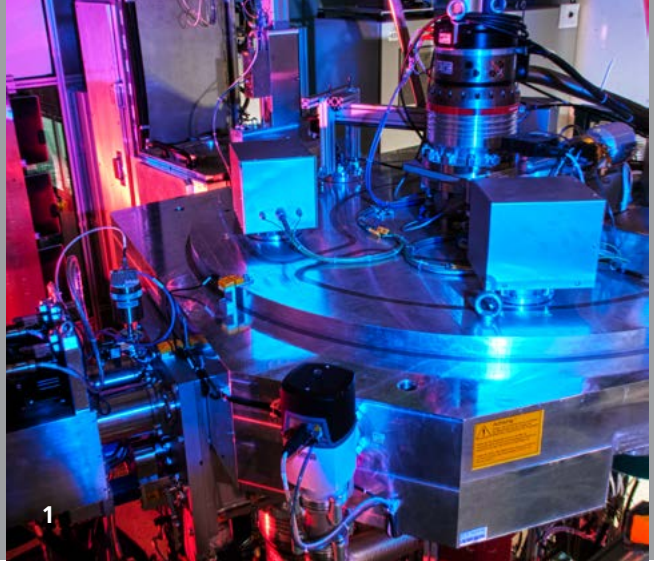

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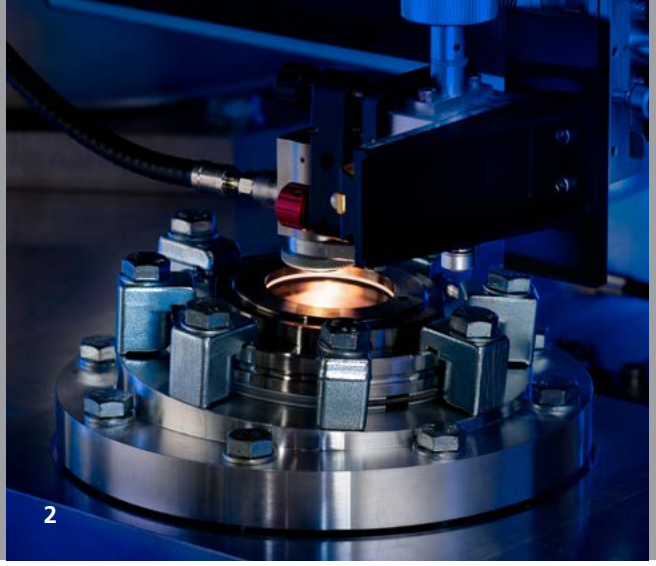

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# EOSS® PLATFORM – DEMONSTRATION OF LONG-TERM STABLE DISTRIBUTION

With the development and construction of the innovative coating platform EOSS® the Fraunhofer IST has created new possibilities for depositing highly sophisticated optical coatings. Not only are coatings with an extremely low level of defects possible but also highly complex layer designs with several hundreds of layers and this with an extreme accuracy and uniformity of coating. The Fraunhofer IST's EOSS® system platform saw further development in 2015 as well. Industrial users make high demands of the system's stability in production. Unvarying implementation of specifications requires a stable distribution of layer thickness. With the EOSS® it could be demonstrated that the concept of rotating cathodes and optimized sputtering targets is well suited for delivering outstanding homogeneity in optical filter coatings even over very long periods of weeks and months.

**EOSS® coating concept**

In the production of optical coatings the Fraunhofer IST relies on using magnetron sputtering technology. With the EOSS® platform an approach has been selected in which a batch of ten substrates each with a diameter of 200 mm is arranged on a turntable which rotates continuously at a fast speed. Using cylindrical magnetron sources rather than planar magnetrons yields decisive advantages, since the layer thickness distribution is extremely stable in the long term. The advantage is obvious: readjustments, batch planning or other measures are no longer necessary. In the case of the sputtering cathodes, sub-stoichiometric oxides among other things are used as targets. Previous research showed that this leads to improved values for the layer thickness distribution and that conditioning can be simplified significantly. Current measurements at the Fraunhofer IST show that absorption is even improved in the case of $Ta_2O_5$ as a high-index material.

The graph shows the results of a long-term investigation of layer thickness distribution. During the course of our work more than 70 layers of µm thickness (here $SiO_2$) have been deposited in different coating runs. The black curve shows the initial distribution. After ten weeks the red distribution emerged. Then the sputter compartment was opened, cleaned and a number of components replaced at the same time. Following a short period of running-in, the violet distribution was measured, which corresponds almost exactly to the initial distribution.

**Example: production of optical filters**

Long-term stability was evident not only in the creation of individual layers but also in the production of filters. The plate-to-plate distribution is also always relevant here. The second graph shows the homogeneity of the layers after ten weeks of operation with a fully populated batch with ten substrates – nine carriers and one monitoring system. In the graph the normalized position of the band edge is plotted on the y axis while the distribution on the longitudinal and transverse axes was measured relative to the movement. The shape of the curves shows clearly that the distribution is excellent even with a full batch with ten substrates each with a diameter of 200 mm.


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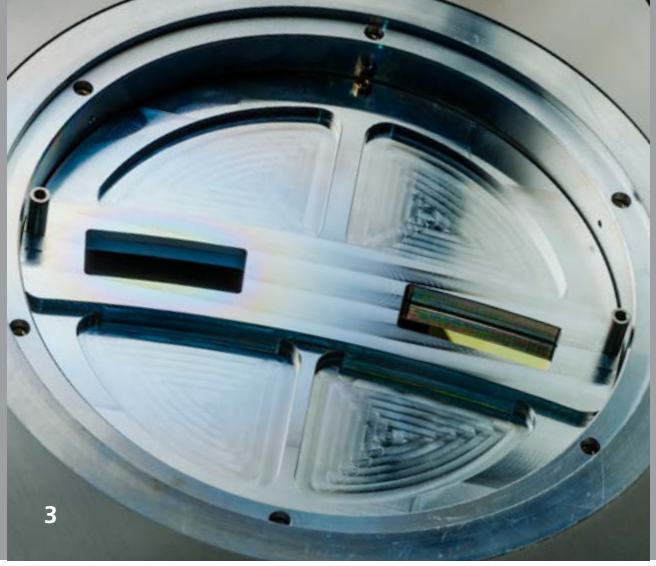
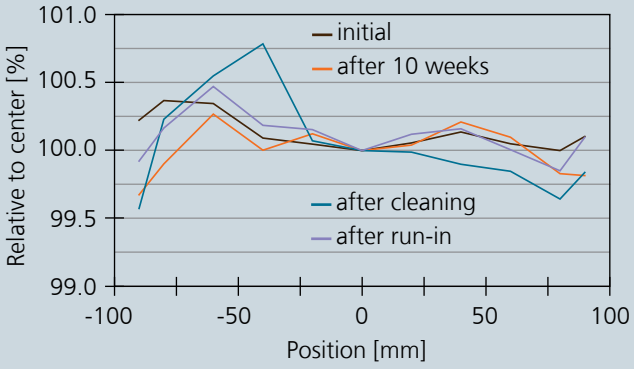
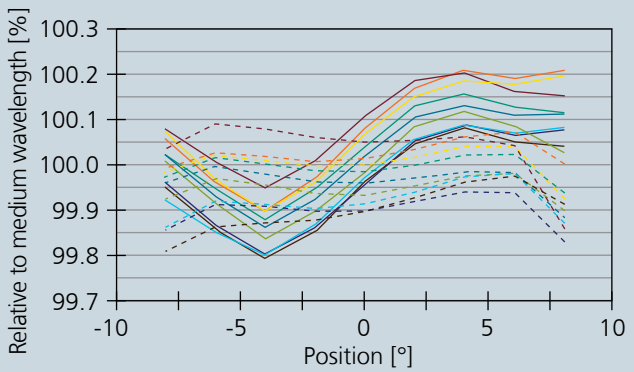


The examples illustrate how with EOSS® technology new and extremely sophisticated optical coatings can be manufactured on the industrial scale with a high level of process reliability.

Layer thickness distribution of $SiO_2$ layers after various process steps




Homogeneity of layers (fully loaded) after ten weeks of operation.




**1** *The EOSS® coating platform at the Fraunhofer IST.*

**2** *The optical broadband monitoring system MOCCA+® from the outside.*

**3** *View of the monitor plate, a component of the MOCCA+® monitoring system.*

# CONTACT

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