

The off-line adjustment of the parasitic production of low-energy RI-beam system for installation in BigRIPS

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The construction of a low-energy RI-beam facility SLOWRI¹⁾ began in 2013. The parasitic low-energy RI-beam production system (PALIS)²⁾ in SLOWRI was successfully manufactured in 2014. The preliminary installation of PALIS in the second focal plane chamber (F2) in BigRIPS was demonstrated. The performance evaluation of PALIS by off-line experiments is in progress.

We will restore unused RI-beams by installing a small gas cell in the F2 chamber in BigRIPS. This will provide parasitic low-energy RI-beams for various precision experiments whenever BigRIPS experiments are in operation. In order to realize the parasitic beam production, there should be no interference from PALIS in terms of BigRIPS beam tuning, detector operation and replacement, vacuum level, etc. This year we confirmed the following items whether there is no mechanical interference due to the installation of PALIS in the F2 chamber. The first item was the fitting check between the F2 chamber and PALIS which is integrated with the F2 chamber's roof³⁾. Position reproducibility was ensured by using locating guide pins equipped in PALIS. PALIS, whose weights approximately 1100 kg, was carefully moved by a floor-operated crane and placed on the F2 chamber within <1.0 mm reproducibility without any trouble. The second item was the applicability for the replacement of detectors used for BigRIPS beam tuning without taking PALIS away. There are three detectors, i.e., two PPACs and one plastic scintillator inside the F2 chamber, they need to be occasionally replaced for maintenance. By using two maintenance windows equipped in PALIS, we confirmed that these detectors were able to be put in or out. The third item was the vacuum level for the F2 chamber together with PALIS. After several hours of pumping, the pressure in the F2 chamber was 10^{-4} Pa, the same as in conventional operation. Fig. 1 shows the photographs during the installation test of PALIS in the F2 chamber in BigRIPS.

The off-line experiment was started for the performance evaluation of PALIS. A new differential pumping method was implemented in PALIS from the result of a prototype system⁴⁾. The differential pumping region is divided into four sections. The capability of differential pumping was verified; a pressure difference from approximately 10^5 Pa argon or helium in the gas cell down to 10^{-4} Pa in the final section was achieved, while using a 2 mm diameter gas cell exit hole.



Fig. 1. The upper photo shows the entire PALIS integrated with the F2 chamber's roof. The lower photo is the gas cell part in PALIS.

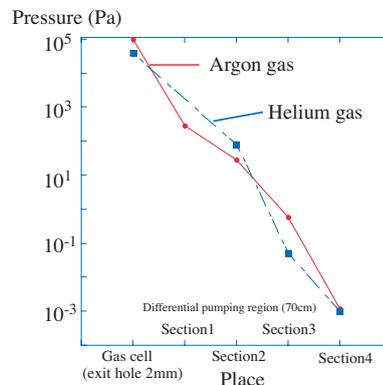


Fig. 2. Capability of differential pumping in PALIS.

We plan to start on-line commissioning experiments in 2015.

References

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