**Development and Commissioning of Upgraded Microwave Radiometer for CTS Diagnostics at W7-X Stellarator**

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In this paper, we present the design of the upgraded microwave CTS receiver at Wendelstein 7-X. This is a heterodyne radiometer designed to perform measurements of collective Thomson scattering radiation around frequencies of both 140 GHz and 174 GHz. The key aspect of this upgrade is the additional operation frequency range around 174 GHz characterized by low electron cyclotron emission background and reduced refraction. This allows receiving the scattering radiation with improved signal-to-noise ratio and extends the set of possible scattering geometries. We have characterized the transmission losses of the passive microwave components of the receiver and the performance of down-converter units for both operation frequency ranges. The passive notch filters have been adjusted to provide a stopband attenuation of more than 50 dB and to suppress the stray radiation from the gyrotrons in the corresponding frequency ranges. Furthermore, voltage controlled variable attenuators have been included in the radiometer to protect the down-converter units during the start-up of gyrotrons. This protection system delivers more than 70 dB of additional losses in the frequency range from 136 GHz to 180 GHz. The noise factor of the system has been defined with the help of Friis formula. Finally, we present and discuss initial measurements of collective Thomson scattering.

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