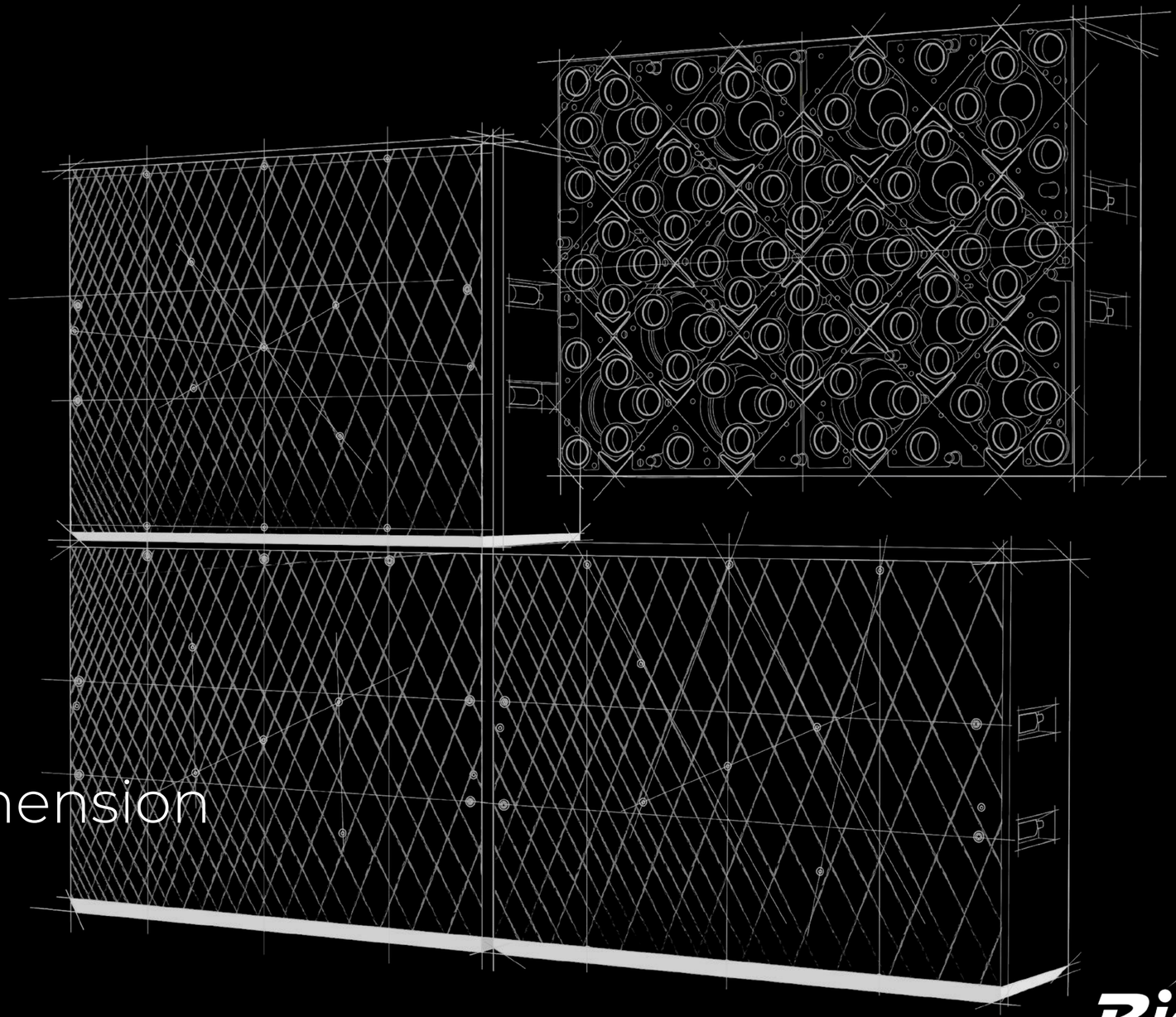
Breaking barriers in sound

Next generation Matrix Array loudspeakers

HOLOPLOT

BICSI® ENDORSED EVENT



Matrix Arrays

Audio in another dimension

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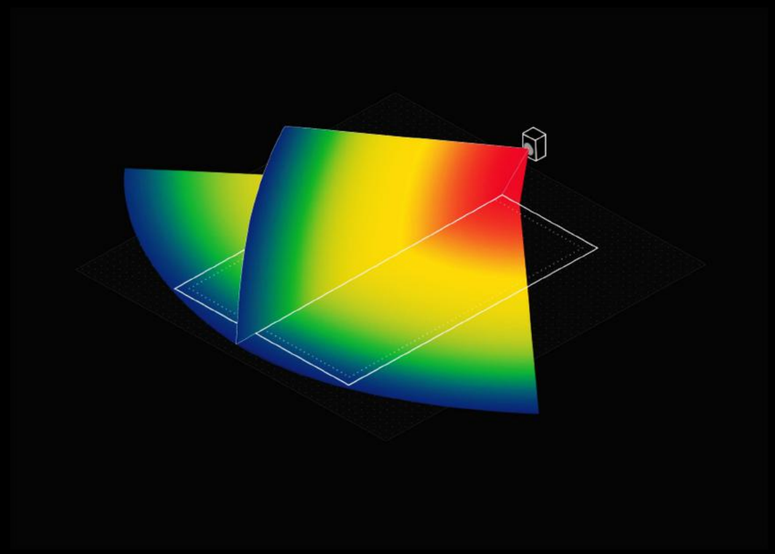
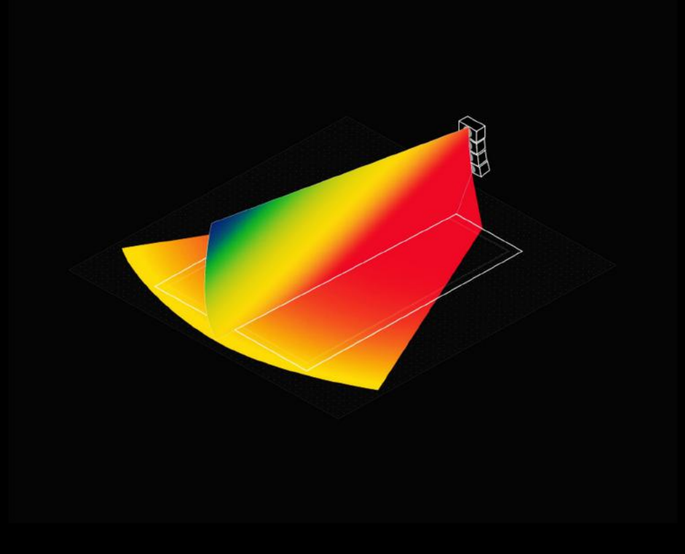
The Matrix Array

An evolution in loudspeaker technology



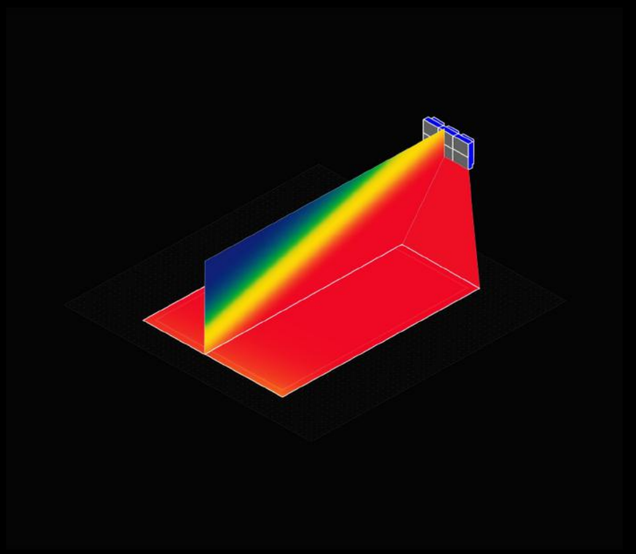
Point Source

Uncontrolled sound propagation



Line Array

Sound control in the vertical plane



Matrix Array

Advanced sound control in 3D

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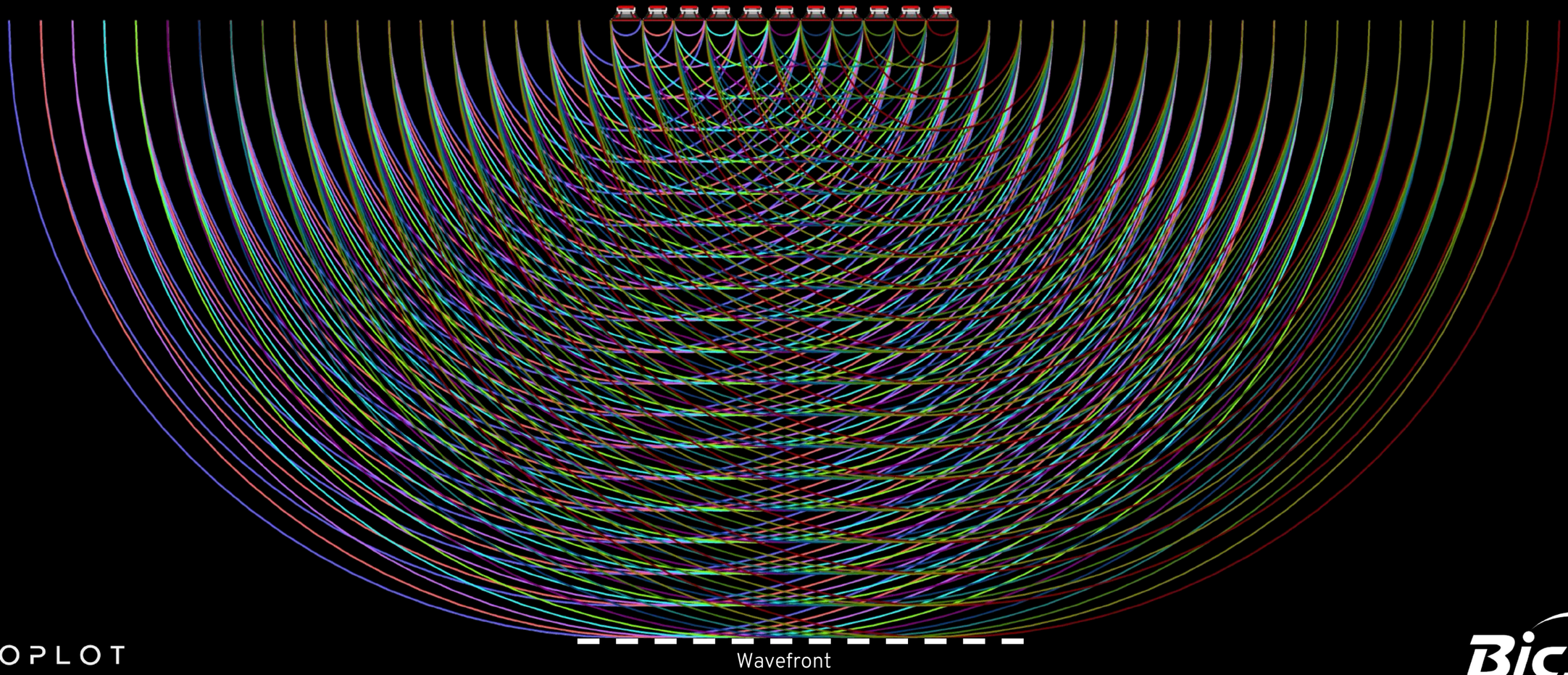
Approach to Matrix Arrays

Huygens principle in practice



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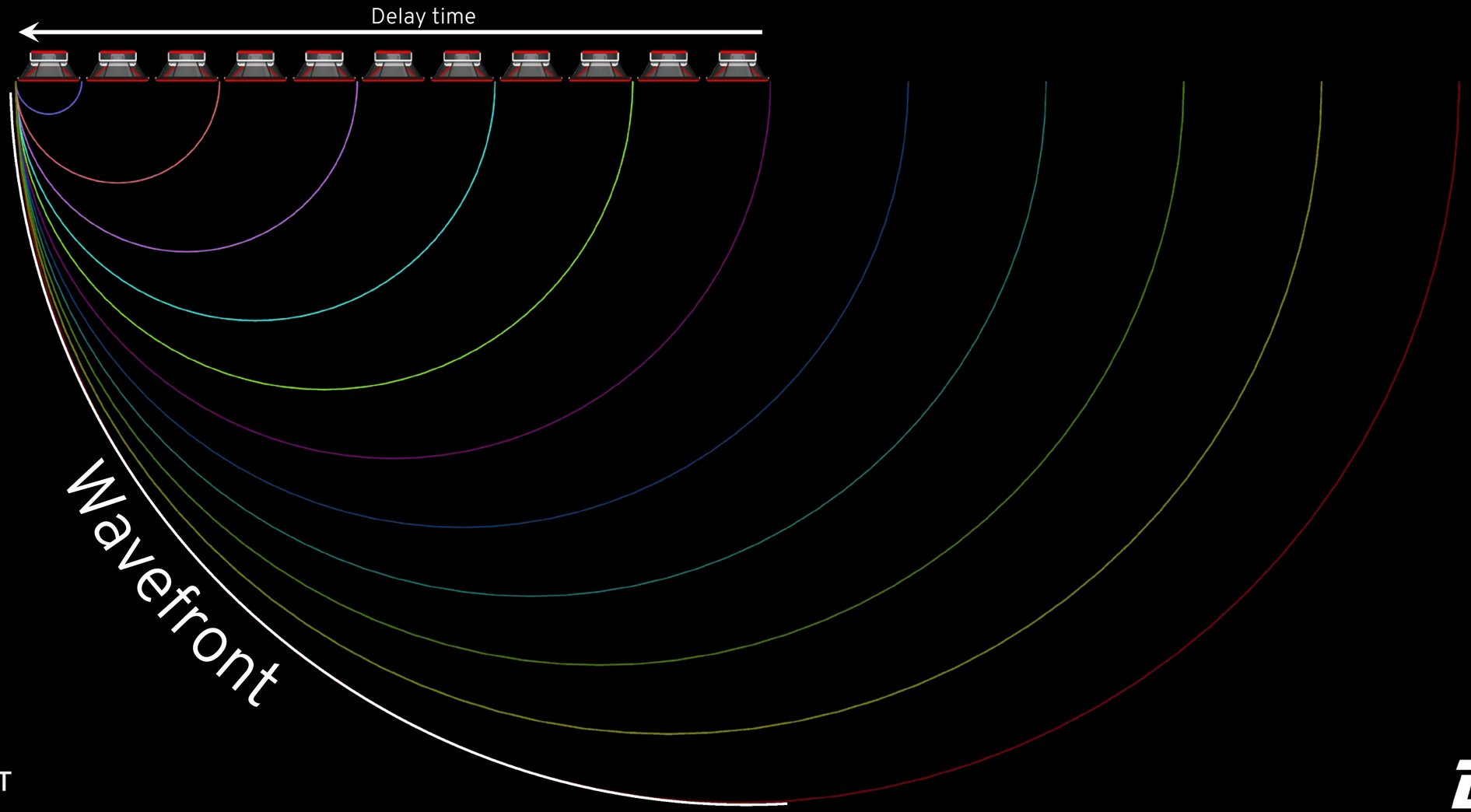
Approach to Matrix Arrays

Huygens principle in practice



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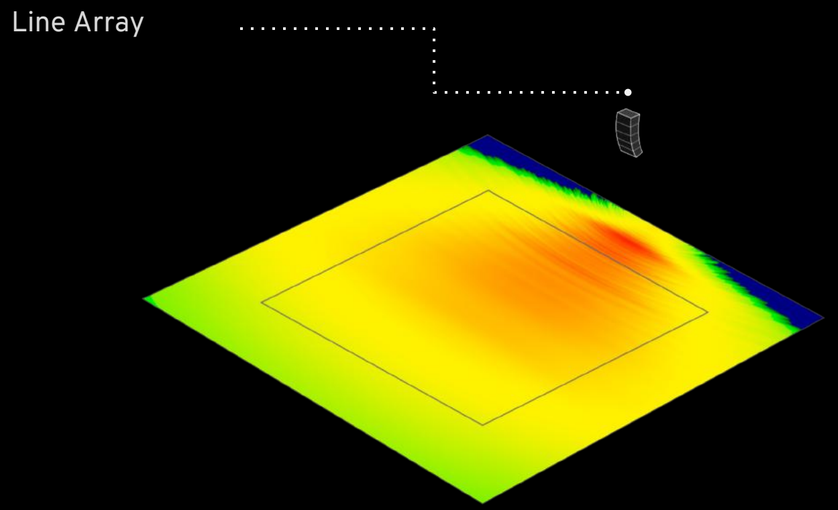
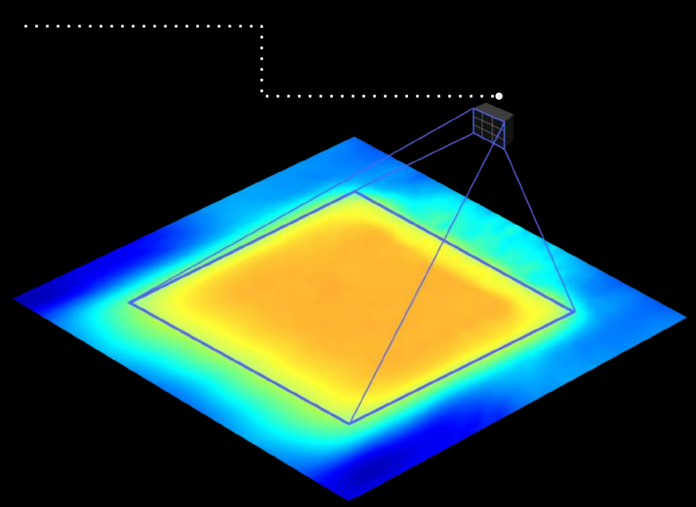
A new level of control

Line Array



- Control in the vertical Axis but fixed dispersion in the horizontal
- SPL reduces by 3dB/doubling of distance for a line source.
- Coverage heavily dependent on physical location of the array

Matrix Array



- Precise control of the sound in both the horizontal and vertical axis
- Consistent level over distance
- Coverage area can be determined through software

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Matrix Array technology

A new era of sound

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Science-based
Software-driven, hardware-enabled

Cloud IoT Platform

Smart Remote Servicing

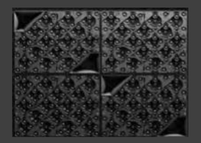
Applications

Integrated end-to-end digital workflow, reducing execution time

Algorithms & OS

Automation, reduction of human error and optimised results

Matrix Array



Unique, fully integrated and scalable system concept

SOFTWARE-DRIVEN

HARDWARE-ENABLED

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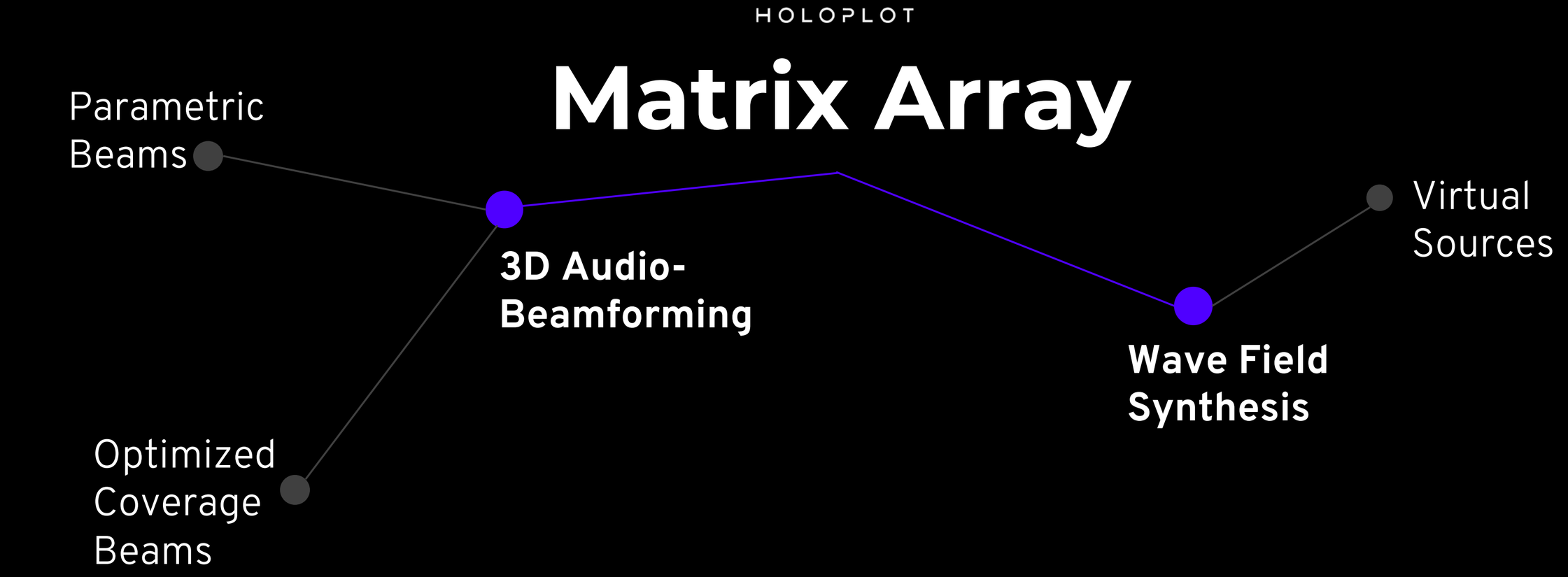
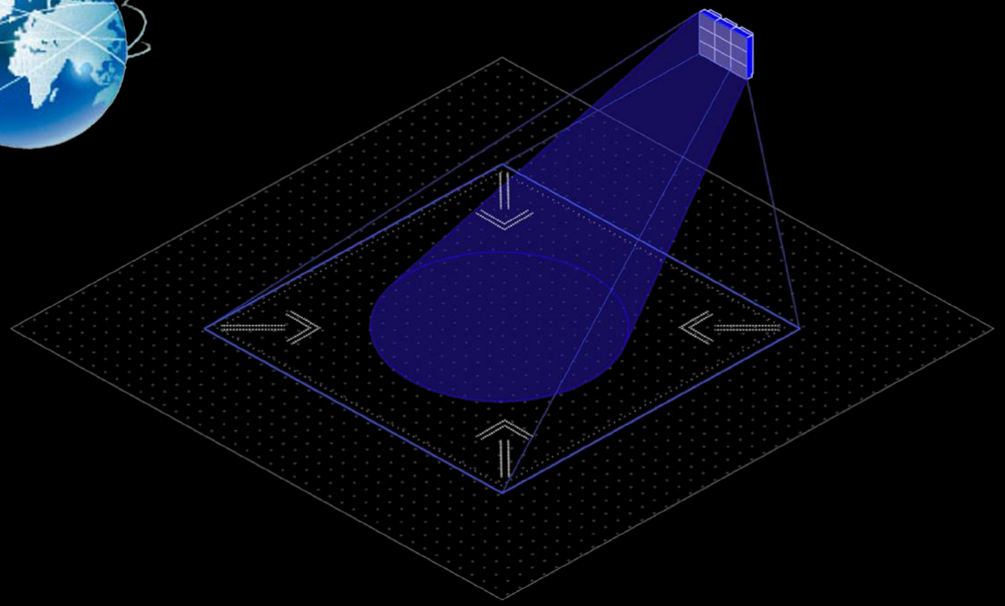
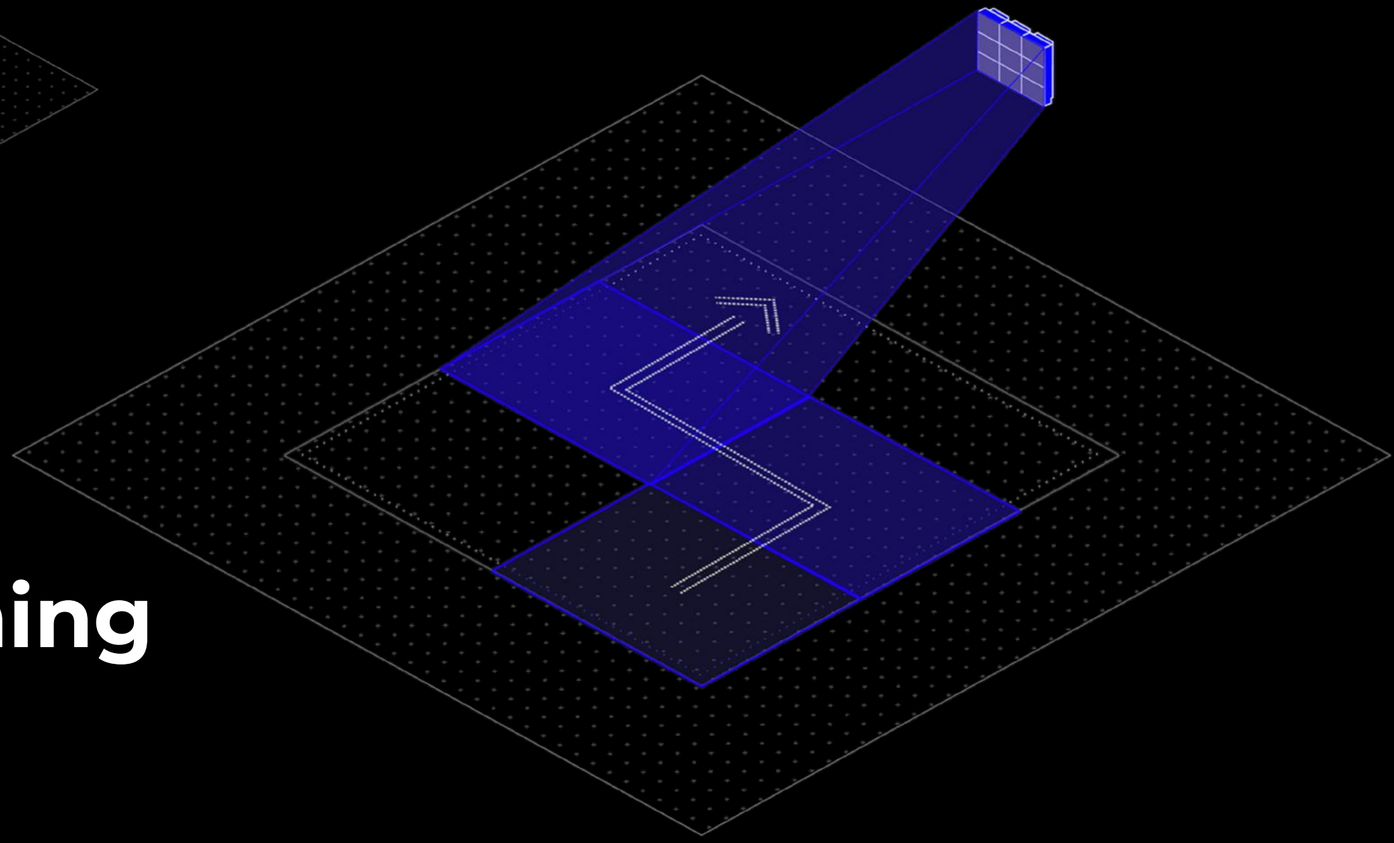
Matrix Array technology pillars







3D Audio-Beamforming

Parametric Beams

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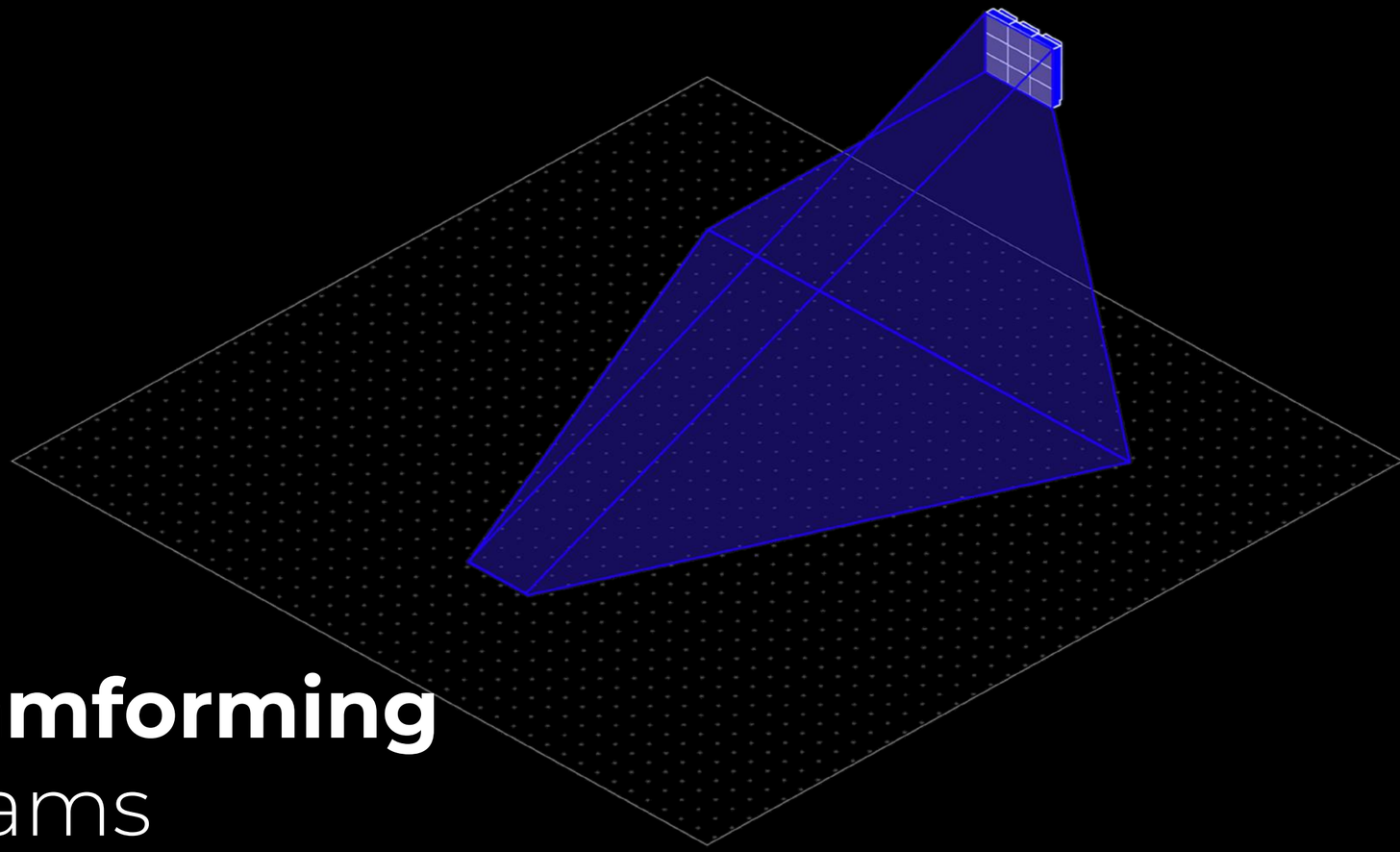

3D Audio-Beamforming

Optimised Beams

HOLOPLOT

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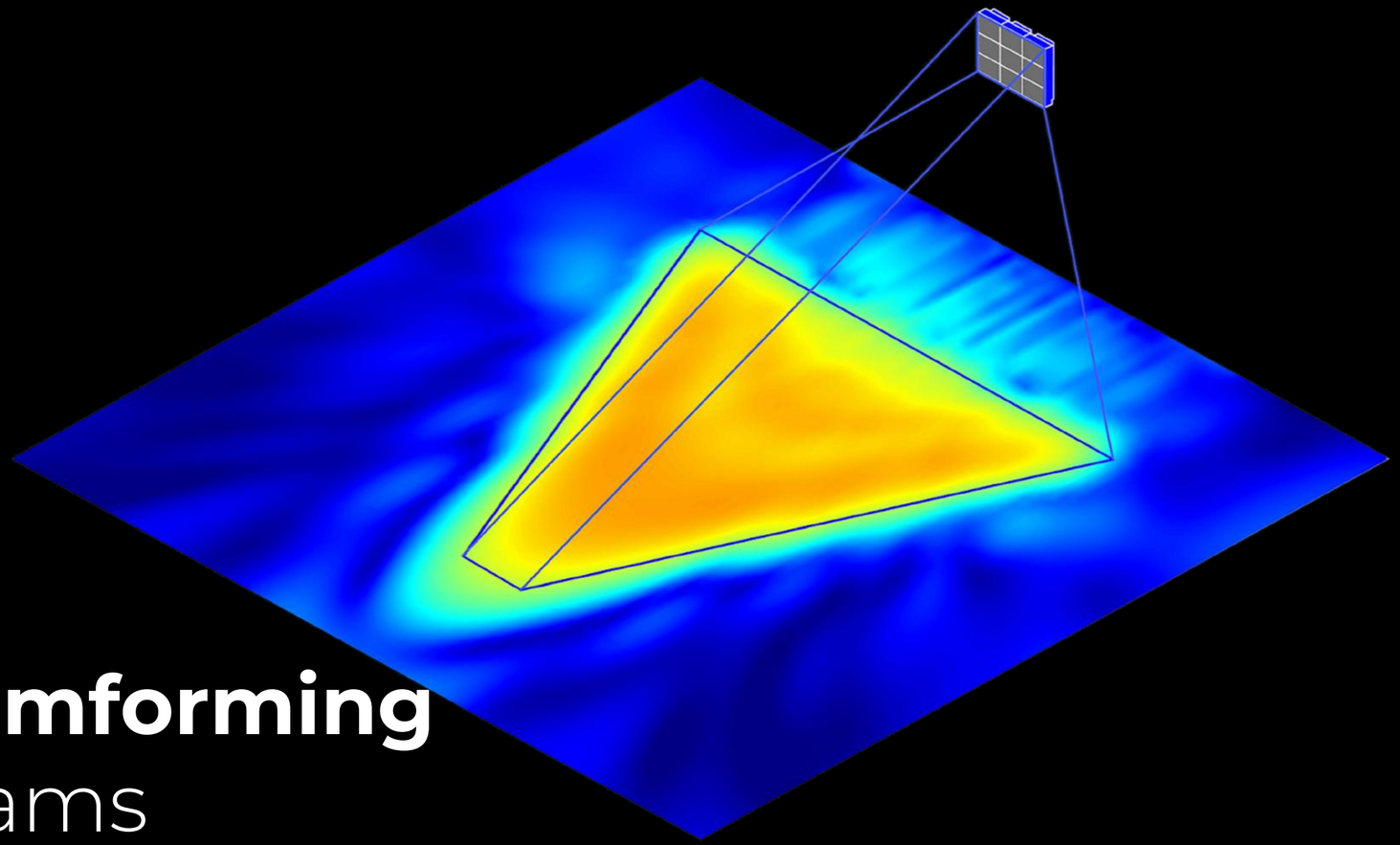
ENDORSED EVENT



3D Audio-Beamforming

Optimised Beams

HOLOPLOT

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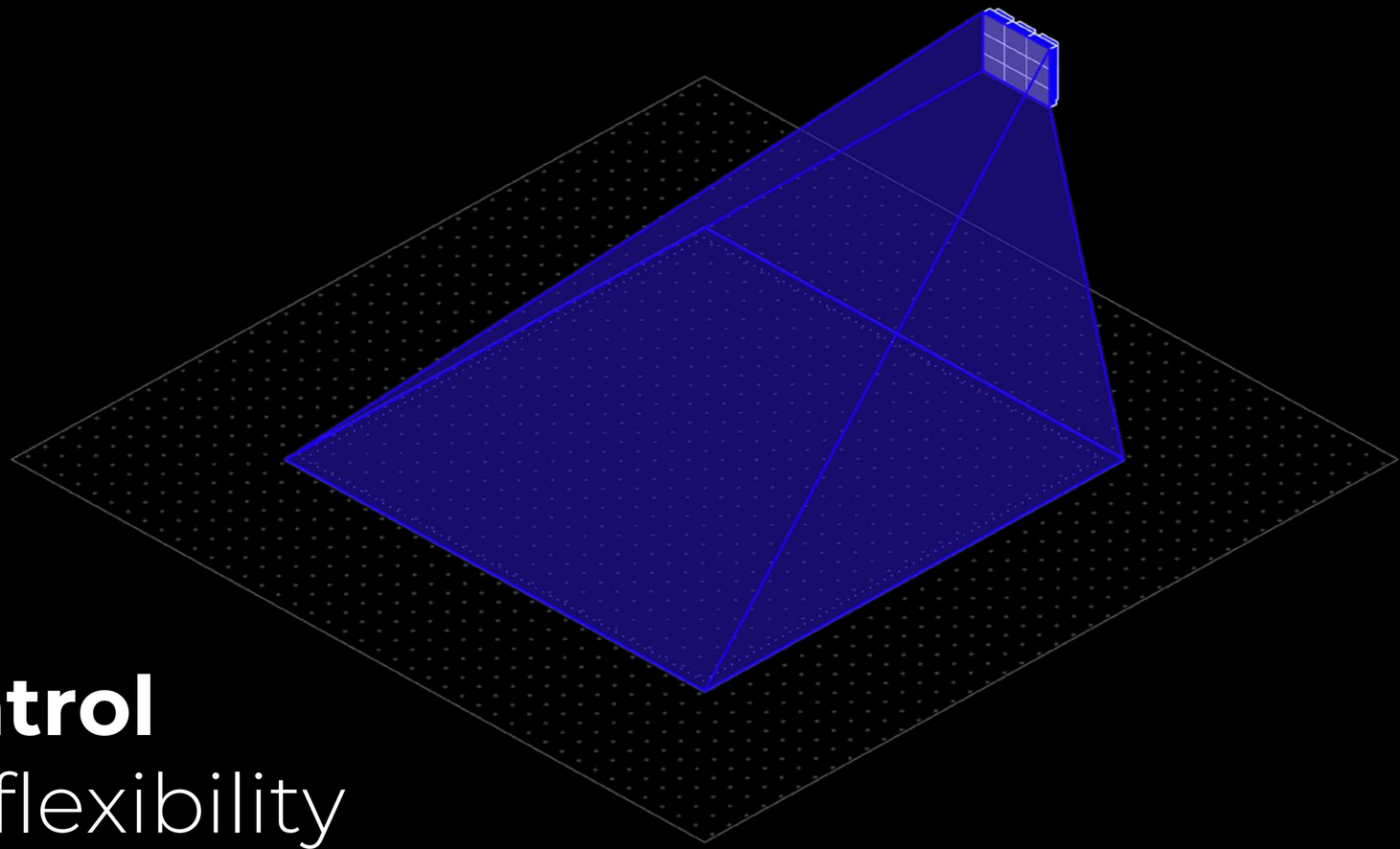
ENDORSED EVENT

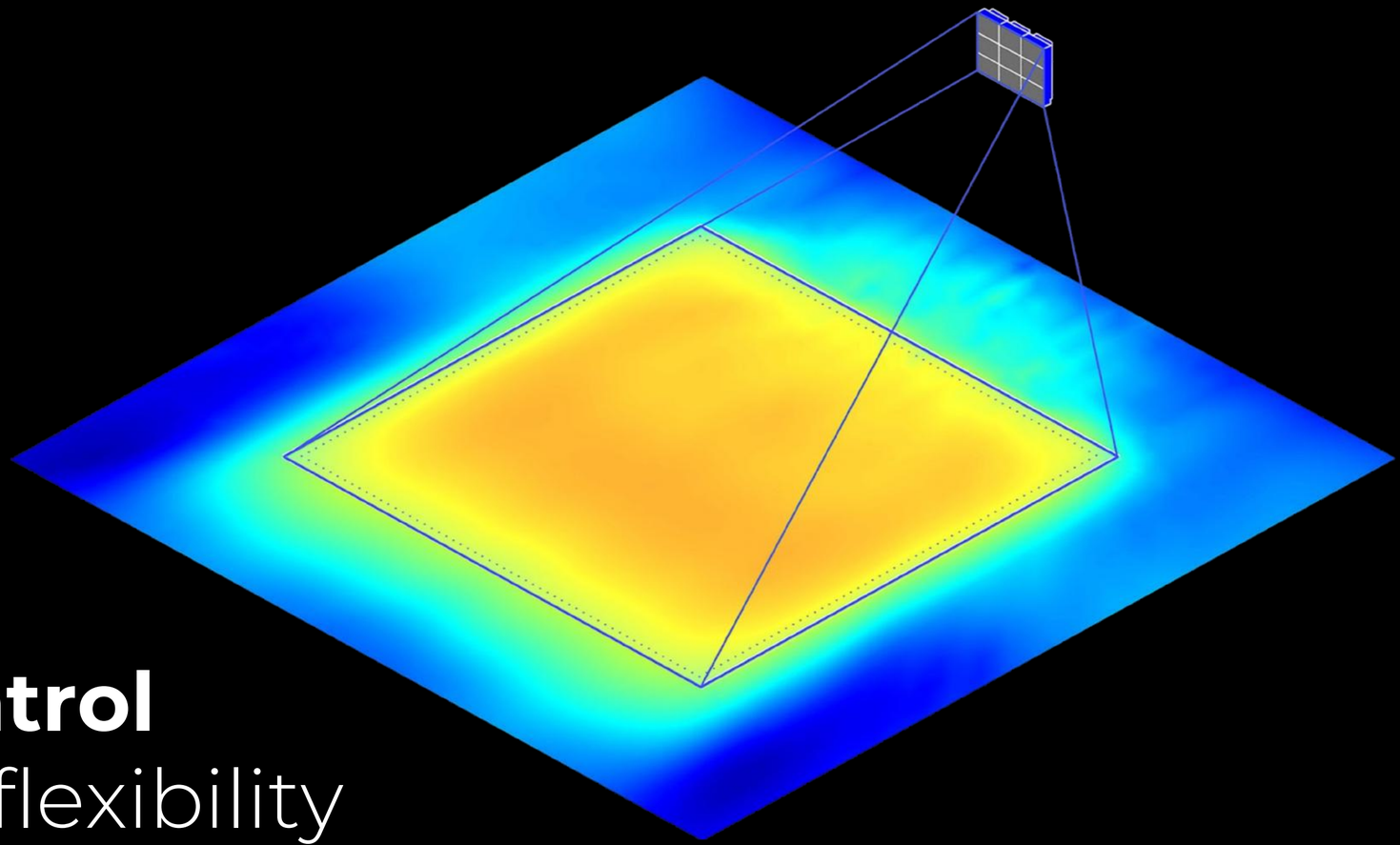


Coverage control

Precision and flexibility

HOLOPLOT

BICSI ENDORSED EVENT

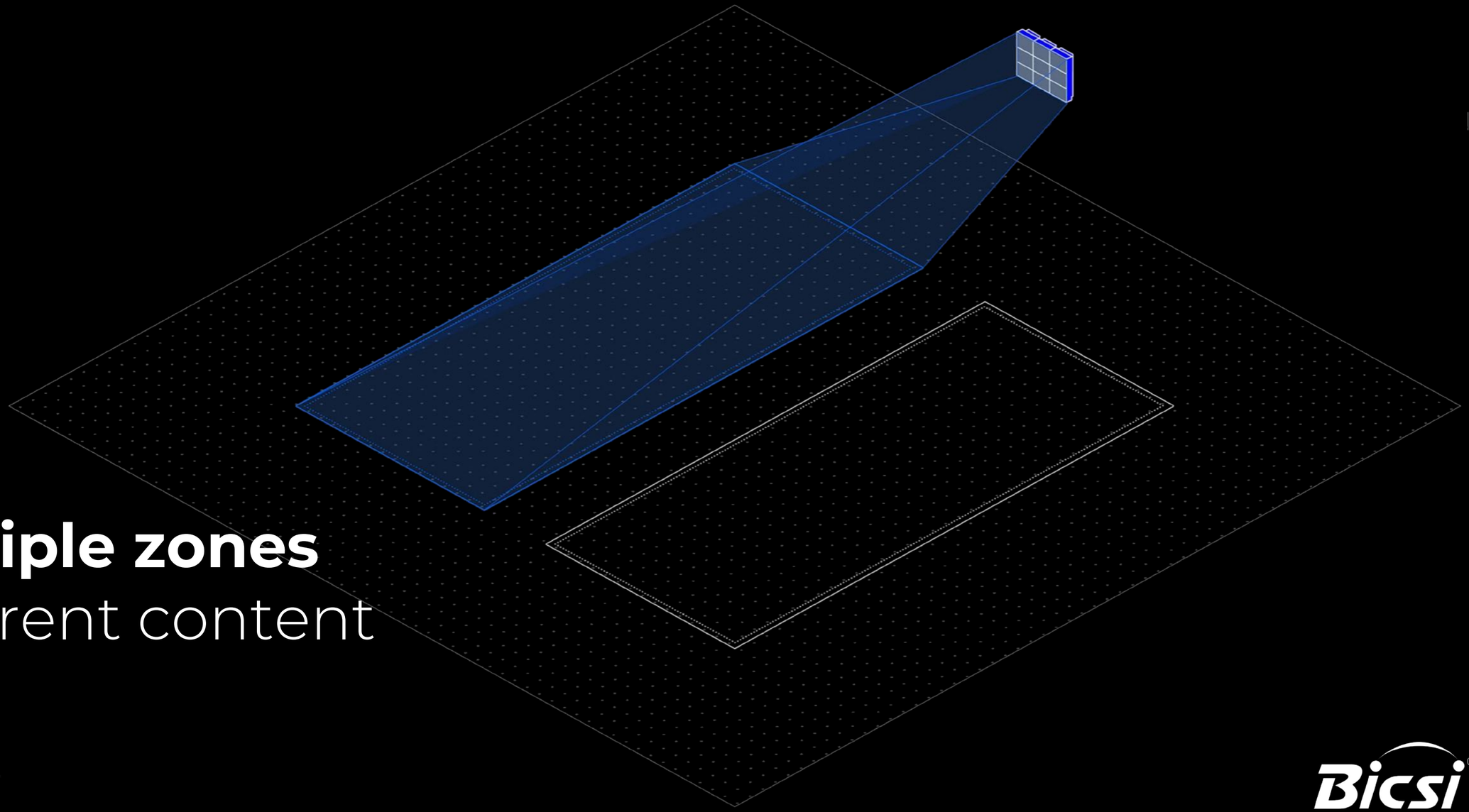


Coverage control

Precision and flexibility

HOLOPLOT

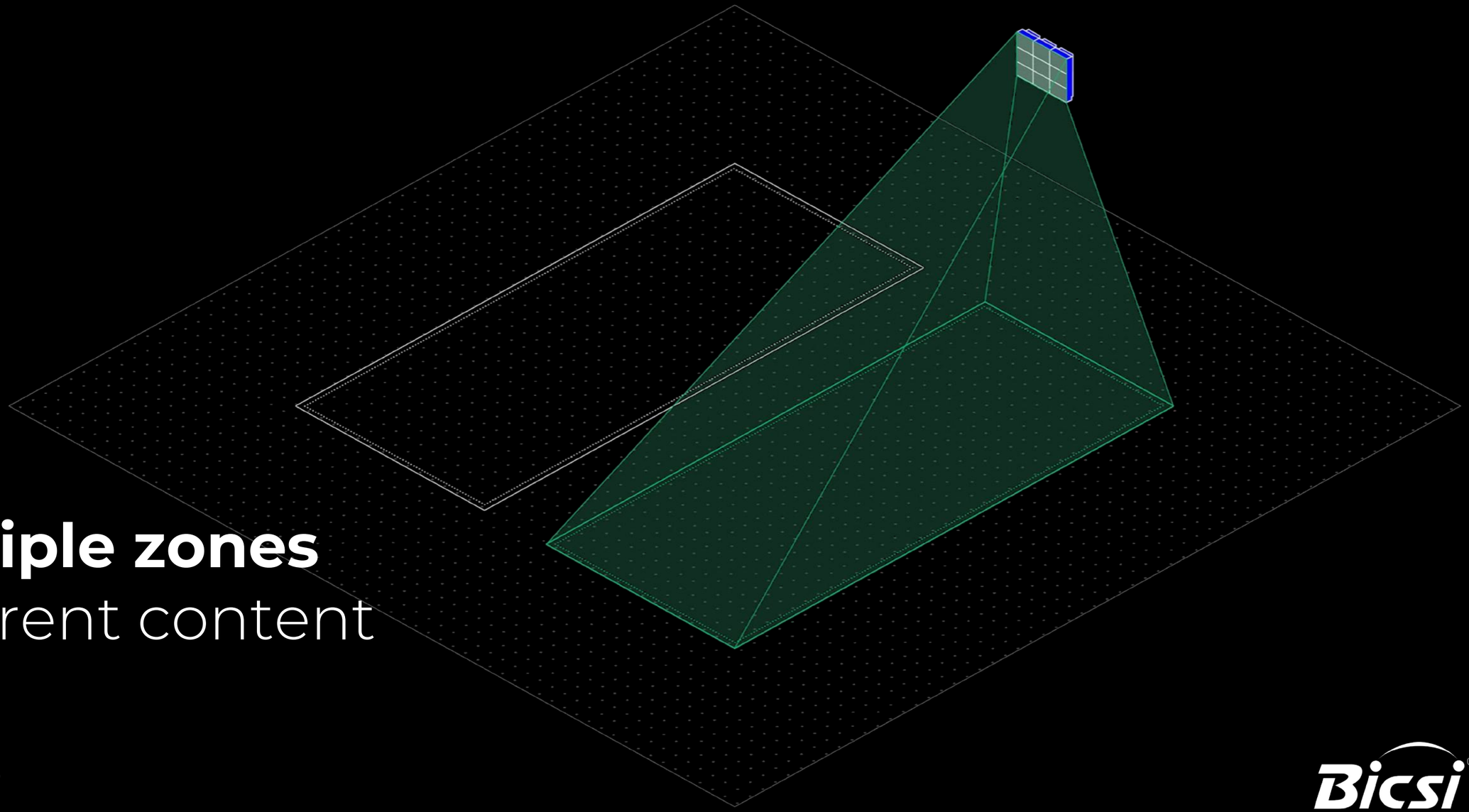
BICSI® ENDORSED EVENT



Multiple zones
Different content

HOLOPLOT

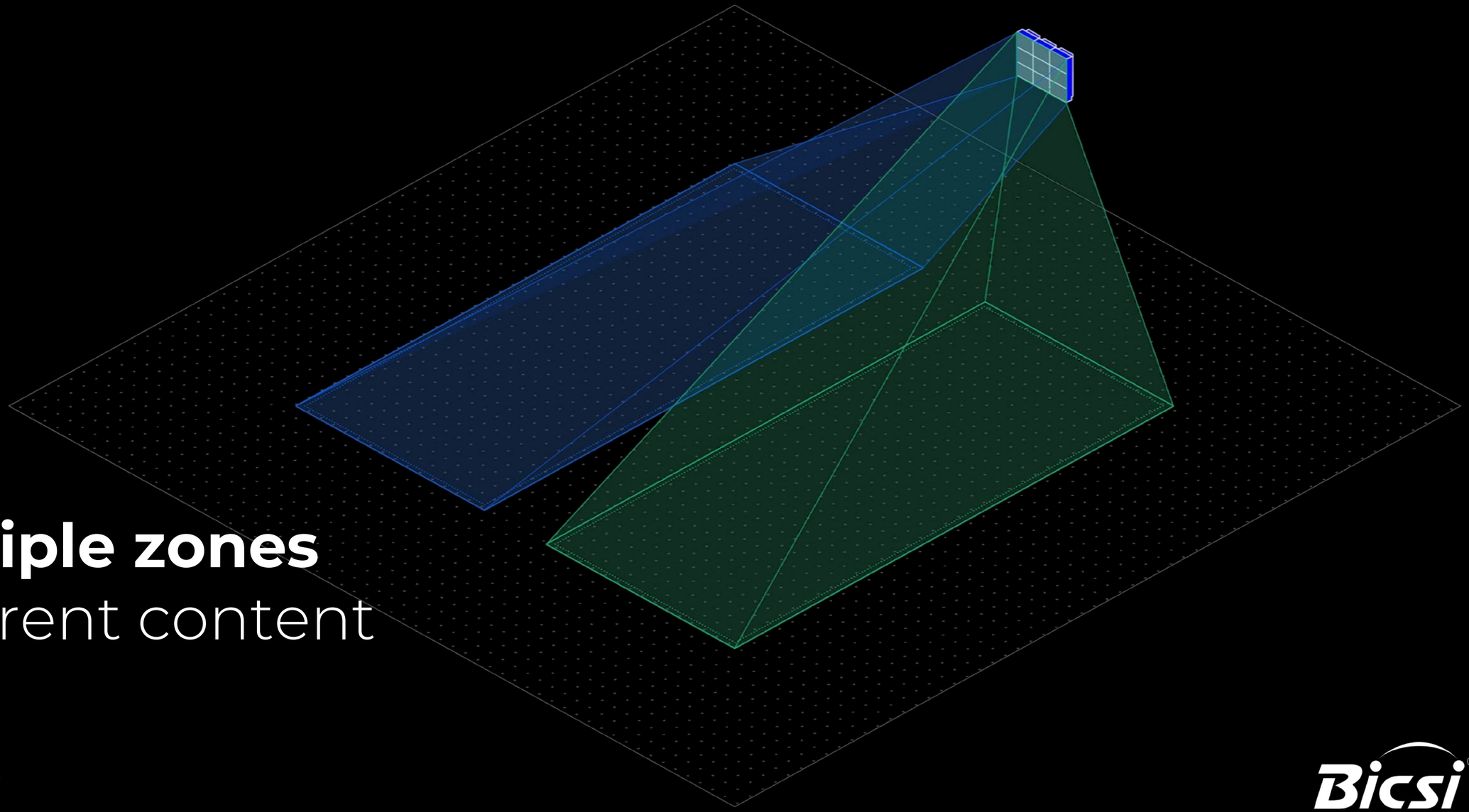
BICSI ENDORSED EVENT



Multiple zones
Different content

HOLOPLOT

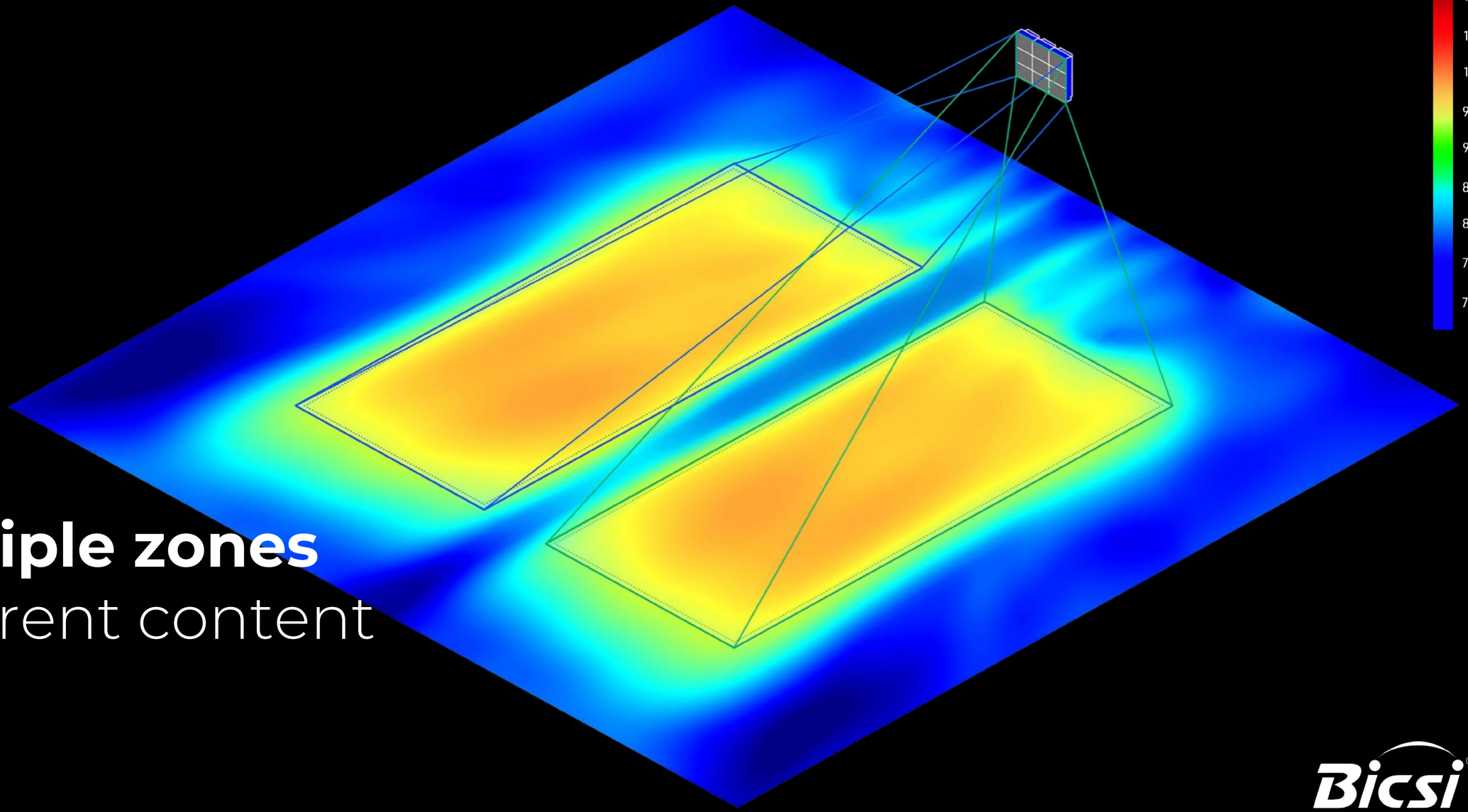
Bicsi®
ENDORSED EVENT



Multiple zones
Different content

HOLOPLOT

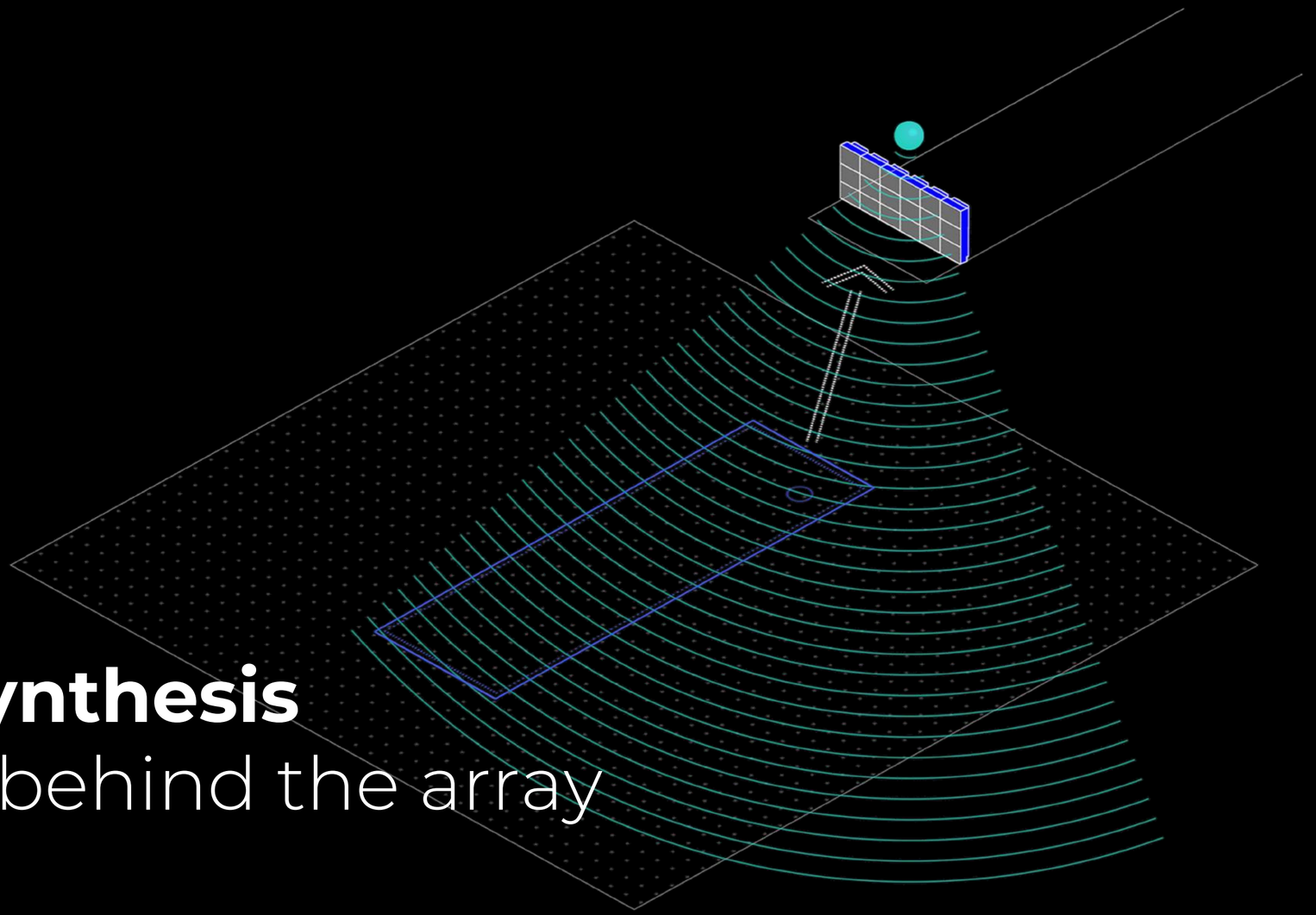
BICSI ENDORSED EVENT



Multiple zones
Different content

HOLOPLOT

BICSI® ENDORSED EVENT

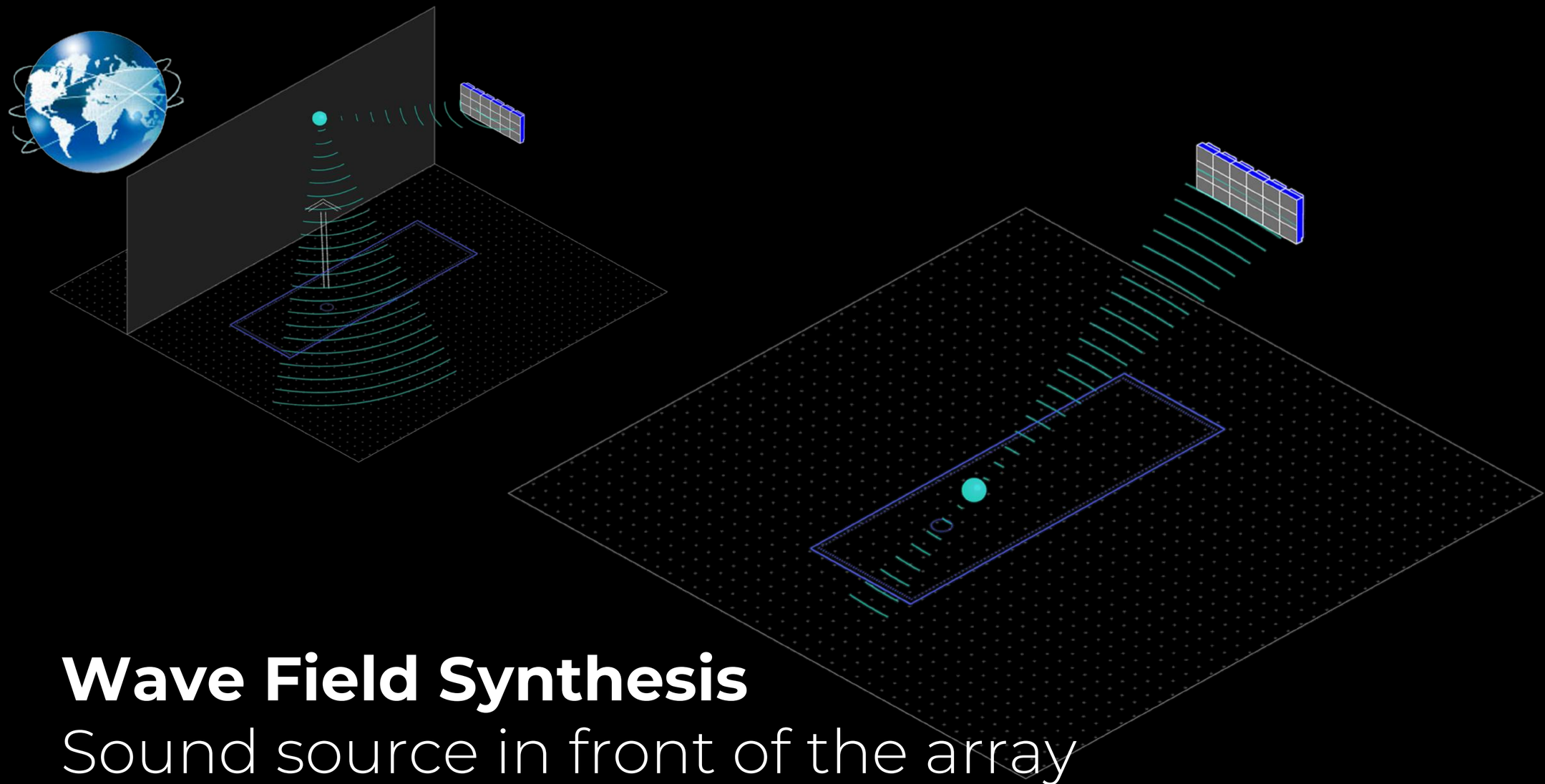


Wave Field Synthesis

Sound source behind the array

HOLOPLOT

BICSI ENDORSED EVENT

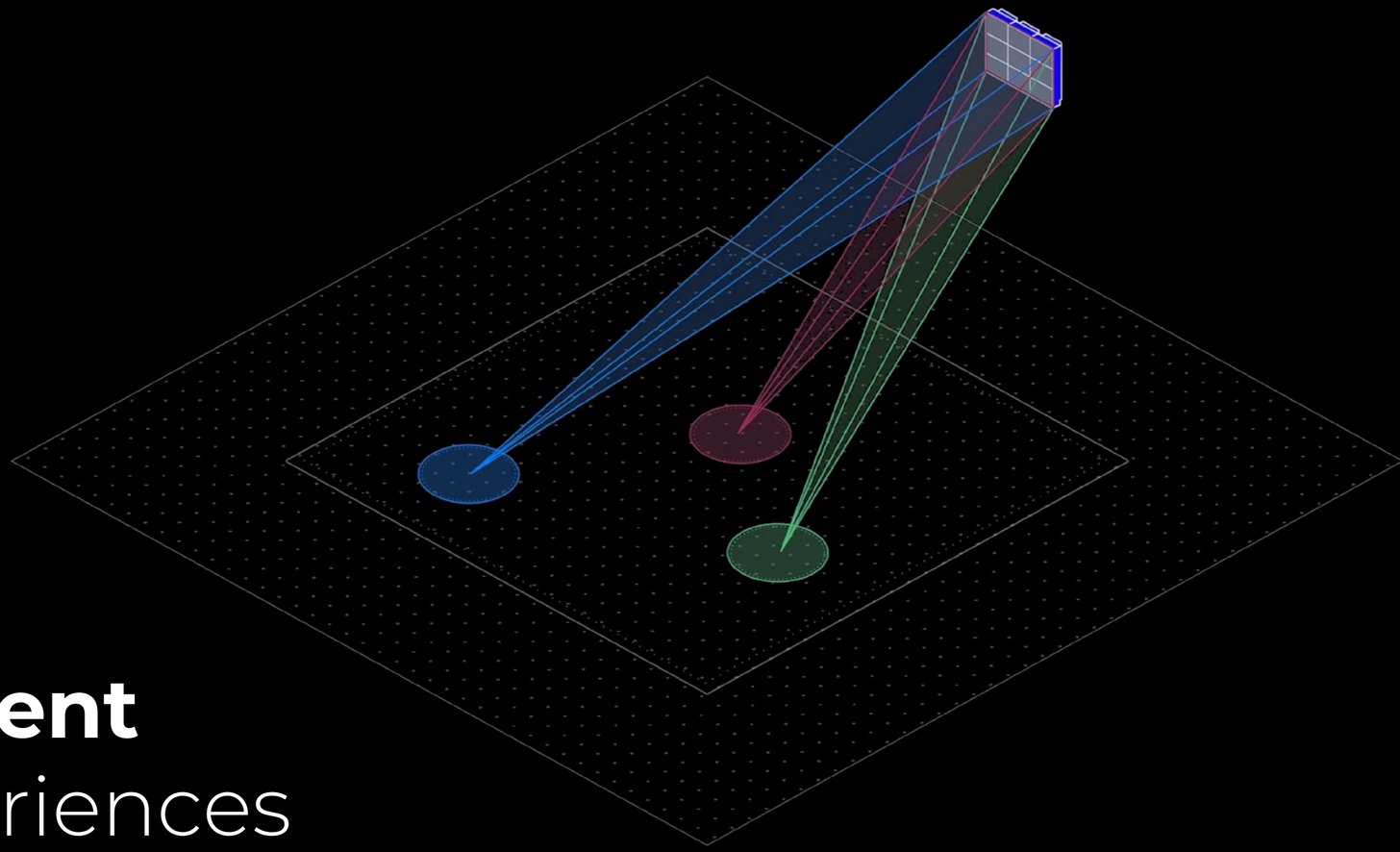


Wave Field Synthesis

Sound source in front of the array

HOLOPLOT

Bicsi®
ENDORSED EVENT

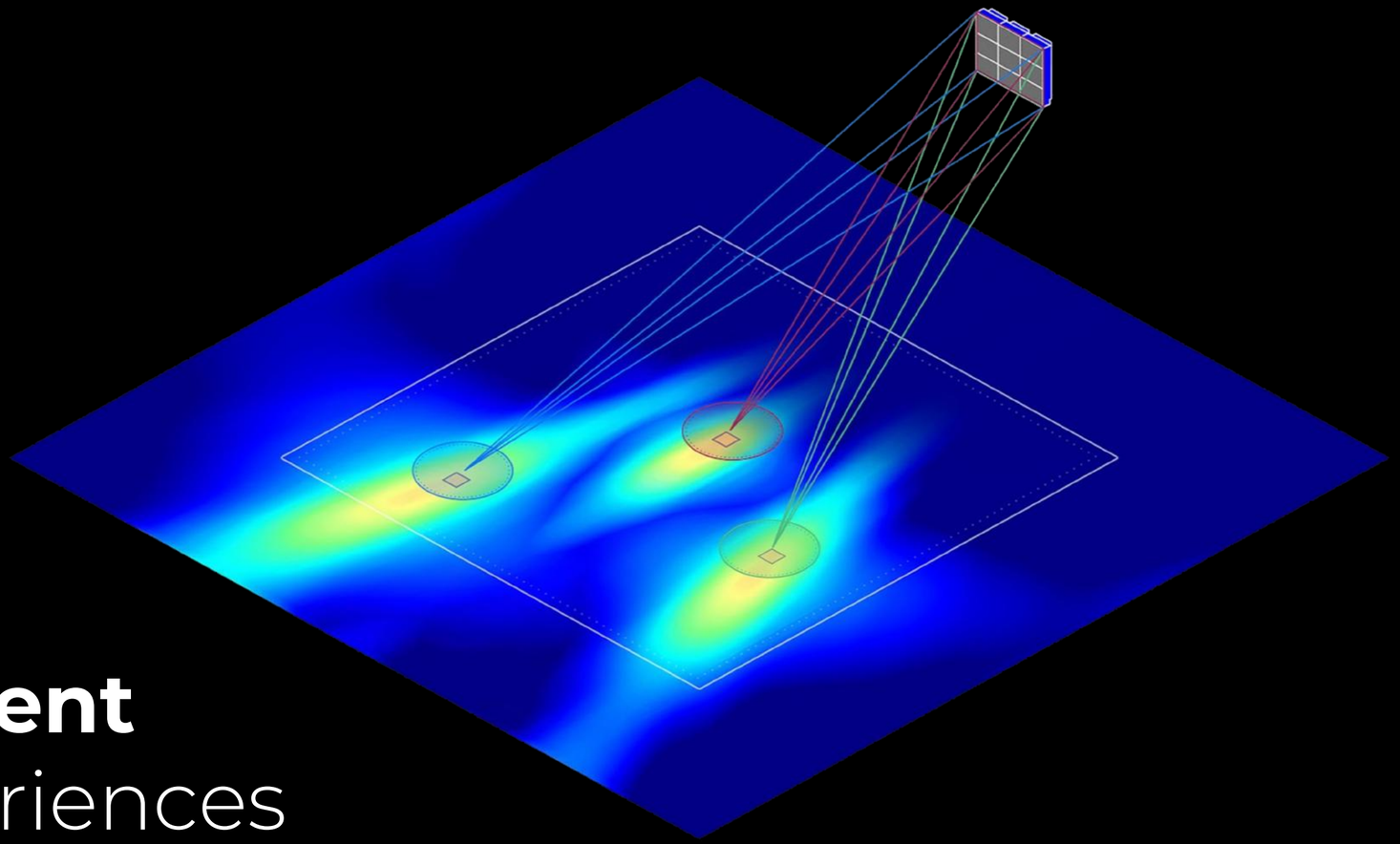


Focused content

Targeted experiences

HOLOPLOT

BICSI ENDORSED EVENT

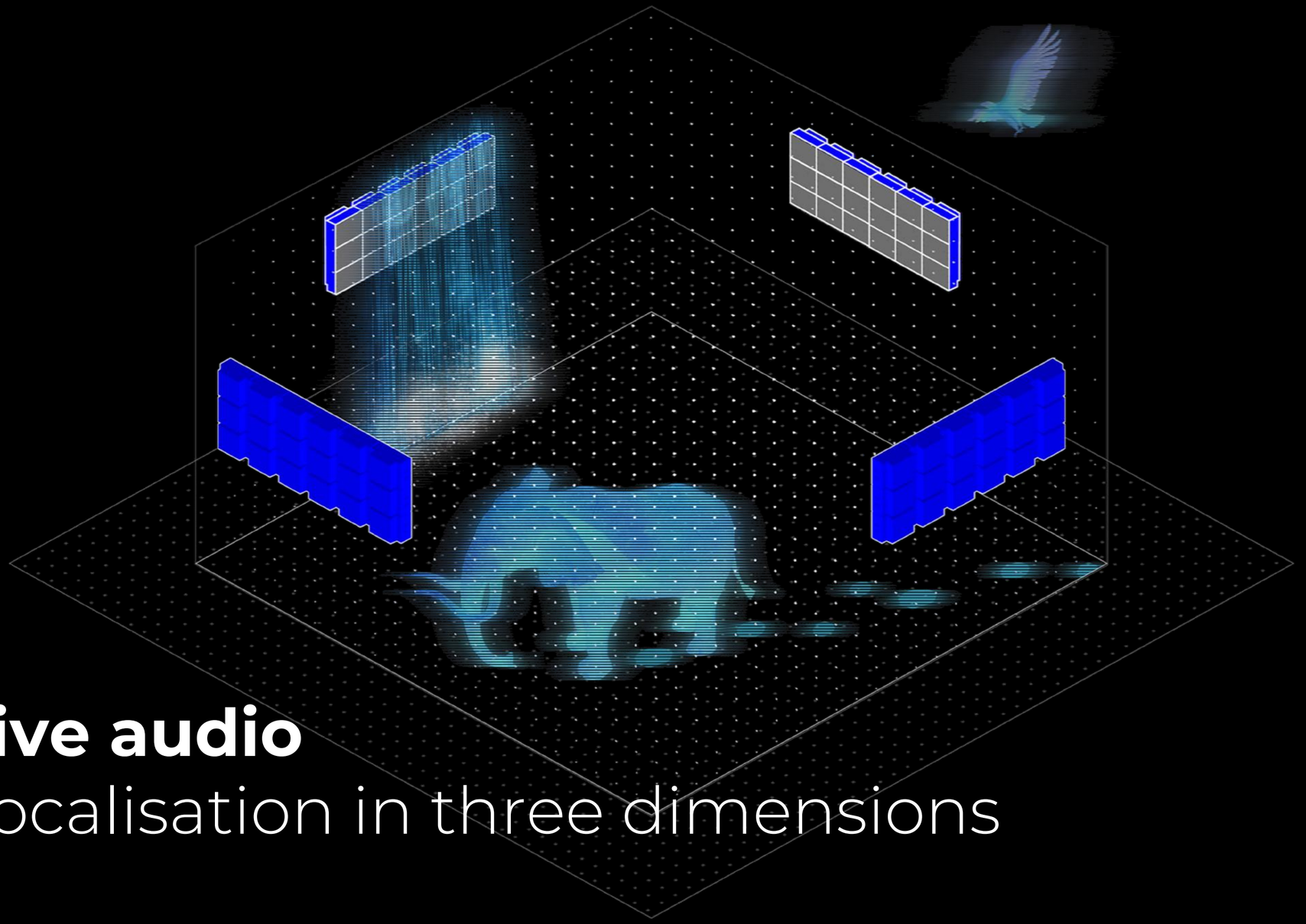


Focused content

Targeted experiences

HOLOPLOT

Bicsi®
ENDORSED EVENT



Immersive audio

Lifelike localisation in three dimensions

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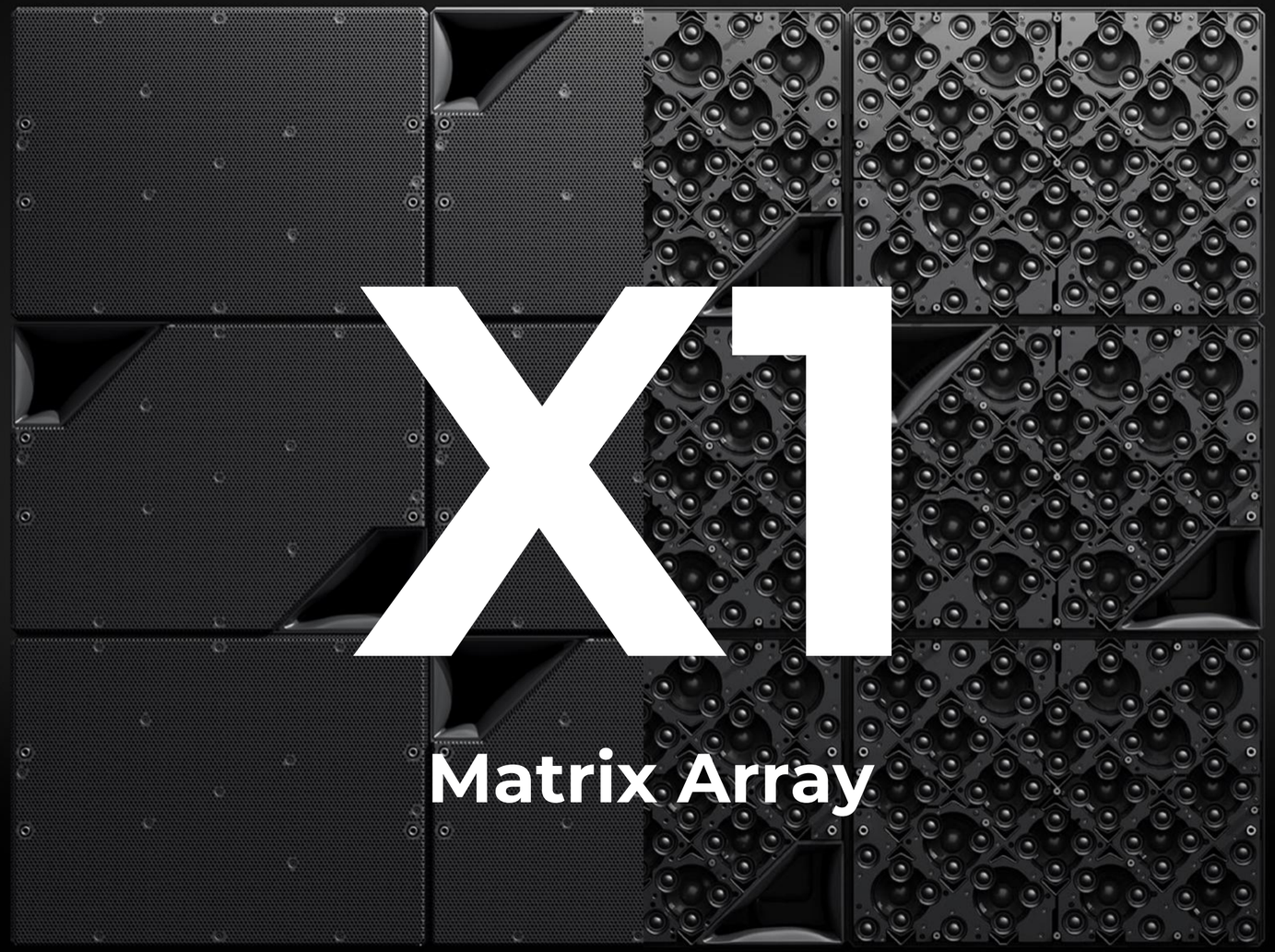

X1

Matrix Array

HOLOPLOT

Bicsi®
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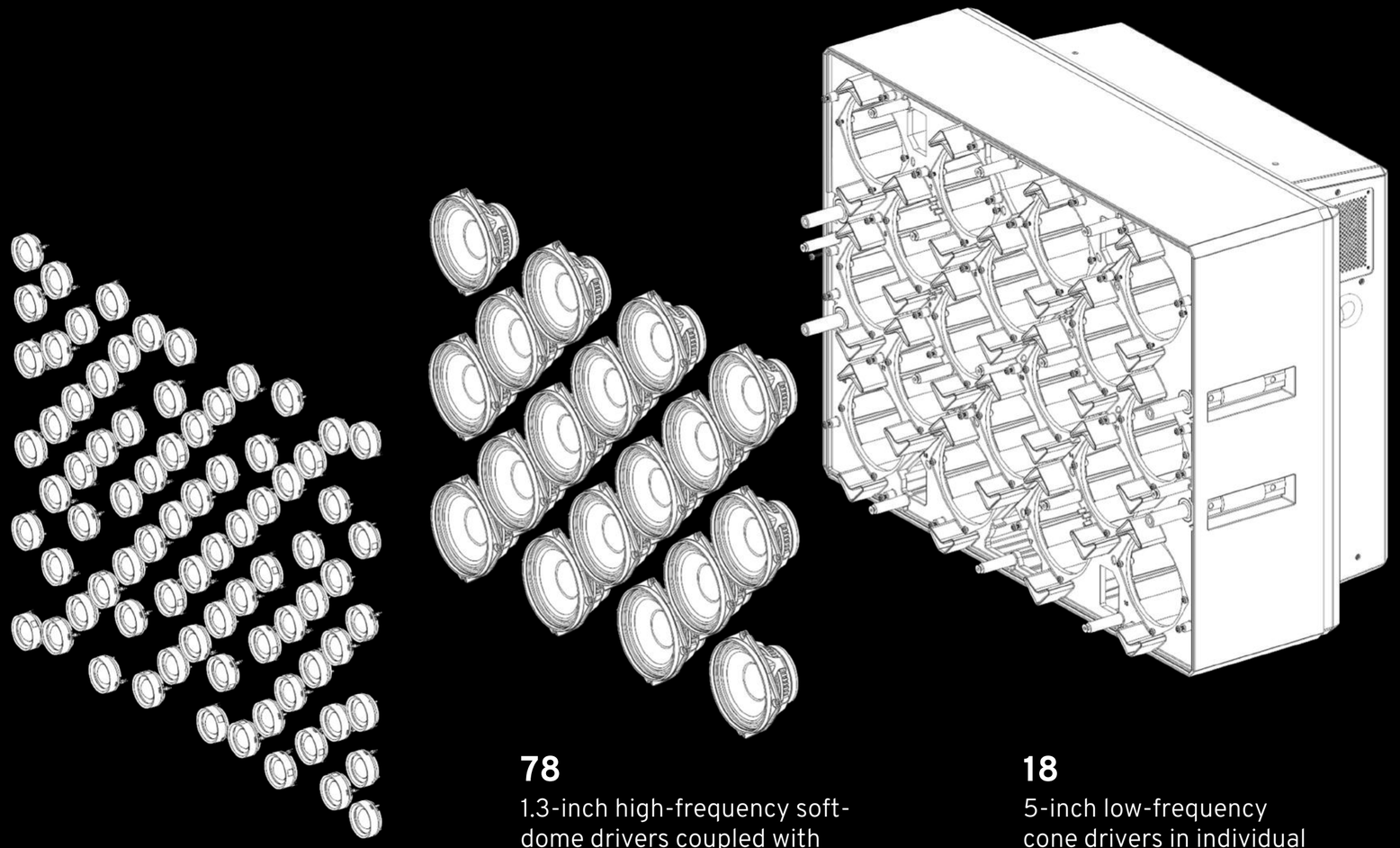
X1 Modul 96

Two-layer Matrix Array



78
1.3-inch high-frequency soft-dome drivers coupled with individual wave guides

18
5-inch low-frequency cone drivers in individual dual-ported chambers

HOLOPLOT

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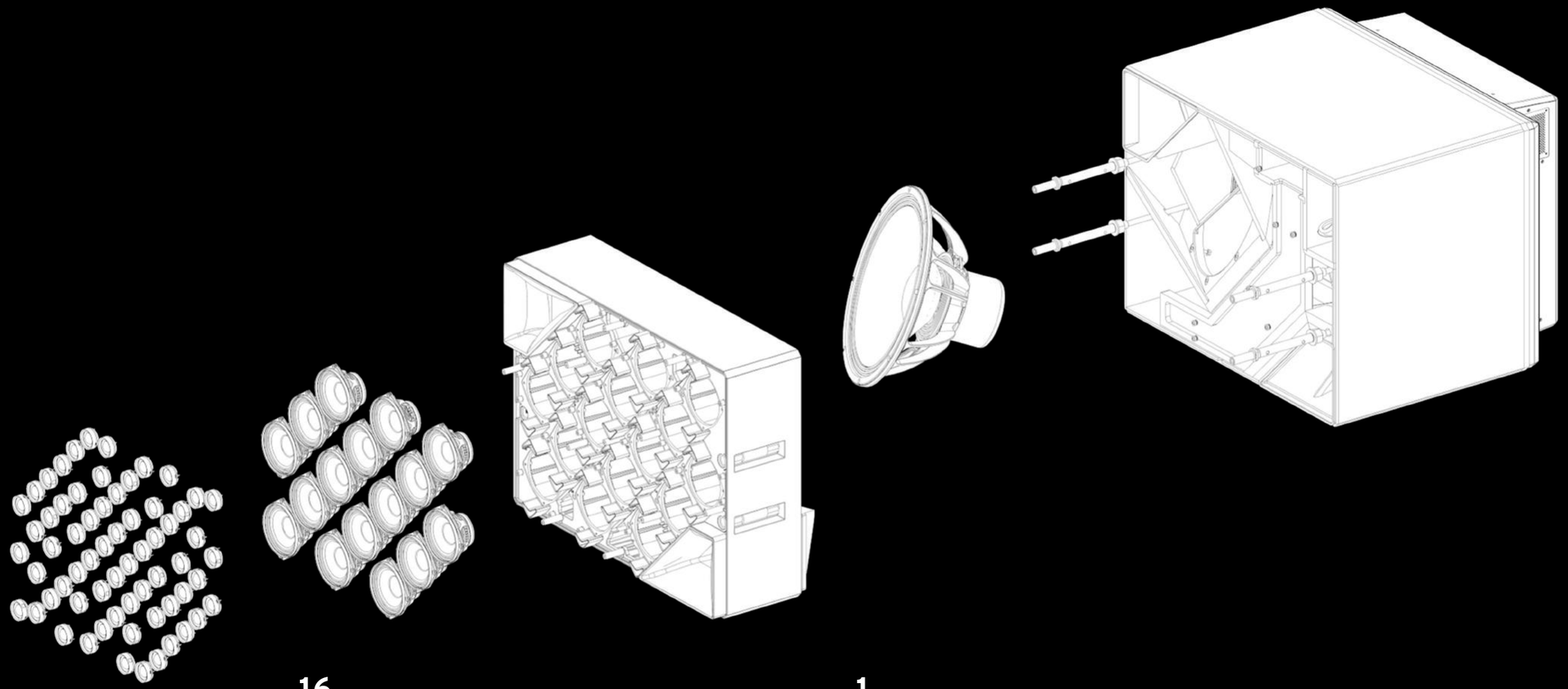
X1 Modul 80-S

Three-layer Matrix Array



64
1.3-inch high-frequency soft-dome drivers coupled with individual wave guides

16
5-inch low-frequency cone driver in individual dual-ported chambers

1
18-inch sensor-controlled subwoofer with two high energy, high density neodymium-iron-boron magnets in a bandpass enclosure with air-flow optimised ports

HOLOPLOT

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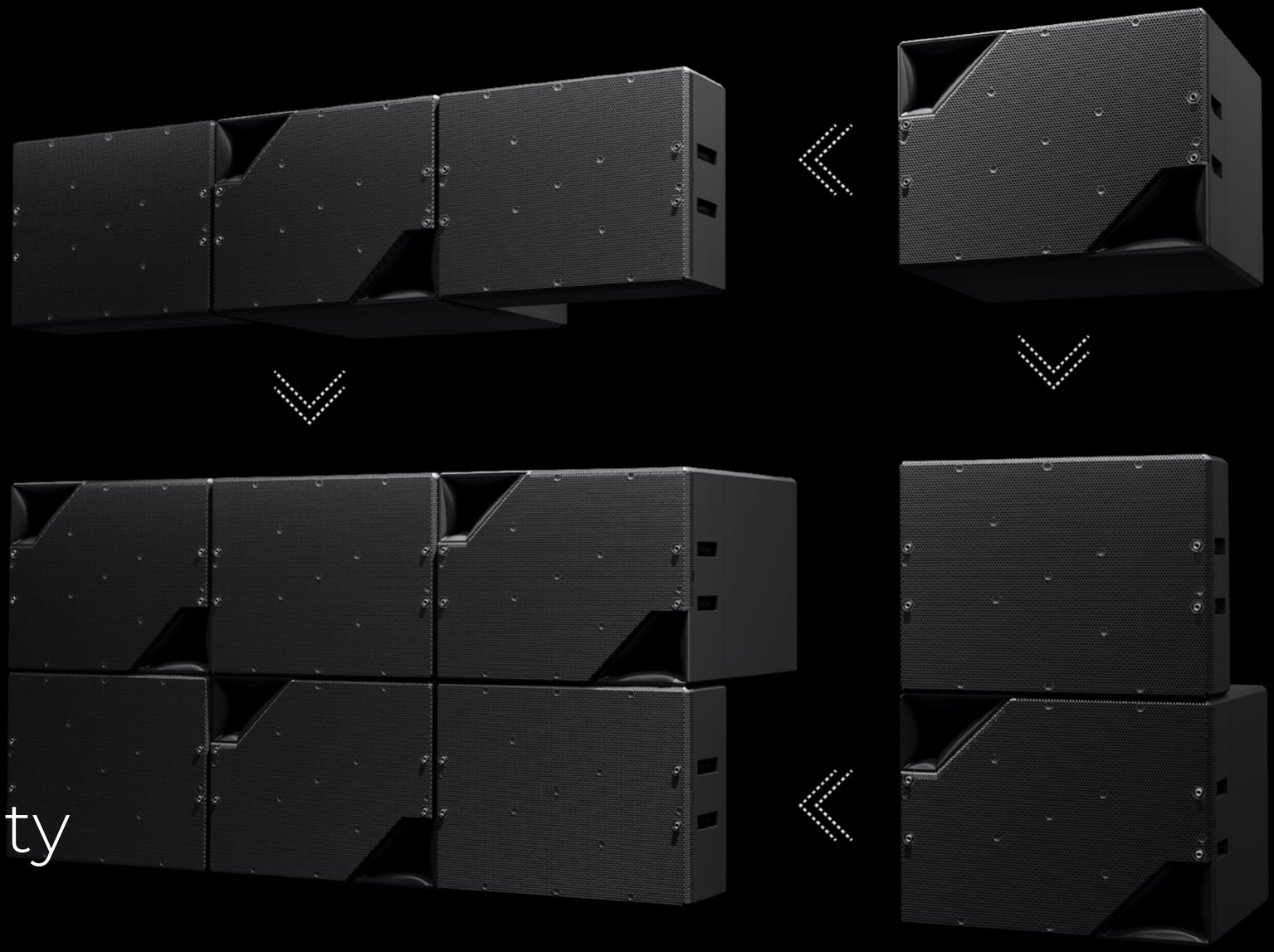

Scalability
through modularity

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More than a speaker
Connected Services

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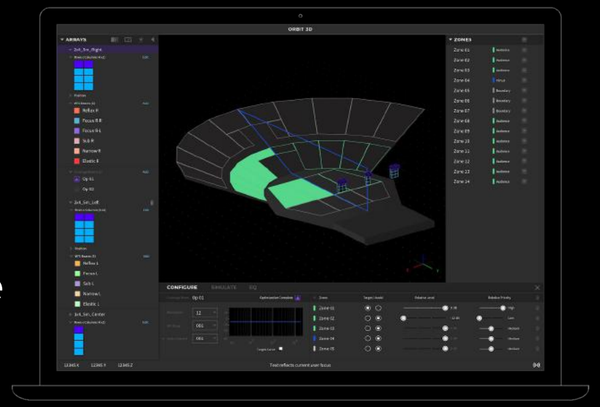
Software & Core Technology

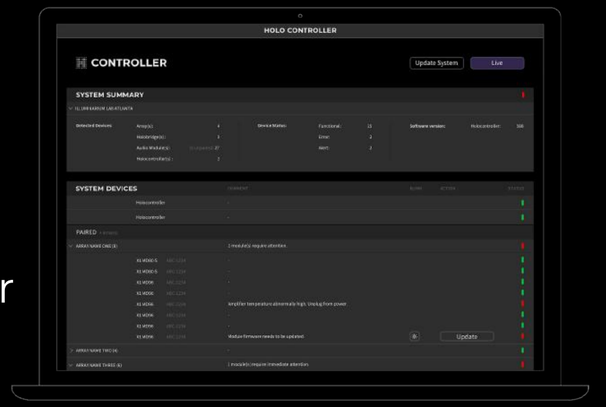
Evolving performance, updates and upgrades

Applications

Planning Tool
Design & configure



Control Interface
Operate & monitor



Core Technology

HOLOPLOT OS
Linux-based, distributed
Audio Operating System

HOLOPLOT
OS

HOLOPLOT Algorithms
3D Audio-Beamforming &
Wave Field Synthesis

HOLOPLOT
DSP

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Internet of things
Smart features, service and monitoring

Full system introspection
Health and performance monitoring of system and components based on a multitude of in-device sensors

Remote monitoring & access
Smart off-site system analysis and issue resolution, and remote system management (e.g. pre-set switching)

Over-the-air updates
Improvements, security updates and new features - making your system better over time

In sync with HOLOPLOT Cloud
All system monitoring and configuration data is backed up for the lifetime of the installation

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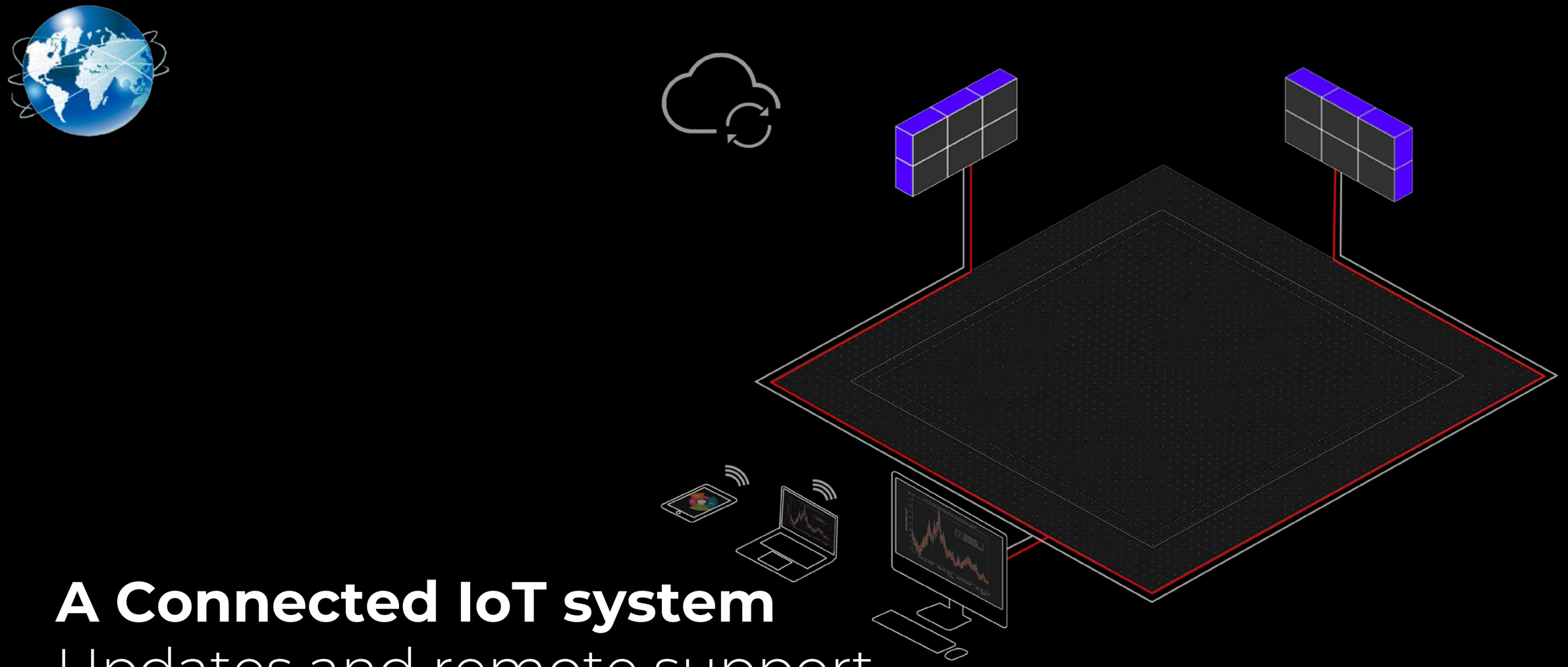

A Connected IoT system

Updates and remote support

HOLOPLOT

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Network and signal chain
Overview

Audio over IP (AES67 / RAVENNA)

Control over IP

Beam settings

Preconfigured into pre-sets by HOLOPLOT design tools, including all beam settings, tuning settings and screen compensation

Input sources

Multiple options including live acts, audio playout and gaming

Note: system is fully redundant (control and audio), automatic stream failover

Show control

Integrates HOLOPLOT API for pre-set switching, adjustment of environmental conditions, watchdogs, monitoring

HOLOPLOT Controllers

Gateway for control and monitoring, apply presets / settings

Mixing Console Cores

IP network DSP for AES67 / RAVENNA

Note: HOLOPLOT Control (UI) is used for metering, detailed health monitoring, system event logging, and routing audio streams

Audio delivery

HOLOPLOT
Audio Modules

HOLOPLOT

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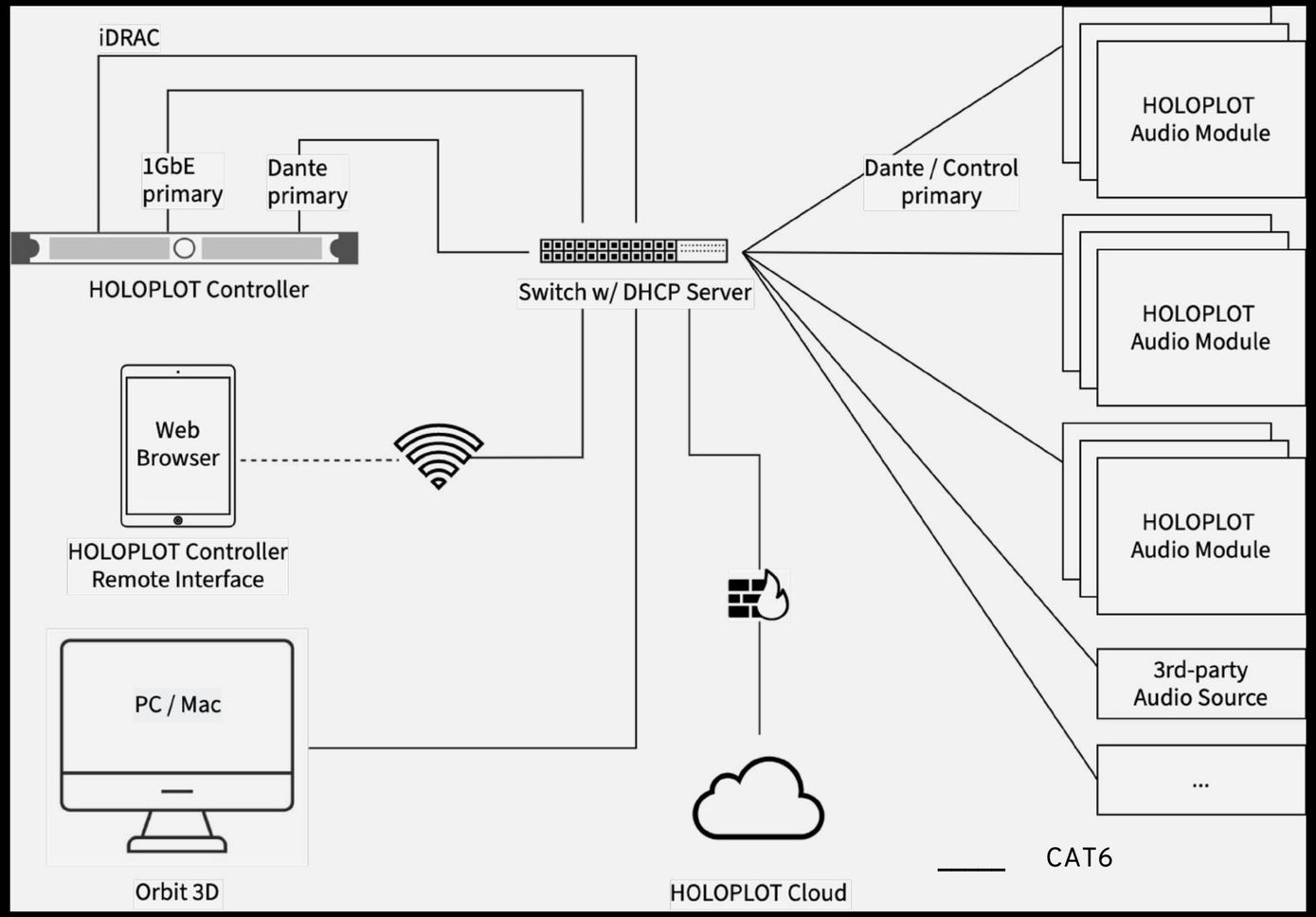
Minimum system setup
System design



System Setup
HOLOPLOT Controller and single switch

HOLOPLOT

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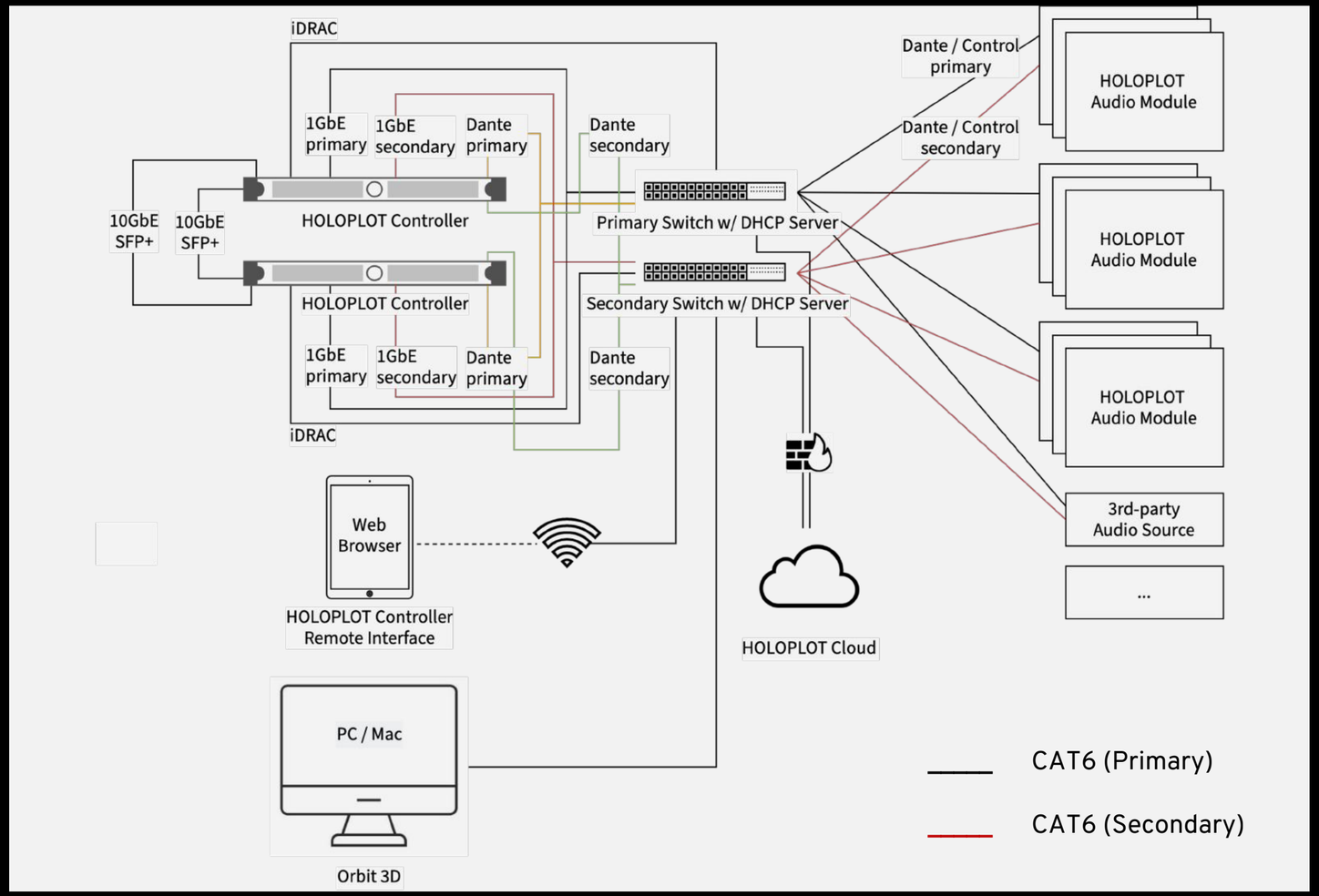
Network redundancy
System design



System Setup

Network with two redundant HOLOPLOT Controllers and two redundant switches

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Audio over IP
Ravenna

What is RAVENNA?
RAVENNA is an **open solution** for real-time distribution of audio and other media content in IP-based network environments. Utilizing standardized network protocols and technologies,

RAVENNA can operate in existing network infrastructures and is fully AES67 and SMPTE ST 2110-compliant. This makes RAVENNA one of the most future proof solutions on the market right now.

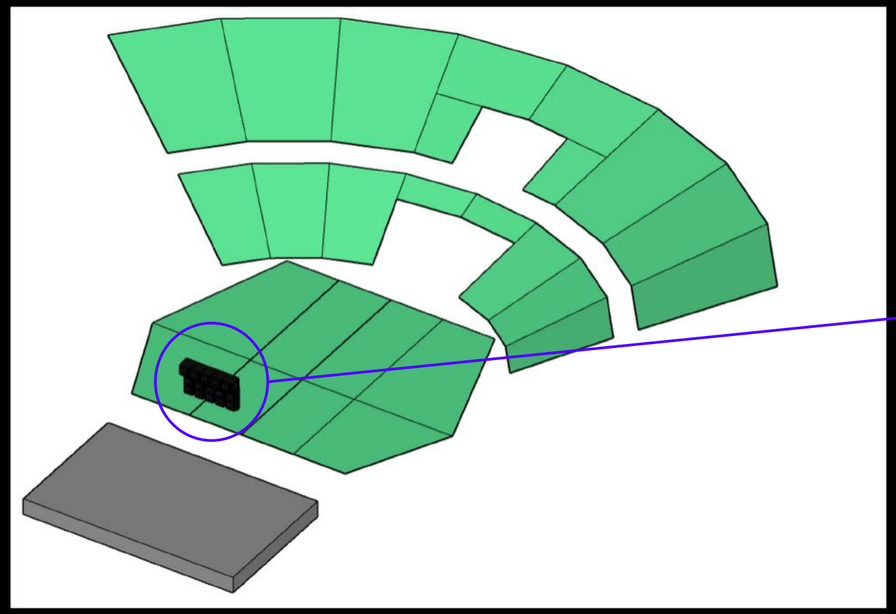
Benefits of RAVENNA
RAVENNA offers the best performance characteristics of any Audio-over-IP transport solution on the market today:

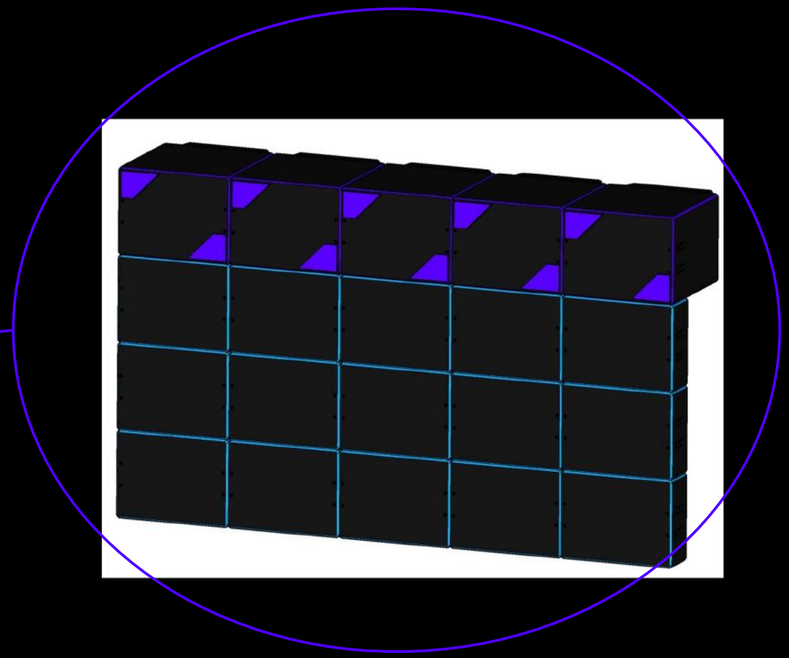
- Always multicast
- very low latency
- full end-to-end redundancy
- routable across VLANs

While other AoIP protocols are closed, RAVENNA is completely open. This means that anybody can access the description of the protocol.

Ravenna audio streams to the HOLOPLOT system are generally configured to meet AES67 specification, i.e. 8-channel, 48 kHz, 24 bit.

Use case: centralized





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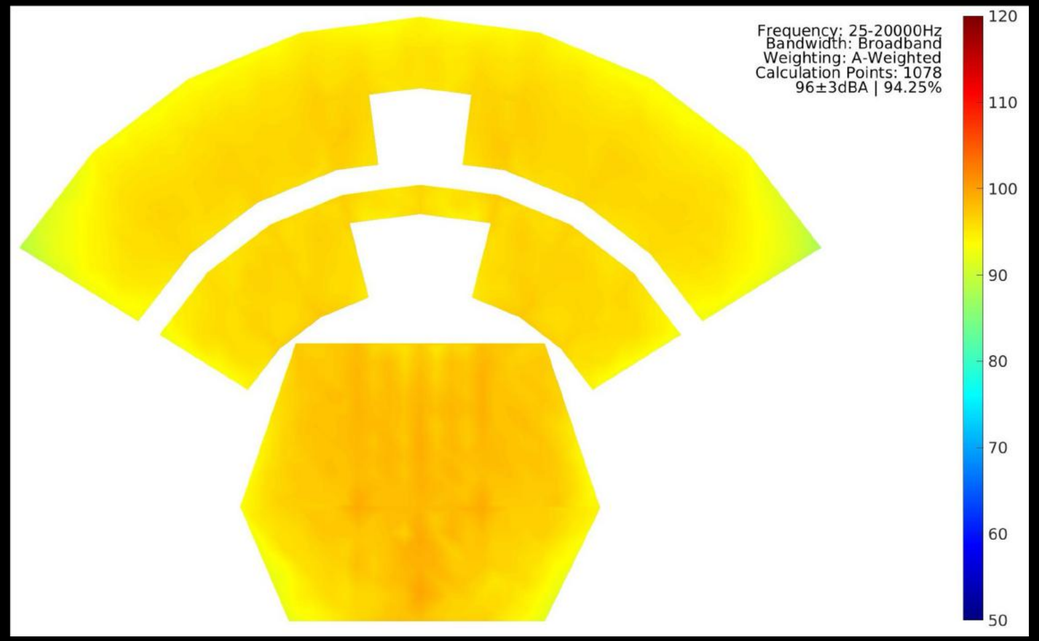
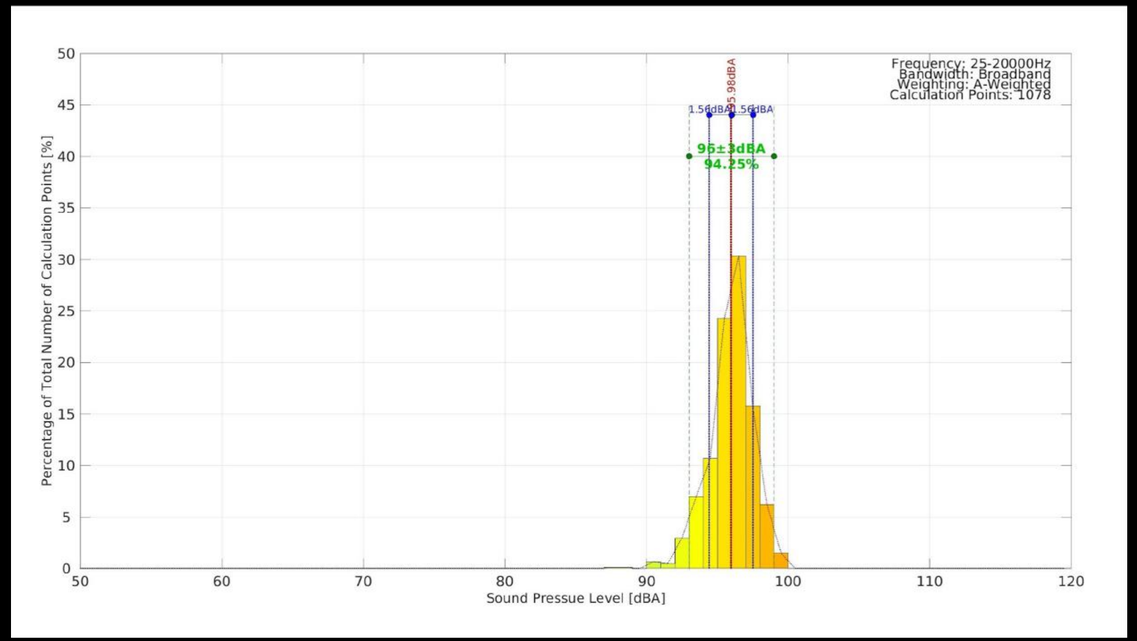
Direct SPL

Homogeneous broadband coverage





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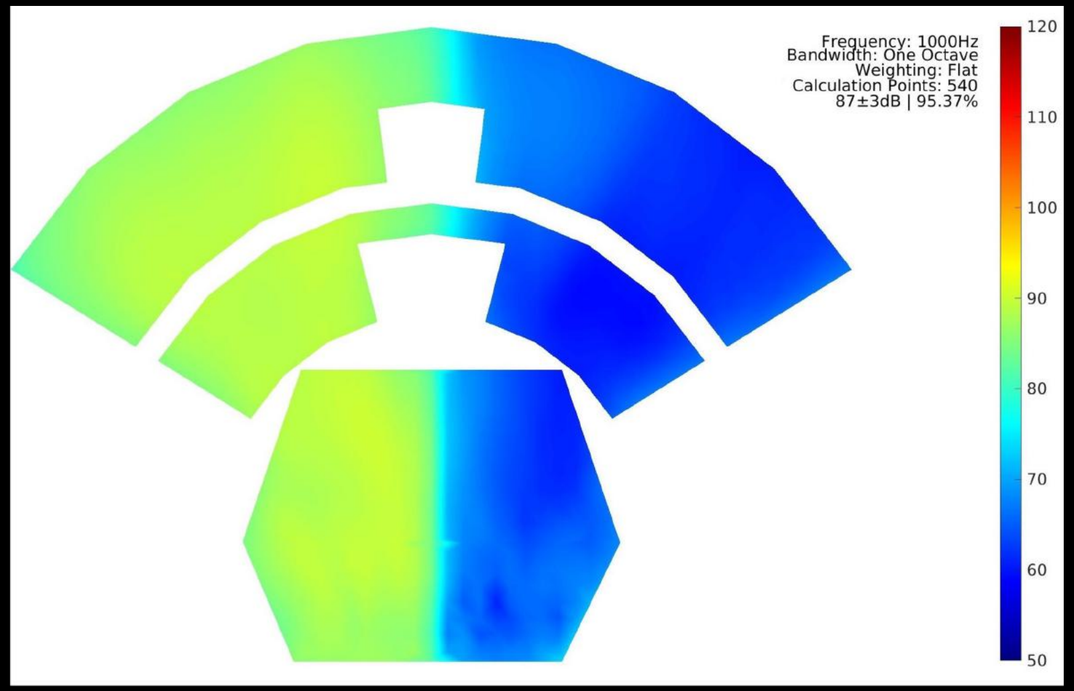
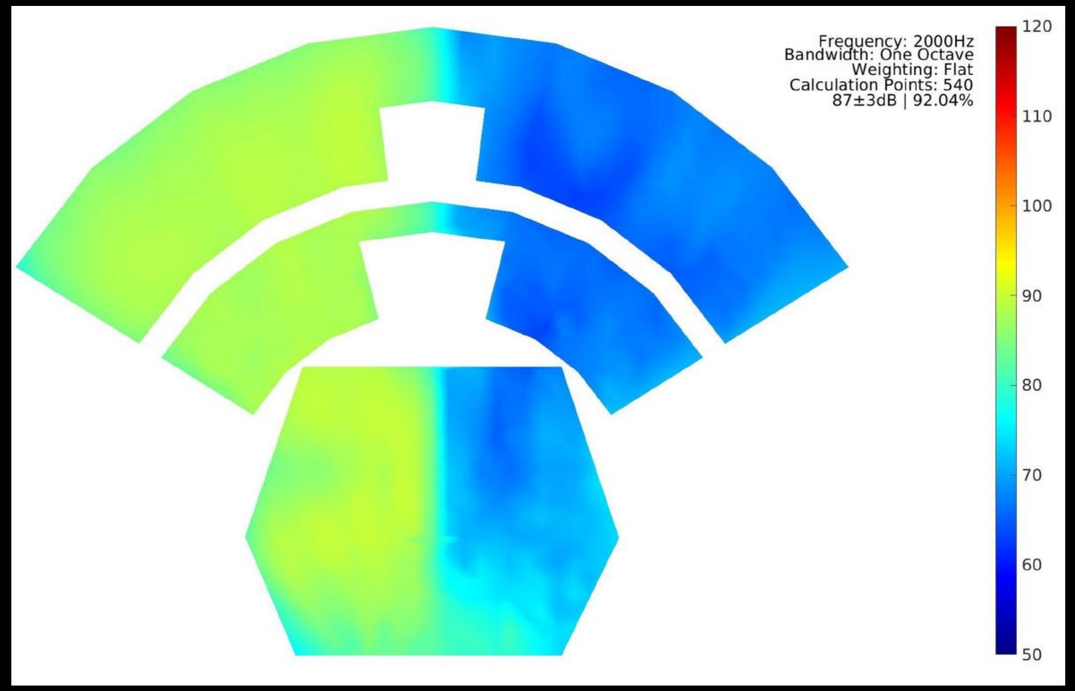
Audio content zoning

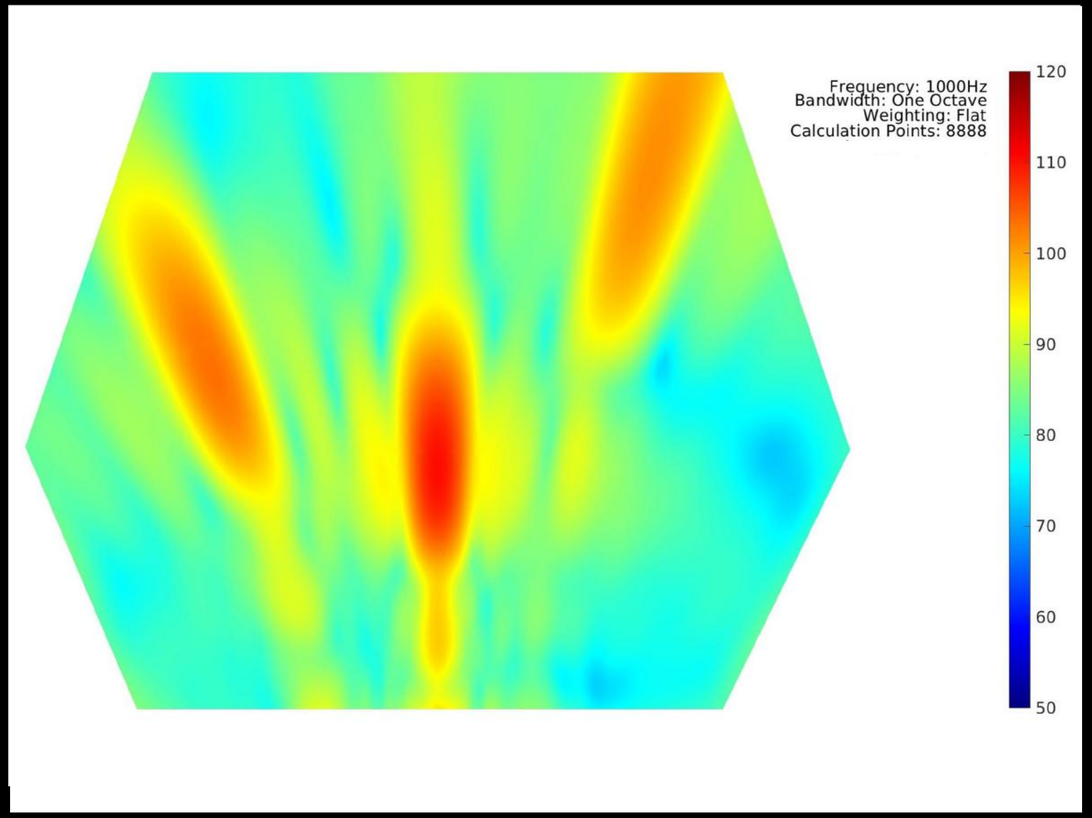
Horizontal separation at 1 and 2 kHz

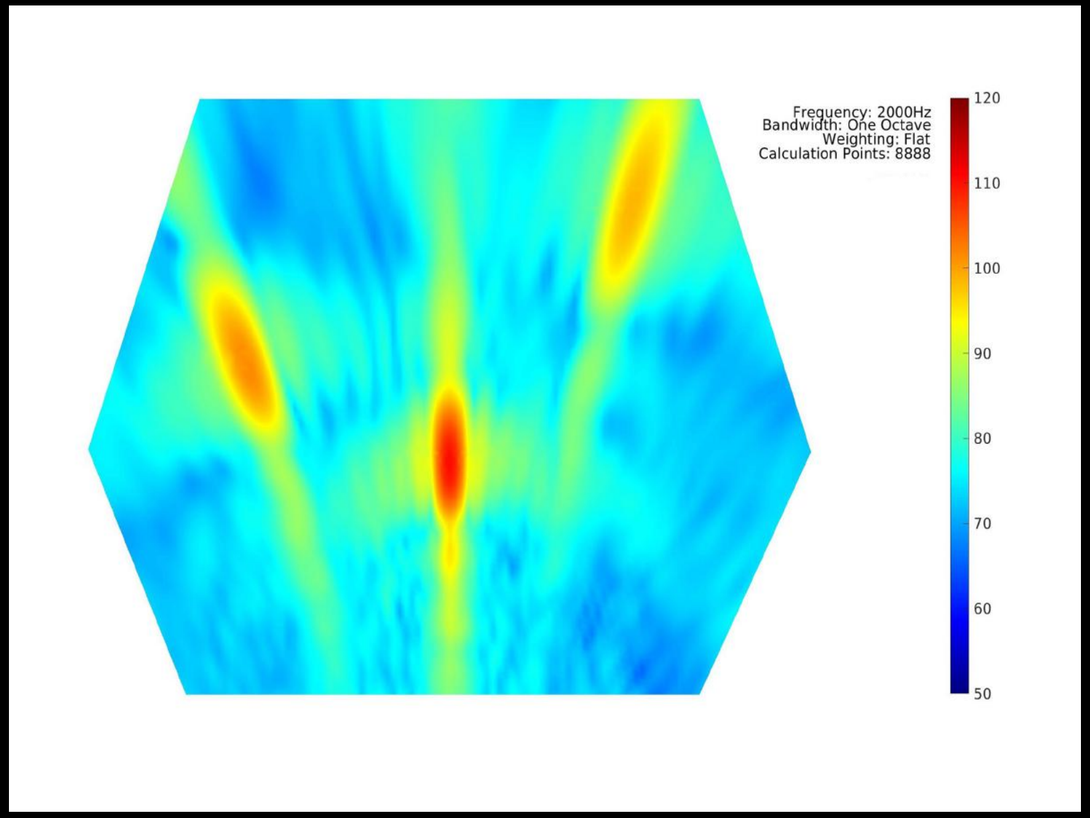




Audio content focussing

Three focus points at 1 and 2 kHz





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Matrix Array technology

Real-world cases

HOLOPLOT

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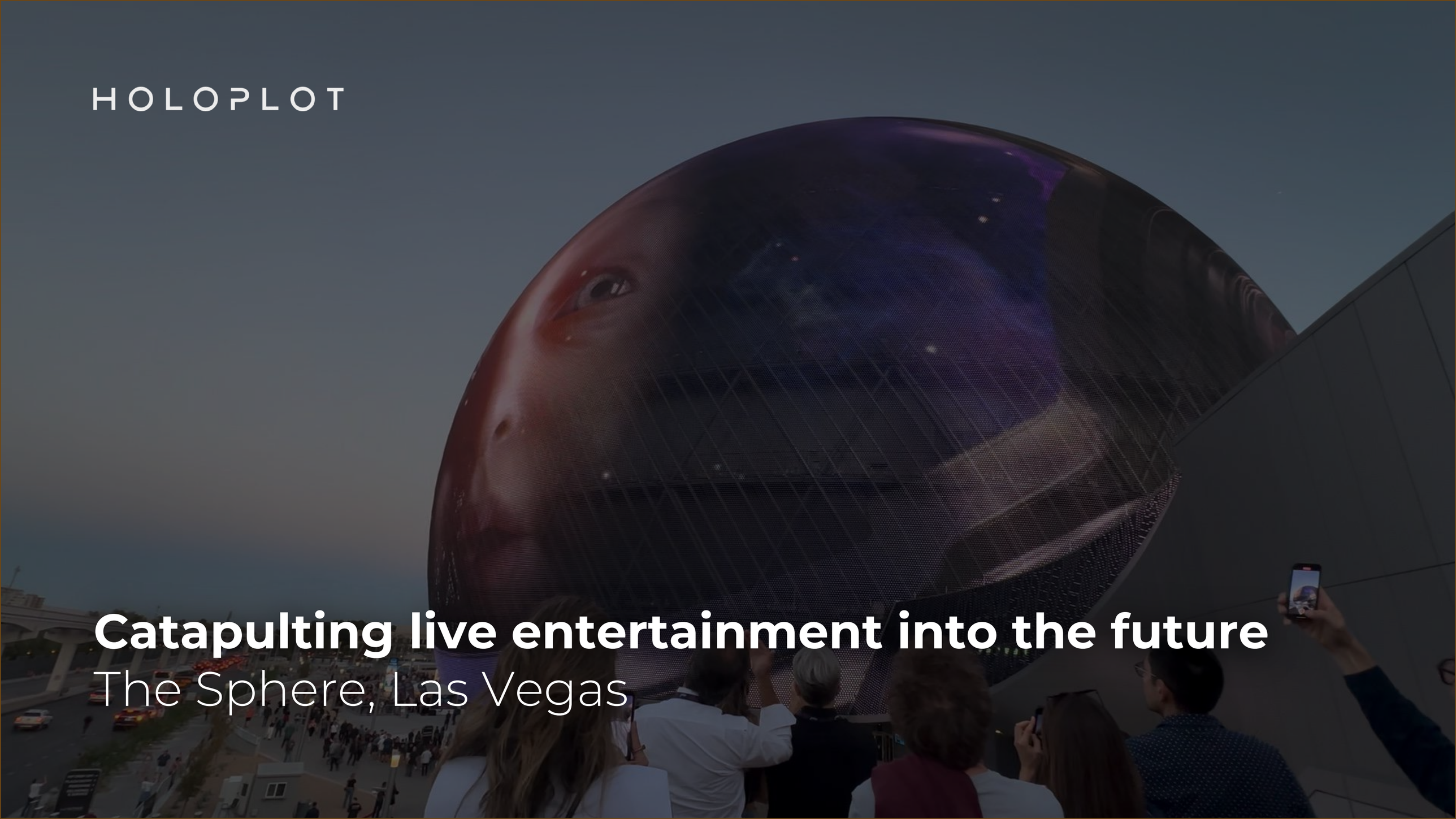
HOLOPLOT



Catapulting live entertainment into the future

The Sphere, Las Vegas

The Sphere
At a glance

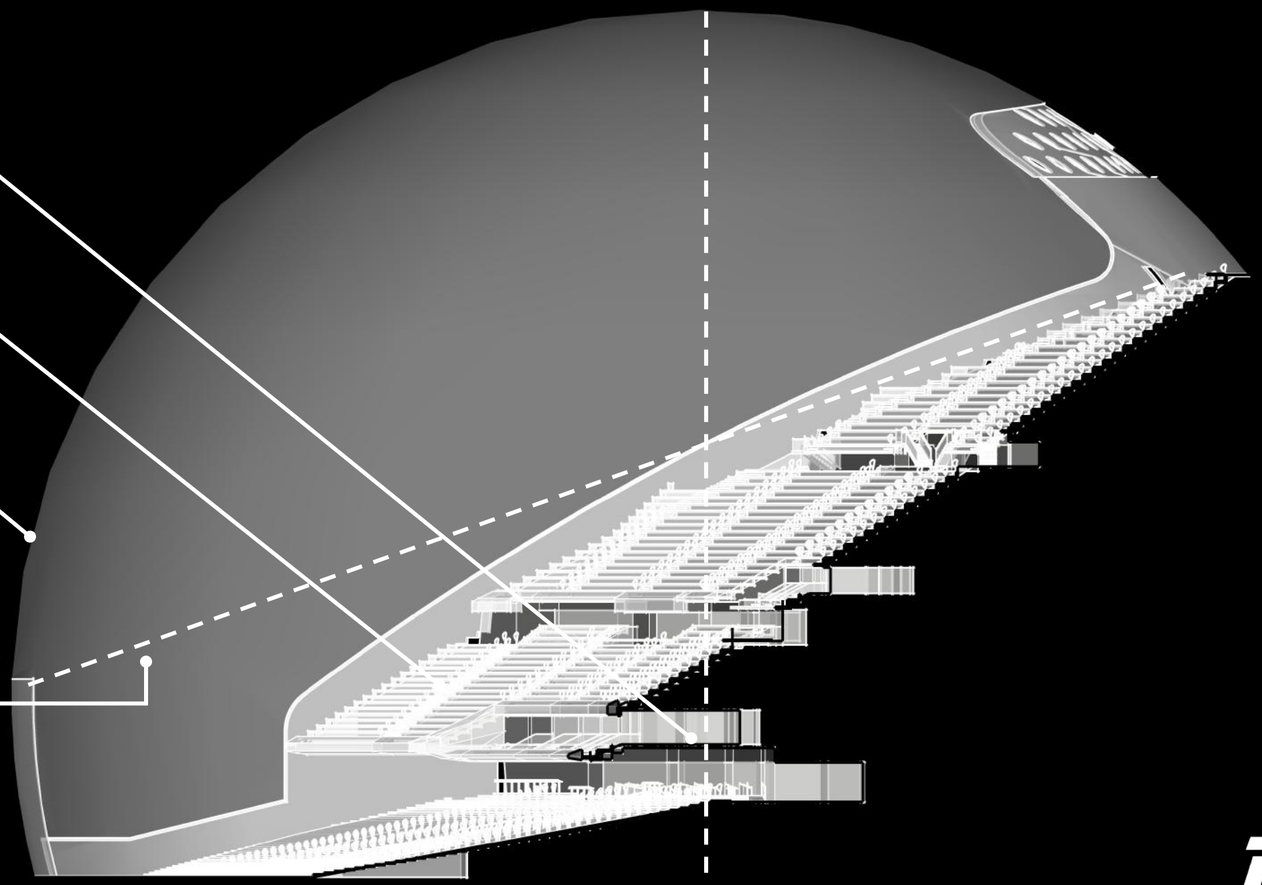
75 m height

18,600 seats

18K, 160.000 sq foot LED Screen

About 1’600 X1 modules distributed across the venue & **behind the LED**

Up to 110 m distance In Vegas, with extremely low humidity



HOLOPLOT

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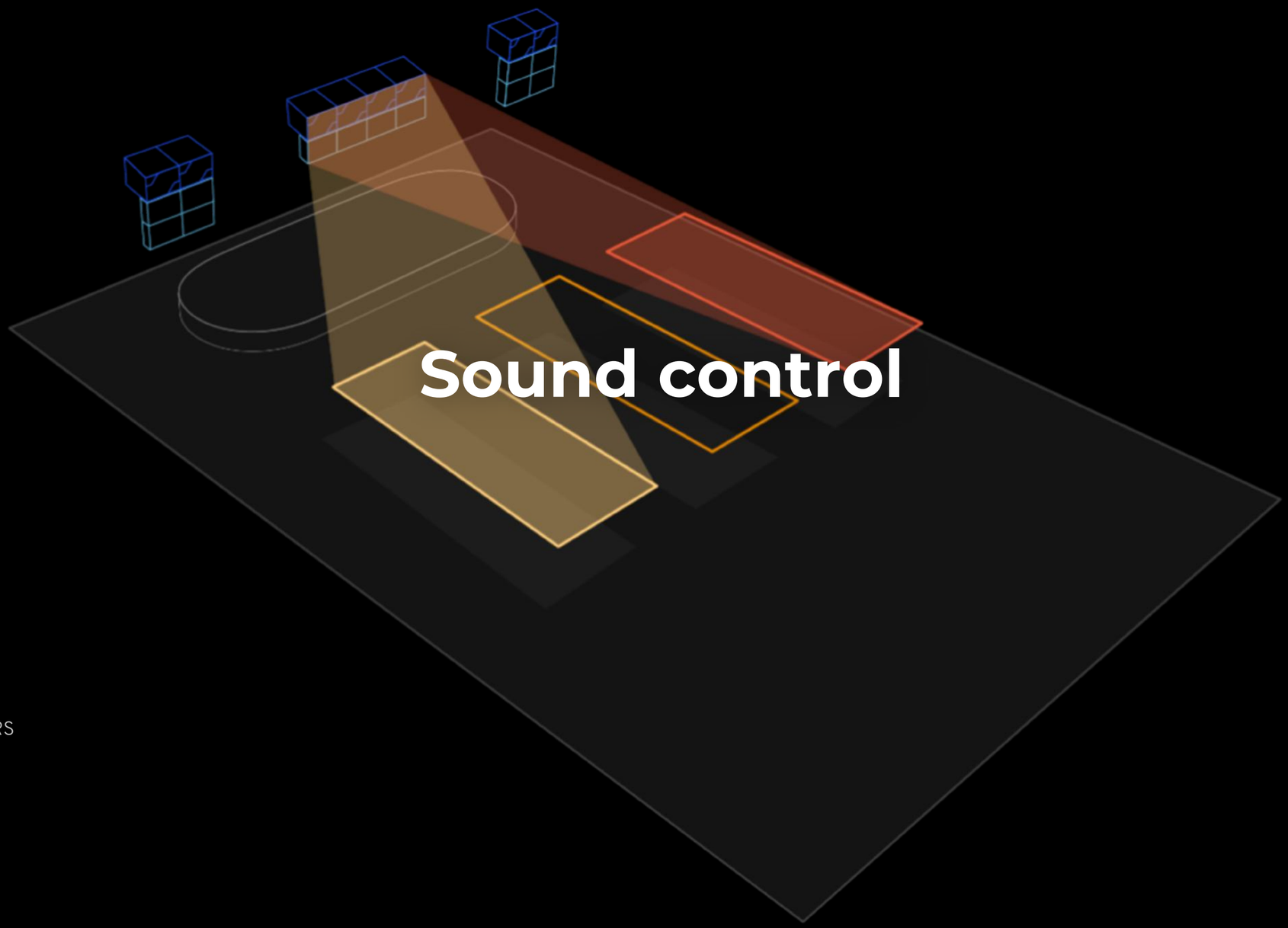
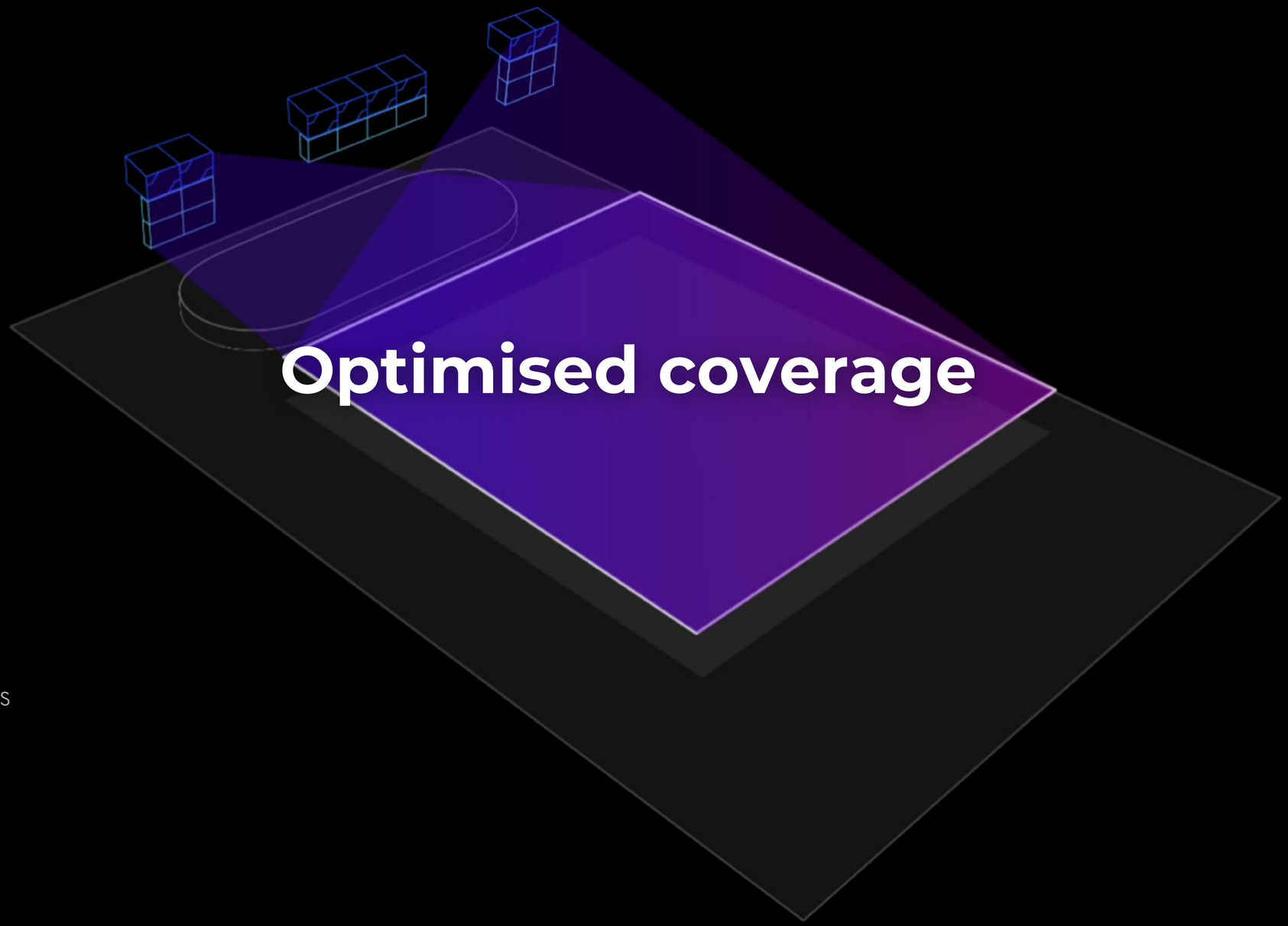


Sound control

SOUND CONTROL
OPTIMISED COVERAGE
CONCEALED LOUDSPEAKERS
SYSTEM FLEXIBILITY
UNIQUE IMMERSIVE TOOLS

HOLOPLOT

Bicsi®
ENDORSED EVENT



Optimised coverage

SOUND CONTROL
OPTIMISED COVERAGE
CONCEALED LOUDSPEAKERS
SYSTEM FLEXIBILITY
UNIQUE IMMERSIVE TOOLS

HOLOPLOT

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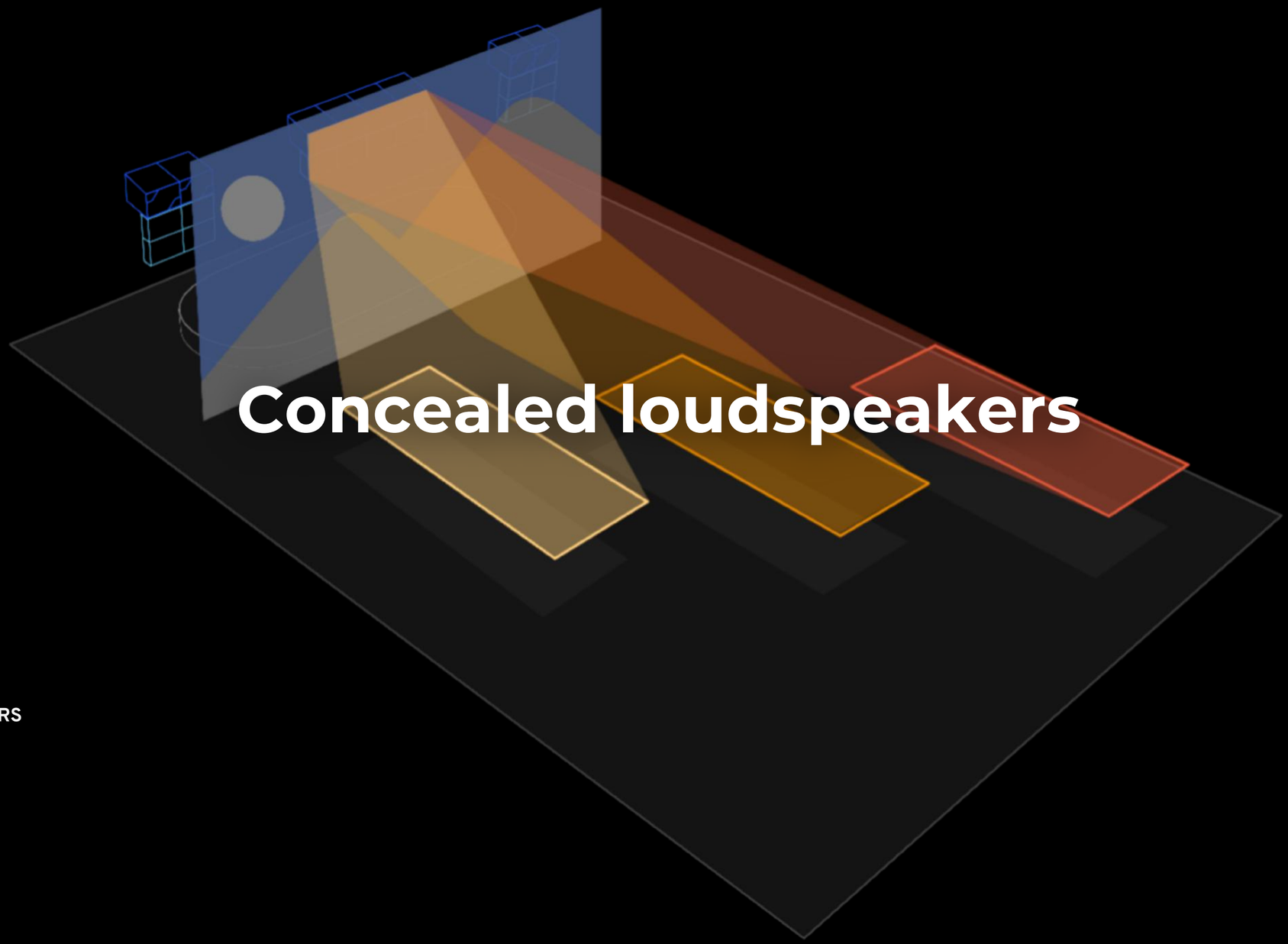

Concealed loudspeakers

SOUND CONTROL
OPTIMISED COVERAGE
CONCEALED LOUDSPEAKERS
SYSTEM FLEXIBILITY
UNIQUE IMMERSIVE TOOLS

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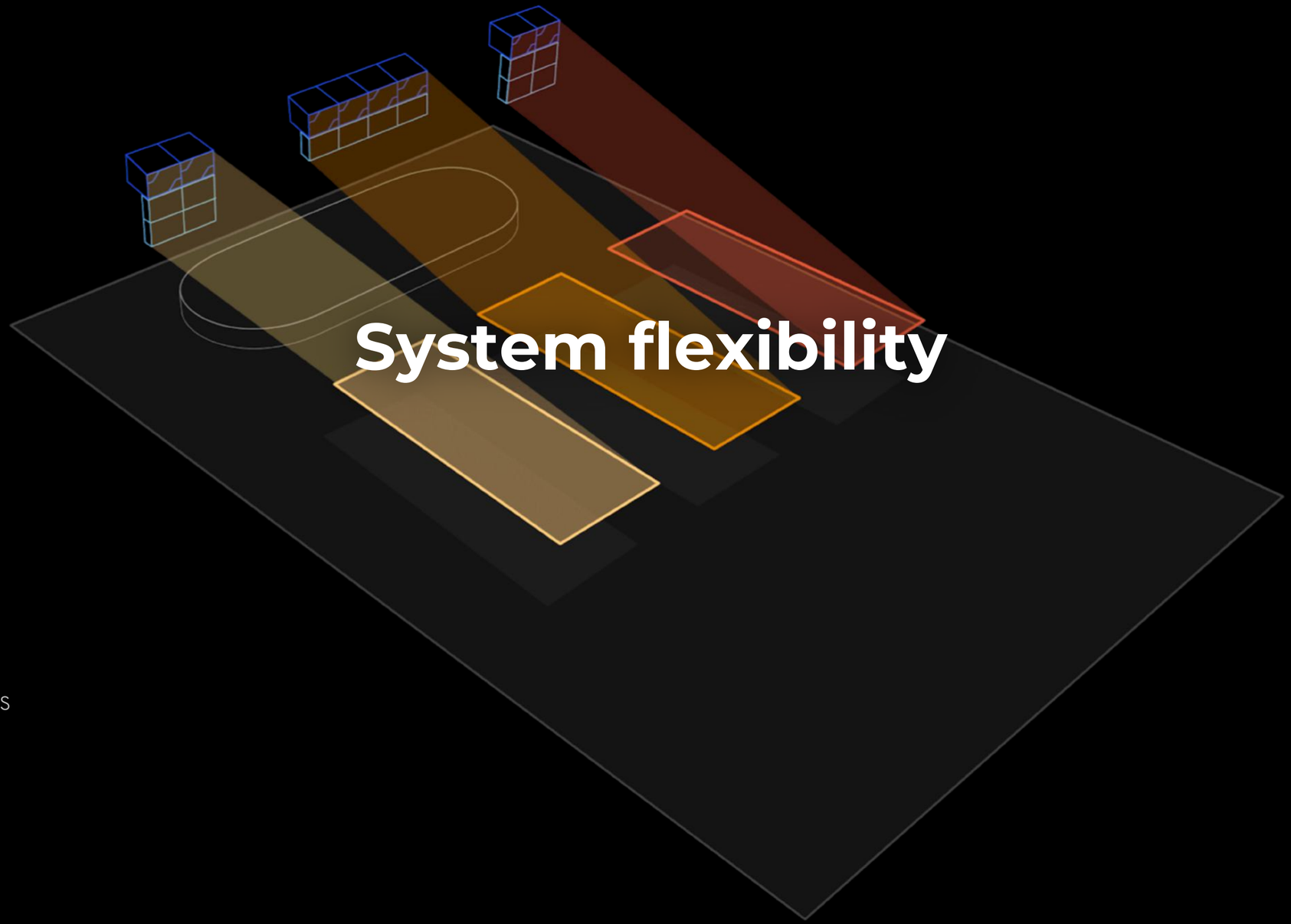

System flexibility

SOUND CONTROL
OPTIMISED COVERAGE
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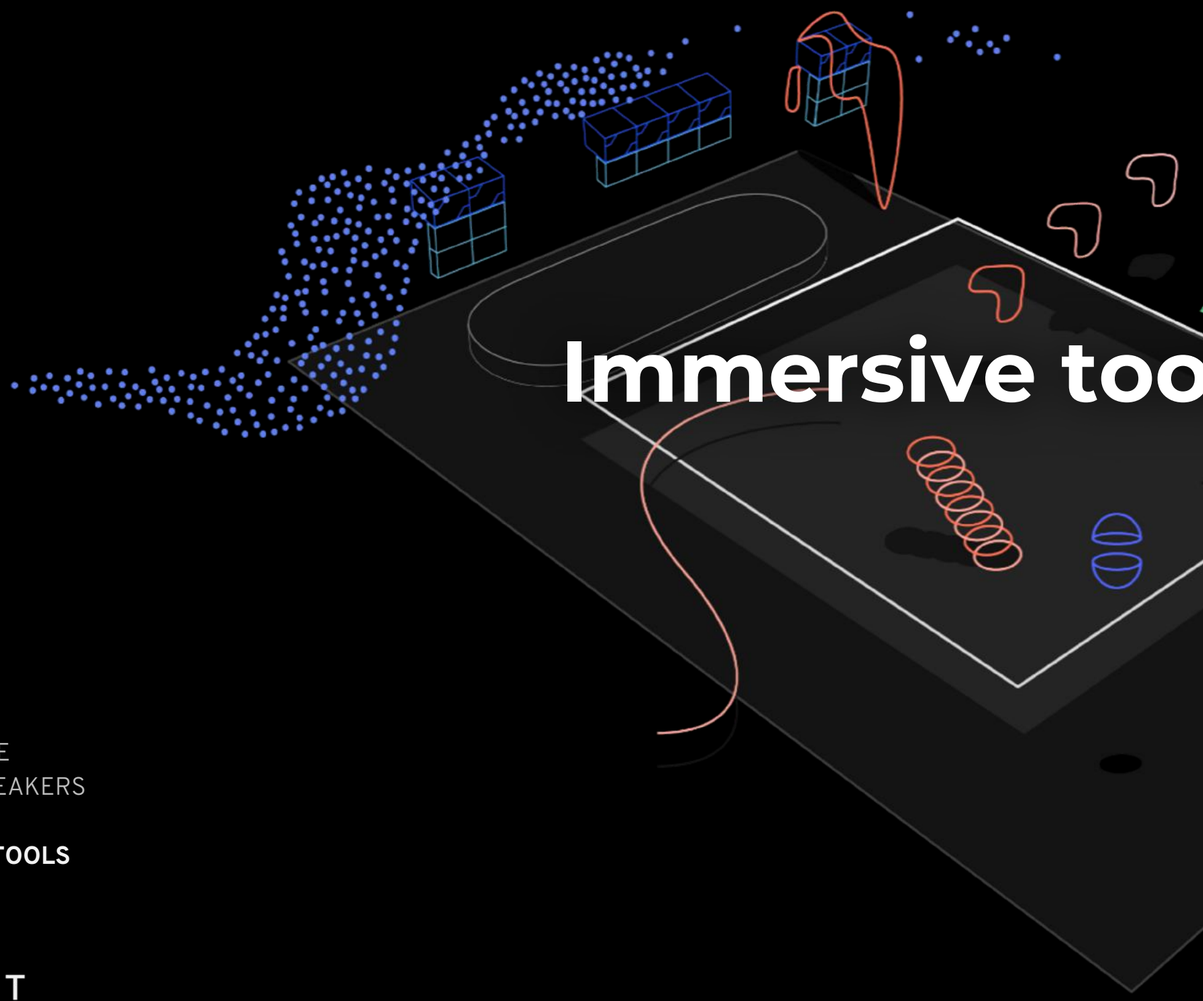

Immersive tools

SOUND CONTROL
OPTIMISED COVERAGE
CONCEALED LOUDSPEAKERS
SYSTEM FLEXIBILITY
UNIQUE IMMERSIVE TOOLS

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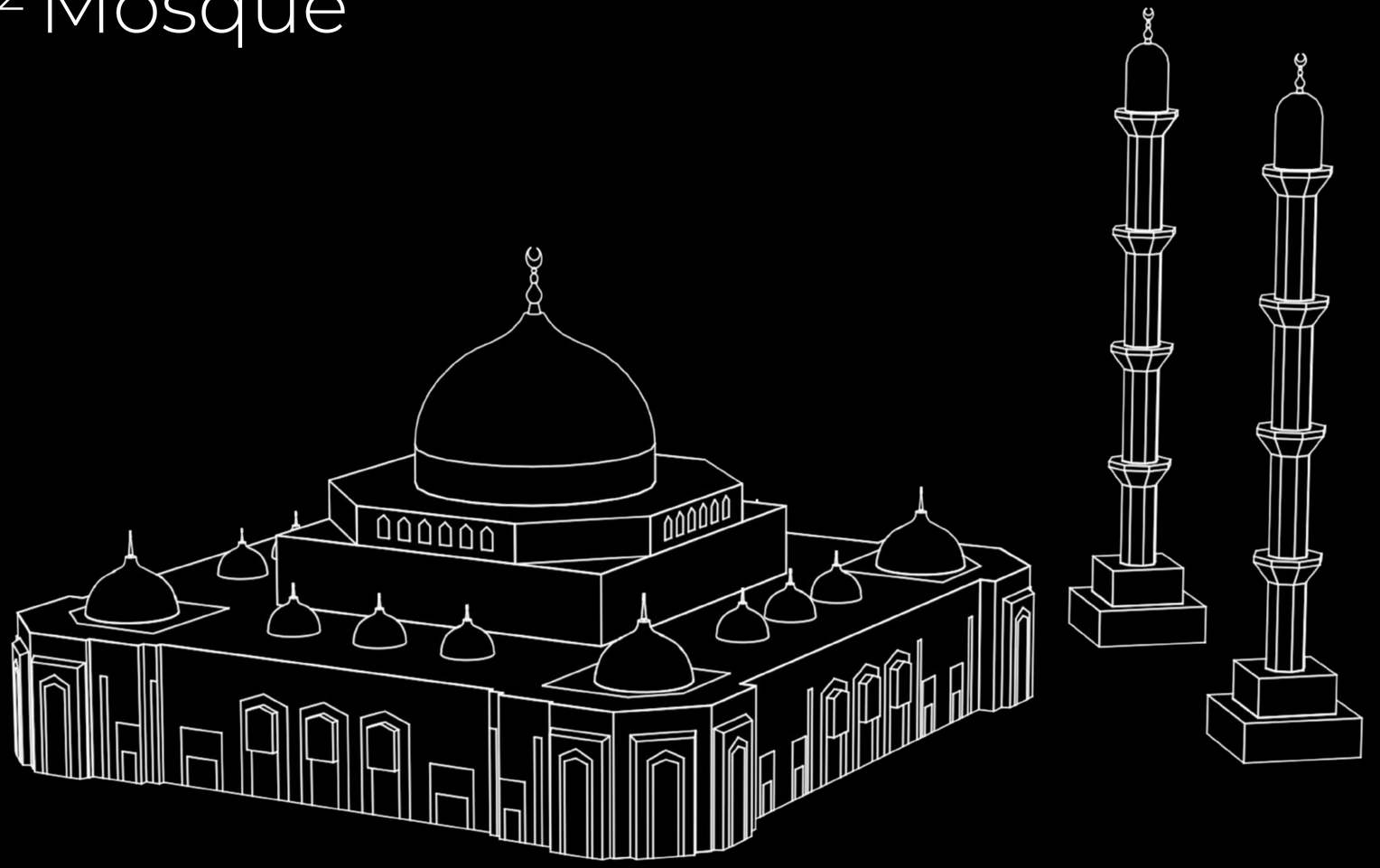
A worship solution in One of Africa’s largest mosques

Cairo, Egypt

Venue size

A 10’000m^2 Mosque

- Most surfaces exposed to sound made from highly reverberant marble
- 60m high dome
- Interior worship space broken up by a number of pillars, also made from marble



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Masjid Misr
Introduction

The brief

- Highest possible audio intelligibility
- Protect the architectural integrity of the building

The solution

- Completely hidden Matrix Array sound system, mounted at extreme heights
- Reduced hardware installation points, thanks to Matrix Arrays' control capabilities

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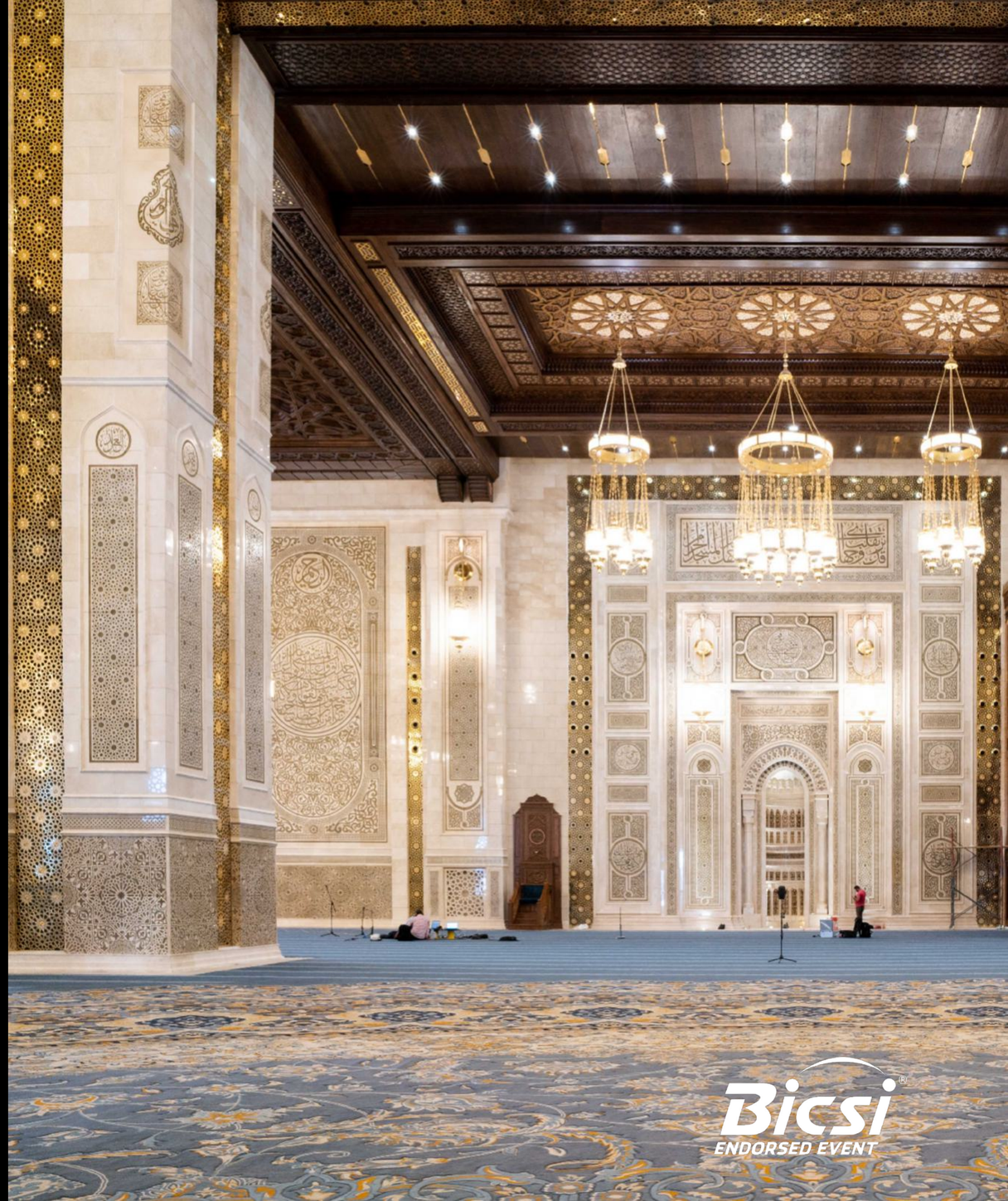

Masjid Misr
Results

50%

reduction in acoustic treatment

70%

reduction in hardware installation points

0.6

average STI measurement

100%

uncompromised interior design

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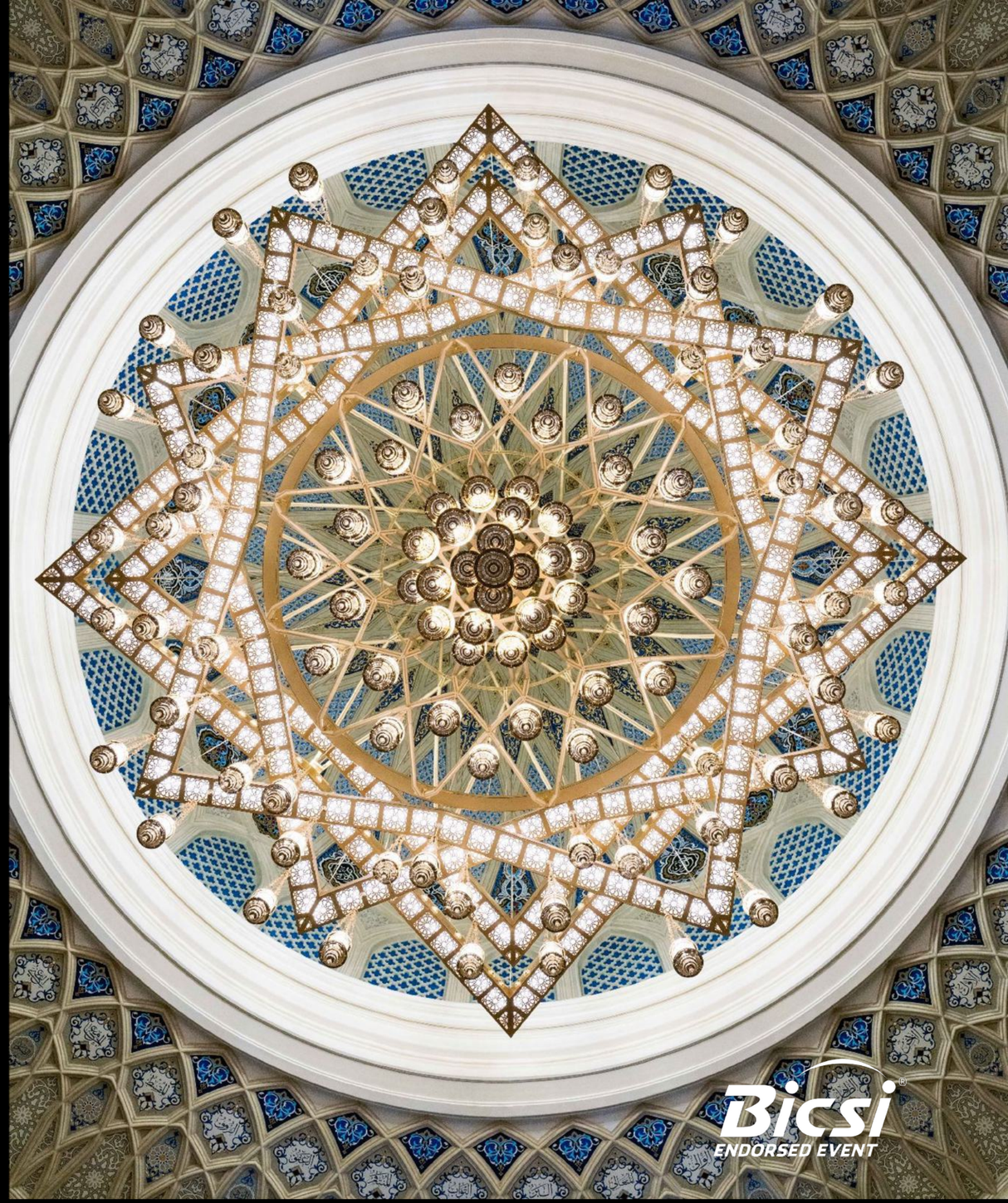
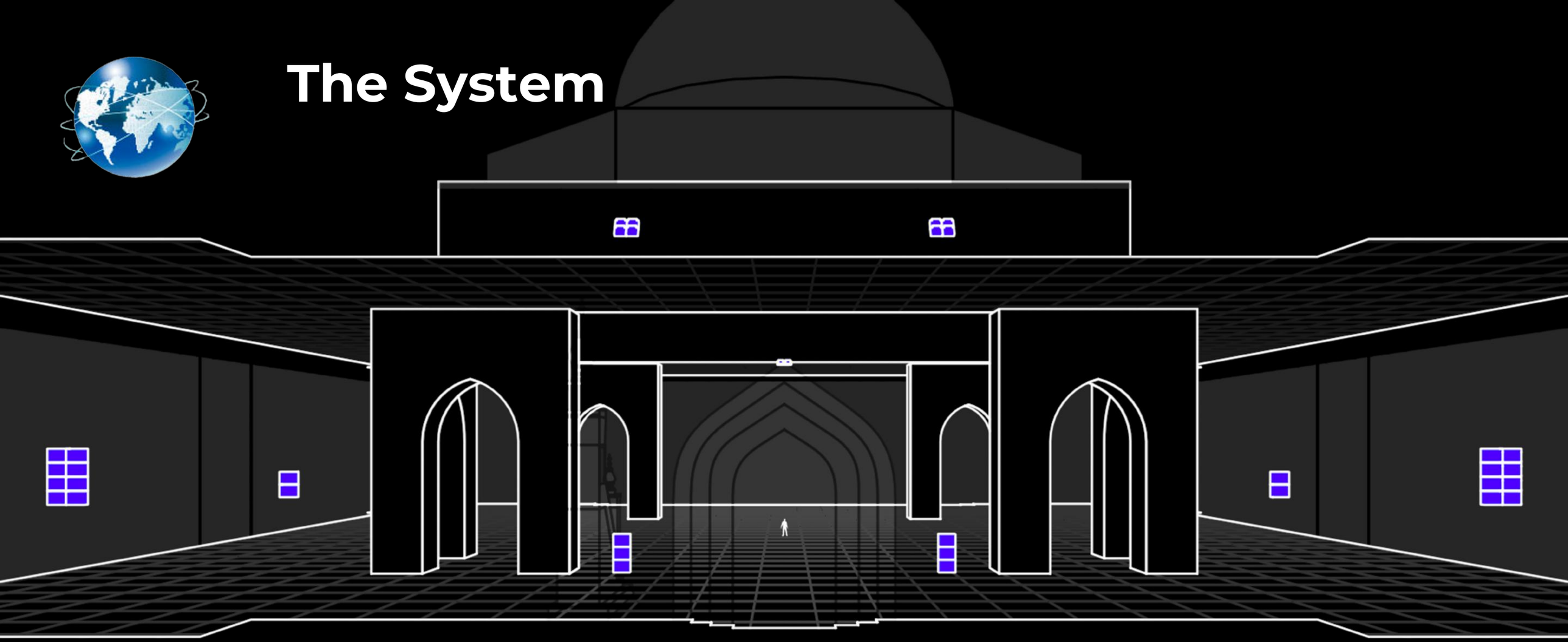


The System



The system consists of **only nine arrays**.
Six arrays positioned on the front wall, two on the dome base and one concealed in the ceiling to cover the rear. This is a 70% reduction in speaker positions, compared to conventional sound system solutions.

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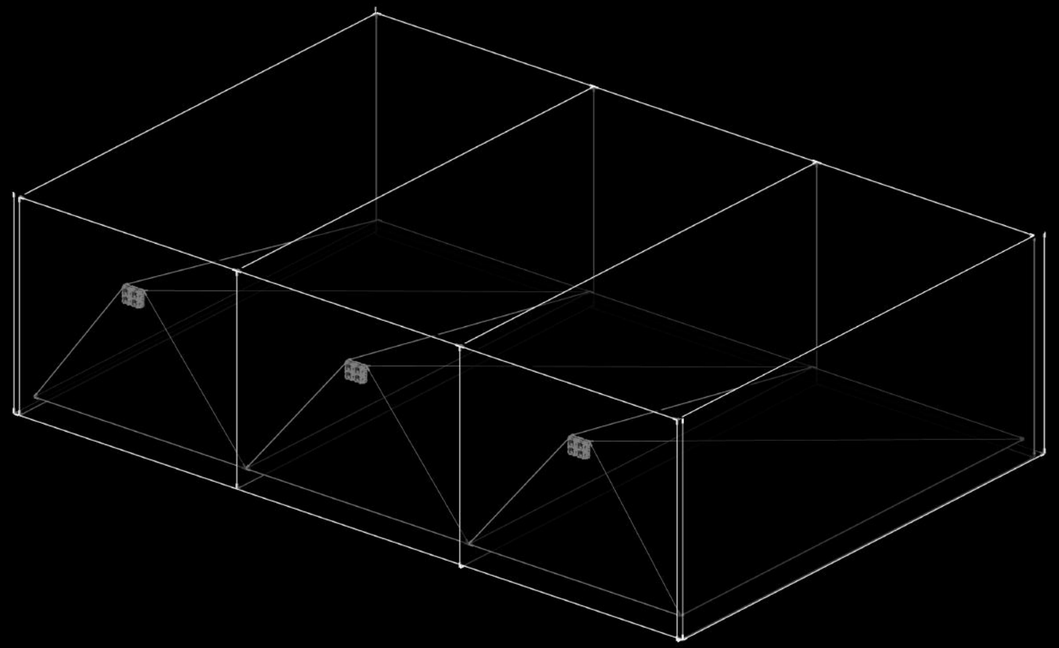
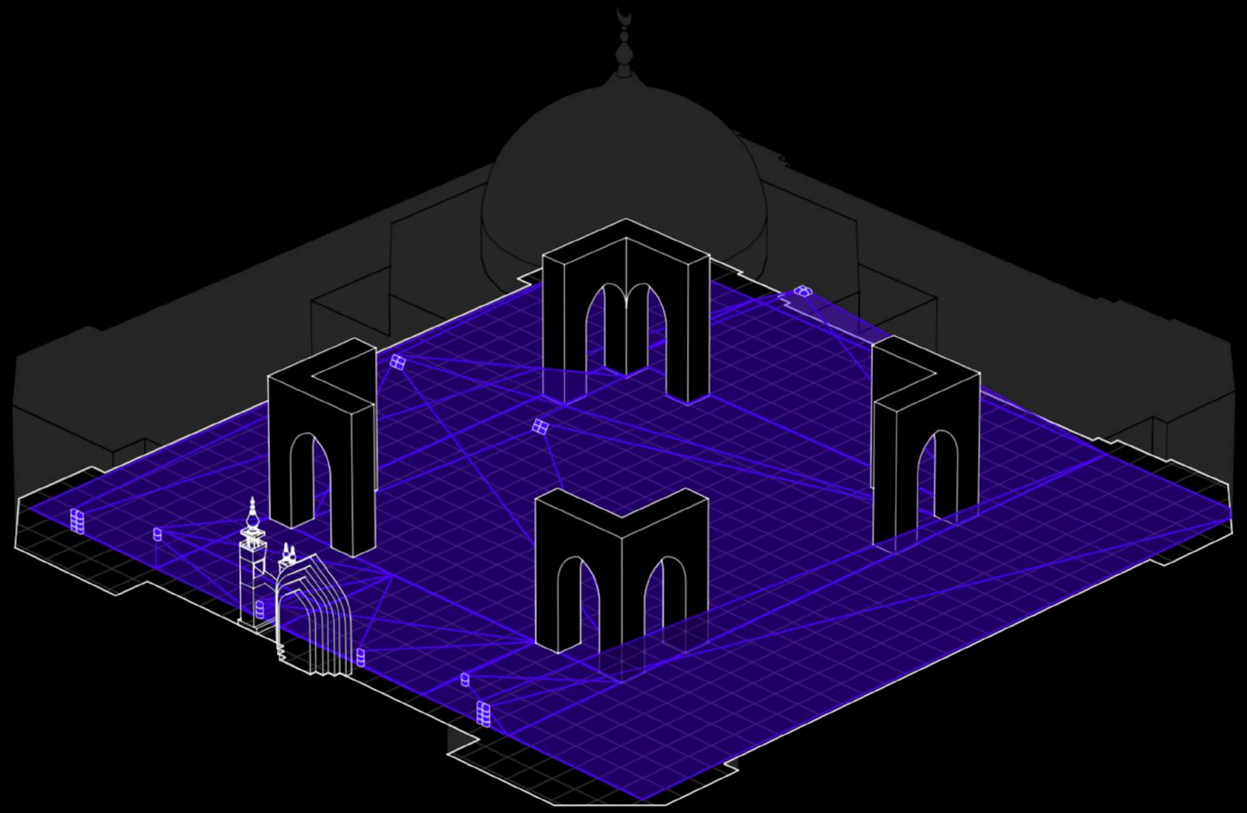
An unconventional approach

Targeting and avoiding





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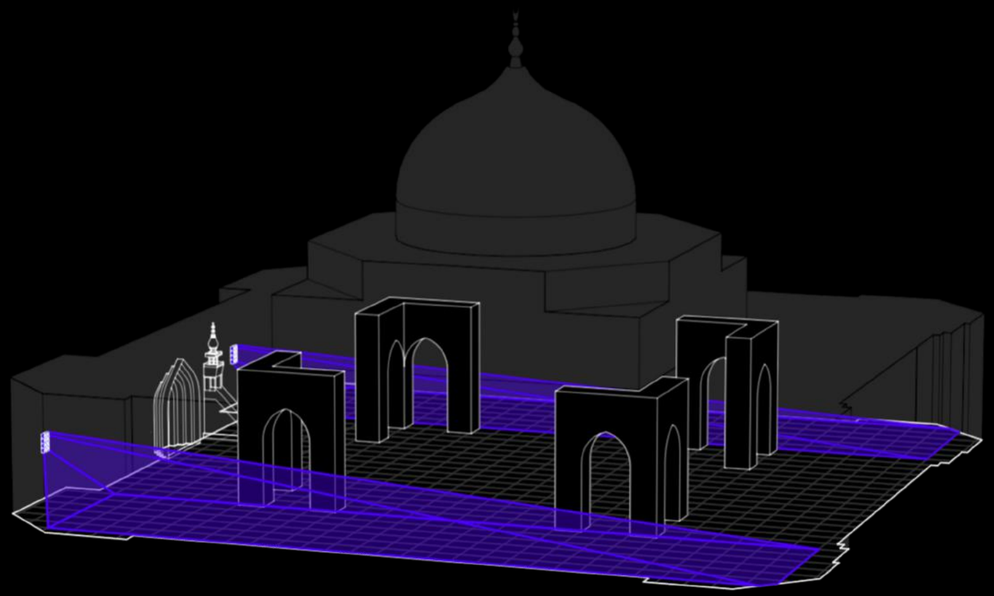
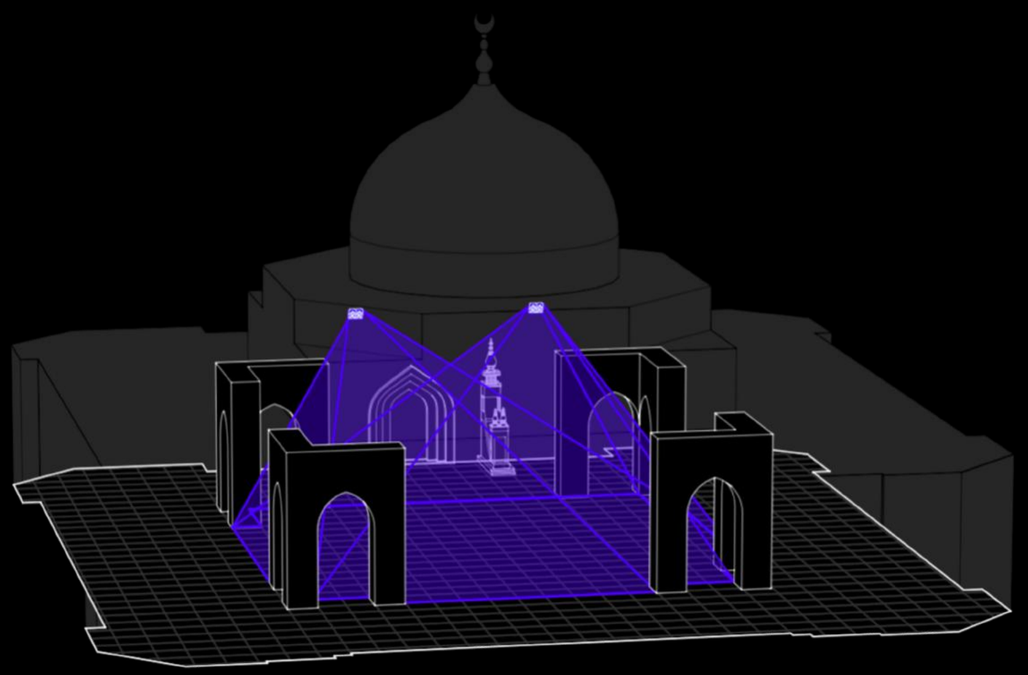
Controlled targeting



The corridors
Two 4x2 arrays situated on the far left and right hand side of the building create coverage corridors for an area that's **93m long and 18m wide** respectively.



The center
The arrays in 2x2 configuration at the dome targeted to the audience area below are at very high mounting positions (23m).

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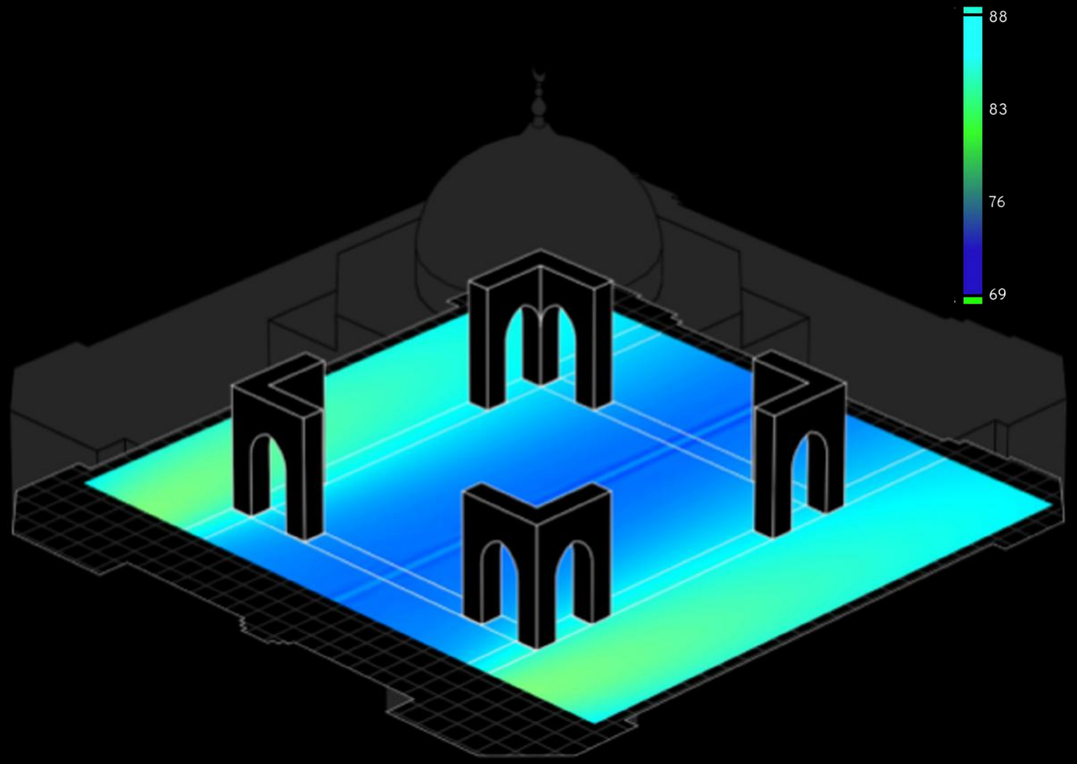
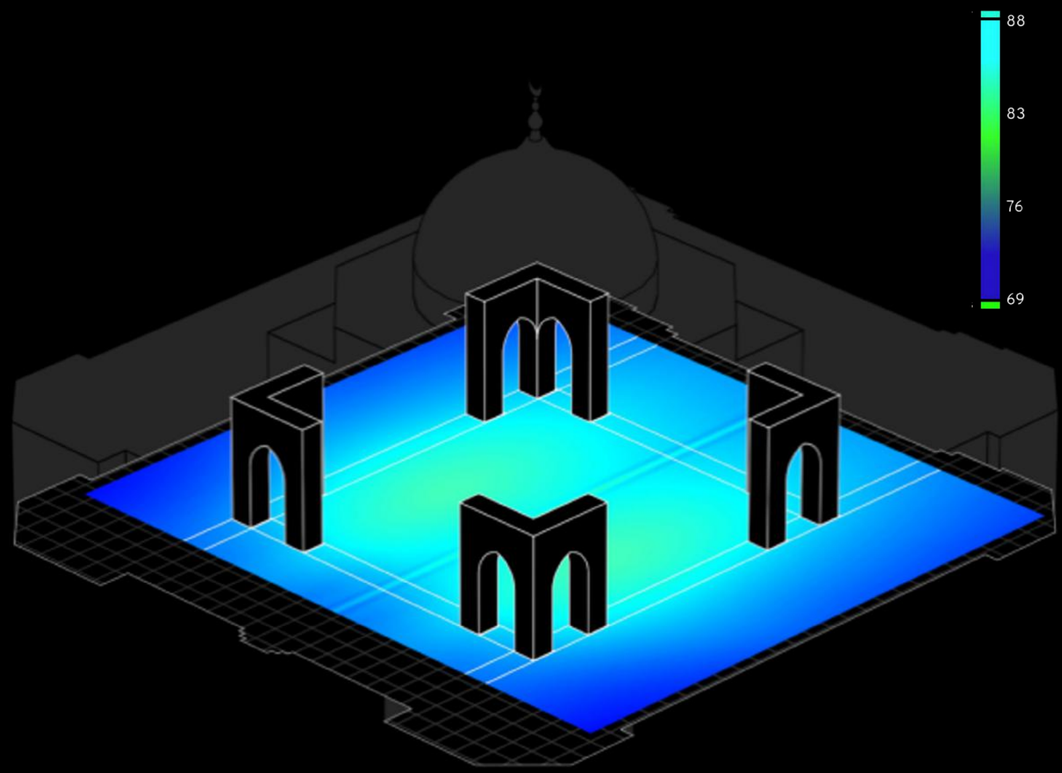
SPL
Target areas vs avoidance zones





The corridors
SPL homogeneity in the corridors (targeted) is 84% at +/- 3dB while in the central areas (avoided) the SPL drops by 13 dB at 1kHz.

The center
SPL homogeneity in the central area (targeted) is virtually 100% at +/- 3dB while in the front & corridor areas (avoided) the SPL drops by 7 dB at 1kHz and 10 dB at 2kHz.

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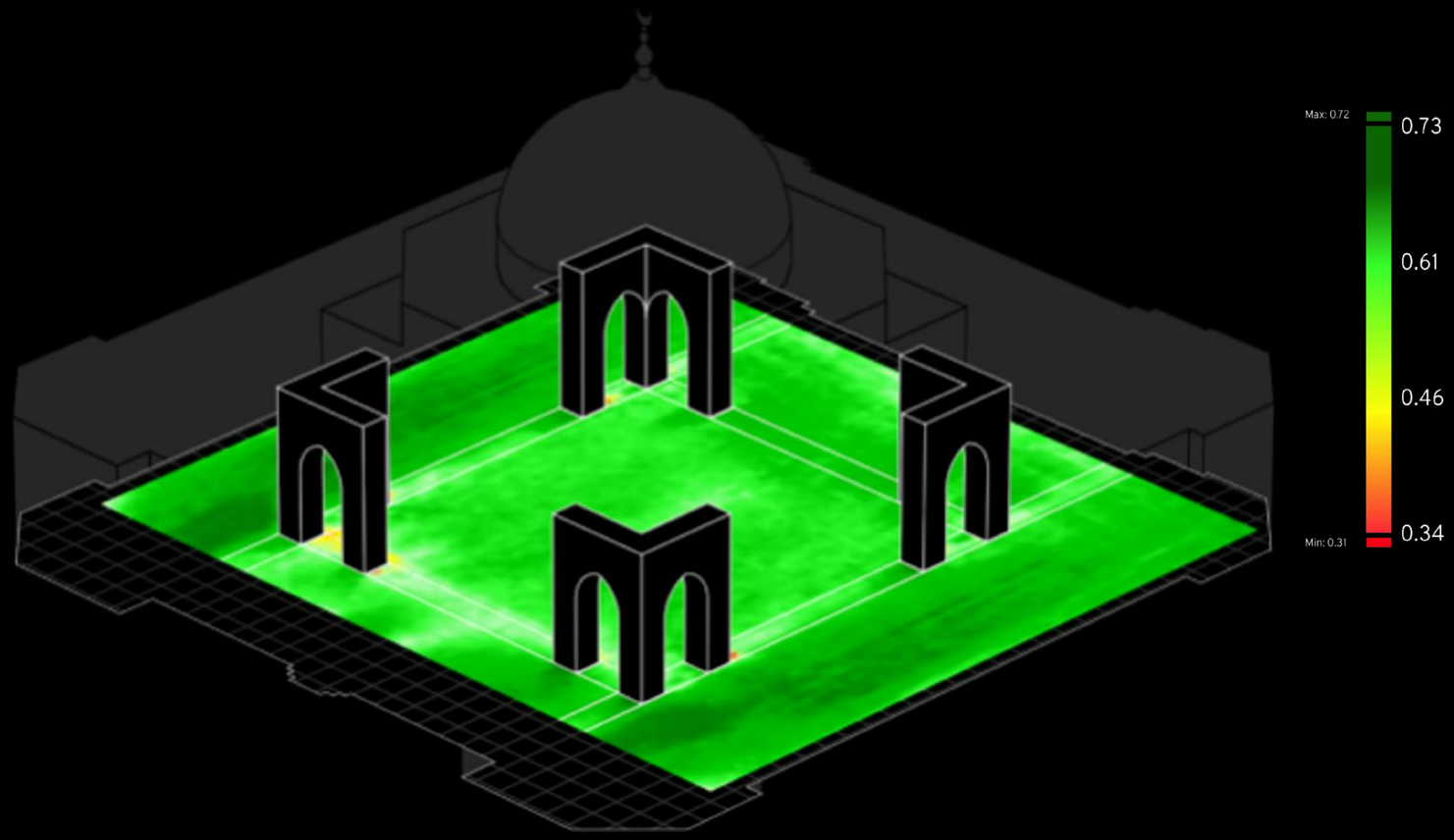
Speech intelligibility
Optimised coverage

STI map for standing position

98% of standing and kneeling positions fall within STI of 0.5 and 0.72.



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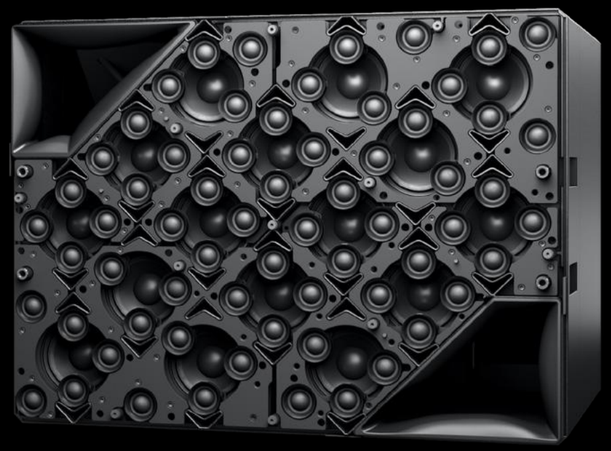
Matrix Array product families

X1

The sound system for live entertainment applications



X2

Same core technology, but optimized for speech applications

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Join the mission!

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