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Experimental Verification of Peer-to-Peer Magnetron Locking[1]
EDWARD CRUZ, RON GILGENBACH, YUE LAU, BRAD HOFF, PHONG-PHAETH PENGVANICH, University of Michigan — Injection locking of conventional magnetrons, and other types of oscillators, employing a master-to-slave configuration has been studied theoretically and experimentally [1,2]. We have recently derived the condition for peer-to-peer locking of two conventional magnetrons [3]. This condition reduces to Adler's classical locking condition (master-to-slave) if the coupling is one way. Dependent on the coupling, the frequency of oscillation when locking occurs does not necessarily lie between the free running frequencies of the two isolated, stand-alone magnetrons. Likewise, when the locking condition is violated, the beat frequency is not necessarily equal to the difference between these free running frequencies. These features were revealed in our recent experiments on the peer-to-peer locking of two 1-kW magnetrons. The necessary condition under which the two magnetrons may be locked to a common frequency is also experimentally verified.

[1] P. Pengvanich et al., J. Appl. Phys. 98, 114903 (2005).
[2] V. B. Neculaes, Ph.D. Dissertation, U. Michigan, Ann Arbor, MI (2005).
[3] P. Pengvanich et al., Phys. Plasmas 15, 103104 (2008).

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Edward Cruz
University of Michigan

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