From Multi-Channel to Object-Audio and to the Home

Next Generation audio technology for an immersive entertainment experience

Arnd Paulsen
Senior Manager Broadcast Systems

Rik Van Leeuwen
Senior Sales Manager Netherlands

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Dolby's history in innovation

noise
reduction

5.1-channel
digital audio

surround sound
for headphones

3D digitalc

7.1-channel
cinema sound

1965 ————————————— 2015

home theater

real-time
5.1 broadcast

HD audio
for PCs

mobile entertainment

Dolby® Atmos™
cinema sound

Overview

The Immersive Experience

From Channels to Objects for Cinema

Dolby Atmos in the Home

Summary

Immersive experience

Dolby Atmos is the only audio format offering an immersive experience for all screens. The cinema and home experience is so lifelike that viewers feel immersed in the very environment where the film takes place. Through sound, all senses are stimulated to create an emotional response from the audience.

New user behavior, new receiver-devices

….threaten the traditional broadcast business model:

- new services

- receiver-devices become more powerful

- more market participants try to catch the same audience

How to keep your audience?   How to sell more receivers?

How to increase your audience?

Cheaper **Better**
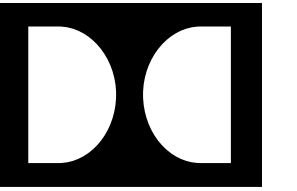
Price degradation for devices/services   Differentiation with better experience

From Channels to Objects

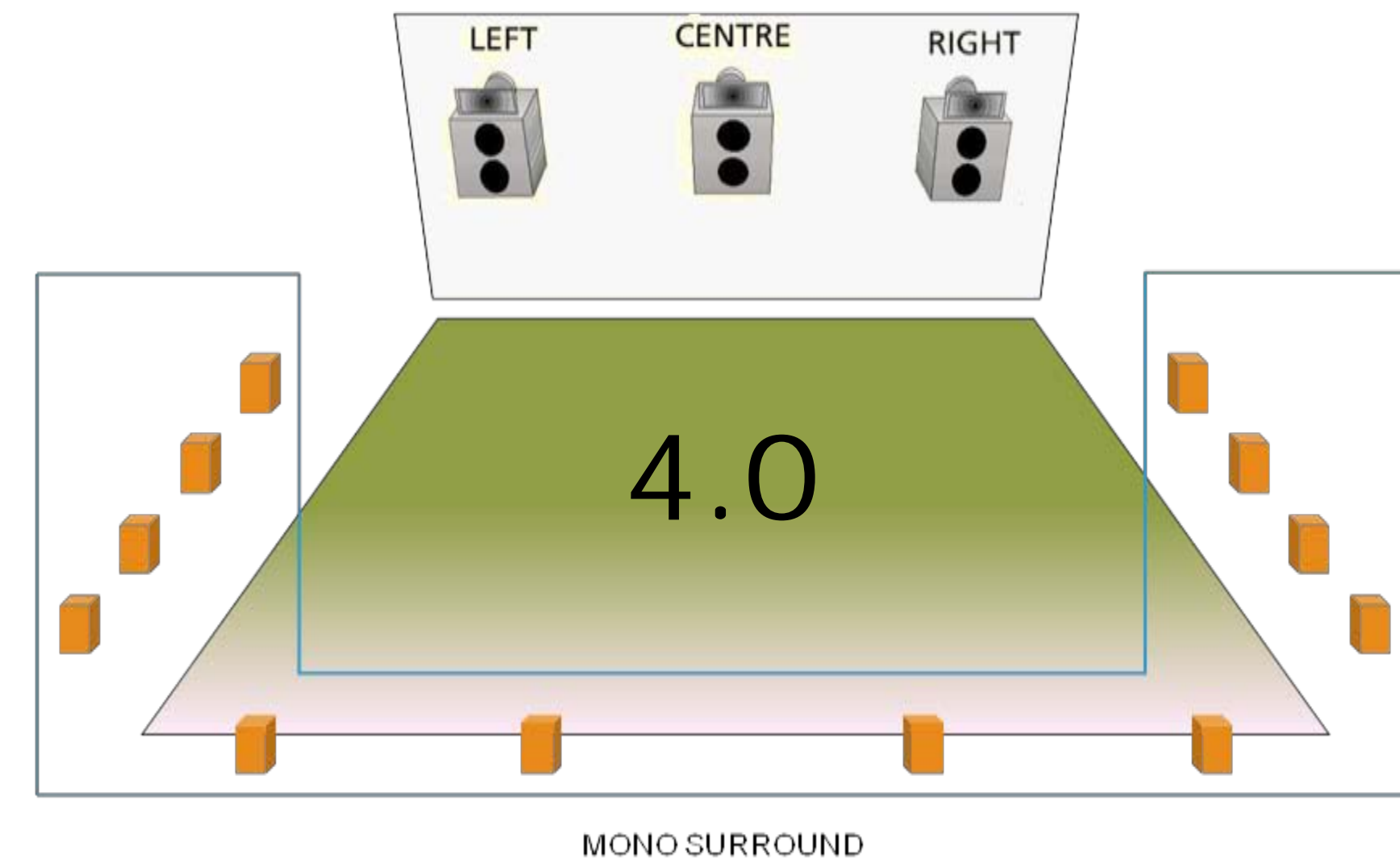From Dolby Stereo to Dolby Atmos

Development of channel-based systems

Dolby Stereo – since 1977 (STAR WARS)

Encoding of channels
- Left
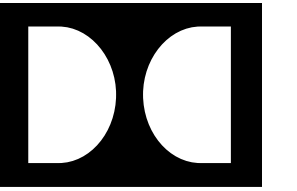- Center
- Right
- Surround

into channels LT, RT with Dolby Stereo-Matrix

Recording onto the analogue optical sound track of the 35mm-copy

Decoding in the cinema-processor back to 4 channels
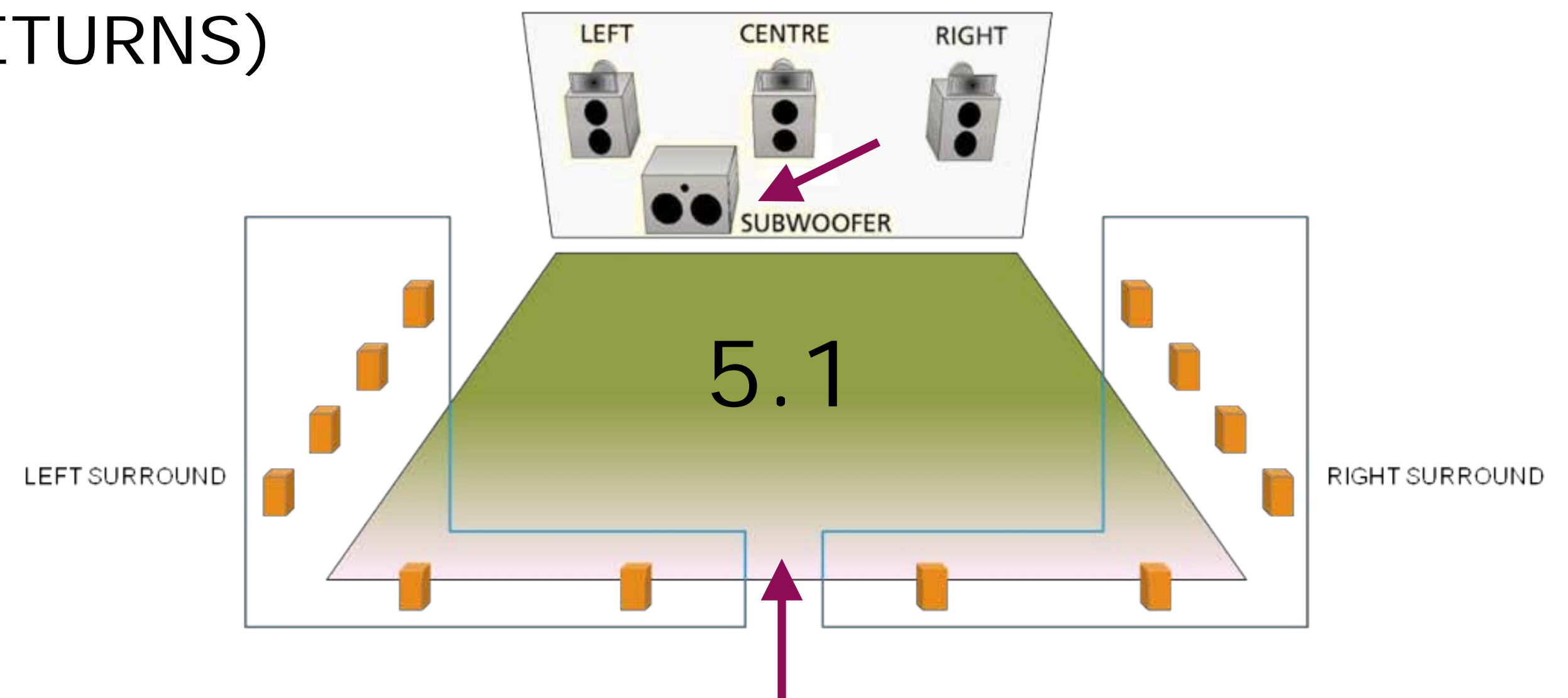
Development of channel-based systems

Dolby Digital – since 1992 (BATMAN RETURNS)

Encoding of 5.1 Channels
- Left
- Center
- Right
- Left Surround
- Right Surround
- Subwoofer (bandwidth limited at 120Hz)
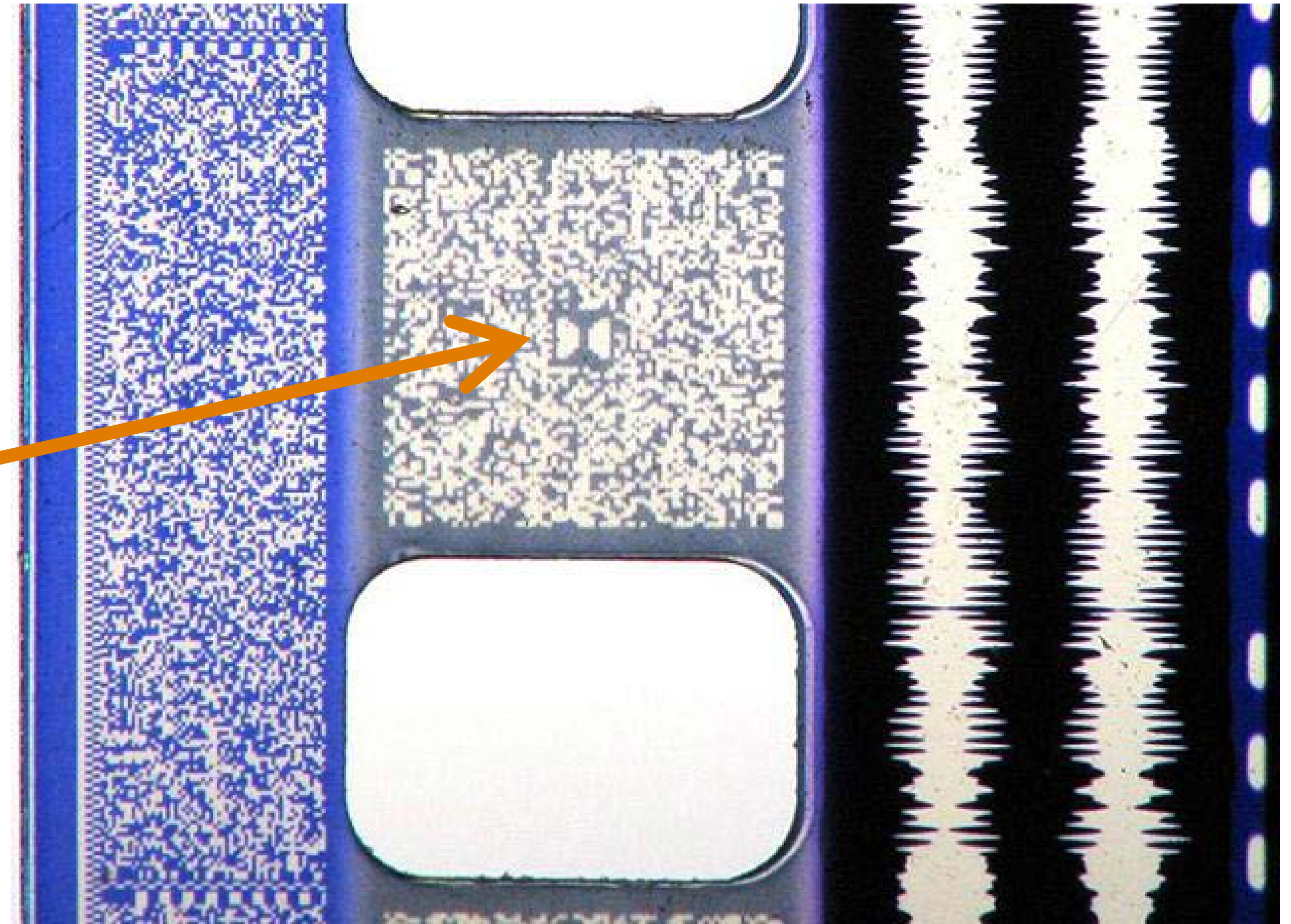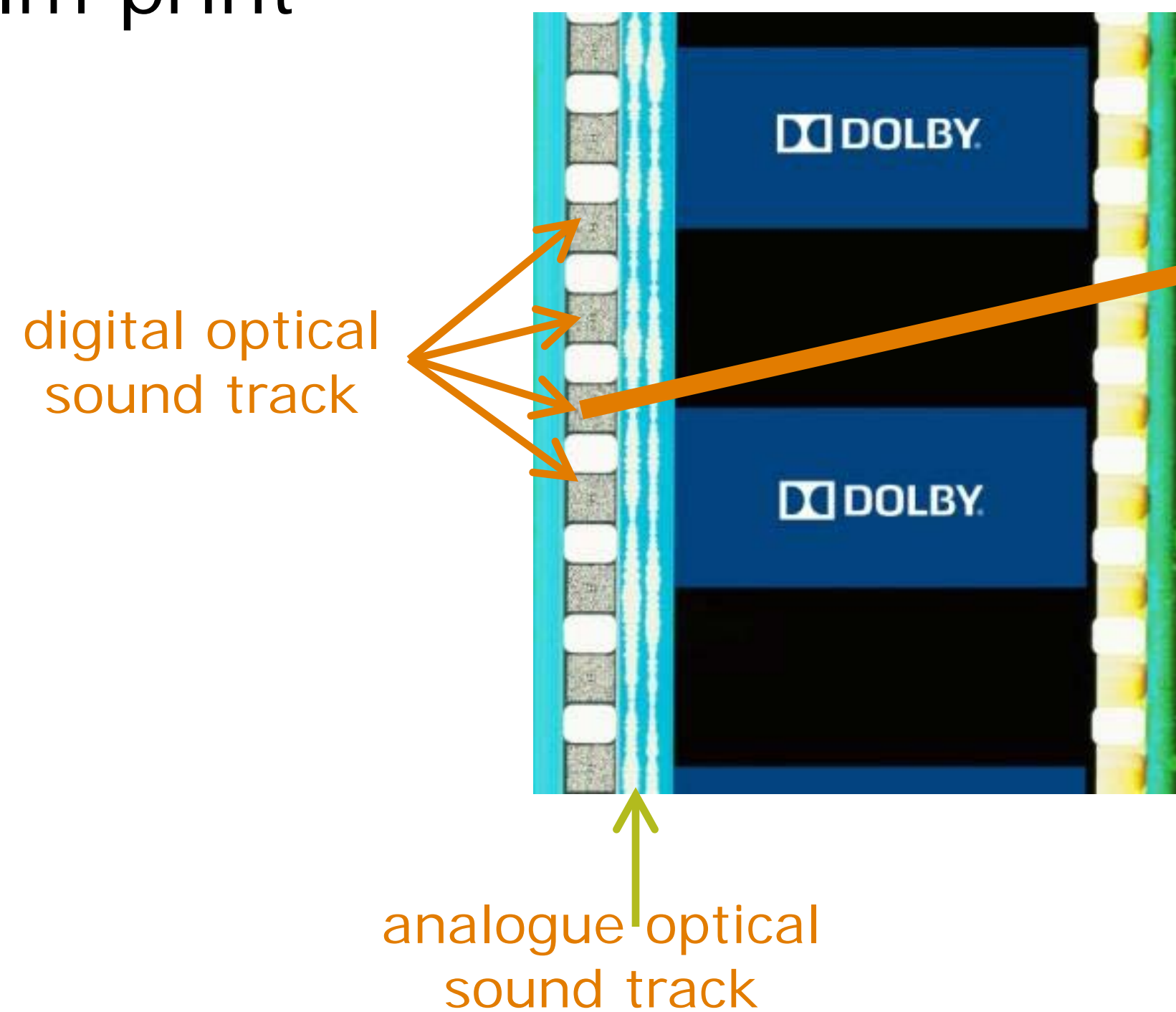
Into a single data stream

Data blocks between the perforation holes of the 35mm-copy
Analogue Dolby Stereo-optical sound track as backup

Side story: Dolby Digital on 35mm print

Position of analogue and digital optical soundtracks on a 35mm film print

digital optical sound track

analogue optical sound track

Development of channel-based systems

Dolby Digital Surround EX - since 1999 (STAR WARS: EPISODE I)
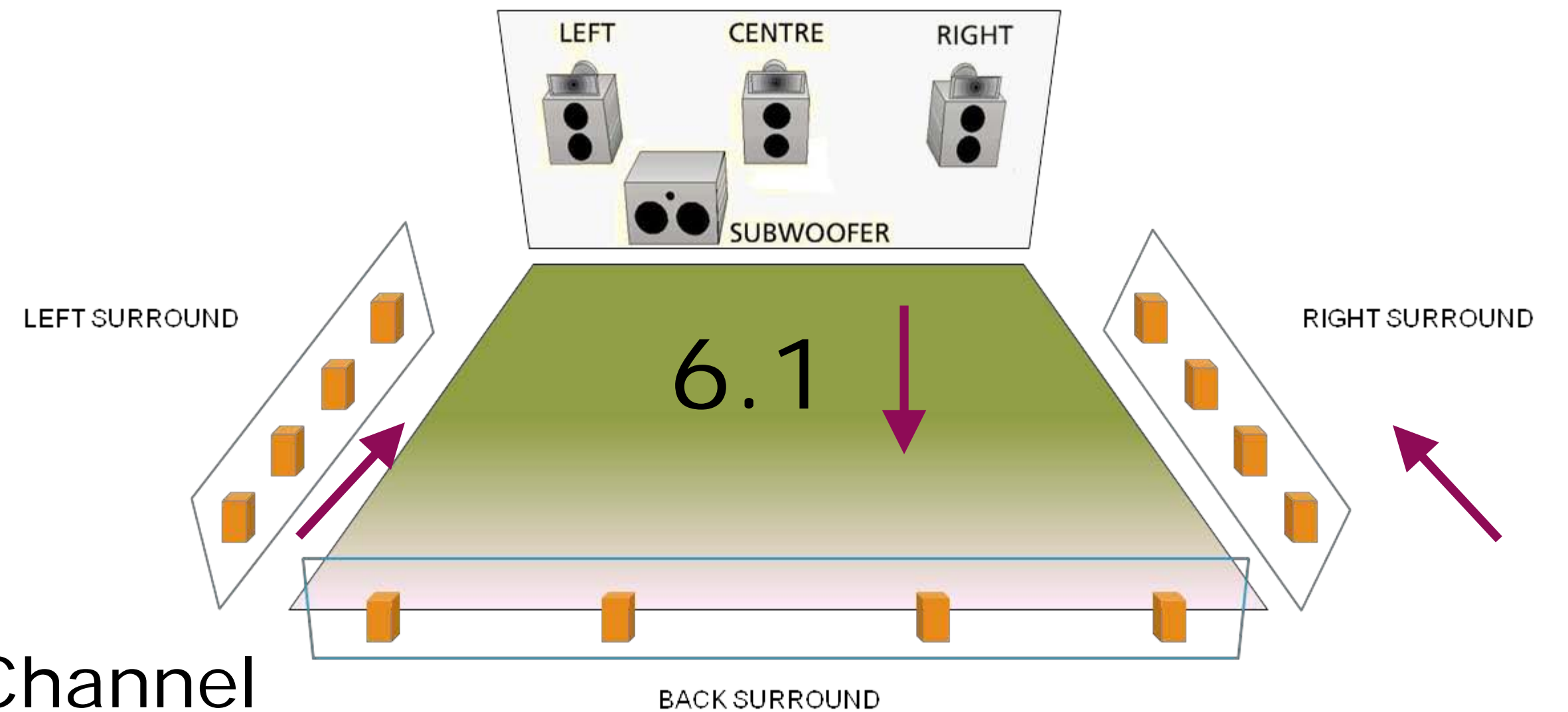
Encoding of a single Back Surround-Channel

In addition to a Left Surround and Right Surround

Compatible to Dolby Digital
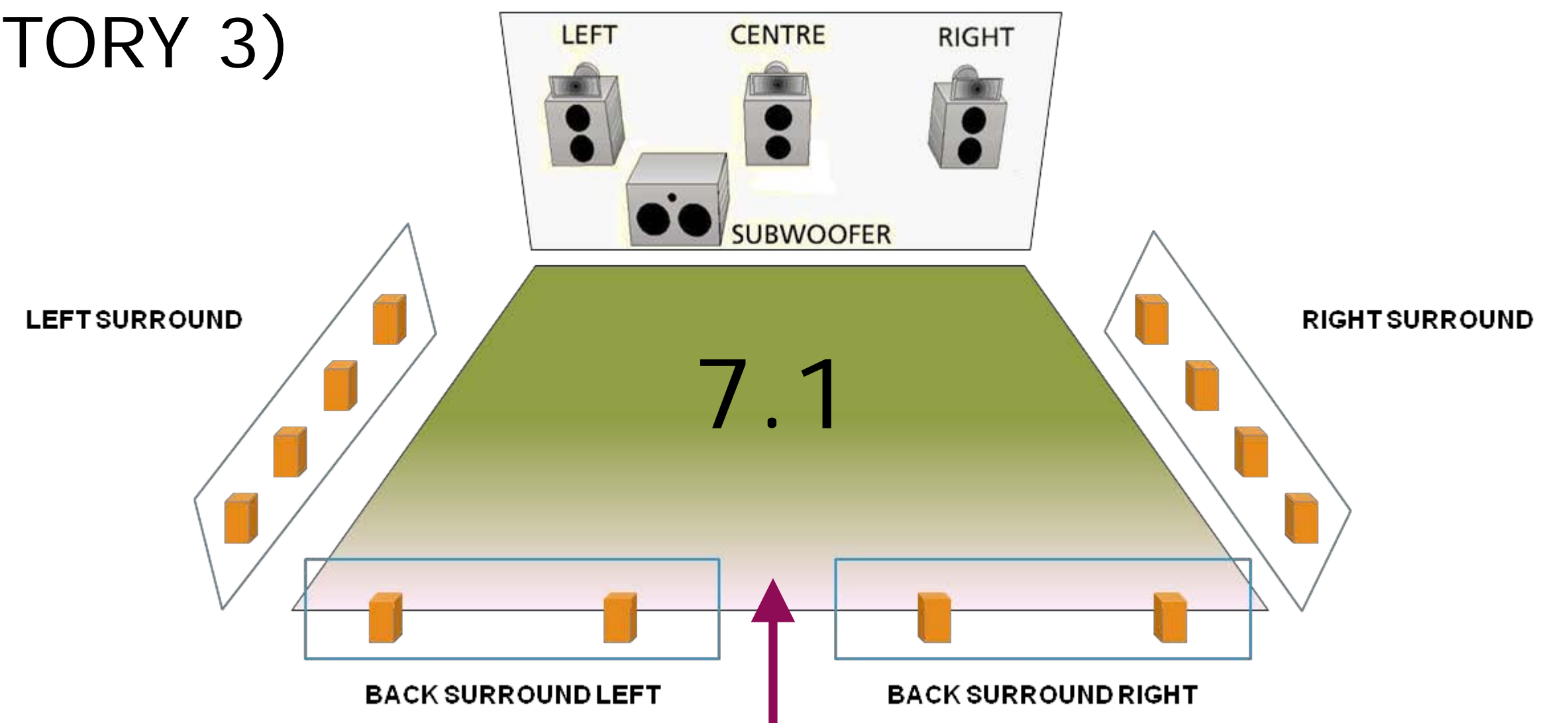
Development of channel-based systems

Dolby Surround 7.1 – since 2010 (TOY STORY 3)

3 discrete Front Channels

4 discrete Surround Channels

Only for D-Cinema

Existing 8-channel infrastructure in Production/Distribution/Cinema allows easy implementation

How to move forward? 9.1 ,11.1, 22.2 ?
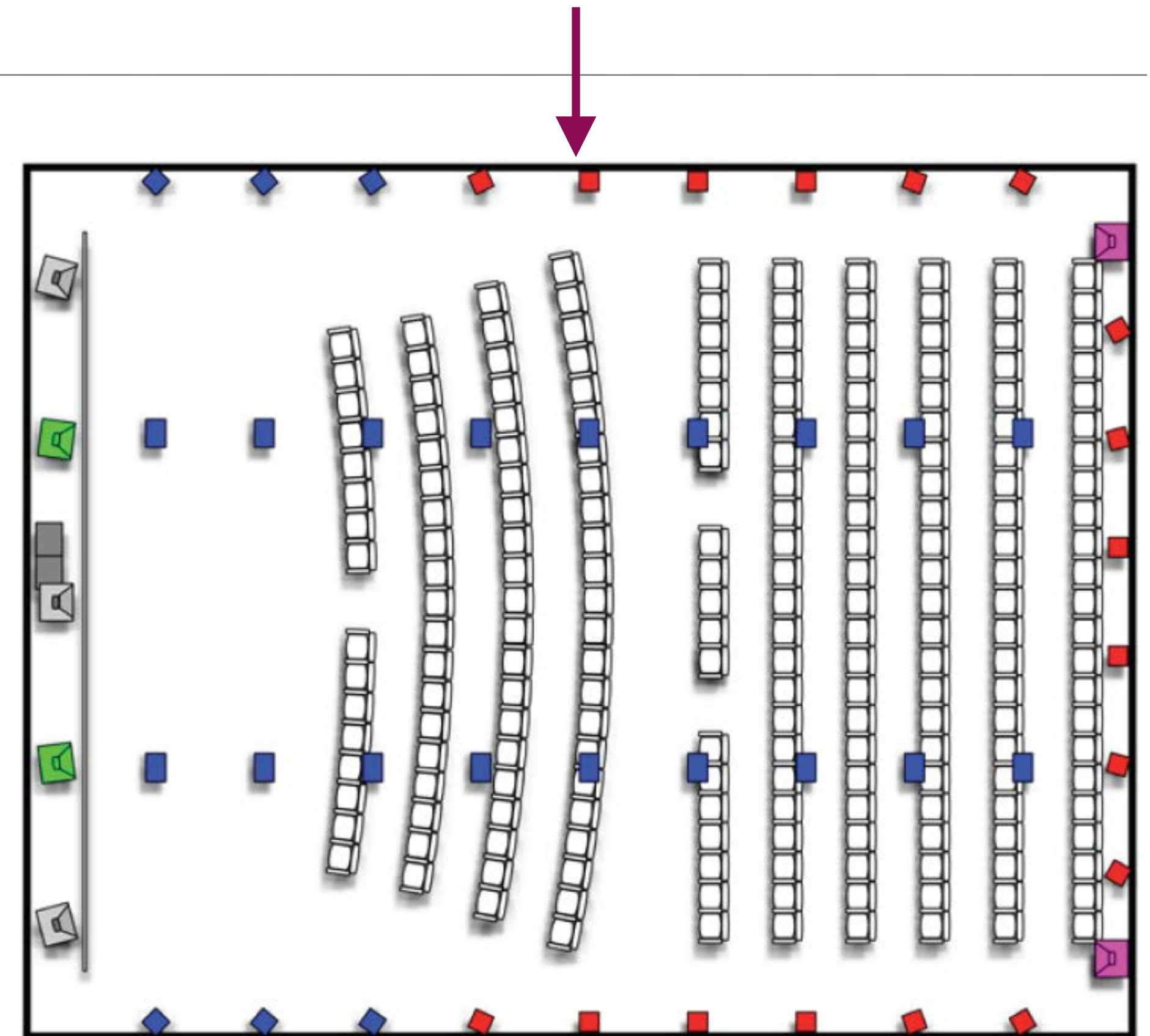
Object-oriented audio

Dolby Atmos – since 2012 (BRAVE)
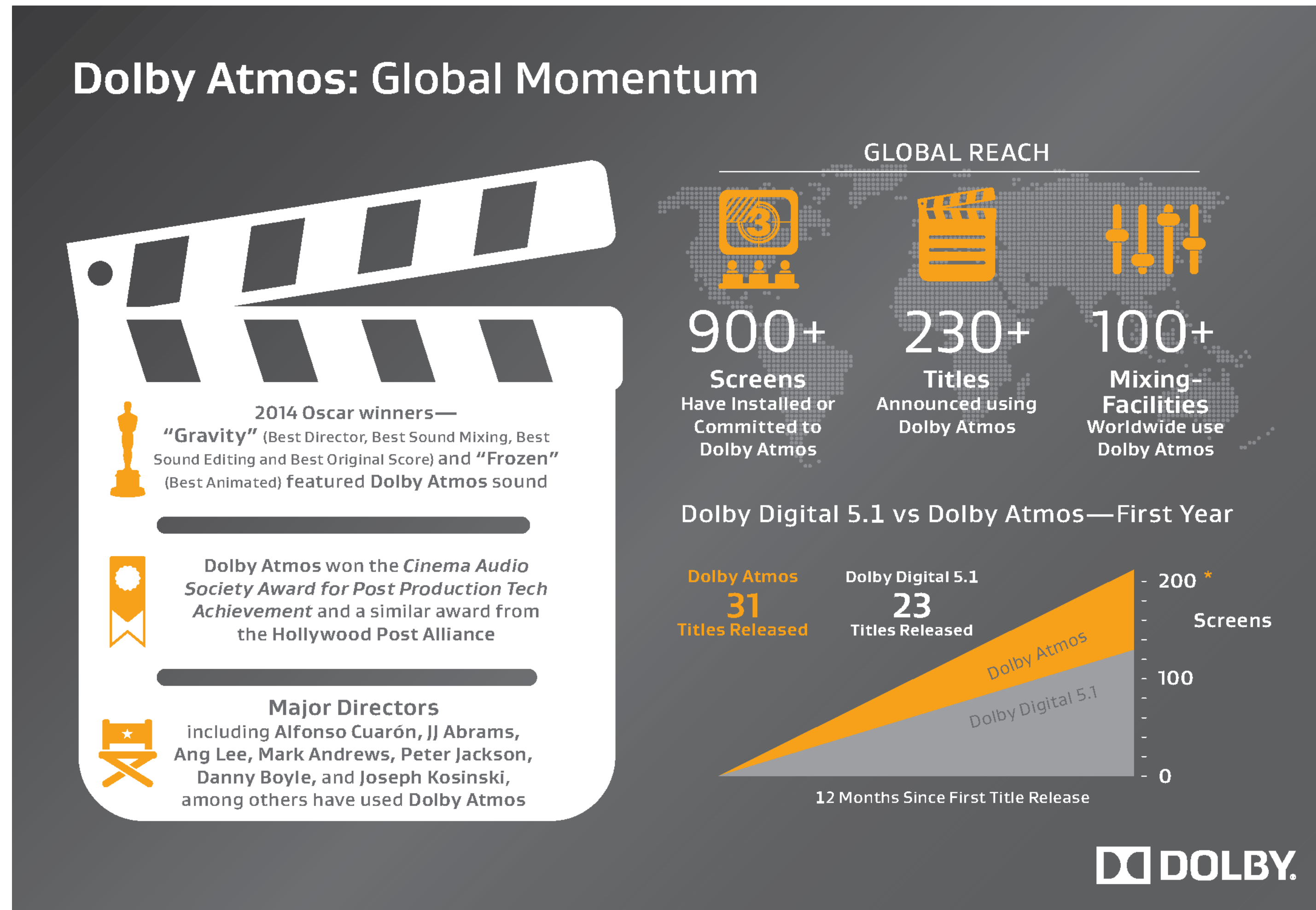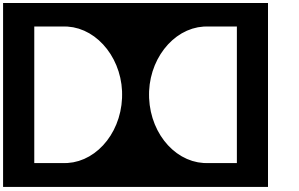
The new dimension of Surround Sound

- Independent speakers
- Up to 64 Playback-Channels

Enhanced audio experience through

- More creativity thanks to less limitations
- More precision and control
- Content mix can scale across small to large playback set-ups
- Ultimate immersive experience: listeners are enveloped in the scene

Dolby Atmos in the cinema

Dolby Atmos: Global Momentum

GLOBAL REACH

900+
Screens
Have Installed or
Committed to
Dolby Atmos

230+
Titles
Announced using
Dolby Atmos

100+
Mixing-
Facilities
Worldwide use
Dolby Atmos

2014 Oscar winners—
"Gravity" (Best Director, Best Sound Mixing, Best
Sound Editing and Best Original Score) and "Frozen"
(Best Animated) featured Dolby Atmos sound

Dolby Atmos won the *Cinema Audio
Society Award for Post Production Tech
Achievement* and a similar award from
the Hollywood Post Alliance

Major Directors
including Alfonso Cuarón, JJ Abrams,
Ang Lee, Mark Andrews, Peter Jackson,
Danny Boyle, and Joseph Kosinski,
among others have used Dolby Atmos

Dolby Digital 5.1 vs Dolby Atmos—First Year

Dolby Atmos
31
Titles Released

Dolby Digital 5.1
23
Titles Released

200 *

Screens

100

0

Dolby Atmos

Dolby Digital 5.1
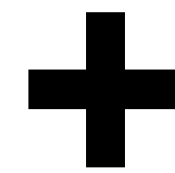
12 Months Since First Title Release

DOLBY.

Dolby Atmos object-layers

Base Audio *Bed*
Static audio elements with stirring base tones and rich complex audio textures

+
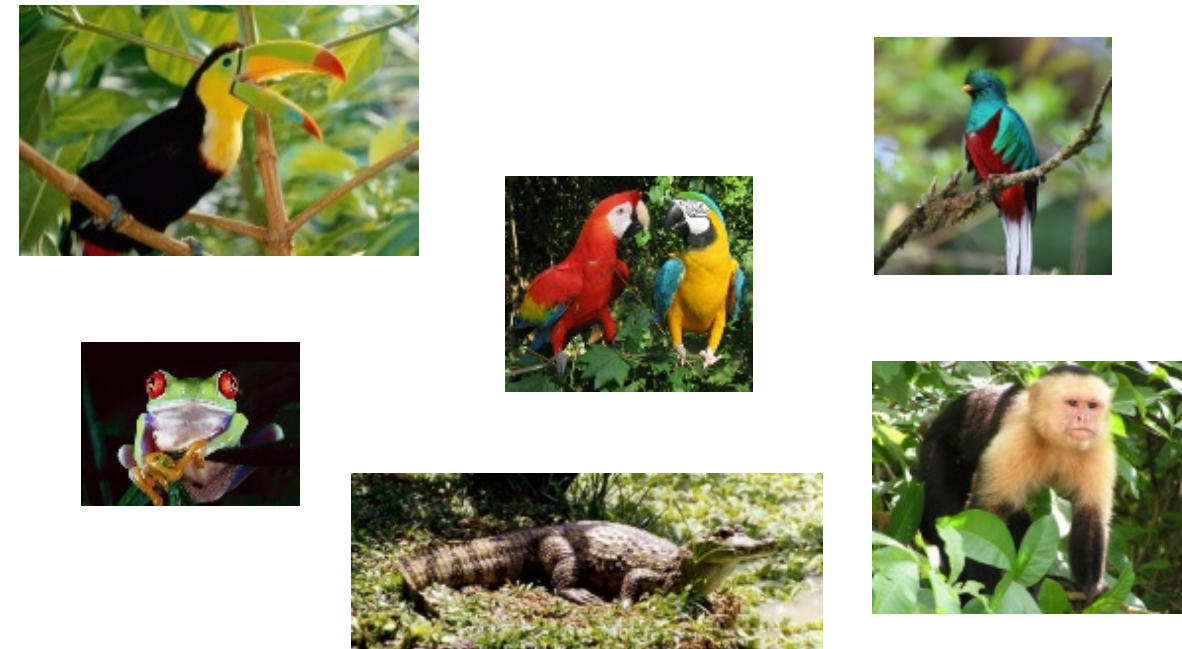
Sound *Objects*
Moving around and above you in multi-dimensional space add a **new height dimension**!

=

Real Sound Simulation
Multi-dimensional audio that fully immerses you in the scene.
- Unlimited creative freedom
- Extremely flexible
- Translates to any speaker configuration

A new approach to Audio Mixing and Playback

- A hybrid approach of channel-based audio bed and objects
- Content creators mix in a 3D space (including height) for more creative freedom
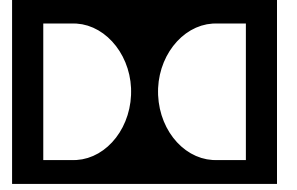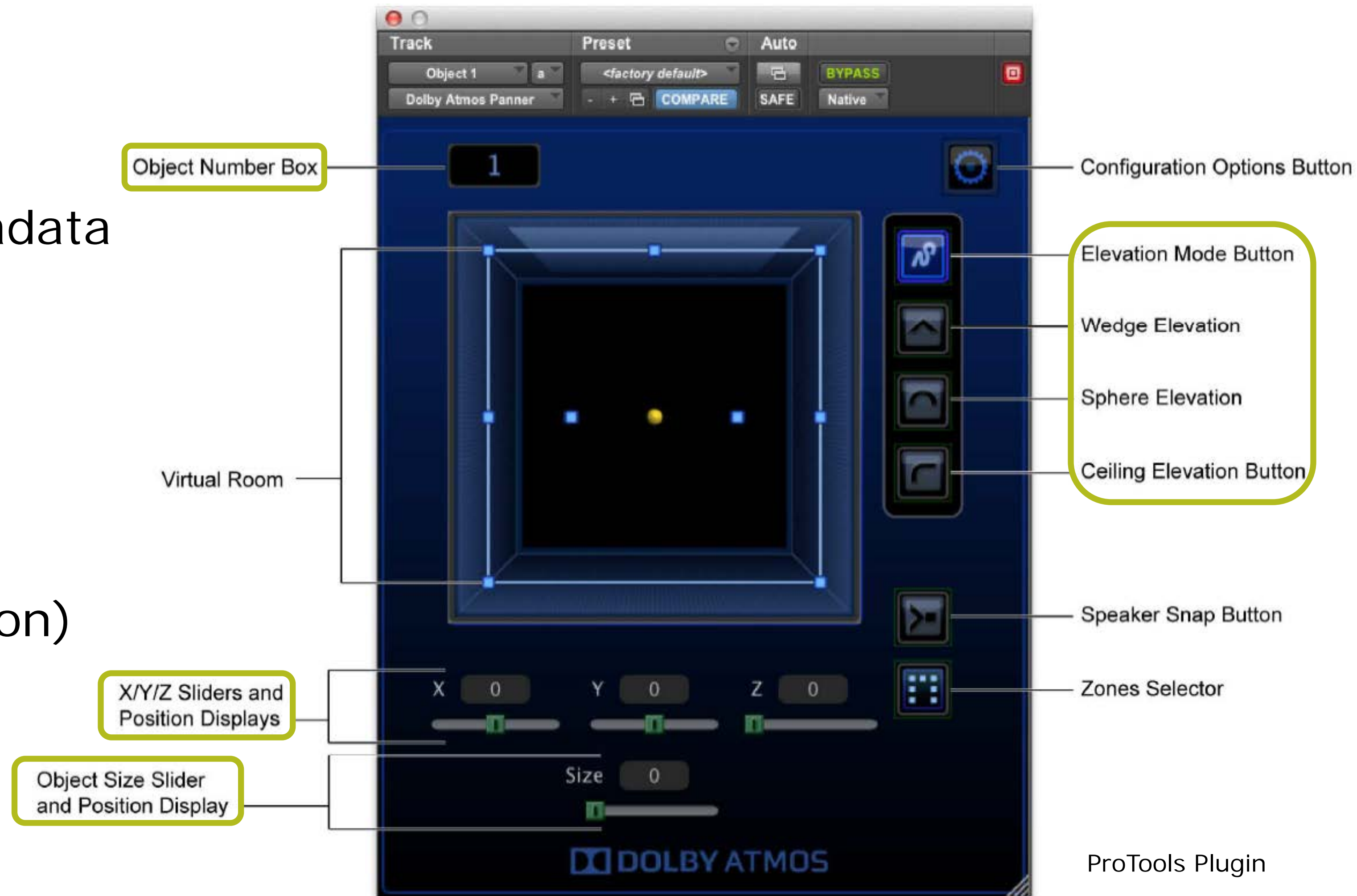
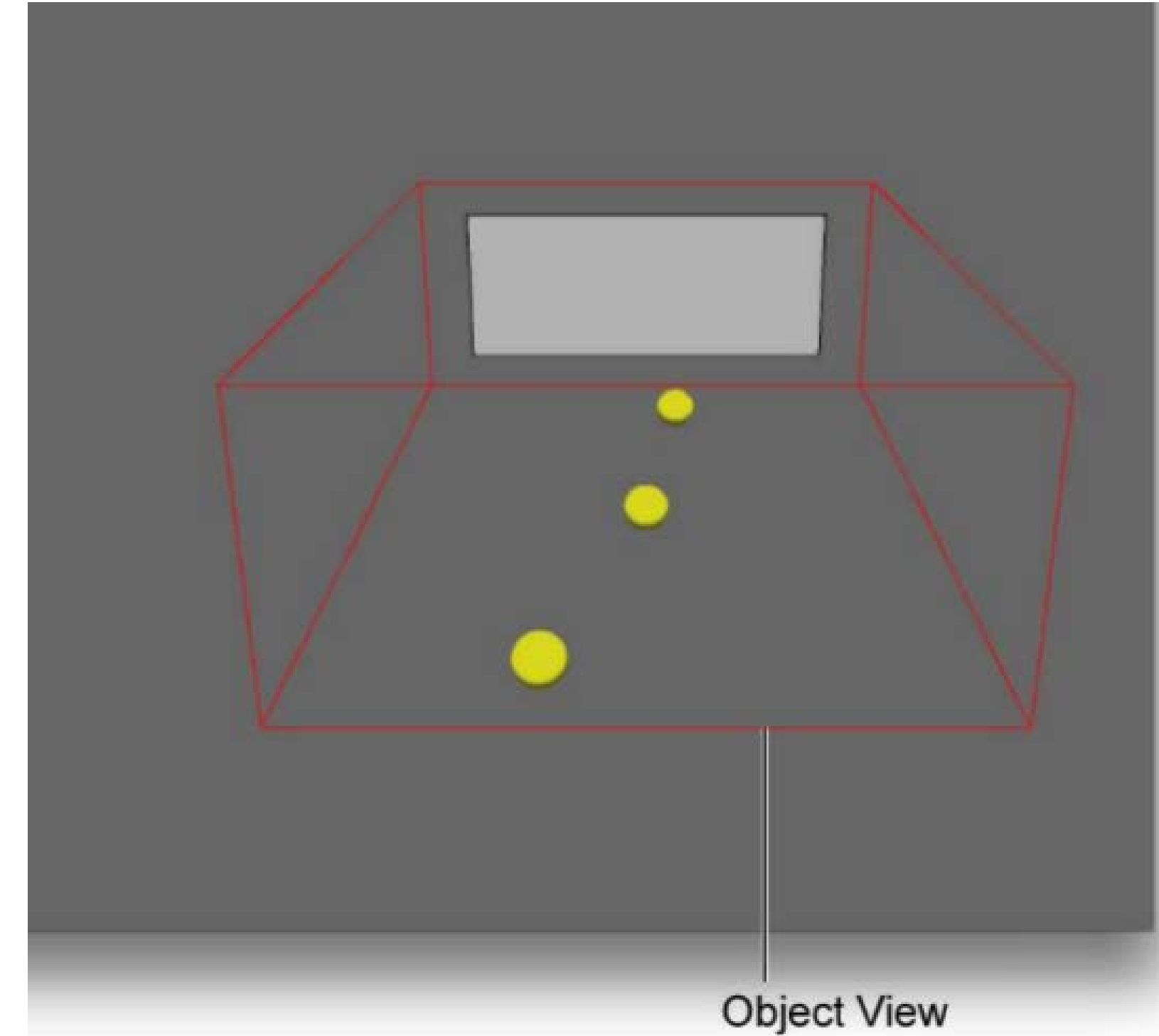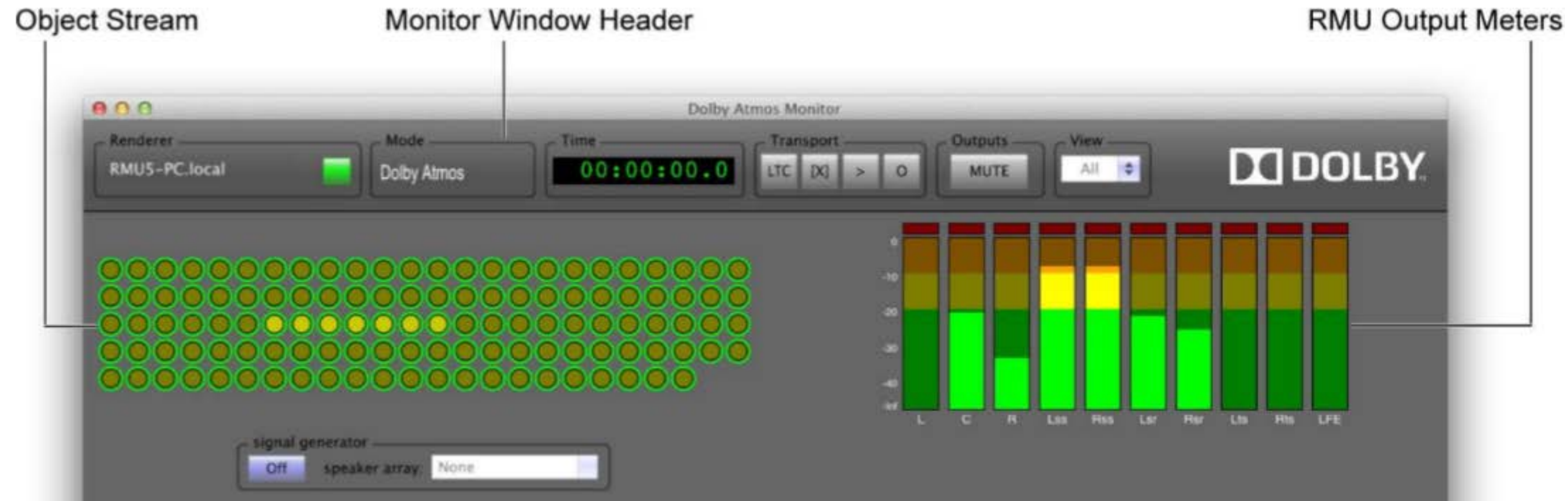# Properties of audio objects

What are Audio Objects

- (many, short) audio clips
- Enriched with object-metadata

Object properties

- Number (ID)
- Position (X, Y, Z)
- Size (divergence, dimension)
- „Path" (automatable)

Properties of audio objects

# The possibilities of object-oriented audio

Static Rendering   Audio objects are rendered in a fixed arrangement into a playback environment.

Enhanced audio experience through

- More creativity (precision & control)
- Full ambience, stronger impact
- Takes 3D surround into the room (away from the walls)
- Scalable playback, optimized for any playback environment

Redefining the consumer audio experience
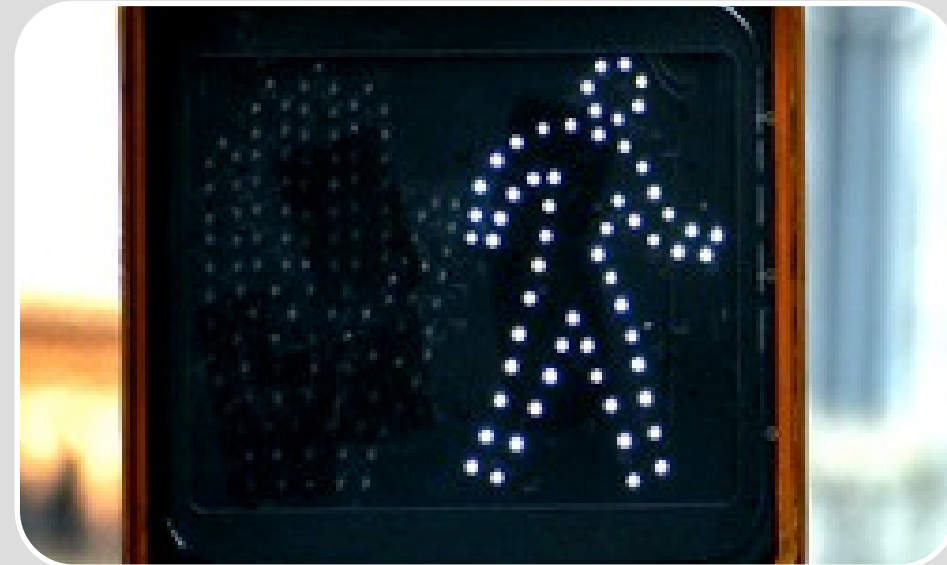
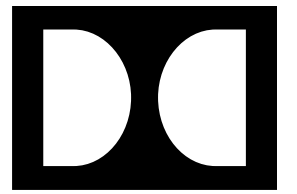| **Accessible**	**Personalized**	**Immersive**	**Adaptable**
Descriptive audio, dialogue enhancement, multiple languages	Modify the presentation to the listener's preference	Put the consumer in the action and the venue Lifelike experience	Optimal playback on every device

Delivery via Dolby Digital Plus

Dolby Atmos in the Home

Bluray, Home Cinema system, VOD

First generation output configurations

Home theater systems will use new overhead speakers to play back audio mixed in the height plane.

Typical Output Configurations	
7.1.4	7.1 on the floor and 4 x height
5.1.4	5.1 on the floor and 4 x height
7.1.2	7.1 on the floor and 2 x height
5.1.2	5.1 on the floor and 2 x height
3.1.2	3.1 on the floor and 2 x height
2.1.2	2.1 on the floor and 2 x height

- Speakers mounted overhead
- Separate amplifier feeds for overhead speakers
- 5.1.2 minimum for capability

How do we make overhead audio practical for most consumers?

Dolby speaker technology

Height speaker solution for reproduction of overhead objects in a Next Generation Audio mix

New speaker characteristics designed to create an enhanced experience using conventional speaker layouts. Separately addressable *up-firing* driver with its own binding posts

Minimizes total speaker footprint while adding new audio dimension

How will Dolby Atmos content be delivered?

Movies, music and video games

Blu-ray disc
- Dolby TrueHD and Dolby Digital Plus for primary soundtrack
- Dolby Digital Plus is also possible for alternate languages

OTT streaming (HbbTV, UltraViolet, etc) -> Mobile / Smart TV / STB
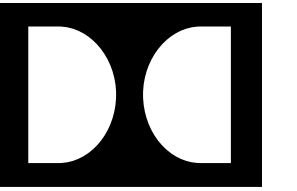- Dolby Digital Plus. Eg: MPEG-DASH, Smooth Streaming, HLS, CFF

Downloadable files
- Dolby Digital Plus. Eg: MP4

Broadcast -> TV & STB
- Dolby Digital Plus. Eg: MPEG/DVB Transport Stream

Compatible transmission

Backward-compatible Dolby® TrueHD and Dolby Digital Plus codecs

- Multiple content skus not necessary
- A single disc/single digital stream supports Dolby Atmos and legacy system playback

Conform to the current Blu-ray specification

Compatible with existing containers for OTT delivery

Bitstream transmission over **existing HDMI** protocol (1.4 or greater). **Decoding** of the Dolby Atmos signal occurs in the AV receiver

Legacy systems play the 5.1 or 7.1 formats

Summary

Summary

A dramatically enhanced audio experience is achievable through

- Object-oriented Surround-Sound with the option of personalization

   Adapts to the local play back environment (e.g. speaker configuration)

   Just an increase of the audio channel number is contra-productive

- The option of personalization

   Provides an adaption to the individual's listening preferences

   Accessibility for hearing impaired

The consumer experiences a clear difference and is motivated

   To stay with a enhanced service or pay additionally for a better service

   To take the investment into new receiver hardware

The route to the Next Gen experience

Dolby provides technologies & solutions for the complete signal chain

➢ Not just a „Codec", but also Mezzanine/Contributions-Formats

➢ Tools such as reference-monitors, -encoder, -decoder, metadata-editor, etc

➢ Close work with the Content Industry to develop workflows and tools jointly at a very early stage

➢ Active work in industry standard bodies

Technologies on their own cannot deliver a NextGen Experience only a complete eco-system can enable it.

Let's define the future

of entertainment together

Links

DOLBY ATMOS®
http://www.dolby.com/atmos

DOLBY AUDIO™
http://www.dolby.com/us/en/professional/technology/dolby-digital-plus.html

DOLBY VISION™
http://www.dolby.com/us/en/professional/technology/home-theater/dolby-vision.html
http://blog.dolby.com/2013/12/tv-bright-enough/

DOLBY 3D
http://www.dolby.com/us/en/professional/technology/dolby-3d-glasses-free-3d.html

DOLBY CINEMA™
www.dolbytheatre.com