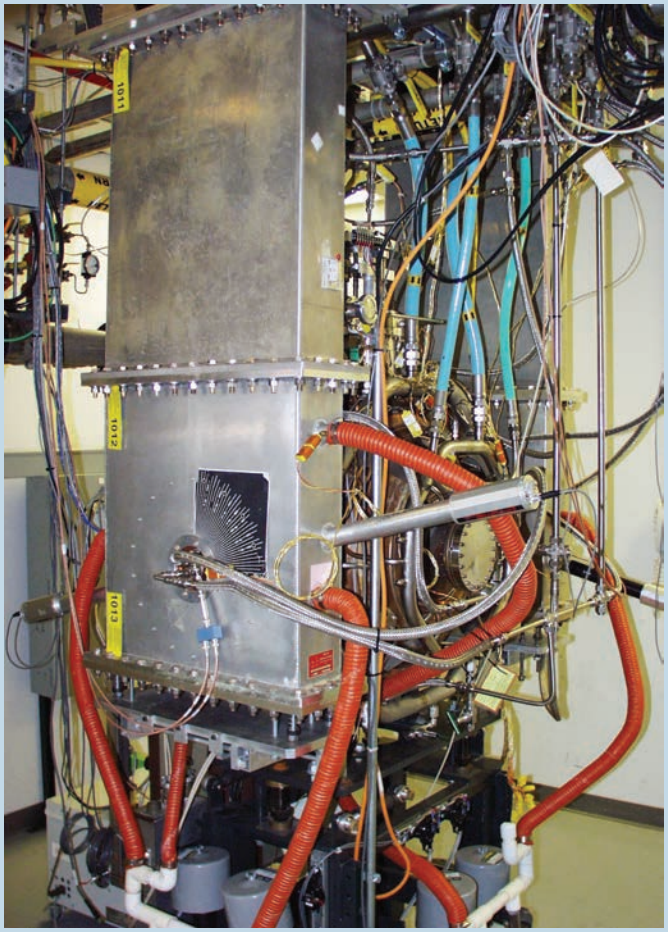
352-MHz Radio-Frequency Test Stand



352-MHz rf test stand

A complete 352-MHz radio-frequency (rf) test stand is utilized to test and condition rf cavities and related components, including 352-MHz, 1-MW CW klystrons, in both CW and pulsed mode. The test stand consists of a fully-enclosed radiation shield enclosure large enough to contain a fully dressed single-cell or 5-cell 352-MHz rf cavity, complete with a dedicated access control system for personnel protection, documented to provide personnel radiation protection to the equivalent of 200-kW CW rf power input to an Advanced Photon Source (APS) single-cell cavity. The test stand also includes dedicated ionizing radiation monitoring, slow and fast rf interlock systems, a temperature-regulated deionized water source and distribution system for component cooling, and Experimental Physics and Industrial Control System tools for process-variable monitoring and logging. Single-cell and 5-cell 352-MHz rf test cavities are available as test fixtures for high-power components such as piston- and ferrite-based cavity tuners, cavity input couplers, and mode dampers. The test stand system also includes a dedicated 1-MW klystron power source, which comprises a 352-MHz, 1-MW CW klystron; klystron high-voltage support oil tank with a solid-state mod-anode regulator; a 1.3-MW CW output circulator; and a 352-MHz, 1-MW CW rf load for testing and evaluating the APS klystrons under full-power conditions. The 1-MW rf load system includes a second 352-MHz, 1.3-MW CW circulator at the rf load input. This circulator can be utilized as an additional rf power output port for the test stand, useful for testing WR2300 waveguide components. The circulator provides a nominal 22 dB of isolation between the test stand power source and devices under test.

Examples of use:

- Conditioning spare rf cavity couplers, tuners, and higher order mode (HOM) dampers
- High-power test of prototype HOM dampers
- 500-kW, 3-msec test of a coaxial fast ferrite phase shifter and companion 3-dB hybrid for Fermilab
- 1-MW CW full-power qualification test of WR2300 waveguide shutters for two manufacturers
- 200-kW CW test of an APS single-cell rf cavity fitted with two input couplers
- 150-kW CW test of a 352-MHz fast ferrite rf cavity tuner