Design of higher-harmonic gyrotron oscillators with frequency-multiplied pre-bunched beams

ARNE FLIFLET, MELISSA HORNSTEIN, STEVEN GOLD, Plasma Physics Division, Naval Research Laboratory — There is currently considerable interest in operating gyrotrons at higher cyclotron harmonics in order to access the near-THz regime and reduce magnetic field requirements. Bandurkin and Savilov\textsuperscript{2} recently proposed a scheme for bunching of gyrating electron beams at a multiple of the signal frequency based on Bragg cavities. In this work we investigate the use of this bunching technique to enhance higher-harmonic operation in gyrotron oscillators with annular beams. We compute the frequency-multiplied prebunching for given Bragg cavity parameters and use a large-signal, multimode, multi-harmonic gyrotron oscillator code to predict the parameter regions of stable higher-harmonic operation for several point designs.

\textsuperscript{1}Supported by the Office of Naval Research.
\textsuperscript{2}I.V. Bandurkin and A.V. Savilov, Phys. Rev. ST 8, 010702 (2005).