ADVANCES IN GYRO-AMPLIFIER RESEARCH

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Gyro-devices are fast wave devices based on the principles of
the electron cyclotron maser\textsuperscript{1,2}. Gyro-oscillators have been
successfully developed in the form of gyrotrons\textsuperscript{3,4}. Gyro-
amplifiers have been studied for approximately as long as
gyro-oscillators but in the early years the amplifiers exhibited
stability issues. Gyro-amplifiers include broadband gyro-
TWTs and the narrower band gyro-klystrons. Introducing
distributed losses can prevent gyro-amplifier oscillations,
although this approach becomes more difficult at high
powers. Garven et al.\textsuperscript{5} successfully demonstrated a ‘zero-
drive stable’ high power gyro-TWT at 35GHz by
incorporating lossy ceramic rings. Blank et al.\textsuperscript{6} in 2002
achieved an impressive 100kW peak output power from a 94
GHz gyro-klystron.

A design which can avoid some of the disadvantages of
conventional gyro-TWTs was reported by Denisov et al.\textsuperscript{7} in
1998 and was experimentally demonstrated by Bratman et
al.\textsuperscript{8} in 2000. This has led to a series of broadband, high power
gyro-TWTs\textsuperscript{9} and has stimulated research on the key
components\textsuperscript{10,11} for these gyro-amplifiers. The advances
made during the most recent ten years will be presented.

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6. M. Blank, et al., “Development and demonstration of high-
   average power W-band gyro-amplifiers for radar
7. G. G. Denisov, et al., “Gyrotron traveling-wave amplifier
   with a helical interaction waveguide”, Phys. Rev. Lett., 81,
8. V. L. Bratman, et al., “High gain wideband traveling-wave
   amplifier with a helically corrugated waveguide”, Phys. Rev.
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