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[Invited] Development of Current Biased Superconducting Stripline Detectors and Signal Processing Circuits Compatible with Standard SFQ Foundry Processes

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Superconducting Stripline Detectors (SSLD), which are recently emerging type of detectors, can operate in kinetic inductance detector (KID) mode or transition edge sensor (TES) mode depending on the working conditions. As known, one of the fundamental bottlenecks in the superconducting detector based systems is the integration level which is basically the number of pixels in a detector matrix. DC current biased SSLDs combined with the single flux quantum (SFQ) logic read-out circuits have the potential to reach the integration levels of semiconductor based detectors. This is possible by the monolithic integration of detectors with the read-out circuits, requirement of just one DC bias point for all the SSLD pixels, and relatively simple principle of operation. The utilized principle design is compatible with standard SFQ foundry processes and integrates the detector and addressing circuits in one chip. Thus, it is possible to implement many pixels that would be impossible to achieve otherwise. In addition, the cost of the detector chip is reduced drastically compared to a full custom design and fabrication. In this work we will explain the principle of operation of an SSLD array together with read-out electronics, proposed design and present the experimental results obtained so far.

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