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Lessons learned from SMILES project, and possible SMILES-2

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Superconducting Submillimeter-Wave Limb-emission Sounder (SMILES) was the first instrument to use 4K cooled SIS (Superconductor-Insulator-Superconductor) detection system for the observation of the atmosphere in the frequency regions 625 GHz (Bands A and B) and 650 GHz (Band C) [1]. It has demonstrated its high sensitivity (System Temperature, Tsys ~250K) for measuring stratospheric and mesospheric species, O3, HCl, ClO, HO2, HOCl, BrO, and O3 isotopes from Oct. 12, 2009 to Apr. 21, 2010 [2-5]. So it was very successful scientific program, even though it have been conducted as an engineering demonstration program.

Since SMILES operation has terminated after only 6 months operation due to failure of sub-mm local oscillator (and later 4K cooler system), there exist strong scientific demand to develop successor of SMILES, the SMILES-2, which has optimized and enhanced frequency coverage to observe: (a) BrO and HOCl without interferences of stronger emission lines, (b) N2O, H2O, NO2, and CH3Cl not covered by the SMILES frequency regions, and (c) O2 line to measure temperature.

This paper will describes (a) list of SMILES publications on timeline, (b) lessons learned from SMILES project, and (c) possible SMILES-2 observations based upon those SMILES lessons.