50 neutral and extra-bass over-ear headphones

Open = open-back | **Closed** = closed-back
Sen=sensitivity (V) | **Imp**=impedance | **Wgt**=weight (G) | **Pri**=price
orange or red = notice this, ≠ inappropriate values

A

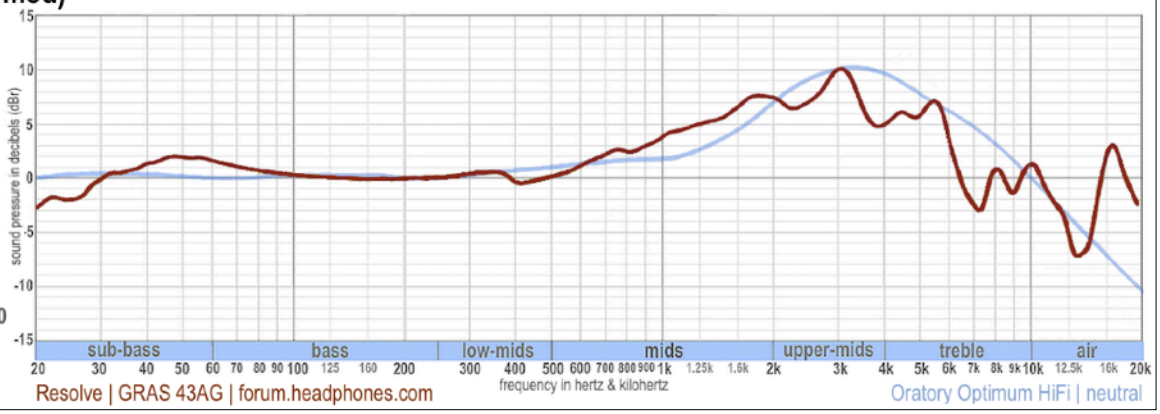
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Explanatory notes

Abyss Diana Phi (DMS mod)

Open
Planar

Sen: 91
Imp: 35
Wgt: 240
Pri: $4K



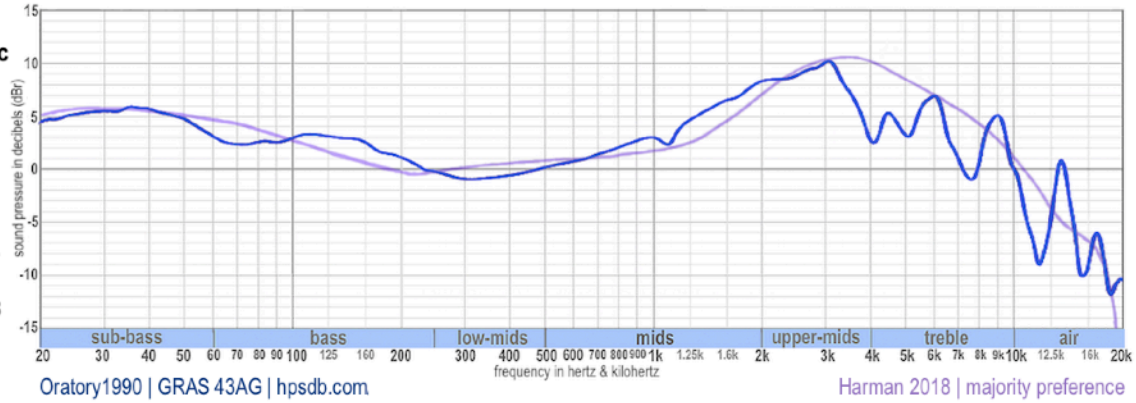
Resolve | GRAS 43AG | forum.headphones.com

Oratory Optimum HiFi | neutral

AKG K361

Closed
Dynamic

Sen: 114
Imp: 32
Wgt: 218
Pri: $85



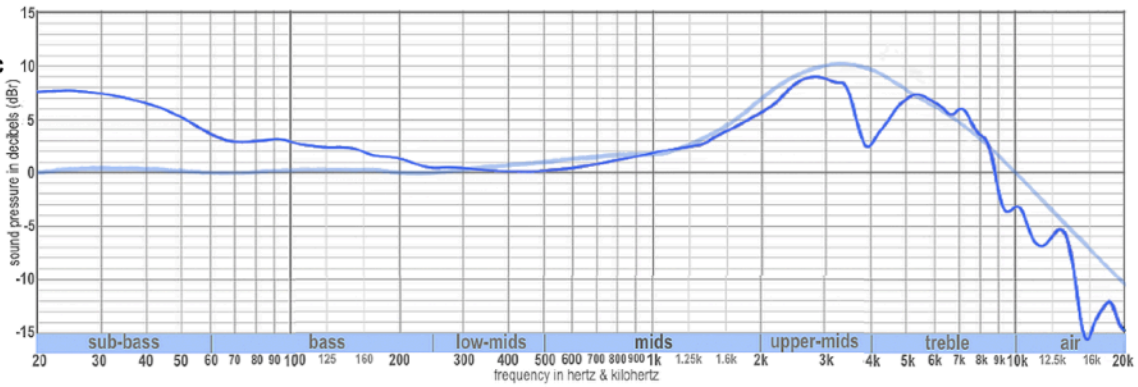
Oratory1990 | GRAS 43AG | hpsdb.com

Harman 2018 | majority preference

AKG K371

Closed
Dynamic

Sen: 114
Imp: 35
Wgt: 275
Pri: $120



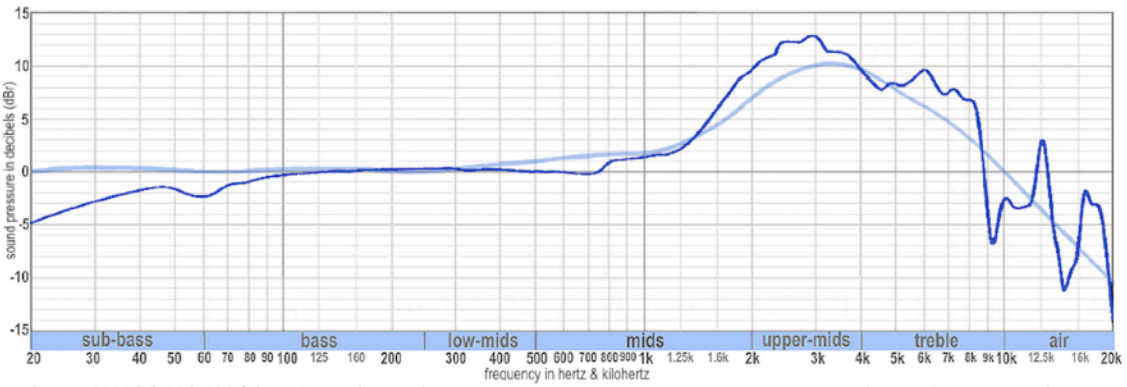
Oratory1990 | GRAS 45BC | hpsdb.com

Harman 2018 | majority preference

AKG K612

Open
Dynamic

Sen: 101
Imp: 200
Wgt: 238
Pri: $200



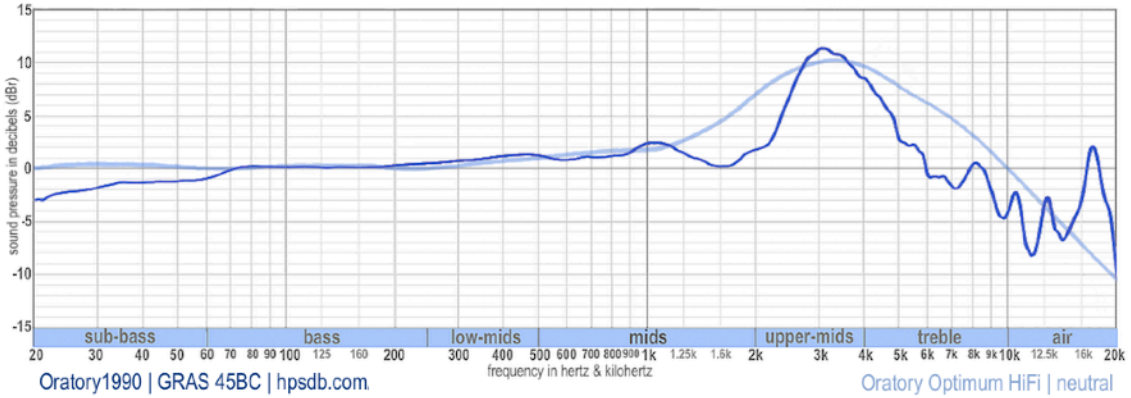
Oratory1990 | GRAS 43AG | hpsdb.com

Oratory Optimum HiFi | neutral

Audeze LCD-1

Open
Planar

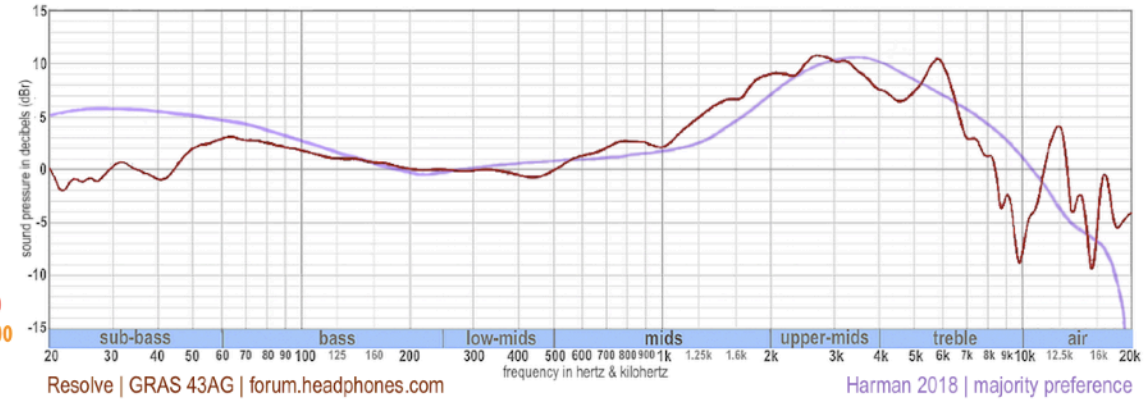
Sen: 117
Imp: 16
Wgt: 260
Pri: $300



Audeze LCD-XC

Closed
Planar

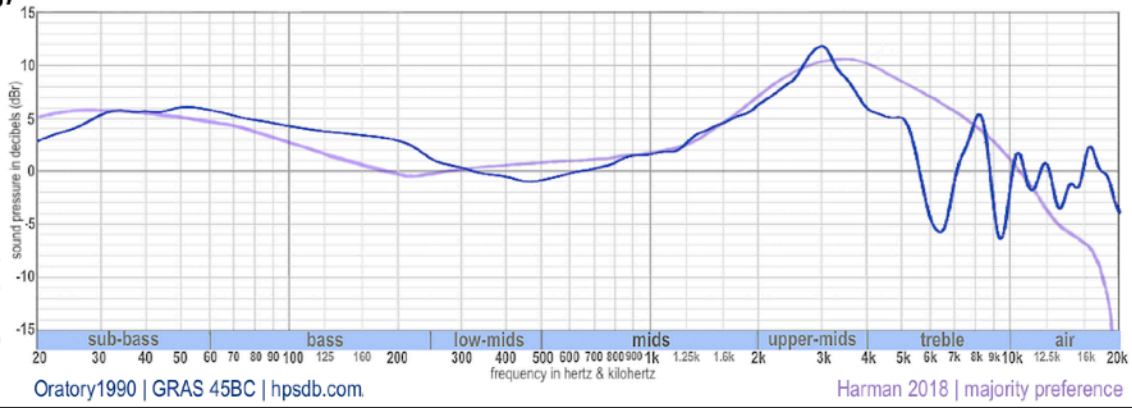
Sen: 117
Imp: 20
Wgt: 720
Pri: $1300



Audeze Mobius (gaming)

Closed
Planar

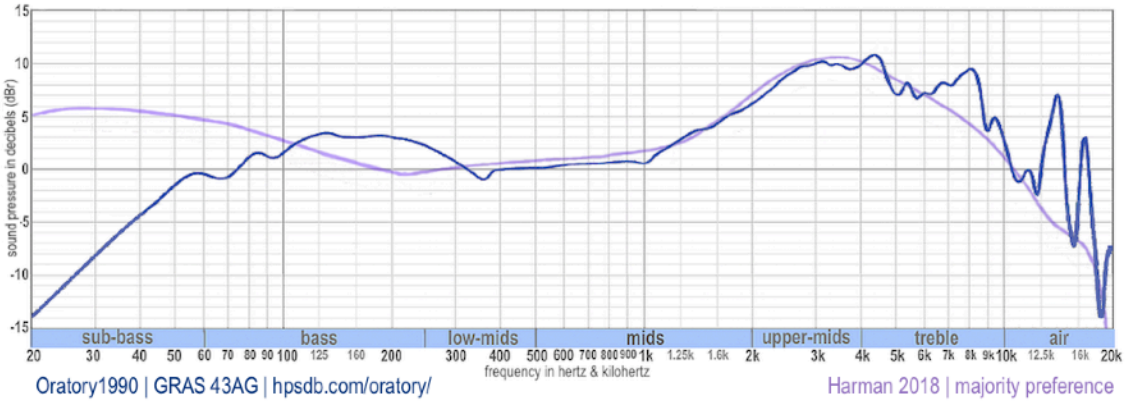
Sen: N/A
Imp: N/A
Wgt: 350
Pri: $250



Audio-Technica ATH-M40x

Closed
Dynamic

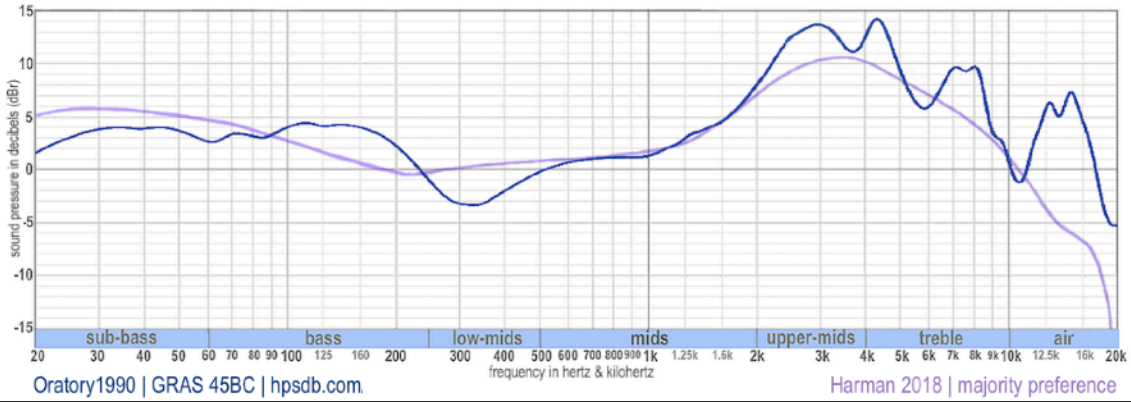
Sen: 113
Imp: 35
Wgt: 240
Pri: $100



Audio-Technica ATH-M50x

Closed
Dynamic

Sen: 113
Imp: 38
Wgt: 285
Pri: $150



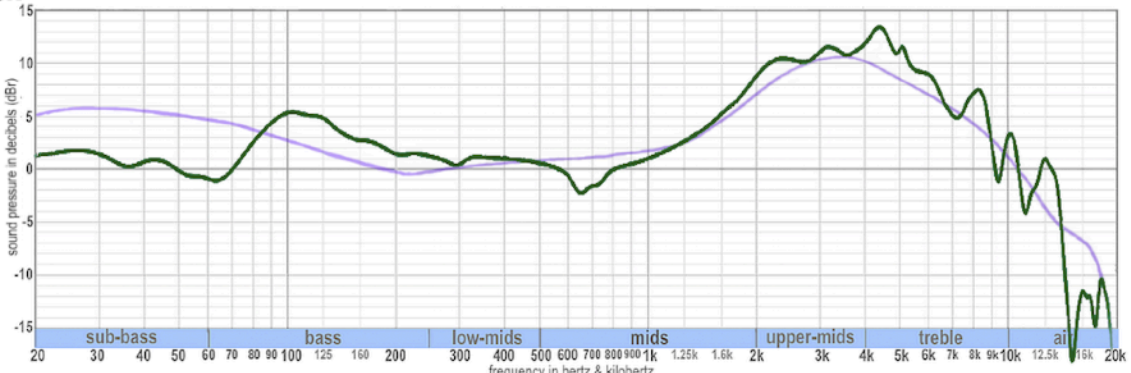
Oratory1990 | GRAS 45BC | hpsdb.com

Harman 2018 | majority preference

Audio-Technica ATH-M70x

Closed
Dynamic

Sen: 112
Imp: 35
Wgt: 280
Pri: $350



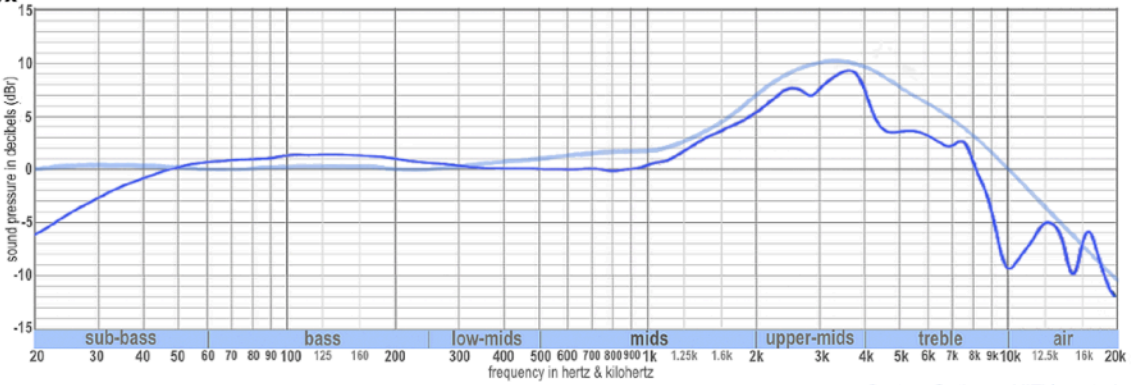
Crinacle | GRAS 43AG-7 | https://crinacle.com/

Harman 2018 | majority preference

Audio-Technica ATH-R70x

Open
Dynamic

Sen: 99
Imp: 470
Wgt: 210
Pri: $350



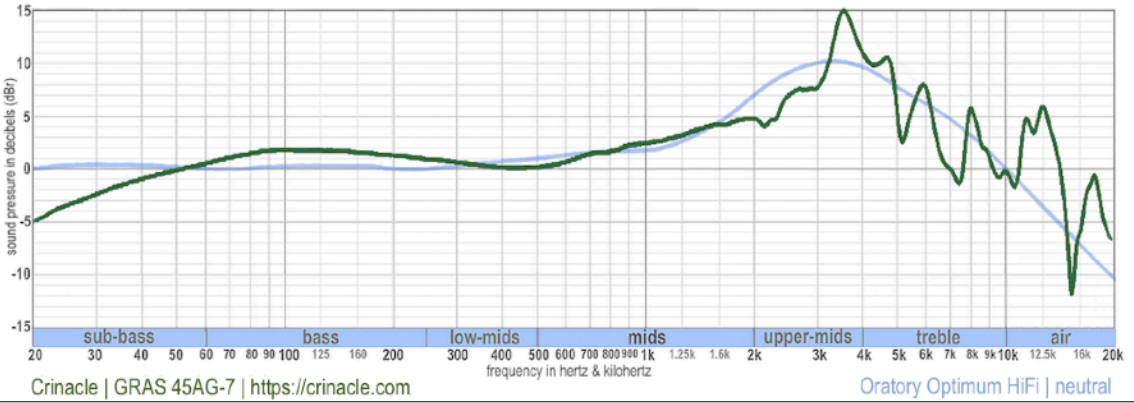
Oratory1990 | GRAS 43AG | hpsdb.com/oratory/headphones

Oratory Optimum HiFi | neutral

Audio-Technica ATH-ADX5000

Open
Dynamic

Sen: 104
Imp: 420
Wgt: 270
Pri: $2250



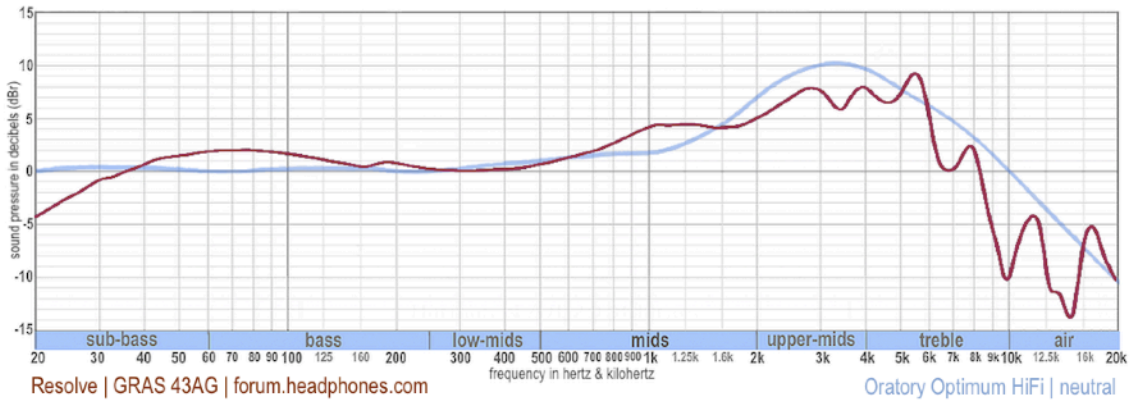
Crinacle | GRAS 45AG-7 | https://crinacle.com

Oratory Optimum HiFi | neutral

Auroris Audio Borealis

Open
Dynamic

Sen: 114
Imp: 32
Wgt: 484
Pri: $899



Resolve | GRAS 43AG | forum.headphones.com

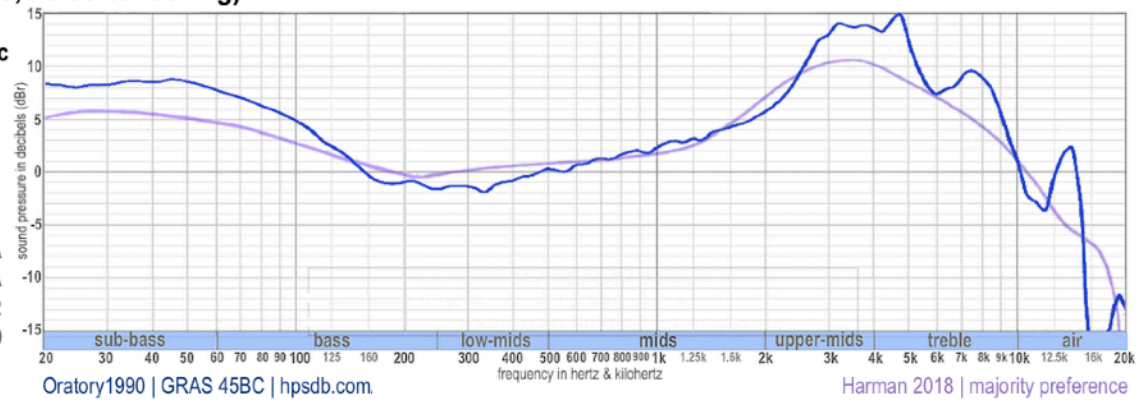
Oratory Optimum HiFi | neutral

B

Beats Solo Pro (wireless, noise-cancelling)

Closed
Dynamic

Sen: N/A
Imp: N/A
Wgt: 262
Pri: $199



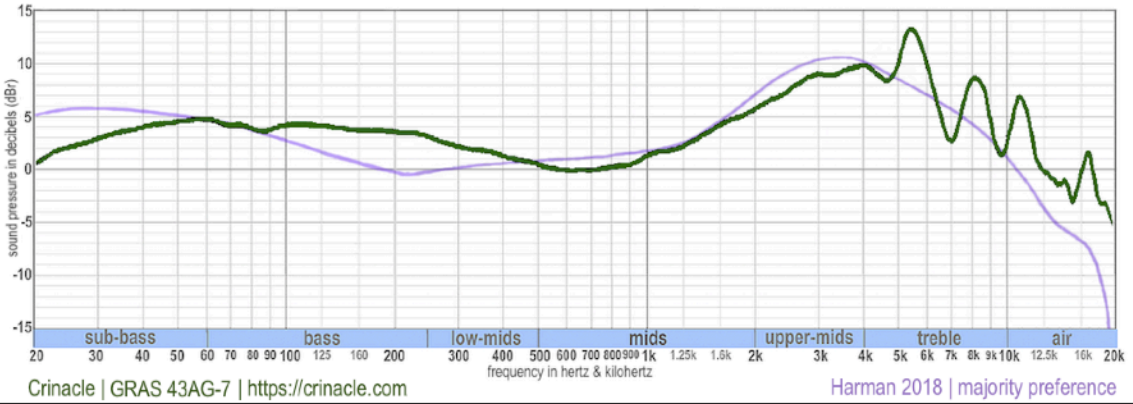
Oratory1990 | GRAS 45BC | hpsdb.com

Harman 2018 | majority preference

beyerdynamic TYGR 300R

Closed
Dynamic

Sen: 111
Imp: 32
Wgt: 290
Pri: $180



Crinacle | GRAS 43AG-7 | https://crinacle.com

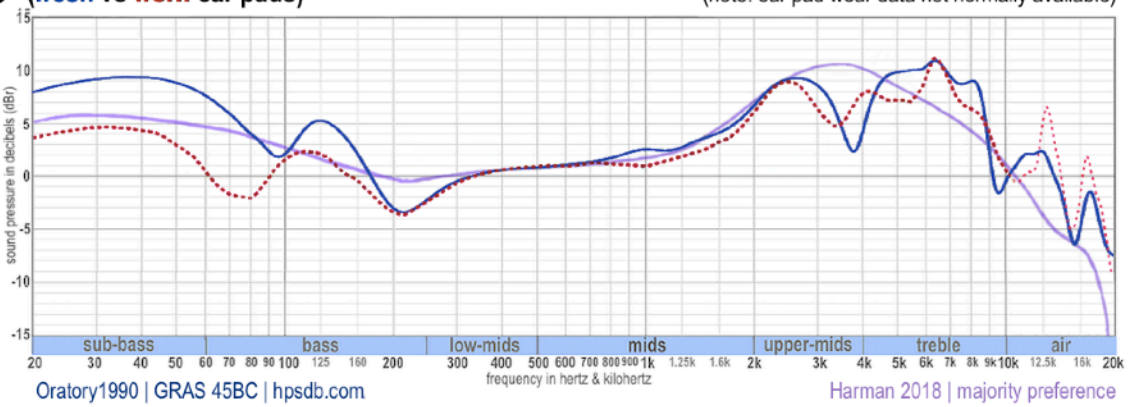
Harman 2018 | majority preference

beyerdynamic DT770 Pro (fresh vs worn ear pads)

(note: ear pad wear data not normally available)

Closed
Dynamic

Sen: 102
Imp: 250
Wgt: 270
Pri: $160



Oratory1990 | GRAS 45BC | hpsdb.com

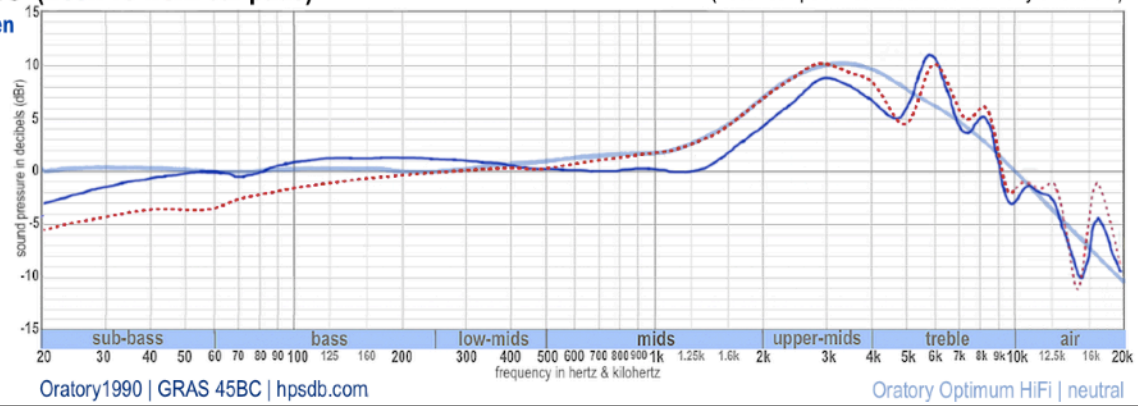
Harman 2018 | majority preference

beyerdynamic DT 880 Pro (fresh vs worn ear pads)

(note: ear pad wear data not normally available)

Semi-open
Dynamic

Sen: 102
Imp: 250
Wgt: 290
Pri: $230



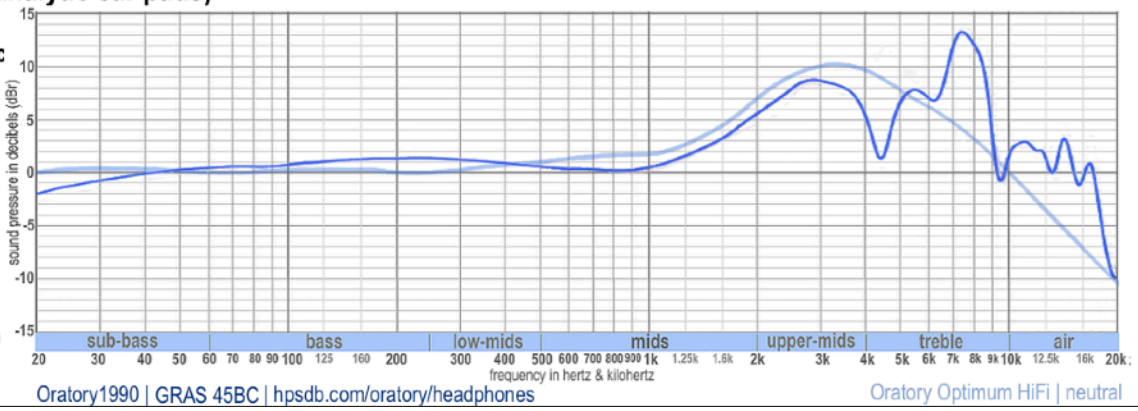
Oratory1990 | GRAS 45BC | hpsdb.com

Oratory Optimum HiFi | neutral

beyerdynamic DT1990 (analytic ear pads)

Open
Dynamic

Sen: 108
Imp: 250
Wgt: 379
Pri: $600



Oratory1990 | GRAS 45BC | hpsdb.com/oratory/headphones

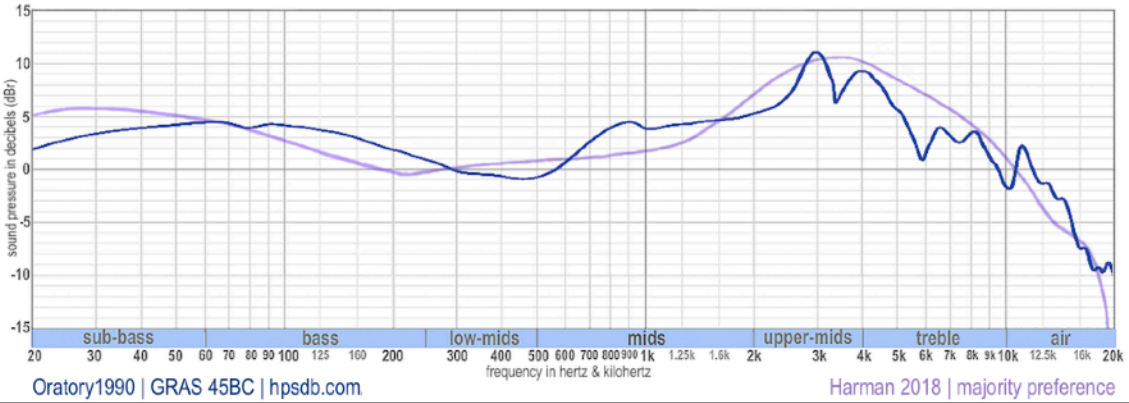
Oratory Optimum HiFi | neutral

C

Creative Aurvana Live!

Closed
Dynamic

Sen: ?
Imp: ?
Wgt: 210
Pri: Disc.?



Oratory1990 | GRAS 45BC | hpsdb.com

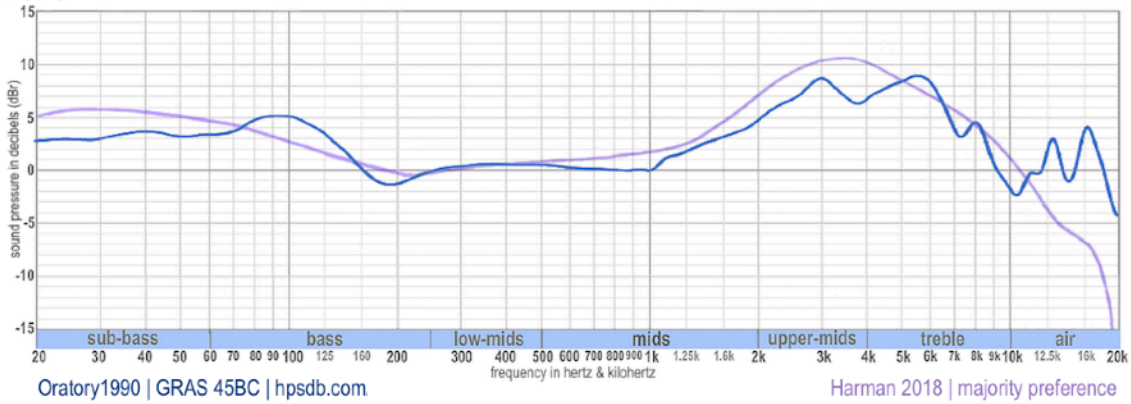
Harman 2018 | majority preference

D

Dan Clark Audio Aeon 2 Noire

Closed
Planar

Sen: 111
Imp: 13
Wgt: 328
Pri: $900



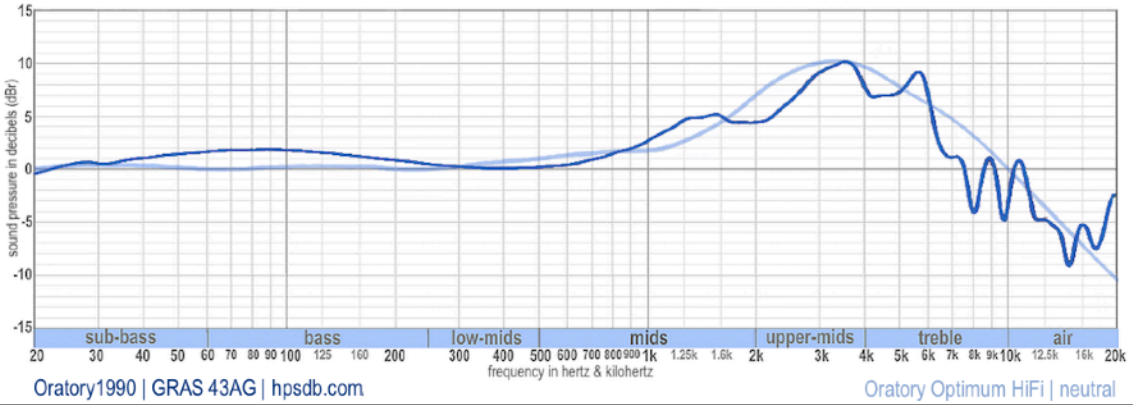
Oratory1990 | GRAS 45BC | hpsdb.com

Harman 2018 | majority preference

Drop+Focal Elex

Open
Planar

Sen: 115
Imp: 80
Wgt: 450
Pri: $700



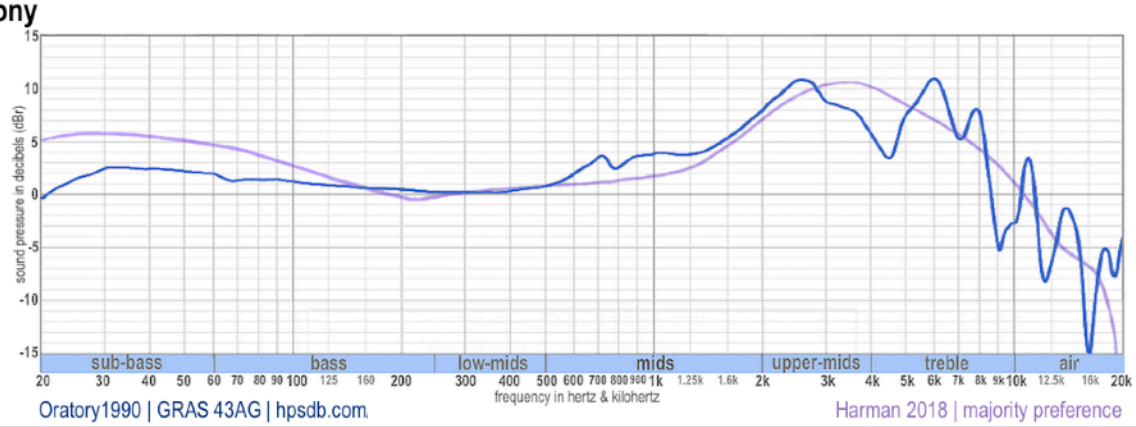
Oratory1990 | GRAS 43AG | hpsdb.com

Oratory Optimum HiFi | neutral

Drop+Fostex TR-X00 Ebony

Closed
Dynamic

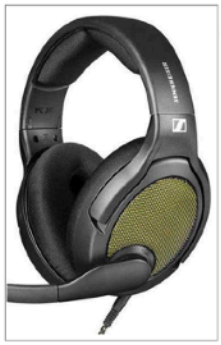
Sen: 111
Imp: 25
Wgt: 450
Pri: discl.



Oratory1990 | GRAS 43AG | hpsdb.com

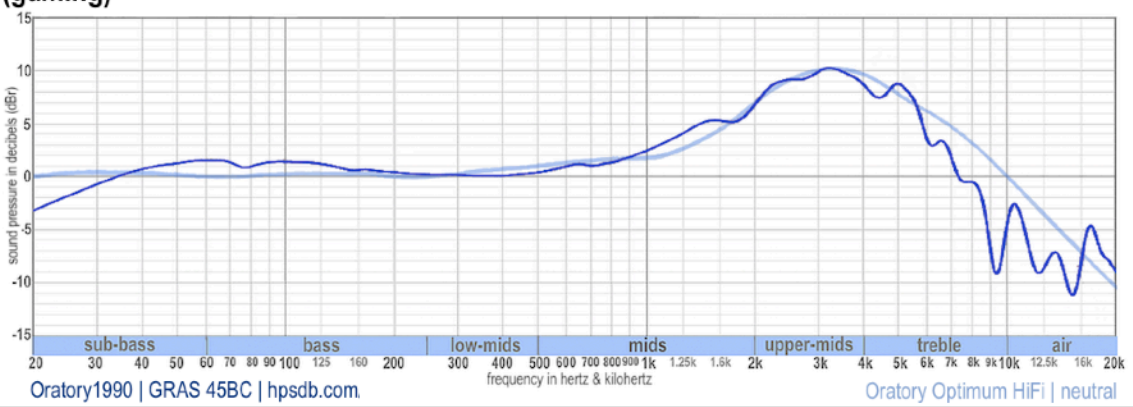
Harman 2018 | majority preference

Drop+Sennheiser PC38X (gaming)



Open
Dynamic

Sen: 109
Imp: 28
Wgt: 253
Pri: $169



Oratory1990 | GRAS 45BC | hpsdb.com

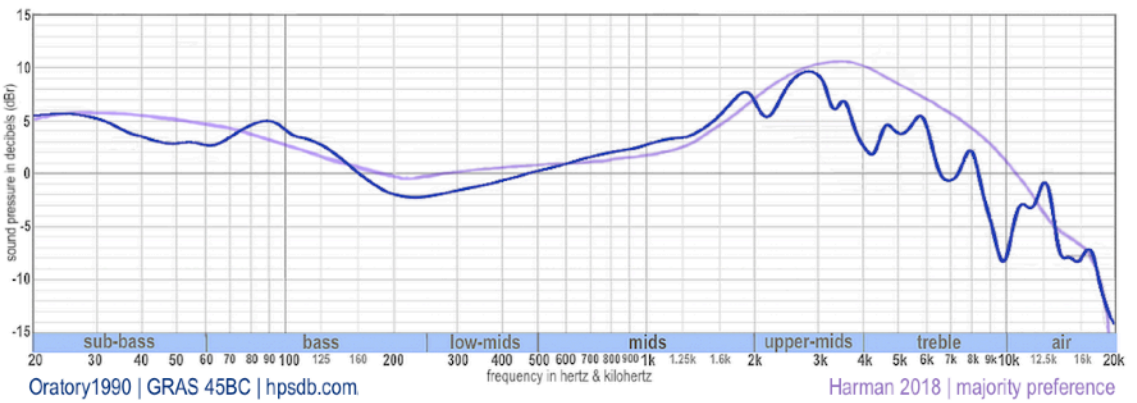
Oratory Optimum HiFi | neutral

F

Focal Celestee

Open
Dynamic

Sen: 120
Imp: 35
Wgt: 430
Pri: $990



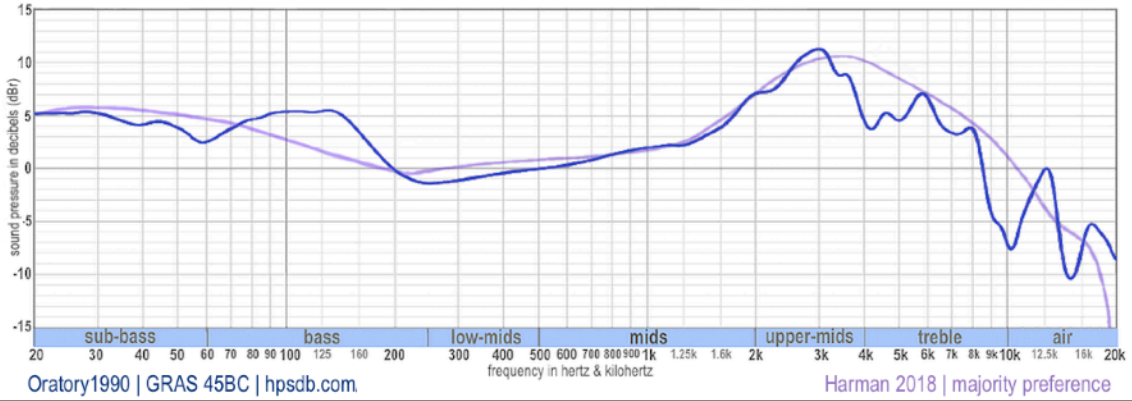
Oratory1990 | GRAS 45BC | hpsdb.com

Harman 2018 | majority preference

Focal Radiance

Open
Dynamic

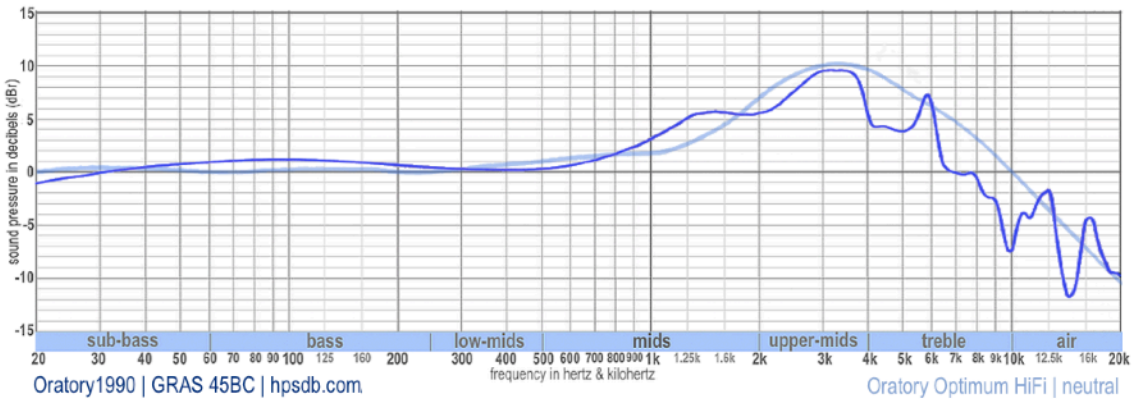
Sen: 115
Imp: 35
Wgt: 435
Pri: $1290



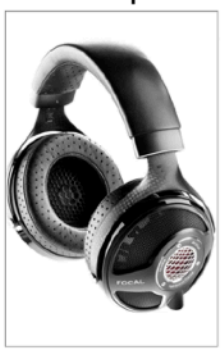
Focal Clear

Open
Dynamic

Sen: 116
Imp: 55
Wgt: 450
Pri: $1490

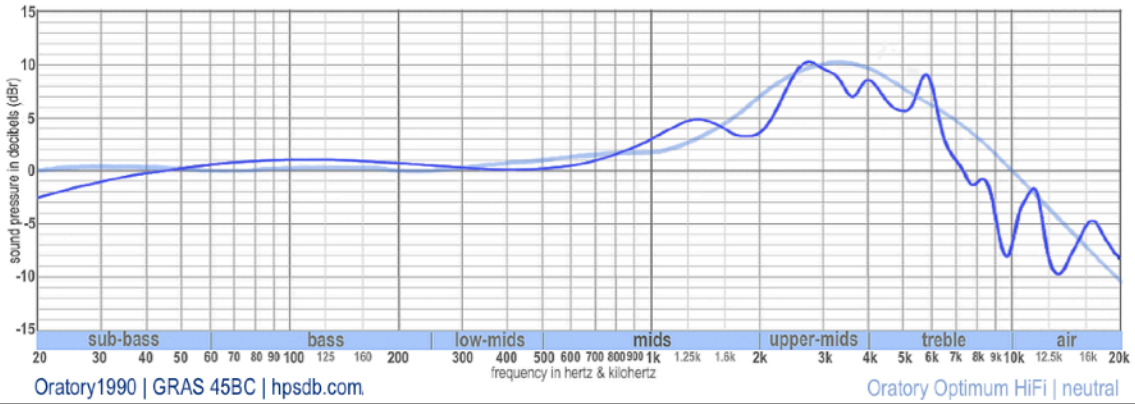


Focal Utopia



Open
Dynamic

Sen: 109
Imp: 80
Wgt: 490
Pri: $3330

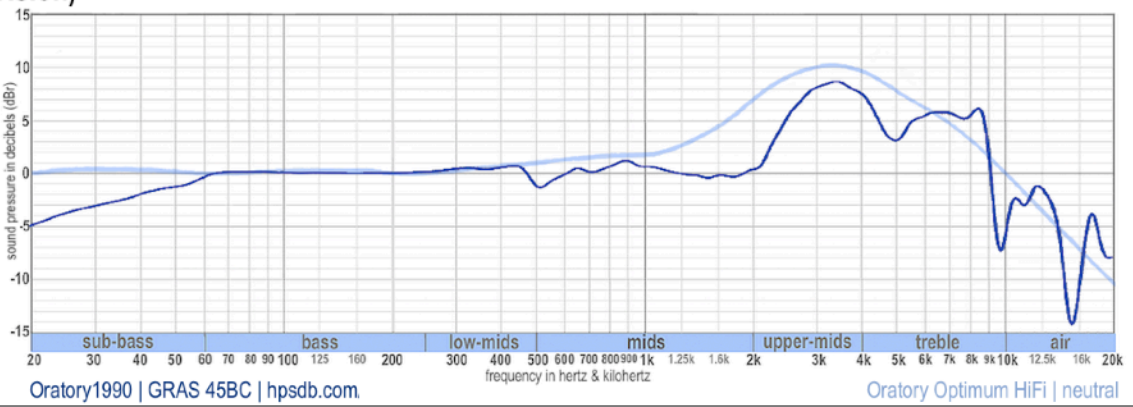


H

Hifiman HE400i (2020 revision)

Open
Planar

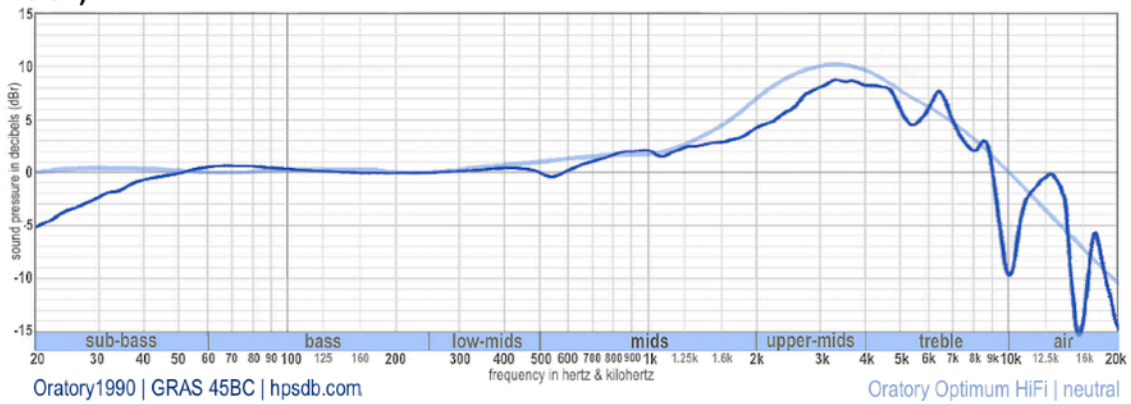
Sen: 107
Imp: 35
Wgt: 370
Pri: $200



Hifiman Sundara (2020 revision)

Open
Planar

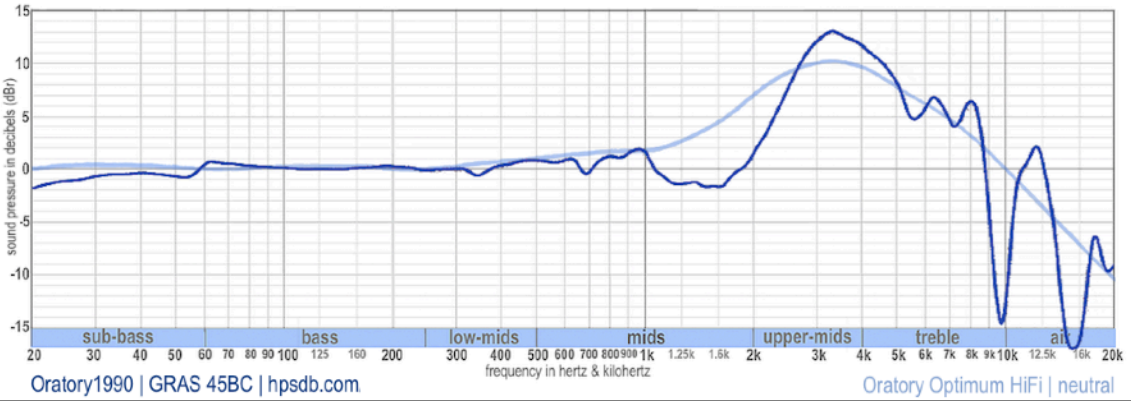
Sen: 108
Imp: 37
Wgt: 372
Pri: $350



Hifiman Ananda

Open
Planar

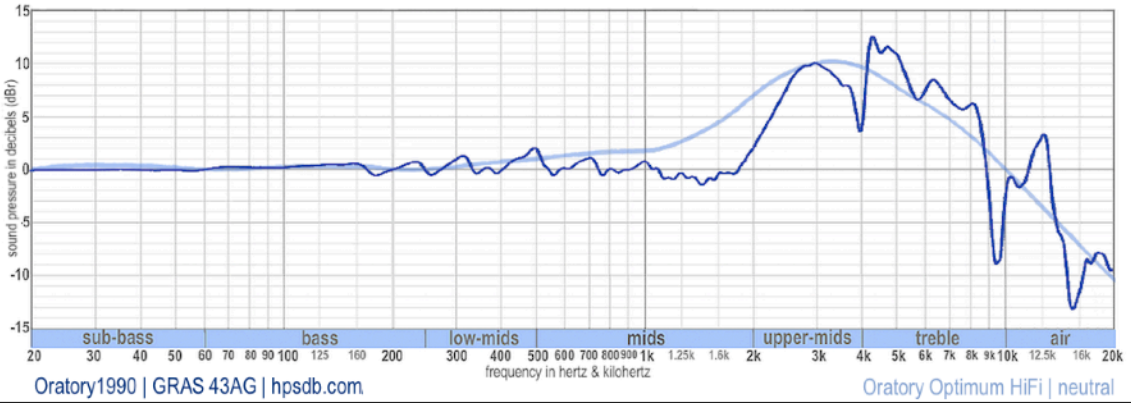
Sen: 103
Imp: 25
Wgt: 399
Pri: $850



Hifiman Arya

Open
Planar

Sen: 105
Imp: 35
Wgt: 399
Pri: $160

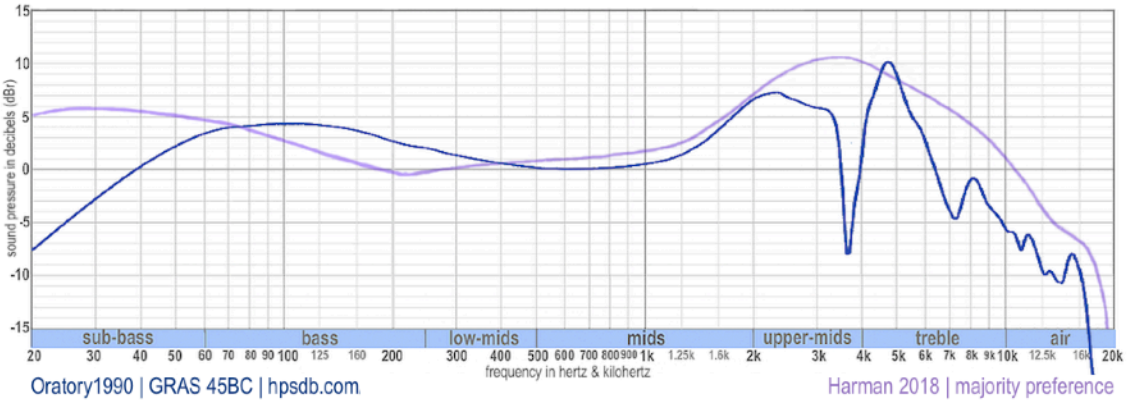


K

Koss Porta Pro

Open
Dynamic

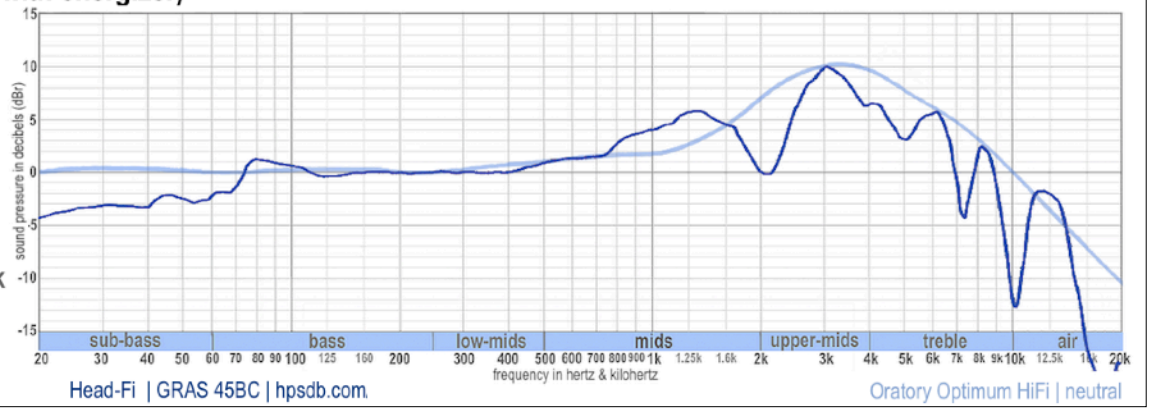
Sen: 101
Imp: 60
Wgt: 79
Pri: $45



Koss ESP950 (supplied with energizer)

Open
Electro-static

Sen: 104
Imp: 100K
Wgt: 353
Pri: $999

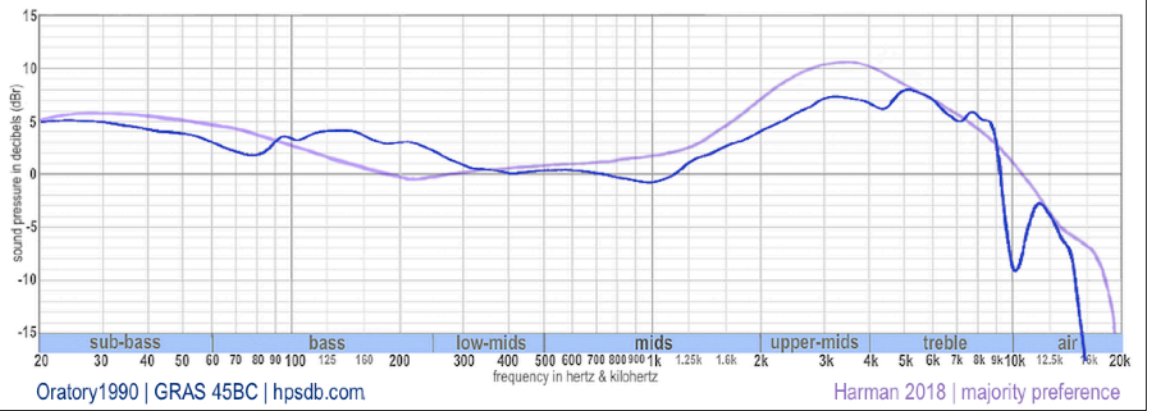


N

NAD Viso HP 50

Closed
Dynamic

Sen: 115
Imp: 32
Wgt: 272
Pri: $250

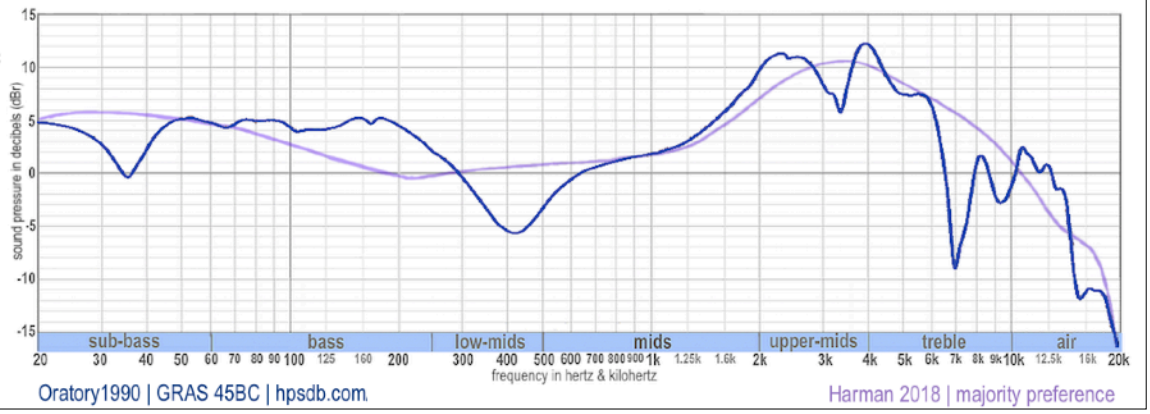


O

Ollo S4R

Closed
Dynamic

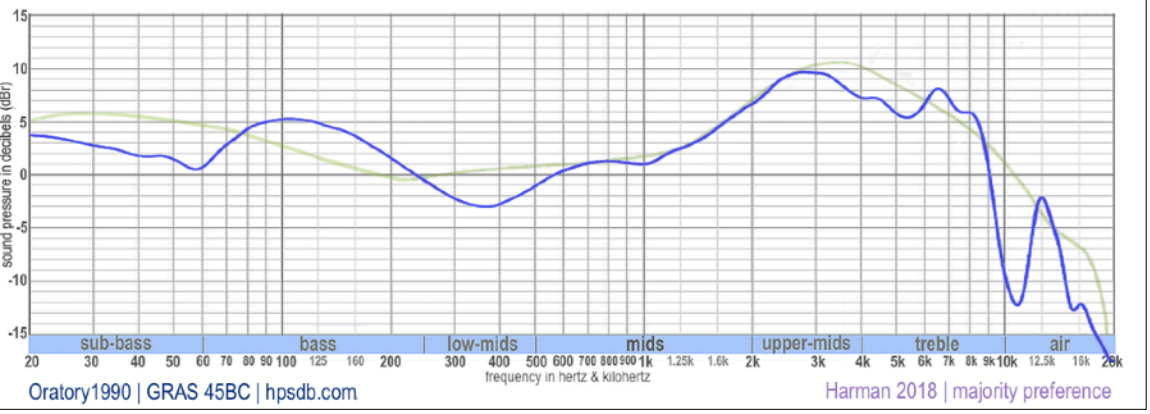
Sen: 111
Imp: 32
Wgt: 382
Pri: $390



Oppo PM-3

Open
Planar

Sen: 118
Imp: 26
Wgt: 373
Pri: Disc.

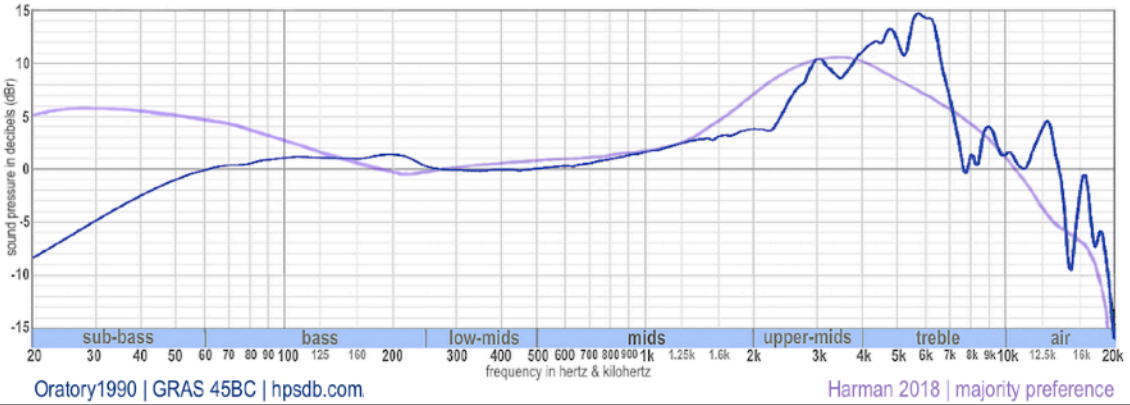


P

Philips SHP9500

Open
Dynamic

Sen: 101
Imp: 32
Wgt: 320
Pri: $90



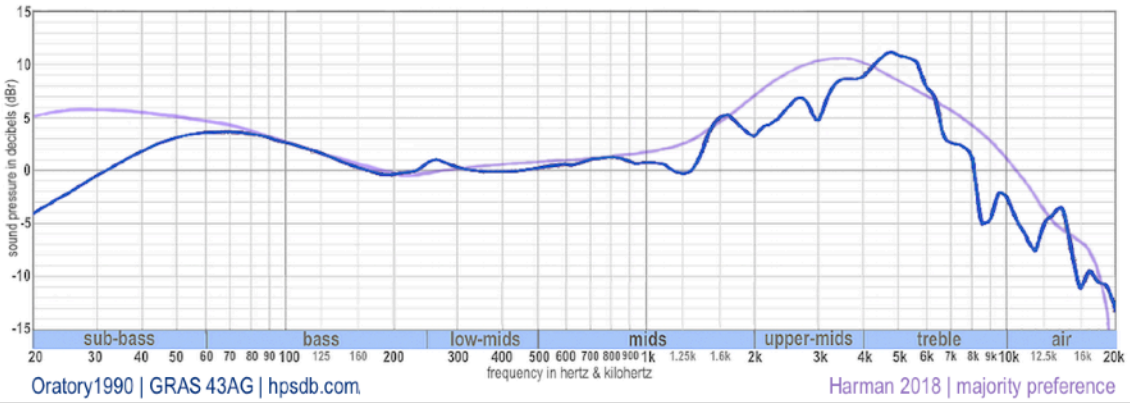
Oratory1990 | GRAS 45BC | hpsdb.com

Harman 2018 | majority preference

Philips Fidelio X2/HR

Open
Dynamic

Sen: 115
Imp: 30
Wgt: 380
Pri: $145



Oratory1990 | GRAS 43AG | hpsdb.com

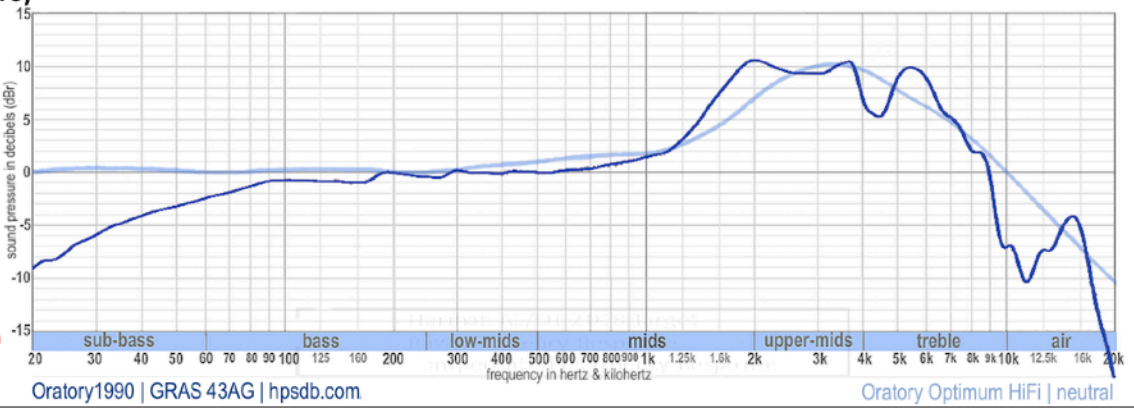
Harman 2018 | majority preference

R

RAAL SR1a (ear speakers)

Open
Ribbon

Sen: 128
Imp: 0.2
Wgt: 425
Pri: $3500

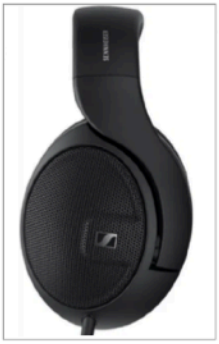


Oratory1990 | GRAS 43AG | hpsdb.com

Oratory Optimum HiFi | neutral

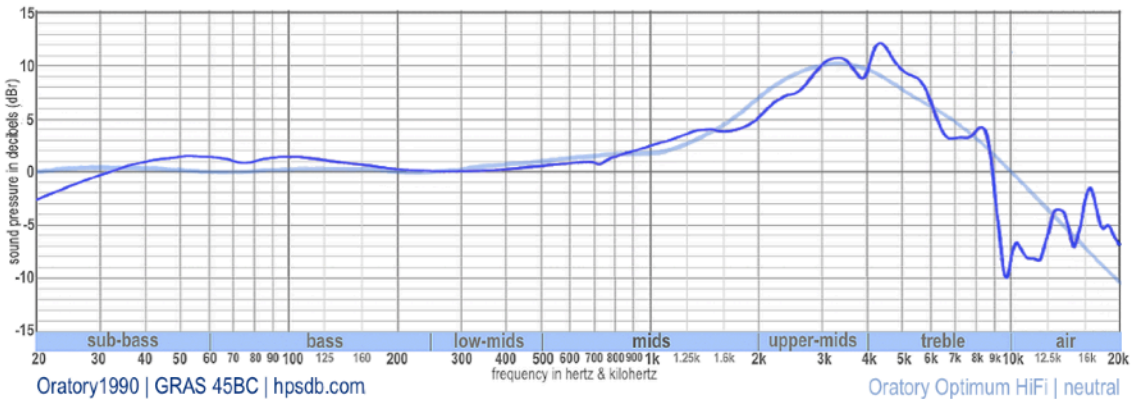
S

Sennheiser HD 560S



Open
Dynamic

Sen: 110
Imp: 120
Wgt: 240
Pri: $200



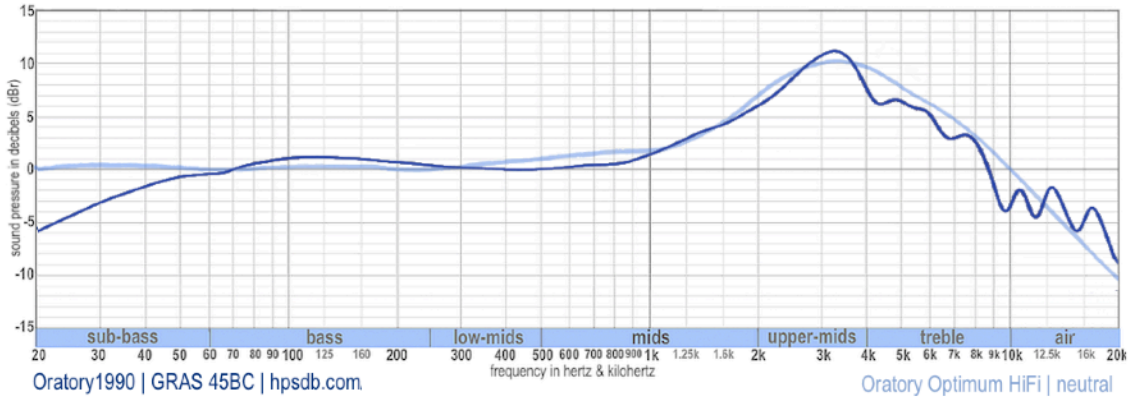
Oratory1990 | GRAS 45BC | hpsdb.com

Oratory Optimum HiFi | neutral

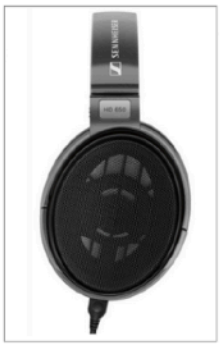
Sennheiser HD 600

Open
Dynamic

Sen: 104
Imp: 300
Wgt: 260
Pri: $400

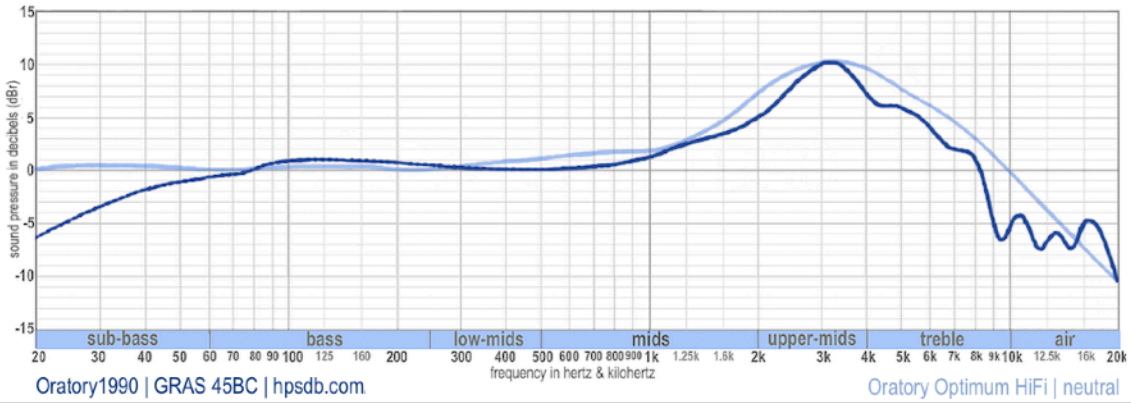


Sennheiser HD 650



Open
Dynamic

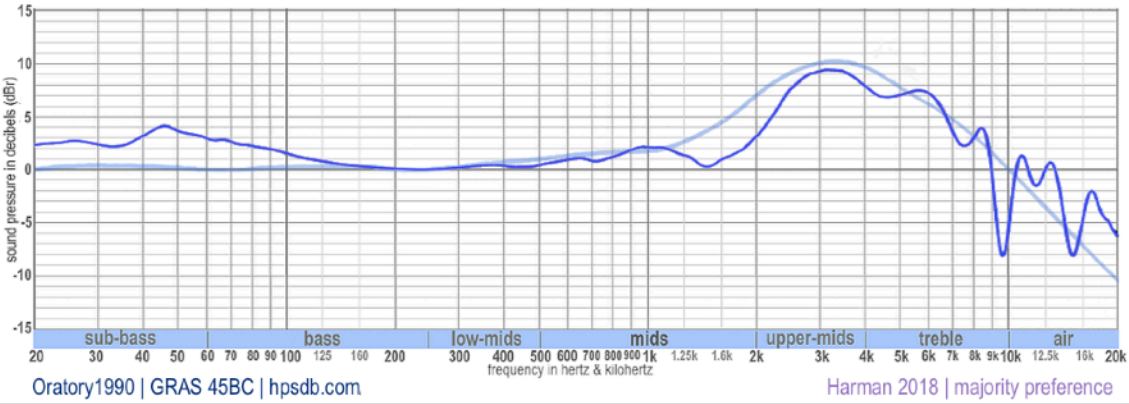
Sen: 104
Imp: 300
Wgt: 260
Pri: $400



Sennheiser HE 1

Open
Electro-static

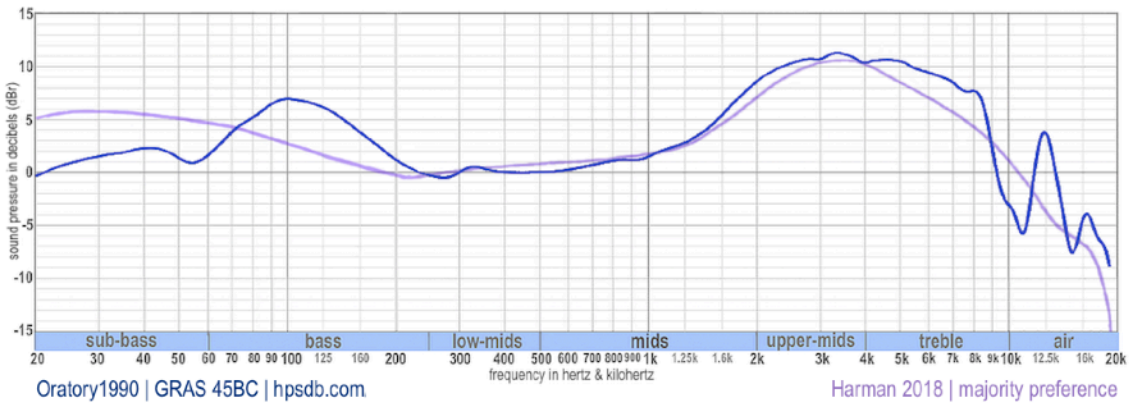
Sen: ?
Imp: ?
Wgt: ?
Pri: Disc.



Shure SRH840

Open
Dynamic

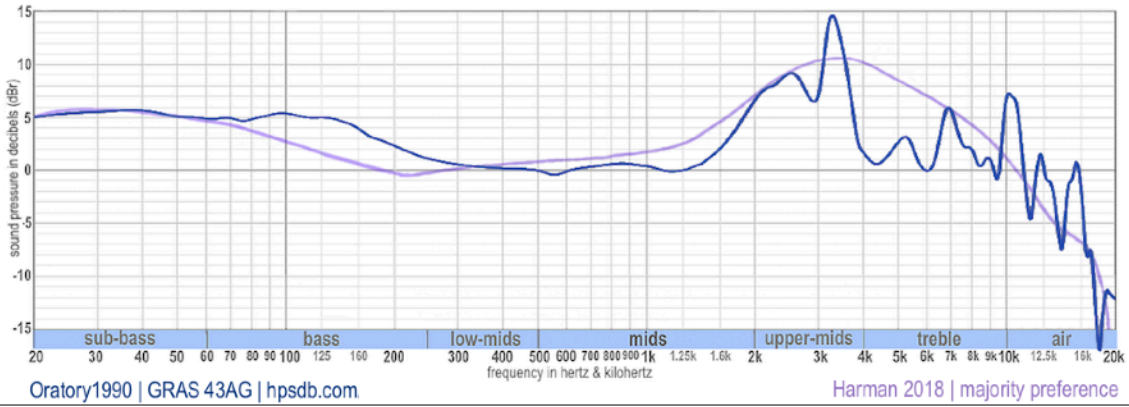
Sen: 116
Imp: 44
Wgt: 374
Pri: $149



Sony MDR Z1R

Closed
Dynamic

Sen: 112
Imp: 64
Wgt: 385
Pri: $1800



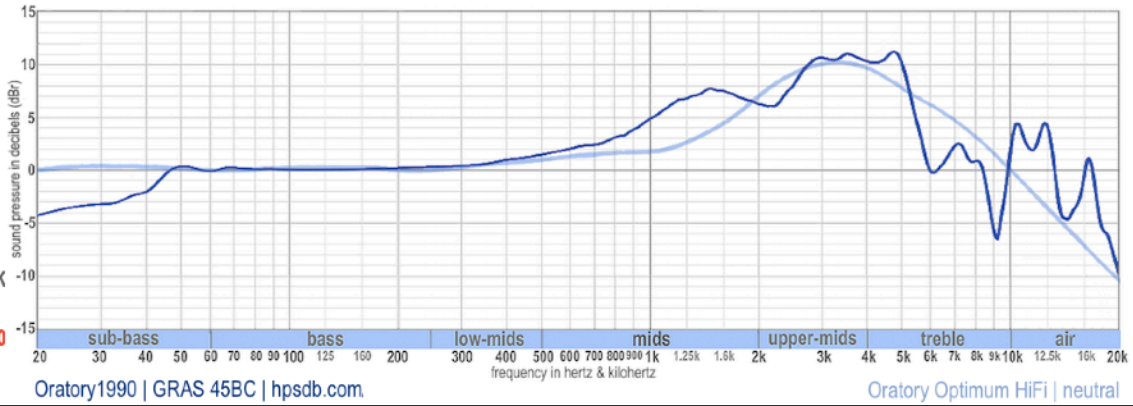
Oratory1990 | GRAS 43AG | hpsdb.com

Harman 2018 | majority preference

Stax SR-009

Open
Electro-
static

Sen: 80
Imp: 145K
Wgt: 441
Pri: $4020



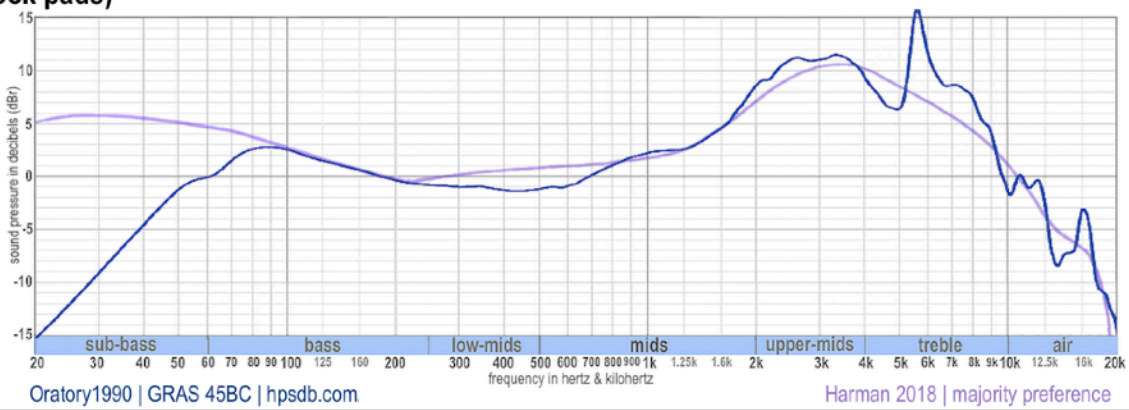
Oratory1990 | GRAS 45BC | hpsdb.com

Oratory Optimum HiFi | neutral

Superlux HD-668B (stock pads)

Semi
Dynamic

Sen: 111
Imp: 56
Wgt: 222
Pri: $37



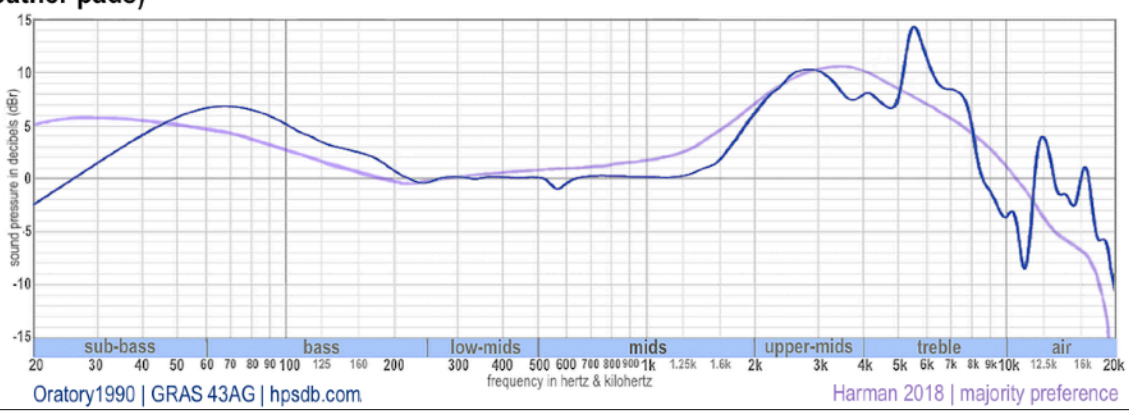
Oratory1990 | GRAS 45BC | hpsdb.com

Harman 2018 | majority preference

Superlux HD-681B (pleather pads)

Semi
Dynamic

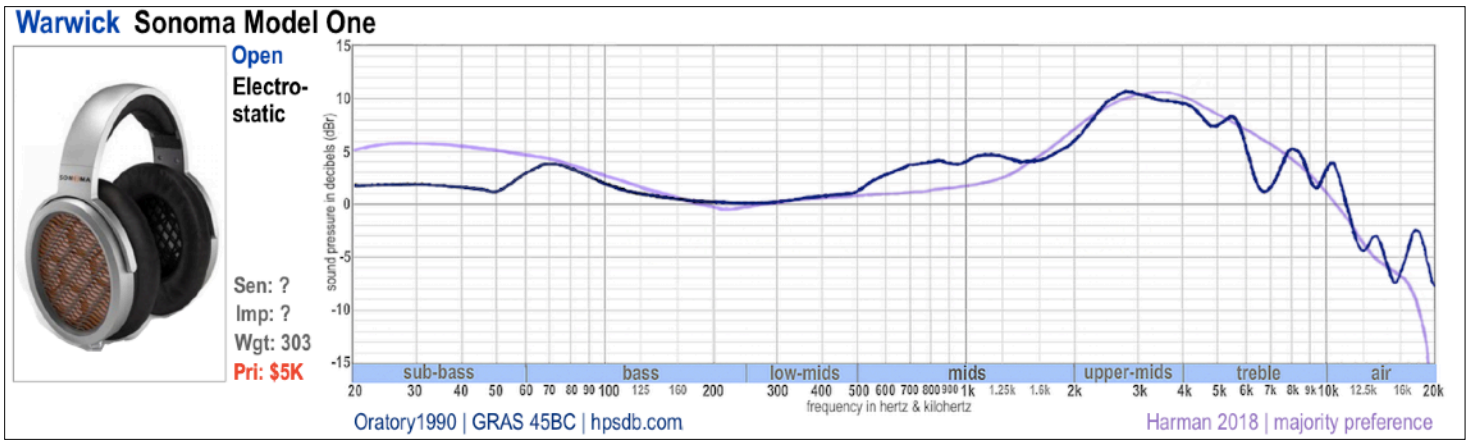
Sen: 113
Imp: 32
Wgt: 221
Pri: $34



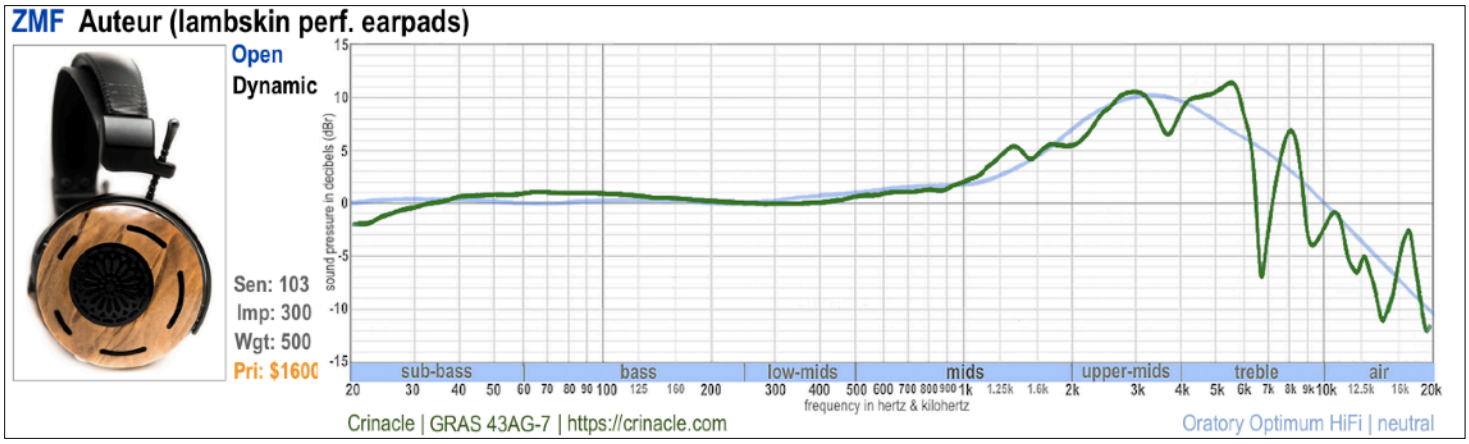
Oratory1990 | GRAS 43AG | hpsdb.com

Harman 2018 | majority preference

W



Z



✣ ✧ ✣ ✧ ✣ ✧ ✣

Explanatory notes

I explain the rationale for this oddball collection of headphones starting on page 11 of Wrapping your head around the whole flat/neutral/Harman thing.

Note: this resource doesn't tell you anything about sound quality, except how much departure the headphone exhibits compared to neutral or consumer preference.

Regardless, you may also find it useful if researching the purchase of a headphone with a relatively accurate/uncoloured frequency response. If frequency response graphs look confusing or intimidating, you might want to read my tutorial The Skinny on Headphone Frequency Response Graphs. The general idea, however, is simplicity itself. If the jagged line of the headphone measurements goes above or below the pale blue or purple smoothly curved line, that's a possible source of concern. The labeling in the blue bar at the bottom shows you where from bass to treble a given area of concern lies. Headphones with a pale blue reference curve are best considered if you're looking for all-around accuracy/neutrality. The pale purple reference curve shows what a reasonable amount of boosted bass looks like, including especially where the boost should taper off to zero.

That said, a common mistake is to assume that the *amount* of bass loudness tells the whole bass story. In fact, a headphone with a very incisive, resonant bass *quality* (like many planar magnetic models) can be more satisfying without a loudness boost, than other headphones with bass that is only boosted in *quantity*. This points to the limitation of frequency response graphs. They give a lot of information about one dimension of the headphone sound experience, but none at all about other dimensions, such as stereo imaging, dynamics and transients. They also don't tell the complete story on detail/clarity — although serious deviations in frequency response are absolutely culprits in muddying the detail waters.

Another caveat regarding the graphs is that both the sub-bass and the air regions on the far left and right seldom come into play. No voices and very few instruments (or even natural phenomena) produce sounds at either extreme. These are also areas in which even the best measuring equipment has serious limitations.

Another, practical, issue is sound isolation. Each headphone has an indication of open vs closed. **Open-back** means the headphone allows at least a significant amount of sound to spill out into the surrounding air. So an open-back headphone is already a non-starter in situations in which you need to keep from annoying other people. But for sealing *out* external sound, even **closed-back** models vary drastically in effectiveness. Headphones with a porous ear pad construction allow sound to leak in.

As well as the graph, each headphone model includes a short list of sensitivity, impedance, weight and price numbers:

Sensitivity expressed as dB_{SPL}/1Volt (rather than the more common dB_{SPL}/1mW) directly corresponds to the loudness dial on your device. For a portable player like a smart phone, any sensitivity number over roughly 98 to 100 should work just fine. (These devices typically output 1.2 volts).

Impedance essentially shows how much electrical current your headphone requires to produce sound. Here values that are too *low* are of concern. Anything under roughly 30 (Ohms) has a good chance of demanding more sustained current flow than an unaided portable player can deliver.

Weight. It's impossible to express comfort/fit in a simple way. Weight is just one aspect. But headphones weighing more than a pound (454 grams) are fairly likely to be problematic for a long listening session.

The **Price** given for each model is its US dollars list. This gives you a general idea whether a headphone is even worth looking at, depending on your budget. Many uninitiated into the depths of the headphone enthusiast microcosm will be flabbergasted that such a thing as a headphone selling for more than $500 dollars even exists (let alone the roughly $60,000 of the current model Sennheiser HE 1). Nevertheless, for the headphones in this collection evidence suggests sound quality scales with price — just not linearly, especially after $1000. Law of diminishing returns.

Worn vs **fresh** ear pads: at this time the graphs for the DT 770 and DT 880 are the only measurements available for pad wear. It is not possible to generalize that other headphones would exhibit similar pad wear. We know anecdotally that the HD 6-series has had similarly profound changes with pad wear over time. Some headphones with memory foam ear pads may exhibit very little change. My beyerdynamic DT 1990 has Visco memory foam inside the ear pads and have had 2½ years of extensive use. I can tell by how well they EQ based on the graph in this collection that they still sound just as the graph shows.