In-situ diagnostics Second Harmonic Generation (SHG) for PLD system at DIFFER

This memo explains the reasoning to request for an exemption of the European Tender procedure.

Purpose
For the current PLD system at DIFFER, delivered by Demcon TSST, we want to purchase an in-situ Second Harmonic Generation (SHG) diagnostics for optical analyses of thin film depositions.

The exemption request is based on
1. Technical uniqueness
2. Interoperability

Technical uniqueness
The SHG instrument we want to procure is uniquely suited for our intended research applications and the integration in the current experimental set-up, the existing PLD research cluster basis.

This uniqueness is confirmed by an internal market survey, for which we performed an internet search for (in-situ) SHG (method and companies), literature research on scientific publications, and talked to experts both from companies and science. Conventional search tools as well as AI tools were used to receive the information.

Although instruments have been built and reported in the scientific literature, these were home-made devices at universities or research institutes, whereas DIFFER wants to purchase a complete off-the-shelf, ready-to-use product, both on hardware and software solutions.
The conclusion was that only one company can offer a complete integral solution for an in-situ SHG instrument in our existing Demcon TSST PLD research cluster basis.

The purchased instrument is an in-situ SHG diagnostics that
- is connected to an ultra-high vacuum system
- is a complete functioning and integrated SHG system for in-situ measurements; able to measure during growth
- is able to function with a focal distance of both source and detector of approximately 350 mm is installed on-site and tested by the supplier
- includes software to control the hardware and to analyze the data, including assisted startup procedures, predefined data-acquisition modes, real-time plotting of signals and metadata
- is fully integrated in our current PLD research cluster basis (which is a Demcon TSST system as well)

Interoperability
The requested instrument must operate seamlessly with the existing Demcon TSST PLD research cluster basis. It should therefore be integrated with the:
- existing hardware platform (PLD research cluster basis)
- current software control and software environment
- existing safety protocols

When the SHG instrument is purchased from the same supplier as the research cluster basis the interoperability is optimized and guaranteed. Particularly, hardware integration in the existing cluster line and software solutions for data exchange are profitable if the new instrument, which is as an extension to one of the PLD chambers of the PLD research cluster basis is installed by the same supplier.

Conclusion

Our conclusion is that only Demcon TSST can offers an in-situ SHG diagnostics system that fulfills the technical and interoperability requirements.