

## A 211-275 GHz receiver prototype

Kirill Rudakov<sup>1,2,3</sup>, Pavel Dmitriev<sup>3</sup>, Andrey Baryshev<sup>2,4</sup>, Andrey Khudchenko<sup>2</sup>, Ronald Hesper<sup>2</sup>,  
Oleg Kiselev<sup>3</sup>, Valery Koshelets<sup>3</sup>

<sup>1</sup>*Moscow Institute of Physics and Technology, Dolgoprudny, Russia*

<sup>2</sup>*Kapteyn Astronomical Institute, University of Groningen, Groningen, the Netherlands*

<sup>3</sup>*Kotel'nikov Institute of Radio Engineering and Electronics RAS, Moscow, Russia*

<sup>4</sup>*SRON Netherlands Institute for Space Research, Groningen, the Netherlands*

\*Contact: <mailto:kirill.i.rudakov@gmail.com>

**Abstract**— We have made a preliminary design of a sideband separating (2SB) receiver for frequency range 211-275 GHz, which can be implemented for LLAMA observatory in Argentina [1], and for the Millimetron space mission [2]. The receiver is conceptually similar to the ALMA Band 9 2SB receiver [3][4], it will be based on single ended superconductor-insulator-superconductor (SIS) mixers connected to a waveguide RF hybrid block. The design of the single ended SIS mixer was developed using electromagnetic modeling in CST microwave studio. We use a waveguide orthogonal probe and have found optimal waveguide sizes and quartz substrate width. The mixer is based on Nb/AlN/NbN SIS junctions embedded in a Nb/SiO<sub>2</sub>/Nb microstrip line. In order to improve design stability with respect to manufacturing tolerances we will investigate extension of the 64GHz bandwidth utilizing high current density AlN barrier SIS junctions. The detailed receiver description will be presented at the conference.

[1] Large Latin American Millimeter Array, <http://www.iar.unlp.edu.ar/llama-web/>

[2] Make a link to some latest paper about Millimetron

[3] Hesper, R., Gerlofsma, G., Mena, F. P., Spaans, M. C., and Baryshev, A. M., "A sideband-separating mixer upgrade for alma band 9," in [Twentieth International Symposium on Space Terahertz Technology, Charlottesville ], 257–260 (apr 2009).

[4] A. Khudchenko, R. Hesper, A.M. Baryshev, J. Barkhof and F.P. Mena, "Modular 2SB SIS Receiver for 600-720 GHz: Performance and Characterization Methods", IEEE Tr. on TST, vol. 7, No. 1, 2017.