Qudelix-5K

User Guide

AUG 2020

Key Specification

- **Bluetooth 5.0**
  - Class 2 (2.5mW 4dBm) up to 10m
  - 2.4GHz
- **Qualcomm QCC5124 Bluetooth Chipset**
- **Dual ES9218P SABRE HiFi® DAC**
  - 3.5mm output works with single DAC only.
  - Dual DAC is available with 2.5mm output.
- **High Precision Audio Clock**
- **aptX Adaptive, LDAC, AAC, aptX-HD, aptX, SBC**
- **High-Resolution USB DAC 96KHz / 24-bit**
  - USB Audio Class 1.0
  - Windows/MacOS/Linux (No Device Driver)
  - Android Device through C-to-C or OTG cable
- **10-band Double Precision GEQ/PEQ**
- **High Sensitivity 3-D LDS (Laser Direct Structuring) Antenna**
  - Bluetooth Range more than 10 meters
- **Qualcomm® cVc™ noise cancellation technology**
- **High Sensitivity MEMS Microphone**
- **Four Multi-functional Buttons & Two LEDs**
- **Over-the-Air firmware update**
- **Material**
  - Plastic Body (Black) with anti-scratch UV Coating
  - Aluminium Clip (Dark Gray)
- **52.8 x 26.7 x 15.6mm (including Clip)**
- **26 grams**

Key Specification

- **Output Power**
  - 3.5mm 80mW per channel
  - 2.5mm 240mW per channel

- **SNR (A-weighted)**
  - 3.5mm -118dB
  - 2.5mm -122dB

- **THD+N**
  - 3.5mm 0.004%
  - 2.5mm 0.002%

- **Separation**
  - 3.5mm 79dB
  - 2.5mm 117dB (1KHz/32-ohm)

- Output Impedance
  - Less than 1-ohm

Buttons - BLUE

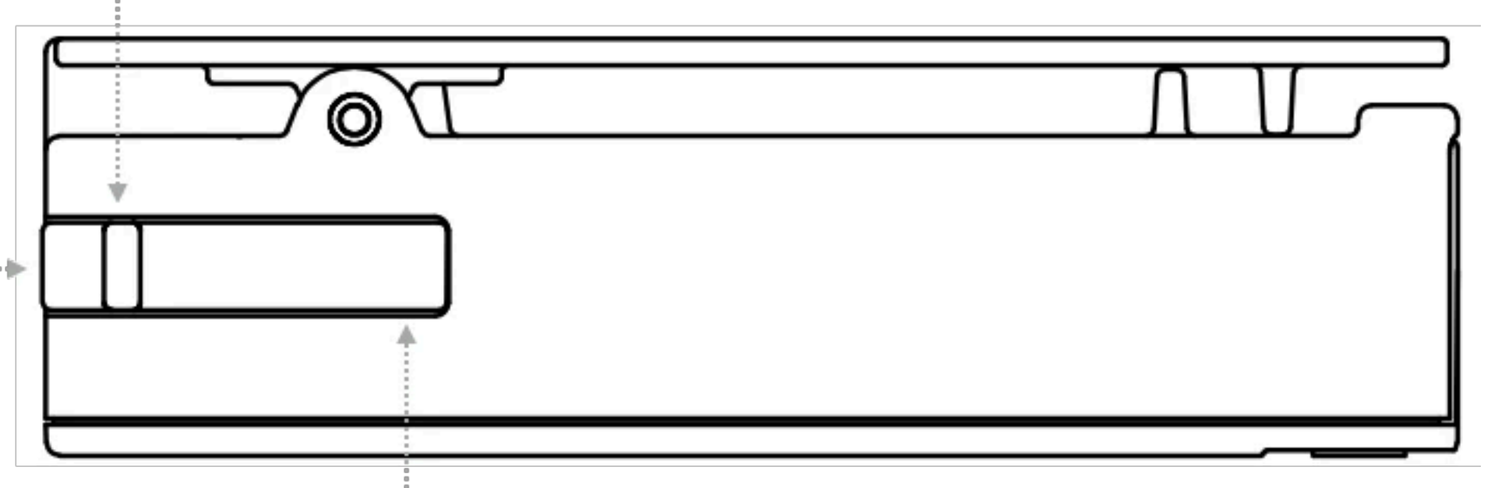
BU(Blue Upper)

Pairing Mode (long press 3 sec)

Play/Pause (Single Click)

Next Track (Double Click)

Answer Incoming Call (Single Click)



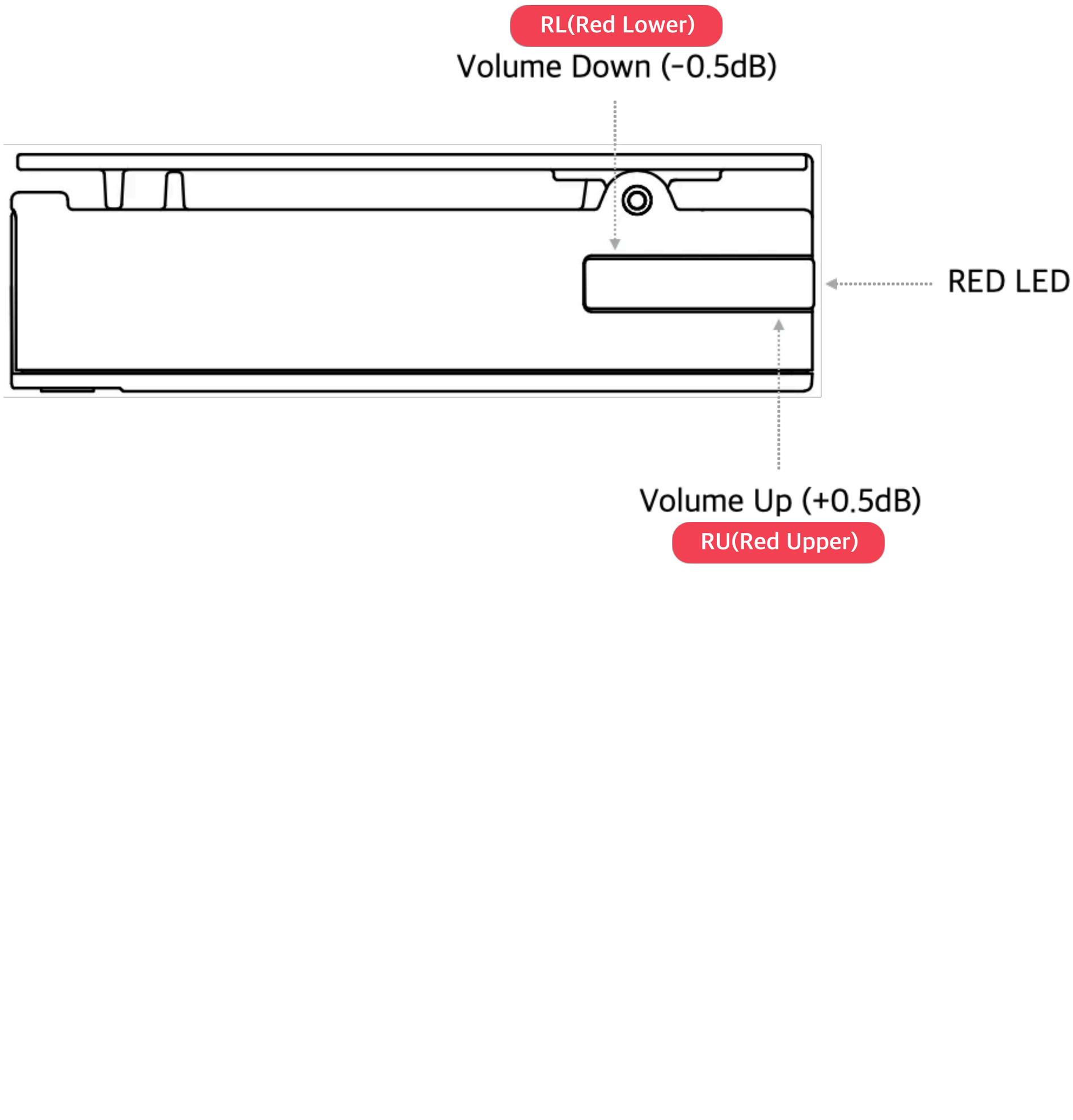
BLUE LED

Power On/Off (long press 3 sec)

Previous Tack (Double Click)

BL(Blue Lower)

Buttons - RED


RL(Red Lower)
Volume Down (-0.5dB)
RED LED
Volume Up (+0.5dB)
RU(Red Upper)

Pairing with Android

1. Power On 5K BL(Blue Lower)

- BL button long press more than 3 sec.

2. Enter Pairing Mode BU(Blue Upper)

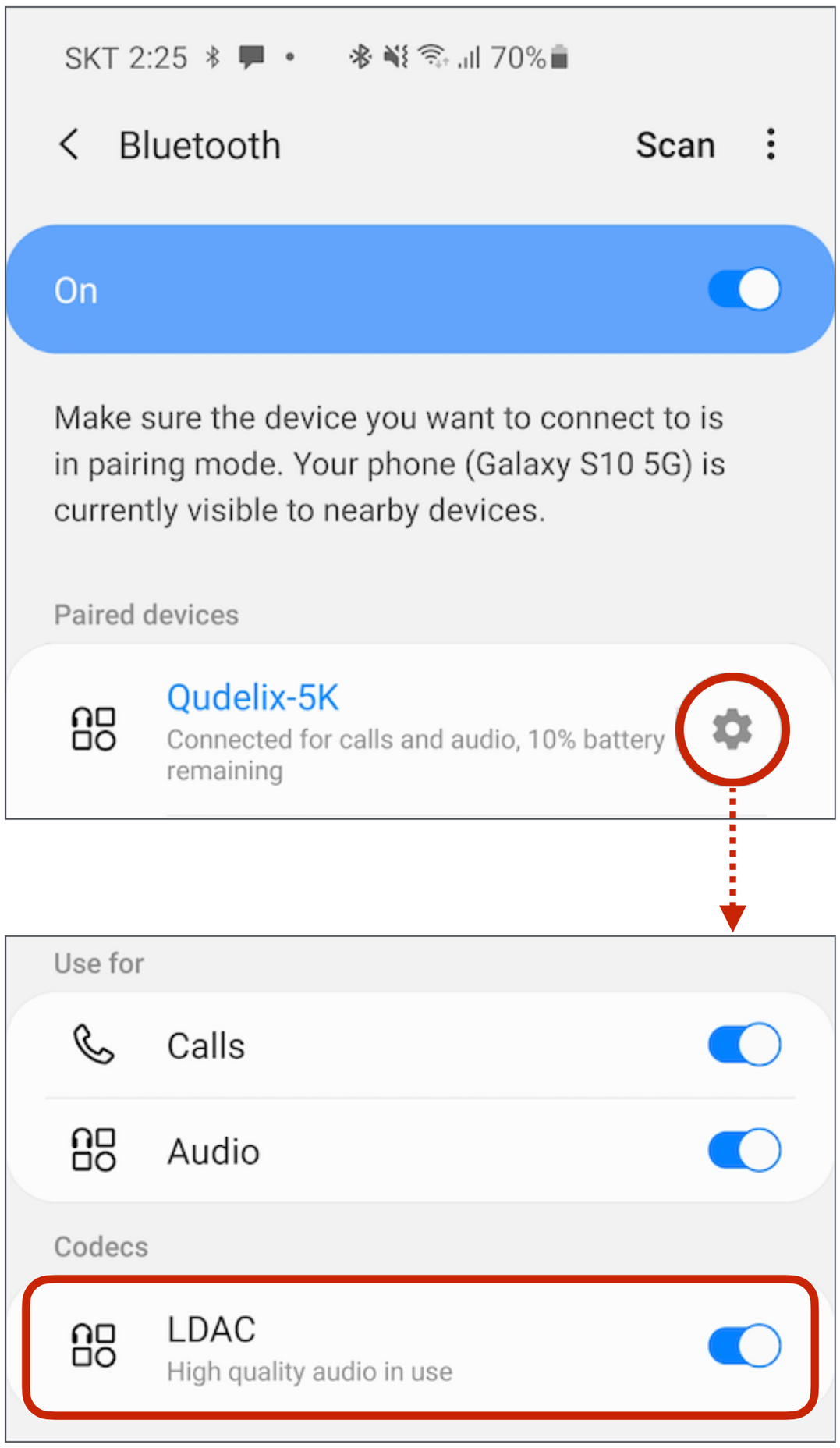
- BU button long press more than 3 sec.
- Red, Blue LED blink when pairing mode

3. Go to your Android Bluetooth menu

- Scan Bluetooth devices
- Select **Qudelix-5K**

4. Enter Qudeilx-5K option

- Enable LDAC (Android 8.0 or higher)



*Enable Sony LDAC after pairing

Pairing with iOS

1. Power On 5K BL(Blue Lower)

- BL button long press more than 3 sec.

2. Enter Pairing Mode BU(Blue Upper)

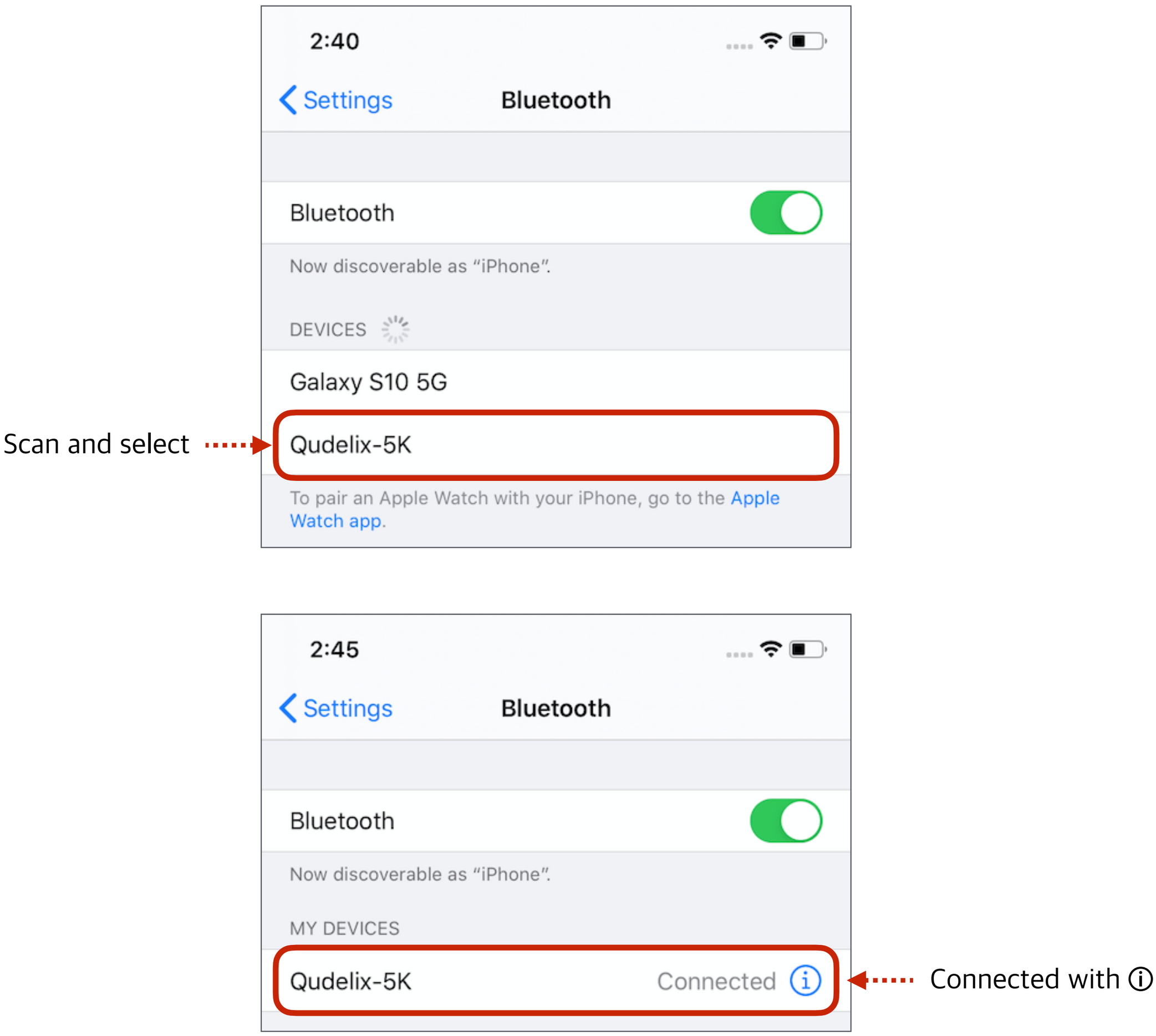
- BU button long press more than 3 sec.
- Red, Blue LED blink when pairing mode

3. Go to your iOS Bluetooth menu

- Scan Bluetooth devices
- Select **Qudelix-5K**

4. Paired

- Once connected(Paired) to iOS device, you will see **Qudelix-5K Connected** ⓘ in MY DEVICES list

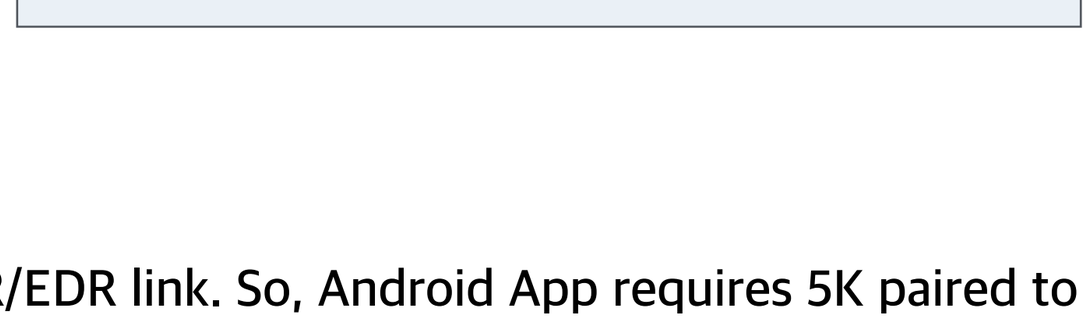


Qudelix 5K Bluetooth Audio Connection

Mobile App

- https://play.google.com/store/apps/details?id=com.qudelix.qudelix&hl=en_US
- https://apps.apple.com/kr/app/qudelix/id1515641059?l=en

- 5K allows the APP connection with **one device at a time.**
- iOS App uses the BLE link. So, you will see **Qudelix-5K Connected without (i)** when the app is connected.

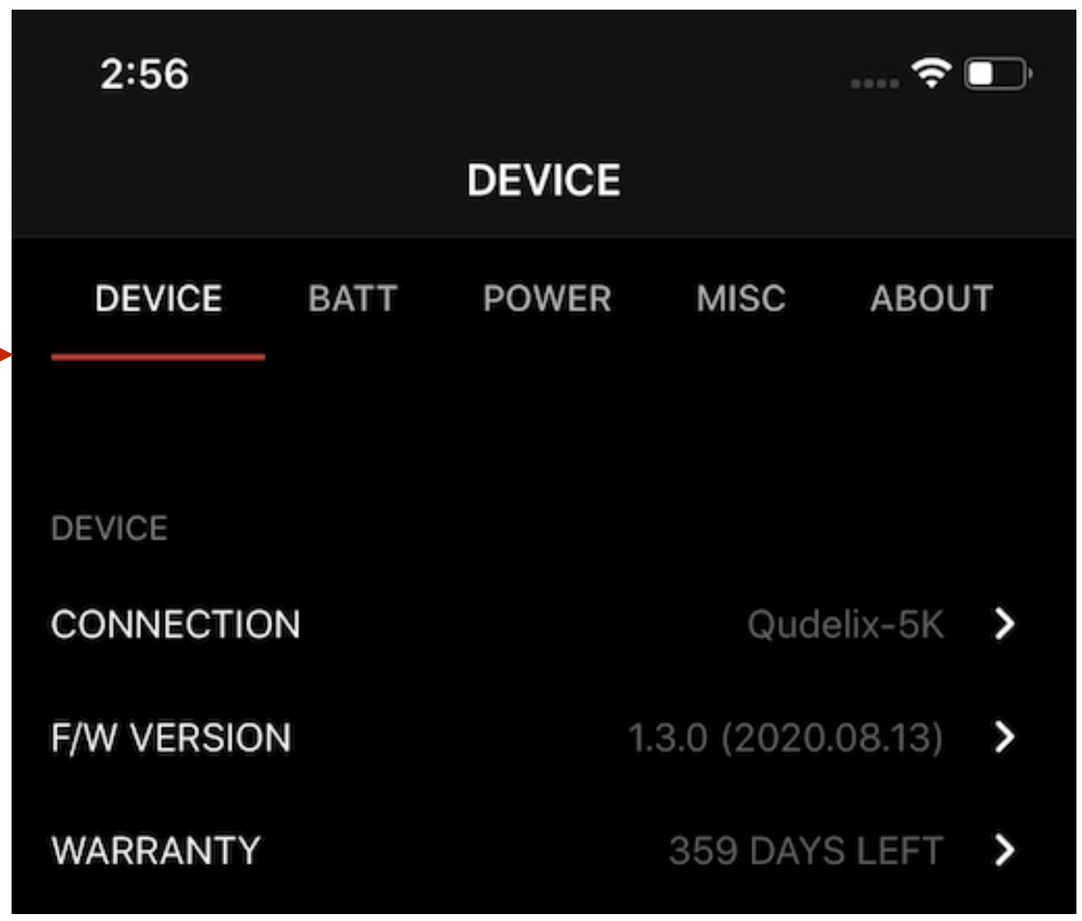


BLE App Connection

A2DP Audio Connection

- Android App uses the BR/EDR link. So, Android App requires 5K paired to the system before the app connection.

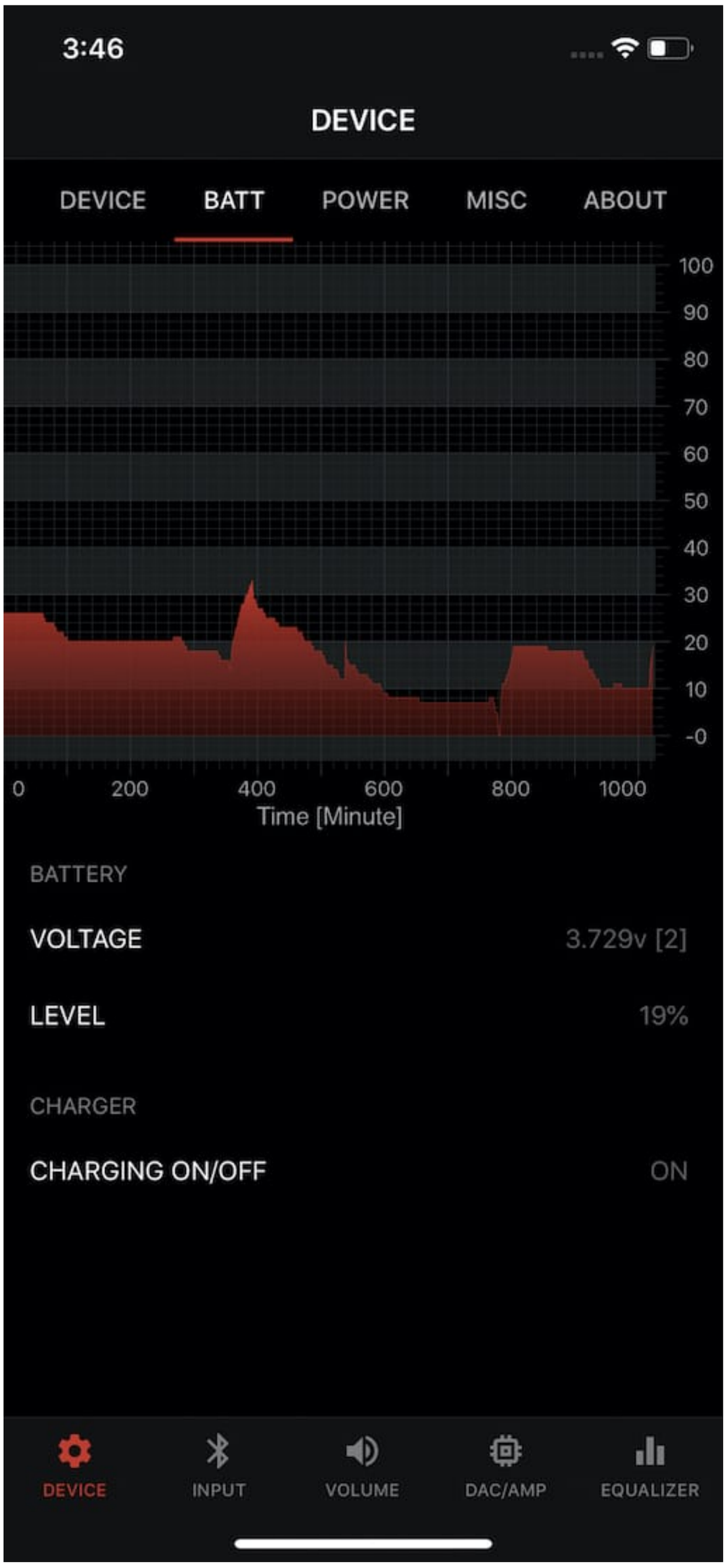
***The Red Bar indicates the app is connected to the device, gray otherwise.**



Battery

- The app displays the current battery and charger status.
  - Battery Log Graph
  - Instantaneous battery level
- The battery voltage is just for reference.

- **Please use 5V Standard USB Charger or PC USB port.**
  - The 5K built-in charger will limit the maximum charging current to 200mA.
  - 500mA Battery (2H 30MIN charging time from empty to full)



Battery Time

- **Please note that the battery times may differ across each use case.**
  - The battery time varies across the codec, sample rate, power profile, and the output mode. The sensitivity of the connected earphones/headphones and the output volume level also can make the battery time longer or shorter.

AAC 44.1KHz

	Standard Mode		Performance Mode	
	Current Avg. [mA]	Time [Hour]	Current Avg. [mA]	Time [Hour]
Balanced 4V Dual DAC	51.30	8.77	66.80	7.49
Balanced 2V Dual DAC	40.00	12.50	51.90	9.63
Unbalanced 2V Single DAC	30.60	16.34	38.00	13.16
Unbalanced 1V Single DAC	25.00	20.00	30.40	16.45

LDAC 44.1KHz @ 909Kbps

	Standard Mode		Performance Mode	
	Current Avg. [mA]	Time [Hour]	Current Avg. [mA]	Time [Hour]
Balanced 4V Dual DAC	55.00	9.09	70.20	7.12
Balanced 2V Dual DAC	42.70	11.71	55.40	9.03
Unbalanced 2V Single DAC	33.00	15.15	40.50	12.35
Unbalanced 1V Single DAC	27.20	18.38	32.80	15.24

LDAC 96KHz @ 990Kbps

	Standard Mode		Performance Mode	
	Current Avg. [mA]	Time [Hour]	Current Avg. [mA]	Time [Hour]
Balanced 4V Dual DAC	59.20	8.45	74.50	6.71
Balanced 2V Dual DAC	46.90	10.66	59.70	8.38
Unbalanced 2V Single DAC	35.40	14.12	43.10	11.60
Unbalanced 1V Single DAC	29.80	16.78	36.10	13.85

ES9218P DAC/AMP

- **2V RMS mode vs. 1V RMS mode (Output Power)**
  - High or Low Amplifier Gain Selection
  - Both modes provide the same sound performance.
  - 2V RMS mode provides a +6dB greater output level at a little higher background noise floor.
  - Both modes could sound a little different from each other. But, it doesn't mean that which one is better.
  - In most cases, it is highly recommended using the 1V RMS mode, which provides longer battery time and the lower noise floor.
  - For high sensitivity IEM, the 1V RMS mode offers the best noise performance and power efficiency. There's no reason to keep the low gear on the highway.

  - To prevent sudden amplification, the FW is designed to compensate the volume level, upon 1V and 2V HPAMP Gain change. You will experience no difference in loudness when switching the mode to 2VRMS, but you will have the max volume extended by +6dB.

- **Statndard vs. Performance (DAC Profile)**
  - 5K sets and drives ES9218p DAC in two different ways: one for the best sound quality and the other for the efficiency.
  - STANDARD provides the best trade-off for battery time and sound quality, while PERFORMANCE does the best sound quality with lesser battery time.
  - USB connection to the device overrides the current profile and switches it to PERFORMANCE temporarily.

- 3.5mm UNBAL works with a single DAC only. (Max. 2V RMS)

- 2.5mm BAL works with dual DAC (Max. 4V RMS)

- 8-Different Type of DAC LPF provided

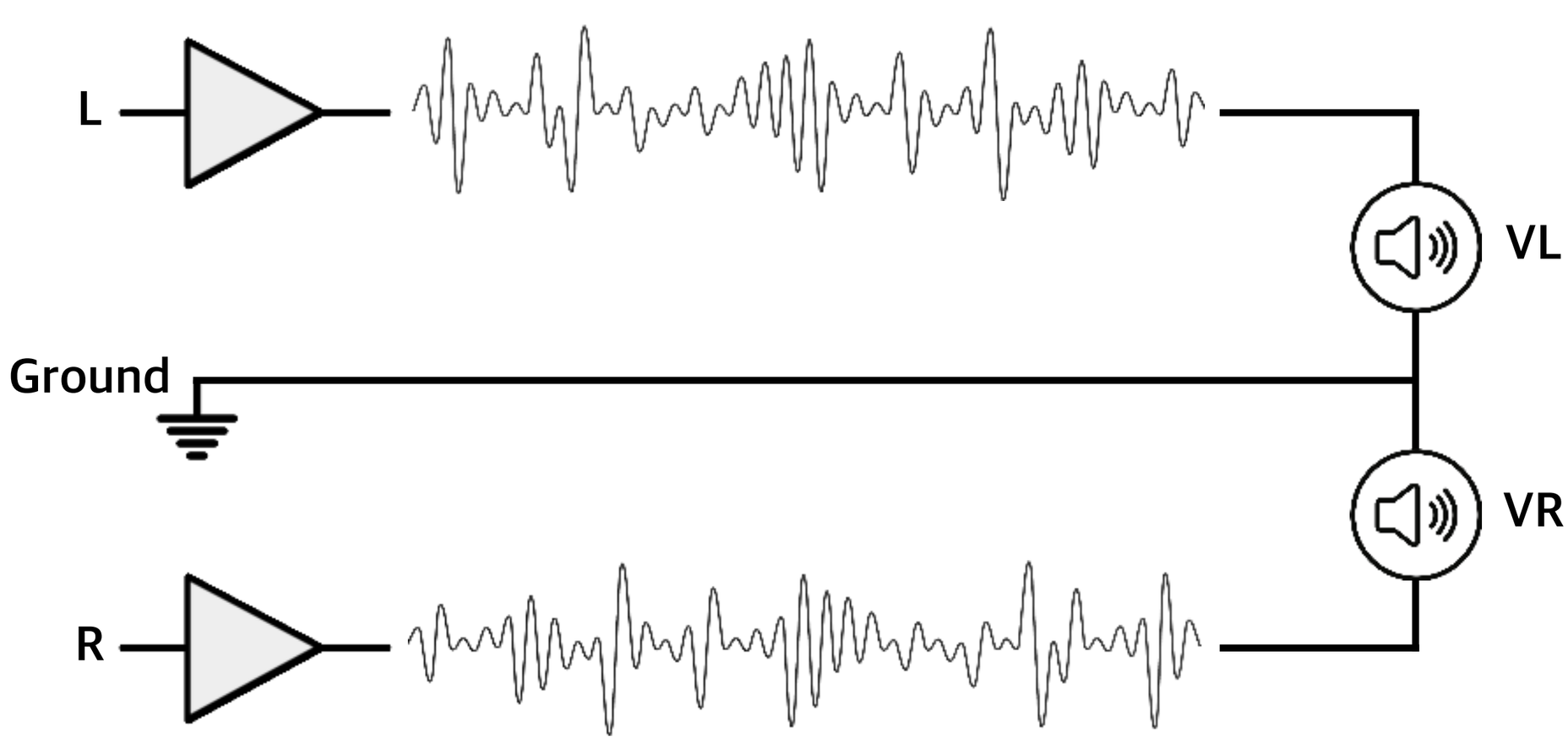
UNBALANCED (Single-Ended) 3.5mm

- Works with Single ES9218p
  - Max. 2V RMS output

- 3-Wire Output from Source Device
  - 2 ch DAC/AMP for Stereo Audio
  - 1-pin Ground

- Common Ground
  - Ground Pin goes to both Speaker-L and Speaker-R
  - Ground ripple(noise) affects both L & R channel

- Both AMP_NOISE and GROUND_NOISE affects the Sound Quality
  - VL = L + AMP_NOISE + GROUND_NOISE
  - VR = R + AMP_NOISE + GROUND_NOISE

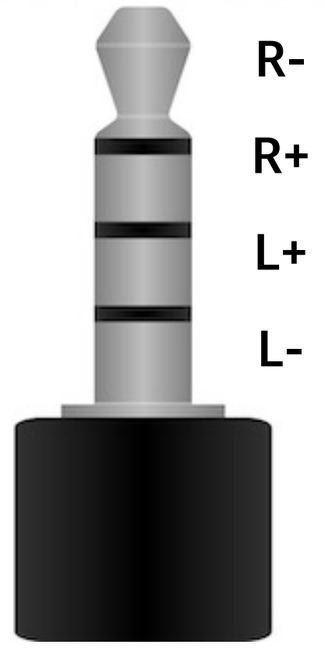


BALANCED (Full-Differential) 2.5mm

- Works with Dual ES9218p
  - Max. 4V RMS output

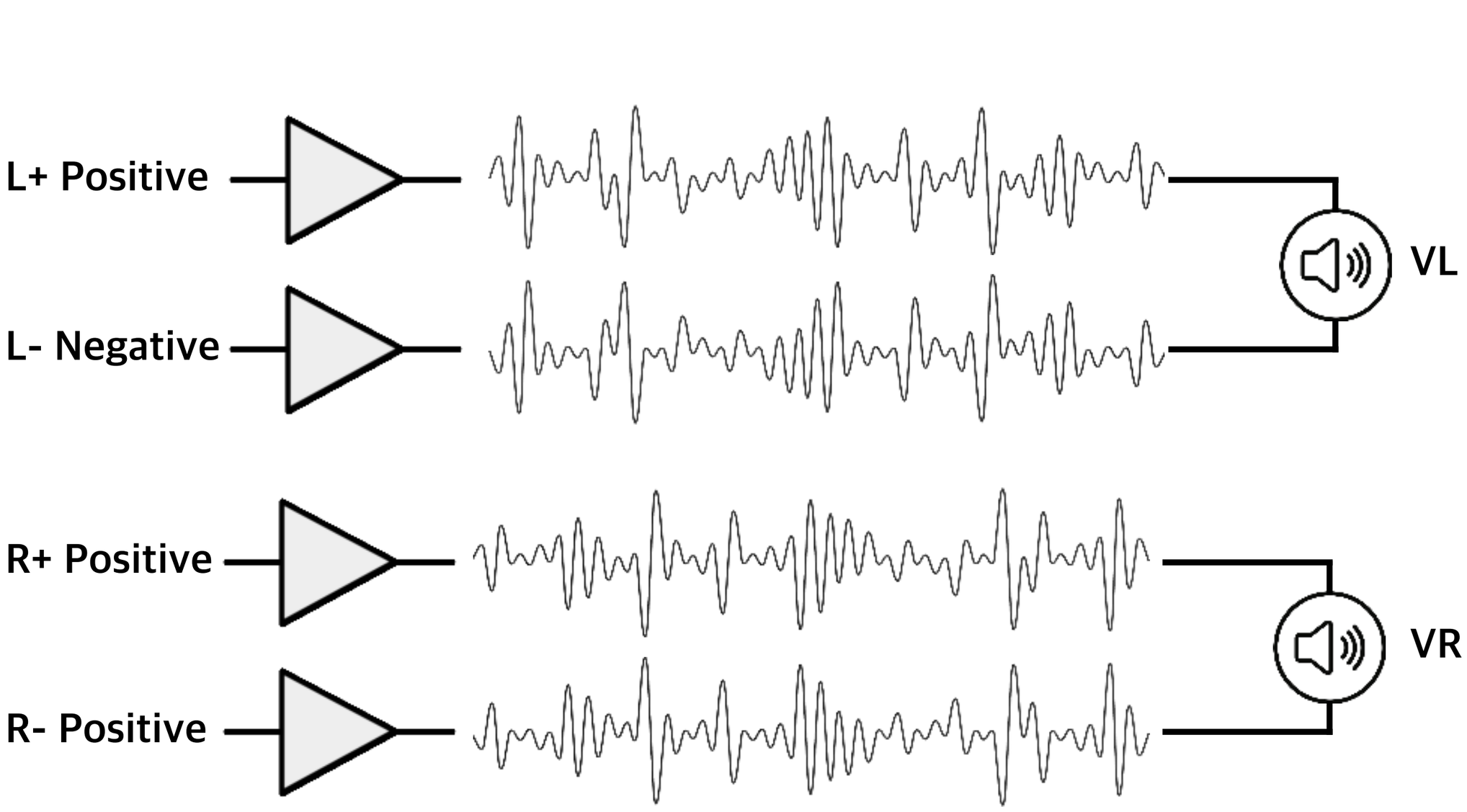
- 4-Wire Output from Source Device
  - 4ch DAC/AMP required for Stereo Audio
  - Original Signal (L+/R+) and Inverterd or Negative Signal (L-/R-)

- Free from Ground Noise



- Common Mode Noise Reduction
  - Common AMP_NOISE is canceled out easily
  - VL = (LP+ AMP_NOISE) - (LN+AMP_NOISE) = LP-LN = 2L
  - VR = (RP+ AMP_NOISE) - (RN+AMP_NOISE) = RP-RN = 2R

- Relatively better Sound Quality
  - Better Linearity
  - Better Channel Separation
  - 2x more power and driving capability

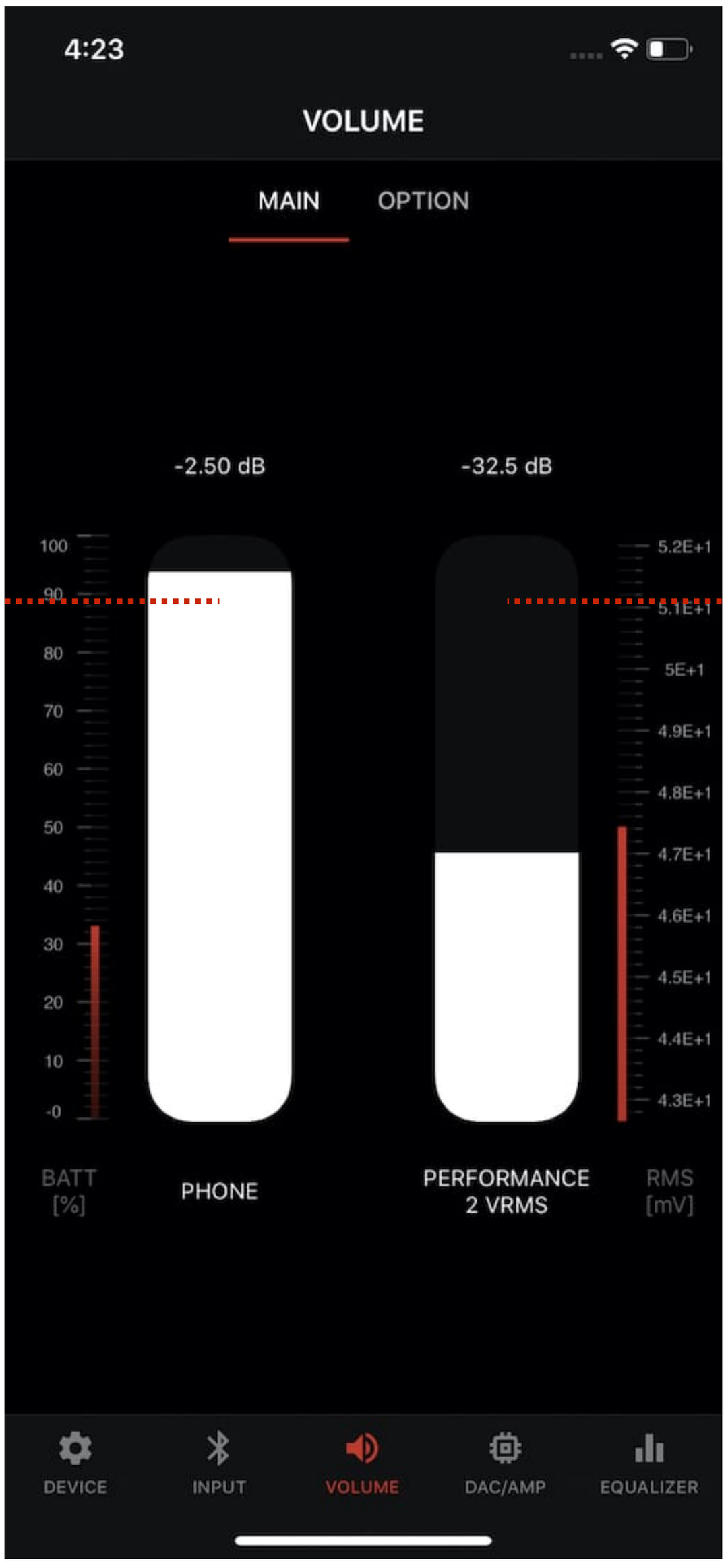


*With any given hardware device, supporting both UNABL and BAL, BAL always provides relatively better performance then UNBAL.

Volume

- **Absolute Volume Control**
  - 5K offers 2-way associative control for optimal sound quality. It always keeps and guarantees the full precision audio stream over Bluetooth or USB. In either way, via smartphone source volume or 5K device volume, you can control the loudness level without any loss. It is highly recommended to turn on the Absolute Volume for the best sound quality.

Source Volume

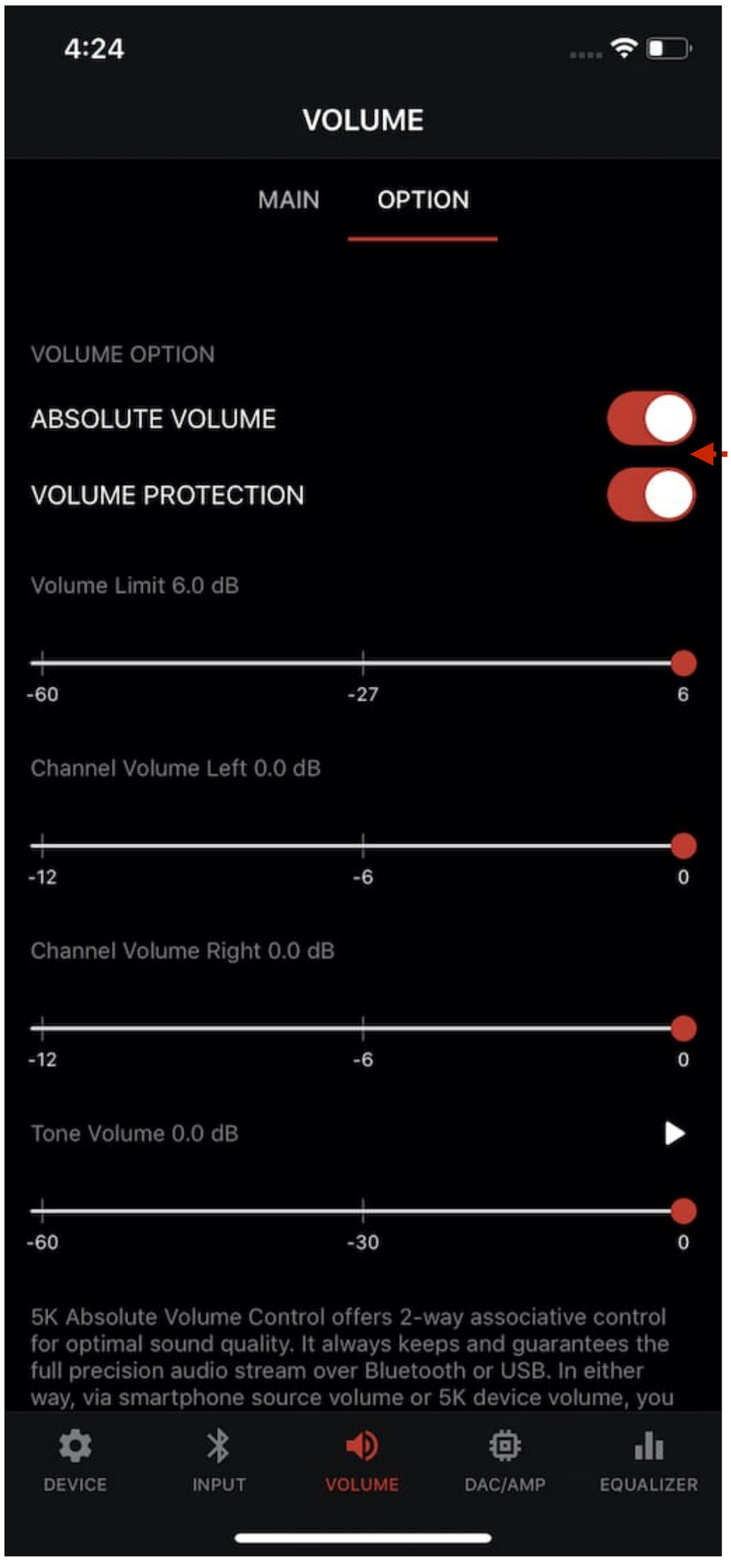


5K Device Volume

Volume Option

- The 5K provides a higher output power than other portable audio devices.
- An accidental volume up may damage your ear and IEMs. For high sensitivity IEMs, we strongly recommend limiting the device volume.

- **Absolute volume** and **volume protection** are highly recommended in all use case.



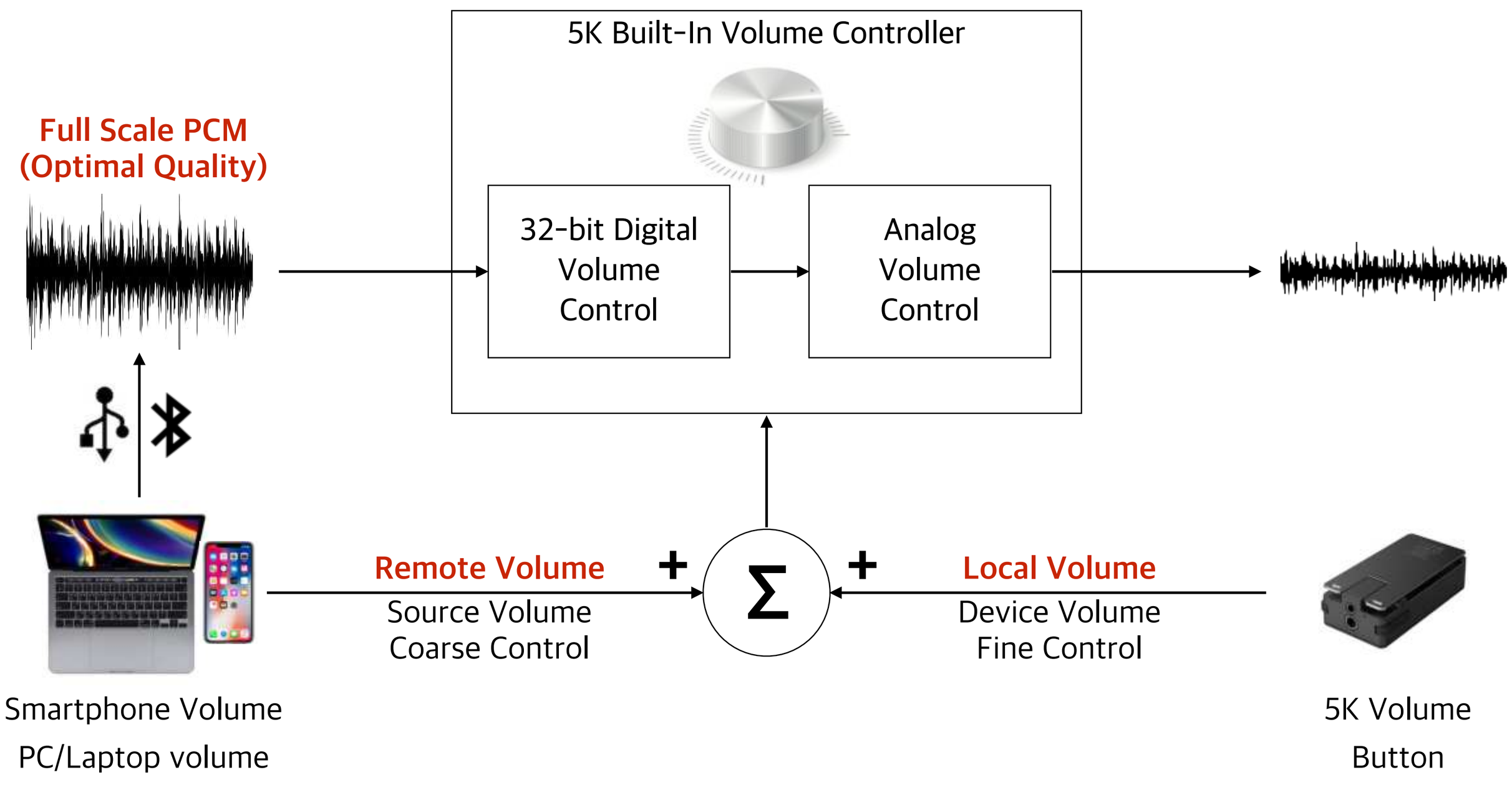
Highly Recommended

2-way Associative Absolute Volume

- **Smartphone, PC/Laptop volume control**
  - Remotely adjusts 5K built in Volume Controller
  - Coarse Control

- **5K Device Volume Control**
  - 0.5dB step Fine Control

- **Optimal sound quality at any given volume level**
  - No need to care for smartphone volume.
  - Any smartphone volume level keeps the best sound quality (Bluetooth and USB)



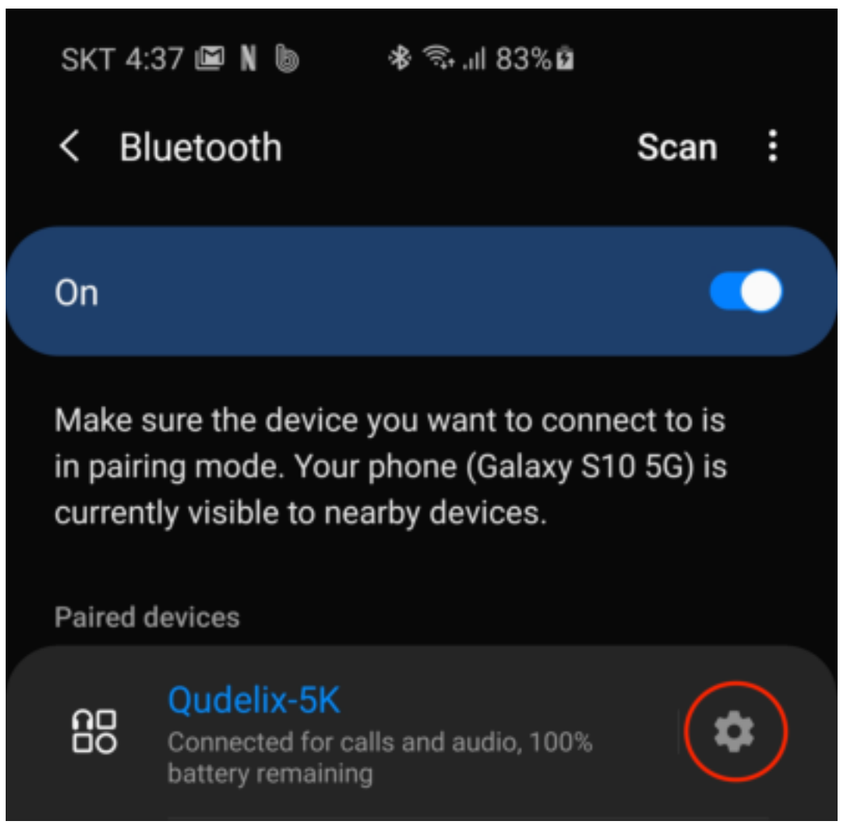
2-Way Associative Absolute Volume Control

*Android USB Audio doesn't support Absolute Volume Control. For the optimal sound quality with Android USB DAC, you need to set the maximum smartphone volume.

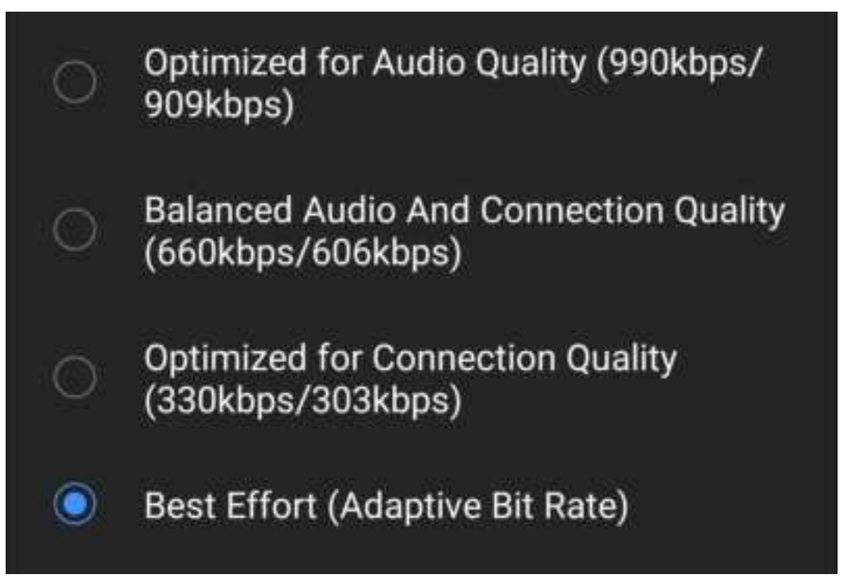
Bluetooth Codec

- **SONY LDAC**
  - Available with Android 8.0 or higher.
  - In general, LDAC 606/660kbps or higher provides excellent sound quality comparable to the wired interface. If you don't get sufficient sound quality, please set a higher LDAC bit rate in the Android Developer Options menu.
  - Some specific Android smartphones may not be able to provide reliable 990kbps streaming. Turning off the smartphone display, or using 5GHz WiFi might help the LDAC streamed a little better.
  - The LDAC 660kbps is the best trade-off for reliable streaming and sound quality. In most cases, you would get good enough sound quality with LDAC 660kbps.

- **Enable SONY DAC**
  - Bluetooth Menu —> Paired Devices —> Qudelix-5K —> device option -> LDAC

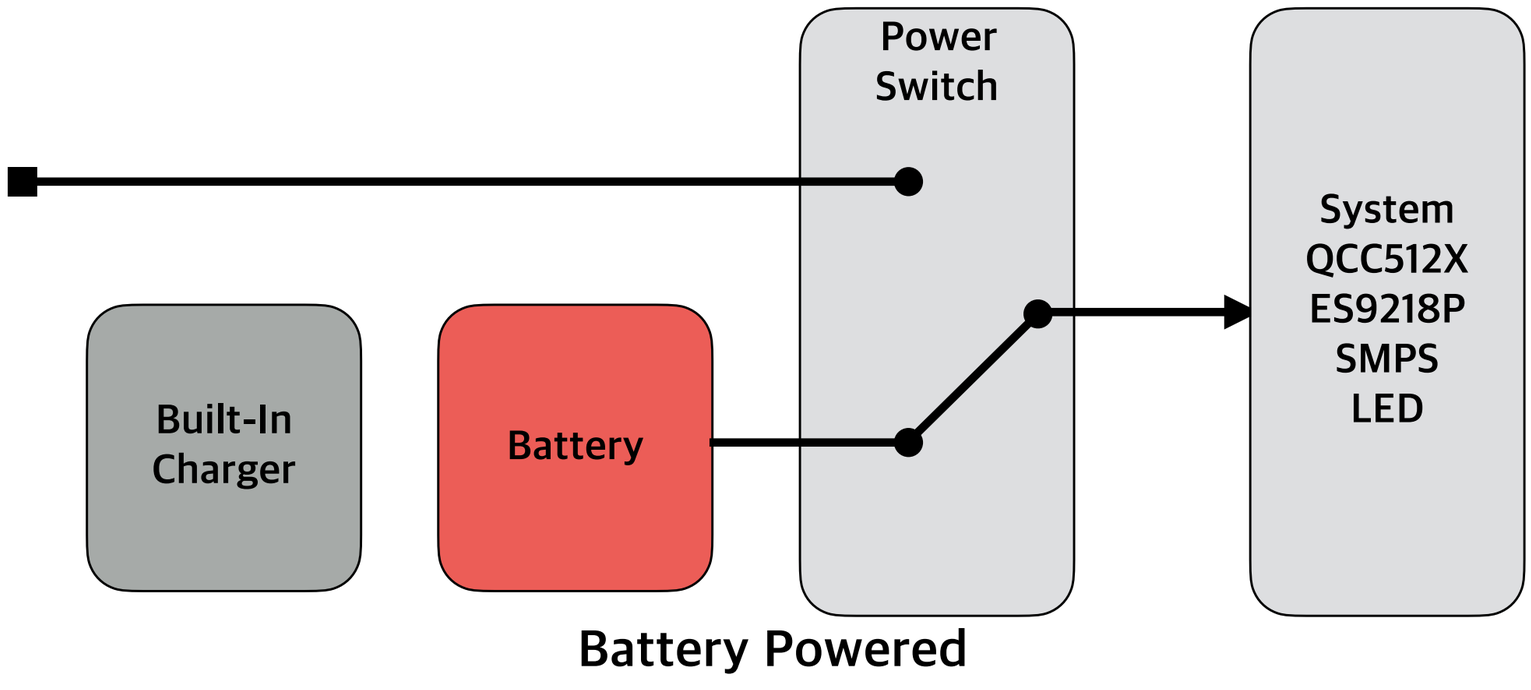


- **Setting LDAC Bitrate & Sample Rate**
  - Enable Android Developer Option
    - https://developer.android.com/studio/debug/dev-options?hl=en
    - Please refer the link above and enable the developer option menu.
  - System Setting —> Developer Option —> LDAC Quality

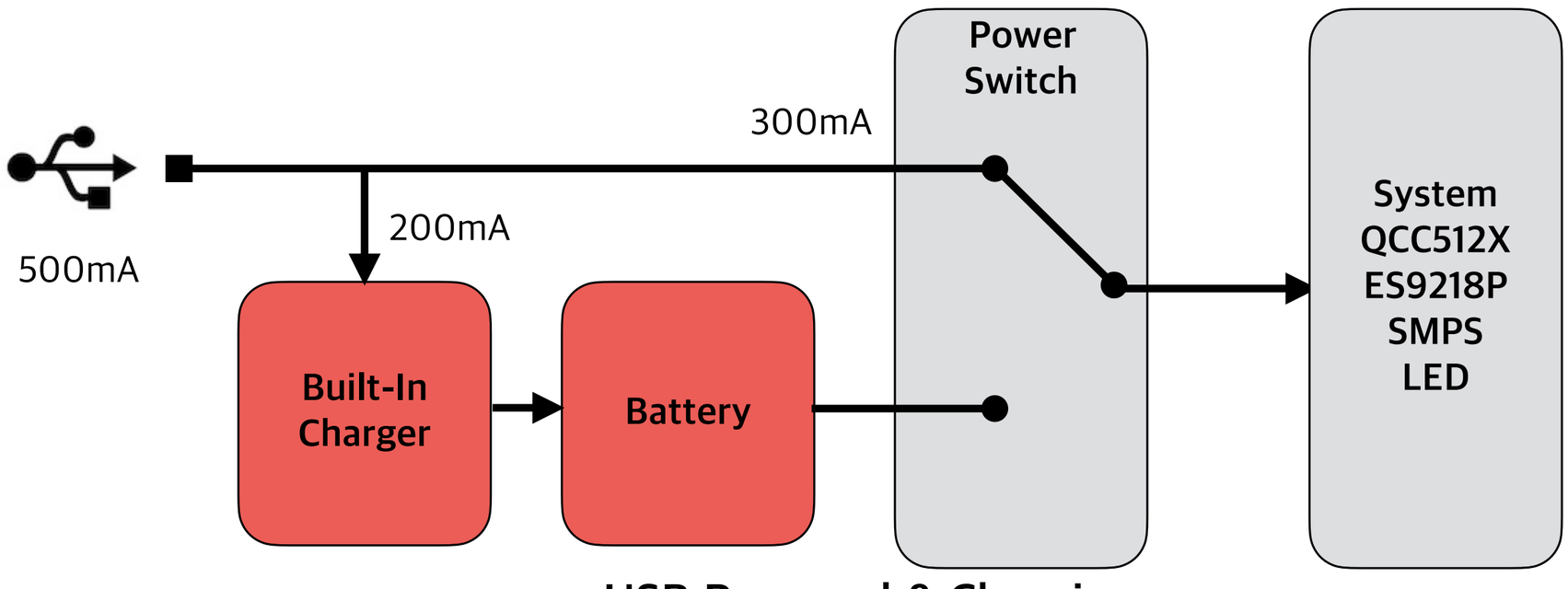


USB DAC & Power Source

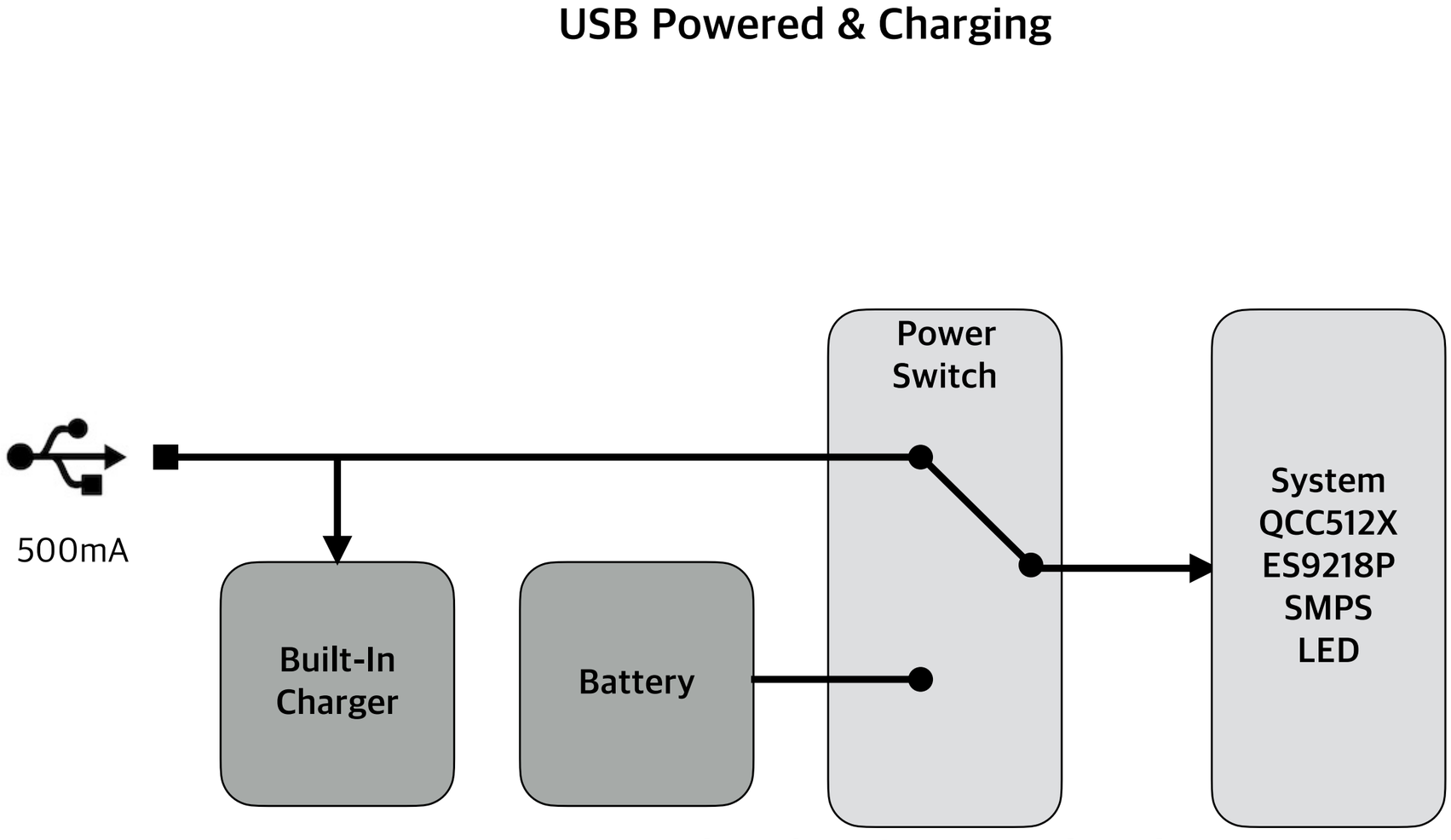
- **Automatic Battery Care when working as a USB DAC**
  - Keep the battery life longer
  - The same Battery charging time even at streaming audio



Battery Powered



USB Powered & Charging



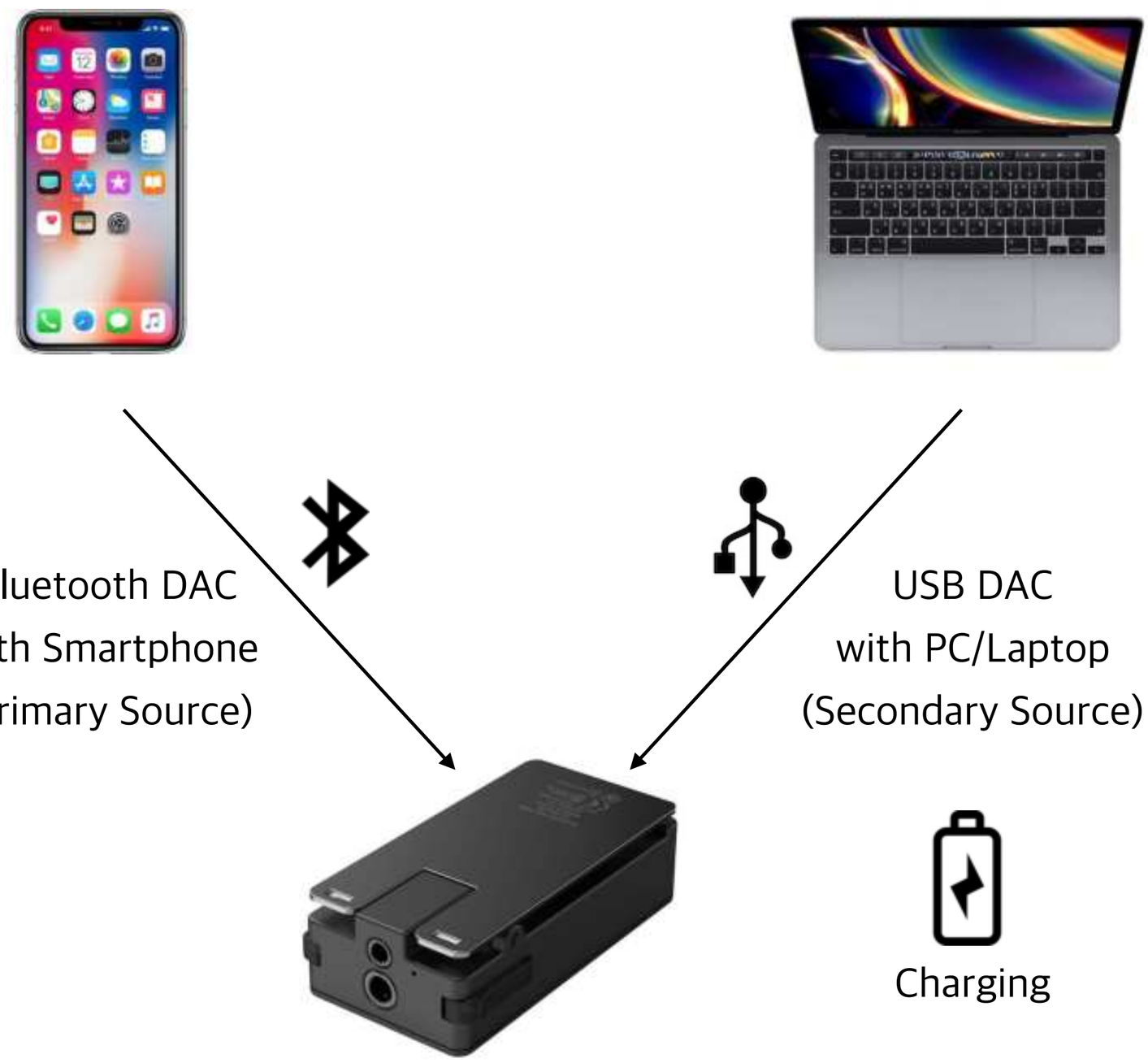
USB Powered & Charging Completed

USB DAC & Bluetooth DAC

- **5K works as Bluetooth DAC & USB DAC simultaneously.**
  - Bluetooth DAC connected to Smartphone (Primary Source Device)
  - USB DAC connected to PC/Laptop (Secondary Source Device)

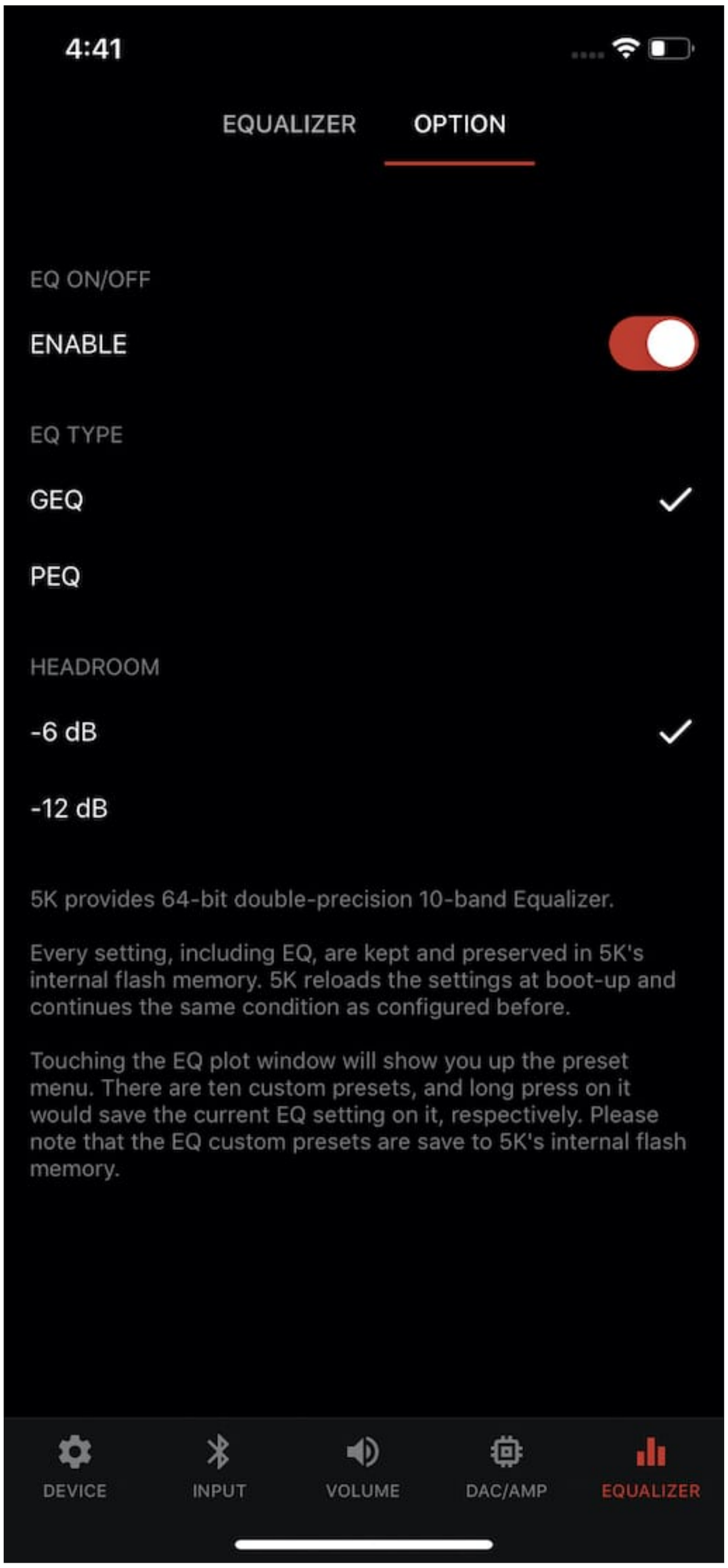
- **Streaming is exclusive to one source device at a time.**
  - Seamless audio switching between Bluetooth and USB Source Devices
  - USB DAC streaming is interrupted by the primary source device.

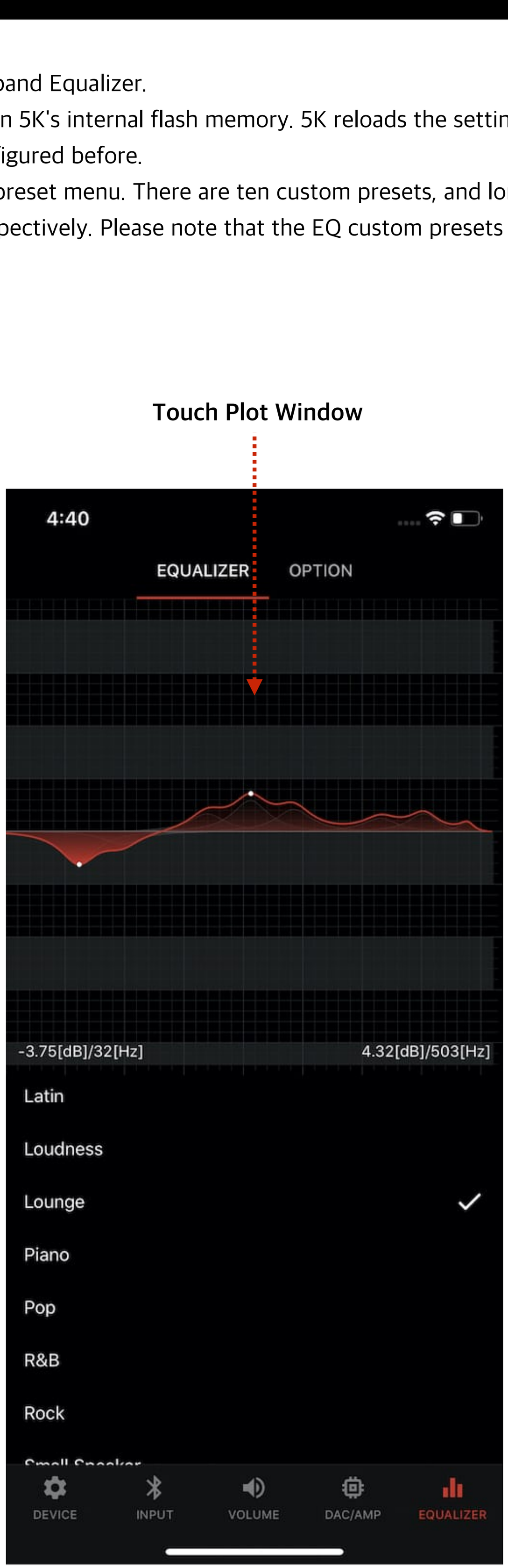
- **To prevent unwanted USB DAC streaming interruptions by the Bluetooth source device (i.e., smartphone), switch the smartphone into silence mode.**



Equalizer

- 5K provides 64-bit double-precision embedded 10-band Equalizer.
- Every setting, including EQ, are kept and preserved in 5K's internal flash memory. 5K reloads the settings at boot-up and continues the same condition as configured before.
- Touching the EQ plot window will show you up the preset menu. There are ten custom presets, and long press would save the current EQ setting on each, respectively. Please note that the EQ custom presets are save to 5K's internal flash memory.

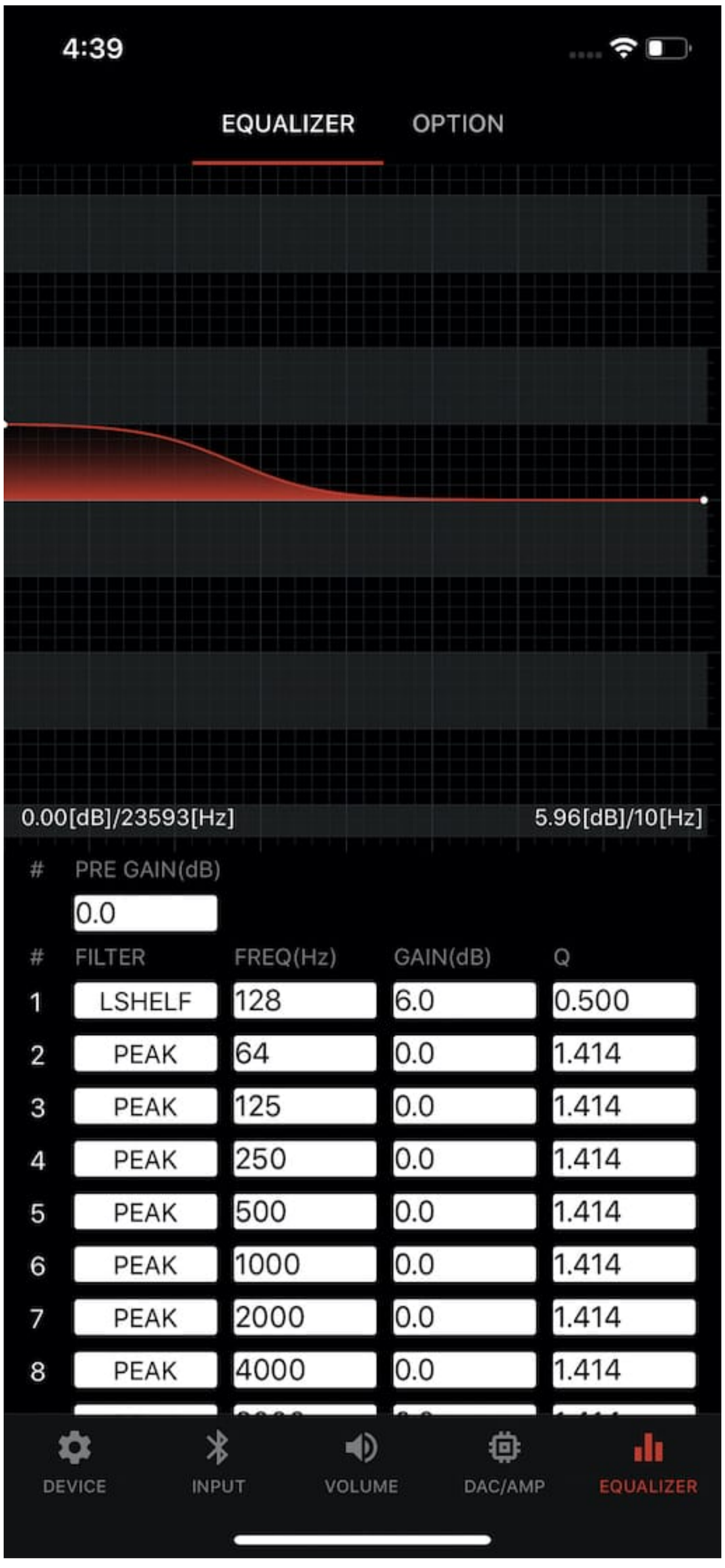




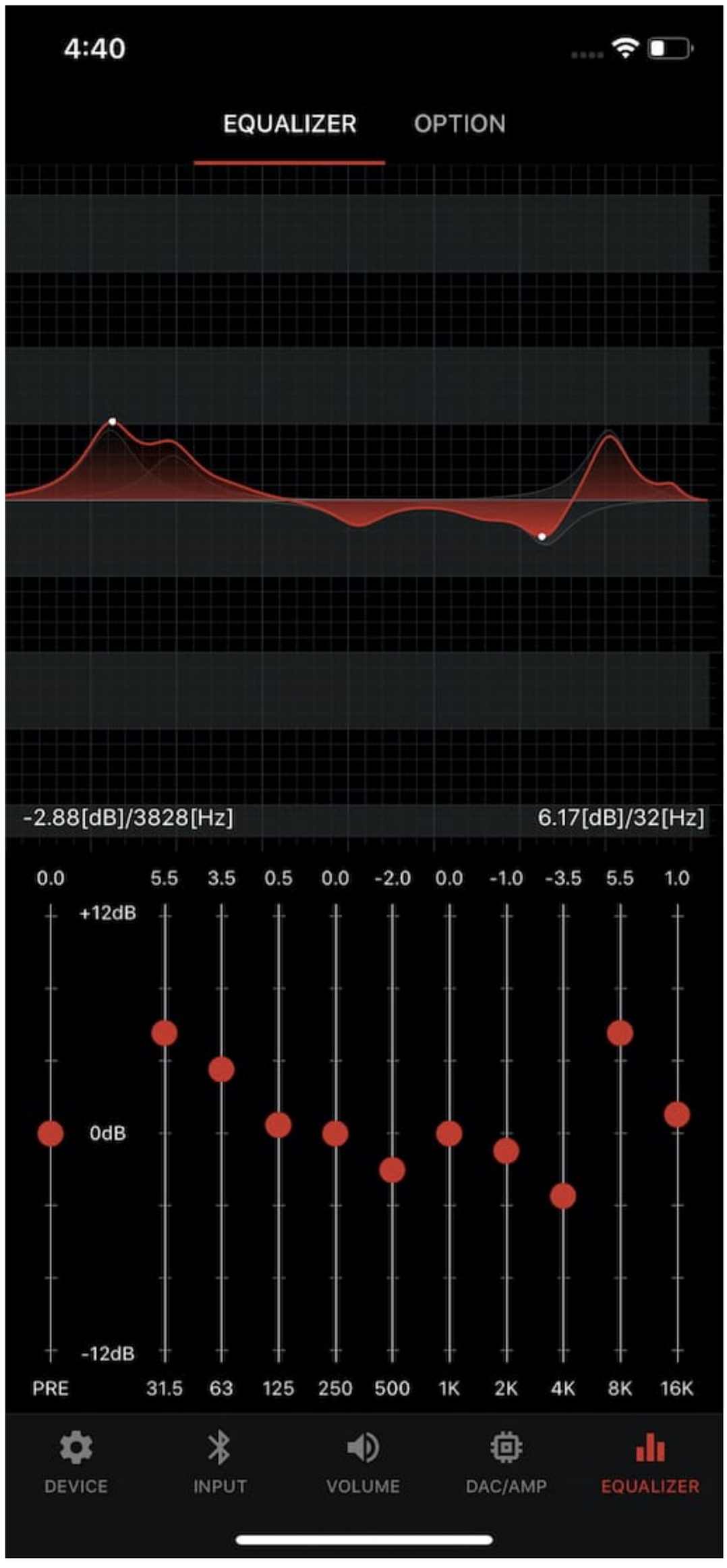
PEQ & GEQ

- 10-band PEQ or GEQ supported
- PEQ Filter Type
  - PEAK / LPF / HPF / LSHELF / HSHELF

PEQ



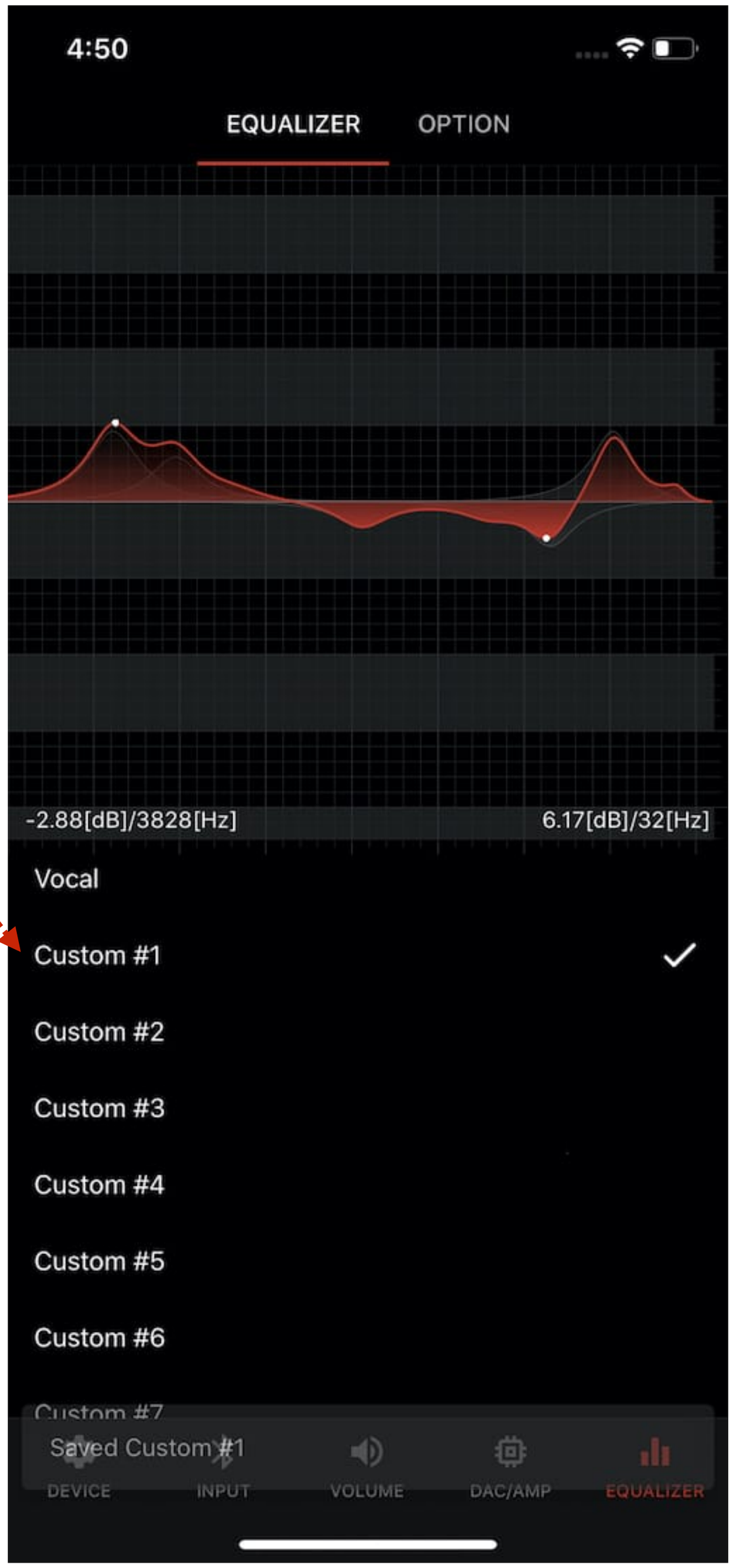
GEQ



EQ Preset

- 10 Custom User Presets
- All Presets are saved in the 5K’s internal flash memory.

Long Press to save the current EQ profile



Antenna

High Sensitivity 3-dimensional LDS Antenna is printed on the bottom case and is placed around the red LED button. 5K provides the best RF performance in most use cases. However, for the optimal performance, please keep this area away from any metallic surfaces.

Bluetooth 2.4 GHz Class 2.5mW (4dBm)

3 Dimensional LDS (Laser Direct Structuring) Antenna

Appendix - PCBA

5K has three BGA(Ball Grid Array) IC parts; QCC5124, and two ES9128p.

To enhance the PCB reliability and durability, we did the epoxy underfills on those sensitive BGA parts, although having additional cost increase. Those parts are bonded twice with soldering and epoxy underfills.

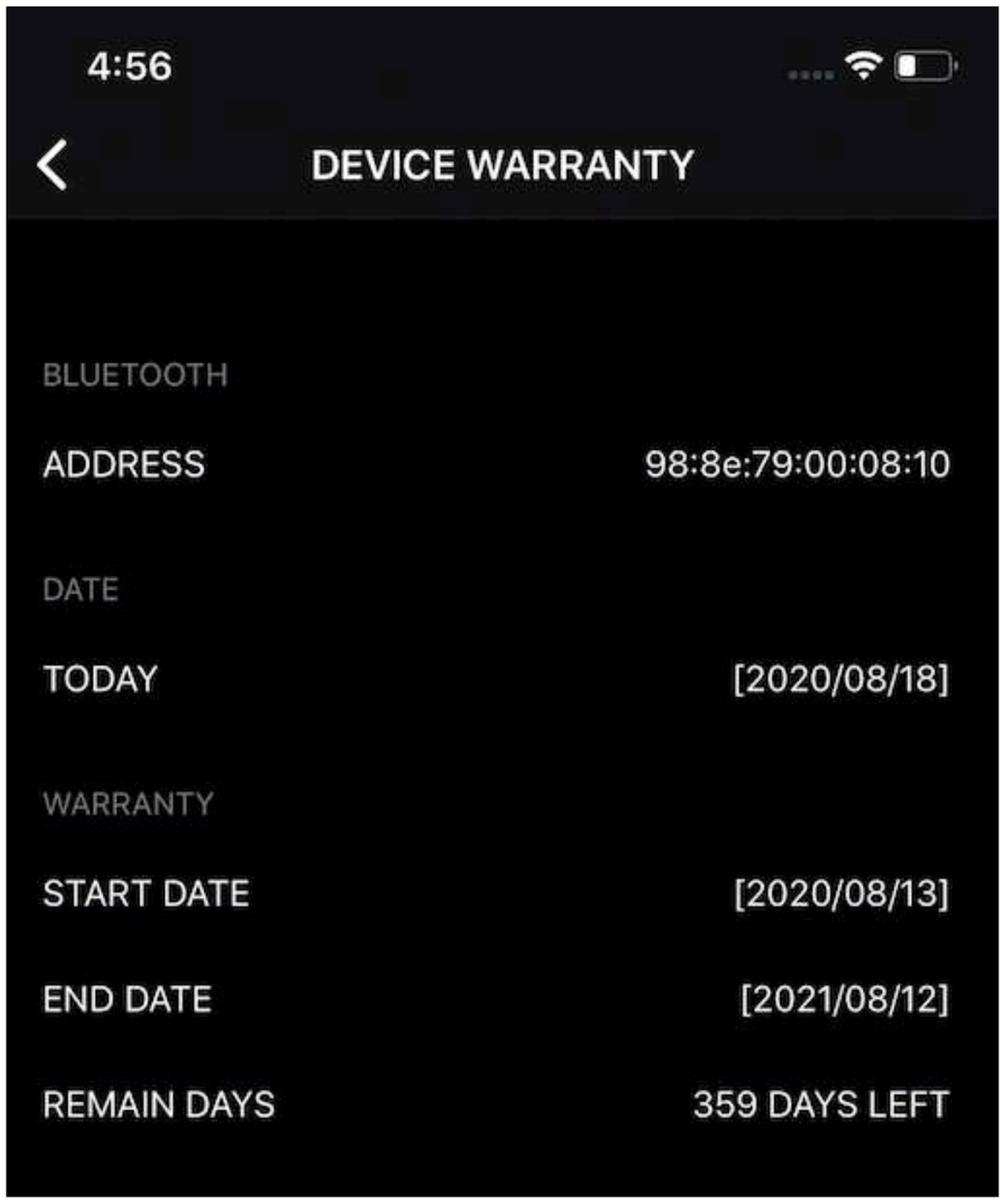
Warranty

- **One year warranty**
  - From the date of the first app connection
  - Automatically activated from the first connection with the companion mobile app
  - Any problem arises due to a defect in manufacturing the product will be repaired or replaced
  - The warranty is transferable and is not limited to the original purchaser
- **Warranty is managed upon Bluetooth MAC address and serial number**
  - No need to keep the proof of the purchase
  - No receipt nor invoice required for the warranty service

- **Any issue caused by accident or misuse**
  - Can be replaced with a refurbished product at customer’s charge & shipping fee

- **For any purchase from local distributors**
  - The respective distributor is responsible for the warranty and will handle the case directly

- **WARNING**
  - Warranty void if the case opened
  - DO NOT disassemble or open the case.
  - The top and bottom parts are tightly bonded internally and can't be opened even if the screws are removed



Appendix - Size & Weight

Size

52.8(H) x 26.7(W) x 15.6(D) mm (including Clip)

Weight

25g

Appendix - Package

PACKAGE

91mm (L) x 55mm (W) x 55mm (H)

INCLUDED

USB C-to-C Cable (120mm)

USB C-to-A Cable (120mm)

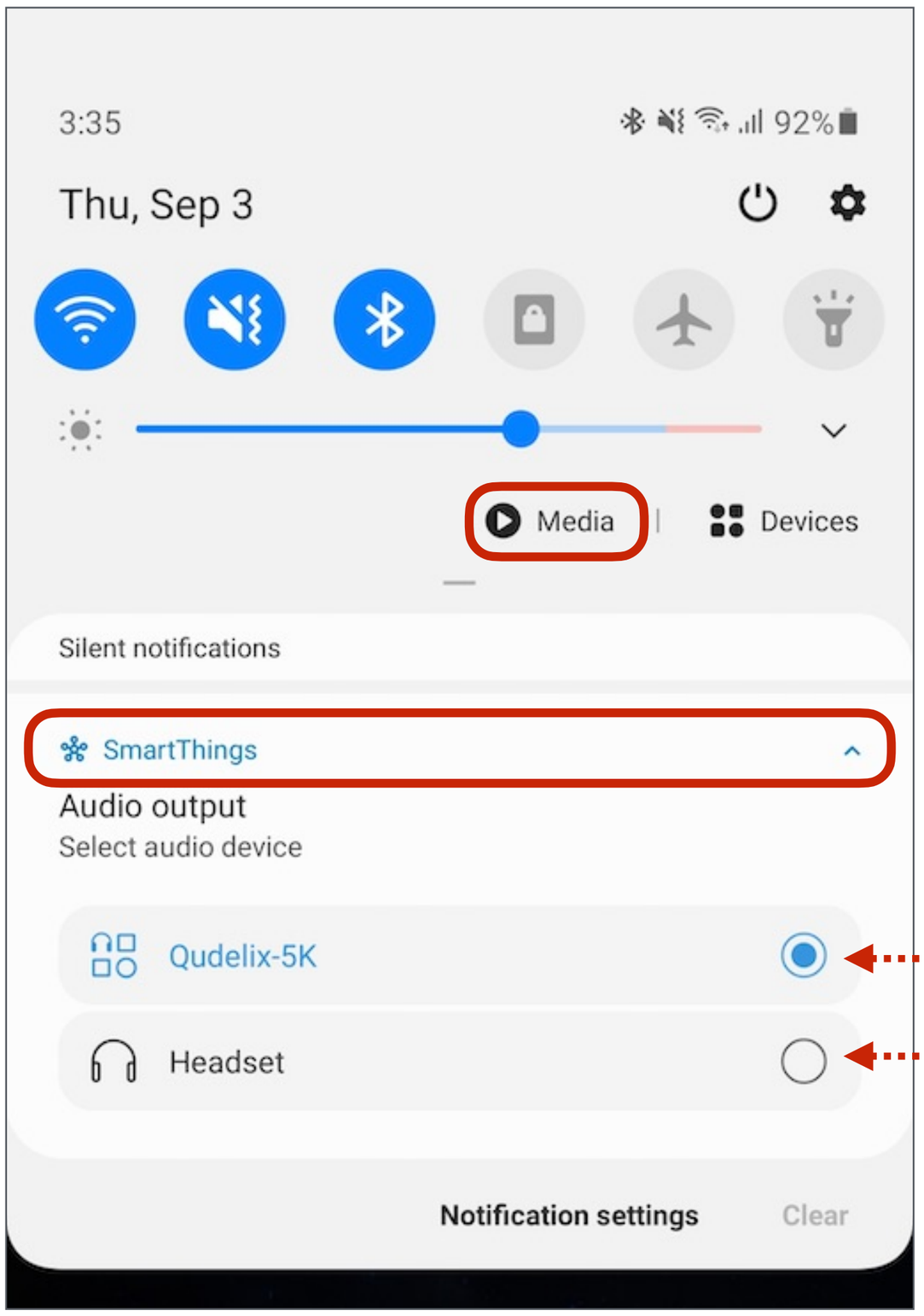
*No User Manual included in the package. Please refer this user guide.

Appendix - Android Audio Output Device

- **5K Can be connected to Android both through Bluetooth and USB DAC (C-to-C) at the same time.**

- In that case, the Android device detects multiple audio output devices. And the Android selects the active output device exclusively.

- *With some specific Android devices, **SONY Android App** sometimes overrides the system Audio Output selection to Bluetooth forcibly. If you don't get any sound through Android USB DAC, please try uninstalling SONY App.



Android Audio Output Galaxy S10

Appendix - Android Audio Output Device

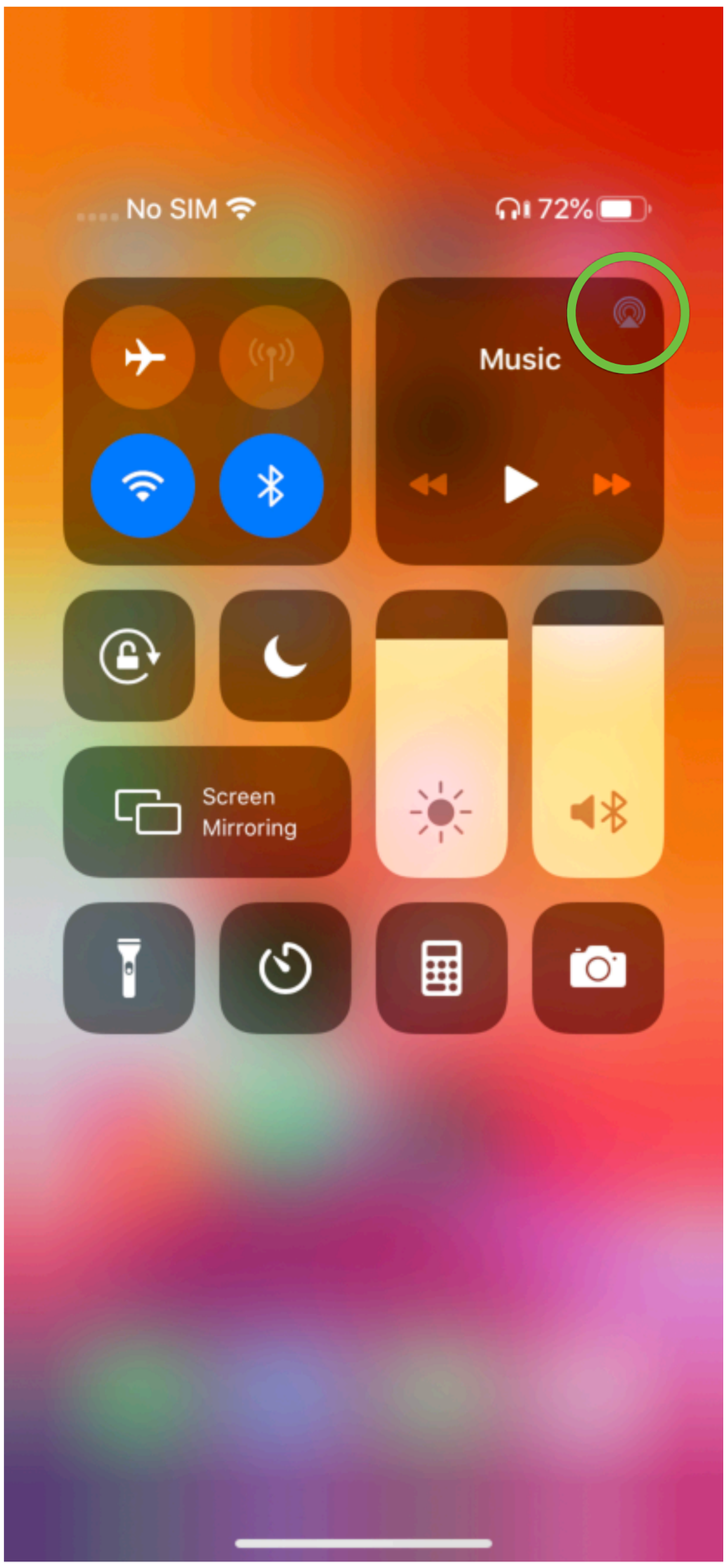
- In Android, Media —> Audio Output, you can select the active device you want to use.
- The system menu for Audio Output may be different across smartphone manufacture.

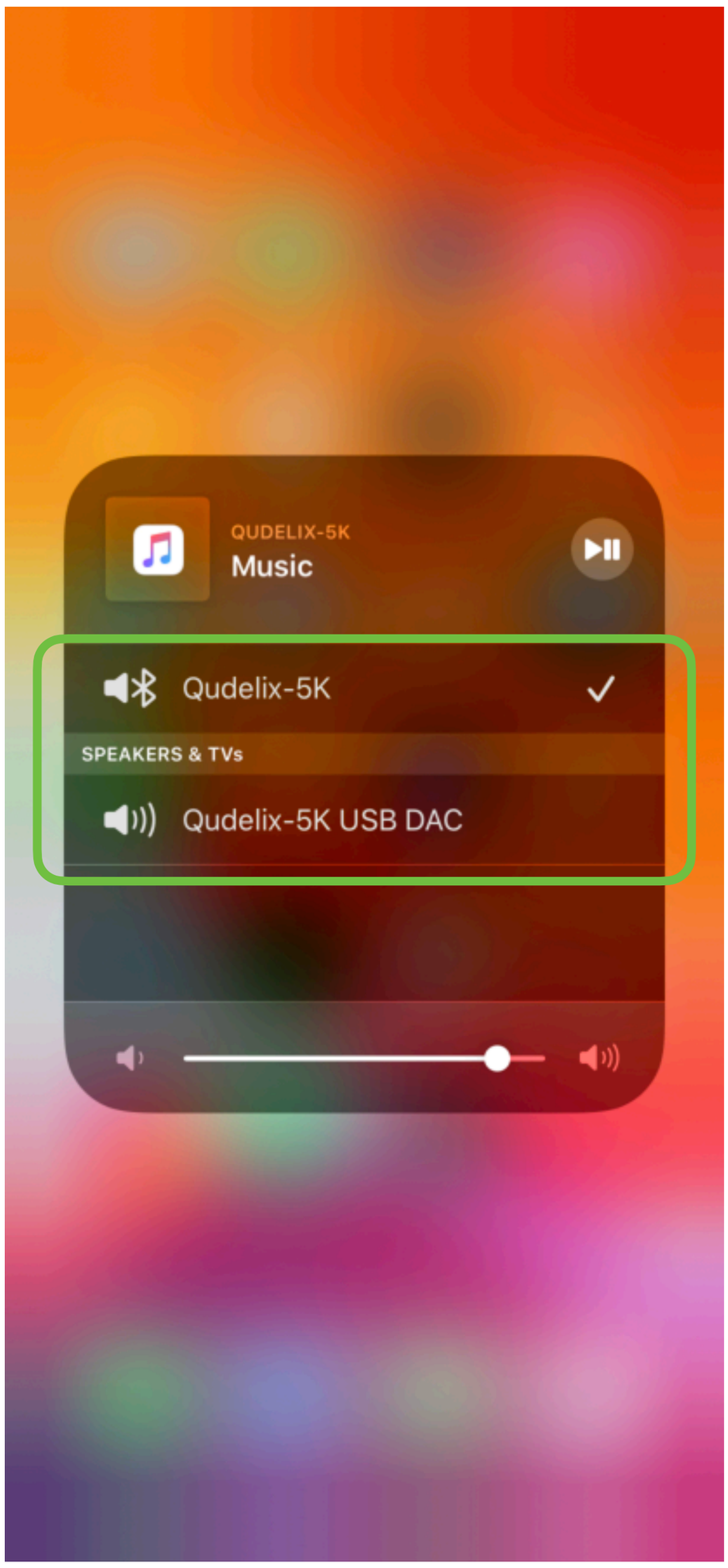
Android Audio Output Galaxy S10

Appendix - iOS Audio Output Device

- **5K Can be connected to iPhone both through Bluetooth and USB DAC (Apple Camera Kit) at the same time.**

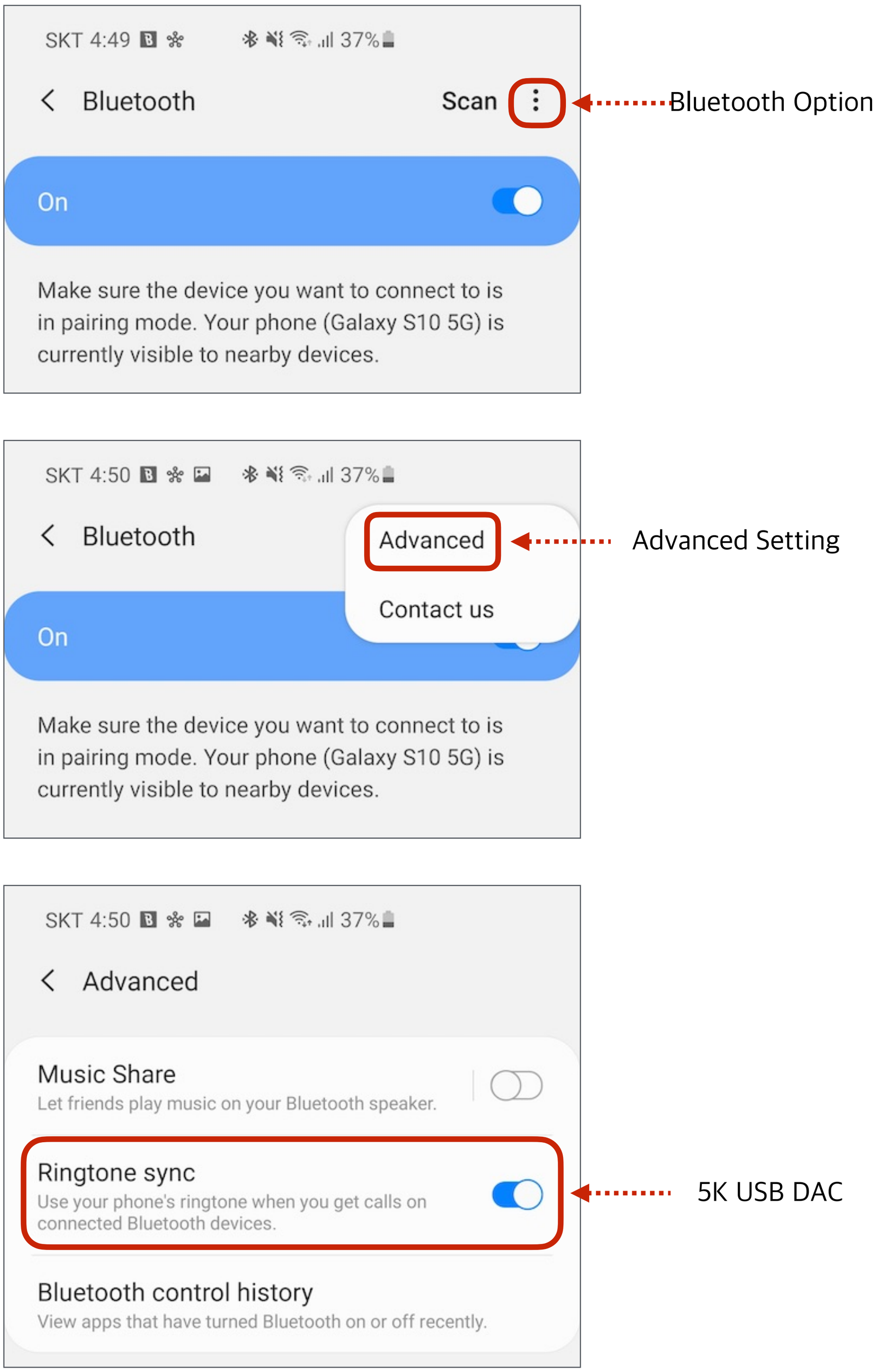
- In that case, the iPhone detects multiple audio output devices. And the iOS selects the active output device exclusively.





Appendix - Android In-Band Ringtone

- The way how the Bluetooth receiver plays the incoming call ringtone, Android OS selects.
- System Bluetooth —> Option (Top Right) —> Advanced —> Ringtone sync



Android In-Band Ringtone Galaxy S10