

Radiation Damage Effects in Polarized Deuterated Ammonia

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Spin 2002
11 September 2002

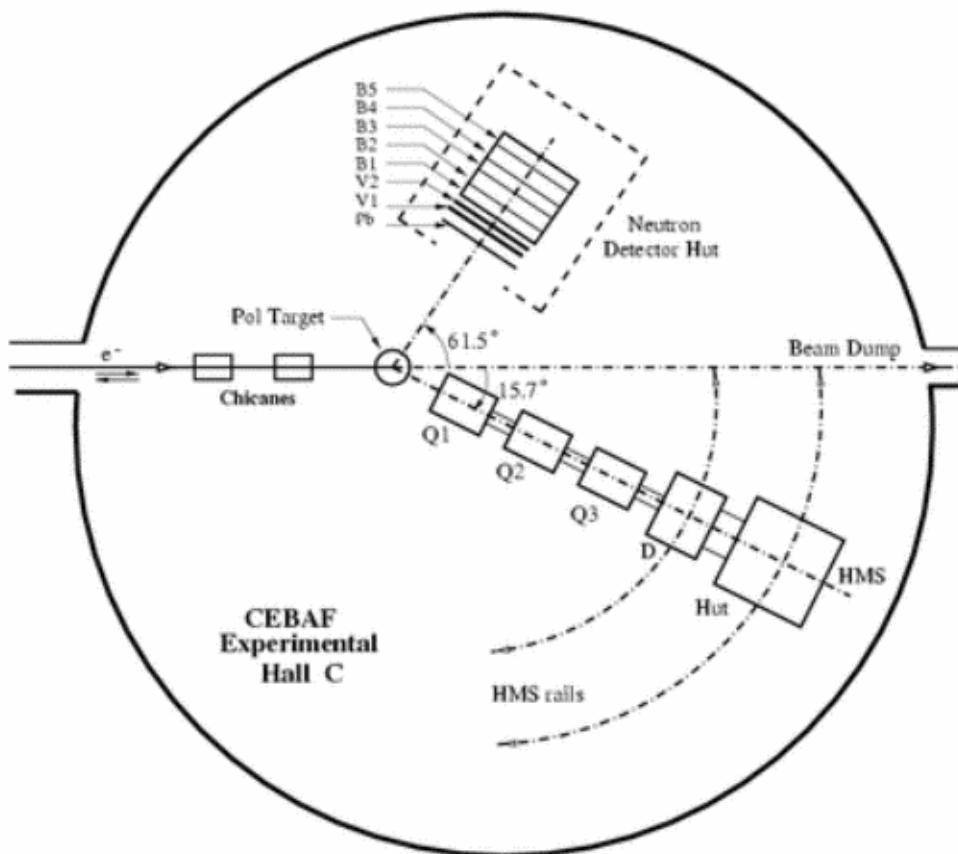
E93-026, Hall C, Jefferson Lab GeN – Neutron Electric Form Factor

Beam: 2.3 GeV
70% Polarization
30Hz Helicity Flip

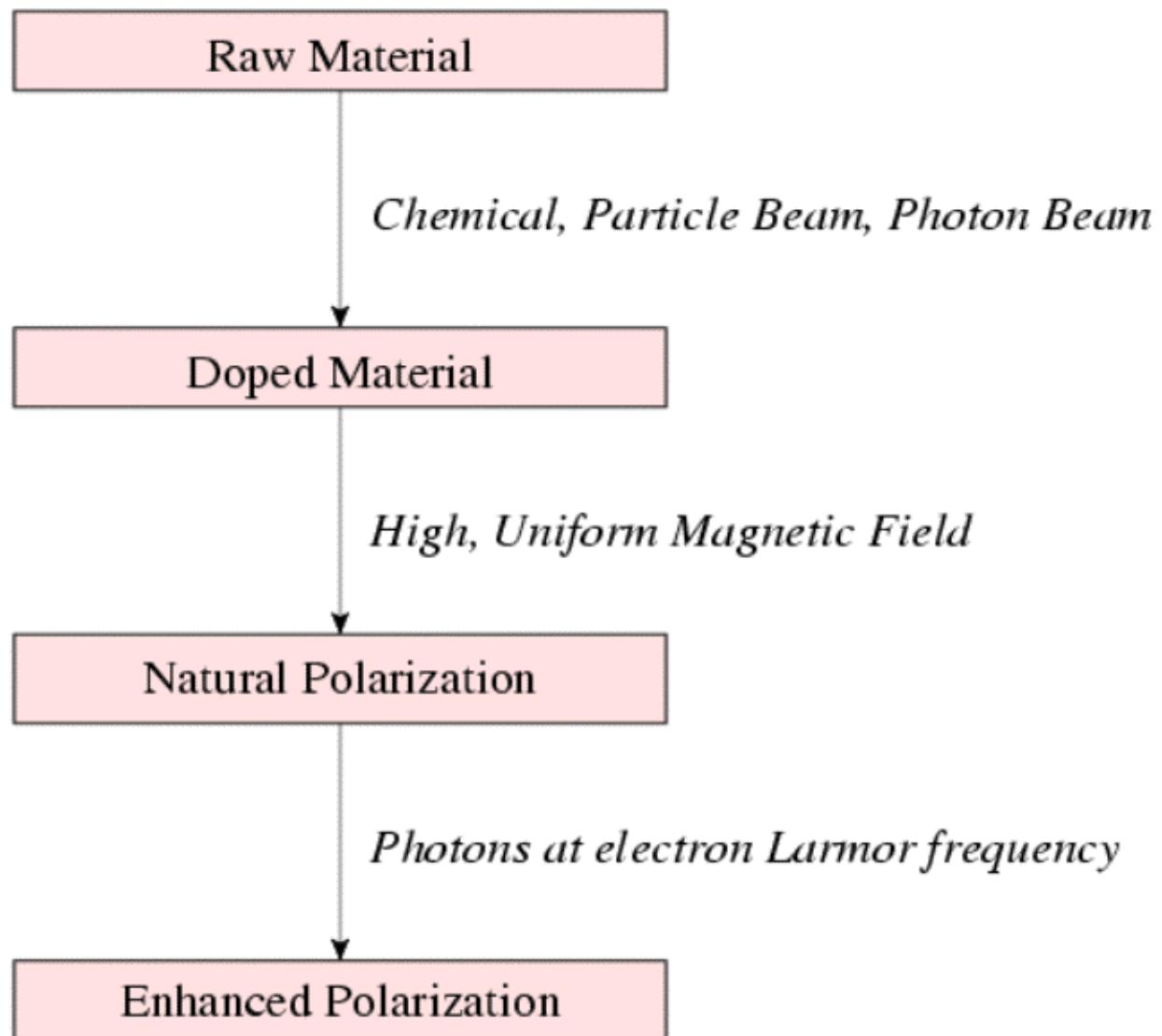
Spectrometer: 15.3, 18.3 degrees
1.963 to 2.810 GeV/c

Kinematics: $Q^2=0.5, 1.0 \text{ GeV}/c$

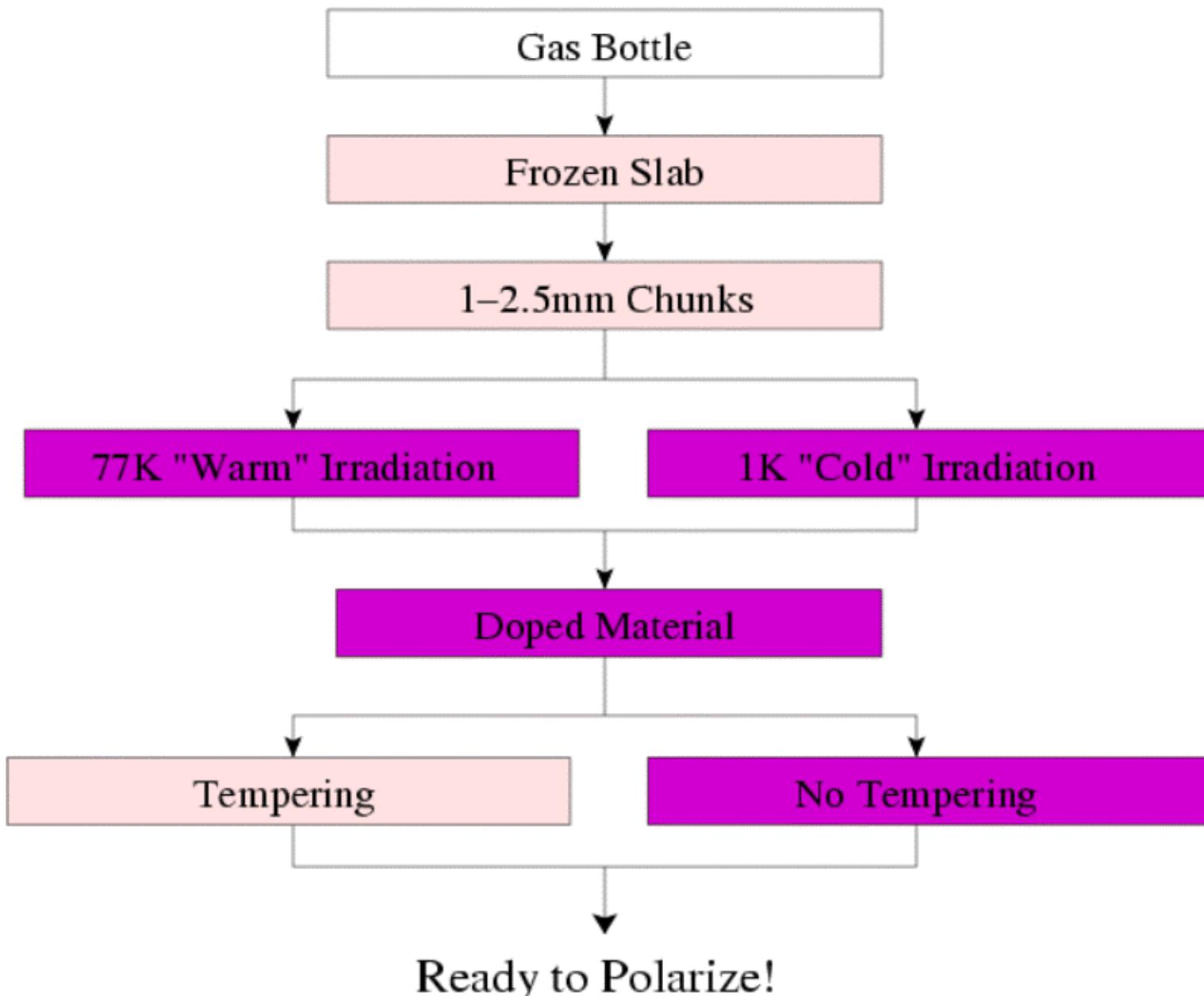
Spin 2002 Talk: Nikolai Savvinov, Tues 14:50

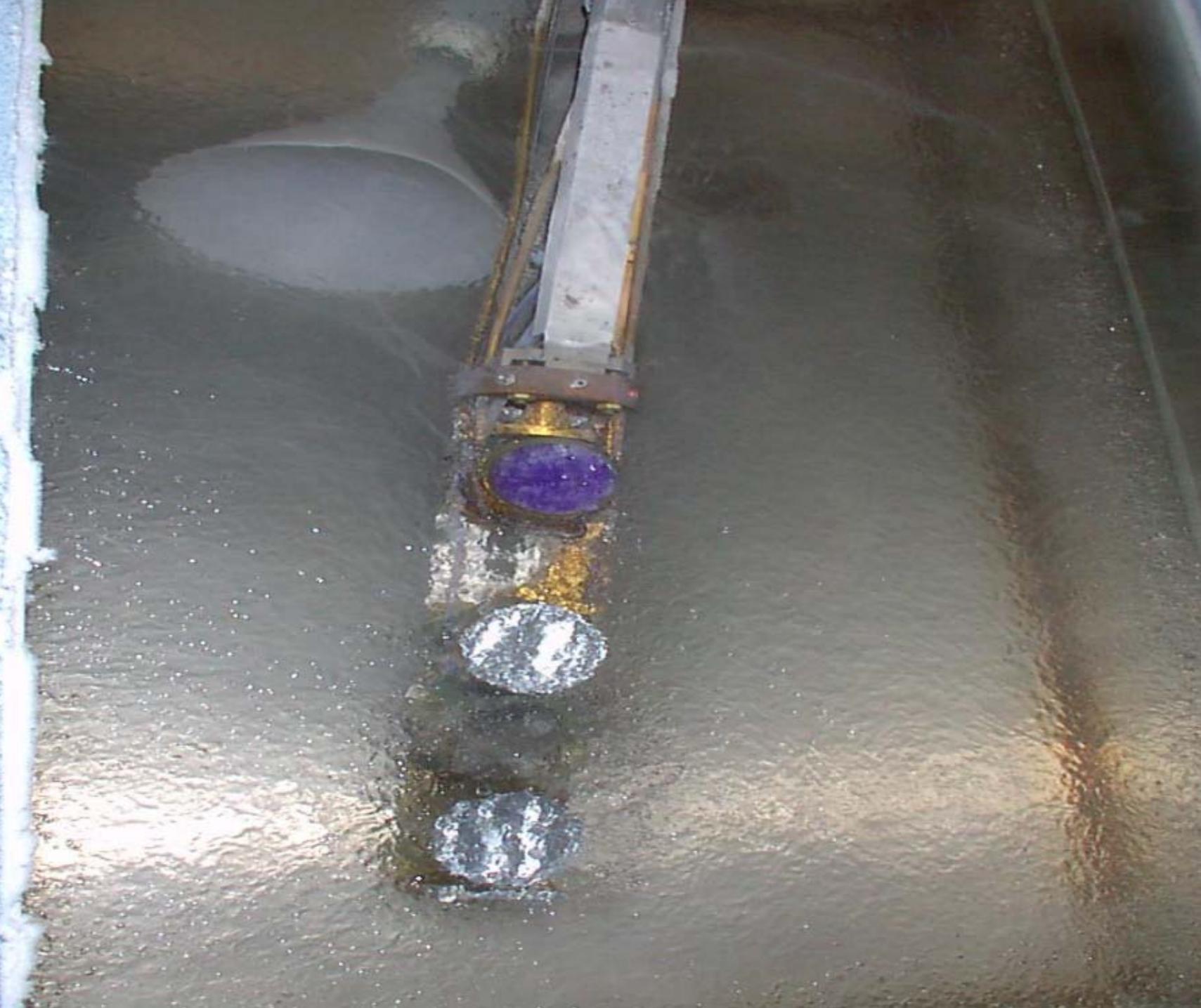


Dynamic Nuclear Polarization



Ammonia Target Material Preparation

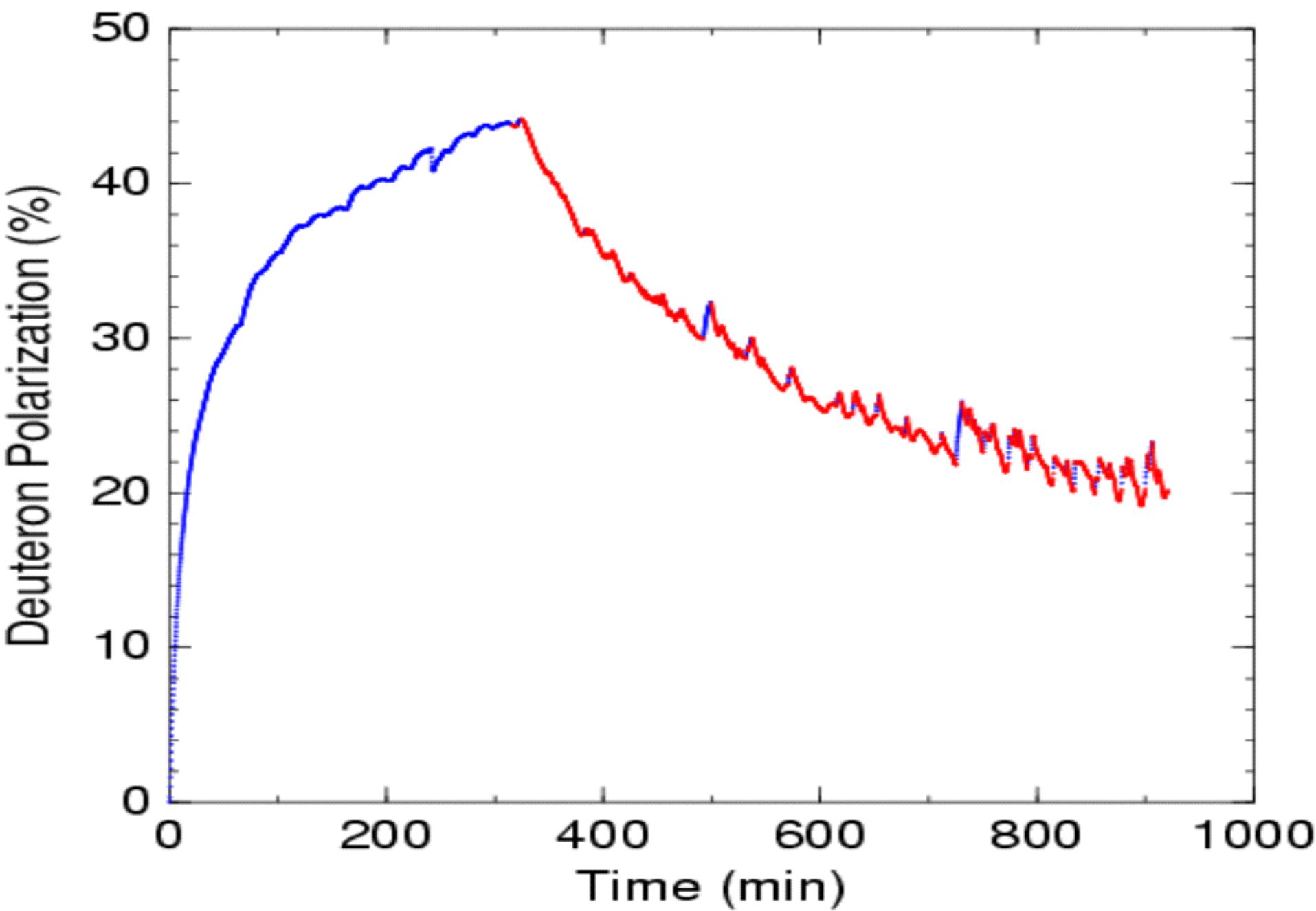




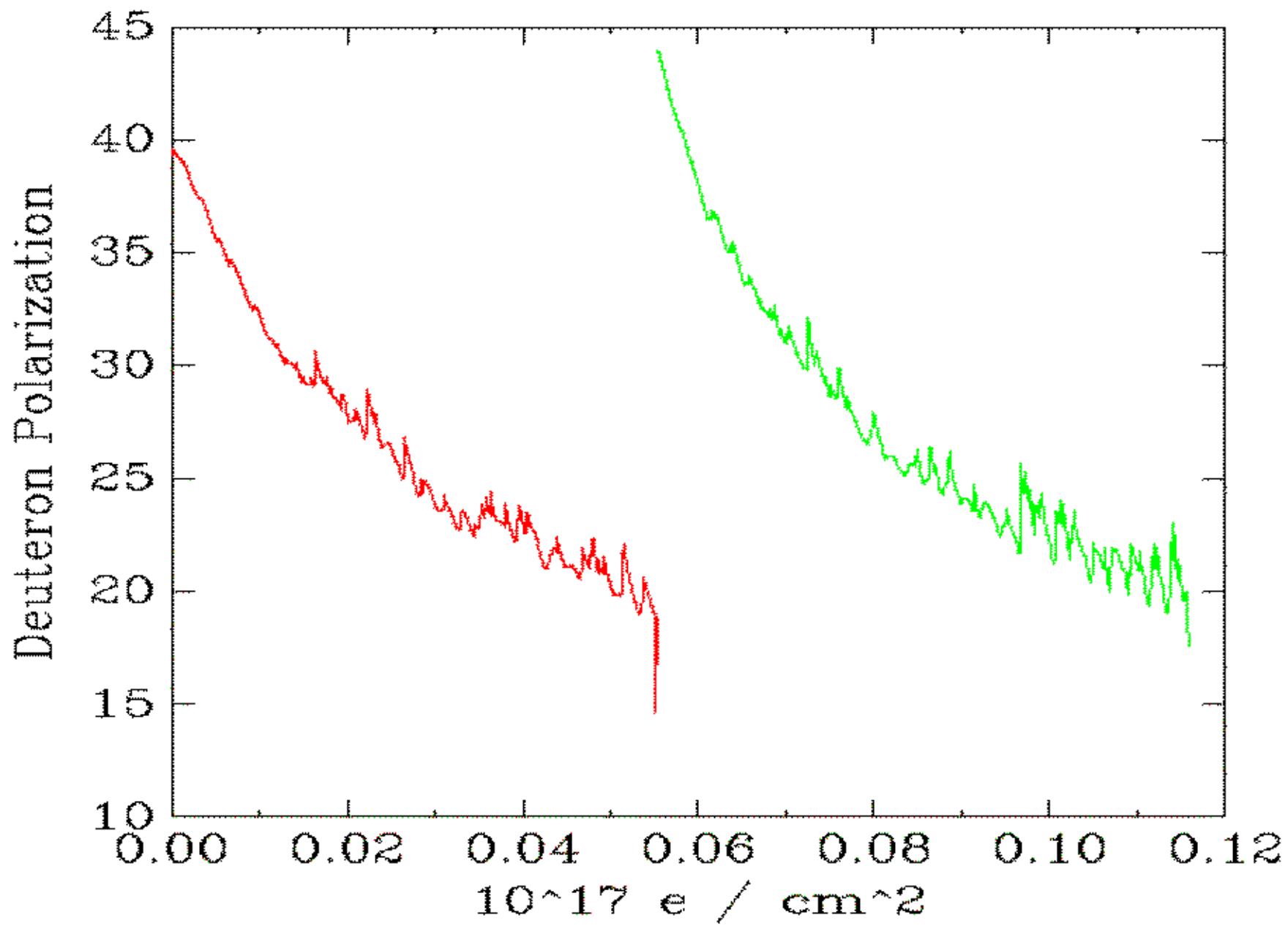
Target Material Preparation Distribution

	Not Tempered	Tempered
Cold Irradiated	Load 1, 57.5 mC Load 2, 23.1 mC	
Warm Irradiated		Load 3, 70.2 mC Load 4, 43.8 mC Load 5, 53.8 mC Load 6, 36.6 mC Load 7, 45.9 mC

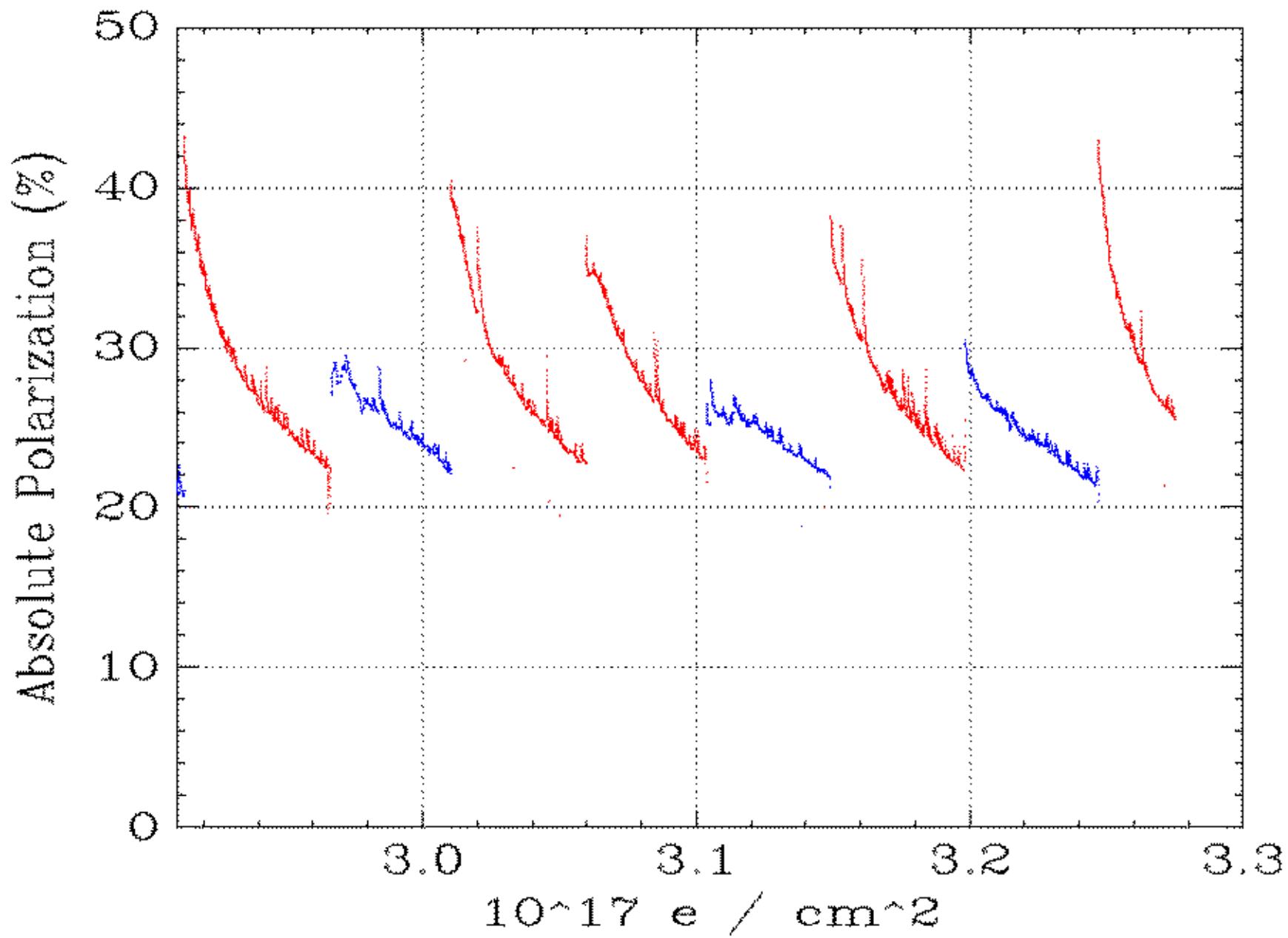
Gen Target Performance, 10Sep01



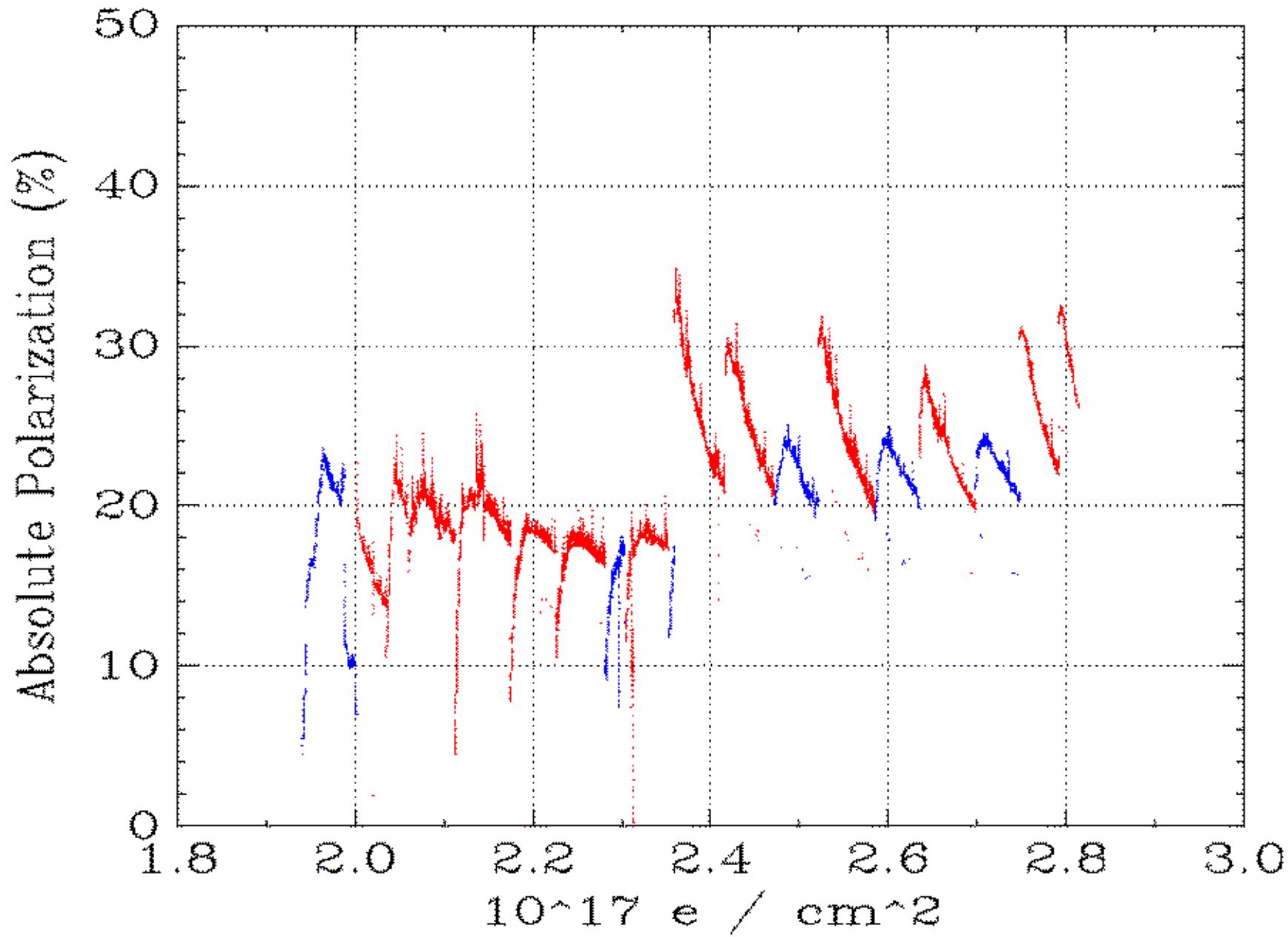
Two Anneal Cycles



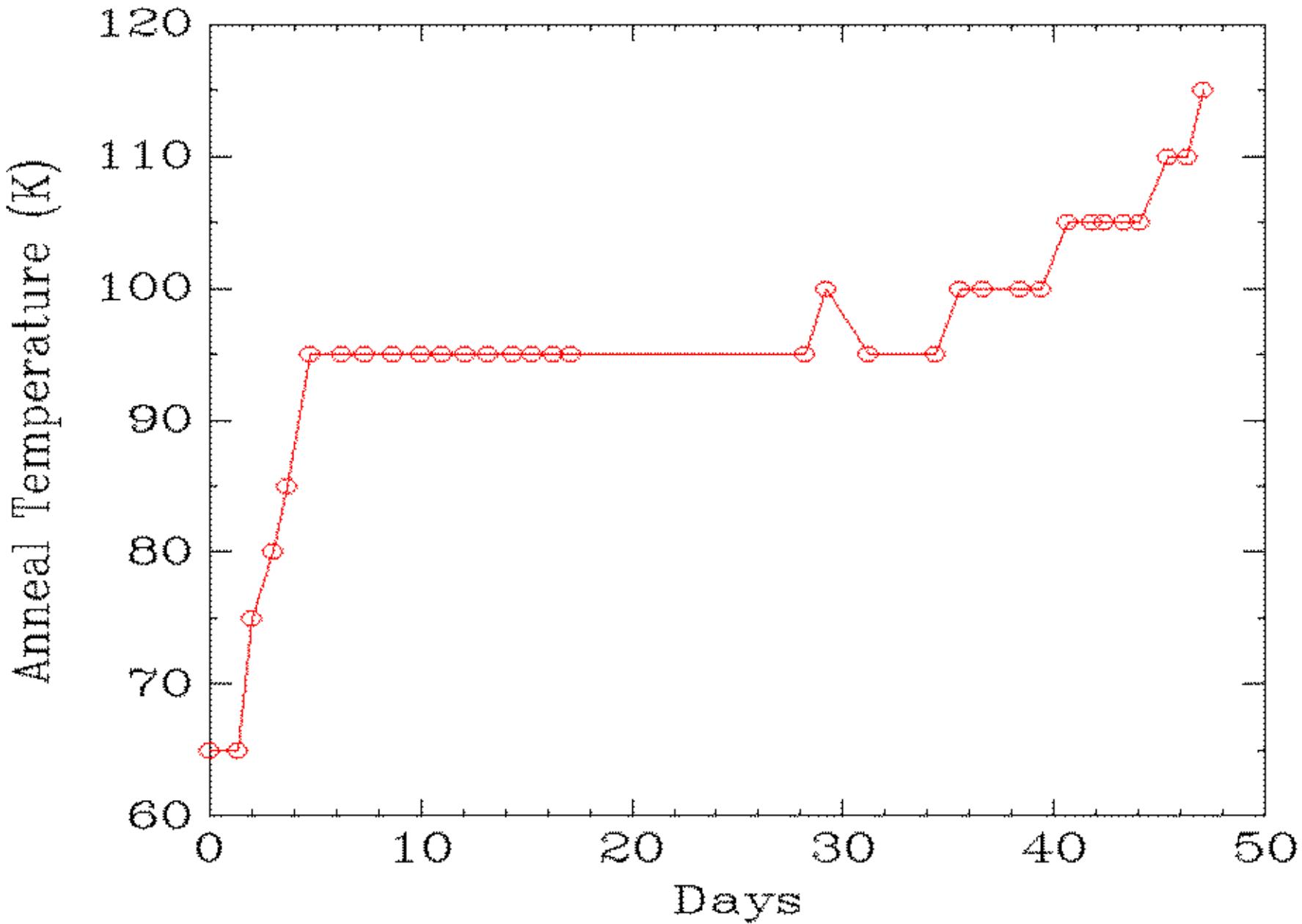
Positive vs. Negative Performance



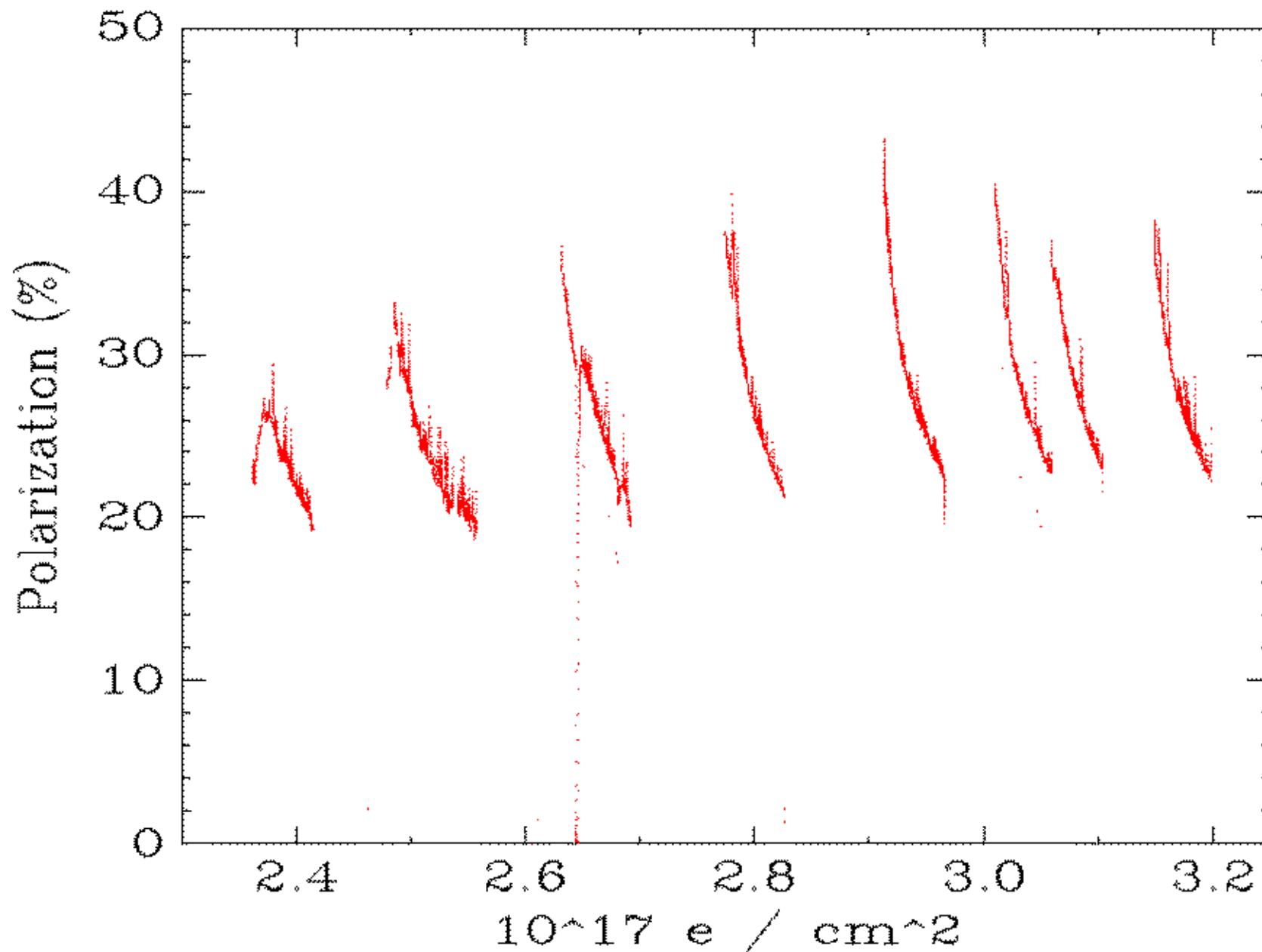
Effect of Proper Anneal Temp

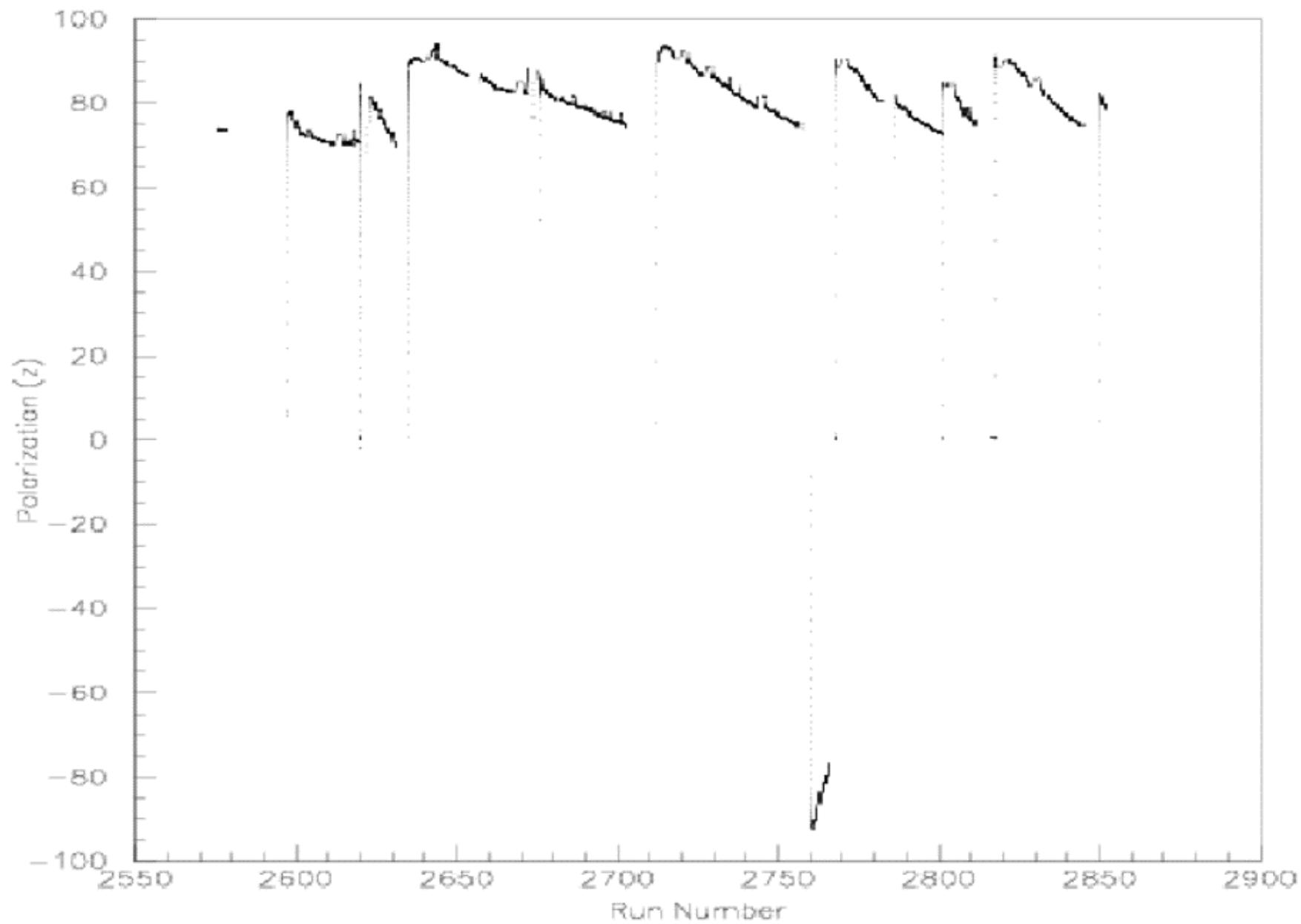


Anneal History

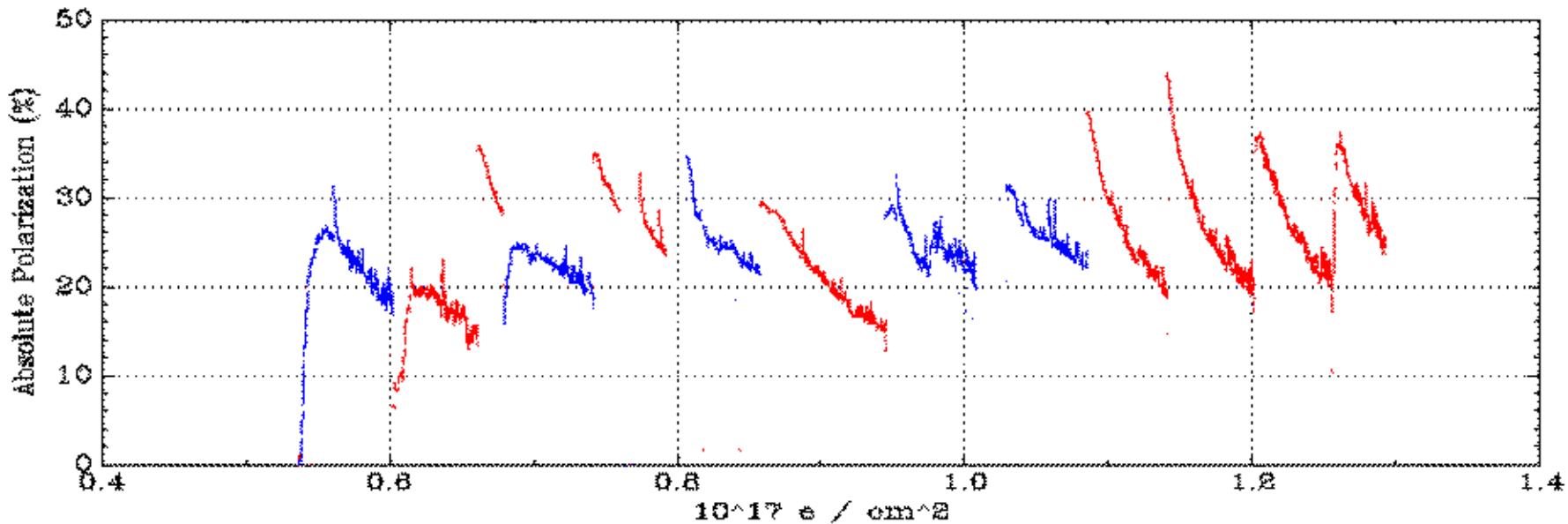


Decay Rate Increases with Dose

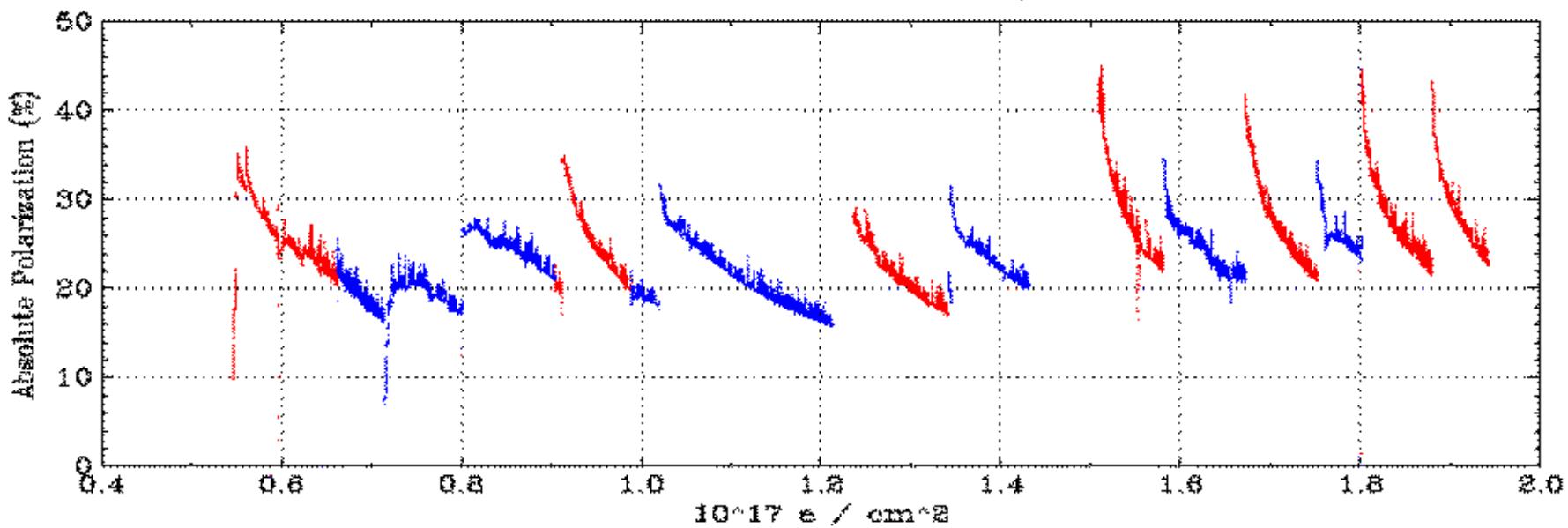




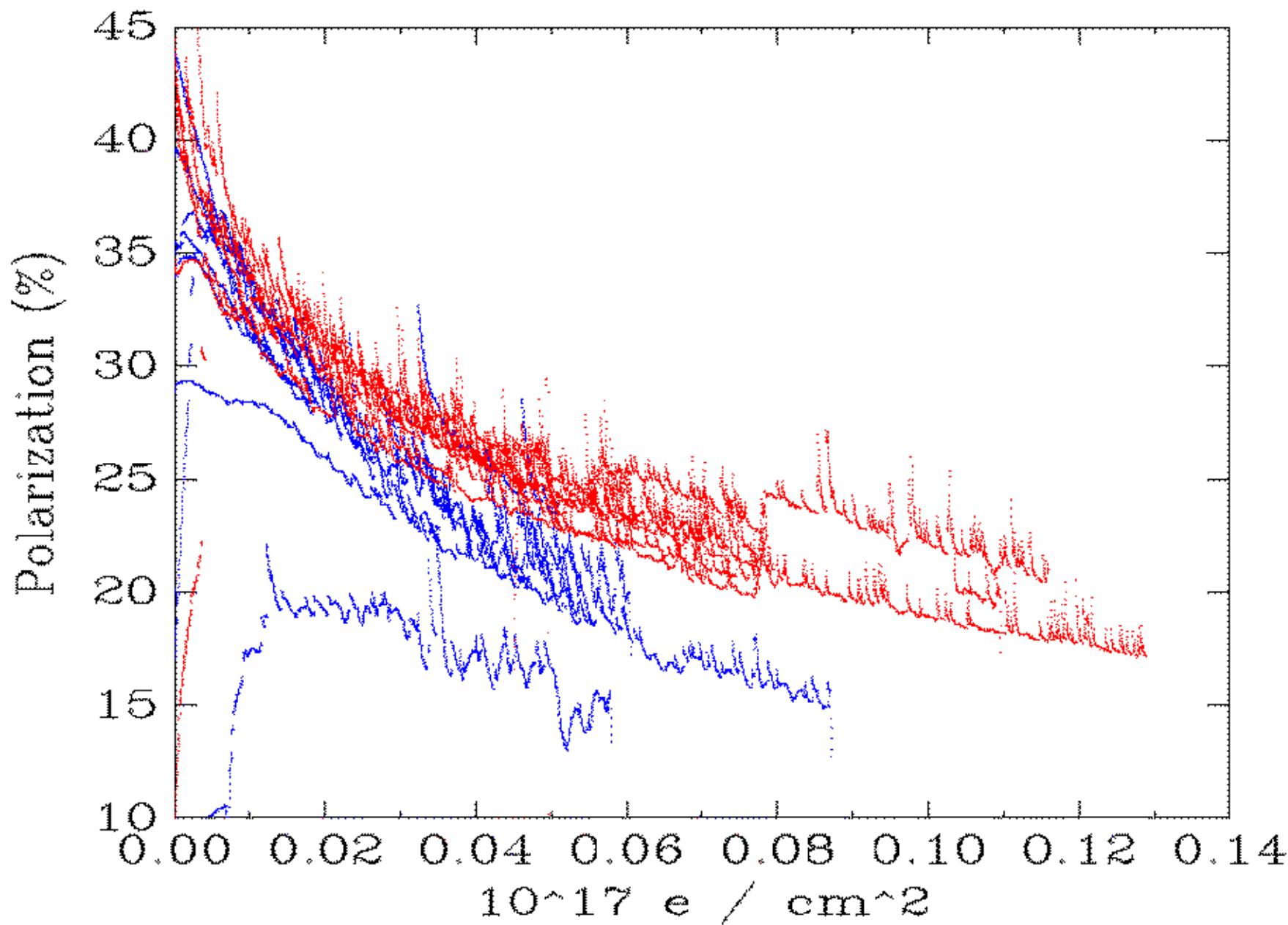
Cold Irradiated



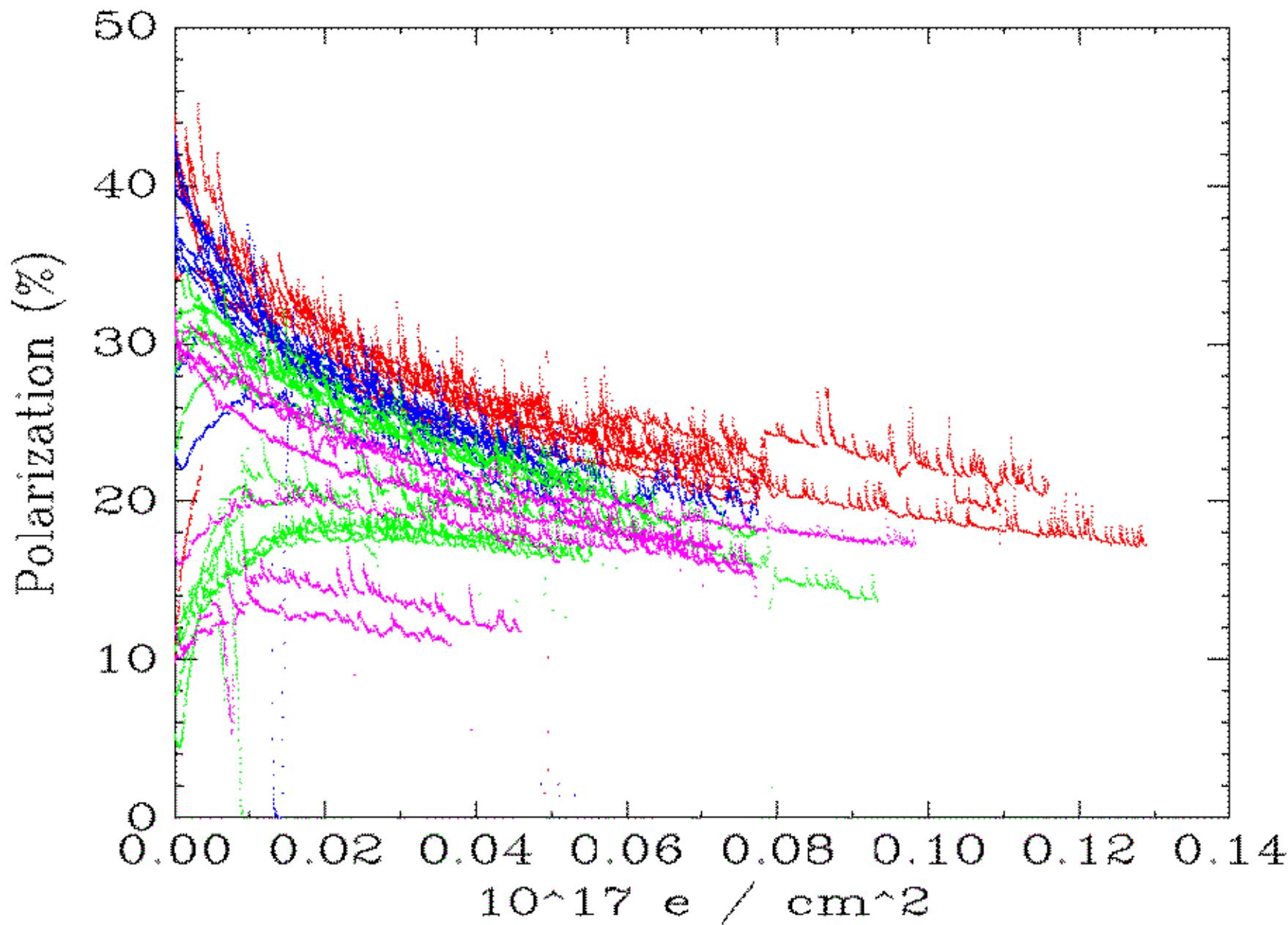
Warm Irradiated & Tempered



Warm vs Cold Irradiation

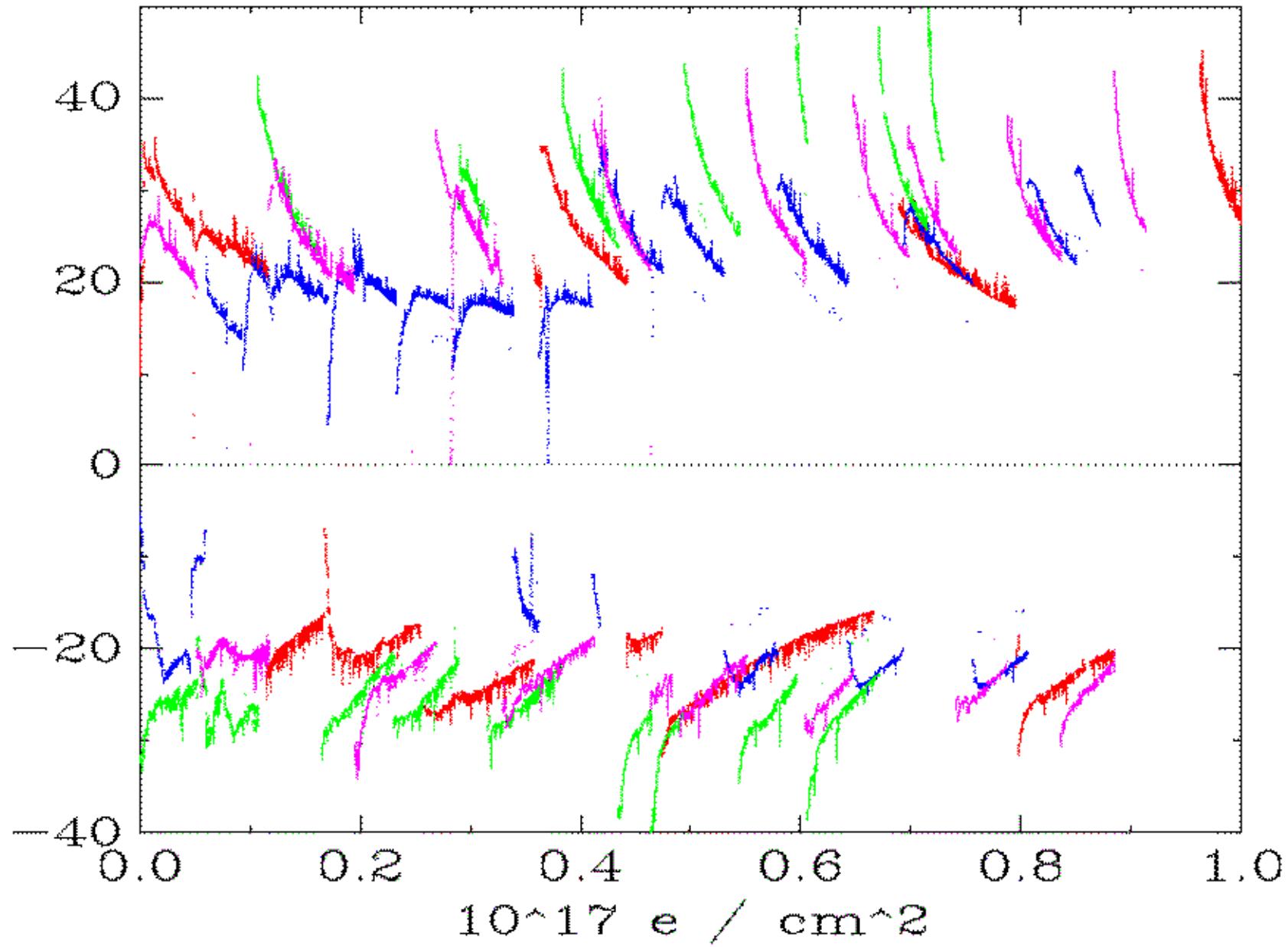


Tempered Material Batches



Tempered Batches

Polarization (%)



Conclusions and Outlook

- Largest dose on ammonia material – $2.3 \times 10^{17} \text{ e / cm}^2$
- Polarization performance strongly dependent on anneal temperature
- Best anneal temperature around 95K, but climbs to 110K with dose
- Decay rate does increase with dose, but only slightly
- Tempering material significantly improves performance
- Analyze RSS Experiment for more data
- Perform fits to anneal cycles to quantify performance