



## Manufacturing ultra-Low Noise TES Arrays for the SAFARI Instrument on SPICA

**Main author:**

RIDDER Marcel

**Co-authors:**

Bruijn M, SRON Netherlands Institute for Space Research, The Netherlands

Gao J.R., SRON Netherlands Institute for Space Research, The Netherlands, Kavli Institute of NanoScience, Delft University of Technology

Hijmering R.A., SRON Netherlands Institute for Space Research, The Netherlands

Hilton G, NIST National Institute of Standards and Technology, USA

Hoevers H, SRON Netherlands Institute for Space Research, The Netherlands

Khosropanah P, SRON Netherlands Institute for Space Research, The Netherlands

Ridder Marcel, SRON-Utrecht

Schmidt D, NIST National Institute of Standards and Technology, USA

Suzuki T, SRON Netherlands Institute for Space Research, The Netherlands

Zuiddam M, Kavli Institute of NanoScience, Delft University of Technology

The SAFARI Instrument on SPICA space telescope requires ultra-low NEP of a Transition Edge Sensor (TES) with a few times  $10^{-19}$  WHz<sup>-1/2</sup>. SRON is developing ultra-sensitive TES detectors based on a TiAu bilayer with a critical temperature ( $T_c$ ) of  $\sim 100$  mK. The TiAu bilayer is a thermometer on a Silicon Nitride (SiN) island, which is thermally linked to a Silicon support structure with four SiN suspensions. The low thermal conductance ( $G$ ) defined by the cross-section of SiN legs and their lengths is critical for reaching a low NEP.

For the fabrication dry Deep Reactive Ion Etching (DRIE) technique has been used to etch the Silicon support structure. SRON has recently developed this fabrication technique, which has already been demonstrated by other groups such as NIST and Cambridge. We succeeded in fabricating a series of detector chips with variations in pixel layout, island sizes, geometry of the SiN suspension and width of the SiN legs.

In this work, we will report details of the fabrication, in particular, we will report how to control the etching, but not attacking thin SiN legs, and how to realize uniform etching within a wafer of 4 inches.