MicroTCA Developments for Low Level RF and Beam Position Monitors for LCLS-II at SLAC

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A team at SLAC has successfully launched the first MicroTCA developments for the new 4th generation light source at SLAC, the Linac Coherent Light Source LCLS-II. This is the second of three machines ultimately to be built, each using one third of the 3km linac.

Both Low Level RF (LLRF) and Beam Position Monitoring (BPMs) pose special problems: The LLRF must obtain short term phase stability of 30 femtoseconds RMS or less, and the BPMs must measure a 250 picoCoulomb (pC) bunch to an accuracy of 5 microns and a 1 PC bunch to 1 mm, both single shot. Also the BPM must support two single bunches within the 1.5 usec envelope of the high power RF pulse.

The LLRF application has been prototyped and run successfully on-beam, the first instrumentation at SLAC to use intra-pulse feedback to improve phase stability of the electron beam before it enters the undulators to produce the high energy X-Rays for experiments. The BPM is also prototyped successfully and is being prepared for an on-beam test of three BPMs during December 2012.

This presentation describes the system hardware and software architectures, design advantages of the new approaches, industry support, overall plans and progress to date. Both systems need to be installed in LCLS-II klystron gallery by end of 2013 and operational in 2014. A third team is developing xTCA hardware-firmware software infrastructure to support the new platform and integrate all applications into the high level control system under EPICS.

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