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## REFERENCES

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- [1] A. A. Andronov, V. A. Flyagin, A. V. Gaponov, A. L. Goldenberg, M. I. Petelin, V. G. Usov and V. K. Yulpatov, "The gyrotron: high power sources of millimeter and submillimeter waves," *Infrared Physics*, vol. 18, pp. 385-393, 1978.
- [2] C. J. Edgcombe, Ed., *Gyrotron Oscillators: Their Principles and Practice*, London: Taylor & Francis, 1993.
- [3] G. S. Nusinovich, "Review of the theory of mode interaction in gyrodevices," *IEEE Trans. Plasma Sci.*, vol. 27, pp. 313-326, 1999.
- [4] H. Jory, "Gyro-device development and applications," *Int. Electron Dev. Meeting Tech. Dig.*, pp. 182-185, 1981.
- [5] J. Benford and J. Swegel, Ed., *High Power Microwaves*, Boston: Artech House, 1992.
- [6] J. C. Butterworth, and T. A. Wallace, "High power MMW transmitters," N. C. Curie and C. E. Brown, Ed., "Principle and Applications of Millimeter-Wave radars," Boston: Artech House, 1989.
- [7] J. L. Eaves and E. K. Reedy, *Principle of Modern Radar*, New York: D. Van Nostrand, 1987.
- [8] J. L. Hirshfield and V. L. Granatstein, "Electron cyclotron maser — an historical survey," *IEEE Trans. Microwave Theory Tech.*, vol. 25, pp. 522-527, 1977.
- [9] K. Amboss, "The current art of millimeter-wave solid state and tube type power sources" *Conf. Proc., Military Microwaves*, MM-80, London, pp. 520-546, 1980.
- [10] K. R. Chu and A. T. Lin, "Gain and bandwidth of the gyro-TWT and CARM amplifiers," *IEEE Trans. Plasma Sci.*, vol. 16, pp. 90-104, 1988.
- [11] K. R. Chu, L. R. Barnett, W. K. Lau, L. H. Chang, and C. S. Kou, "Recent developments in millimeter wave gyro-TWT research at NTHU," *Int. Electron Dev. Meeting Tech. Dig.*, pp. 699-702, 1990.

- [12] M. Makowski, "ECRF systems for ITER," *IEEE Trans. Plasma Sci.*, vol. 24, pp. 1023-1032, 1996.
- [13] M. Thumm, "State-of-the-Art of High Power Gyro-Devices and Free-Electron Masers: Update 1955," FZKA Report 5728, Institut für Technische Physik, Karlsruhe, 1996.
- [14] R. S. Symons and H. R. Jory, "Cyclotron resonance devices," *Adv. Electron Phys.*, vol. 55, pp. 1-75, 1986.
- [15] S. Y. Liao, *Microwave Electron Tubes*, New Jersey: Prentice-Hall, 1988.
- [16] V. A. Flyagin and G. S. Nusinovich, "Gyrotron oscillators," *Proc. IEEE*, vol. 76, pp. 644-656, 1988.
- [17] V. A. Flyagin, A. V. Gaponov, M. I. Petelin, and V. K. Yulpatov, "The gyrotron," *IEEE Trans. Microwave Theory Tech.*, vol. 25, pp. 514-521, 1977.
- [18] M. Thumm, "MW gyrotron development for fusion plasma applications," *Plasma Phys. Control. Fusion*, vol. 45, pp. A143–A161, 2003.
- [19] B. N. Basu, *Electromagnetic Theory and Applications in Beam-Wave Electronics*, Singapore: World Scientific, 1996.
- [20] A. S. Passive high-power microwave components Jr., *Microwave Tubes*, Boston: Artech House, 1986.
- [21] O. P. Gandhi, *Microwave Engineering and Applications*, New York: Pergamon Press, 1981.
- [22] R. Chatterjee, *Microwave, Millimetre-Wave and Submillimetre-Wave: Vacuum Electron Devices*, New Delhi: Affiliated East-West Press, 1999.
- [23] M. K. Thumm and W. Kasperek, "Passive high-power microwave components," *IEEE Trans. Plasma Sci.*, vol. 30, pp. 755-786, 2002.
- [24] R. J. Barker, J. H. Booske, N. C. Luhmann Jr. and G. S. Nusinovich, Ed., *Modern Microwave and Millimeter-Wave Power Electronics*, New Jersey: IEEE Press, 2004.
- [25] A. V. Gaponov-Grekhov and V. L. Granatstein, Ed., *Application of High Power Microwaves*, Boston: Artech House, 1994.

- [26] M. V. Kartikeyan, E. Borie, and M. K. A. Thumm, *Gyrotrons High-Power Microwave and Millimeter Wave Technology*, Germany: Springer, 2004.
- [27] R. J. Barker and E. Schamiloglu, Ed., *High-Power Microwave Sources and Technologies*, New York: IEEE Press, 2001.
- [28] V. L. Grantstein and I. Alexeff, Ed., *High Power Microwave Sources*, Boston: Artech House, 1987.
- [29] G. S. Nusinovich, *Introduction to the Physics of Gyrotrons*. Baltimore, MD: Johns Hopkins Univ. Press, 2004
- [30] K. L. Felch, B. G. Danly, H. R. Jory, K. E. Kreischer, W. Lawson, B. Levush, and R. J. Temkin, "Characteristics and applications of fast-wave gyro devices," *Proc. IEEE*, vol. 87, pp. 752-781, 1999.
- [31] Garate, E. P., Fisher, A., and Main, W. G., "Coaxial Configuration of the Dielectric Cerenkov Maser", *IEEE Trans. Plasma Sci.*, vol. 18, no. 5, pp. 831-836, 1990.
- [32] Happek, U., and Sievers, A. J., "Observation of Coherent Transition Radiation", *Phys. Rev. Lett.* 67, vol. 67, no. 21, pp. 2962-2965, 1991.
- [33] V. L. Granatstein, R. K. Parker, and C. M. Armstrong, "Vacuum electronics at the dawn of the twenty-first century," *Proc. IEEE*, vol. 187, pp. 702-716, 1999.
- [34] K. R. Chu, "The electron cyclotron maser," *Rev. Mod. Phys.*, vol. 76, pp. 489-540, 2004.
- [35] Blumenthal, G. R., and Gould, R. J., "Bremsstrahlung, Synchrotron Radiation, and Compton Scattering of High-Energy Electrons Traversing Dilute Gases", *Rev. Mod. Phys.*, vol. 42, no. 2, pp. 237-270, 1970.
- [36] G. S. Nusinovich and O. Dumbrajs, "Theory of gyro-backward wave oscillator with tapered magnetic field waveguide cross section," *IEEE Trans. Plasma Sci.*, vol. 24, pp. 620-629, 1996.
- [37] Neilson, J., Read, M., Ives, L., "Design of a permanent magnet gyrotron for active denial systems". In: 34th international conference on infrared, millimeter, and terahertz waves (IRMMW-THz 2009), 21–25 Sept 2009, Busan, Korea.

- [38] Kumar, N., Singh, U., Kumar, A., Sinha, A.K., “Design of 95 GHz, 100 kW gyrotron active denial system application” *Vacuum*, 99., pp. 99-106, Jan. 2014
- [39] Pioczyk, B., Arnold, A., Budig, H., Dammertz, G., Dumbrajs, O., Drumm, O., Kartikeyan, M.V., Kuntze, M., Thumm, M. and Yang, X., “Towards a 2 MW, CW, 170 GHz coaxial cavity gyrotron for ITER”. *Fusion Engineering and Design*, vol. 66, pp 481-485, 2003.
- [40] Pioczyk, B., Dammertz, G., Dumbrajs, O., etc., “A 2 MW, 170 GHz coaxial cavity gyrotron experimental verification of the design of main components,” *3rd IAEA Technical Meeting on ECRH Physics and Technology in ITER*. 2005.
- [41] M. Blank, B. G. Danly, B. Levush, “Experimental demonstration of W-band gyro klystron amplifiers with improved gain and efficiency”. *IEEE Trans Plasma Sci.*, vol. 28, pp 706–711, 2000.
- [42] C.-H. Du, P.-K. Liu, *Millimeter-wave gyrotron traveling-wave tube amplifiers*, Berlin, Germany: Springer-Verlag, 2014.
- [43] Y. Zhang, “A new type of slow-wave structure: the rib-loaded disk-loaded waveguide,” *Proc. Int. Conf. Communications, Circuits and Systems, ICCAS 2004*, vol. 2, pp. 1460-1463, 2004.
- [44] K. R. Chu, Y. Y. Lau, L. R. Barnett, and V. L. Granatstein, “Theory of a wide-band distributed gyrotron traveling-wave amplifier,” *IEEE Trans. Electron Dev.*, vol. 28, pp. 866-871, 1981
- [45] K. R. Chu, P. Sprangle, and V. L. Granatstein, “Theory of dielectric loaded cyclotron traveling wave amplifier,” *Bull. Amer. Phys. Soc.*, pp. 23, 1978, cited in [123].
- [46] S. J. Rao, P. K. Jain, and B. N. Basu, “Broadbanding of gyro-TWT by dispersion shaping through dielectric loading” *IEEE Trans. Electron Dev.*, vol. 43, pp. 2290-2299, 1996.
- [47] Y. Zhang, Y. Mo, and X. Zhou, “Rigorous analysis of the disk-loaded waveguide slow-wave structures” *Int. J. Infrared and Millimeter Waves*, vol. 24, pp. 525-535, 2003.

- [48] A. J. Lichtenberg, "Prebunched Beam Traveling-Wave Tube Studies." *IRE Trans. Electron Devices*,, 1962, v. 9, n. 4, pp. 345-351.
- [49] J. M. Baird and W. Lawson, Magnetron injection gun (MIG) design for gyrotron applications," *Int. J. Electronics*, vol. 61, pp. 953-967, 1986.
- [50] J.M.Baird and W. Lawson, "Magnetron injection gun (MIG) design for gyrotron applications,"*Int. J. Electron.*, vol. 61, pp. 969– 984, July 1986.
- [51] G. P. Saraph, V. L. Granatstein, and W. Lawson, "Design of a single stage depressed collector for high-power, pulsed gyro klystron amplifiers," *IEEE Trans. Electron Devices*, vol. 45, no. 4, pp. 986–990, Apr. 1998.
- [52] T.M.Antonsen Jr, S.Y.Cai, and G.S.Nusinovich, "Effect of window reflection on gyrotron operation," *Physics of Fluids B: Plasma Physics*, vol. 4, no. 12, pp.4131-4139, 1992.
- [53] A. D. LaRue and R. R. Rubert, 'Multi-Megawatt Hybrid TWT's at S-Band and C-Band," *IEEE Electron Devices Meet.*, Washington, D.C., Oct. 1964.
- [54] R. J. Butwell, F. Friedlander, and G. T. Hunter, "Oscillation Suppression in Multi-Megawatt Cloverlead Twystrons by Stagger-Tuned Lossy Resonant Cavities," *Electron Devices Meeting*, IEEE, 1969, pp. 100-102.
- [55] V. L. Granatstein and W. Lawson, "Gyro-Amplifiers as Candidate RF Drivers for Tev Linear Colliders," *IEEE Trans. Plasma Sci.*, 1996, v. 24, pp. 648–665.
- [56] M. E. MacDonald, J. P. Anderson, R. K. Lee, D. A. Gordon, and G. N. McGrew, "The HUSIR W-band transmitter," *Lincoln Lab. J.*, vol. 21, pp. 106–114, 2014.
- [57] M. Blank, P. Borchard, S. Cauffman, and K. Felch, "Development and Demonstration of Broadband W-Band Gyro-Amplifiers for Radar Applications," *Infrared and Millimeter Waves, 2007 and the 2007 15th International Conference on Terahertz Electronics. IRMMW-THz. Joint 32nd International Conference on*, vol. 4, no. 13, pp. 364–366, 2007.
- [58] A. V. Gaponov-Grekhov and V. L. Granatstein, *Eds., Applications of High-Power Microwaves*. London, U.K.: Artech House, 1994.
- [59] G. S. Nusinovich, M. K. A. Thumm, and M. Petelin, "The Gyrotron at 50: Historical Overview," *J. Infrared Millim. THz Waves*, 2014, v. 34, pp. 325–381.

- [60] K. L. Felch, B. G. Danly, H. R. Jory, K. E. Kreischer, W. Lawson, B. Levush, and R. J. Temkin, "Characteristics and Applications of Fast-Wave Gyro devices," *Proc. IEEE*, 1999, v. 87, pp. 752–781.
- [61] G. J. Linde, M. T. Ngo, B. G. Danly, W. J. Cheung, and V. Gregers-Hansen, "WARLOC: A High-Power Coherent 94 GHz Radar," *IEEE Trans. Aerospace Electronic Systems*, 2008, v. 44, n. 3, pp. 1102–1117.
- [62] Bonifazi, C., Ruggieri, M., and Paraboni, A., "The DAVID Mission in the Heritage of SIRO and ITALSAT Satellites," *IEEE Trans. Aerospace Electron Syst.*, 38, pp.1371-1376, (2002).
- [63] Jebiril, A., Fragale, C., Lucente, M., Ruggieri, M., and Rossi, T., "WAVE – A new satellite mission in W-band," *Proc. IEEE Aerospace Conference*, Big. Sky, USA, paper no. 1007, 2005.
- [64] Stephends, G. L., Vane, D. G., Boain, R. J., Mace, G. G., Sassen, K., Wang, Z., Illingworth, A. J., O'Connor, E. J., W. B. Rossow, S. L. Durden, S. D. Miller, R. T. Austin, A. Benedetti, and C. Mitrescu, "The Cloud Sat mission and the A-Train," *Bull. Amer. Meteorol. Soc.*, 83, pp. 1771-1790, 2002.
- [65] W. Lawson, J. Calame, B. Hogan, P. E. Latham, M. E. Read, V. L. Granatstein, M. Reiser, and C. D. Striffler, "Efficient Operation of a High Power X-Band Gyro klystron," *Phys. Rev. Lett.*, 1991, v. 67, pp. 520-523.
- [66] P. E. Latham, W. Lawson, V. Irwin, B. Hogan, G. S. Nusinovich, H. W. Matthews, and M. K. E. Flaherty, "High Power Operation of an X-Band Gyro twistron," *Phys. Rev. Lett.*, 1994, v. 72, n. 23, pp. 3730–3734.
- [67] W Lawson, P. E. Latham, J. P. Calame, J. Cheng, B. Hogan, G. S. Nusinovich, V. L. Granatstein, M. Reiser, "High Power Operation of Fundamental-Mode and Second Harmonic Gyro-twystrons," *J. Appl. Phys.*, 1995, v. 78,
- [68] W. Lawson, R. L. Ives, M. Mizuhara, J. M. Neilson, and M. E. Read, "Gyro klystron for Advanced Accelerator Applications," *IEEE Trans. Plasma Sci.*, 2001, v. 29, n. 3, pp. 545–558.
- [69] L. Wang, K. Dong, J. Wang, Y. Luo, W. He, A. W. Cross, K. Ronald, and A. D. R. Phelps, "Design of a Ka-Band MW Level High Efficiency Gyro klystron for

- Accelerators,” *2017 10th UK-Europe-China Workshop on Millimetre Waves and Terahertz Technologies, UCMMT 2017*, vol. 12, pp. 1752–1757, 2017.
- [70] R. Q. Twiss, “Radiation Transfer and the Possibility of Negative Absorption in Radio Astronomy,” *Australian J. Phys.*, 1958, v. 11, pp. 564–579.
- [71] A. V. Gaponov, “Interaction Between Electron Fluxes and Electromagnetic Waves in Waveguides,” *Izv. VUZ., Radiofizika*, 1959, v. 2, pp. 450–462; and “Addendum,” *Izv. VUZ., Radiofizika*, 1959, v. 2, pp. 836–837.
- [72] J. Schneider, “Stimulated Emission of Radiation by Relativistic Electrons in a Magnetic Field,” *Phys. Rev. Lett.*, 1959, v. 2, n. 12, pp. 504–505.
- [73] V. V. Zheleznyakov, “On the Instability of Magneto-Active Plasma Relative to High-Frequency Electromagnetic Perturbations,” *Izv. VUZov Radiofizika*, 1960, v. 3, no. 1, pp. 57–66.
- [74] A. V. Gaponov, A. L. Goldenberg, D. P. Grigor’ev, I. M. Orlova, T. B. Pankratova, and M. I. Petelin, “Induced Synchrotron Radiation of Electrons in Cavity Resonators,” *JETP Lett.*, 1965, v. 2, pp. 267–269.
- [75] A. V. Gaponov, M. I. Petelin, and V. K. Yulpatov, “The Induced Radiation of Excited Classical Oscillators and its Use in High Frequency Electronics,” *Radiophys. Quantum Electron*, 1967, v. 10, pp. 794.
- [76] V. V. Alikeev, G. A. Bobrovskii, M. M. Ofitserov, V. I. Poznyak, and K. A. Razumova, “Electron-Cyclotron Heating on the Tokamak TM-3,” *JETP Lett.*, 1972, v. 15, pp. 27–31.
- [77] I. I. Antakov, M. A. Moiseev, E. V. Sokolov, and E. V. Zasyrkin, “Theoretical and Experimental Investigation of X-Band Two-Cavity Gyroklystron,” *Int. J. of Infrared and Millimeter Waves*, 1994, v. 15, pp. 873–887.
- [78] E. V. Zasyrkin, M. A. Moiseev, I. G. Gachev, and I. I. Antakov, “Study of High-Power Ka-Band Second Harmonic Gyro klystron Amplifier,” *IEEE Trans. Plasma Sci.*, 1996, v. 24, pp. 666–670.
- [79] V. L. Granatstein and W. Lawson, “Gyro-Amplifiers as Candidate RF Drivers for TeV Linear Colliders,” *IEEE Trans. Plasma Sci.*, 1996, v. 24, pp. 648–665.

- [80] J. Choi, A. H. McCurdy, F. Wood, R. H. Kyser, J. P. Calame, K. Nguyen, B. G. Danly, T. Antonsen, B. Levush, and R. K. Parker, "Experimental Investigation of a High Power, Two-Cavity, 35 GHz Gyro klystron Amplifier," *IEEE Trans. Plasma Sci.*, 1998, v. 26, pp. 416–425.
- [81] J. P. Calame, M. Garven, J. J. Choi, K. Nguyen, F. Wood, M. Blank, B. G. Danly, and B. Levush, "Experimental Studies of Bandwidth and Power Production in a Three-Cavity, 35 GHz, Gyroklystron Amplifier," *Phys. Plasmas*, 1998, v. 6, pp. 285–297.
- [82] M. Garven, J. P. Calame, K. T. Nguyen, B. G. Danly, B. Levush, and F. N. Wood, "Experimental Studies of a Four-Cavity, 35 GHz Gyroklystron Amplifier," *IEEE Trans. Plasma Sci.*, 2000, v. 28, n. 3, pp. 672–680.
- [83] M. Blank, B. G. Danly, B. Levush, J. P. Calame, K. Nguyen, D. Pershing, J. Petillo, T. Hargreaves, R. True, A. Theiss, G. Good, K. Felch, B. James, P. Borchard, T. Chu, H. Jory, W. Lawson, and T. Antonsen, "Demonstration of 10 kW Average Power 94 GHz Gyro klystron Amplifier," *Phys. Plasmas*, 1999, v. 6, pp. 4405–4410.
- [84] W. Lawson, J. Calame, B. Hogan, P. E. Latham, M. E. Read, V. L. Granatstein, M. Reiser, and C. D. Striffler, "Efficient Operation of a High Power X-Band Gyroklystron," *Phys. Rev. Lett.*, 1991, v. 67, pp. 520-523.
- [85] S. G. Tantawi, W. T. Main, P. E. Latham, G. S. Nusinovich, W. G. Lawson, C. D. Striffler and V. L. Granatstein, "High-Power X-Band Amplification from an Overmoded Three-Cavity Gyro klystron with a Tunable Penultimate Cavity," *IEEE Trans. Plasma Sci.*, 1992, v. 20, pp. 205–215.
- [86] L. R. Barnett, K. R. Chu, J. M. Baird, V. L. Granatstein, and A. T. Drobot, "Gain, Saturation and Bandwidth Measurements of the NRL Gyrotron Traveling Wave Tube," *IEEE Int. Electron Devices Meeting*, 1979, pp. 164–167.
- [87] R. S. Symons, H. R. Jory, S. J. Hegji, and P. E. Ferguson, "An Experimental Gyro-TWT," *IEEE Trans. Microwave Theory Tech.*, 1981, v. 29, pp. 181–184.
- [88] K. C. Leou, D. B. McDermott, and N. C. Luhmann, Jr., "Large- Signal Characteristic of a Wide-Band Dielectric-Loaded Gyro-TWT Amplifier," *IEEE Trans. Plasma Sci.*, 1996, v. 24, n. 6, pp. 718–726.

- [89] G. G. Denisov, V. L. Bratman, A. W. Gross, W. He, A. D. R. Phelps, K. Ronald, S. V. Samsonov, and C. G. Whyte, "Gyrotron Traveling Wave Amplifier with a Helical Interaction Waveguide," *Phys. Rev. Lett.*, 1998, v. 81, pp. 5680–5683.
- [90] K. R. Chu, H. Y. Chen, C. L. Hung, T. H. Chang, L. R. Barnett, S. H. Chen, T. T. Yang, and D. Dialetis, "Theory and Experiment of Ultrahigh Gain Gyrotron Traveling-Wave Amplifier," *IEEE Trans. Plasma. Sci.*, 1999, v. 27, n. 4, pp. 391–404.
- [91] J. P. Calame, M. Garven, B. G. Danly, B. Levush, and K. T. Nguyen, "Gyrotron-Traveling Wave-Tube Circuits Based on Lossy Ceramics," *IEEE Trans. Electron Devices*, 2002, v. 49, n. 8, pp. 1469–1477.
- [92] Wang, Y. Luo, Y. Xu, R. Yan, Y. Pu, X. Deng, and H. Wang, "Simulation and Experiment of a Ku-Band Gyro-TWT," *IEEE Trans. Electron Devices*, 2014, v. 61, n. 6, pp. 1818–1823.
- [93] R. Yan, Y. Tang, and Y. Luo, "Design and Experimental Study of a High-Gain W-Band Gyro-TWT with Nonuniform Periodic Dielectric Loaded Waveguide," *IEEE Trans. Electron Devices*, 2014, v. 61, n. 7, pp. 2564–2569.
- [94] Y. Xu *et al.*, "Proof-of-Principle Experiment of a 20-kW-Average-Power Ka-Band Gyro-Traveling Wave Tube With a Cut-Off Waveguide Section," in *IEEE Electron Device Letters*, vol. 41, no. 5, pp. 769-772, May 2020.
- [95] H. Li, J. Wang, Y. Yao and Y. Luo, "Development of High-Efficiency Gyro-TWT With a Nonuniform Dielectric-Loaded Circuit," in *IEEE Transactions on Electron Devices*, vol. 66, no. 6, pp. 2764-2770, June 2019.
- [96] Shou-Xi Xu ,Zhi-Hui Geng ,Wei Gu, Jie Yang, Jian Zhang and Rui Zhang, "Design and simulation of a W-band gyrotron traveling wave amplifier" *Journal of Electromagnetic Waves and Applications* ,2021,v.35,n.17, pp. 2384-2395.
- [97] G. Liu , W. Jiang , Y. Yao , Y. Wang , W. Wang , Y. Cao, J. Wang , and Y. Luo, "High Average Power Test of a W-Band Broadband Gyrotron Traveling Wave Tube," *IEEE Electron Device Letters*, vol. 43, no. 6, pp. 950-953, June 2022.
- [98] <http://www.radartutorial.eu/08.transmitters/twystron.en.html>

- [99] V. L. Bratman, M. A. Moiseev, M. I. Petelin, and R. E. Erm, "Theory of Gyrotrons with a Non-Fixed Structure of the High-Frequency Field," *Radiophys. Quantum Electron.*, 1973, v. 16, n. 4, pp. 622-630.
- [100] M. A. Moiseev, "Maximum Amplification Band of a CRM Twistron," *Radiophys. Quantum Electron.*, 1977, v. 20, n. 8, pp. 1218-1223.
- [101] T. M. Tran, K. E. Kreischer, and R. J. Temkin, "Theory of harmonic gyro-twistron," MIT Plasma Science and Fusion Center 1985.
- [102] T. M. Tran, B. G. Danly, K. E. Kreischer, J. B. Schutkeker, R. J. Temkin, "Optimization of gyro klystron efficiency," *Phys. Fluids*, 1986, v. 29 n. 4 pp. 1274-1281.
- [103] G. S. Nusinovich, and H. Li, "Theory of Gyro-Travelling-Wave Tubes at Cyclotron Harmonics," *Int. J. Electron.*, 1992, v. 72, n. 6, pp. 895-907.
- [104] G. S. Nusinovich and H. Li, "Theory of the Relativistic gyro-twistron," *Phys. Fluids B*, 1992, v. 4, n. 4, pp. 1058-1065.
- [105] P. E. Latham, G. S. Nusinovich, and J. Cheng, "Stability of Gyro twistrons," *Proc. Particle Accel. Conf.*, 1993, pp. 2659-2660.
- [106] P. E. Latham and G. S. Nusinovich, "Optimum Operation of Gyro twistrons," *Proc. Particle Accel. Conf.*, 1993, pp. 2661-2663.
- [107] P. E. Latham and G. S. Nusinovich, "Theory of Relativistic Gyro-Traveling Wave Devices," *Phys. Plasmas*, 1995, v. 2, n. 9, pp. 3494-3510.
- [108] P. E. Latham and G. S. Nusinovich, "Stability Analysis of Relativistic Gyro-Traveling Wave Devices," *Phys. Plasmas*, 1995, v. 2, n. 9, pp. 3511-3523.
- [109] W. Lawson, P. E. Latham, J. P. Calame, J. Cheng, B. Hogan, G. S. Nusinovich, V. L. Granatstein, M. Reiser, "High Power Operation of Fundamental-Mode and Second Harmonic Gyro-twistrons," *J. Appl. Phys.*, 1995, v. 78, pp. 550-559.
- [110] Perry Malouf and Victor Granatstein, "Design and Computer Simulation of a Gyro-twistron," *Int. J. Electron.*, 1992, v. 72, n. 6, pp. 943-958.
- [111] G. S. Nusinovich, P. M. Malouf, and V. L. Granatstein, "Theory of Gyro twistrons with Mixed Transverse Geometries of the Various Stages," *IEEE Trans. Plasma Sci.*, 1994, v. 22, n. 5, pp. 518-525.

- [112] P. M. Malouf, V. L. Granatstein, S. Y. Park, G. S. Park, C. M. Armstrong, "Performance of a Wideband Three-Stage Mixed Geometry Gyro-twystron Amplifier," *IEEE Trans. Electron Devices*, 1995, v. 42, n. 9, pp. 1681-1685.
- [113] Perry M. Malouf, and Grigory S. Nusinovich. "Microwave Amplifier Having Cross-Polarized Cavities," U.S. Patent Application 08/610, 778, filed November 3, 1998.
- [114] M. Blank, E. V. Zasyrkin, and B. Levush, "An Investigation of X-Band Gyro twystron Amplifiers," *IEEE Trans. Plasma Sci.*, 1998, v. 26, n. 3, pp. 577-581.
- [115] C. S. Kou, M. H. Wu and Fourier Tseng, "Nonlinear Analysis of a Multi-Cavity Gyro-twystron," *Int. J. Infrared and Millimeter Waves*, 1997, v. 18, n. 10, pp. 1857-1883.
- [116] Chu KR., Latham PE, Granatstein VL. Penultimate cavity tuning of the gyro klystron amplifier. *Int. J. Electron.* 1988; 65(3): 419-428.
- [117] Symons R., Vaughan R. The linear theory of the clustered cavity klystron. *IEEE Trans. Plasma Sci.* 1994; 22 (5):713-718.
- [118] Nusinovich GS, Danly BG, Levush,. Nonlinear analysis bandwidth in stagger-tuned gyro klystrons. *Physics of Plasmas*. 1997; 4(2): 469-478.
- [119] G. S. Nusinovich, W. Chen, and V. K. Tripathi, "Linear theory of a gyro twystron with stagger-tuned cavities," *IEEE Trans. Plasma Sci.*, vol. 26, no. 3, pp. 468-474, Jun. 1998.
- [120] W. Chen, G. S. Nusinovich, and V. L. Granatstein, "Nonlinear theory of gyro twystrons with stagger-tuned cavities," *IEEE Trans. Plasma Sci.*, vol. 27, no. 2, pp. 429-437, Apr. 1999.
- [121] M. Blank, B. G. Danly, and B. Levush, "Experimental Demonstration of a W-Band 94 GHz Gyro twystron Amplifier," *IEEE Trans. Plasma Sci.*, 1999, v. 27, n. 2, pp. 405-411.
- [122] M. Blank, K. Felch, B. G. James, P. Borchard, P. Cahalan, T. S. Chu, H. Jory, B. G. Danly, B. Levush, J. P. Calame, K. T. Nguyen, and D. E. Pershing, "Development and Demonstration of High-Average Power W-Band Gyro-

- Amplifiers for Radar Applications,” *IEEE Trans. Plasma Sci.*, 2002, v. 30, n. 3, pp. 865–875.
- [123] R. Ngogang, G. S. Nusinovich, T. M. Antonsen, and V. L. Granatstein, “Wave interaction in relativistic harmonic gyro-traveling-wave devices,” *Physical Review E*, 2006, v. 73, n. 5, pp. 1–11
- [124] Blank M, Danly BG, Levush B. Circuit Design of a Wideband W-Band Gyro klystron Amplifier for Radar Applicatios. *IEEE Trans. Plasma Sci.* 1998; 26(3): 426-432.
- [125] K. R. Chu, V. L. Granatstein, P. E. Latham, W. Lawson and C. D. Striffler, "A 30-MW Gyroklystron-Amplifier Design for High-Energy Linear Accelerators," in *IEEE Transactions on Plasma Science*, vol. 13, no. 6, pp. 424-434, Dec. 1985.
- [126] C. S. Kou, Q. S. Wang, D. B. McDermott, A. T. Lin, K. R. Chin and N. C. Luhmann, "High-power harmonic gyro-TWT's. I. Linear theory and oscillation study," in *IEEE Transactions on Plasma Science*, vol. 20, no. 3, pp. 155-162, June 1992.
- [127] S. Ruess et al., "An Inverse Magnetron Injection Gun for the KIT 2- MW Coaxial-Cavity Gyrotron," *IEEE Trans. Electron Devices*, vol. 63, no. 5, pp. 2104-2109, 2016.
- [128] K. Dong, Y. Luo, W. Jiang, H. Fu, and S. F. Wang, "Magnetron Injection Gun Design for Multifrequency Band Operations," *IEEE Trans. Electron Devices*, vol. 63, no. 9, pp. 3719-3724, Sep 2016.
- [129] K. Nguyen, B. Danly, B. Levush, M. Blank, C. Liu and T. Antonsen, "Design of magnetron injection gun for 94 GHz gyro-amplifiers," *IEEE Conference Record - Abstracts. 1996 IEEE International Conference on Plasma Science*, pp. 264, 1996.
- [130] K. Nguyen *et al.*, "Electron gun and collector design for 94-GHz gyro-amplifiers," *Proceedings of the 1997 Particle Accelerator Conference (Cat. No.97CH36167)*, 1997, pp. 3180-3182 vol.3.
- [131] C. P. Yuan, T. H. Chang, N. C. Chen and Y. S. Yeh, "Magnetron injection gun design for broadband gyrotron backward-wave oscillator," *2009 34th*

*International Conference on Infrared, Millimeter, and Terahertz Waves*, 2009, pp. 1-2.

- [132] L. Zhang, L. J. R. Nix and A. W. Cross, "Magnetron Injection Gun for High-Power Gyro klystron," in *IEEE Transactions on Electron Devices*, vol. 67, no. 11, pp. 5151-5157, Nov. 2020.
- [133] A. Kumar, U. Singh, N. Kumar, N. Kumar, V. Vyas and A. K. Sinha, "Design of a Triode Magnetron Injection Gun for a 1-MW 170-GHz Gyrotron," in *IEEE Transactions on Plasma Science*, vol. 40, no. 9, pp. 2126-2132, Sept. 2012.
- [134] CST-Particle Studio, *User's Manual*, Darmstadt, Germany, 2016.
- [135] G. P. Saraph, V. L. Granatstein, and W. Lawson, "Design of a single stage depressed collector for high-power, pulsed gyroklystron amplifiers," *IEEE Trans. Electron Devices*, vol. 45, no. 4, pp. 986–990, Apr. 1998.
- [136] D. Bhattacharya, N. K. Sahu, A. A. Khan, H. Khatun, and A. K. Sinha, "Electrical and thermo-mechanical analysis of beam recovery system for megawatt power gyrotron," *Fusion Eng. Design*, vol. 88, no. 4, pp. 253–257, Mar. 2013.
- [137] T.M.Antonsen Jr, S.Y.Cai, and G.S.Nusinovich, "Effect of window reflection on gyrotron operation," *Physics of Fluids B: Plasma Physics*, vol. 4, no. 12, pp.4131-4139, 1992.
- [138] K. J. Bunch, and R. W. Grow, The helically wrapped circular waveguide. *IEEE Trans. Electron Dev.*, vol. 34, pp. 1873-1884, 1987.
- [139] K. C. Leou, T. Pi, D. B. McDermott, and N. C. Luhmann, "Circuit design for a wide-band disk-loaded gyro-TWT amplifier," *IEEE Trans. Plasma Sci.*, vol. 26, pp. 488-495, 1998.
- [140] S. J. Cooke, and G. G. Denisov, "Linear theory of wide-band gyro-TWT Amplifier using spiral waveguide," *IEEE Trans. Plasma Sci.*, vol. 26, pp. 519-530, 1998.
- [141] P. J. B. Clarricoats and P. K. Saha, "Propagation and radiation behaviour of corrugated feeds Part 1—Corrugated-waveguide feed," *Proc. IEE*, vol. 118, pp. 1167-1176, 1971.

- [142] P. K. Saha and P. J. B. Clarricoats, "Propagation and radiation behaviour of corrugated coaxial horn feed," *Proc. IEE*, vol. 118, pp. 1177-1186, 1971.
- [143] P. J. B. Clarricoats, "Propagation behaviour of periodically loaded waveguides containing dielectric and ferrimagnetic materials," *Proc. IEE*, vol. 115, pp. 652-661, 1968.
- [144] G. Singh, S. M. S. Ravi Chandra, P. V. Bhaskar, P. K. Jain, and B. N. Basu, "Analysis of dispersion and interaction impedance characteristics of an azimuthally-periodic vane-loaded cylindrical waveguide for a gyro-TWT," *Int. J. Electronics*, vol. 86, pp. 1463-1479, 1999.
- [145] J. Esteban and J. M. Rebollar, "Characterization of corrugated waveguides by modal analysis," *IEEE Trans. Microwave Theory Tech.*, vol. 39, pp. 937-943, 1991.
- [146] G. P. Anastasiou, G. P. Latsas, I. G. Tigelis, M. Dehler, P. Queffelec, and N. F. Dasyras, "Calculation of the electromagnetic waves in nonperiodic corrugated waveguides with dielectric loading," *IEEE Trans. Plasma Sci.*, vol. 32, pp. 1310-1316, 2004.
- [147] H. Li and X. Li, "Analysis and calculation of an electron cyclotron maser having inner and outer slotted structure," *Int. J. Electronics*, vol. 70, pp. 213-219, 1991.
- [148] S. Amari, J. Bornemann, and R. Vahldieck, "Application of a coupled-integral-equations technique to ridged waveguides," *IEEE Trans. Microwave Theory Tech.*, vol. 44, pp. 2256-2264, 1996.
- [149] S. Amari, R. Vahldieck, and J. Bornemann, "Analysis of propagation in periodically loaded circular waveguides," *IEE Proc. Microw. Antennas Propag.*, vol. 146, pp. 50-54, 1999.
- [150] P. K. Jain and B. N. Basu, "Electromagnetic wave propagation through helical structures," in the monograph: *Electromagnetic fields in Unconventional Materials* (John Wiley & Sons, USA: Editors: O. N. Singh and A. Lakhtakia) (2000).
- [151] S. Sensiper, "Electromagnetic Wave Propagation on Helical Structures (A Review and Survey of Recent Progress)," in *Proceedings of the IRE*, vol. 43, no. 2, pp. 149-161, Feb. 1955.

- [152] Y. Y. Lau, K. R. Chu, L. R. Barnett, and V. L. Granatstein, Gyrotron travelling wave amplifier: I. Analysis of oscillations," *Int. J. Infr. Millim. Waves*, vol. 2, no. 3, pp. 373–393, May 1981.
- [153] H. Hahn, "On the analysis of periodic waveguide discontinuities by modal field matching," *Int. J. Electronics and Comm., AEU*, vol. 32, pp. 81-85, 1978.
- [154] D. B. McDermott, H. H. Song, Y. Hirata, A. T. Lin, L. R. Barnett, T. H. Chang, et al., " Design of a W-band TE 01 mode gyrotron traveling-wave amplifier with high power and broad-band capabilities ", *IEEE Trans. Plasma Sci.*, vol. 30, no. 3, pp. 894-902, 2002.
- [155] H.H.Song, D.B.McDermott, Y.Hirata, L.R.Barnett, C.W.Domier, H.L.Hsu, T.H.Chang, W.C.Tsai, K.R.Chu, and N.C.Luhmann, "Theory and experiment of a 94 GHz gyrotron traveling-wave amplifier," *Phys. Plasmas*, vol. 11, no. 5, pp. 2935–2941, May 2004.
- [156] C. H. Du et al., "Design of a W-band gyro-TWT amplifier with a lossy ceramic-loaded circuit", *IEEE Trans. Electron Devices*, vol. 60, no. 7, pp. 2388-2394, Jul. 2013.
- [157] C.H. Du and P.-K. Liu, "A lossy dielectric-ring loaded waveguide with suppressed periodicity for gyro-TWTs applications," *IEEE Trans. Electron Devices*, vol. 56, no. 10, pp. 2335–2342, Oct. 2009.
- [158] V. Kesari, P. K. Jain, and B. N. Basu, "Analysis of a circular waveguide loaded with thick annular metal discs for wide-band gyro-TWTs," *IEEE Trans. Plasma Sci.*, vol. 33, no. 4, pp. 1358–1365, Aug. 2005.
- [159] C.H. Du and P.-K. Liu, "Beam-wave coupling strength analysis in a gyrotron traveling-wave amplifier," *J. Infr., Millim., Terahertz Waves*, vol. 31, no. 6, pp. 714–723, Mar. 2010.
- [160] J. Seftor, A. Drobot and K. R. Chu, "An investigation of a magnetron injection gun suitable for use in cyclotron resonance masers", *IEEE Trans. Electron Devices*, vol. 26, pp. 1609-1616, Oct. 1979.
- [161] J. Y. Choe and H. S. Uhm, "Theory of gyrotron amplifiers in disc or helix loaded waveguides," *Int. J. Electron.*, vol. 53, no. 6, pp. 729–741, Jun. 1982.

- [162] C. H. Du, P. K. Liu, Q. Z. Xue, and M. H. Wang, "Effect of a backward wave on the stability of an ultrahigh gain gyrotron traveling wave amplifier," *Phys. Plasmas*, vol. 15, no. 12, pp. 123107-1–123107-3, Dec. 2008.
- [163] G. Liu *et al.*, "High Average Power Test of a W-Band Broadband Gyrotron Traveling Wave Tube," in *IEEE Electron Device Letters*, vol. 43, no. 6, pp. 950-953, June 2022.
- [164] I. G. Tigelis, J. L. Vomvoridis and S. Tzima, "High-frequency electromagnetic modes in a dielectric-ring loaded beam tunnel," in *IEEE Transactions on Plasma Science*, vol. 26, no. 3, pp. 922-930, June 1998.
- [165] C. S. Kou and F. Tseng, "Linear theory of gyrotron traveling wave tubes with nonuniform and lossy interaction structures," *Phys. Plasmas*, vol. 5, no. 6, pp. 2454–2461, June 1998.
- [166] A. S. Singh and M. Thottappan, "Stability Study in Dielectric Ring Loaded Periodic Interaction Structure for a Megawatt Class Gyro-twystron," in *IEEE Transactions on Electron Devices*, vol. 65, no. 10, pp. 4585-4591, Oct. 2018.
- [167] Y. Tang *et al.*, "Multimode Steady-State Analysis for a Gyrotron Traveling Wave Amplifier Based on a Distributed Loss-Loaded Metal Cylindrical Waveguide," in *IEEE Transactions on Electron Devices*, vol. 64, no. 2, pp. 543-549, Feb. 2017.
- [168] R. E. Collin, *Foundation for Microwave Engineering*, New York: McGraw-Hill, 1988.
- [169] S. G. Yadav, Akash and M. Thottappan, "Design and Simulation Investigations of Stagger-Tuned W-Band Gyro-Twystron," *IEEE Trans. Electron Devices*, vol. 69, no. 2, pp. 777-784, Feb. 2022.
- [170] C. R. Donaldson, P. McElhinney, L. Zhang and W. He, "Wide-Band HE<sub>11</sub> Mode Terahertz Wave Windows for Gyro-Amplifiers," in *IEEE Transactions on Terahertz Science and Technology*, vol. 6, no. 1, pp. 108-112, Jan. 2016.
- [171] Nusinovich GS, Danly BG, Levush B. "Gain and bandwidth in stagger-tuned gyro klystrons". *Physics of Plasmas*, vol. 4, no. 2, pp. 469-478, 1997.

- [172] Nusinovich GS, Antonsen TM, Guo H., and Granatstein VL. “Theory of clustered-cavity gyro klystron”. *Phys. Plasmas*, vol. 9, no. 9, pp. 4032–4039, 2002.
- [173] Sinitsyn OV, Nusinovich GS, Granatstein VL. Comparison of two concepts: Multi-cavity versus clustered-cavity gyrokystrons. Proceedings of American Institute of Physics Conference; 2003 Dec 1-3; Washington, DC (USA): p. 378–385, 2003.



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## AUTHOR'S RELEVANT PUBLICATIONS

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### Journals:

**S. G. Yadav**, Akash and M. Thottappan, "Design and Simulation Investigations of Stagger-Tuned W-Band Gyro-Twystron," in *IEEE Transactions on Electron Devices*, vol. 69, no. 2, pp. 777-784, Feb. 2022, doi: 10.1109/TED.2021.3137366.

**S. G. Yadav**, Vangalla Veera Babu, and M. Thottappan, "Gain and Bandwidth Improvement Studies of Millimeter Wave Periodically Dielectric Loaded Gyro-Twystron Amplifier," in *IEEE Transactions on Electron Devices*, doi:10.1109/TED.2022.3217760

### Conferences (International):

**S. G. Yadav**, A. S. Singh and M. Thottappan, "3D Particle-In-Cell Simulation of W-band Gyro-Twystron Amplifier," *2018 IEEE MTT-S International Microwave and RF Conference (IMaRC)*, 2018, pp. 1-4, doi: 10.1109/IMaRC.2018.8877115. **(Oral presentation)**

**S. G. Yadav**, A. S. Singh and M. Thottappan, "PIC Simulation of a Periodically Dielectric Loaded Millimeter Wave Gyro-twystron Amplifier," *2019 IEEE Asia-Pacific Microwave Conference (APMC)*, 2019, pp. 357-359, doi: 10.1109/APMC46564.2019.9038451. **(Oral presentation)**

**S. G. Yadav**, Vangalla Veera babu and M. Thottappan, " Design and PIC Simulation Studies of Cluster Cavity W-Band Gyro-Twystron," *2022 IEEE Microwave, Antennas, and Propagation Conference (MAPCON)*, 2022, **(Oral presentation)**

Vangalla Veera babu, **S. G. Yadav** and M. Thottappan, " Design and PIC Simulation of Millimeter Wave Stagger Tuned Gyro-Twystron," *2022 IEEE Microwave, Antennas, and Propagation Conference (MAPCON)*, 2022, **(Oral presentation)**

### Conferences (National):

**S. G. Yadav**, **A.S. Singh** and M. Thottappan, " Beam-Wave Interaction Studies of W band Gyro-twystron," *2018 National Conference on Emerging Trends in Vacuum Electronic Devices & Applications (VEDA)*, IIT Guwahati. **(Oral presentation)**

