Cyclotron-Resonance-Maser Arrays

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The cyclotron-resonance-maser (CRM) array [1] is a radiation source which consists of CRM elements coupled together under a common magnetic field. Each CRM-element employs a low-energy electron-beam which performs a cyclotron interaction with the local electromagnetic wave. These waves can be coupled together among the CRM elements, hence the interaction is coherently synchronized in the entire array. The implementation of the CRM-array approach may alleviate several technological difficulties which impede the development of single-beam gyro-devices. Furthermore, it proposes new features, such as the phased-array antenna incorporated in the CRM-array itself. The CRM-array studies may lead to the development of compact, high-power radiation sources operating at low-voltages. This paper introduces new conceptual schemes of CRM-arrays, and presents the progress in related theoretical and experimental studies in our laboratory. These include a multi-mode analysis of a CRM-array, and a first operation of this device with five carbon-fiber cathodes.