Measuring through Glass or a Window with the Laser Tracker

Measuring through glass will not produce repeatable or accurate results. Unless the glass surface has very specific coatings, back reflections could be present and these would affect the radial measurements.

Even if the glass surface does have proper coatings to prevent or minimize this, the glass has a different index of refraction than the air the beam is traveling through. Sometimes the intent is to measure a target that is in a vacuum chamber separated by a glass barrier. This only adds to additional error because the vacuum on the other side of the glass has different index of refraction than either the glass or the air.

This index of refraction change can result in an error in the radial distance measurement and will also result in the beam “bending” or no longer traveling a straight path from the tracker to the target. This bending of the beam will affect the angular measurements from the tracker. The nature of the bend will also change as the angle the beam enters the glass window changes resulting in a loss of both accuracy and repeatability. If the purpose was to measure into a vacuum chamber, the beam will bend again as it leaves the glass into the vacuum adding additional error.

To illustrate how complicated shooting through glass is, FARO® has designed a Windowed Spherically Mounted Retroreflector (SMR) for the FARO Tracker. This SMR does have a thin glass window that the beam shoots through. This window does have specific coatings and its position / orientation between the glass surface and the corner cube is fixed and does not change. The position between these two items is designed so that when the target type is set to 1.5" Windowed SMR (or 7/8" Windowed SMR), the tracker is able to measure its location accurately and repeatedly. If the window was removed from this SMR and/or the target type was set incorrectly, the measurements will no longer be accurate or repeatable.

Keywords:
glass, window, tracker, refraction