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**ABSTRACT.** To study plasma properties in the presence of large and small MHD modes, new high-resolution ECE diagnostics have been installed at TEXTOR tokamak, and some of the already existing systems have been upgraded. Two models for the plasma transport properties inside large $m/n = 2/1$ MHD islands have been found to give estimations for the heat diffusivities, which are much lower than the global plasma heat diffusivity, which is in agreement with previous measurements in different tokamaks. The 3D-reconstruction of large $m/n = 2/1$ modes in TEXTOR with the help of all available ECE diagnostics allows modelling the island as a structure with closed flux surfaces. The main plasma heat flux flows through the X-point area probably along stochastic magnetic field lines. The confinement is improved within the magnetic island, compared to the background plasma. This is confirmed by a temperature profile flattening and sometimes even a secondary peaking inside the island, compared to the X-point.

Making use of the mode rotation, assumed to be a rigid rotor, it has been possible to obtain information on the topology of the $m = 1$ precursor mode leading to sawtooth collapses. It becomes clear that this precursor cannot be described by an $m = 1$ cold tearing mode island but by a hot crescent wrapped around a cold high-density bubble. In the future multi-chord ECE-imaging will allow this mode reconstruction without the assumption of the rotation to be rigid.

From the measurements of the broadband temperature and density fluctuations one can conclude that the turbulent structures inside the $q = 1$ surface are separated from the turbulence outside the $q = 1$ surface. This fits nicely with the observation that $q = 1$ surface acts as a barrier for the thermal transport. Correlation length and time measured inside $q = 1$ are in agreement with the observed turbulent heat diffusivity.

Qualitative studies of non-thermal electrons at different heating regimes (ECRH and Ohmic) at TEXTOR were done with the help of the combined 2$^{\text{nd}}$-3$^{\text{rd}}$ harmonic X-mode ECE radiometer. It has been found that the lower energetic non-thermal electrons are directly responsive to small density changes, in contrast to the highly energetic runaways with energy up to 20 MeV. Those are only affected by a substantial density ramp up.