

R^R Rave Reviews

Earthquake Sound makes a wide range of electronic components for the car audio, architectural audio and professional audio industries. They manufacture products on an OEM basis which are sold under other brand names and they make some of the world's most powerful subwoofers.

The Earthquake Sound SuperNova MKII reached 113 dB at 35 Hz. This was the highest output level delivered by any subwoofer we had tested up until that time. When Earthquake set out to make an even more powerful unit, they wanted to produce a subwoofer with fewer sonic compromises – one that actually sounded better, not simply one that played louder. The SuperNova Millennium 15 accomplishes this goal by employing some interesting engineering innovations.

Vented subwoofers, which include those using passive radiators, can usually play louder than sealed enclosure designs because of reduced cone excursion at or near the system tuning frequency. The downside is that vented designs can't equal the transient response of sealed-enclosure subwoofers and typically have twice the phase shift and twice as much group delay. (See the Sunfire Architectural True Subwoofer review for further details) Joseph Sahyoun, of Earthquake Sound, envisioned a vented subwoofer tuned to a subsonic frequency so that these phase and group delay problems could be shifted down in frequency into a range where they would be inaudible. He suspected that a vented subwoofer designed in this way could offer the high output capability of a typical vented system, along with the speed and linear-phase characteristics of a sealed system, within the audible range. Carrying out this concept proved to be harder than expected. A port would be too long to fit in a compact enclosure, and conventional passive radiators were not up to the task.

Reaching a tuning frequency of 15 Hz or so, which is about an octave below the sealed system resonance, required the development of a new type of passive radiator. This patented design is called SLAPS, for Symmetrically Loaded Audio Passive System. The SLAPS passive radiator allows diaphragm excursion of up to 4-inches with symmetrical loading of the active driver on both inward and outward strokes. Now I will explain why it was necessary to invent SLAPS.

How low can you go?

A subwoofer vent tuned to a very low frequency will be very large, just like an organ pipe designed to play a very low tone. The vent contains a volume of air that resonates at the chosen tuning frequency. The lower this frequency, the greater the volume of air required. As the system is tuned to lower and lower frequencies, eventually a point will be

reached where the vent will be too large to fit within the subwoofer enclosure.

A passive radiator works just like a vent or port. The mass of the moving element (passive diaphragm) replaces the mass of air in the vent. You can't make the air in a vent heavier, but the diaphragm of a passive radiator can be weighted to tune it to a lower frequency . The vent (port) has to get longer and longer to lower the tuning frequency, but a passive radiator can stay the same size and just be made heavier. That's not all there is to it, though.

As the tuning frequency of a passive radiator gets lower, the required excursion (or travel) of the diaphragm gets larger. Conventional passive radiators have frames or baskets, much like active drivers and the diaphragms are suspended at the outer circumference by the surround, with a pleated spider connected to the basket acting as a spring to center and return the diaphragm to its resting position. The spider limits the diaphragm excursion and can exhibit non-linear characteristics, providing unequal resistance to inward movement and to outward movement as excursion increases.

Slaps

The SLAPS passive radiator has no spider or basket to limit diaphragm travel, and it uses a special double surround to provide perfectly symmetrical resistance to inward and outward movement. The surround has a half-roll shape facing outward like a conventional passive radiator, plus a half-roll facing inward towards the interior of the enclosure. These two push-pull surround sections are spaced about an inch apart and are made of material with a tapered cross section to provide perfectly symmetrical spring action to restore the diaphragm to its resting position with equal resistance to inward or outward movement over a very long range of travel. This surround design prevents any rocking motion, even when the diaphragm is weighted in the center, and eliminates the need for a spider and basket.

The SLAPS passive radiator loads the MAGMA15 active driver symmetrically to help keep its long voice coil centered in the gap. This has the effect of extending the linear travel capability of the active driver, while permitting extremely long travel and high output from the passive diaphragm. The combination of the specially-designed Magma active driver and SLAPS passive radiator allows the system to be tuned to an infrasonic frequency, producing a phase response curve that looks like a sealed enclosure design, above 20Hz.

The SuperNova Millennium should have the phase characteristics (above 20Hz) and ultra-deep bass extension of a sealed box subwoofer, along with the power and high output capability of a vented subwoofer. Let's see how it actually performs.



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Enclosure Type: Vented (passive radiator)
Driver (s): 1x15" active, 1x15" passive
Amplifier Power: 580 watts, Class D
High-pass Filter:
Line-level 70Hz at 6dB/octave
Speaker level: none
Low-Pass Filter: 24dB/octave variable
from 40 Hz-120Hz
Dimensions (wxhxd in inches): 20x17.5x18
Weight (lbs.): 110

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Outside

The SuperNova Millennium 15 is remarkably compact for a subwoofer with two 15-inch drive elements. It's a 17.5-inch cube, but the driver and passive radiator protrude about 1.25 inches out from each side, for an overall width of 20 inches, and the connectors add about half an inch to the front-to-back dimension. The enclosure is made from 15 layers of laminated Scandinavian birch which is coated inside and out with a thick, half poly-mix material that looks like a very coarse, black wrinkle finish. This coating adds structural rigidity and damps cabinet panel resonance. The subwoofer looks rugged and professional but it is not unattractive.

The black anodized connector panel on the rear of the enclosure doubles as the chassis for the amplifier. There are four pairs of five-way binding post inputs and outputs for speaker-level signals, RCA jacks for line-level inputs and outputs, continuously variable controls for gain and low-pass frequency (50 Hz- 150 Hz), switches for the phase (0°-180°) and power off/auto-on, plus a remote control input. An IEC power connector completes the rear panel. There is no heat sink other than the connector panel itself.

The driver and passive radiator are identical in appearance. The frames are about 16 inches in diameter, and the filled diaphragms are about 10.5 inches in diameter, appearing flat from the outside. The active element faces left and the passive faces right, with the connector panel at the back. No grilles are included, so the drive elements are exposed.

A tiny infrared receptor for the remote control comes with a substantial length of cable to allow it to be placed at the subwoofer or several feet away. The hand-held remote control adjusts volume only.

Inside

The internal amplifier is a 580-watt class D pulse width modulation (PWM) design. It features a toroidal transformer which is attached to the cabinet floor and a patented optical distortion limiting (ODL) circuit to prevent the amplifier from clipping regardless of input signal level or gain



setting. The gain control has a motor-driven pot for remote adjustment of volume-level.

The low-pass filter is a fourth-order (24dB/octave) Linkwitz-Riley configuration that is continuously variable from 50 Hz- 150 Hz. There is a first-order (6dB/octave) high-pass filter on the line-level outputs fixed at 100 Hz. No speaker-level high-pass filter is included.

The MAGMA 15 active drive unit has a 3-inch voice coil with a winding height of 1.85 inches. The 7-inch diameter epoxy coated spider is spaced an inch away from the top plate. The huge magnet assembly is an inch-and-a-half thick. The back plate is bumped .375 inches, and the pole piece has a 1-inch vent hole through the center. This cast-basket driver exhibits high construction quality and looks very rugged.

The patented SLAPS passive radiator has a flat diaphragm that is about an inch thick, with a metal weight in the center. The push-pull surrounds are spaced about an inch apart and are about 1.75 inches wide. The surround material is tapered in thickness to allow 4-inch peak-to-peak travel with linear motion and no rocking. The SLAPS has no basket or spider to inhibit travel.

Sound

The SuperNova Millennium 15 plays at incredibly high levels all the way down to 18Hz and below. It delivered 118dB at 45Hz at the listening position which is about 3 meters away from the subwoofer.. This level was maintained within 3dB all the way down to 25Hz. I measured 117dB at 40Hz, 117dB at 35Hz, 116dB at 30Hz, 115dB at 25Hz, and 102dB at 20Hz with clear and solid sound. It produced a clean 98dB at 18Hz! Above 25Hz these levels exceed those delivered by the huge Servo Drive subwoofer and they far surpass any other reasonably-sized home theater subwoofer in the review. The Earthquake SuperNova Millennium 15 produced the highest output of any practical

home theater subwoofer I've reviewed and it also performed well on musical selections.

The Earthquake subwoofer did an excellent job of reproducing the rhythm and pace of music. Pitch definition was good. I managed to get a pretty good blend with the main speakers. The Earthquake produced more powerful bass at lower frequencies than other vented subwoofers and blended better with the main speakers. Sound effects are another story.

Deep, high-impact bass for sound effects was simply outstanding. The big Earthquake delivers the low frequency "air" of a large venue with startlingly realistic punch when loud effects occur. You won't find a subwoofer with more slam than this one. It is the most powerful LFE subwoofer I've heard, period. The ultra-high output level capability means that there will always be plenty of headroom to reproduce the loudest effects with clarity and full dynamic range.

The patented optical distortion-limiting (ODL) circuit worked flawlessly to prevent overloading the amplifier or driver. There was never a whimper of distress regardless of signal frequency or level. At normal listening levels the SuperNova just loafs along effortlessly, and when a really loud effect comes along this subwoofer handles it without compression or distortion.

Conclusion

The Earthquake SuperNova Millennium 15 is the most powerful home theatre subwoofer that I've heard and performs very well for music reproduction, too. It beats the other vented designs for fidelity and delivers higher output than any other compact home theatre subwoofer I've reviewed. It costs less than \$2,000, looks good, and is completely self-contained. Want to move your world? Get an Earthquake SuperNova Millennium 15. Want to move your neighbor's worlds as well? Get two.

dB measurements as tested by WideScreen Review, Buyer's Guide issue # 36

MANUFACTURER	MODEL	MSRP\$	DRIVER	dB@40Hz	dB@35Hz	dB@30Hz	dB@25Hz	dB@20Hz	dB@18Hz
EARTHQUAKE	SUPERNOVA	3,000	15"	117	117	116	115	102	98
B & W	4000-ASW	3,000	15"	115	115	115	114	102	N/A
BAG END	S-18E	2,680	18"	110	110	110	108	100	N/A
TRIAD	PLATINUM	2,200	18"	N/A	N/A	N/A	106	92	90
VELODYNE	F-1800R	1,999	18"	112	112	113	110	98	N/A
ENERGY	ES-18XL	1,700	18"	114	114	112	106	98	90
PARADIGM	SERVO-15	1,500	15"	112	112	110	106	96	90
BAG END	INFRA-18	1,495	18"	108	108	106	102	90	N/A