GDM2022

Global Distribution Meeting

K-ARRAY Unique Audio Solutions

KSCAPE Merging Senses

KGEAR Smart Audio Solutions

STUDIO
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Donato Masci
Acoustic Designers

Dolby Atmos

Cinema,
Home Entertainment,
Music.

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Donato Masci & Cecilia Torracchi

Chi siamo

Who we are

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Donato Masci

Studio Sound Service – who we are

Studio Sound Service is an acoustic design and consultancy studio, located in Florence. Since 1983 we have been designing environments for music and audio / video production. We deal with acoustics and electroacoustics in every field, from the musical and cultural sector to the construction, commercial and industrial sector.

- Iyuno • SDI Media Acoustic Designers (2019-ongoing);
- 3Cycle postproduction Facility @ Rome;
- FOX Dolby Atmos Studios @ Rome (IT), Münich (DE), London (UK);
- Netflix Facility @ Rome (IT)
- Disney Facility @ Warsaw (PO), Milan (IT)
- In House (Dolby® approved – Sorrentino) @ Roma;
- Aemme Recording Studio – Salvatore Addeo @ Lecco
- D:POT Recording Arts @ Prato – Fabrizio Simoncioni;
- Platinum Studio @ San Gimignano – Diego Calvetti;
- Mulinetti Studio @ Genova – Alberto Parodi
  (Resolution Award 2015 Best Audio Facility, Nomination);
- The Garage @ Civitella v.d.C. (AR)
  (Resolution Award 2014 Best Audio Facility, Nomination);
- House of Glass @ Viareggio (LU) – Gianni Bini
  (Resolution Award 2013 Best Audio Facility,Nomination);
- Waves Music @ Genova;
- PPG Studios (Andrea Bocelli) @ S. Pietro Belvedere (PI);
- SonicFab Studio @ Pioltello (MI);
- Renato Zero Studio @ Rome;
- Marco Masini Studio @ Florence;
- Biagio Antonacci Studio @ Bologna;
- Damian Lazarus, Monastic Studio @ Vicchio (FI);
- Giorgia Angiuli Studio @ Florence;
- Vinai Studio @ Brescia;
- Barys Arena (ice hockey) @ Astana, Kazakhstan;
- George Lucas Home Theater, Italy;
- Chiesa Santa Maria Nuova (Arch. M. Botta) @ Terranuova B. (AR);
- Prada Auditorium and Conference Room via Orobia @ Milano;
- Presentation room Ferrari HQ @ Maranello (MO);
- Duomo di Siena new audio system;
- Siemens HQ @ Milano;
- Chorus Life (arena e cittadella) @ Bergamo
- EVAC Dubai Metro;
- EVAC Bahrain and Islamabad airport (THALES).

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Audio Facilities

Cicaleto Recording

Arezzo, IT

3Cycle

Rome, IT

FOX - NatGeo DE

München, DE

FOX - NatGeo IT

Roma

inHouse
Mirko Perri

Roma

Damian Lazarus

Vicchio (FI)

SonicFab

Pioltello (MI)

House of Glass
Gianni Bini

Viareggio

Mulinetti Alberto Parodi

Genova

Aemme Recording Studio Salvatore Addeo

Lecco

Waves Music

Genova

Officina Sonora del Bigallo

Bagno a Ripoli - FI

Marzi Recording Studio

Rimini

Sudestudio

Guagnano – LE

Museo dell'Opera del Duomo

Pisa, IT

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Donato Masci
Casi studio

Production/Recording Studio

Barys Arena

Astana – Kazakhstan

Hotel Mediterraneo

Napoli

Siemens Hq

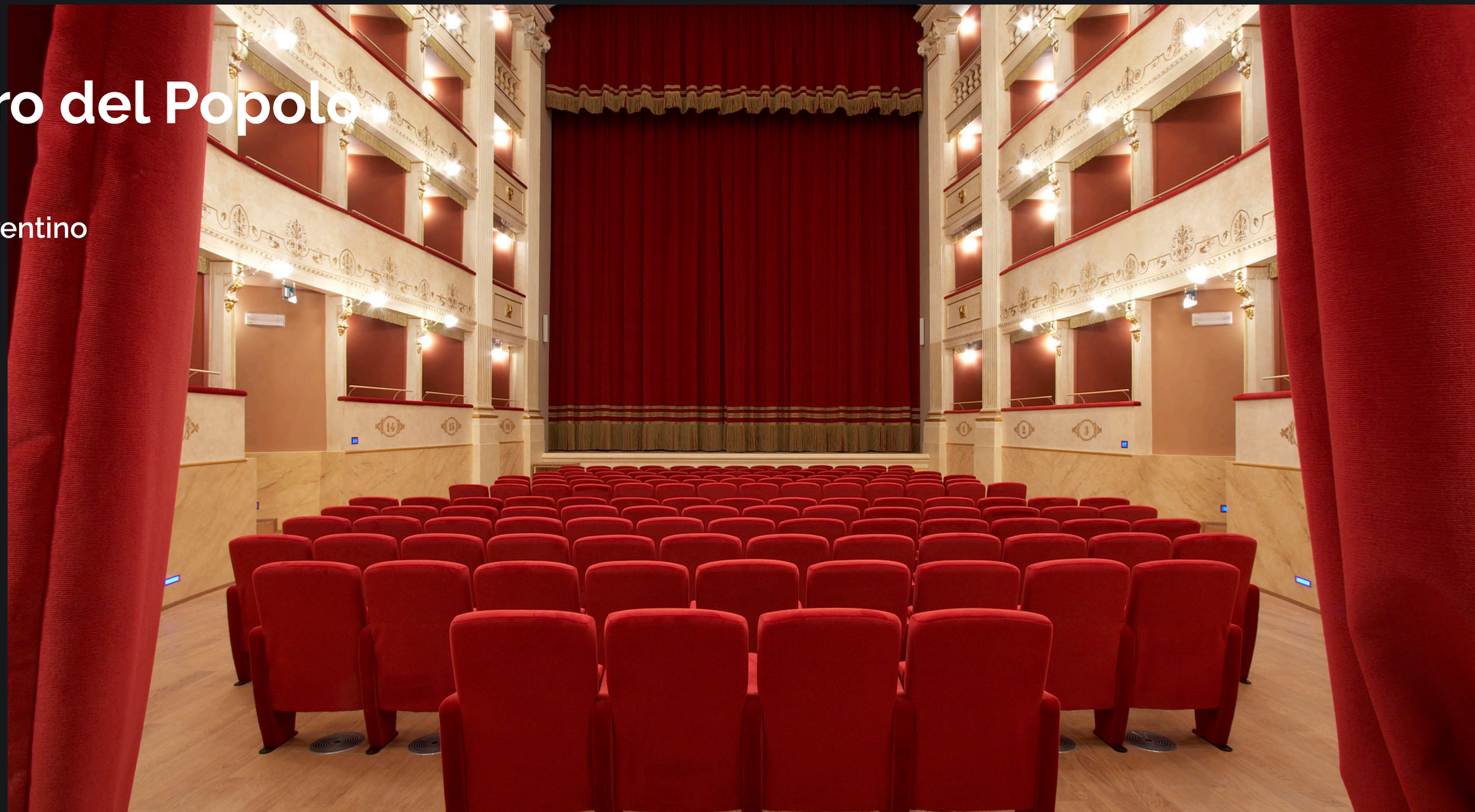
Milano

Ferrari Presentation Room

Maranello

Teatro del Popolo

Castelfiorentino



Duomo di Siena

Siena

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A Brief History of Multichannel Audio

(for video...?)

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Evolution: acoustics vs technology

Time Parameters

1890 Sabine:
- Sabine's law
- Reverberation Time RT60

Energetic Parameters

1962 Beranek:
- Music, Acoustics and Architecture, questionnaire in concert halls
- New acoustic parameters (ITDG, Loudness, RT (EDT, reverberation frequency characteristics, etc.)
- C80, C50, D50)

Spaciousness and enveloping Intelligibility

1971 Houtgast & Steeneken:
- Speech Intelligibility
- STI (RaSTI, STIPA)

1971 Barron:
- Spatial feeling;
- Enveloping
- SCC

1977 Ando & Kageyama:
- subjective preferences in relation to physical binaural factors
- IACC, ITDG

1972 Damaske & Ando:
- subjectivity of the diffusion and direction of the sound source
- IACC, τ_{IACC}

1983-1997 Sato, Mori, Ando, Cocchi, Farina & Rocco:
- subjective preference with respect to 4 "orthogonal" parameters of the acoustic field
- listening level, ITDG. IACC, τIACC

1890 — 1960 — 1970 — 1980 — 1990 — 2000

AM Radio ***Reel to Reel*** ***First stereo*** ***Dolby Cassettes***
Electrical Phonographs
AM/FM/Phono

44.1/16 Digital CD
Dolby Surround, THX 70mm & IMAX

MP3, AC3, DTS 96/24 DVD-A, SACD
5.1 compressed digital system

1886 Tainter & Bell:
Invention of the gramophone (recording on disk)

1901 First transatlantic radio transmission

1914 Ford "T"
First car audio system

1904 Marconi:
Radio Patent

1926 John Logie Baird
Invention of Television

1933 Armstrong
Invention of FM

1936 Magnetophone
First magnetic tape recorder

1948 12'' Vinyl introduction

1949 AMPEX 300

1954 First portable transistor radio

1952 8-tracks recorder

1956 STEREO tape recordings

1958 First STEREO LP

1962 Philips
Compact Cassette Tape

1967 TV Color in UK

1969 Dolby-B noise reduction

1971 CPU microprocessor

1978 Sony
Walkman

1982 Commodore
Commodore 64

1982 Sony & Philips
Compact Disc (CD)

1985 IXI
First digital audio player

1992 Sony
MiniDisc (MD)

1995 DVD

1997 MP3
Popularity of MP3 compressed format

1999 Napster
mp3 peer-to-peer sharing

2001 Apple
iPod

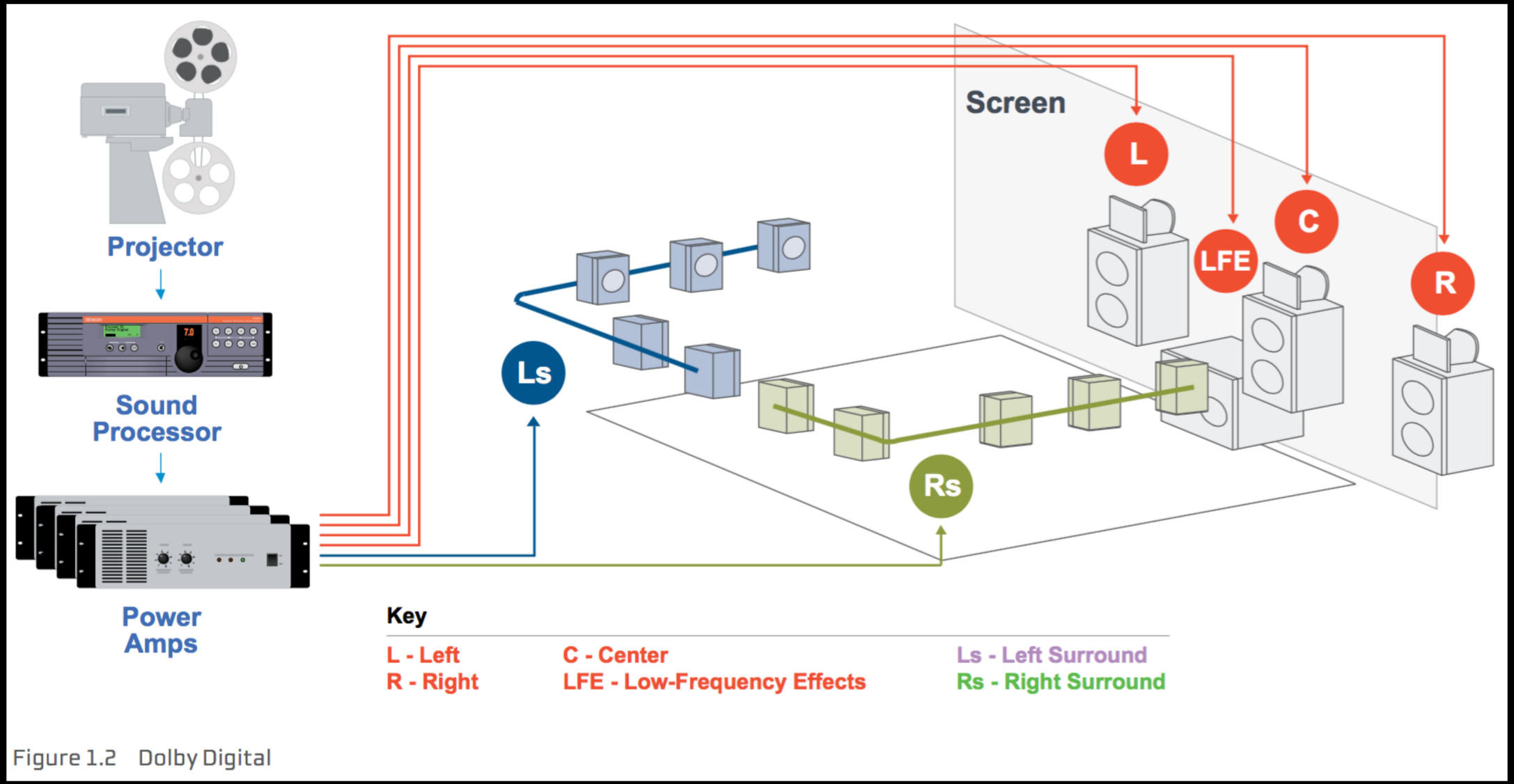

Figure 1.2 Dolby Digital

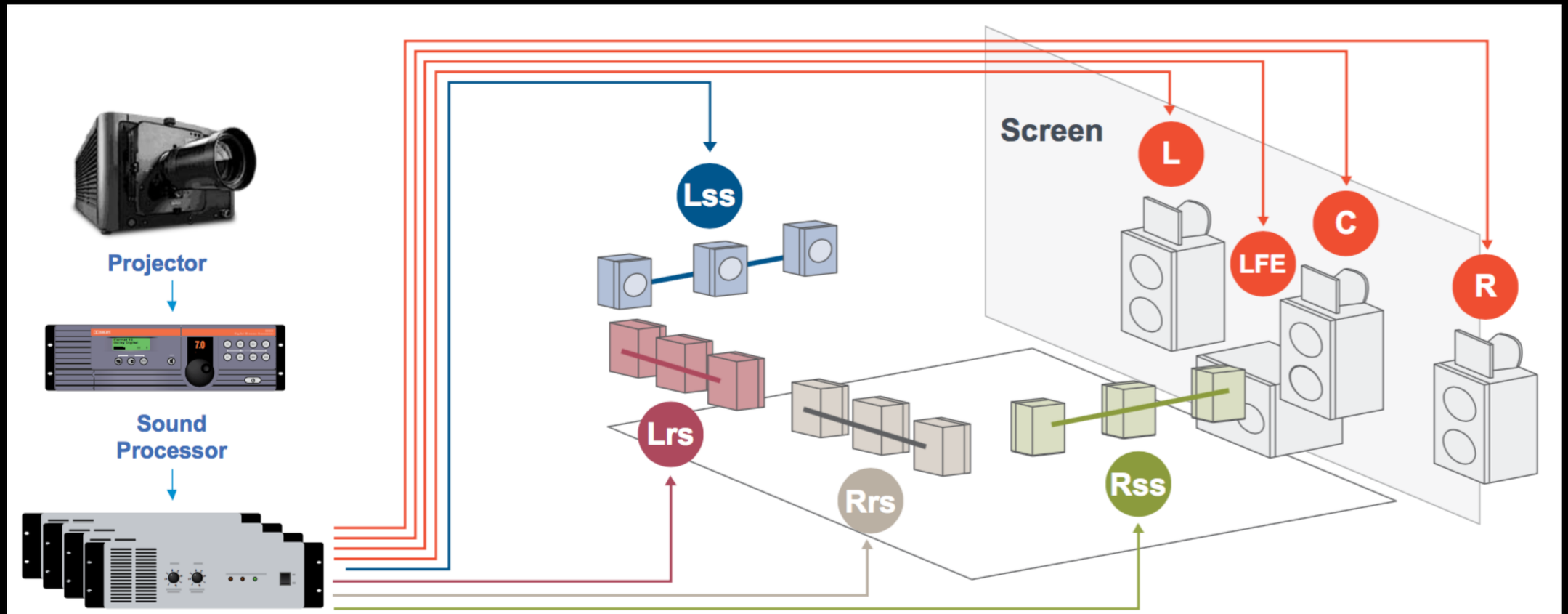

Figure 1.3 Dolby Surround 7.1

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The modern day standard: Dolby Atmos

1. Cinema (2012)
2. Home Entertainment (2016-2017)
3. Music (2021)

24 bit
48/96 KHz

Objects + Beds

While the use of audio objects provides the desired control for subtle effects, other aspects of a movie's soundtrack work effectively in a channel-based environment.

A. the "beds" are submixes or stems based on channels (5.1, 7.1 or 9.1)

B. ambient effects and reverbs actually benefit from being sent to speaker arrays -> channels instead of objects.

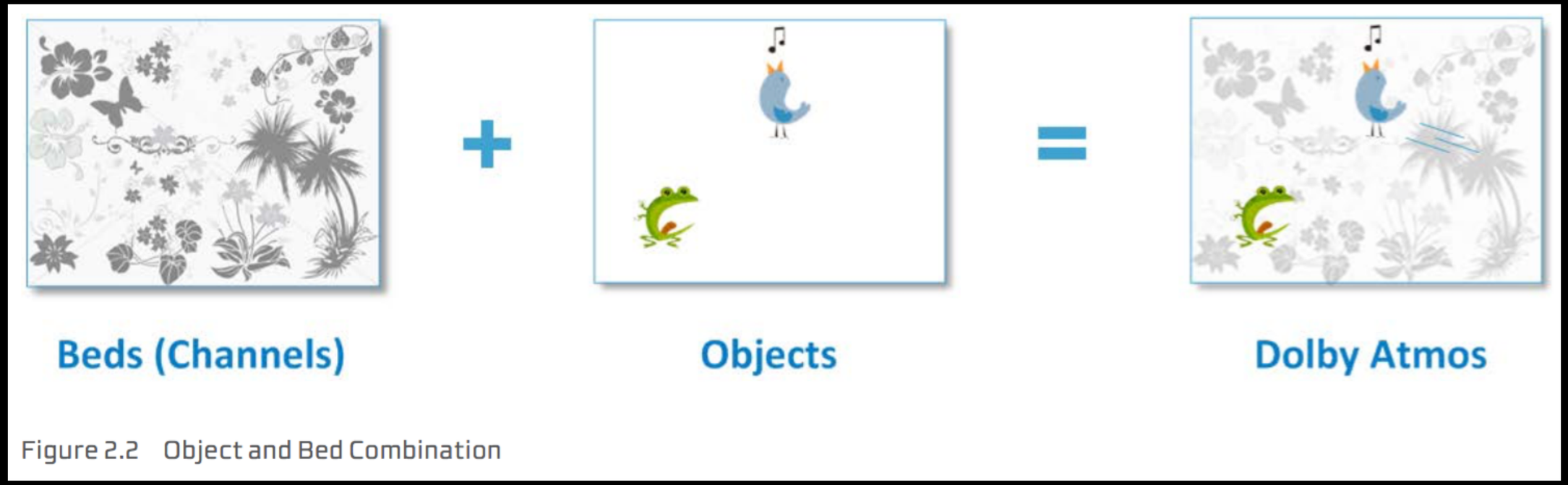

Figure 2.2 Object and Bed Combination

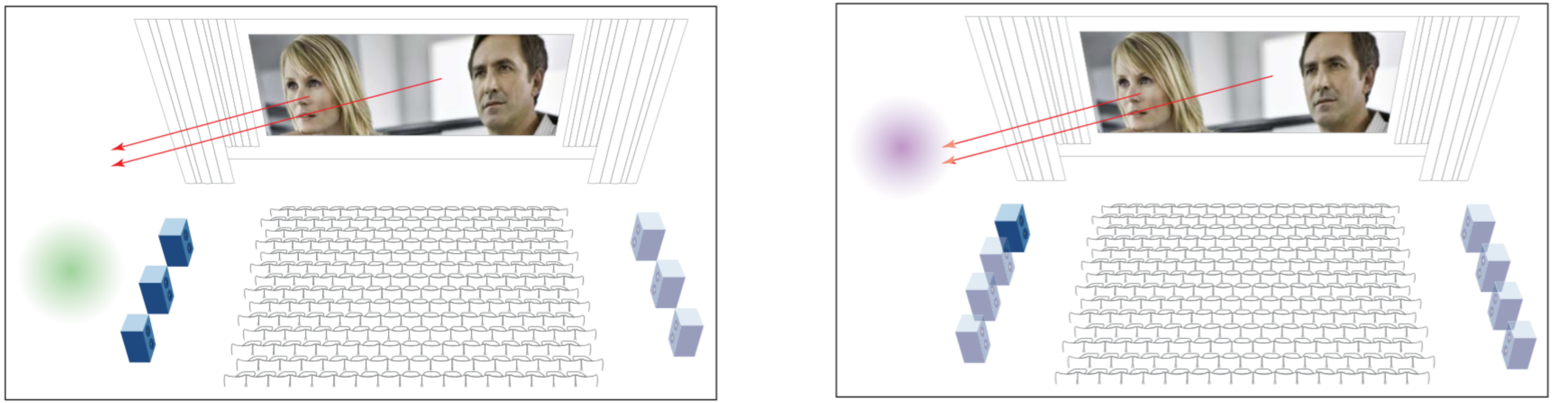

Figure 2.1 Benefits of Increased Surround Resolution for Audio/Visual Coherence

Audio Objects:

sound elements (individuals or groups) that share the same physical position in the auditorium

A. They can be static or moving.

B. Controlled by metadata detailing the location of the sound at any given moment.

C. When objects are monitored or played in a room, they are rendered based on positional metadata using the speakers present, rather than necessarily being output over a physical channel.

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Dolby Atmos – Recommended Speaker Location – Theatre

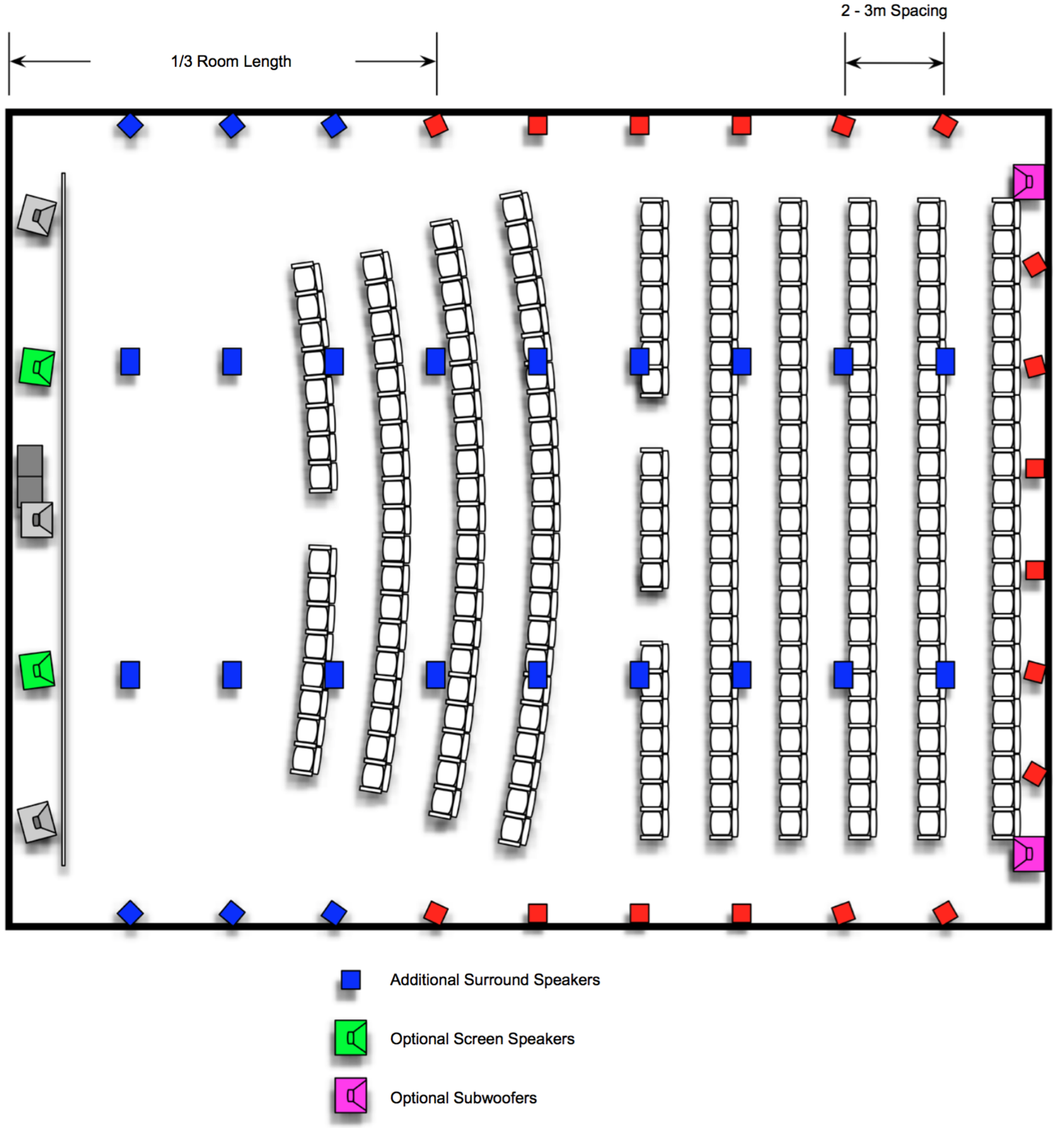

Figure 5.1 Recommended Speaker Locations

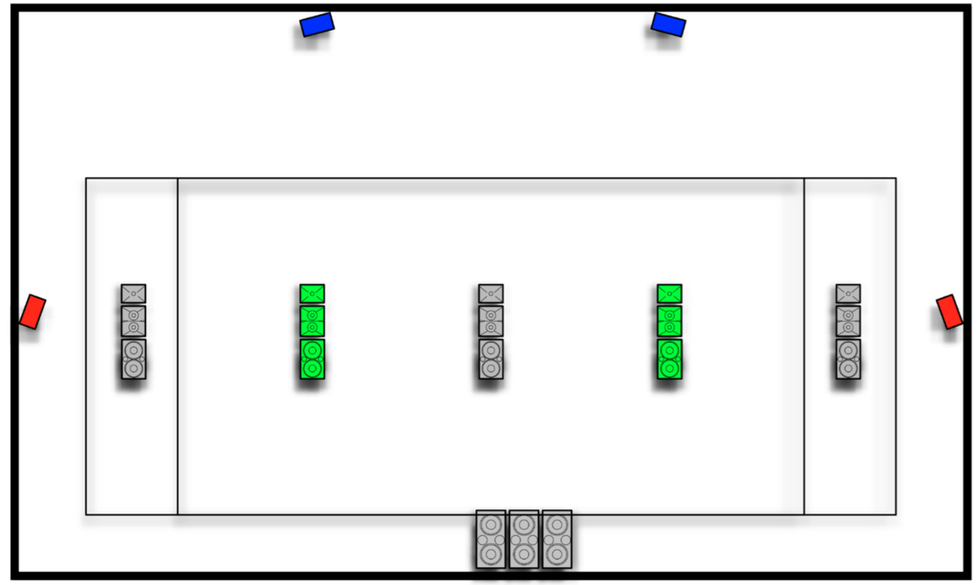

Figure 5.2 Recommended Speaker Locations (Screen, Side Surrounds, and Top Surrounds)

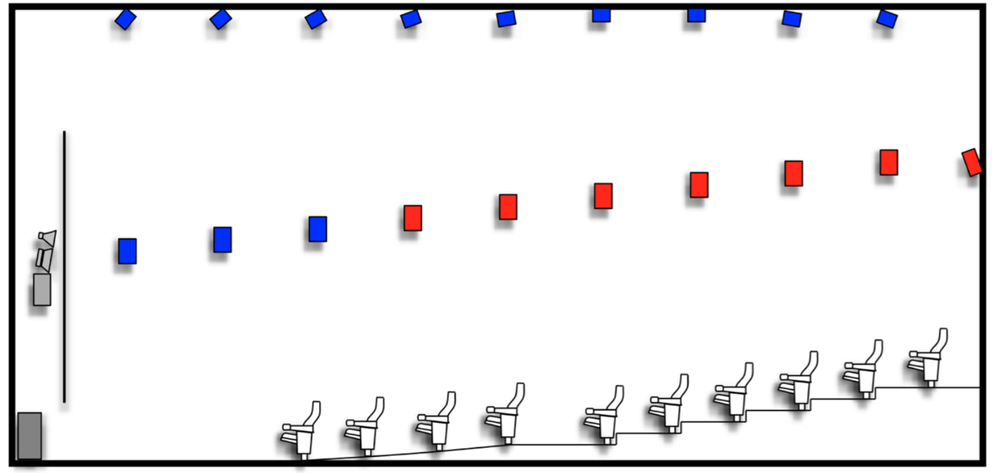

Figure 5.3 Recommended Side Wall and Ceiling Speaker Locations

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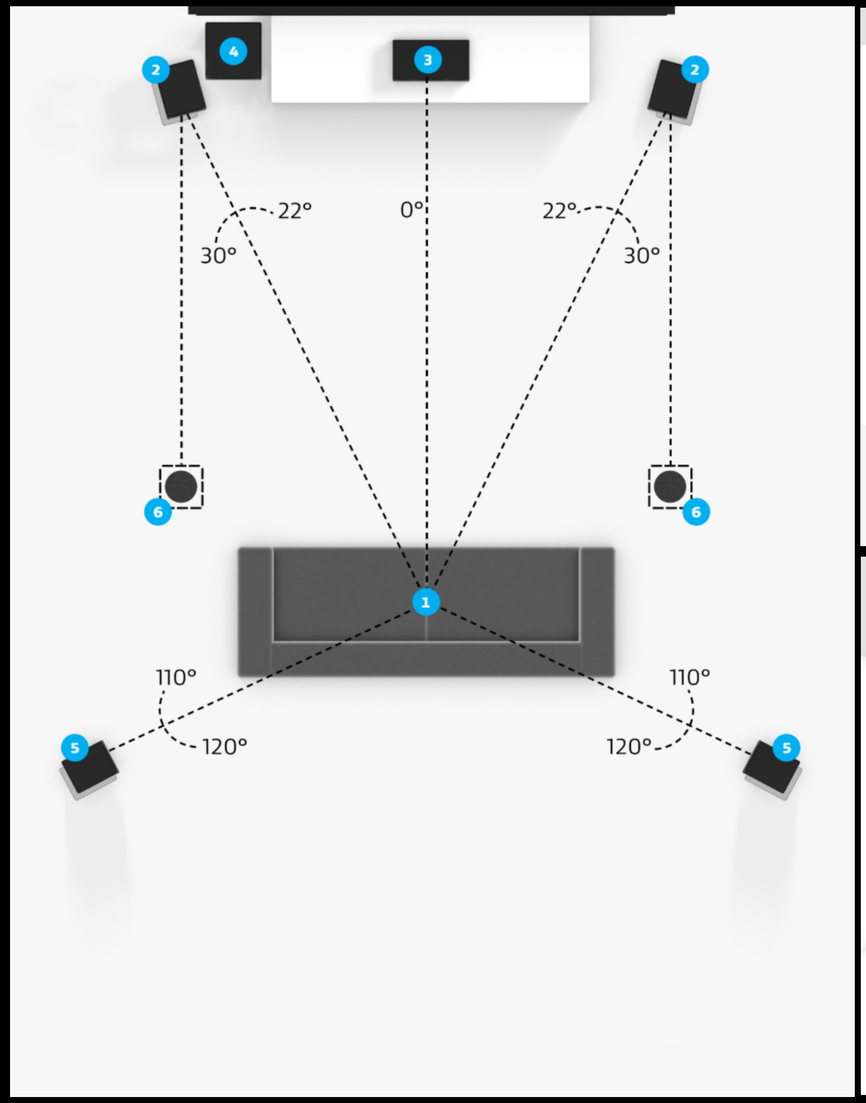
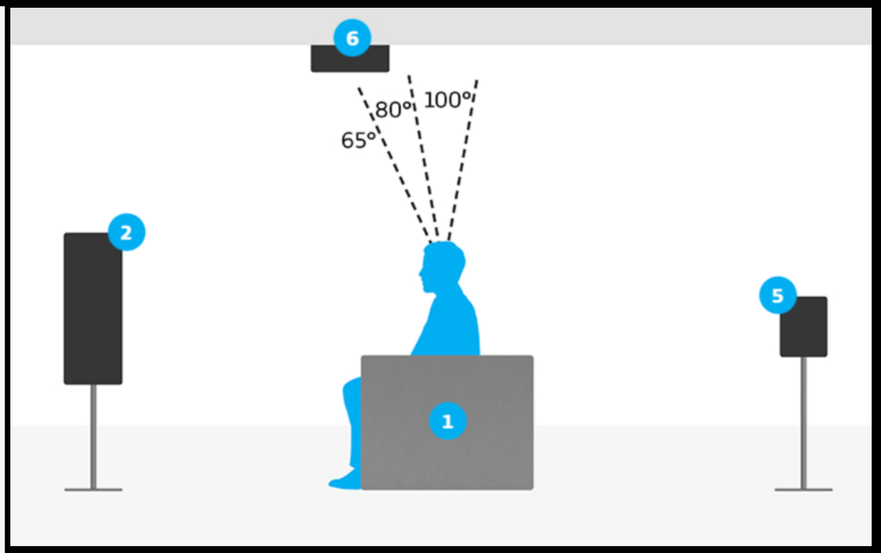
Dolby Atmos – Recommended Speaker Location – Home Theatre

Home Theater 5.1.2 down-firing





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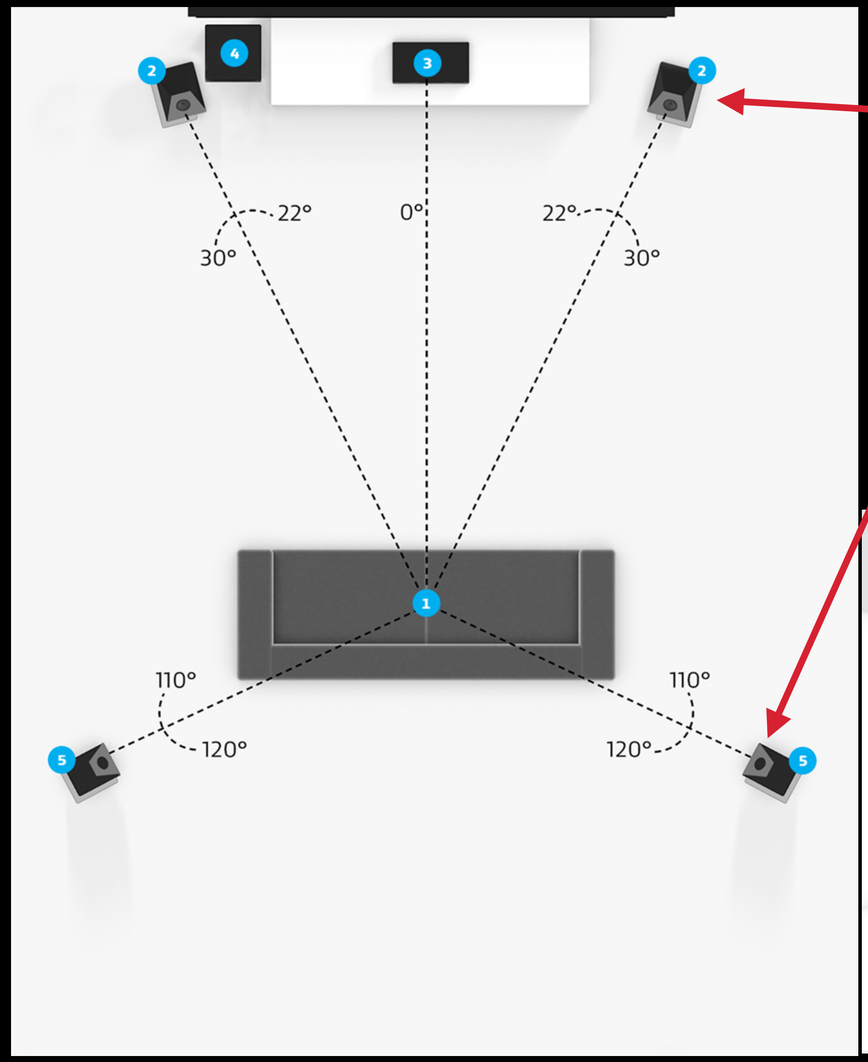
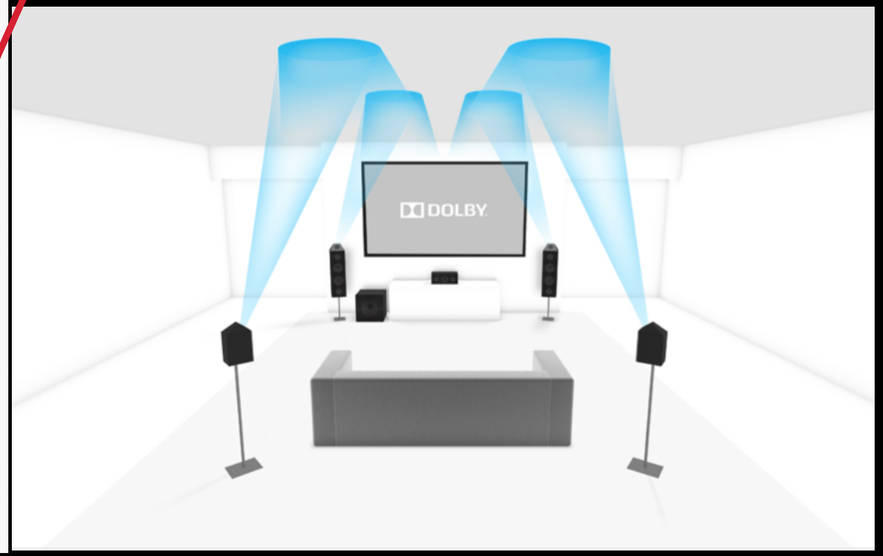
Dolby Atmos – Recommended Speaker Location – Home Theatre

Home Theater 5.1.4 up-firing



Atmos enabled surround speakers (up-firing)



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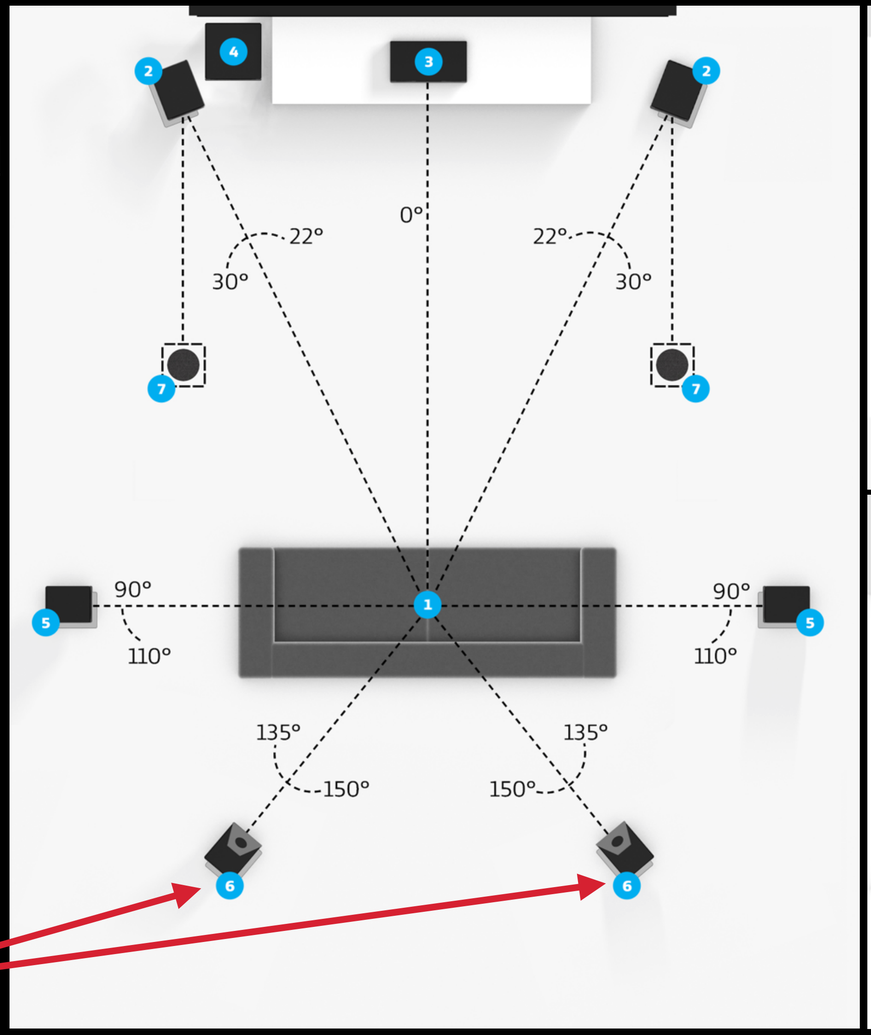
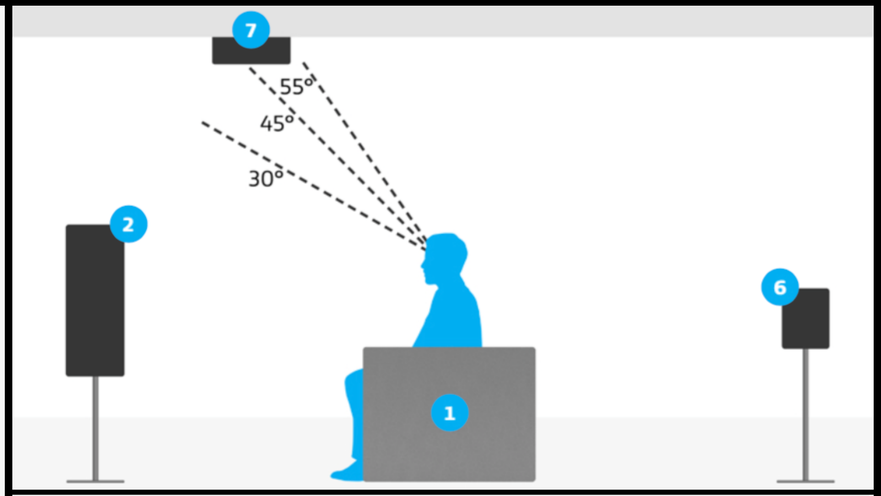
Dolby Atmos – Recommended Speaker Location – Home Theatre

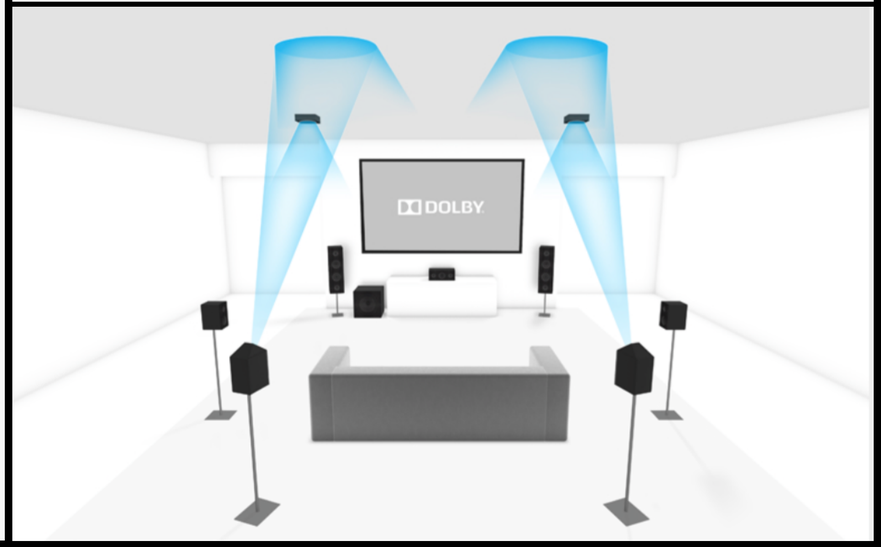
Home Theater
7.1.4
Hybrid overhead

front down-firing
back up-firing

Atmos enabled
surround speakers
(up-firing)







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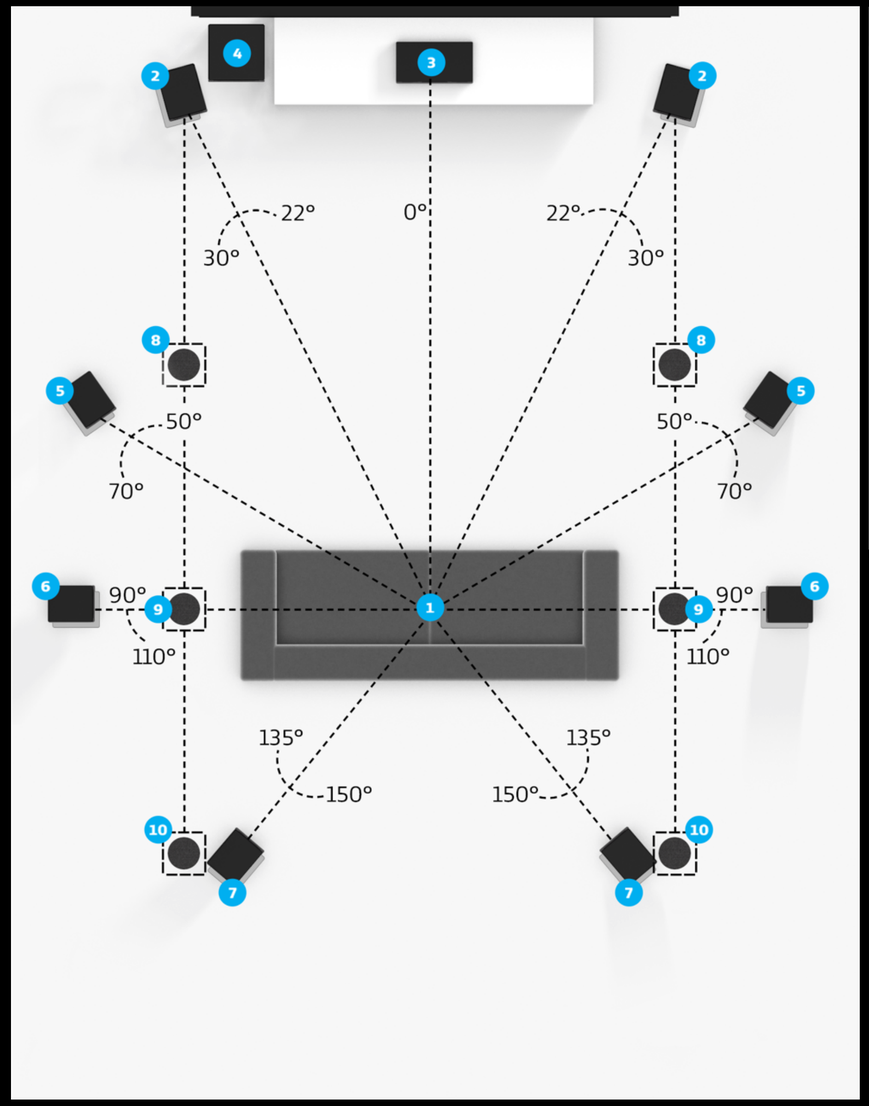
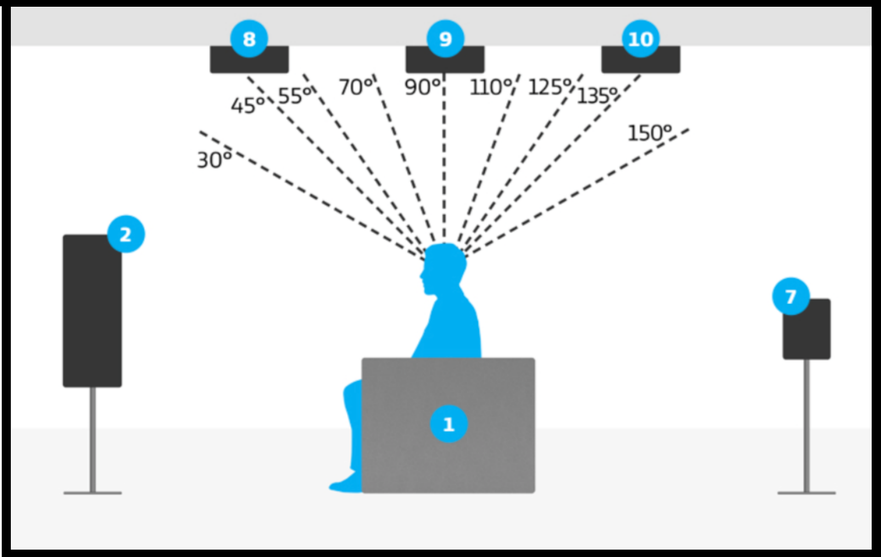
Dolby Atmos – Recommended Speaker Location – Home Theatre

Home Theater 9.1.6 down-firing





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How to listen in Dolby Atmos?

1. **Discrete Channel Audio System**
   7.1.4+

2. **Headphones**
   (mobile phones, computers Atmos ready)

3. **Soundbars**

4. **Automotive**

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Dolby

Dolby Atmos Technical Guidelines

1. **Cinema Theatrical**
   Theatres and Studios
   Certification Programme —> Dolby Consultant for Theatrical

2. **Home Entertainment**
   Home theatres and Studios
   No more certification needed for studios
   (but a Dolby Consultant can be useful for commissioning…)

3. **Music**
   Home theatres and Studios
   Official Listing for studios —> Dolby Consultant for Music

DARDT
Dolby Atmos Room Design Tool

It is an Excel file with macro developed by Dolby to configure a room in Dolby Atmos, there are different types (theatrical Home Entertainment and Music)

A. Monitor layout configuration, size, angles and delay quickly represent the layout

B. SPL configuration and verification

C. Equipment configuration

D. Analysis and guideline for optimal reverberation time

E. Acoustic analysis tool (room modes, boundary induced cancellation Analysis, Room dimensions ratio analysis)

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Dolby Atmos Music – DARDT

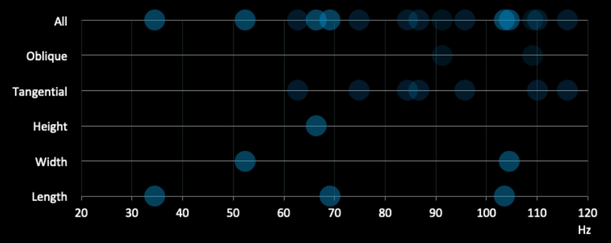
Theoretical Room Modes

Help

Plot of quantity, density and frequency points.

Theoretical room modes along each of the highlighted room dimensions.

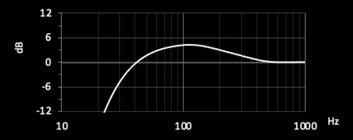
Plot refers to the room dimensions entered and the subsequent room ratios.
Rectangular shaped box assumed.



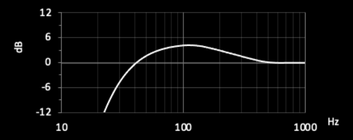
Boundary Induced Cancellation Calculation Analysis and Discussion

Help

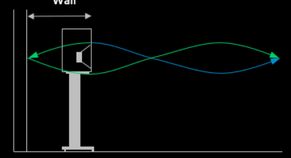
Speaker Label	
Speaker LF Cut-Off/Bass Management Frequency	40 Hz
Distance Speaker Driver from Wall (m)	



Speaker Label	
Speaker LF Cut-Off/Bass Management Frequency	40 Hz
Distance Speaker Driver from Wall (m)	



Distance Driver from Wall



Axial Modes along Room Length

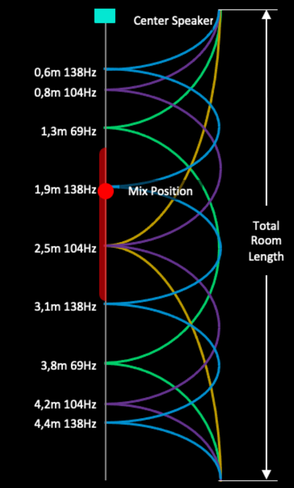
Help

Please ensure bass management subwoofers, client and mix position are positoned away from dominant room mode positions

Distance Mix Position - Front Wall (m)	1,9

1st Mode	35 Hz
2nd Mode	69 Hz
3rd Mode	104 Hz
4th Mode	138 Hz

Front of Room



Rear of Room

Axial Modes along Room Width	
1st Mode	52 Hz
2nd Mode	105 Hz
3rd Mode	157 Hz
4th Mode	209 Hz

Room Dimension Ratio Analysis

Help

The size and shape of a room determines its modal behaviour.
In the case of rectangular rooms certain sets of room dimension ratios have been found to give smoother low frequency response than others. The shaded diagram shows best (light green) and second best (dark green) room ratios for a room of 50 cbm (actual room volume is 43 cbm).

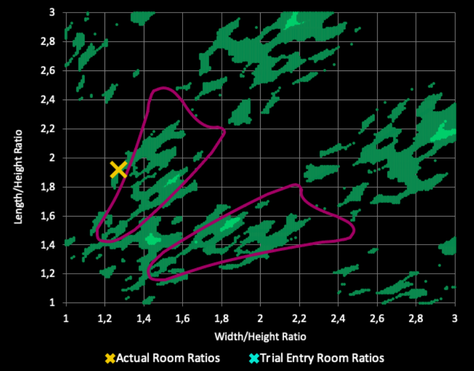
Please use the 'Trial Entry' cells and flip the length and width if the room width exceeds the room length such that the room ratios are off chart.

Dimensions copied from Main Section		Trial Entry
Room Length (m)	5,0	
Room Width (m)	3,3	
Room Height (m)	2,6	

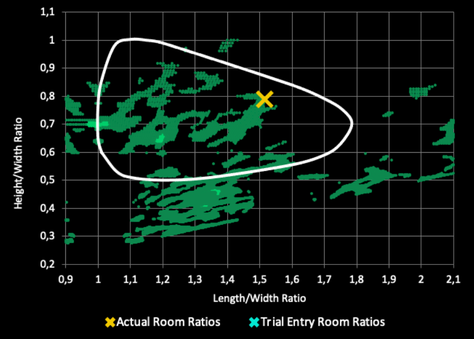
Ratio Width/Height	1,27	
Ratio Length/Height	1,92	

☑ Show Bolt Area

Ratio Length/Width	1,52	
Ratio Height/Width	0,79	



Alternative view for hybrid, orthogonal rooms used for theatrical premixing with area of recommended room ratios



1. **Cinema Theatrical**
   Theatres and Studios

Dolby Atmos Room Design Tool
- K-Array products available in the next version!

2. **Home Entertainment**
   Home theatres and Studios

3. **Music**
   Home theatres and Studios

Dolby Atmos Room Design Tool
- K-Array products available in the last version!

Dolby Atmos Home Entertainment Studio

Units	Speaker Layout Dimensions (m)				Layout Type	Circular Layout	Calibration Level
	Length	Width	Height	Mix Position			
metric	8,00	4,00	3,00	2,50	Orthogonal	5,0	79 dB

Please do not use Backspace/Delete on data entry cells

☐ Additional Speakers

☐ x-y-z Entry

Speaker Positions

Reset

☑ Select Mounting Condition

☐ Theatrical Bi-Amped Speakers

Untick checkbox for passive speakers

Speaker Model

		x (m)	y (m)	Height from Floor (m)	Horizontal Angle	Longitud. Elevation Angle	Lateral Elevation Angle		Mounting Condition	Watts	Sensit
C		2,00	0,00	1,20	0°	0°		☑	Against/in wall		
L/R		0,56	0,00	1,20	30°	0°		☑			
LFE	1 unit	1,28	0,00	0,00				☑			
Ls/Rs		0,00	2,85	1,20	100°		0°	☑			
☑ Lrs/Rrs		0,00	8,00	1,20	160°	0°		☑			
Ltf/Rtf		0,20	0,70	3,00	45°	45°	45°	☑			
Ltr/Rtr		0,20	4,30	3,00	135°	45°	45°	☑			

- JBL 705P
- JBL 708P
- JBL Control 2P
- JBL LSR6325P-1
- JBL LSR6328P
- K-array 1xKV52+KU26/KA68
- K-array 1xKV102+KU210/KA68
- K-array 3xKV52+KU210/KA68
- K-array 1xKK102+KU212/KA68
- K-array 2xKK102+KS2P/KA68
- K-array 2xKP102+KS3P/KA208
- K-array 2xKV52F+KU210/KA68

Dolby Atmos Music Studio

Units	Speaker Layout Dimensions (m)				Layout Type	Circular Layout	Calibration Level	Speaker Layout
	Length	Width	Height	Mix Position				
metric	7,00	4,00	3,00	2,50	Orthogonal	5,0	85 dB	7.1.4

Please do not use Backspace/Delete on data entry cells

☑ Additional Speakers
☐ Array Mode

☐ x-y-z Entry

		Speaker Positions						Reset	Speaker Model					Reset			
		x (m)	y (m)	Height from Floor (m)	Horizontal Angle	Longitud. Elevation Angle	Lateral Elevation Angle		☑ Select Mounting Condition ☐ Theatrical Bi-Amped Speakers *Untick checkbox for passive speakers*	Mounting Condition	Watts	Sensitivity	Ω		Watts required	Active Speaker Max Peak SPL	Headroom above Target SPL
	C	2,00	0,00	1,20	0°	0°			☑ K-array KK52/KA68 150Hz BM	Against/in wall						120,0 dB	3,0 dB
	L/R	0,56	0,00	1,20	30°	0°			☑ K-array KK52/KA68 150Hz BM	Against/in wall						120,0 dB	1,8 dB
	LFE	1,28	0,00	0,00				1 unit	☑ K-array KS1P/KA208	On floor or against wall						137,0 dB	7,1 dB
☐	Lw/Rw																
	Ls/Rs	0,00	2,85	1,20	100°		0°		☑ K-array KK52/KA68 150Hz BM	Against/in wall						120,0 dB	7,8 dB
☑	Lrs/Rrs	0,00	7,00	1,20	156°	0°			☑ K-array KK52/KA68 150Hz BM	Against/in wall						120,0 dB	0,2 dB
☐	Lfh/Rfh																
	Ltf/Rtf	0,20	0,70	3,00	45°	45°	45°		☑ K-array KK52/KA68 150Hz BM	Against/in ceiling						120,0 dB	4,1 dB
☐	Ltm/Rtm																
	Ltr/Rtr	0,20	4,30	3,00	135°	45°	45°		☑ K-array KK52/KA68 150Hz BM	Against/in ceiling						120,0 dB	4,1 dB
☐	Lrh/Rrh																
☐	Sub BM																

Dolby Atmos Music Studio

General Requirements

1. Room Dimensions
2. Room Acoustic characteristics
3. Audio System (7.1.4 +)
   (with precise aiming)
4. Audio System SPL > 85 dB(C)
   (+20 dB headroom!!!)
5. Calibration system for commissioning
6. Dolby software authoring tools
   DAPS / DAMS

to ensure listening compatibility between different studios, it is advisable to calibrate the Atmos Music studios by following a specific approach in terms of SPL and response curve - which will in any case give operational flexibility.

1. Room Dimensions

A. Minimum layout height 2.4 m

B. Minimum layout width 3 m

C. Minimum layout length 3.5 m

D. Minimum recommended volume > 50 m^3

E. Listening distance ≤ 5 m (recomm. ≤ 4 m)

The dimensions refer to the layout of the speakers, not the room !!!

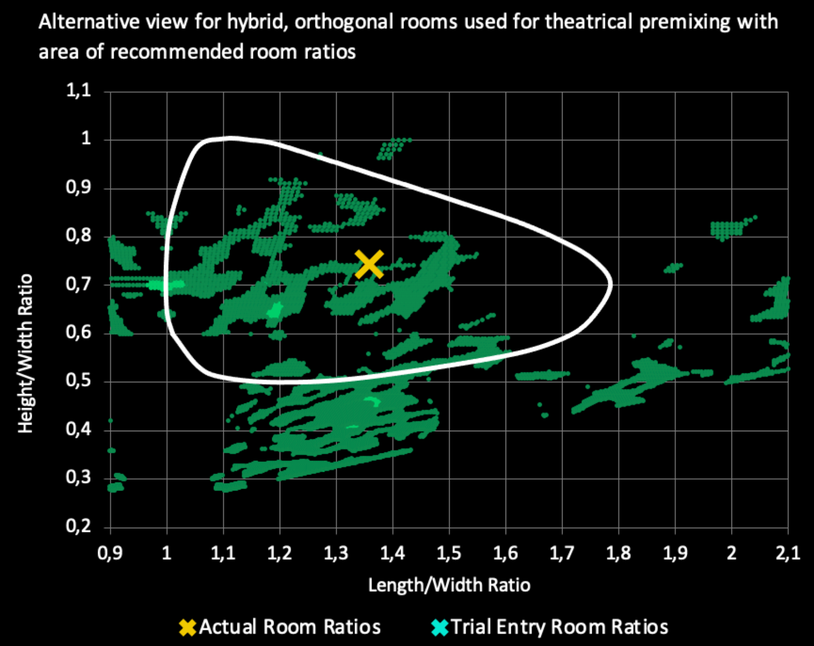
2. Room Acoustic characteristics

A. NC25 Background Noise

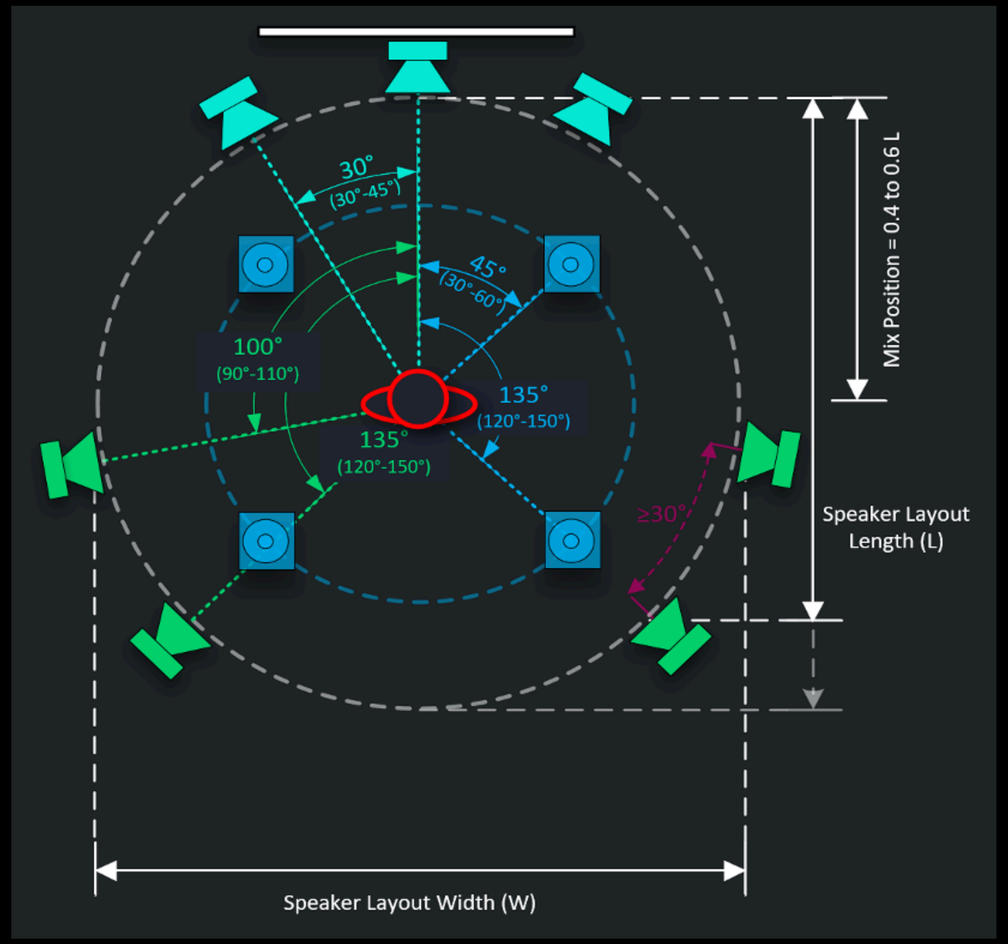
B. Controlled first reflections

C. RT60 in Dolby tolerance (DARDT)

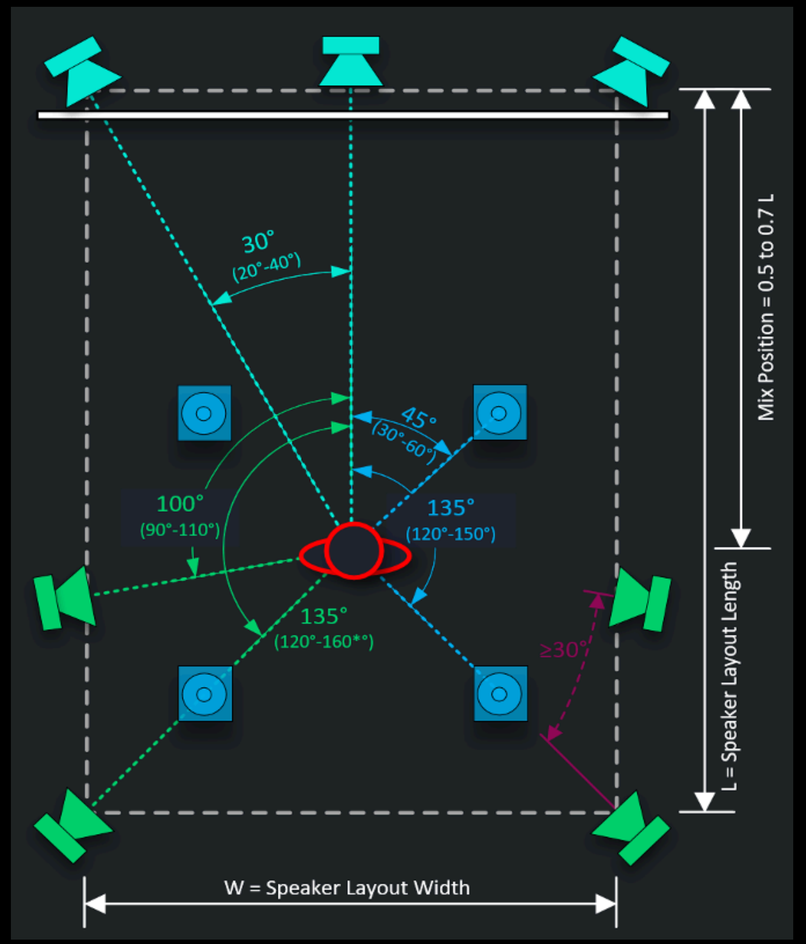
D. Dimensional ratio within the limits



3. Audio System
(Precise aiming!)

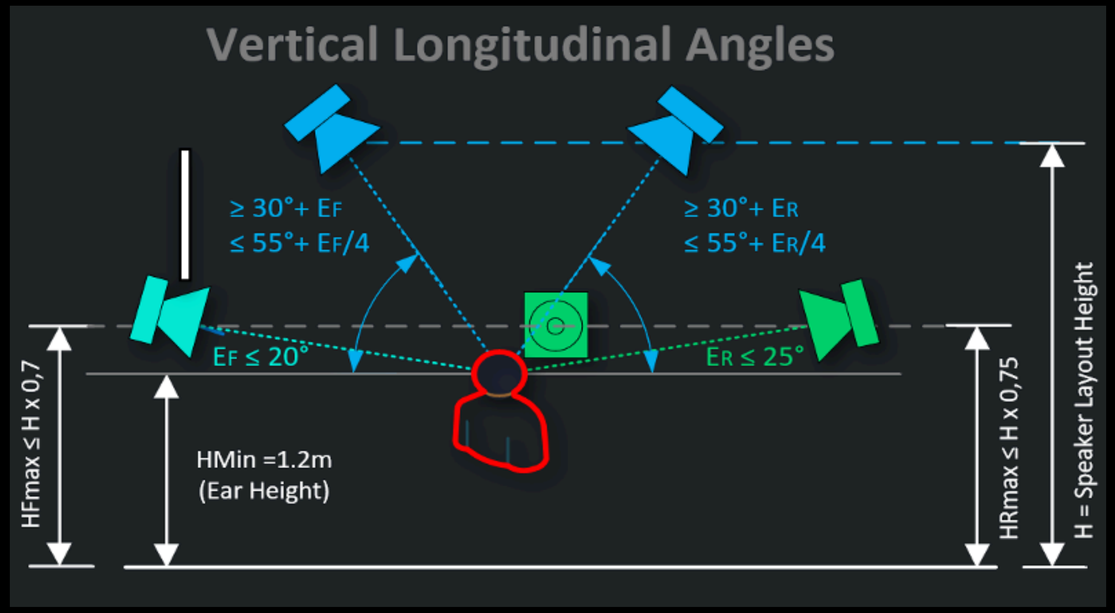


Equidistant Layout

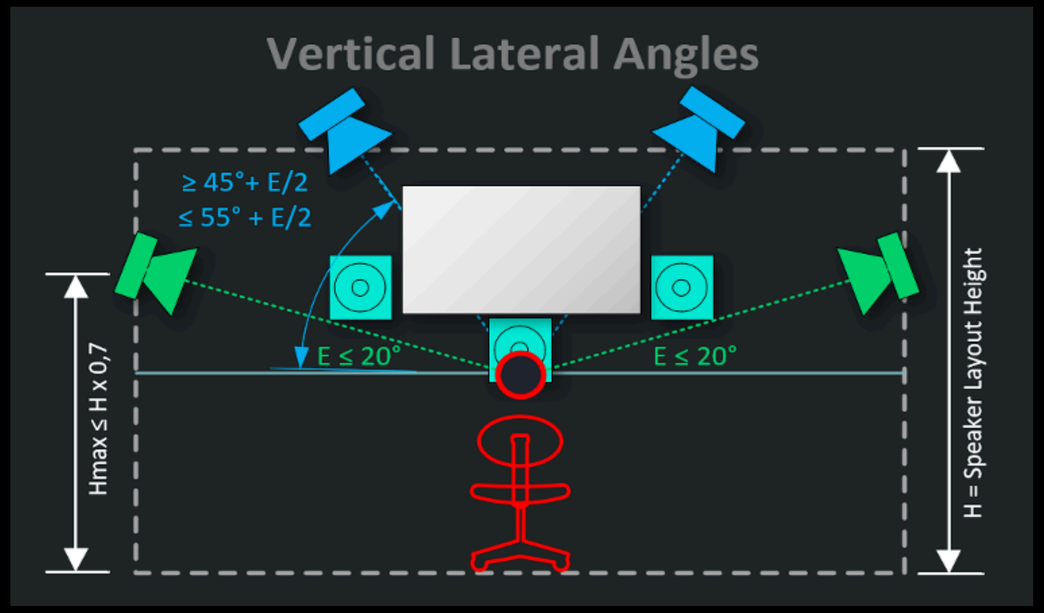


Orthogonal Layout

3. Audio System *(Elevations)*



Side elevation, angles and tolerances



Front Elevation, angles and tolerances

4. Audio System SPL > 85 dB(C) (+20 dB headroom!!!)

A. Calibration @ 85 dB(A)
   +20 dB headroom so 105 dB(C)
B. Subwoofer @ +10 dB (SMPTE 202)
   +20 dB headroom so 115 dB(C)
C. If you are using non-fullrange speakers, bass management must be used
D. Speaker compliant (ISO 2969 SMPTE 202) (40Hz ÷ 18kHz @ ± 3dB).
   Subwoofer 31.5÷150 Hz
E. It is recommended that they are all from the same manufacturer and properly aligned.
F. Surround speakers should have a wide directivity of at least ± 45 ° from 100Hz to 10kHz

Powerful speakers, not small.
"Important" audio system.

5. Commissioning Audio Calibration System

It is also important to know for the system there must be a way to calibrate (and fine tune, EQ + Delay) each single speaker.
If you use DAMS we can do it with that, but unfortunately DAPS doesn't have equalisers.

A. AVID MTRX + SPQ card
most used solution

B. JBL Intonato

C. Trinnov MC PRO

D. Yamaha MMP1

E. BSS, Symmetrix, etc.

If you have DAMS, there is no need for another calibration system!

Commissioning

Commissioning	
Verify Room Dimensions	
Verify HE RMU is a qualified machine	
Set up Renderer	
Set Speaker Delays	
Confirm Speaker Routing	
Polarity Check	
Calibrate Speakers (see below)	
RTA traces for each loudspeaker as screenshots	
Impulse Responses as screenshots and wavs	
RT60 Measurements	
Noise Criteria Measurement (NC) with Screenshot	
Headroom Check with Subwoofer limiter on and off	
Play known Content	
Aspect Ratios 1.33:1/1.77:1/1.85:1/2.39:1 configured	
Monitoring Formats set up per studio requirements	
Backup Renderer file	
Get photos of the studio, documenting installation and problem areas	
Document any problems areas in various results (response measurements, photos, settings). Detail any solutions communicated to the client and any further ideas for problem resolution	
Train Staff on Use of Qualified Computer Hardware	
Train Staff on DAW Integration	

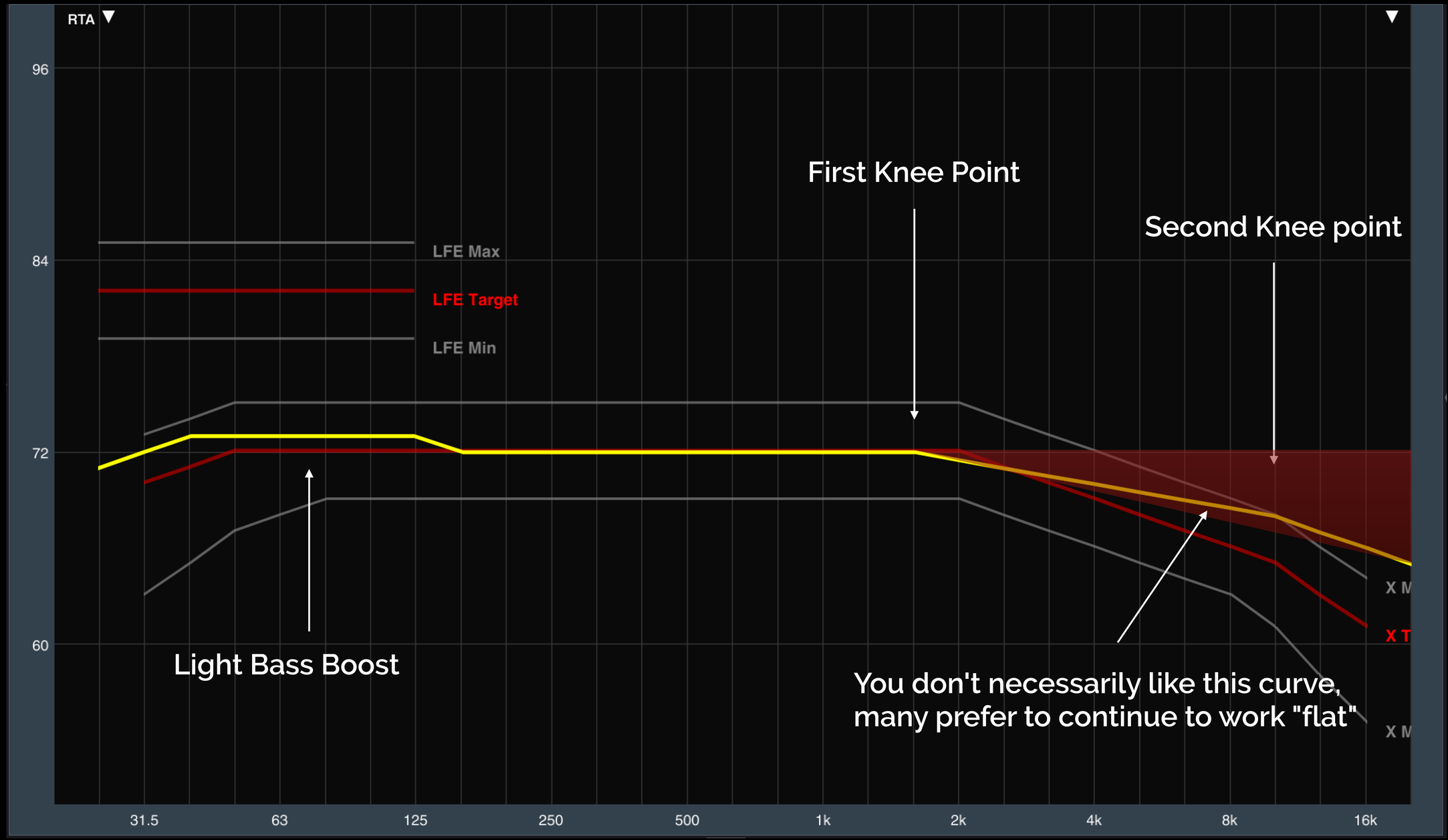
Several tasks and measures to be done:

1. 8-channel measurement system: - time alignment (delay) for each monitor and frequency sub-response in 1/3 octave aligned with the target curve -> EQ!
   (choose the curve you prefer)
2. Background noise measurement (NC25)
3. Measurement of the impulse response for each individual channel
   (report RT60 in the DARDT)
4. DARDT completion
5. Photo and Reports

STUDIO SOUND SERVICE

Donato Masci

Dolby Atmos Music – Target Curve



Loudspeaker specifications For cinema

1. Screen Speakers response that conforms to ISO 2969:1987/SMPTE ST 202:2010 specifications.
   Two way: 105 dB LF, 101 dB midHi
   Three Way: 105 dB, 101 dB, 98 dB
   Four Way: 105 dB, 101 dB, 98 dB, 92 dB
   F Range: 40Hz to 16kHz,+3/–6dB
   F Response: 80 Hz to 16 kHz, ±3 dB

2. SUB SLP +10 dB (compared to Screen)
   Frequency Response: 31.5–120 Hz, ±3 dB

2. Surround SPL (each): 99dB, (array): 105dB
   FR: 40Hzto16kHz,+3/–6dB
   Horizontal Angle, Front Side Surround ≥ 60˚
   Vertical Angle, Front Side Surround ≥ 40˚
   Horizontal Angle, Side Surround ≥ 90˚ ≥100˚)
   Vertical Coverage, Side Surround ≥ 50˚±10˚
   Front and Rear Top Surround: ≥50˚

3. Top Surround discrete Loudspeaker: ≥100˚ (vertical and horizontal) – a conical dispersion horn should have a coverage area ≥100˚
   Top Surround paired Loudspeaker: ≥100˚ (vertical and horizontal) – a conical dispersion horn should have a coverage area ≥80˚

Advice for listening

1. Art Blakey – “Close your Eyes”
2. The Beatles – “Oh! Darling” (2019 mix)
3. The Doors – “Riders on the Storm”
4. Jacob Collier – “All I Need”
5. St Vincent – “Pay your Way in Pain”
6. Jack Harlow – “Way Out”
7. Kodak Black – “Feeling Peachy”
8. J. Brahms - Simphony #3 in F major (conducted by Ben Gernon / w. London Philarmonic Orchestra)
9. Jack Savoretti – “Too much History”
10. Sitrekin – “Open Chest”
11. Ariana Grande – “Dangerous Woman”
12. Kraftwerk – “Tour de France” + “Robots”
13. Rush – “Tom Sawyer”
14. Briston Maroney – “Rollercoaster”
15. Kanye West – “Black Skinhead”
16. Gregory Porter – “Mona Lisa”
17. William Orbit – The Painter
18. Porcupine Tree – Closure/Continuation
19. The Mars Volta – The Mars Volta
20. Yeah Yeah Yeahs – Cool it down
21. Jean Michel Jarre – next album

STUDIO
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Grazie!

PDF Presentation Download

studiosoundservice.com/it/education

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studiosoundservice.com

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