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14.29 Multichannel X-Ray Hot-Spot Imager Operating in the 5- to 30-keV Range on OMEGA

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A design is presented of a multichannel x-ray imager spanning energies from 5 to 30 keV for use as a fixed-port diagnostic for OMEGA experiments. The purpose of the absolute, multichannel imaging radiation diagnostic is to infer electron temperature Te and thereby provide a new approach to existing hot-spot temperature and pressure measurements. In contrast to the standard approach of inferring ion temperature from fusion neutrons, this x-ray based technique is insensitive to hydrodynamic motions. Absolute x-ray yield will be measured in channels defined by increasing amounts of titanium filtration and this signal will be used to fit a parameterized hot-spot emission model. The range is selected to probe optically thin x-rays and provide 100-eV sensitivity of inferred Te. The multispectral imaging will use a hybrid-penumbral approach so as to separate the hot-spot from coronal hot-electron emission yet maximize signal. Magnification will be 10× and 20× for ˜5- to 10-μm resolution of the hot-spot as recorded on a time-integrated, absolutely calibrated image-plate detector. This material is based upon work supported by the Department of Energy National Nuclear Security Administration under Award Number DE-NA0001944.

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