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Cross-correlation heterodyne detection part II: Measuring microwave nontrivial propagating signals EDWIN P. MENZEL, MATTEO MARIANTONI, M. A. ARAQUE CABALLERO, F. DEPPE, E. HOFFMANN, T. NIEMCZYK, A. MARX, R. GROSS, Walther-Meissner-Institut and TU Muenchen, Garching, Germany, E. SOLANO, Departamento de Quimica Fisica, Universidad del Pais Vasco / Euskal Herriko Unibertsitatea, Bilbao, Spain — The accurate measurement of the first two moments of Gaussian states (e.g., coherent or squeezed states) allows for their complete characterization. This provides a tool to clarify the quantum nature of microwave radiation, an important issue for example in circuit quantum electrodynamics. We present a full experimental characterization of nontrivial microwave signals with an average photon number of the order of 1, whose variance exhibits an elaborate dependence on external control parameters. We experimentally access the entire covariance matrix by splitting the input signals via microwave beam splitters and performing cross-correlation measurements. In this manner, we are able to precisely resolve the first two moments, a challenging task at microwave frequencies. Furthermore, we succeeded to measure the third central moment of similar nontrivial signals. We acknowledge support from SFB631, NIM, EuroSQUIP, and the Ikerbasque Foundation.

Edwin P. Menzel
Walther-Meissner-Institut and TU Muenchen, Garching, Germany

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