

21st joint workshop on electron cyclotron emission (ECE) and electron cyclotron resonance heating (ECRH)

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Electron cyclotron heating and current drive systems on DIII-D

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The electron cyclotron heating (ECH) system on DIII-D is currently comprised of four 110-GHz non-depressed collector gyrotrons. All four gyrotrons are expected to inject a total of more than 2.5 MW into the plasma for an administrative limit of 5 s during the upcoming experimental campaign. The history of the ECH system complex on DIII-D will be reviewed and future expansion includes the addition of two more 110-GHz non-depressed collector gyrotrons featuring CuCrZr collectors and one depressed collector gyrotron, all expected to be delivered in 2022.

During a previous experimental campaign, experiments carried out at 110 GHz demonstrated that electron cyclotron current drive (ECCD) in the DIII-D tokamak was almost doubled by using a novel top launch geometry compared with the conventional outside launch ports. Two new top launchers are installed and will be tested in the coming experimental campaign in 2022.

In addition to the electron cyclotron system, two new RF current drive systems are being added to DIII-D. A full scale 2-m long helicon antenna with a 1.2-MW 476-MHz klystron that powers the antenna has been installed and tested with a coupled power of 300 kW.

Another RF system being added is the lower hybrid current drive system that will launch RF from the center post of the tokamak on the high magnetic field side. The lower hybrid current drive will be powered by eight 4.6 -GHz klystrons, each able to deliver 255 kW with first experiments expected to be performed in 2023.

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