COLORBEAM

TECHNICAL WHITE PAPER

Independent Engineering Evaluation

of measured lighting performance.

Measured findings on EMF, electrical noise, flicker and melanopic range for the Colorbeam low-voltage architectural lighting system.

INDEPENDENT EVALUATOR

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TESTING

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Evaluation and verification retest

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ABOUT THIS EVALUATION

Performance claims are easy to make. *We asked someone to measure ours.*

In August 2026, Colorbeam commissioned an independent electrical engineer to evaluate a complete, working Colorbeam system in a real residential setting. The goal was simple: measure what the system actually does to the electrical and lighting environment of a home.

The evaluation was conducted by **Mitch Marchand, BSc. EE.**, founder of EMF Aware and an instructor with the Building Biology Institute. Colorbeam funded the work. The measurements, findings and conclusions are his.

Testing covered four areas: AC magnetic and electric fields, high-frequency noise on the building's electrical supply, flicker and stroboscopic effects across the dimming range, and the spectral and melanopic characteristics of the light itself. A focused verification retest followed on August 29, 2026.

WHAT THIS PAPER IS

- A summary of measured results from an independent, controlled field evaluation.
- Documentation of the specific system and configuration that was tested.
- Colorbeam's primary reference for the measured performance of its platform.

WHAT THIS PAPER IS NOT

- A product certification or accredited-laboratory report.
- A medical assessment, or a claim that the system prevents or treats any condition.
- A guarantee that every installation will reproduce these values without proper configuration and installation.

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EXECUTIVE SUMMARY

01

Measured performance of the tested configuration *under documented conditions.*

Under the specific evaluation conditions, the evaluated Colorbeam system configuration added no measurable high-frequency noise to the building's electrical supply, produced very low magnetic fields at the fixture, and dimmed at switching frequencies far above the threshold associated with observable flicker.

0 measurable

High-frequency noise added to the building supply under the tested conditions

0.25–0.3 mG

AC magnetic field measured at the fixture face

~35 kHz

PWM dimming frequency on tunable-white strip and verified downlight path

3 of 3

Lighting paths classified "no observable effect" under IEEE 1789 at every tested dim level

95–98

CRI (Ra) measured on the tunable-white strip at full output

0 wireless

Radio-frequency lighting components in the tested platform

KEY FINDINGS

- **Electrical noise.** Conducted high-frequency noise stayed within the room's natural baseline across every operating state, including deep dimming.
- **Fields at the fixture.** The evaluator assessed downlight and strip fields as meeting building-biology guideline values with minimal clearance: about 2 in. for strip and 6 in. for control equipment.
- **Flicker.** Every tested lighting path was classified as *no observable effect* under IEEE 1789 at all tested dim levels, from 5% to full output.
- **Melanopic range.** Measured m-EDI ranged from 420–525 at full output to 1.5–5.1 at the warmest, dimmest setting.

VERIFIED IN FOLLOW-UP TESTING

During the initial session, one decoder (the SR2112) was found configured at its 1 kHz setting. At the evaluator's recommendation it was set to approximately 35 kHz and **independently retested.** The retest confirmed the change and closed the finding. The results in this paper reflect the verified configuration.

Measured contribution to the electrical environment *under the tested conditions.*

Some clients and building professionals prefer to minimize electrical and magnetic fields from building systems wherever a practical alternative exists. The evaluation measured how much the evaluated Colorbeam system configuration contributes to the electrical environment of the space.

MAGNETIC FIELDS AT THE SOURCE

SOURCE	AC MAGNETIC FIELD	RECOMMENDED CLEARANCE
BR-9W downlight	0.3 mG at fixture – 0.05 mG above 2kHz	Minimal
Tunable-white LED strip	0.25 mG at fixture – 0.03 mG above 2 kHz	~2 in.
Control equipment	Under 1 mG at 6 in.	~6 in.

The evaluator assessed the measured fixture results as meeting the referenced building-biology guideline values under the tested conditions and stated clearances. Because drivers and power supplies are centralized, control equipment can be located in a mechanical room or other dedicated space.

CONDUCTED HIGH-FREQUENCY NOISE

Many dimming systems inject high-frequency noise onto a home's wiring, and that noise typically increases as lights are dimmed. In this evaluation, changes in conducted noise remained inside the room's normal baseline drift across every operating state measured.

CONDITION	CONDUCTED NOISE
System off	116 GS units
Complete system operating, dimmed to 5%	85 GS units
SR2112 dimmed to minimum (1/255)	No measurable change in noise or supply voltage

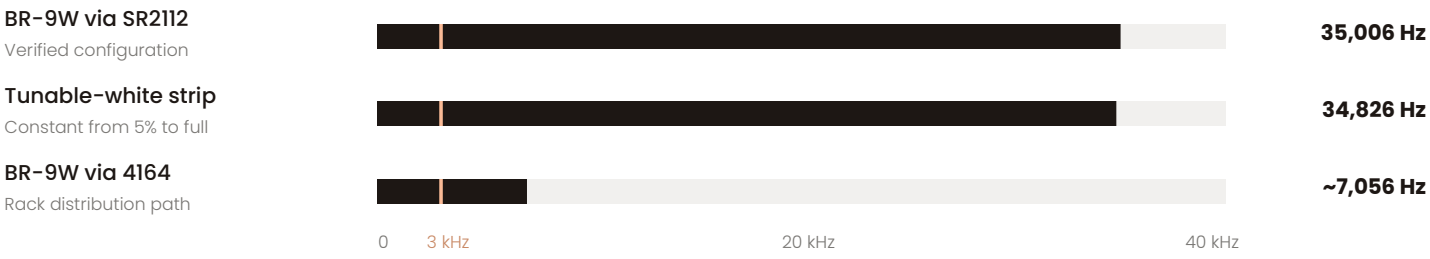
READING THE RESULT

The lower reading with the system on reflects normal fluctuation in the room's baseline, not a reduction caused by the system. The evaluator's conclusion is that the evaluated Colorbeam system configuration **added no measurable high-frequency noise** to the building supply under the tested conditions.

Flicker isn't always visible. *It is always measurable.*

LEDs are dimmed by switching them on and off very rapidly, a method called pulse-width modulation (PWM). Slower switching can produce flicker or stroboscopic effects, and faster switching reduces them. IEEE 1789 provides guidance on temporal light modulation and identifies 3 kHz as the frequency above which no observable effect is expected.

MEASURED SWITCHING FREQUENCY BY LIGHTING PATH



All three paths were classified by the evaluator as **no observable effect** under IEEE 1789 at every tested dim level. References to IEEE 1789 are provided for technical context and evaluator classification and do not constitute certification, approval or endorsement by IEEE.

STROBOSCOPIC VISIBILITY (SR2112, VERIFIED CONFIGURATION)

The stroboscopic visibility measure (SVM) captures whether motion under a light could appear choppy. A value below 1.0 is below the threshold of visibility for an average observer.

OUTPUT LEVEL	MEASURED SVM
Deepest tested dim (5%)	0.7–0.9
50%	0.4–0.6
75%	0.1–0.3

DESIGN NOTE

For kitchens, gyms and other spaces with fast movement, the evaluator recommends scene levels of 50% output or higher, where measured SVM is lowest. Deep-dim readings were taken at very low sensor illuminance and were attributed mainly to residual low-frequency content and sensor noise.

Measured melanopic range *of the tested downlight configuration.*

The evaluation included measurements of melanopic equivalent daylight illuminance (m-EDI), a metric used in lighting research to characterize the spectrum and intensity of light, across the downlight's operating range.

DAYTIME, FULL OUTPUT

420–525 m-EDI

Measured on the downlight at settings of 2700 K and above.

EVENING, WARM AND DIM

1.5–5.1 m-EDI

Measured on the downlight at its warmest setting and 5% output.

Values measured at 3 ft from a single fixture. Results in a finished space depend on fixture quantity, placement, surfaces, scene programming and eye-level exposure.

ARCHITECTURE THAT SUPPORTS THE RESULT

- **Low-voltage DC to every fixture.** Reduces reliance on 120 V branch wiring running through occupied ceilings and walls.
- **Centralized drivers and power.** Control equipment can be located in a mechanical room or other dedicated space.
- **No wireless lighting components in the tested platform.** The evaluated lighting configuration contained no wireless lighting components.
- **Clean dimming electronics.** The evaluator's recommendations did not call for any redesign of the dimming electronics or filtering.

INSTALLATION MATTERS

Cable type, grounding, mounting, equipment selection, configuration, programming, commissioning and the surrounding electrical environment can influence field performance. Projects with specific EMF, flicker or other performance targets should document the intended configuration and verify project-specific results through on-site measurement. Products must be installed, configured and commissioned in accordance with applicable Colorbeam documentation, product ratings, electrical codes and other applicable requirements.

CONCLUSION AND REFERENCES

05

Under the specific independent test conditions, the evaluated Colorbeam system configuration added no measurable high-frequency noise to the building's electrical supply, produced very low magnetic fields at the fixture, dimmed at switching frequencies well above the IEEE 1789 no-observable-effect boundary on every tested path, and delivered a wide melanopic range, from 420–525 m-EDI at full output to 1.5–5.1 at its warmest, dimmest setting.

SCOPE AND IMPORTANT NOTICE

These findings come from a one-time controlled field evaluation of a specific system configuration, including the SR2112 decoder set to approximately 35 kHz. The evaluation used field-grade instruments in a residential environment, not an accredited laboratory, and results in other installations may vary. This publication is not a guarantee of performance in another project, installation or configuration. References to standards are for technical context only and do not indicate certification or endorsement. Colorbeam makes no representations regarding health or wellness outcomes. See the Important Notice on page 2 for the complete limitations and conditions applicable to this publication.

PRIMARY SOURCES

REPORT	DATE
Colorbeam Technical Evaluation: EMF and Light Quality EMF Aware. Prepared by Mitch Marchand, BSc. EE. Testing August 25–26, 2026.	August 27, 2026
Addendum No. 1: SR2112 Retest at 35 kHz EMF Aware. Verification retest conducted August 29, 2026.	August 31, 2026

FULL REPORTS AVAILABLE ON REQUEST

This paper summarizes selected findings. The complete independent reports, including all measurement data, are available to architects, designers, integrators and building biologists on request at **info@colorbeamlighting.com**.

APPENDIX: SYSTEM TESTED AND METHOD

A

SYSTEM EVALUATED

COMPONENT	ROLE	CONFIGURATION
GATEway-1DMX	Lighting processor / DMX gateway	USB-C supply as shipped
PS-SR2112-96	96 W, 48 VDC power supply	Default
DMX-SR2112	12-channel constant-current decoder	PWM approx. 35 kHz (verified)
PS-RM-4164 / ETH-RM-4164	Rack power supply and 16-port distribution	Default
SRPC-2108-24-200CVF	Constant-voltage driver	PWM at maximum, approx. 35 kHz
BR-9W downlights	9 W fixtures	Driven from SR2112 and 4164 paths
Tunable-white LED strip	Constant-voltage strip	Driven from SRPC-2108

INSTRUMENTS

INSTRUMENT	MEASUREMENT
Fluke 289 True-RMS	AC voltage and frequency on data, DMX and low voltage runs
Stetzer Microsurge Meter	Conducted high-frequency noise and supply measurements
EM3 three-axis meter	AC magnetic and electric fields
In.Licht Ultra	Spectrometer and flicker meter for light-quality metrics

METHOD

Light-quality measurements were taken in a blackout enclosure within a residential environment, with background light verified at 0.1 lux and zero melanopic content. Downlights were measured at 3 ft; a 6 in. strip sample was measured at 1 ft to obtain workable sensor levels. The primary light-quality dataset comprised 60 measurement points. The SR2112 verification retest comprised 20 points: four colour-temperature settings at five dim levels (5%, 25%, 50%, 75% and 100%).

STANDARDS AND METRICS REFERENCED

IEEE 1789-2015 temporal light modulation guidance · WELL v2 L08 lighting-quality pathways · EU Ecodesign SVM benchmark · CIE 13.3 and CIE 224 / TM-30 · Melanopic equivalent daylight illuminance (m-EDI)

Standards and metrics are referenced for technical comparison and context only and do not, by themselves, establish certification, approval, endorsement or project-specific compliance.