



G B V I

# High-performance projector optical edge-blending solutions

## **Out the Window Simulation & Training:**

FLIGHT SIMULATION: FIXED & ROTARY WING  
GROUND VEHICLE SIMULATION  
MEDICAL TRAINING  
SECURITY & DEFENCE  
URBAN & RURAL ENVIRONMENTS  
NIGHT VISION

## **Visitor Attractions & Cultural Venues:**

DOMES THEATRES  
LARGE SCREEN DISPLAYS & CINEMAS  
DIGITAL PLANETARIUMS  
CURVED SCREEN ATTRACTIONS  
IMMERSIVE CAVES

## **Theme Parks & Dark Rides**

IMMERSIVE & DARK RIDES  
FLYING RIDES  
CURVED SCREEN & DOME ATTRACTIONS

# Chronos optical blending

Chronos optical blending uses physical masking techniques to provide managed fading of multiple partially-overlapped projected images so that their images are blended together to form a larger, continuous image.

Our optical blending technology enables integrators to provide display systems free from the visual issues caused by digital blending. This means no 'double-bright' overlap regions, and no impact to contrast or dynamic range, as black level infill is no longer necessary to match blend brightnesses.

GBvi's Chronos blending solutions enable display system integrators to achieve an even black level across multi-channel projection displays, realising the maximum dynamic range and enhancing the perception of life-like imagery.

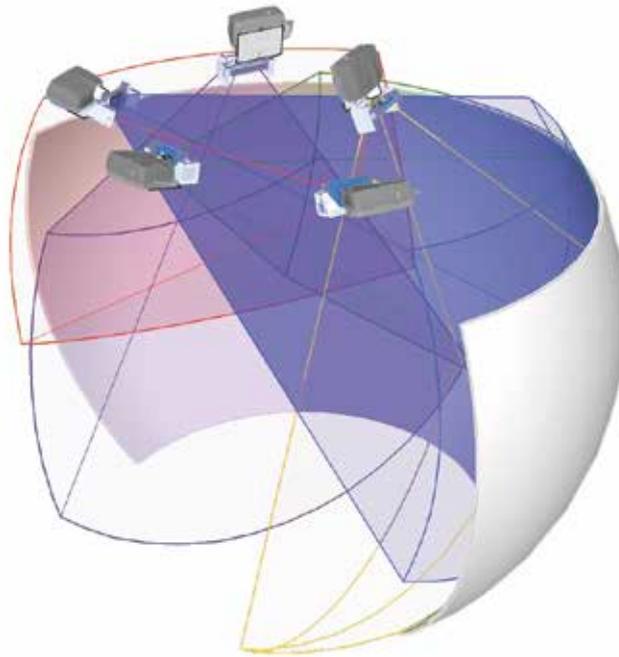
## Why Chronos?

Chronos is the primary optical blending solution for multi-channel projected displays – we have invested heavily in developing blend technologies, design tools, algorithms and alignment processes to make it easier for our customers to incorporate this vital component.

Our expertise in the field of projection display systems means we can provide an unrivalled service, helping customers with the whole display challenge - not confining our input to the blending alone.

Chronos has been successfully implemented on WUXGA, WQXGA and 4K single-chip DLP, WUXGA and 4K 3-chip DLP and 4K LCoS projectors, including lamp, laser-phosphor and LED illuminated models. We continually adapt to projector technologies as they evolve and develop and our products can be applied to most projection configurations:

- Simple single-level arrays
- Complex multi-level arrays
- Front & rear projection
- Collimated displays
- Domes and partial domes



Chronos performs  
well for all scene  
content, not just  
dark scenes.



- Masks can remain in place for all scene intensities, simplifying integration and saving system costs.
- **Avoids “mode switch” between optical and electronic blend configurations.**
- Works with high light-output (flux) projectors.
- **Resolves “Saccade” visual effect often seen with DLP electronic blends.**
- Low-complexity installation.
- **Fixed mask plates; no motorised system.**
- Minimised diffraction blurring means that pixels remain resolved in the blend region.
- **Blending is achieved throughout the spectral range, including near-IR up to ~900nm.**
- Complex blend geometry can be supported.
- **Alignment test patterns are available at no extra cost that, used correctly, enable high-channel-count domes to be successfully aligned.**
- A wide range of Chronos blend technologies and configurations are available so that solutions can be tailored to the display system design, projector type and budget.

# The Chronos Range

Video projectors need to be integrated into a wide range of applications, often requiring the use of ultra-wide-angle projection lenses or third party auto-alignment systems.

As a result, some projectors may need less conventional forms of blending, and that's exactly what we offer.

## Chronos Glass

Chronos Glass optical blending is our primary blending solution and is the highest performance glass blend mask technology available in the market. Designed to generate a perfectly seamless image across multiple projector channels, it is ideal for flight simulation, digital planetarium and theme park dark ride applications.

Our highly flexible in-house design tools allow us to design and produce glass masks unique to your display for pixel-perfect projection channel edge-blending.

### **New Chronos Glass: Greyscale**

Our Chronos Glass option can now use true Greyscale technology to provide perfect, diffraction free blending for LED and laser phosphor-projectors.

Chronos Glass Greyscale addresses the 'small 4K' and 8K class of projection systems where some optical trade-offs are most challenging, particularly with laser-phosphor illumination.

Our new greyscale technology has been developed in-house to provide blend masks that have genuine "variable density", opening up new options and combinations of projector and display types. Artifact-free projected throughput is achieved to result in perfect blends and even hot-spot correction in rear-projected display environments.

## Chronos Foil

Chronos Metal Foil mask technology is designed for use with mask actuation systems and with very high brightness projectors. It is a novel, highly robust solution, which differs from other foil solutions in that it does not use a sawtooth or comb profile, but instead migrates our pattern algorithms that have been used for high-quality glass and film blend masks.

# Chronos Film

For systems that will have a low overall luminance, such as night training simulators, Chronos Film is the ideal option. Produced using the same algorithms as our Glass range, Chronos Film offers an equally high quality blend pattern but on an emulsion film. This film may degrade over time under high light flux, where we would suggest installing glass instead, but for darker content it will produce an excellent quality blend at a lower cost, with no risk of degradation.

# Chronos Rewind

Use of Auto-Alignment (AA) systems for projection display calibration is becoming universal. While these systems produce excellent results, some require removal of the blend masks from the light path to enable alignment and calibration to take place.

Chronos Rewind allows for AA systems to be integrated alongside our Chronos optical blend masks as part of multi-channel displays.

Designed for use with a broad range of digital displays, Chronos Rewind uses an actuated platform and simple trigger interface to move the blend mask to and from the projector lens as required in a carefully controlled and precise manner.

This process allows for the blend to be retracted from the lens, auto calibration to be completed, and for the blend mask to be returned to its original, correct position.



## Who we work with

- 3D Perception
- 7thSense Design
- Antycip Simulation
- AV Pro
- Barco
- CAE
- Canon
- Digital Projection
- DJ Willrich
- Electrosonic
- Immersaview
- Immersion
- Immersive Display Solutions
- Mechdyne
- Navitar
- Norxe
- Panasonic
- project.syntropy
- Rockwell Collins
- RSA Cosmos
- Scalable Display
- SCISS
- Sony
- TEQ4
- Thales

# Optical Blending FAQ

## What is the maximum number of projectors you work with?

We have no set maximum. To date Chronos has been successfully implemented on dome displays with up to 14 channels each. The alignment processes significantly ease the installation and setup efforts, so even higher channel counts can certainly be supported.

## Can you help with display design and layout?

Yes. GBvi has extensive projection display design experience and a standard component of our service is to review your display design primarily for compatibility with optical blending.

However, if you would like help with display layout or performance analysis, we would be happy to offer this service.

## How is the blend mask positioned?

A set of Chronos Mechanics is comprised of an adjustable rig that positions a glass/film mask at the precise distance in front of the projector.

We recommend the use of Chronos Mechanics, since this serves as a carefully designed solution optimised to fit with Chronos blend masks.

Chronos Mechanics are available in two forms: static, and actuated:

- **Static:** Fully adjustable by hand and once set up, it is left in place permanently. Requires no further action.
- **Actuated:** Motorised (movable) mask to remove the blend from the light path. A solution optimised for systems which show both light and dark scenes for prolonged periods.

## What is the difference between GBvi blend masks and alternatives?

We've invested heavily in developing system design tools, mask pattern algorithms and alignment processes to provide the leading independent optical blending solution, customised to each display design.

This results in high-performance blending, superior to any plain-edge or sawtooth mask solutions that are also used – and it can withstand high light flux without degradation.

## What is the lead-time?

An overall project timescale is typically 6-8 weeks, depending on the design complexity.

However, with advanced notice and with quick provision of customer design data we can often turn systems around significantly faster.



## Why would we need optical blending instead of electronic / software blending?

Very good performance blending can be achieved with electronic (also software) blending, for bright scenes.

However, for darker scenes, the overlap region will quickly become visible as the leakage light from adjacent channels sums together.

While this could be compensated with 'infill', where a deliberate grey scale value is added to video signals to try to match this overlap, this significantly degrades the overall system dynamic range, making dark scenes appear washed out and lacking 'blackness'.

Quality optical blending can completely eliminate this issue, so that dynamic range is optimised and transitions between 'day' and 'night' scenes do not need to be carefully managed.



# About GBvi

We have collective experience of more than 80 years in the field of displays for simulation, training, leisure and attractions. We design and produce multi-channel optical blending solutions for challenging projection environments, with no limit to display size, screen shape or projector count.

Visual innovation is at the core of our business. We continually prototype new technologies and work with unique setups that lead us to devise increasingly innovative approaches to ensure display perfection. We work very closely with all major projector manufacturers, who provide loan units for analysis and test, so we can provide the best performance at the lowest risk. We also have close working partnerships with parallel companies offering complementary solutions such as image servers and auto-alignment systems.

GBvi is a partner to systems designers, engineers and display system integrators – helping to overcome display challenges of complex projection systems. Our heritage in the field of projection display systems places us uniquely to continually innovate to accommodate developments in display design and projector technologies. We fit into the ‘back end’ of a visual system, providing the last building block to complete the solution. We are able to bring our display design and technology development background into play so that GBvi can be an integral partner and team member for our customers. By specialising in this niche, we can enable any display or visual systems integrator to produce the best result for the end-user.



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