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**Development of fast helium beam emission spectroscopy on MST**  
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Applied Physics, University of Strathclyde, Glasgow, UK — A fast helium beam  
emission spectroscopy (BES) diagnostic is being developed to measure electron tem-  
perature and density fluctuations on MST. The light signals for two HeI triplet  
wavelengths (587.6nm and 706.5nm) and two HeI singlet wavelengths (501.6nm and  
667.8nm) have been observed and analyzed. The observed local emission fluctua-  
tions from a fast neutral helium beam injected into the plasma may be inverted to  
the local plasma parameter fluctuations by making use of a full collisional-radiative  
model, the Atomic Data and Analysis Structure (ADAS) code package. The exist-  
ence of metastable fractions ( $2^1S$  and  $2^3S$ ) in the fast neutral helium beam affects  
the beam stopping and emission coefficients. The local metastable fractions must  
be known to calculate the plasma parameter fluctuations from the observed local  
emission fluctuations. A system of statistical balance equations is solved to estimate  
the local metastable fractions and thus the total line emission intensities at a given  
wavelength. This requires  $T_e$ ,  $n_e$ , and  $Z_{eff}$  profiles as an input and therefore implies  
that the calculated emission fluctuation reflects both the local plasma fluctuation  
and the global plasma parameters. This work was supported by the US Department  
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