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ECRH experiments on Tokamaks SST-1 & Aditya-U and ECRH upgradation plan for SST-1

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A 42GHz-500kW ECRH system [1] is used to carry out various experiments related to plasma breakdown and ECR heating on tokamaks SST-1 and Aditya-U. The system has been upgraded with new anode modulator power supply to launch two ECRH pulses to carry out breakdown and heating simultaneously. In SST-1, ECRH system is used routinely for plasma breakdown at fundamental harmonic, approximately 150kW power is launched for 70ms to 150ms duration and consistent plasma start-up is achieved in SST-1. In the recent experiments, second EC pulse is also launched at the plasma flat-top to heat the plasma, some heating signatures are seen but more experiments will be carried out to confirm the plasma heating with ECRH. In Aditya-U tokamak, simultaneous plasma breakdown and heating experiments are carried out successfully [2]. In the first pulse around 100kW power in fundamental O-mode is launched for 70ms duration for the breakdown at low-loop voltage and around 150kW ECRH power for 50ms duration is launched in second EC pulse to heat the plasma. In case of Aditya-U, plasma heating is observed clearly as soft X-ray signal increases sharply with ECRH. In Aditya-U tokamak, deuterium plasma experiments have been carried out and ECRH launched at the flat-top of deuterium plasma current. In deuterium plasma also ECR heating is observed as soft X-ray signal increases with ECH power. For SST-1, ECRH system is being upgraded with another 82.6GHz system, this system would be used to carry out plasma heating and start-up at second harmonic. The 82.6GHz system is already connected with the SST-1 tokamak, the old 82.6GHz-200kW Gyrotron will be upgraded to 400kW system to carry out effective heating experiments on SST-1 at higher ECRH power. The paper would discuss the recent results of ECRH experiments carried out on tokamaks SST-1 & Aditya-U and present the upgradation plan of EC system for SST-1.

References

[1] B SHUKLA et.al., Fusion Science and Technology vol 65, no.01, 145-153, (2014)
[2] R. TANNA et. al., Nuclear Fusion, vol. 62, no. 4 2017 (2022)

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