

# BEYOND THE HYPE

STRATEGIC PARTNERSHIP FOR UNIQUE OPTICAL  
ENGINE SOLUTIONS FOR SMART GLASSES

24 January 2022  
09:10 am PST / 18:10 pm CET

tooz



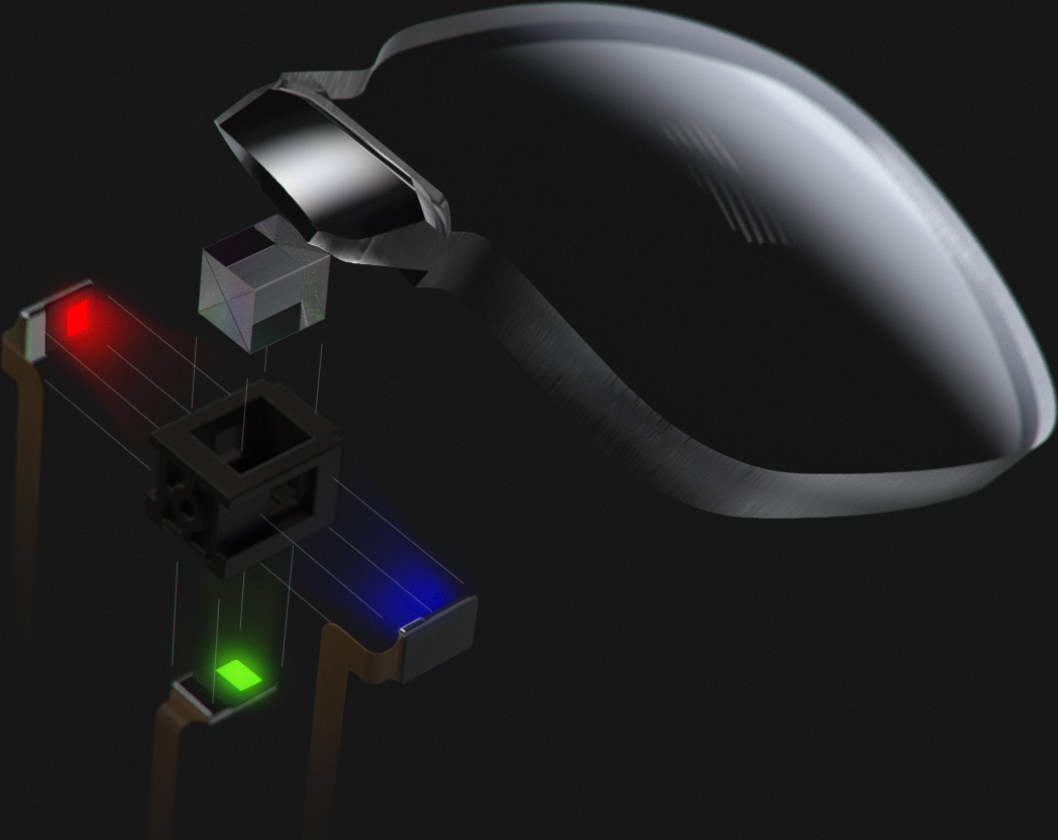
# TOOZ AND JBD PARTNERED TO TACKLE THE LAST HURDLE OF CONSUMER GLASSES HARDWARE

All Day Use / RX  
Style

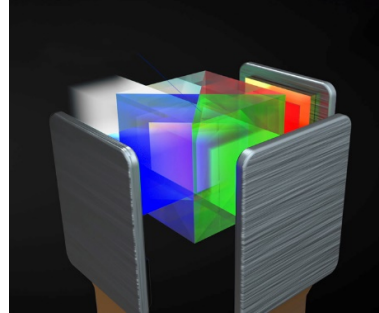
All Ambient Light Conditions  
Battery Runtime



# JBD RGB MICRO-LED ENGINE COUPLED WITH TOOZ CURVED WAVEGUIDE



# TOOZ AND JBDS KEY USPS LEAD TO A REVOLUTIONARY OPTICAL ENGINE



## Monolithic Waveguide

Incl. Incoupling optics

Incl. Outcoupling optics

Incl. Individual Rx

**= Monolithic unit  $\approx$  7g | 3-5 mm  
FDA approved plastic material**

## RGB Micro LED light engine

Only 0.72 cm<sup>3</sup>

5 lm white light output

very power efficient

## Optical engine

full color

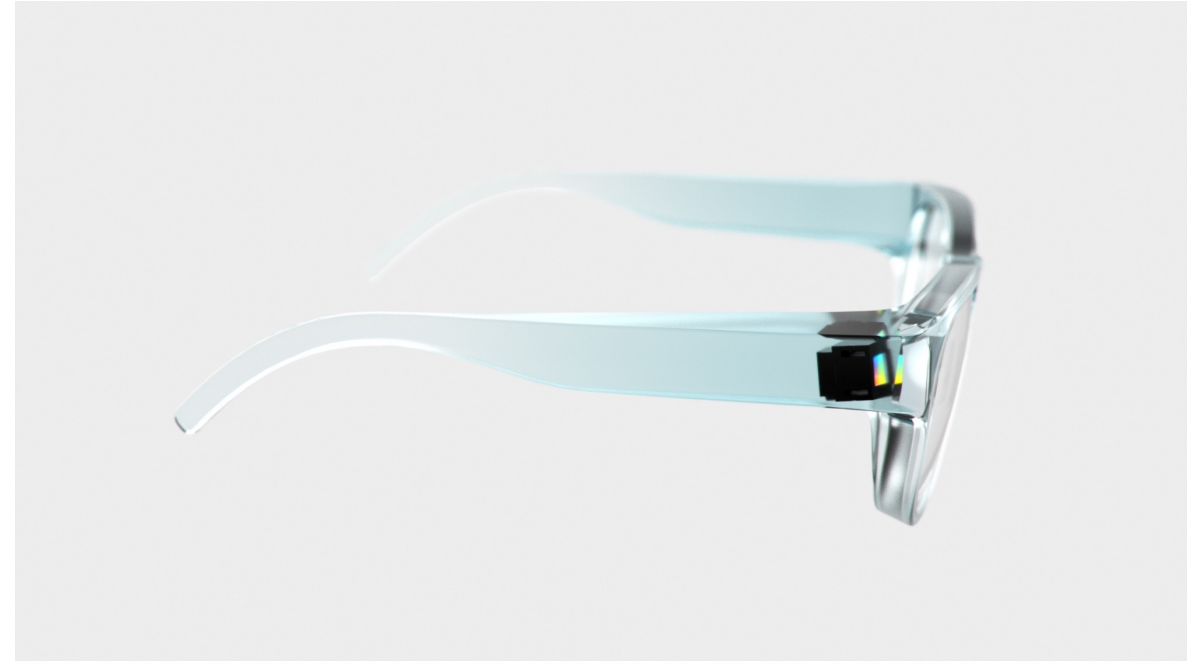
low power

very compact

individual Rx

**= Compact RGB unit with 5K nits to  
the eye @250mW power and  
individual Rx**

# ENABLING COMPACT FASHIONABLE SMART GLASSES



**Key Specs Rx Waveguide + RGB Light engine**  
Volume light engine: **0.72 cm<sup>3</sup>**  
**5K nits** to the eye @ **90%** see-through

**Today**  
Lens thickness incl. Rx: **4.3mm**  
**250mW** power consumption @ 25% APL



**Q4 22**  
Lens thickness incl. Rx: **3.5mm**  
**170mW** power consumption @ 25% APL

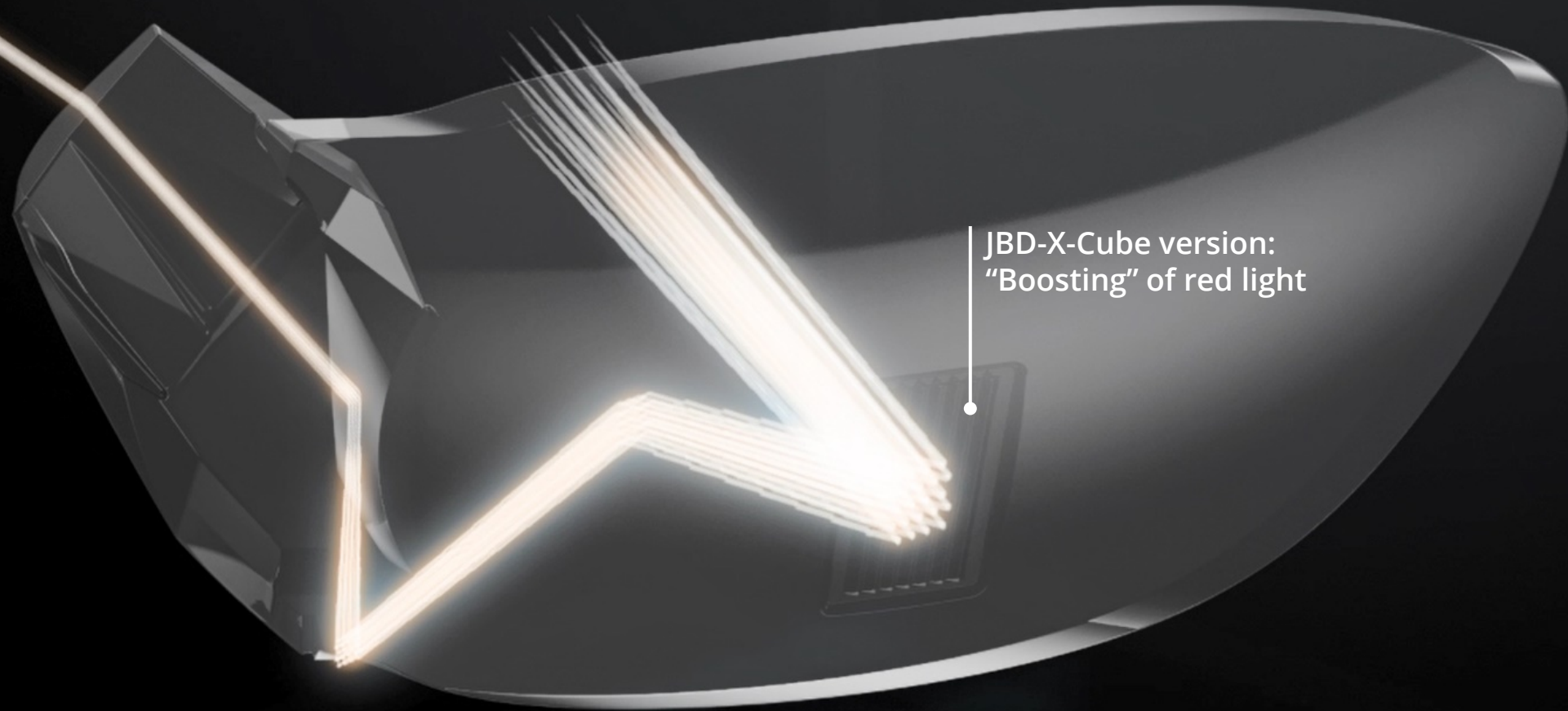
# THE TOOZ TECHNOLOGY – A SCALABLE RX OPTICAL ENGINE

Freeform Prism

Freeform Fresnel  
Combiner

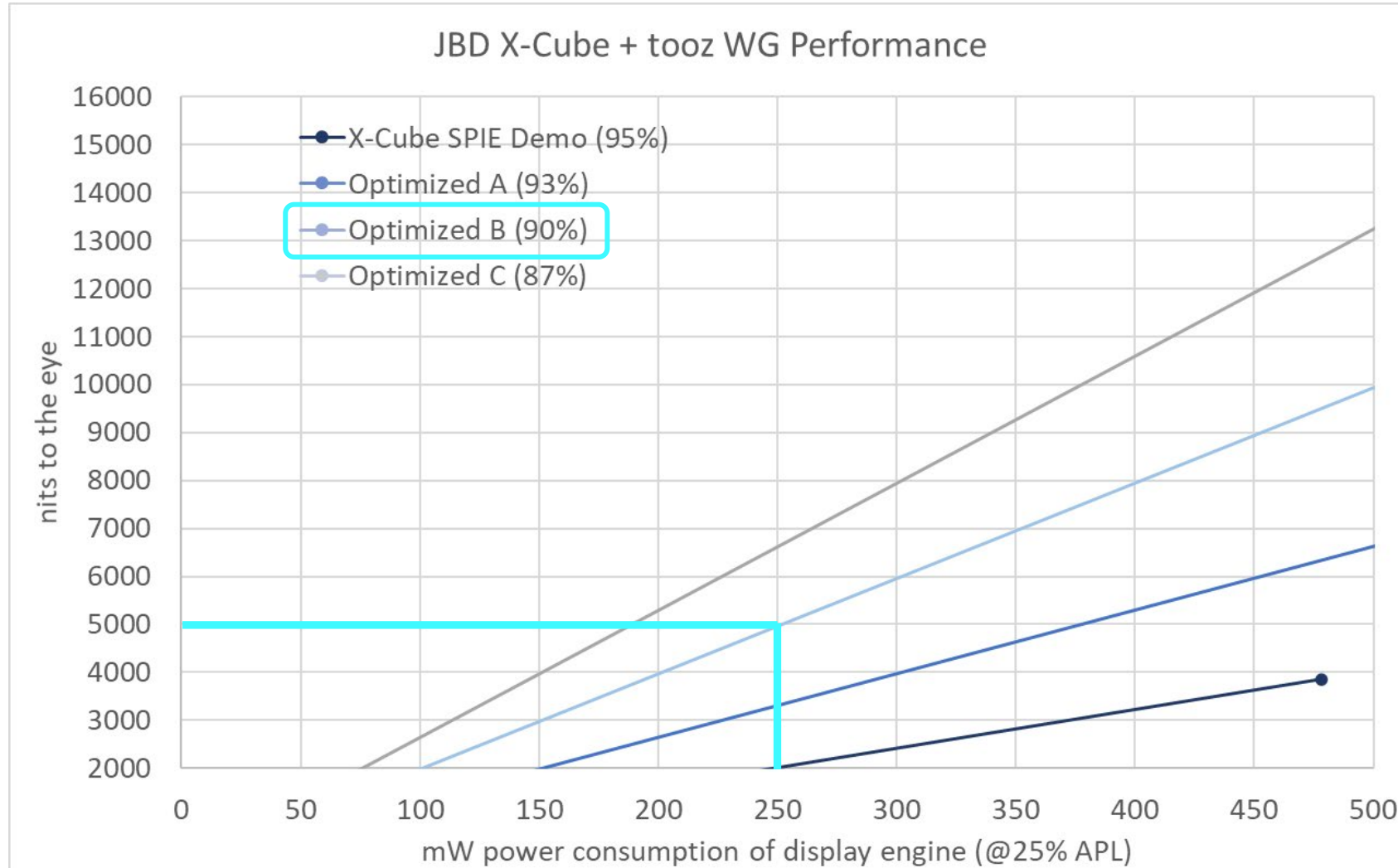
Curved Light  
Guide

# WITH CUSTOMIZABLE LIGHT EFFICIENCY



JBD-X-Cube version:  
"Boosting" of red light

# CUSTOMIZABLE WAVEGUIDE EFFICIENCY ALLOWS OPTIMIZED WAVEGUIDE FOR JBD X-CUBE



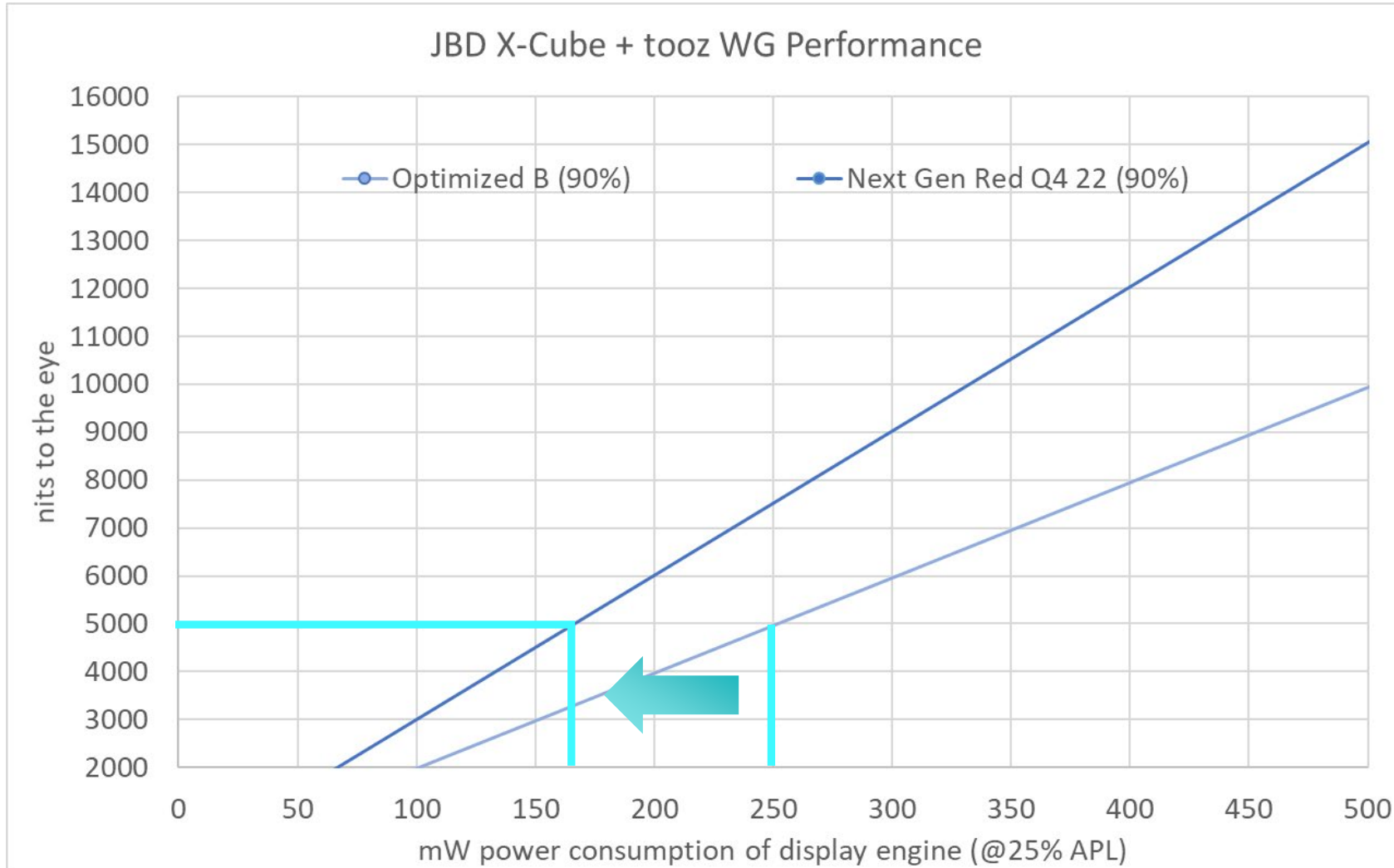
tooz design target for optimized waveguide

90% see-through

5K nits to the eye @ 250mW



# NEXT GEN RED JBD DISPLAYS ALLOW POWER REDUCTION BY 33%



**tooz design target for optimized waveguide**

**90%** see-through

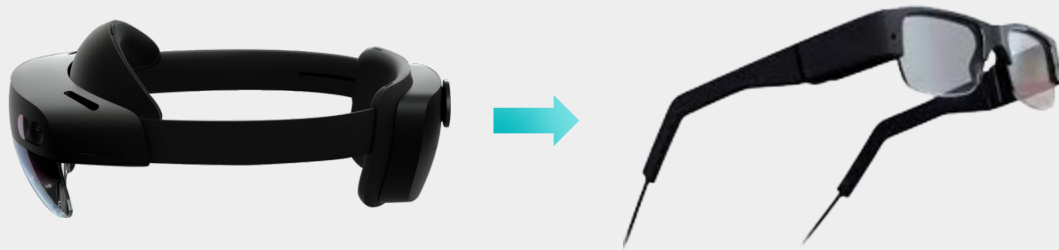
**5K nits** to the eye @ 250mW → **170mW**

# NEW OPTICAL ENGINE WILL STILL FIT INTO NORMAL RX GLASSES

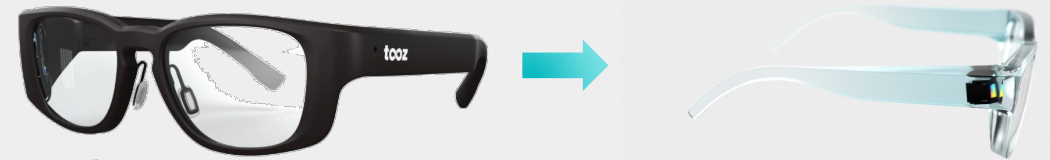
## TWO COMPLIMENTARY PRODUCT SEGMENTS AND STRATEGIES WILL SHAPE THE SMART GLASSES MARKET

**A** Start with everything – stereoscopic 3D, inside out tracking – release for enterprise and scale down to consumer as technology miniaturizes.

**B** Keep look & feel plus intended use (protection & correction) and upgrade only those features who can fit in a stylish form factor of consumer eyeglasses, adding more features as technology miniaturizes.



Weight > 100g  
FOV >> 35°



**TOOZ APPROACH**  
Weight < 50g  
FOV < 25°

# A CURVED WAVEGUIDE IS KEY FOR EFFICIENT RX

## TOOZ CURVED WAVEGUIDE

Full integrated layer for prescription – one monolithic piece



1 x one part monolithic curved waveguide  
incl. prescription layer  
incl. incoupling optics

## PLANAR WAVEGUIDE

All others



2 x prescription element  
2 x virtual image distance adjuster  
1 x planar waveguide  
1 x lens stack for incoupling

# ROADMAP: ENABLING COLOR W/O X-CUBE TO SAVE FURTHER SPACE

## TOOZ CURVED WAVEGUIDE

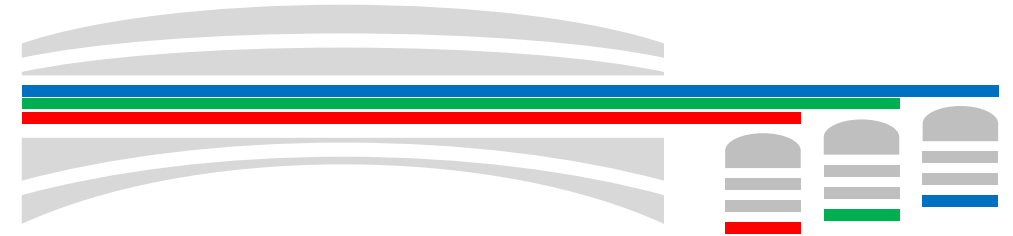
Full integrated layer for prescription – one monolithic piece  
**even for multiple separate displays**



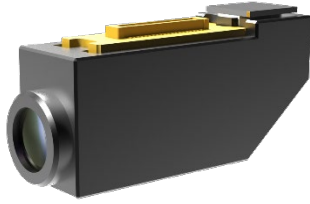
1 x one part monolithic curved waveguide  
incl. prescription layer  
incl. **3 x** incoupling optics

## PLANAR WAVEGUIDE

All others



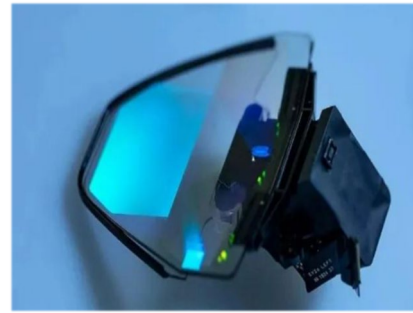
2 x prescription element  
2 x virtual image distance adjuster  
**3 x** planar waveguide – one for each color  
**3 x** lens stack for in-coupling – one for of each color



DLP: 3~5CC



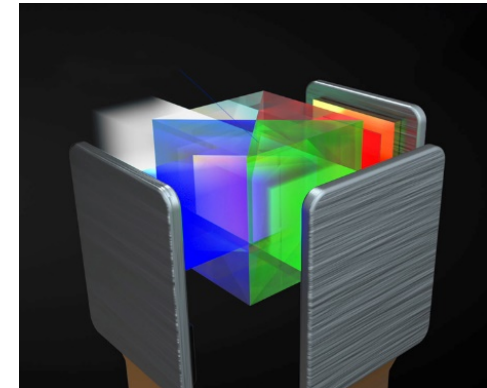
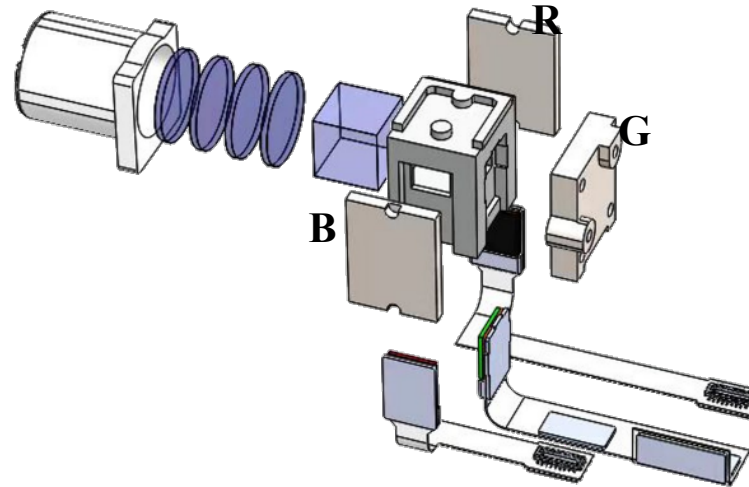
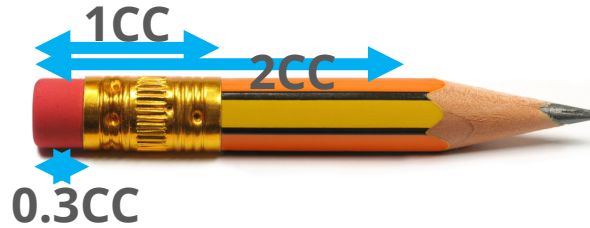
LCOS: 3~5CC



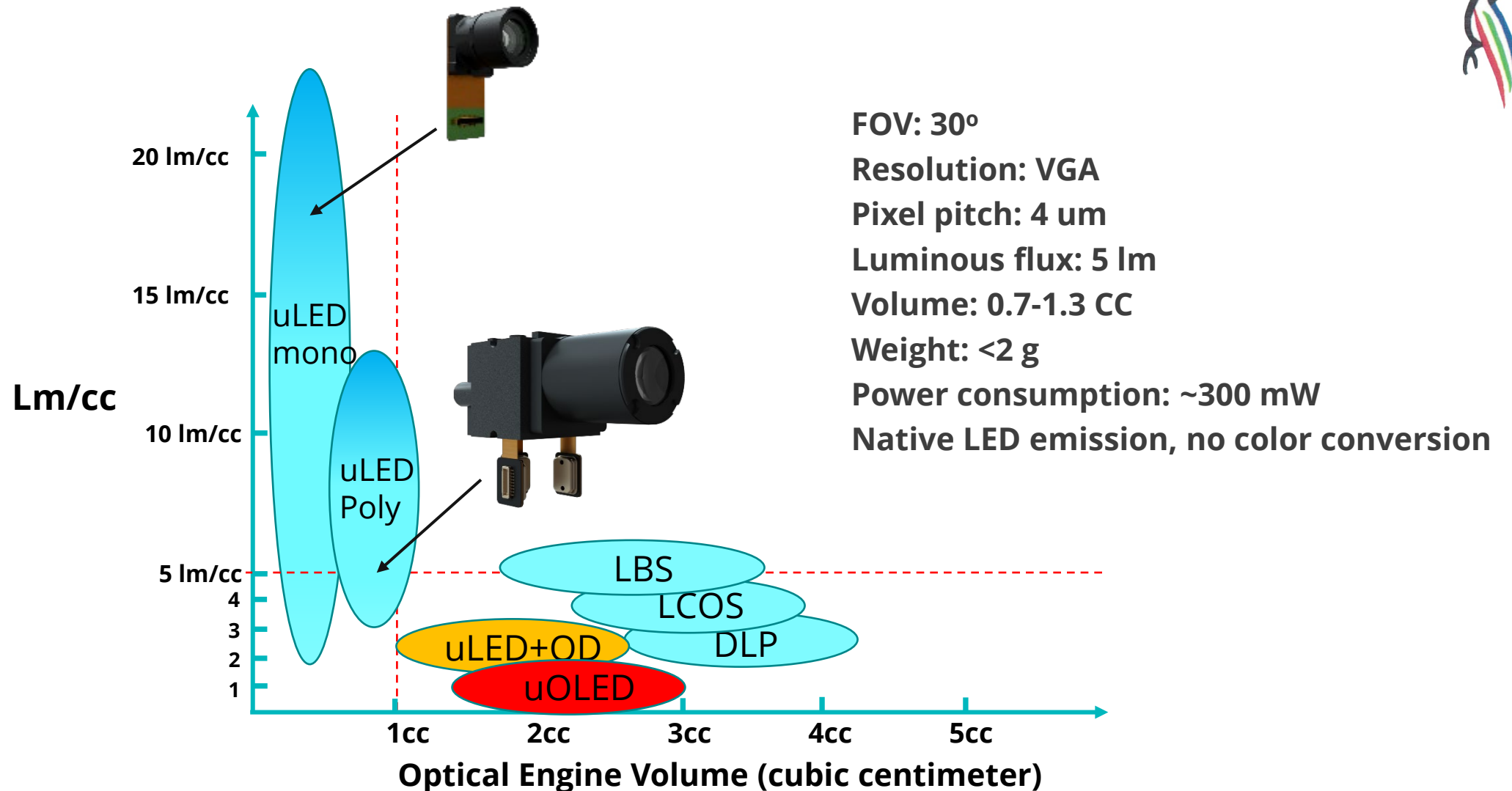
LBS: 2~5CC



JBD uLED: 1.3CC/0.3CC



### JBD launches 1CC AMuLED™ optical engines



**Self-emitting microLED engine has highest “Lm/cc”**

**SEE THE FIRST GEN JBD POLYCHROME MICRO-LED  
DISPLAY MODULE WITH TOOZ CURVED WAVEGUIDE AT  
THE JBD BOOTH AT PHOTONICS WEST 2022**

# CONTACT



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