

# Session Planning

## SOII - 42 : NBI Scenario Development

*"NBI  $W_{dia} / T_i$  optimisation in FMM002"*

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# Proposals



## Priority 1:

stato\_028 O2 reintroduction. Deposition profile changes with field scan.  
sul\_044 Simple NBI source with background ECRH plasma.  
sul\_038 Big gas puff into pure NBI --> W7-AS like HDH mode?

## Priority 2:

alca\_003 NBI current drive validation  
anla\_024 EBE observation during high density NBI (passive)  
crb\_003 Optimum confinement NBI + ECRH  
davku\_006 FIDA with internal islands  
ddaniel\_001 ABES in O2 reintro  
fwa\_019 NBI +/- ECRH scan

## SO discretion:

daz\_020 Gas puff into pure NBI - covered by sul\_038 and not conducted in SOII-5  
stato\_021 OXB attempts at end of pure NBI - Can use last few ~100ms of NBI high density.  
rlcansi\_003 Covered by doing O2 reintroduction in FMM002.  
vape\_003 Maybe covered by sul\_038.

## Configuration:

- SOII-42 is the afternoon session. Morning is in EIM (standard). Need to switch during session.
- NBI needs to do calorimeter shots to check beam steering in FMM (20mins - 1 hour)
- First FMM002 in OP2.2, so we need to do the ECRH and NBI extension (repeat from OP2.1)
- 3 field strengths required for stato\_028: 2.52, 2.57 and 2.62T.  
Conduct pulse length extension in FMM002+2570 and assume valid for  $\pm 2\%$  otherwise field scan will never be possible.
- We can conduct things in EIM before we switch.

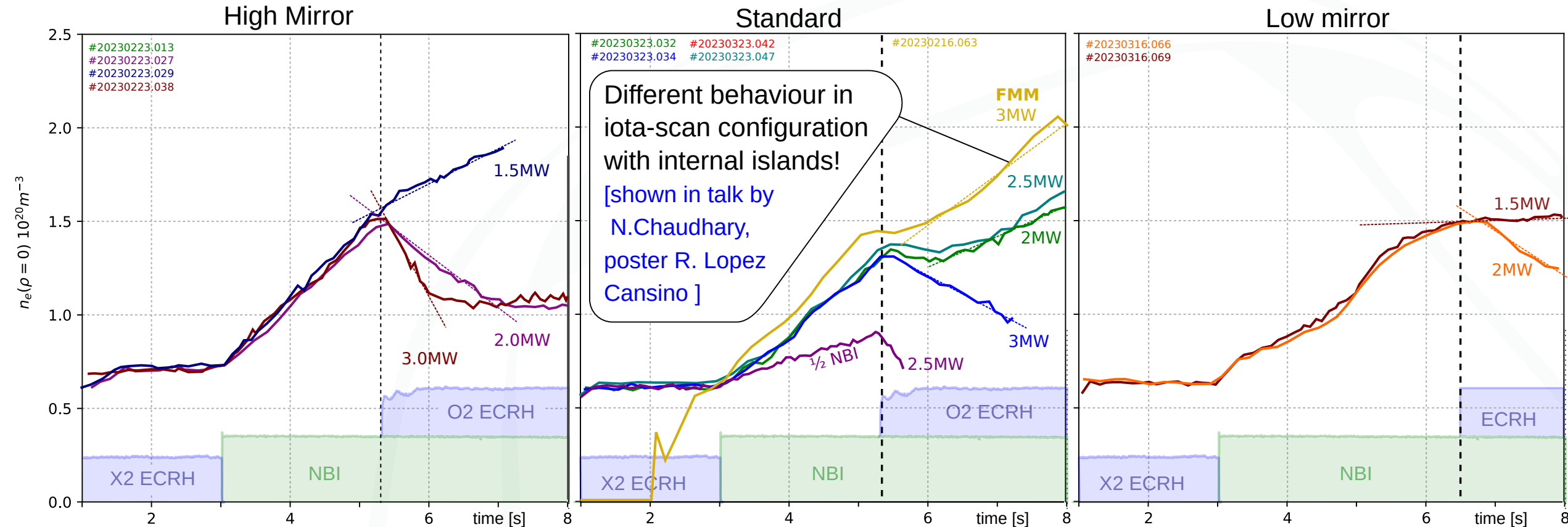
## Heating systems:

- All 4 sources NBI. 3 shots with both boxes for pulse length extension = min. 1 hour.
- NI21 needed in morning session. Morning session requires  $\leq 5$  MW of ECRH, so second box can also be prepared.
- We are limited to 5 MW ECRH on top of 4 sources.

# O2 reintroduction scans so far..

What we know so far (OP1.2b, OP2.1, OP2.2):

- 1) Pump-out stronger with more ECRH power.
- 2) Pump-out configuration dependant:  $KJM \gg EIM > FMM \sim FTM$ .
- 3) Pump-out weaker with stronger density gradient (later reintroduction time)

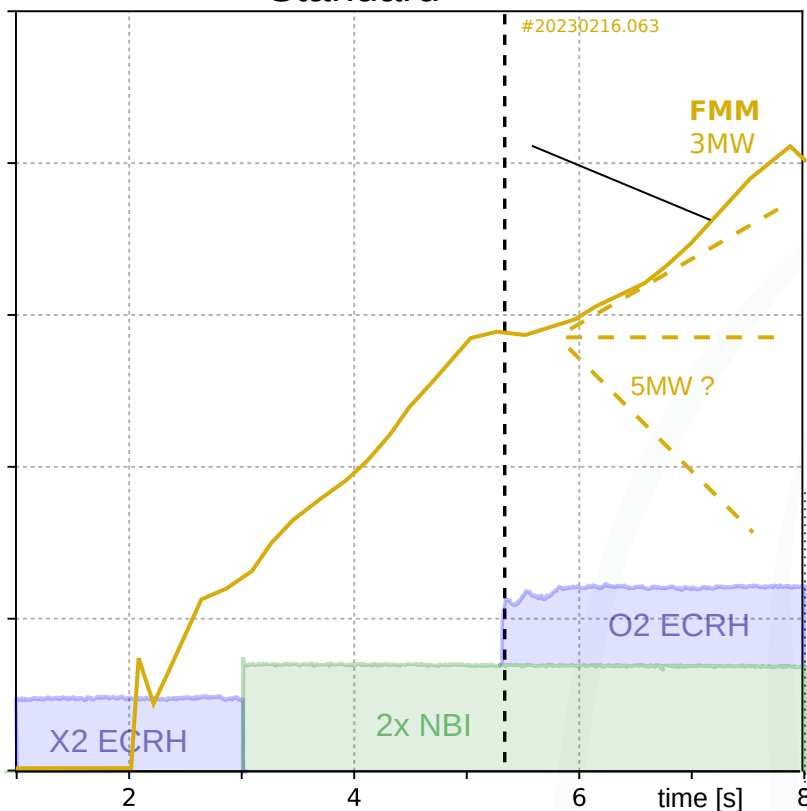


# O2 reintroduction plan

Plan:

Try with 5MW ECRH power in FMM. Can we stabilise density? (**#100**)

Standard



If density increases:

Try 6MW. (**#120**)

Try earlier reintroduction (**#130**) --> higher  $T_i$

If density decreases fast:

Try with 3 or 4 NBI sources (**#140**)

Once ~stable density found (or out of time). Repeat one in:

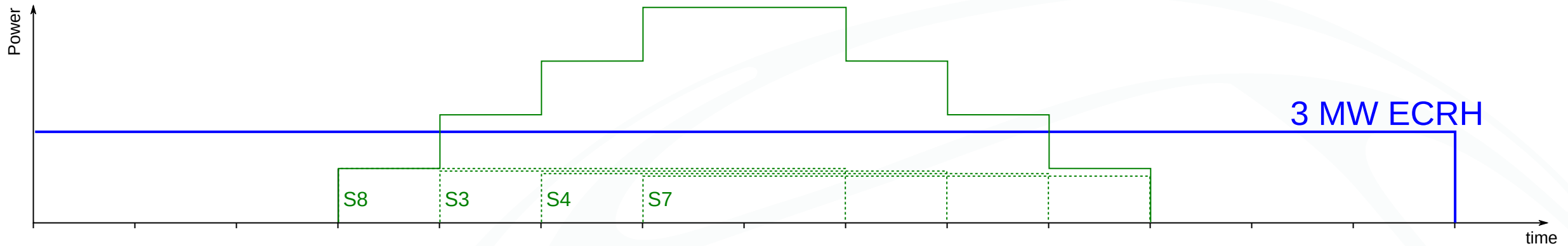
FMM002+2570 (**#150**)

FMM002+2620 (**#160**)

# Simple NBI source scan



For sul\_044: Requests simple NBI source scan with background ECRH plasma.  
- useful comparison data to density gradients in reintroduction.

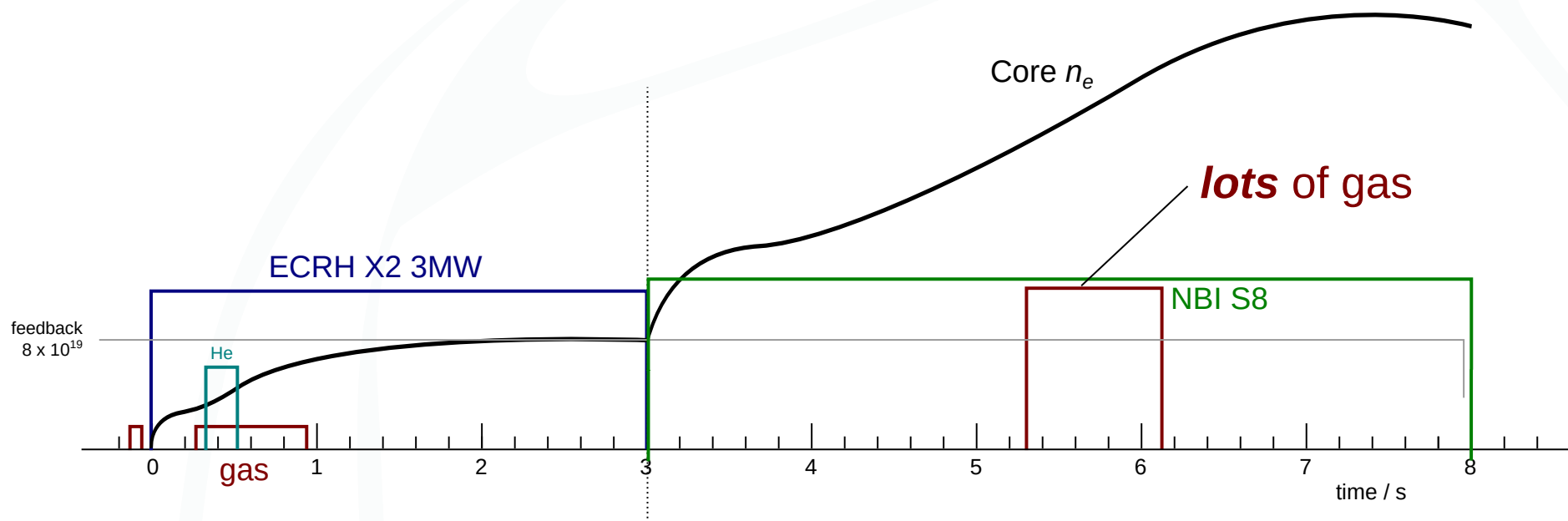


# Gas puff during pure NBI

For sul\_038: Requests strong gas puff during pure NBI to mimick W7-AS HD H-mod scenario.  
Unlikely to work as profile behaviour of pure NBI totally different to W7-AS.  
However, worth seeing what happens and it is the same as planned #400 from SOII-5 for daz\_020 that was not conducted (Reduce  $a/L_n$  by gas puff increasing  $n_e$ ).

However - does HDH make sense with no island divertor? Should we do this in EIM before switch.  
(would than also cover a SOL proposal: vape\_003 - NBI+detachment).

(#220):



# NBCD validation



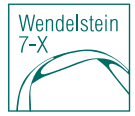
alca\_003: NBCD validation

This requires 2 sources continuous 5s with ECRH for stable density

Could this be conducted in another session with more usual config (e.g. EIM / KJM) where NBI pulse length extension is already done?



# Prio-2 proposals



davku\_006: Active FIDA measurements by blipping S7+S8 during continuous S3+S4 in FMM.  
This would require one extra 4-source shot to do stand-alone. Instead try to add S7/8 FIDA blips to S3+S4 reintroduction attempts of stato\_028.

Covered by other proposals:

anla\_024: EBE measurements in high density NBI

crb\_003: Optimum confinement NBI+ECRH (O2 reintroduction is the best non--pellet confinement).

ddaniel\_001: ABES in O2 reintroduction

fwa\_019: Covered by sul\_044 simple source scan.

No assigned proposals.

- Lots of cleaning
- ECRH power step down at  $8e19$  density to check detachment/density limit as preparation.

Possible:

- High density O2 shots to check if  $T_e$  flattening at internal islands is O2 related.
- Other internal island proposals.
- Pellets HP in FMM.
- Preparation for other FMM scenarios.

# Preliminary shot list



ID	Short description	n.Sources	NBI sources		O2 reintro	O2 power	Primary proposal
20	Massive gas puff into pure NBI	2	(S7+S8) / (S3+S4)	EIM	-	-	sul_038
--- Field change, beam steering checks ---							
95	Density limit check – ECRH step downs	0					
-	pulse length extension 0.5s NBI	4		FMM002+2570	-	-	-
-	pulse length extension 1.0s NBI	4		FMM002+2570	-	-	-
-	pulse length extension 5s NBI	4		FMM002+2570	-	-	-
100	O2 reintroduction. Higher power	2	S7+S8	FMM002+2520	2,3s	5MW	stato_028
120	O2 reintroduction. Higher power	2	S3+S4	FMM002+2520	2,3s	6MW	stato_028
130	O2 reintroduction. Earlier	2	2xS	FMM002+2520	2,0s	5/6MW	stato_028
140	O2 reintroduction. More source	3+	3/4xS	FMM002+2520	2,3s	5MW	stato_028
150	O2 reintroduction. Field scan	2	(S7+S8) / (S3+S4)	FMM002+2570	2,3s	6MW	stato_028
160	O2 reintroduction. Field scan	2	(S7+S8) / (S3+S4)	FMM002+2620	2,3s	6MW	stato_028
200	Simple source scan	4	S7+3+4+8 overlapped	Any	-	-	sul_044
240	Active FIDA measurements	4	S3,S4 on, S7,8 blips	Any	-	-	davku_006