A spectroscopic method to directly measure nonthermal velocity fluctuations (abstract)

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A spectroscopic method to directly measure the nonthermal velocity fluctuations is being studied in the TJ-I tokamak. The method is based on converting velocity in intensity fluctuations by subtracting the signals received at two symmetric positions of a spectral emission line. This is accomplished by means of a multichannel detector in which the channels respond to the line intensity at different wavelengths and positions within a single spectral line. A multichannel plate photomultiplier, with an anode split in 8×8 parts, is optically coupled by means of an anamorphic optical system, to the focal plane of a 1 m spectrometer where the image of a spectral line is formed. Some individual anodes are grouped to configurate four acquisition channels which are fled into four current amplifiers. The 100 kHz bandwidth signals are stored in a digital oscilloscope connected to a VAX computer, where the signals are processed. A simple simulation allows us to relate the differential signal between symmetrical channels to velocity in cases where the radial extension of the emitting ion is comparable to the radial correlation length of the turbulence causing the velocity fluctuations. The influence of the detection statistics on the measurement is analyzed. Preliminary results obtained in the TJ-I tokamak, using this system, will be presented.