Run 2 UITF status update – Nov 8/20

Overview:

- developed reproducible orbit tuning procedure for Run 3
- RF work ⇔ Booster running more stable, 1 - 2 trips/hr
- Laser PID for current lock ⇔ electron current quite stable
- measurements of beam energy loss in the HDice target ⇔ a check on 10 GeV simulations
- NMR measurements of thermal equilibrium signals vs Ie with beam off and beam on - up to ½ nA. (At higher Ie, the temperature is higher and the signal becomes too small.)

- partial block has developed in the $^{3}He/^{4}He$ circulation line, which prevents high flows and limits cooling at higher currents
- Run 2 ends Monday, Nov 9

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- beam energy loss in HDice target at 10 MeV used to simulate loss at 10 GeV
- thermal measurements of beam energy loss in the target:

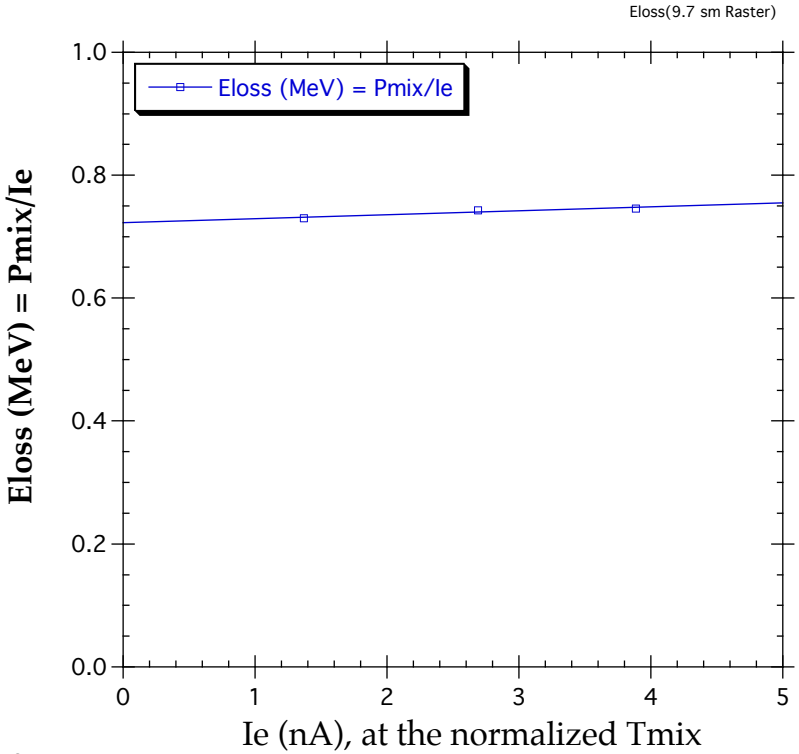
  - Ie (nA) raises IBC temperature to T_{mix}(mK)

  - calibrated heater P_{mix}(mW) raises IBC to the same T_{mix} temperature

  - Eloss (MeV) = P_{mix} (mW) / Ie (nA)

    in mW/nA = MeV-nA/nA

⇔ **Target Eloss = 0.74 MeV/nA**



- simulation carried out with G4-Beamline
  - calls GEANT4
  - two routines available for calculating ΔE
    ⇔ gives 0.55 MeV/nA or 0.85 MeV/nA

⇔ will use measured Eloss to create 10 GeV conditions

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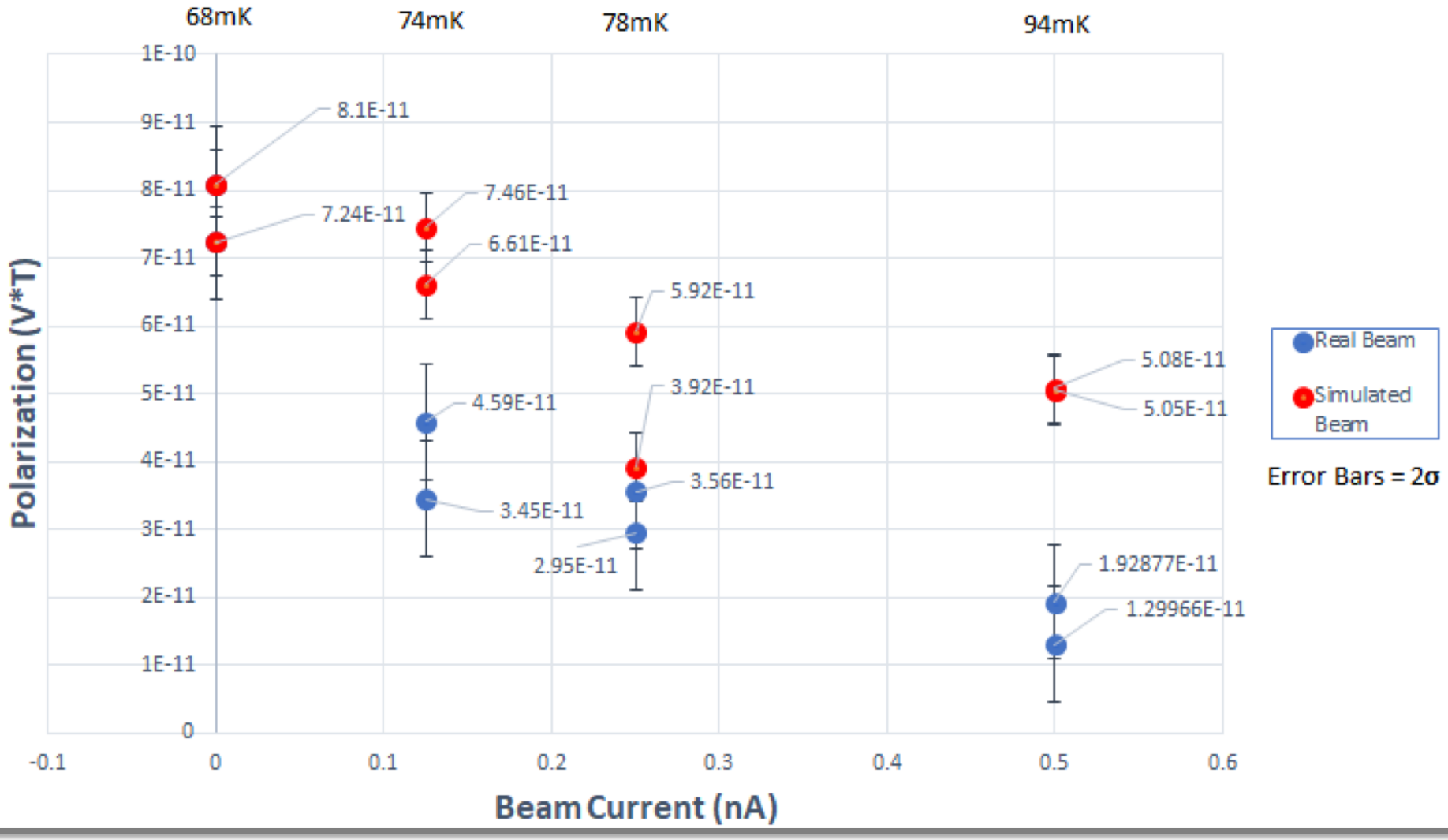
Beam-OFF NMR at beam-on temperatures

Beam-ON NMR



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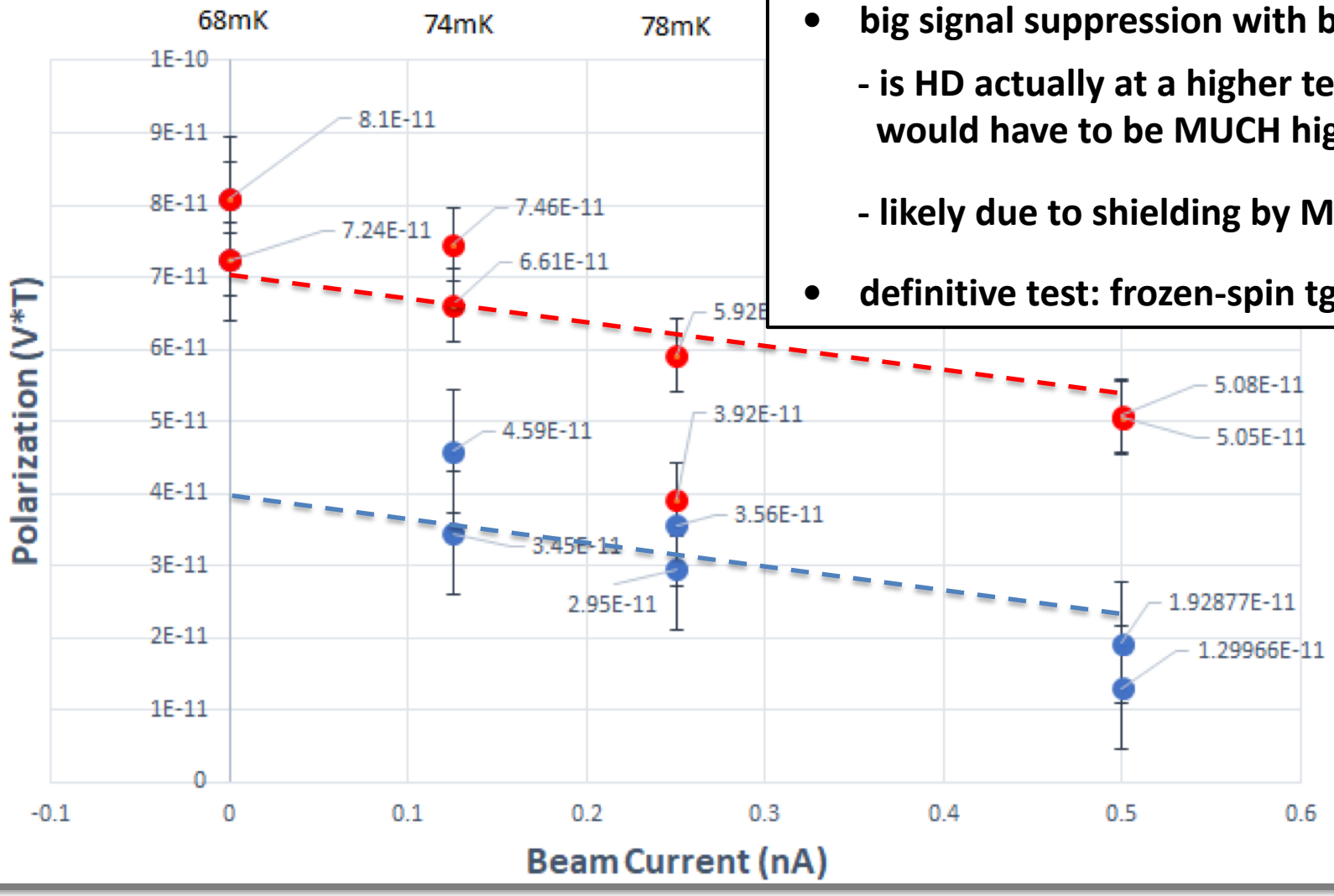
Beam-OFF NMR at beam-on temperatures

Beam-ON NMR



- - - lines have the slope of P^{H}_{TE} with temp

- big signal suppression with beam:
  - is HD actually at a higher temp ?
    would have to be MUCH higher -unlikely
  - likely due to shielding by Moller e

- definitive test: frozen-spin tgt in Run 3

Run 2 UITF status update – Nov 1/20

Goals for next week (Nov 9-14):

- transfer Run 2 target out of *In-Beam Cryostat* (IBC) to *Production Dewar* (PD)
- service IBC to enable running at high cooling flow:
  - remove ^{3}He/^{4}He mixture from the IBC
  - warm dilution circuit, keeping ^{4}He circuit cold, and purge capillaries
  - cool IBC back to base temperature
- test high-power *Adiabatic Fast Passage* (AFP) procedure to flip spins of frozen-spin tgt

The approach to Run 3:

~ Nov 16th : transfer 1st frozen-spin target from *dilution refrigerator* (DF) to PD for NMR

~ Nov 18th : transfer frozen-spin target from PD to IBC

~ Nov 19th : APF in IBC to flip sub-state population so that H is antiparallel to B (to kill HFI);

⇔ start Run 3