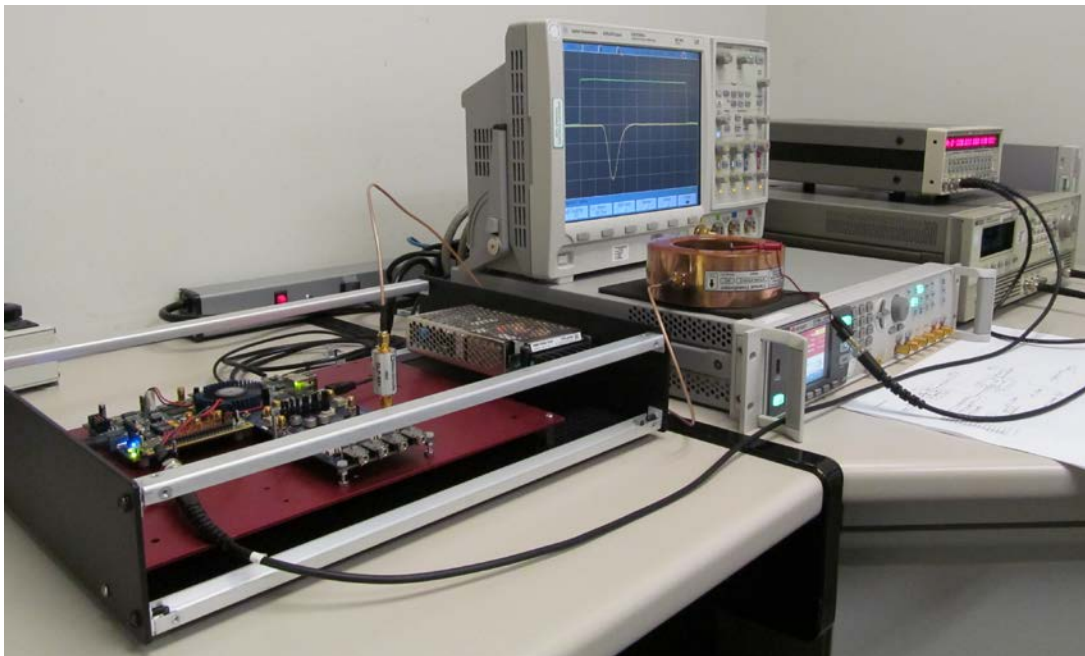


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Accelerator Systems Division provided excellent support for APS operation in 2017-1 achieving 132 hours of the Mean Time Between Faults (MTBF) and 98.6% of the Machine Availability. There were no beam loss faults related to RF systems, which is an outstanding result taken a sheer number and complexity of the equipment. Several other developments and events took place in the first quarter of 2017 and are also highlighted here.

The Diagnostic Group

Development continued on the upgrade of the Beam Emergency Shut-Off Current Monitor (BESOCM). The BESOCM is a radiation safety device that monitors injector charge and generates ACIS trips if the beam current exceeds a safety limit. New electronics will expand operating parameters, such as repetition rate and maximum charge, in order to make the BESOCM system fully compatible with MBA injector operation. An analog-to-digital (ADC)-based integrator has been developed that replaces the analog integrator used in the existing design, and modern Field Programmable Gate Array (FPGA) technology will be used to implement the BESOCM logic. This will improve performance and reliability, and address obsolescence in the existing system, which is based on 20-year old technology. The new BESOCM will also have expanded capabilities for external/remote monitoring.



The Magnetic Devices Group

SCU Status

The final 1.2-m long helical superconducting undulator (HSCU) cryostat has been assembled. The first engineering cool down of the cryostat is in progress. All HSCU major procurements are on schedule. Magnetic simulation of the SuperConducting Arbitrarily Polarizing Emitter (SCAPE) is in progress. A conceptual mechanical design has been drafted. Both 18-mm period superconducting undulators SCU18-1 in Sector 1 and SCU18-2 in Sector 6 are in continuous user operation.

LCLS xLEAP Wiggler

The original device was designed and built at APS. It met all the requirements defined by SLAC. During transportation to SLAC, the device was involved in multiple traffic accidents and suffered serious damage. The wiggler was recovered and shipped back to Argonne on February 6. The device has been cleaned and reworked with a new gap separation mechanism. The device has been tuned mechanically and magnetically to meet and exceed the SLAC specifications. Its performance has been verified at the APS magnetic measurement facility. It has been shipped out on February 24 and safely received by SLAC.

DSC 1.72 cm Undulator

All components have been ordered and expected to be delivered by the second week of April. Assembly of the device has been planned.

Sector 2 Canted ID

Two 3.3 cm APS IDs along with a canting magnet has been set on the 6-meter bench in MM1. The IDs have been shortened to accommodate the canting magnet. Mechanical adjustment and tuning have been completed. Magnetic tuning is in progress.

APS-U

The technical evaluation of the Q1 and Q2 has been complete. Crosstalk analysis between the M1 and Q2 and the corrector and Q1 and Q2 has been completed with negligible coupling. The Q8 assembly has been complete. Q8 measurement is in progress. New ID vacuum chamber design is in progress. Preliminary design review has been staged.

The Power Systems Group

Operations

Completed the most of the planned December/January shutdown work. All the routine power supply maintenance was done. A few planned maintenances of EMI power supplies were not done because of the time constraints. However, these undone maintenances do pose a risk to the operations and they will be put on the schedule for the next shutdown.

Installed the new “Yellow” background on all the emergency push-buttons related to the power supply equipment. This is to be in compliance with the safety regulations.

Installed the prototype design of the PLC replacement of the SR raw DC power supplies in sectors 2 and 3 during the shutdown. The new hardware worked as expected. During the test and the power supply startup, some glitches were found and fixed in the IOC database and in the operation automation scripts that control the raw power supplies.

Held a review on the “Global Installation of the PLC Upgrade of the SR Raw DC Power Supplies.” The review committee has verbally approved the installation plan with a few recommendations in the AC installation and the network IP assignment which will be implemented. The installation will begin in the April/May shutdown with the first step of infrastructure of the AC power and network switches. The procurement of PLC hardware for the global installation is also approved.

Upgrading the control electronics in the interleaving power supplies to resolve the obsolescence issue has begun.

Continued the power supply activities supporting ITS and LEA R&D

APS Upgrade

Completed the schematic designs for the fast corrector power supplies in the preliminary phase. The PCBs are being laid out.

The R&D of the precision ADC circuit for the power supply output current has achieved a few ppm stability in bench test. The next step is to test the circuit with a known power supply that has a current stability of a few ppm.

In the framework of the R&D for the calibration of the external current measurement system, six DCCTs with calibration windings have been set up driven with a common precision current source for testing in-situ calibration algorithms required by the APS-U.

The RF Group

General RF System Operation

As of March 29th, the rf systems have experienced no beam loss related faults in Run 2017-1.

Linac-PAR

Linac klystron s/n 128043, which developed output window vacuum problems while operating in L5, was successfully conditioned to 35MW rf output in the L6 test stand. It is now a workable spare in support of Linac operation.

New Linac klystron s/n 128050 was tested to 38MW rf output in the L6 test stand.

Preparations are underway to test an old klystron in the L6 test stand to evaluate it as a spare in support of operations.

Work is underway to prepare the 500-watt driver amplifier and interface chassis hardware for installation at L3, planned for the upcoming shutdown. This work is in support of the electron gun interleaving operation.

Effort is underway on LLRF design changes at L3 to provide enhanced signal monitoring and related documentation updates.

Effort is ongoing on construction of spare Linac envelope detector and vector detector modules.

The post-bake cleaning of Linac structure IHEP-02 is underway, in preparation for rf testing.

Effort is underway on Linac LLRF system design for the Linac Extension Area project.

Installation of one new driver amplifier in Fundamental PAR system #1 was completed over the December-January maintenance shutdown. The amplifier has performed without problems during Run 2017-1. Preparations are underway to install a second new driver amplifier in Fundamental system #2 during the upcoming shutdown.

Construction of the first prototype of the new Harmonic PAR driver amplifier has been started.

Booster-Storage Ring

Testing of the first production version of the storage ring tuner motor drive electronics is underway in the 350-MHz RF Test Stand under high-power rf conditions. This work is in preparation for installation of the prototype system on one storage ring cavity during the upcoming shutdown.

Work is underway to prepare the new rf system Matching Transformer for installation at RF3 over the upcoming maintenance shutdown.

350-MHz RF Test Stand

Re-tuning of LANL EEV klystron s/n 02 is underway, utilizing the 350-MHz RF Test Stand. The highest power and efficiency achieved to this point at the APS operating frequency is approximately 650kW and 48% respectively. This work is ongoing to improve efficiency and rf gain.

New storage ring tuner ANL-27 was repaired to address very high localized rf finger temperatures while being conditioned. The tuner was re-installed in the test stand cavity and conditioning was

resumed. There is still some evidence of elevated rf finger temperatures. Conditioning of the tuner and related data analysis is ongoing.

Solid State RF Development

Assembly of the 12kW cavity combiner system and related components is underway. This includes the system support frame, drain power distribution box, rf detector chassis, PLC hardware panel, and pre-driver/splitter chassis. The 70V/650A drain power supply was received, along with the aluminum tuner piston. Design effort is underway to install fingerstock on the top and bottom of each combining cavity panel. A design to allow tuning of each coupling loop shorting bar was implemented.

The construction and testing of all six 2kW amplifiers was completed. Final tuning of each amplifier to peak output and efficiency is underway. Assembly of the driver amplifiers is underway, with the first prototype reaching the design value of 100W output at 70% efficiency.

The **Accelerator and Operations Group** report will be given in the next issue of the quarterly bulletin.