

Input power coupler for SRILAC

K. Ozeki,^{*1} O. Kamigaito,^{*1} N. Sakamoto,^{*1} K. Suda,^{*1} and K. Yamada^{*1}

As an upgrade project of the RIKEN Linear Accelerator (RILAC), the construction of a superconducting heavy ion linear accelerator (Superconducting RILAC, denoted as SRILAC hereinafter) is now in progress.^{1,2)} In this report, the progress in the implementation of input power couplers to feed RF power to the resonator is reported.

For the construction of a prototype accelerator system based on the superconducting quarter-wavelength resonator (QWR),³⁻⁹⁾ which was carried out prior to this project, the couplers were designed to have double disk-type ceramic vacuum windows to ensure the vacuum of QWR as well as to avoid the long antenna design.^{10,11)} On the other hand, the couplers for the SRILAC were designed to have single disk-type ceramic vacuum window, in order to simplify the structure and reduce the production cost. The geometry around the vacuum window was designed to have a characteristic impedance of $50\ \Omega$ using CST Microwave Studio.¹²⁾

The couplers were produced by Mitsubishi Heavy Industries Machinery Systems Ltd. A total of ten couplers were delivered in sequence. A photograph of the couplers is shown in Fig. 1.

The couplers must be kept completely clean and degassed in advance in order to prevent contamination of the QWR. All the operations described below were performed in an ISO class-1 clean room.

At the beginning, the following rinsing operations were performed: deconstruction of the coupler, rinsing of each part using ultrapure water, drying, and re-

construction.

After the rinsing operations, a pair of couplers was mounted on an RF test stand chamber (see Fig. 2), and the RF test stand chamber and the two couplers were baked at 120°C .

Then, the ceramic vacuum window was processed with RF power (RF process). Figure 2 shows the setup of the RF process. While feeding RF power to the system, the interlocks were set for an emergence of arc light due to a discharge in the coupler, and a loss of vacuum. The RF process was performed five times (the two couplers were processed once), and every time the RF power was successfully fed up to about 5 kW without any difficulty.

After the RF processes were finished, the couplers were attached to the QWRs in the ISO class-1 clean room. The fabrication of the cryomodules is now in progress.

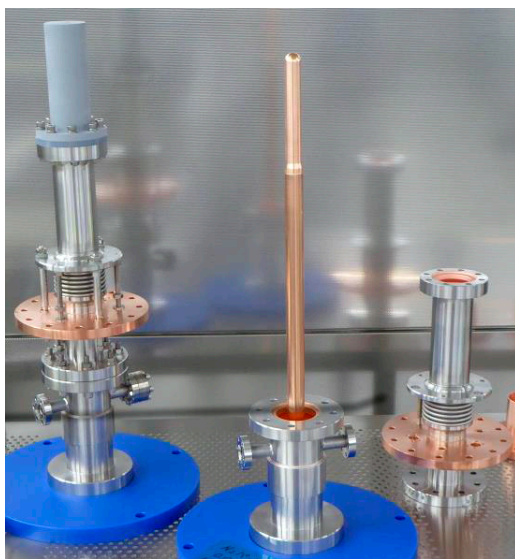


Fig. 1. Two sets of input power couplers. Constructed (left) and deconstructed (center and right) parts.

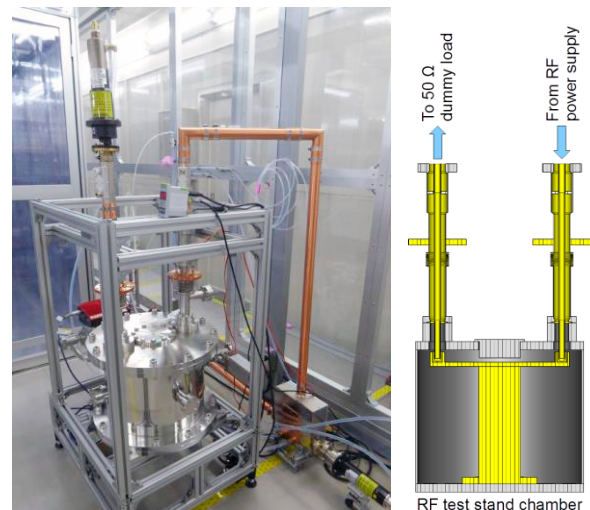


Fig. 2. Photograph (left) and schematic (right) of the RF process. The RF power was fed from the right-side coupler and transmitted to left-side coupler. The left-side coupler was terminated with a dummy load. The input, reflected, and transmitted RF powers were measured.

References

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*1 RIKEN Nishina Center