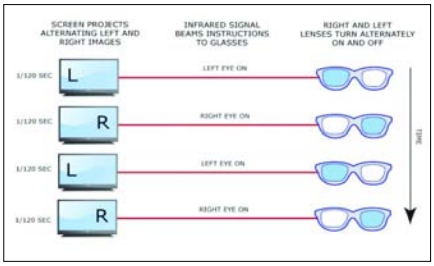
3D - a suitable case for consumer confusion

3D is the latest in a long line of new technologies which taxed the abilities of consumers and retailers to understand the implications of all the various options available. It is also the latest to have multiple and incompatible variations – an all-too-common aspect of the CE industry over the past decades. BILL FOSTER, Senior Technology Consultant with Futuresource, sheds light.

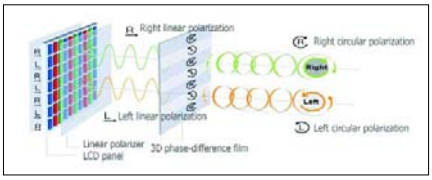
There are two different ways to display 3D on a consumer-grade TV: alternate left and right images viewed with active shutter glasses (the 'frame sequential' method), or by the use of a polarising filter on the display panel and complementary polarised glasses. (A third option, glasses-free auto-stereoscopic displays, are extremely expensive at the present time and targeted only at the B2B market.)



Active shutter 3D glasses principle

Frame sequential, as its name implies, displays the left and right eye images alternately. This requires a panel that can refresh at twice the normal frame rate, e.g. 100Hz (120Hz in 60Hz territories). In fact, almost all panels being used for 3D have higher refresh rates than that.

From a manufacturer's point of view, there is very little modification required to a conventional 2D TV, just some minor and inexpensive changes to the chip driving the panel, plus an HDMI 1.4a input to accept the 2x1080p video stream from a 3D Blu-ray Disc player. The main cost is the active shutter glasses needed to view 3D on these displays, in most cases more than €50 per pair.



Passive polarised 3D glasses principle

The frame sequential system is the favoured option at present for most of the major TV manufacturers, and also the Hollywood studios because it allows them to deliver 'Full HD' to consumers, something that currently differentiates Blu-ray Disc from broadcast 3D.

Polarising filter technology provides an alternative pricing model which shifts the additional cost to the display and away from the glasses. However, because the left and right images are displayed on alternate horizontal lines of a standard 1920x1080 panel, it results in a reduced resolution when viewing 3D, as well as having an (albeit relatively minor) impact on 2D images.

The solution to the reduced resolution issue is to use a '4K' (3840x2160) display, something that manufacturers like LG have been previewing at trade shows, but at present the cost of these panels is too high to enable such TVs to be sold at mass-market pricing.

TVs with a polarising filter are not yet widely available as consumer products, but those that are tend to sell for around the same price as their frame sequential counterpart when bundled with two pairs of active shutter glasses.

Where polarised filter TVs come into their own is when a large number of viewers are involved, for example in pubs and clubs, as well as large families. Polarised glasses cost less than €0.50 to produce and many families will already have several pairs from their trips to the local cinema.

Ready for 3D?

From the above it would appear that consumers have a relatively straightforward choice between a frame sequential TV with active shutter glasses and a polarising filter model with passive polarised glasses.

If only it were that simple. The way each 3D TV manufacturer synchronises its active shutter glasses to its TVs is unique. Put simply, Brand A's glasses won't work with Brand B's TVs. And it doesn't stop there…

All first-generation glasses were synchronised with the display using infra-red emitters in the TV. This encouraged some third party glasses manufacturers to develop 'universal' models which would work with all the different brands of 3D TV, as well as a couple of industry-led initiatives to come up with a standardised protocol.

Things were finally starting to make sense – particularly for retailers who like the reduced shelf space and easier selling proposition offered by a single SKU – until some TV manufacturers realised that there was a better way to drive the glasses and avoid problems like loss of sync when a viewer turned their head away. The solution was RF (radio frequency).

This creates a new variable, however – glasses sold or bundled with 2011 3D TVs using RF don't work with 2010 TVs that used infra-red, even those of the same brand.

To compound the problem further, there is more than one kind of RF – Bluetooth and RF4CE being the two most common. Samsung is the first 'A brand' to move to RF and has adopted Bluetooth, even though it is one of the founders of the RF4CE Consortium (now absorbed into the larger ZigBee Alliance). Panasonic and Sony are also RF4CE founders, so which option will they choose if they decide to go the RF route?

The obvious solution is a new generation of universal glasses that work with all the different systems. A great idea, but there is inevitably a cost attached. Multi-format infra-red models already add a premium over single-standard equivalents, how much more will consumers tolerate? From a retailer's perspective there are precedents to stocking multiple SKUs, although one major US retailer has already stated that it does not want a repeat of the replacement printer cartridge situation.

And then there's the question of power… rechargeable or non-rechargeable batteries? Early consumer models tended to use the latter – not very 'green' but they gave a much longer life and avoided having to remember to plug then in to a charger after use. Replacing a dead dry cell battery mid-way through a programme is certainly a better option than having to watch a double image while a rechargeable battery recovers enough to start using it again.

Nonetheless, 'green' appears to have won out and most glasses today are rechargeable. With the move to RF this may be a good move because the battery drains at a much faster rate than infra-red, down to as low as 10-20 hours. The ideal would be a direct cable connection to the TV or charger but

acceptance of this by consumers is unlikely.

There are also a few other factors which may influence a buying decision such as the need to wear 3D glasses over prescription eyewear and an individual's susceptibility to flicker. Both of these can be an issue with active shutter glasses and may lead some consumers to choose a display with polarising filter and the lighter polarised glasses.

What is a 3D TV?

The fundamental question of what defines a '3D TV' is one that no one in the industry appears to be addressing.

When HD TVs were introduced it was realised very quickly that the various configurations of 'HD' needed to be defined, not only for the benefit of consumers, but also for those who marketed and sold the sets. The European Information & Communications Technology Industry Association (now renamed DigitalEurope) came up with two terms initially – HD Ready and HD TV. HD Ready defines a TV that is capable of displaying an image with a vertical resolution of not less than 720 lines when an HD receiving device such as a set-top box or Blu-ray player is connected to it, while an HD TV must in addition have a built-in tuner capable of receiving local over-the-air HD broadcasts.

This nomenclature has worked well, particularly with the more recent addition of '1080p' to define a TV capable of displaying what manufacturers had begun to describe as 'Full HD' or other even more obscure terms.

Unfortunately, it doesn't appear that DigitalEurope has any plans to create a similar nomenclature for 3D TVs, so we have been left to create our own definitions.

In Futuresource's view, for a TV to be defined as a '3D TV' it must have an HDMI 1.4a input and, in the case of a frame-sequential display which requires active shutter glasses to view the 3D image, an infra-red or RF emitter as well.

The grey area is whether glasses are provided with the TV or not. To date all polarising filter TVs have been supplied with a few pairs of the low-cost passive polarised glasses, but for the frame-sequential 3D TVs it is an entirely different matter.

At the outset, 3D TVs carried premium price points and usually came bundled with two pairs of active shutter glasses. However, more recently there has been a move towards providing the glasses as an optional extra. The reason for this could be to keep the selling price down, allowing consumers the option to add the capability later, or possibly to limit the number of SKUs on offer. Some consumers may be attracted to other aspects of a TV such as Internet connectivity, built-in free-to-air satellite tuner or LED backlighting, all of which are being included at ever-lower price points.

It is relatively easy to establish whether one or more pairs of glasses are bundled with a particular model of TV or must be bought as accessories, but this doesn't take into account the fact that some consumers may purchase the glasses later from a different store, or online. It thus renders any differentiation meaningless.

Futuresource therefore defines a TV supplied with or without bundled glasses as a '3D TV', provided it has all the built-in components necessary to deliver 3D pictures.

A further option has appeared recently in the frame sequential segment that is much less obvious to consumers, however, particularly if they are deferring the decision to buy 3D glasses. One or two manufacturers are now supplying TVs which have no infra-red or RF emitter built in, presumably in order to bring down the retail price even further. These models just have a connector on the back and the emitter is sold as an accessory. We are defining these as '3D Ready TVs'.

Unless the need for an outboard emitter is highlighted at the time of purchase – a major leap of faith in today's retail environment – there is a strong likelihood that anyone purchasing glasses at a later date will think they are faulty or, if he or she has been reading the numerous articles and blogs circulating on the Internet, assume they are incompatible with their TV.

If that wasn't confusing enough, the lack of an emitter creates a further problem for those seeking a 'universal' solution. Some multi-standard active glasses systems work by picking up the emitter signal from the TV and translating it into their own protocol. If there is no built-in emitter, consumers are faced with a double whammy – they must first buy an emitter compatible with their TV before paying out more cash for a third-party universal glasses system.

Good news: no format war!

Interestingly, the area that has probably been highlighted the most by journalists when writing about the '3D format war' is, in fact, not a 'war' at all. The way 3D is encoded on a Blu-ray Disc may be different from the method used by broadcasters, but both work equally well on all new generation 3D TVs, albeit with some loss of picture resolution in the case of broadcast.

Blu-ray players deliver full resolution 1080p left and right images simultaneously to the TV via a new generation of HDMI link designated 1.4a. All 3D TVs must accept this input, which they process internally depending on the type of display technology they use.

3D broadcast signals, on the other hand, are currently being encoded as a single 2D image in a frame-compatible format (side-by-side or top-bottom) and this can be carried over any generation of HDMI link. All 3D TVs are also required to decode and display these formats (although the user may have to select the input format manually from a menu).

As a result, there is no real issue with regard to displaying pictures from any Blu-ray player or TV broadcaster, the only difference between the two being the aforementioned halving of the picture resolution in a frame-compatible broadcast due to the left and right images sharing one 2D picture.

(For the sake of completeness, slightly different rules apply to the PS3, which can play back 3D Blu-ray Discs via its legacy HDMI 1.3 connector.)

From all of the above it will be evident that the industry is facing one of its toughest ever challenges in terms of the consumer proposition. And it's not just consumers who are confused… there are many within the industry itself – from production through to retail – who are struggling to get to grips with this new technology and the numerous ways in which it can be presented.

If DigitalEurope is unable to provide some clear guidelines, as it did so successfully for HDTV, perhaps the industry should take it upon itself to do so.

BIOGRAPHY

Senior Technology Consultant at Futuresource, BILL FOSTER started his career in the 1960s as a vinyl disc mastering engineer, then co-founded Tape One Studios in 1975, which grew to be one of the world's largest independent mastering facilities. From 1983 to 1992 Bill was a board member of the Association of Professional Recording Services (APRS). Bill is a member of the Royal Television Society and the Audio Engineering Society, where he is currently chairman of the UK Section. Contact: bill.foster@futuresource-hq.com