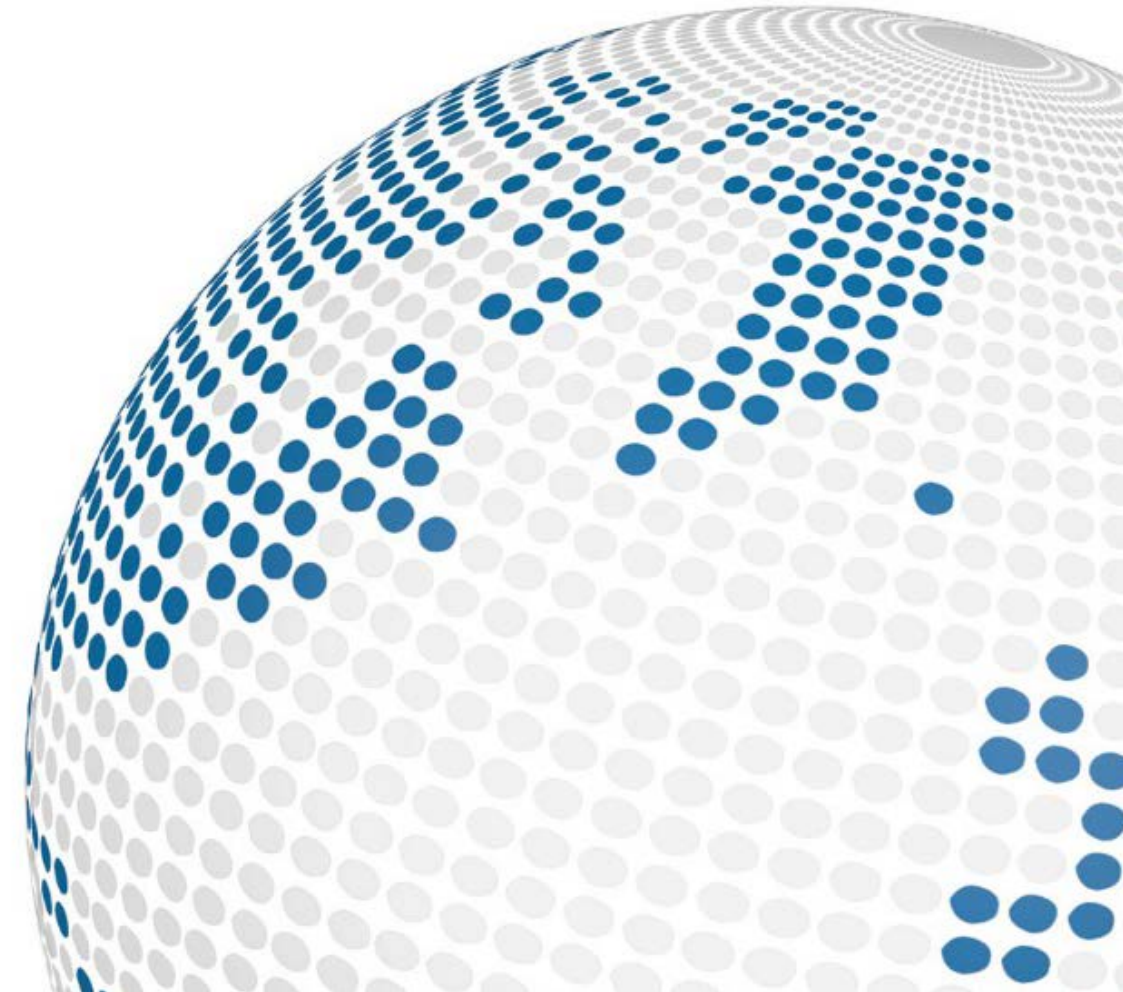


TMF8701/TMF8801/TMF8805 (=TMF8X0X) OPTICAL DESIGN GUIDE (ODG)



ams

Shaping the world with sensor solutions



*Optical simulation results are meant for relative comparison of competing design configurations.
Design prototypes are required for optical performance verification.*

TMF8X0X OPTICAL DESIGN GUIDE

GENERAL GUIDELINE

The design goal is to control system xtalk. The main factors for controlling system xtalk are airgap, glass thickness, glass apertures, optical barrier, and ink/tint characteristics.

General system recommendation are:

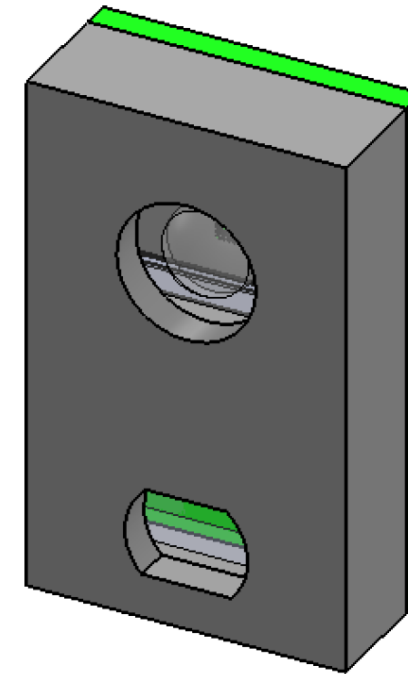
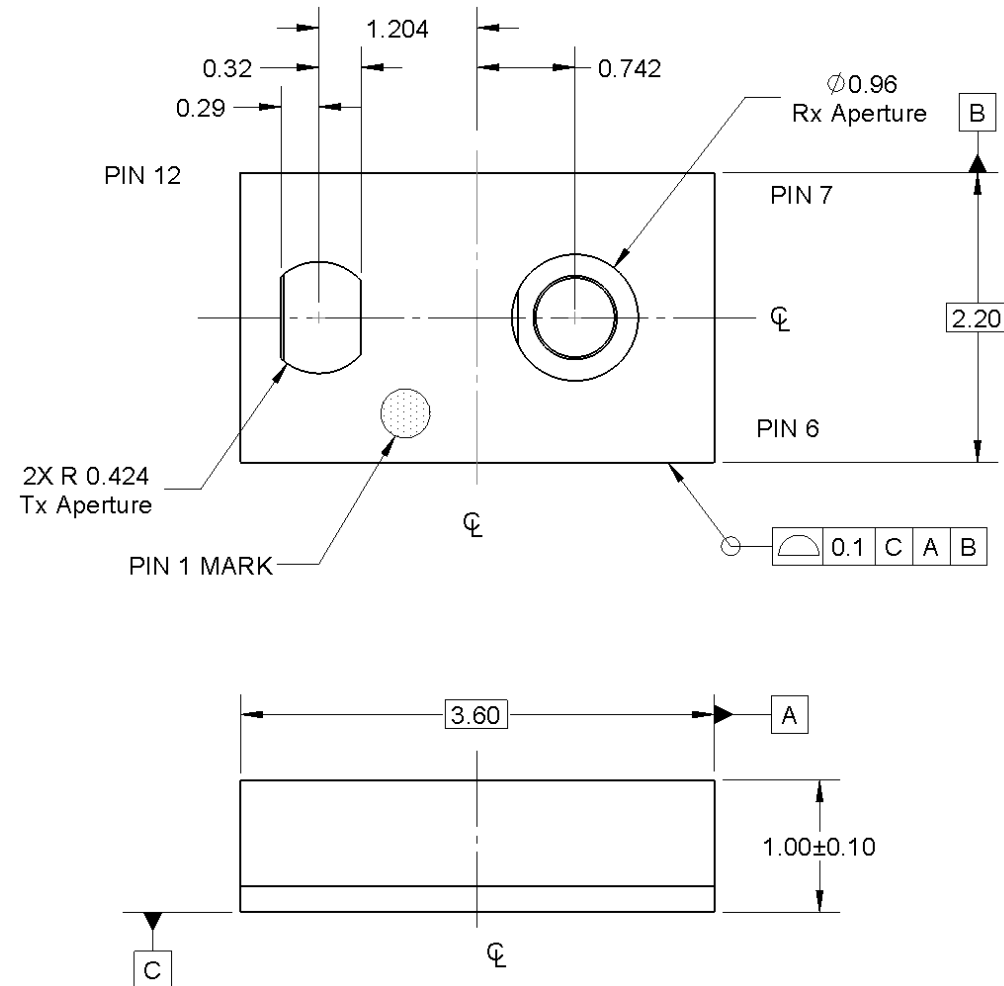
- Glass/TMF8X0X airgap 0.3 - 0.6mm range; IR ink required for calibration and operation
- Optical barrier design (e.g. rubber boot)
- Glass thickness 0.55mm
- Glass apertures $\text{Ø}1.5 / \text{Ø}1.1\text{mm}$ (Rx Ø / Tx Ø)
- Glass aperture ink with 85% IR transmissivity
- Assembly XY tolerance between Glass apertures and TMF8X01 is $\pm 0.20\text{mm}$ maximum

The optical simulation results are provided using 4 configuration for reference. The 4 configurations are:

1. GLASS WITH APERTURES (Tx $\text{Ø}1.1\text{mm}$ /Rx $\text{Ø}1.5\text{mm}$) uses 85% T-IR ink in apertures
2. GLASS NO APERTURES uses plain clear cover glass without 85% T-IR ink/tint
3. GLASS NO APERTURES WITH OPTICAL BARRIER uses plain clear cover glass without 85% T-IR ink/tint
4. GLASS NO APERTURES uses plain clear cover glass with 85% T-IR ink/tint.

TMF8X0X ODG

DRAWING



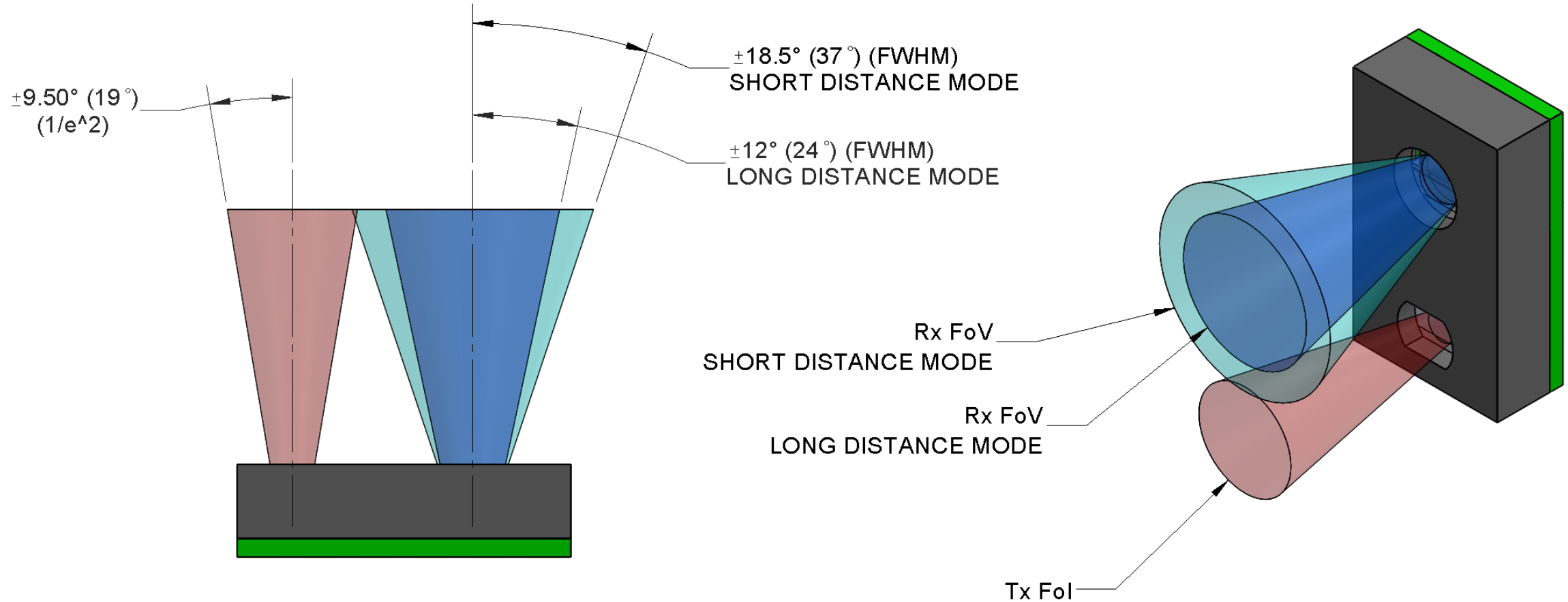
TMF8X0X FoV CONE

Drawing

3D File: TMF8X01 FOV CONE v4.STEP



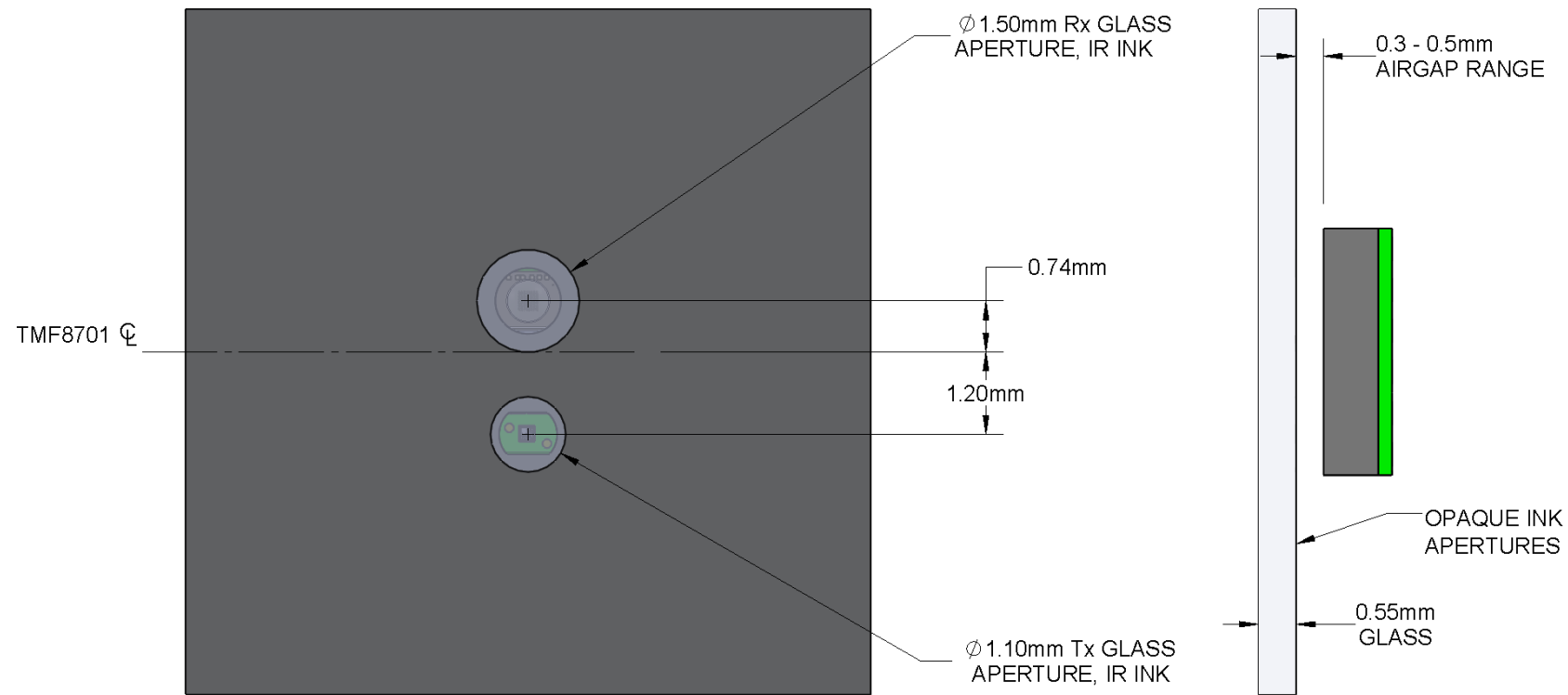
TMF8X01_FOV_CONEs.zip



TMF8X0X GLASS APERTURE DESIGN

Drawing: TMF8X0X Recommendation

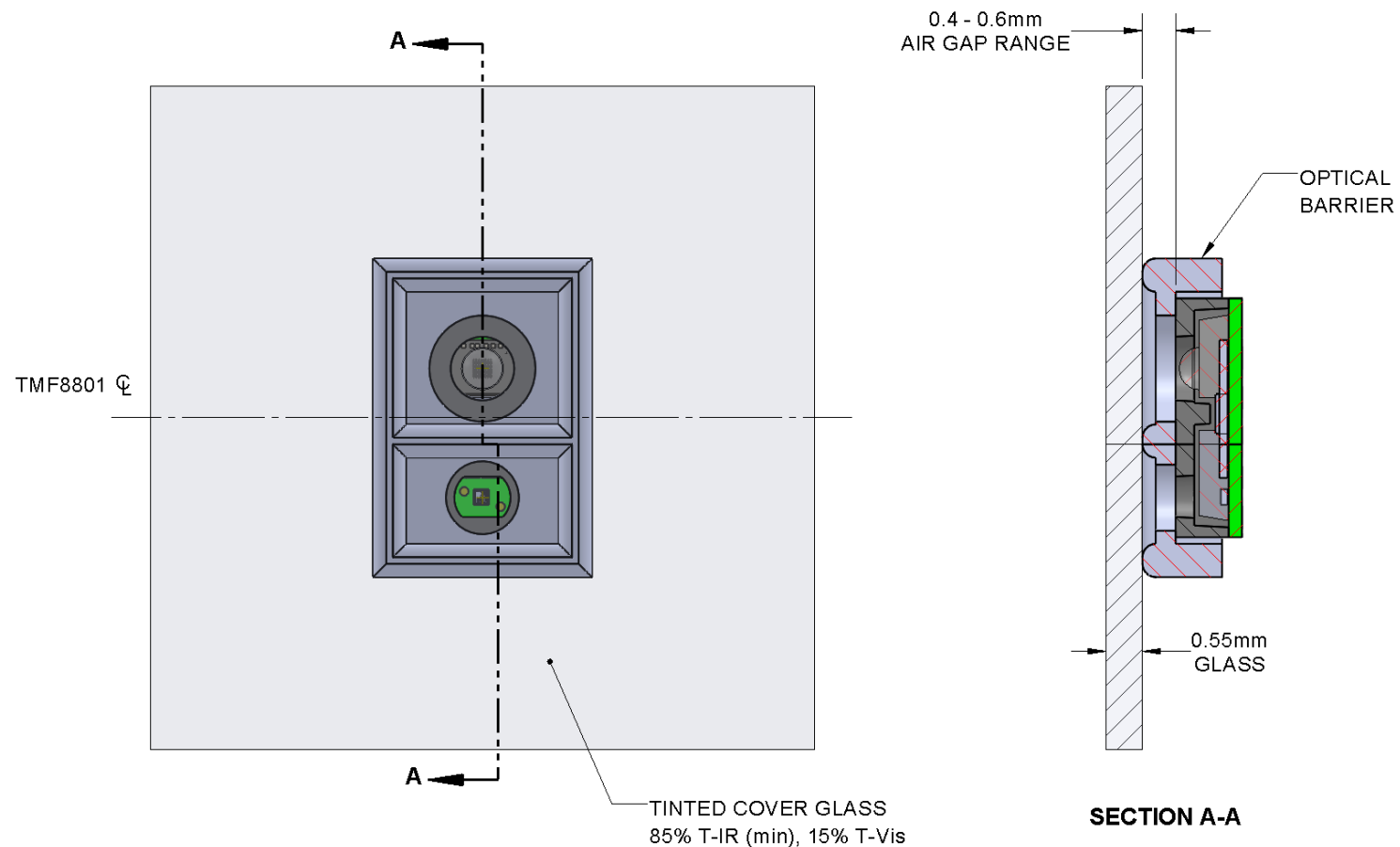
- use IR ink to hide the TMF8X0X, 85% Transmissive IR (MIN), 15% Visible
- simulated results presented here use IR ink cover glass apertures. Simulations use IR ink in cover glass apertures



TMF8X0X OPTICAL BARRIER DESIGN

Drawing: TMF8X0X Recommendation

- use tinted cover to hide the TMF8X0X, 85% Transmissive IR (MIN), 15% Visible
- simulated results presented here do not use tinted cover glass. Simulations use plain clear cover glass.



Simulation assumes that the Optical Barrier is flexible and contacts the Glass over the air gap range.

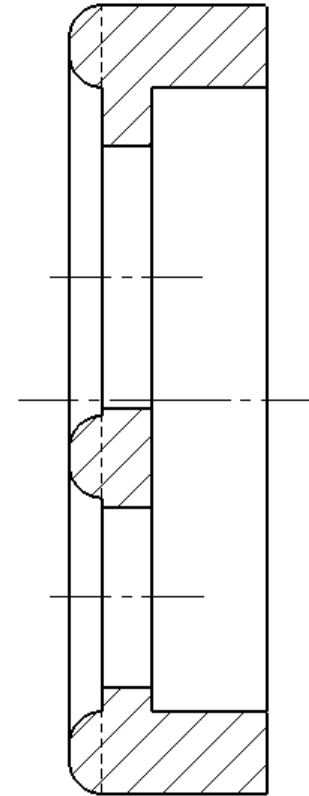
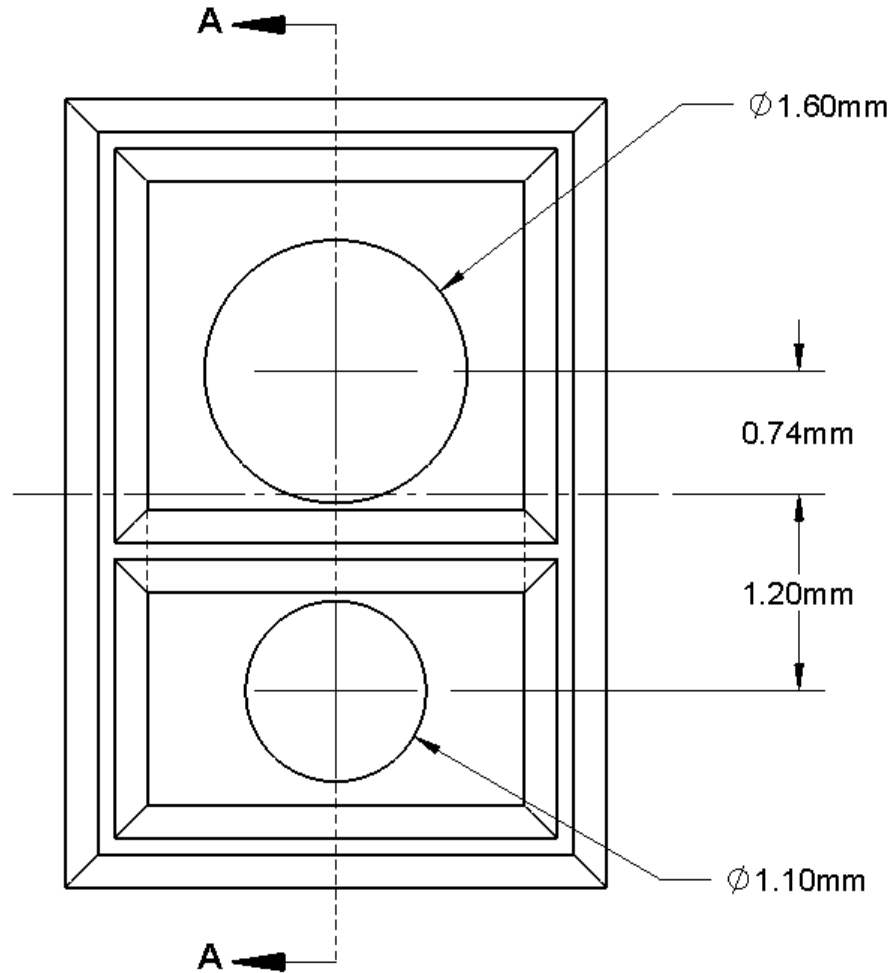
TMF8X0X OPTICAL BARRIER DESIGN

Drawing: Optical Barrier Reference

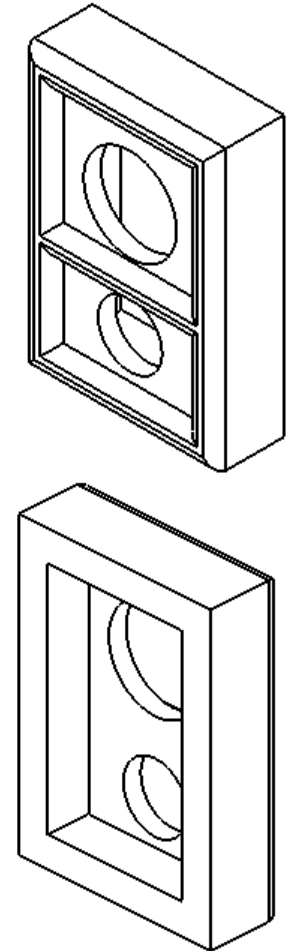
Step file of optical barrier



TMF8x01-OPTO BARRIER.zip



SECTION A-A



Target Crosstalk Values

ToF EVM

Operate the EVM with the full optical stack
No target in front, low ambient light

For TMF8701

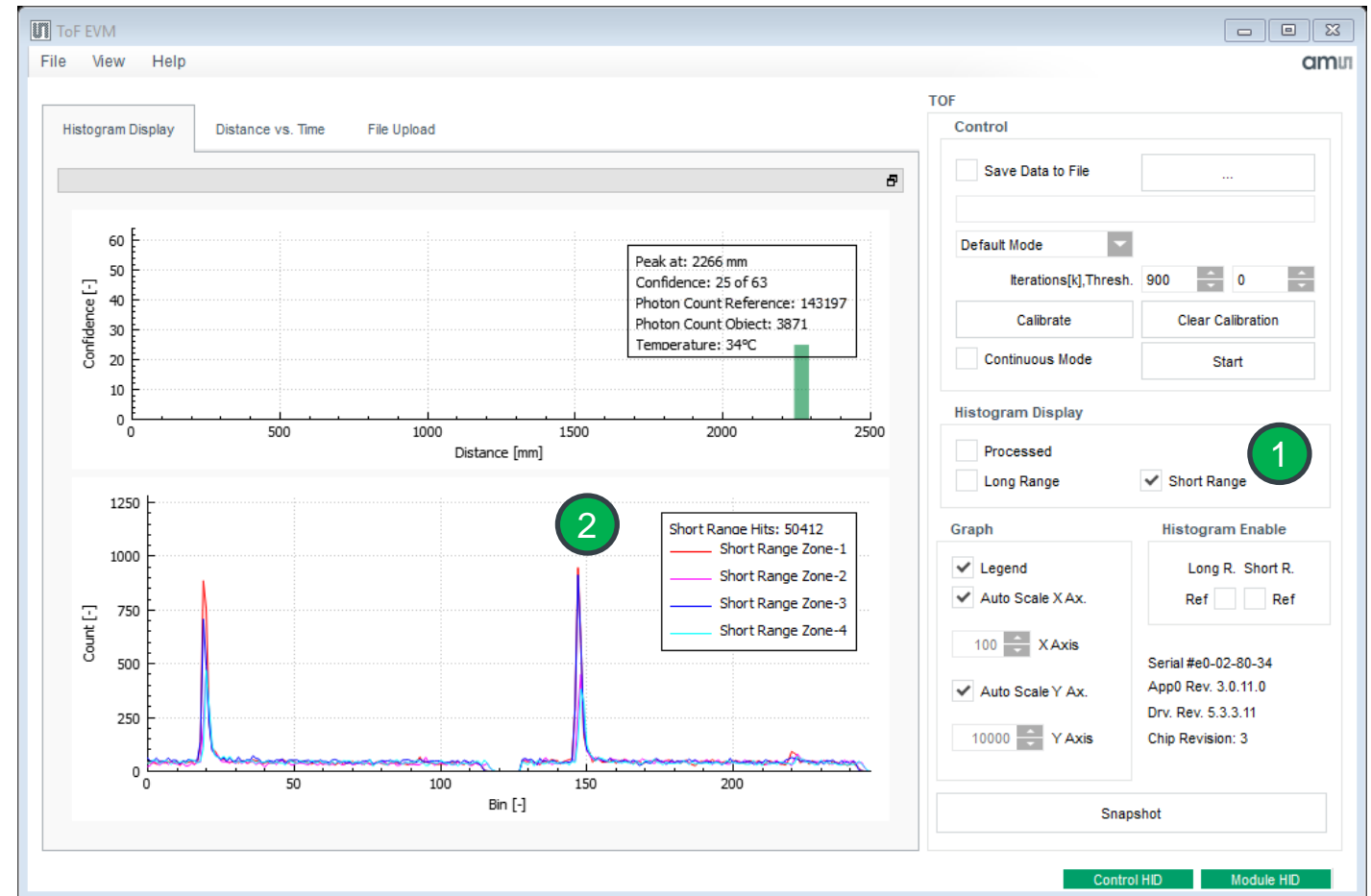
- Select proximity histogram only, see (1)
- The highest peak shall be within 300-1500 counts, see (2)

For TMF8801

- Select short range histogram only, see (1)
- The highest peak shall be within 400-1900 counts, see (2)

For TMF8805

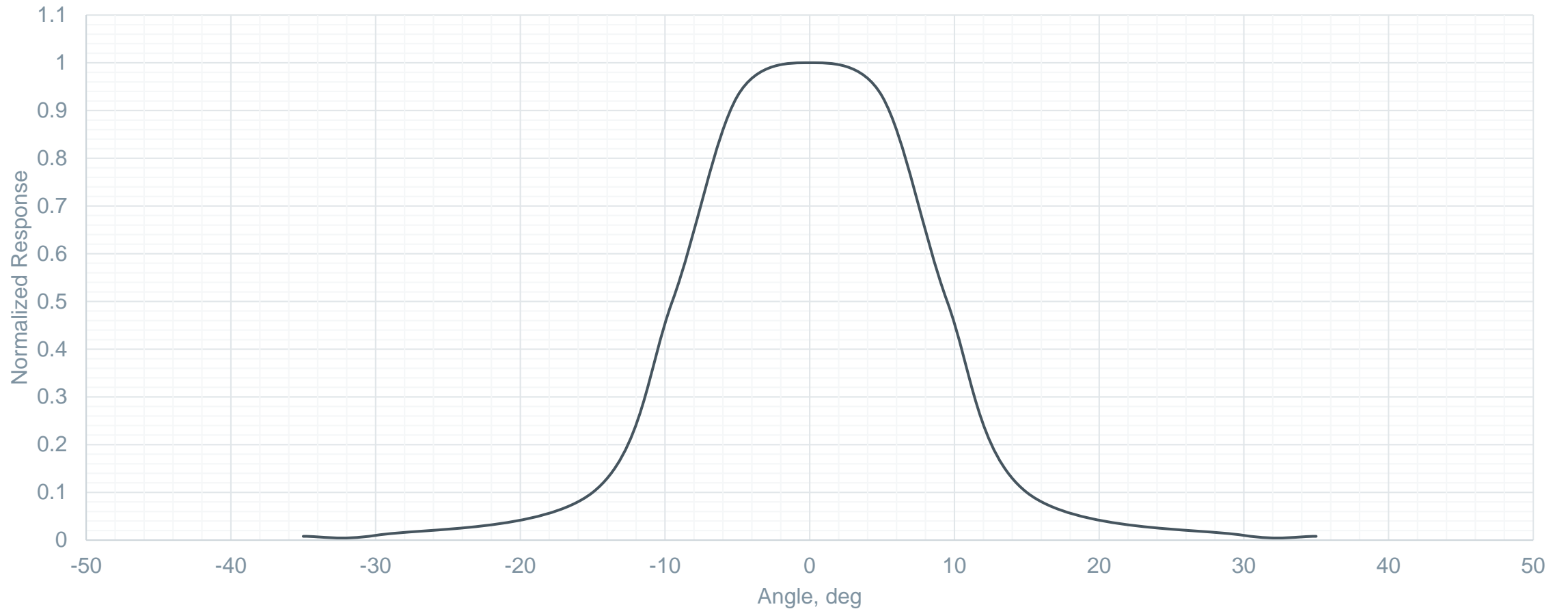
- Select short range histogram only, see (1)
- The highest peak shall be within 400-7000 counts, see (2)



Tx VCSEL, TMF8X0X (PART ONLY)

FoI, EMISSION, $\pm 9.5^\circ$ (19°) $1/e^2$

TMF8x0X Tx FoI, Emission (Typical), 19° ($\pm 9.5^\circ$) $1/e^2$



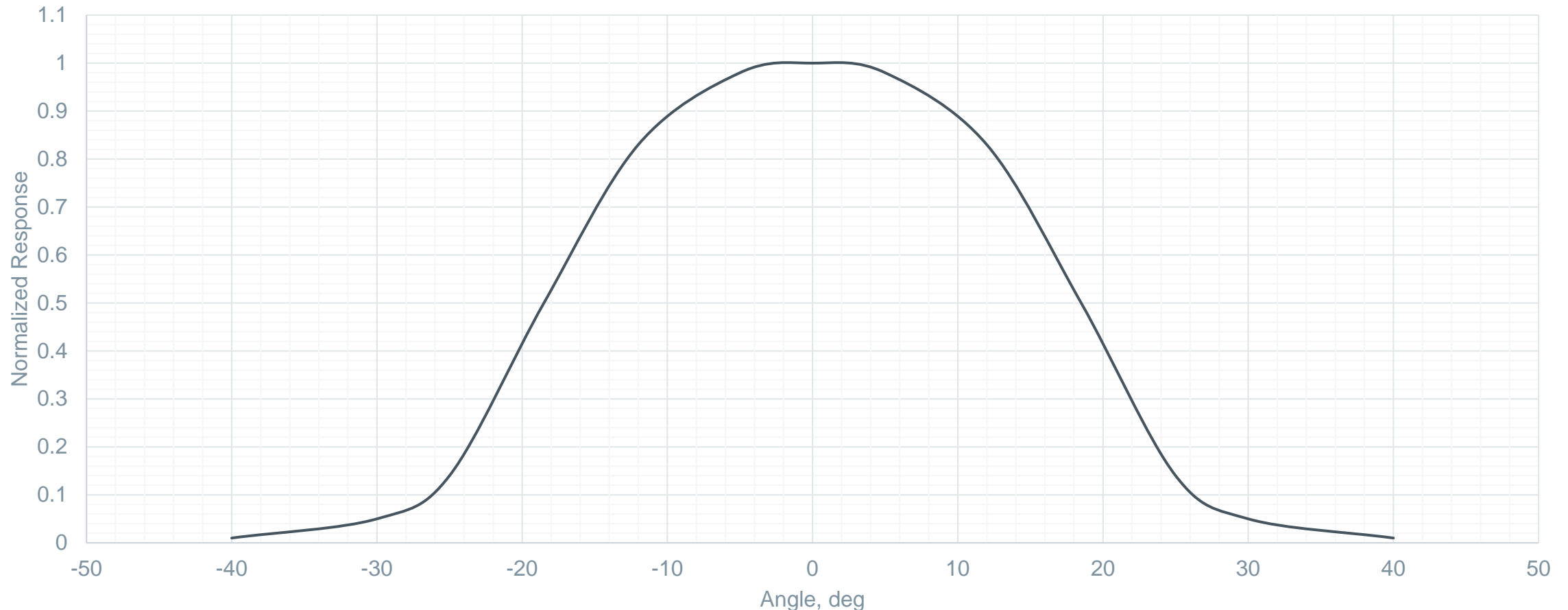
Rx SPAD, PROX MODE, TMF8X0X (PART ONLY)



SPAD FoV: 37° ±18.5° FWHM

Proximity Mode is based on the entire SPAD array.

TMF8x0X Rx FoV, Proximity Mode (Typical), 37° (±18.5°) FWHM



TMF8801/TMF8805: This mode is used for short range detection

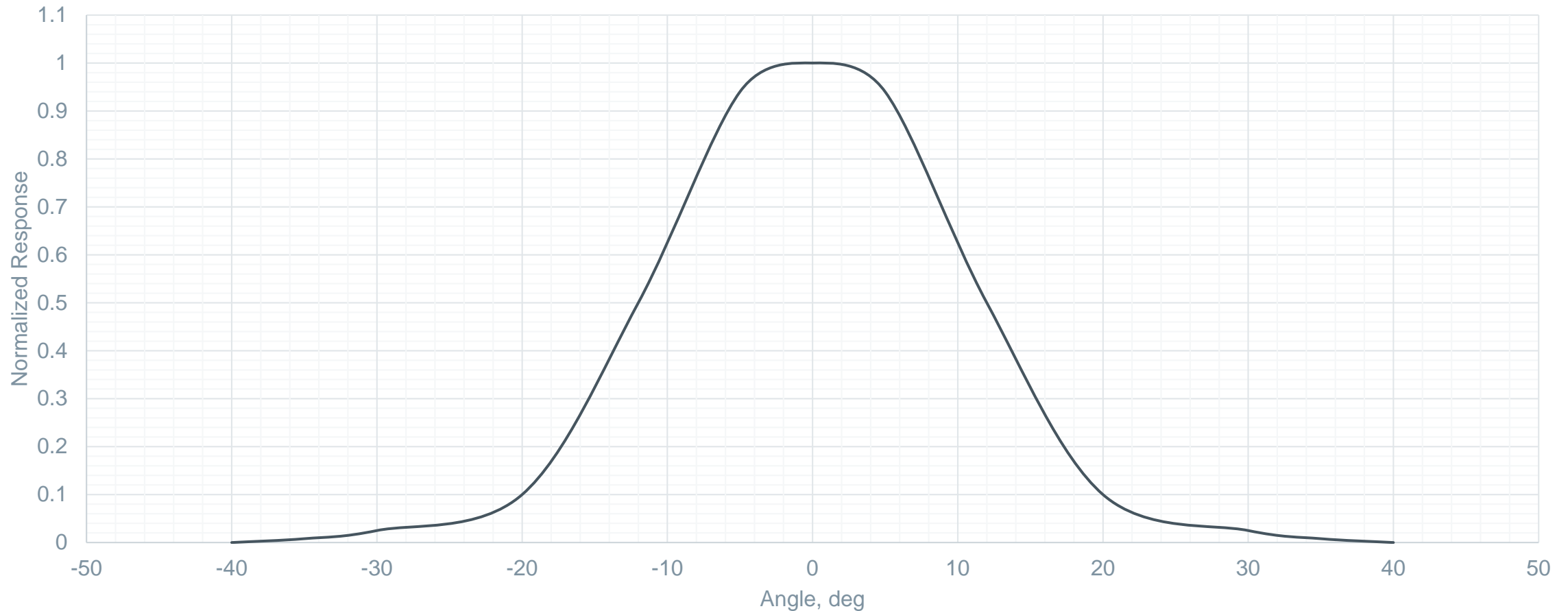
Rx SPAD, DIST MODE, TMF8X0X (PART ONLY)

SPAD FoV: 24° ($\pm 12^\circ$) FWHM

Distance Mode is based on the entire SPAD array.



TMF8x0X Rx FoV, Distance Mode (Typical), 24° ($\pm 12^\circ$) FWHM

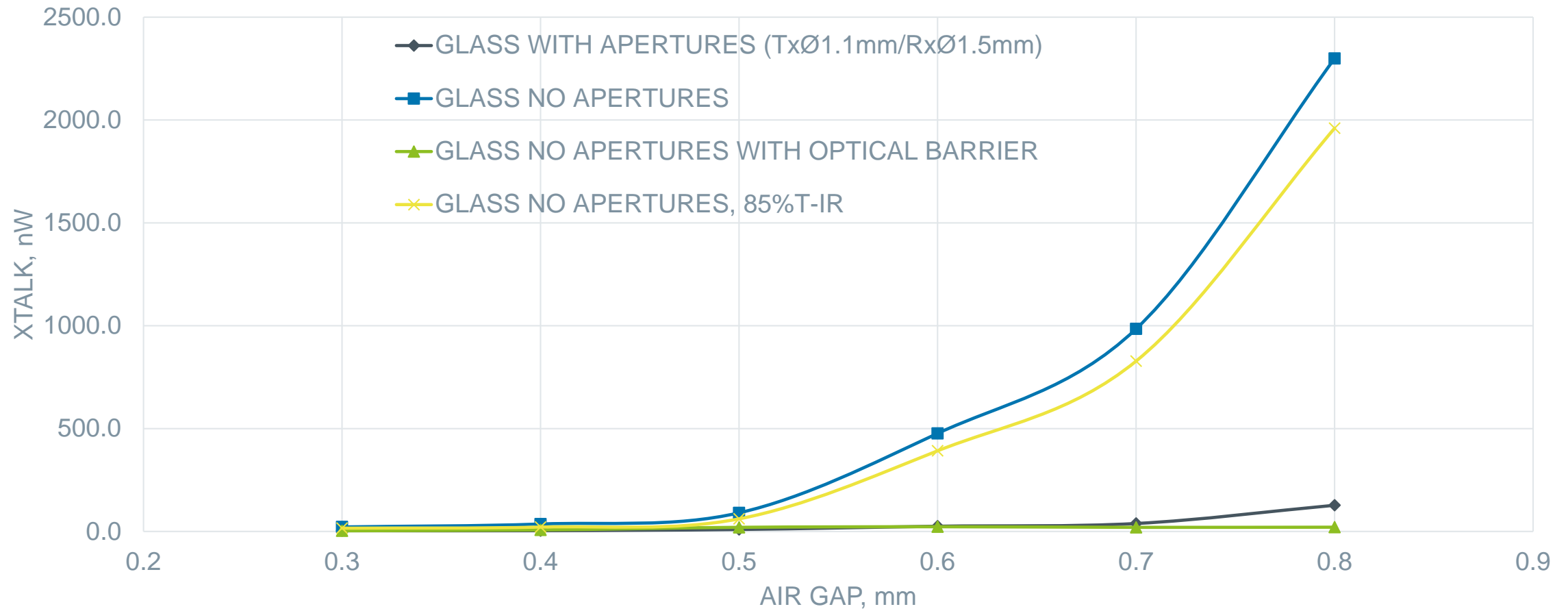


TMF8801/TMF8805: This mode is used for long range detection

TMF8X01 XTALK vs AIR GAP SIMULATED

XTALK RESPONSE

XTALK vs AIR GAP, TMF8X01, GLASS 0.55mm THK



TMF8X01 XTALK vs AIR GAP SIMULATED

XTALK RESPONSE

	Units: nW			
AIR GAP, mm		GLASS NO APERTURES	GLASS NO APERTURES WITH OPTICAL BARRIER	GLASS NO APERTURES, 85%T-IR
0.3	3.6	21.7	3.2	16.1
0.4	3.9	36.0	7.5	21.5
0.5	9.8	90.3	20.0	61.4
0.6	25.5	476.4	22.8	392.0
0.7	38.8	984.6	19.9	828.0
0.8	127.5	2298.8	20.6	1960.0

Simulation configuration descriptions:

1. GLASS WITH APERTURES (TxØ1.1mm/RxØ1.5mm) uses 85% T-IR ink in apertures
2. GLASS NO APERTURES uses plain clear cover glass without 85% T-IR ink/tint
3. GLASS NO APERTURES WITH OPTICAL BARRIER uses plain clear cover glass without 85% T-IR ink/tint
4. GLASS NO APERTURES uses plain clear cover glass with 85% T-IR ink/tint

Correlation Optical Simulation <-> Application

Optical simulation can be used for estimating the variation of an actual customer design

The actual crosstalk value need to be empirically evaluated in a real application

- The crosstalk shall meet the requirement defined in slide “Target Crosstalk Values”
- Please note that TMF8701, TMF8801 and TMF8805 have different application target crosstalk values.



Thank you!

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www.ams.com