



IN ADMIRATION OF MUSIC



DALI SUB E-9 F

TECHNICAL WHITE PAPER

INTRODUCTION



DALI SUB E-9 F

With the rising interest in high quality compact speakers the demand for a potent yet compact subwoofer is growing. The DALI SUB E-9 F was developed precisely to fill this demand. Build around a compact cabinet, a powerful amplifier and a stiff yet lightweight aluminum woofer.

Developing a DALI subwoofer involves the same meticulous attention to detail

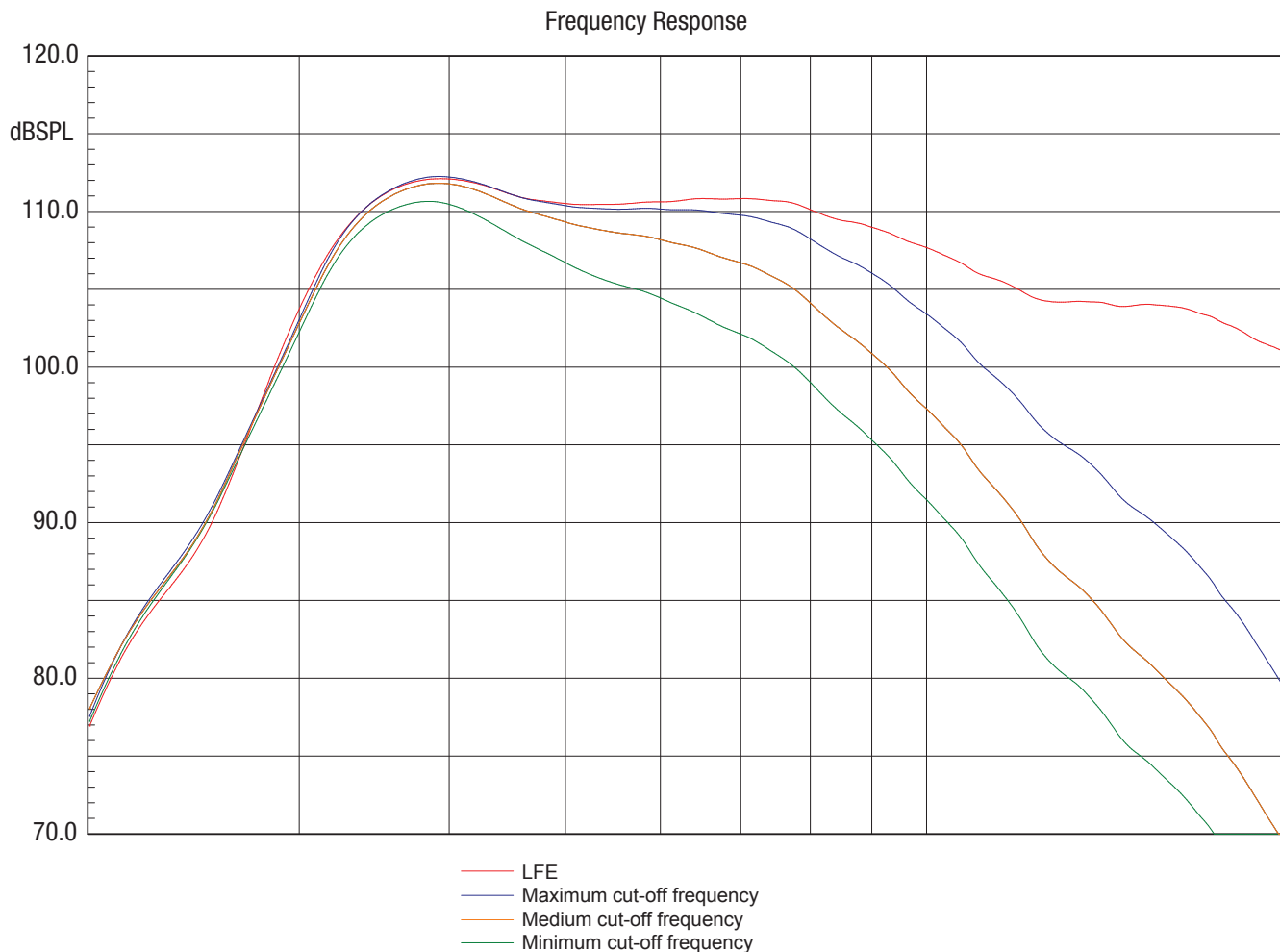
as you will find in the development of a DALI speaker. Our R&D team consistently strive to generate the most natural, yet entertaining, sound – at any price point. That goes for the DALI SUB E-9 F as well.

Today a subwoofer is considered a natural part of any multi-channel sound system, and in many stereo systems as well. With the development of the

SUB E-9 F DALI wanted to create a true versatile product, able to competently match compact and stand speakers from our OBERON and OPTICON MK2 lineup.

This whitepaper takes you ‘behind the scenes’ of the DALI SUB E-9 F, highlighting some of the details which – when joined together – ensure a true DALI experience.

ACOUSTIC BACKGROUND



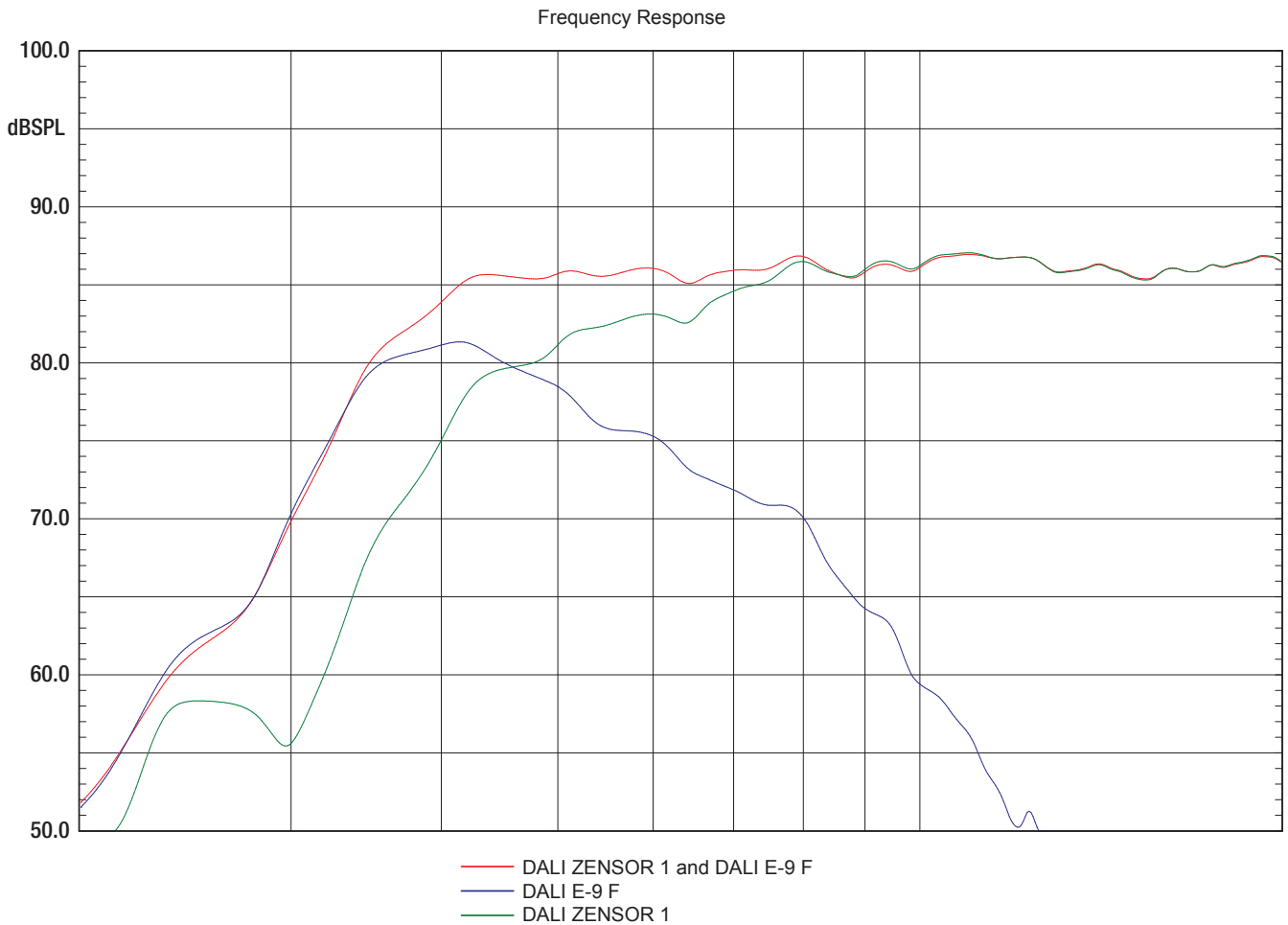
SUB E-9 F frequency response at different low-pass values.

Unlike many subwoofers in the market the DALI SUB E-9 F has been engineered to perform equally well on both music and movies. It is important to us that a subwoofer is capable of rendering a performance true to the input signal. Therefore a DALI subwoofer is everything but a 'boombox'.

Over the years DALI's engineers have developed a set of sound design principles. Today these are applied in the creation of basically any DALI speaker. Naturally our subwoofers must be able to enter into any setup without sacrificing the purpose of providing wide dispersion, time coherent and low-loss performance.



You can read more about our sound design principles at www.dali-speakers.com 120.0dB SPL 110.0100.090.080.070.0Frequency



The DALI SUB E-9 F clearly has its heart set on high fidelity.

Properly set up it has a superior ability to integrate with the front speakers providing more than just an extension of the low frequency range. In fact a perfect subwoofer integration will

increase the sonic value of any smaller front speaker by enabling it to reproduce all fundamental tones properly, both in respect to gain and phase.

This measurement displays the SUB E-9 F connected to a pair of ZENSOR 1 in stereo mode. Note the perfect phase integration and the summing of the main and sub signal.

CABINET



Any risk of port noise derived from the down-firing bass vent itself is seriously reduced by its convex tapered design. Apart from the shape of the flares the vent has also undergone extensive testing, measuring and listening when it comes to dimensions and placement, in order to optimize interaction with the cabinet and woofer.

Built on almost 40 years of knowledge in acoustics and cabinets, the solid MDF cabinet abides the tough DALI specifications.

The enclosure comes in a choice of a Black ash vinyl finish with a Satin Black baffle and a White finish with a Satin White baffle. The grille is available as an accessory in either Shadow Black or Mountain Grey.

The entire cabinet is effectively decoupled from the floor by means of four polymer based oversized spikes.

Appearing to hover above the floor the distance of 30 mm eliminates any potential turbulence from the space between the cabinet and the floor itself.

Still, the proximity to the floor ensures that the benefit of having a down-firing vent is maintained; a higher efficiency and more freedom in positioning.

WOOFER

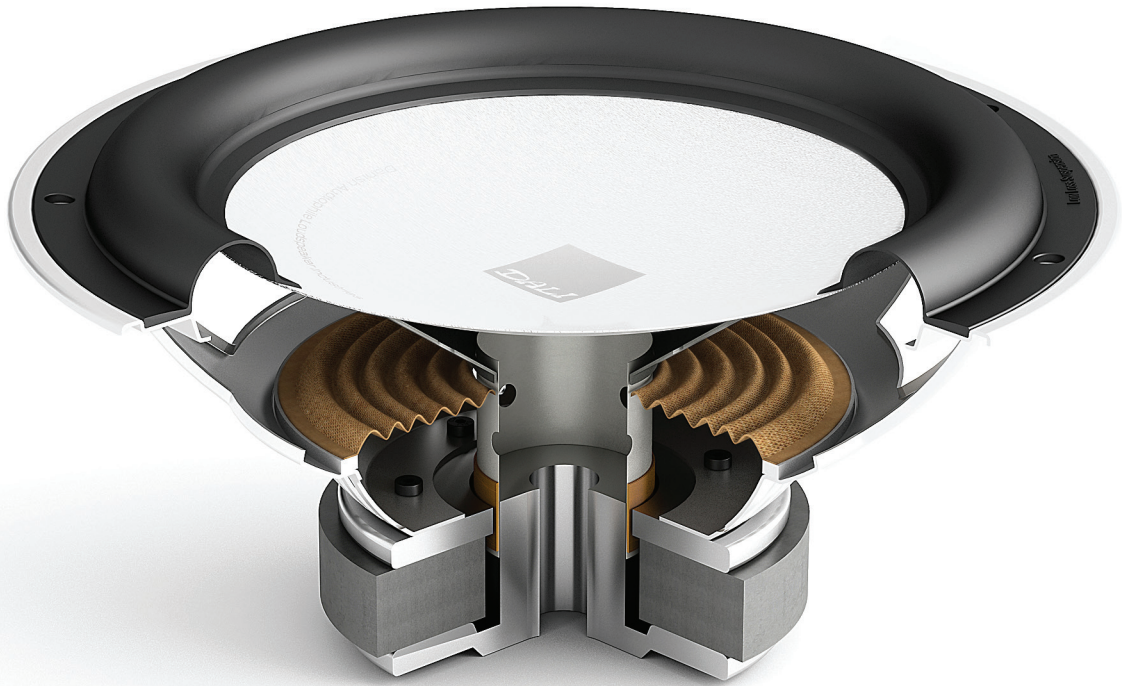
The DALI SUB E-9 F incorporates an aluminium cone woofer. This stiff, yet lightweight, material was chosen to ensure a greater transient response as you would normally expect from a subwoofer in this category. Very much in line with DALI's philosophy in building speakers, the ability to start and stop very quickly enables easy integration with the front speakers.

Designed to be a closed cone you will find no dust cap. Instead it is an integrated part of the cone itself. This is also a contributing factor in ensuring a piston-like behaviour. Consequently distortion is kept to an absolute minimum – especially in the low frequency area which is where the subwoofer operates.

The engine of the woofer is built around an 'oversized' ferrite magnet, and optimized for maximum flux within the voice coil gap. The reason is that it was crucial for the project team to reach a high B/L product to enable the SUB E-9 F to render the finer low frequency details of music, also at a higher sound pressure level. The measured B/L value of 14 N/Ampere is a good indication of the level of control and precision that was reached, and rarely to be found in this category at all. And the numerous listening sessions has truly convinced us that this was the right way to go.

One of the inherent abilities of pure aluminium is an extreme rigidity, measuring a Young's modulus of 69 GPa. In comparison the typical paper cone material measures 4 GPa.





The woofer for the SUB E-9 F was developed from scratch by DALI's acoustic engineers.

The voice coil is 26.5 mm long, and built for long excursions. It is vented to ensure aircooling to the system, and the coil itself. Venting this 4-layer voice coil keeps the temperature down, and the benefit is a stable impedance response.

Also the pole piece is vented for maximum cooling. Here the venting has another purpose too; it reduces internal compression in the motor system. This ensures free movement of the cone without any over-/underpressure affecting the performance.

Adhering to the low-loss sound design principle, the surround of the woofer is built to allow long and linear excursion. The oversized suspension is designed to allow both weak and strong transients to turn into undistorted acoustic signals.

Shadow Black

Mountain Grey



AMPLIFIER



The high-efficiency amplifier needs no external heat sink.

The integrated 170 Watt RMS Class D amplifier is a highly linear construction. The DALI SUB E-9 F will follow and render the required signal with an absolute minimum of bias. Designed not only for continuous power, but also for peak power, this subwoofer is able to deliver 220 Watt Peak Power. This is very relevant when it comes to both movie and music signals.

Switchmode power supply is part of the reason for very low power consumption - only 0.4 Watt in stand-by mode. And the amplifier displays an impressive efficiency of 70%. In unison the

high-efficiency amplifier section and power supply construction generate an absolute minimum of heat loss. For that reason you will find no external heat sink on this subwoofer.

To improve sound reproduction in general, and to ensure that this subwoofer is able to perform under difficult circumstances, a limiter has been incorporated in the amplifier section.

The integrated limiter works in two areas: It compares the input signal amplitude to the potential output signal

level, and it compares the available supply voltage from the power supply to the expected output signal. If any of these comparisons show that there will be a problem then the limiter will cut the signal in a soft manner and without affecting peak power.

Fitted with controls for gain, cut-off frequency, and phase, the DALI SUB E-9 F will adapt to any front speaker and room acoustics. And with a choice of LFE and LINE inputs it can be connected to almost any amplifier, receiver or processor.

APPLICATION



Placing a subwoofer is a very large part of creating the perfect audio reproduction. DALI recommends placing the SUB E-9 F in a corner or if that is not possible alongside a wall. This will maximise the bass output and the distribution around the room.

The compact size of the SUB E-9 F makes placing it correctly much easier than many larger subwoofers. Its stylish Satin Black front baffle and aluminium woofer give the SUB E-9 F lots of personality and at the same time manages to underline the elegant look of the subwoofer. An optional front grille can be mounted over the woofer. The front grille is held in place by concealed magnets. With the grille fitted the subwoofer discreetly blends into most domestic environments.

Available in Satin Black and Satin White finishes, the SUB E-9 F is the natural companion for many DALI speakers.

Importantly; the design, technology, and construction of this subwoofer makes it a perfect upgrade of a speaker system of another brand. Whether it's a 2.1-, 5.1- or 7.2-channel system – or something in between – the DALI SUB E-9 F will take natural sound one step further.

TECHNICAL SPECIFICATIONS

Technical Specifications	DALI SUB E-9 F
Frequency Range [+/- 3] dB [Hz]	37 - 200
Input Impedance [kohm]	25
Maximum SPL [dB]	111
Crossover Frequencies [Hz]	40 - 120
Low Frequency Driver(s)	1 x 9" long stroke
Enclosure Type	Bass reflex
Bass Reflex Tuning Frequency [Hz]	39.0
Connection Input(s)	RCA, Stereo (low-pass filtered) LFE (Mono)
Recommended Placement	Floor, near wall or corner
Magnetic Shielding	No
Max. Amplifier Power Output [RMS Watts]	220
Continous IEC Power Output [RMS Watts]	170
Max. Power Consumption [Watts]	250
Dimensions (H x W x D) [mm]	307 x 287 x 310
Dimensions (H x W x D) [inches]	12.1 x 11.3 x 12.2
Weight [kg/lb]	11/24.25