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## Report of electron beam acceleration with STF-2 cryomodules for the ILC

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In the Superconducting rf Test Facility (STF) at High Energy Accelerator Research Organization (KEK), the cool-down tests of STF-2 cryomodules and the beam operations have been held since 2019.

STF-2 cryomodules are the same type as those for the International Linear Collider (ILC). As a result of beam operation so far, the averaged acceleration gradient of 9 cavities reached 33 MV/m, which satisfies the specification of the ILC (31.5 MV/m). This is an important milestone in demonstrating technology to realize the ILC.

Hence anomalous emittance growth after passing the accelerating cavities was seen on previous beam operation in April 2021, we observed inside the cavities by eye and confirmed there is no obstacle which was the source of this emittance growth. After checking almost same performance of accelerating cavities as those of the previous beam operation, we investigated various candidates that could cause this anomalous emittance growth in the beam operation.

For a long pulse (740us) and high current (5.8mA) beam same as those of the ILC specification, about 100 us long pulsed beam operation was demonstrated without loss. By implementing feedforward control to suppress the acceleration gradient drop due to beam loading, we could perform successful beam operation without loss. This is a powerful finding for beam operation with a pulse length equivalent to that of the ILC specification in STF-2.

We will present the outline of the cool-down test and the beam operation at STF.

### In-person participation

No

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**Classifica Sessioni:** Accelerators: Physics, Performance, and R&D for future facilities

**Classificazione della track:** Accelerators: Physics, Performance and R&D for future facilities