MAST Developments

(in addition to diagnostics and control improvements)

EBW installation

Replacement centre stack
(37% more inductive flux; higher stresses allowed)

MAST Improved Divertor
(improved c/col armour;
smaller P2 plates;
instrumented divertor plates)

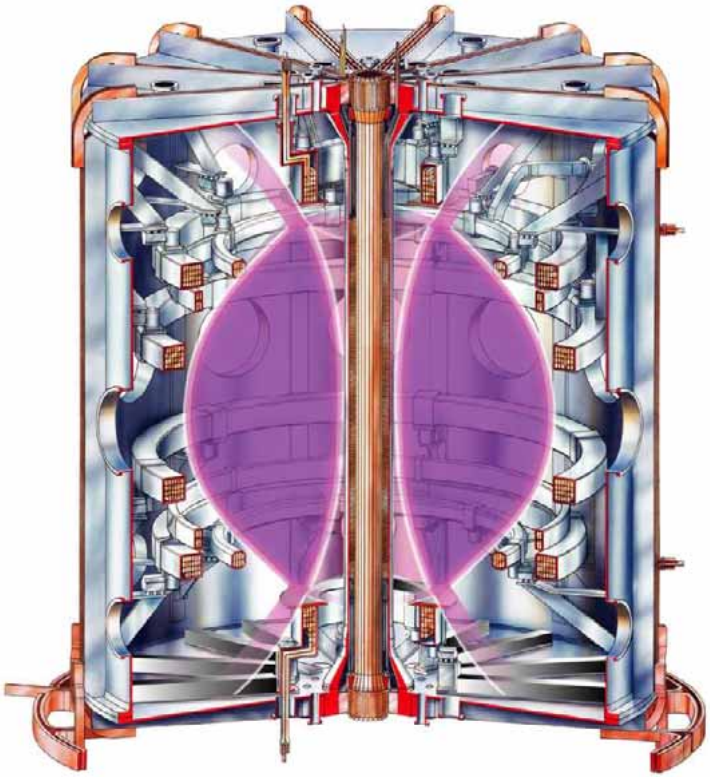
Higher plasma elongation

Higher power NBI

P2 current reversible

Higher current in P3 coils

Error field correction coils



Replacement centre stack

Installation 2003

- Improved design
- Longer solenoid
- TF: operation at ~90kA (cf 85kA) giving 0.51T at R=0.85m
- Solenoid: swing from ± 55kA (cf. ± 40kA)

EBW facility (using 60GHz ECRH)

new antenna installed Sept 2002

(TF rod current limited to > 90kA or < 78kA)

<u>Experiments planned (V Shevchenko):</u>

Pre - ionisation studies, ECRH heating,

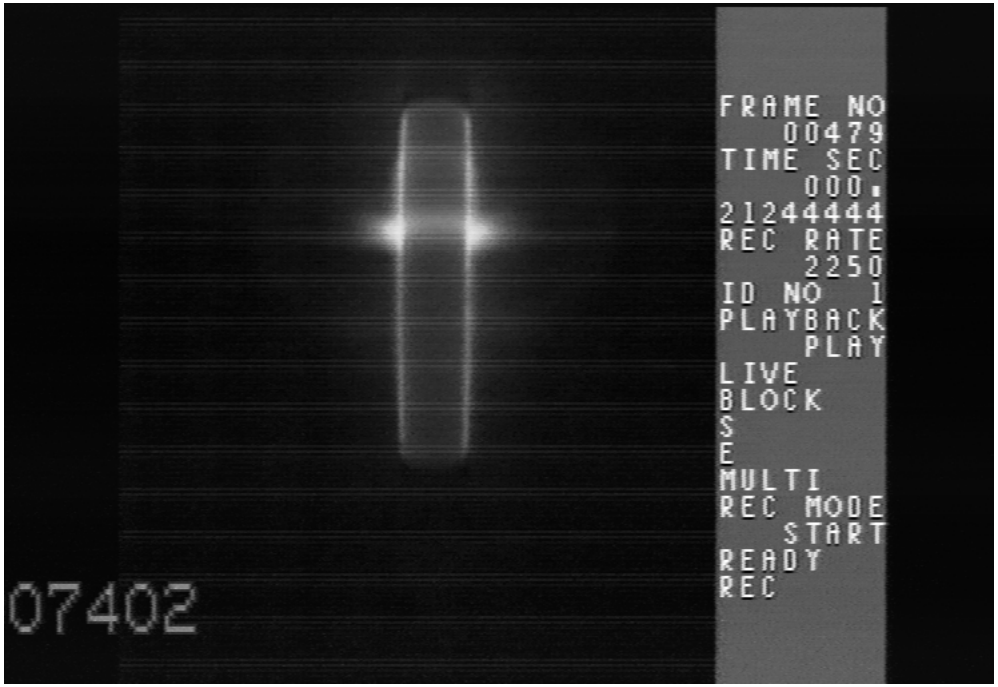
tests of Cary Forest 'bootstrap' CD scheme,

EBW heating experiments

First ECRH breakdown on MAST

6th November 2002

This used the new antenna



TF only (+gas)

60GHz ECRH, X-mode

3 x 150kW used

(up to 7 lines available)

Radius of resonance = 21cm (cf. c/col graphite radius = 20cm)

MAST NBI Programme

Present Status - 2002 (M3)

- Maximum injected deuterium beam power per injector: 1.7 MW
- Maximum total injected deuterium beam power: 2.9 MW
- Maximum beam pulse length: 300 ms

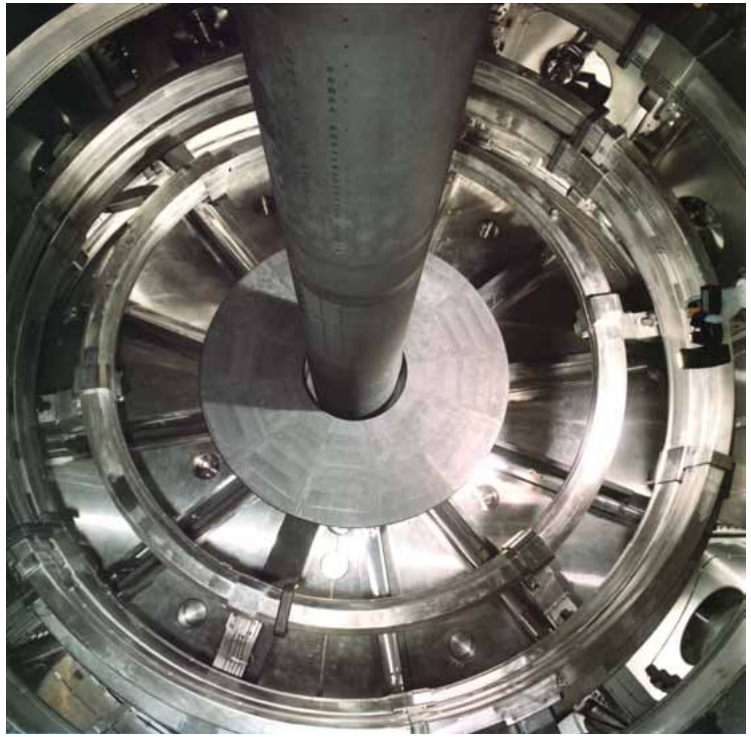
Short-Term Programme - 2002/2003 (Existing Injectors)

- Maximum deuterium beam power per injector: >2 MW
- Maximum total deuterium beam power: >4 MW
- Maximum beam pulse length >400 ms

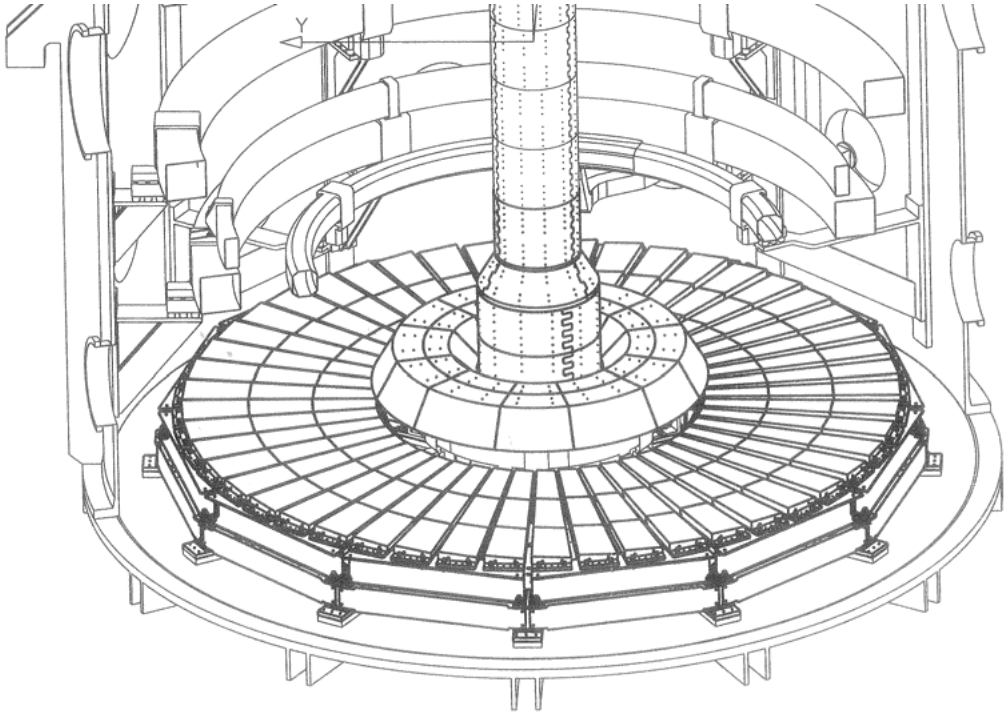
Long-Term Programme - 2004 (Upgraded Injectors)

- Maximum deuterium beam power per injector: 2.5 MW
- Maximum total deuterium beam power: 5 MW
- Maximum beam pulse length 5000 ms

MAST Improved Divertor (MID)

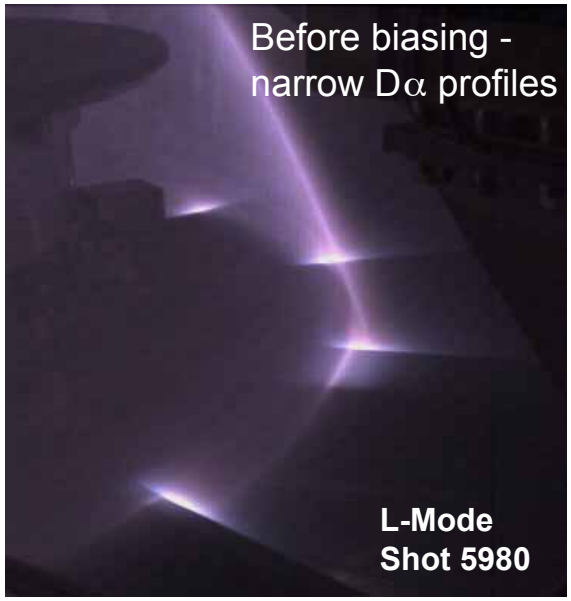


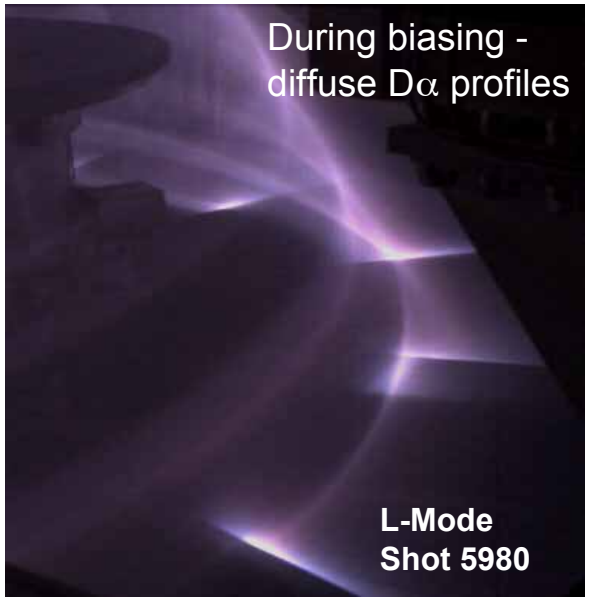
Present divertor
(simple P2 plate, ribs on tank ends)

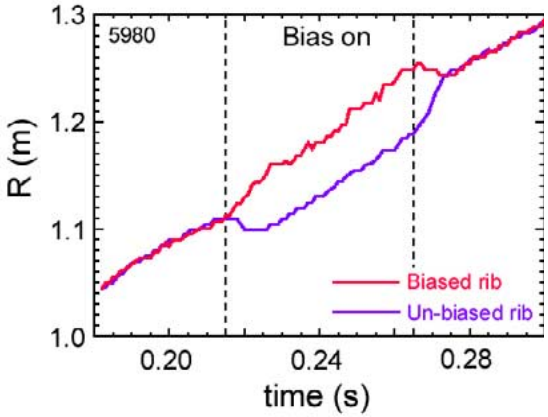


MID
shaped P2 plates; imbrocated tile divertor plates; improved c/col armour

The Improved divertor can be biassed, to continue studies begun in the M3a campaign:





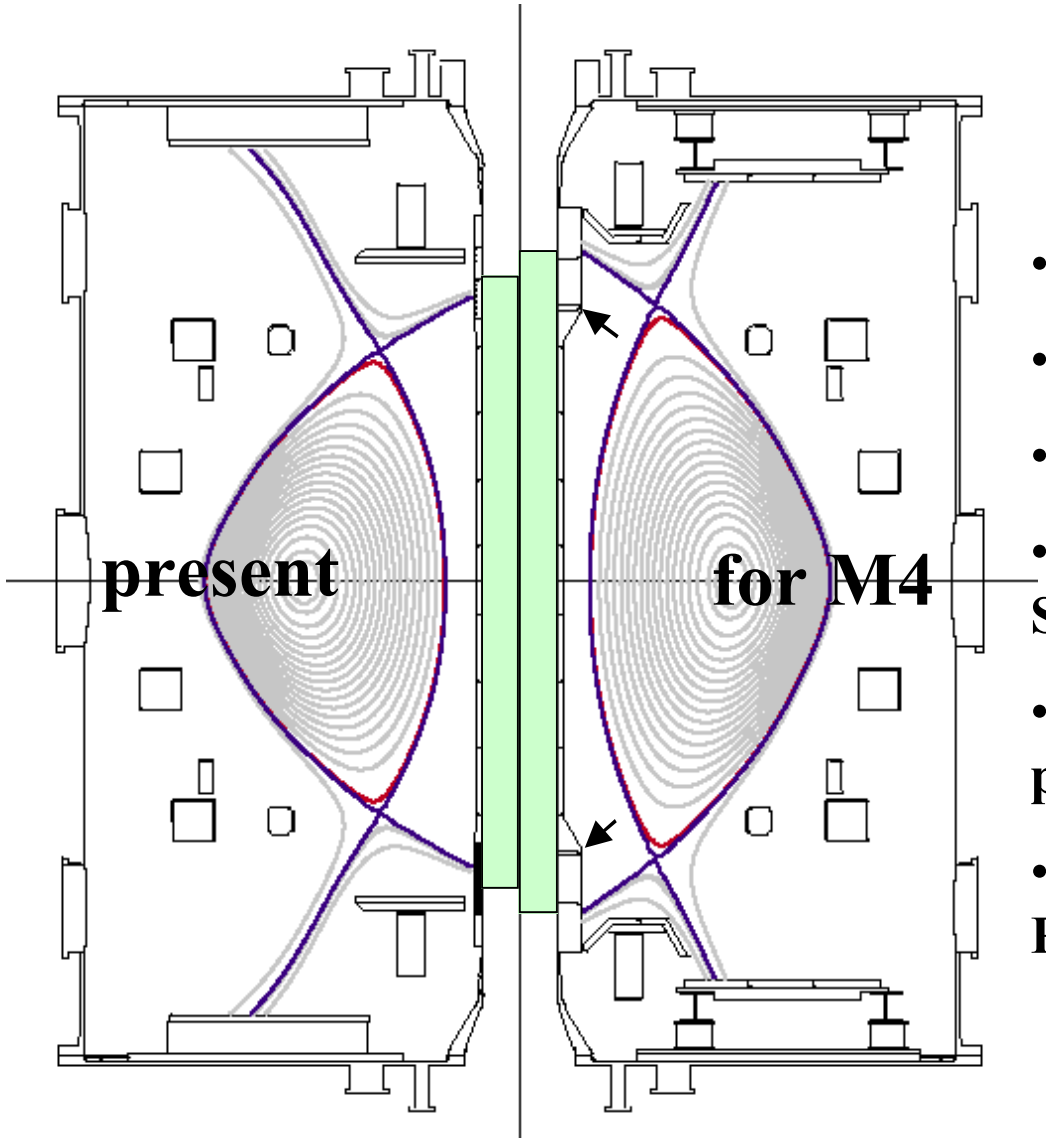


movement of strike point along lower outer ribs during biassing

stills from High-speed colour video of lower outer target area (left) before biasing and (right) during biasing.

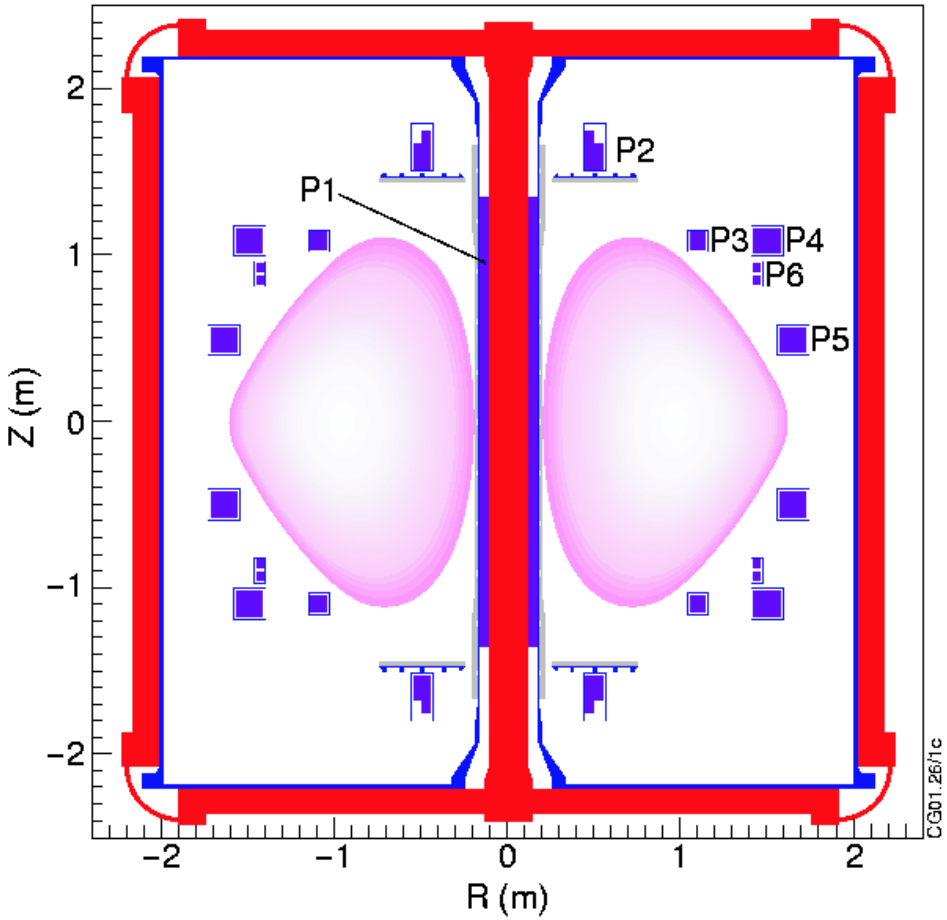
Results are in agreement with theory (COHEN, R.H., et al., Nucl. Fusion **37** (1997) 62; RYUTOV, D.D., et al., Plasma Phys. Contr. Fusion **43** (2001) 1399; HELANDER, P., et al., Proc IAEA Conf, Lyon, 2002 (Paper TH/8-1)

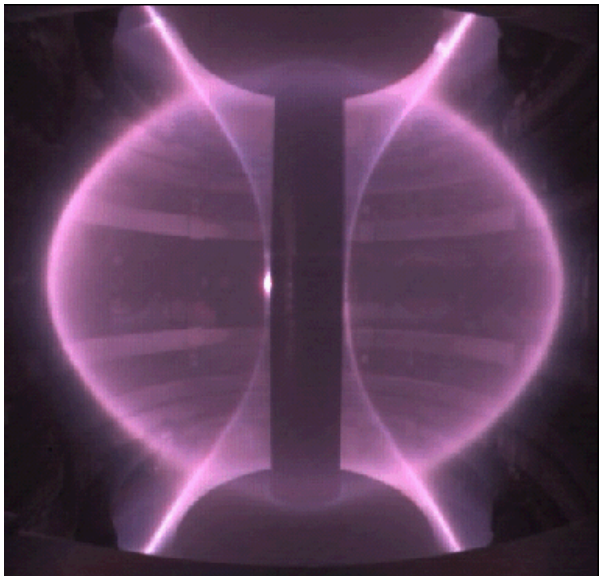
MAST layout for M4



- Longer solenoid
- P2 coils raised by 10cm
- shaped P2 armour
- larger footprint for inner SOL strike points
- controllable inner gas puff (arrowed)
- to include top launch for PI studies

Schematic of MAST





Still from colour video of typical DND plasma