Multi-batch Slip stacking for Numi

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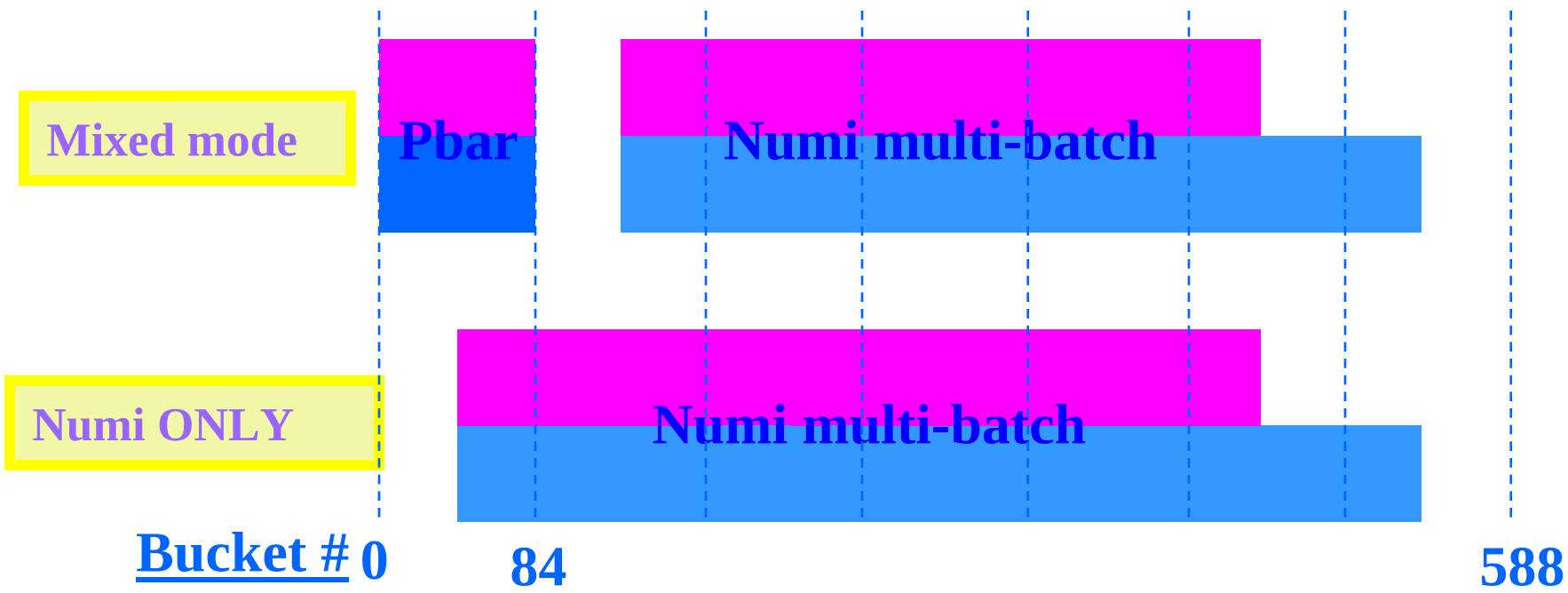
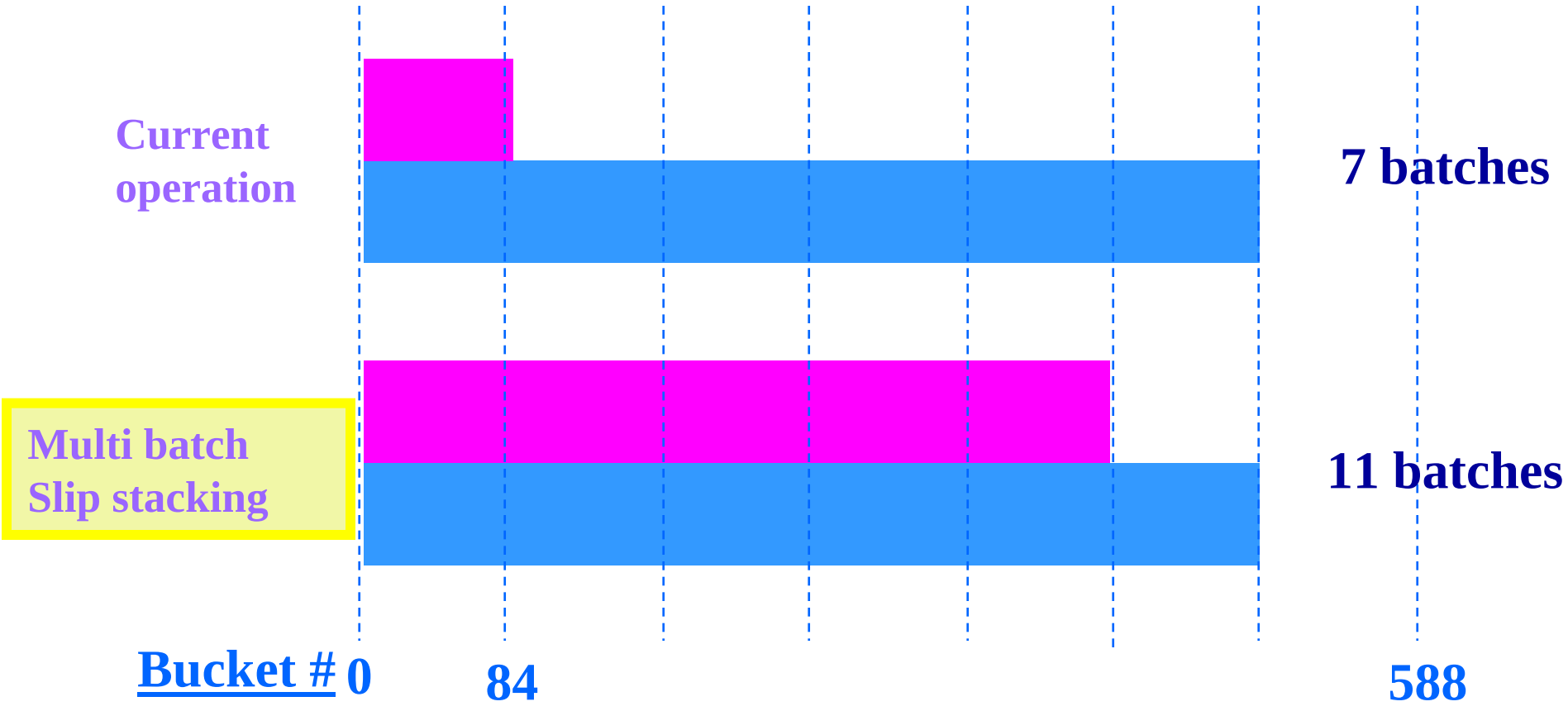
Proton Plan Goal

- **Intensity: 11 x 4.3E12 @ injection**
  4.5E13 ppp @ extraction
- **Total beam power: 400kW** **80kW → Pbar**
  320kW → Numi
- **Total beam loss: < 5%**

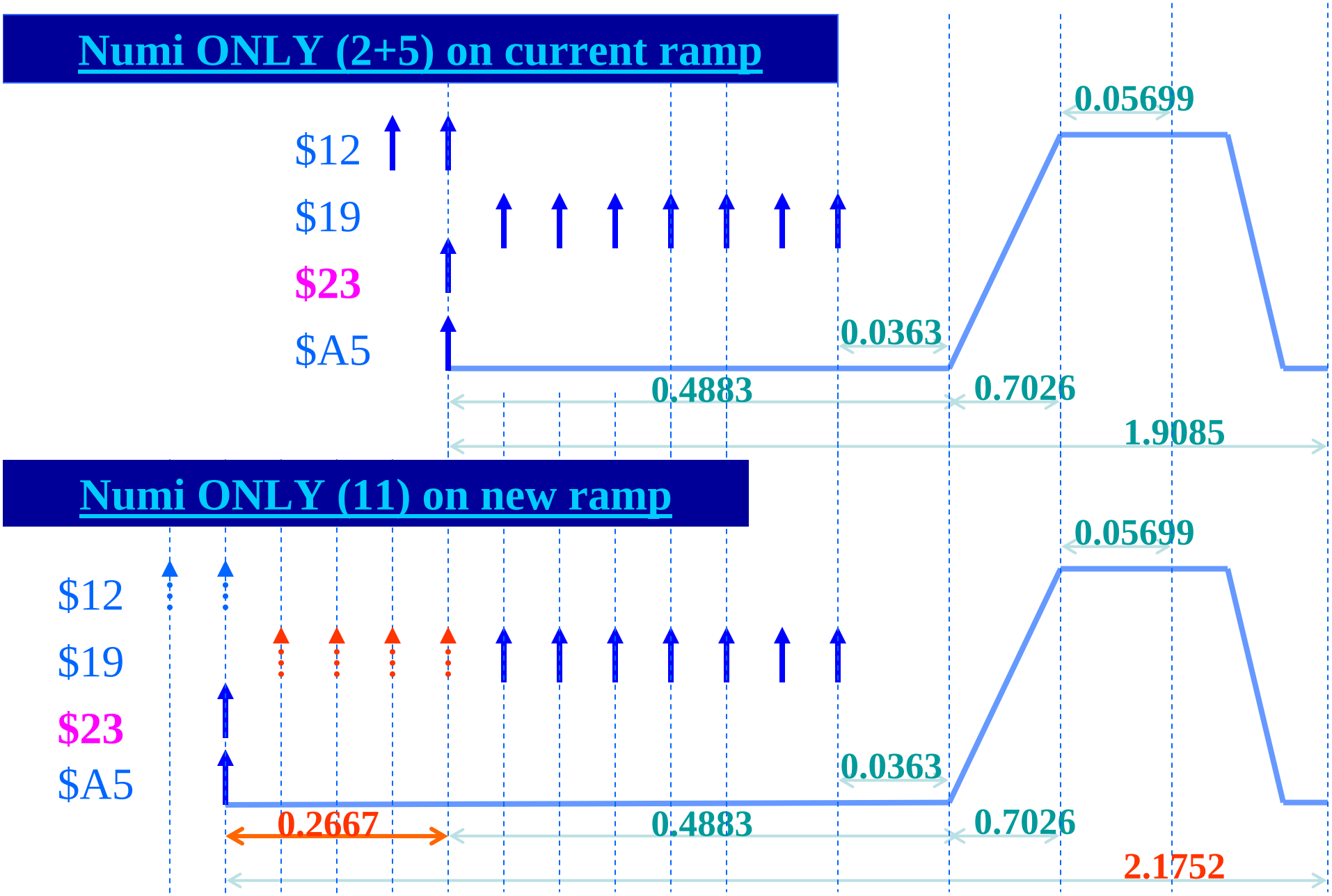


Present Status

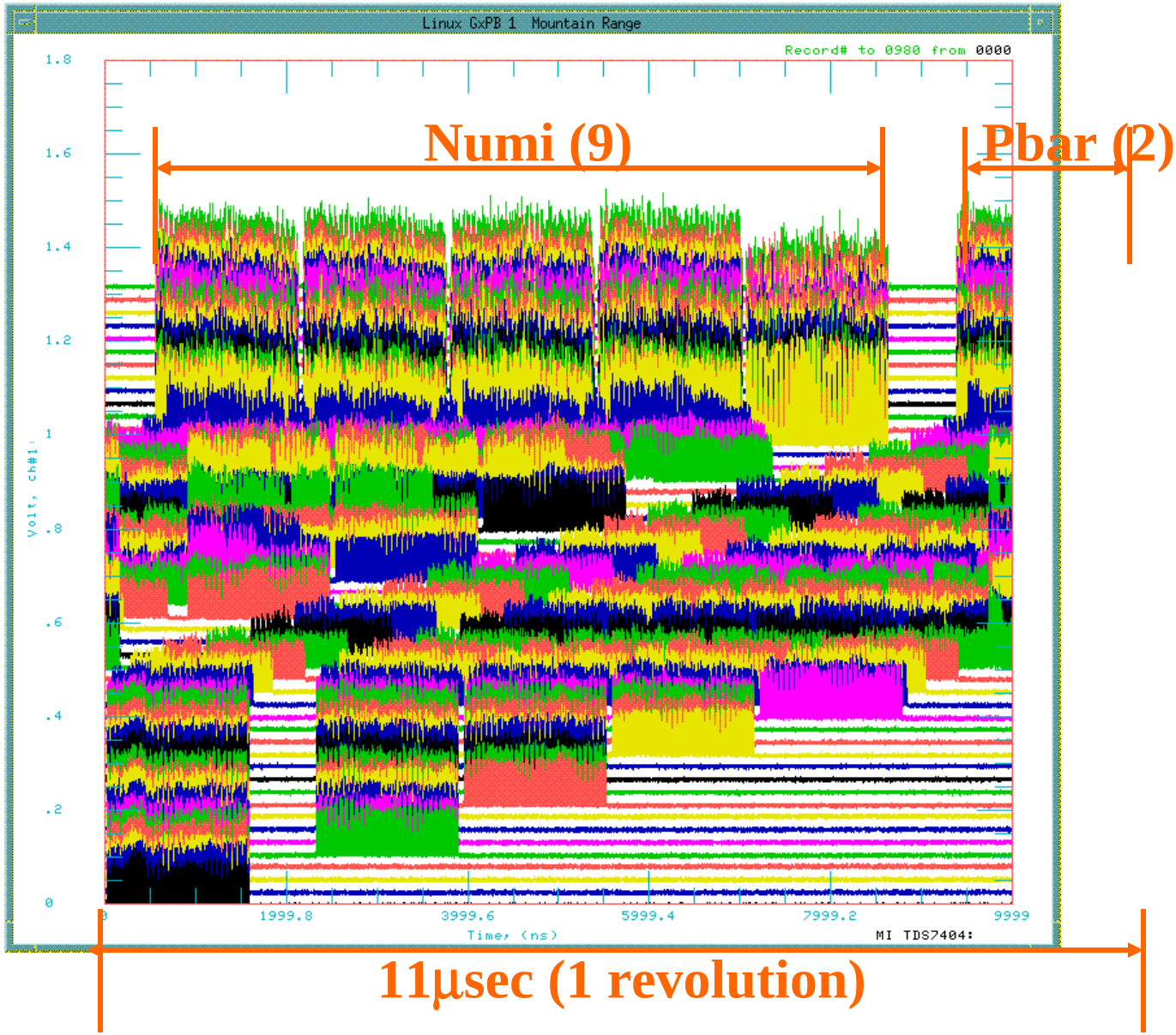
- Fit MI ramp to 2.2 sec
- Verify 11 batch slip stacking scheme
- Send 11 batch to Numi target with int. of ~3.0E13



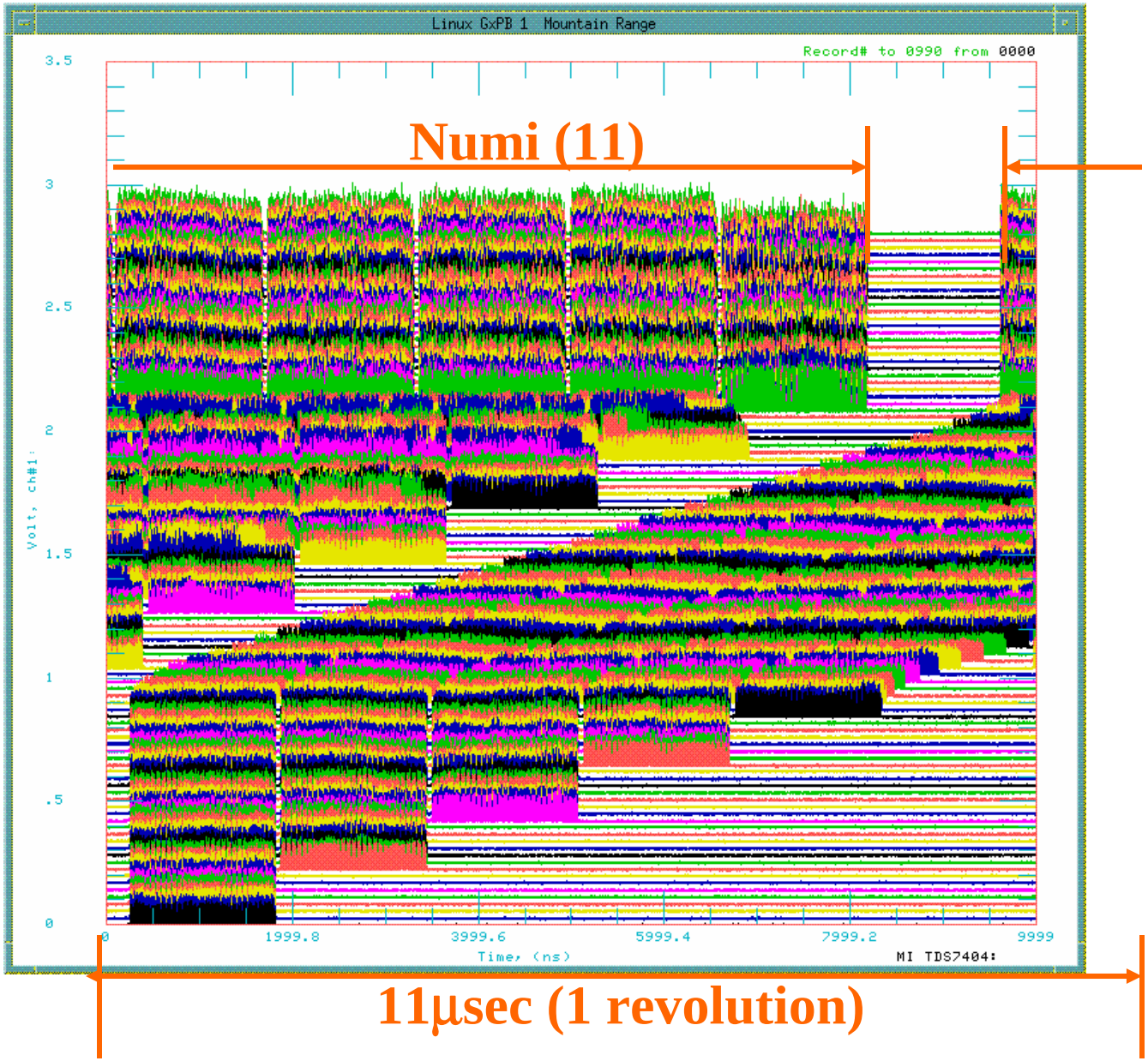
Main Injector Ramp



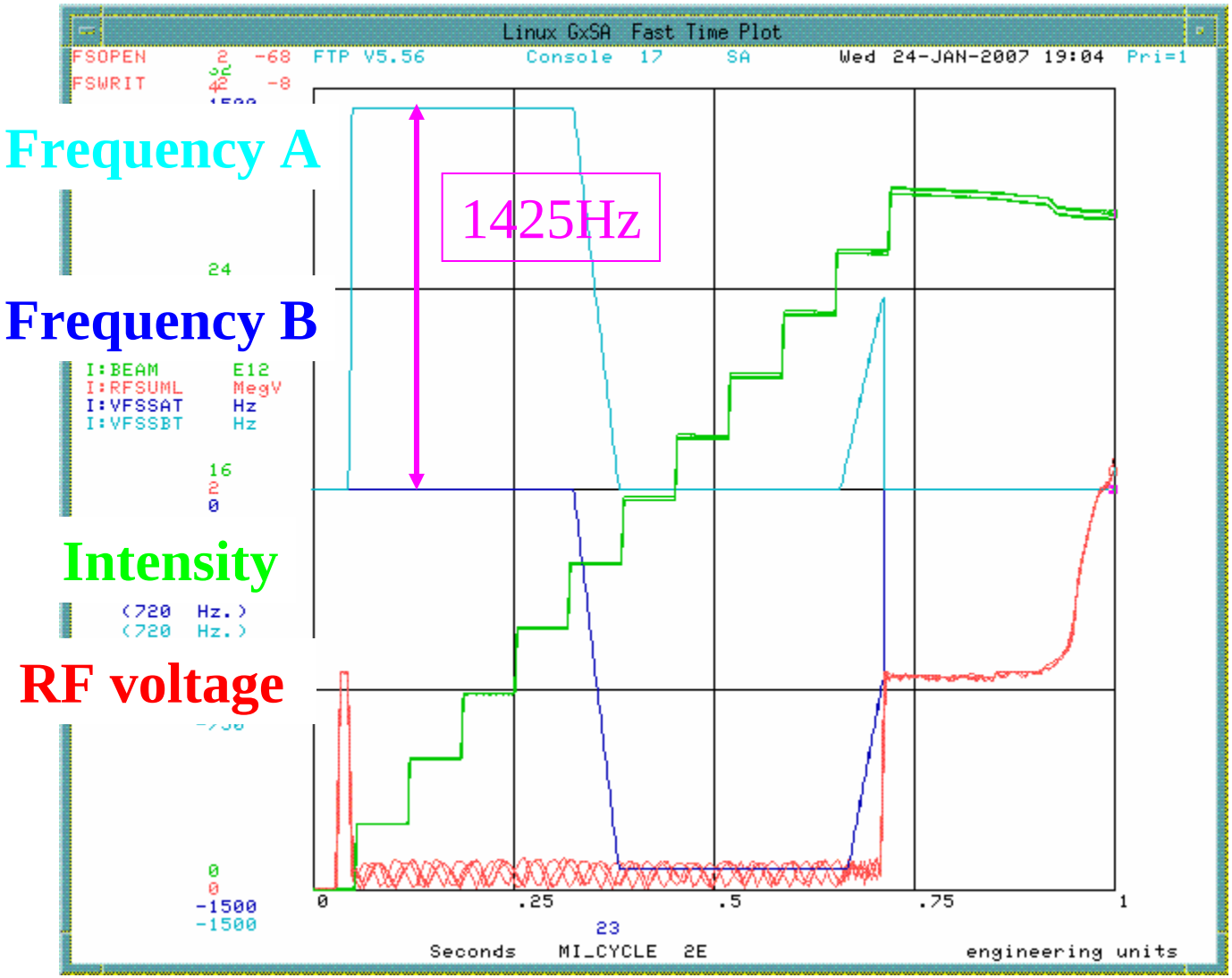
Slip stacking on Mixed mode cycle



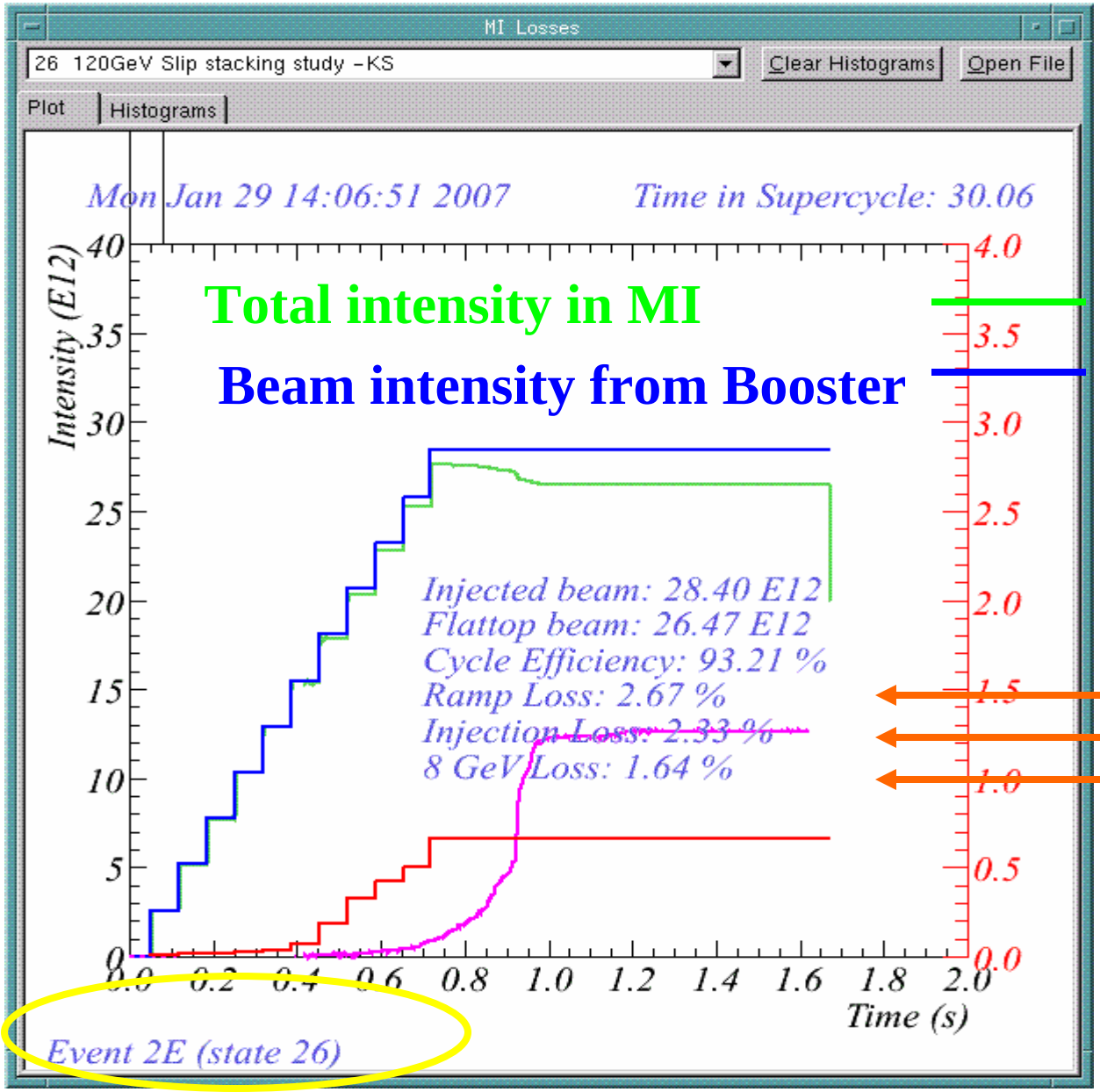
Slip stacking on Numi Only cycle



Intensity and frequency curves



Beam studies on 2E cycle



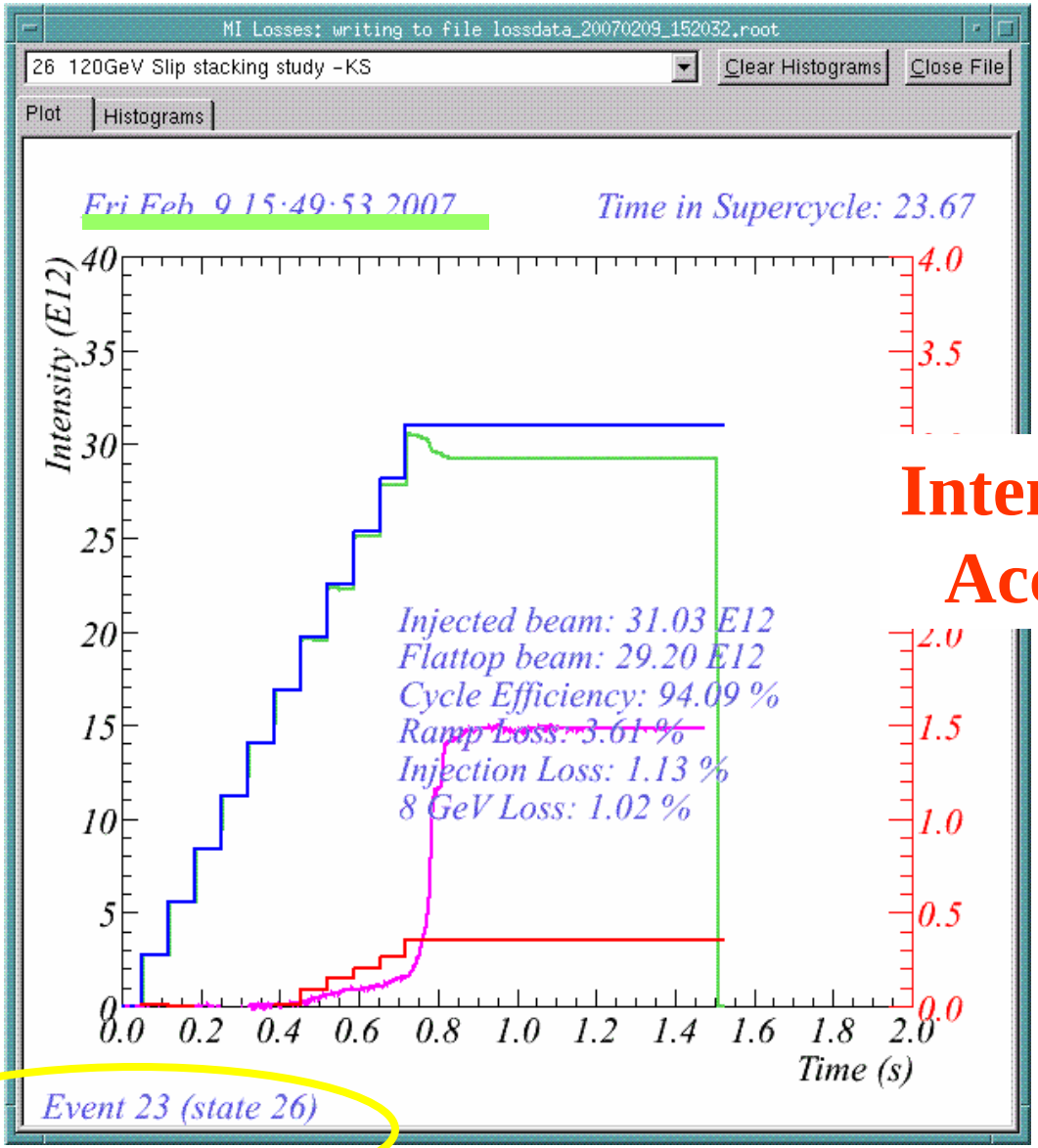
Intensity:~2.7E13

Acc. eff.: ~93%

Beam loss

- **Beginning of Acceleration**
- **Injection kicker gap**
- **8GeV Life time**

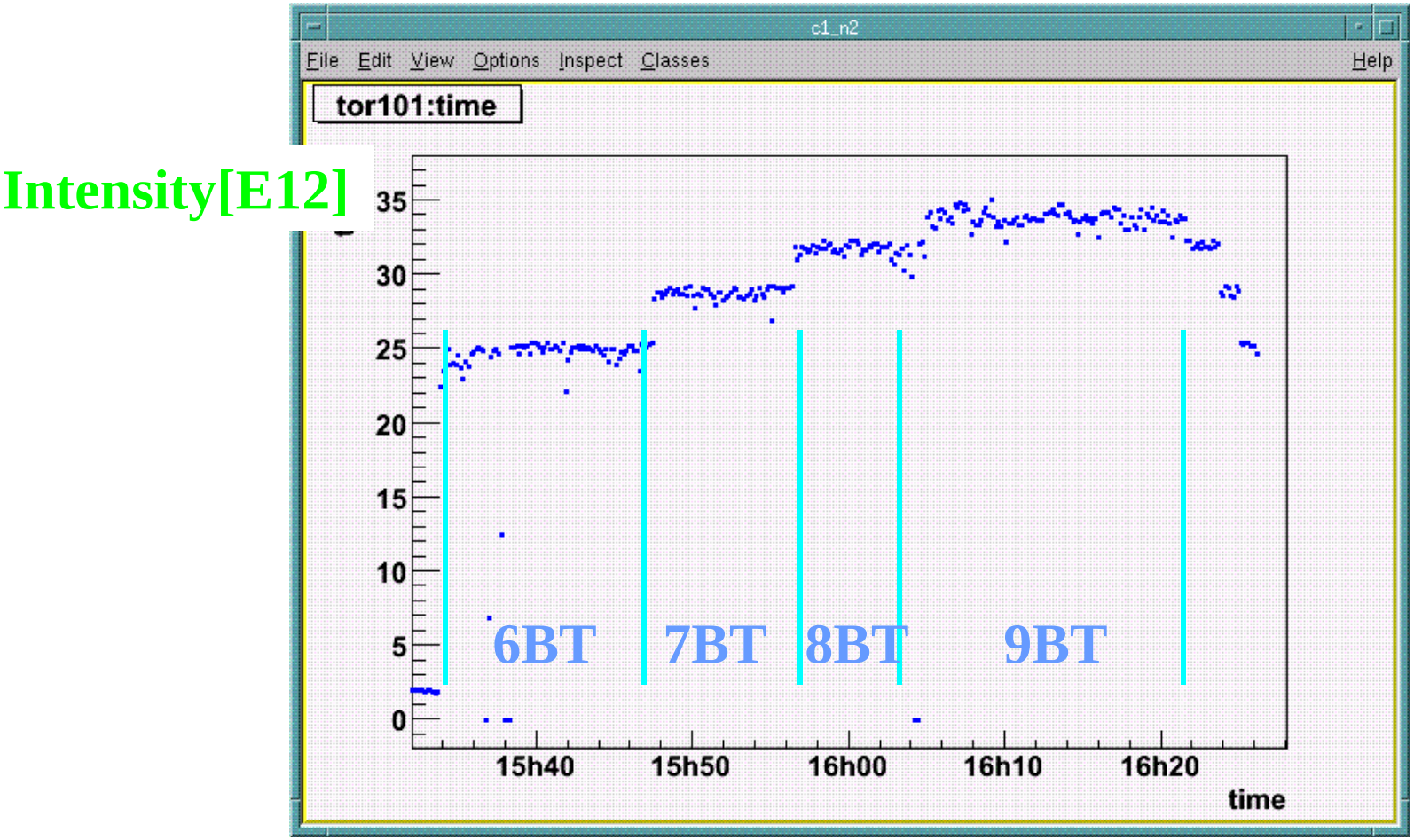
Beam to Numi Target



Intensity:~3.0E13

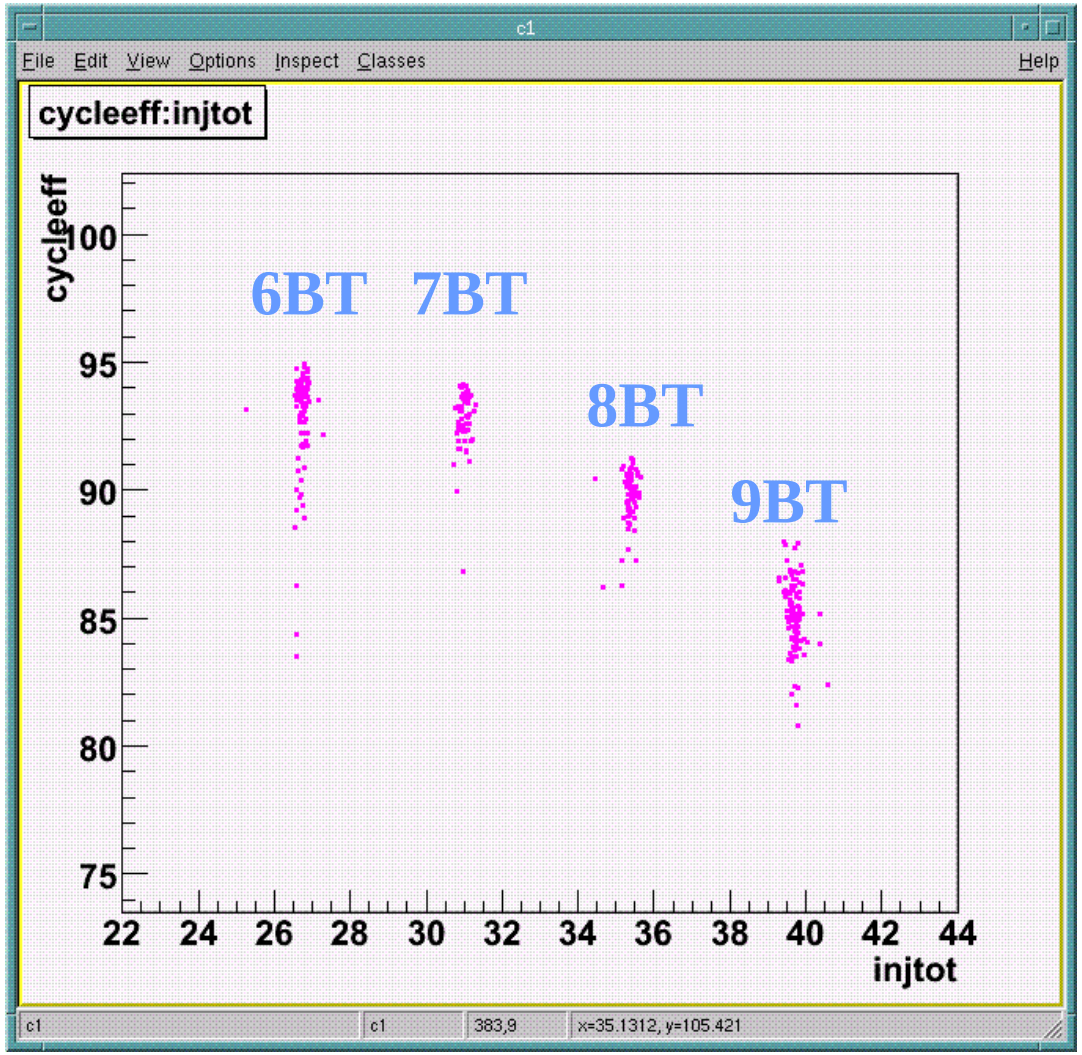
Acc.eff.: ~94%

Intensity on Numi TOR101

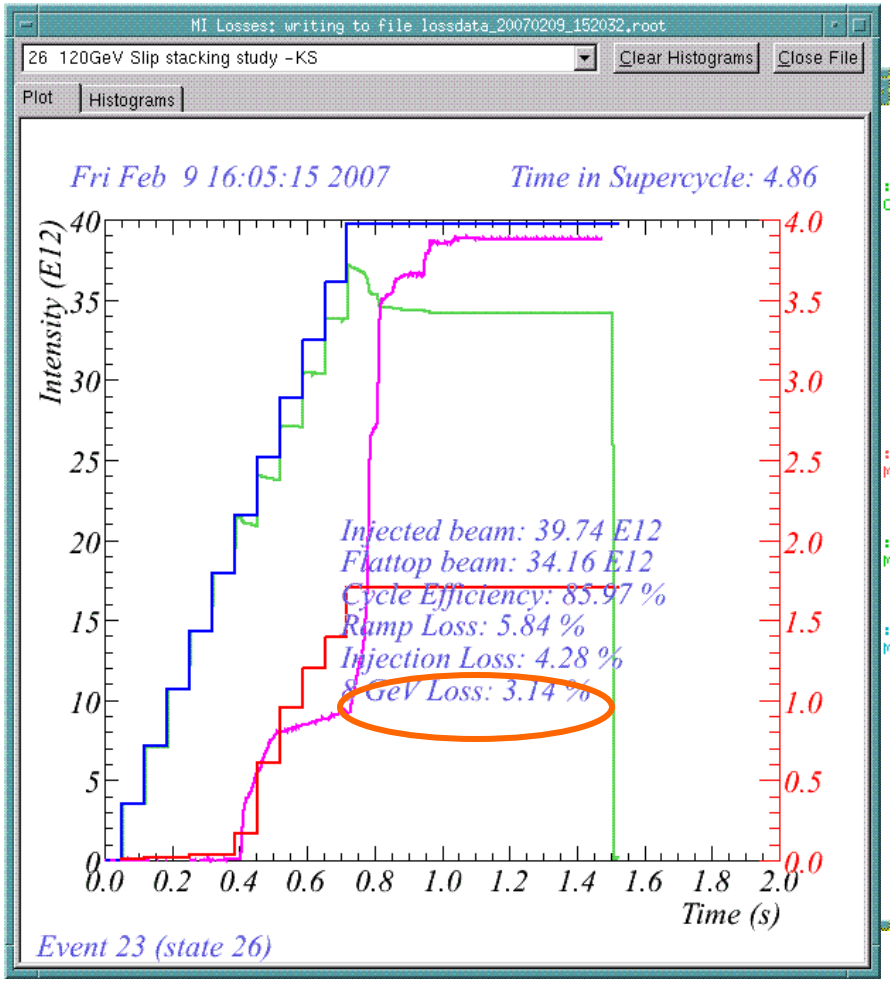


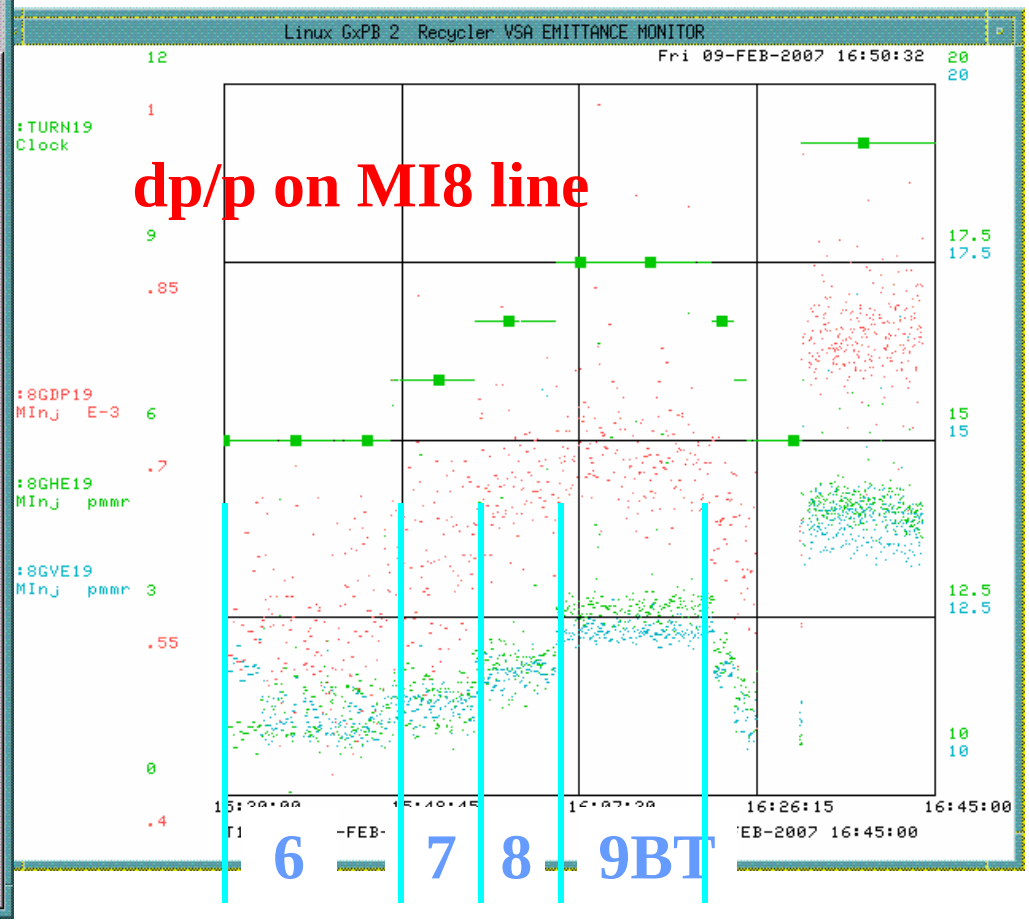
Sent record intensity of 3.5E13 to Numi Target

Efficiency vs Intensity



Beam loss on highest intensity





High Chromoticity ~-18
NO Damper during slipping

Larger dp/p from Booster

Summary

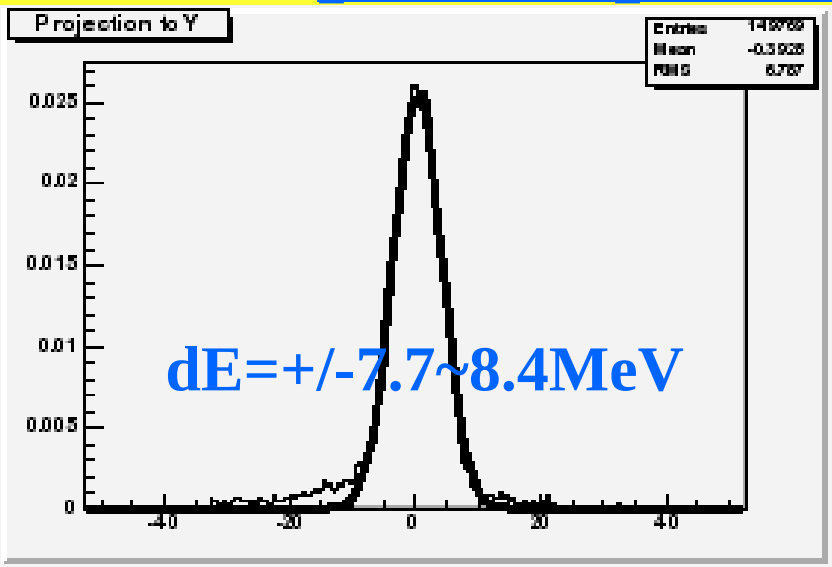
- MI 23cycle ramp fit to 2.2 sec.
- Verified 11 batch slip stacking scheme.
- 11 batch sent to Numi target
  with intensity of ~3.0E13with 94% eff.
  and record intensity of 3.5E13 with 86% eff..
- Beam loss monitor is operational (abort capability & display).

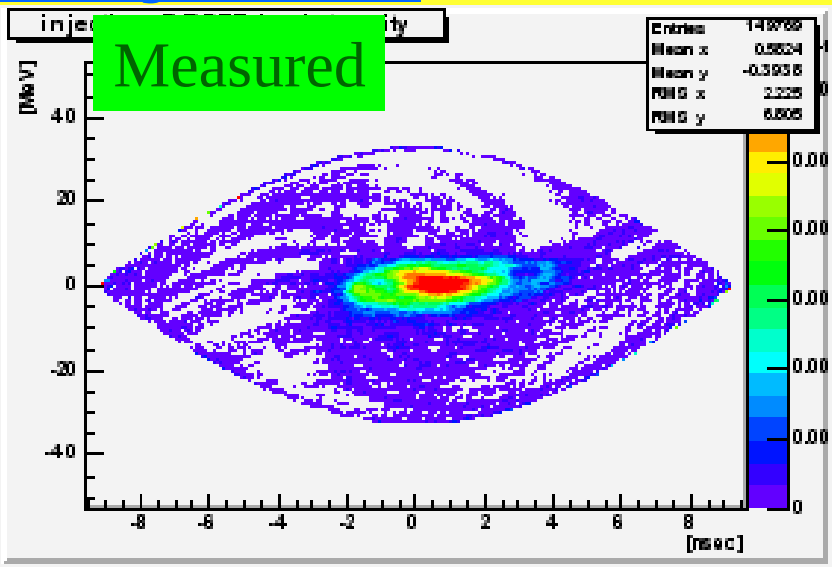
Full intensity operation

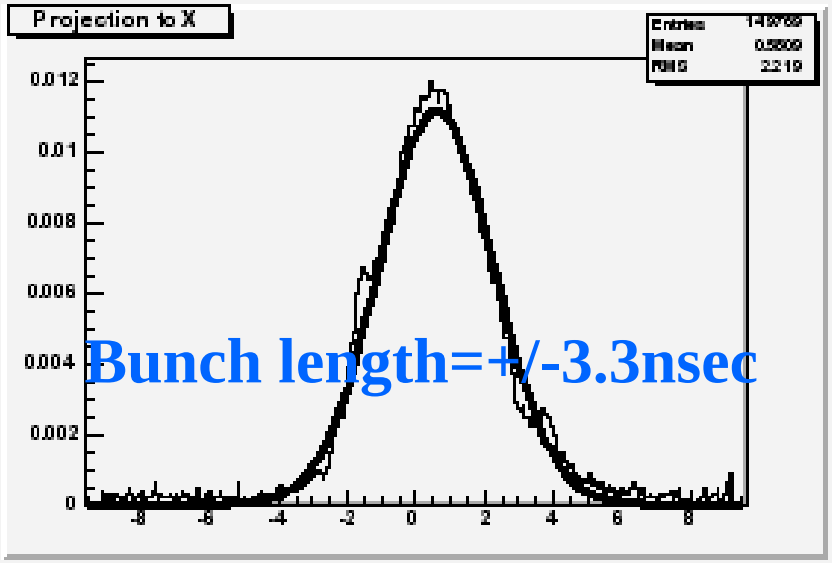
Collimator to collimate beam @ 8GeV → Acc. loss.
Small energy spread beam from Booster → Kicker gap loss
Transverse damper during slipping. → 8GeV Life time

- Back up

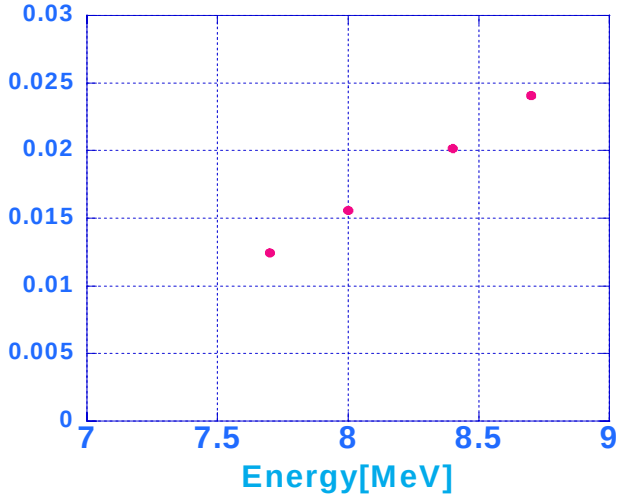
Beam distribution in Longitudinal phase space at injection

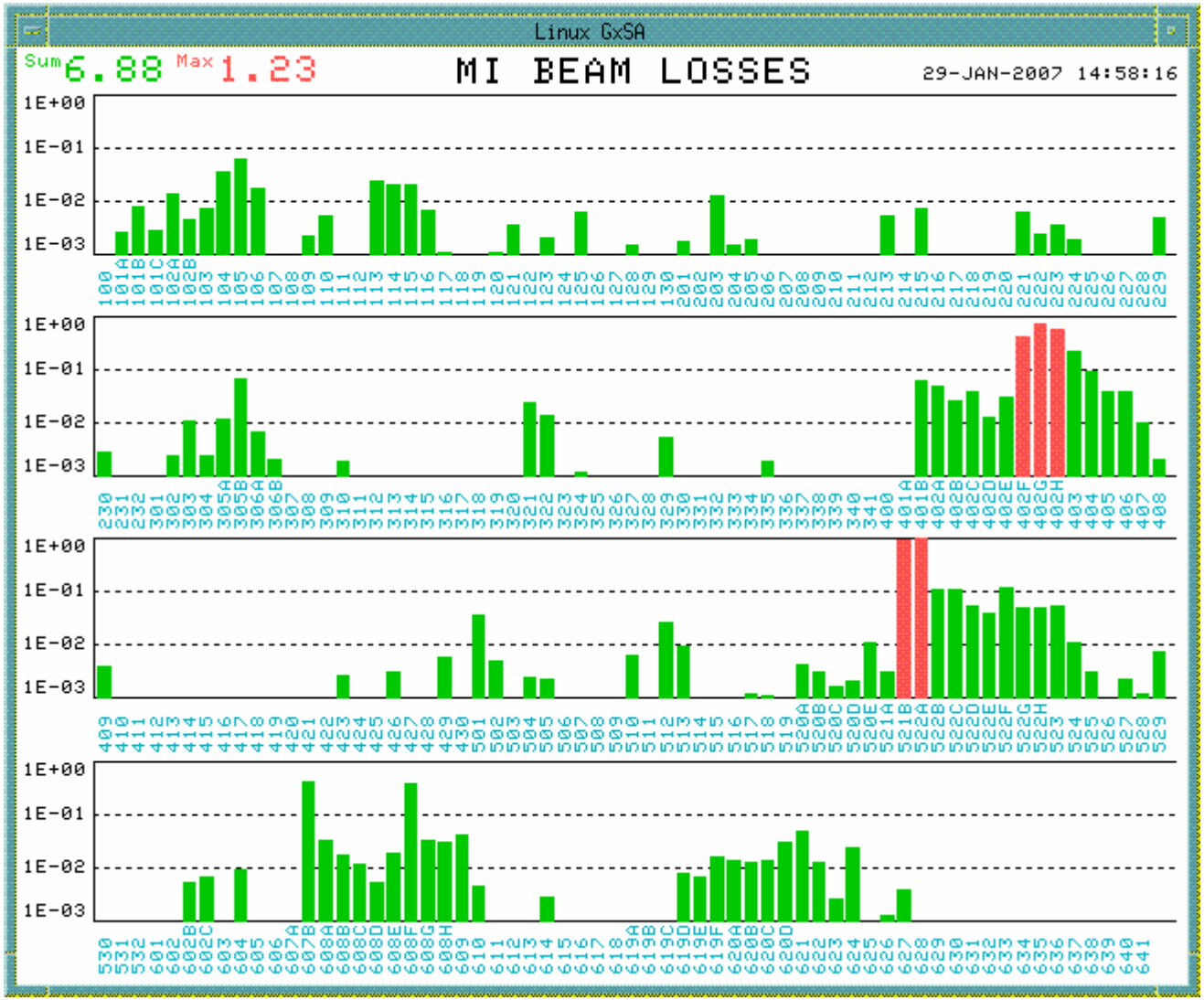




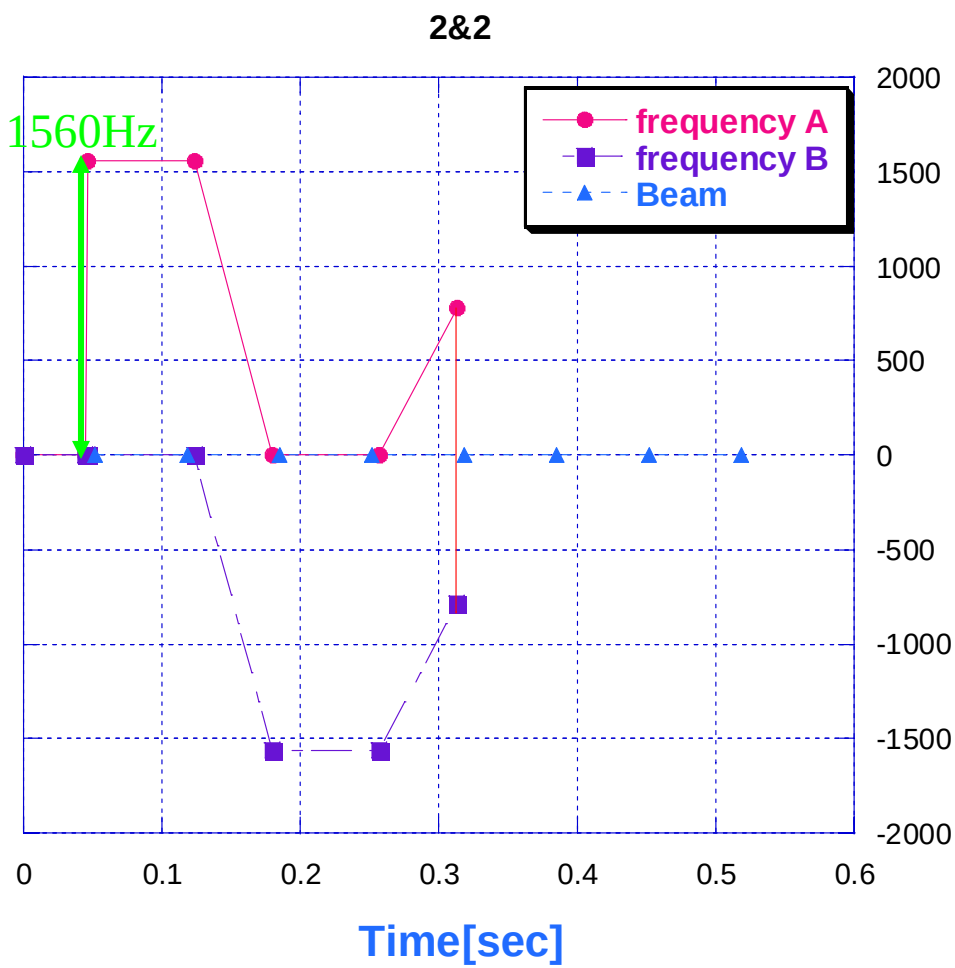


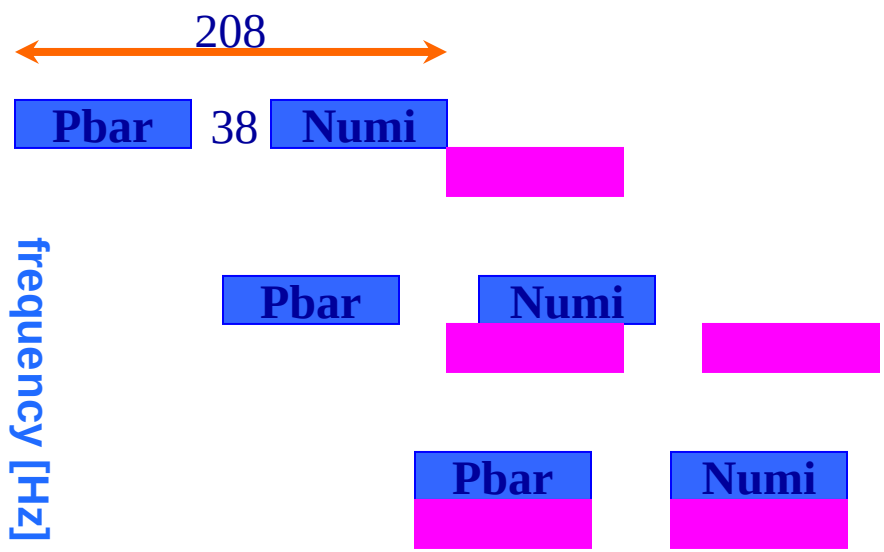
Simulation results of kicker gap loss



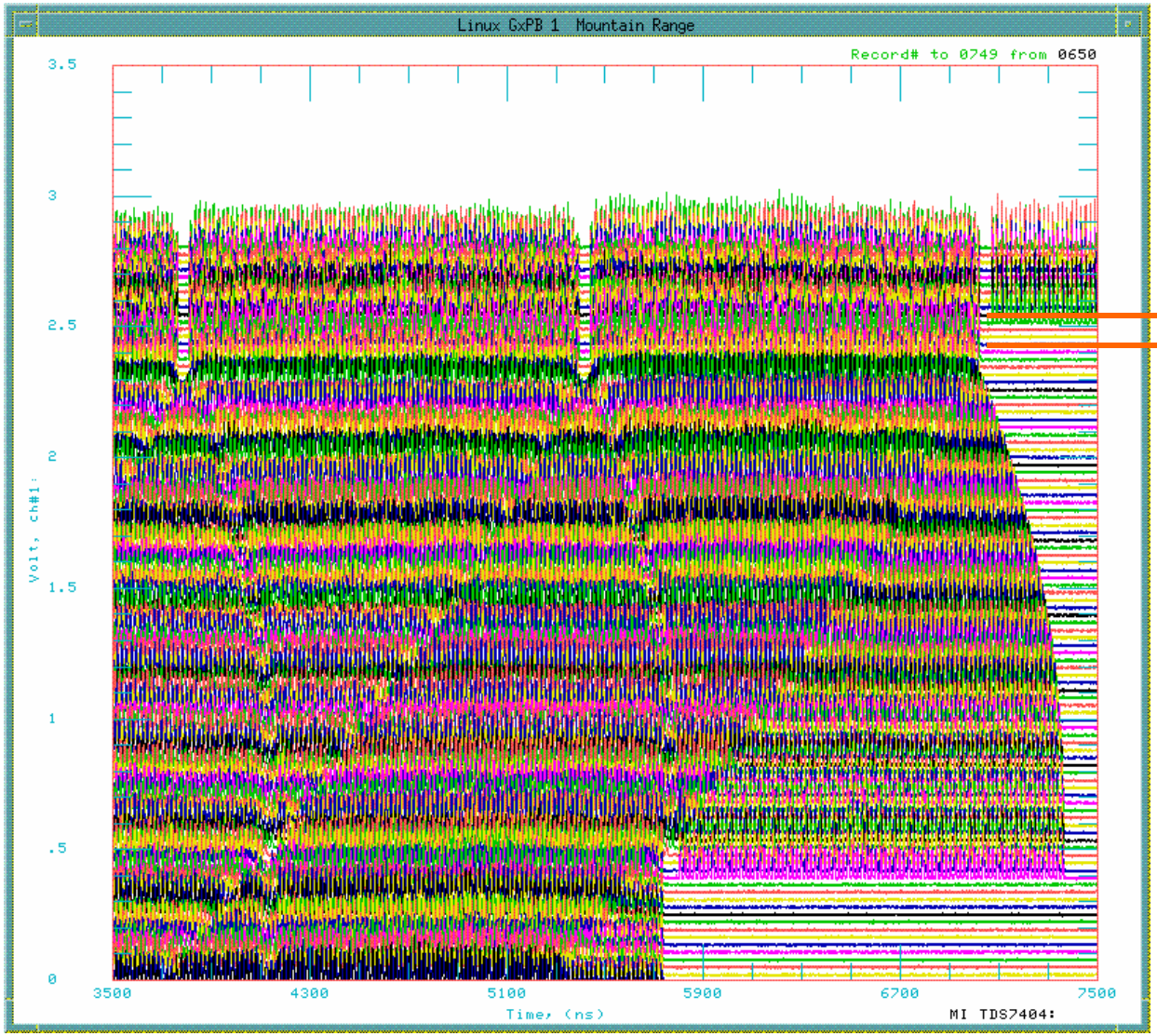

Linux GxSA
Sum 6.88
Max 1.23
MI BEAM LOSSES
29-JAN-2007 14:58:16
1E+00
1E-01
1E-02
1E-03

Pbar(2) +Numi(2+4)





Recapture time



11th injection

Recapture