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PhotonDiag2015 workshop: introductory overview

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This issue of the *Journal of Synchrotron Radiation* is a special issue including papers from the PhotonDiag2015 workshop. Here, a brief introduction is given.

Keywords: free-electron laser (FEL); PhotonDiag2015 workshop; photon diagnostics; beamline instrumentation; beamline design.

For decades, synchrotron radiation sources have had the exclusive privilege of conducting X-ray science research. X-ray science now has a new forefront to explore: free-electron laser (FEL) based experiments.

Photon pulses with ultra-high brilliance, very short pulse lengths, unprecedented degree of coherence and wavefront quality produced by FELs have to be delivered either unperturbed or properly modified to the experimental stations. Together with the constant need for improved optical components and innovative detectors, one of the key factors to fully exploit the potential of such novel sources is the development and implementation of dedicated photon diagnostics. The measurement of the temporal and spectral structure of each single pulse, the knowledge of the effect of each optic on the wavefront, the non-invasive quantification of the power or intensity of each single pulse, and the optimization of the focusing optics become of primary importance for the success of high-impact scientific experiments.

All these aspects of photon diagnostics, and the forefront technology in mirror fabrication and metrology as well as in X-ray detectors, were discussed at the PhotonDiag2015 – Workshop on FEL Photon Diagnostics, Instrumentation and Beamlines Design. The three-day workshop was held at the International Center for Theoretical Physics (ICTP) in Trieste, Italy, on 8–10 June 2015, co-hosted by Elettra Sincrotrone Trieste and FELs OF EUROPE. This is the second workshop of this kind, after the PhotonDiag2010 held at DESY, Hamburg, in June 2010.



More than 80 participants from around the world, coming from FEL facilities, synchrotron radiation sources, university laboratories, private and public institutions, fruitfully discussed and presented the achievements in the field of X-ray optics, diagnostic and detection. Eleven worldwide-recognized experts were invited to present accomplishments in the field of photon beam diagnostic techniques, time-related beam properties, FEL optics, photon beam transport, science instruments as well as detector and data handling for FEL-based experiments. Thirty-three topical presentations and time for discussion with either vendors or scientist/engineers from different laboratories made this workshop a forum for asses-

sing the current state of the art in photon transport related solutions and to draw the foundation for future collaborative developments.

After three days of fruitful and collaborative discussions, the participants returned to their labs knowing that, from now on, this dedicated, and very much appreciated, FEL workshop will be a recurring biennial event. The next conference is planned to be conducted in 2017 at the SLAC National Accelerator Laboratory. This will expand the boundary of the conference outside of Europe, but preserving its original purpose of friendly and open collaboration in this still unexplored field.