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NSTX

Comparison of ELMs in LSN and DN in NSTX

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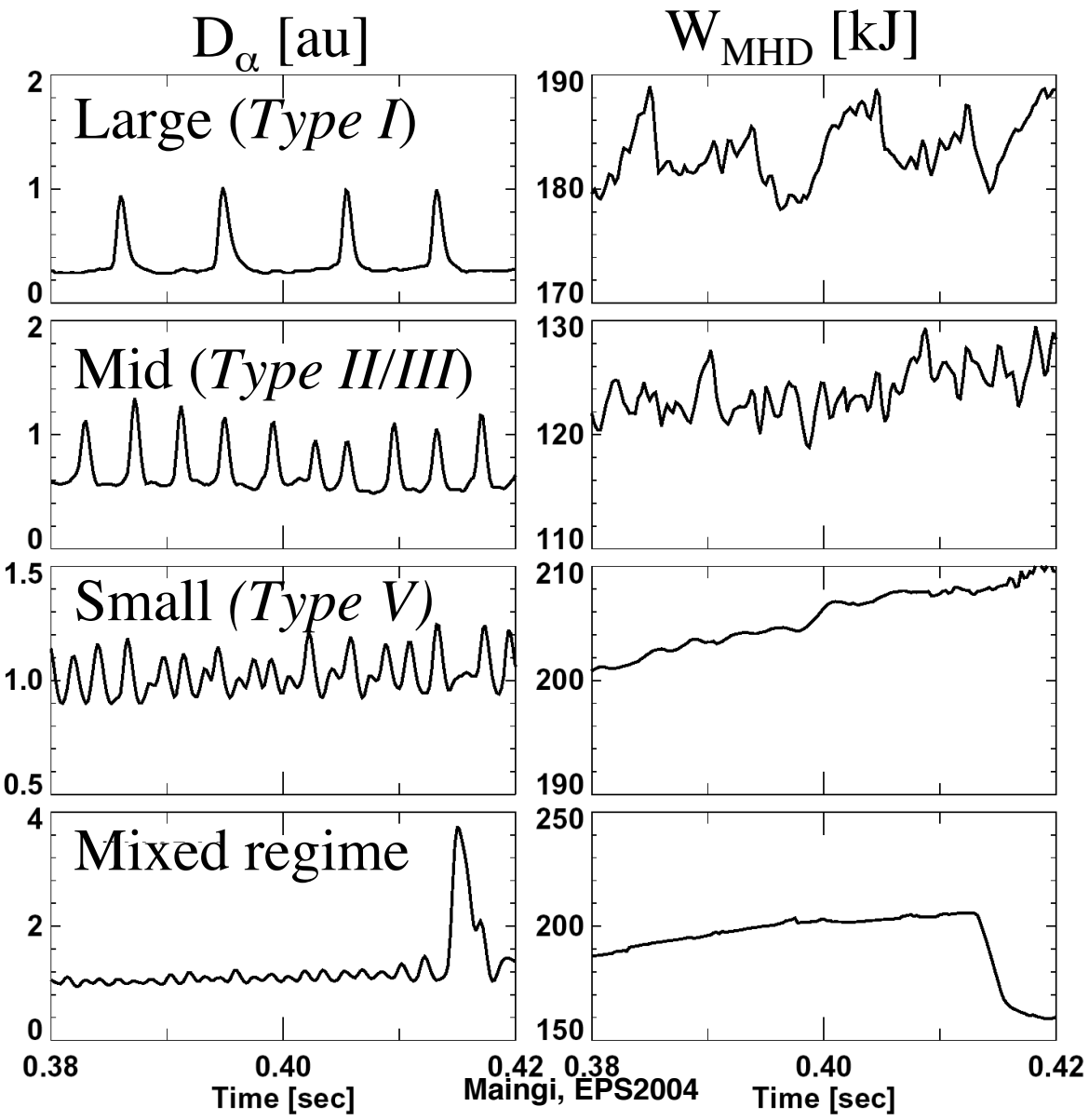
ELMs change markedly with drsep, but effect on power threshold is complex

- Type II/III ELMs observed in DN but grassy Type V ELMs with a few Type I ELMs observed in LSN (κ~2.0-2.1, δ~0.4, *drsep*~1.5 cm, I_p=0.8 MA)

- Higher δ~0.8 discharges with Type I ELMs alone

- L-H power threshold typically higher in DN than LSN, except that L-H identity experiment with MAST showed H-mode access only at DN but not when biased down or up from DN (I_p=0.5 MA)

Many Different ELM types Observed in NSTX



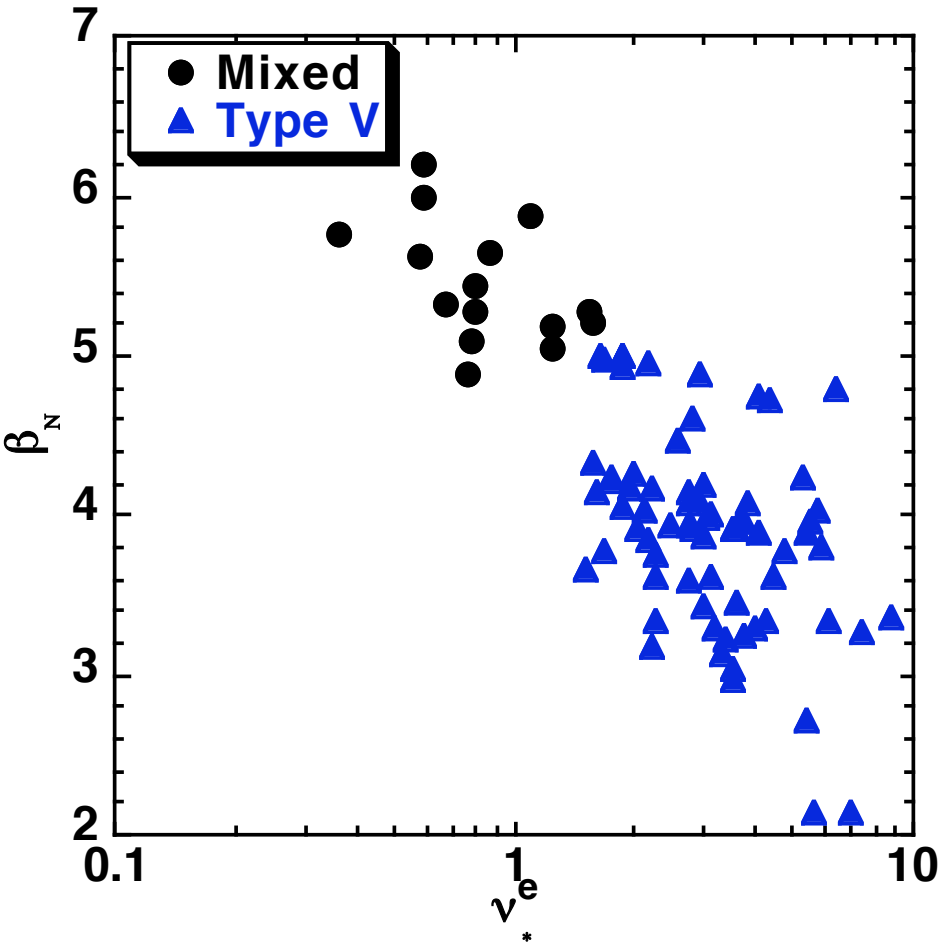
$\Delta W_{MHD}/W_{MHD}$~ 3-15%
ν_{ELM} ↑w/P_{heat}
$P_{heat} >> P_{L-H}$

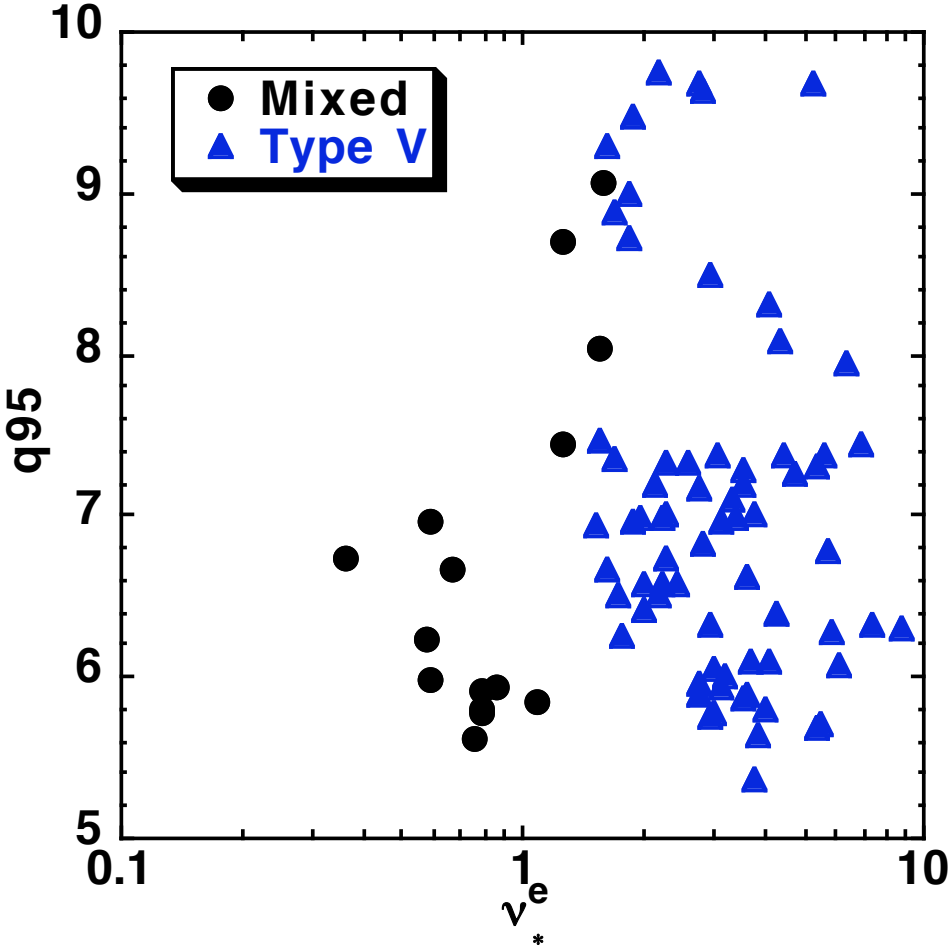
$\Delta W_{MHD}/W_{MHD}$~ 1-5%
ν_{ELM} ↓w/P_{heat}
$P_{heat} \geq P_{L-H}$
only found near DN

$\Delta W_{MHD}/W_{MHD} \leq$ 1%
Wide P_{heat} range
ν_{ELM} ? w/P_{heat}

$\Delta W_{MHD}/W_{MHD} \leq$ 30%
High P_{heat}, β_N
ν_{ELM}^{BIG} ↑w/P_{heat}

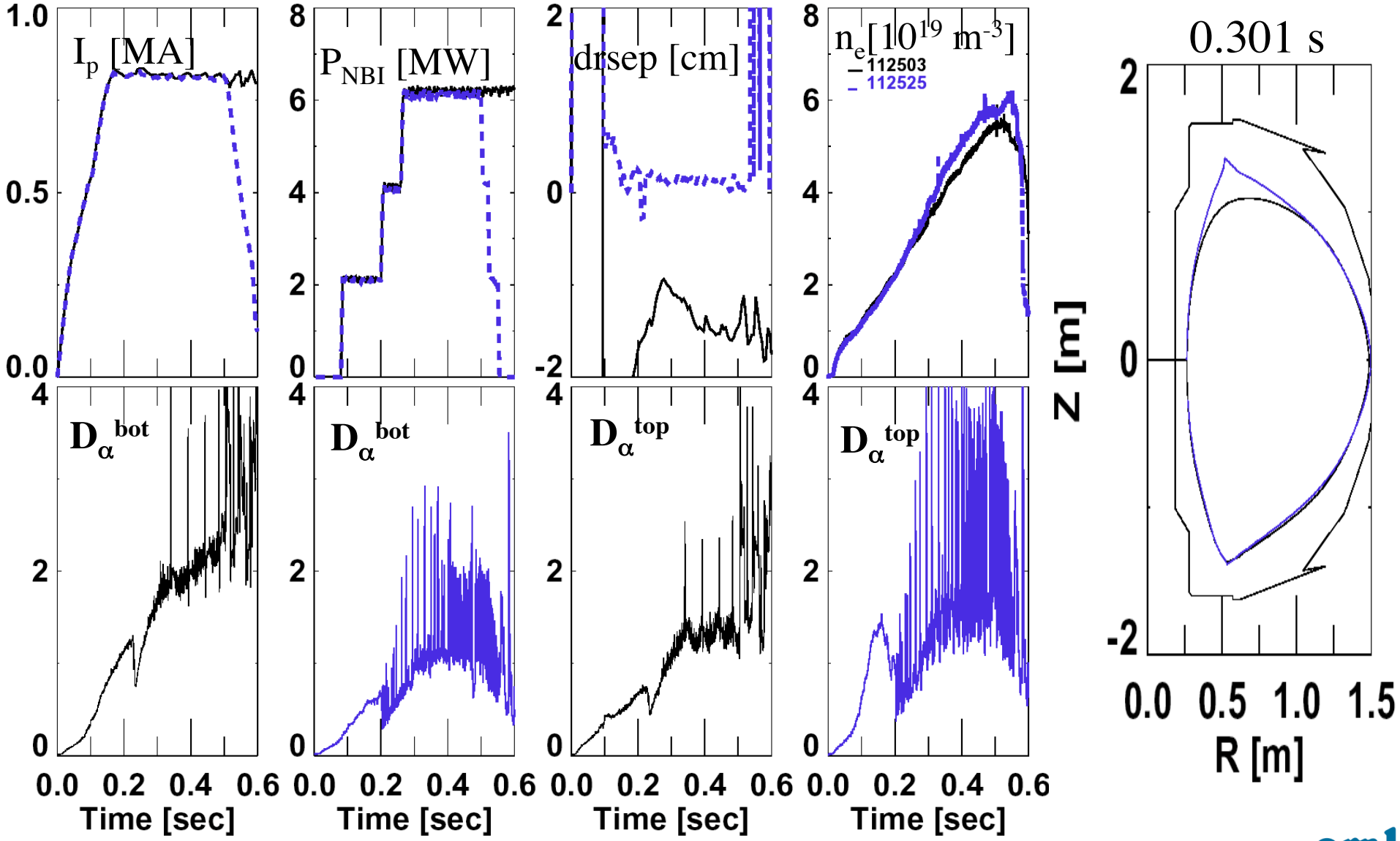
Pedestal $\nu_*^e \approx 1$ Divides Type V and Mixed ELM regimes



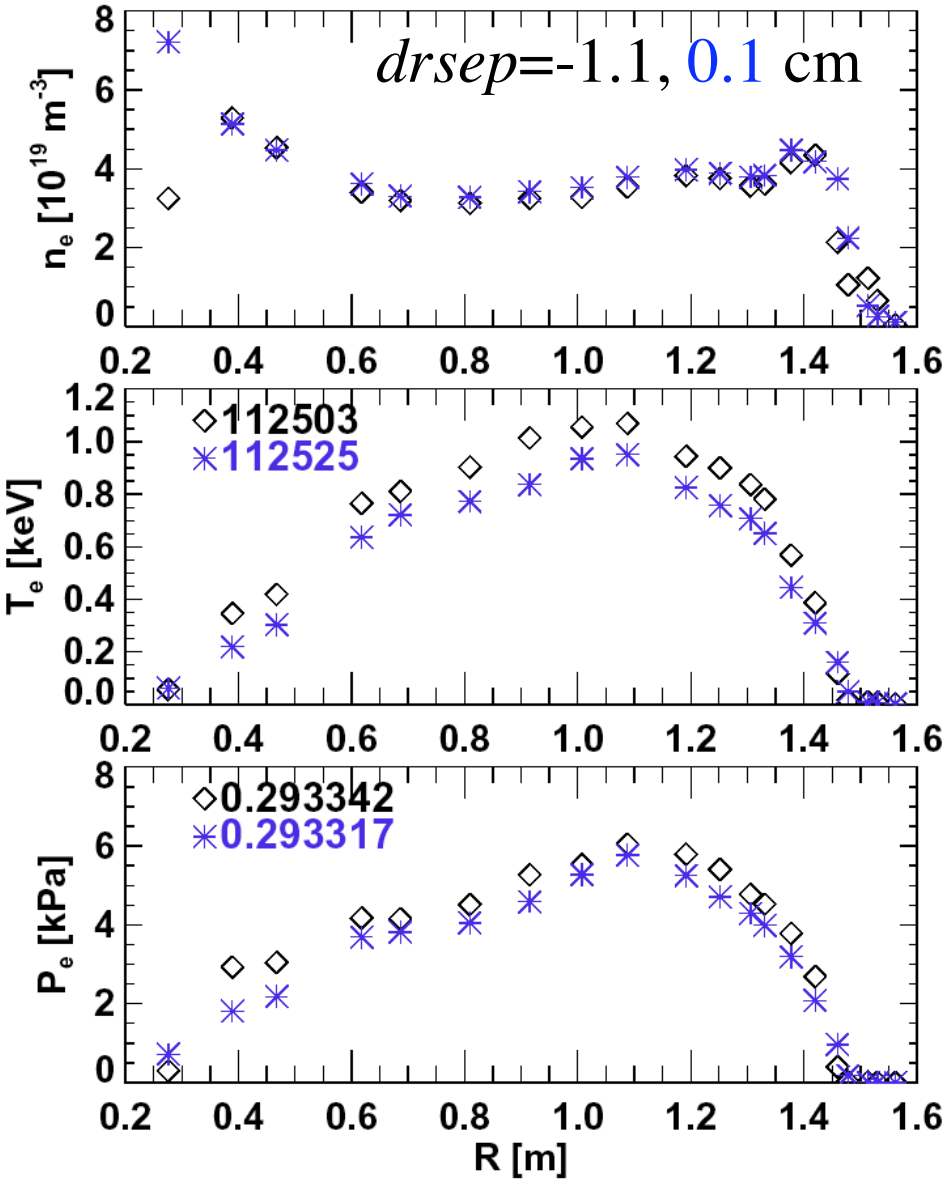


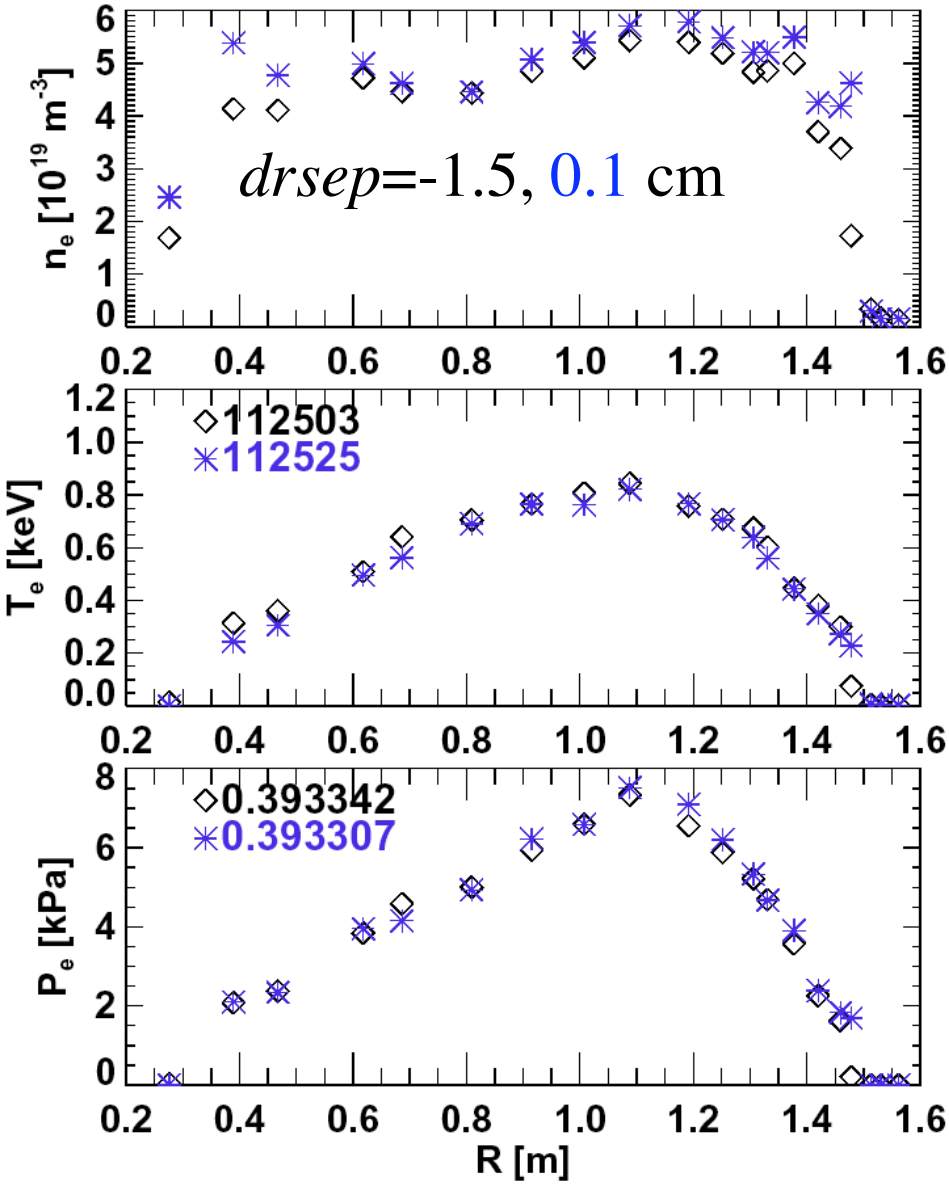
I_p: 0.6-0.9 MA, B_t=0.45 T, P_{NBI}: 2-6 MW, LSN, κ=2.0, δ=0.4

Type II/III ELMs observed in DN whereas Mixed Type I and V ELMs observed in LSN

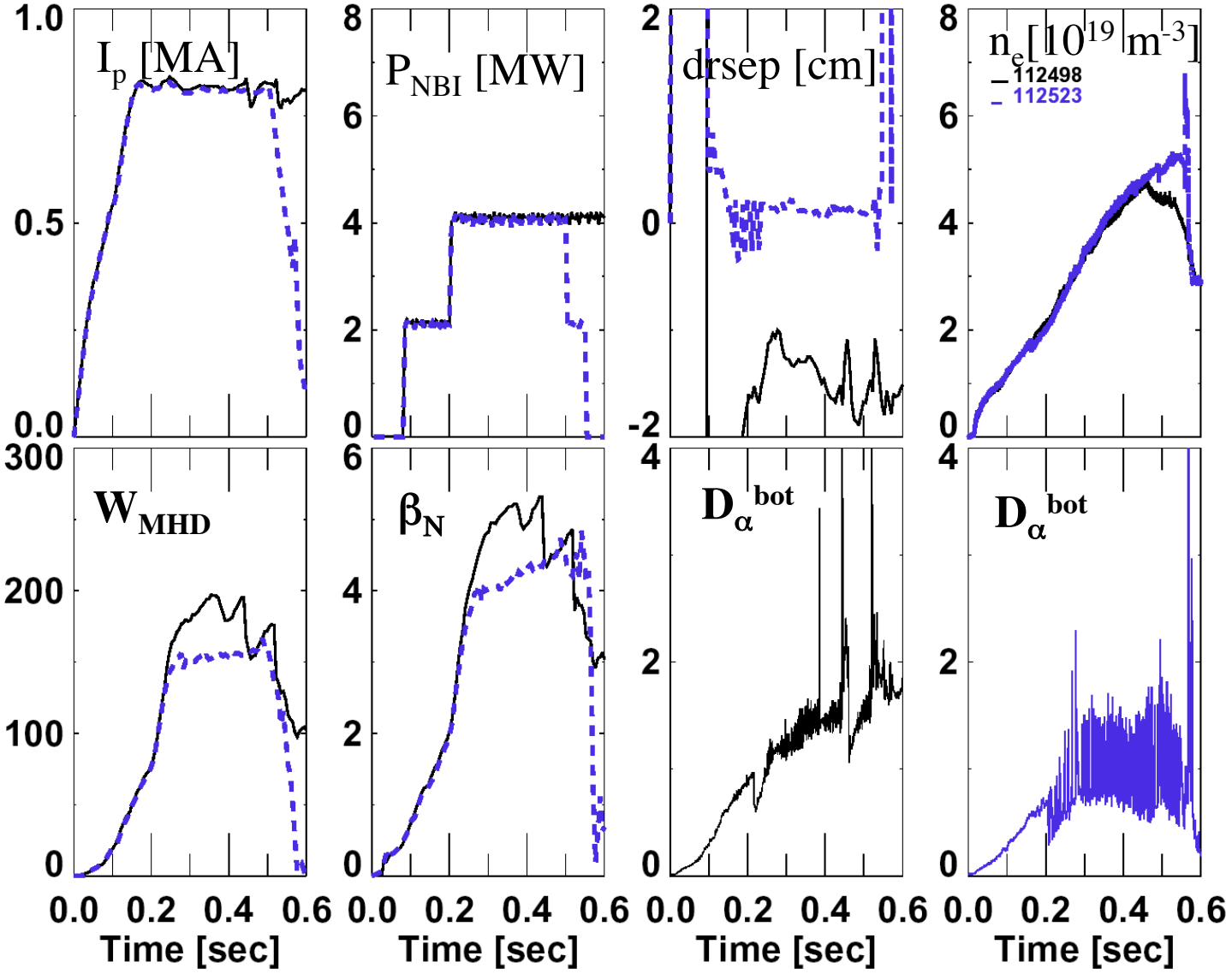


No dramatic change in pedestal parameters between DN and LSN

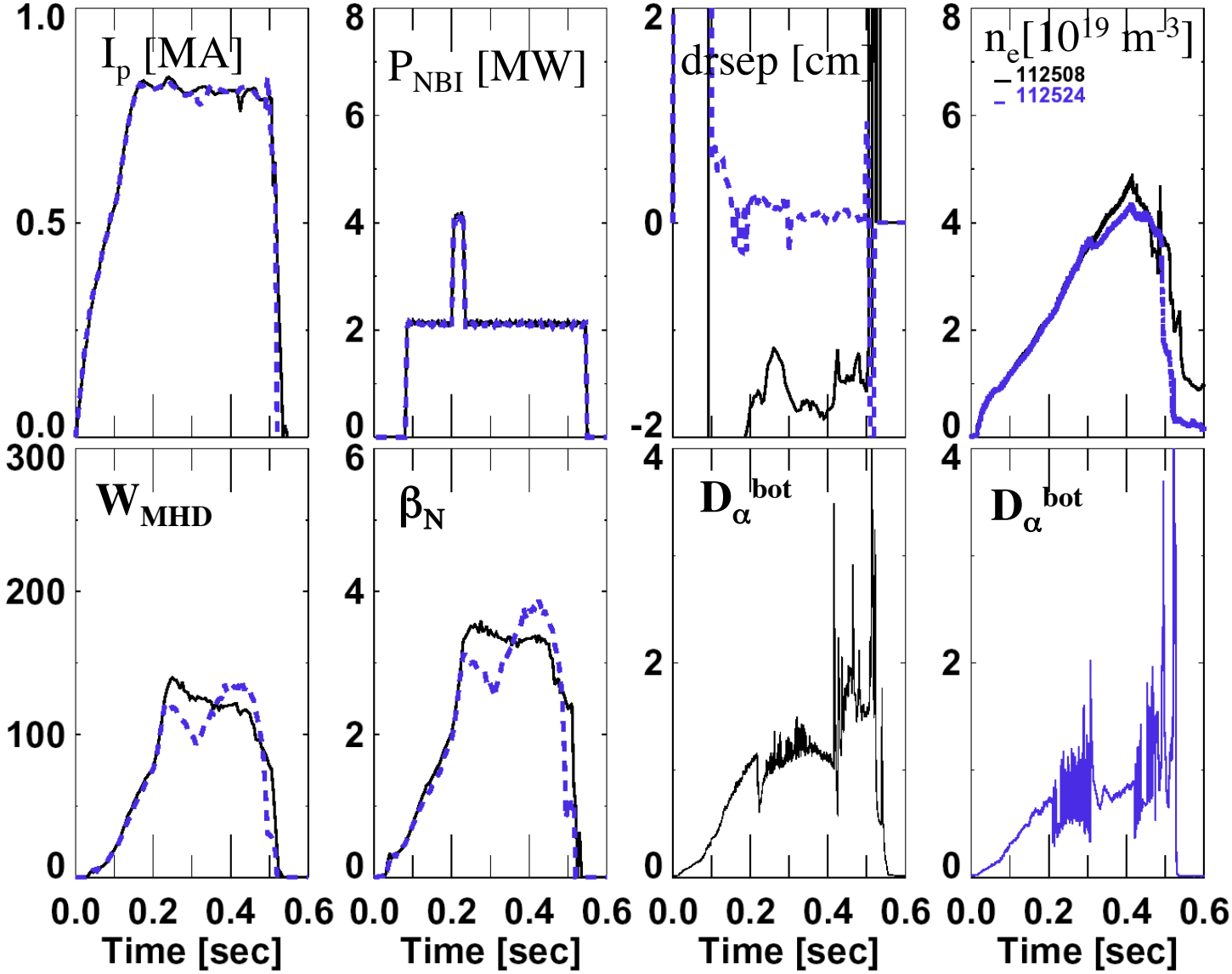




Type II/III ELMs observed in DN whereas Mixed Type I and V ELMs observed in **LSN**



H-L (and L-H?) power threshold higher in DN than in LSN

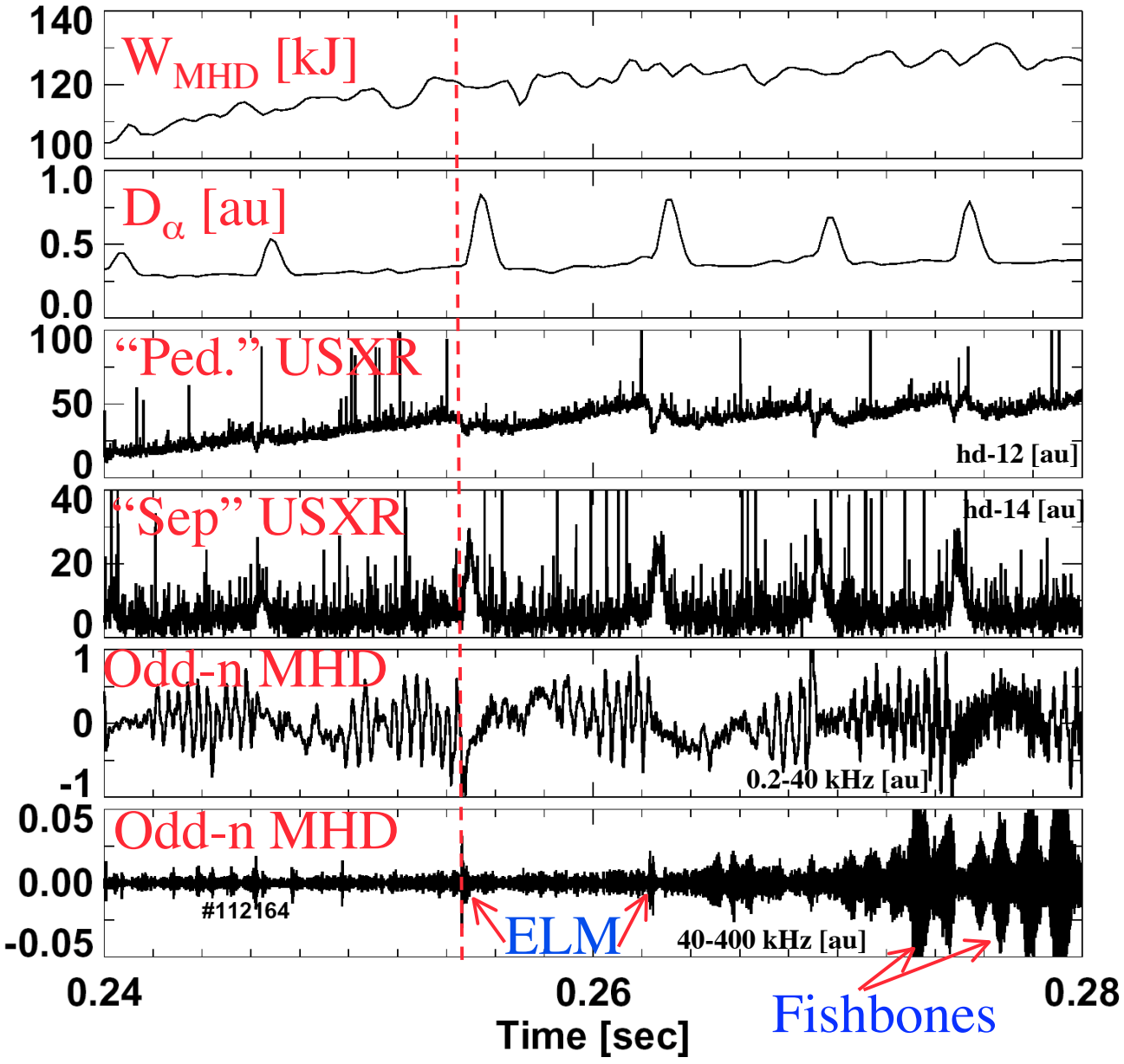


Summary and Conclusions

- Type II/III ELMs observed in DN but grassy Type V ELMs with a few Type I ELMs observed in LSN (κ~2.0-2.1, δ~0.4, *drsep*~1.5 cm, I_p=0.8 MA)
  - ❑ No dramatic change in pedestal at highest P_{NBI}
  - ❑ Higher H-L (L-H?) threshold power in DN
  - ❑ ELMs similar at small *drsep* < 0.5 cm
- Higher δ~0.8 discharges with Type I ELMs alone
- L-H identity experiment with MAST showed H-mode access only at DN but not when biased down or up from DN (I_p=0.5 MA) - why?
- Role of elongation in ELMs apparently strong in NSTX

Backup

Characteristics of Type III ELMs



Little impact per each ELM

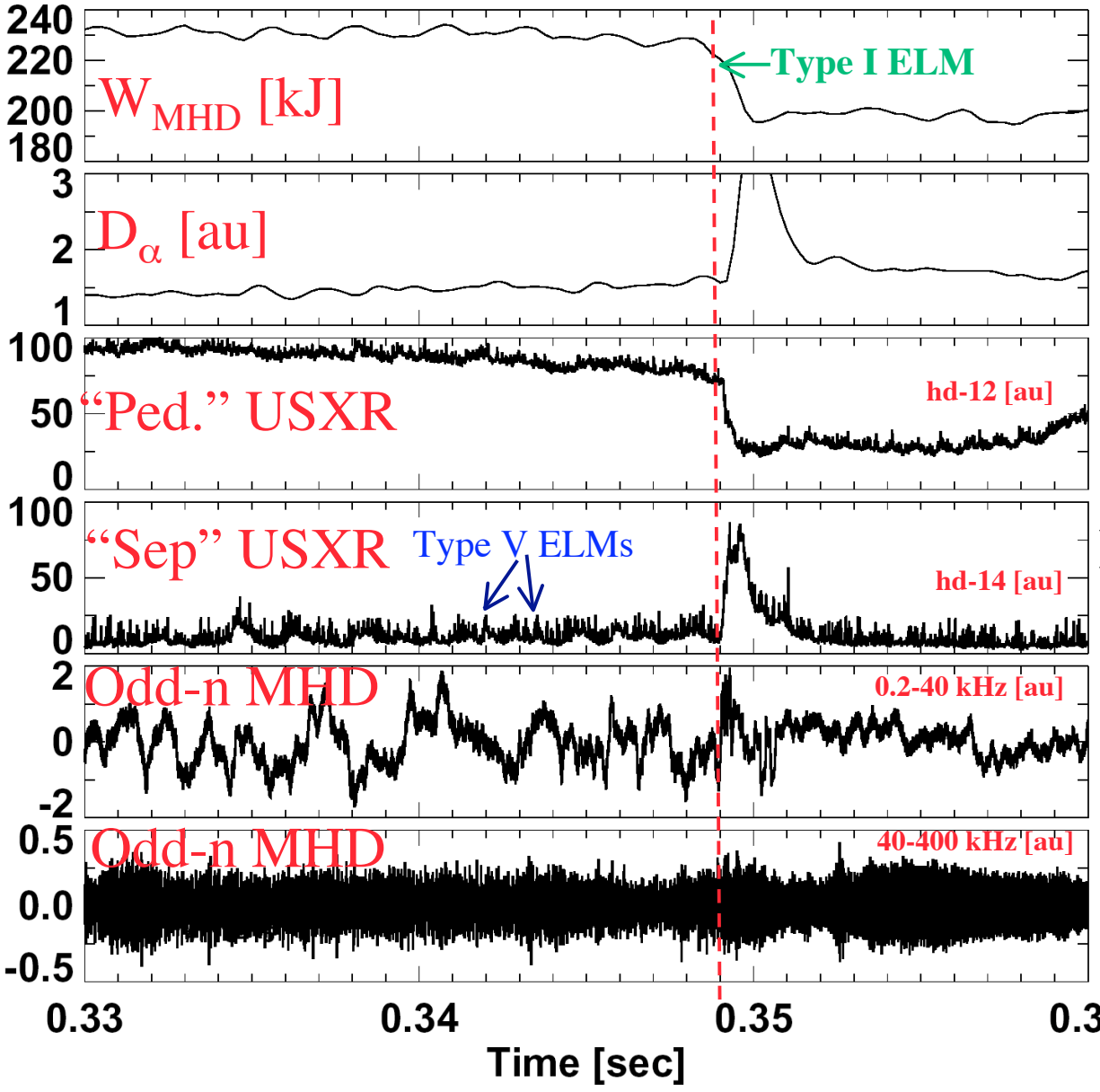
Outflux from pedestal

Influx to SOL Or separatrix

Low frequency 2 kHz pre-cursor

High frequency signature

Characteristics of Type I and V ELMs



Type I ELM
large ΔW_{MHD}

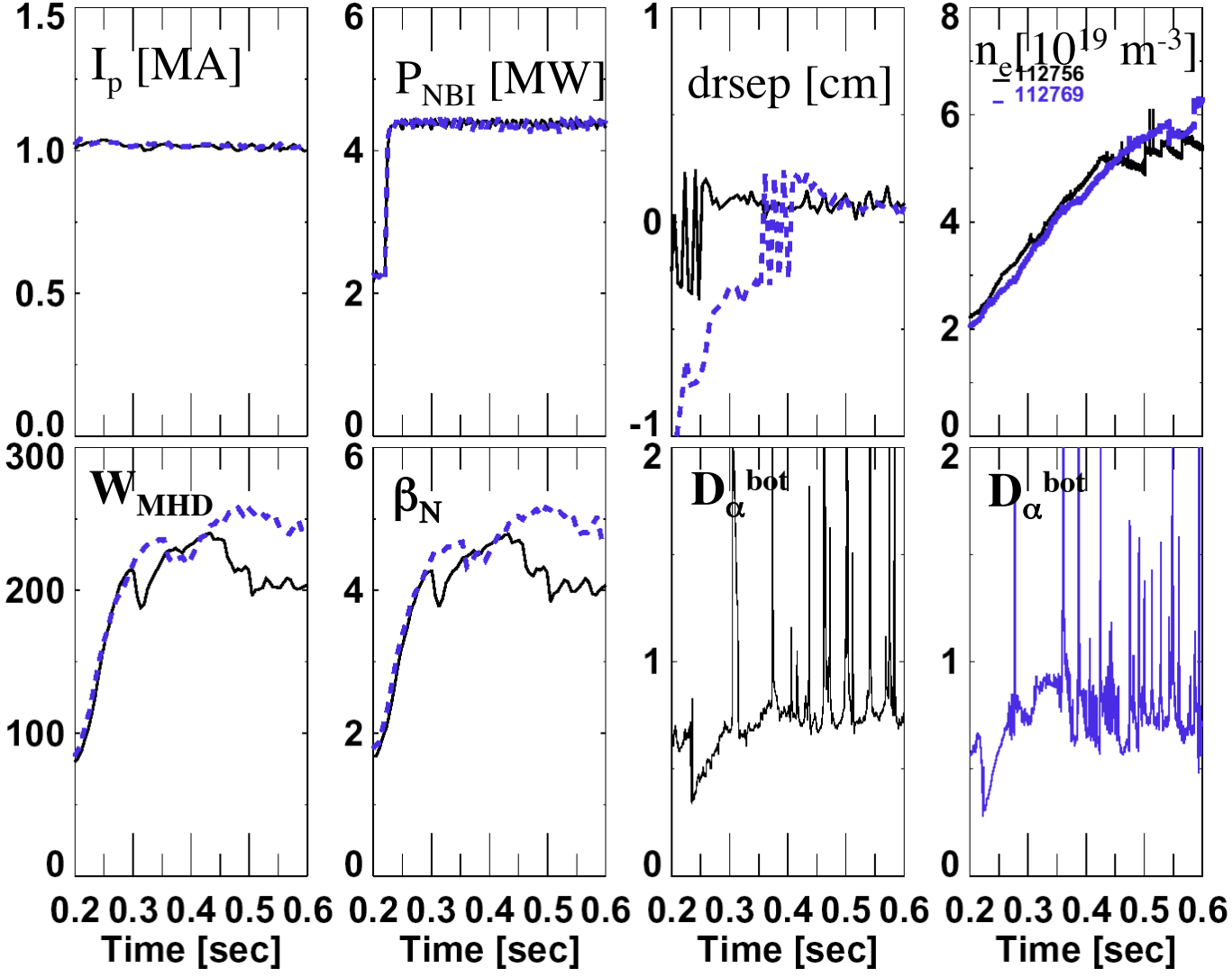
Outflux from pedestal

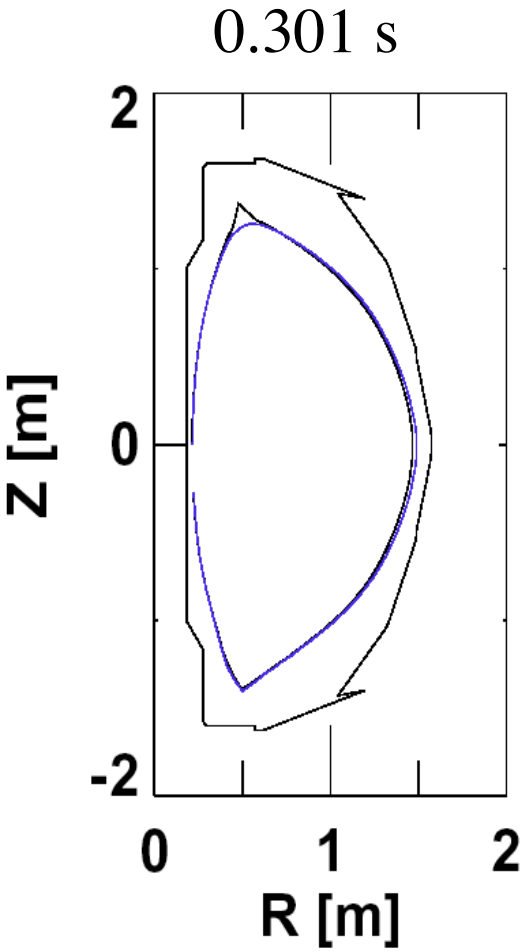
Influx to SOL
Or separatrix

No pre-cursors for Type I

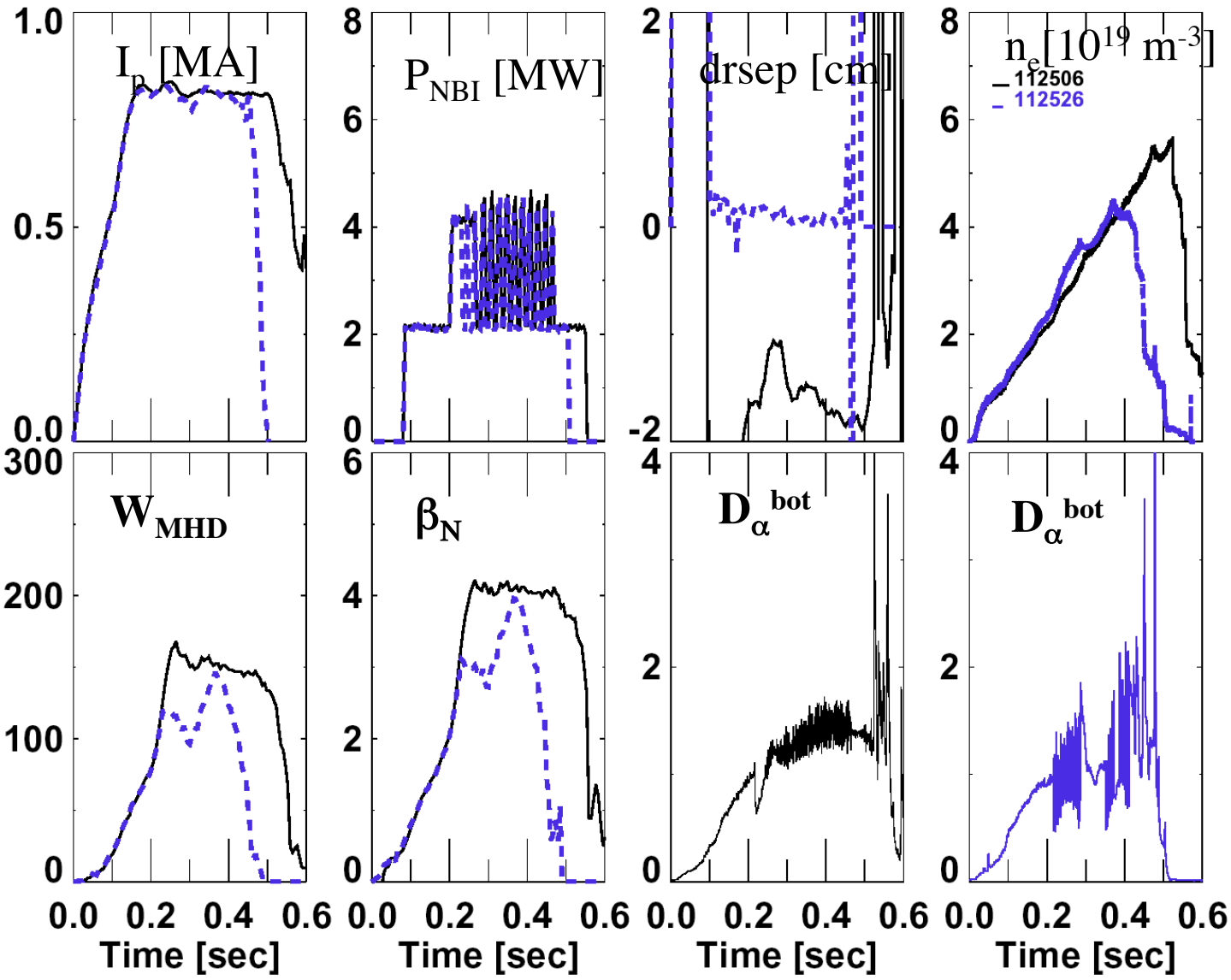
No clear Type I signatures

DN and LSN ELMs look similar for small drsep





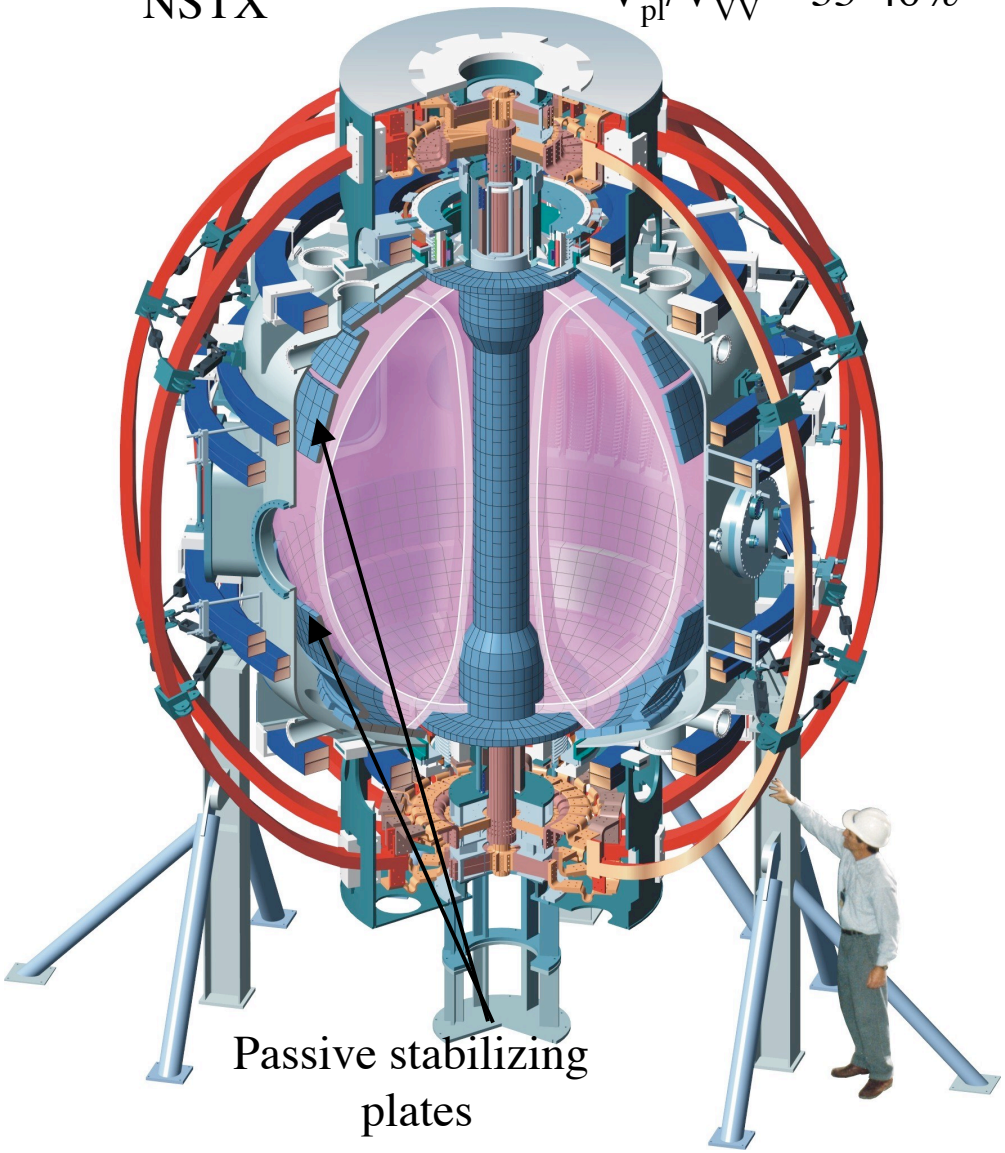
H-L (and L-H?) power threshold higher in DN than in LSN



NSTX and MAST save similar plasma size but MAST vacuum vessel larger and outer walls further away

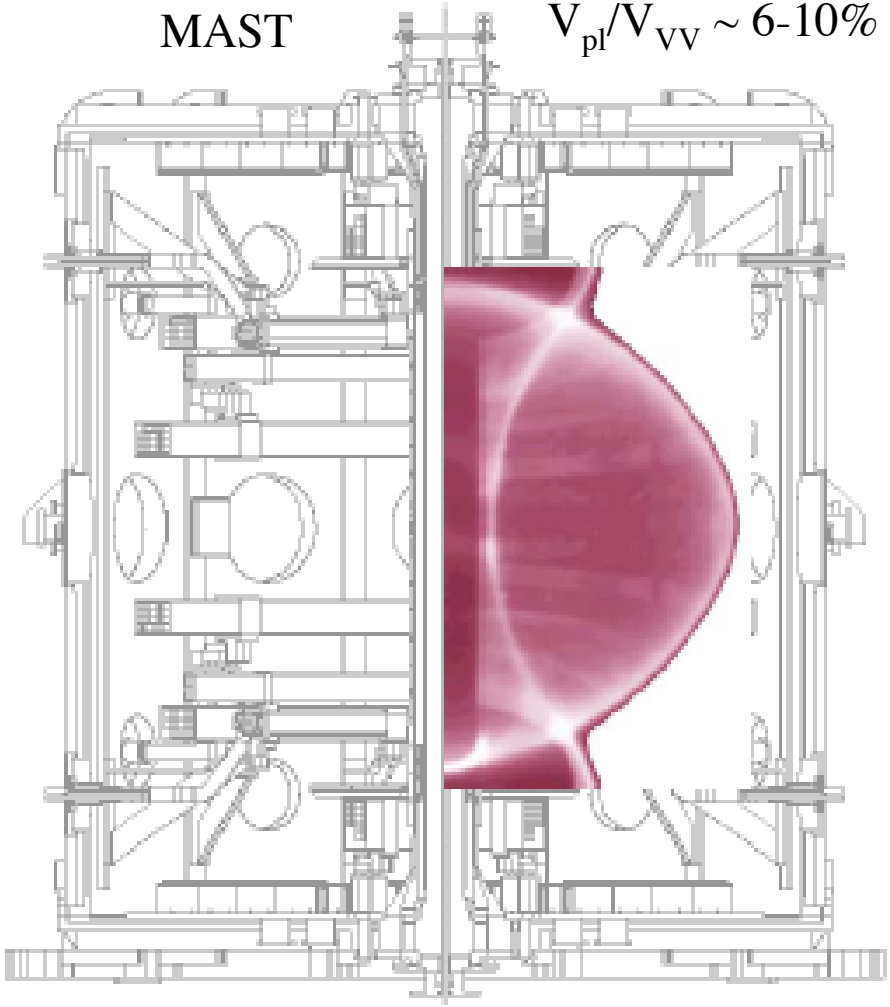
NSTX

V_{pl}/V_{VV} ~ 35-40%

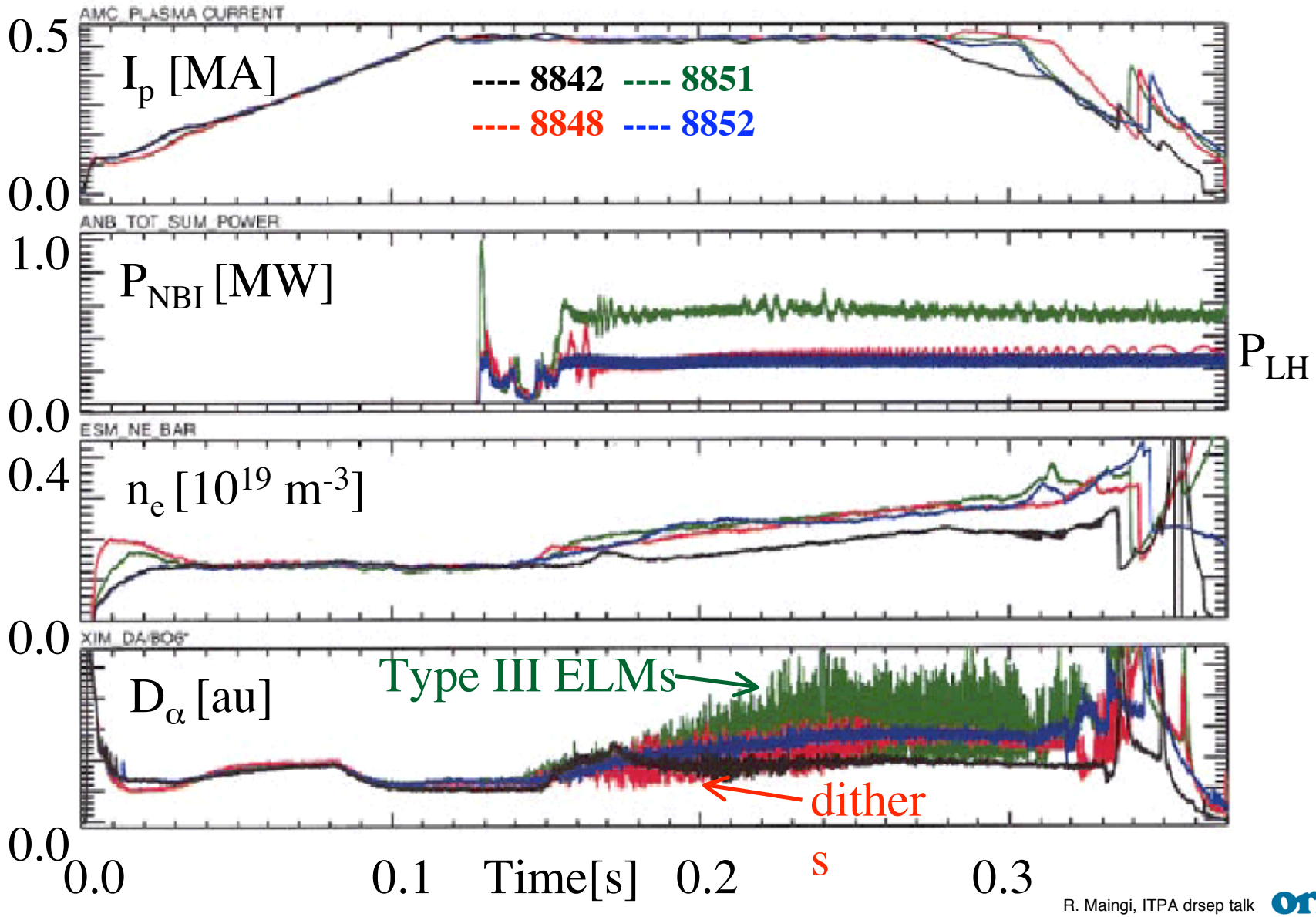


MAST

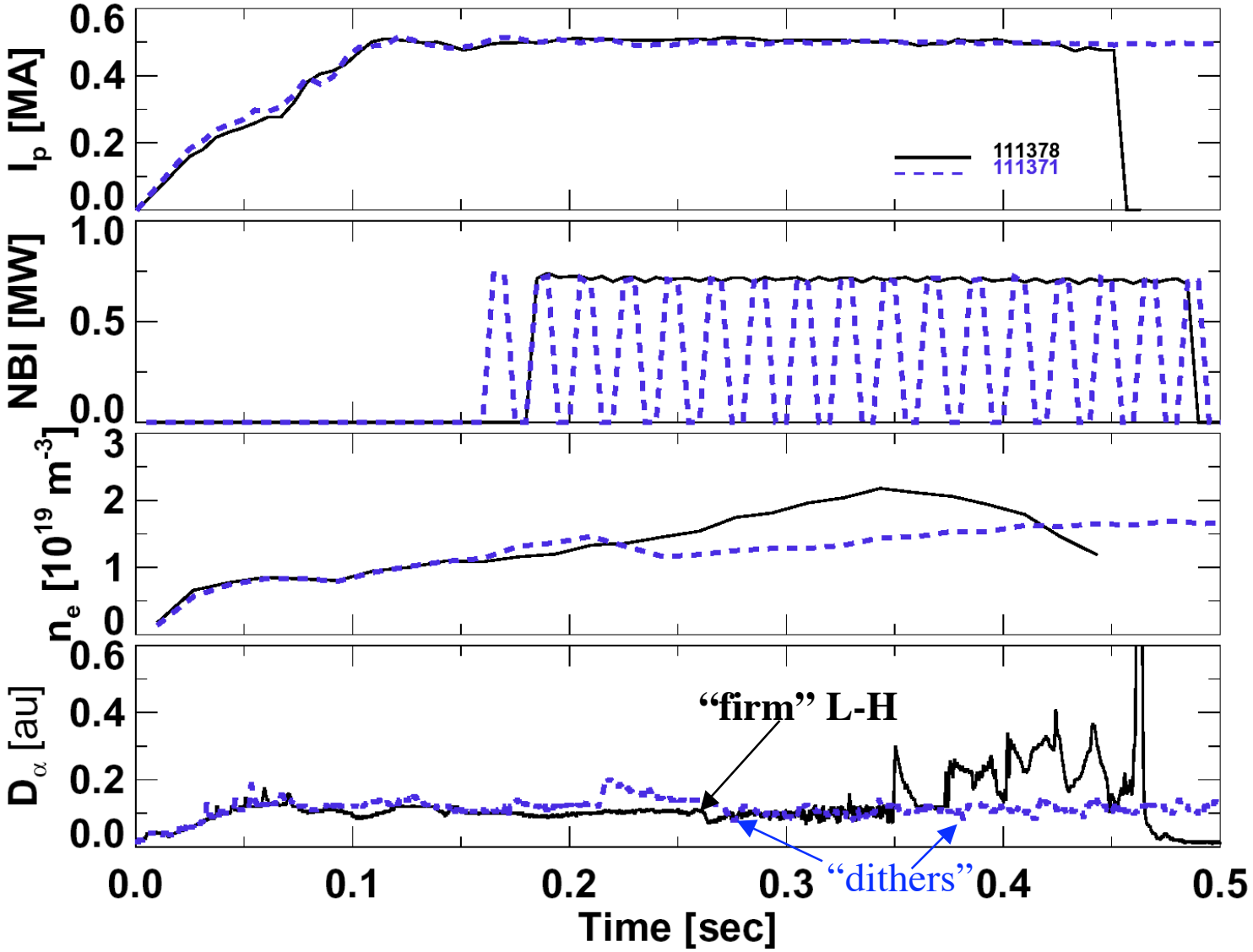
V_{pl}/V_{VV} ~ 6-10%



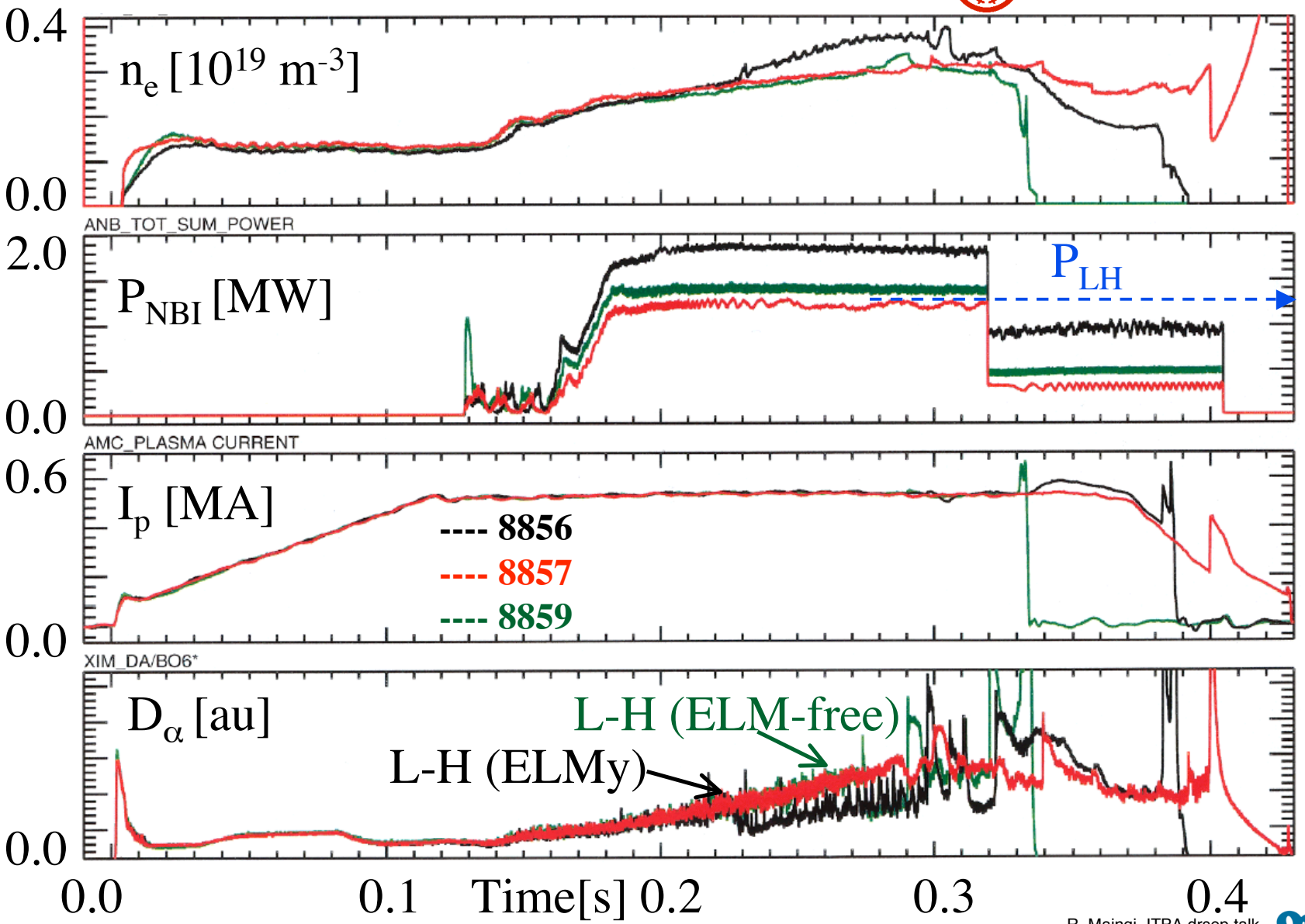
Dithery H-mode in CDND near P_{LH} in MAST



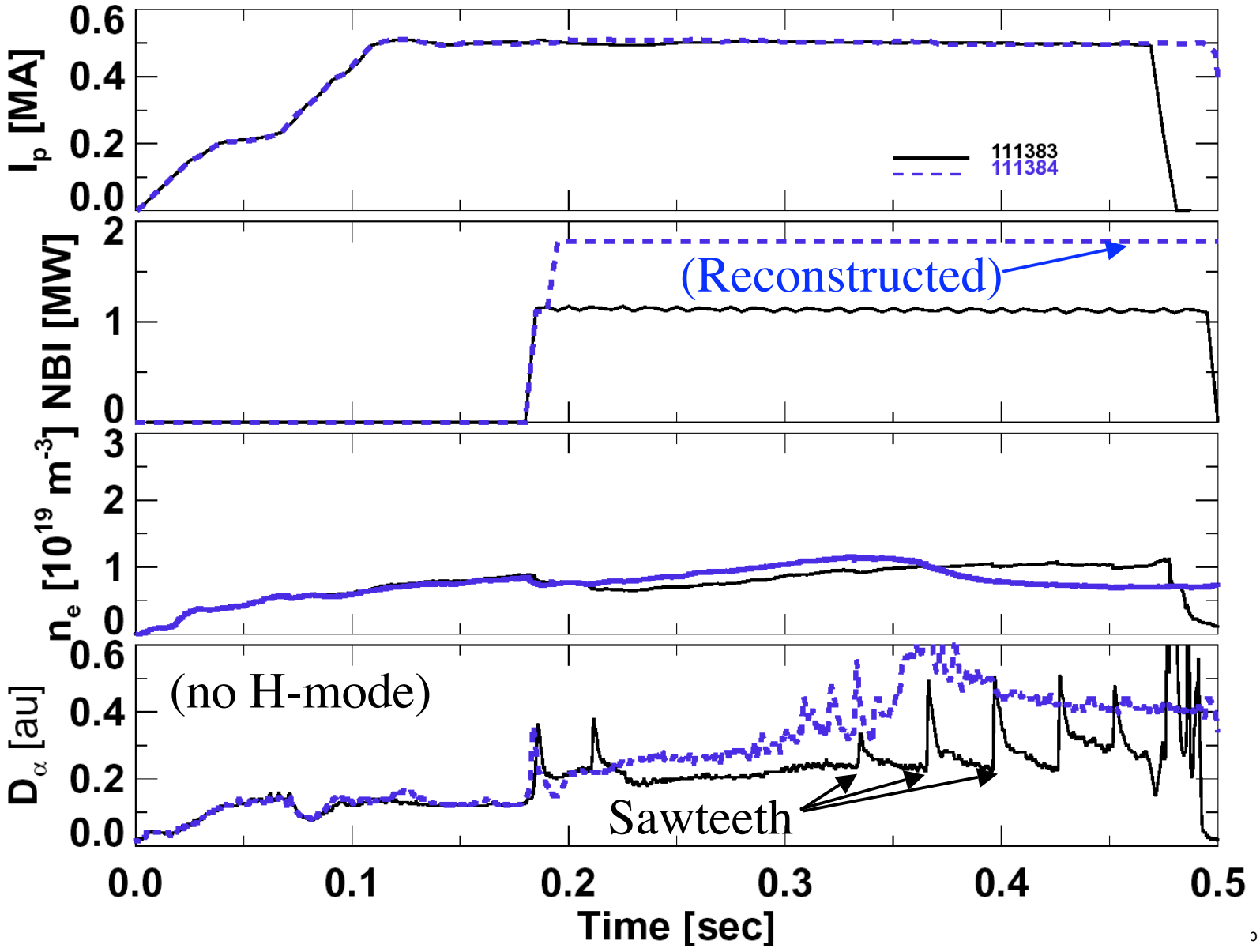
NSTX dithers not as 'periodic' as MAST (CDND near P_{LH})



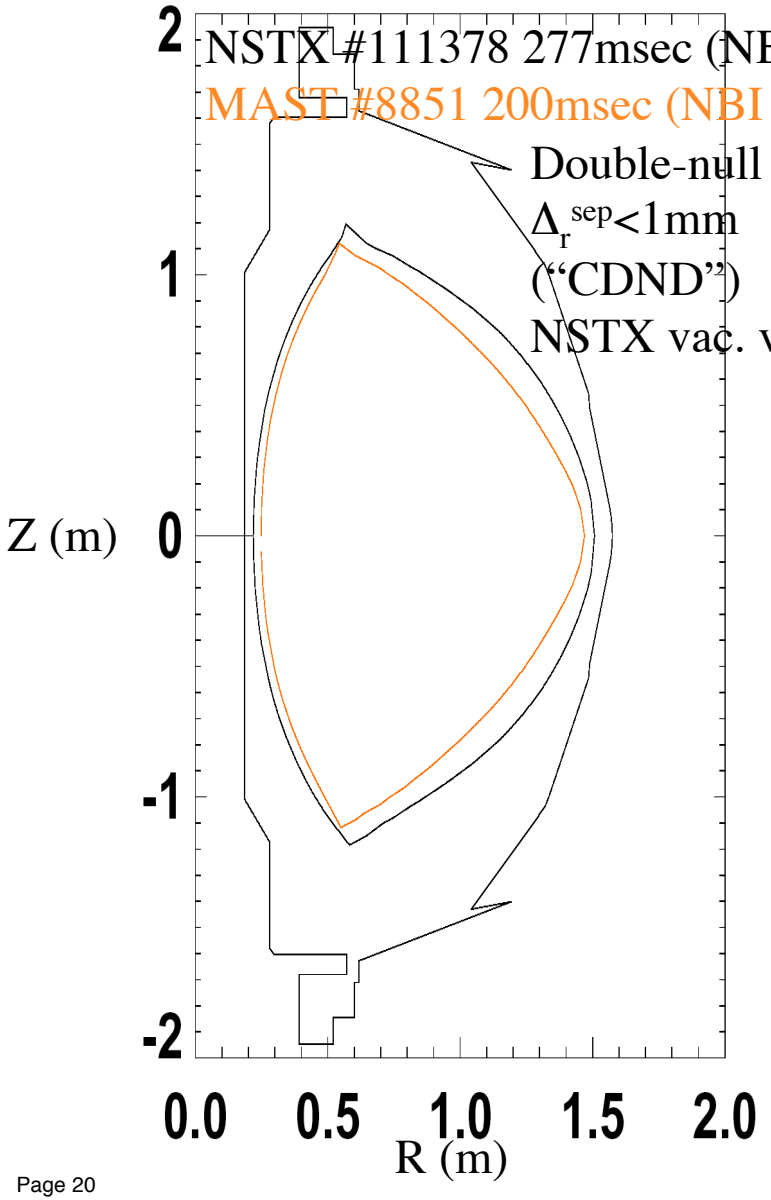
Clear H-mode Transition in LDND near P_{LH} in MAST

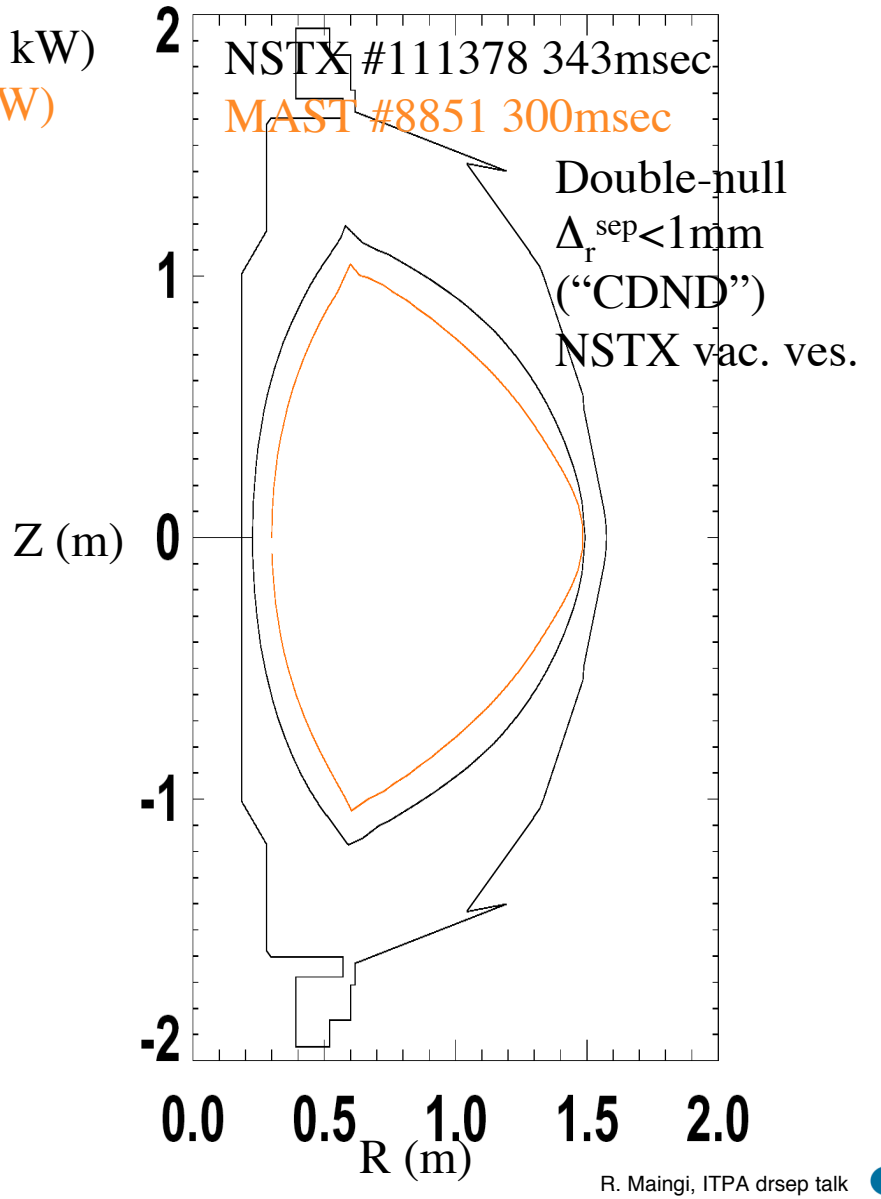


No transition observed in LDND in NSTX (too low density or MHD at NBI turn-on?)



CDND Shapes were reasonably well matched, although NSTX shape (under rtEFIT) was a little larger





NSTX LDND shape a little larger than MAST
Magnetic balance (drsep) scan possible with rtEFIT