Contribution submission to the conference Berlin 2024

Synthetic diamond for windows of the Heating & Current Drive System of ITER — •Sabine Schreck[1], Gaetano Aiello[1], Pablo Estebanez[2], Andreas Meier[1], Theo Scherer[1], Dirk Strauss[1], Christoph Wild[3], and Eckhard Wörner[3] — [1]Karlsruhe Institute of Technology, Institute for Applied Materials, 76021 Karlsruhe, Germany — [2]Fusion for Energy, 08019 Barcelona, Spain — [3]Diamond Materials GmbH & Co. KG, 79108 Freiburg, Germany

With the aim to heat and stabilize the plasma of the ITER research reactor microwave radiation of around 1 MW power needs to be guided from gyrotrons into the plasma. This requires a number of windows that guarantee vacuum tightness, tritium confinement and high microwave transmission. The key component of such windows is a transparent disk made of synthetic polycristalline diamond. Produced by an optimized microwave plasma assisted chemical vapor deposition (MPA-CVD) process, and after a specific post-processing the disks (D=70mm, d=1,11mm) typically exhibit a very low loss tangent ($< 2*10$ E-5). Because of the windows safety function each single disk, manufactured by Diamond Materials, needs to pass a qualification process, including the determination of the dielectric loss at disk center and its distribution over the disk area. At KIT dedicated Fabry-Perot resonators are used for the loss measurements. Further, optical inspections with a digital microscope and a determination of possible polarization effects are performed. Under a contract with F4E more than 25 disks (out of 60) have been already qualified and first conclusions can be made.

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Email: sabine.schreck@kit.edu