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XP1023: Optimized RWM control for high $<\beta_N>_{pulse}$ at low collisionality and l_i

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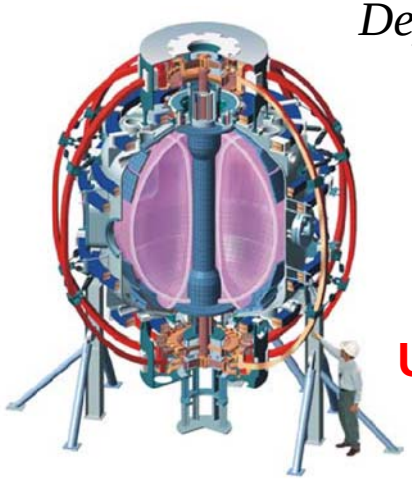

UPDATE on RWM B_R, and B_p+B_R sensor feedback

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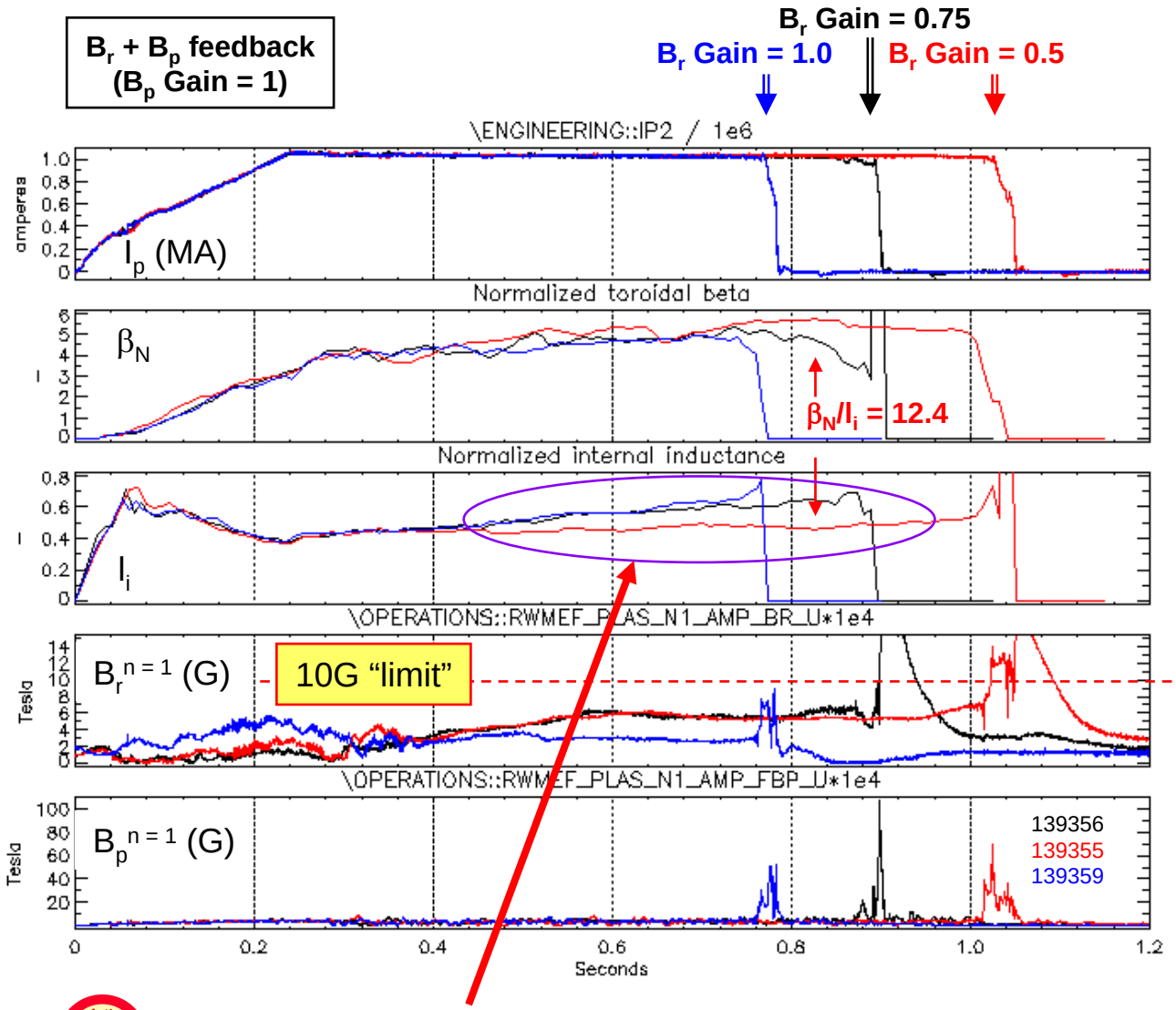
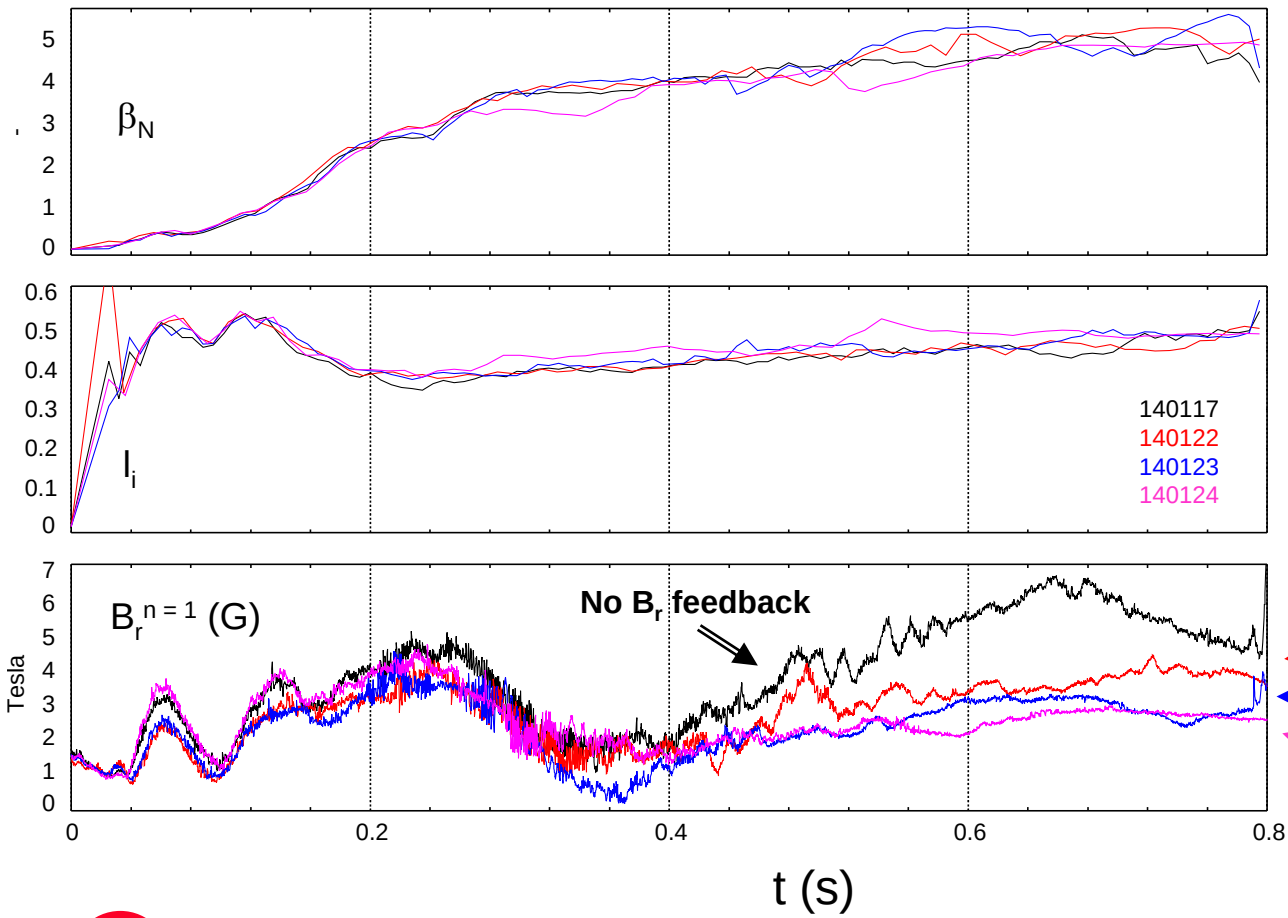
Original three point B_r sensor feedback gain scan taken was invalid – due to radiated power excursions (l_i increases)



- Highest β_N/l_i of the day, long pulse length
  - β_N/l_i = 12.4 reached
    - NSTX highest value = 13
- Increased B_r sensor FB gain showed shorter pulse
  - B_r feedback spatial phase may be optimized with B_p sensor FB
    - Further analysis needed
  - Results not yet optimized
    - Need to complete scans

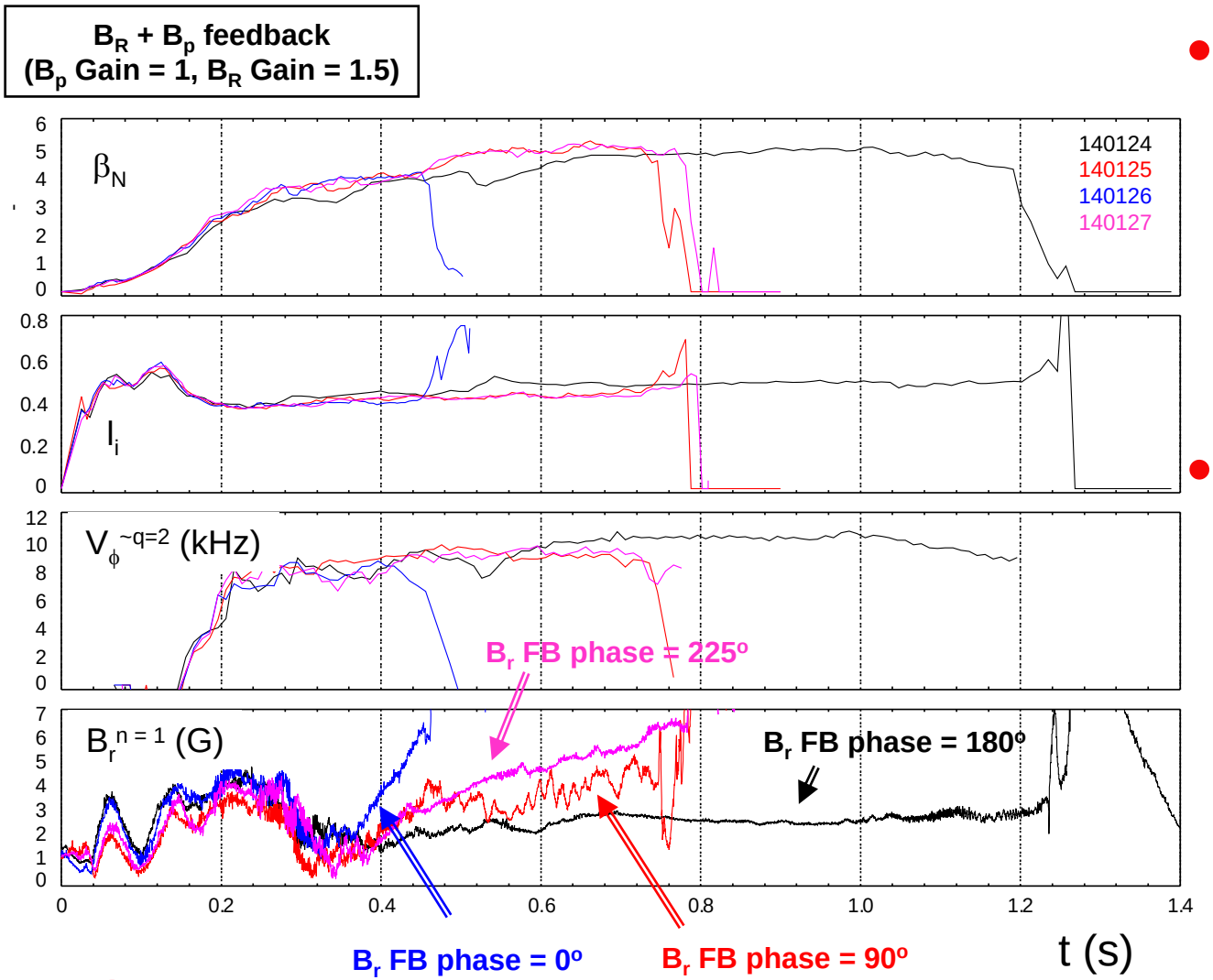
RWM B_R sensor feedback reduces n= 1 radial error field significantly

B_R + B_p feedback (B_p Gain = 1)



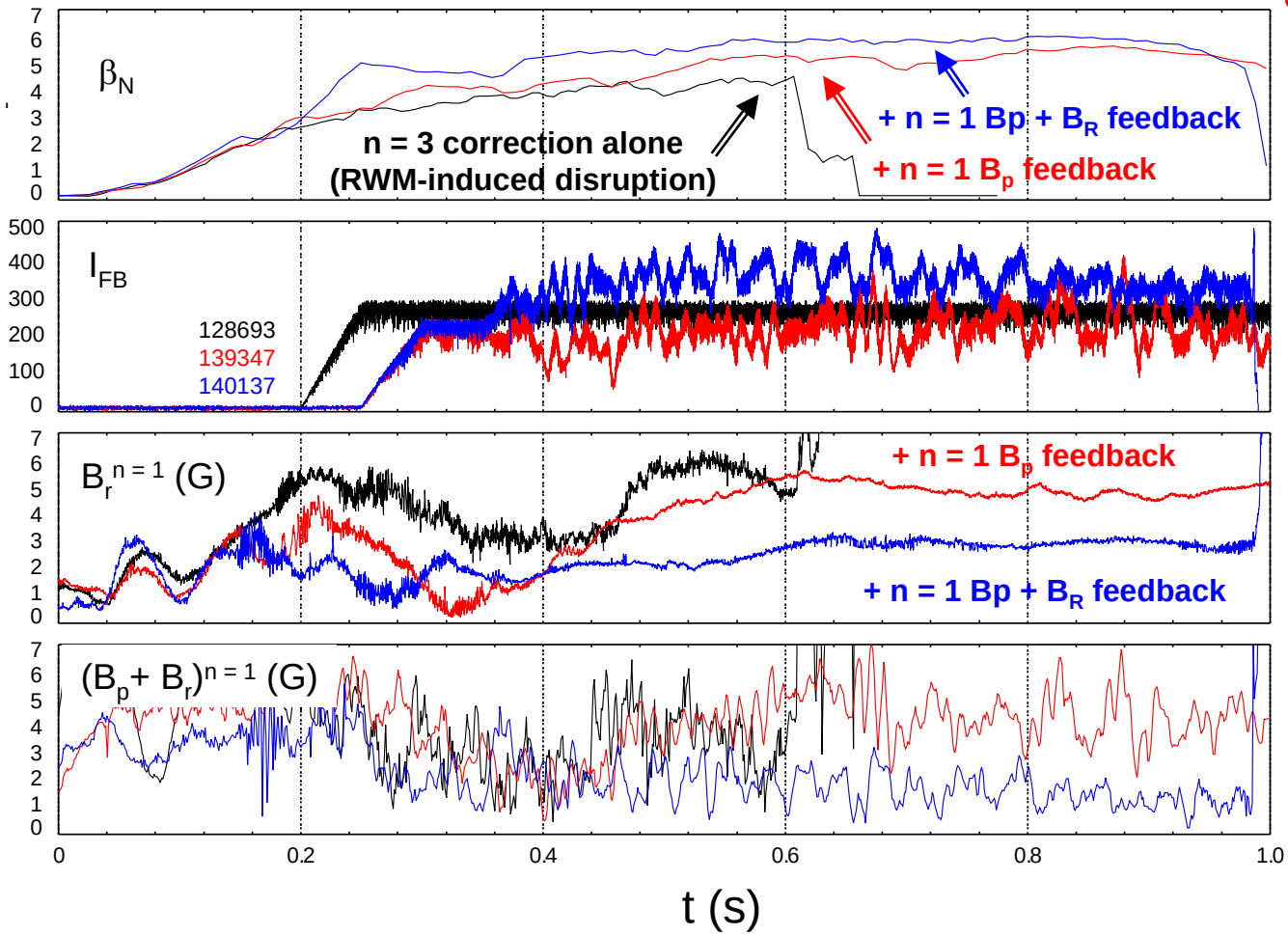
- New B_r sensor feedback gain scan taken on low l_i target plasmas
  - Highest gain attempted (1.5) most favorable
- B_r feedback constrains slow (~ 10 ms) n = 1 radial field growth
  - $B_r^{n=1}$ = 9G consistently disrupts plasma

RWM B_R sensor n= 1 feedback phase variation shows clear settings for positive/negative feedback



- B_r sensor feedback phase scan shows superior settings
  - Result clarified significantly by new MIU algorithm OHxTF compensation
- Positive/negative feedback produced at expected phase values
  - 180° negative FB
  - 0° positive FB
  - n=1 growth/decay of other settings bracketed by 0°, 180° settings

Use of combined RWM sensor n= 1 feedback yields best reduction of n = 1 fields / improved stability



- Varied levels of n > 1 field correction
  - n = 3 DC error field correction alone more subject to RWM instability
  - n = 1 B_p sensor fast feedback sustains plasma
  - Addition of n = 1 B_R sensor FB prevents disruptions when amplitude reaches ~ 9G, better sustains rotation