Summary of XP-827

(LITER Characterization and ELM Mitigation)

and Lithium Run Plan Discussion

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NSTX Physics Meeting

May 12, 2008

Overview of XP-827: LITER Characterization and ELM Mitigation

- **Sequence**
  - Day-1: High Recycling, Low Triangularity Shots
  - Day-2: High Triangularity Shots (9.5min HeGDC)
  - Day-3: High Triangularity Shots (0-9.5min HeGDC)

- **Approach**
  - As the lithium pumping began to be effective, the shape of the Reference Discharges was maintained while
    - Avoiding locked mode fizzles and disruptions, and beta limits by varying gas fueling, NB power profiles, and application of the RWM system as required to control density and achieve long, ELM free discharges.
  - The Experimental Results include
    - The required changes to obtain long, ELM-free, discharges.
    - The characteristics of the resulting discharges.

Summary of XP-827 Procedure

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• Procedure

• The 2 LITER system evaporated a total of 20.6 g into the vessel between discharges.

• Prior to the discharge, the LITERs were withdrawn behind special shutters,

- during discharges, and
- during the subsequent HeGDC (up to 9.5 min)

• 22.8 g of lithium accumulated on the shutters during the withdrawal phase.

• After HeGDC, the LITERs were reinserted for 10 minutes, and deposited Li at 10-70 mg/min, prior to the next discharge.

Summary of XP-827 Results

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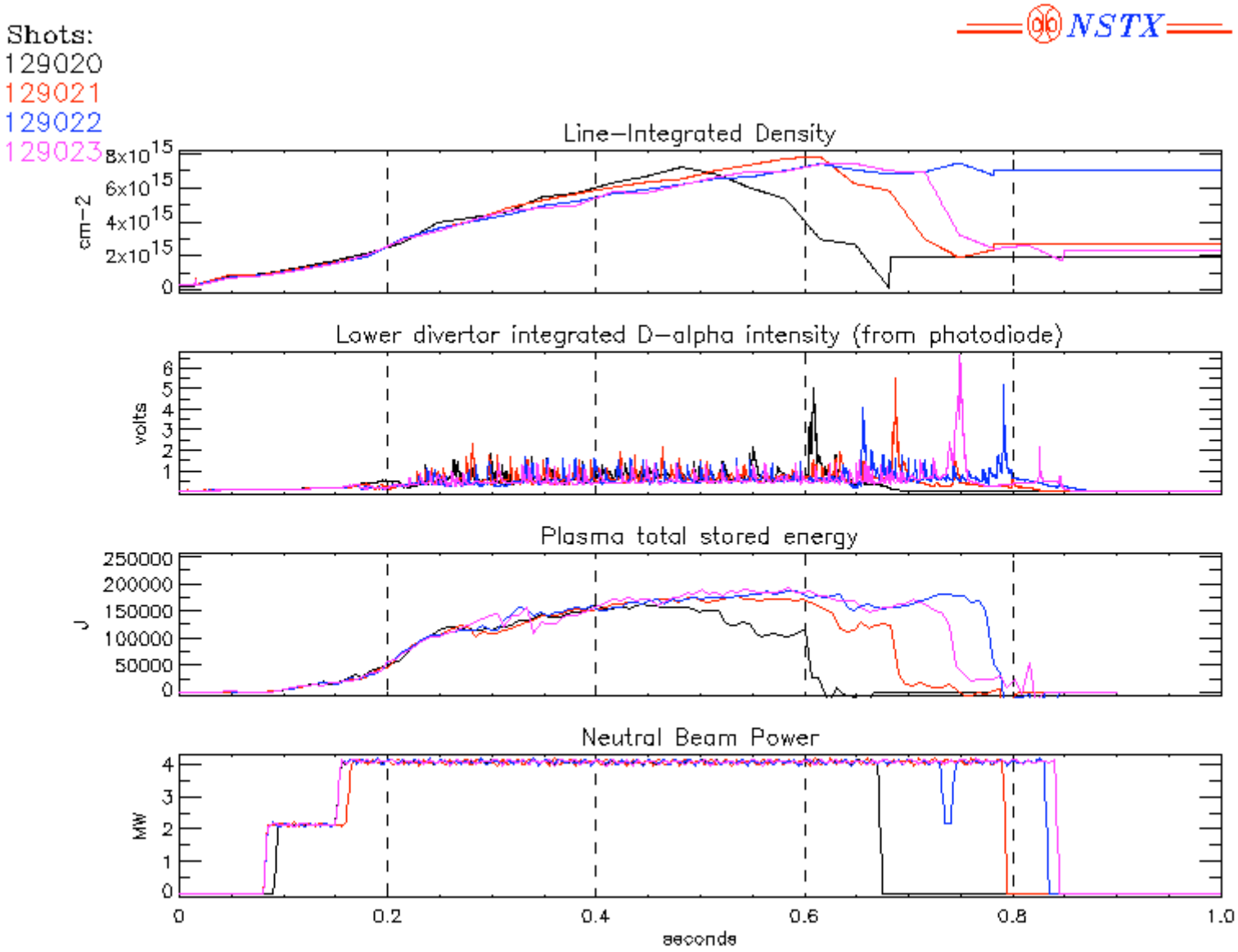
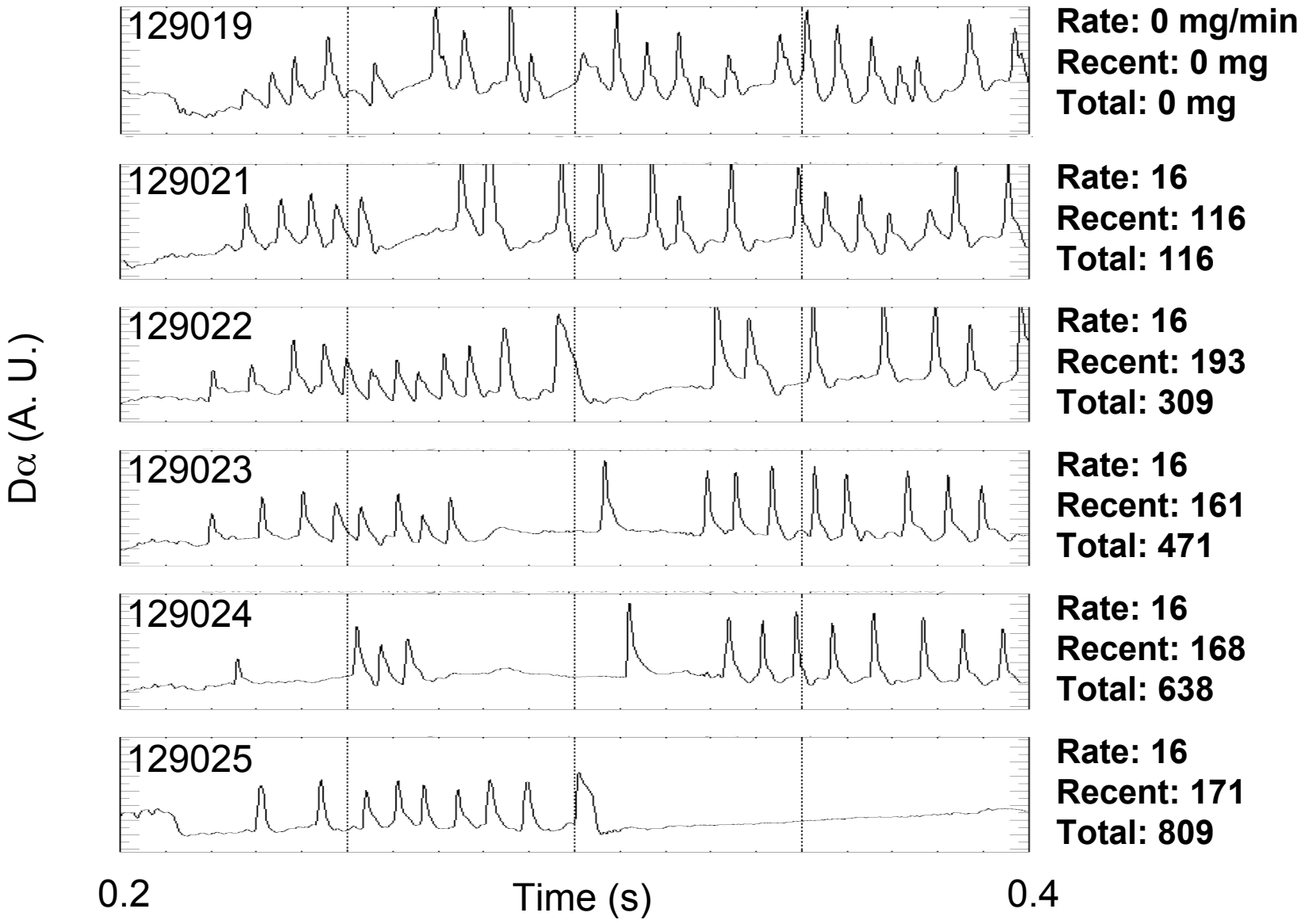
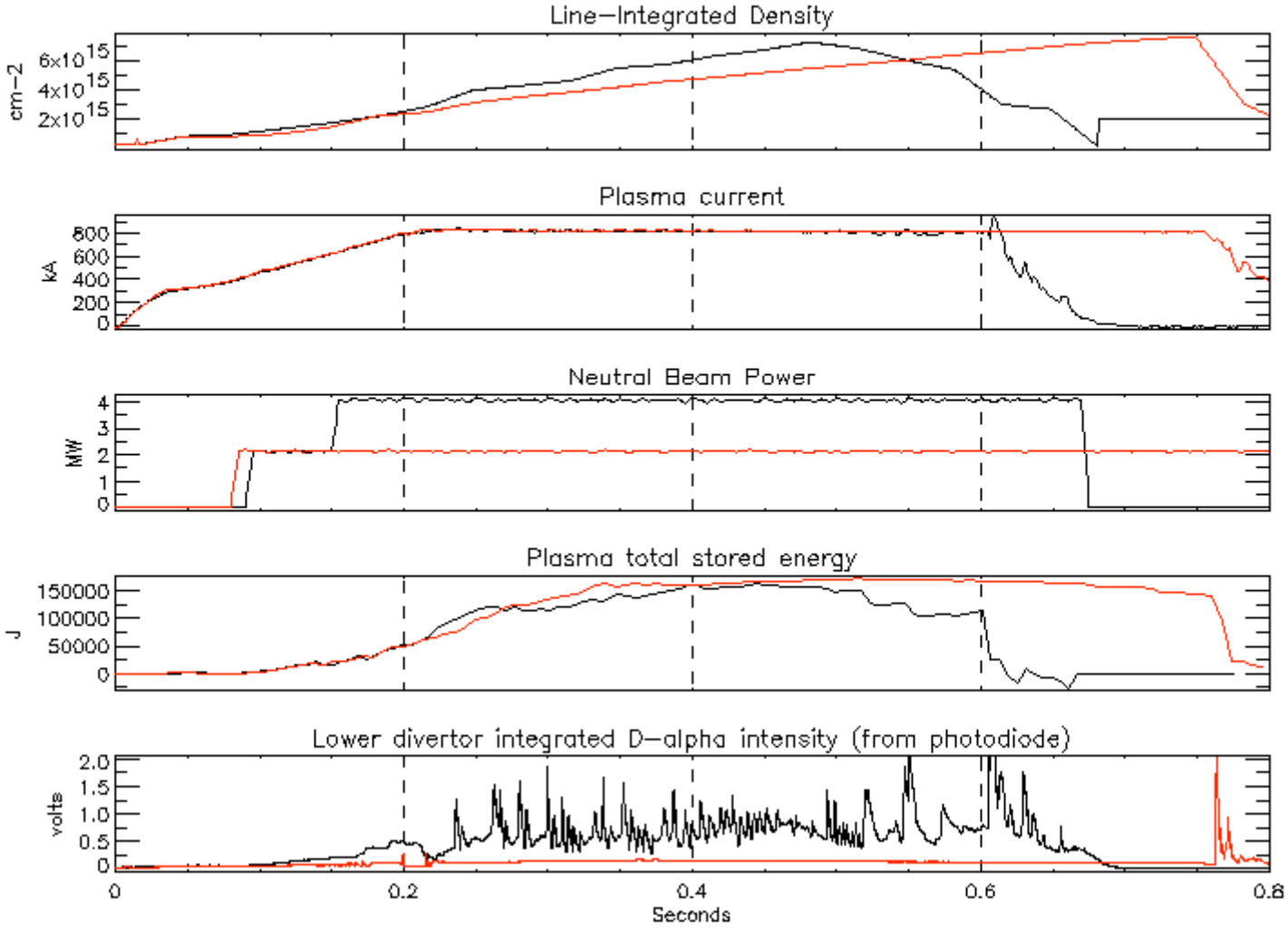
- **The findings include:**

1) Plasma density reduction as a result of lithium deposition.
2) Suppression of ELMs.
3) Improvement of energy confinement in a low-triangularity shape.
4) Improvement in plasma performance for standard, high-triangularity discharges.
5) Reduction of the required HeGDC time between discharges.
6) Increased pedestal electron and ion temperature.
7) Reduced SOL density.
8) The discharges also benefited from the application of n=1 and n=3 mode control which reduced deleterious MHD activity.

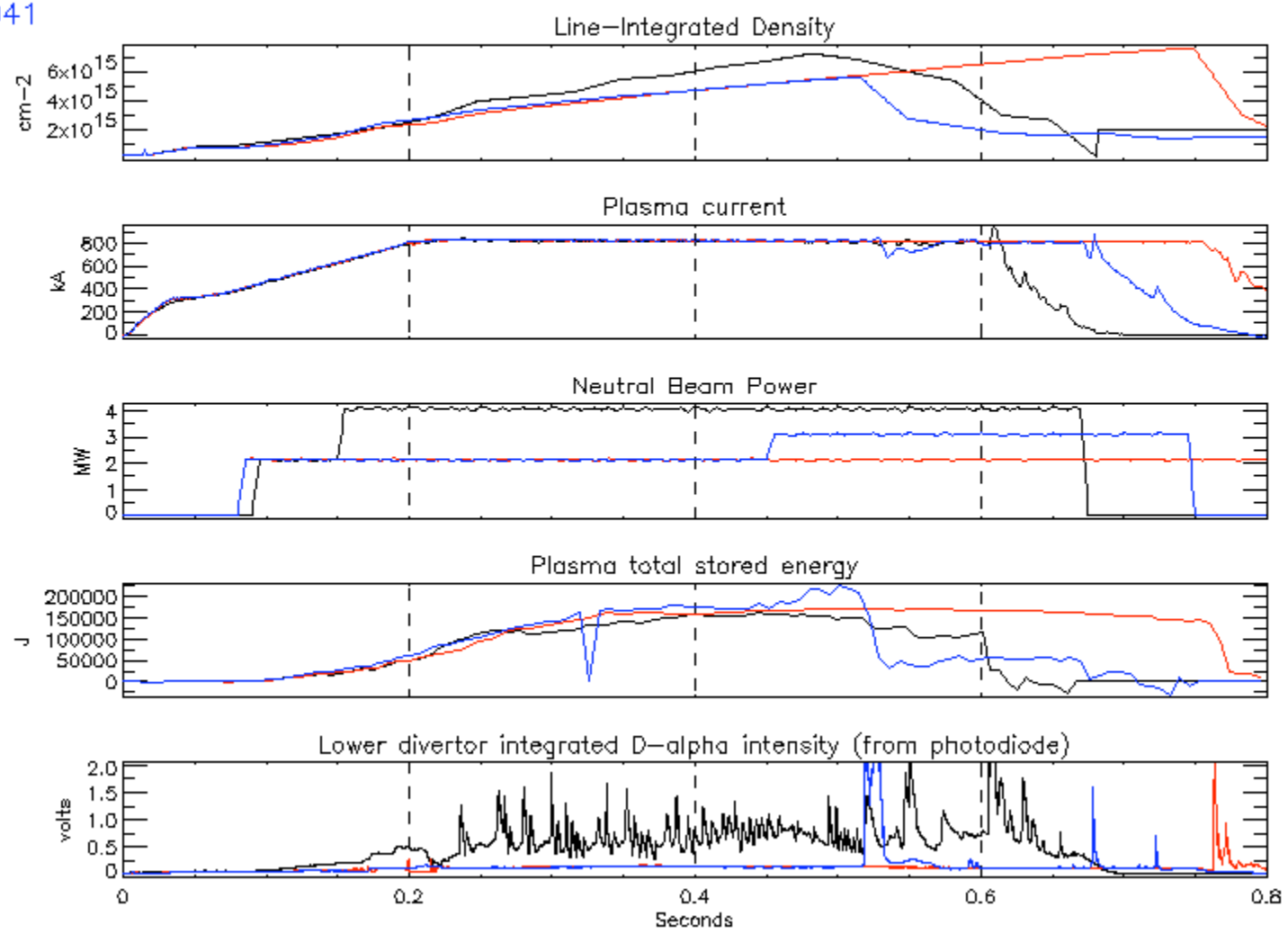

Shots:
129020
129021
129022
129023
NSTX
Line-Integrated Density
cm-2
8x10^15
6x10^15
4x10^15
2x10^15
0
Lower divertor integrated D-alpha intensity (from photodiode)
volts
6
5
4
3
2
1
Plasma total stored energy
J
250000
200000
150000
100000
50000
0
Neutral Beam Power
MW
4
3
2
1
0
0
0.2
0.4
0.6
0.8
1.0
seconds


129019
Rate: 0 mg/min
Recent: 0 mg
Total: 0 mg
129021
Rate: 16
Recent: 116
Total: 116
129022
Rate: 16
Recent: 193
Total: 309
129023
Rate: 16
Recent: 161
Total: 471
129024
Rate: 16
Recent: 168
Total: 638
129025
Rate: 16
Recent: 171
Total: 809
Dα (A. U.)
0.2
Time (s)
0.4

Shots:
129020
129038



Shots:
129020
129038
129041



Discussion Points

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- What is the balance between LITER characterization (for FY08 and LLD) and use as an FY08 operational tool?
- How should the Run Plan be revised to allow pursuit of the Findings (slide 4),*versus* only using Li as an operational tool to support the planned XPs?
- How to integrate LITER and the forthcoming Li powder results into the Run Plan?
- How many more LITER Li loadings are required for the Run Plan?