USER FACILITY STATUS IN 1997

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During 1997, the K1200 cyclotron delivered beam for a total of 4519 hrs, distributed as follows: 4215 hrs for 37 PAC-approved experiments, 146 hrs for 14 short test runs and discretionary experiments, and 158 hrs for accelerator and equipment development. Included in the last category were 100 hrs for development of the newly-commissioned S800 spectrograph and 20 hrs for deflector development.

Of the 37 PAC-approved experiments, 28 used secondary beams produced by the A1200 fragment separator. The distribution of experimental stations where the experiments were performed was as follows: 2 with the A1200 in stand-alone mode, 4 with the NaI detector in the Transfer Hall, 1 with the _-NMR setup in the Transfer Hall, 3 with the 4π Array, 4 in the N3 vault (some with, some without, the 92" chamber), 4 in the N4 vault (3 of them with the Neutron Walls), 6 with the RPMS, 2 with the SuperBall, and 11 with the S800 spectrograph. About 2% of the total beam time was used by non-nuclear science experiments.

Approximately 185 scientists took part in these experiments: 45 from within the NSCL and 140 from outside. They came from 56 institutions in 14 countries. The number of foreign visitors was 47. The number of students (mostly graduate students) participating in the experiments was about 53, consisting of 20 from the NSCL and 33 from other institutions.

Besides four routine shutdowns of 14-day duration for maintenance and upgrade work, there was a five-week suspension of operation during February-March 1997 for rearrangement of electronics and cables on the K1200 RF balcony needed for the coupled cyclotron upgrade project.

The operation of the facility was generally smooth, except for two periods of unscheduled downtime. In January, four days were lost when the E1 deflector failed due to the accidental deposition of too much beam power on it, and it took a few days for the radioactivity to cool down enough for the deflector to be replaced. In the September-October period, there were several machine problems. The K1200 was shut down for two days because of a leak caused by damage to the upper center plug from dee sparks; other equipment breakdowns resulted in shorter downtimes: RF transmitter and control electronics problems, deflector drawing excessive current, control problems with two beam line steering magnets, and some trim coil power supply repairs. The current in the main magnet coil was unstable until the cause—overheating of contacts in the slow dump switch—was found and corrected. A breakdown of the liquid helium system in early October resulted in a warm-up of the K1200 and the S800 spectrograph plus its beam line magnets. Fortunately, just-in-time emergency repairs averted an additional warm-up of the remaining beam line magnets. Operation of the K1200 was disrupted for several days, and use of the S800 for scheduled experiments was impossible for over a month. While significant inefficiencies and inconveniences for individual users could not be avoided, the negative impact of this unscheduled downtime on the overall program could be reduced somewhat by advancing the time schedule for a shutdown originally planned for later in October and by rescheduling and running experiments which did not need the S800 spectrograph.

Noteworthy changes in the experimental equipment capability of the laboratory during the year were as follows. (a) The beta-NMR equipment that had been set up in the Transfer Hall, which is inaccessible during experiments, was moved in late 1997 to a more convenient location in the S1 vault. A small three-degree magnet, whose pole gap was increased to accommodate the catcher foil and detector arrangement, is being used to provide the holding field for the beta-NMR experiments. This magnet is located just downstream from the RPMS target box. For conventional RPMS operations, the beta-NMR equipment can be readily removed from the magnet and replaced with a short section of beam pipe. (b) Small but important improvements were made to the S800 spectrograph system. These included the installation of a focal plane slit system to block off the elastic peak during giant resonance studies, and of a thin scintillator at the focal

plane for better particle identification. (c) Funding for an array of position-sensitive segmented Germanium detectors was received in the last quarter of 1997 from the Major Research Initiative program of the NSF, supplemented by a contribution from Michigan State University. The technical specifications of the array were discussed at a users' workshop in August 1997. The plan is to procure the array and construct the needed electronics in 1998, and commission the system and use it in a few experiments in 1999 before the 18-month shutdown of operations planned for mid-1999.

The NSCL control system made significant progress. Interfaces to the system were standardized, so that data to and from the system can now be accessed through both custom and industrial interfaces. The custom interface consists of software that was written to allow access through common languages such as FORTRAN, C, C++, PASCAL, etc. The industrial interfaces used are VISTA, Labview, and Wonderware. VISTA is currently used to control instruments and beamlines for the experimental program, while Labview is being applied by the operations and cryogenics groups to supply general controls for the entire facility. Although connections originating from outside of the building network domain have special security applied to them, most control applications can acquire data over standard Internet connections remotely. For example, an individual could use the same software that is used at the laboratory to monitor, and sometimes control, devices from home over a standard phone modem maintaining an Internet connection through any provider.

A long-term project was started to upgrade the VME-bus based portion of the control system, which was becoming seriously out-of-date, with significant components obsolete and no longer supported by most hardware and software vendors.

Several different options were considered to modernize the NSCL cooling system, which is used to cool the deionized water circulating in the lab’s many magnets. The existing cooling towers and heat exchangers are 20 to 30 years old and are failing fast. Keeping in mind our present and future needs, the optimum choice appears to be to purchase one large cooling tower to meet the needs of the K500 and K1200 cyclotrons and to repair the present K500 cooling tower and replace its heat exchanger to meet the needs of the experimental vaults. It is desirable to implement this scheme in 1998, provided that the needed additional funds can be secured.

The NSC Program Advisory Committee met twice in 1997. The 22nd meeting of the PAC (PAC-22) was held January 8, 1997, to consider 20 proposals for 3288 hours from 103 scientists at 27 institutions in 8 countries. The Committee recommended allocation of 2240 hours of beam time, including 144 hours held in reserve. PAC-23 met on October 1-2, 1997, to consider 32 proposals for 4075 hours of beam time from 176 scientists at 54 institutions in 20 countries. The Committee recommended allocation of 1990 hours of beam time, including 120 hours held in reserve. Of the total of 38 experiments approved by the two PACs, 19 were proposed by outside spokespersons, and 32 were collaborations between NSCL staff and users from other institutions. The Committee members for PAC-22 were Gary Crawley (NSCL), William Friedman (University of Wisconsin at Madison), Robert Janssens (Argonne National Laboratory), Witek Nazarewicz (Oak Ridge National Laboratory), and Robert Vandenbosch (University of Washington). For PAC-23, Sam Austin (NSCL) replaced Gary Crawley.