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60 GHz-300 kW Gyrotron General Design for the Mexican Tokamak "T"

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An important system into the magnetic confinement devices to obtain appropriate knowledge on plasma behavior in nuclear fusion is the electron cyclotron resonance heating (ECRH). We present the preliminary design of our source for ECRH system applied in our Tokamak device, a gyrotron device 60 GHz-300 kW which is currently developed by the Fusion Research Group (GIF, Spanish acronyms) at the Universidad Autónoma de Nuevo León (UANL) in Monterrey, Mexico.
It is present a gyrotron general design characterized whit a magnetic intensity of 2.56 T, required into the cavity to arise 60 GHz high-power millimeter frequency in the fundamental harmonic and nominal beam parameters such as interaction region to cathode ratio of a magnetic compression of 13.68; a beam voltage of 100 kV, a beam current of 3 A, and transverse to axial velocity ratio of 1.5. From analytical adiabatic trade-off equations a triode type magnetron injection gun is designed. The mean radio of the emitter (7.3 mm), slant length of the emitting surface (8.8 mm), cathode modulating anode gap (11.5 mm), slope angle of emitter (40 degree) are obtained. These results are supported by 2D computer simulations performed by COMSOL Multiphysics and optimized using the electron optics finite element code EGUN.

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