Nonimaging Optics Design Competition 2026

Can you fit the light from a square peg through a round hole?

1995

1995 Design Challenge

"Given a spherical Lambertian source of radius 1 cm, devise an axially symmetric projector design that transmits as much of the energy as possible into a 5° half-angle emergent cone with a circular exit aperture radius of 22.9474265 cm (which corresponds to the ideal concentration ratio). Assume 100% reflectivity and perfect specularity. Any combination of reflective and/or refractive components may be employed. No optical component may approach within a distance of less than 0.5 cm from the source

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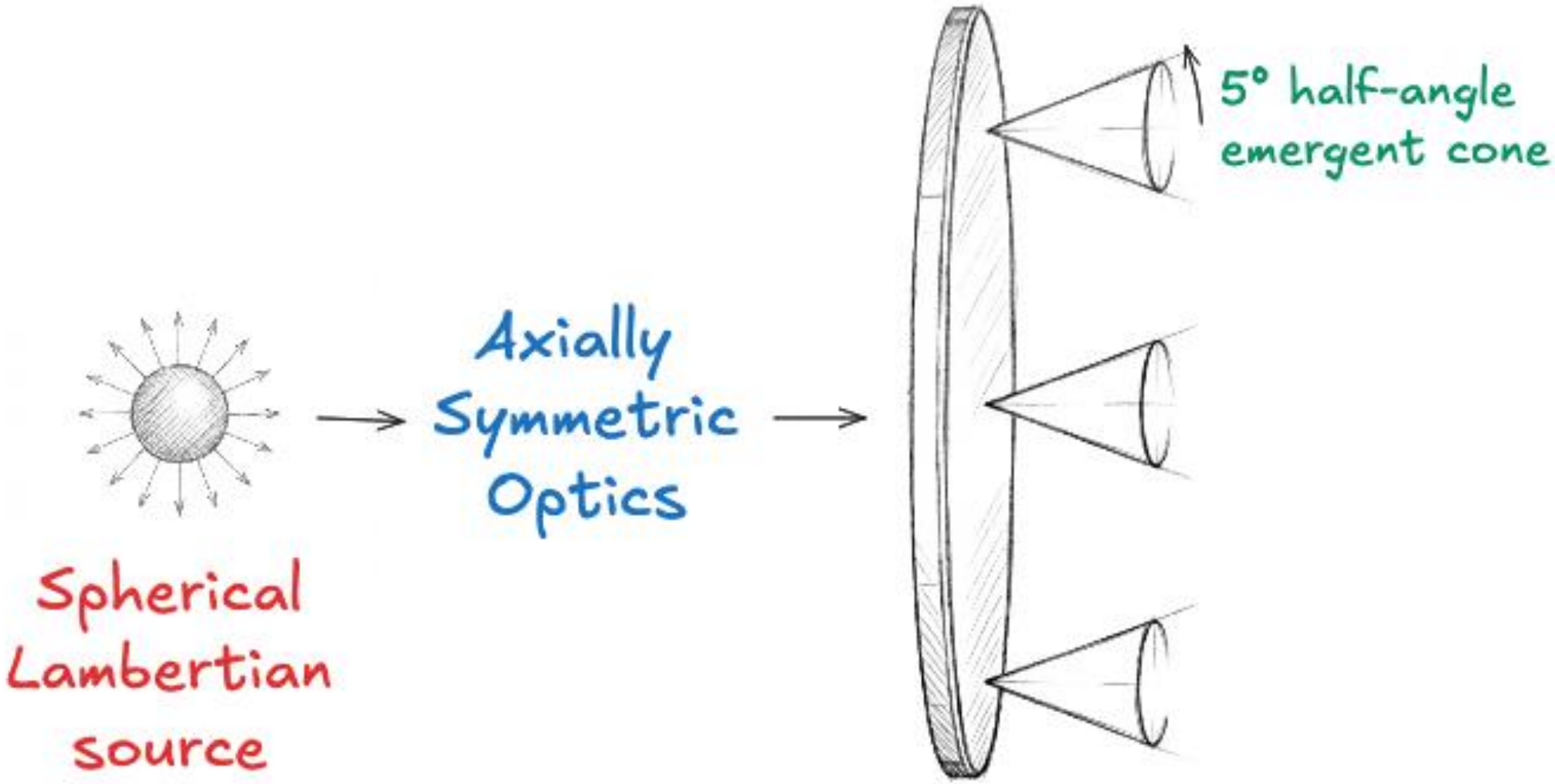
1995 Design Challenge



1997

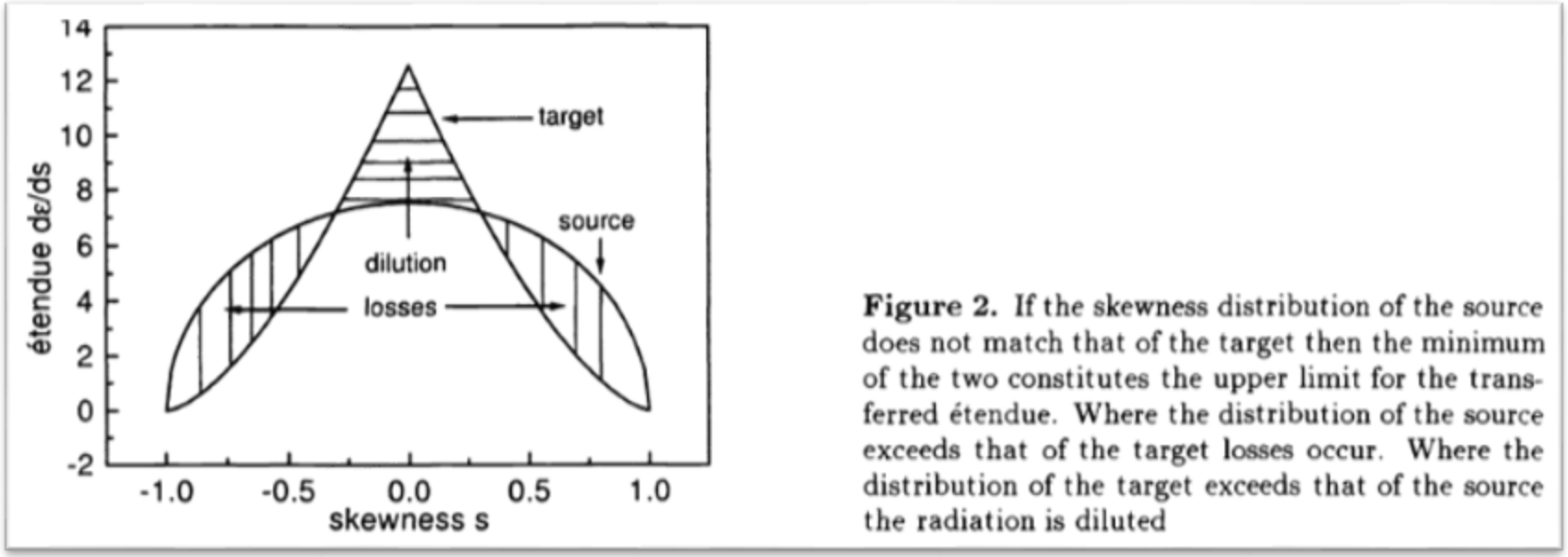
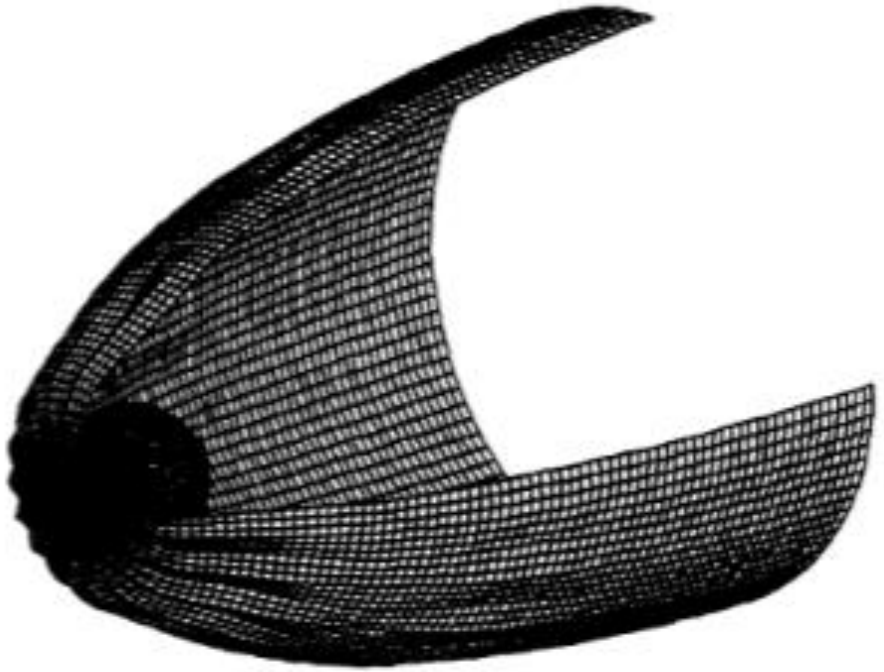


Figure 2. If the skewness distribution of the source does not match that of the target then the minimum of the two constitutes the upper limit for the transferred étendue. Where the distribution of the source exceeds that of the target losses occur. Where the distribution of the target exceeds that of the source the radiation is diluted

Paper 1:
Ries, Shatz, Bortz, Spirkl, "Consequences of skewness conservation for rotationally symmetric nonimaging devices," Proc. SPIE 3139 (1997); https://doi.org/10.1117/12.290221

Paper 2:
Bortz, Shatz, Ries, Winston, "Consequences of etendue and skewness conservation for nonimaging devices with inhomogeneous sources and targets," Proc. SPIE 3139 (1997); https://doi.org/10.1117/12.290222



Paper 3:
Shatz, Bortz, Ries, Winston, "Nonrotationally symmetric nonimaging systems that overcome the flux-transfer performance limit imposed by skewness conservation," Proc. SPIE 3139 (1997);
https://doi.org/10.1117/12.290226

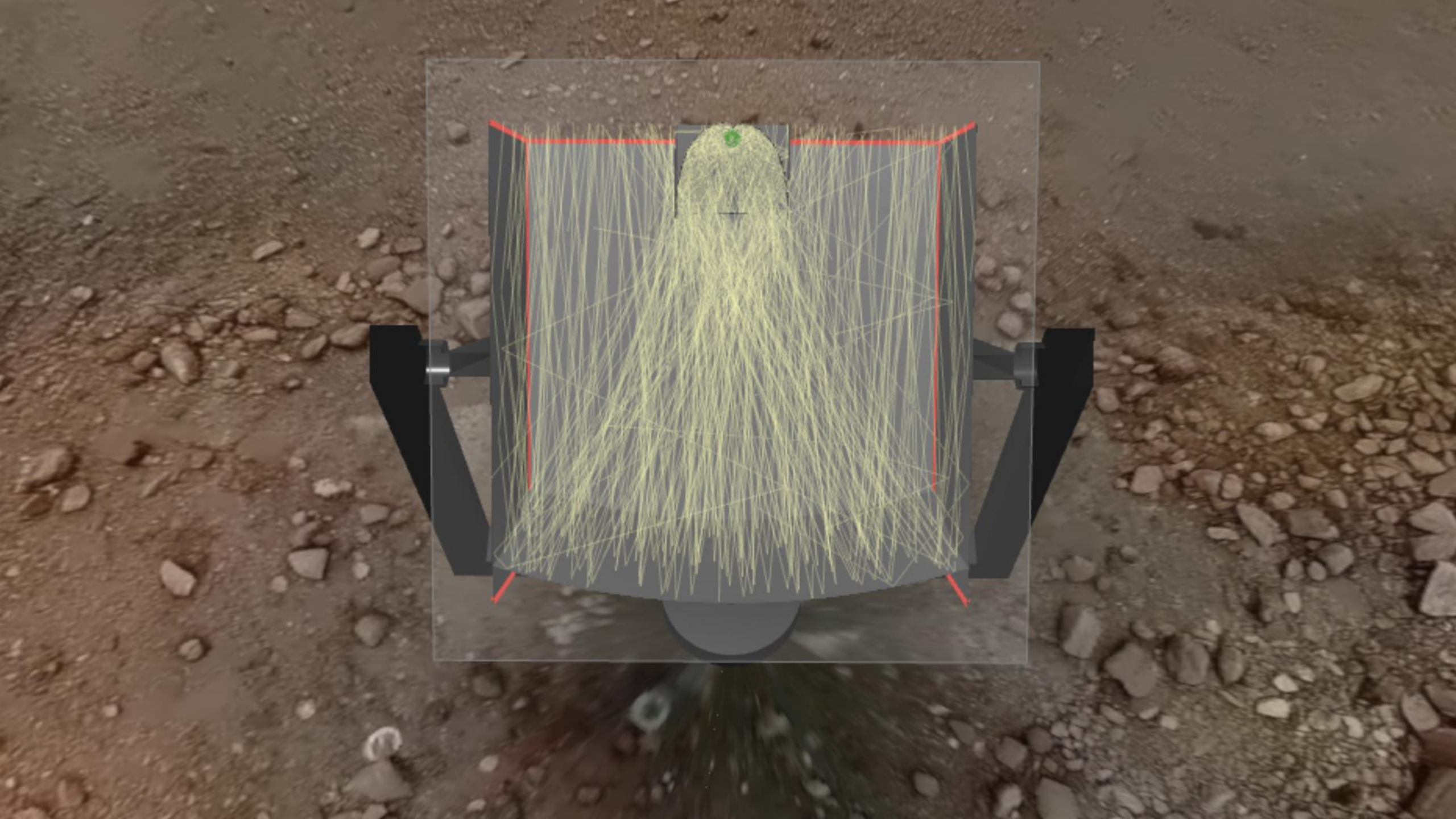
Nonimaging Optics Design Competition 2025

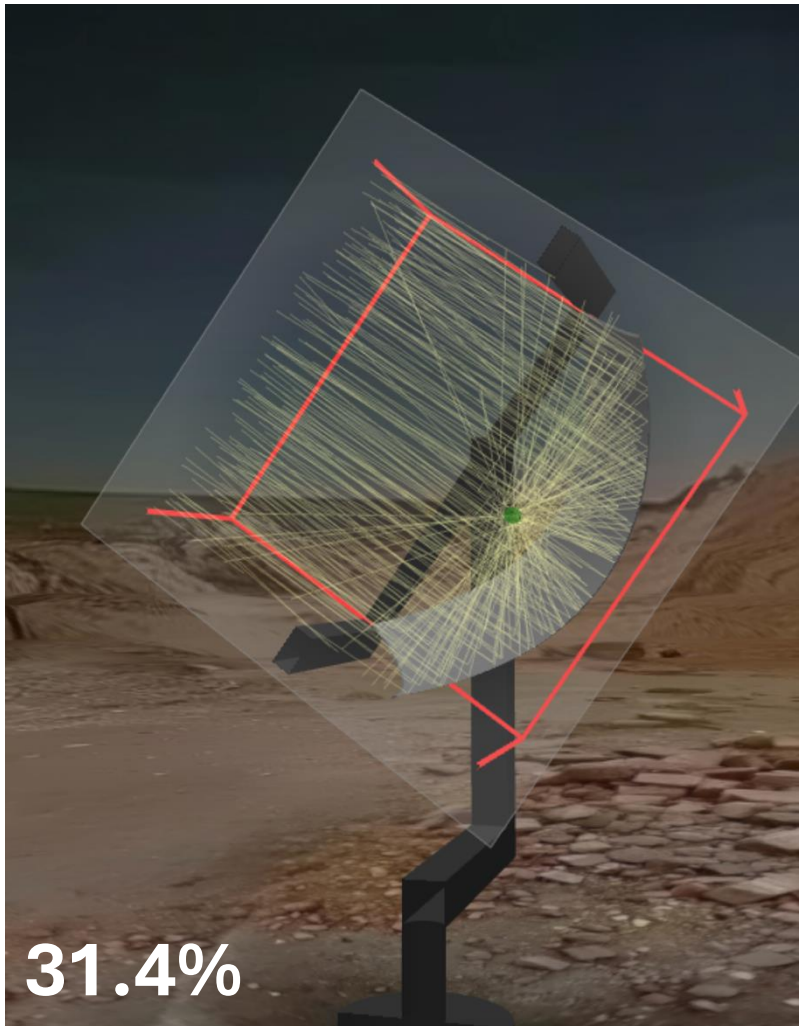
Can you illuminate the nonimaginum rod and find your way back home?

Winning design:
Ludo Haenen (Signify)

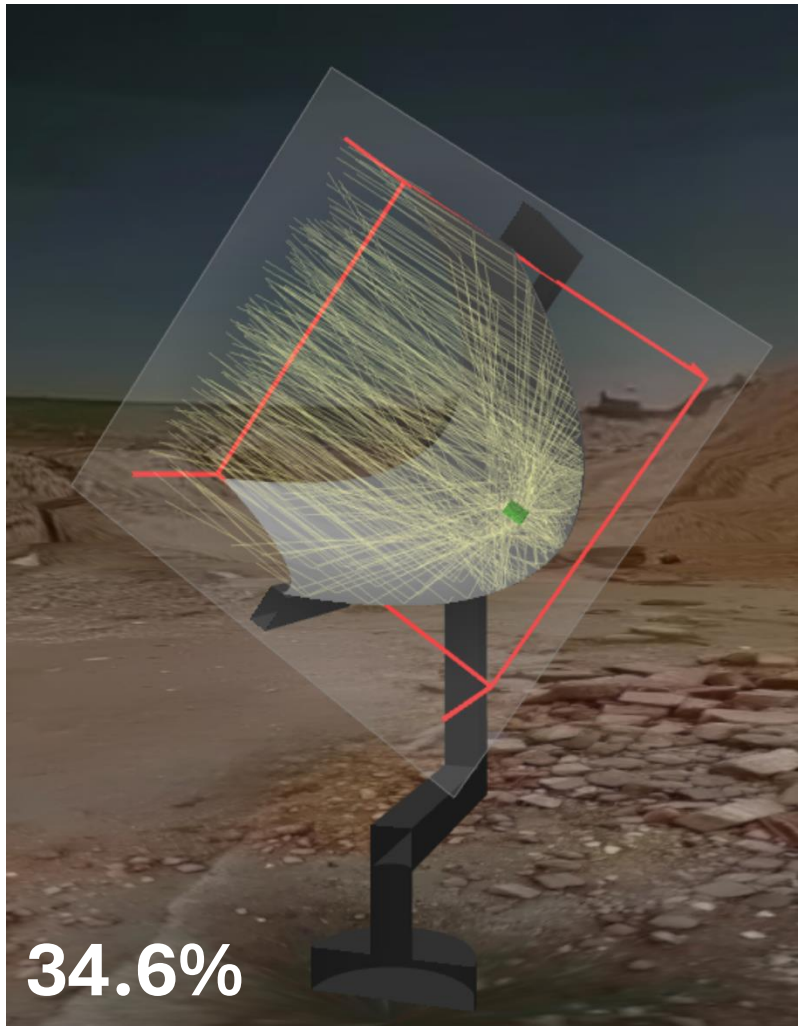
Efficiency:

53.3%

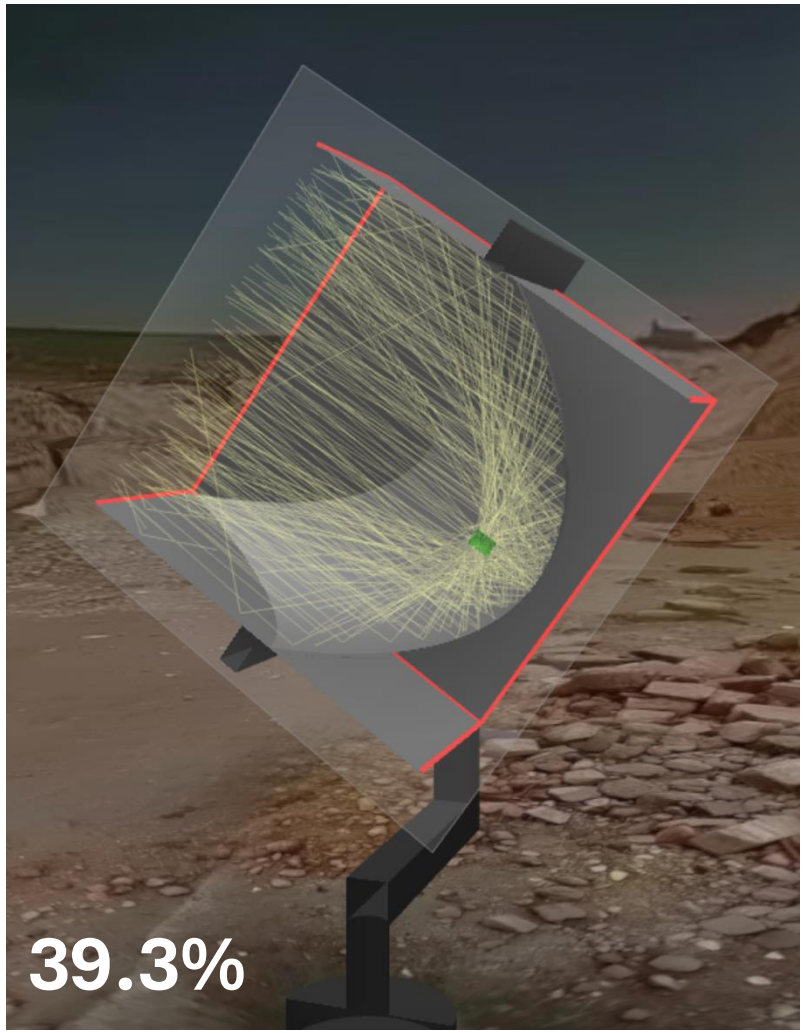




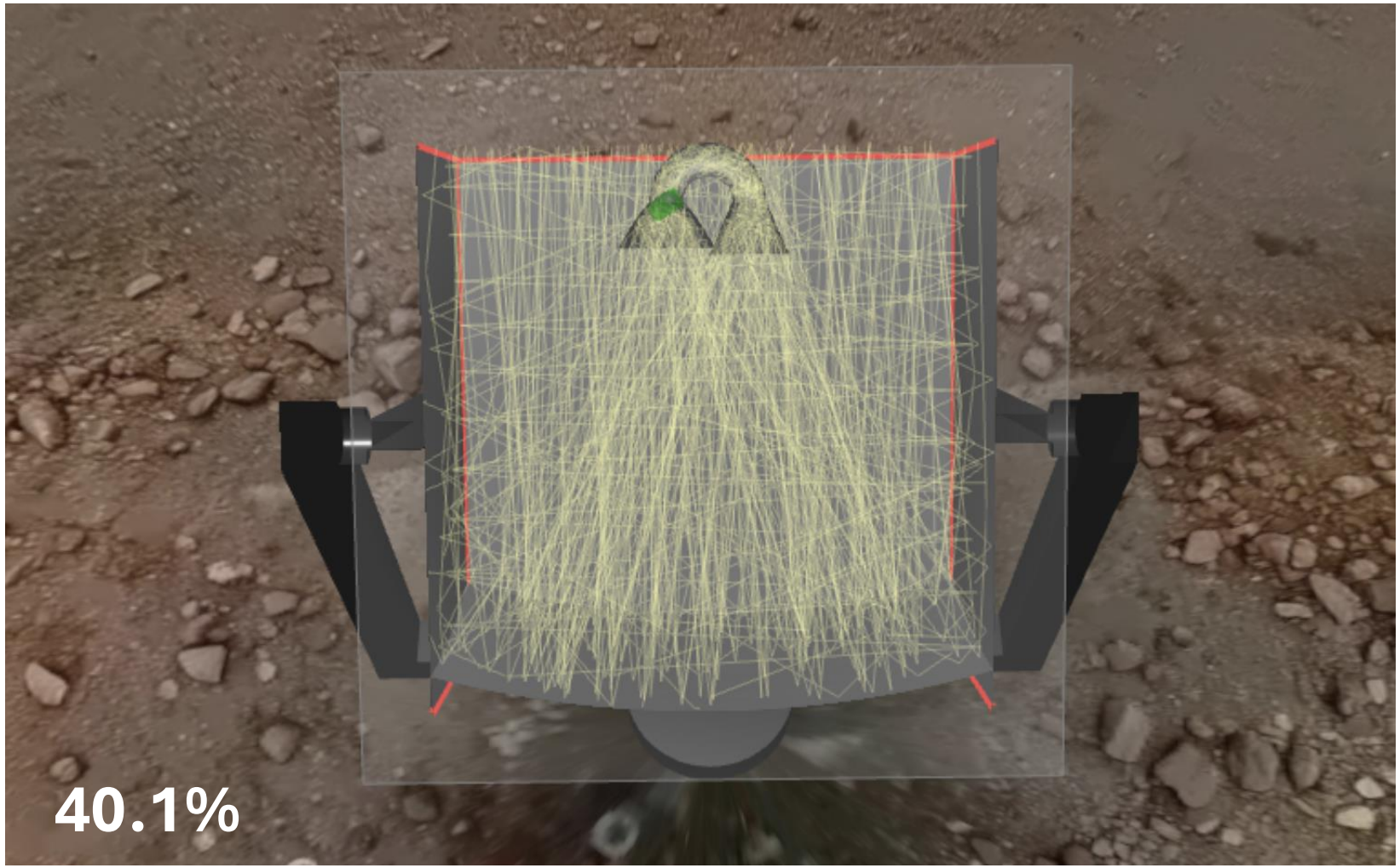
Alex Lehmann (UNSW)
Custom Matlab-code



Jean-Baptiste Keck (UGA)
Custom Pytorch-code



Victor Poughon (UGA)
Torch Lens Maker



John Hygelund
Zemax OpticStudio

Table 1.

Summary of contestants and the best efficiency of their submitted designs.

Name	Country	Affiliation	Software	Best efficiency
Yamila Borsch	Germany	Edmund Optics	Ansys Zemax OpticStudio	12.7%
Ludo Haenen	The Netherlands	Signify Research	LightTools	53.3%
Tobias Hönle	Germany	Magic Leap Inc.	Ansys Zemax OpticStudio	41.6%
John Hygelund	USA	Arthrex California Technology	Ansys Zemax OpticStudio	40.3%
Jean-Baptiste Keck	France	Université Grenoble Alpes	Custom PyTorch code	34.6%
Alex Lehmann	Australia	School of Photovoltaic & UNSW Sydney	Custom code	31.5%
Victor Poughon	France	Université Grenoble Alpes	Torch Lens Maker	39.3%
Henning Rehn	Switzerland	Illuminatio Solutions GmbH	LightTools + own optimizer code	37.6%
Joris Vrehen	The Netherlands	Signify Research	LightTools	49.0%

Smeesters, Borsch, Haenen, Hönle, Hygelund, Keck, Lehmann, Poughon, Rehn, Vrehen, Jiang, Cooper, Johnsen, "The XX concentrator design challenge," Proc. SPIE 13597 (2025); https://doi.org/10.1117/12.3065448

Nonimaging Optics Design Competition 2026

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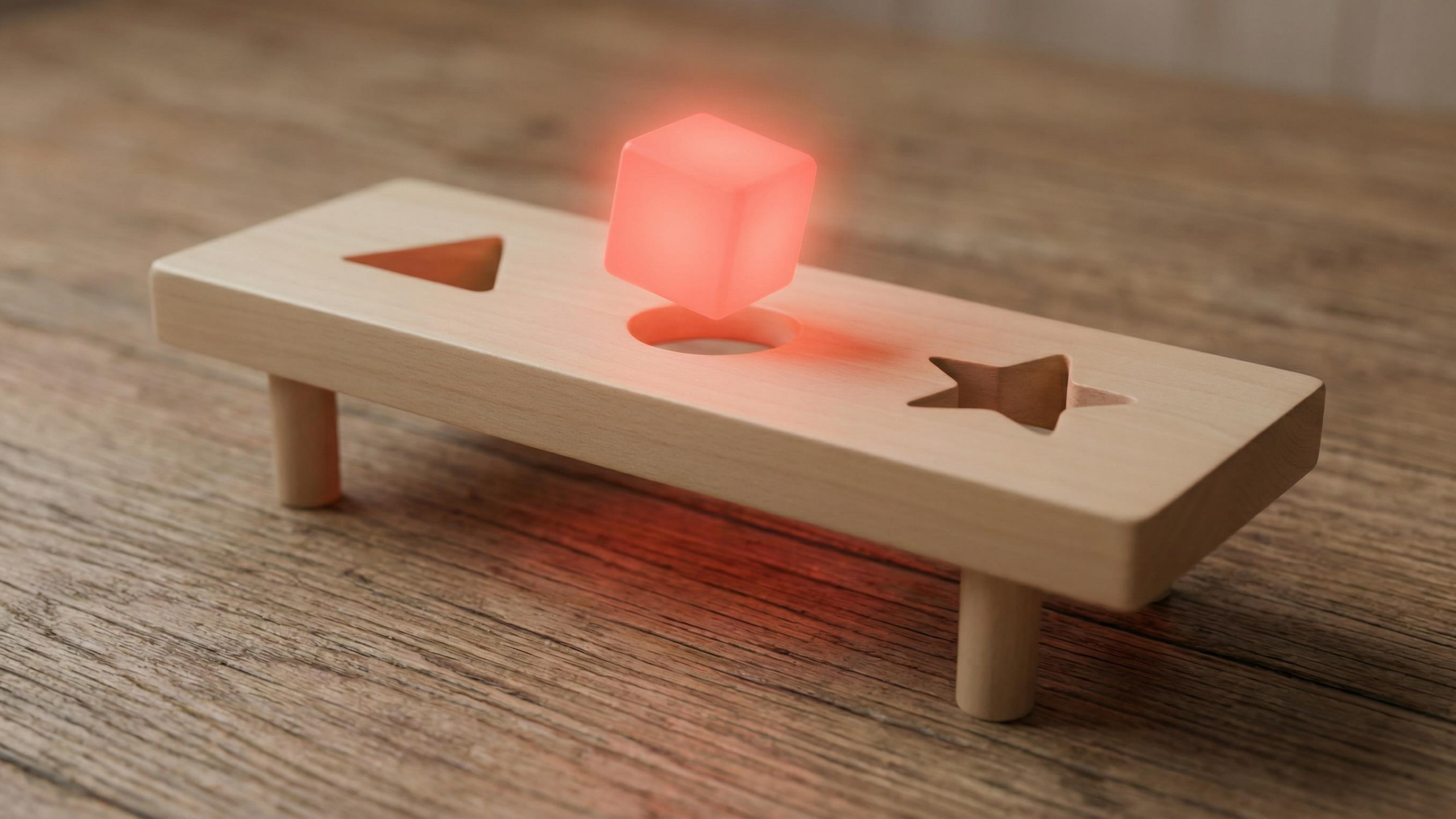
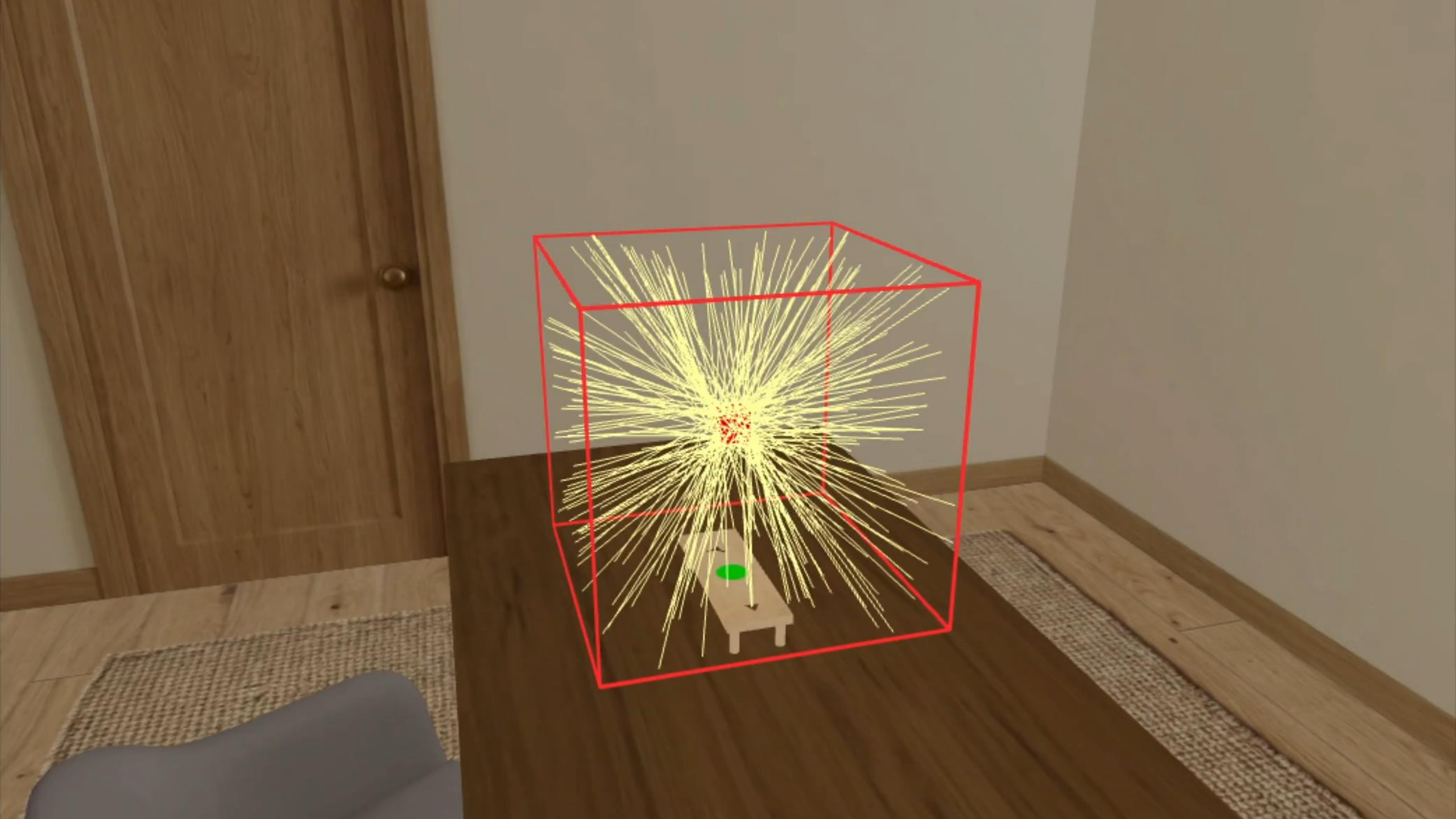
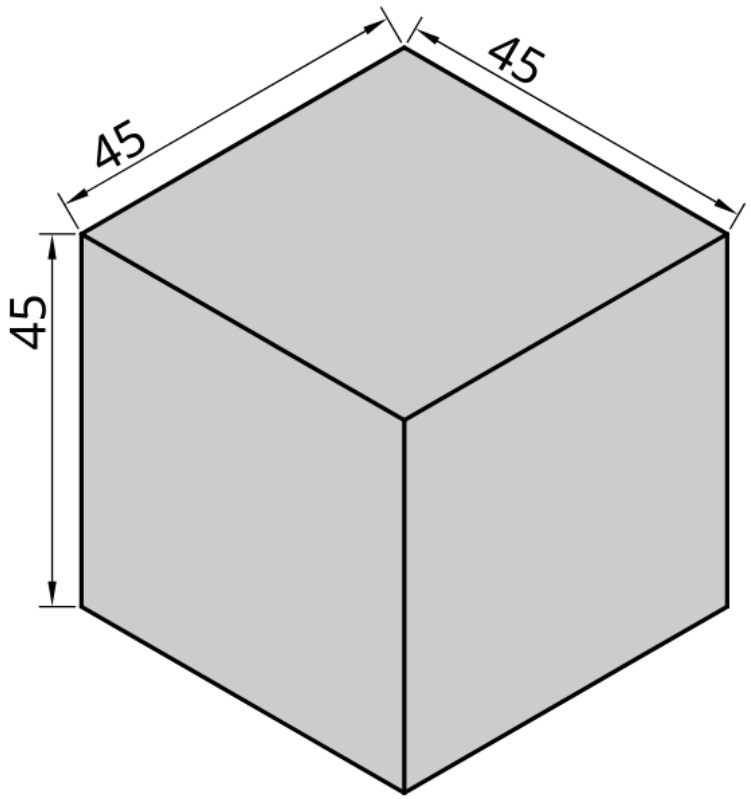
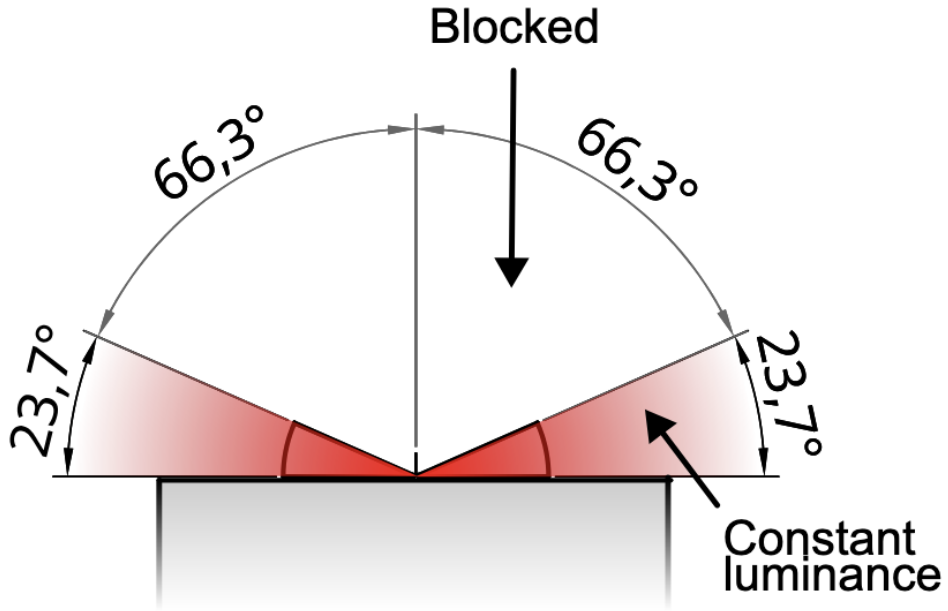


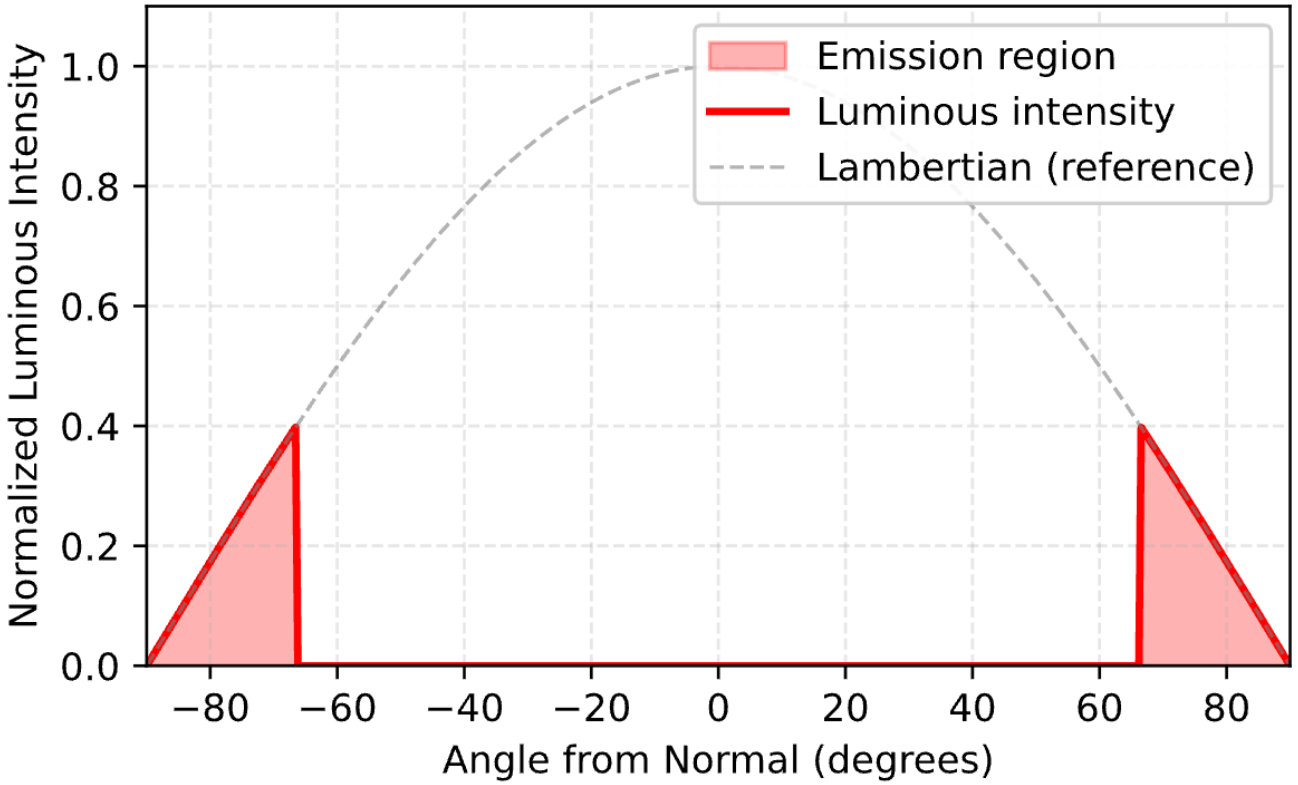


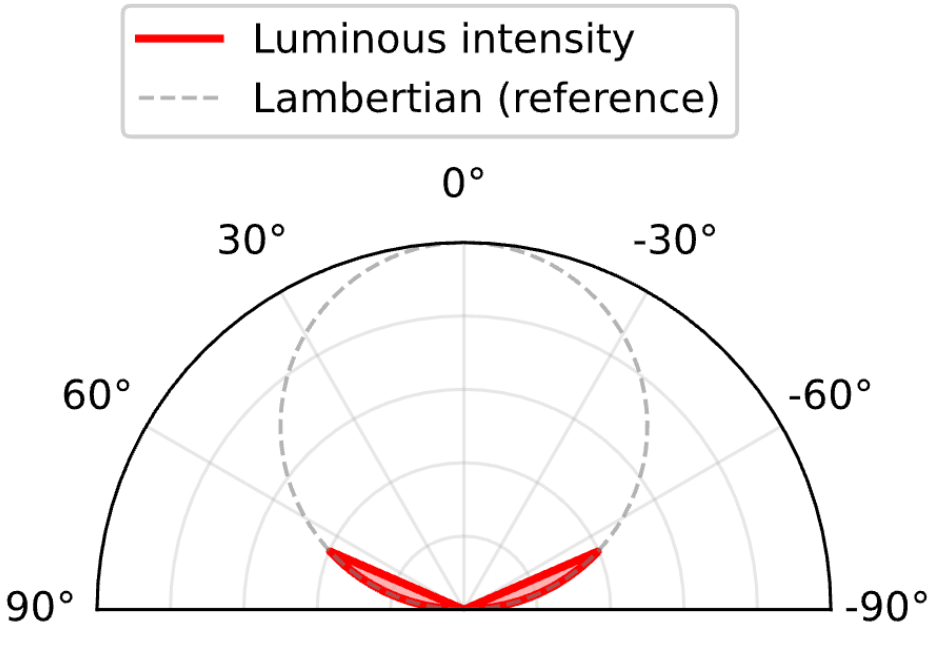
The source



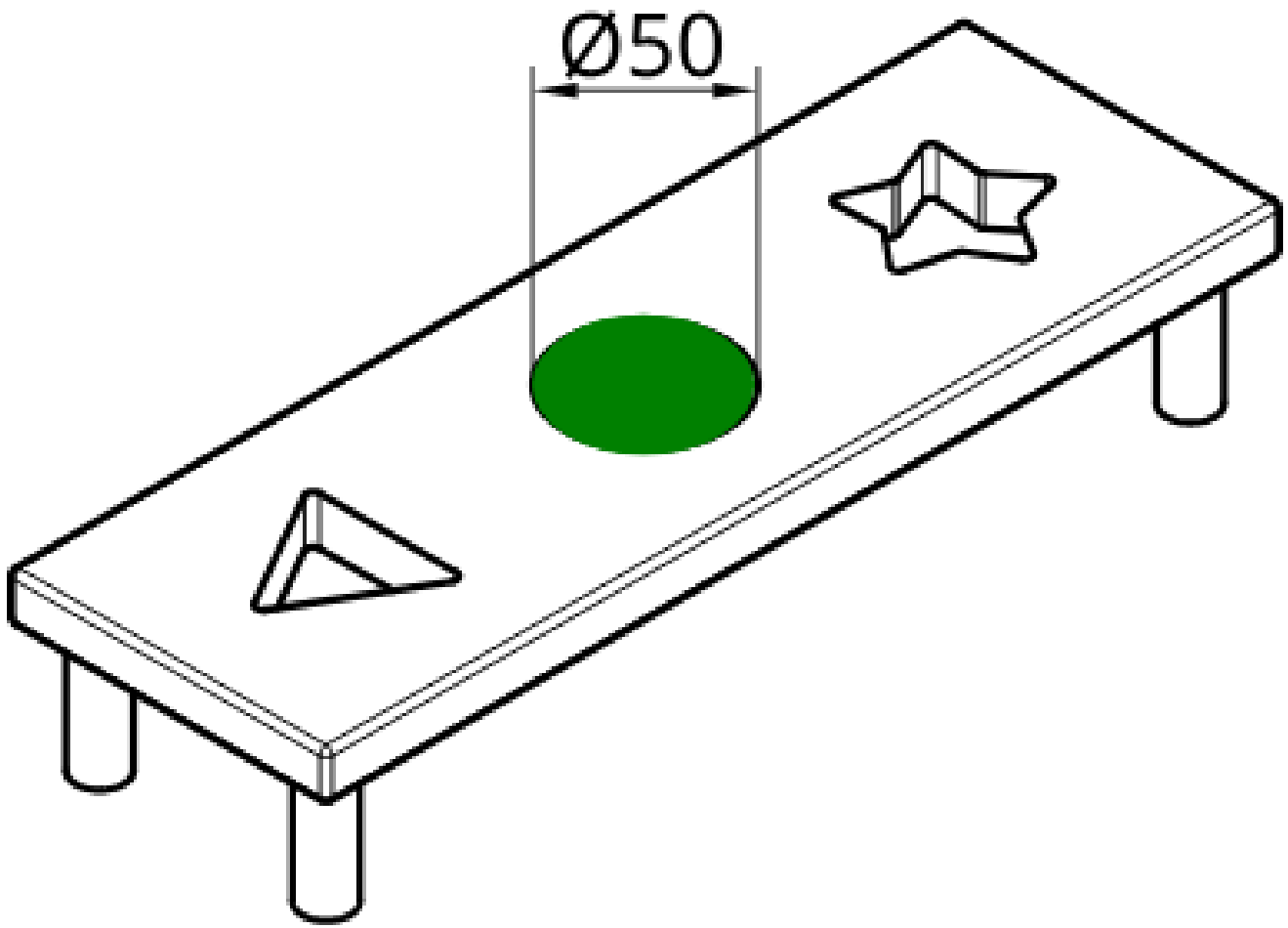


The source


Emission region
Luminous intensity
Lambertian (reference)
Normalized Luminous Intensity
1.0
0.8
0.6
0.4
0.2
0.0
−80
−60
−40
−20
0
20
40
60
80
Angle from Normal (degrees)


Luminous intensity
Lambertian (reference)
0°
30°
-30°
60°
-60°
90°
-90°

The target



Rules

- Build volume: 500 mm x 500 mm x 500 mm
- Reflective optics only
- Light leaving the build volume is considered lost.
- The source is perfectly absorbing
- The source must be at least 39.0 mm away from any edge of the build volume
- The target disc is fixed at the bottom center of the build volume
- File size: 100 MB STL or STEP
- Mirrors have a reflectivity of 95%.

Live demo

https://nonimaging-conference.org/competition-2026