

Scientific Visual

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First automated quality control of a 260 kg Kyropolous sapphire crystal

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Scientific Visual, a global leader in automated quality control in industrial crystals, recently successfully demonstrated the world's first 260 kg Kyropolous (KY) sapphire crystal scanning.

The 260 kg KY inspection is a part of the Scientific Visual technological roadmap to enable fully automated large diameter crystal quality check for LED, micro-LED, and size-sensitive optical applications. Human-independent internal defect identification, which is crucial for ultra-large sapphire products, has successfully been achieved with the 260 kg crystal.



3D defect map of 260 kg sapphire KY crystal. Color marks the defect density.

Fully automated scanners developed by Scientific Visual map the precise location of defects inside the complex-shape crystals, regardless of type, size, and morphologies, using tomography technique. They allow each defect to be classified according to the quality thresholds exclusively defined by crystal manufacturers or buyers.



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Another objective of the roadmap is to bring Scientific Visual crystal scanners to a new functionality level, which is now of paramount importance since LED makers are moving to 8" wafers technology. The increase in wafer size makes the quality requirement imperative for micro-LED producers.

"Our newly added Yield[™] Coring Optimisation software routine is in continuous development to response to challenging conditions faced by our main target market: LED sapphire. Extra-large crystals are rarely defect-free, and the optimization of coring positions allows to gain extra 2-5% harvesting yield across the processing and guarantees uniform wafer quality. The optimization routine considers XYZ positions of internal defects, crystallographic axis orientation and allows planning for the desired size of cylindric and rectangular ingots. Our customers can ramp up their sapphire production securely, having Scientific Visual scanners as a reliable quality control tool," - Scientific Visual's CEO Dr. Ivan Orlov said.



Optimised coring plan for the 260 kg KY sapphire crystal with cylindric cores and rectangular blocks, inclined at a specific angle to axis c (0001). As an example, on the figure below, you could see wafering plan for the red-coloured core.

"We have also received very positive feedback from the non-KY ultra-large crystal manufacturers since the introduction in 2021 of our new equipment which scans up to 500 kg raw crystals. We are currently working closely with



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Wafering plan for the red-colored core on the figure above: 3D defect map (left), only quality wafers (middle), both quality and rejected wafers (right).

About Scientific Visual

Scientific Visual is a leading supplier of automated crystal inspection tools for semiconductor, laser, watch, and optical industries. The company's product portfolio includes scanners for sapphire, ruby, LBO, KTP, CaF₂, ZnSe, and LiNbO₃/LiTaO₃ raw crystals.

For more information, please visit http://www.scientificvisual.ch/

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Click here to download high-resolution illustrations. Click here to play a video of the crystal 3D model.