

Asymmetric Beam-beam Experiment

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General

1) Beam time: 2:00 hours

2) Procedure

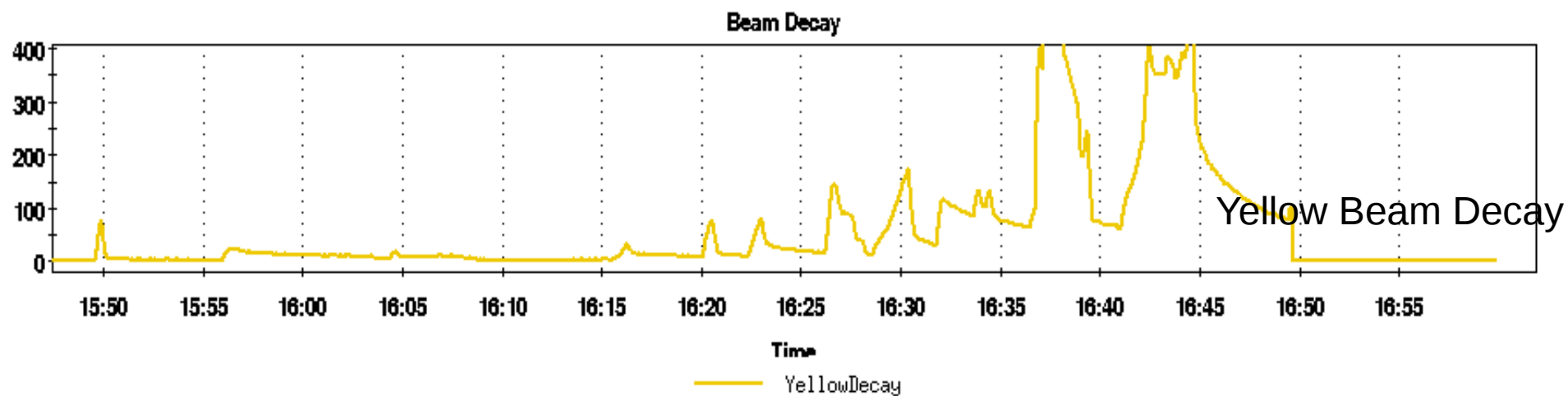
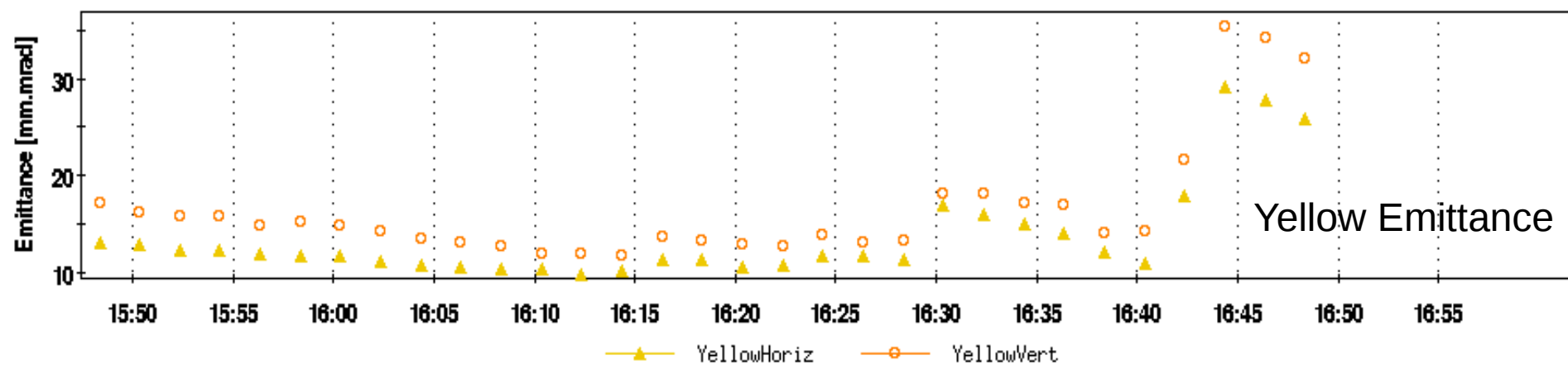
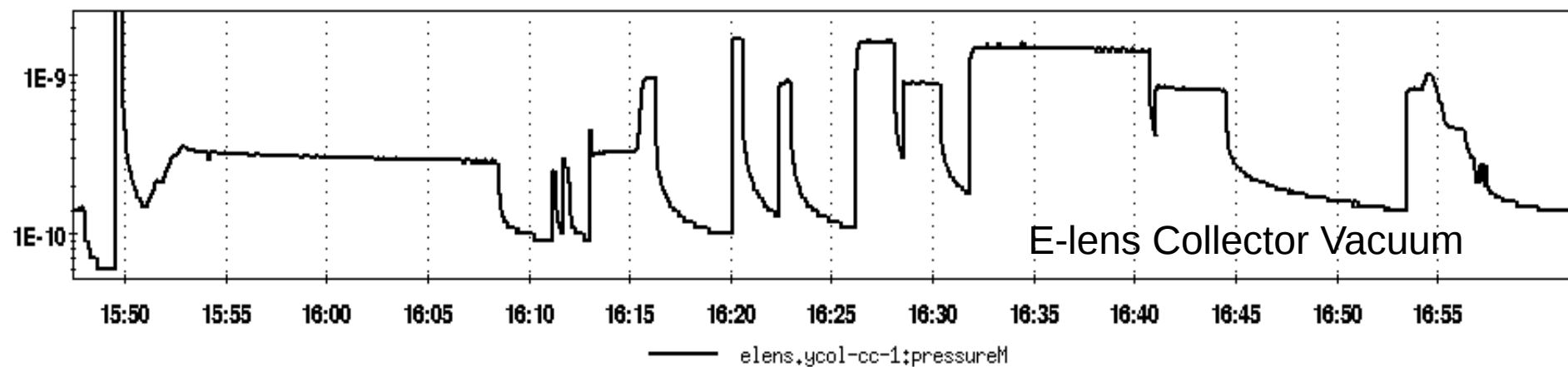
→ 13 * 12 bunches non-colliding pattern

→ Ramping up YEL solenoid to 4T

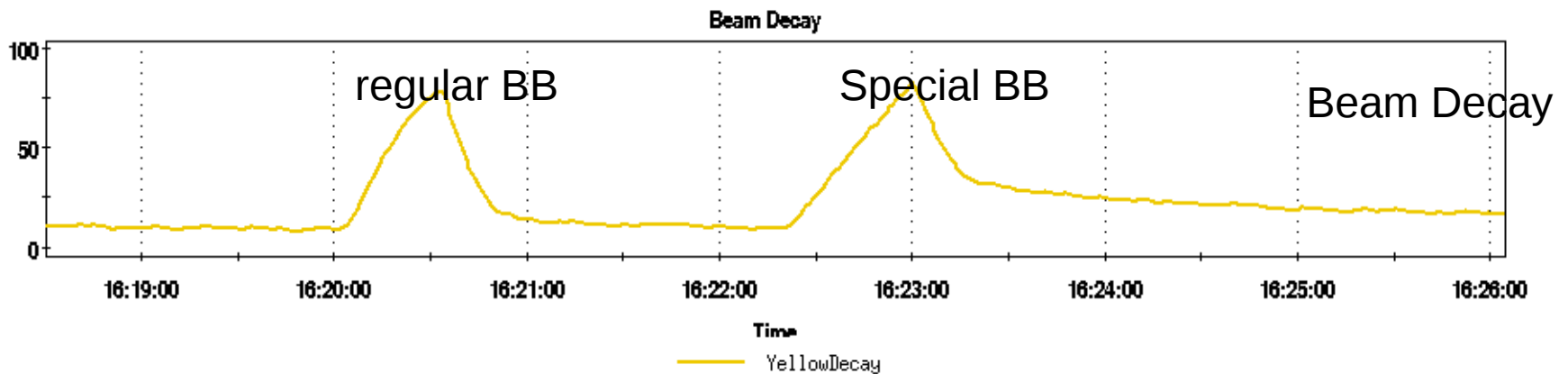
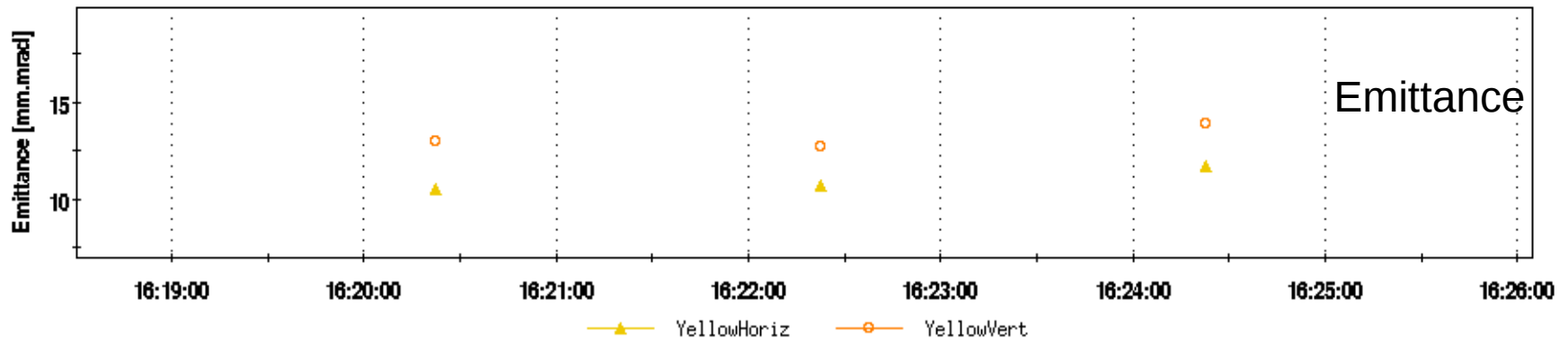
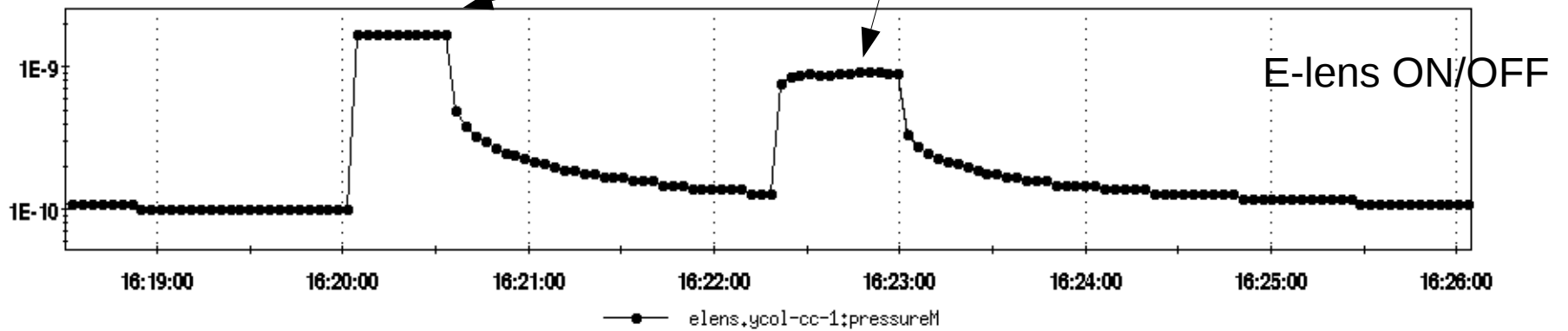
→ overlapping Au and electron beam with pulse mode

3) Experiment

shot DC electron beams w/o special electron current pattern (110 turns with electrons, followed by 10 turns without electrons), observe beam decay and emittance growth.

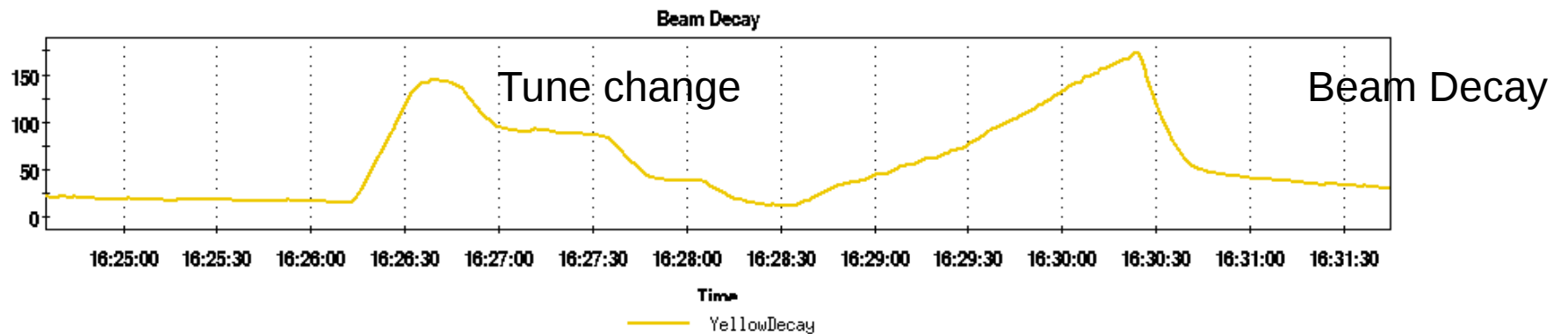
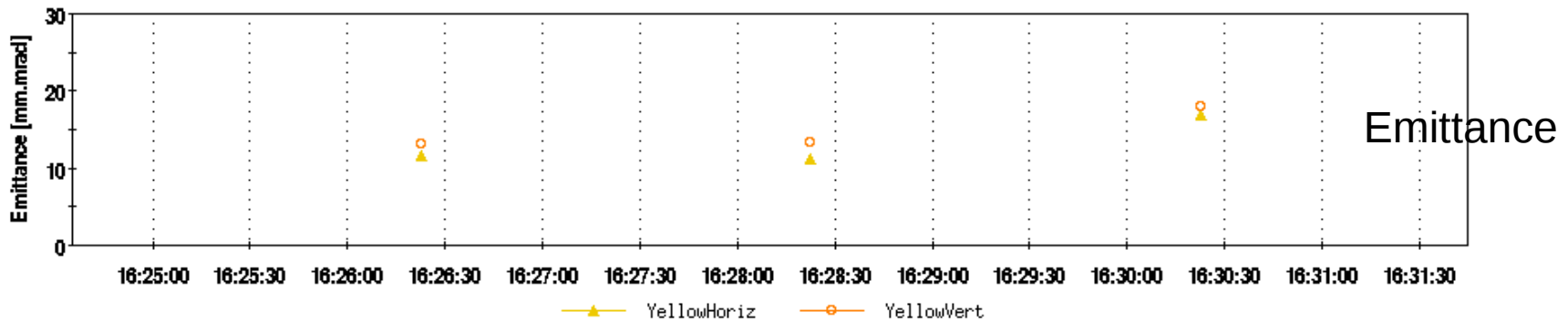
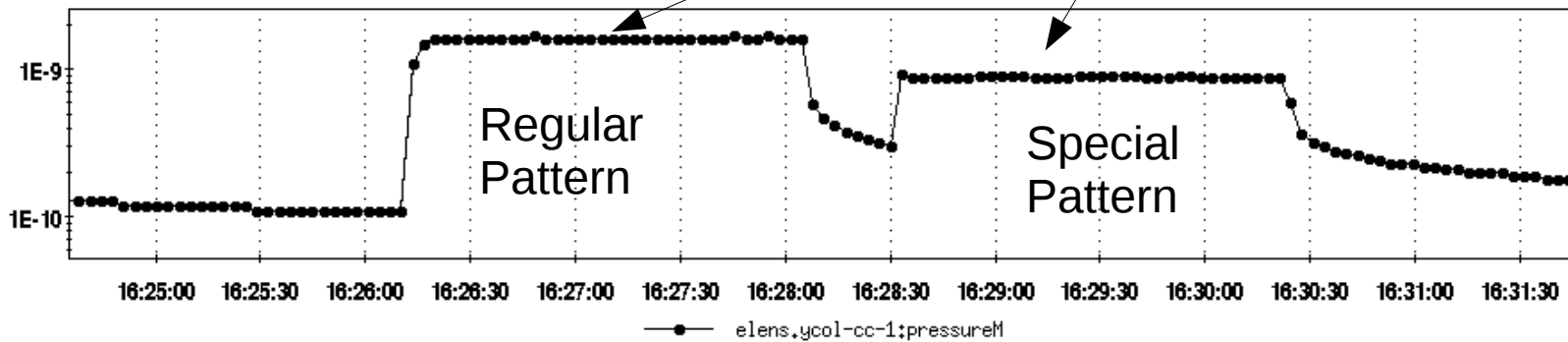


Electron beam ON, $I_e = 85\text{mA}$



- Observations: 1) Regular BB interaction increase loss.
2) Special BB interaction pattern increase loss too.

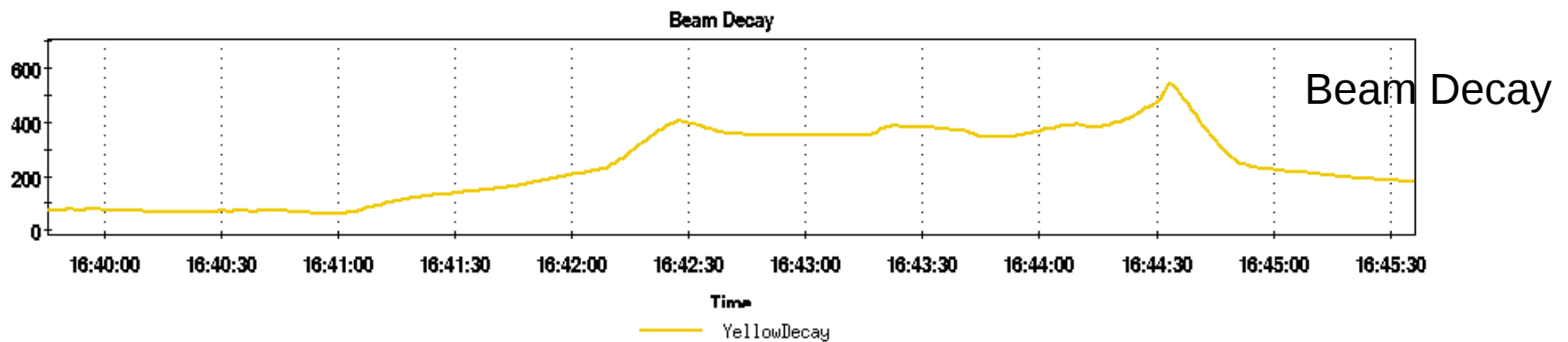
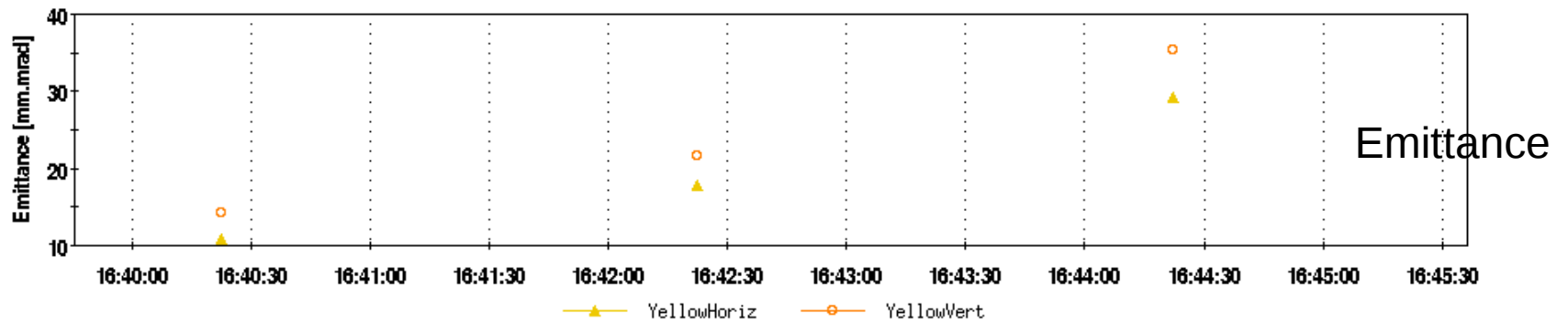
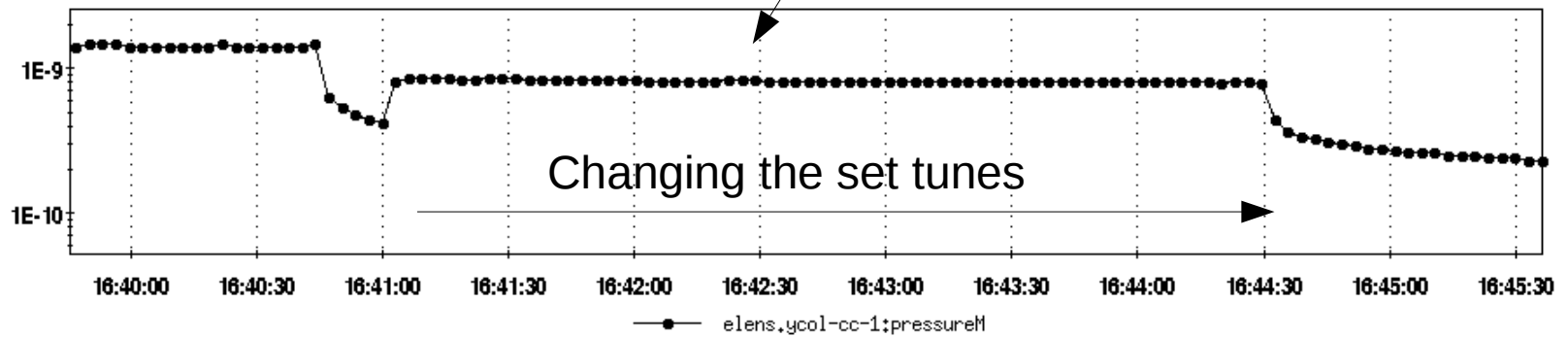
E-lens ON, $I_e=180\text{mA}$



Observations:

- 1) With regular BB pattern, loss can be reduced by reducing set tunes.
- 2) With the new tune setting, special pattern introduces extra loss and emittance blowup.

Special BB pattern, $I_e=80\text{mA}$



Observations:

- 1) With special BB interaction pattern, by increasing Q_{yaway} from 0.2, we couldn't improve beam lifetime.
- 2) Emittance blew up. Experiment ended.

Summary

- 1) Experiment using e-lens to simulation asymmetric BB interaction was done.
- 2) With special BB interaction pattern, we observed extra Au ion beam loss and emittance blow-up, which couldn't be improved by set tune change.
- 3) No further beam time request so far before we explained the observations.