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Ka-band Microwave Power Transmission System for 28 GHz Electron Cyclotron Resonance Ion Source at KBSI

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A 28 GHz microwave power transmission system is designed to deliver the 10 kW microwave power from a gyrotron oscillator to an electron cyclotron resonance ion source to produce both a high current and highly charged ions. The microwave power produced by the gyrotron oscillator, which is installed in Korea Basic Science Institute (KBSI), is measured using a directional coupler and a dummy load up to 10 kW at the frequency of 28 GHz. The gyrotron microwave power source of the transmission system operates in continuous wave mode with smoothly regulated output power. The whole microwave power transmission system is designed to transfer microwaves to the ion source at low power loss, low mode conversion, and low reflected power. To take account of these issues the transmission line between gyrotron and plasma chamber is comprised of arc detector, dual directional coupler, mode filter, mode converter, 90 degree corrugated bend, high voltage break, and vacuum window, which are arranged in the order named. In this paper, the design of a 28 GHz, 10 kW microwave transmission system and the measured performance of power transmission line will be presented in detail.