

VANGUARD LED DISPLAYS



Wave

Simulation DISPLAYS

VANGUARD

LED DISPLAYS



Visit our site to
learn more!

- **Precision Visual Detail for Training:** dvLED displays provide sharp, clear, deep, and continuous images whereas projected images can be distorted and unclear
- **Realistic Cues for Pilot Performance:** dvLED supports terrain interpretation, depth perception, parallax, early runway recognition, and fine-detail visibility needed in training environments
- **Designed for Simulation Standards:** Aligns with FAA, EASA, military, and FFS Level-D expectations, which score visual MTF and line-pair resolution, not raw pixel counts
- **Superior Clarity Over Projection:** dvLED produces a seamless image across the display without optical edge blending, maintaining perfect pixel clarity which projection struggles to achieve
- **High-Performance Visual Characteristics:** Pixel pitch, fill factor, black level, halo control, diode uniformity, color crosstalk, frame sync, and latency all influence training realism and fidelity using dvLED displays
- **Configurable for Simulation Domes:** dvLED radius and pixel pitch relationships directly define arcminute performance, enabling training systems to target required acuity levels for each mission profile

In simulation environments, visual displays carry the weight of realism, pilot performance, and regulatory expectations. The correct metric for defining visual acuity in a dome is arcminutes per optical line pair, because pilots do not perceive pixels, they perceive contrast boundaries where detail actually lives. This approach matches the behavior of human visual acuity, which resolves line pairs rather than individual dots on a display.

Multiple projector displays require edge blending to create a sufficiently wide image which can distort fine markings, signage, or runway cues. An LED surface, by contrast, produces a unique and consistent contrast, allowing flight trainees to interpret terrain texture, motion parallax, and target acquisition with clarity. These qualities support the demands of commercial FTDs, military mission rehearsal, JTAC environments, and the stringent expectations of Full-Flight Simulator (Level-D) training, where perfect resolution, not pixel count, defines certification readiness.

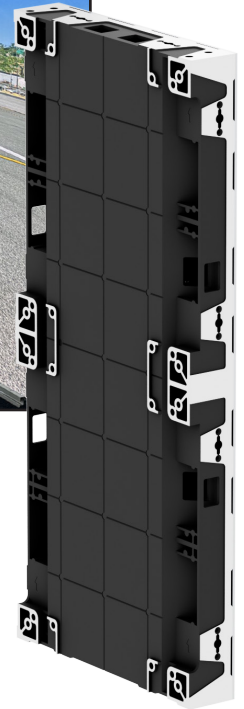
dvLED performance depends on several interconnected visual factors, including pixel pitch, viewing radius, MTF, fill factor, black level, and latency. These characteristics determine how accurately the display preserves sharp, clear images and contrast across the field of view and how well pilots can read gauges, identify runway markings, or recognize distant targets during dynamic motion cues. Because radius and pitch directly control arcminute outcomes, system designers can select configurations that meet the needs of large-format training environments or approach sub-arcminute performance where mission accuracy demands it.

With its ability to maintain detail, contrast, and resolution across large visual surfaces, dvLED offers a more efficient alternative to projection. It supports training programs that require crisp cues, predictable performance, and stable optical characteristics across the entire image. By aligning with the way pilots see the world, dvLED enables simulation systems to deliver visuals with high accuracy and mission-ready fidelity.



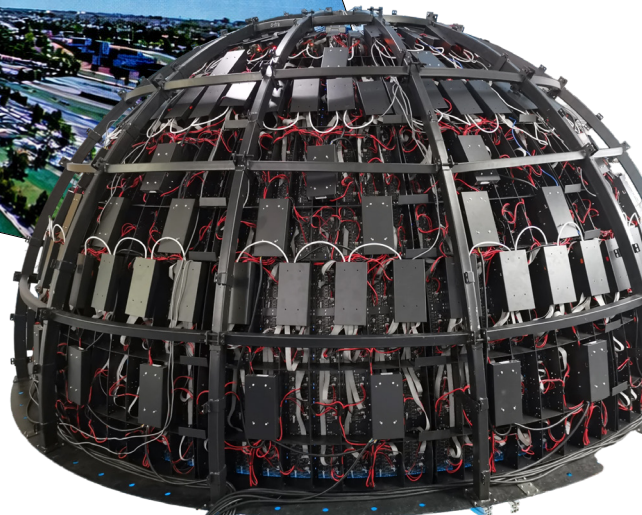


- Configurable **smooth** curving displays
- **Concave, convex, or flat**
- Fine-pitch down to **1.25mm**
- Single frame size and module size
- Configurable as true **16:9, 2K, 4K**, and more



Cerium sphere

- **Sphere-shaped** display
- Up to **360°** field of view
- **Configurable** size



Wave



pitch	1.2	1.5	1.8	2.5
pixel tech	SMD	SMD	SMD	SMD

ideal for

Smooth, curving displays

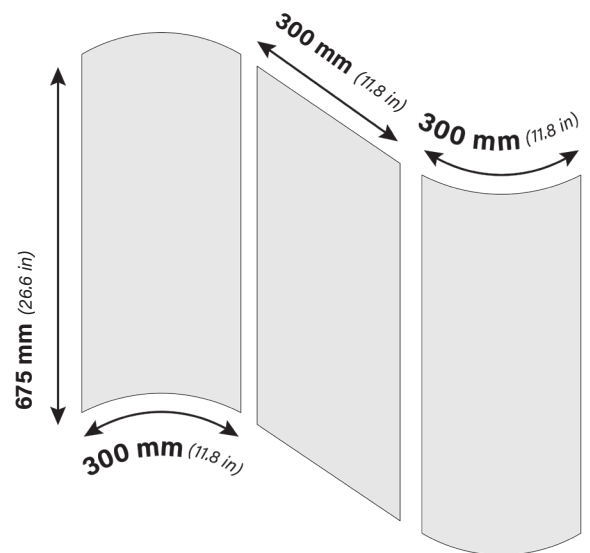
summary

Creating faceted curves with flat panels will soon be a thing of the past. Introducing the Wave series, a leap forward in the evolution of curving fine-pitch LED. Design, installation, and service are made easier with a single panel size and universal flexible modules.

Wave panels have a 4:9 aspect ratio enabling a true 16:9 aspect ratio, which can be configured to true FullHD 2K or UltraHD 4K resolutions.

- Axion Pro series, 1,920 x 1,080 px | 4x4, 1.2mm
- Wave series, 1,920 x 1,080 px | 8x2, 1.2mm

dimensions



aspect ratio

4:9

weight

7.7 kg (17 lbs)

max brightness

800 nits

IP rating

IP41

optional

- Epoxy masking or coating
- MIP - High-contrast pixels
- Cosmetic/protective edge trim
- Embeddable controller
- Mobile cart
- Flight cases
- Remote AC>DC power conversion

Wave

SERIES NAME

MAXIMUM BRIGHTNESS (NITS)	up to 800	
DIMENSIONS	WIDTH	300 mm (11.8 in)
	HEIGHT	675 mm (26.6 in)
	DEPTH	58 mm (2.3 in)
PANEL ASPECT RATIO	0.4:1	
PANEL WEIGHT	5.8 kg (12.8 lbs)	
MODULES PER PANEL	4 per panel	
VIEWING ANGLE	HORIZONTAL	160°
	VERTICAL	160°
LED LIFETIME* (HRS)	100,000	
CONTRAST	6,000:1	
DRIVERS	ICN1065S, ICN1069 (depending on pitch)	
SCAN RATE	1/27, 1/30, 1/60 (depending on pitch)	
PROCESSING DEPTH (BITS)	14 default (8-16 range)	
REFRESH RATE (HZ)	3,840 default (3,840 range)	
FRAME RATE	60 default (50, 60 options)	
COLOR TEMPERATURE	7,500 default (2000-12000 range)	
COLOR GAMUT	2.8 (1.0-4.0)	
BONDING WIRE	Copper	
POWER COMMON	Anode, Cathode (depending on pitch)	
WATTS PER PANEL	122-138W max (43-48W average)	
WATTS PER SQ M	600-680W max (210-238W average)	
MAX AMPS PER CASCADE	10	
OPERATING VOLTAGE	100-240V AC, 50/60 Hz	
OPERATING TEMPERATURE	-10°C - +40°C	
MAXIMUM HEAT	415-471 BTU/hr (depending on pitch and panel size)	
HUMIDITY	10% - 80%, non-condensing	
IP RATING	IP41	
FRAME MATERIAL	Die-cast Aluminium	
HANGING AND STACKING	15 hanging max 30 stacking max	
REAR BOLT THREADING	M8	
POWER CONNECTORS	C13/C14	
DATA CONNECTORS	RJ45	
SERVICE ACCESS	Front	
WARRANTY	3 year (up to 5 available)	
CERTIFICATIONS	EMC-A, CCC, FCC, ETL, LVD, CE, RoHS	



Visit our site to
learn more!



*Elevate your training
programs, empower your
professionals, and redefine
realism!*

Cerium sphere

SPECIAL Unique LED

pitch

0.9

1.5

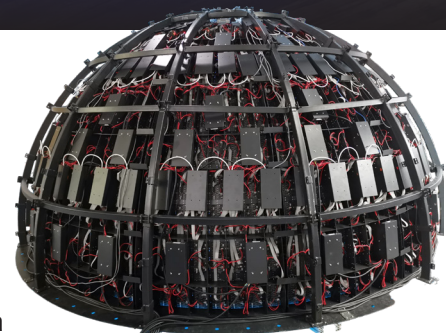
ideal for

pixel tech

SMD

SMD

**Immersive simulation
display**



summary

Cerium represents the next evolution for simulation technology. Taking a huge leap from a simple curved display, Cerium can create a cylinder, dome, globe, tunnel, or sphere as an immersive space which is ideal for flight, pilot, and driver simulation.

Cerium creates a seamless display in a shape which only projection can achieve, but without the edge blending or vulnerability to ambient light or light paths. Cerium displays include a rugged Epoxy Coating (GOB) treatment for advanced pixel protection.

applications

- Military
- Maritime
- Helicopter
- Airplane
- Aerospace

Why dvLED technology is the best for simulation

RESOLUTION | At a diameter just under 5 meters (4.84m), a Cerium 0.9mm display achieves an angular resolution of **2.56 arc-minutes** — making it as sharp as projection.

CONTRAST | dvLED displays offer truly black blacks (thanks to diode-off pixels), achieving contrast levels not possible with LCD, OLED, or projection.

BRIGHTNESS | dvLED performance is unaffected by ambient light, cockpit instrumentation, classroom lighting, or theatrical lighting.

LIGHTING | Realistic lighting effects, including sun movement and shadows, are produced by the display itself and reflected accurately into the cockpit.

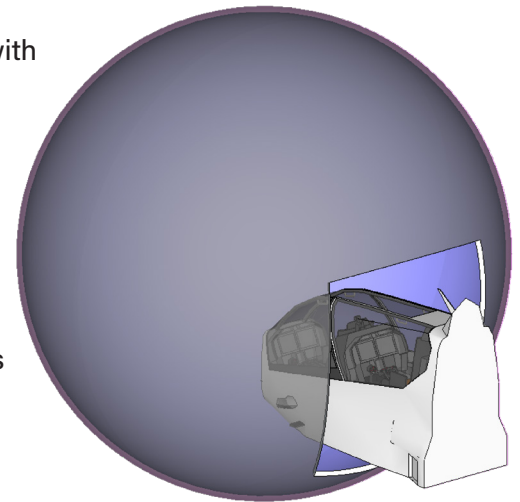
MAINTENANCE | No fans, filters, or bulbs. 5% spare parts are included with every dvLED system. No regular maintenance required.

FOOTPRINT | dvLED requires no space for projector throw — only the footprint of the display itself.

SHADOW-FREE | Individuals can stand directly in front of the display without casting shadows.

SEAMLESS IMAGERY | Unlike projection, dvLED displays are continuous and do not require edge blending.

NOISE | No moving parts = silent operation.



In the realm of immersive training experiences, the Cerium series simulation display stands as paragon of innovation and excellence. Whether it's aviation, healthcare, or military simulations, Cerium series simulation displays are the driving force behind creating life-like scenarios, enriching training environments, and ensuring optimal learning outcomes. Cerium series simulation displays transform training from flat and dull to dynamic and immersive.

The displays boast high resolution and advanced pixel technology to ensure crystal-clear visuals that mimic real-world scenarios with exceptional detail. Advanced LED technology ensures vibrant colors, high contrast ratios, and a seamless viewing experience, capturing every nuance of the simulated environment.



Cerium series displays incorporate dynamic features such as high refresh rates and low latency, ensuring that movements and interactions in the simulation are rendered in real time.

This level of responsiveness creates an environment where trainees can truly immerse themselves, fostering a more profound understanding of complex tasks and scenarios.

With aviation's high-demands for precision and responsiveness, Cerium can be custom tailored for your solution and is compatible with various simulation software, providing seamless integration and compatibility for an array of training applications.

Vanguard's Simulation LED Displays emerge as the unparalleled choice to meet the expectation where excellence is non-negotiable. Elevate your training programs, empower your professionals, and redefine realism with Vanguard's state-of-the-art displays.

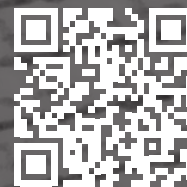
Vanguard LED Displays

summation

A leader in innovative digital LED display solutions, Vanguard offers an unrivaled range of products, technologies, and support.

Vanguard is an American-owned company, headquartered in Lakeland, Florida. Our mission statement - Complete customer satisfaction, defined by our core values of expertise, integrity, responsiveness, service, and value.

Our core values take many practical forms including Industry leading new technology, expert design advice at the outset of a project, timely quotes, the quickest lead times in the industry, helpful CADs and electrical drawings, professional commissioning, proficient on-site training, and stellar after-sales services.



Scan to
contact us!

0.9mm

- Radius of 1 meter (*minimum possible*) – 6.19 arcminute per optical line pair
- Radius of 1.5 meters – 4.13 arcminute per optical line pair
- Radius of 2 meters – 3.09 arcminute per optical line pair
- Radius of 2.5 meters – 2.48 arcminute per optical line pair

0.6mm

- Radius of 2.5 meters (*minimum possible*) – 1.65 arcminute per optical line pair
- Radius of 3 meters – 1.38 arcminute per optical line pair
- Radius of 3.5 meters – 1.8 arcminute per optical line pair
- Radius of 4 meters – 1.03 arcminute per optical line pair

VANGUARD
LED DISPLAYS