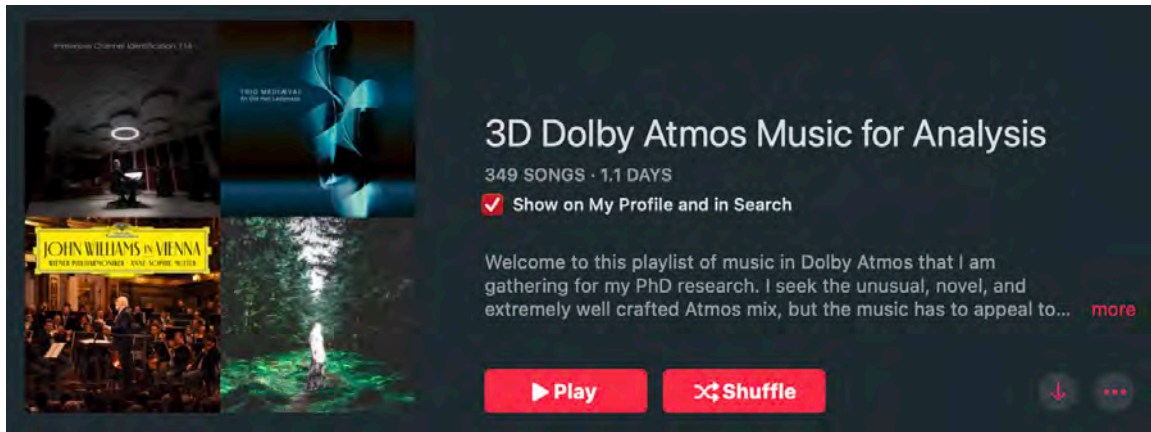




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Photograph by Bill King

V-10-17-24



immersive Channel Identification: 7.14

3D Dolby Atmos Music for Analysis

349 SONGS · 1.1 DAYS

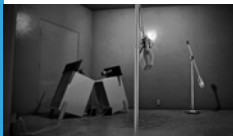
Show on My Profile and in Search

Welcome to this playlist of music in Dolby Atmos that I am gathering for my PhD research. I seek the unusual, novel, and extremely well crafted Atmos mix, but the music has to appeal to... [more](#)

[▶ Play](#) [↻ Shuffle](#) [↓](#) [⋮](#)

The screenshot shows a Spotify playlist interface. On the left, there are four album covers: 'Immersion Channel Identification: 7.14', '3D Dolby Atmos Music for Analysis', 'John Williams in Vienna: Studio Recordings - Live Score Suite', and 'The Matrix Reloaded: The Original Motion Picture Score'. The main text on the right describes the playlist as a collection of 349 songs, totaling 1.1 days of music, gathered for PhD research. It includes a 'Show on My Profile and in Search' toggle which is checked. Below the description are 'Play' and 'Shuffle' buttons, along with download and menu icons.





INNOVATION IN MUSIC 2022



# Introducing the Dolby Atmos Hyper Near-Field Tiny Studio—HN-FTS.

**Hyper Near-Field** = Speakers placed hyper near to a single hyper tuned mix position.  
**Tiny Studio** = Where possible, apply philosophies from the global Tiny Home movement.



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## 7.1.4 Atmos Hyper Near-Field Tiny Studio: Goals

### **Establish the philosophy and benchmark ethos:**

- Economical efficacy, environmental small scale, large operational scope, premium quality, hyper tuned one sweet spot, accurate translation.
- Encourage audio/music technology manufacturers to involve the Ethos and design bespoke products for this size of room.

### **Provision of the “optimal music listening experience:”**

- An optimal 7.1.4 Atmos listening experience-(speakers) portrays spaces and places vividly—generates deep visceral emotions.
- It engages the listener by transforming their state of mind, to “flow” with music’s moment and subjective meanings.
- Mobile binaural headphone rendering is improving rapidly—one can take 3-D spaces to places.

### **The business argument:**

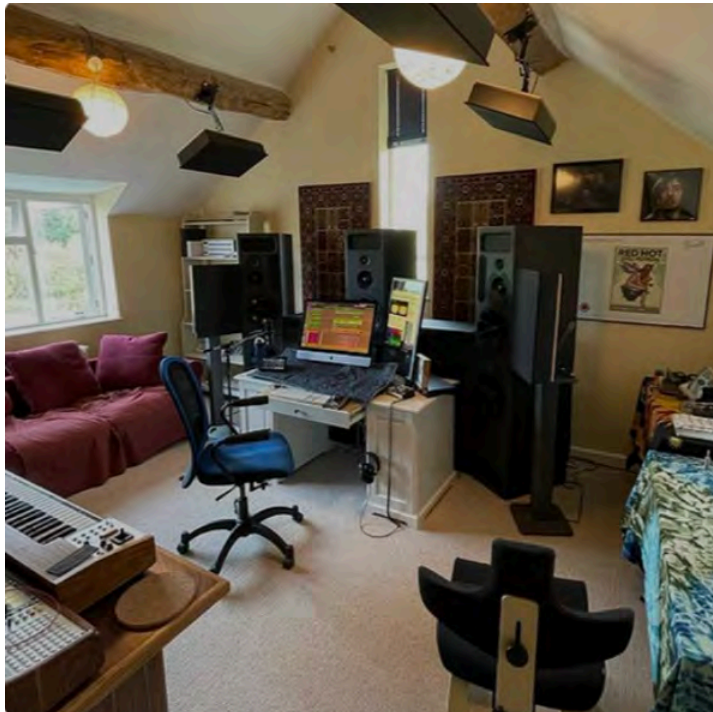
- 3-D music and audio is burgeoning and well established—Dolby Atmos is compatible with legacy Dolby formats.
- In 2020 there were about 30 studios—in 2024, over 1000, Growth of the Atmos format is advancing rapidly.
- Independent music creators need frugal solutions—Global real estate and rent are expensive.

### **Who is this for?:**

- Professional creators, schools, and established music studios that want to expand to Atmos effectively and economically.
- Until now, no documentation existed for a tiny premium 7.1.4 Atmos music room to achieve Dolby’s playback spec.
- Supports teleworking, on-line education, and audio/video/music production from within residential spaces.

# Eminent creators often work from residential spaces

**Andrew Sheps:** “My introduction to the idea of record making was that you made the record you wanted to make. There weren’t reasons not to do it; you’d never make an excuse for it.”  
<https://tapeop.com/interviews/133/andrew-scheps/>



**Daniel Lanois:** “It’s not all that glamorous, what’s nice about it is that it’s really dense down here, so there’s no room sound, I don’t like room sounds; just keep things tight.”  
<https://www.youtube.com/watch?v=wSXw9-9kb1s> (Studio Tour w Rick Beato)



## Viable role models: Hyper near-field 2.0 & 5.1 mobile rooms

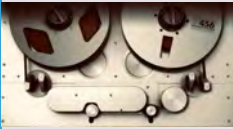


Image 1: Le Studio-Mobile



Image 2: Livewire-Mobile



Image 3: Petrovic-Davidovic,  
"My Room Principle."  
AES-2010



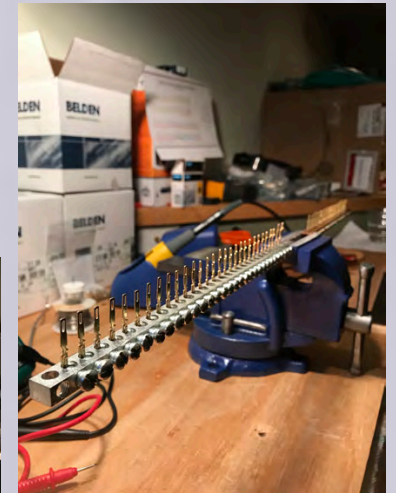
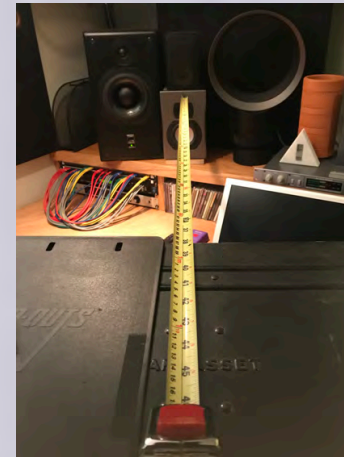
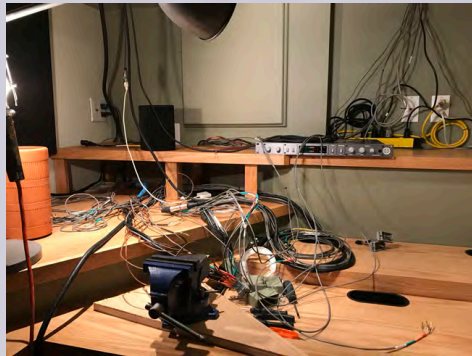
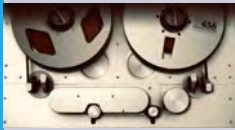
Image 4: gomobilesessions.com-with Anubis

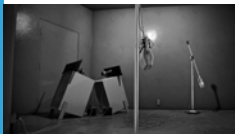


Image 5: gomobilesessions.com

# A small Atmos room philosophy and benchmark.

## How do we do this?





## **Project intention**

Establish a philosophy & benchmark for a premium sounding 7.1.4 HN-FTS

## **Methodology: literature, implement, test, adjust**

Philip Newell, Floyd Toole, Alton Everest, Kenneth Pohlmann, AES-E-Library, Sound on Sound Magazine, Dolby Professional Support, and professional Facebook groups—The Metaversity!  
[Atmos Music Mixing Professionals and Atmos Post Mixing Professionals]

## **Room function**

Sole operator music/audio composition, mix, and master.

## **Five key questions**

- 1) Is a Hyper Near-Field Tiny Studio classification viable?
- 2) By how much and where can the Dolby Atmos “best practices” be adapted?
- 3) Where do we adapt Dolby’s guideline to overcome physical obstacles?
- 4) What tools, and components, are required to meet Dolby’s specifications?
- 5) Where and what economic differences are found between Near-Field and a Hyper Near-Field Tiny Studio?

## Hyper Near-Field Tiny Studio—context.

**Challenge:** Dolby Home Entertainment Studio Certification Guide does not describe or encourage room sizes below 50m<sup>3</sup>, The HN-FTS project challenges that argument.

**Inspiration & ethos:** the global *Tiny Home* movement; large operational scope within a small scale, premium quality components, economy of scale, low energy consumption, cozy environment, buy-local, repair/re-use.

**Basic Tools:** Dolby Audio Room Design Tool (DARDT), Clap IR, REW room EQ wizard, SMAART, Sonarworks, SPL meter, tape measure, premium quality materials and tools-solder/wire/connectors.

**Basic skills:** Carpentry and electrical/mechanical engineering.

**Final attributes:** Physically well correlated, economical dynamic range, meets Noise Criterion NC 25 specification, short RT-60: single-sub bass management, strong in-phase mono bass, minimal electronic room correction, strong dimensional imaging-(height), high impact, high intelligibility, strong lateral listener envelopment (LEV), strong horizontal apparent source width (ASW).

**Cost:** \$40 to \$80K CAD (Transition from an existing 2.0, 5.1 room to 7.1.4 Atmos). Approx. 1/3rd to 1/2 of the cost of a larger near-, mid-field Atmos room.

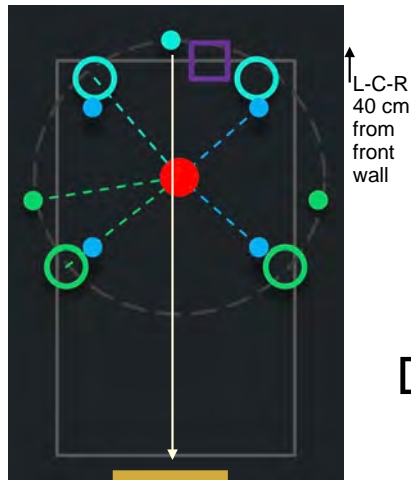


# Tiny Home = Tiny Studio

*"I've built 6 studios and decommissioned 5."*

The global tiny home concept is an architectural and social movement that advocates downsizing, buy-local, light environmental footprint, large scope, small scale, premium quality, simplification.

Equi-orthogonal layout



H = 2m  
W = 2 to 2.44 m  
L = 4.7m

Rectangular room geometry

Center rear door=bass trap

Size comparison;

(m<sup>2</sup>=square area  $A=a^2$  / m<sup>3</sup>=cubic volume  $V=s^3$ )

Average home = 379.04-m<sup>3</sup>

Tiny home max = 88.80-m<sup>3</sup>  
(2018 international residential code)

← Approx. 75% smaller

Dolby Atmos minimum guideline = 50 m<sup>3</sup>

HN-FTS = 24 m<sup>3</sup>

← Approx. 50% smaller  
(Aggressive goal)

Speaker to mix distance: 1.2 m

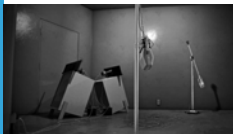
Requires about 120 watts per channel @ 8 ohms-87 db sensitivity,  
500 watts for the sub

1700 - 2000 watts total.

(More power is always better)

New Bryston Atmos class D amp will provide about 240 watts per channel

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# Step one: learn and fully understand the Dolby Audio Room Design Tool (DARDT)

*Don't buy any audio equipment until the studio is designed "virtually" in DARDT*

## Information for DARDT

Studio Info: Name, address, contact.

Choose your layout type: Orthogonal, Equidistant, (Equi-Ortho-?)

Enter your room and speaker layout/dimensions: L,W,H and mix position

Choose your calibration level: 79, 82, or 85 dbC+20 db=105 dbC TP

Choose your Equipment: Enter the specifications of (selected) equipment

## Primary data

Floor plan and elevation measurements

Proposed dimensions and location-orientation of speaker array

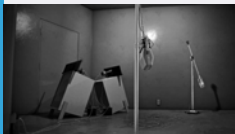
RT-60 measurements (Reverb time to -60 db)

NC 25 measurement (Noise Criterion)

Distance of speakers to the mix position

*Use a tape measure or a laser tape measure to generate DARDT input data.*

*Be accurate to within 1 mm if possible.*



# DARDT



**Dolby Atmos Music Studio** DARDT version 5.3.7 HE

**Speaker Layout Dimensions (m)**

Units	Length	Width	Height	Mid Position	Layout Type	Circular Layout
metric	4.7	2.0	2.0	1.2	Orthogonal	2.4

Calibration Level: 82 dB | Speaker Layout: 7.1.4 | Music | Advanced mode enabled

Additional Speakers

x-y-z Entry

**Speaker Positions**

	x (m)	y (m)	Height from Floor (m)	hor angle	longitud. Elevation Angle	lateral Elevation Angle
C	1.2	0.0	1.2	0°	0°	
L/R	0.4	0.2	1.2	31°	0°	
LFE	0.9	0.0	0.0			
1 unit						
Is/Rs	0.1	1.5	1.2	108°		0°
Lrs/Rrs	0.1	2.3	1.2	141°	0°	
Ltl/Rtl	0.8	0.9	1.7	34°	61°	70°
Ltr/Rtr	0.8	1.7	1.7	158°	45°	68°

**Speaker Model**

Mounting Condition	Watts	Sensitivity	Ω	Watts required	Active Speaker Max Peak SPL	Headroom above Target SPL
Away from Wall	100 W	87.0 dB	8	47 W		3.3 dB
Away from Wall	100 W	87.0 dB	8	44 W		3.7 dB
On floor or against wall	500 W	90.0 dB	8	389 W		1.1 dB
Against/in Wall	100 W	87.0 dB	8	9 W		10.5 dB
Away from Wall	100 W	87.0 dB	8	33 W		4.9 dB
Against/in Ceiling	100 W	87.0 dB	8	5 W		13.8 dB
Against/in Ceiling	100 W	87.0 dB	8	6 W		12.7 dB

**Amplifier Model**

Amplifier Mode	Watts available	Amplifier Headroom	Delay
ART SLA	100 W	3.3 dB	1 ms
ART SLA	100 W	3.6 dB	1 ms
PSB CSW500	n/a		
ART SLA	100 W	10.5 dB	1 ms
ART SLA	100 W	4.8 dB	0 ms
ART SLA	100 W	13.0 dB	2 ms
ART SLA	100 W	12.2 dB	2 ms

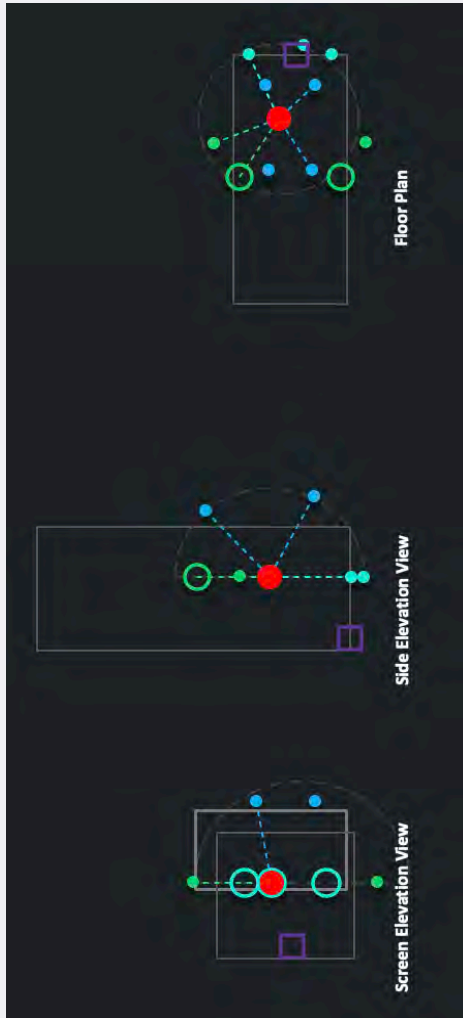
**Equipment List Dolby Atmos Music Studio**

Speakers		Amplifiers		
Model	Count	Model	Count	Unused
PSB CSIR Sub	1	PSB CSW500	1	0
PSB Alpha 3	7	ART SLA	6	1
PSB CS500	4			

3D visualization of speaker layout in a room with axes x, y, and Height from Floor.

Buttons: Show Layout Guide, Show Help, Download Link to Technical Guidelines, Dolby Atmos Post & Music Pro Support.

# HN-FTS—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.

All	20	30	40	50	60	70	80	90	100	110	120
Oblique											
Tangential											
Height											
Width											
Length											

### Axial Modes along Room Length Help

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

Distance	1.71
Mix Position - Front Wall (m)	

1st Mode	37 Hz
2nd Mode	73 Hz
3rd Mode	110 Hz
4th Mode	147 Hz

Front of Room

Rear of Room

0.6m	147Hz	Center Speaker
0.8m	110Hz	
1.2m	73Hz	
1.8m	147Hz	Mix Position
2.4m	110Hz	
2.9m	147Hz	
3.5m	73Hz	
3.9m	110Hz	
4.1m	147Hz	

Total Room Length

1st Mode	86 Hz
2nd Mode	173 Hz
3rd Mode	259 Hz
4th Mode	345 Hz

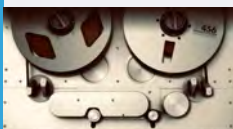
### Boundary-induced Cancellation Calculation Analysis and Discussion Help

Speaker Label	L/R
Speaker LF Cut-Off/Bass Management Frequency	80 Hz
Distance Speaker Driver from Wall (m)	0.4

Speaker Label	LFE
Speaker LF Cut-Off/Bass Management Frequency	10 Hz
Distance Speaker Driver from Wall (m)	0.14

Distance Driver from Wall

# HN-FTS—DARDT



## Dolby ATMOS Home Entertainment Studio Entry Sheet

[Click here for Audio Block Diagrams](#)

### Equipment

Home Entertainment Renderer	
Number of physical Channel Faders	0
Number of 64 channel audio Outputs	128
Number of 64 channel audio Inputs	128
Console/Controller Make/Model	Merging Technologies — Anubis & Hapi MKII
Synchronization/TC Unit Make/Model	Merging Technologies — Anubis & Hapi MKII
DAW Type/Version	Pro Tools
Dolby ATMOS Pan Control Device	Mouse Control

### Monitoring Equipment

7.1 discrete Monitoring Path	yes
Monitor Router/Switcher	Merging Technologies — Anubis & Hapi MKII
External Crossover if used	N/A
Calibration EQ processor	Anubis
Bass Management Processor	Anubis

### Picture Replay

Image Display Type	Flat Panel Display
Video Projector/Display Make/Model	N/A
Video native Pixel Resolution	1920 x 1080
4k replay capable	<input type="checkbox"/>
HDR capable	<input type="checkbox"/>
PAL Playback	<input type="checkbox"/>
NTSC Playback	<input checked="" type="checkbox"/>

### Measured RT60 [s]

	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	Notes
Measurement 1	0.07	0.07	0.09	0.05	0.07	0.06	0.14	Average of 3 samples
Measurement 2	0.07	0.16	0.14	0.17	0.07	0.21	0.27	Average of 5 samples
Measurement 3	0.07	0.08	0.07	0.07	0.09	0.11	0.06	Average of 3 samples
Measurement 4	0.11	0.12	0.16	0.11	0.16	0.15	0.22	Average of 7 samples
Measurement 5	0.07	0.09	0.08	0.08	0.08	0.08	0.03	Average of 4 samples
Measurement 6	0.12	0.08	0.07	0.44	0.41	0.06	0.14	Average of 5 samples
Measurement 7	0.10	0.10	0.09	0.09	0.09	0.09	0.07	1 sample-RT60-0.107 seconds
Measurement 8	0.17	0.09	0.08	0.06	0.07	0.07	0.07	Average from 36 samples
Measurement 9	0.12	0.13	0.10	0.12	0.12	0.07	0.08	Average from 1 sample RT.0.107
Measurement 10	0.10	0.11	0.10	0.10	0.08	0.11	0.13	Average of 3 samples
Average	0.10	0.10	0.10	0.13	0.12	0.10	0.12	

Highlight Values that appear erroneous

Room Volume (cbm)	Layout Size = Room Size?	Room Length (m)	Room Width (m)	Room Height (m)
19	<input checked="" type="checkbox"/>	4.7	2.0	2.0



Upper/lower limits (dark turquoise) are based on a room volume  
Dark orange curves mark upper/lower limits based on a measured RT60 @ 500Hz

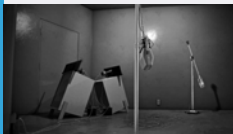
## Near- to hyper-near field benchmark comparison

Dimension	Dolby near-field	Hyper near-field
	Specification	Tiny Studio
Minimum layout height	2.4 m	1.75 m
Minimum layout width	3 m	2.0 m
Minimum layout length	3.5 m	2.4 m
Recommended room volume	>50 m <sup>3</sup>	24 m <sup>3</sup>
Speaker distance to mix position	≤5 m (<4 m recommended) <sup>[a]</sup>	1.2 m

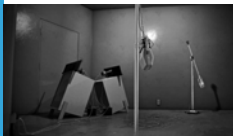
(Floor to speaker-grill center)

### My HN-FTS speakers

- Select one speaker brand (Canadian PSB), passive, excellent tonal balance, 87db sensitivity, mixed size-OK, light and easy ceiling mount-aim, 2m speaker-array radius, very unique PSB passive Subwoofer.
- **A10” speaker in an elegant 4” deep chassis**, placed against the front wall, powered by a 500 watt PSB amp.
- Highly correlated physical speaker layout = minimal amount of electronic room correction, amps & hardware placed outside studio to provide low heat & noise, low daily power consumption, repairability is easy, PSB passive speakers are economical—budget savings allows for premium amps and AD/ DA hardware.



# Speaker delay calculator



## Atmos HN-FTS Speaker Delay Calculator

Novotny\_12\_12\_23

### Legend

Base Distance/Base Time ~ Speed of Sound = 1,125ft/sec ~ 1,125 ft/ms  
 30,5 cm = 1 ms ~ 1/10th of a ms = .03 microseconds ~ 35 micro seconds = 1 centimeter.

Anubis Firmware: 1.5.11b55  
 Anubis Buffer: 1.33ms (64)

Mix Position Height-122 CM

Speaker	ATC 2.0	PSB 7.1.4-64KB Anubis Buffer=1.33 ms	Distance to mix in cm	Difference in cm	Difference in Microseconds	Speaker Delay	Delay Setting
LS	No correction required	Room Timing Correction	120	5	0.016393443	0.016393443	1.428
RS	"	Room Timing Correction	120	5	0.016393443	0.016393443	1.428
C	"	Room Timing Correction	120	5	0.016393443	0.016393443	1.428
LFE	"	Room Timing Correction	110	15	0.049180328	0.049180328	1.441
SL	"	Room Timing Correction	103	22	0.072131148	0.072131148	1.487
SR	"	Room Timing Correction	103	22	0.072131148	0.072131148	1.487
Left Side-Rear	"	Base Distance	125	0	0	0	1.33
Right Side-Rear	"	Base Distance	125	0	0	0	1.33
TL	"	Room Timing Correction	107	18	0.059016393	0.059016393	1.487
TR	"	Room Timing Correction	109	16	0.052459016	0.052459016	1.48
TRL	"	Room Timing Correction	113	12	0.039344262	0.039344262	1.457
TRR	"	Room Timing Correction	111	14	0.045901639	0.045901639	1.457

# HN-FTS chains of operation

A chain—software.

B chain—hardware.

QC chain—hardware & software.

**A chain**: Computer system, Dolby renderer, DAW, plugins, Virtuoso binaural renderer-APL Labs. Ravenna/AES67, Audio Movers Omnibus & Listento, (or Loopback), Apple Music.

**B-chain**: Premium AD/DA:-Anubis-Hapi MKII, 128X128 virtual i/o

7.1.4 Speakers: Canadian made, 7-PSB (passive) Alpha P3, 4-CSB 100 + 1-CSIR Sub &

2.0 Speakers: ATC SCM20ASL PRO — High Performance Active Loudspeakers

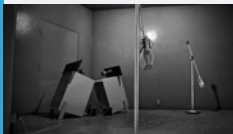
Isolation: Canadian made, ISOAcoustic pucks

Power amps: 2 Bryston 6 channel Class D - 240 watts per channel.

Headphones: Grado RS II (large cup) reference series, AirPods Pro

**QC-chain**: ARVUS H2-4D decoder, Blue Ray-AVR, Apple Music-Loopback to speakers or Virtuoso

AirPods Max to check Apple spatial rendering.



# Summary of Atmos room best practices

**Bryan Pennington**: Senior Field Applications Engineer  
[professionalsupport@dolby.com](mailto:professionalsupport@dolby.com)



- **Objective:** Achieve consistent translation to the consumer, and other professional Atmos studios.
- **Room size:** Not too big or too small, **too big can be problematic.** HN-FTS benchmark tells how small.
- **Room shape:** **Rectangular-long axis orientation to prevent loading the room with standing waves.**
- **Speaker selection:** **Atmos works with all speakers and price does not denote quality.**
- **Use DART:** Virtually calculates speaker placement, SPL and modals. Gathers RT-60.
- **Speaker aiming:** Aim at mix position in an over the shoulder style to allow for a wider sweet spot.
- **SPL/level calibration:** **Use a good meter with A and C weighting. Slow and fast response.**
- **C weighting:** for speakers with similar but flat responses down to 40HZ.
- **A weighting:** A weighting for speakers with disparate uneven responses.
- **Pink noise:** **HN-FTS pinked @77dbC-my preferred daily monitor level.** Make each speaker the same volume.
- **LFE:** **Make it about 4 to 6 db louder than the centre channel. (LFE must balance with bass managed energy)**
- **Monitor level:** 85 dbC is the standard for reference checks, common monitor level range between 70-80 dbC.
- **Common monitor level:** **Helps an engineer to naturally mix Atmos to -18 LKUFS**
- **Delays:** Physical or Electronic. Electronic is calibrated precisely using SMAART (<https://www.rationalacoustics.com/>)

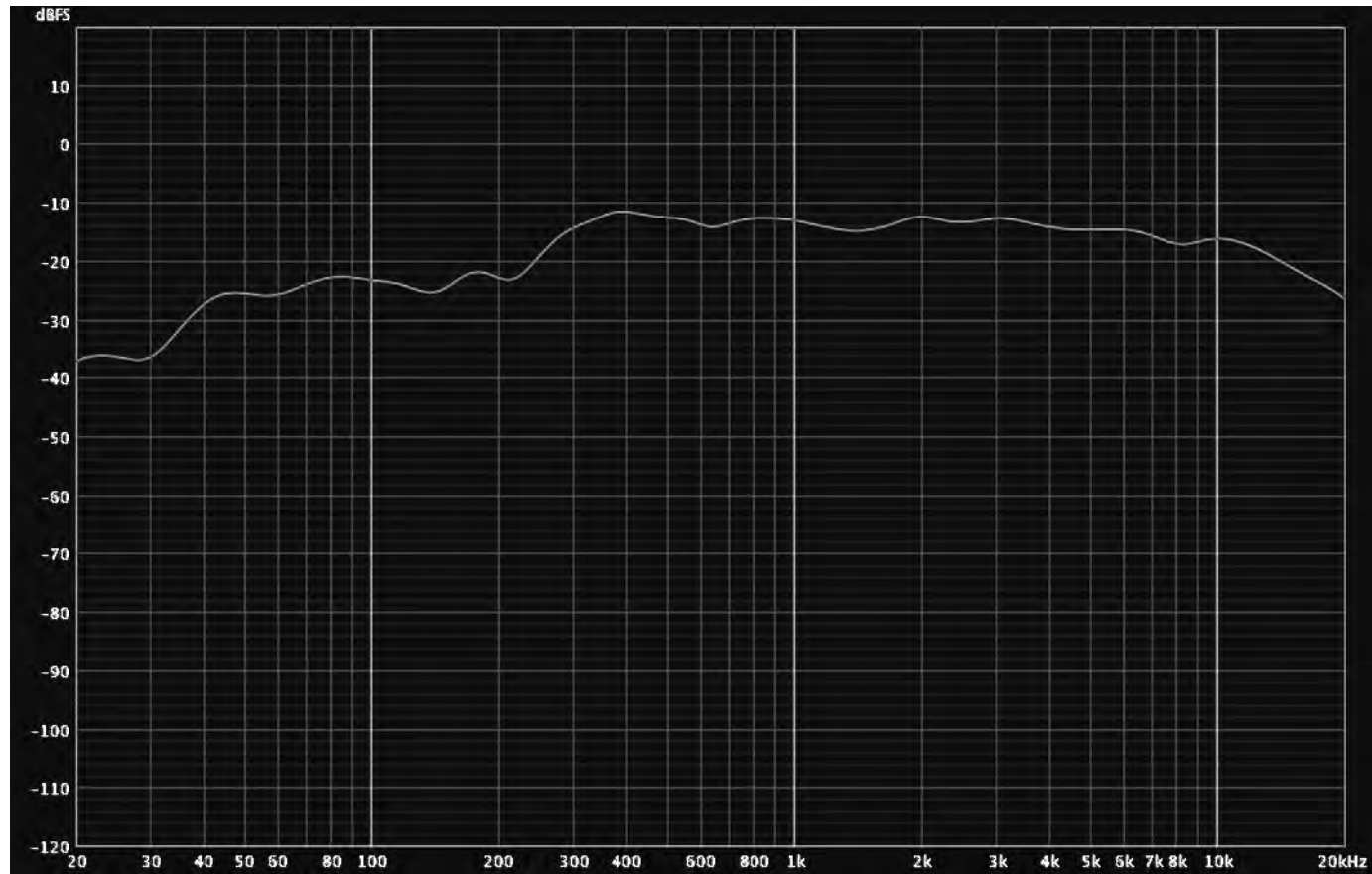
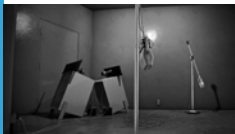
# Atmos Room Best Practices

**Bryan Pennington:** Senior Field Applications Engineer  
[professionalsupport@dolby.com](mailto:professionalsupport@dolby.com)

- Acoustic room tuning: Use bass trapping-corner diffusers, keep RT60 between .05 to .08 ms. 60/40 or 70/30 is a good rule of thumb for absorptive/reflective surface treatment.
- RT 60: Too much room reverb time can lead to smearing and room modes that are unreparable with electronic calibration. **Holes in spatial dimension can appear in small space Atmos playback.**
- RT 60: Too little room reverb time can lead to “too much reverb printed into the mix.” **However, most music mix engineers like a dry small size room for high intelligibility, impact.**
- Speaker EQ: Two goals, 1) to make speakers sound more like each other, 2) to help your mixes translate to other environments.
- Real time analysis: Tune your room with an RTA using several microphones to average frequencies below 500 HZ. **For music no Dolby curve is necessary but some engineers do use the Dolby music curve.**
- **HN-FTS: Hyper tunes to one mix position with one calibration microphone and involves no averaging.**
- **HN-FTS: does use the Dolby music or cinematic room curve.**
- Final tips: 1) **Constantly refine acoustics,** 2) **Test Atmos mixes in a other verified Atmos rooms.**



# HN-FTS: Original REW pink test @ 75 dBc—04-12-23



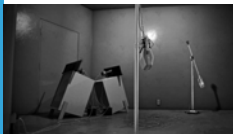
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# Adjustments

- Refine speaker distance to mix position by utilizing DARDT to project results and then ear test.
- Test speaker binging: full bung, 1/2 bung, loose bung, no bung (settled on no bung)
- Tighten physical system timing using the timing calculator, move speakers where possible.
- Add ISO Acoustic speaker pucks and stands to improve imaging and tighten low mid range.
- Lower mix height position to from 51" to 48" and lowered the 7 standard mid plane speakers 3".
- Move left rear speaker about 30 cm away from the wall, located it below the left top rear speaker
- Refine balance between bass management level and LFE level
- Implement Sonarworks SoundReference Sound ID multichannel in Anubis
- Final test with SMAART ([Thank you Ed Segeren](#), Electro Acoustic Engineer—Toronto, LA, NYC)



# HNFTS SMAART test: 12-19-23



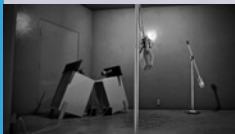
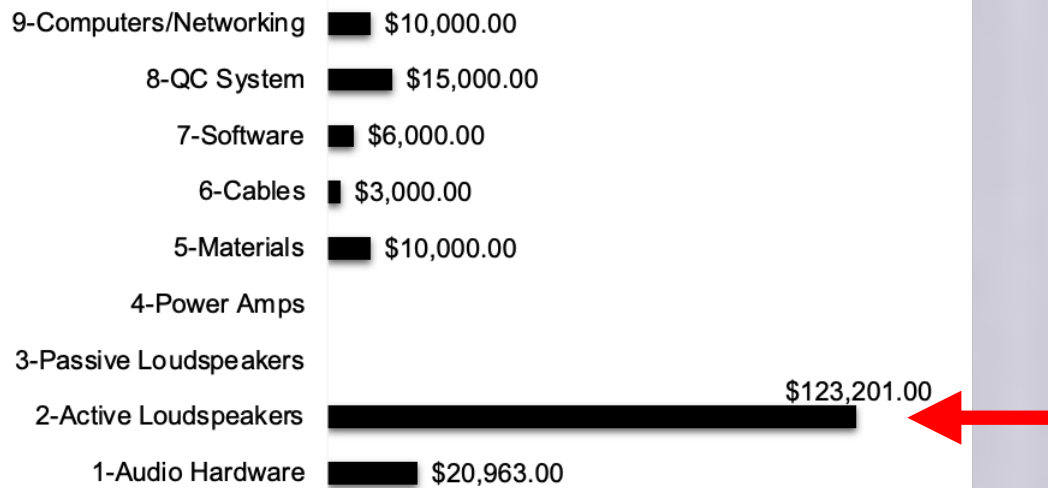
## 12 Channel Aggregate

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# Economic overview: estimate

ATC speaker selection confirmed via DARDT-85dbC +20 True peak

NEAR-FIELD: \$188,164—CAD



# Economic overview: estimate

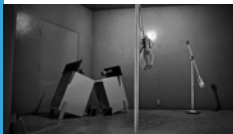
PSB speaker/ART amp selection confirmed via DARDT-83 dbC +20 True peak

## HYPER NEAR-FIELD: \$54,606—CAD



DARDT - HN-FTS power in watts

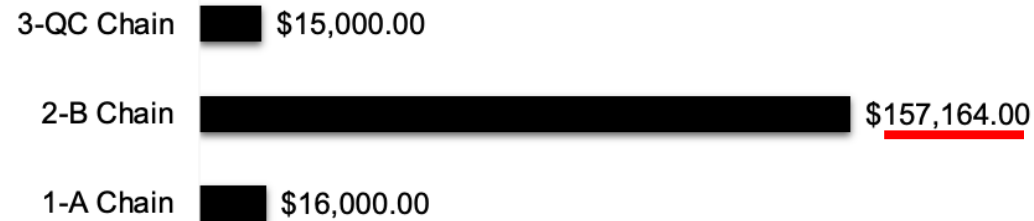
(1700 watts in a 1.5 m cubic [approx] speaker radius.)



# Economic comparison: chain by chain

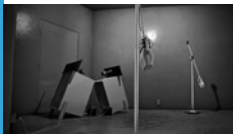
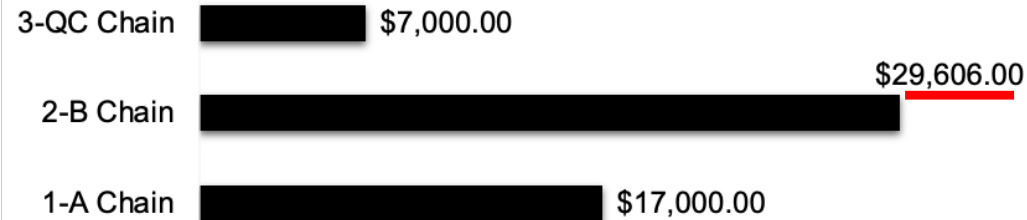
Near-Field: \$188,164—CAD

■ 1-A Chain ■ 2-B Chain ■ 3-QC Chain

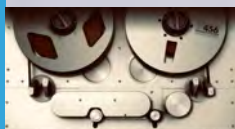


Hyper Near-Field: \$53,606.00—CAD

■ 1-A Chain ■ 2-B Chain ■ 3-QC Chain



## Optional items



Item	Description	Price CAD
<b>PSI Audio AVAA C214</b>	Active bass absorber	\$5880
<b>Audeze CRBN Electrostatic Headphones</b>	Mastering Reference	\$6142
<b>Trinnov MC16-AES67</b>	Spectral phase processor	\$13,000
<b>DIY Diffusers</b>	Above schroeder frequency	\$1000
<b>Virtuoso</b>	Binaural Renderer	\$299
<b>Total</b>		<b>\$26321</b>

# HN-FTS conclusions

## *Strengths*

**Highly correlated** speaker sphere; **Good dimensional separation** between height and standard plane, **Strong imaging; High dynamic range, Passive speakers with amps outside studio=lower studio temperature, low noise floor, easy repair, Hyper Near-Field translates to automotive Atmos systems, Low RT-60 helps electronic room tuning to be effective.**

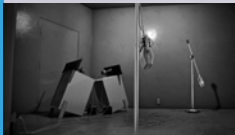
**Standing waves:** Careful choice and location of sub, rectangular room, rear door bass trap, Linkwitz-Riley cross over at 86Hz for single sub bass management, Standing waves are innocuous at mix position, ISOAcoustic Puck isolators—reduce horizontal smear and spectral masking.

**Audio Network Expandability:** Anubis speaker controller with Hapi MKII provides efficient operation, premium sound quality

## *Weakness/Challenges*

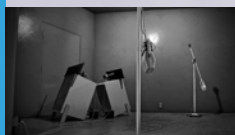
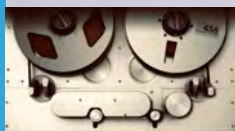
**One person mix position:** current music business economics make any Atmos studio hard to justify for an independent creator, large learning curve, significant investment of time, energy, and money. Skills needed.





## Summary

**HN-FTS** philosophy and benchmark introduce durable and adaptable (premium) solutions that consider music business economics, which everyday, push the independent music & sound practitioner, studio owner, and educational institution to do more with less.



## Acknowledgements

Ed Segeren, Dave Dysart, Warren Beck, Nick Lobodycz, Graham Collins

Dr. Paul Barton- Lenbrook Industries, PSB speakers,

Adrian Novotny – BSC-Mech. Eng. University of Waterloo

Justin Gray, Ron Searles, Jeff Wolpert, Neil Parfit,

John Wheels Hurlbut, Company 3-Toronto,

Richard Chycki, Micheal Francis Nunan

Ceri Thomas (Apple), Emma Brooks – Dolby Laboratories

AES Immersive and Mastering Academy, AES Toronto

John Krivit, heyaudiostudent on facebook

Eventide, Les Paul Foundation, Bettermaker, Oeksound, Nuemann Immersive

Dr. Rob Bowman, Al Henderson, and

Dr. Douglas Van Nort, Research chair-York University, Dr. Denis Martin, University of Toronto,

Dr. Gary Bromham – Queen Mary University of London, Center for Digital Music,

Dr. Dan Pratt – University of West London, Wells Gordon – Florida State University

Dr. Andrew Bourbon/Hyunkook Lee/Mark Wendl – Huddersfield University

Marcella Rada – University of Surrey

JinTing Zhao-SheQ Audio

The Innovation in Music International conference committee:

Dr. Russ Hepworth-Sawyer – MOTTOSound, York St. John University

Dr. Jan-Oloff Gullo – Royal College of Music (KMH), Sweden

Dr. Justin Patterson – University of West London

Dr. Rob Toulson – RT6o Ltd, UK

Merging Technologies:

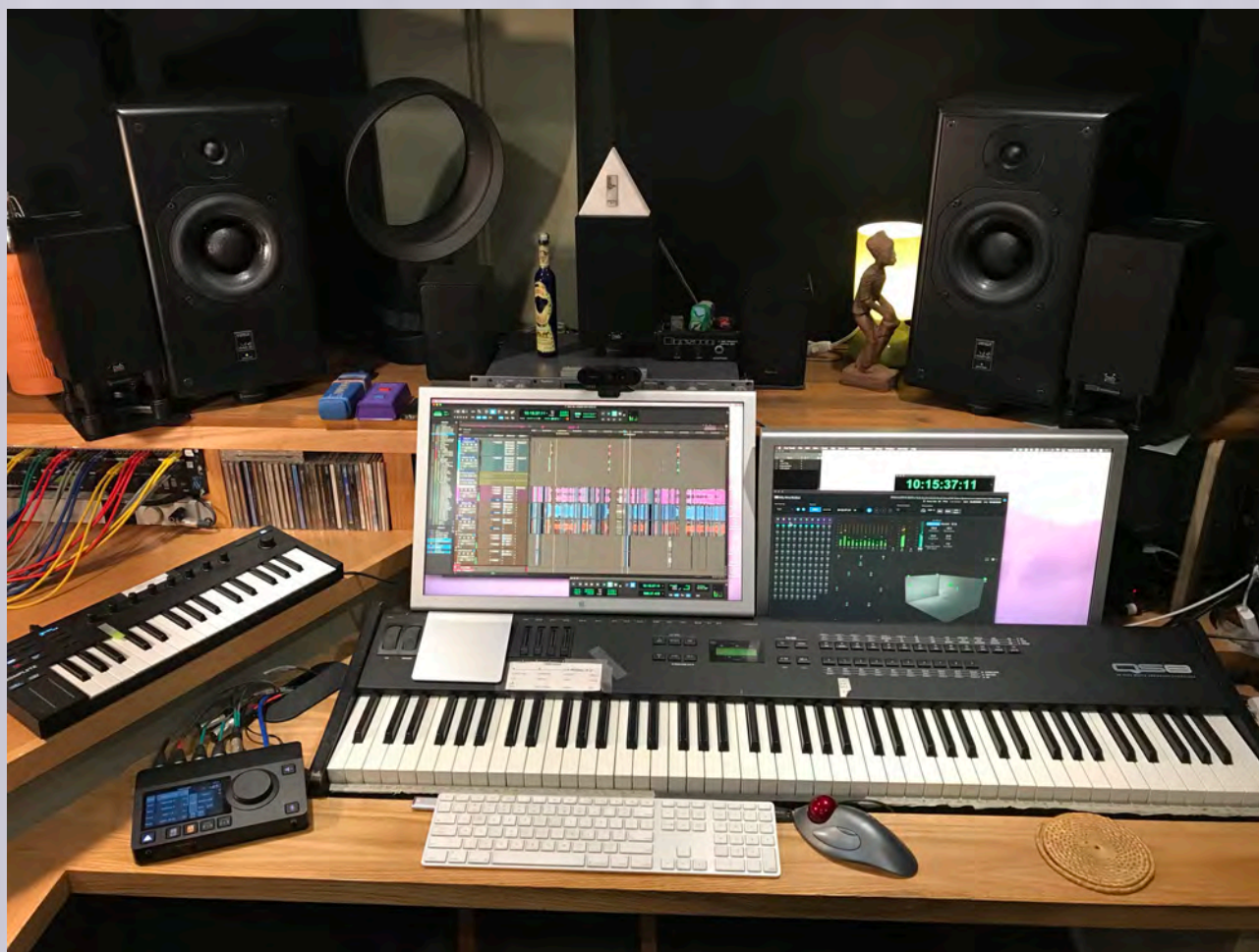
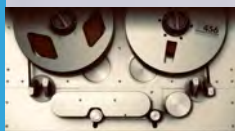
Rune Jacobsen, Ricardo Ryan, Maurice Engler, Didier Bender

Routledge Academic, Taylor Francis Publishing

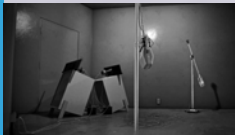
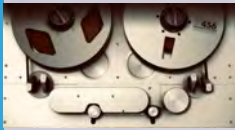
Hannah Barnes-Rowe

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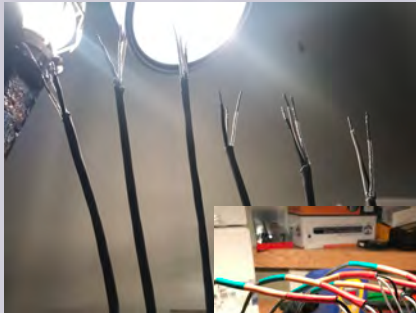
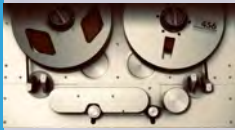
# Image Gallery

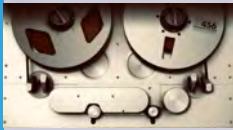


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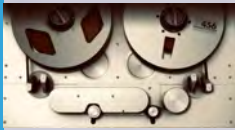


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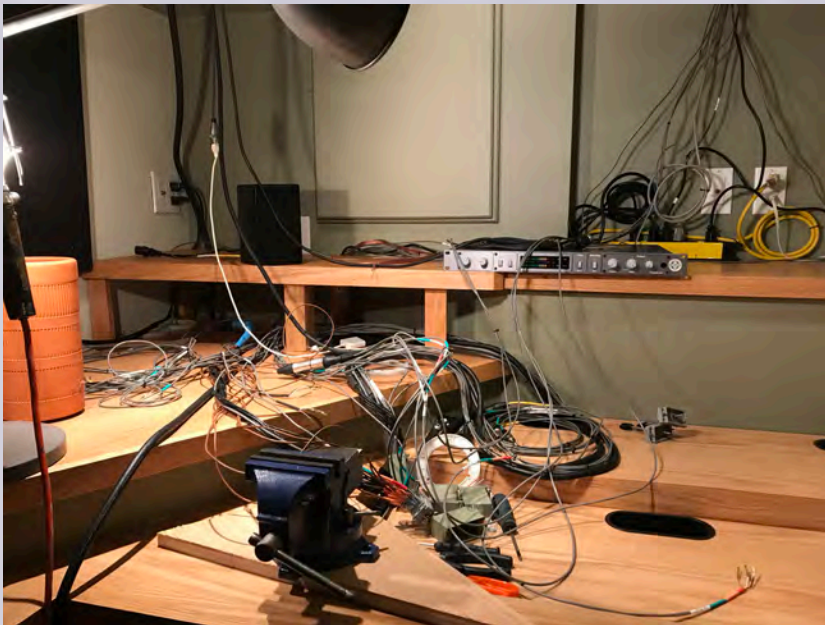


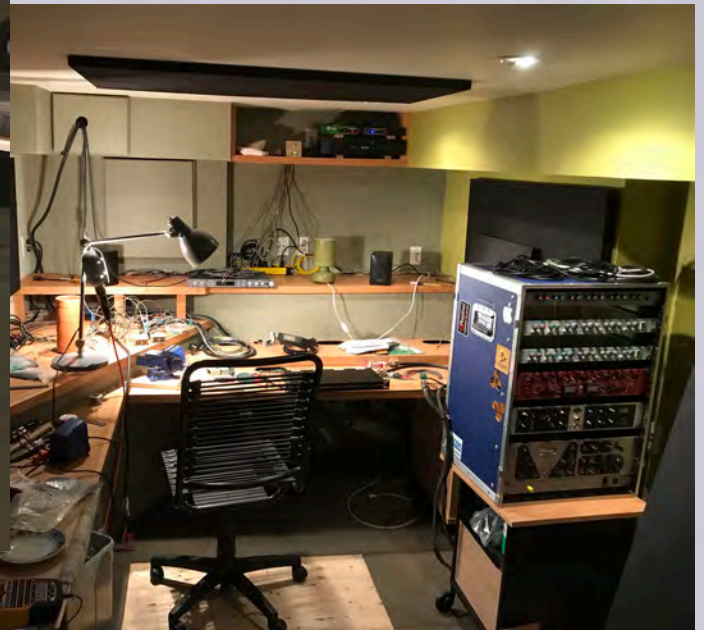
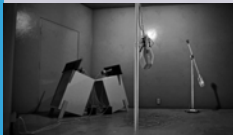
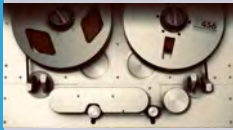


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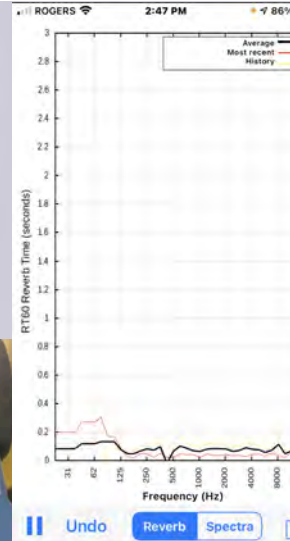
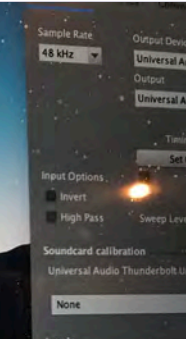
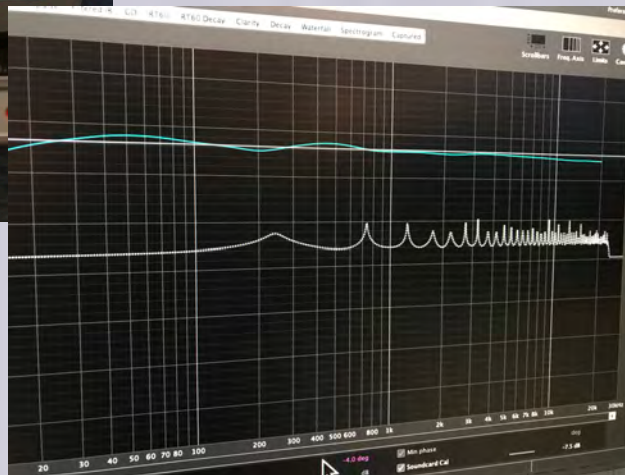
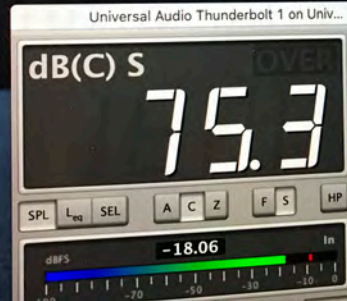
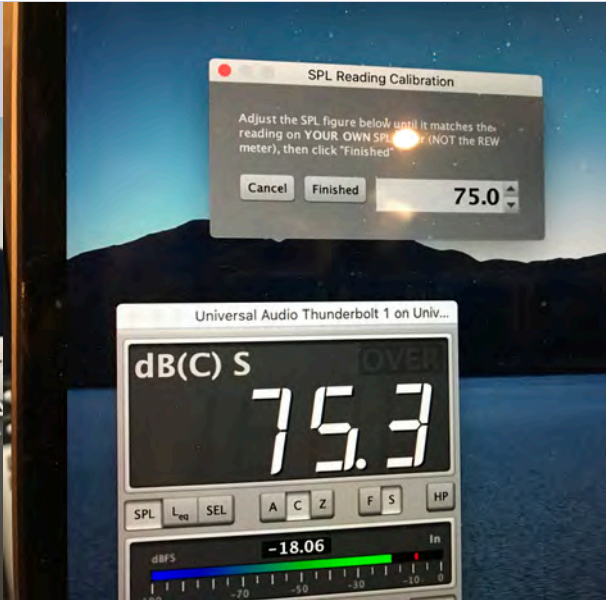
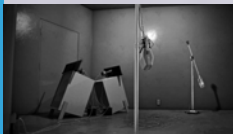
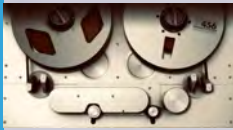


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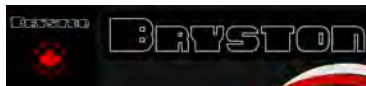
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