INTERNATIONAL MICROWAVE SYMPOSIUM 2011
June 5 -10, 2011

Extended Abstracts of Talks Presented at the Session WE1F:
"100 Years of Superconductivity – Existing and Emerging RF Applications of Superconductivity"

Published in 2011 IEEE MTT-S International Microwave Symposium

WE1F - Microwave Superconductivity Part 1: History, properties and early applications
Abstract: The 100th anniversary of superconductivity will be celebrated during 2011. As part of this celebration, a Special Session has been scheduled for IMS 2011 to commemorate this event and highlight the potential impact of superconductivity on electronic technologies, especially in the microwave and terahertz frequencies regimes. In this paper, Part 1, the history, properties and some early high frequency applications of superconductivity will be reviewed, while in Part 2, current and future applications will be discussed.

https://ieeexplore.ieee.org/document/5972594
DOI: 10.1109/MWSYM.2011.5972594

WE1F-2 Microwave Superconductivity Part 2: Current and Future Applications
Abstract: The 100th anniversary of superconductivity will be celebrated during 2011. As part of this celebration, a Special Historic Session has been scheduled for IMS 2011 to commemorate this event and highlight the potential impact of superconductivity on electronic technologies, especially in the microwave and terahertz frequencies regimes. In Part 1, a very brief overview of superconductivity and its unique properties was presented along with a summary of some of the early rf and microwave applications. In Part 2, we will describe some of the current applications of superconductivity especially those employing high temperature superconducting (HTS) materials.

https://ieeexplore.ieee.org/document/5972994
DOI: 10.1109/MWSYM.2011.5972994

WE1F-3 Superconductor Analog-to-Digital Converters and Their Applications
Abstract: A wide variety of applications, ranging from radio-frequency (RF) receivers for broadband communications and signal detection, on earth and in space, would benefit from high-performance superconductor analog-to-digital converters (ADCs), based on magnetic flux quantization and fast switching Josephson junctions. Superconductor ADCs are capable of very high sample rates (100 GHz or more), very high linearity, and high sensitivity. Nyquist-rate ADCs use the high sample rate to digitize a wide instantaneous bandwidth (tens of GHz) and are useful for wideband spectrum monitoring as well as high-end scientific instrumentation. Delta and delta-sigma oversampling ADCs use the high linearity to achieve programmable trade-off between dynamic range and instantaneous bandwidth. These lowpass and bandpass ADCs have been used for direct digitization of narrower (tens to hundreds of MHz) RF bands in the 1-20 GHz range for a variety of communications, intelligence, electronic warfare, and radar applications. Another application area of these cryogenic ADCs is for outputs of cryogenic sensor arrays and terahertz mixers. Recent advances in various classes of ADCs for different applications are described.

https://ieeexplore.ieee.org/document/5972910
DOI: 10.1109/MWSYM.2011.5972910

WE1F-4 Dispersive Microwave Readout for Quantum Electrical Circuits

Abstract: Summary form only given, as follows. Over the past decade, quantum coherent behavior has been observed in electrical circuits engineered to have discrete, individually addressable energy levels. The basic architecture of a quantum dispersive measurement consisting of a two-level quantum bit coupled to a LC tank circuit is reviewed. Recent progress with this type of readout has led to the real-time monitoring of a superconducting qubit with the observation of individual quantum jumps between energy levels.

https://ieeexplore.ieee.org/document/5973408
DOI: 10.1109/MWSYM.2011.5973408

WE1F-5 Superconducting Microwave Resonant Circuits for the Detection of Photons from Microwaves through Gamma Rays

Abstract: Thin-film superconducting microwave resonators play an important role in large superconducting photon cameras for applications ranging from cosmology to nuclear non-proliferation. The high quality factor and low loss of these devices make it possible to couple many resonators to a single feedline, enabling frequency-division multiplexing of large arrays of detectors. We review the use of superconducting microwave resonators for both microwave kinetic inductance detectors (MKIDs) and superconducting transition-edge sensors (TES).

https://ieeexplore.ieee.org/document/5972694
DOI: 10.1109/MWSYM.2011.5972694