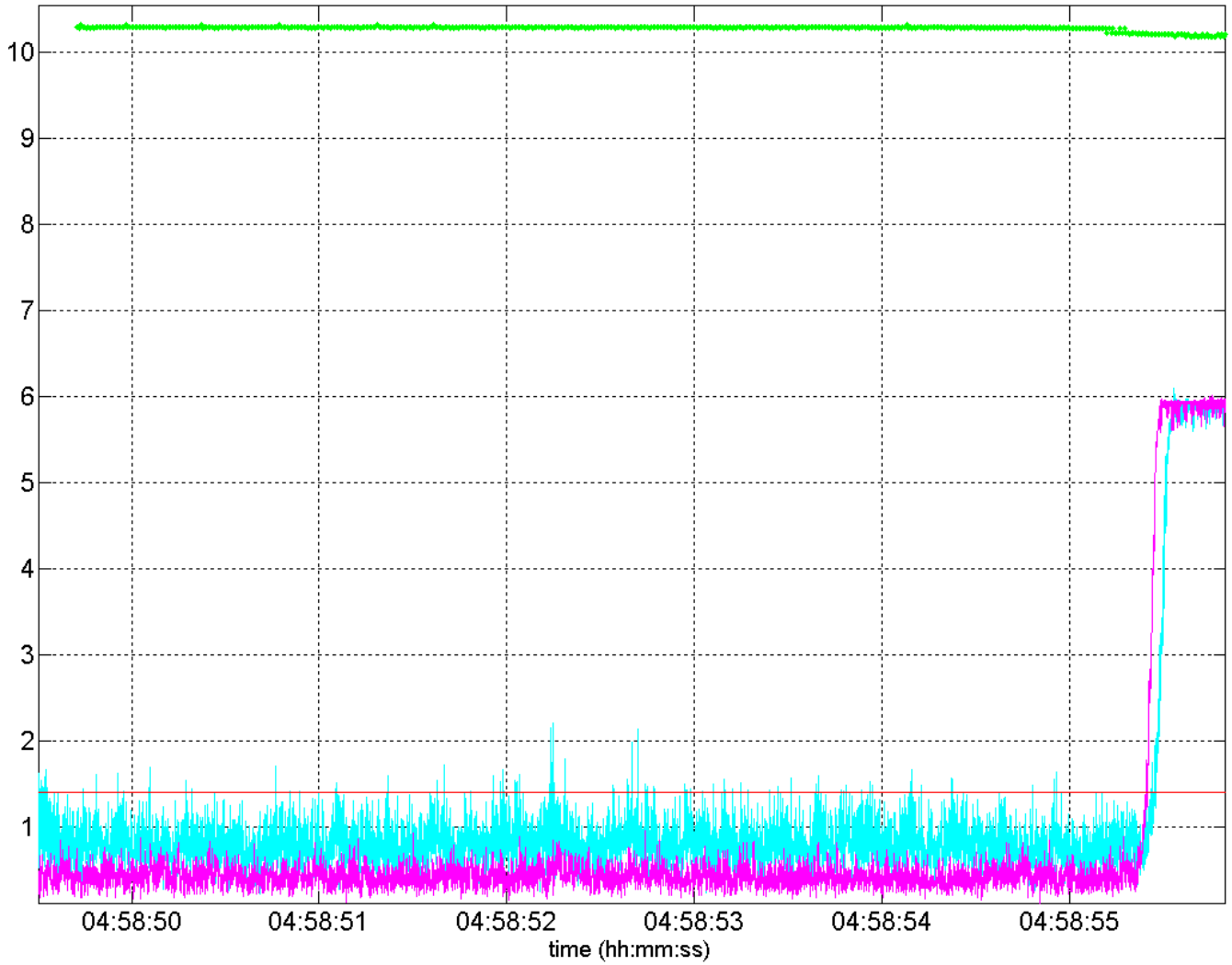


Courtesy B. Salvant

MEASUREMENTS (2/24)

Case 1 (coast 5)

Collimator out (± 30 mm)

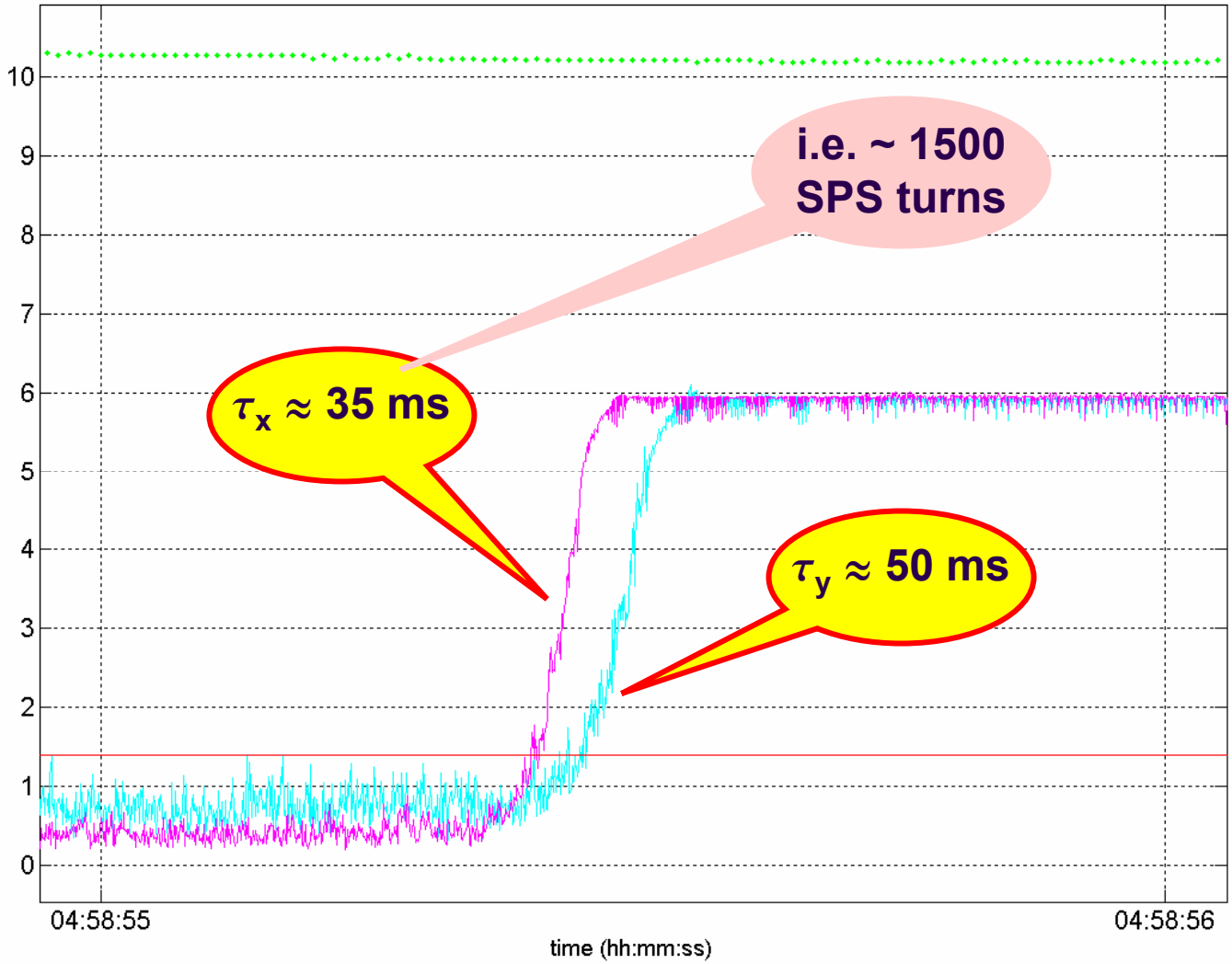


Courtesy B. Salvant

MEASUREMENTS (3/24)

Case 1 (coast 5)

Collimator out (± 30 mm)

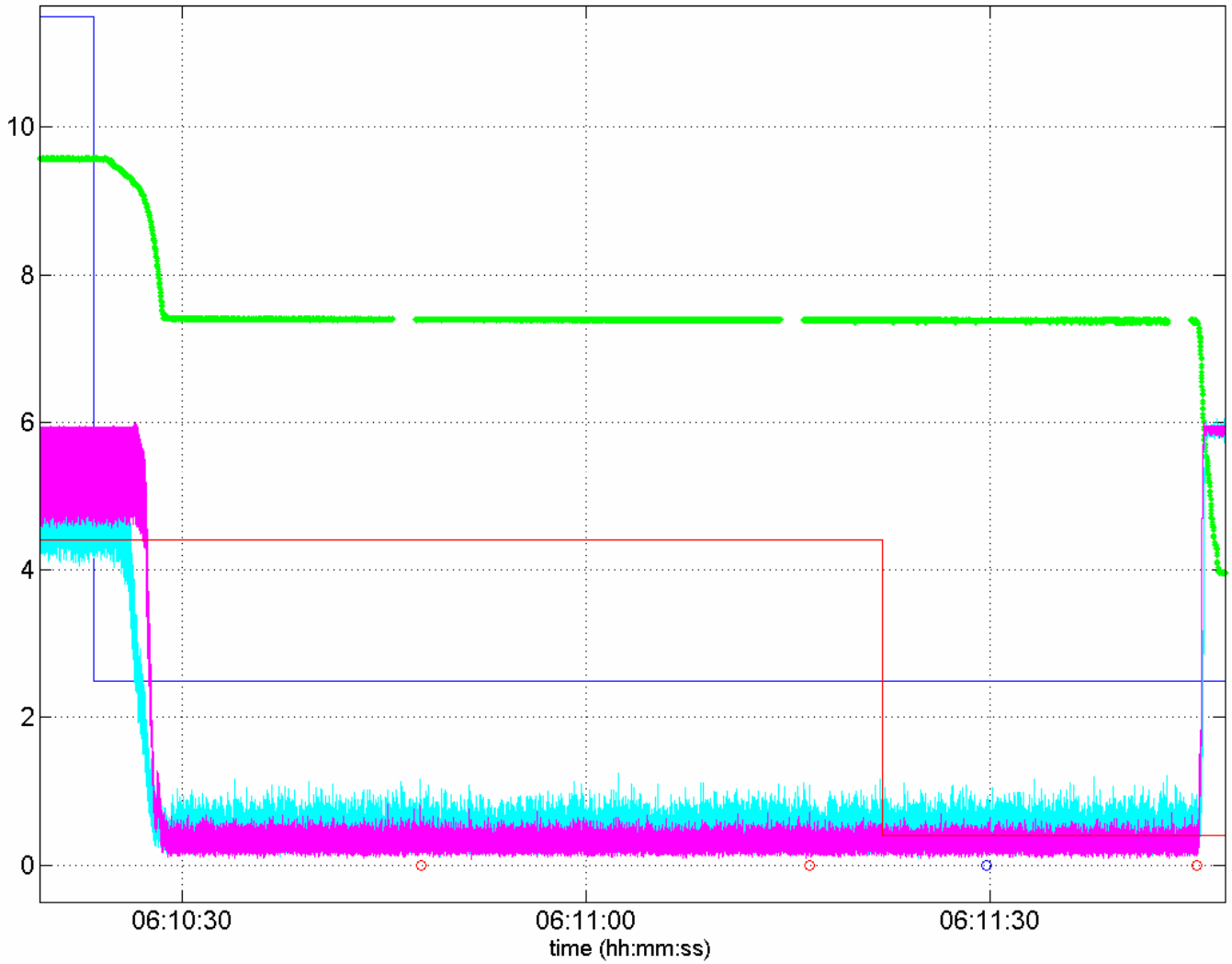


Courtesy B. Salvant

MEASUREMENTS (4/24)

Case 2 (coast 7)

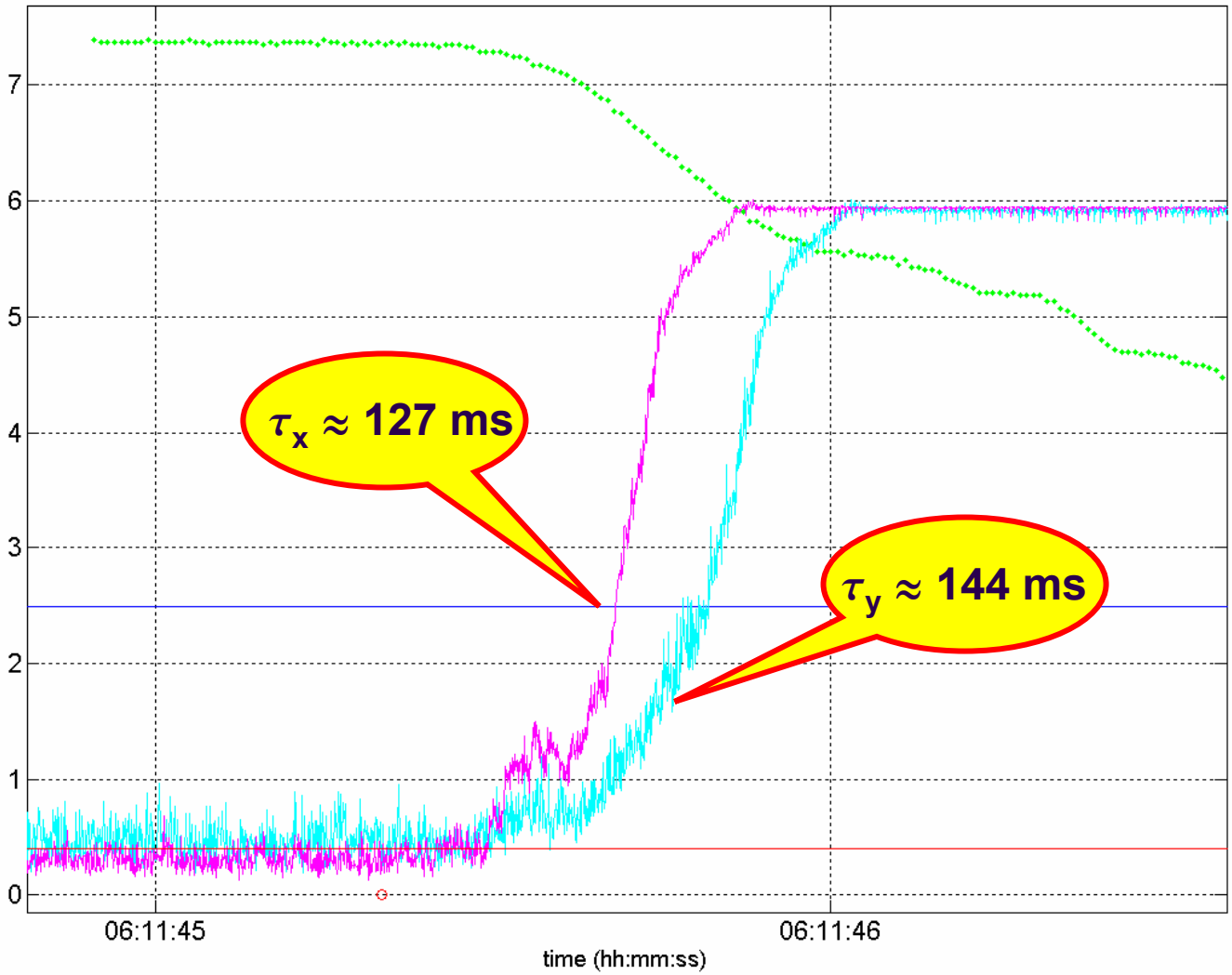
Collimator in (-2;+2.5 mm)



Courtesy B. Salvant

MEASUREMENTS (5/24)

Case 2 (coast 7)

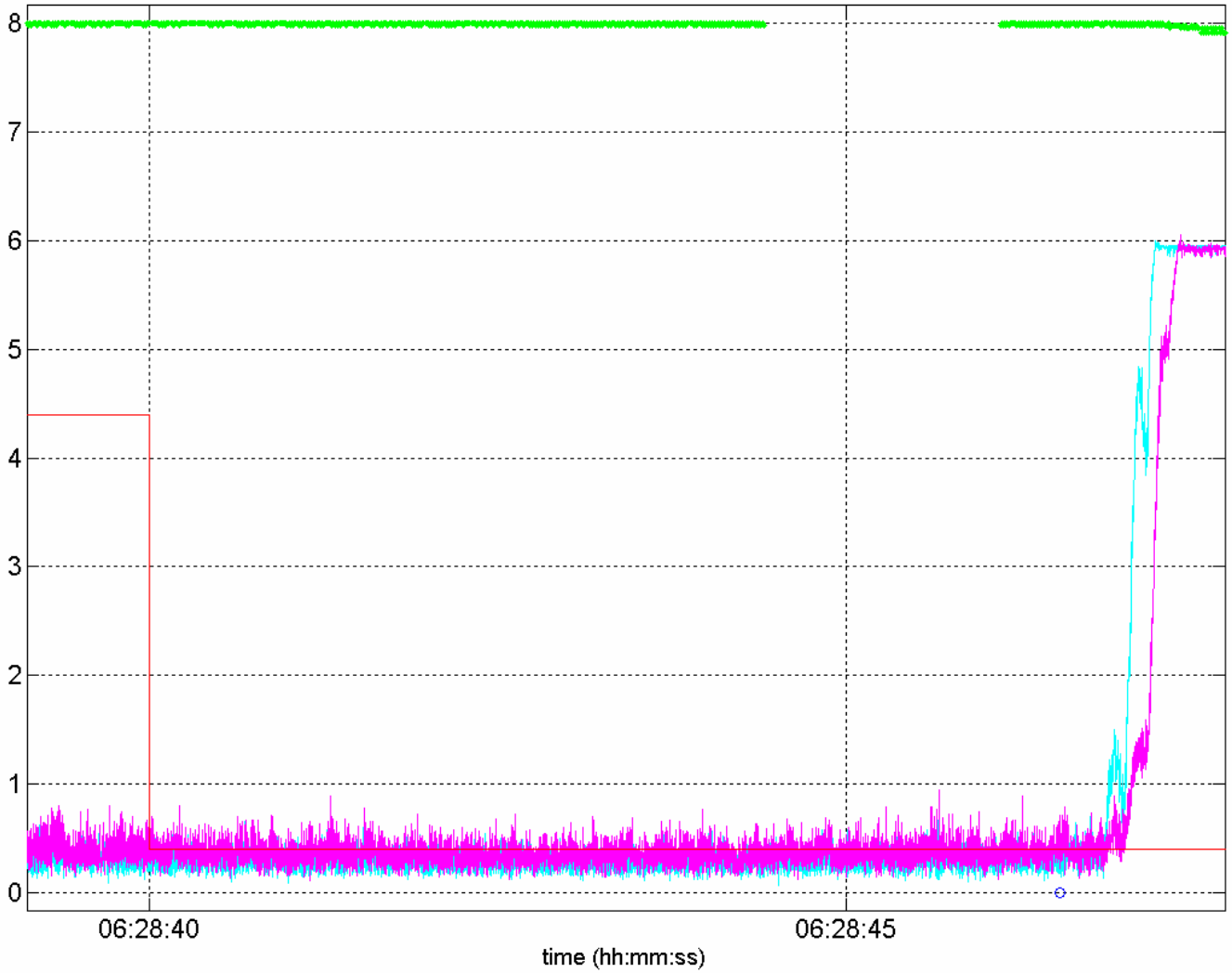


Courtesy B. Salvant

MEASUREMENTS (6/24)

Case 3a (coast 8)

Collimator out (± 11.5 mm)

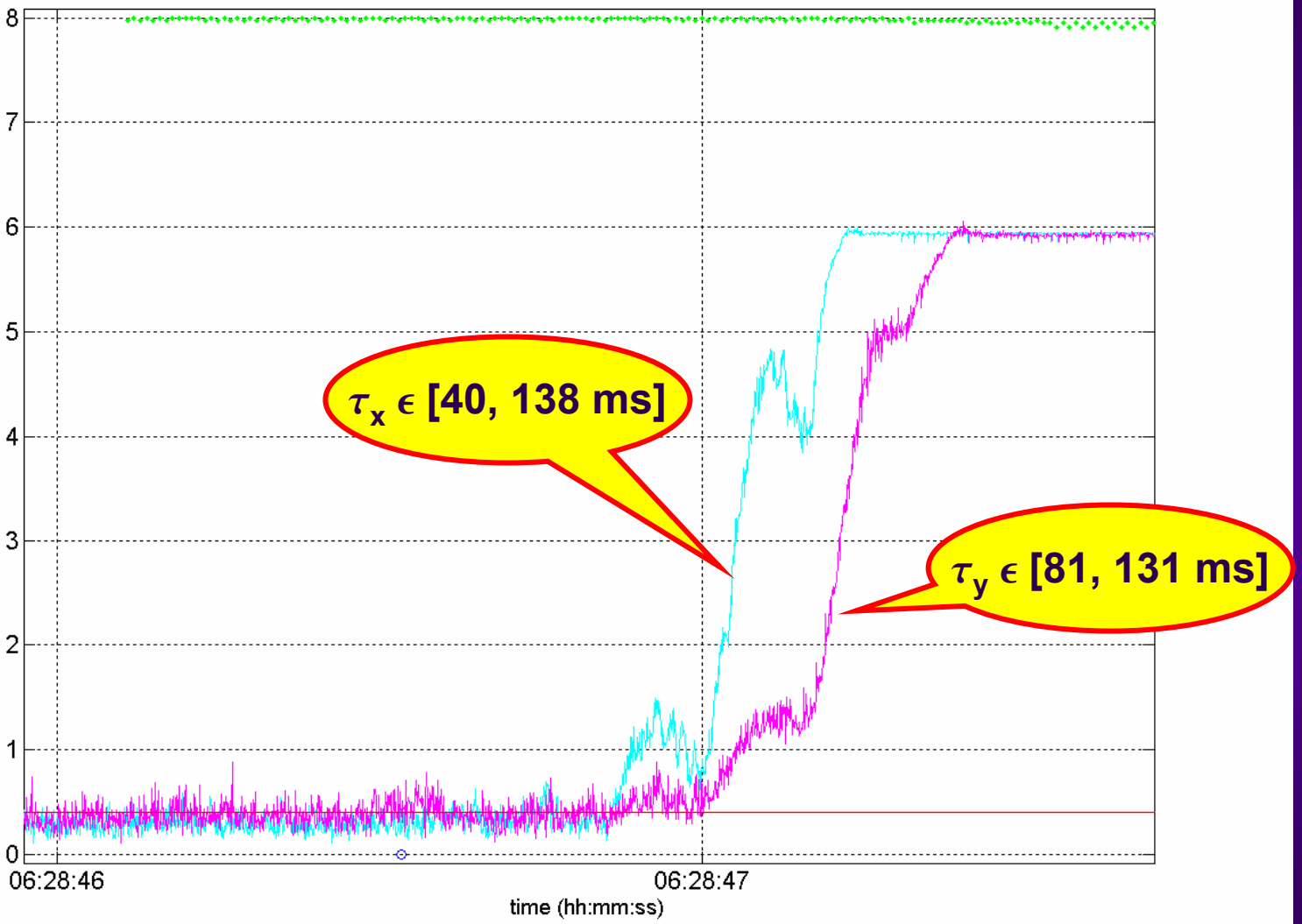


Courtesy B. Salvant

MEASUREMENTS (7/24)

Case 3a (coast 8)

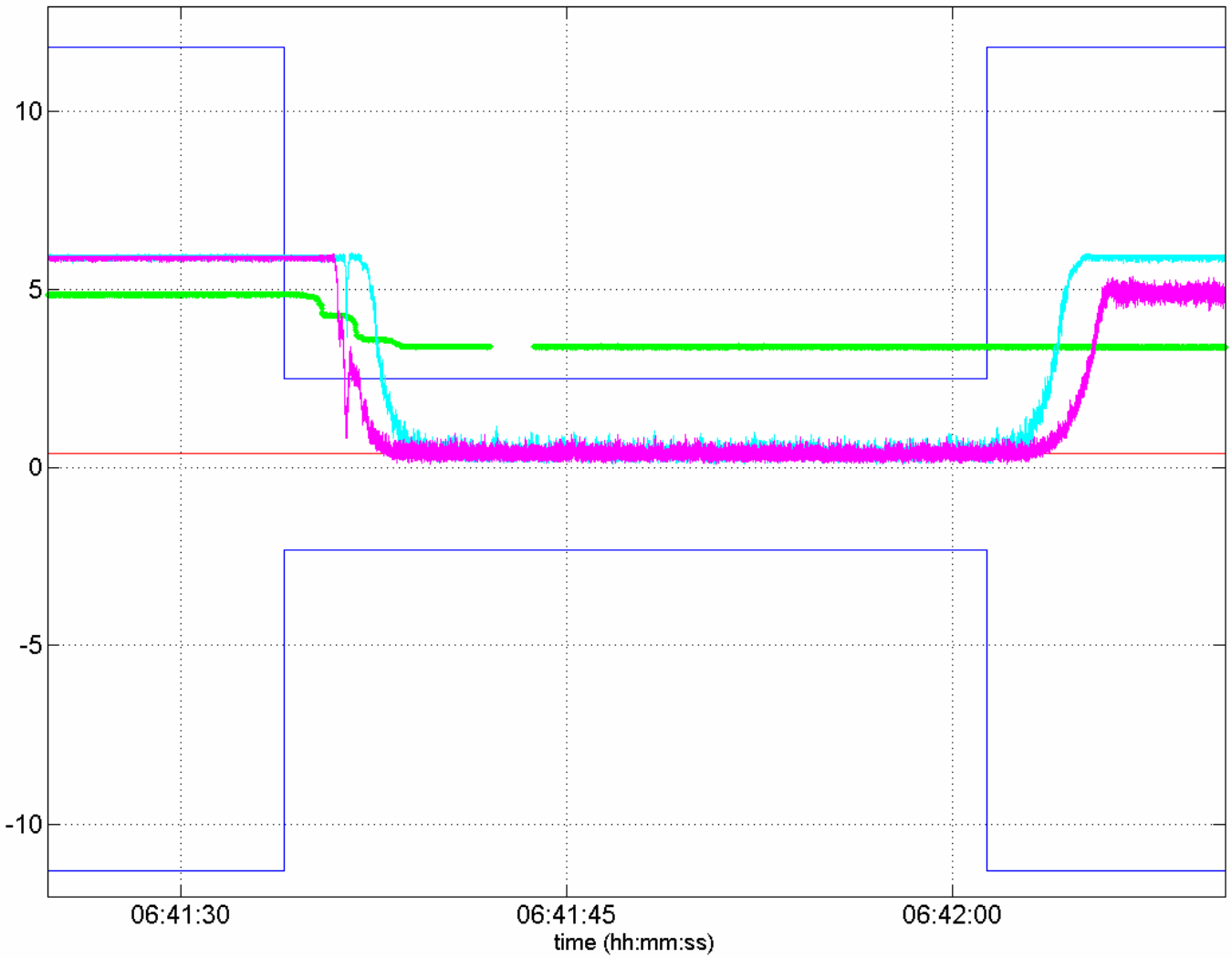
Collimator out (± 11.5 mm)



Courtesy B. Salvant

MEASUREMENTS (8/24)

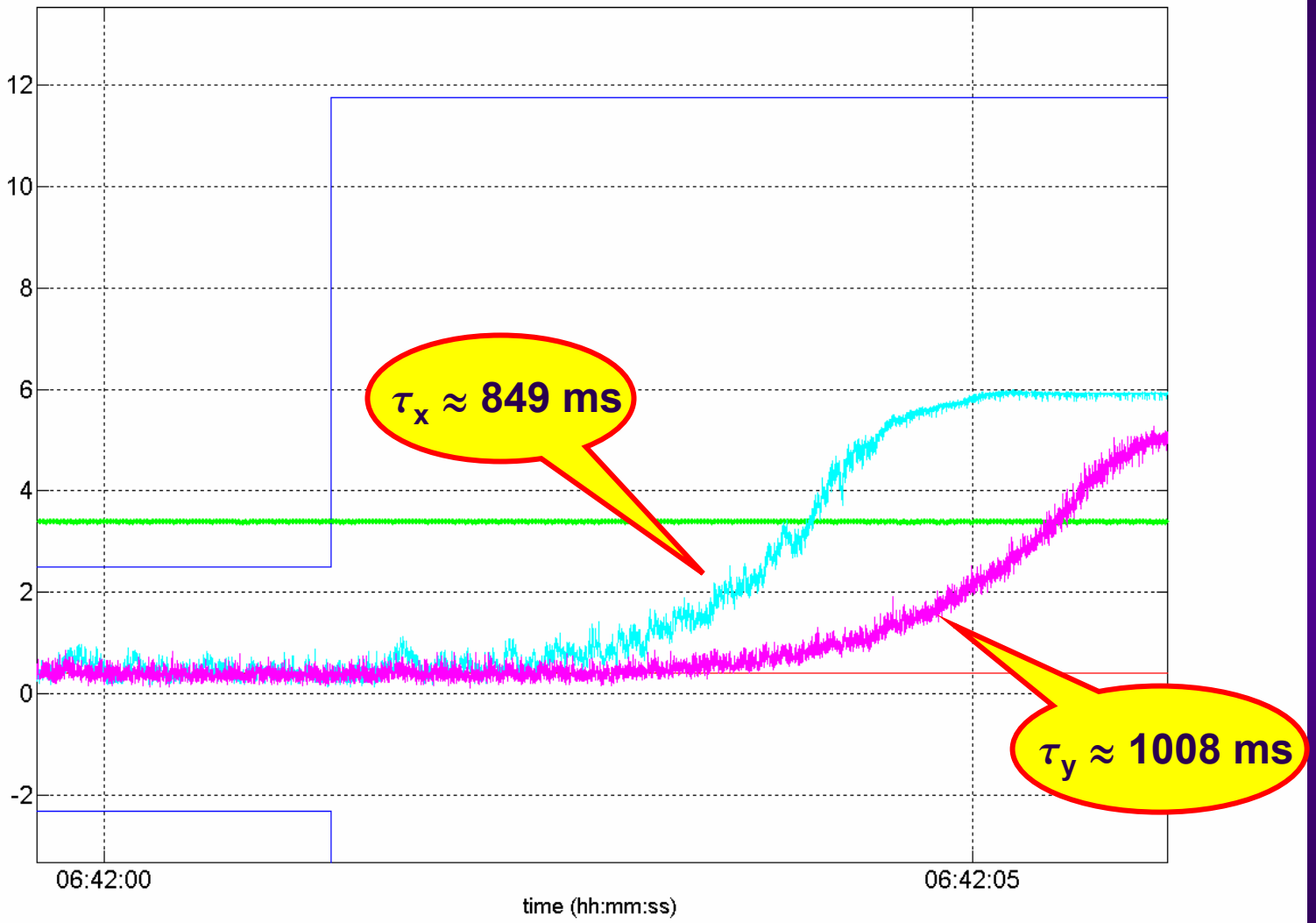
Case 3b (coast 8)



Courtesy B. Salvant

MEASUREMENTS (9/24)

Case 3b (coast 8)

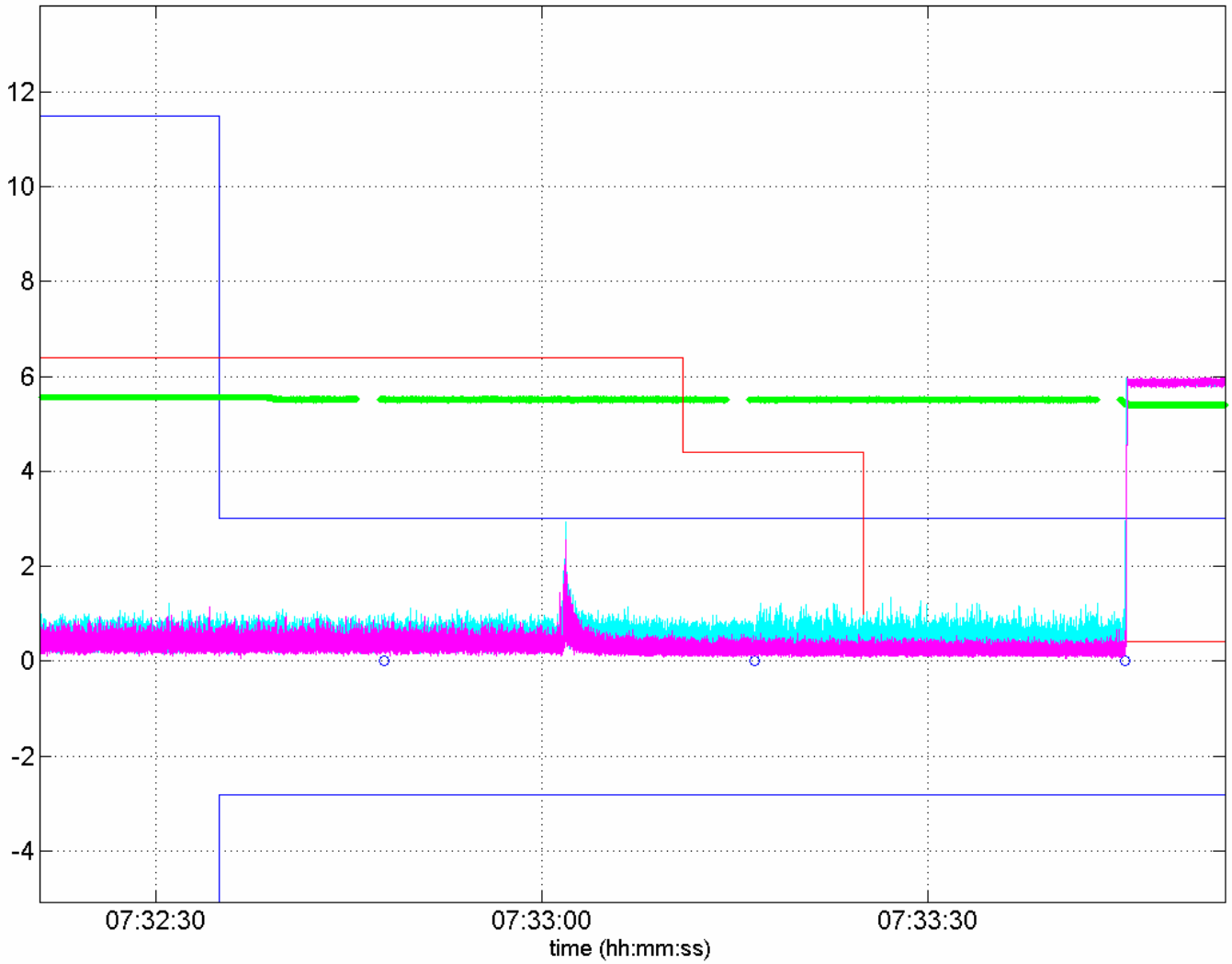


Courtesy B. Salvant

MEASUREMENTS (10/24)

Case 4a (coast 11)

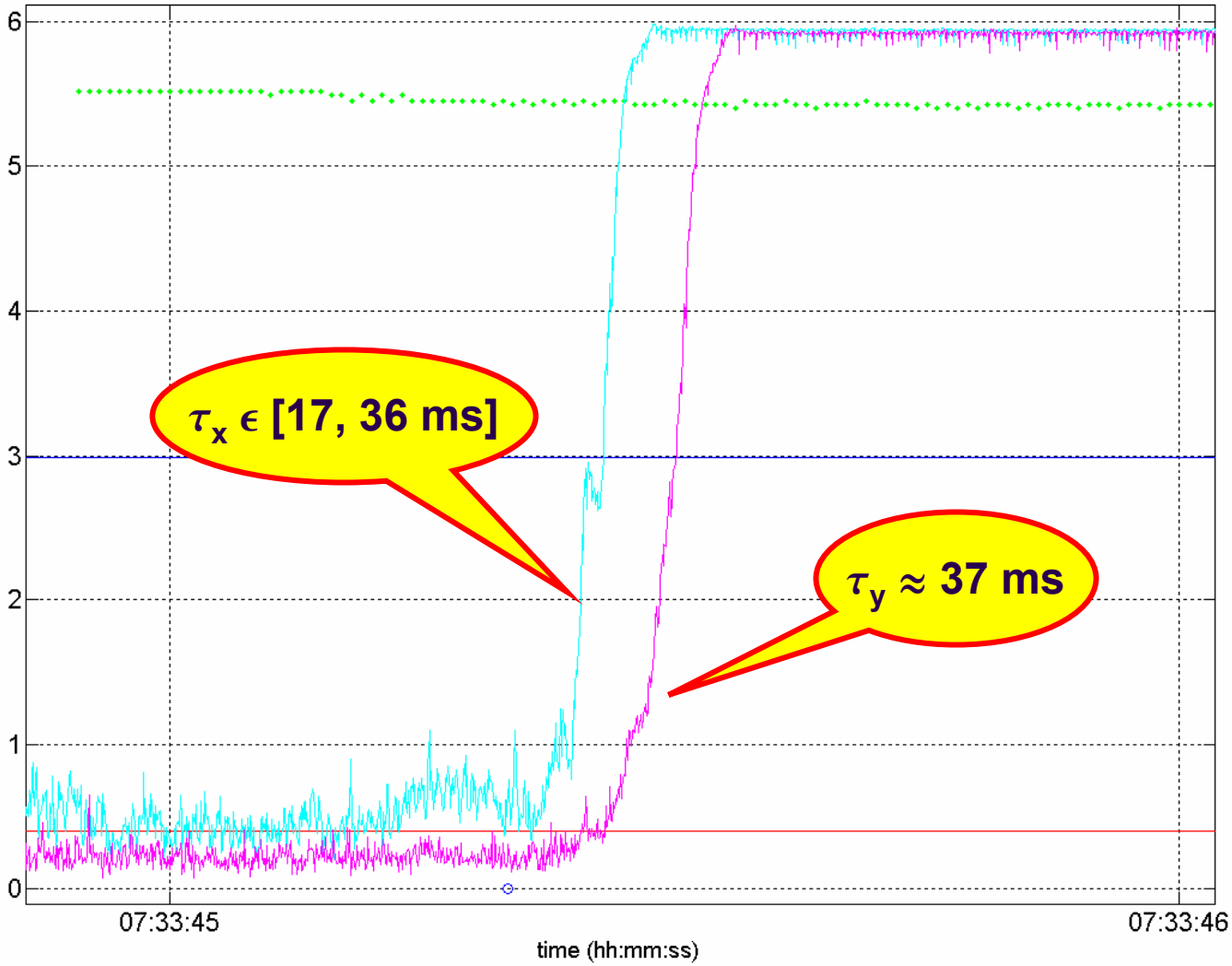
Collimator in (± 3 mm)



Courtesy B. Salvant

MEASUREMENTS (11/24)

Case 4a (coast 11)

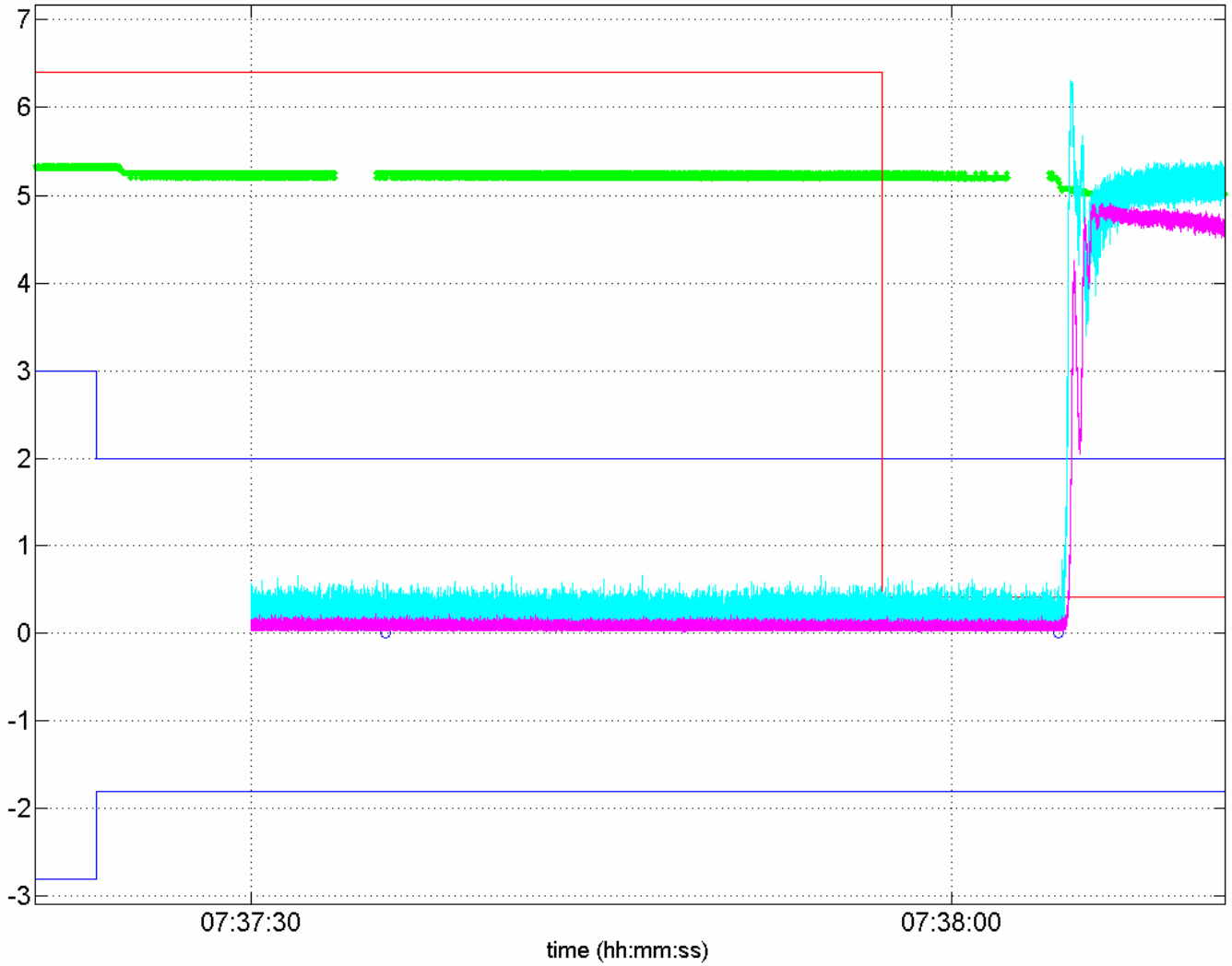


Courtesy B. Salvant

MEASUREMENTS (12/24)

Case 4b (coast 11)

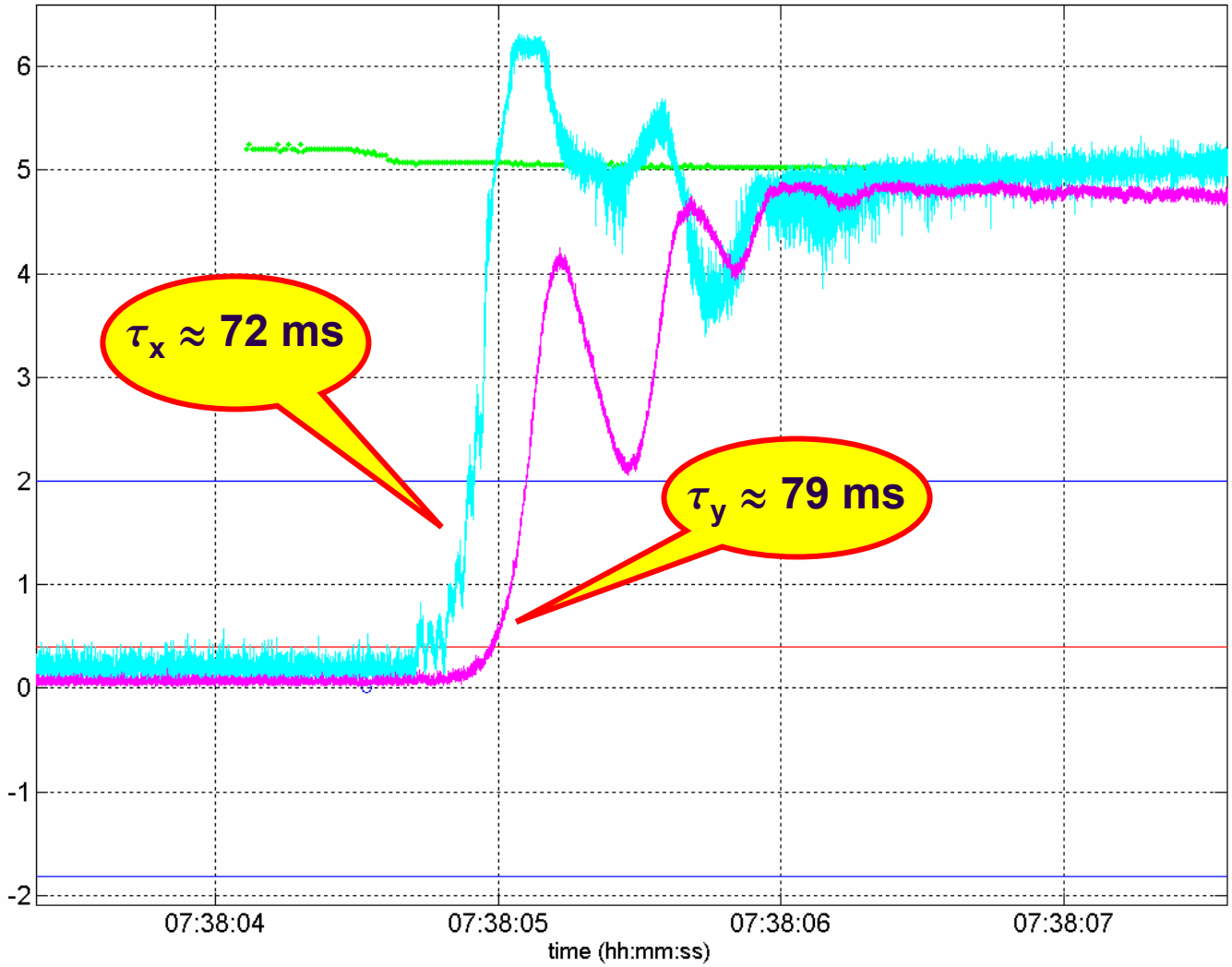
Collimator in (± 2 mm)



Courtesy B. Salvant

MEASUREMENTS (13/24)

Case 4b (coast 11)

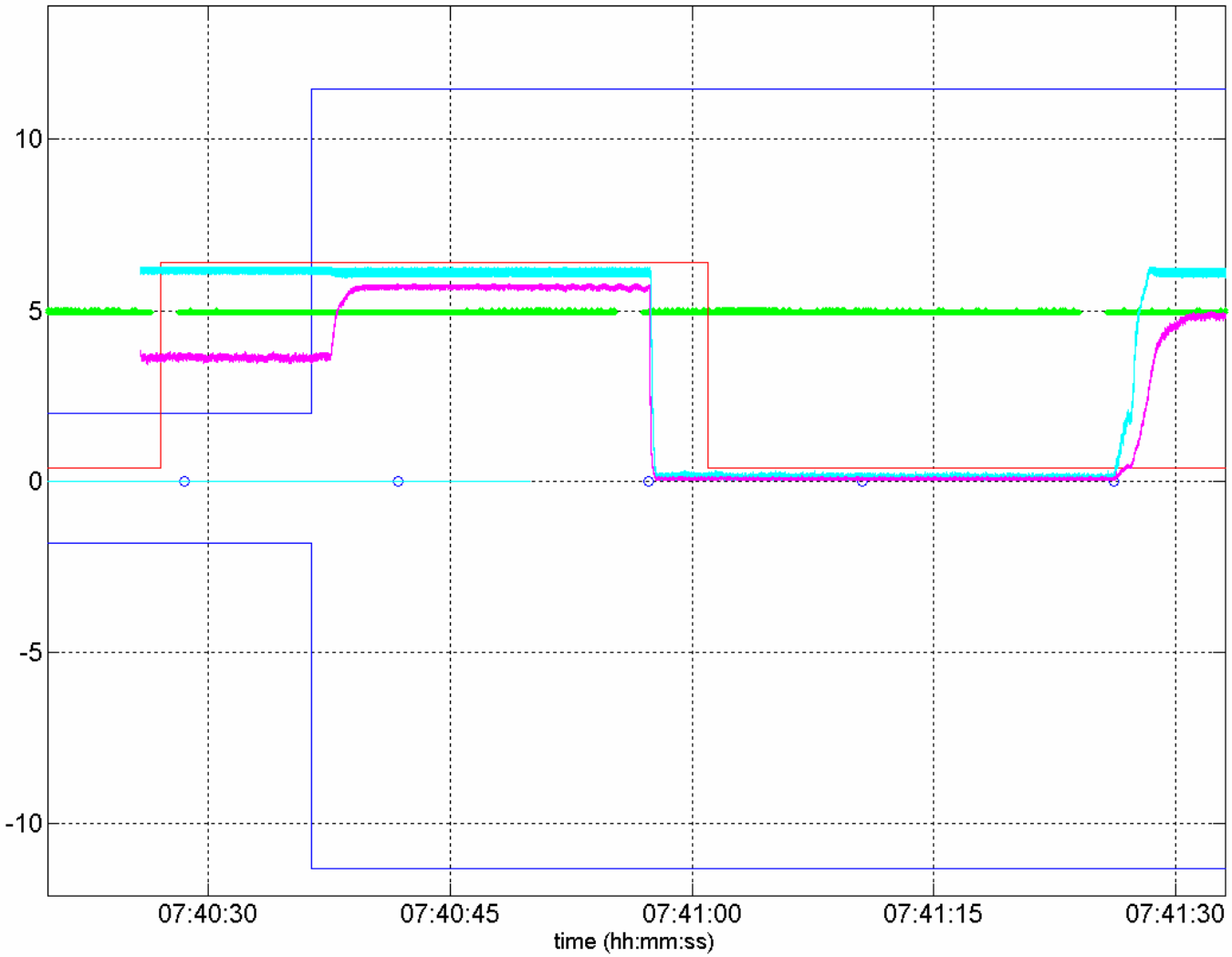


Courtesy B. Salvant

MEASUREMENTS (14/24)

Case 4c (coast 11)

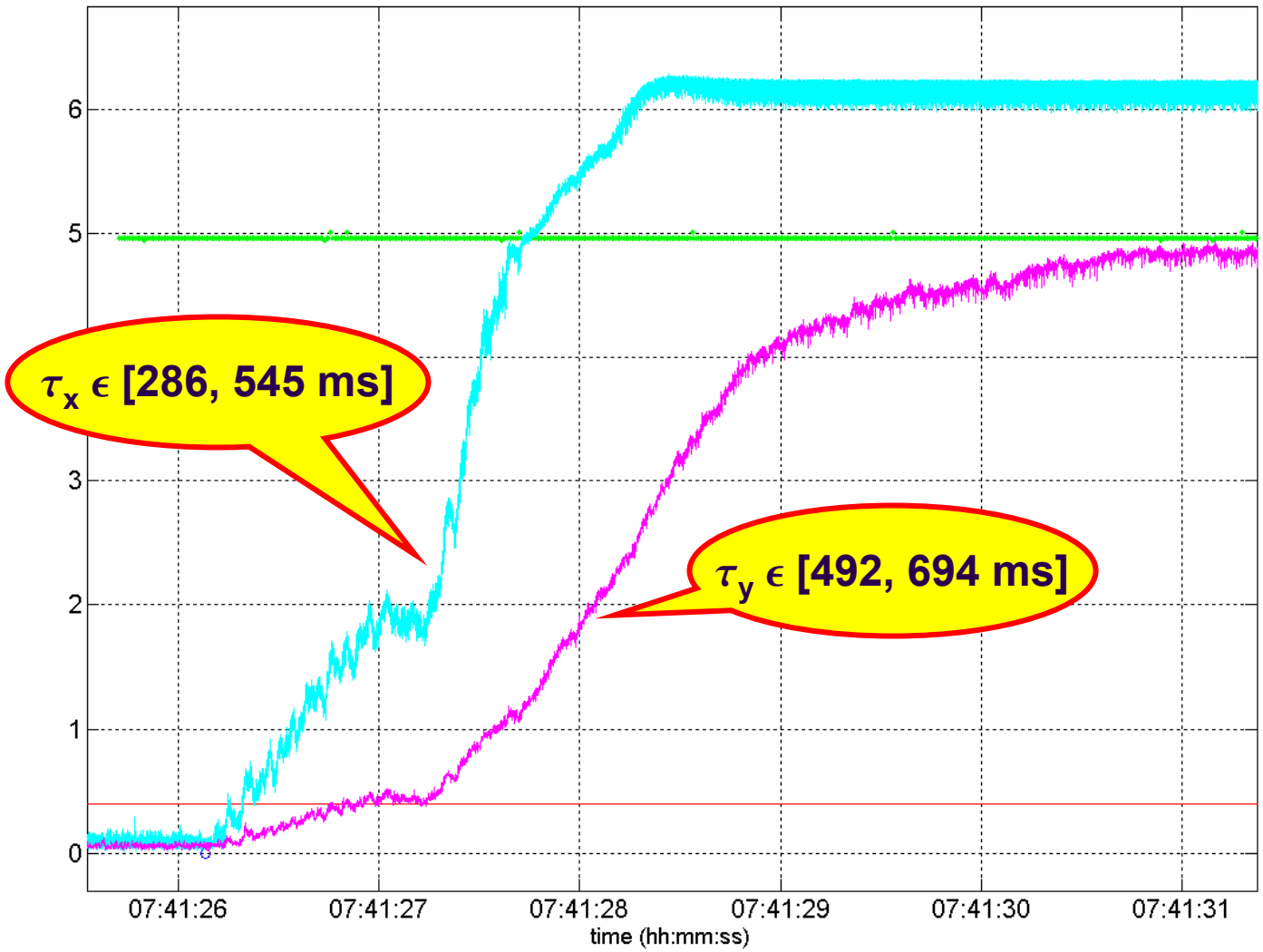
Collimator out (± 11.5 mm)



Courtesy B. Salvant

MEASUREMENTS (15/24)

Case 4c (coast 11)

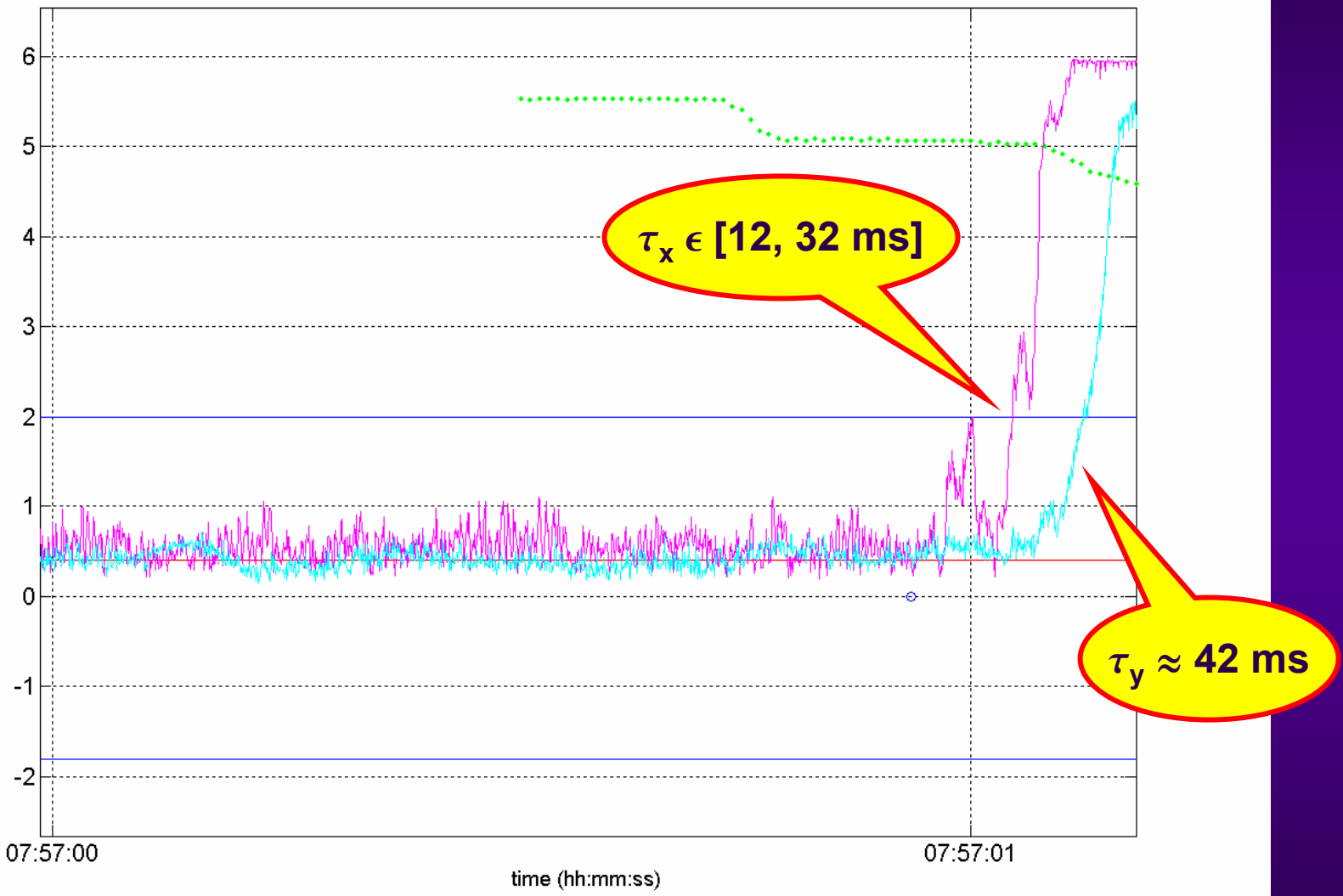


Courtesy B. Salvant

MEASUREMENTS (16/24)

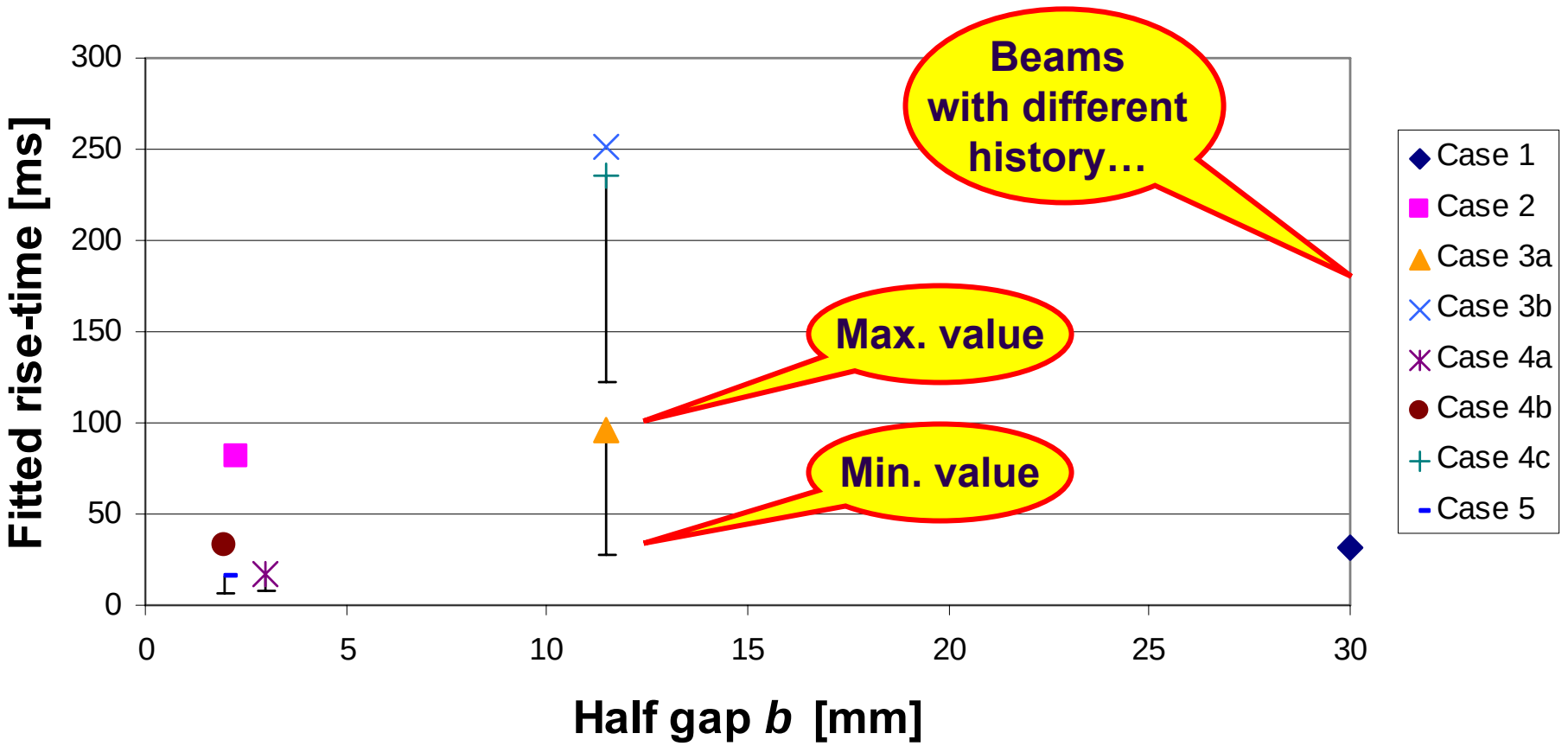
Case 5 (coast 12)

Collimator in (± 2 mm)



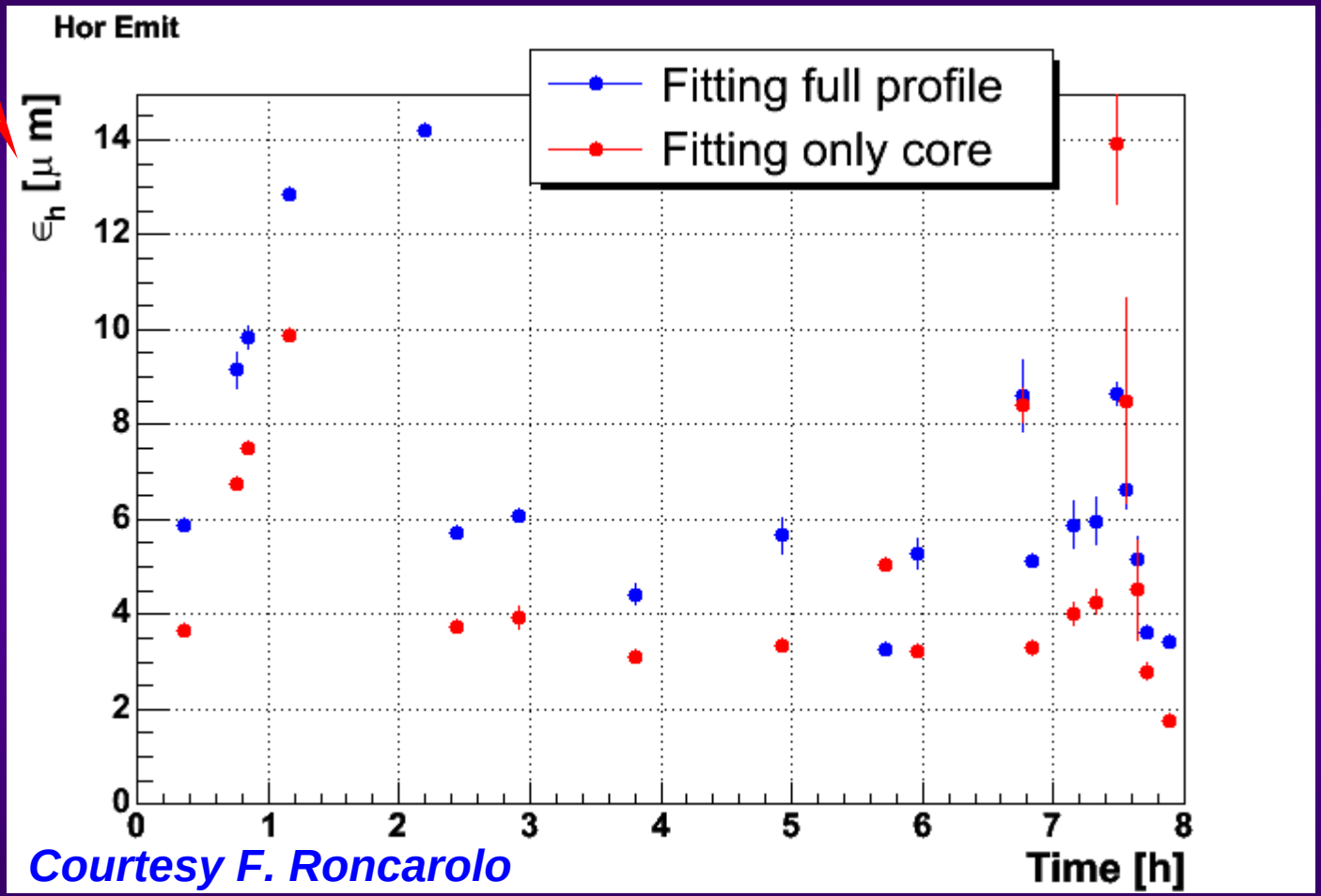
Courtesy B. Salvant

MEASUREMENTS (17/24)

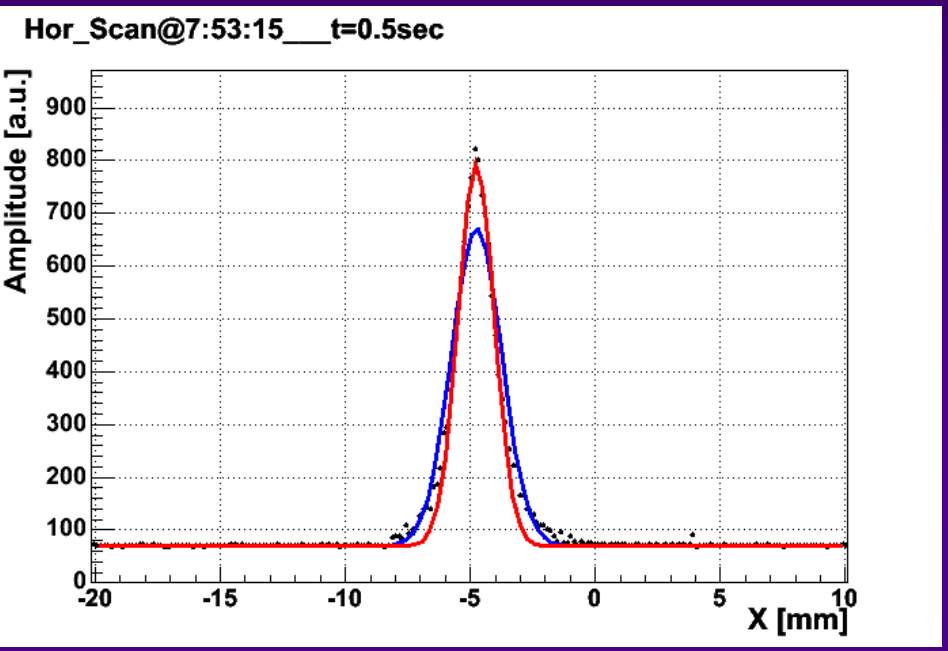


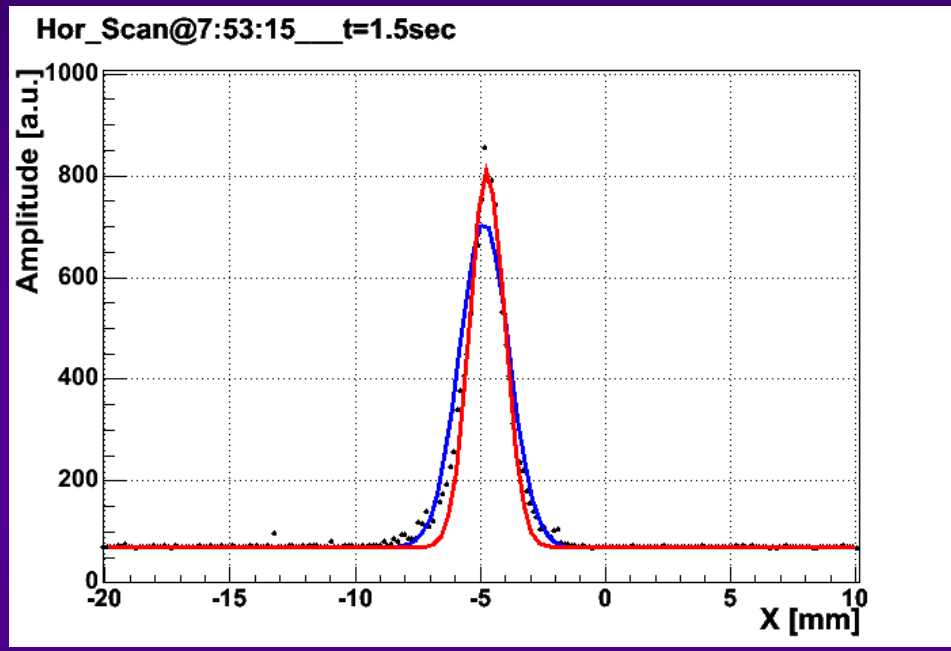
MEASUREMENTS (18/24)

norm., 1 σ



MEASUREMENTS (19/24)

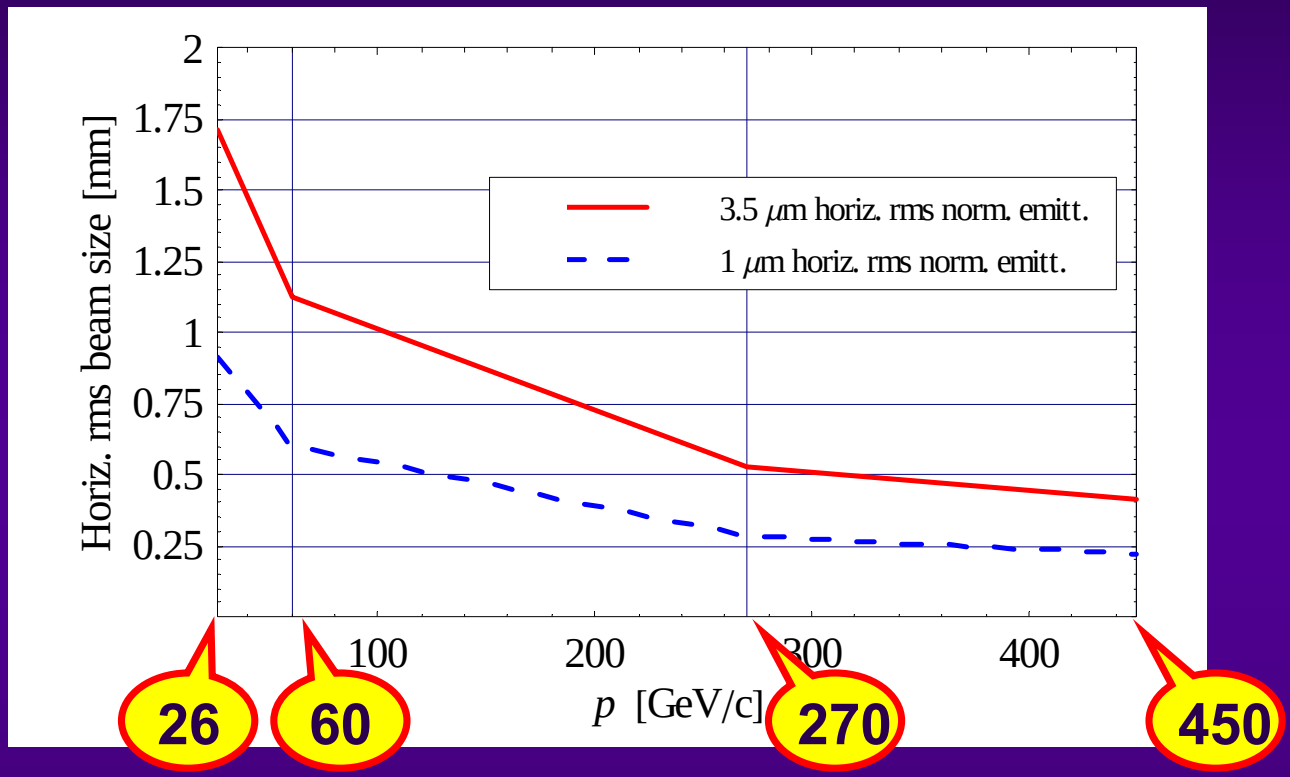




Courtesy F. Roncarolo

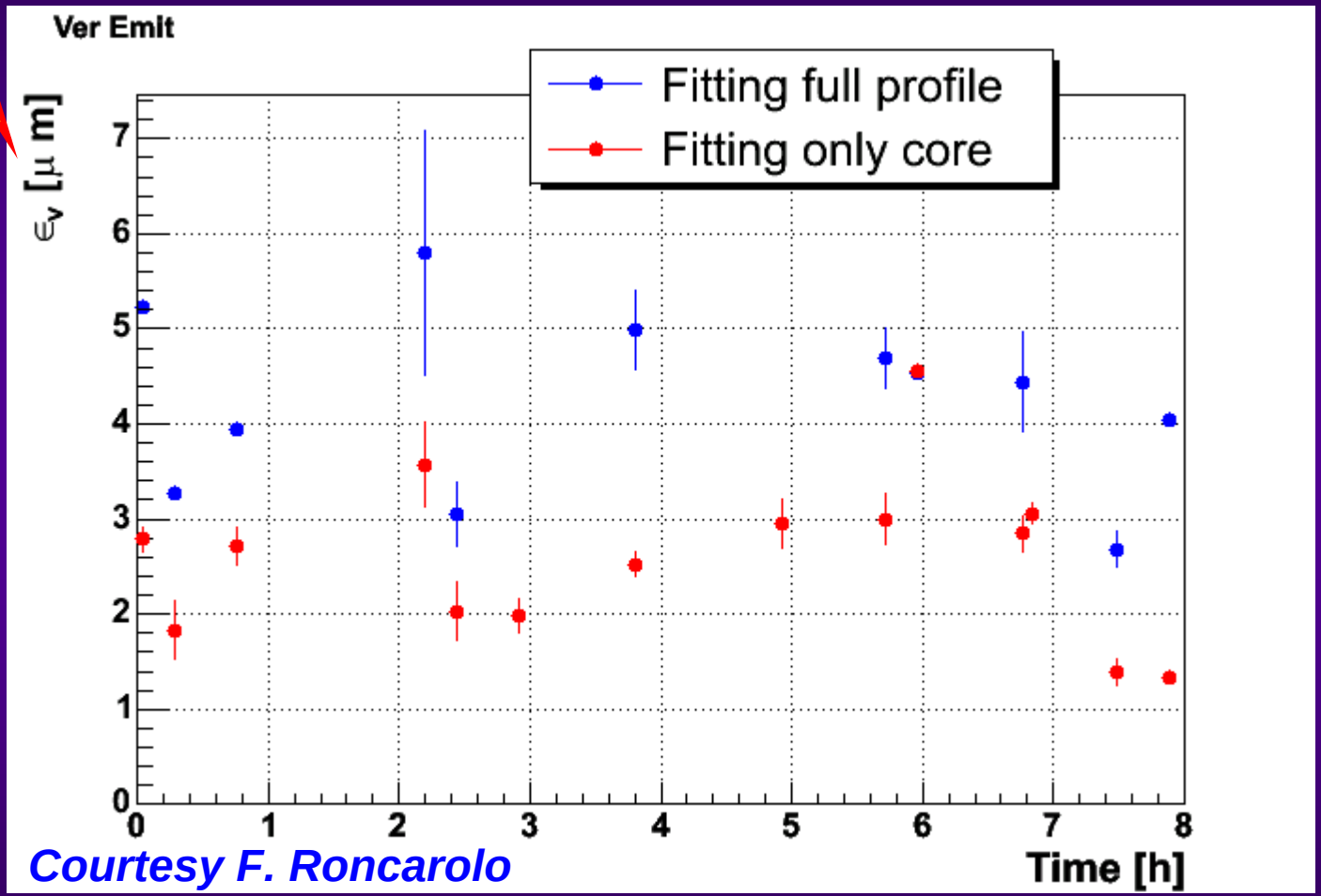
MEASUREMENTS (20/24)

Reminder:



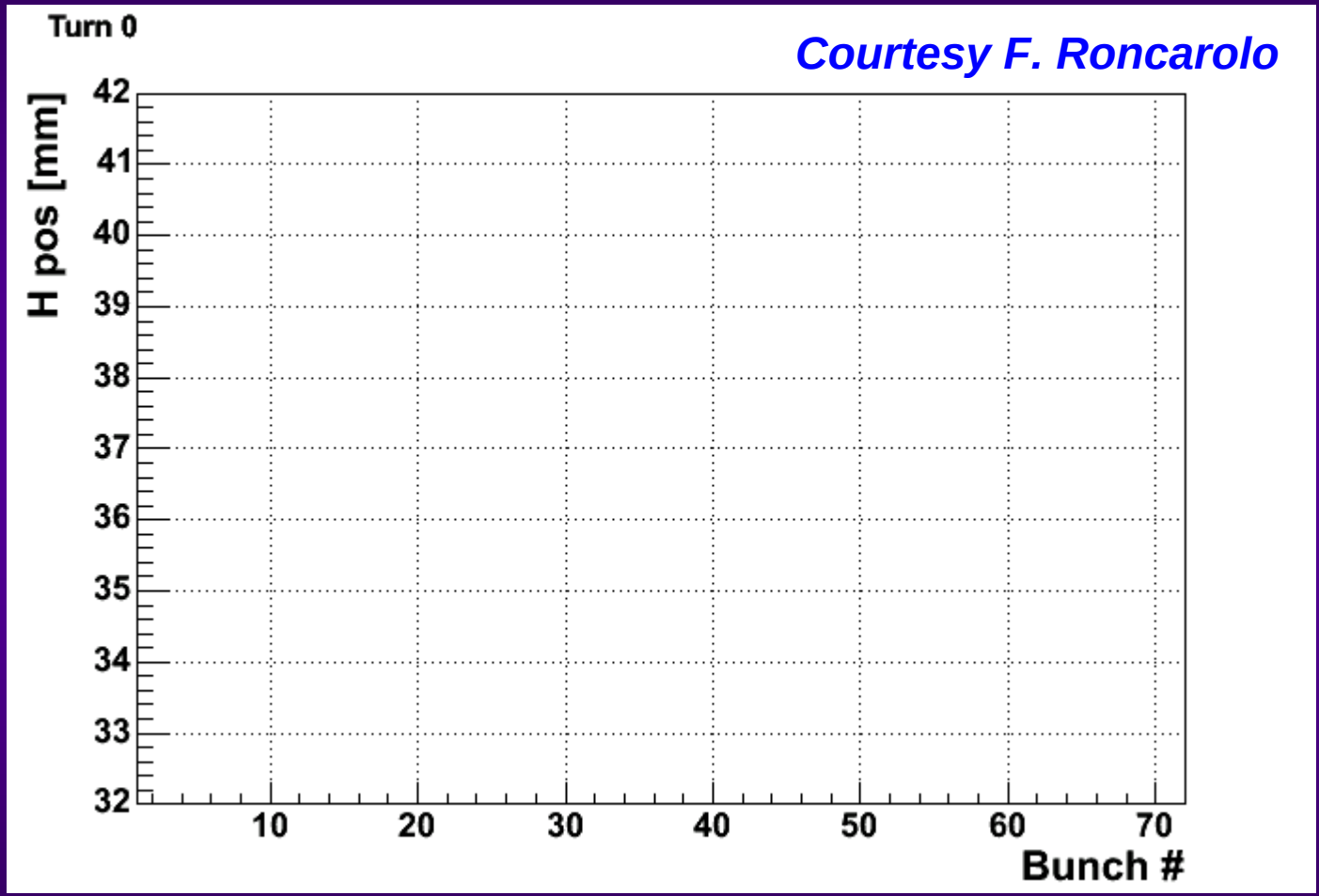
MEASUREMENTS (21/24)

norm., 1 σ



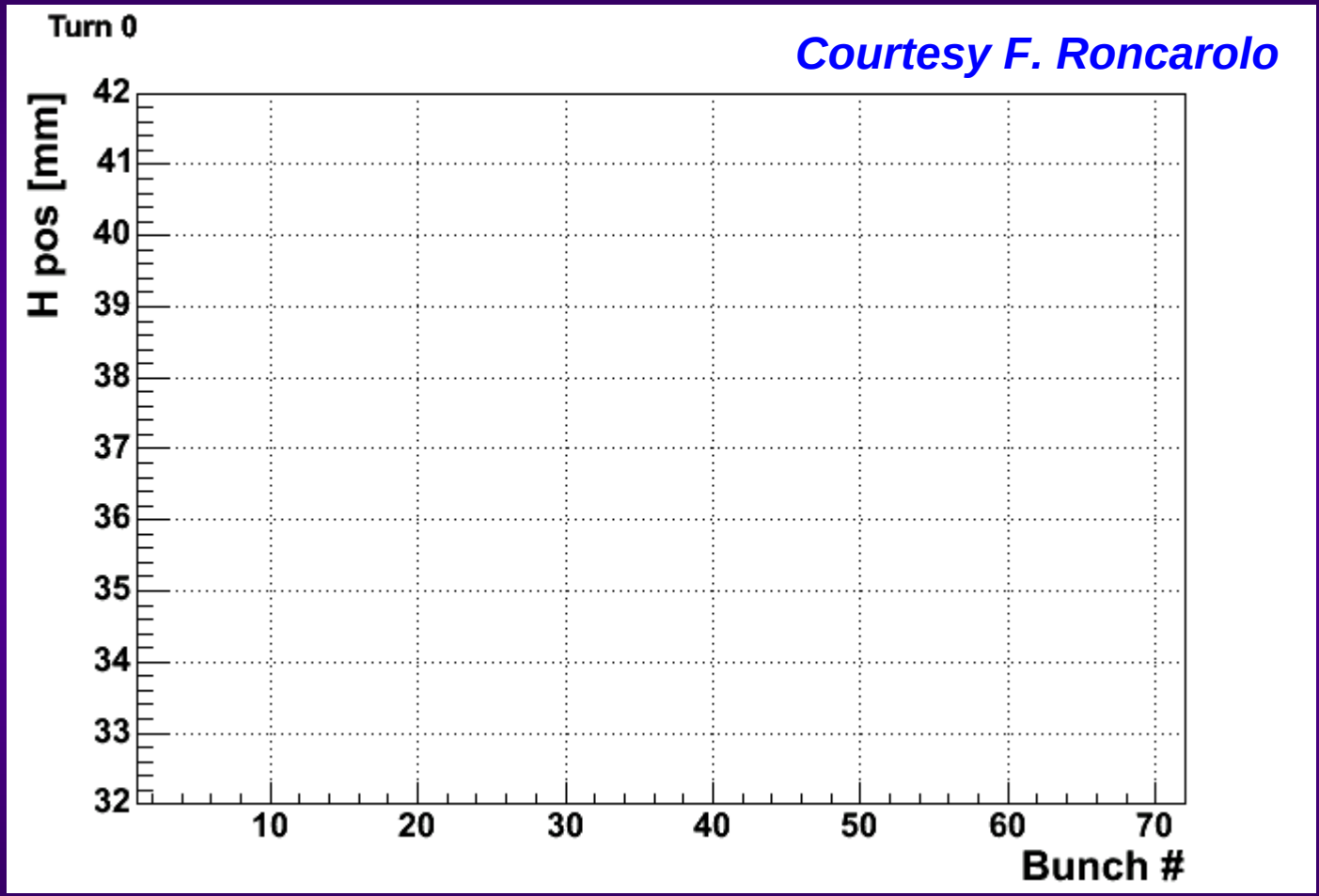
MEASUREMENTS (22/24)

Collimator OUT, $\pm$ 11.5 mm, and ξ_x = 0.04 (Anim_07h29)



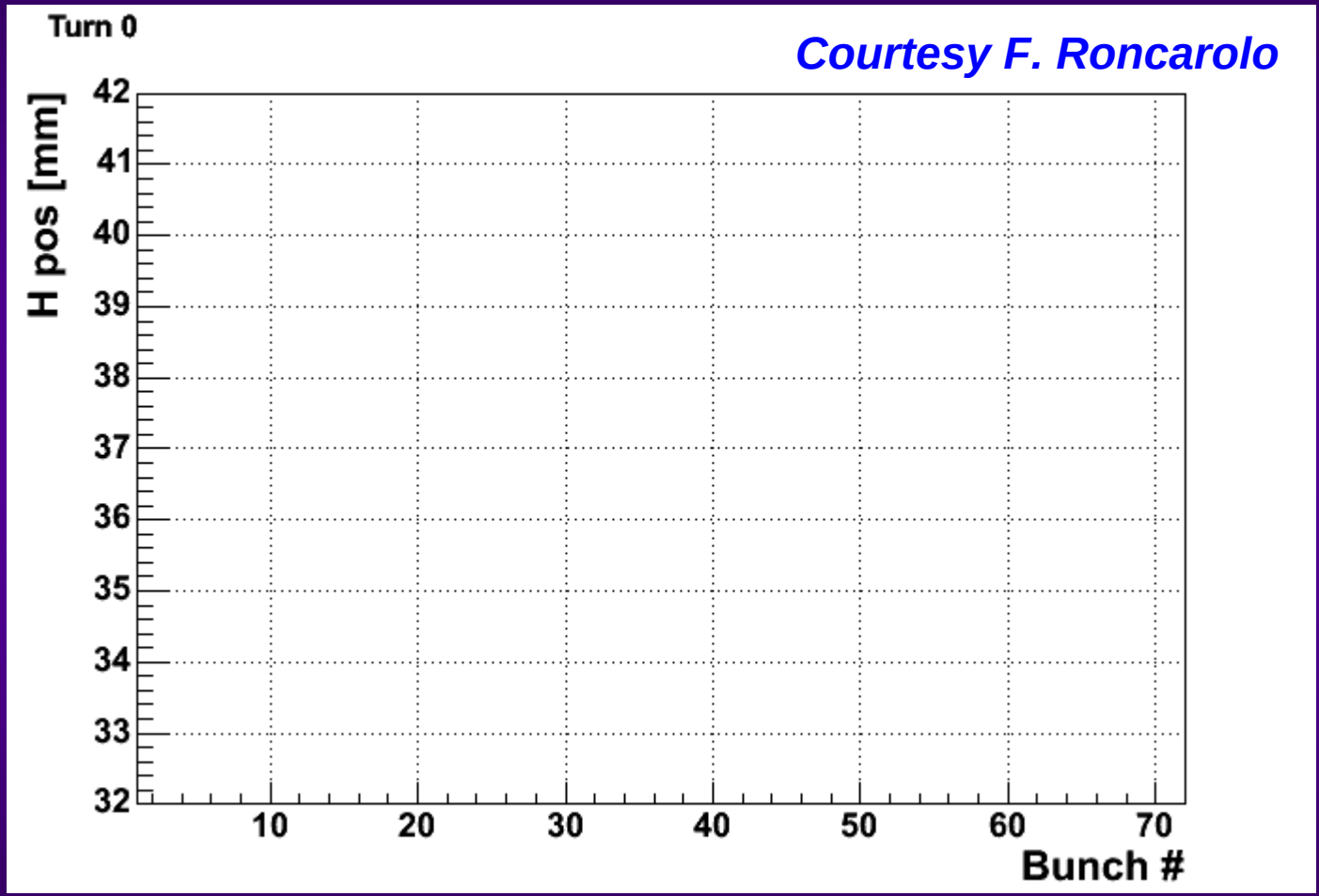
MEASUREMENTS (23/24)

Collimator IN, ± 3 mm, and ξ_x = 0.64 (Anim_07h33)



MEASUREMENTS (24/24)

Collimator OUT, ± 11.5 mm, and ξ_x = 0.04 (Anim_07h42)



CONCLUSION

- **2006 tune shifts close to (slightly higher than) the ones from 2004**
  - **Continuous instead of discrete measurements**
  - **Shorter bunch length in 2006**
  - **What about the transverse emittances?**

  $\Longrightarrow$ Still to be analyzed in detail

- **Interesting new results (instability rise-times) with 72 bunches with collimator OUT and with collimator IN (several gaps)**

  $\Longrightarrow$ Still to be analyzed in detail