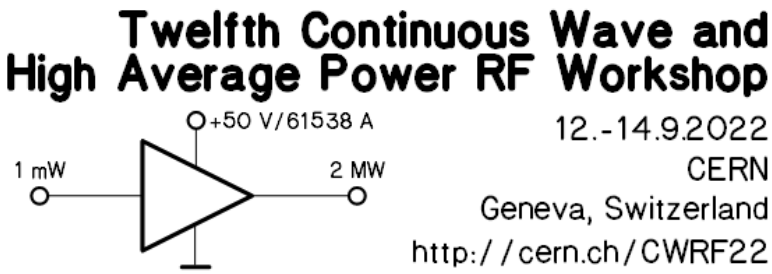

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Dual Klystron Driven Storage Ring RF System at Advanced Light Source

Wednesday 14 September 2022 11:35 (25 minutes)

The Advanced Light Source (ALS) has completed an upgrade on its storage ring RF system, which enabled various RF drive modes that can deliver up to 320kW power into two RF cavities through a motorized waveguide matrix. The system incorporates two 300kW klystrons, both are powered by -52.5 kV DC voltage via a fast-disconnect switch network, and are driven by a digital low-level RF control system that actively stabilizes the cavity voltages and phases through 4 feedback loops in an FPGA.
Two RF cavities can be driven by a single klystron, or by one of each klystron, depending on the high voltage and waveguide configuration modes. There are 42 RF power sensors and 16 Arc detectors along the RF distribution path, where a subset is included in the fast interlock system with $< 3\mu$s latency for real-time machine protection. A PLC network is developed to configure high voltage system and waveguide matrix, control klystron operations, monitor water cooling system and circulator tuning, interface with various interlock systems, and manage overall RF system operations. Control systems are developed to enable FPGA-PLC-EPICS communication to support daily operation and parameter optimization. The system is commissioned with full 1.9 GeV, 500mA electron beam, and is in operation since October 2021.

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