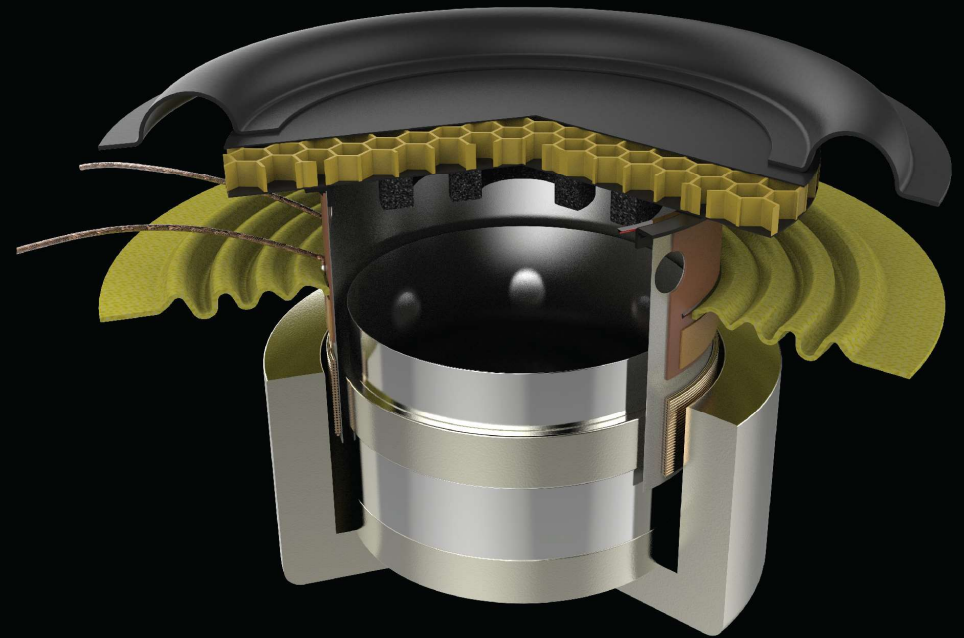




BMR Design Guide



Acoustic System Benefits

(1x BMR) replaces (tweeter + mid-bass)

| | | | | IMPACT | | |
|---------------------------|--|--|--|----------|--------|---------|
| | | | | ACOUSTIC | SYSTEM | PRODUCT |
| REMOVE COMPONENTS | <ul style="list-style-type: none"> • Single acoustic source • Reduce electronic losses • Simplification of design | <ul style="list-style-type: none"> • Eliminates: Tweeter / LC Circuit I2S channel / Lens • Reduces: Amp channels / Losses • Employ lower cost amp | <ul style="list-style-type: none"> • Reduce total system cost • Reduce IQC testing time • Lower supply chain costs: Buying/Shipping/Warehousing | | | |
| NO CROSSOVER | <ul style="list-style-type: none"> • Improves: <ul style="list-style-type: none"> • Voice intelligibility • Musicality | <ul style="list-style-type: none"> • Potentially improves AEC • Simpler to tune | <ul style="list-style-type: none"> • Reduced time to market | | | |
| REDUCE FORM FACTOR | <ul style="list-style-type: none"> • Improve bass alignment options | <ul style="list-style-type: none"> • Better design flexibility | | | | |
| ULTRASONIC OUTPUT | <ul style="list-style-type: none"> • Eliminate need for additional ultrasonic drive unit | <ul style="list-style-type: none"> • Determine room boundaries • Gesture recognition | <ul style="list-style-type: none"> • Identify number and location of users | | | |

Acoustic System Benefits

(BMR + bass) replaces (tweeter + mid-bass)

| | IMPACT | | |
|--|--|--|--|
| | ACOUSTIC | SYSTEM | PRODUCT |
| LOWER CROSSOVER | <ul style="list-style-type: none"> • Move crossover away from sensitive 1 – 3kHz region • Relax requirement for bass driver to reach up to tweeter crossover frequencies | <ul style="list-style-type: none"> • Easier to integrate power response of drivers when separation much less than wavelength • Improves voice intelligibility • Improves musicality | <ul style="list-style-type: none"> • Simplify bass driver requirements for lower cost |
| ULTRASONIC OUTPUT | <ul style="list-style-type: none"> • Eliminate the need for additional ultrasonic drive unit | <ul style="list-style-type: none"> • Determine room boundaries • Gesture recognition | <ul style="list-style-type: none"> • Identify number and location of users |
| WIDE DIRECTIVITY W/ SMOOTH POWER RESPONSE | <ul style="list-style-type: none"> • Improved voice intelligibility and musicality throughout the room | <ul style="list-style-type: none"> • More uniform coverage • Reduce DSP requirements | <ul style="list-style-type: none"> • Consistent experience throughout the room |

Sound Bar Benefits

BMRs replace Tweeters + mid bass

| | IMPACT | | |
|---------------------------|--|---|--|
| | ACOUSTIC | SYSTEM | PRODUCT |
| REMOVE COMPONENTS | <ul style="list-style-type: none"> • Simplification of design • No crossover • Improves: <ul style="list-style-type: none"> • Voice intelligibility • Musicality • Spatial consistency • Rhythm & Timing | <ul style="list-style-type: none"> • Eliminates: Tweeter / LC Circuit I2S channel / Lens • Reduces: Amplifier channels Electronic losses Tuning complexity • Employ lower cost amp | <ul style="list-style-type: none"> • Reduce total system cost • Reduce IQC testing time • Lower supply chain costs <ul style="list-style-type: none"> • Buying • Shipping • Warehousing |
| WIDE DIRECTIVITY | <ul style="list-style-type: none"> • BMR adds off-axis energy for more uniform spatial coverage | <ul style="list-style-type: none"> • Fewer drivers to achieve same experience | <ul style="list-style-type: none"> • Consistent listening experience throughout the room |
| REDUCE FORM FACTOR | <ul style="list-style-type: none"> • Improve bass alignment options | <ul style="list-style-type: none"> • Better design flexibility | |
| ULTRASONIC OUTPUT | <ul style="list-style-type: none"> • Eliminate the need for additional ultrasonic drive unit | <ul style="list-style-type: none"> • Determine room boundaries • Gesture recognition | <ul style="list-style-type: none"> • Identify number and location of users |

ATMOS Sound Bar Benefits

BMRs replace Tweeters + mid bass

| IMPACT | | |
|--|---|--|
| ACOUSTIC | SYSTEM | PRODUCT |
| <ul style="list-style-type: none"> • Simplification of design • No crossover • Improves: <ul style="list-style-type: none"> • Voice intelligibility • Musicality • Spatial consistency • Rhythm & Timing | <ul style="list-style-type: none"> • Eliminates: Tweeter / LC Circuit I2S channel / Lens • Reduces: Amplifier channels Electronic losses Tuning complexity • Employ lower cost amp | <ul style="list-style-type: none"> • Reduce total system cost • Reduce IQC testing time • Lower supply chain costs <ul style="list-style-type: none"> • Buying • Shipping • Warehousing |
| <ul style="list-style-type: none"> • BMR adds off-axis energy for more uniform spatial coverage | <ul style="list-style-type: none"> • Fewer drivers to achieve same experience | <ul style="list-style-type: none"> • Consistent listening experience throughout the room |
| <ul style="list-style-type: none"> • Improve bass alignment options | <ul style="list-style-type: none"> • Better design flexibility | |
| <ul style="list-style-type: none"> • Eliminate the need for additional ultrasonic drive unit | <ul style="list-style-type: none"> • Determine room boundaries • Gesture recognition | <ul style="list-style-type: none"> • Identify number and location of users |

REMOVE COMPONENTS

WIDE DIRECTIVITY

REDUCE FORM FACTOR

ULTRASONIC OUTPUT

Automobile Benefits

Entry-level: BMR 2.1 vs Traditional 2.2 System

| | IMPACT | | |
|--------------------------------------|---|--|---|
| | ACOUSTIC | SYSTEM | PRODUCT |
| ELIMINATE DOOR SPEAKERS | <ul style="list-style-type: none"> Reduce: External to internal noise Internal to external audio (phone, voice, music etc) | <ul style="list-style-type: none"> Remove: Audio wiring to the door; need for audio wiring to flex harness External weather proofing | <ul style="list-style-type: none"> Simplifies manufacturing Reduce vehicle weight |
| FLEXIBLE TRANSDUCER PLACEMENT | <ul style="list-style-type: none"> Improves imaging Higher vocal intelligibility More immersive Raises soundstage | <ul style="list-style-type: none"> More interior design options for placement including A and B pillars Place crossover frequency well below critical voice band Less critical placement of subwoofer | <ul style="list-style-type: none"> Operates off In-cabin harness Seamless integration of audio into vehicle |
| SINGLE IN-CABIN WOOFER | | <ul style="list-style-type: none"> Eliminate need for two woofers | <ul style="list-style-type: none"> Operates off In-cabin harness Reduce vehicle weight |
| FEWER COMPONENTS | <ul style="list-style-type: none"> Simpler design timeline | <ul style="list-style-type: none"> Reduce: Amplifier/DSP channels, transducers, wiring, grilles, fasteners, etc. | <ul style="list-style-type: none"> Lower total system cost Reduce weight Less parts to purchase and manage |