

ARCHITECTURAL LIGHTING

QuarkStar and Sylvania present new solution to European downlight segment

Edge-X optical technology delivers new direct/indirect capability in downlights for architectural lighting manufacturers.

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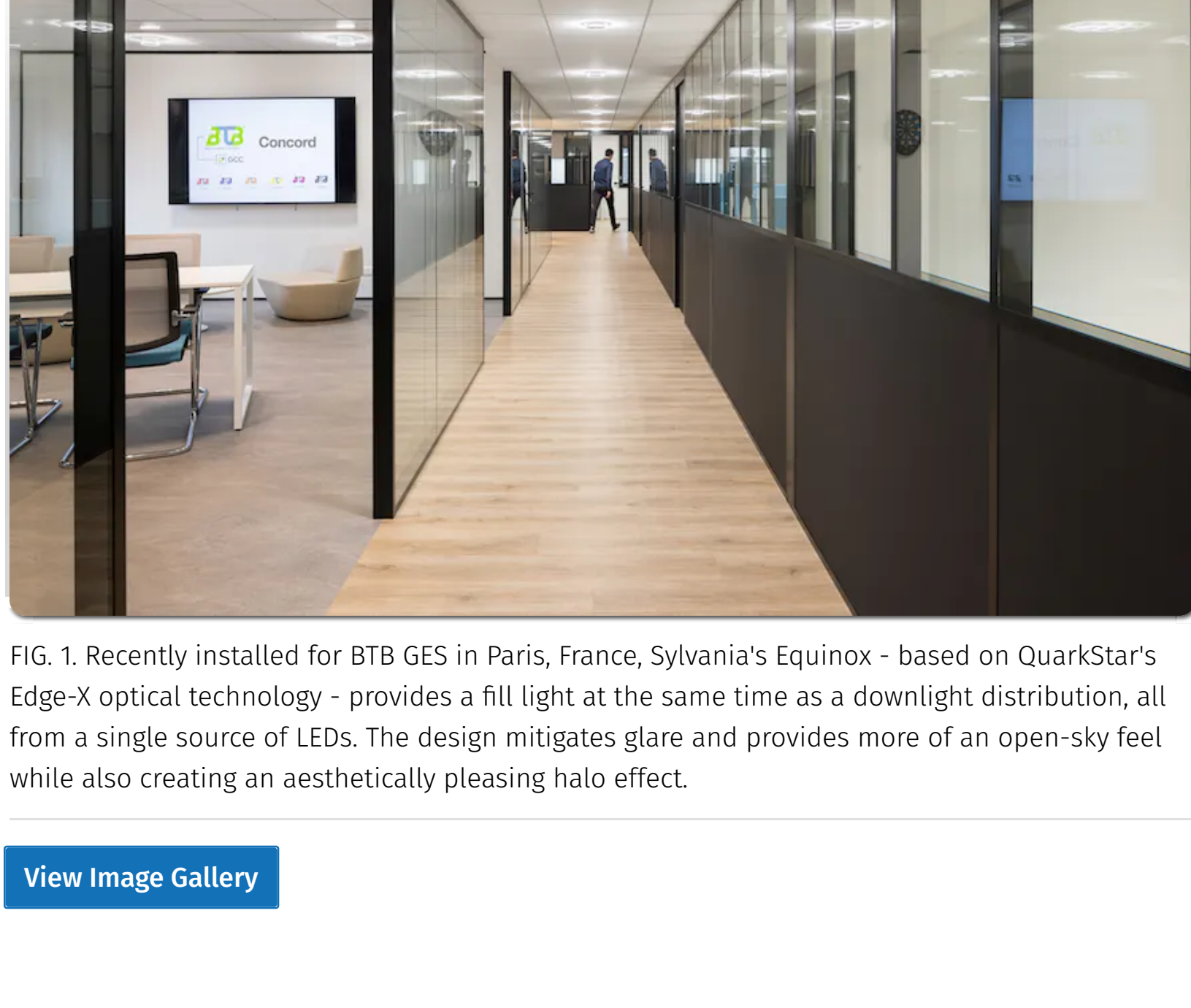


FIG. 1. Recently installed for BTB GES in Paris, France, Sylvania's Equinox - based on QuarkStar's Edge-X optical technology - provides a fill light at the same time as a downlight distribution, all from a single source of LEDs. The design mitigates glare and provides more of an open-sky feel while also creating an aesthetically pleasing halo effect.

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Last month, solid-state lighting skunkworks QuarkStar and architectural lighting provider Sylvania announced their collaboration on a new LED luminaire that launched as part of [Sylvania's high-end Concord lineup](#).

The partners tout the Equinox downlight (Fig. 1, above), currently available in EMEA, as the first major advance in recessed-can downlight design since the product's invention 75 years ago. Equinox leverages [QuarkStar's Edge-X optical engine design](#) to resolve the traditional downlight's "cavern-like effects" while also alleviating discomfort from glare, said QuarkStar chief operating officer Jacqueline Teng in an interview with *LEDs Magazine*.

All things Equinox

Describing the luminaire simply as a "downlight" is slightly misleading. With the Edge-X technology, a single row of 90-CRI LED sources is coupled to a waveguide where the illumination generated is mixed by total internal reflection. Then the light is split at the opposite end by a shaped optic called an extractor using refraction, rather than a typical reflection technique, allowing Edge-X to deliver both downlight to the space and uplight to the ceiling in a circular halo effect. This allows the Equinox to achieve a Unified Glare Rating (UGR) of less than 19 for visual comfort, where the lower the number, the better the glare control. (Both the U.S. Green Building Council LEED certification and International WELL Building Institute requirements list a maximum allowable value of 19 in order to achieve a specific credit in their evaluation methods.)

While UGR designations are often based on primary use of the fixture, the industry at this point does not have a universal descriptor for a recessed-can downlight that simultaneously provides both indirect and direct distributions. For the time being, a simple "downlight" it is.

Agnieszka Paprocka, Sylvania's senior product line manager – EMEA, summarized the company's aims with the luminaire and its contribution to architectural lighting. "The ability to minimize dark ceilings, entirely changing the ambience of a room whilst beautifully illuminating the space, is unique to the QuarkStar technology [inside Equinox] and is a game-changer for the industry," she said.

Paprocka added that Equinox brings a compact footprint and flexibility to ceiling lighting with a locking mechanism that allows the optic to be nearly recessed for "a minimalistic edge of light" or fully extended (see Fig. 2). The sleek fixture delivers a total of 2500 lm with a luminous efficacy of up to 125 lm/W and is available with various trim, driver, and control options.

The future of "QuarkStar Inside"

LEDs also spoke with industry consultant Clifton Stanley Lemon, who is working with QuarkStar on its North American business development strategy. Lemon noted that while the Edge-X optical technology was previously covered due to its award-winning linear installation into [the Kinder Building at the Houston Museum of Fine Arts](#), the Sylvania SSL product marks the first commercially available, circular production model with what he called "QuarkStar Inside."

"The optical control engine — QuarkStar's innovation — opens up enormous potential in creating new forms of light distributions," Lemon explained. "Here, for example, dual-distribution luminaires may become an entirely new category. And [Equinox] certainly shows that we can rethink a layered light approach and effectively get two light layers from a single light source."

Referring to a [2019 Strategies in Light presentation by Wilson Dau*](#), Teng and Lemon confirmed that the company has been working on numerous applications of the Edge-X technology since its earliest public demonstrations in 2018. During SIL, Dau focused on how to revamp the downlight form, starting with improving the appearance of light from a direct/indirect system and optimizing glare control.

Dau explained how the lessons learned from the company's development of linear optical solutions could be applied to future forms, including the circular downlight, depending upon the shape of the extractor optic at the end of the waveguide, which would be defined by the lighting application.

"Advanced optical control is going to decrease the contrast between the luminaire and the surrounding area," Dau said in the SIL video. The approach, he continued, helps to balance and reduce light from "the offending angles [...] between 90° and 45°" that are typically responsible for discomfort caused by glare.

Teng noted to *LEDs* that the circular luminaire prototype was first demonstrated at Light+Building in 2019 based on optical designs developed by another QuarkStar team member, Dr. Eric Bretschneider. But shortly thereafter, as we all experienced, "COVID lockdown measures massively disrupted supply chains and product teams alike and the Equinox project was delayed," Teng said.

Still, for QuarkStar, the Equinox release is only the beginning. "We have a small internal team with a great sense of innovation and motivation to advance lighting," Teng said. Using a deep tech approach to lighting solutions, she said, the company is looking forward to working with additional U.S.-based production and OEM partners.

Lemon added, "The point is to provide partners and collaborators with an optical system that transcends conventional optics, offering them the Edge-X platform to completely reinvent luminaires and their functions: including improved light distributions, light quality, color control, and light extraction efficiency."

Leaving convention behind

"The [Edge-X] optical design is all about providing 'useful' lumens," Teng explained. "It's a difficult concept to quantify, but absolutely necessary to pursue." [SSL pioneer Roland Haitz](#), a member of the QuarkStar team until his passing in 2015, often expounded on maximizing the efficacy of LEDs "to capture every photon possible," Teng quoted. "The corollary is they then need to be put where they're needed and *only* where they're needed. Does a fixture really have high efficacy if half its light is not where it's supposed to be? This is the next stage in the pursuit of true efficacy."

Teng explained that the optical technology was designed to be fairly agnostic with respect to what LEDs it couples and that the beam-shaping capabilities are wide open. "Edge-X is an extremely versatile platform where the imagination is really allowed to play," she explained. "There are now two commercial examples of the Edge-X technology that have wildly different form factors — linear and circular — and each has wildly different distributions, but both are based on the same optical engine. And to further prove the point, QuarkStar's recent [L-Prize Concept Phase-winning design](#) is also built around Edge-X." As one L-Prize judge commented, "The optical design is novel and stands out over today's luminaire systems."

"Up until now," Teng said, "the industry has had its hands full just 'fixing' LEDs' problems so that they perform on par with previous light sources, albeit with better efficiency. No one has really looked past that yet to what capabilities SSL technology can provide *beyond* previous light source technologies besides the obviously tiny form factor. We haven't seen many people using the opportunity to manipulate and shape the light itself, which is where LEDs can really shine by comparison."

"The ability to exquisitely shape light without secondary optics, while delivering a high quality of light, can redefine the idea of what a luminaire can be," Lemon said. "We will be engaging with designers in order to understand how this new technology can inspire their creativity. We've been limiting our imaginations to the forms and approaches of the past for too long. We're just beginning to explore the full potential of SSL and advanced optics to do things we never knew we could do — it's an exciting time!"

**Wilson Dau is principal at Dau Design and Consulting Inc. (DDCI) and has consulted with QuarkStar since the firm's inception.*

CARRIE MEADOWS is managing editor of *LEDs Magazine*, with more than 20 years' experience in business-to-business publishing across technology markets including solid-state technology manufacturing, fiber optic communications, machine vision, lasers and photonics, and LEDs and lighting.

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