V130a Development of DESHIMA 2.0: Upgrade design overview

Y. Tamura, A. Taniguchi, K. Suzuki, T. J. L. C. Bakx (Nagoya), T. Takekoshi, K. Kohno (UTokyo), T. Oshima, J. Maekawa, R. Kawabe (NAOJ), M. Naruse (Saitama), A. Endo, S. Ikarashi, N. Llombart, D. J. Thoen, A. Pascual Laguna, S. Dabironezare, S. Hähnle (TU Delft), P. P. van der Werf (Leiden), K. Karatsu, J. Bueno, V. Murugesan, S. J. C. Yates, R. Huiting, P. J. de Visser, and J. J. A. Baselmans (SRON)

DESHIMA (DEep-Spectroscopic HIgh-redshift MApper) is a wideband integrated superconducting spectrometer (ISS) for the ASTE (Atacama Submillimeter Telescope Experiment) telescope. The DESHIMA ISS chip consists of an antenna coupled to a transmission line filterbank, with a microwave kinetic inductance detector (MKID) behind each filter. All MKIDs are read out simultaneously with a single pair of coaxial cables, using frequency domain multiplexing. In 2017, DESHIMA was evaluated in the laboratory (Endo et al. 2019a in press) and it detected the first astronomical signal using the ISS technology on the ASTE (Taniguchi et al., ASJ 2019 Spring Meeting, V103a; Endo et al. 2019b in press).

Here we report the design and plans for the upgrade of DESHIMA—DESHIMA 2.0. We will present the design of DESHIMA 2.0 that will allow an instantaneously frequency coverage of 220–440 GHz with a resolution of $F/\Delta F = 500$. With this upgrade, DESHIMA 2.0 will operate as a submillimeter redshift machine, targeting for example the luminous [CII] 158 μm line from submillimeter galaxies at $z = 3.3$–7.6. In the talk, we will also present prospects for the commissioning and science verification on ASTE in 2020.