Installation of SLOWRI-1†

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The installation of SLOWRI[1], a principal facility at RIBF that will provide low-energy, high-purity RI-beams of all elements, started in FY2013. SLOWRI consists of two gas catchers (GasCell-A and -B), mass separators, a 50-m beam transport line, a beam cooler-buncher, and lasers.

The necessary infrastructure was prepared in the summer of 2013. Two 400-mm-diameter holes in the shielding block were drilled for the beam transport line. A 3.5-m long hole was drilled between the laser room and BigRIPS room for creating a laser path. A staircase was closed by a steel roof to extend the SLOWRI experimental room. The cable rack of BigRIPS was modified, and the electronic racks and compressors for the cryogenic cooling system were relocated to install GasCell-A. Large concrete blocks were also relocated to install the mass separator for GasCell-B. A laser hut was built to install pulsed lasers, and utilities for the high-power lasers were prepared.

GasCell-A (RF carpet gas cell)[2] will be installed at the exit of the D5 dipole magnet of BigRIPS. The gas catcher contains a large cryogenic He gas cell with a large traveling wave rf-carpet[3,4]. It will convert the main beams of BigRIPS to low-energy, low-emittance beams without any restrictions on the chemical properties of the elements. GasCell-B (PALIS)[5] will be installed in the vicinity of the second focal plane slit of BigRIPS. It will provide parasitic RI beams from ions lost in the slits during other experiments. In this gas catcher, thermalized RI ions quickly become neutral and will be re-ionized by resonant laser radiations. These gas catchers will be ready for off-line testing by March 2014.

The 50-m beam transport line under installation (Fig. 1) consists of four dipole magnets (SD1 to SD4), two focal plane chambers, 62 electrostatic quadrupole singlets, 11 electrostatic quadrupole quartets (EQQ1 to EQQ11), and 7 beam profile monitors (BPMs). SD1 and SD2, located immediately after the gas catchers will be used for isotope separation. After eliminating contaminant ions at the focal plane chamber, the low-energy beam will be transported by FODO lattice structures with phase space matching using EQQs. The EQQs have multipole elements made of 16 rods on which various potentials can be applied to produce 6-pole and 8-pole fields, simultaneously, to compensate for ion optical aberrations. This multipole element can also produce dipole fields for steering and scanning the beam. The BPMs have a classical cross-wire beam monitor as well as a channel electron multiplier with a pinhole collimator. Combining the scanning capability of the EQQs and the pinhole detector, we can observe a beam profile even for very low-intensity RI-beams.

Fig. 1. Part of SLOWRI beam transport line, under installation.

In the SLOWRI experiment room, a beam cooler-buncher[6] and a multi-reflection time-of-flight mass spectrograph[7] will be installed for conducting various precision experiments.

Off- and on-line commissioning will take place in FY2014, and the low-energy RI-beams will be provided for users in FY2015.

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