



DOE SSL Workshop 2018

Blue high-efficiency TADF emitters for OLED lighting

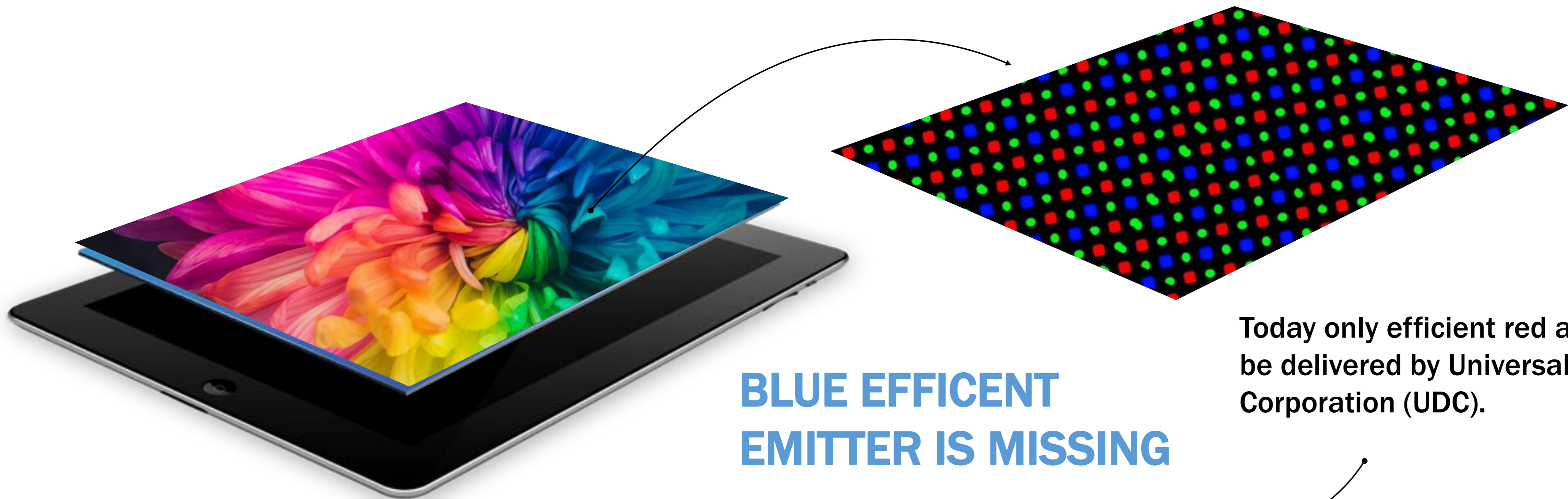
Dr. Larissa Bergmann

January 30th, 2018



WHY DO WE TARGET BLUE?

HIGH-EFFICIENCY BLUE IS THE MOST REQUESTED MATERIAL IN OLED DISPLAYS



**BLUE EFFICIENT
EMITTER IS MISSING**

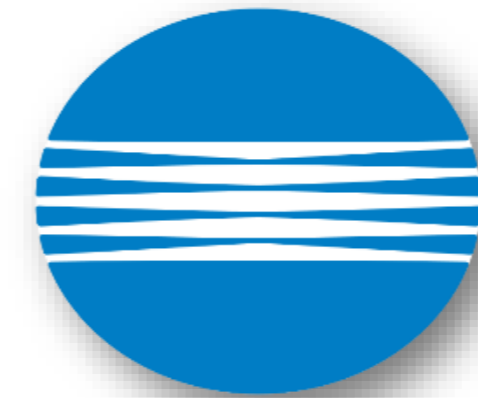
Today only efficient red and green can be delivered by Universal Display Corporation (UDC).

The OLED industry is forced to use inefficient blue: fluorescent material

>100 LM/W REQUIRES HIGH-EFFICIENCY BLUE

Several companies have shown that >100 lm/W can be achieved with OLED lighting:

Panasonic



KONICA MINOLTA

In all cases, a high-efficiency blue was needed.

HIGH-EFFICIENCY DEEP BLUE TO BRING BETTER PERFORMANCE

So far only phosphorescent sky blue could be used for high efficiency white due to the short lifetime of deep blue phosphorescent emitters.

But deep-blue high-efficiency emitters could deliver higher efficiency and a higher CCT:

CIE-y	λ_{\max} nm	Potential LER (a.u.) Calc. @3000K	Potential CCT $\Delta_{uv} < 0.01$ Calc. CRI ≥ 80
0.42	474	100	3,300 K
0.35	464	105	4,200 K
0.26	456	109	> 6,500 K

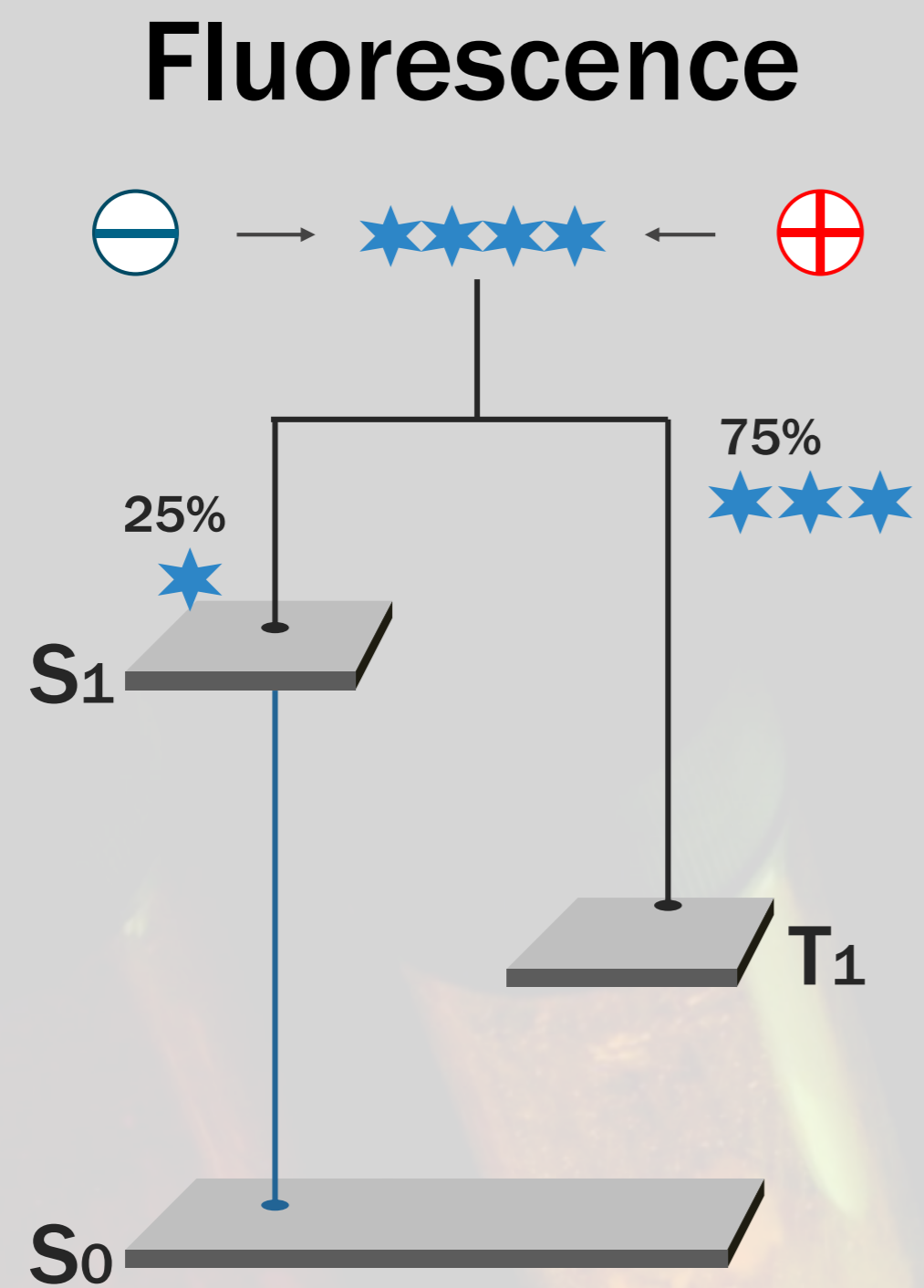
Konica Minolta, China OLED Summit 2016

→ High-efficiency deep blue with longer lifetime is still needed.

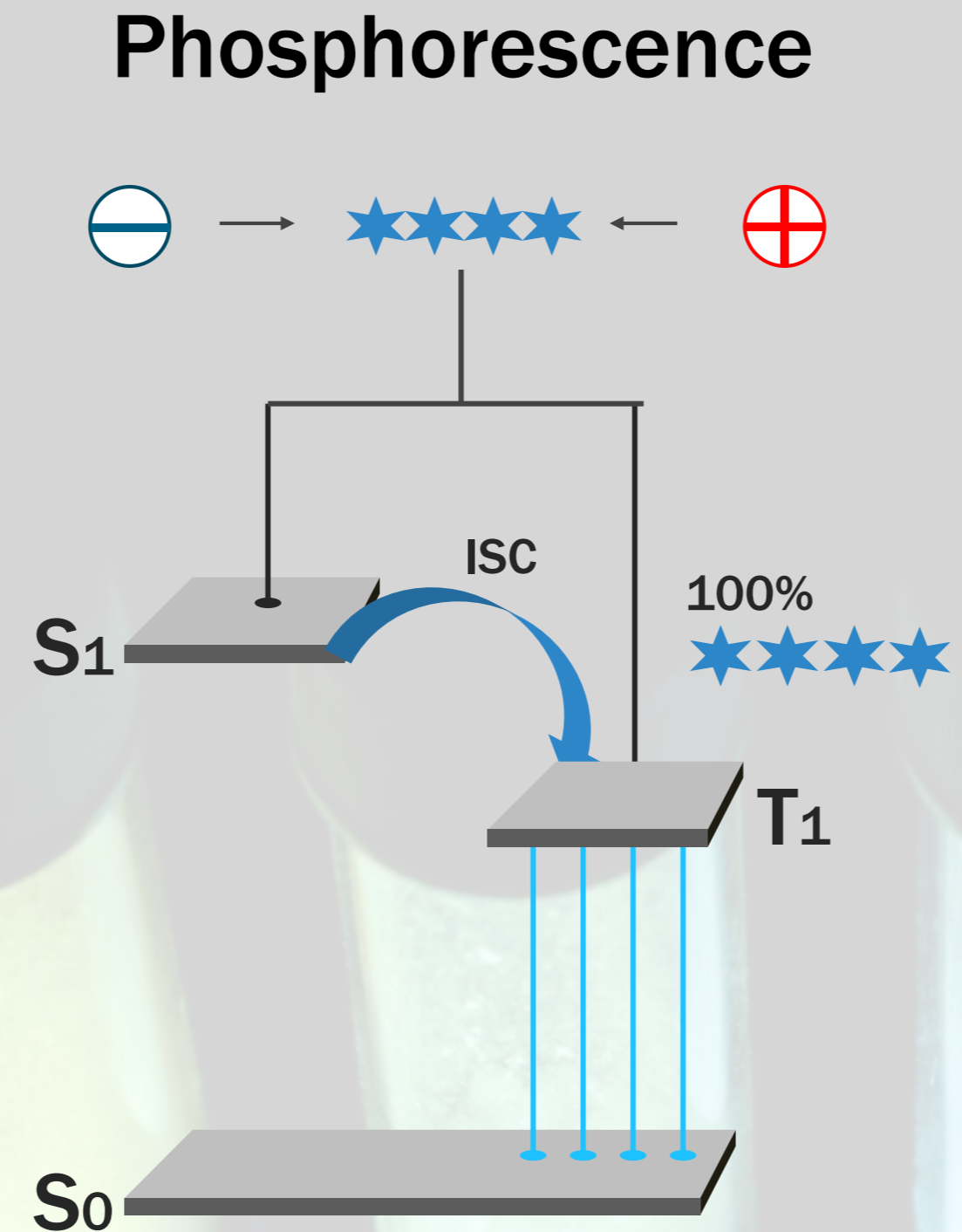
EMITTER TECHNOLOGY OVERVIEW



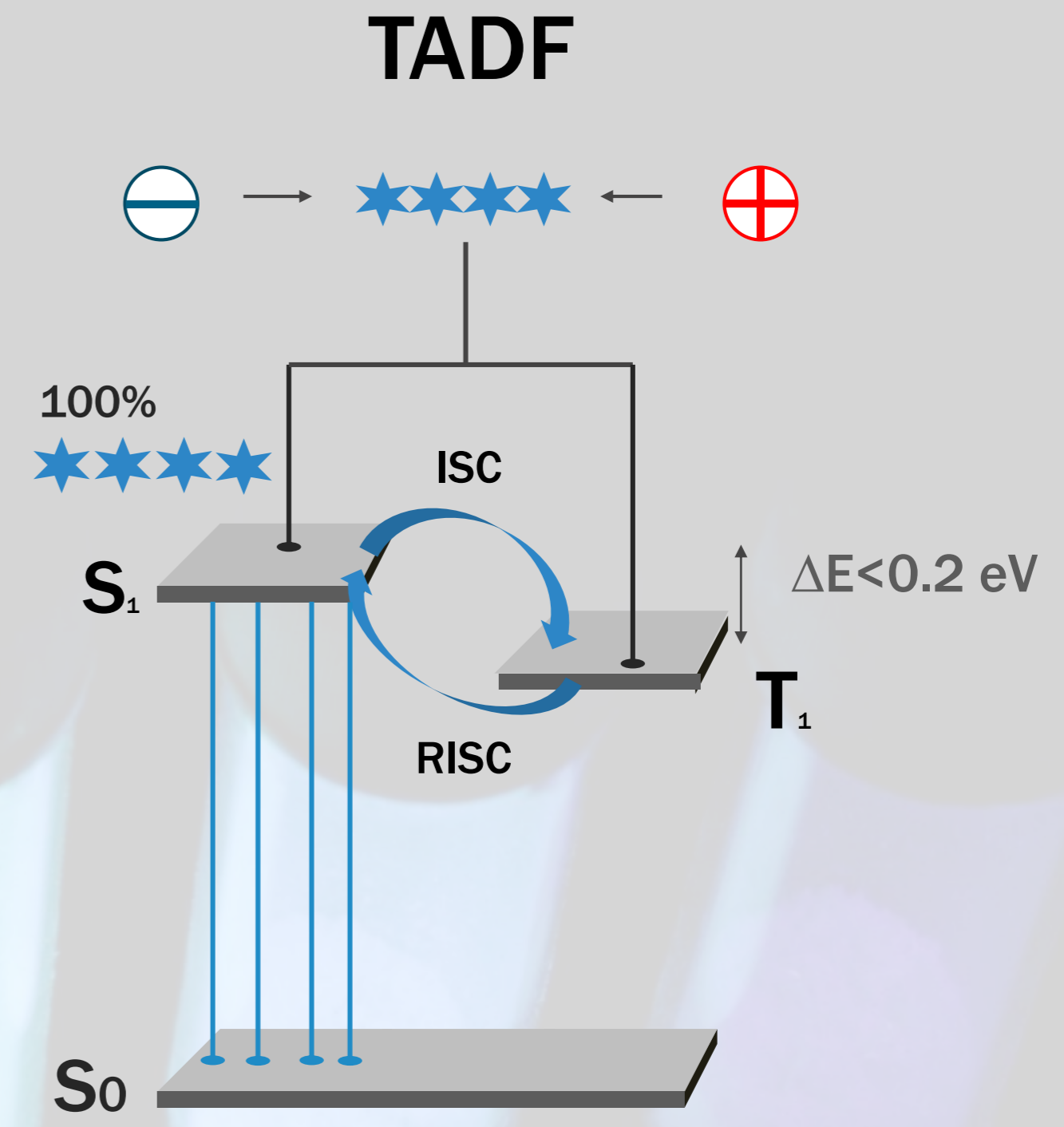
EMITTER TECHNOLOGY OVERVIEW



Low efficiency



Blue lifetime is very short



CYNORA's approach



- International team of 100 TADF experts (16 nationalities)
- Focus on Marketing and IP: More than 100 patent families
- Close cooperation with key display makers
- Collaborations with leading universities worldwide
- Our Mission: Create value for the OLED device makers by enabling highest energy efficient products.

INVESTORS

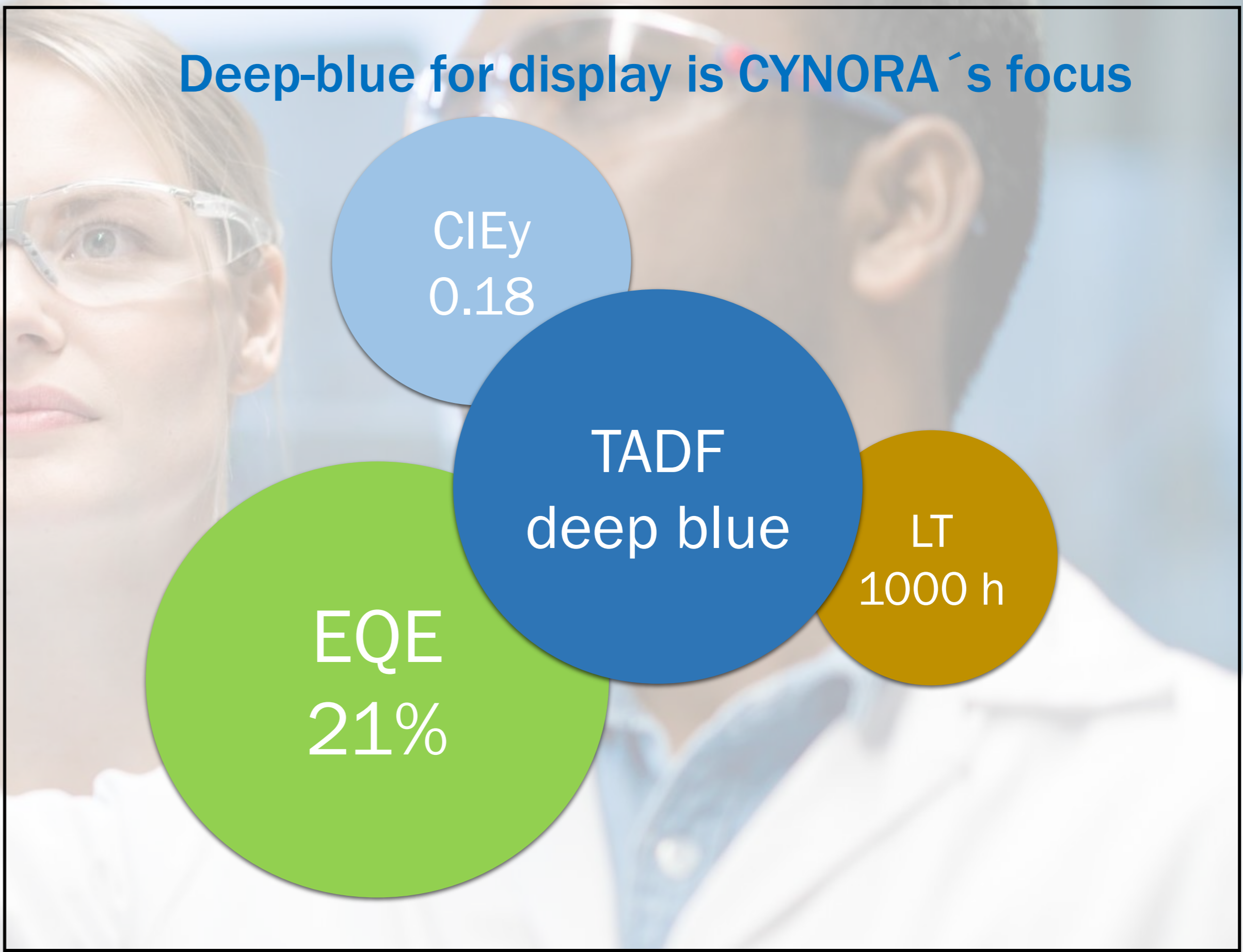
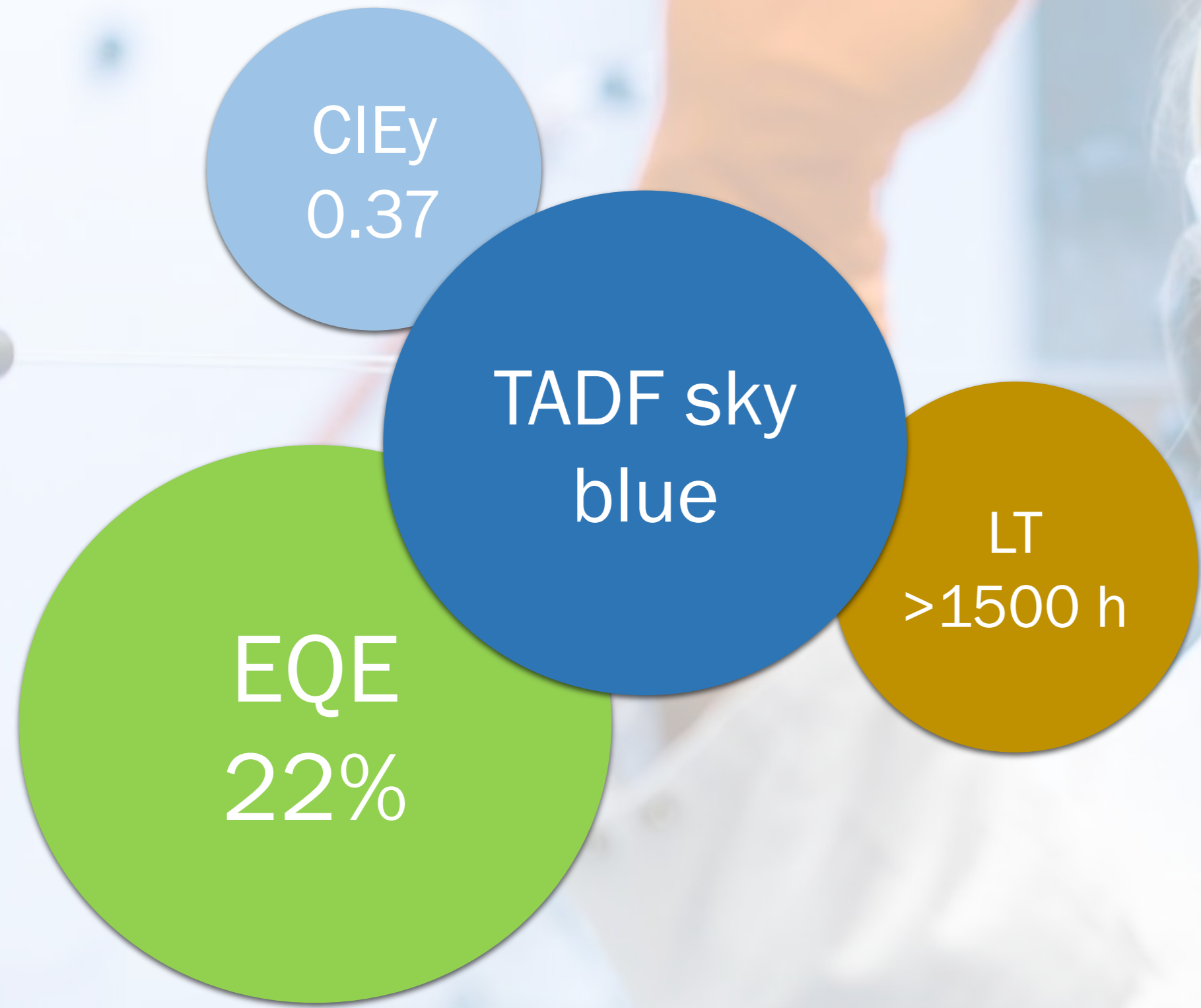


Wecken & Cie.



WHERE ARE WE TODAY?

Deep-blue for display is CYNORA's focus

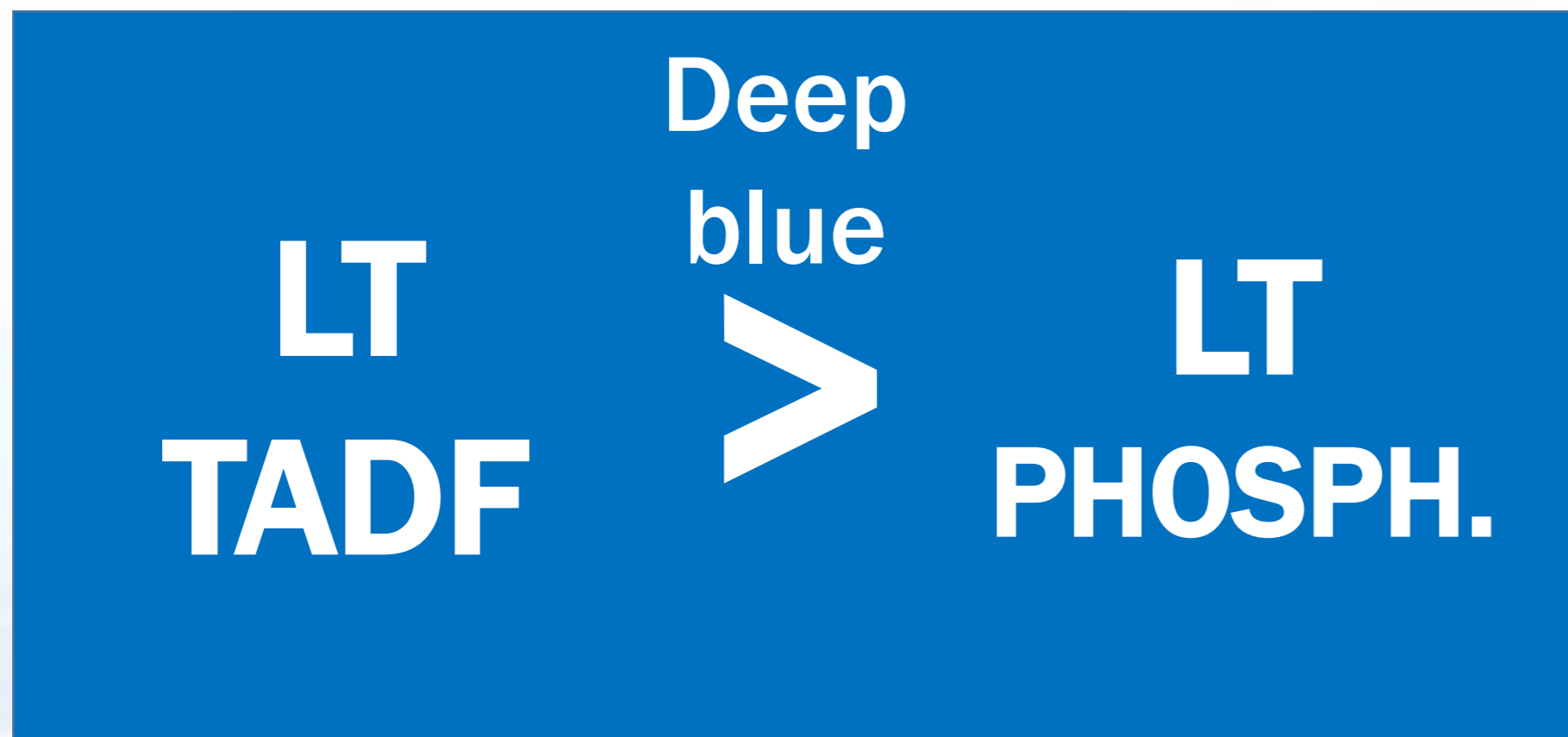


EQE- EFFICIENCY

LT-LIFETIME 50 AT 1000 NITS

CIEy-COLOR POINT

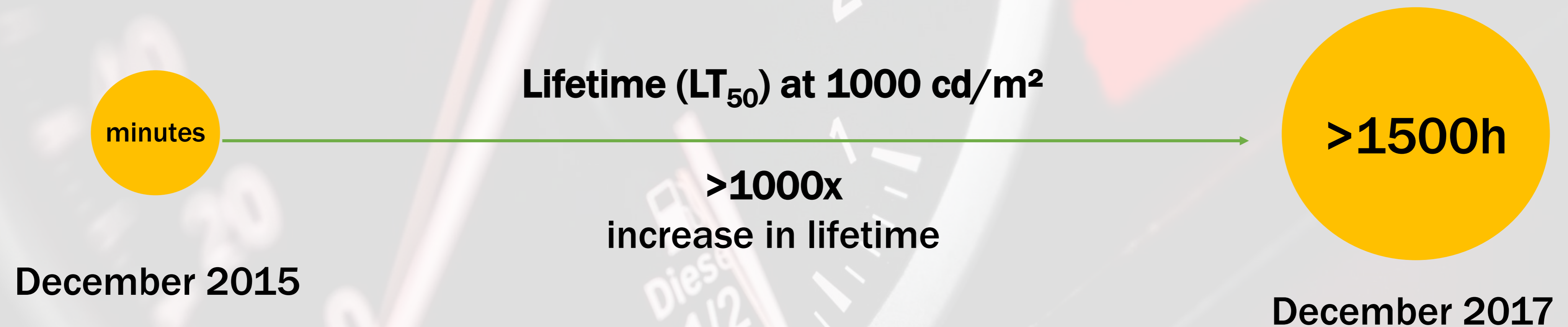
LIFETIME COMPARISON BLUE TADF AND PHOSPHORESCENCE



CYNORA has only focused on deep-blue for displays so far. The sky blue results in this presentation are a by-product of this development.

FAST PROGRESS AT CYNORA

Tremendous progress in the last two years



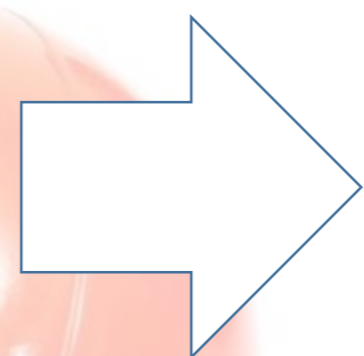
Additional >10x seems achievable with some focus on lighting blue

NEXT STEPS 2018-2020?

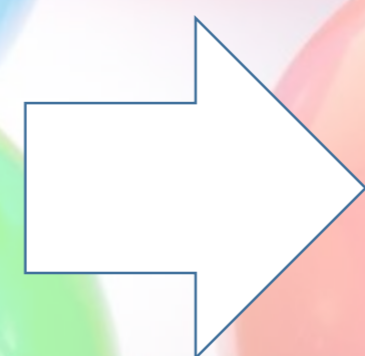


NEXT STEPS 2018-2020?

**Blue
Emitter
2018**



**Green
Emitter
2019**



**Red
Emitter
2020**

CYNORA TO DELIVER ALL OLED EMITTERS BY 2020





**TADF can
deliver high-
efficiency blue
with long
lifetime**



**First
high-efficiency
deep blue in
commercial
displays by 2019**



**All colors
(RGB)
available
within 2 years**

OLED

TECHNOLOGY

TADF

EFFICIENCY

DISPLAY

LIGHTING

OPTOELECTRONICS

DISPLAY

BLUE

EMITTERS

CYNORA

LIGHTING

LIGHTING

THANK YOU!

DISPLAY

OLED

DISPLAY

TECHNOLOGY

TADF

EFFICIENCY

OLED

