

## Performance of NbN and NbTiN HEB waveguide mixers for GREAT and upGREAT

D. Büchel<sup>\*</sup>, K. Jacobs, P. Pütz, M. Schultz, C. E. Honingh, and J. Stutzki

*1. Physikalisches Institut, Universität zu Köln,  
Zùlpicher Str. 77, 50937 Köln, Germany*

\*Contact: [buechel@ph1.uni-koeln.de](mailto:buechel@ph1.uni-koeln.de)

**Abstract**—We present results and analysis of heterodyne measurements at 1.9 THz using hot electron bolometer (HEB) waveguide mixers comparing NbN micro-bridge on a 2  $\mu\text{m}$  thick Si membrane with NbTiN on a 3  $\mu\text{m}$  thick SiN membrane. The mixers are designed and fabricated in Cologne for the GREAT/upGREAT instrument, which is in operation on the Stratospheric Observatory for Infrared Astronomy (SOFIA).

All mixers are measured in the same heterodyne setup in a liquid helium cryostat at optimum bias conditions (lowest noise temperature), over a 0.5 – 5 GHz IF range. For the NbN HEB mixers the average mixer gain over a 1-2 GHz IF bandwidth is (-6 +/- 1) dB with an average mixer noise of (450 +/- 50) K and a noise bandwidth of (4.0 +/- 0.4) GHz. For the NbTiN HEB mixer the mixer gain is around (-10 +/- 1) dB with a mixer noise of about (500 +/- 50) K and a noise bandwidth of (2.3 +/- 0.4) GHz.

For both HEB mixer types the gain and noise are also calculated from the lumped-element model using the broken-line transition model. The moderate agreement between calculated and the experimental data will be discussed.