Carbon Blooms on JET & TFTR (R. Raman, 19-April-2017)

Working on greyed out items

JET

Tested Fine grained graphite, CFCs and Be (40 x 18 x 4cm – Mark II divertor tiles)

Maximum design limit 1600C

Thermal conductivity into tile & low thermal expansion coefficient important to avoid tile cracking due to thermal heating

JET NBI test bed used for testing in the heat flux range of 5 to 30 MW/m^2

C-bloom starts at 1800C +/- 150C vs 1600C +/- 150C in TFTR.

With divertor gas puffing, JET has operated at 8MW (input power?) for 6s, vs. 2.5s without gas puffing. Divertor heat loading during these 6s pulses?

Tiles mechanically constrained to avoid cracking at power levels (2d and unidirectional tiles used)

DMS704 / T02 tiles adopted based on cost and test results.

TFTR

Misalignments or damage to tiles were the primary location of the C-blooms (hot spots)

There is a tile temperature and energy threshold for the carbon bloom.

Initially POCO graphite tiles were used.

This was later changed to 4D-CFCs, and tile alignment improved to +/-0.5mm accuracy. This allowed the carbon blooms to be increased from starting at 15MJ to 46MJ. Divertor heat loading during these pulses, and pulse duration?

Did 4d-CFCs allow the bloom to initiate at 2400C during divertor operation and at 2800C during limiter operations?

TEXTOR

10cm x 6cm x 5cm tiles

Used fine grain graphite (EK98) – also used boron-doped graphite.

340kA plasmas

With 2MW/m^2 did the temperature reach 3000C in 3s?