Multi-TIR 20mm Nested Lens for Domeless LEDs

- **Patent pending Multi-TIR innovation**
- **Low-profile lens for domeless LEDs**
- **Tight beam with minimal spilled light**
- **Ideal for high-candela (high center-beam candlepower) applications**

Fraen Corporation's Multi-TIR Nested lens delivers narrow beam lighting when used with a variety of domeless LEDs. The patent pending technology enables higher candela-per-lumen than standard TIR collimators or reflectors of equivalent diameter.

Typical applications include:

- LED lighting application requiring a narrow-beam and/or high center-beam candela
- Architectural Lighting
- Retail Applications
- Wall-wash Lighting
- Portable Spotlights
- Stadium Lighting
- Signage

FRAEN Corporation
80 Newcrossing Road
Reading MA 01867
USA
Phone: +1 781.205.5300
Fax: +1 781.942.2426

Inquiries: optics@fraen.com
Website: fraen.com

For ordering or sales information in your region, please visit
http://www.fraen.com/optics/contact-us/.

General Characteristics

Materials

Lens Material	Optical Grade PMMA
Operating Temperature range	-40° C / + 80° C
Storage Temperature range	-40° C / + 80°C
Holder Material	PC
Operating Temperature range	-40° C / + 120° C
Storage Temperature range	-40° C / + 12°C

Average transmittance in visible spectrum (400 – 700nm) >90%, as measured using 3 mm thick Optical Grade PMMA.

Please note that flow lines and weld lines on the external surfaces of the lenses are acceptable if the optical performance of the lens is within the specification described in the section "OPTICAL CHARACTERISTICS"

IMPORTANT NOTES – Lens handling and cleaning*:*

- *Handling: Always use gloves to handle lenses and/or handle the lenses only by the flange surface. Never touch the outside surfaces of the lenses with fingers; finger oils and contamination will absorb or refract light.*
- *Cleaning: Clean lenses only if necessary. Use only soap and water to clean the surfaces. Never expose the lenses to solvents such as alcohol, which can damage the plastic.*

Scope

This datasheet provides information about the FNL-S1-20-R Multi-TIR Nested lens, and the optical performance when used with a variety of domeless (flat-top) LEDs. The optic is also available in a holder, with 3M VHB tape attached to the holder (FNL-S1-20-HB1) for assembling the optic to a printed circuit board.

Optical Characteristics – On-axis Intensity[1], Beam Angle[2], Field Angle[3]

LED		Color	On-axis Intensity (peak)	Beam Angle (FWHM)	Field Angle (FW10%)
CREE	XQ-E HI	Cool White	54 cd/lm	5.2º	10.0º
PHILIPS LUMILEDS	Luxeon Z	Cool White	57 cd/lm	5.6º	10.5º
PHILIPS LUMILEDS	Luxeon Z	Warm White	64 cd/lm	5.6º	9.5º
PHILIPS LUMILEDS	Luxeon Z	Red	38 cd/lm	6.0º	12.0 º
PHILIPS LUMILEDS	Luxeon Z	Green	59 cd/lm	5.5º	10.0º
PHILIPS LUMILEDS	Luxeon Z	Blue	53 cd/lm	5.5º	9.5º
PHILIPS LUMILEDS	Luxeon ZES	Cool White	36 cd/lm	6.5º	13.0º
OSRAM	Oslon Black Flat[4]	Cool White	61 cd/lm	5.7 º	9.5 º

NOTE: Other LEDs are currently being evaluated and tested, and the performance results will be added to this table soon. For performance information with specific LEDs not listed above, please contact Fraen *www.fraen.com/optics/contact-us*.

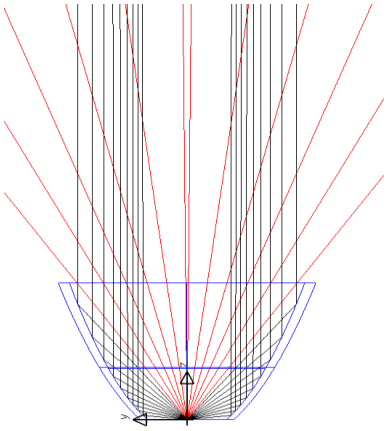

Figure 1A: Standard Reflector

Central (red) rays are not controlled by the reflective surface, so they diverge, resulting in "spilled" light.

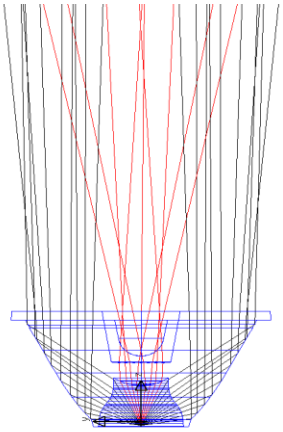

Figure 1B: Standard TIR

Central (red) rays are controlled by the central lens geometry, resulting in some collimation, contributing to both the center beam and spilled light.

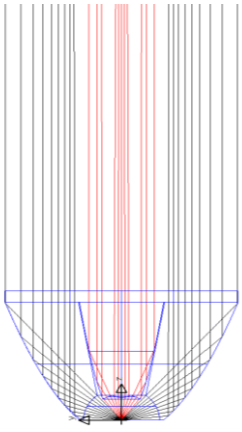

Figure 1C: Fraen Nested Lens

Central (red) rays are well-collimated by the inner TIR component, maximizing the center beam intensity.

[1] To calculate the on-axis intensity in candelas (cd), multiply the on-axis candela per lumen value, above, of the lens (cd/lm) by the total luminous flux in lumens (lm) of the LED used. Luminous intensity depends on the flux binning and tolerance of the LEDs. Please refer to the LED datasheet for more details on flux binning.

[2] Beam angle is the full angle where the beam intensity is half the on-axis peak intensity.

[3] Field angle is the full angle where the beam intensity is 10% of the on-axis peak intensity.

[4] At the time of this datasheet release there is no LM-80 data for this part. For additional details contact the LED manufacturer.

Mechanical Characteristics

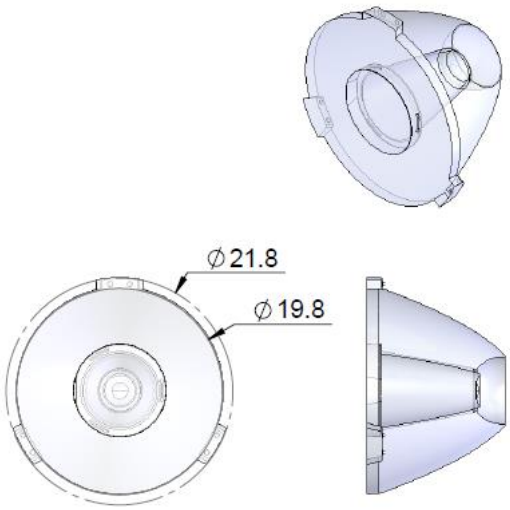

Figure 2: FNL-S1-20-R drawing (dimensions in mm)

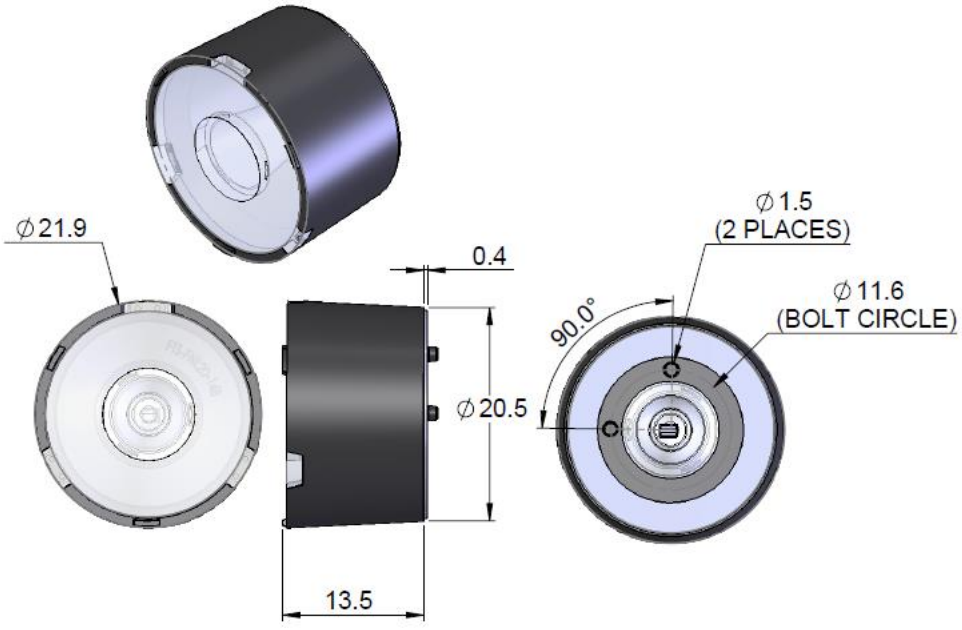

Figure 3: FNL-S1-20-HB1 drawing (dimensions in mm)

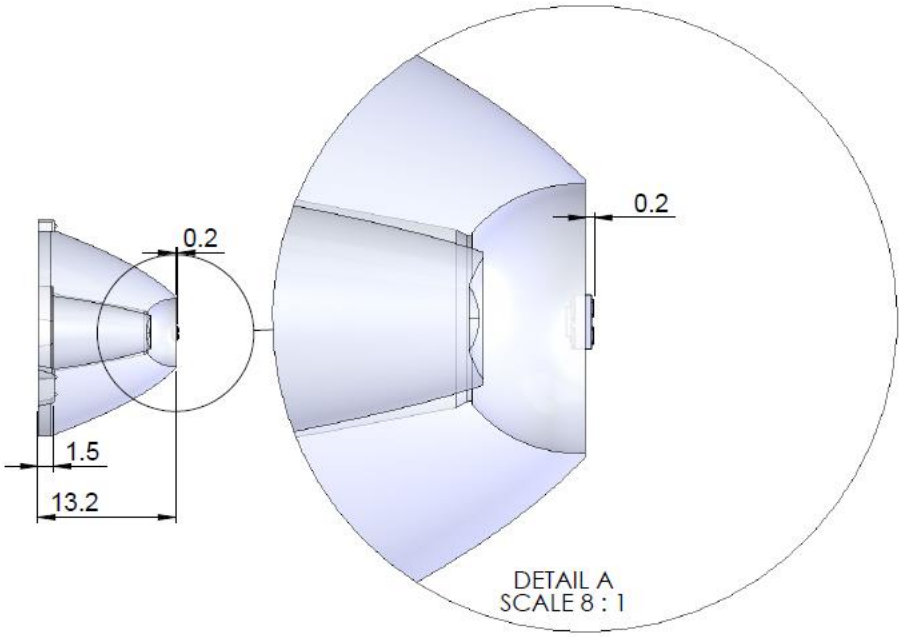

Figure 4: Fraen Multi-TIR Nested Lens showing optimal distance to the bottom of the LED. The best location for the FNL-S1-20-R relative to the LED is such that the bottom of the LED is 0.2 mm from the bottom of the optic. The distance shown applies to Lumileds Luxeon Z & ZES, Cree XQ-E HI, and Osram Oslon Black Flat.

Figure 5: Exploded view of FNL-S1-20-HB1. The 3M VHB tape has a nominal thickness of 0.4 mm. At this thickness, the tape positions the LED relative to the optic at the best location as shown in Figure 4.

Part Number	Description
FNL-S1-20-R	Nested TIR Lens (2-piece optic assembly, without lens holder)
FNL-S1-20-HB1	FNL-S1-20-R assembled securely to a black lens holder with 3M VHB double-sided adhesive tape applied

For assistance, please contact Fraen http://www.fraen.com/optics/contact-us/.