



Initial assessment of Langmuir probes for JT-60SA

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Task: probe position determination

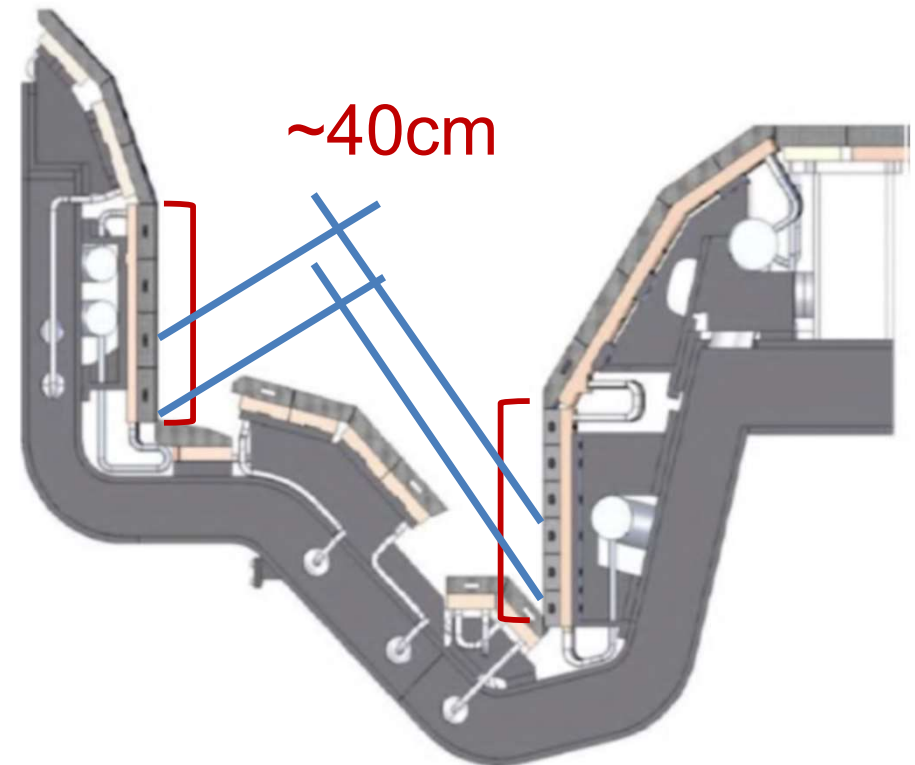


- Limited number of probes
- Large divertor
- 2 possible strike point positions
 - Corner
 - Half of the v. targets

- Limited flux expansion
- Low λ_q



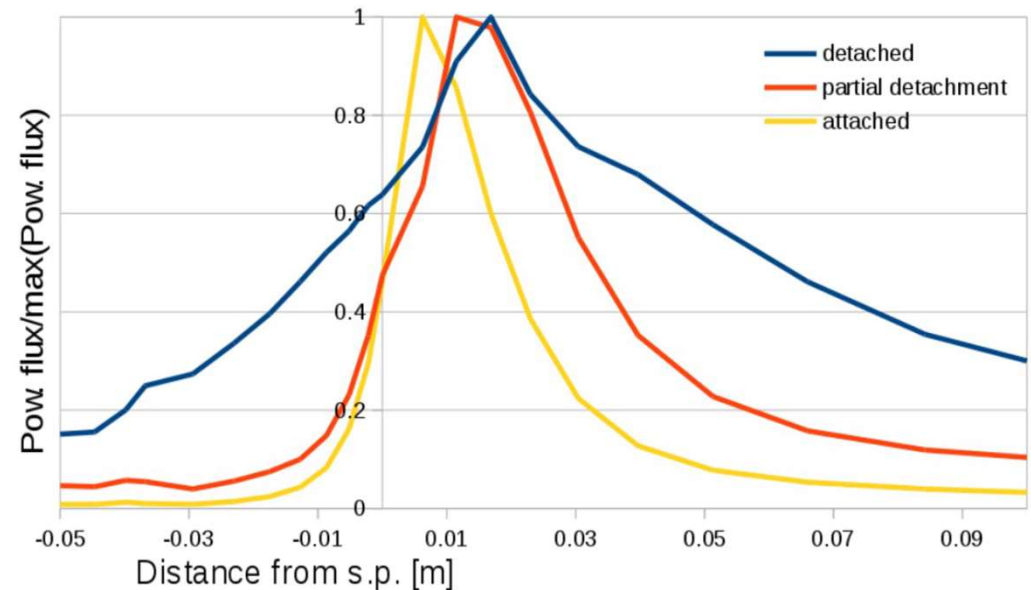
High spatial resolution
required at the targets





Scale length of divertor power deposition

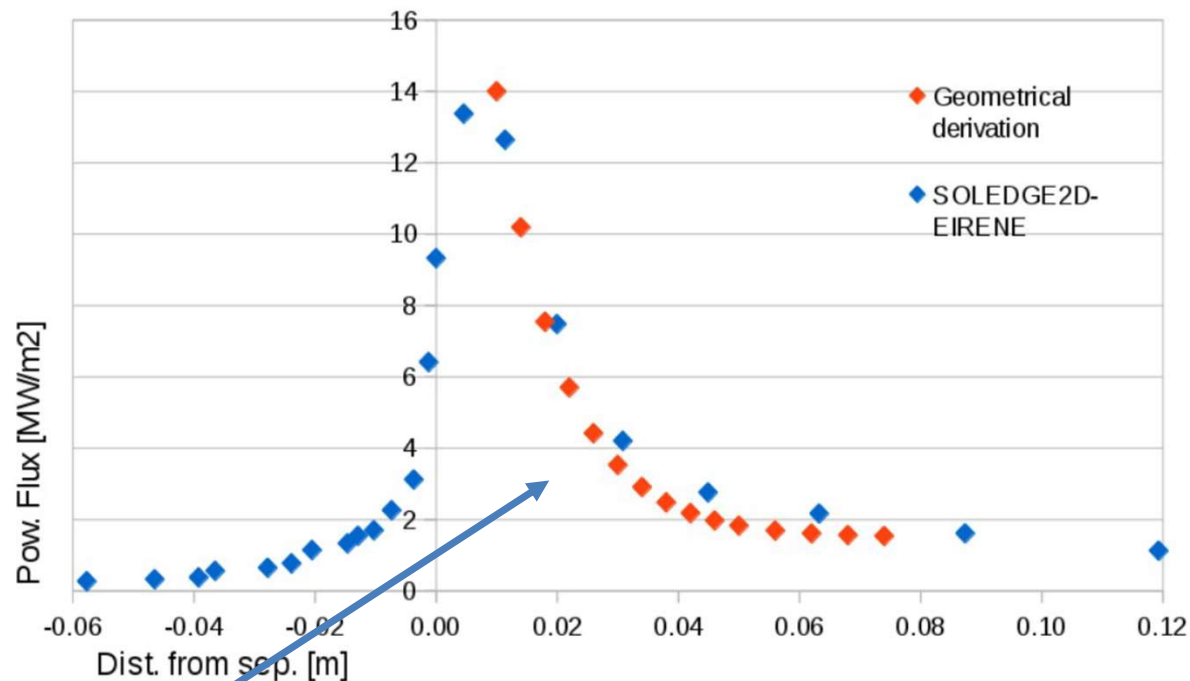
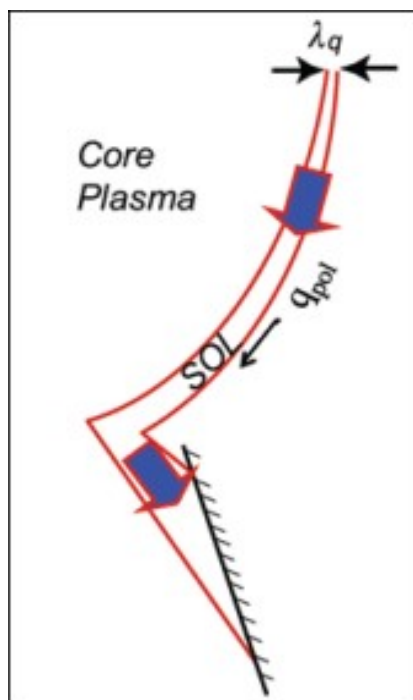
- Attached plasmas
 - $\lambda_{q,tar} \sim 1-2$ cm
(high res. required)
- Detached plasmas
 - $\lambda_{q,tar} \sim 2-4$ cm
(lower res. required)
- From Sc.2 and Sc.3 modelling
 - $[\lambda_{q,tar}]_{OT} > [\lambda_{q,tar}]_{IT}$
 - I.T. more likely to be detached.



A simple model



2D edge modelling codes can predict the power distribution, but they are **not strictly required** in this simple analysis because we are only interested in the absolute value of $\Gamma_{E,tot}$ but **only** on its **spatial distribution** on the target



$$\lambda_{q, out. tar.} = \lambda_{q, OMP} f_{Ex, OMP} \quad \left| P_{tar}(x) = P_{max} \exp\left(\frac{x - x_0}{\lambda_{q, out. tar.}}\right) \right.$$



It is a underestimation of $\lambda_{q,\text{tar}}$ ($\sim 30\%$)

Worst case scenario
(lower λ_q -
higher resolution)

	Sc. #2	Sc. 3#
$\lambda_{q,\text{O.T.}}$	7mm	8mm
$\lambda_{q,\text{I.T.}}$	13mm	14mm

Maximum spatial resolution is 15 mm

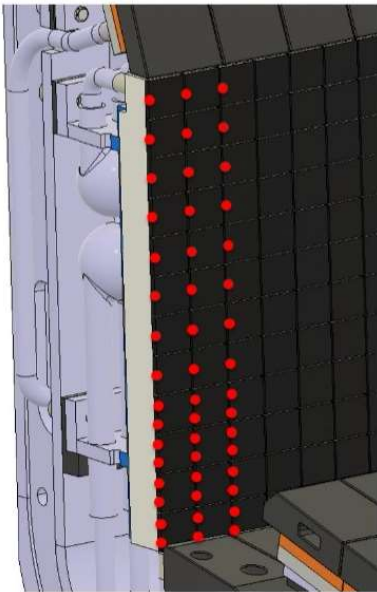


Maximum resolution around the strike points is required.

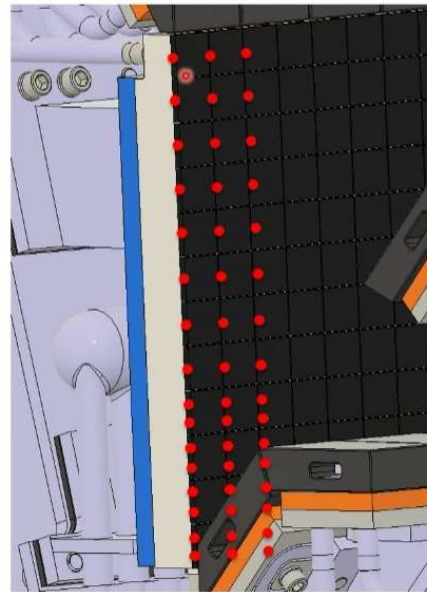
Three solutions



- Denser distribution close to the corner



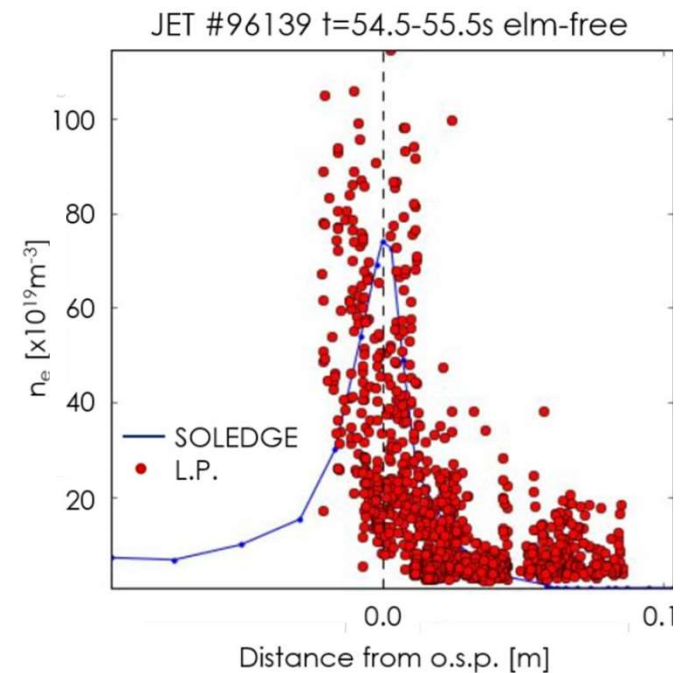
P15 → 16 triple probes on IVT



P3 → 16 triple probes on OVT

- More probes also around the middle of the vertical target

- Sweeping





- A complete scenario with strike-points at the middle of target high
- Complete scenarios with realistic strike point positions (ex: Sc.#4, Sc.#5)
- Do we need probes only on the vertical plates?
- Could we quantify sweeping range?



- Quantify the advantages or disadvantages of each strike-point position
 - Power exhaust
 - Pumping



Thank you for your attention