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Laboratory Evaluation of DESHIMA: A Submillimeter Wave On-chip Filterbank Spectrometer

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DESHIMA is an on-chip filter bank spectrometer that utilizes NbTiN superconducting resonant filters. The output signal of each filter is read out by microwave kinetic inductance detectors (MKIDs). The high multiplexing capability of MKIDs enables us to realize wide-band coverage with moderate frequency resolution.

The target frequency band of DESHIMA is 326-905 GHz with frequency resolution of $F/dF = 500$. The first generation of DESHIMA, covering a frequency range of 326-368 GHz, is planned to be installed on the ASTE telescope in the Atacama desert.

The main components of the DESHIMA instrument are 4 K cold optics cooled down by a pulse tube cooler, 100 mK light-tight box for MKIDs cooled down by an adiabatic demagnetization refrigerator (ADR), and an FFT based multi-tone readout circuits.

The design, fabrication, assembly, and cool down test of the instrument have been successfully carried out by collaboration between Delft University of Technology and SRON.

Laboratory-based tests to characterize the whole DESHIMA system are being carried out with a photomixing THz CW source.

In this talk, we would like to present about the DESHIMA instrument focusing on cryostat integration and characteristics of the filter bank evaluated in the test system.

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