

WHITEPAPER

PUTTING 3D INTO PERSPECTIVE

A 3D Technology Guide for Location Based Entertainment



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INTRODUCTION

Mention 3D and many of us will immediately think of the pioneering 3D movies where frighteners like the shark Jaws jumped out of the cinema screen to shock the audience. These initial experiences were fun at the time but the surprise of the repetitive effect quickly grew old and was tiring on the eyes.

However, 3D has not faded away, far from it. In fact, the use of 3D technology has continued to develop with more powerful media servers and resolutions continuing to improve the experience. Use of the latest 3D techniques in blockbuster movies, such as Avatar 2, look set to revive 3D at the cinema but the other major focus for modern 3D is in the area of entertainment and theme parks.

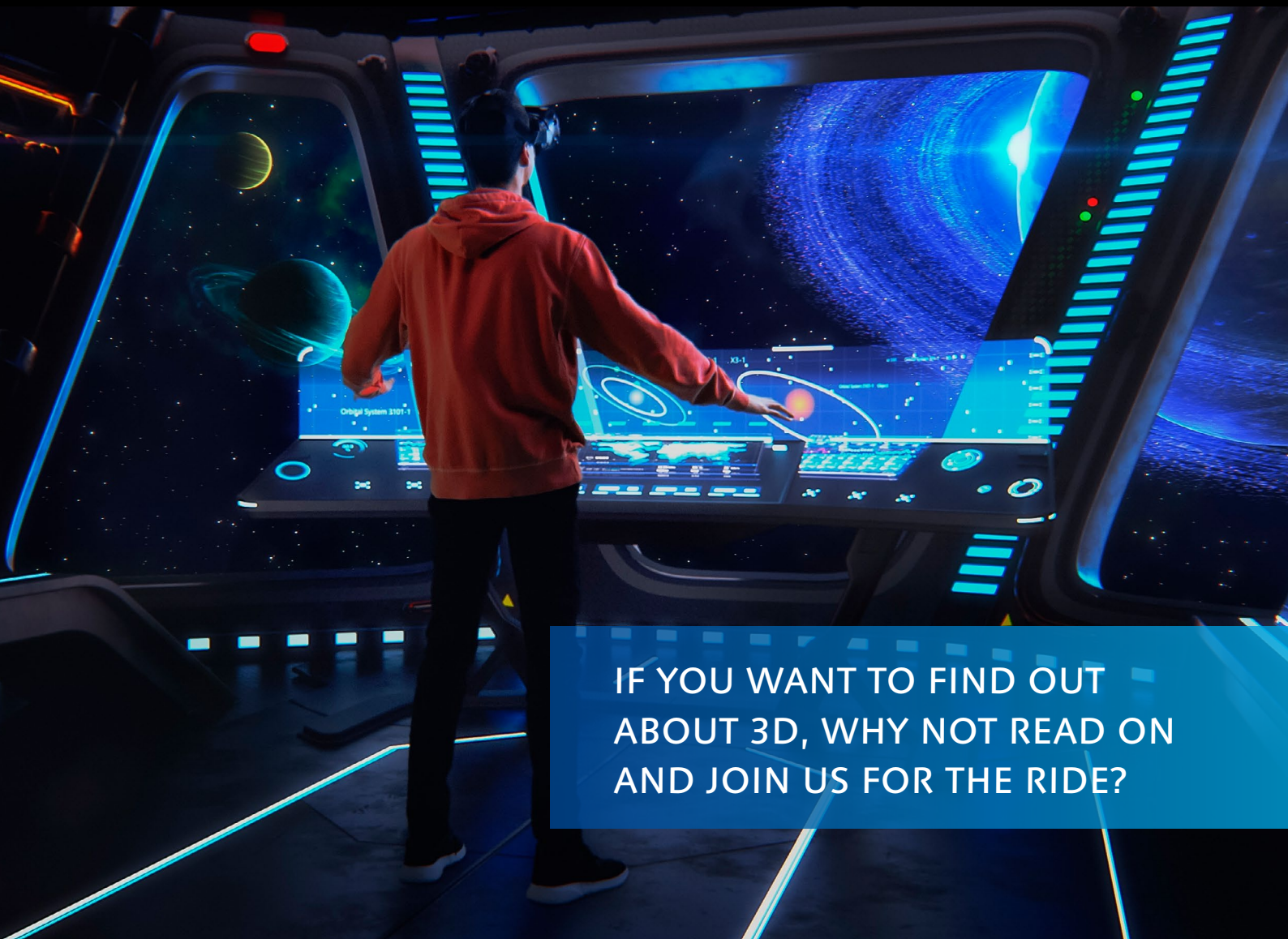
The global 3D technology market is expected to reach **€703 billion by 2030**, up from €171 billion in 2020, and growing at a compound annual growth rate of **16.3%**, according to Allied Market Research.



As well as growth in the healthcare, defence and other industrial sectors, it is the **Entertainment industry** that is expected to spearhead this development.

Major theme parks are already using headsets and high tech glasses to provide virtual and augmented reality experiences but, although thrilling for a short ride, these experiences are limited in some ways. They only allow each participant to experience the ride alone and commercially the headsets are expensive to deploy and maintain. The holy grail is to be able to provide an immersive 3D experience without complex headset technology that will allow participants to share their experience with friends and family.

IN THIS GUIDE, WE TAKE A LOOK AT HOW 3D PROJECTION WORKS, THE CURRENT METHODS OF DELIVERY WITH THEIR ADVANTAGES AND DISADVANTAGES AND TECHNOLOGIES IN USE.



IF YOU WANT TO FIND OUT ABOUT 3D, WHY NOT READ ON AND JOIN US FOR THE RIDE?

HOW 3D VISION WORKS

Stereopsis, more commonly known as 3D depth perception, occurs when the brain combines the two images received from each eye and creates one single 3D image. This allows us to easily engage and interact with the world around us.

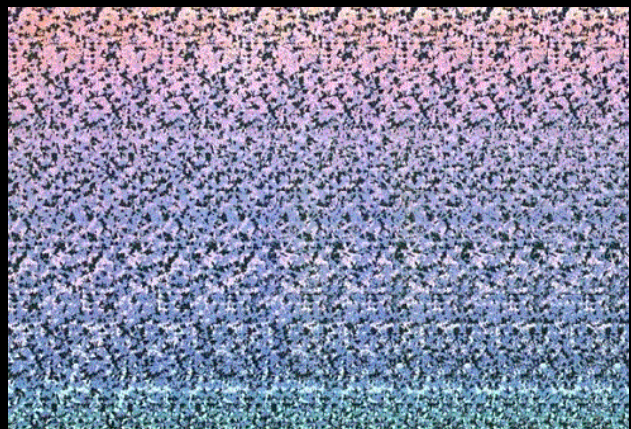
Around 5% of the population is thought to suffer from **stereo blindness**, meaning they are unable to see in 3D. A fun way to test your vision is to take a look at these Magic Eye pictures, otherwise known as Autostereograms. They are two-dimensional (2D) images with repeating patterns that hide an underlying three-dimensional (3D) image. They are effectively, a picture within a picture.

The hidden 3D image can be seen with just the naked eye if the correct focus is achieved. When you look at an autostereogram, your brain initially sees repeating 2D patterns from both eyes. This is because your brain automatically focuses on the image itself.

When you can focus your eyes behind the 2D pattern, you start to look at the pattern from a slightly different angle. At this point, stereopsis begins to work and the brain constructs the 3D image at a depth different to that of the 2D pattern.




Can you see the spider and two dinosaurs in 3D in these images?



If you are having difficulty, try staring in the middle of the image. Then cross your eyes until a third shape appears between them. Then relax your eye focus until the 3D image appears.

3D PROJECTOR TECHNOLOGIES



There are fundamentally two types of 3D technologies available for use with projectors: **ACTIVE** and **PASSIVE**.

Active 3D Technology

Active 3D projection is based on the use of Active shutter alternate frame sequencing and battery powered (active) glasses with transparent LCD panels in front of each eye. These active shutter glasses use separate liquid crystal displays in front of each eye. The LCD turns opaque in one eye at a time, so that each frame is seen by only one eye.

Driving active shutter glasses means the displaying device and the source must be able to run at 2x the original

frame rate to provide enough information to each eye to create the 3D effect.

There is nothing new about active shutter systems in general. The first active shutter systems date back to the 1920's when spinning mechanical shutters were used to create 3D effects. However, the big improvement in this technology has been the ability to deliver higher frame rates from 60 frames to 120 frames per eye – providing a much more seamless effect with better separation.

Only a single projector is required to create a 3D effect and any projection surface can be used. It's also a very scalable solution as multiple projectors can be synchronised together. Active systems are mainly used in specialist areas such as medical training, where they provide a high-quality

image. However, they are not suited to mainstream environments and cannot deliver 4K resolution. Only specific projectors models can decode and synchronise active shutter 3D systems. The glasses are expensive and also require a wireless data link active at all times.

There are 3 common methods of synchronising active shutter glasses:



DLP Link

No transmitter needed, uses a flash of white between frames to sync glasses.



IR Link

Infrared transmitters are used. Good for small-medium sized auditoriums, where line of sight is possible.



RF Link

Radio Frequency transmitters are better for large spaces, where it is not practical to maintain line of sight between every audience member and the transmitter.



Panasonic Active 3D Projector models:

DLP Link



LRZ35



RZ470



DZ870



CW330

IR/RF Sync



RZ24K



RZ17K



RZ34K



RZ21K



RZ31K



RZ12K



RS11K



DZ21K/2



DZ13K

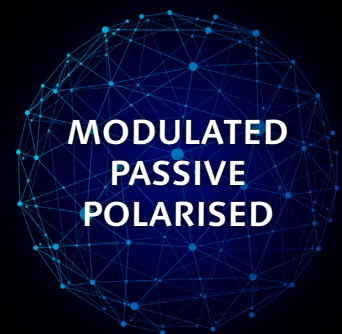
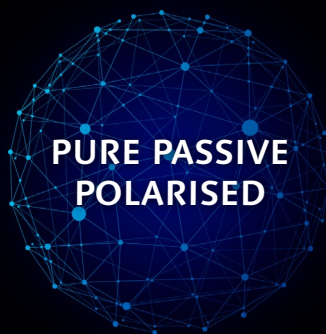
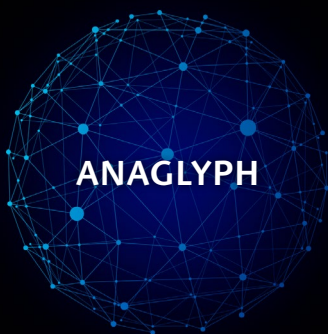


DZ870



Passive 3D Technology

There are 3 types of Passive 3D technology systems in use:



These systems operate in conjunction with unpowered (passive) glasses, with lenses of glass or plastic film, and work without the need for a transmitter.

Anaglyph Passive 3D

The biggest improvements in Passive 3D technology have come in the Anaglyph sector of the market, as a result of innovations from German technology company Infitec. Just like the early 3D movies, the system uses different wavelengths of light to encode the left and right eye image. The most common anaglyph systems use either cyan/red or green/magenta. Both images are superimposed and shown simultaneously. Any display device or single projector can display anaglyph content.

Historically, the main downside of anaglyph encoding is the loss of colour accuracy, and in early systems colour saturation as well. However, the most advanced Infitec anaglyph system uses two projectors with notch filters for each primary colour to reproduce a full colour image per eye. This means that the viewer's brain sees the image in much more natural colour giving a very life-like experience.

Specific filters need to be added to the projector to use Infitec glasses. Panasonic offers laser projector models with the filters already included. External filters can be bought as accessories for Panasonic lamp projectors.

Panasonic Passive Anaglyph 3D Projector (Infitec capable) models:

Laser



* With Built-in filters

Lamp



* Filters available as external accessory



Pure Passive 3D - Polarised

A Pure Passive 3D system uses polarisation to restrict the light that reaches each eye to create the 3D effect. Two projectors, with appropriate filters, project two matching images superimposed on top of each other onto a special polarisation preserving screen surface. This reflective surface looks silver, hence the old movie theatre term "the silver screen."

The standard passive glasses then capture each colour in a separate eye – creating the 3D effect. The use of two projectors can make this system more expensive but two projected images also doubles the brightness of the image providing higher quality. A method to separate the left and right to each projector is also required.

Panasonic Passive 3D (Polarised) suitable projector models:

LCD



* Sold after Q1 2022

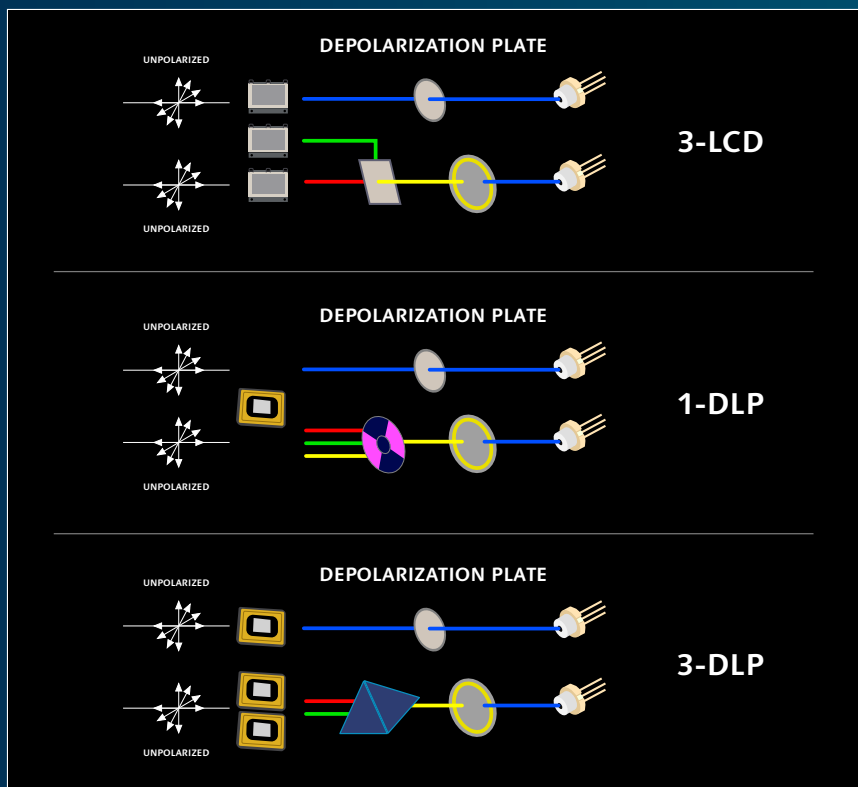
DLP



* Built to order mod kit

POLARISING A LASER/PHOSPHOR PROJECTOR

It should be noted that laser/phosphor projectors produce a mix of polarised and unpolarised light. As a result, polarising filters placed outside the projector will have an uneven polarising effect on different colours. Adding a phase difference elimination (depolarizing) filter inside the projector's blue only light path ensures only unpolarized light is used to create the image and resolves the issue.



Modulated Passive – Polarised

A Modulated or Hybrid Passive system requires just one (active 3D-capable) projector. In this system synchronised output from the projector triggers a polarising modulator, which enables standard passive glasses to be used. A polarization preserving screen surface is still required.

3D PROJECTOR SYSTEM PROS AND CONS

All 3D systems have their own **advantages and compromises** and it is important to carefully consider the individual requirements and use for the system before purchase. Here is an easy reference guide to get you started.

		PURE PASSIVE	MODULATED PASSIVE	ACTIVE SHUTTER	ANAGLYPH / INFITEC
Picture Quality	FLICKER	None	Minor	Noticeable below 100Hz	None
	COLOUR	Good	Good	Good	Average
	POSSIBLE RESOLUTION	Up to 4K	Limited to 1080p due to projector models	Limited to 1080p due to projector models	Up to 4K
	BRIGHTNESS	High (approx 40% or original)	Average (approx. 20% of original)	Average (approx. 20% of original)	Low (can be less than 10% of original)
Accessories	FILTER TYPE	Passive linear polarizer per projector	Single active modulated circular polarizer	None	Wavelength cutoff filter per projector
	GLASSES TYPE	Passive polarised	Passive polarised	Active Shutter	Wavelength cutoff filter
	SCREEN TYPE	Polarization preserving material	Polarization preserving material	Any	Any
Configuration	PROJECTORS REQUIRED	2	1	1	2
	INSTALLATION	Dual units stacked	Single unit only	Single unit only	Dual units stacked
	TYPICAL COST	Low	Low - Medium	Low - Medium	High

CONCLUSION

3D imaging has captured the imagination of audiences in entertainment for over 100 years and there is little sign that the public's enthusiasm for the phenomenon is fading. In fact, with investment being made in the latest 3D technologies from blockbuster film makers to major theme parks owners, such as Disney, and projection manufacturers like Panasonic - **growth in the sector looks set to continue for the foreseeable future.**





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To learn more about Panasonic 3D capable projectors visit:

<https://eu.connect.panasonic.com/gb/en/product-groups/visual-system-solutions-projectors>