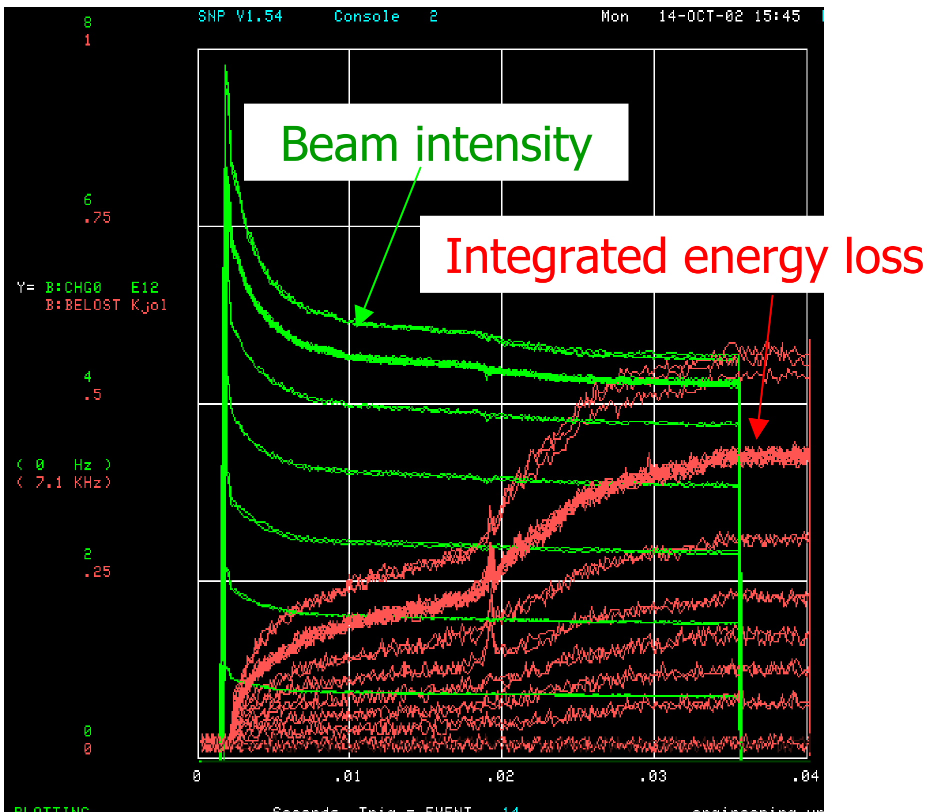
8 GeV H^- Injection

- Beam power:
  - Extraction: **2 MW** @ 120 GeV
  - Injection: **133 kW** @ 8 GeV
  - (Reference: Booster total loss budget 0.4 kW)
- Compare to MiniBooNE:
  - **18 kW** @ 5e16 per hour, 8 GeV
- Compare to A0 (pbar target):
  - **48 kW** @ 5e12 per pulse, 2-sec cycle, 120 GeV
- Compare to SNS:
  - **Injection & extraction: 1 MW** @ 1e14 per pulse, 60 Hz, 1 GeV

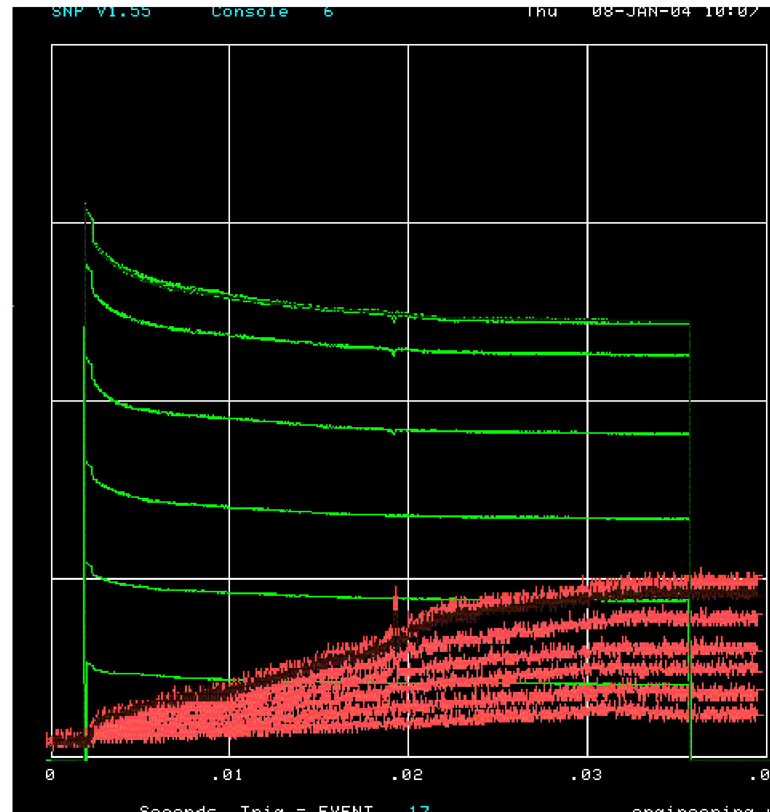
- Bottom line:
  - **For the sc linac option, minimizing injection loss is essential.**
  - **(Note: For the synchrotron option, bucket-to-bucket transfer loss would be much smaller.)**

Booster - the Bottleneck

2 years ago



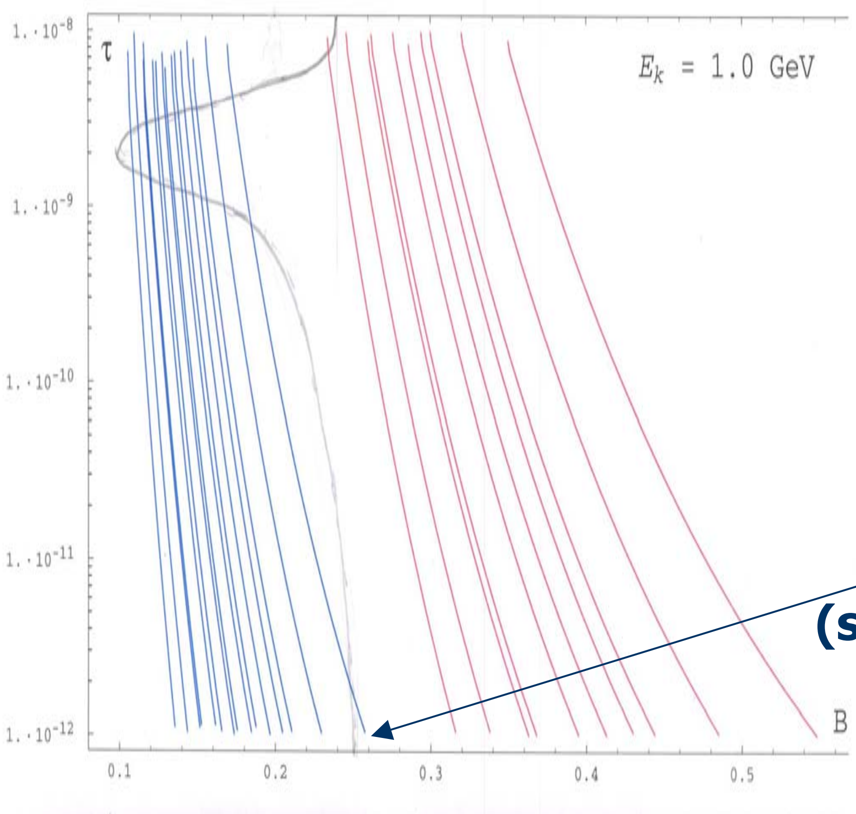
Now



Lorentz Stripping of H^- and H^0

- E (MV/cm) = 3.197 x p (GeV/c) x B (T)
- H^- lifetime:
  - Accurate formula: $\tau = (a/\gamma\beta cB) \exp(b/\gamma\beta cB)$, a, b = const.
  - Approximate "Rule of thumb": p x B < 6-7 GeV/c x kG
  - i.e., E < 1.918 – 2.238 MV/cm
  - E.g., 400 MeV line:
    - p = 0.954 GeV/c
    - B < 6.3-7.3 kG
    - Strongest bend = 5.97 kG
    - Lambertson = 6.72 kG
- Excited H^0 state lifetime - "Rees rule":
  - E = 1.171 MV/cm fits in the gap between n = 4 and n = 5 Stark states
  - 1.334 GeV H^- (ESS): B = 1.77 kG
  - 1 GeV H^- (SNS): B = 2.16 kG
  - 8 GeV H^- (Proton Driver): B = 0.412 kG, $B\rho$ = 29.65 T-m, ρ = 720 m
- Compare to MI dipole field:
  - @ 8 GeV: B = 1.013 kG, $B\rho$ = 29.65 T-m, ρ = 293 m
  - @ 150 GeV: B = 17.2 kG, $B\rho$ = 503.47 T-m, ρ = 293 m

Did SNS/BNL Do It Right?



Y.Y. Lee's plot

2.5 kG

(should it be 2.16 kG?)