

# **Manufacturing of endoscopes for monitoring water-cooled divertor in Wendelstein 7-X**

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The modular stellarator Wendelstein 7-X (W7-X) in Greifswald (Germany) started operation in 2015 with short pulse limiter plasmas and continued with pulsed divertor plasmas in 2017-2018. In 2021, the next operation phase (OP) OP2 will start after installation of 10 water-cooled CFC armored divertors, allowing for steady state operation.

Since divertor heat loads are very sensitive to plasma parameters, each water-cooled divertor needs to be monitored to interrupt or adapt plasma operation once overload is detected. For that purpose ten endoscopes are planned: two in module 3 and eight more in a different type of port in the other modules. The infrared (IR) radiation from the plasma facing surface as well as the plasma edge radiation in the visible (VIS) range is captured through a pinhole in a water-cooled plasma facing head and transmitted to the rear side outside the vacuum where the light is split and captured by an IR and VIS camera. The challenge is to reach a high-resolution image of the entire target while capturing a large field of view (FOV) of 120 degrees.

In a previous [paper](#), the design was presented. In the current paper, the progress of manufacturing is shown up to the milestones of the demonstration of the optical performance and vacuum compatibility.