

HemiStar™
Application Notes

HemiStar Fisheye lenses enable display design freedom.

These notes illustrate some of the display design options for the core HemiStar lenses listed. These are general notes that apply to other HemiStar lenses, including custom versions.

Many others are possible. Fisheye projections enable innovative and cost-effective high-performance displays



Lens Application Parameters

HemiStar Lenses project wide-angle beams. The angular size of the beam depends on two key factors:

- 1) The projector panel size
- 2) The lens field limits

HemiStar lenses are also designed to suit classes of projector. The optical architecture within each projector is generally classed as

- a) Single-chip DLP
- b) Three-chip DLP
- c) LCoS / D-ILA / SXRD
- d) LCD

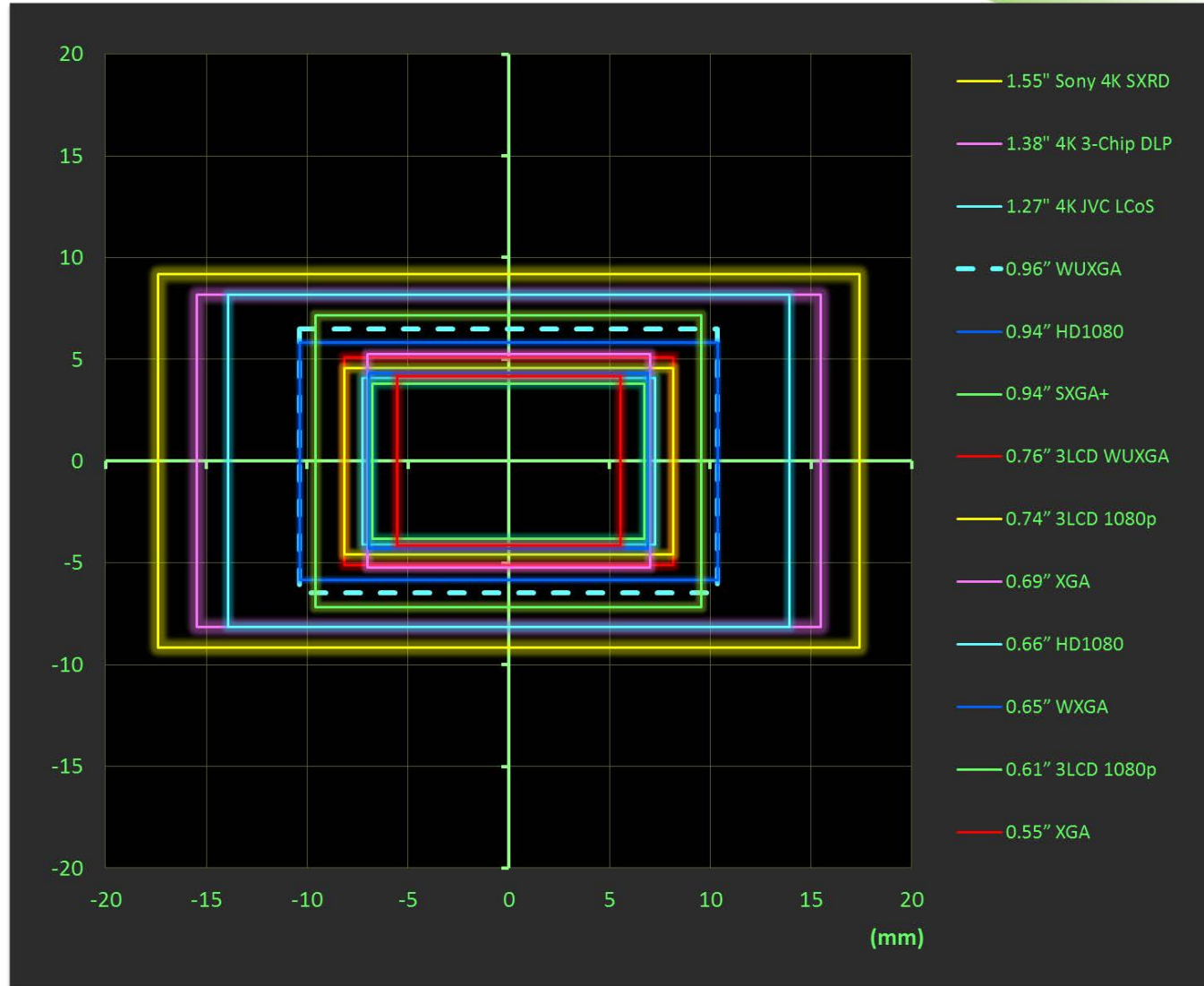
Other optical design factors mean that compatibility is checked on individual applications

Projector Panel Size

A selection of panel sizes are compared in this chart.

Their diagonal size is expressed in inches.

The horizontal and vertical size is normally expressed in millimetres



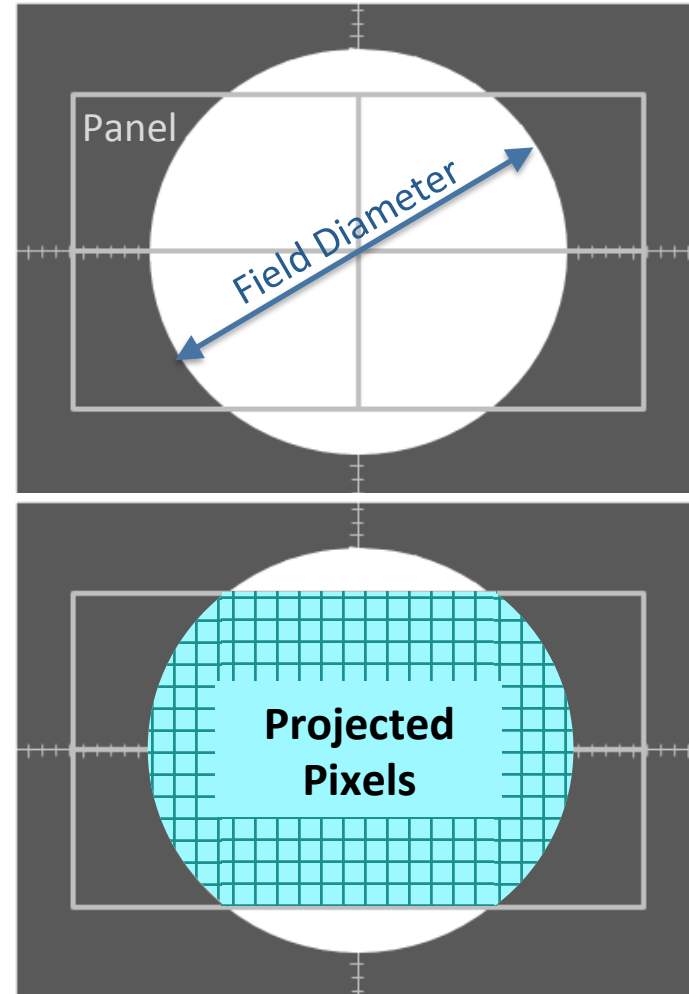
	Pixel Pitch (mm)	Resolution	Horizontal Pixels	Vertical Pixels	Width (mm)	Height (mm)	Diagonal (in)
1.55" Sony 4K SXRD	0.0085	4K	4096	2160	34.816	18.360	1.55
1.38" 4K 3-Chip DLP	0.00756	4K	4096	2160	30.966	16.330	1.38
1.27" 4K JVC LCoS	0.0068	4K JVC	4096	2400	27.853	16.320	1.27
0.96" WUXGA	0.0108	WUXGA	1920	1080	20.736	11.664	0.94
0.94" HD1080	0.0108	HD1080	1920	1080	20.736	11.664	0.94
0.94" SXGA+	0.01368	SXGA+	1400	1050	19.152	14.364	0.94
0.90" WQXGA	0.00756	WUXGA	2560	1600	19.354	12.096	0.90
0.76" 3LCD WUXGA	0.0085	WUXGA	1920	1200	16.320	10.200	0.76
0.74" 3LCD 1080p	0.0085	1080P	1920	1080	16.320	9.180	0.74
0.69" XGA	0.01368	XGA	1024	768	14.008	10.506	0.69
0.67" WUXGA	0.00756	WUXGA	1920	1080	14.515	8.165	0.66
0.66" HD1080	0.00756	HD1080	1920	1080	14.515	8.165	0.66
0.65" WXGA	0.0108	WXGA	1280	800	13.824	8.640	0.64
0.61" 3LCD 1080p	0.00703	1080P	1920	1080	13.498	7.592	0.61
0.55" XGA	0.0108	XGA	1024	768	11.059	8.294	0.54

Lenses can project a circular spot ('Field Diameter') which is overlaid on the projector panel.

The projector's panel usage is summarised by this diagram

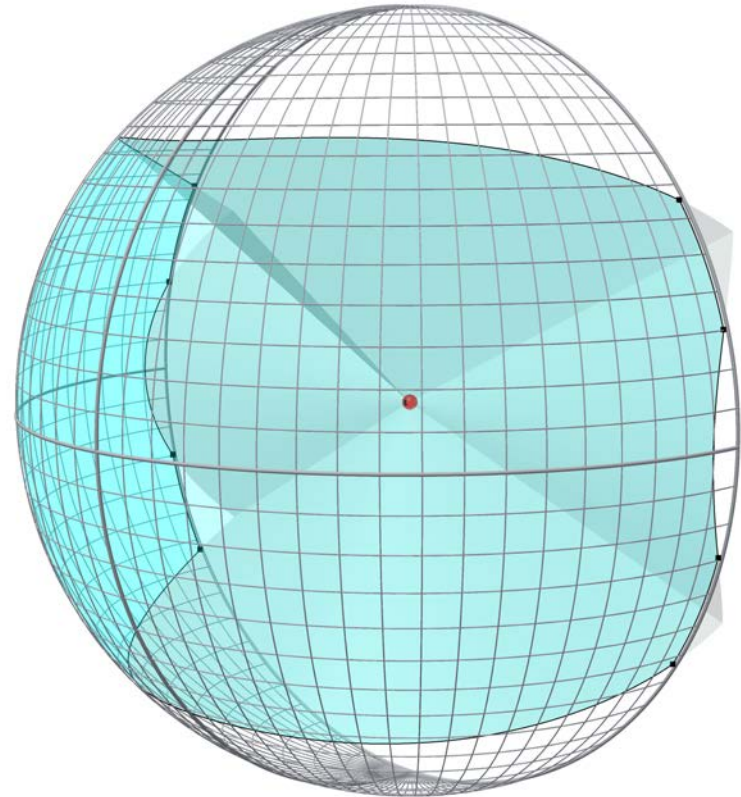
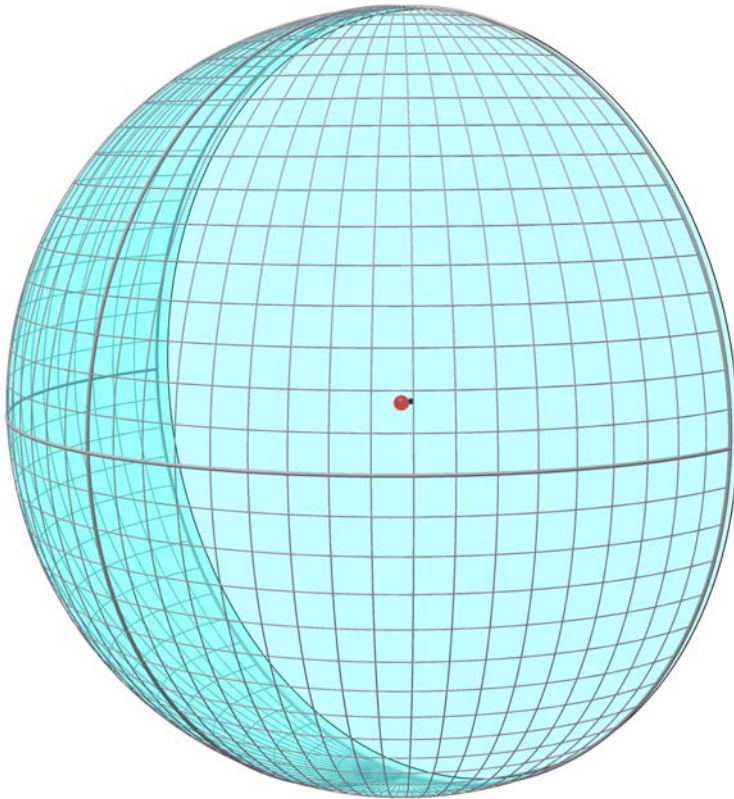
- The crosshairs lie on the lens axis
- The white circle is the Field Diameter
- The rectangle is the panel

So the projected pixels are in the overlap region



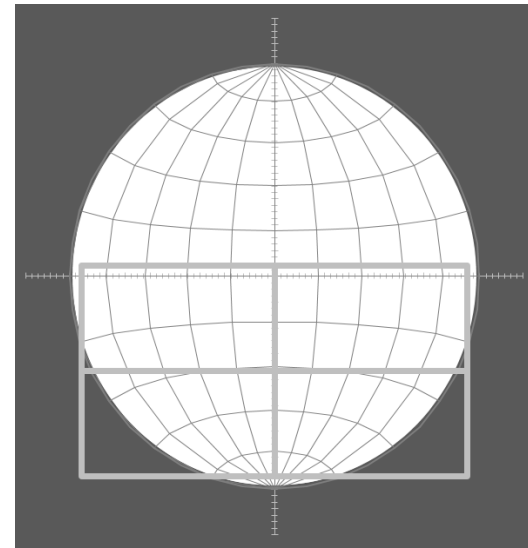
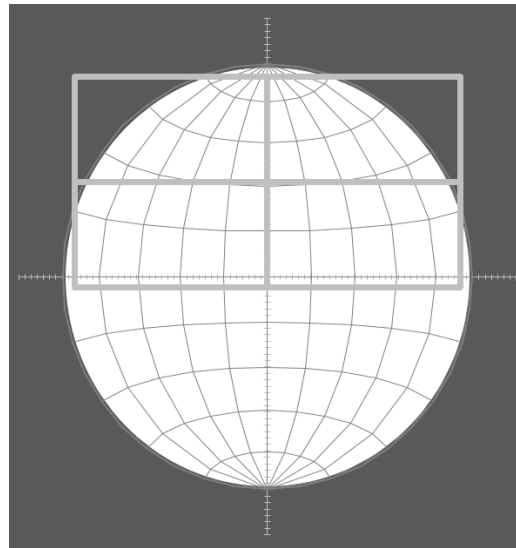
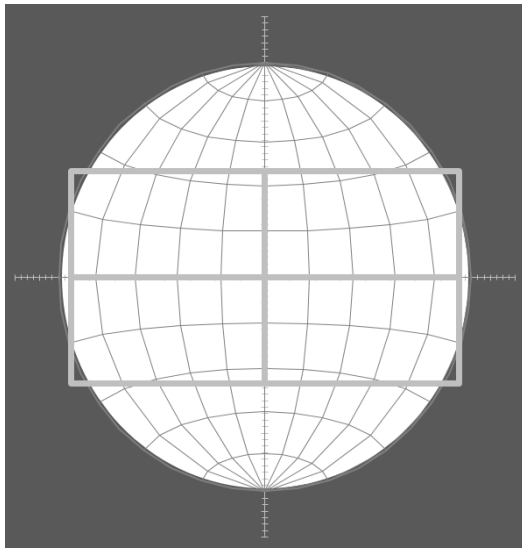
Projection Beam Size

The projected beam may look like a circular cone or a heavily-pincushioned rectangle. When projected from the centre of a dome they look like this:



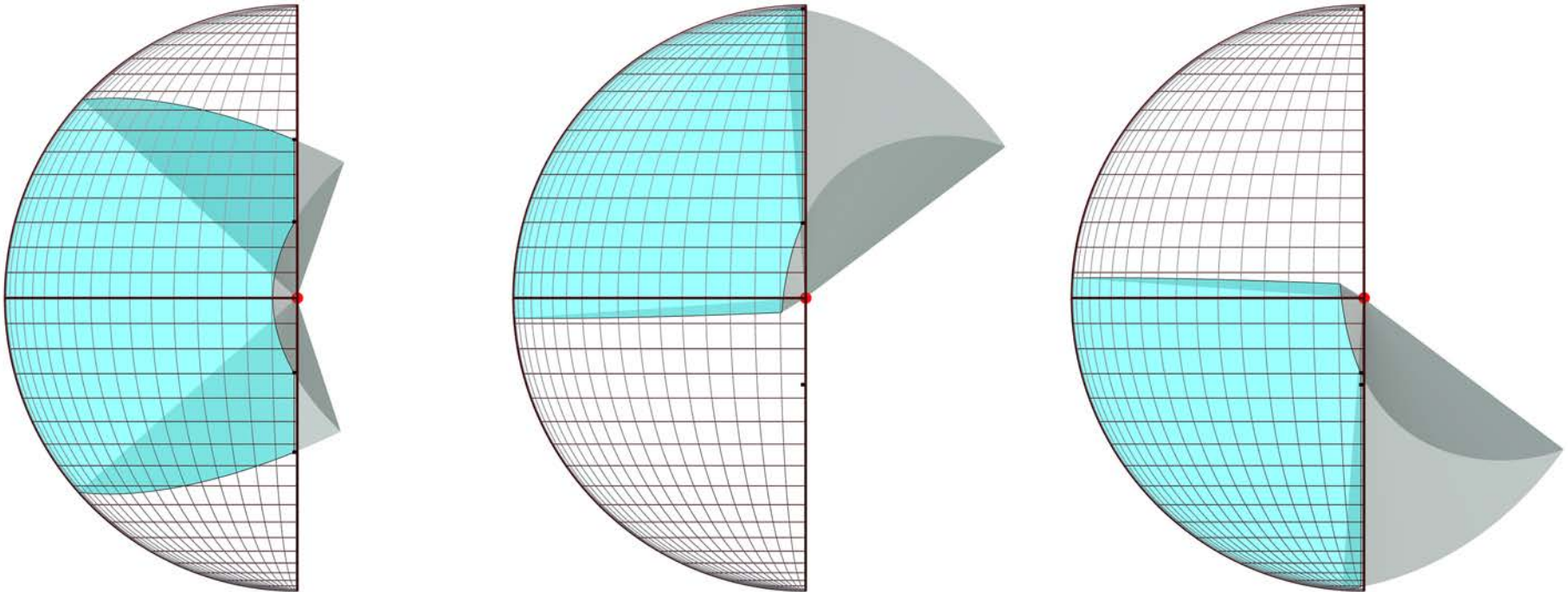
Shifted Image

When the field diameter is larger than the panel height then lens shift can be used for offset projections



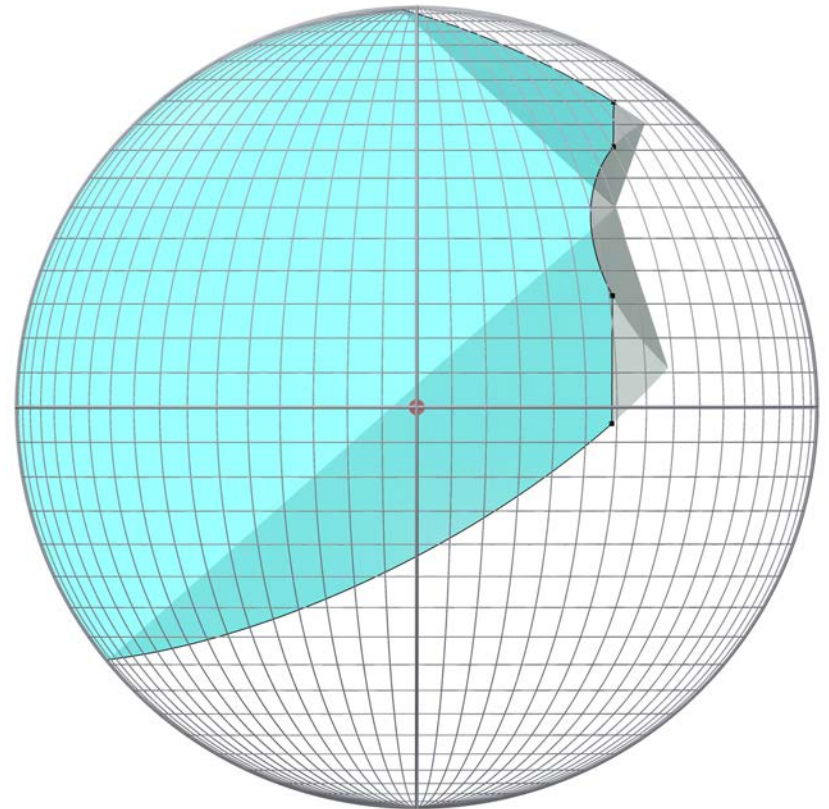
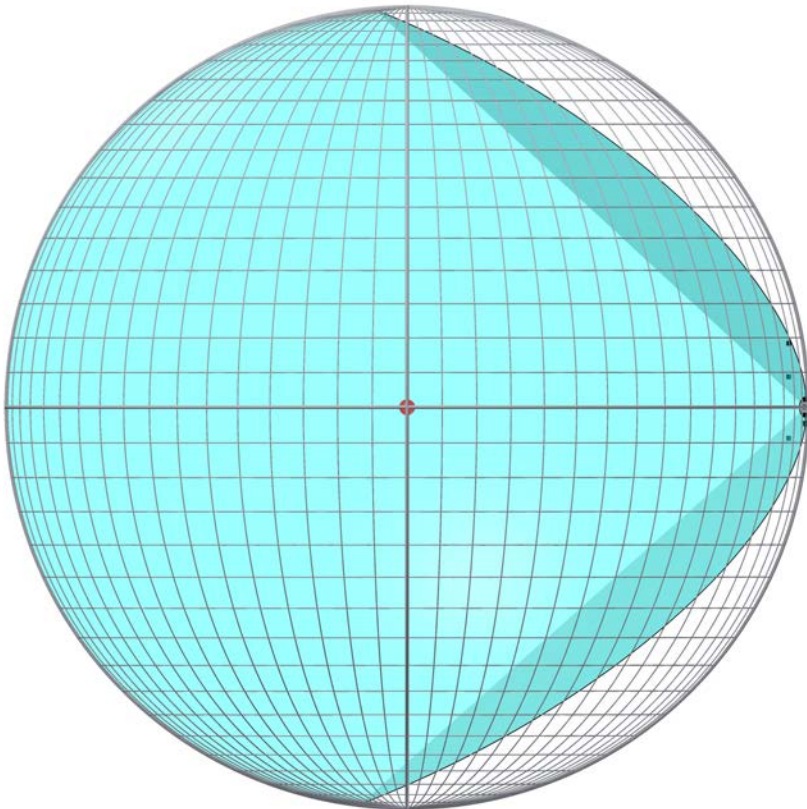
Shifted Image

The shifted image enables significant display design freedom



Projection away from dome centre

HemiStar lenses have a very large depth of focus which brings positional freedom



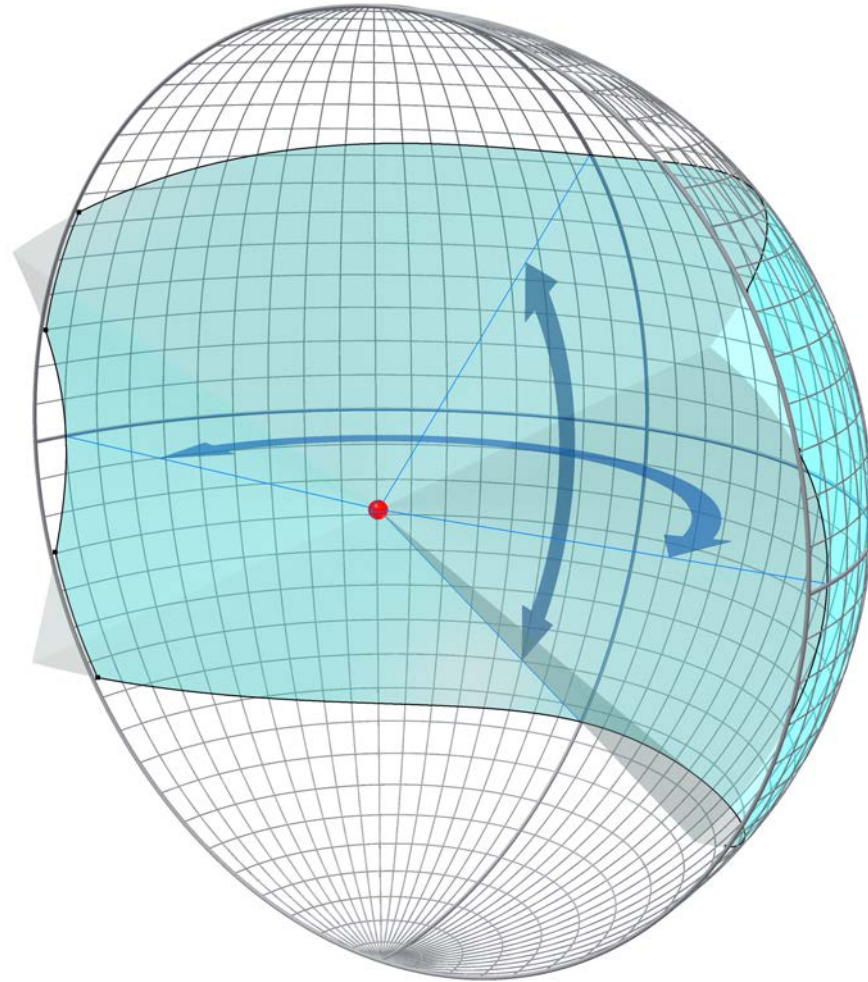
Projection Angle Definition

HemiStar projection beam angles will vary with the projector and lens shift.

Angles are provided for each projector without lens shift

The diagram here shows the vertical and horizontal beam angles

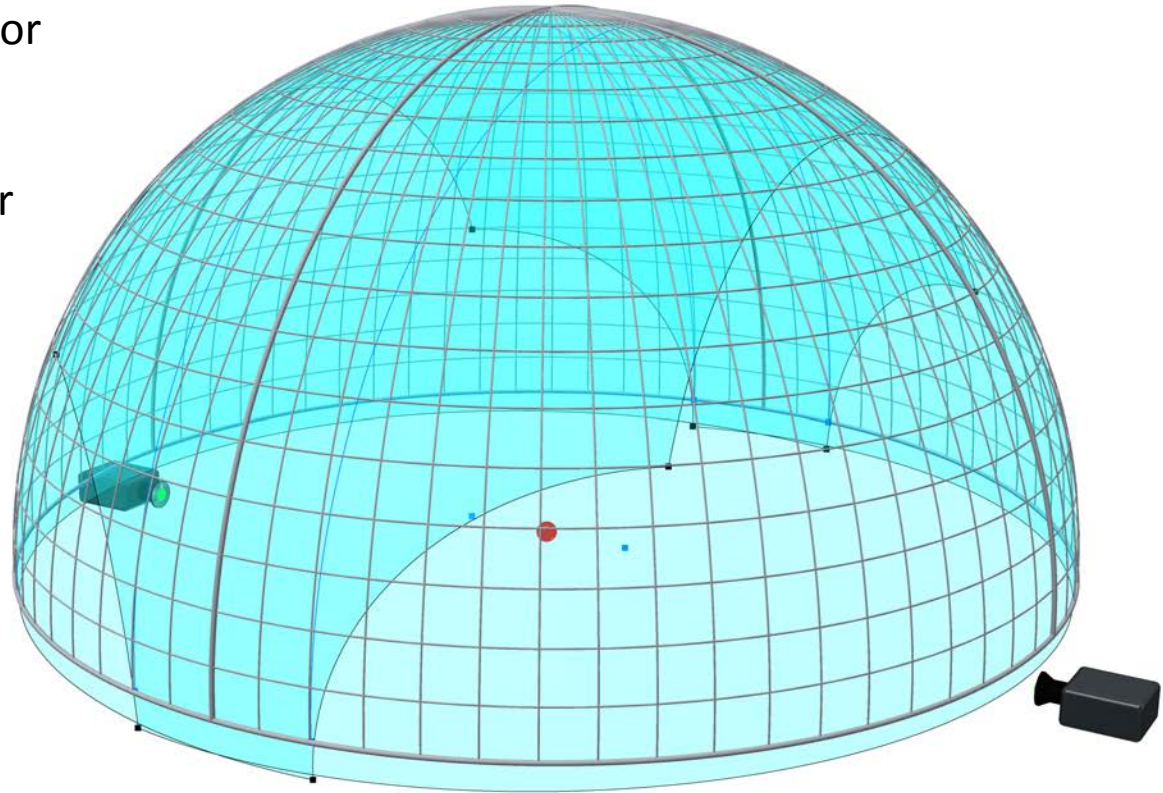
A 5-degree grid is used as a guide

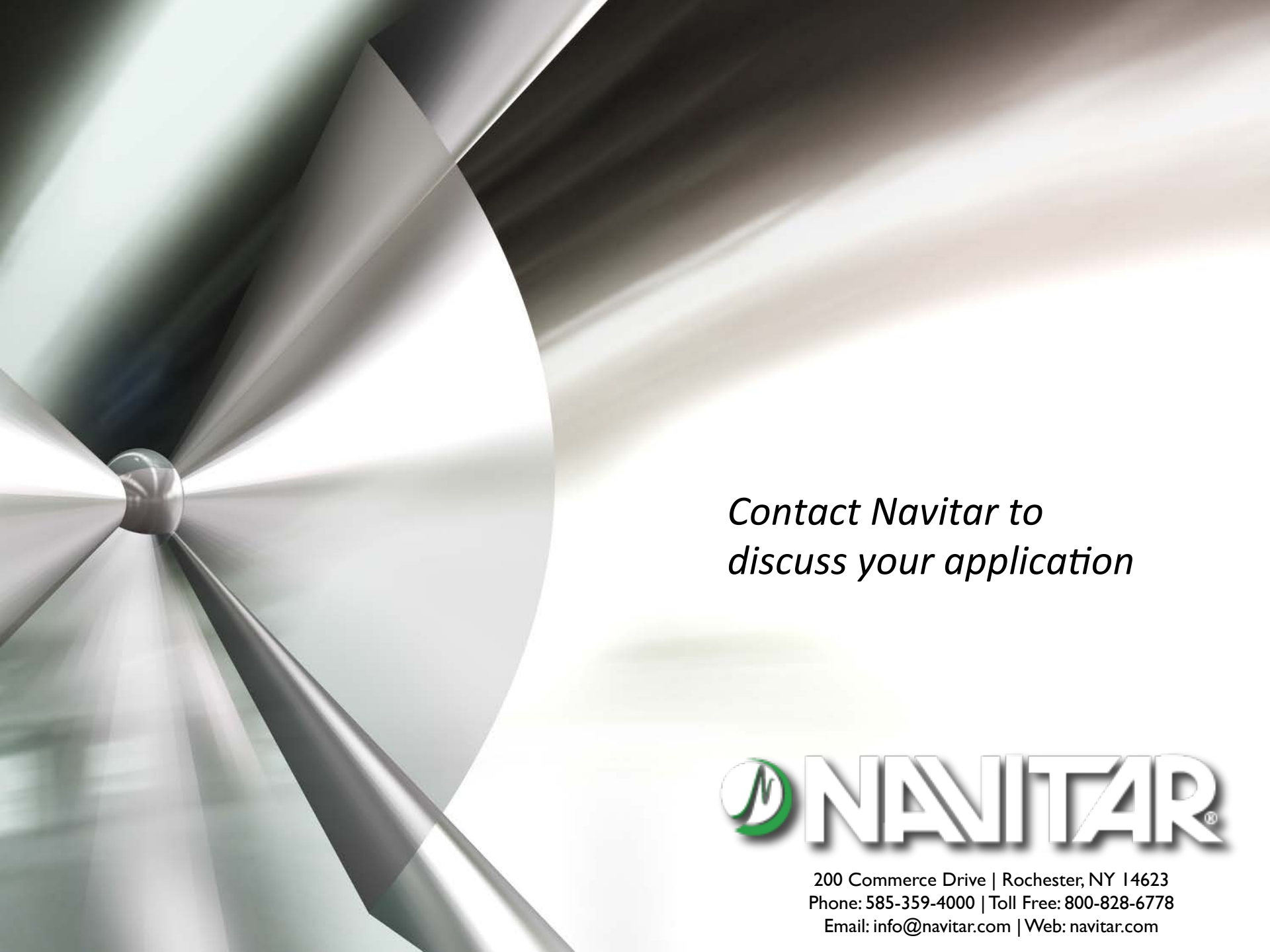


Dual Projector Dome

Some HemiStar lenses are capable of dual-projector dome displays

This may be from either dome center or cove positions





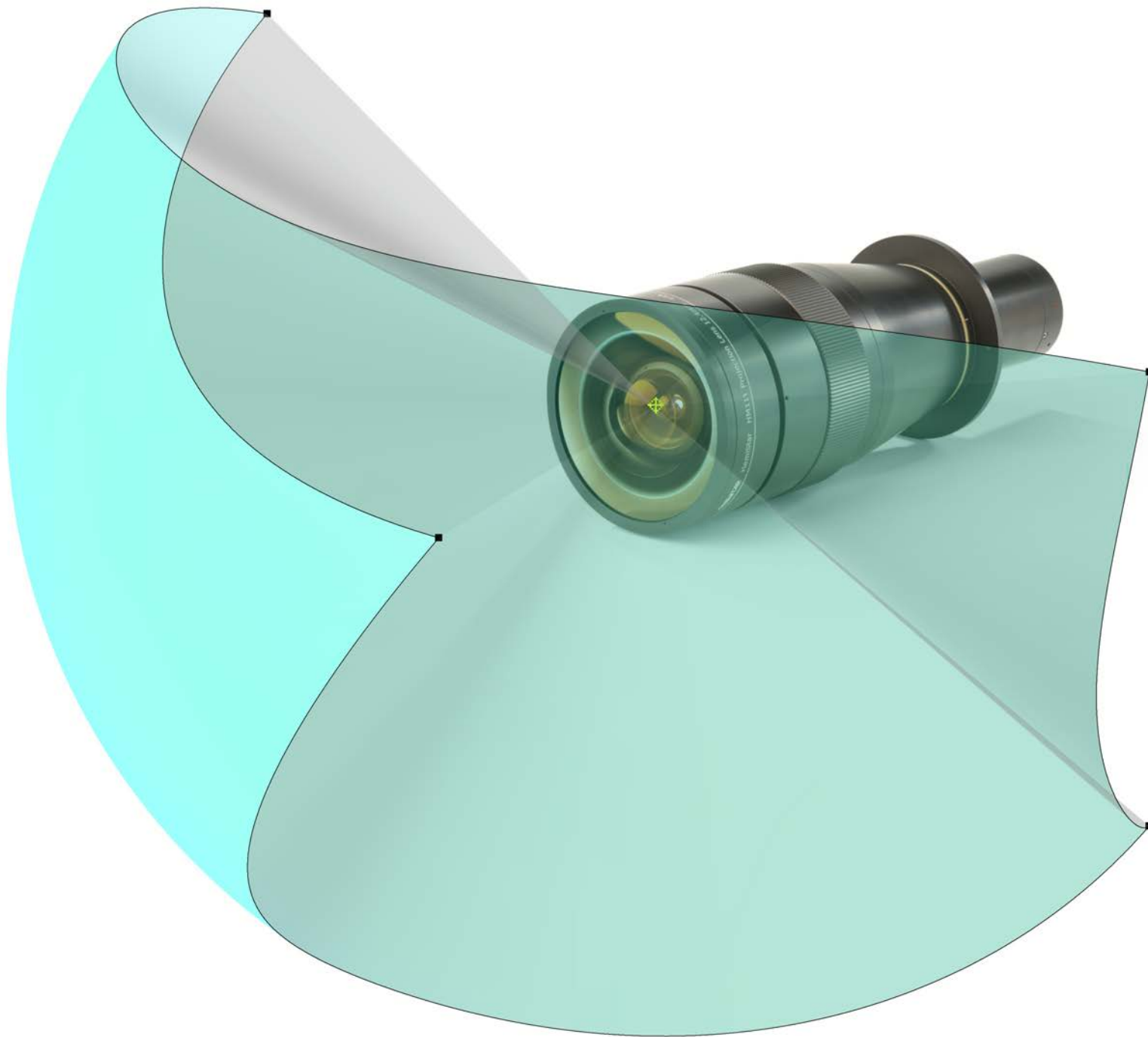
*Contact Navitar to
discuss your application*



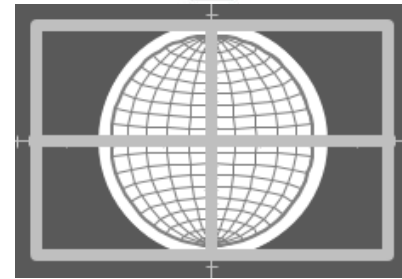
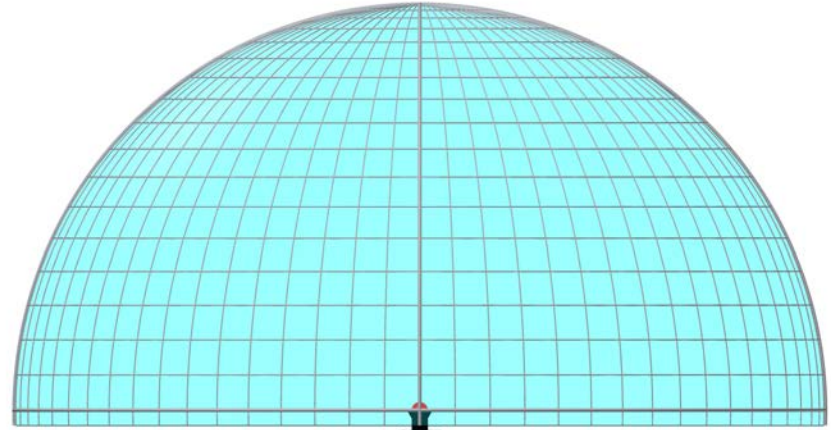
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HemiStar™
Lens Guide



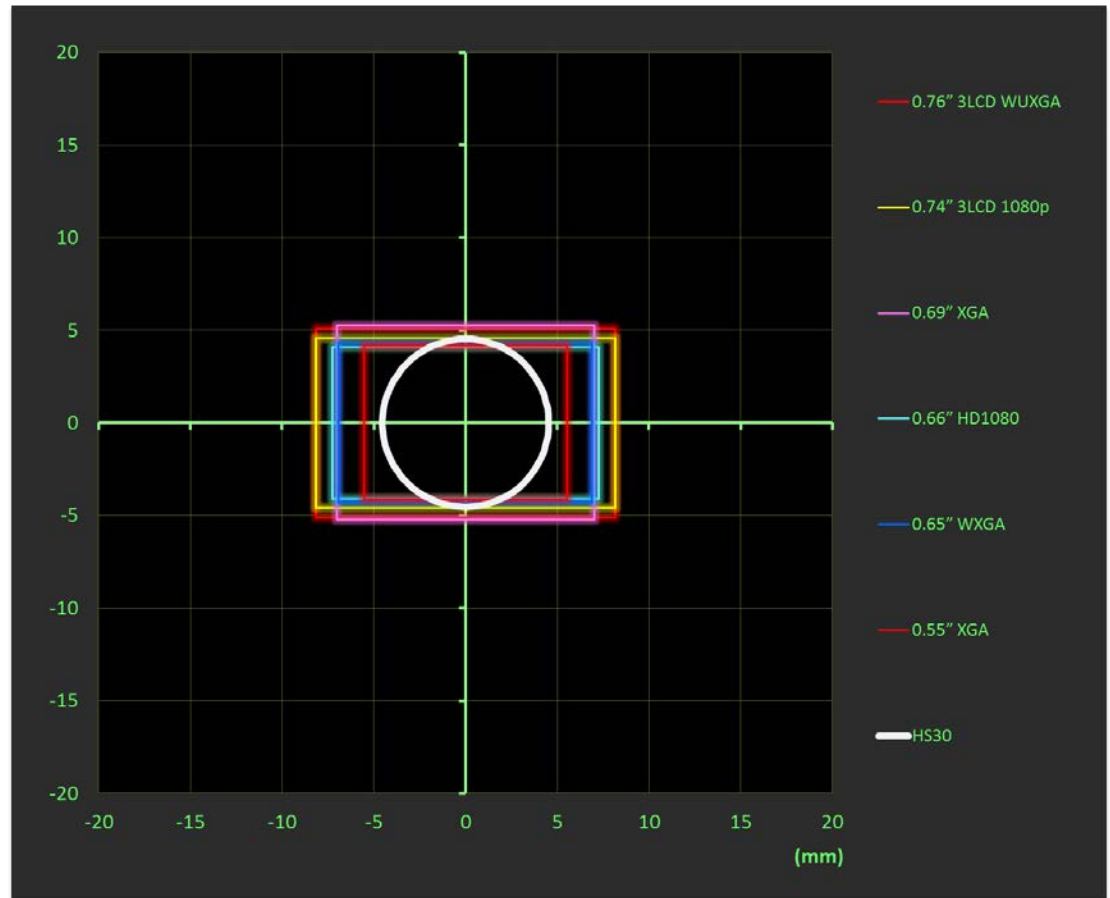
HemiStar™ HS30



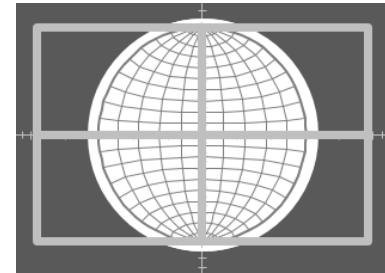
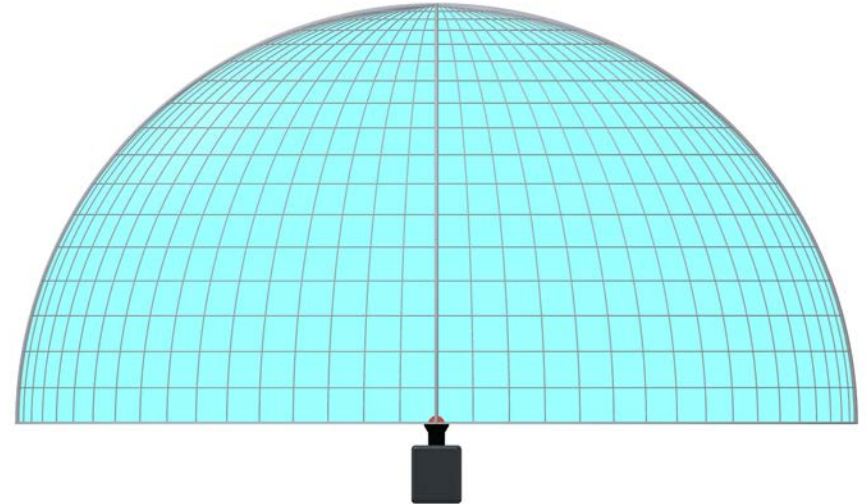
HS30 projecting a
0.67" WUXGA Panel

HemiStar™ HS30 Compatibility

Compatible Projectors	H Angle	V Angle
0.76in 3LCD WUXGA	184.4°	184.4°
0.74in 3LCD 1080p	184.4°	184.4°
0.69in XGA	184.4°	184.4°
0.67in WUXGA	184.4°	184.4°
0.66in HD1080	184.4°	163.7°
0.65in WXGA	184.4°	174.4°
0.55in XGA	184.4°	166.6°



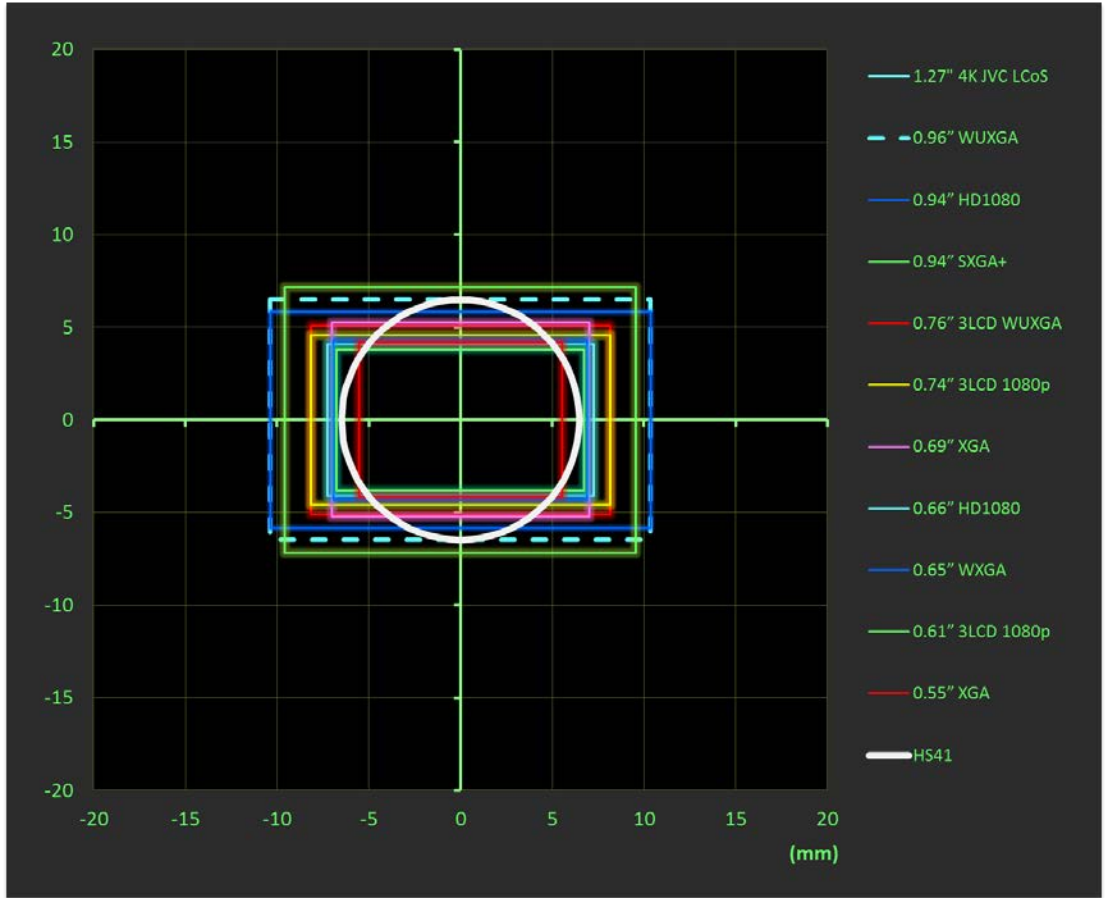
HemiStar™ HS41



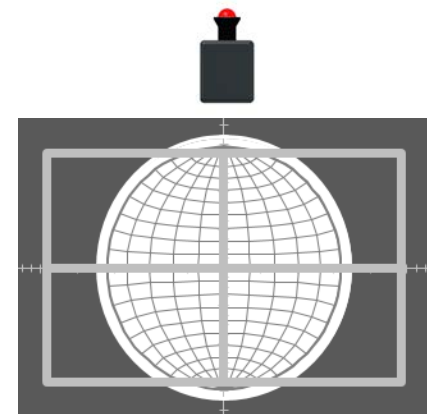
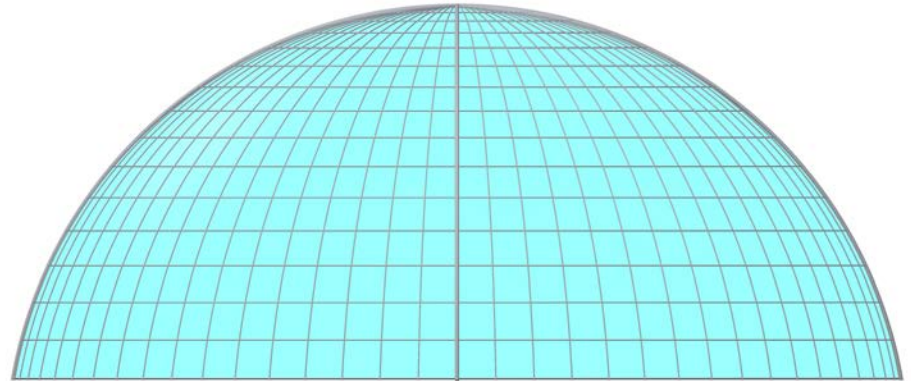
HS41 projecting a
0.90" WQXGA Panel

HemiStar™ HS41 Compatibility

Compatible Projectors	H Angle	V Angle
1.38in 4K 3-Chip DLP	0.0°	0.0°
1.27in 4K JVC LCoS	0.0°	0.0°
0.96in WUXGA	194.5°	172.3°
0.94in HD1080	194.5°	194.5°
0.94in SXGA+	194.5°	194.5°
0.90in WQXGA	194.5°	179.6°
0.76in 3LCD WUXGA	194.5°	148.5°
0.74in 3LCD 1080p	194.5°	132.6°
0.69in XGA	194.5°	153.4°
0.67in WUXGA	194.5°	131.0°
0.66in HD1080	194.5°	117.3°
0.65in WXGA	194.5°	124.4°
0.61in 3LCD 1080p	194.5°	108.8°
0.55in XGA	162.3°	119.2°



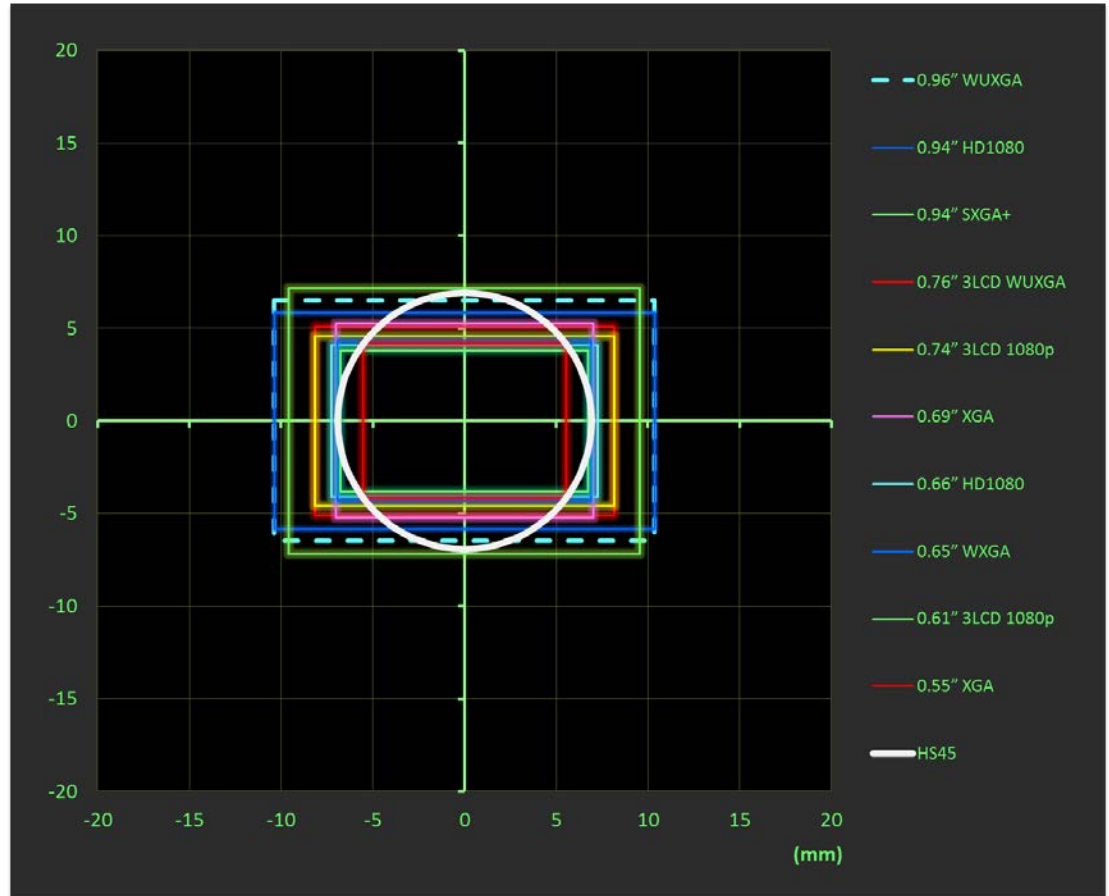
HemiStar™ HS45



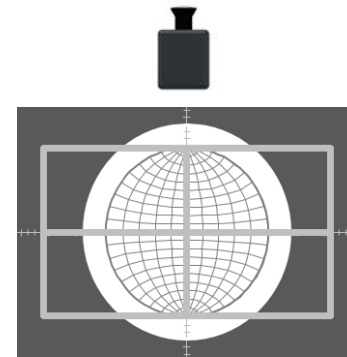
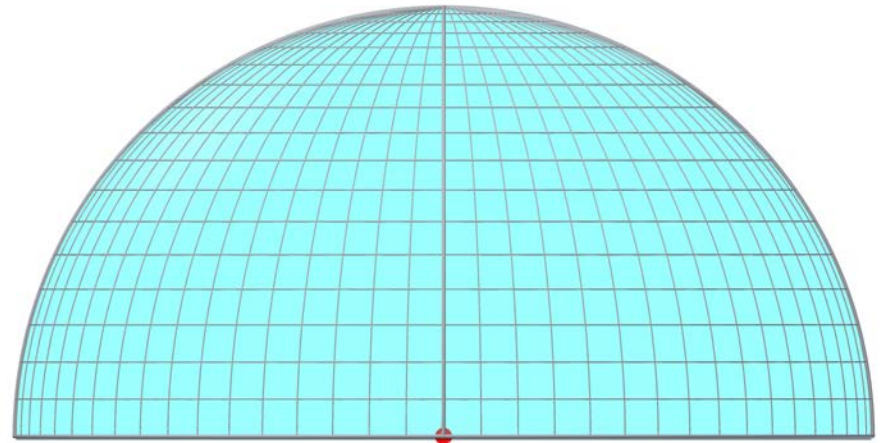
HS45 projecting a
0.90" WUXGA Panel

HemiStar™ HS45 Compatibility

Compatible Projectors	H Angle	V Angle
0.96in WUXGA	185.8°	154.0°
0.94in HD1080	185.8°	172.8°
0.94in SXGA+	185.8°	185.8°
0.90in WQXGA	185.8°	160.2°
0.76in 3LCD WUXGA	185.8°	133.5°
0.74in 3LCD 1080p	185.8°	119.5°
0.69in XGA	185.8°	137.7°
0.67in WUXGA	185.8°	118.0°
0.66in HD1080	185.8°	105.8°
0.65in WXGA	185.6°	112.1°
0.61in 3LCD 1080p	180.7°	98.1°
0.55in XGA	145.5°	107.5°



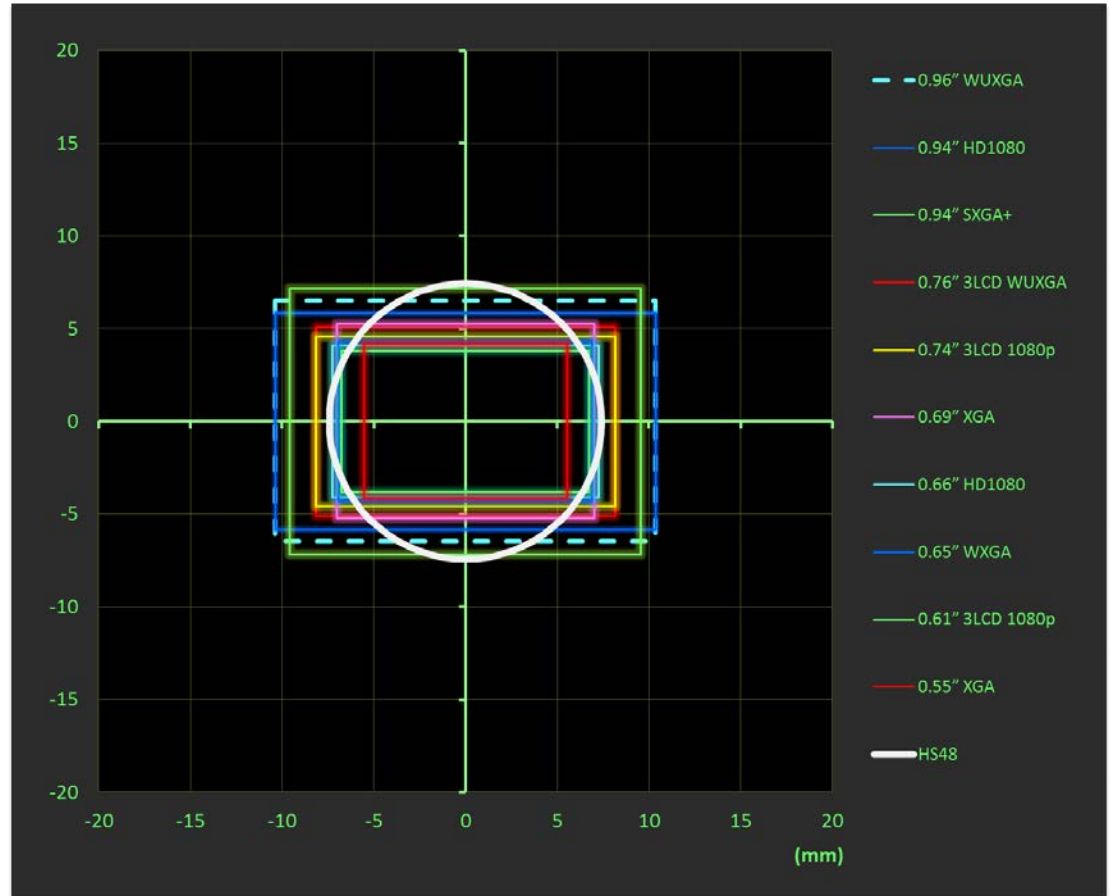
HemiStar™ HS48



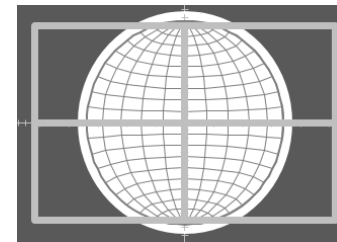
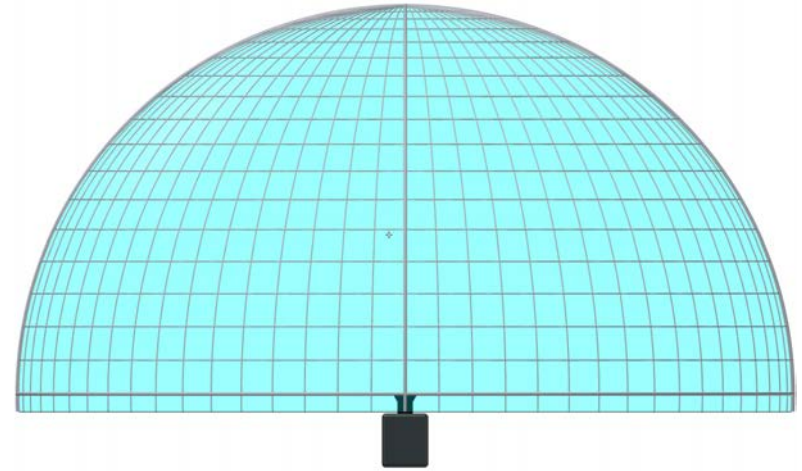
HS48 projecting a
0.90" WQXGA Panel

HemiStar™ HS48 Compatibility

Compatible Projectors	H Angle	V Angle
0.96in WUXGA	189.2°	145.2°
0.94in HD1080	189.2°	162.7°
0.94in SXGA+	189.2°	182.1°
0.90in WQXGA	189.2°	151.0°
0.76in 3LCD WUXGA	189.2°	126.0°
0.74in 3LCD 1080p	189.2°	112.8°
0.69in XGA	177.2°	130.0°
0.67in WUXGA	184.3°	111.4°
0.66in HD1080	184.3°	99.9°
0.65in WXGA	174.6°	105.9°
0.61in 3LCD 1080p	170.1°	92.6°
0.55in XGA	137.2°	101.5°



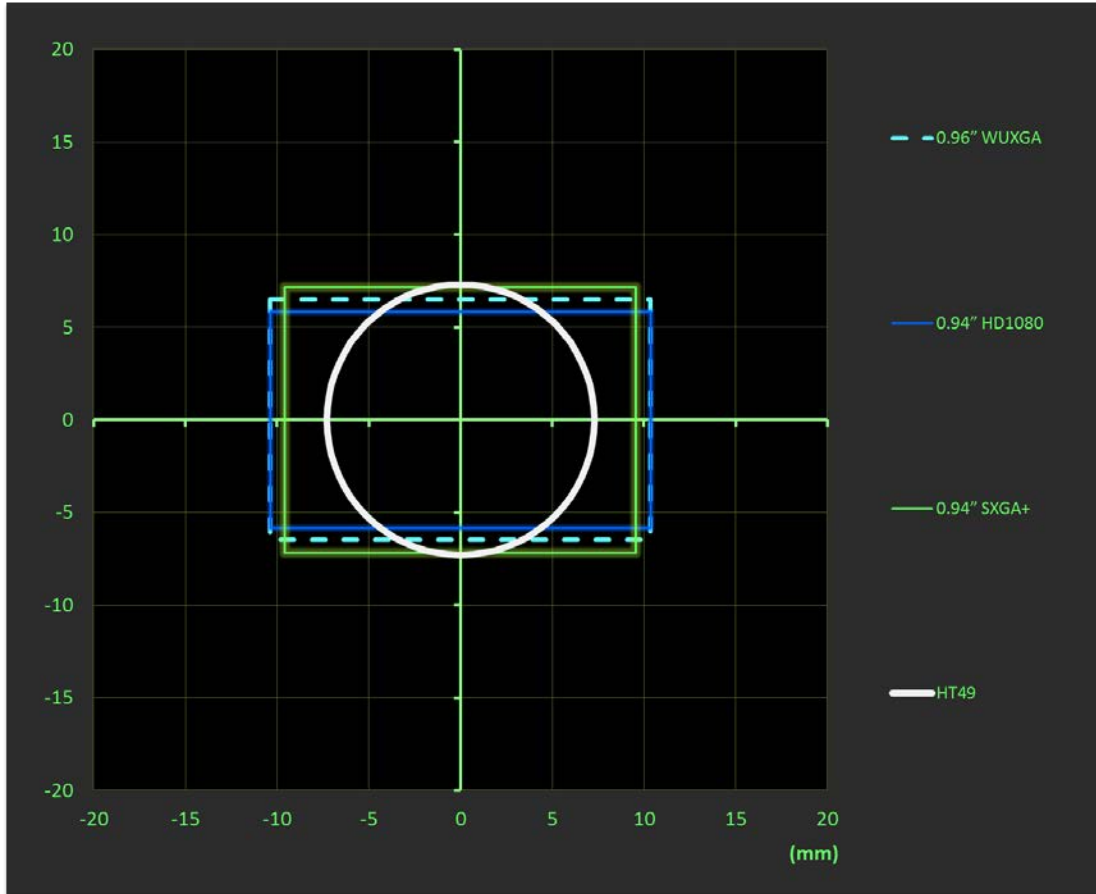
HemiStar™ HT49

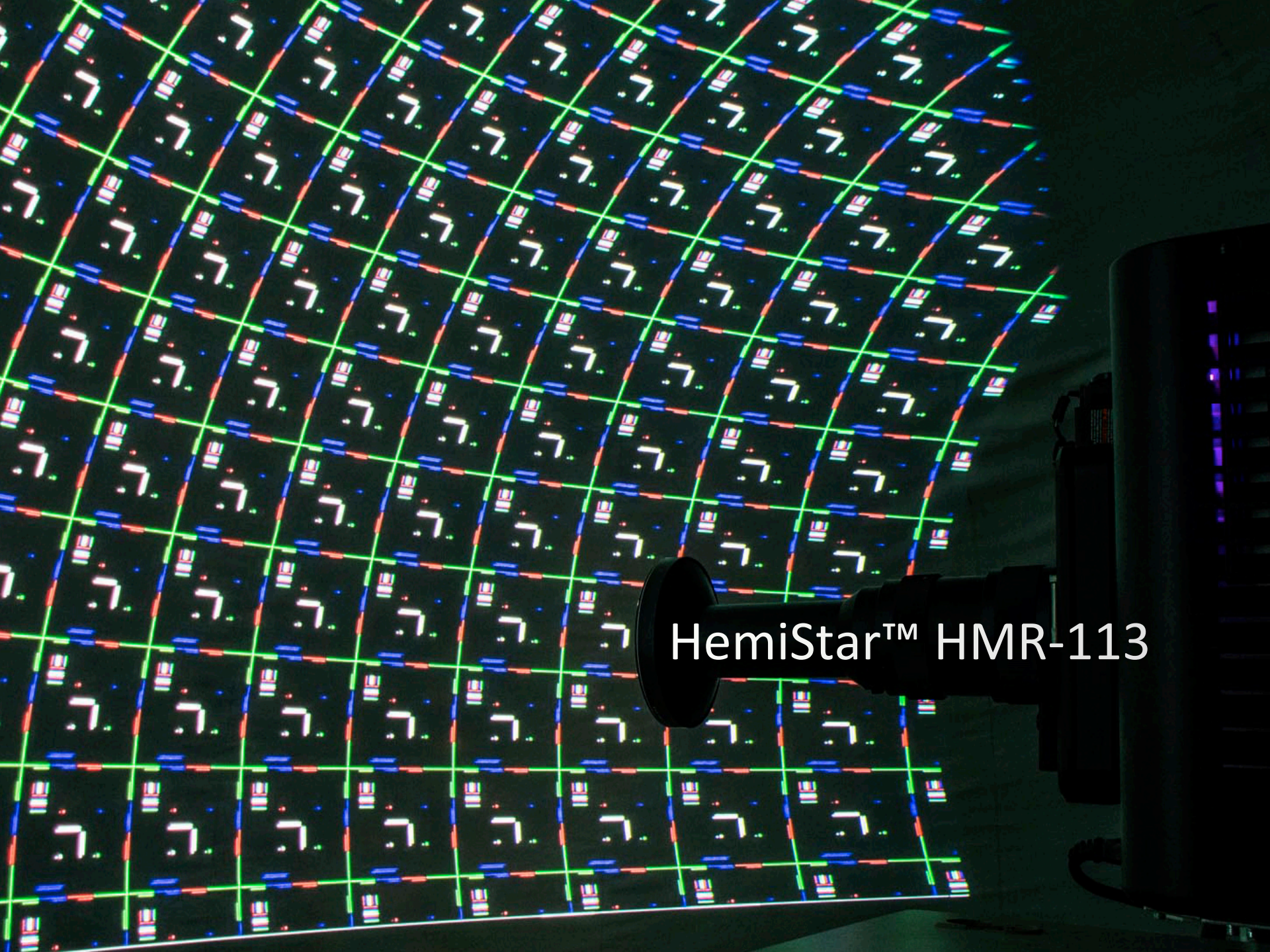


HS49 projecting a
0.96" WUXGA Panel

HemiStar™ HS49 Compatibility

Compatible Projectors	H Angle	V Angle
0.96in WUXGA	185.4°	142.4°
0.94in HD1080	185.4°	160.7°
0.94in SXGA+	185.4°	181.7°

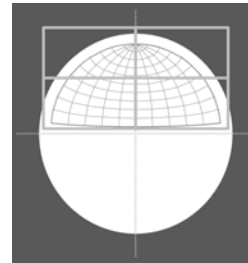
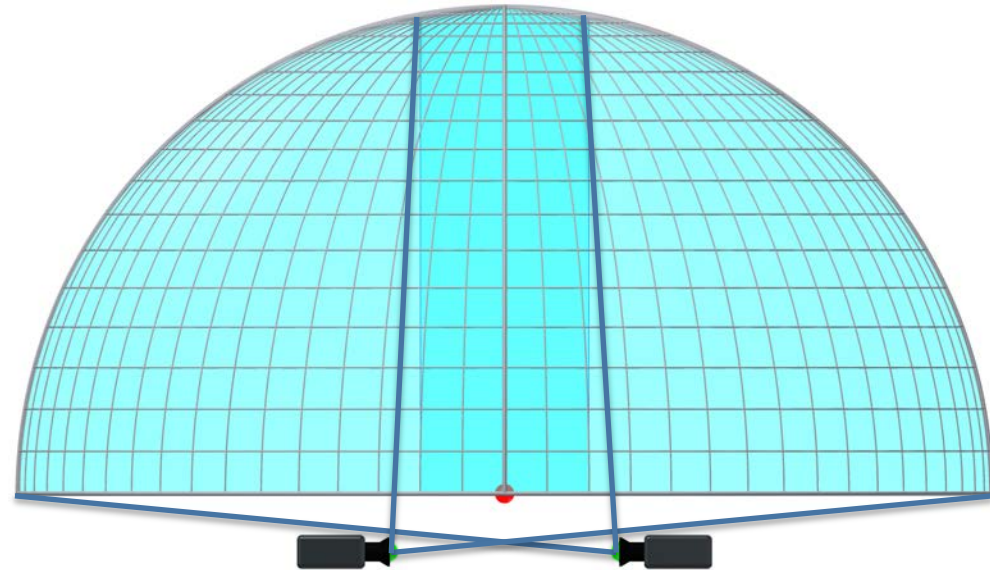
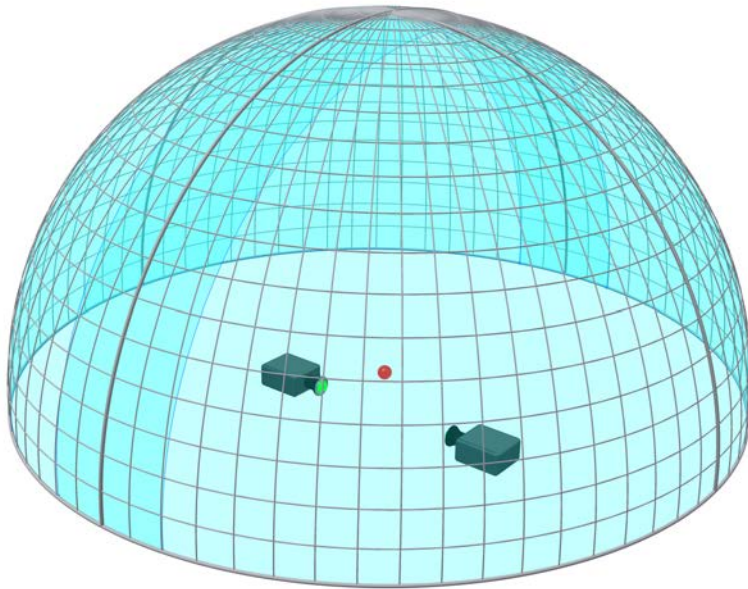




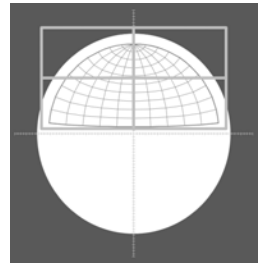
HemiStar™ HMR-113

HMR-113 Dome Example

The layout allows projection from dome center

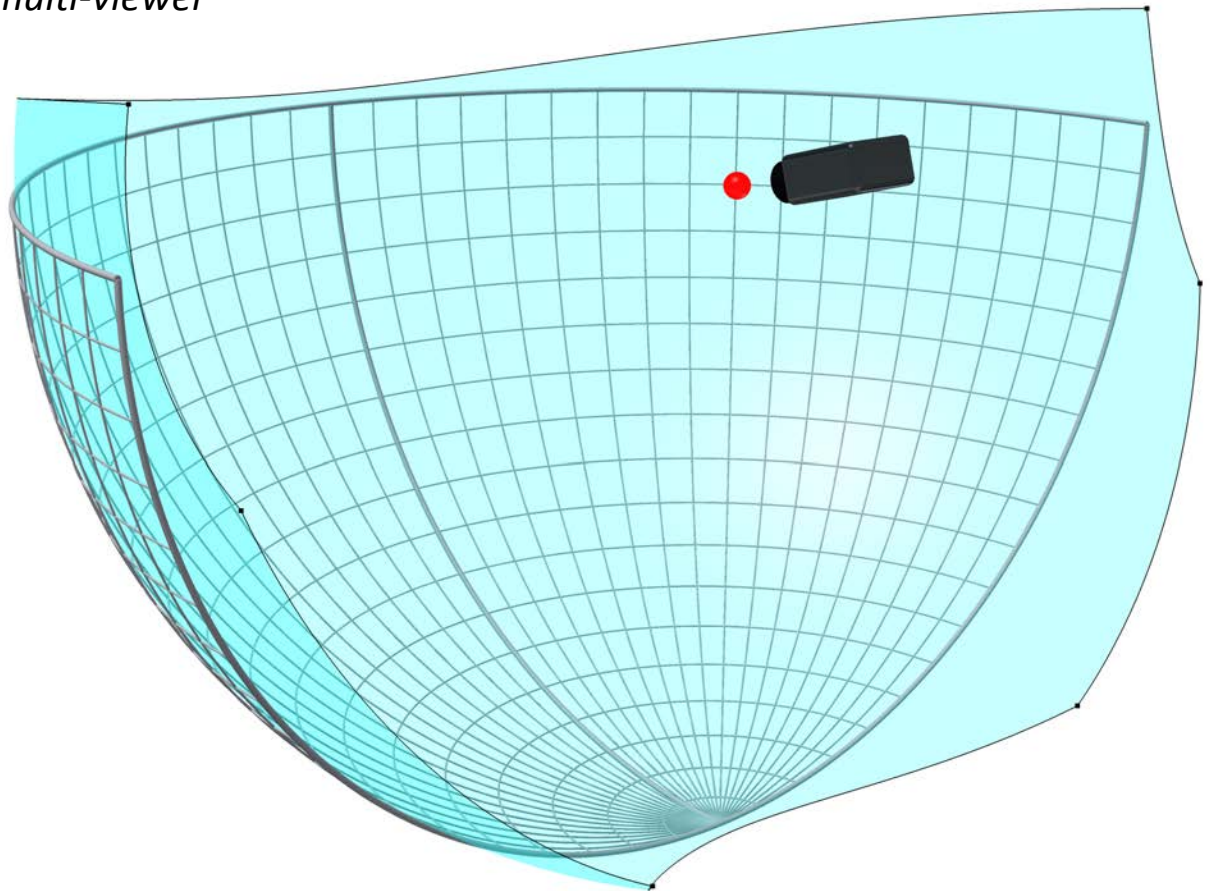
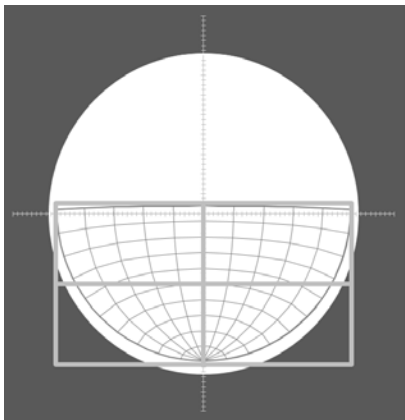
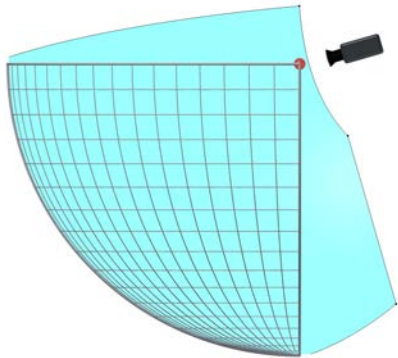


Dual Channel Example
HMR-113 projecting a
3-Chip 4K DLP device
with blend allowance



HMR-113 Entertainment Example

The layout allows wide projection of content with a 3-chip 4K DLP device for multi-viewer attractions



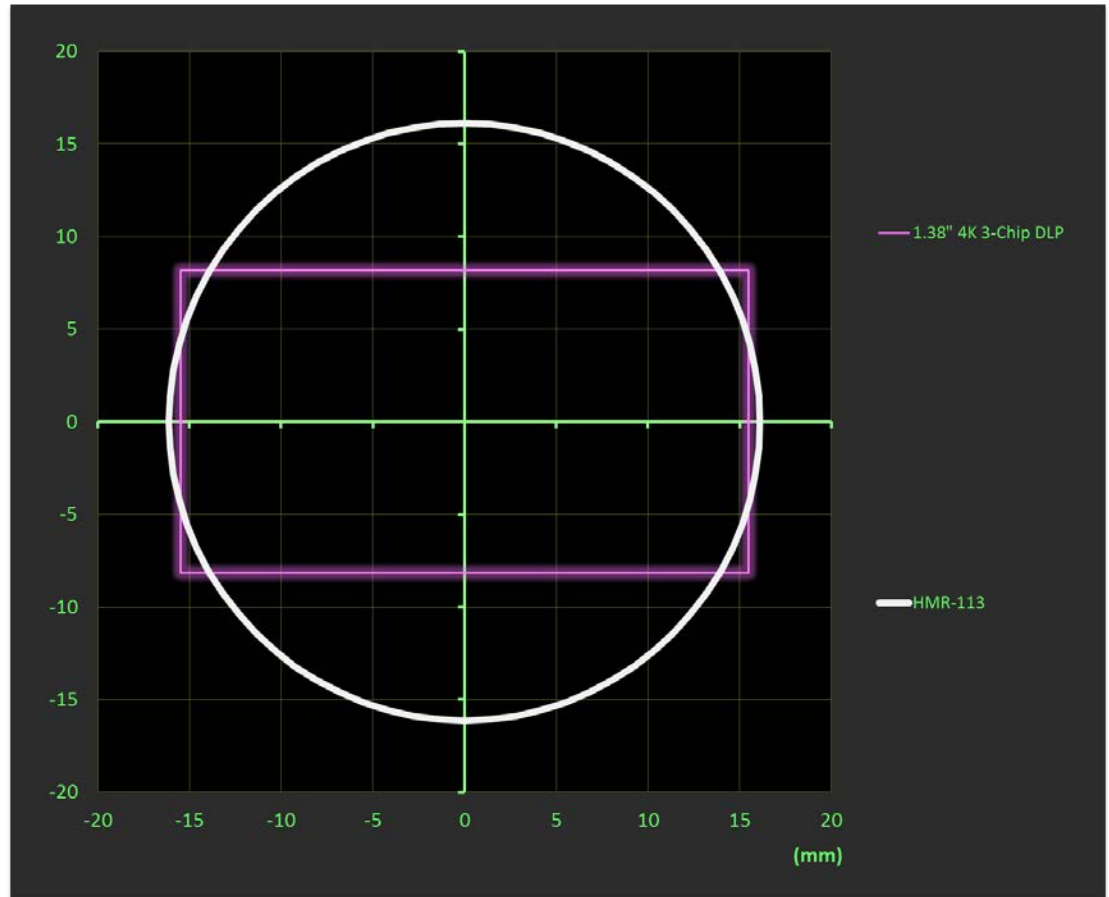
HemiStar™ HMR-113 Compatibility

Compatible Projectors H Angle V Angle

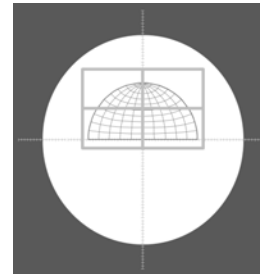
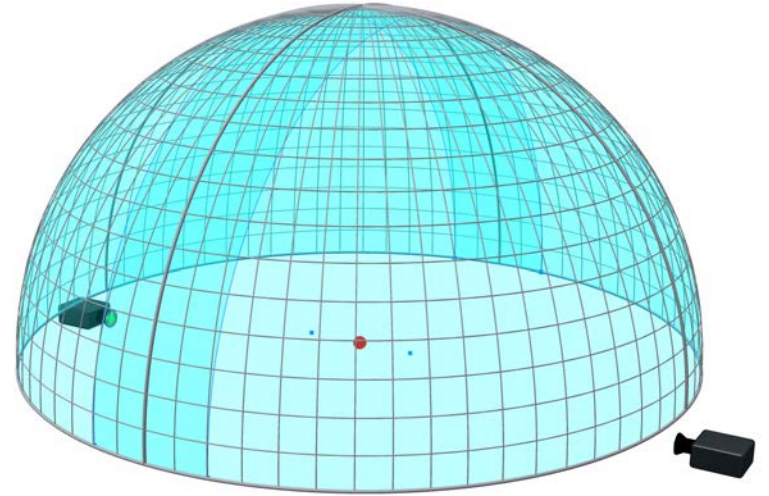
1.38in 4K 3-Chip DLP

170.6°

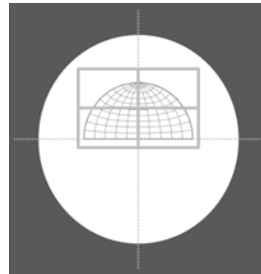
84.4°



HemiStar™ HM117

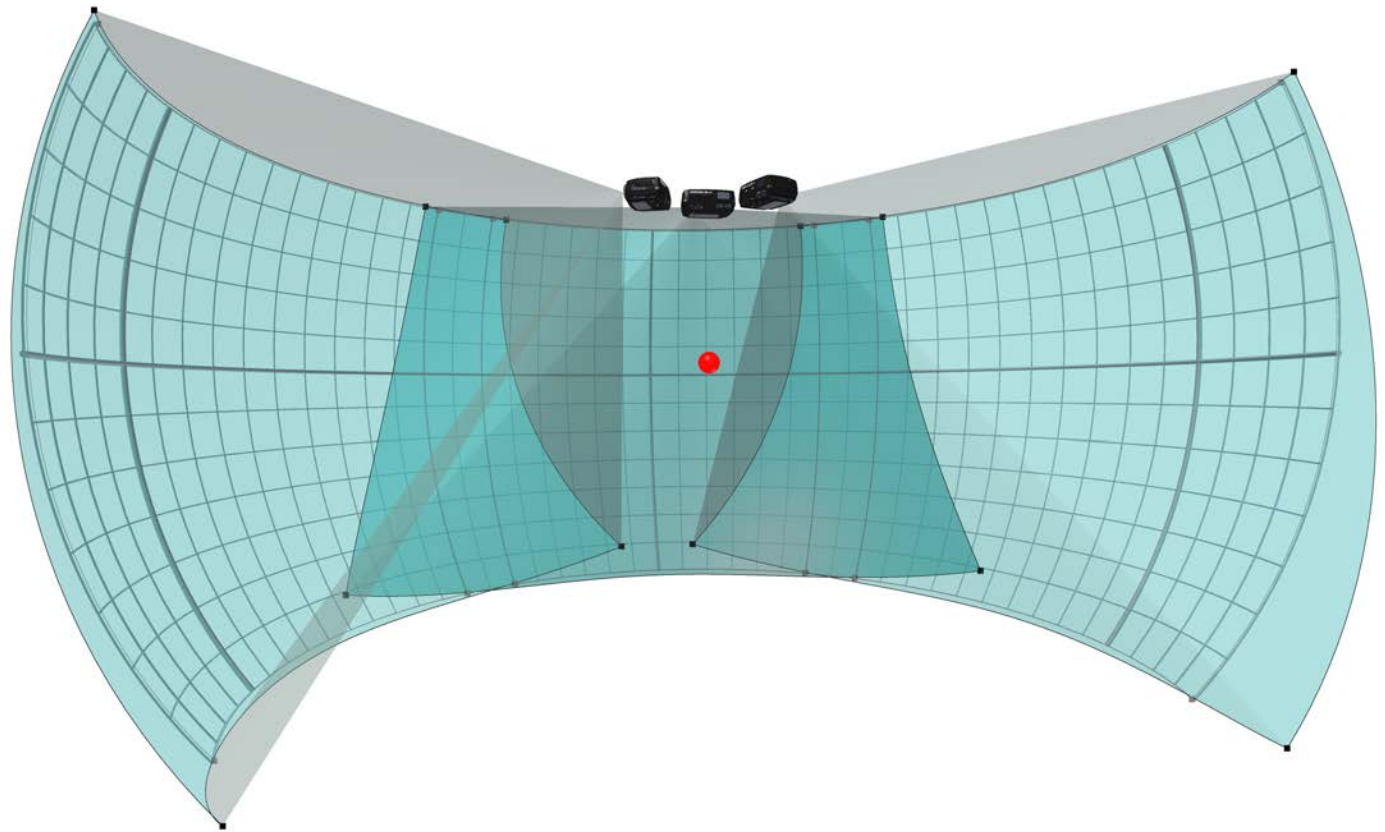
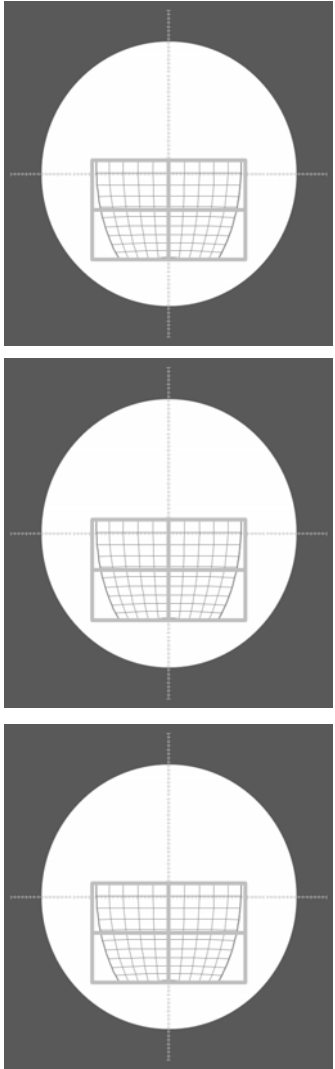


Dual Channel Example
HM117 projecting a
0.90" WQXGA Panel
with blend allowance



HM117 Flight Simulation Example

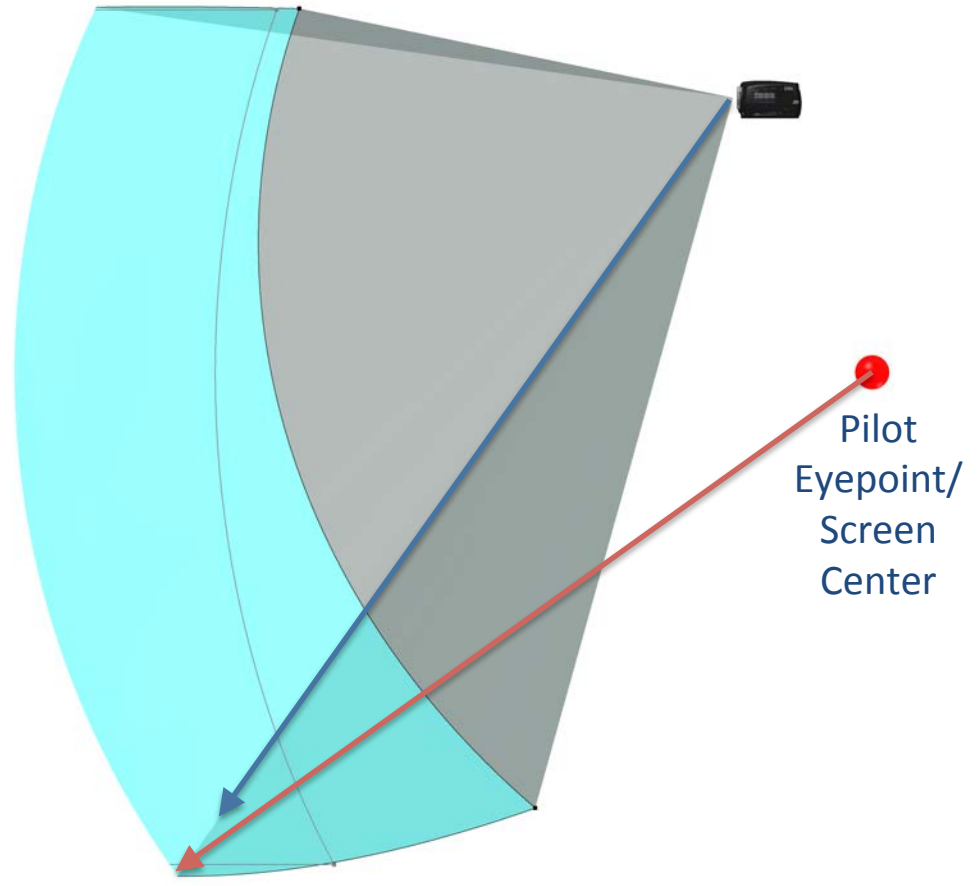
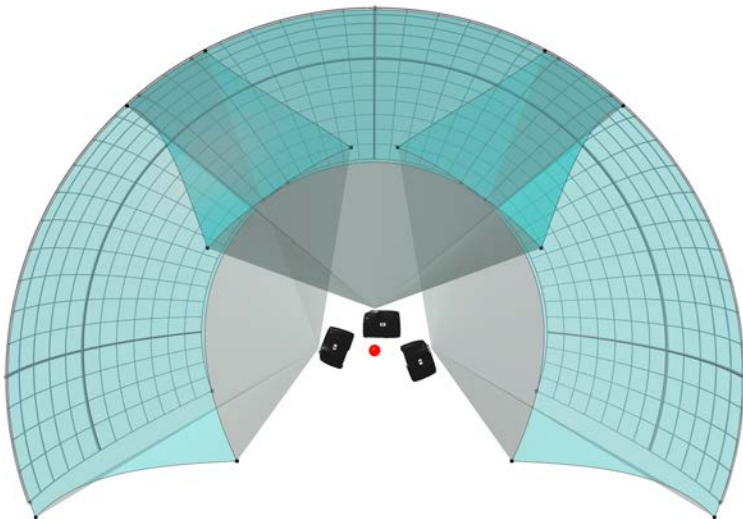
3 x projection design F35 WQXGA devices (0.9") with shifted HM117 lenses



HM117 Flight Simulation Example

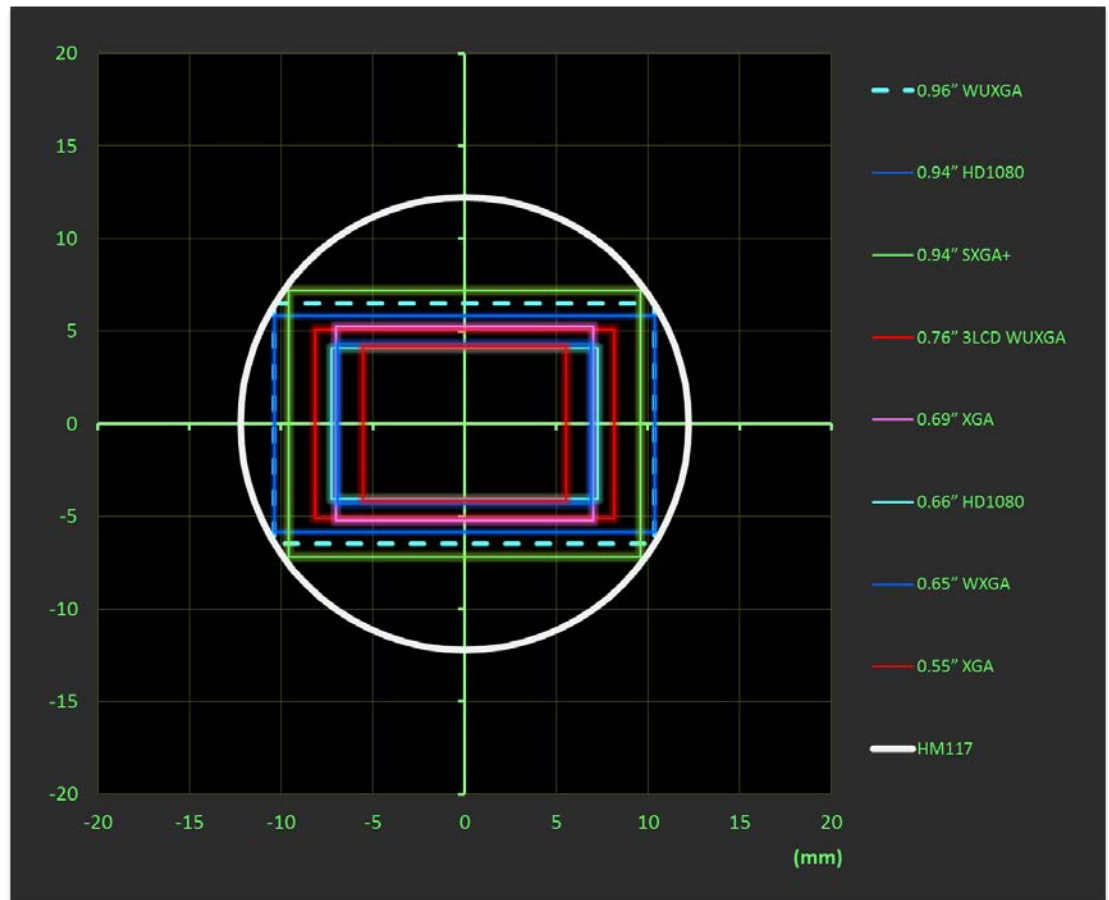
The layout allows projection forward from the screen center.

The steep projection to the base of the screen reduces cockpit shadowing & maximises downwards FOV from the pilot eyepoint.

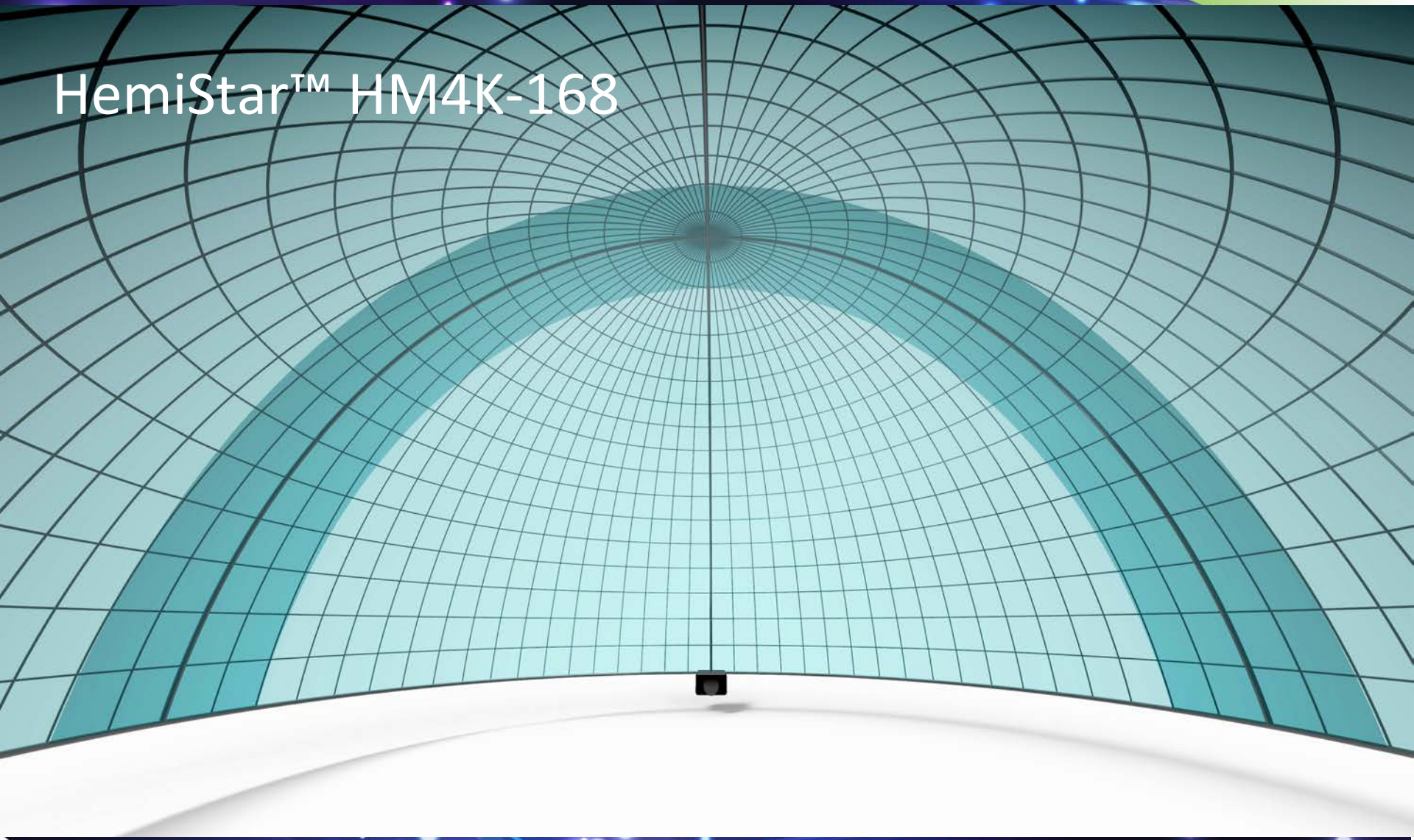


HemiStar™ HM117 Compatibility

Compatible Projectors	H Angle	V Angle
0.96in WUXGA	108.0°	58.2°
0.94in HD1080	108.0°	65.0°
0.94in SXGA+	98.9°	72.4°
0.90in WQXGA	100.0°	60.5°
0.76in 3LCD WUXGA	83.0°	50.7°
0.69in XGA	70.5°	52.2°
0.67in WUXGA	73.2°	44.9°
0.66in HD1080	73.2°	40.4°
0.65in WXGA	69.5°	42.8°
0.55in XGA	55.1°	41.0°

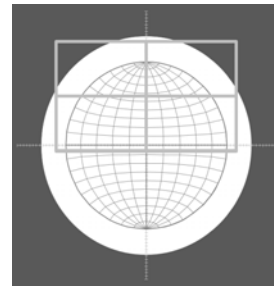
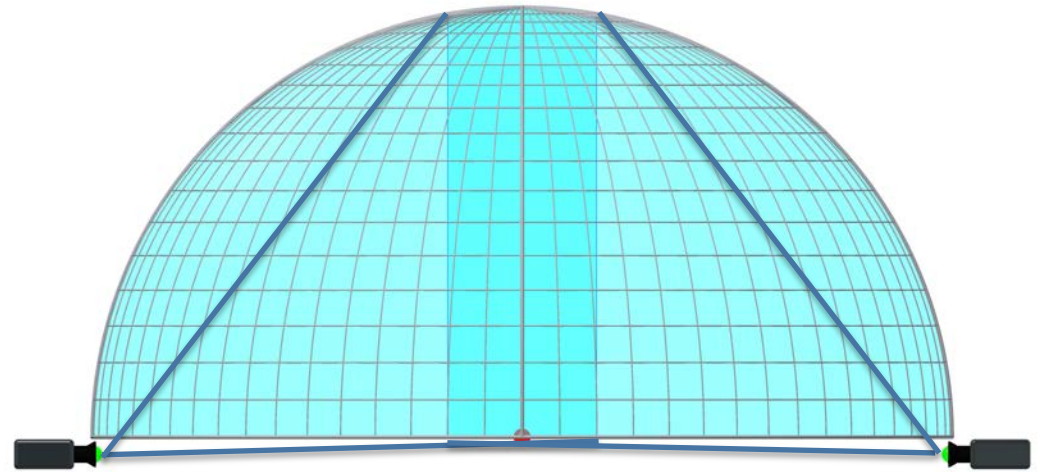
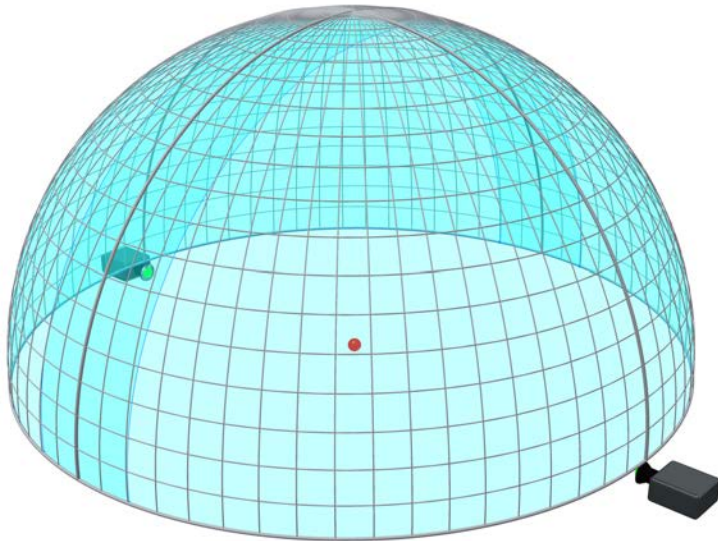


HemiStar™ HM4K-168

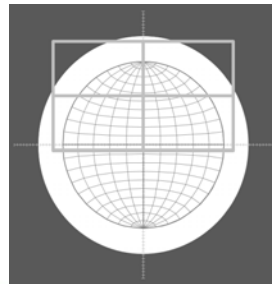


HM4K-168 Dome Example

The layout allows projection from the cove

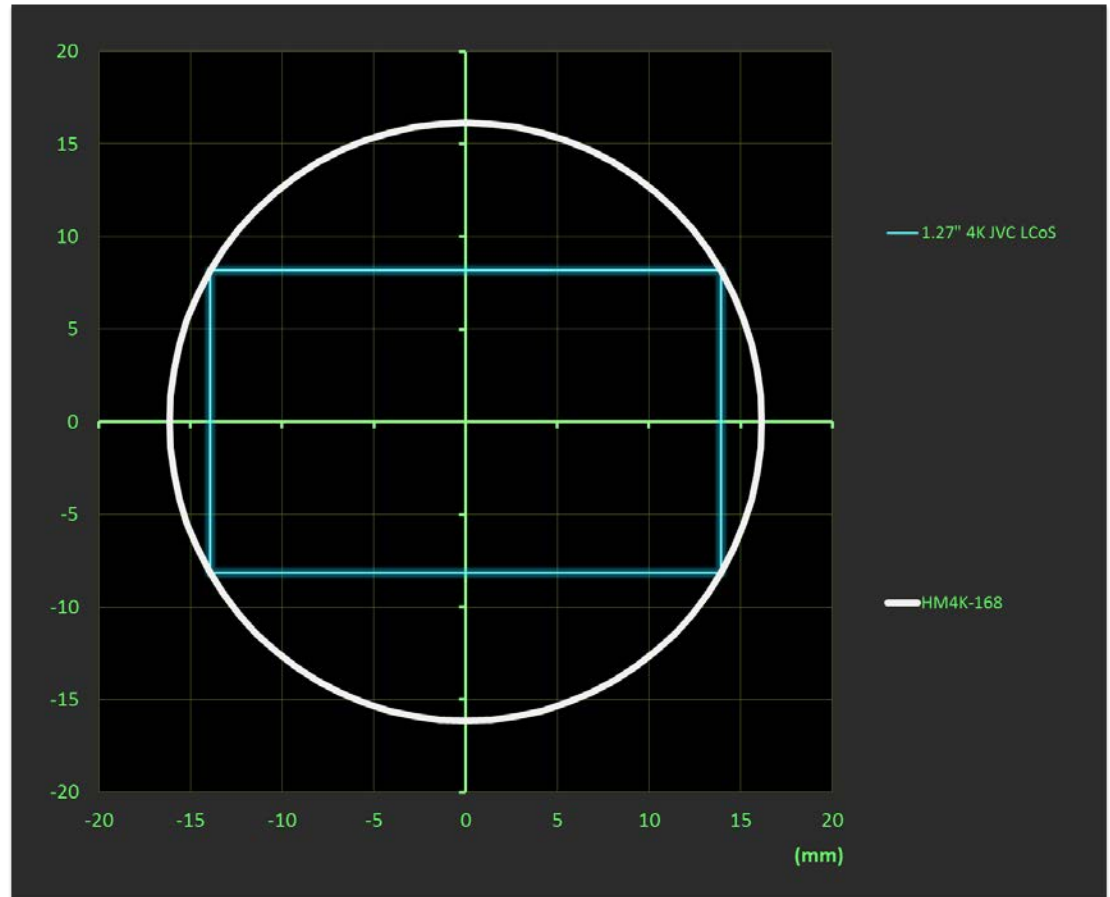


Dual Channel Example
HM4K-168 projecting a
3-Chip 4K D-ILA device
with blend allowance



HemiStar™ HM168-4K Compatibility

Compatible Projectors	H Angle	V Angle
1.27in 4K JVC LCoS	102.9°	57.0°



*Contact Navitar to
discuss your application*



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