EDAG Lighting & Display Systems

NATURAL 3D APPEARANCE, UNBOUNDED FORM: EDAG´S REMOTE PHOSPHOR APPROACH FOR LAMP DESIGN

REMOTE PHOSPHOR REARLAMP
AGENDA

- Why Remote Phosphor? – OEM challenges & market opportunity
- Market & design benchmark – where current rear lamps reach their limits
- Design inspiration → Covering natural and immersive look´s
- Technology proof – light-to-phosphor simulation & measurement correlation
- Physical proof – mock-up & Unreal Engine visualization
- Validation & robustness – First insights on phosphor coating light guides
- Call to action – next steps for joint innovation projects

REMOTE PHOSPHOR REARLAMP
PROJECT PARTNERSHIP

“LIGHTING PARTNERSHIP FOR INNOVATION DEVELOPMENT”

EDAG

- Development lead
- Styling and design
- Electronic & Software development
- Validation of phosphor coating

→ Realisation of mock-up

h² Hochschule Magdeburg • Stendal

- Correlation of optical simulation for light conversion
- Design of pre development components
- Visualization of mock up in unreal engine

NICHIA

- Technical input of physical data for phosphor
- Guidance for process handling
- Delivery of raw phosphor material

Thesis 24Q3-24Q4 → Sem. Project 25Q1-25Q2 → Sem. Project 25Q4-26Q1

DVN

REMOTE PHOSPHOR REARLAMP
BENCHMARK & STATUS QUO

Mercedes-Benz EQS

Sculpted 3D repetition

Alfa Romeo Bertone Pandion

Organic unpredictable complexity

Saab PhoneiX

Flat display-inspired design

REMOTE PHOSPHOR REARLAMP
BENCHMARK & STATUS QUO

STRONG DESIGN POTENTIAL IN TAIL LIGHTS THAT EXPLORE:

— INTRICATE GEOMETRY

— VOLUMETRIC LAYERING

— EXPRESSIVE STRUCTURES

REMOTE PHOSPHOR REARLAMP

INSPIRATION BEYOND THE OBJECT - VISUAL METAPHORS

KRYPTONITE CRYSTAL

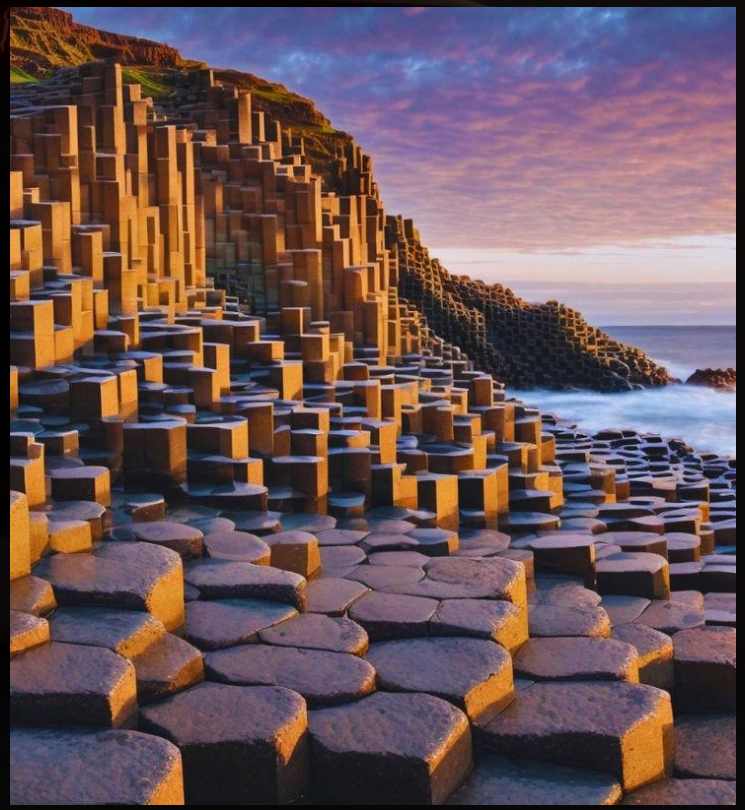
– IRREGULAR, REFRACTIVE, GLOWING FROM WITHIN

INFINITE MIRRORS

– PERCEIVED DEPTH, LAYERED LIGHT, SURREAL DIMENSION

GIANT'S CAUSEWAY

– NATURAL HEXAGONAL REPETITION, GEOLOGICAL ORDER VS. CHAOS



REMOTE PHOSPHOR REARLAMP
INSPIRATION BEYOND THE OBJECT – NATURAL OBJECTS

MOLTEN LAVA OR MAGMA
– GLOWING FLOW, ENERGY UNDER TENSION, ORGANIC DANGER



BIOLUMINESCENT ALGAE
– LIGHT REACTING TO MOVEMENT, EPHEMERAL GLOW, MAGICAL

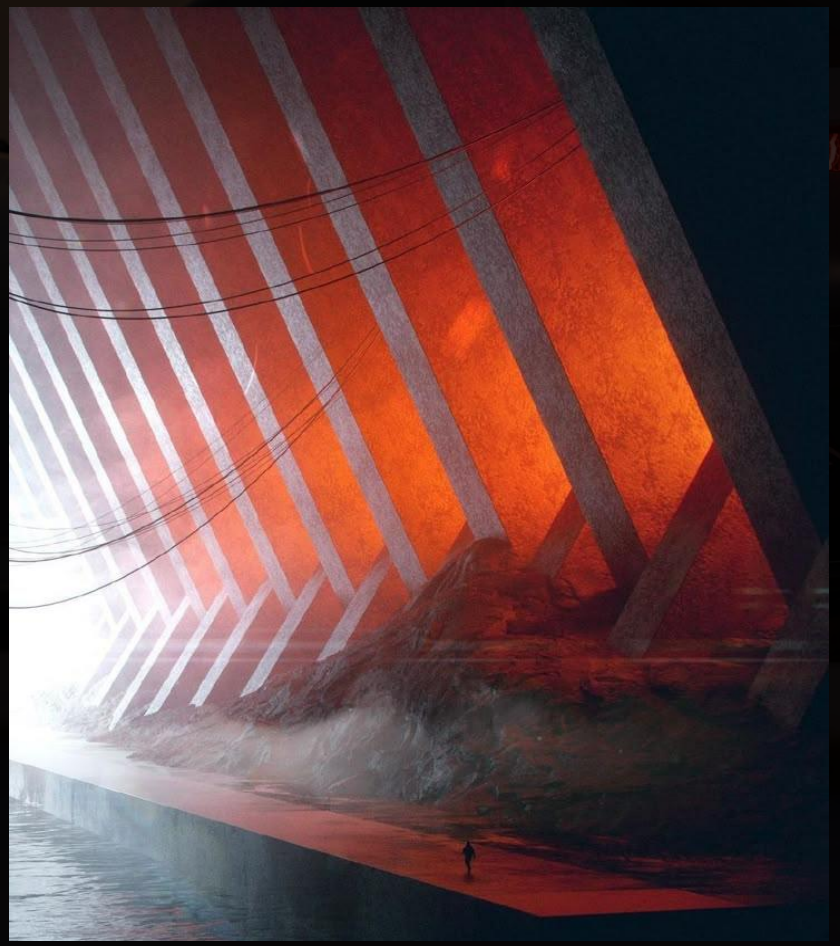


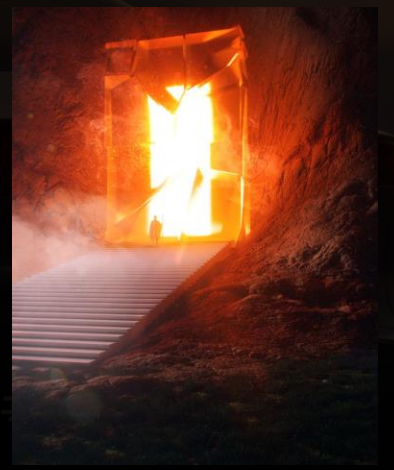
ICE SHARDS
– SHARP, TRANSLUCENT, LIGHT-CATCHING EDGES



REMOTE PHOSPHOR REARLAMP
ALIVE FROM WITHIN - INNER FORCE

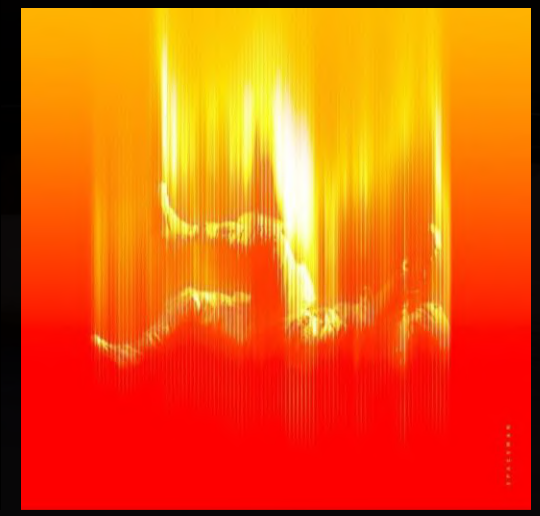
LIGHT EMERGING FROM THE CORE



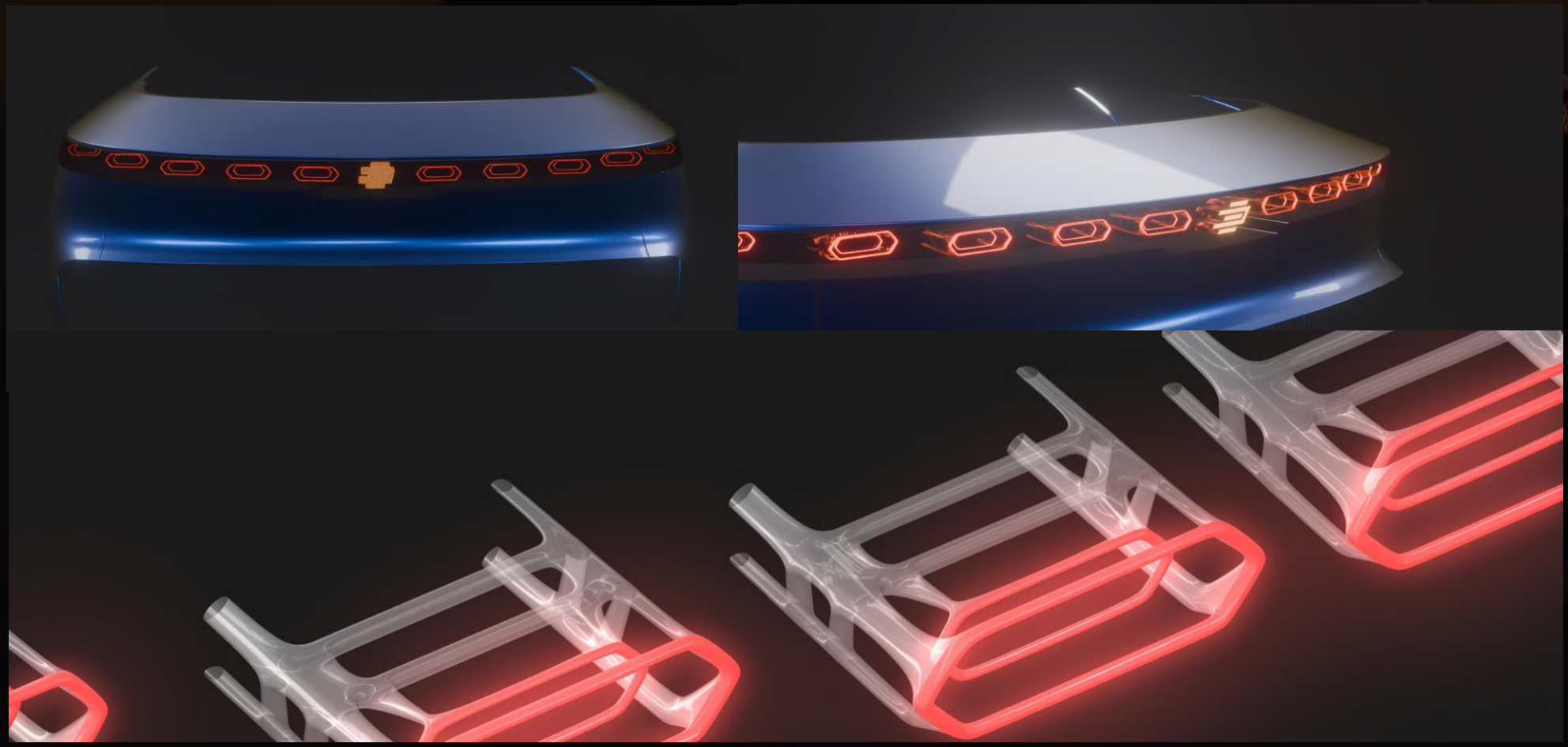

REMOTE PHOSPHOR REARLAMP
EPHEMERAL TRAILS

MOMENTS OF MOTION CAPTURED IN LIGHT AND FLUID



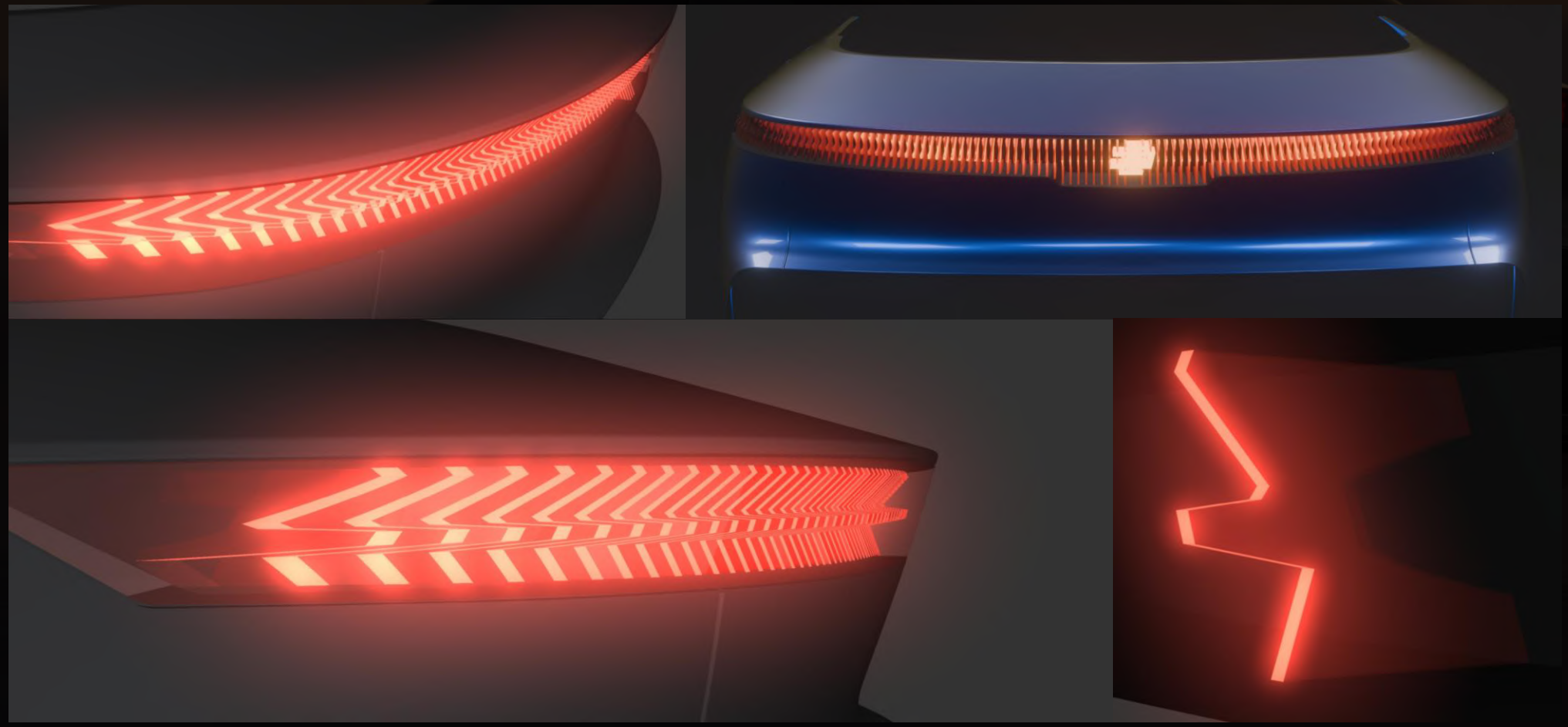
REMOTE PHOSPHOR REARLAMP
DESIGN CONCEPTS

DESIGN CONCEPT 1 - FROM INTANGIBLE GESTURE TO PHYSICAL STRUCTURE



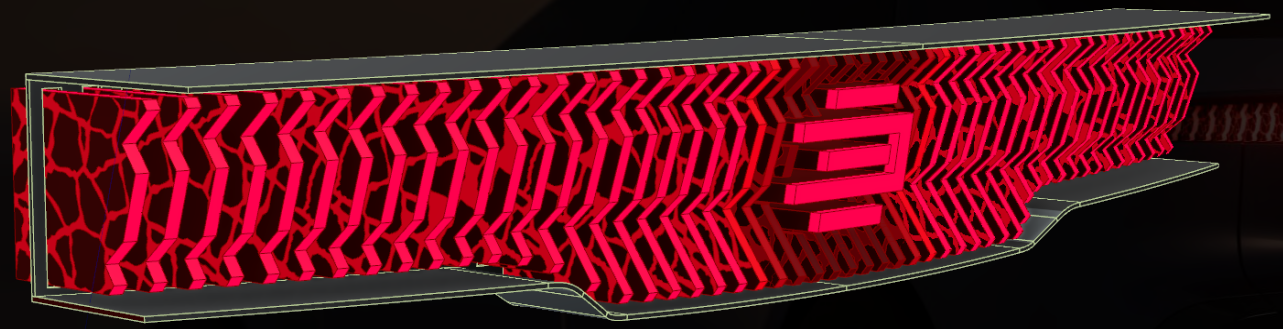
REMOTE PHOSPHOR REARLAMP
CONCEPT STUDIES

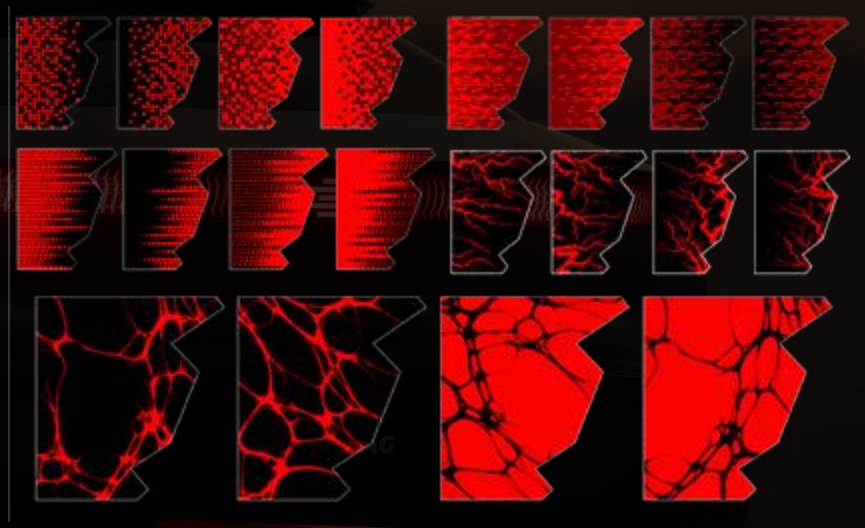
DESIGN CONCEPT 2 - LIGHT EMERGING FROM THE CORE

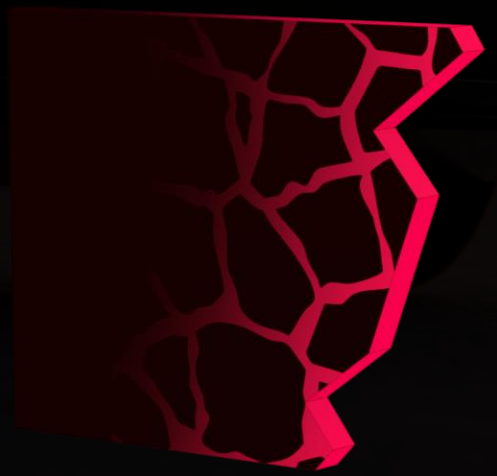


REMOTE PHOSPHOR REARLAMP
MOCKUP STYLING

FIRE BLADE GRAPHIC STYLING REFINEMENT

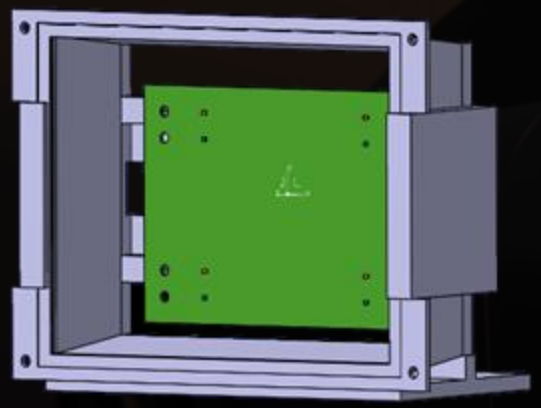


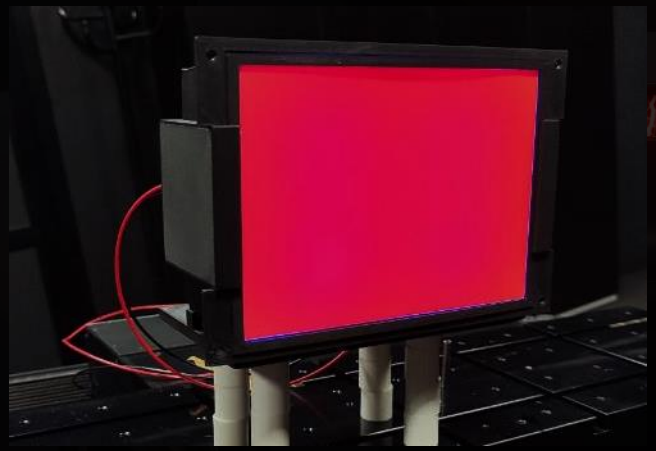


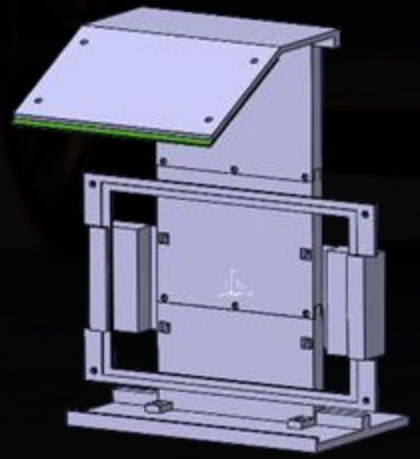


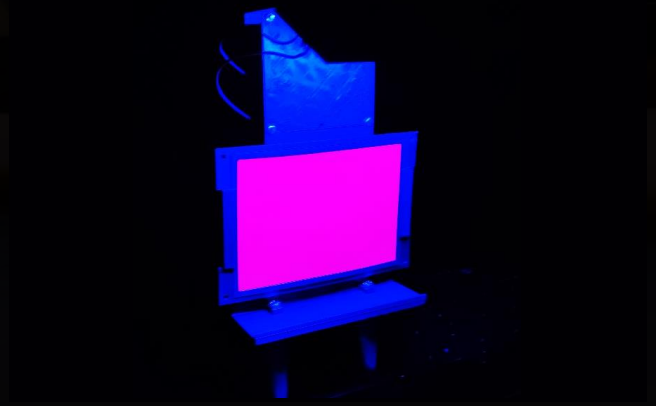
REMOTE PHOSPHOR REARLAMP
CONVERSION OF LIGHT

LIGHT / PHOSPHOR INTERACTION CORRELATION TESTS

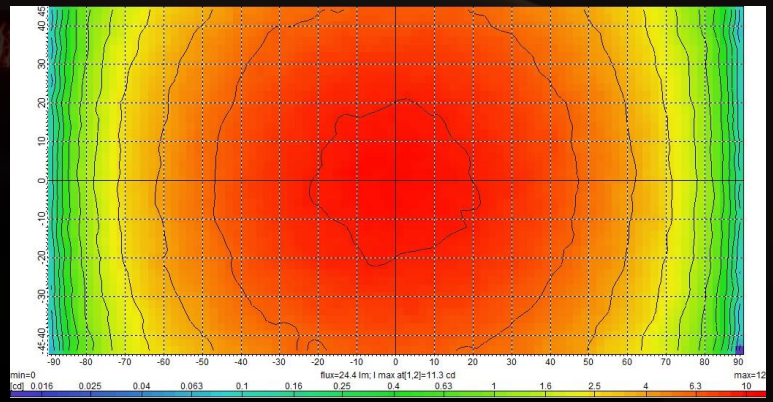




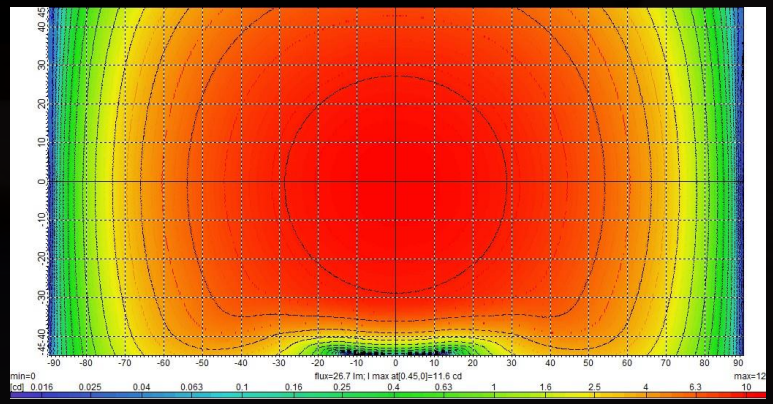




Simulation in LightTools:

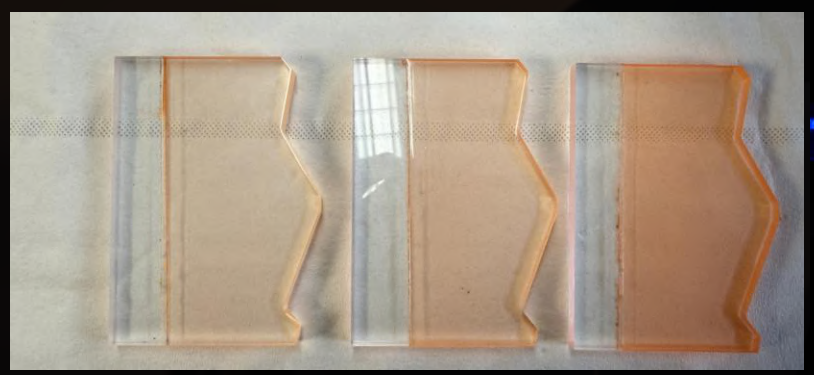
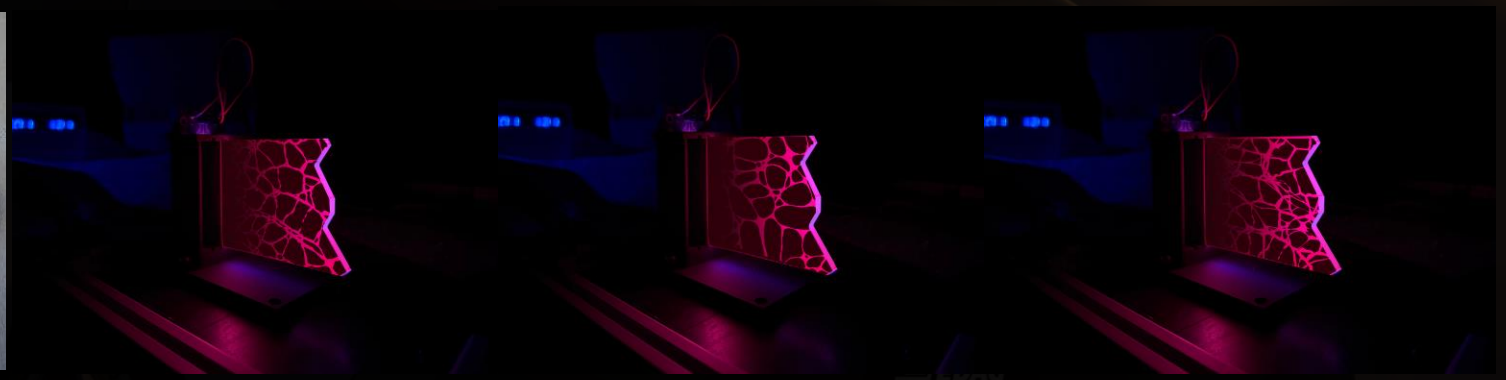
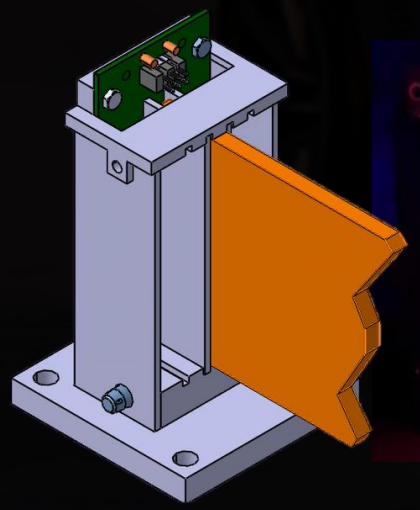
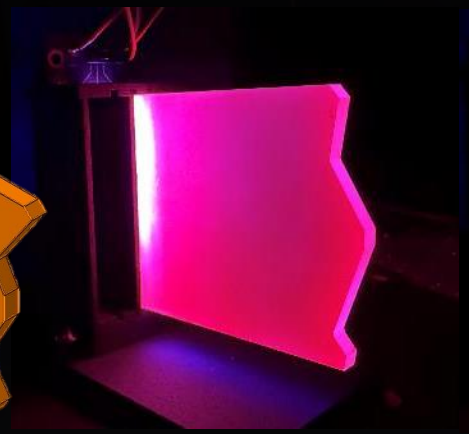
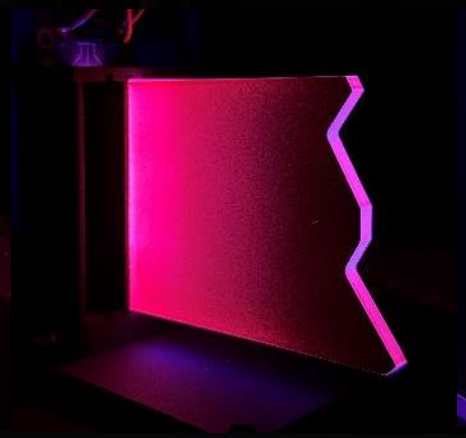
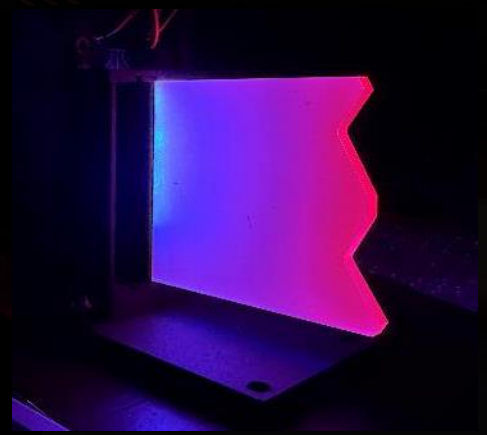
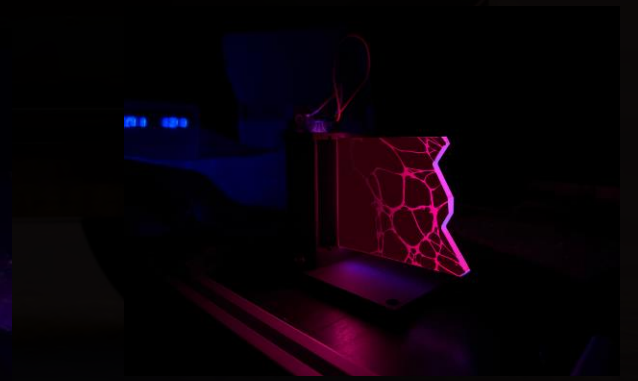


Measurement:



REMOTE PHOSPHOR REARLAMP
COATING TRYOUTS

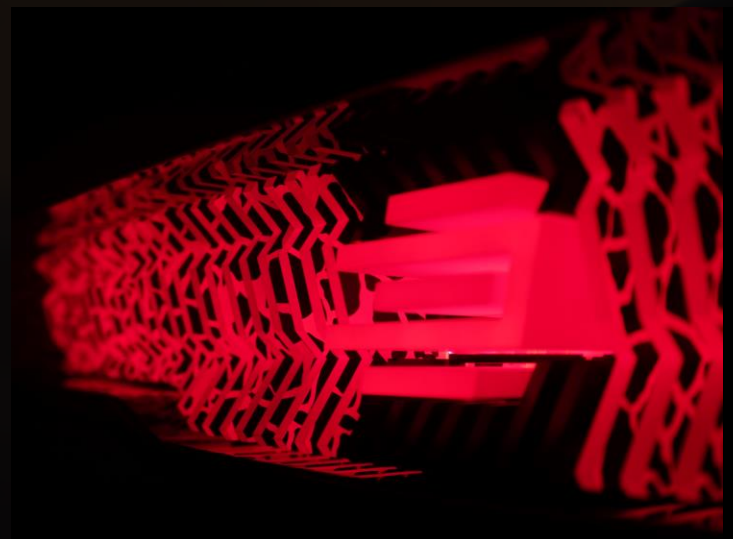
LIGHT / PHOSPHOR INTERACTION CORRELATION TESTS

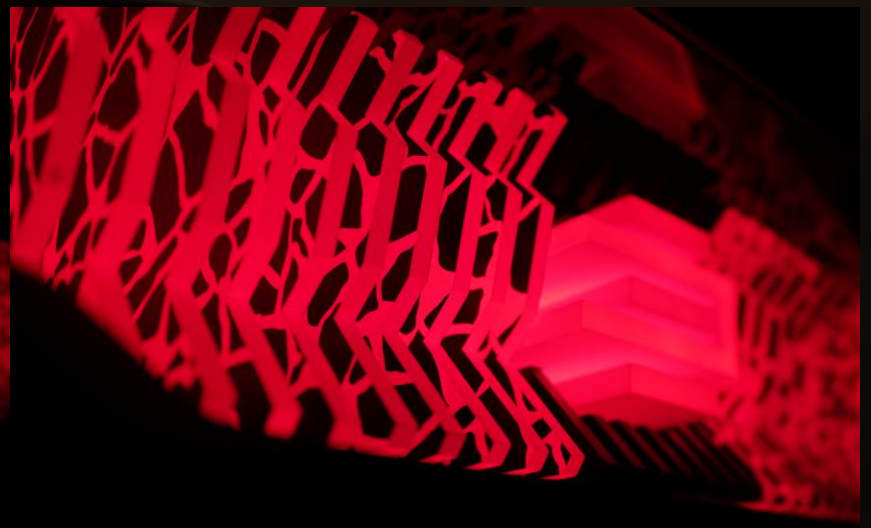








REMOTE PHOSPHOR REARLAMP
DESIGN VISION

“Imagine molten lava frozen into a controllable light signature.”

REMOTE PHOSPHOR REARLAMP
PHYSICAL MOCK-UP



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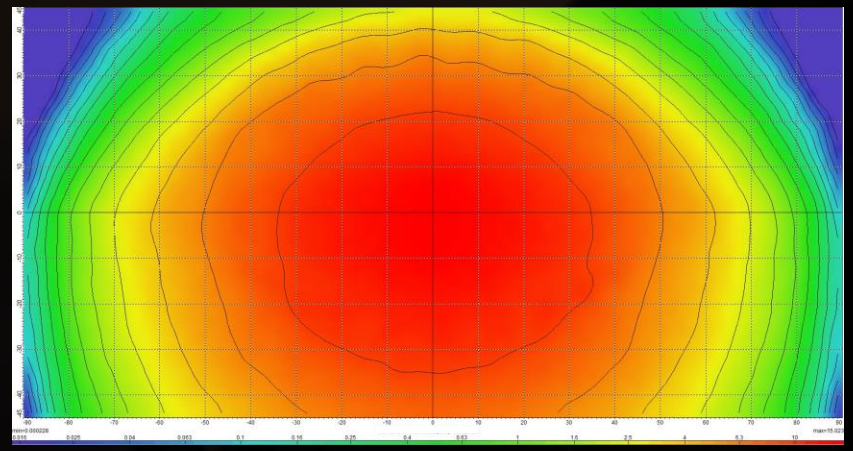
REMOTE PHOSPHOR REARLAMP
OPTICAL STATUS

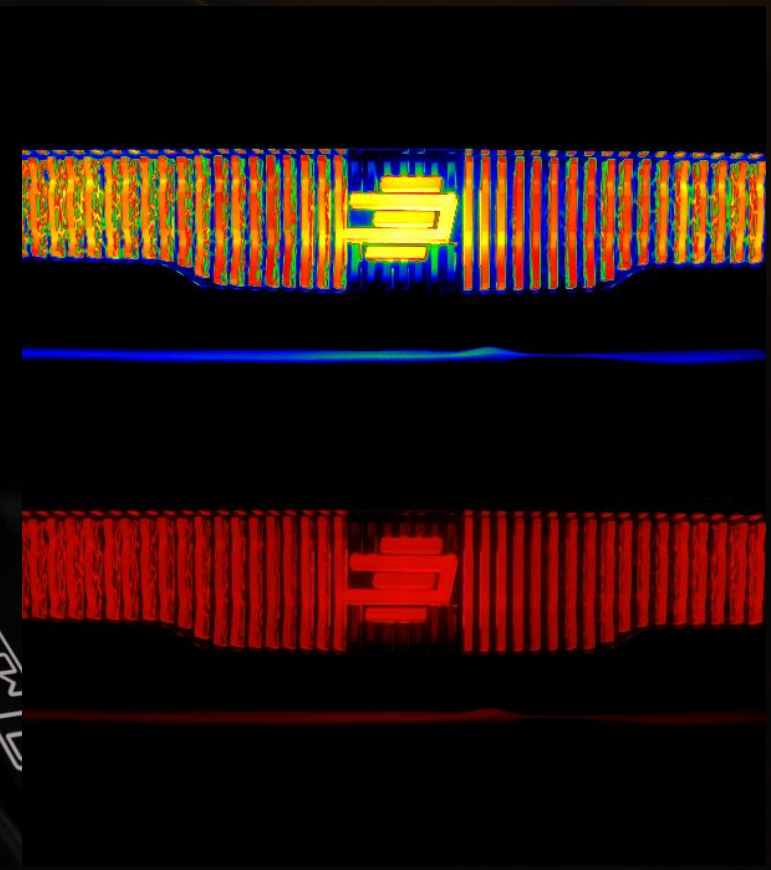
GONIO MEASUREMENT



ECE R148 , rear position light left

H / V	-45	-30	-20	-10	-5	0	5	10	20	30	80
15	17 2.1 0.05					17 2.8 0.05					17 0.7 0.05
10					17 4.2 0.8		17 4.2 0.8				
5			17 4.2 0.4	17 4.9 0.8		17 4.9 2.8		17 4.9 0.8	17 4.9 0.4		
0				17 4.2 1.4	17 4.2 3.6	17 4.2 4	17 4.2 3.6	17 4.9 1.4			17 0.7 0.05
-5			17 4.9 0.4	17 4.9 0.8		17 4.9 2.8		17 4.9 0.8	17 5.6 0.4		
-10					17 4.9 0.8		17 4.2 0.8				
-15	17 2.8 0.05					17 2.8 0.05					17 0.7 0.05

LMK MEASUREMENT



→ Phosphor concept leading to OK position light results on complete rearlamp level

REMOTE PHOSPHOR REARLAMP
ENVIRONMENTAL TESTS

K-01 High/low temperature storage

P-03 Parametertest

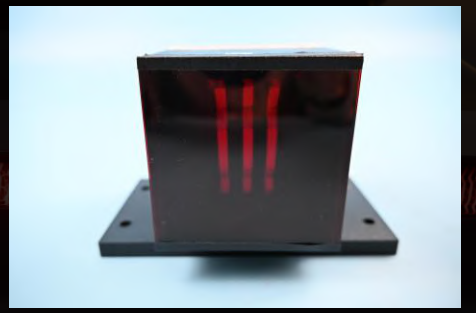
M-04 Vibration

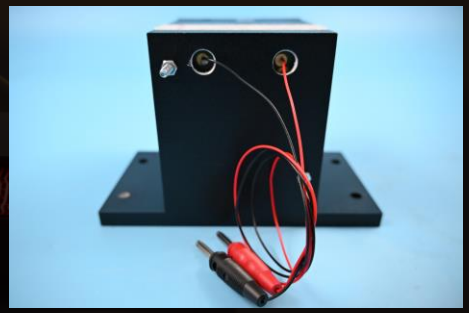
P-03 Parametertest

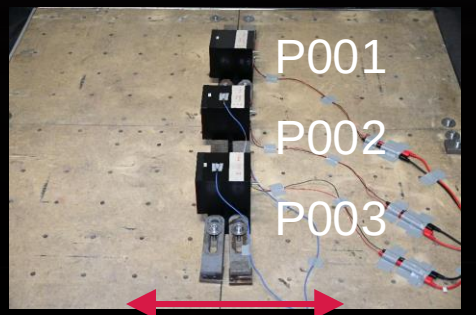
K-08 Damp Heat

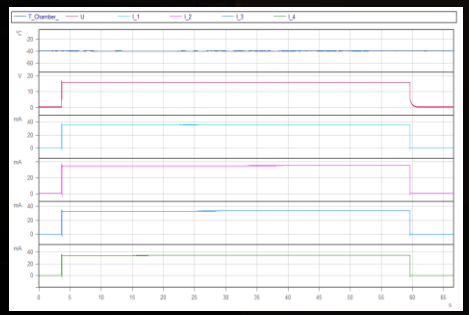
M-05 Mechanical shock

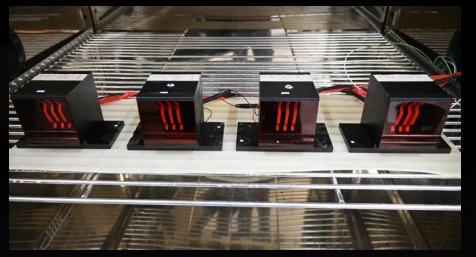
P-03 Parametertest

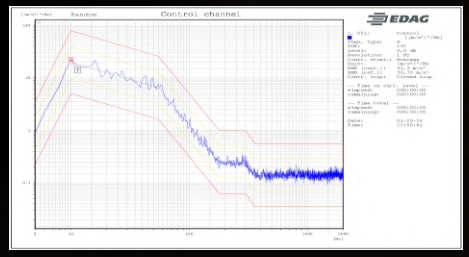












REMOTE PHOSPHOR REARLAMP
ENVIRONMENTAL TESTING

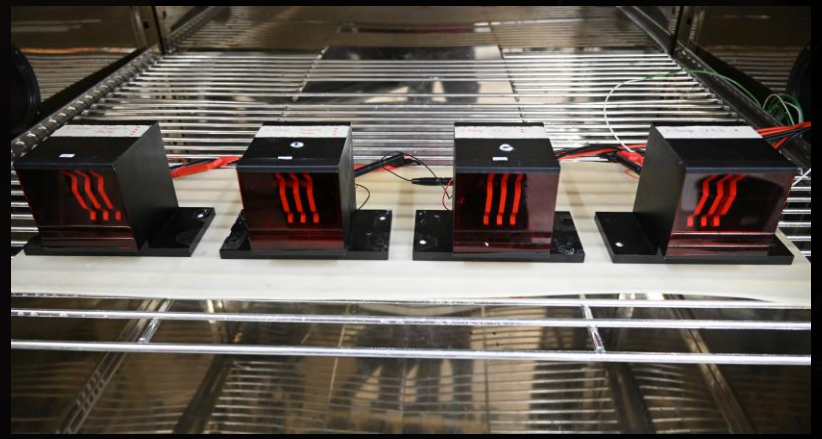
Testing in accordance with DIN EN 60068-2-30
Test duration and conditions:

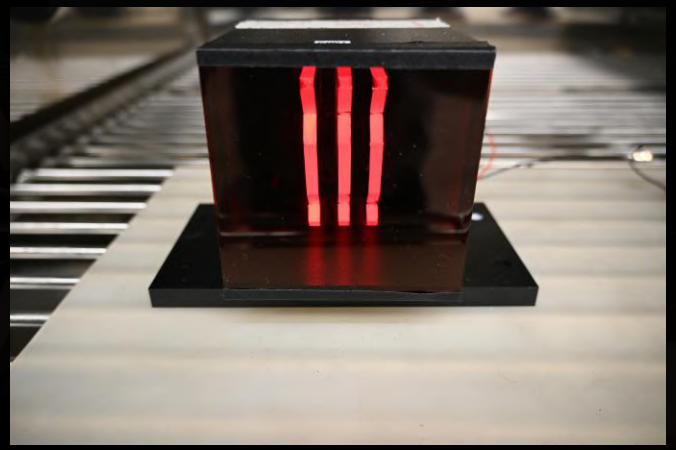
- Total test duration→ 144h
- Operating mode of the test sample

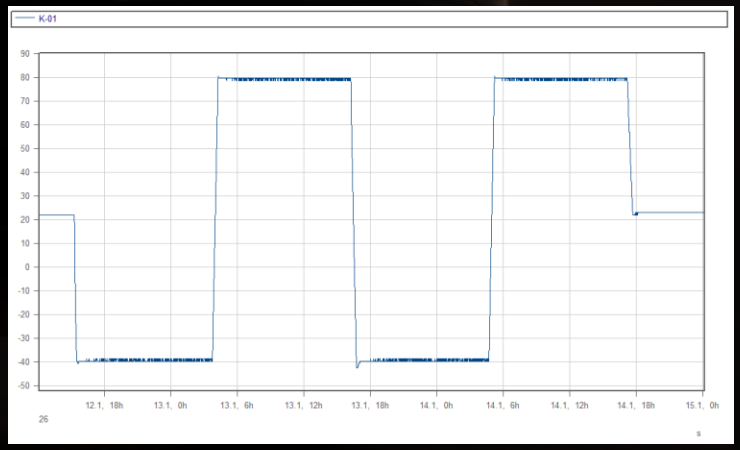
→ Parameter test P-01 after reaching the upper (55°C) and lower (25°C)test temperature for 10s at UB

Test duration and test temperature:

- 2 cycles of 24 hours each, consisting of:
- 12 hours of storage at Tmin (-40°C)
- 12 hours of storage at Tmax (80°C)





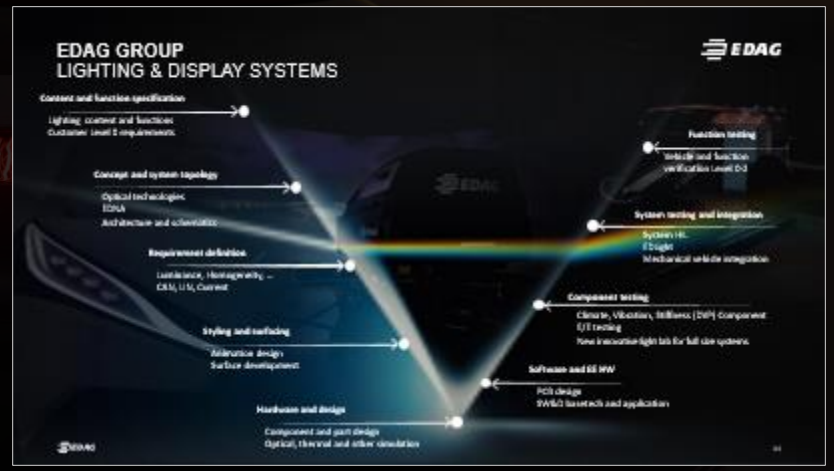


→ NO OBSERVATION OF PHOSPHOR CHANGES OR LIT ON / LIT OFF APPEARANCE AFTER TEST SEQUENCE

REMOTE PHOSPHOR REARLAMP
CALL TO ACTION & SUMMARY

Summary:

- Remote Phosphor unlocks new levels of 3D depth and design freedom in rear-lamp concepts
- Approach is technically validated through simulation, physical mock-ups, and testing
- EDAG´s service portfolio is showcased on our project in a fruitful partnership cooperation with Nichia & H2 Magdeburg → Thanks to everyone working hard!



Call to action:

- Identify fit and differentiation potential for your current rear-lamp roadmap
- Start with a design study or technology feasibility assessment

“Let´s get in touch to identify match zones with your current lighting roadmap or innovate it!”


EDAG
Lighting & Display Systems
THANK´S AND SEE YOU!