

# Experiences from long-pulse ECRH operation at W7-X

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Reaching the milestone of > 1GJ of heating energy was an important demonstration of the physical and technical capabilities of the W7-X stellarator. This milestone was achieved using exclusively ECRH power, which was also a challenge for the ECRH system itself and the handling of ECRH-specific loads on the components in the vessel. This is especially true for high density operation and not fully absorbed heating with the second harmonic O-mode (O2), where the microwave stray radiation level was minimized by specially designed reflector tiles. The stray radiation level was analyzed for different operating scenarios. In addition, sensitive components had to be protected by special shielding, which could be validated in the long pulse operation scenarios.

In addition, high reliability of the multi-megawatt and multi-gyrotron system had to be achieved. In particular, improvements in power transmission and fast gyrotron control, which are reported here, led to the above mentioned success.

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