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Microwave Kinetic Inductance Measurement of a Carbon Nanotube[1] Y. YIN, J. CHUDOW, D.F. SANTAVICCA, V. MANUCHARYAN, A.J. ANNUNZIATA, L. FRUNZIO, D.E. PROBER, Dept. of Applied Physics, Yale Univ., B. REULET, LPS, Université Paris-Sud, Orsay, France, A. TRUE, C.A. SCHMUTTENMAER, Dept. of Chemistry, Yale Univ., M. PUREWAL, Y. ZUEV, P. KIM, Dept. of Physics and Applied Physics, Columbia Univ. — The single-wall metallic carbon nanotube is a model molecular nano-system, and has also been proposed as a candidate for future IC interconnects. For both these reasons, measurement of the kinetic inductance is desirable. This inductance arises from the kinetic energy of electrons in the four quantum channels. It is a fundamental prediction of the Luttinger liquid theory. Direct measurements at room temperature have been reported by Intel. That measurement is very challenging due to the large resistance compared to 50 ohms, and the small inductive impedance. We propose and demonstrate a new approach which uses two on-chip transmission line resonators to transform the nanotube impedance to nearly match the 50 ohm range of the microwave network analyzer. Simulations and cryogenic measurements will be presented.

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Yan Yin
yan.yin@yale.edu
Dept. of Applied Physics, Yale Univ.

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