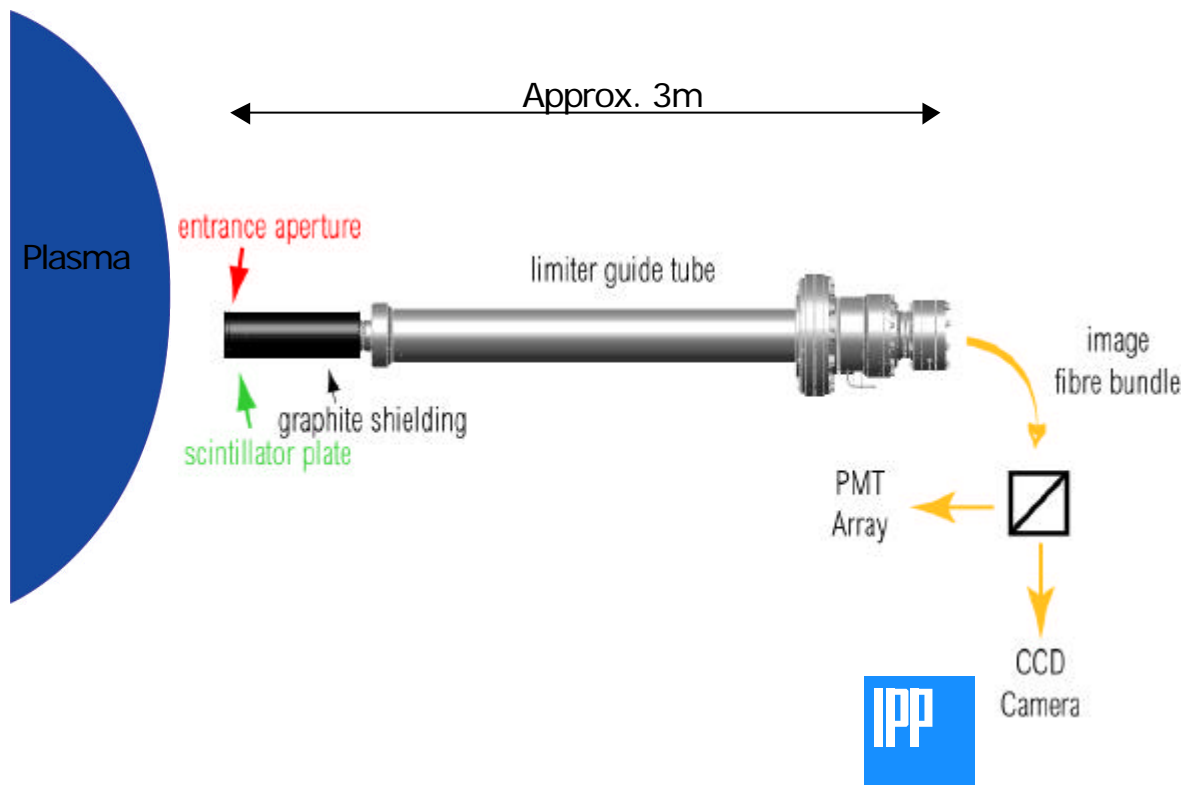
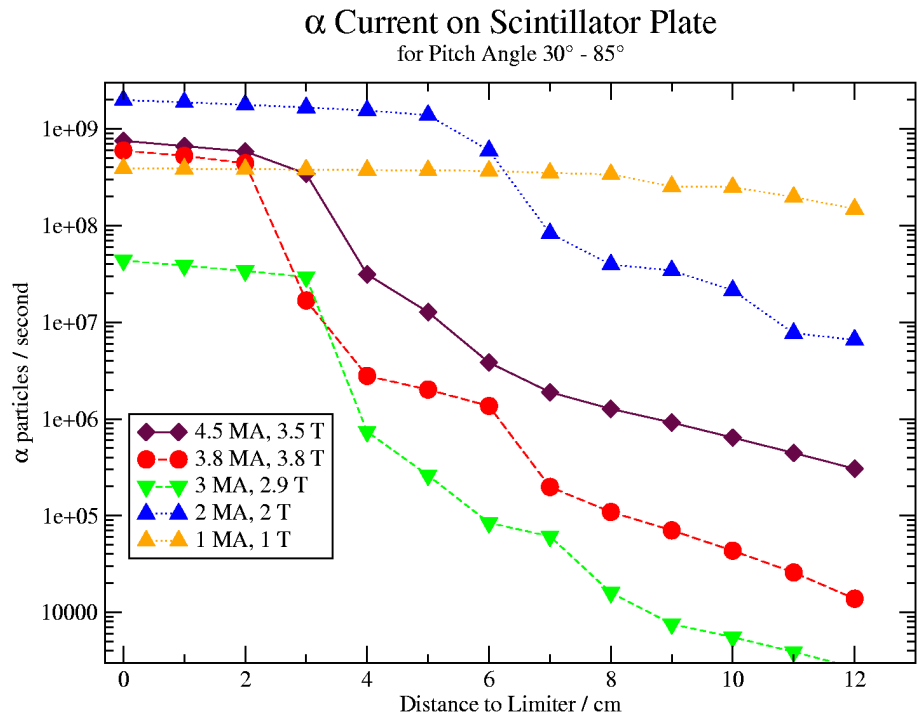


Scintillator Probe Schematic



Estimate of probe signal

- ▶ Based on five selected shots during DTE1
- ▶ Alpha source function integrated along ion orbits
- ▶ Detection limit: $2.4 \cdot 10^4 \text{ s}^{-1}$ (transmission, luminosity, camera noise)



Refined detector shape

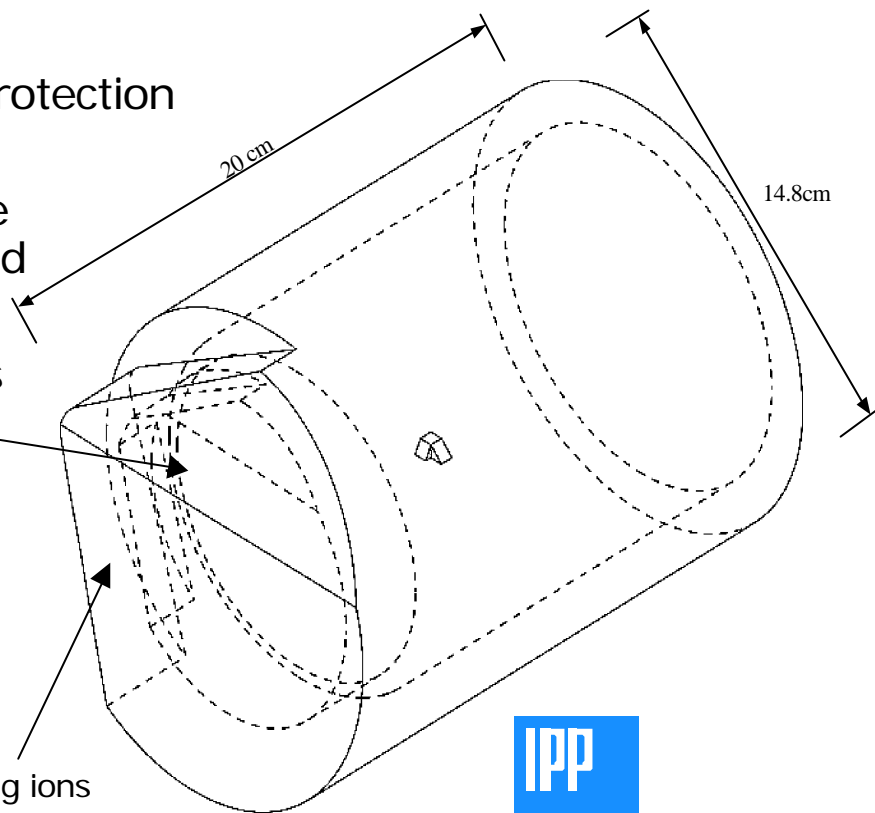
- ▶ CFC cup for heat protection

- ▶ Optimised entrance aperture integrated

- ▶ Front shape follows poloidal limiter contour

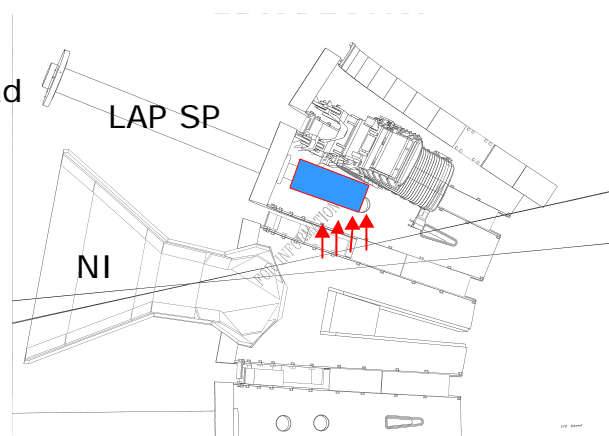
- ▶ Last step: Edges will be chamfered

Recess for gyrating ions



Calculated heat load from NBI

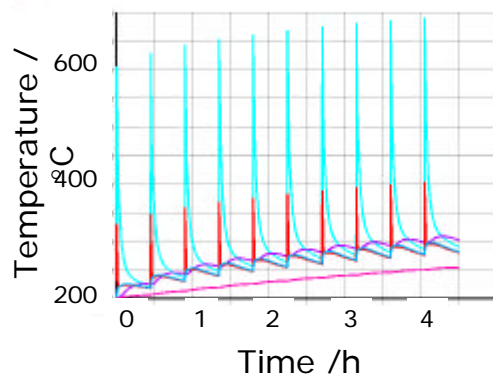
- ▶ Local heat load
max. 12 MW/m²
- ▶ Averaged heat load
0,16 MW/m²



FEM simulation of heat loads



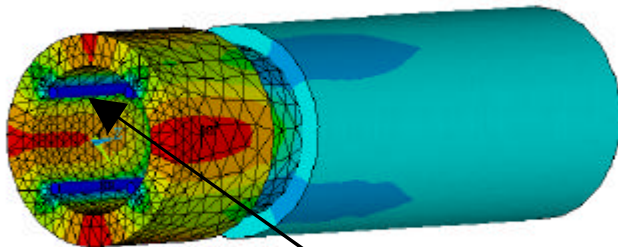
Graphite_front
Inconel_front
Graphite_side
Copper_interface
Copper_tube_middle



- ▶ Inertial cooling + heat conduction (copper liner) not sufficient
- ▶ Active cooling necessary
- ▶ Heat load calcs. of final design in progress

FEM simulation of heat loads (2)

Temperature distribution after cooling down phase
(scale 19.9-20.1°C)



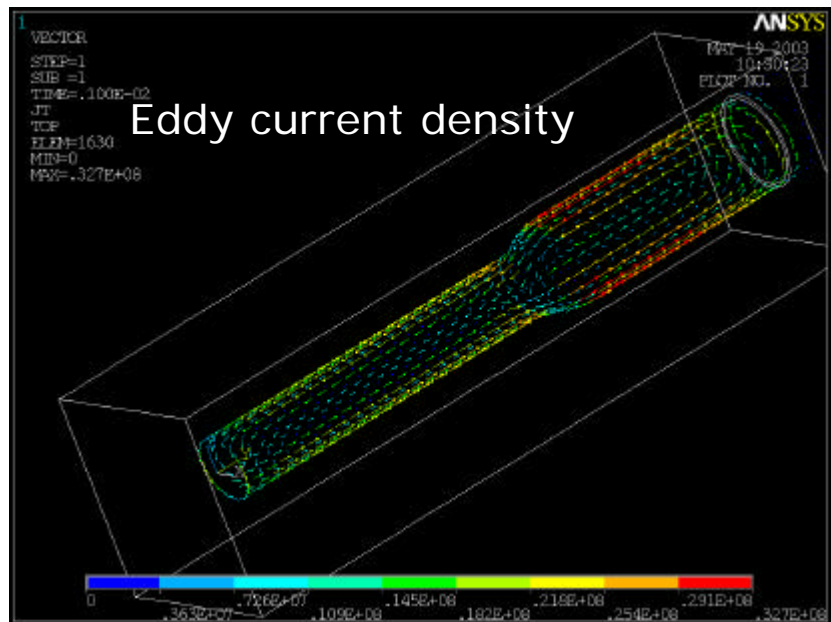
- ▶ Example:
line contact between cooling pipes and Inconel tube

- ▶ Elaborated several cooling concepts
- ▶ Final concept with active cooling and gap between CFC and Inconel tube
- ▶ Final Design with cooling loop close to scintillator plate

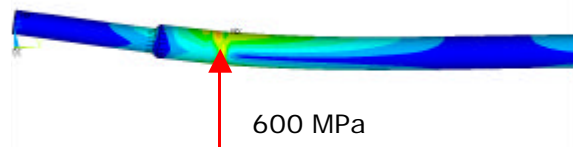


FEM simulation of forces

- ▶ Tube very close to plasma – large wetted area
- ▶ Halo currents
- ▶ Eddy currents



FEM simulation of forces



▶ Initial tube design

▶ Wall thickness at support: 6mm

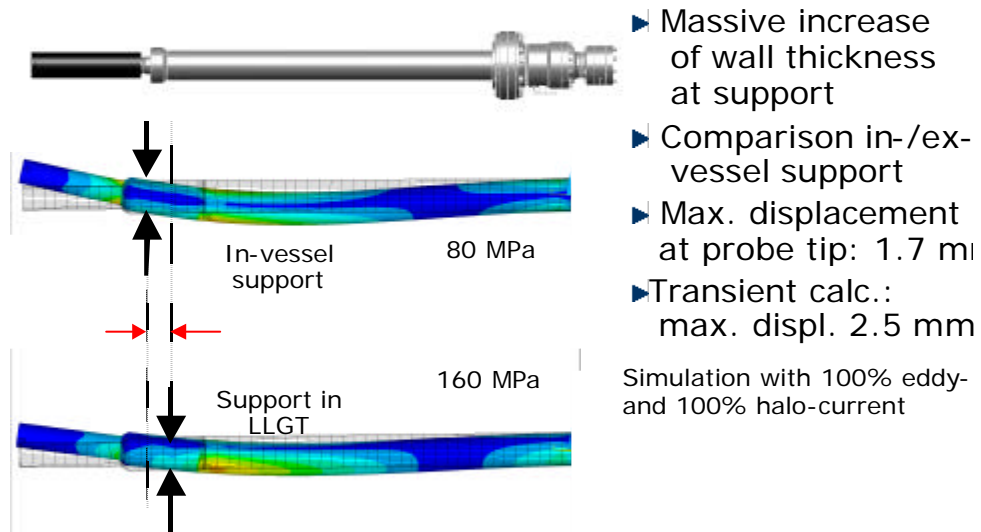
▶ Max. stress 600 MP

▶ Inc. 625: Yield stre
375 MPa (20°C)

▶ Increased wall thickness leads to stronger eddy currents – trade off!



FEM simulation of forces



Status

- ▶ Next design review meeting: 02.07.03
- ▶ TCD-I for CFC cup necessary beginning of July (42w delivery time)
- ▶ Final Design Review envisaged for late August

Further Tasks:

- ▶ FEM simulation with final design (CAD exported data)
- ▶ Optics (in progress)
- ▶ Search for suppliers (already started for Inc. and CFC)

Scintillator Probe schedule

Preliminary design review	02/07/03	IPP
Final design review	10/09/03	IPP/PPPL
Probe fabrication & delivery	02/08/04	IPP
Install probe in LGT	14/09/04	JOC
Fiber optic bundle delivery	26/11/04	PPPL
CCD camera delivery	26/11/04	PPPL
System test & calibrate	11/02/05	IPP/PPPL /JOC
Final board	12/07/05	IPP/PPPL /JOC