



by Lightspeed Design, Inc.

DEPTHQ® 3D PASSIVE POLARIZATION “BEST-IN-CLASS”

FAQ

With superior optics, speed, brightness, sharp focus, low crosstalk, advanced heat protection, IP protection and six-studio Hollywood approval, DepthQ® 3D Passive Polarization for 3D Digital Cinema is your proven “best in class” investment, today and for the future.

ABOUT DepthQ® 3D:

DepthQ® 3D products for 3D digital cinema consist of our *patented* DepthQ® Standard Polarization Modulator and our *newly patented* high-brightness DepthQ® CineBright™ 3D Light Recycler. Both products enable the world's shortest dark times - thus easily ensuring bright, low-crosstalk operation. Please read on to discover what other benefits help to qualify them as “Best in Class”.



FAQ 1: What factors determine the best 3D experience?

With liquid crystal based polarization modulators, the quality of the optics is most important, and determined by several factors: optical efficiency, switching speed, flatness/focus, contrast and heat protection. DepthQ® 3D's optics are superior to our competitors in these areas. Other factors include your projector's dark time, lamp life, the quality of your port glass, the glasses you choose and your screen. Read on to see how ALL of these factors affect your Total System Efficiency (how much light your patrons see).

FAQ 2: What is the Optical Efficiency of the DepthQ® 3D products?

All LC-based polarization switches start with nearly identical per-eye Optical Efficiencies of ~17% (including the 3D glasses).

DepthQ® Standard

is actually ~17.5% optically efficient (i.e. light-efficient) using common low-cost cinema glasses, or up to ~19% with premium (expensive) glasses.

DepthQ® CineBright™,

because it recaptures and re-uses some of that lost light, is ~28% optically efficient using common low-cost cinema glasses, or up to ~31% with premium (expensive) glasses.

FAQ 3: Can every product benefit from 'premium glasses'?

Yes, 'premium glasses' using higher-quality components can increase everyone's light efficiency, but at 'premium prices' prohibitive to a theater. Know that any marketed brightness values based solely on using premium glasses are not realistic for 3D cinema. Also note: some inexpensive 3D glasses measure out to appear more efficient than others, but receive their increase in brightness by leaking more crosstalk (ghosting) through them, providing a poor customer experience.

FAQ 4: What is DepthQ® 3D's Switching Time?

DepthQ® 3D has a patented, symmetrical Switching Time of only 50µsec, while the competitors' products simply cannot completely switch faster than ~550µsec in both directions - and some are considerably slower than that.

FAQ 5: What is Dark Time?

'Dark Time' is the time projector light must be turned OFF between Left and Right images to allow a 3D product to switch eyes. The longer the Dark Time, the less light to the screen. See the video proof here: <http://bit.ly/ZHMzCr>. At 50µsec, DepthQ® 3D switches far faster than the fastest projector Dark Time available to date of 350µsec, producing the highest Total System Efficiency in our class. A competitor's manual states their modulator requires a Dark Time of 1200µsec while a spinning wheel polarizer requires 1157µsec (for triple-flashed 24FPS content).



FAQ 6: How do Switching Time, Dark Time and Crosstalk relate?

If a 3D product does not finish switching within the projector’s Dark Time, one eye will see light meant for the other eye. This is called ‘Crosstalk’ (ghosting). **Setting a projector’s Dark Time faster than a product’s Switching Time causes excess ghosting.** Our fastest competitors (~550µsec) are advising that projector Dark Time be set as fast as the projector can switch, which is typically 350µsec. *They are therefore causing excess ghost.* At **50µsec**, DepthQ® 3D is DONE switching well within the fastest projector Dark Time of 350µsec. **So you can use the fastest Dark Time available, for the brightest 3D image, with zero chance of excess ghost.**

FAQ 7: What is High Frame Rate (HFR) 3D?

Today’s standard for 24FPS captured 3D content is to project it triple-flashed at 144FPS (72FPS per eye). HFR 3D is 3D content captured and projected at even higher frame rates. ‘The Hobbit’ was captured at 48FPS per eye, to be projected double-flashed at **192FPS (96FPS per eye)**. James Cameron may aim even higher with his ‘Avatar’ prequels, capturing at 60FPS per eye, and projecting 240FPS.

FAQ 8: How do Switching Time, Dark Time & HFR 3D relate?

With HFR 3D, the amount of time available to show a single frame decreases, so long Dark Times will use even **more** of the available light. Because of its miniscule 50µsec switching time, **only DepthQ® 3D is truly ‘100% HFR-Ready’** and can handle authentic **double-flashed HFR at 192 FPS or 240 FPS - even as high as 400 FPS** - while continuing to let you use the shortest available projector dark time. A spinning wheel polarizer’s 3D HFR specifications do not exceed single-flash 48FPS (96FPS) and 60 FPS (120 FPS), while a competing modulator’s specs max out at double-flashed 48 FPS (192 FPS).

FAQ 9: What is Total System Efficiency?

Total System Efficiency is how much light your paying customers actually see (per eye), after accounting for Optical Efficiency, Dark Time, color calibration, port glass, and screen/eyewear losses. The de facto industry standard was set by RealD®, at ~15%. A product’s required Dark Time is the most significant factor when it comes to Total System Efficiency, but it is often absent from marketing.

DepthQ® Standard

A Total System Efficiency of **~16% is achievable using DepthQ® Standard** paired with commercially available, low-cost glasses.

DepthQ® CineBright™,

Because it recycles some of that lost light, you can expect DepthQ® CineBright™ to achieve **~25.5% Total System Efficiency** with those same glasses.

FAQ 10: Why do some companies’ ‘efficiency’ comparisons seem skewed?

Competitors’ marketing sometimes compares their Optical Efficiency against another company’s more meaningful Total System Efficiency, creating a misleading impression. The reality is all LC based polarization switches start with nearly identical ‘Optical Efficiencies’ of ~17% – one factor of many to follow. DepthQ® Standard has consistently stated our efficiency at a conservative ~15%, using the only efficiency that really matters - Total System Efficiency. This follows the industry’s de facto standard. **But you can hit ~16% with DepthQ® Standard and ~25.5% with DepthQ® CineBright™ using a new screen and efficient port glass.**

FAQ 11: So who’s really brighter in the end?

DepthQ® Standard

Using our Optical Efficiency of ~17.5%, and our competitors’ optical efficiencies and dark times from their manuals or marketing, **DepthQ® Standard (DT of 350µsec) is ~18% brighter** than a competing modulator (DT of 1200µsec) and **~12% brighter** than a spinning wheel system (DT of 1157µsec). In a direct test, DepthQ® Standard proved **~9% brighter** than another competing modulator (DT of 350µsec, true switch time 520µsec) (Tested 3/18/2013).

DepthQ® CineBright™,

In another fair and detailed direct brightness comparison conducted by an industry professional installer, DepthQ® CineBright™ was shown to be **~7% brighter** than the market leader’s light recycling product. (Tested 1/19/2015).

FAQ 12: How does Total System Efficiency relate to lamp life?

Falling below the recommended end-of-life foot-lamberts for 3D cinema (6 - 4.5ft-L) before your lamp's true end-of-life is costly. DepthQ® 3D's higher Total System Efficiencies allow you to hit your foot-Lamberts spec longer, maximizing your lamp investment.

FAQ 13: What does 'maximizing lamp life' mean in terms of Cost Savings?

Bottom line...DepthQ® 3D saves you money on lamp costs (you can change your lamps less frequently).

DepthQ® Standard

Using the same products and specifications in the comparisons above in FAQ 11, including a 10K lumen lamp running 24FPS content at 144FPS 6 hrs/day 6 days/week on a 32' screen, and a 3D end-of-life of 4.5 ft-Lamberts, DepthQ® Standard will save you approximately \$500 to \$1200 (US \$) annually per 3D screen.

DepthQ® CineBright™,

Using DepthQ® CineBright™, you can also not only drop to a less-bright, less-expensive lamp to maintain the same foot-lamberts in brightness, but use significantly less electricity. Comparing the same products and specifications as left you could save ~\$800 to \$1550 (US \$) annually per 3D screen.

FAQ 14: How do you calculate your Maximum Screen Width estimates?

We believe in presenting somewhat conservative numbers in our marketing that take into account typical real-world additional losses like projector dark time, color-correction and port glass. Additionally, for any given lamp power, **we target the largest screen size that still provides at least 25% lamp headroom** - to allow for the inevitable brightness loss that occurs as your lamp ages. This means using our published Maximum Screen Width estimates you would typically continue to be able to hit your 3D foot-Lamberts goal even when your lamp has lost 50% of its expected useful brightness. Maximum screen size estimates are easily inflated by ignoring real-world losses and/or reducing lamp brightness headroom - so you could theoretically use the same lamp on a bigger screen, but you'd be changing the lamp much more frequently. Our calculations are cross-referenced using both the Christie and Barco calculators: Christie Digital: <http://bit.ly/2slS6HT> Barco: <http://bit.ly/2tf1WHY>.

FAQ 15: What are the DepthQ® 3D Products' Throw Ratio limits?

DepthQ® Standard

DPM-L-DCI/EL3G: $\geq .8 : 1$ in either FLAT or SCOPE
No Minimum Throw Distance

DepthQ® CineBright™

DPM-CBV2-DCI/EL3G: SCOPE: $\geq 1.17 : 1$ FLAT: $\geq 1.36 : 1$
DPM-CBST-DCI/EL3G: SCOPE: $\geq 1.13 : 1$ FLAT: $\geq 1.13 : 1$
Minimum Throw Distance: 11m (36.1')

FAQ 16: What do you mean by 'Advanced Heat Protection'?

Only DepthQ® 3D protects your investment from heat degradation over time with our advanced heat-rejecting metallic polarizer. See the video proof here: <http://bit.ly/10bmCyb>. You won't burn it up. It won't yellow. It won't degrade. All our competitors use...plastic laminated to glass. See the video proof here: <http://bit.ly/18tS7XY>.

FAQ 17: What is the Maximum Projector Power DepthQ® 3D allows?

DepthQ® 3D, with its heat-rejecting metallic pre-polarizer, accepts up to 56K lumens - so protects your investment whether your light source is lamp or laser (and is compatible with all laser types).

FAQ 18: Other products have a bigger aperture. Isn't that better?

Large aperture devices require their apertures to be filled with light in order to stay cool, often causing you to move your projector back. DepthQ® 3D's heat-rejecting metallic polarizer allows a smaller aperture, letting you stay close to the lens to save space in your booth and minimize installation expense.

FAQ 19: Why do I see image softness and warping in other products?

Our competitors' products are not necessarily flat optically, and can soften or warp your image. DepthQ® 3D is laser-tested to meet a precise flatness specification, keeping your images sharp and uniformly focused. See the video proof here: <http://bit.ly/YYHMei>.

FAQ 20: What is your Contrast Ratio?

When it comes to contrast specifications, the true limiting factor is the quality of the silver screens, which are generally around 50:1. All polarized 3D products are subject to this constraint. **Our contrast is >100:1 which exceeds the screen.**



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FAQ 21: Is there any real difference between a spinning wheel and DepthQ® 3D?

Besides the significantly longer Dark Time and lower Total System Efficiency, a mechanical spinning wheel that creates static electricity and attracts dust and popcorn oil is a high maintenance device. Additionally, there is a recurring \$500 expense to replace the wheel approximately once per year. DepthQ® 3D is a solid state, low-maintenance device that simply delivers more light to your guests.

FAQ 22: Will DepthQ® 3D work with my digital projector?

DepthQ® 3D works with any DCI-compliant DLP projector.

FAQ 23: Can I easily move DepthQ® 3D out of the way for 2D movies?

DepthQ® 3D includes a moving actuator with an easily-implemented IP remote control capability to automatically move the unit out of the way for 2D content, and back in place for 3D content.

DepthQ® Standard

Total travel time: ~4 seconds.

DepthQ® CineBright™,

Total travel time: ~8 seconds.

FAQ 24: Can I install DepthQ® 3D directly to my wall?

DepthQ® Standard

includes all the hardware necessary to mount directly to a wall, on a table top, or in a rack.

DepthQ® CineBright™,

We recommend the CineBright system be rack-mounted in order to keep its relationship closely tied to the projector (and we include all the parts required).

FAQ 25: Active 3D and Dolby® 3D glasses are expensive and uncomfortable. Are Yours?

DepthQ® 3D uses circular polarized 3D glasses, which are significantly lighter, more comfortable and much less expensive than either Dolby® or Active systems. Additionally, DepthQ® 3D is compatible with all circular polarization eyewear brands, so you can make your own choice.

FAQ 26: How does DepthQ® 3D's price compare to other brands?

DepthQ® 3D products offer substantial benefits and operations cost savings over other brands, yet remain competitively priced, and are backed by a full 5 year optical, 3 year electronics warranty.



FAQ 27: What is DepthQ® 3D's business model?

Buy DepthQ® 3D, and you own it forever. We require no collection of royalty, licensing fees, or participation in the box office. Plus, since our product is compatible with all circular polarization eyewear brands, you have the flexibility to use our glasses or choose your own.

FAQ 28: What do YOU mean by 'Hollywood Approved'?

We have demonstrated to, and been approved by six major Hollywood studios. Others' claims of 'Hollywood Approved', may just represent a single studio. Missing a studio's approval can literally lock you out of content. That's quite a risk.

FAQ 29: Why do your patents matter?

DepthQ® 3D technology is covered by international patents - in the United States, European Union, Canada, China and Korea. These novel patents protect you from claims of IP infringement. If you buy a RealD® imitation you're taking an unnecessary risk.

DepthQ® Standard & DepthQ® CineBright™

LC-Tec Displays AB U.S. Patent Nos. 8023052 B1 and 8184215 B2, CN102725682 B, KR 20130097158 A, EP2606398 A4

DepthQ® CineBright™ Lightspeed Design, Inc. U.S.

Patent Nos. 9494805 B2 and 9693044 B2, EP 2959341 B1, CA 2907565 C, CN104272182 B

FAQ 30: What companies are behind DepthQ® 3D?

With DepthQ® 3D your trust is well-placed. DepthQ® 3D is co-developed by Lightspeed Design, Inc. and LC-Tec Displays AB, two companies with over 50 years combined expertise in stereoscopic design and liquid crystal manufacturing and development. Lightspeed Design, Inc. is an established 3D provider for many discerning clients including Disney, Christie Digital, DreamWorks, IMAX, Mercedes, Microsoft, Boeing, & NASA. LC-Tec invented rugged, fast polarization technology so innovative the original company and patents were purchased by 3M.



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