



ALT ABR meeting – SWAN project
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Agenda

- Spec overview
- Block Diagram
- SoC comparison
- Acoustic capability
- Questions
- R&R
- ROKU demo

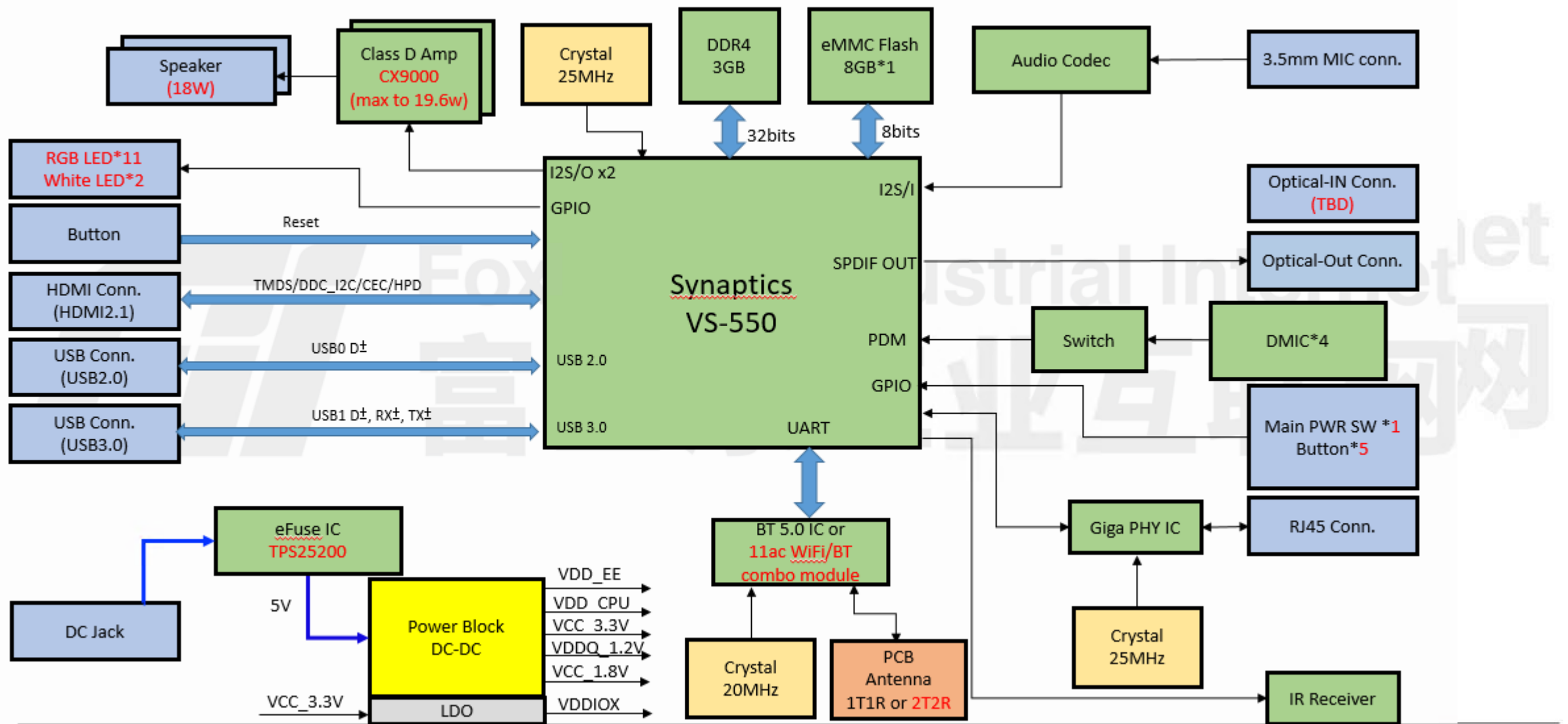
SPEC OVERVIEW



Main Func.	Dolby Digital + AI (NUGU) + WiFi
OS	AOSP
Chipset	Synaptics VS550/ Amlogic 905X3
Memory	
DRAM	DDR4 3GB
Flash	eMMC 8GB
Network	
LAN	10/100/1000 Base-T Ethernet
Bluetooth	Bluetooth 5.0
WiFi	X
AI	
Mic.	4 x Far-Field Mic.
RCU	
Remote Control	BT w/IR based RCU
Interface	
HDMI	1 x HDMI 2.0x @ 4Kp60 output, HDCP 2.2
USB 2.0	1 x USB 2.0 Host Type A
USB 3.0	1 x USB 3.0 Host Type A
Optical-IN	X

S/PDIF	1 x S/PDIF
Ethernet	1 x RJ45 (10/100/1000 Mbps)
Mic.	1 x 3.5 mm Mic. (Wired)
IR Receiver	1 x IR Receiver
LED	11 x RGB 2 x White
Power	1 x DC jack input (12V 4A)
Button	
Main Power Switch	O
Power On/Off	O
CH Up/Down	O
BT Paring	O
AI On/Off	X
Acoustic	
Speaker	2 x 20W speaker
Tweeter	X
Passive Radiator	2 x Passive Radiator
Certification	
KC	O
HDMI	O
BQB	O
Dolby AC3	O

Synaptics VS550 Block Diagram



SoC comparison

	Synaptics VS550(AOSP)	Amlogic 905X3(AOSP)	Amlogic 905X3 (ATV)
Audio tuning	V	V (need 3 rd party support)	V
AEC integration	V	V (need 3 rd party support)	V
Anechoic chamber	V	V (need 3 rd party support)	V (need 3 rd party support)
Experience in acoustic field	V	V (need 3 rd party support)	V
Price advantage	2	3	1

- Why Amlogic based solution is more expensive?
 - Amlogic doesn't have its own AEC or other acoustic related resources and need to co-work with the 3rd party whose royalty and NRE together eat up the price gap.

Acoustics Test Capability – Environment

Anechoic Chamber

- Inner Dimension : 2 m(L)×2 (W)×2 (H)
- Background Noise : < 15dBA
- Cut-off Frequency : 125 Hz



Anechoic Box

- Inner Dimension : 0.6 m(L)×0.58 (W)×0.85(H)
- Background Noise : < 25dBA
- Cut-off Frequency : 120 Hz



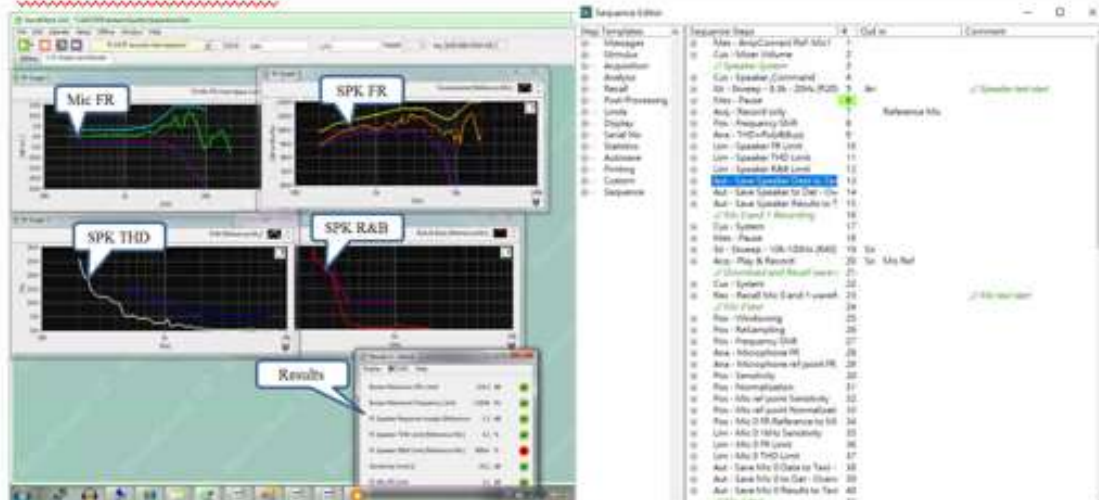
Listening Room for (Alexa spec.)

- Inner Dimension : 7 m(L)×6 (W)×3(H)
- Background Noise : < 30dBA
- Reverberation time between 0.2 s and 0.7s
- Bigger than ETSI test room

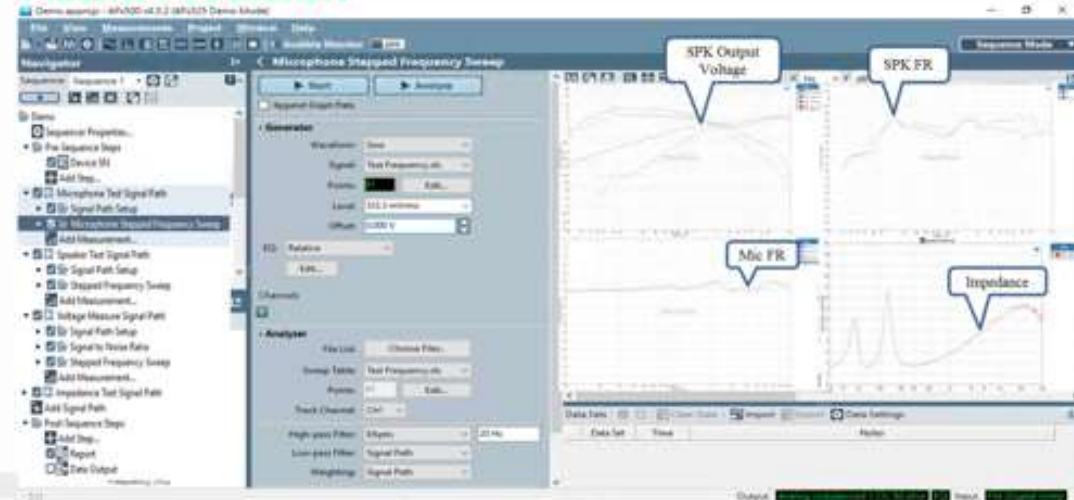


Acoustics Test Capability – Analyzer

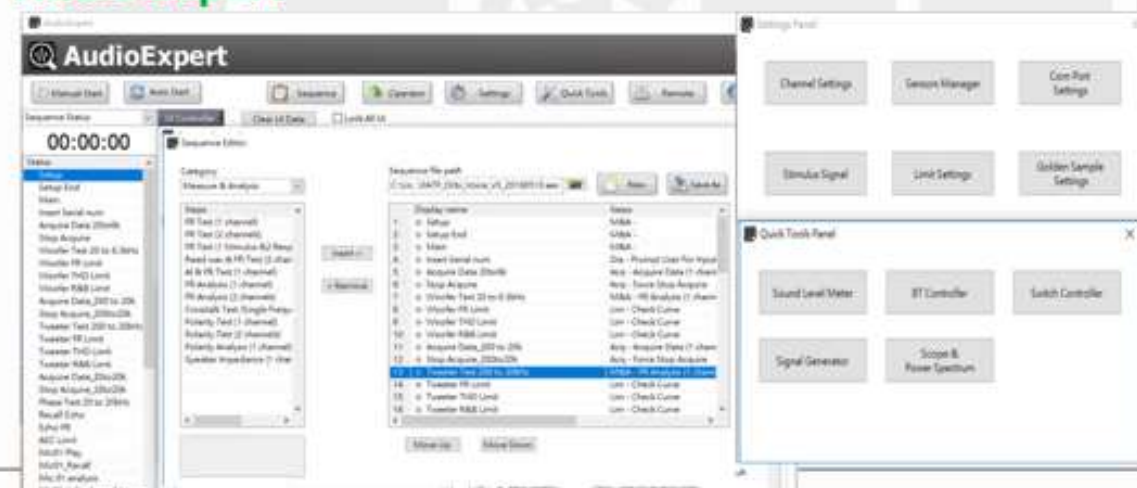
SoundCheck



Audio Precision



Audio Expert



Electro-Acoustics Capability

1. Speaker / Earphone Test
2. Microphone Test
3. Noise Detection
4. Board Level Signal measurement



**Listen Soundcheck
USB Ampconnect one**



**Noise Speaker
with stand**



**B&K Nexus
Conditioning
Amplifier**



Anechoic Chamber



APx585



**Telephone Test
Head**



**Type 1 / 3.2 High/Low
leakage artificial ear**



**B&K 4955 / 4192 /
4191/GRAS 26AM**



**Microphone Calibrator
B&K 4231 / GRAS 42AB**

Acoustic Standards Testing

1. TIA 810B
2. TIA 920
3. ETSI ES 202 737/738/739/740
4. HAC 68.316 / 68.317 / TIA-1083-A
5. TOSQA
6. HQS-IP
7. HQS-Mobile
8. VFTST Audio WB/NB



HAC Probe



UPL 16



**B&K 4128c
HATS**



**Head Acoustics
HMS II.3 HATS**



**Head Acoustics MFE VI.1
(Analog Front-end)**



**Head Acoustics MFE VIII
(VoIP SIP Ref. GW)**



**Head Acoustics ACQUA
(Speech Quality
Analysis System)**

Acoustics Test Capability – Lab test

Transducer Test

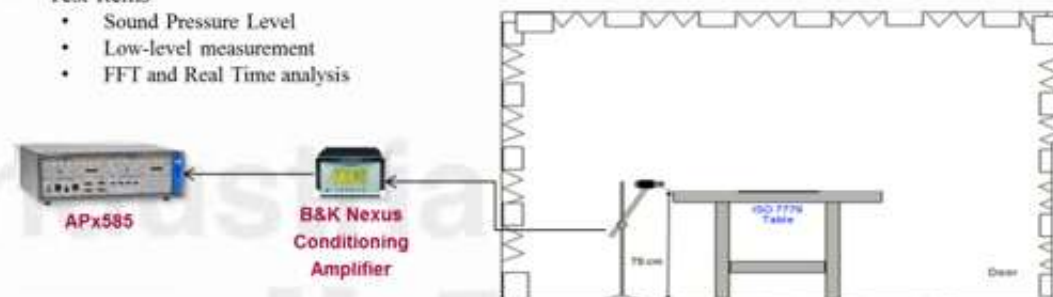


Test and Analysis Items

- ✓ Sound pressure level
- ✓ Sensitivity
- ✓ Frequency response
- ✓ Phase
- ✓ Total harmonic distortion
- ✓ Total harmonic distortion with noise
- ✓ SNR
- ✓ Impedance
- ✓ Rub and Buzz (test by soundcheck)
- ✓ T-S parameters

Acoustic Noise Test

- Measure frequency range from 20Hz to 20KHz
- Measure the sound pressure level with "A-weighting" which approximates the response of the human ear to sounds of medium intensity
- Test Items
 - Sound Pressure Level
 - Low-level measurement
 - FFT and Real Time analysis



Noise Simulation Test (Background noise simulation)

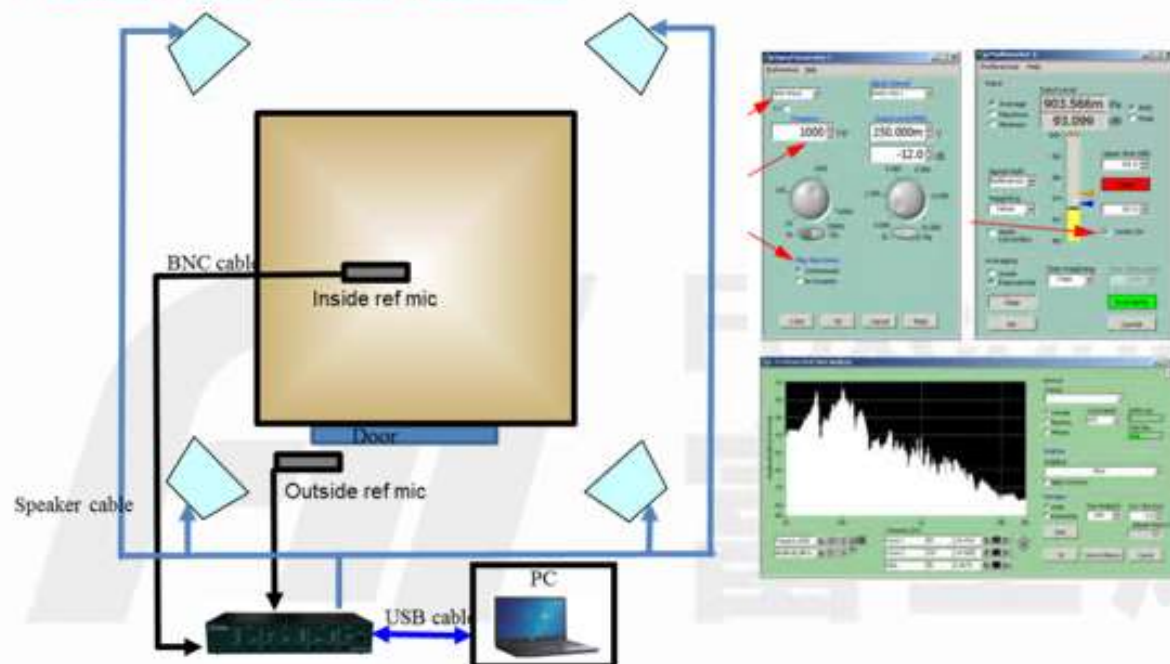
- Measure microphone system performance (speech quality, voice recognition, noise reduction) in difference noise condition
- Test Items
 - Voice Wake-up & Voice Recognition in difference noise condition
 - Noise Reduction Performance



- Inner Dimension : 7 m(L)*6 (W)*3(H) (larger than ETSI request 3.5 m(L)*4 (W)*2.5(H))
- Background Noise : < 30dBA
- Reverberation time between 0.2 s and 0.7 s
- Bigger than ETSI test room

Acoustics Test Capability – Production line test

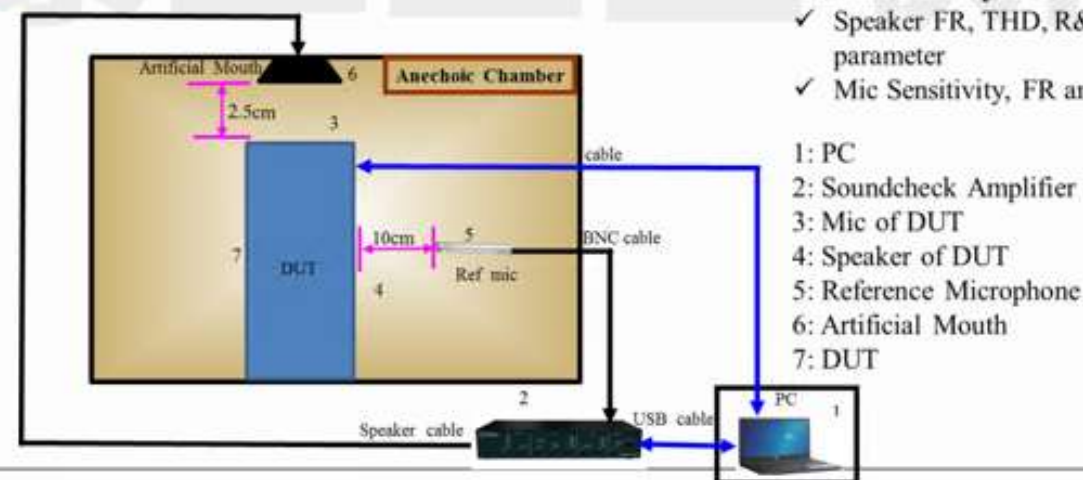
Production Line Acoustic Test Setup



Production Line Anechoic Box Noise Isolation Capability Experiment

Test and Analysis Items

- ✓ Speaker FR, THD, R&B, Phase and TS parameter
- ✓ Mic Sensitivity, FR and THD



Questions

- Does SKT develop AEC algorithm itself?
 - If yes, SKT needs to provide the acoustic design rule for Microphones and Speakers.
- Does SKT include other acoustic related algorithm such as ANS (noise suppression)?
- What trigger word algorithm will be used?
- Will there be ATV version?
- Can ALT provide audio Electro-Acoustics performance specifications, such as frequency response, input sensitivity, SNT, THD+N, SPL(Max speaker Pressure Level) and acoustic noise level?
- In order to get the best sound quality, are there any benchmark models in the market for reference?
- Is Atmos surely required? If so, need ALT to provide the Dolby Atmos spec regulation for HW evaluation. Also need to kick off soon to push SoC vendors to start their development.
- Need to increase the housing dimension if add Dolby Atmos features.(2 additional speakers and PCB size increase). Also need to increase the power adaptor to 12V/7A to provide the sufficient power for system.
- Dolby Atmos requires additional 2 speakers for overhead sound. Need ALT to provide the speaker's spec.
- When is ID design provided?

R&R

Category	Item	FII	ALT	Remark
Housing	ID		V	SKB will design new one.
	ME	V		
	Tooling	V		
	Injection	V		
Accessory	Remote controller		V	B/S material
	Power adapter		V	B/S material
	HDMI cable			T.B.D
	LAN cable			T.B.D
	Quick Start Guide Design		V	
	Quick Start Guide Manufacture	V		
Package/Label	Design		V	
	Manufacture	V		
STB	Materials sourcing	V		
	Materials purchase	V		
	HW customization	V		
	ATV/AOSP platform	V		
	Middleware		V	SPTek
	SW application layer		V	

R&R

SPK	Speakers arrange layout	V		Squawker x 2, tweeter x 2, passive radiator or duct type
	Materials sourcing	V		
	Materials purchase	V		
	HW customization (amp.)	V		
	SW customization (amp.)	V		
	Basic Sound Tuning	V		Need to know the audio requirement from B&O
	Arrange for final sound		V	B&O
	Final Sound Tuning	V		B&O
FFVR	HW customization	V		
(NUGU or Google)	Provide SKT AI Platform		V	
	SKT AI Platform Porting	V		
	Pre-processing for FFVR	V		
	QA	V	V	
Certi./Safety	HDMI	V		
	HDCP	V		
	BQB	V		
	CTS	V		
	CVS	V		
	NTS	V		
	KC		V	
	Dolby		V	
	DTS		V	T.B.D
	B&O	V	V	
Manufacture	MP	V		