**Heat flux and ion temperature measurements with the Multi-Purpose Manipulator at Wendelstein 7-X**

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Measurements of edge plasma parameters of Wendelstein 7X (W7-X) have been conducted with reciprocating probe heads on the Multi-Purpose Manipulator (MPM) [1][2]. Typically, electron temperature $T\_{e}$ and density $n\_{e} $are obtained from Langmuir probes, where the data evaluation requires an assumption of the ion temperature$ T\_{i}$. Usually, in the edge of magnetic fusion plasmas, $T\_{i}=T\_{e}$ is assumed. However, modelling and experiments have shown that the ion temperatures can by far exceed measured electron temperatures [3].

Retarding field analyzers (RFA) are widely used for the measurement of the ion temperature [4]. RFAs are technically demanding and the necessary size and placing of the RFA limits the design and the operation of the probe heads. These limitations of the RFA probe, mean also that the coverage of ion temperature measurements is limited to specific probe heads.

Thermocouples have been used to measure heat fluxes on limiters and divertors and compared well to Langmuir probe measurements of the electron heat flux in response and magnitude [5]. The total heat flux measured with the thermocouples can be used together with the electron heat flux measured with the Langmuir probes to estimate the ion temperature$:$

$$ Q\_{tot}=Q\_{e}\left(T\_{e},n\_{e}\right)+Q\_{i}(T\_{i},n\_{e})$$

The ion temperature $T\_{i}$ can then be obtained from the relation:

$$T\_{i}≈\frac{Q\_{tot}}{n\_{e}v\_{s}}-T\_{e}$$

Using the measured total heat flux $Q\_{tot}$, electron temperature $T\_{e}$, the electron density $n\_{e}$ and the ion sound speed $v\_{s}$. Measuring the total heat flux on a Langmuir pin by two thermocouples offers a simple alternative to the RFA system for an estimation of the ion temperature in the plasma edge. Measurements of the electron temperatures and densities with Langmuir probe and estimations of the ion temperature with thermocouples will be compared to RFA ion temperature measurements.

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