Real-time Approximation of Photometric Polygonal Lights

Supplemental Material: Evaluation Results

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1 Comparison Renderings

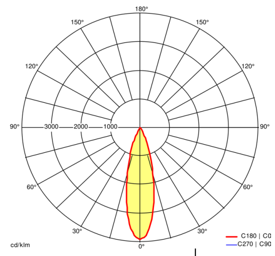
To evaluate the performance with different photometries, we have selected a representative set of luminaires from the luminaire catalog of Zumtobel [1] with a high variance regarding the emission characteristics. On the following pages, each luminaire is presented with the following information:

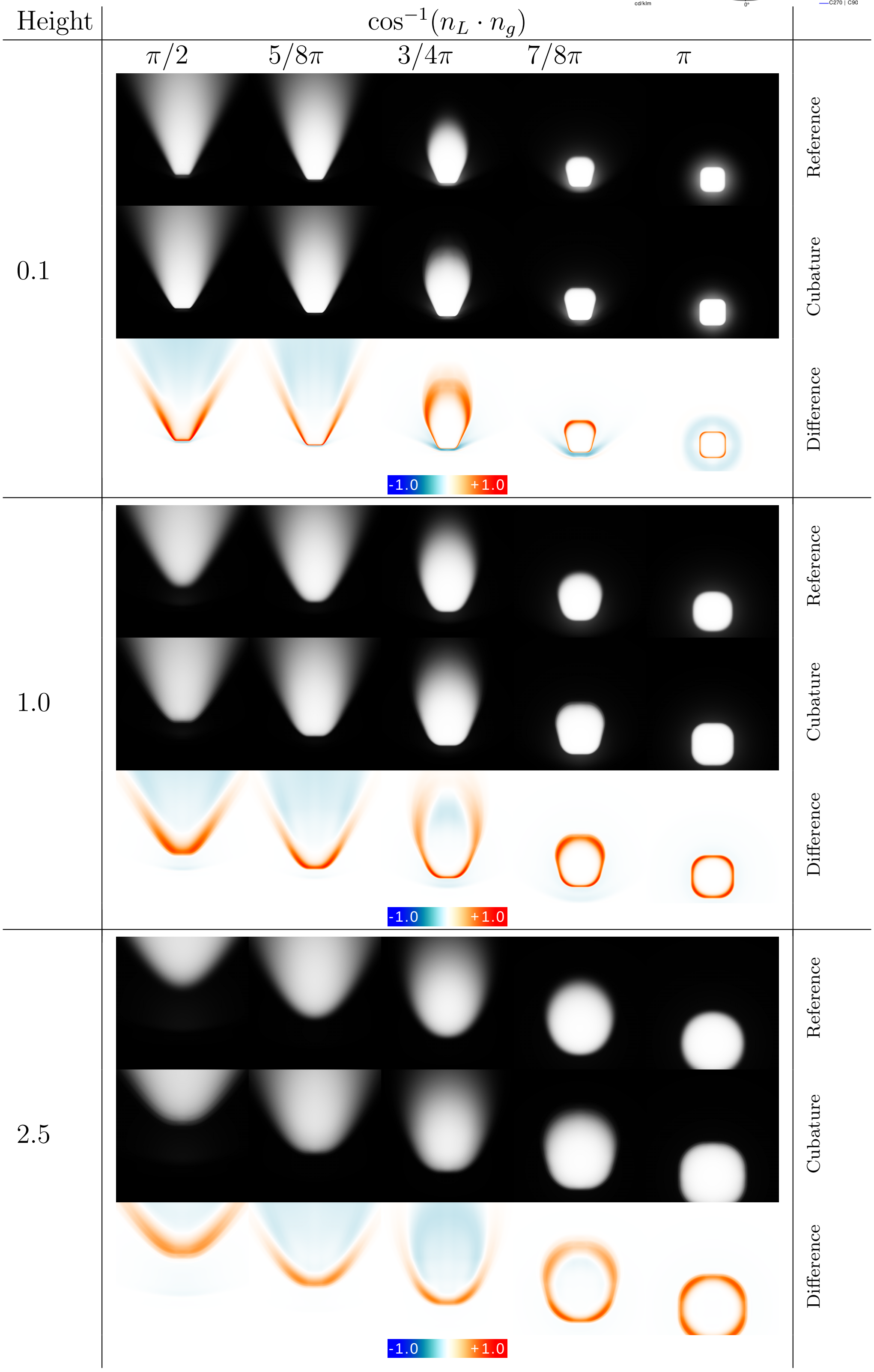
- **Name**: A shortened name which we use to refer to the luminaire.
- **Product Name**: The full name of the luminaire with which it can be found in the Zumtobel catalog.
- **Luminous Intensity Distribution**: An illustration of the luminous intensity distribution, which shows the emission characteristic in a polar plot.
- **Comparison Renderings**: A table showing the comparison of the reference solution and our approximation method for the luminaire generated with our evaluation setup for various relations to the ground plane (see Section 6 in the main paper).

[1] Zumtobel Online Catalog `https://www.zumtobel.com/com-en/products.html`

ARCOS

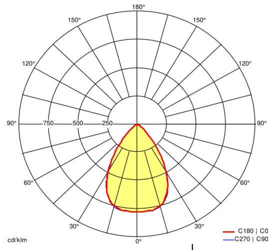
ARC3 1/28W LED927-65 LDO 3CD SP WHM



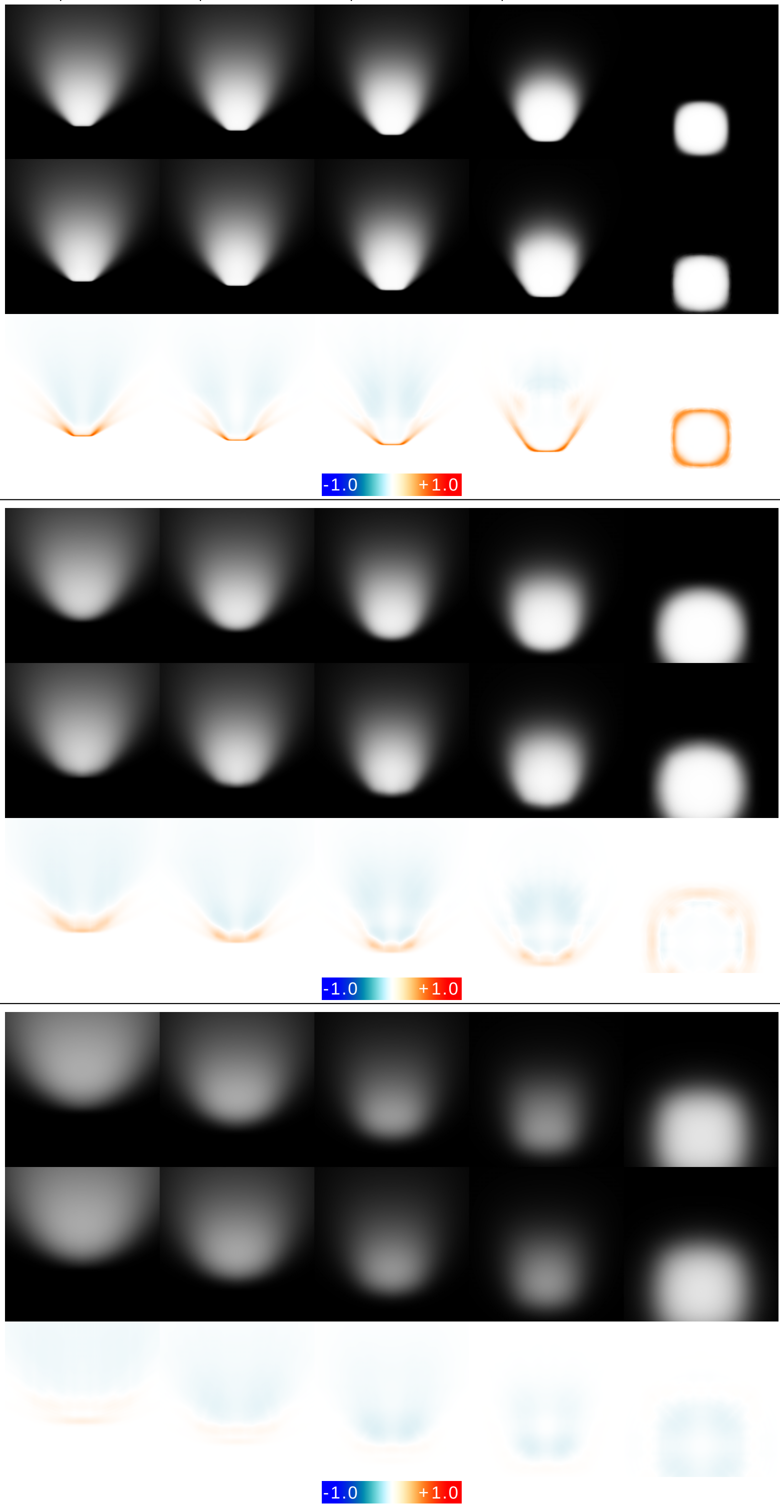


PANOS

PANOS INF Q140HF 22W LED927-65 LDE WH

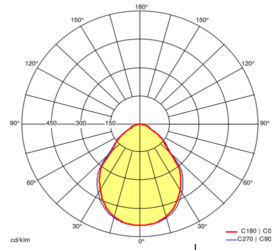


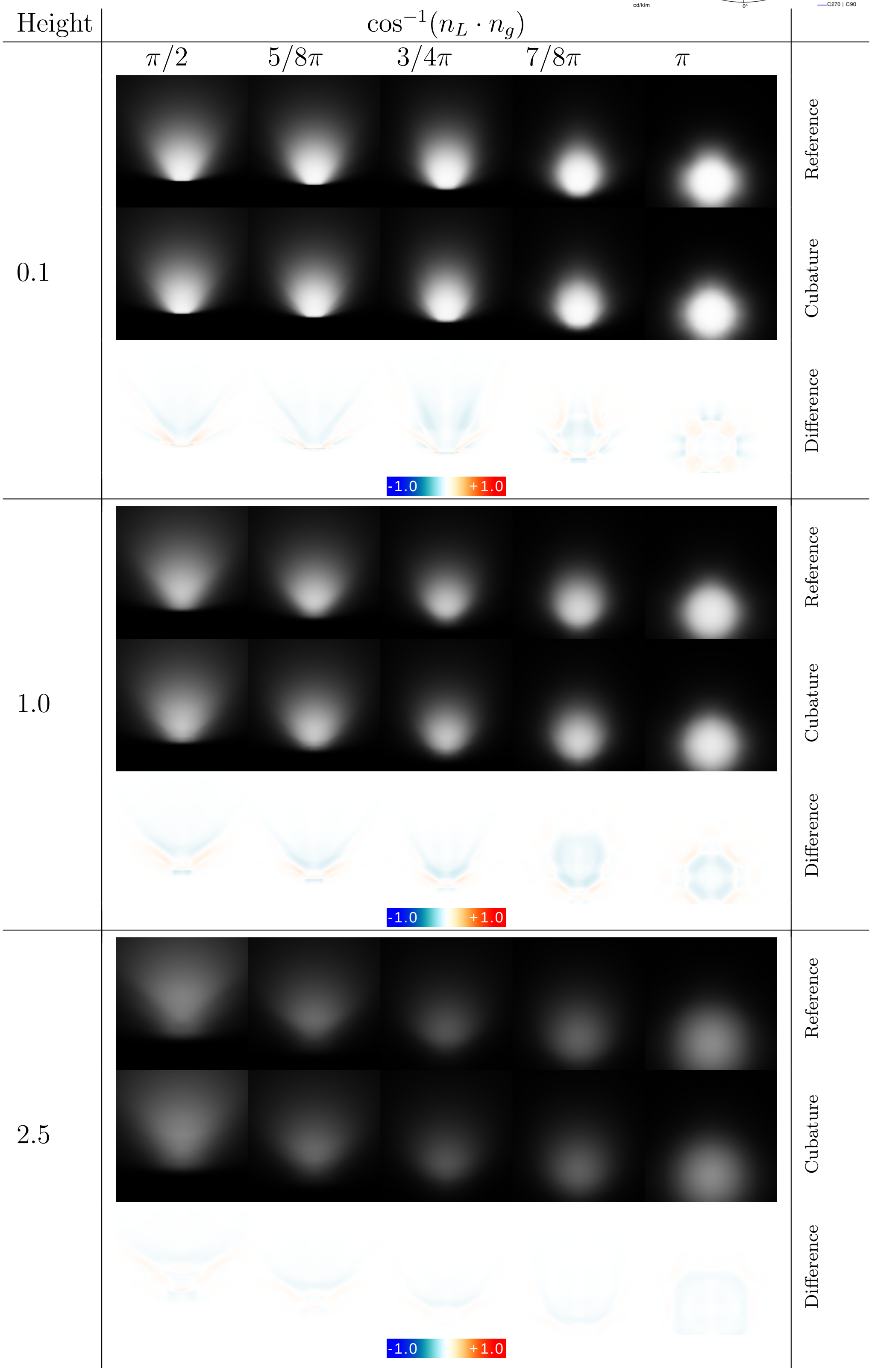
Height	$\cos^{-1}(n_L \cdot n_g)$	
	$\pi/2$ $5/8\pi$ $3/4\pi$ $7/8\pi$ π	
0.1		Reference / Cubature / Difference
1.0		Reference / Cubature / Difference
2.5		Reference / Cubature / Difference



SLOTLIGHT

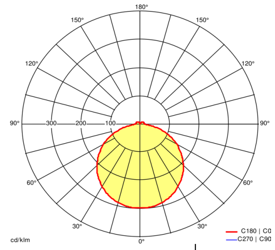
SLOIN A SL IP54 LED2800-840 L2040 PCO

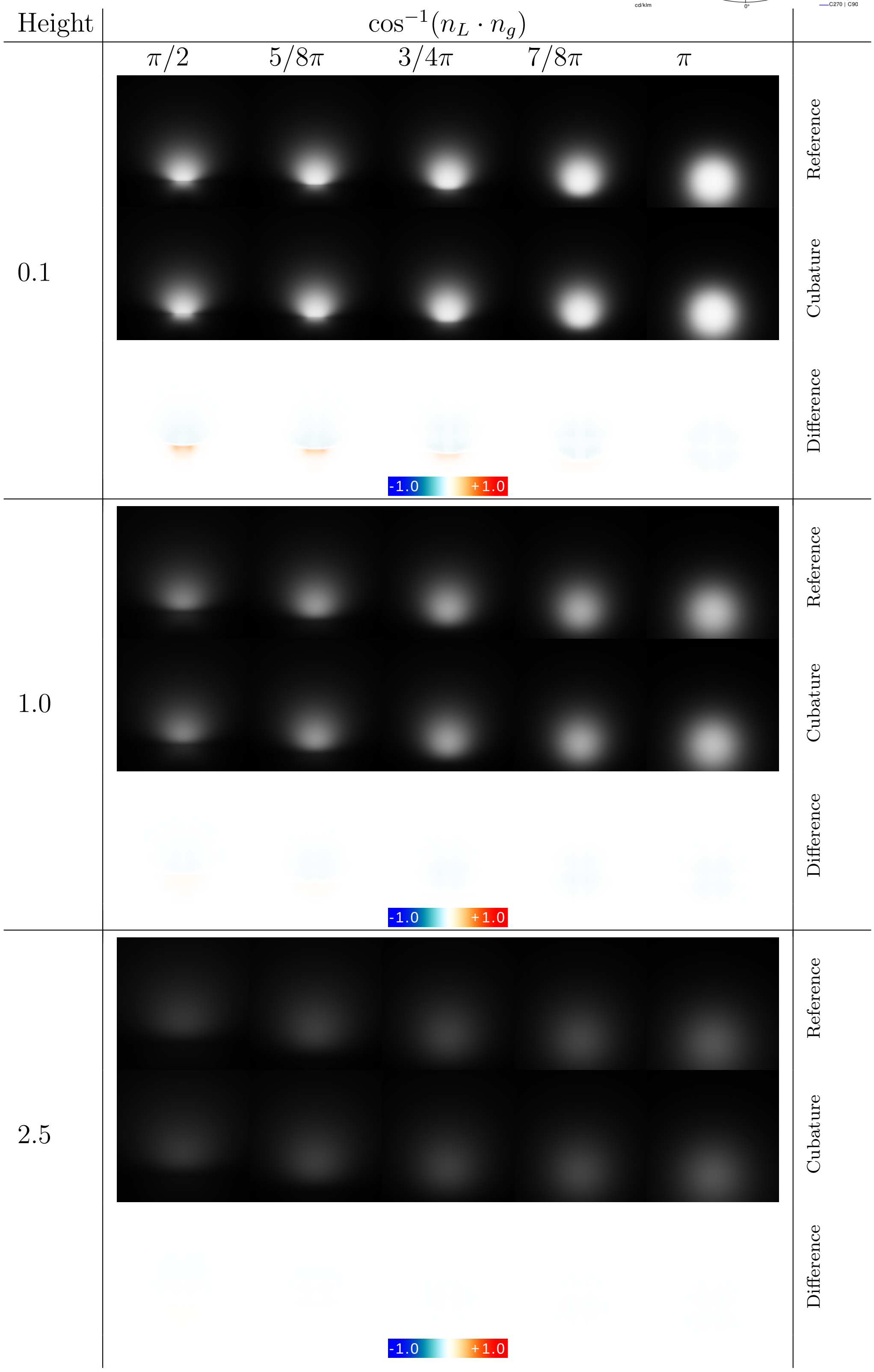




PERLUCE

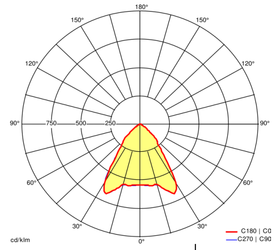
PERLUCE O LED5200-840 Q620 LDE IP50 WH





MIREL

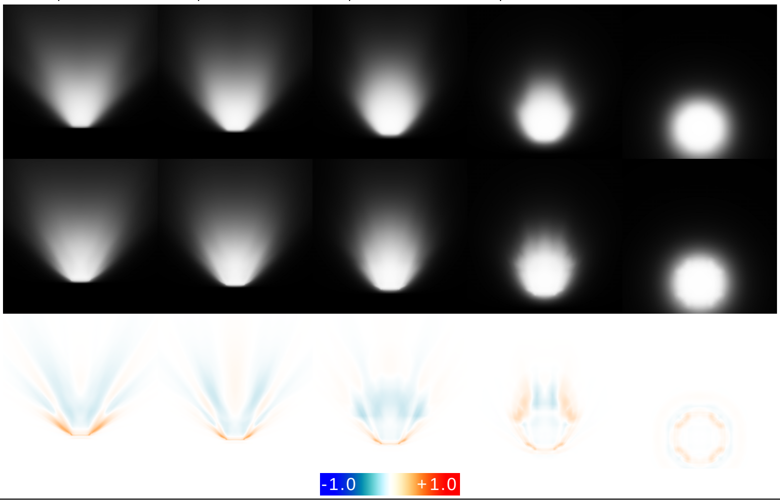
MIRL NIV LED2800-830 M625Q LDO



Height | $\cos^{-1}(n_L \cdot n_g)$

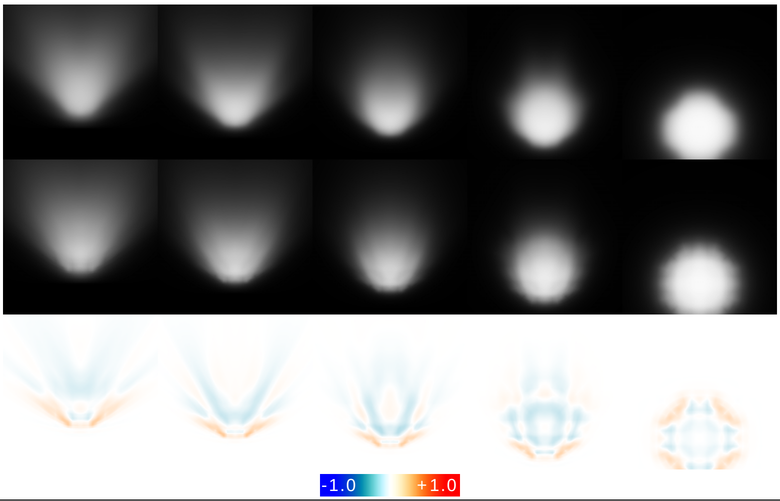
$\pi/2$ $5/8\pi$ $3/4\pi$ $7/8\pi$ π

0.1



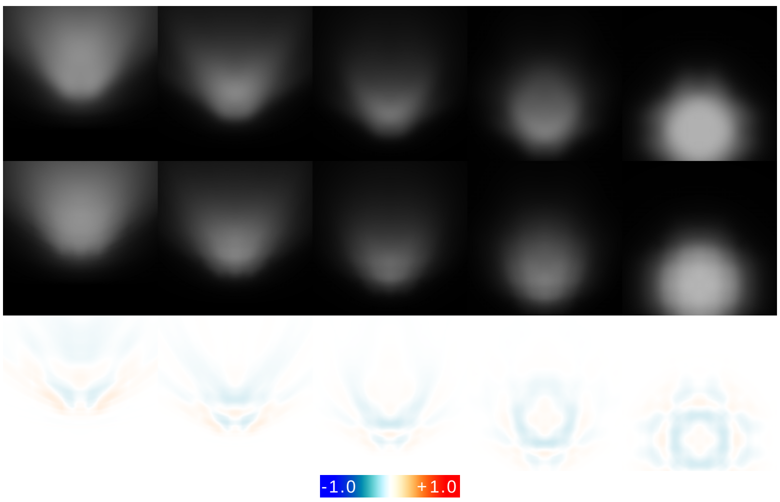
Reference
Cubature
Difference

1.0



Reference
Cubature
Difference

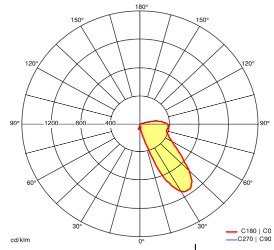
2.5

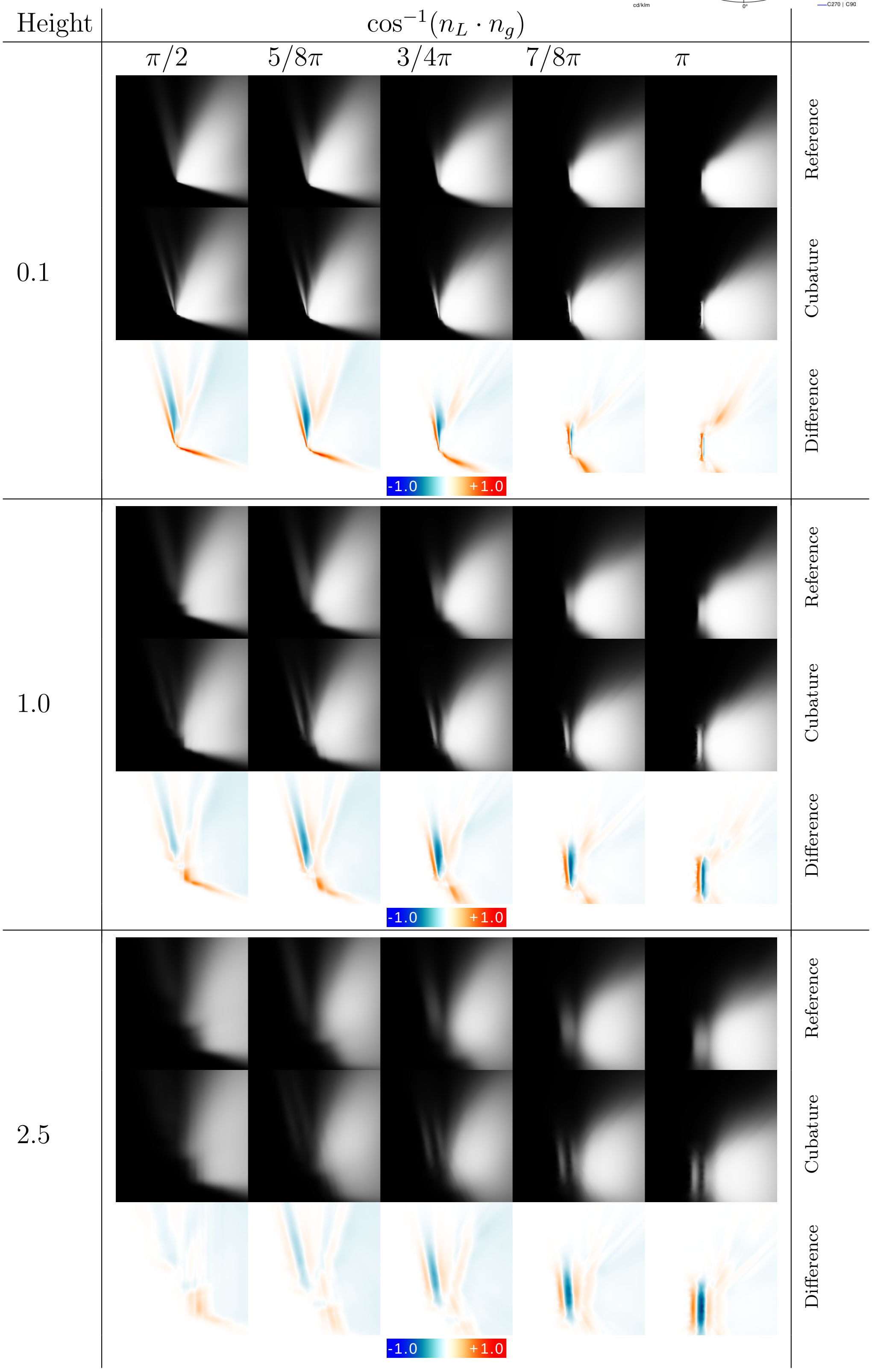


Reference
Cubature
Difference

INTRO

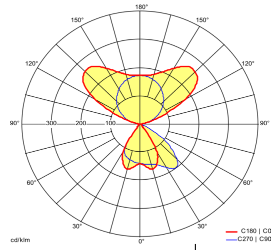
INT LED2800-940 LC 3CV BK

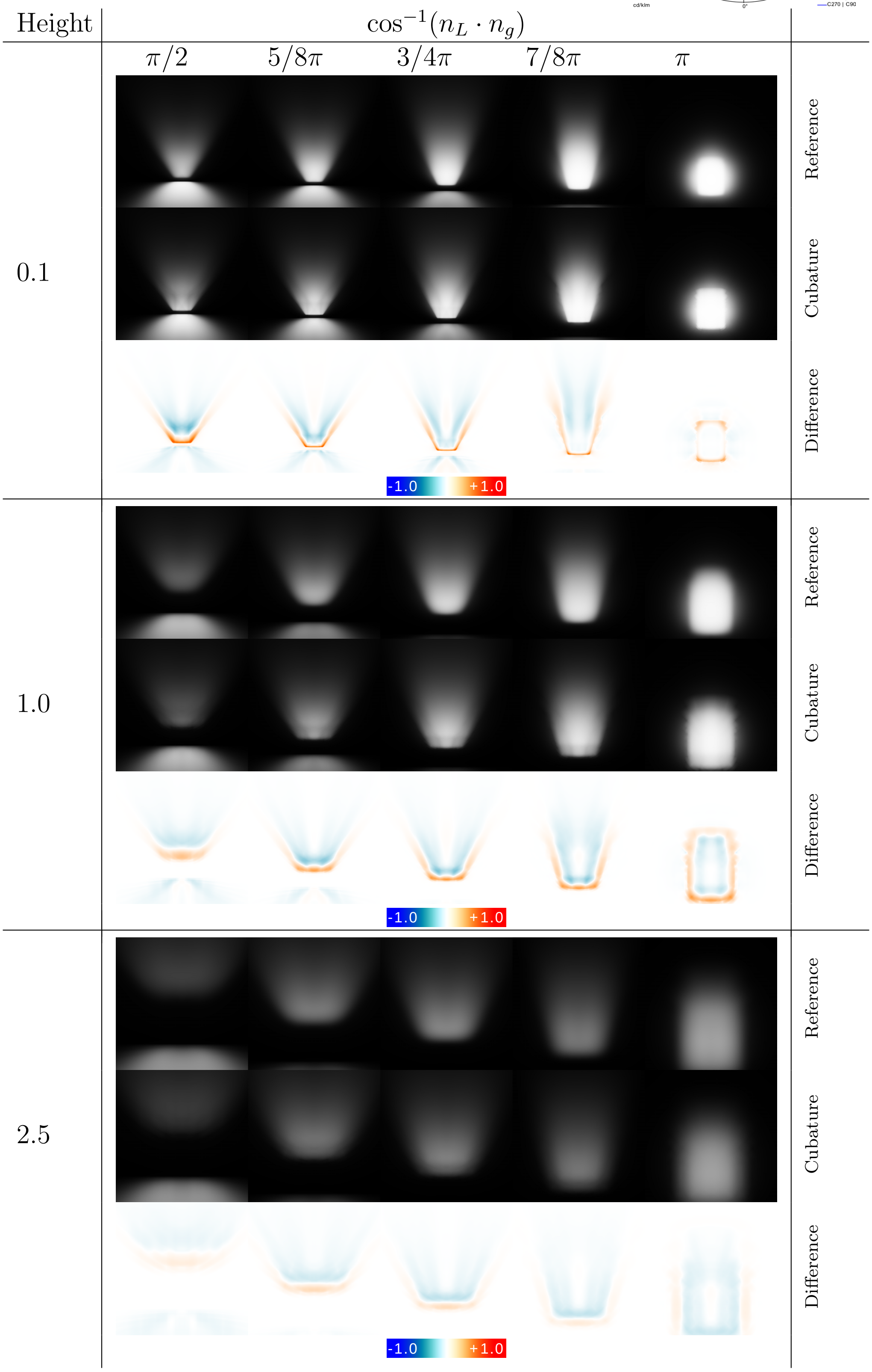




LINETIK

LINETIK-S D/I LED8000-830 SC WH SR2 IL





2 Error Chart

The following chart shows the NRMS error of our approximation calculated from the comparison renderings. It groups the error values per intensity profile and shows a combined error value per evaluation height, that has been calculated from the stitched image containing all orientations.

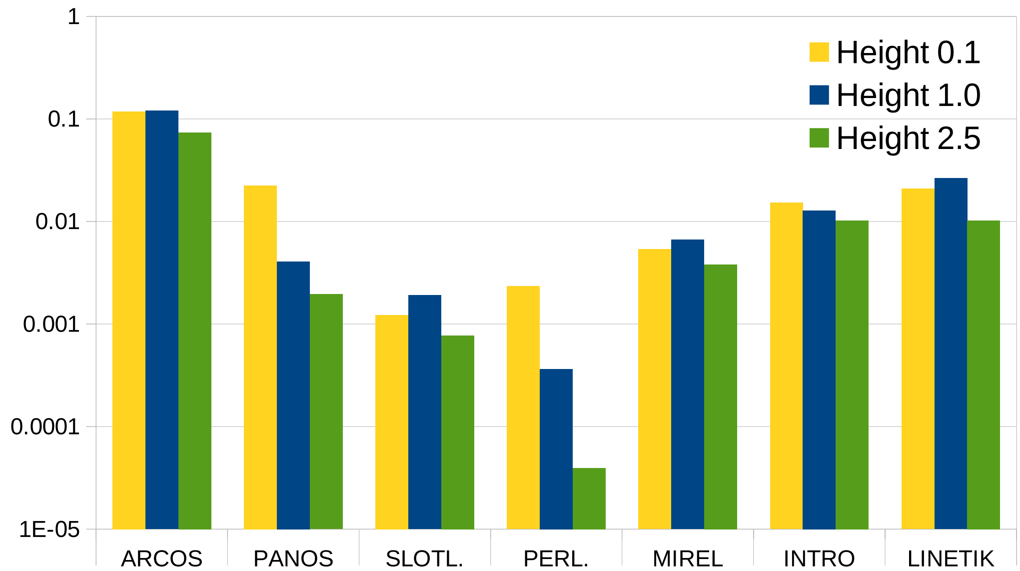


Figure 1: NRMS error of combined images with all orientations at different heights.

3 Geometric Term Approximation

Additionally, we evaluate the approximation of the geometric term by replacing the intensity profile with two simple analytic functions. The first is a diffuse emission that cancels the radiance substitution of Equation 2 (main paper):

$$I(\omega) = \cos(\omega) \tag{1}$$

$$L(x) = \int_{\Omega} (\omega_i \cdot \mathbf{n_x}) d\omega_i \tag{2}$$

Note, we have omitted all constant factors in $L(x)$. Second, we use a constant intensity profile, representing an omni-directional point light:

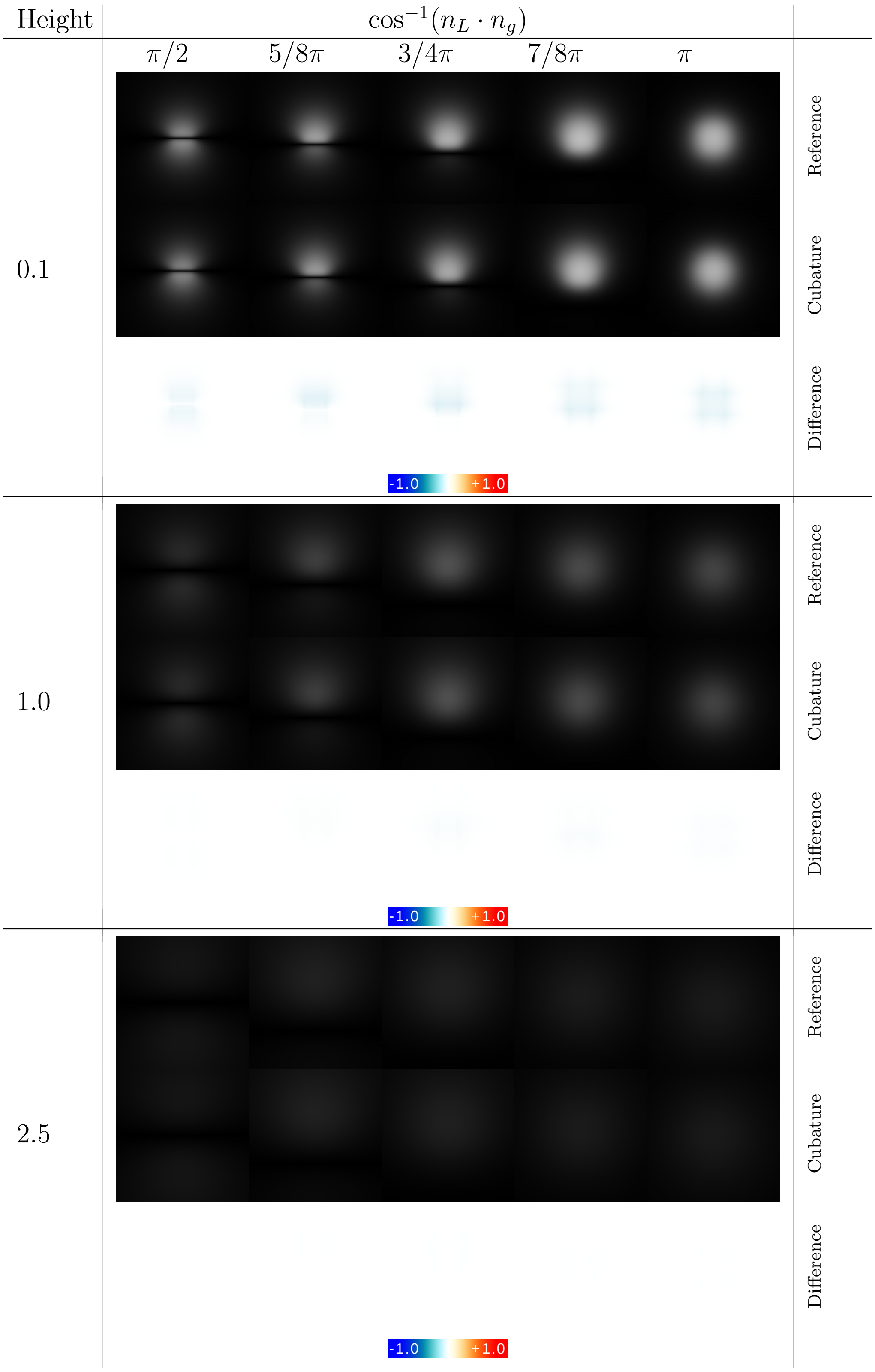
$$I(\omega) = C \tag{3}$$

$$L(x) = \int_{\Omega} \frac{(\omega_i \cdot \mathbf{n_x})}{(-\omega_i \cdot \mathbf{n_A})} d\omega_i \tag{4}$$

The following two pages show the images of the reference renderings, our approximation and the difference. In difference to the previous evaluation, we have reduced the camera view from 5 units to 3 units radius around the light area. Everything else is configured equally.

DIFFUSE

$I(\omega) = \cos(\omega)$



POINT

$I(\omega) = C$