Abstracts

Broadband Josephson voltage standards

C.A. Hamilton and S.P. Benz. "Broadband Josephson voltage standards." 2001 MTT-S International Microwave Symposium Digest 01.2 (2001 Vol. II [MWSYM]): 853-856 vol.2.

A Josephson junction is a perfect frequency-to-voltage converter, that is, V=f/K/sub J-90/ where K/sub J-90/= 483597.9 GHz/V. This unique property has been used to convert a narrow band (1 Hz) 75 GHz reference frequency to a DC voltage standard. Josephson standards use arrays of thousands of junctions to raise the voltage to 10 V. More recently, the broadband capability of Josephson devices is being exploited at NIST to create a new AC voltage standard. In this case, the Josephson junction is a pulse generator that can be triggered at frequencies from DC to 20 GHz, and that produces short (/spl sim/50 ps) voltage pulses with a time integral of exactly 1/K/sub J-90/. A delta-sigma algorithm with a high oversampling ratio is used to define a digital pulse sequence for any desired output waveform. The sequence is programmed into a digital code generator that triggers the Josephson device. The result is a replication of the desired waveform with a time-dependent amplitude that is exactly calculable from a knowledge of the pulse code, the sampling frequency, and the number of Josephson junctions in the array.

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