

Receiving mechanism of array fed by multiple feed points networks : degradation of performance

Citation for published version (APA):

Iacono, A., Coenen, T. J., Bekers, D. J., Neto, A., & Gerini, G. (2010). Receiving mechanism of array fed by multiple feed points networks : degradation of performance. In *Proceedings of the 2010 IEEE Antennas and Propagation Society International Symposium (APSURSI), 11-17 July 2010, Toronto, Ontario* (pp. 1-1). Institute of Electrical and Electronics Engineers.

Document status and date:

Published: 01/01/2010

Document Version:

Publisher's PDF, also known as Version of Record (includes final page, issue and volume numbers)

Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

[Link to publication](#)

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license above, please follow below link for the End User Agreement:

www.tue.nl/taverne

Take down policy

If you believe that this document breaches copyright please contact us at:

openaccess@tue.nl

providing details and we will investigate your claim.

Receiving mechanism of array fed by multiple feed points networks: degradation of performance.

A. Iacono^{*1,2}, T. J. Coenen², D. J. Bekers², A. Neto², and G. Gerini^{1,2}

¹ TU/e, Eindhoven University of Technology, Eindhoven, NL

² TNO, Defence, Security and Safety, Den Haag, NL

This work is part of a collaboration between TNO (Netherlands Organization for Applied Scientific Research) and SRON (Netherlands Institute for Space Research) for the development of technology for the future space mission SPICA proposed by the Japanese Space Agency. The aim of this mission is to observe the formation of galaxies and stars and to investigate the Cosmic Microwave Background (CMB). Observation of the THz spectrum can give insight in these phenomena. Kinetic Inductance Detectors (KID) are high-sensitivity detectors that can be effectively used for imaging at THz frequencies (P. Day, et. al., *A broadband superconducting detector suitable for use in large arrays*, Nature, vol. 425, no. 6960, 2003). KIDs are realized with superconductors and their behavior is strictly linked to the power they absorb at THz frequencies. To effectively couple the incoming signal to the detector, an antenna is connected to the CPW (quarter wavelength) resonator at GHz frequencies that constitutes the KID (Fig.1). In turn the KID is connected to a CPW through line for read-out purposes. The S_{21} parameter of the through line shows a dip at the resonance frequency of the resonator coupled to it. A THz signal received by the antenna breaks the Cooper pairs in the superconductor; this changes the characteristic impedance of the line and consequently the resonance frequency. The frequency shift is a measure for the intensity of the incoming radiation. For coupling the incoming THz radiation, arrays can be also used instead of a single antenna to achieve higher directivity, but the presence of multiple feed points in the lossy corporate feeding network (Fig.2) can result in a degradation of the overall performance of the antenna with respect to the lossless case. An array antenna exhibits a large gain if the contributions received by each array element add up coherently. However, the absorption associated to the breaking of Cooper pairs could be such that the contributions from the physically separated antennas add up incoherently. Consequently, a larger number of elements in the array may not improve the performance. Aim of this work is the investigation of the receiving mechanism to provide a criterium to determine the maximum number of array elements that can be used, depending on the expected loss.

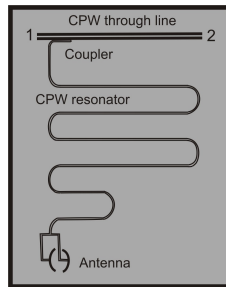


Figure 1: Example of a KID coupled to an arced twin slot antenna.

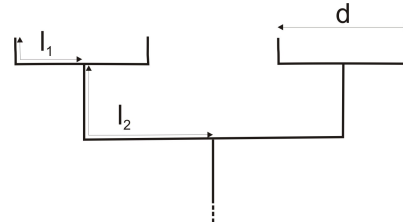


Figure 2: Feeding line for a linear array of 4 elements.