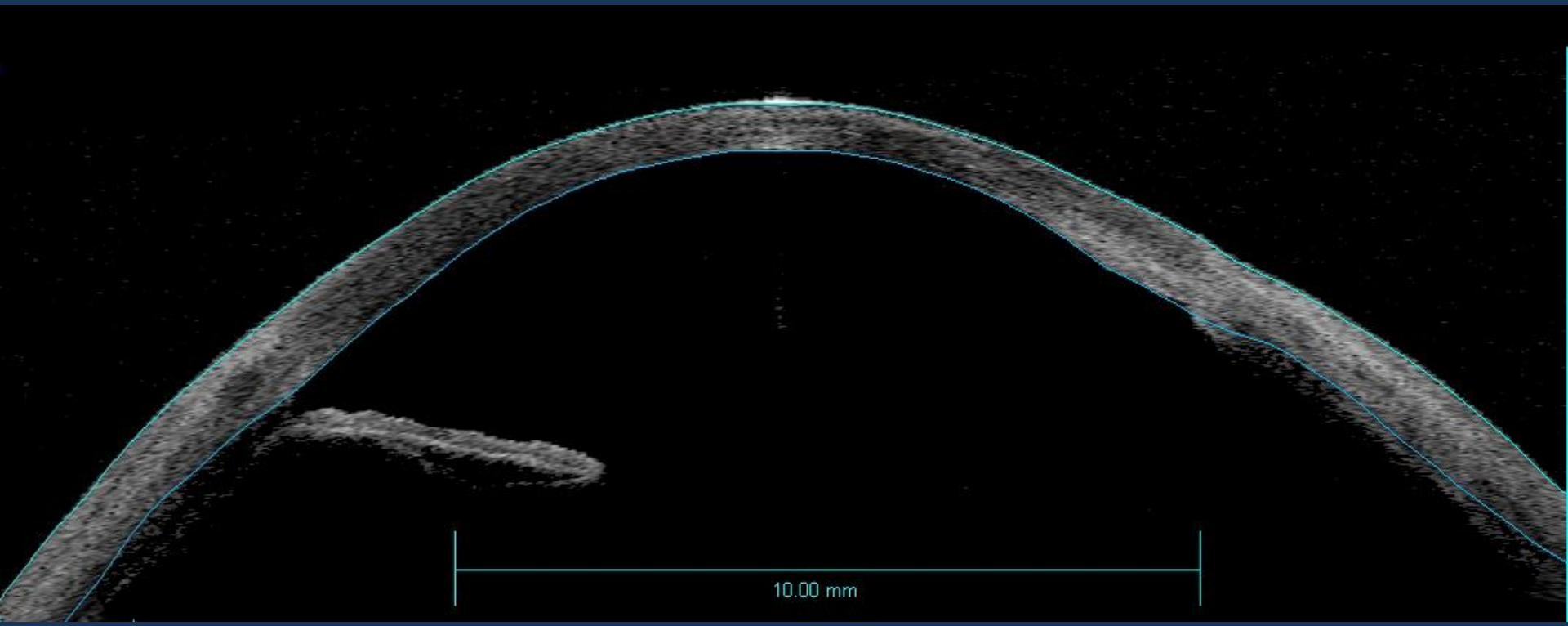
This is the case of a 34 year old man from Brazil who lost his left eye in an automobile accident some years ago. His right eye was severely lacerated, with a scar extending from the nasal sclera and bisecting the cornea at a slightly oblique angle. The iris is missing in the nasal quadrant, and the eye is aphakic (no crystalline lens). He also has a small bullous retinal detachment in the supero-nasal periphery that has been stabilized with laserpexy. He was extremely fortunate to have had such a good surgeon.

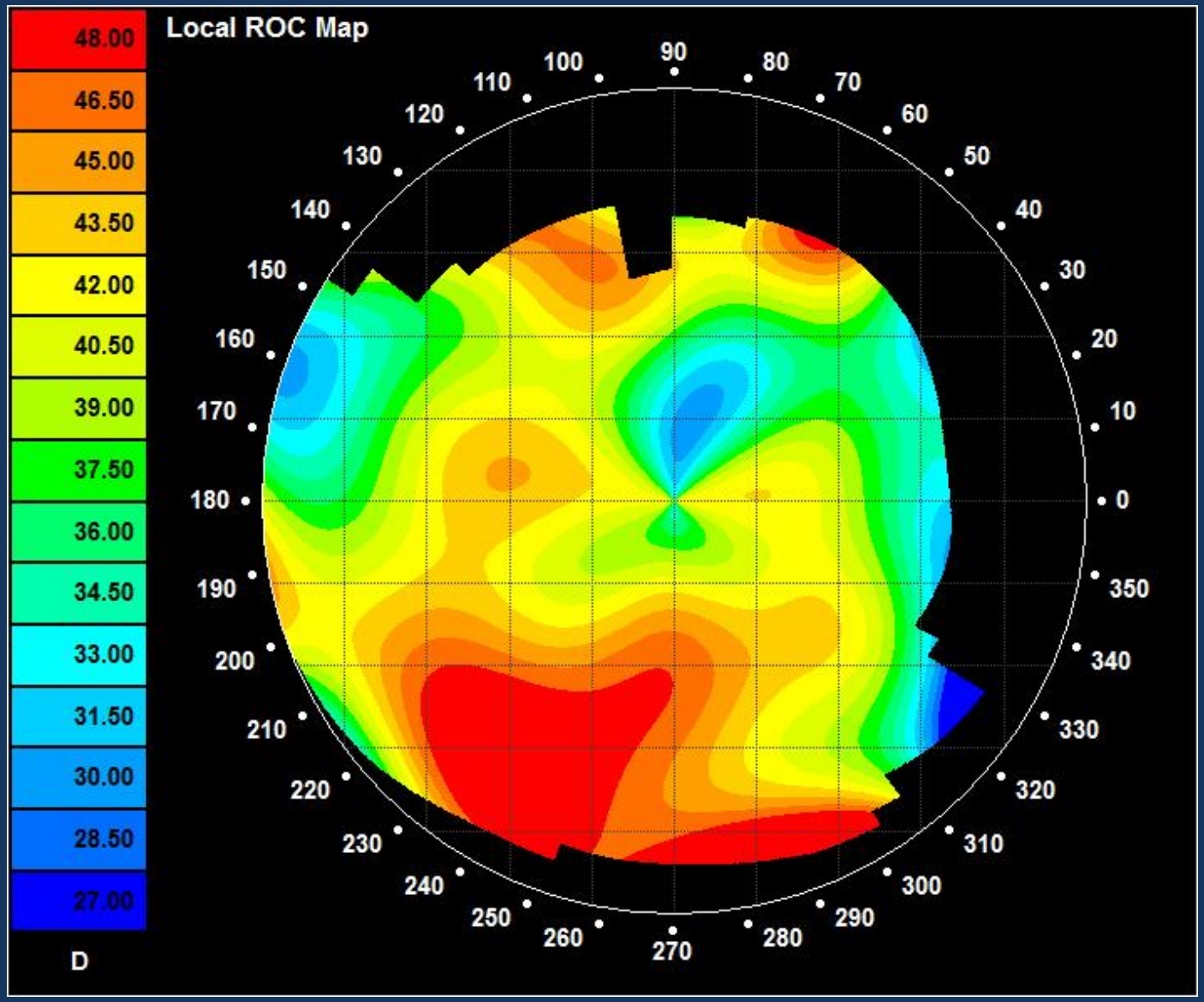
The corneal scar is fortunately not very dense, and he is able to wear a large corneal RGP lens. The high +14D prescription creates a rather smallish area of good vision and is further complicated by the fact that the lens exhibits a large amount of infero-temporal decentration. When the patient is looking through the lens, and with a small cylindrical over-refraction, he can read the 20/40 line on the Snellen chart. The patient very much desires a better contact lens solution. There are several major issues. The first is that the topography of the anterior eye is highly asymmetrical. The second problem is the very high prescription. The third issue is the glare caused by the irregular pupil which falls outside of the optic of the lens.

The Laserfit platform is ideally suited for this type of case. Creating a composite eye from the OCT scans enabled us to produce a well-fitting lens on the first attempt. Because of our 3D system, we were able to optimize the front and back optical surfaces to minimize the thickness as well as eliminate the presence of a ring scotoma. This was accomplished by using a large 9.0 mm posterior optical zone and a smaller anterior optical zone with a blended area. Even though we knew the prescription in his old lens, our first attempt resulted in an over-refraction of -2.00. With a trial lens he was able to read letters on the 20/30 line. The optic of the lens was very well centered. Using the iTrace ray-tracing aberrometer in manual mode, we were able to capture a wavefront with the lens on the eye. The iTrace is unique in that it has a manual over-ride which allows us to customize the diameter of the scan as well as centering the scan on the apex of the lens/cornea. The aberration profile looked quite good, and will be further improved once the fit of the lens is finalized.

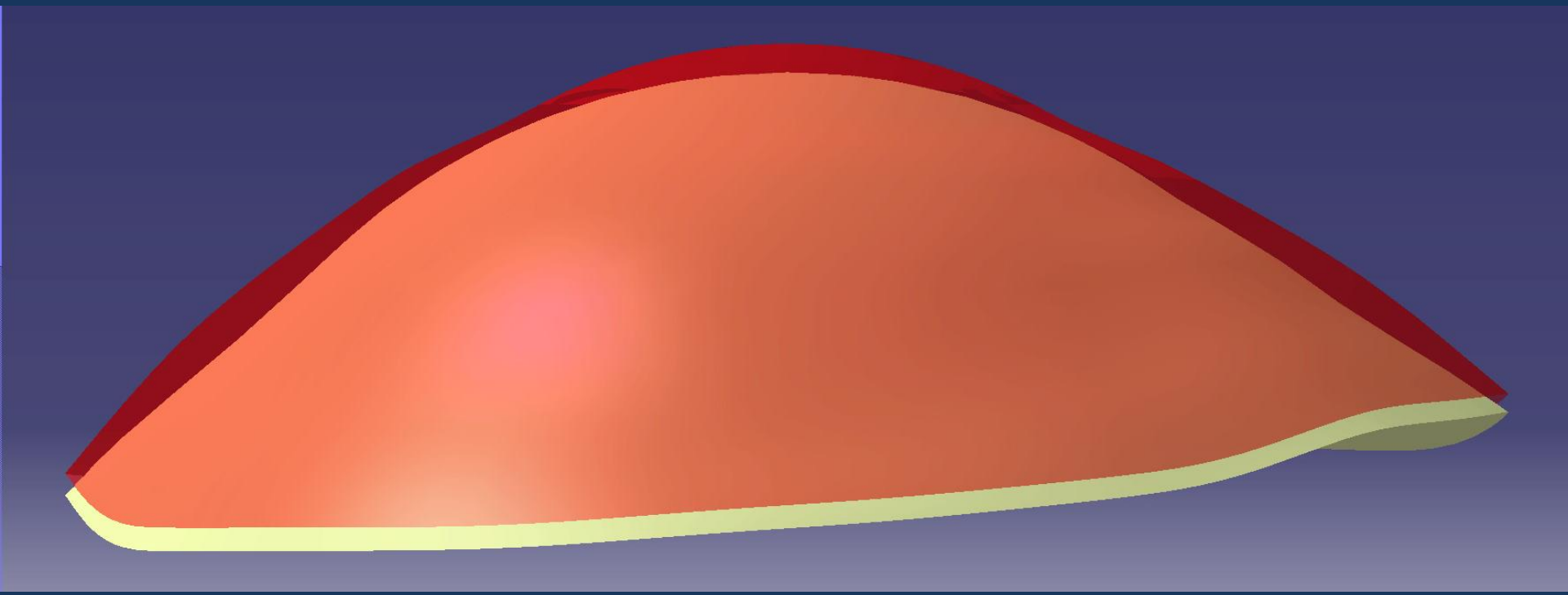
OCT scan of anterior eye in 0 -180 meridian showing missing iris and lens



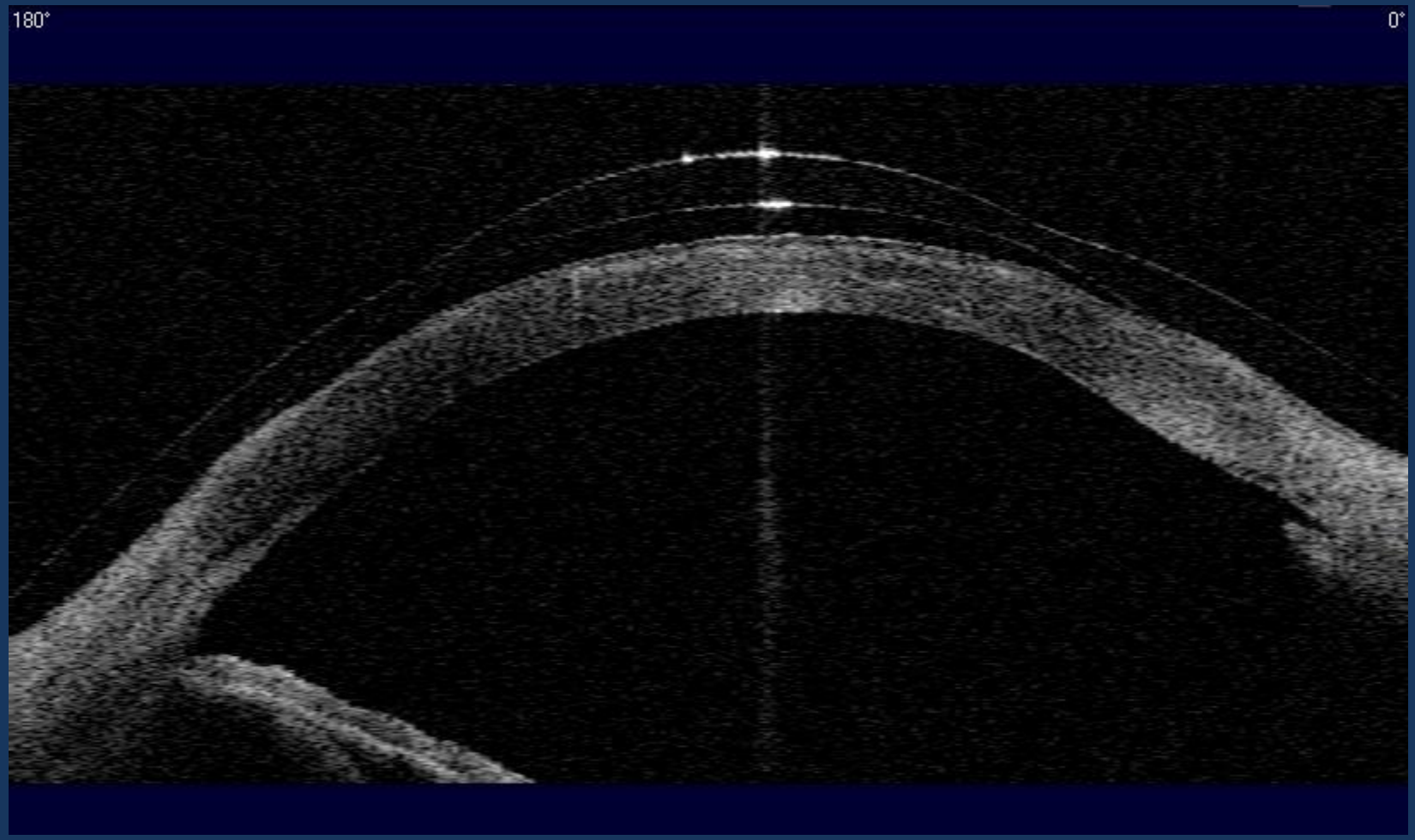
Corneal Topography



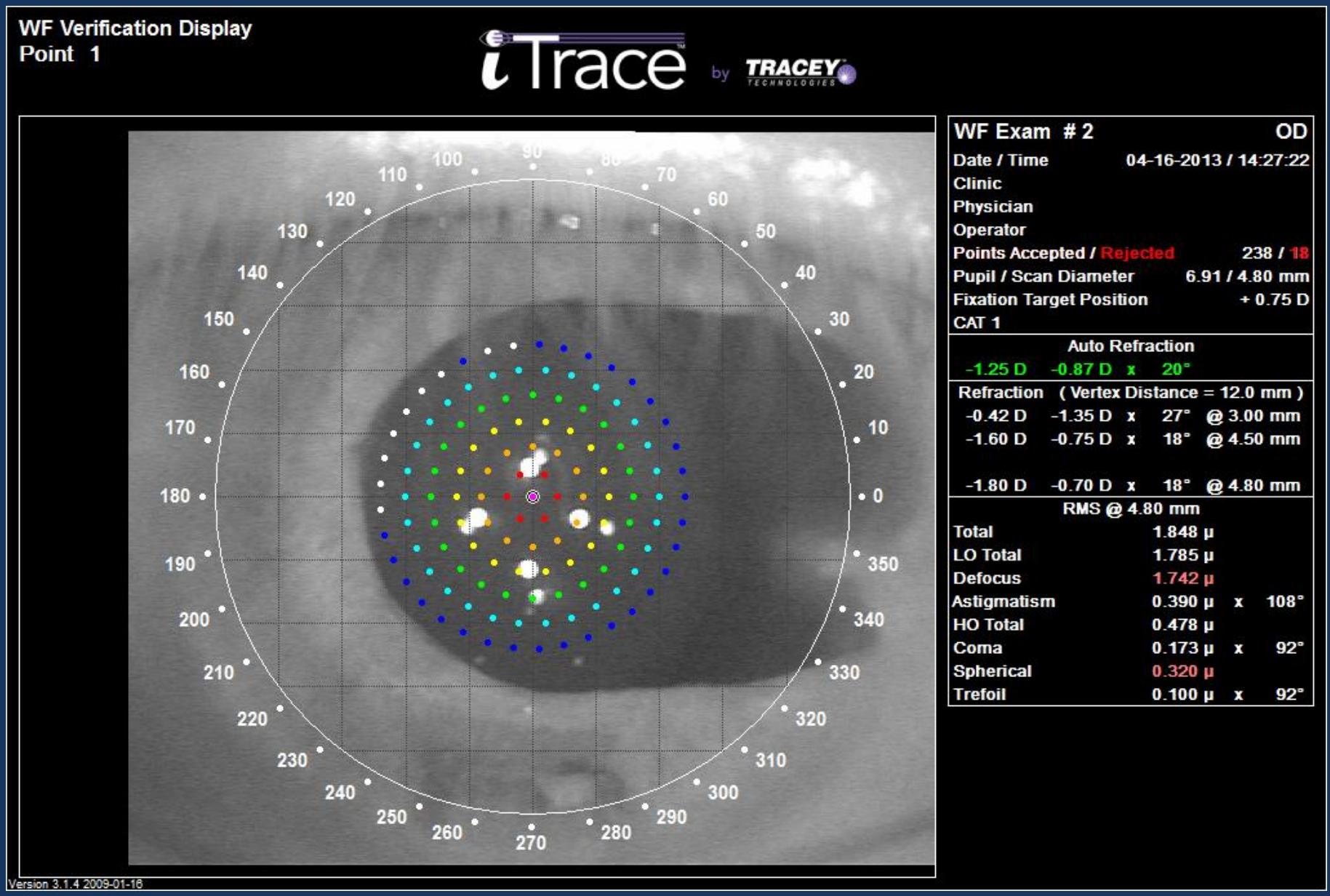
Proposed LASERFIT lens



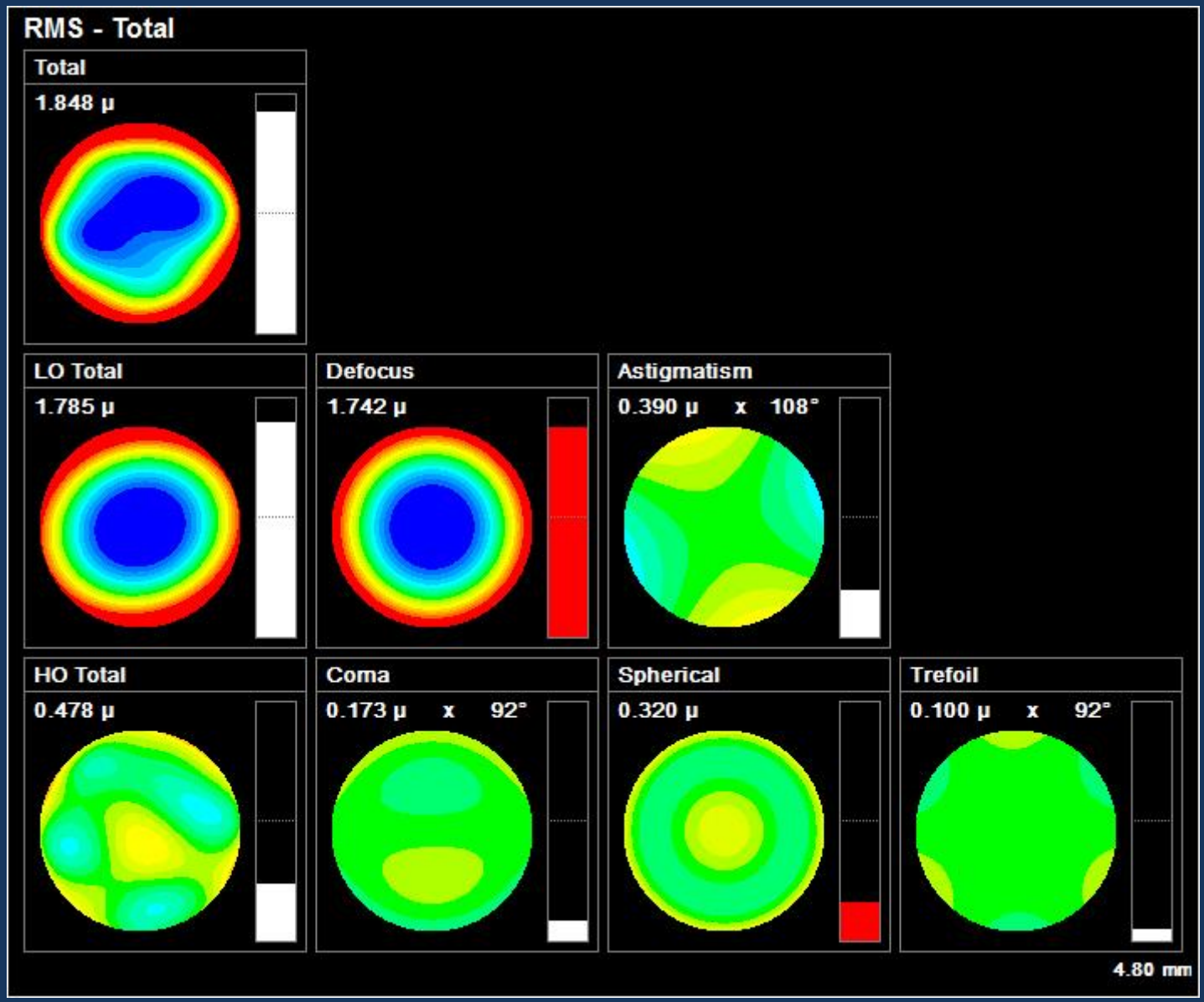
OCT scan of initial LASERFIT lens on the eye



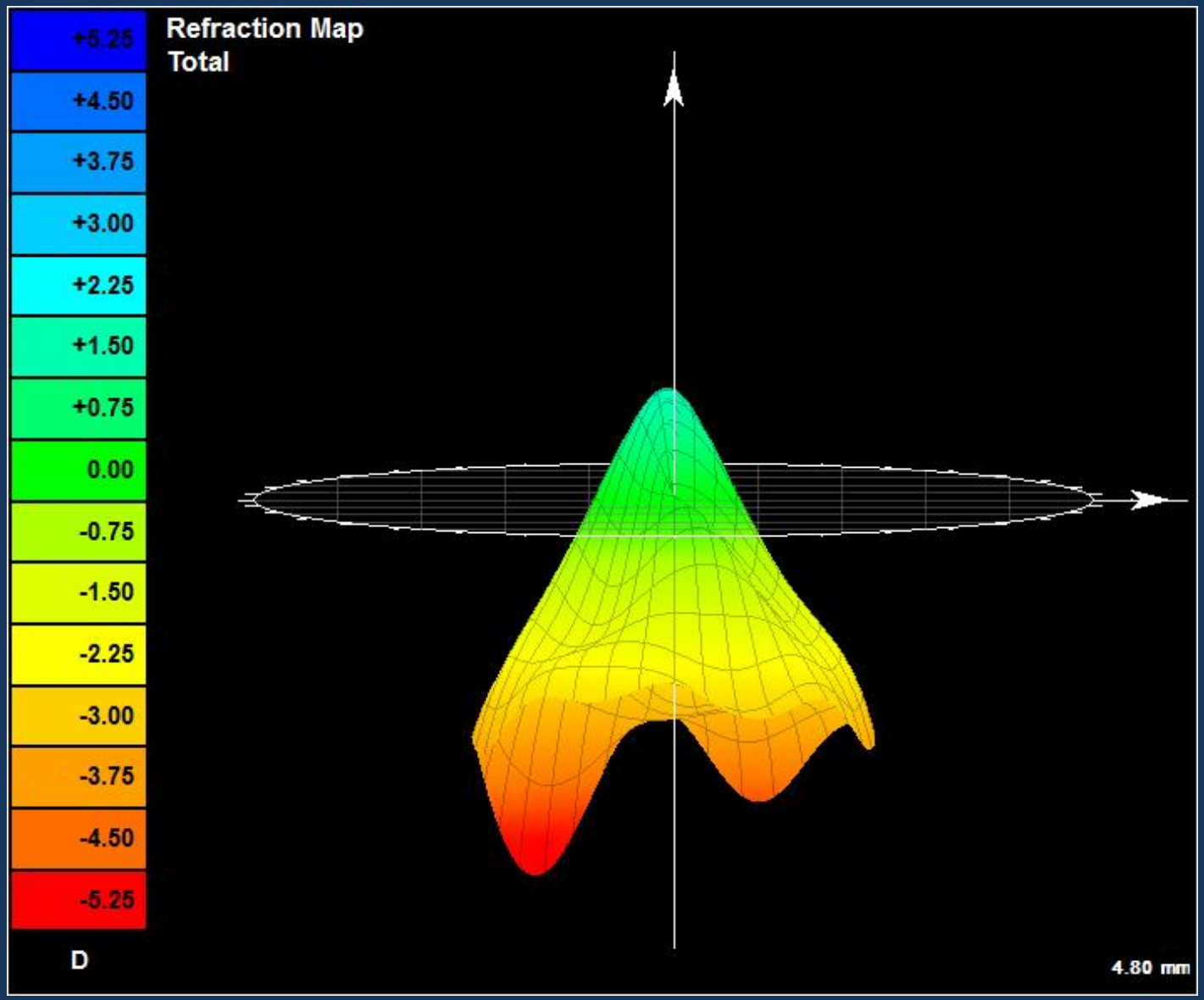
Wavefront over initial lens



Wavefront combined zernike polynomials over initial lens



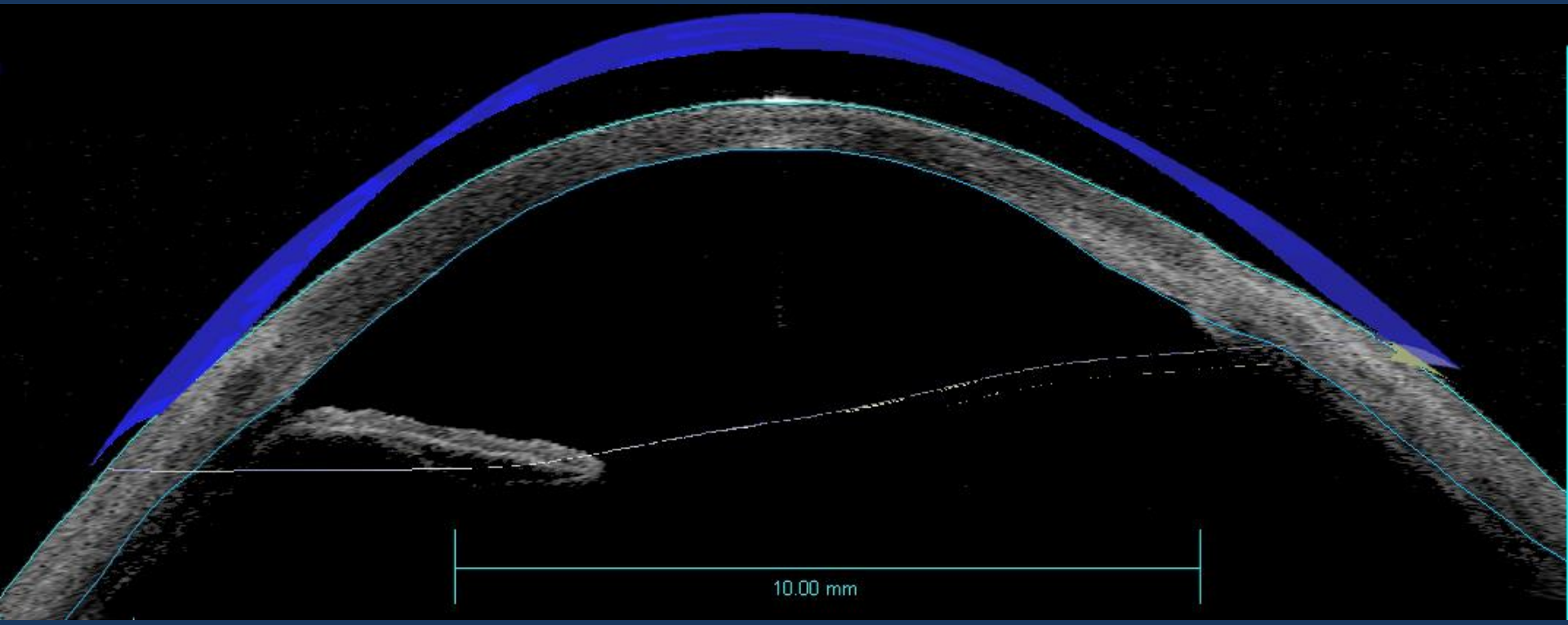
3D refraction over initial lens



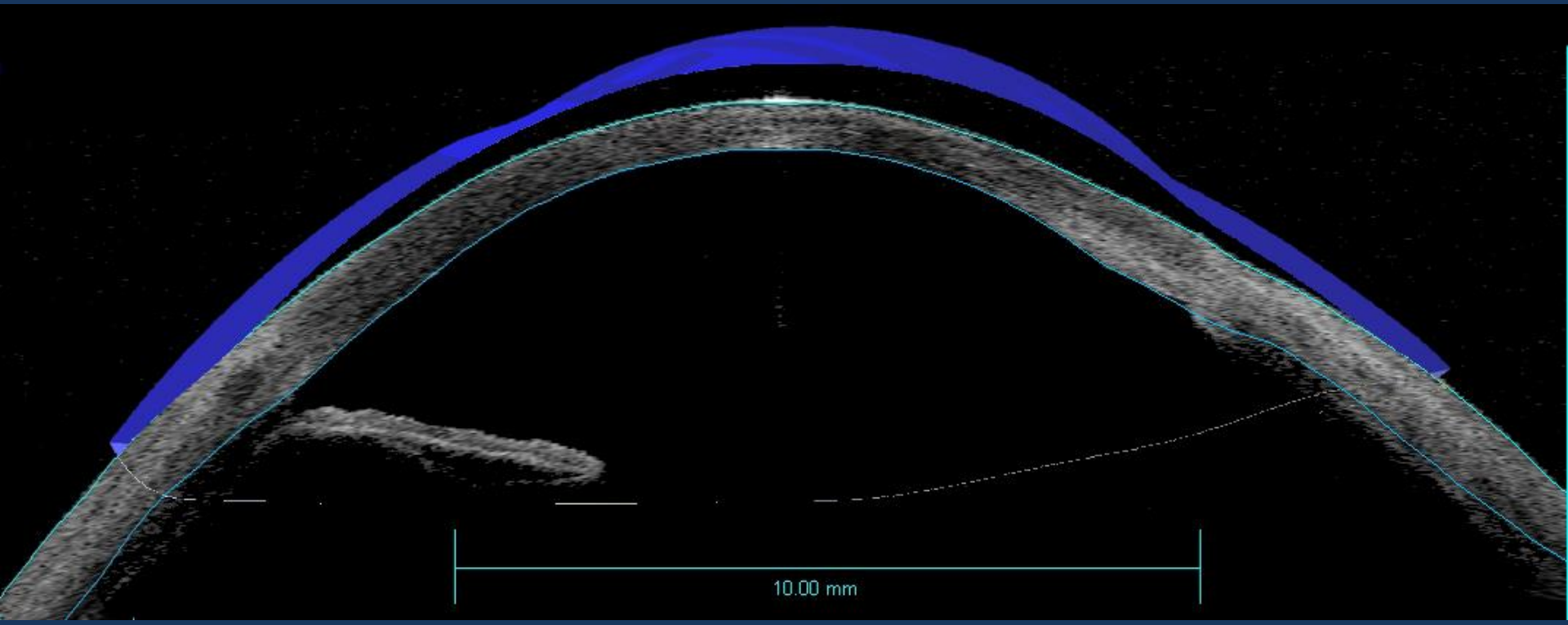
Back home in Brazil the patient had a chance to adapt to the new lens. The lens was well-centered with respect to his old pupil. However, his iris was missing nasally and the high prescription precluded us from making an optical zone large enough to cover that area. The result is that he still was aware of glare and starbursts arising from the area of the missing iris and not covered by the optic of the lens.

He began to tinker and discovered that the starbursting was effecively relieved by sliding the lens nasally by 1.0 mm. His explanation was accompanied by pages of detailed drawings and descriptions of things he tried, how the starbursts appeared before and after, and so on. Therefore we created a special lens with the optic decentered nasally by exactly 1.0 mm. Rather than just slide the optic over in a linear fashion, we rotated the optic along a curved trajectory defined by the center of rotation of the anterior segment.

Graphic showing the location of the current optic



Graphic showing the proposed decentered optic



EPILOGUE

After the patient received his new lens and had the fit checked by his local ophthalmologist, he reported back that the translated optical zone did the trick and that the annoying glare had been greatly reduced. He further stated that he was correctly identifying letters on the 20/20 line.