

# Development of 28/35 GHz Dual-Frequency and 14 GHz Gyrotrons for Advanced Fusion Devices

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Univ. of Tsukuba has been developing over 1 MW gyrotrons of **14GHz to sub-THz** for Fusion Devices and for Demo in collaboration with Kyushu-U., NIFS, QST, Kyoto-U., PPPL and CETD.

## 1. 28/35 GHz Dual-freq. Gyrotron

(Achieved : 1.65 at 28.04 GHz; 1.21 MW at 34.83 GHz)

- Comparing the experimental results with the calculated results, the capability of 0.4 MW with CW at 28 GHz has been confirmed.
- After demonstration of 0.13 MW 30 s, the cooling system and RF transmission system were reviewed and improved for the 0.4 MW CW operation of the gyrotron and plasma injection at GAMMA 10/PDX.
- Using this gyrotron, ECH experiment was performed in the GAMMA10/PDX plasma. Useful results for the ECH in the pilot GAMMA PDX/SC which is being constructed were obtained.

## 2. 14 GHz Gyrotron

(for GAMMA 10/PDX, QUEST, Heliotron J, NSTX-U, LHD)

- Production of the 14 GHz gyrotron parts is in progress along with the built-in corrugated waveguide design for optimizing the output efficiency.

	14 GHz Gyrotron	28/35 GHz Dual-Frequency Gyrotron	
Frequency	14 GHz	28 GHz	34.77 GHz
Output Power	> 1 MW	2 MW	0.4 MW
Pulse Width	> 5 s	3 s	CW
Output Efficiency	35% (with CPD)	50% (with CPD)	
Beam Voltage	75–80 kV	80 kV	70 kV
Beam Current	50 A	70 A	20 A
MIG	Triode	Triode	
Cavity Mode	TE <sub>4,2</sub>	TE <sub>4,5</sub>	TE <sub>10,6</sub>
Output Mode	HE <sub>1,1</sub> Waveguide Mode	Gaussian-like	
Output Window	Sapphire Double Disk	Sapphire Double Disk	
Collector	Depressed Collector (CPD)	Depressed Collector (CPD)	
	Sweeping Coils	Sweeping Coils	

