Maintenance of vacuum conditions of RILAC

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Maintenances of vacuum condition in RILAC are described. There had been two big problems of vacuum conditions at RILAC. One was a vacuum leak at a cavity No. 5, the other was a leak of vacuum at a cavity A1. The cavity No. 5 had a vacuum leak, the pressure of its vacuum was higher than 1×10^{-4} Pa. As for a problem of cavity No. 5, it was difficult to handle it because of its heavy weight, large scale and complicated structure. As shown in Fig. 1, the cavity No. 5 has a large vacuum chamber of which the inner wall was used as an electrode called "outer conductor." Inside of the outer conductor, there were several electrodes to accelerate an ion beam. Some of the acceleration electrodes were connected to a large cavity called "center conductor." Junction area between the electrode and the center conductor was sealed using an O-ring. The opposite side of the wall of the center conductor opposite side of the wall was exposed to atmosphere. Flanges were sealed using O-rings. All O-rings of the vacuum-sealing flanges on the outer conductor were exchanged with new ones, however the pressure was not improved, higher than 1×10^{-4} Pa. We found another air-leak point by using a helium leak detector when we shot helium gas from an atmosphere side of the center conductor. The cavity No. 5 was repaired in from September to November. Another vacuum leak point was sealed face between electrodes and the cavity. When helium gas was shot from the atmosphere side of the center conductor to sealed area. A helium leak detector was reacted. To access the O-ring on the center conductor, a large flange of the outer conductor was opened using a crane. To fix the leak, the electrode was removed from the center conductor. A deteriorating O-ring across the ages was found as shown in Fig. 2 and the O-ring was replaced with new one. When the electrodes were assembled, thin silver plates were stacked on the joint area to place the electrodes on the level. The leak of the tank was fixed and the pressure of the tank was improved to 9×10^{-6} Pa.

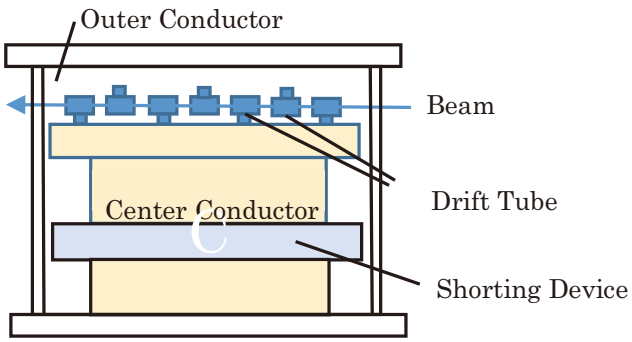

Fig. 1. Schematic diagram of cavity No. 5.

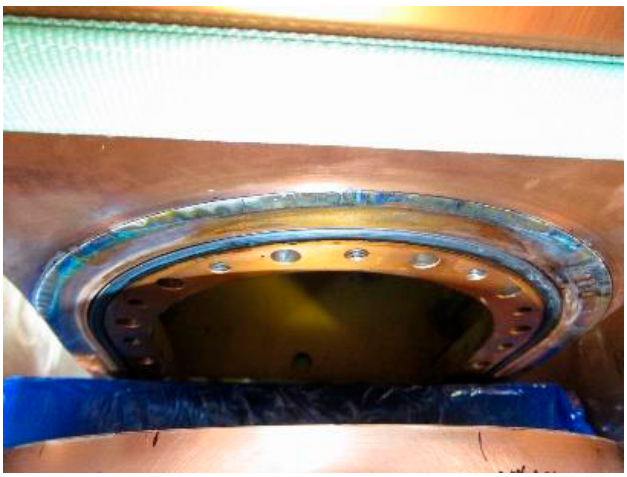

Fig. 2. Sealing face with a degenerate O-ring on center conductor of cavity No. 5.

The cavity, A1, had vacuum leak on the bottom flange, however, a location of the leak point was not identified precisely. We presumed that the air-leak point was under the paint covering the vacuum-sealing flanges because of the delayed response of the helium detection. Thus, in October, after removing the paint, we hunted the air-leak once more. The surface of the flange was masked by plastic tape except the checking area to block the ingress of helium gas. The tape was re-covered every time the checking area changing. At last, we found the air-leak point on an area of the cooling pipe on the flange. The vacuum leak area was found and was applied by sealing agent (VACSEAL). The pressure of A1 was improved to 3×10^{-6} Pa.

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