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# Experimental platforms for measurements of warm dense matter at the European XFEL

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“If you can measure it, it is not warm dense matter and if you can compute it, it is not warm dense matter” has long been an unofficial definition of the peculiar state of matter between condensed matter and hot plasma. It is present in the interior of large planets, small stars and transiently in inertial confinement fusion concepts. Due to immense developments in theoretical methods, computational capabilities, and new experimental infrastructures, this definition has now become outdated. Especially, hard X-ray free electron lasers (XFELs) have proven as a revolutionary tool to advance our understanding from numerical interpolations through a basically unknown regime to an era of precision measurements that can benchmark atomistic simulations and macroscopic models with highest resolution in space and time. In this talk, recent progress at the HED instrument of the European XFEL in measuring WDM will be presented. Chiefly, two experimental platforms to make high-resolution spectroscopic measurements will be described, as well as some initial results and important considerations for experimental design. This talk uses data from HED proposals 3777, 6656, and 8040, and I am indebted to all collaborators who participated in these experiments.

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