



Daimler AG, TECFABRIK, Sindelfingen

Multi-Channel DSP Architecture.

Based on the enormous computing power of our hd MultiDSP, a new multi-channel DSP architecture has been developed that meets the high demands of beamforming algorithms. Each of the up to 32 output channels as well as user channel features a 384 Taps FIR filter and 16x IIR filters in double precision. The all-new hd BeamDSP performs over 300 million instructions per second to meet real-time criteria and provide enough freedom to shape the sound as needed.

Powerful Amplifiers.

Each loudspeaker chassis is equipped with a DSP channel and a digitally interfaced and microprocessor controlled state-of-the-art Class-D amplifier. This guarantees best SNR for all gain settings and the possibility to surveil the impedance of each chassis and report its status in case of any fault. Each amplifier channel can deliver up to 75 watts into 4 Ω loads, delivering uncompromising audio with premium dynamics and headroom.

Harmonic Design® Beamforming Key Features

- 2In/32Out High-End hd BeamDSP
- redundant input selection fallback algorithm
- analog + digital inputs with Dante®*
- AdvancedDirectivityOptimization algorithm
- 384 Taps FIR-Filter each Input/Output
- 16x IIR-Filter (double precision) each Input/Output
- modular equipping in segments of 8
- 75W Class-D amplifiers with digital input for best SNR
- ImpedanceControl with fault detection
- multistage Limiter-Architecture (Peak/RMS/Thermal)
- hd LevelZ Remote Software via USB
- standard colors: black RAL 9005 & white RAL 9010

Applications

- airports
- stations
- churches
- lecture halls
- houses of worship
- museums
- conference rooms
- hotels
- sport arenas
- A/V installations
- live events
- mobile use

*Dante® optional

hd Beam-Series
Beamforming Stick

Key Features

- shielded fullrange chassis
- standard colors: RAL 9005 & RAL 9010
- smallest footprint starting at 80 mm width
- perfect sound & excellent dynamics
- wide horizontal coverage
- superb speech intelligibility
- best integration into room architecture
- HiFi-Sound

Options

RAL color, custom size, various mounting solutions: tilt & swivel adaptor, L-brackets

suggested Subwoofer

hd Slim265, hd Sub-Series, hd P-Series



Model	Transducers	max. Beam Count	Amplifier	SPLmax	Freq. Range (-6dB)	Connections	Weight	Dimensions W x H x D (mm)
ML8Beam	8x 2"	1	8x 75W	119 dB	160 Hz - 20 kHz	Phoenix 3-pole Mains Phoenix 6-pole Input Dante® Ethernet* USB	5 kg	80 x 1103 x 78
ML16Beam	16x 2"	2	16x 75W	123 dB	140 Hz - 20 kHz		8 kg	80 x 1780 x 78
ML24Beam	24x 2"	3	24x 75W	125 dB	110 Hz - 20 kHz		12 kg	80 x 2413 x 78
ML32Beam	32x 2"	4	32x 75W	127 dB	90 Hz - 20 kHz		16 kg	80 x 2998 x 78
PL8Beam	8x 3"	1	8x 75W	123 dB	130 Hz - 20 kHz		10 kg	108 x 1118 x 104
PL16Beam	16x 3"	2	16x 75W	126 dB	110 Hz - 20 kHz		18 kg	108 x 1763 x 104
PL24Beam	24x 3"	3	24x 75W	127 dB	90 Hz - 20 kHz		23 kg	108 x 2541 x 104
PL32Beam	32x 3"	4	32x 75W	129 dB	70 Hz - 20 kHz		29 kg	108 x 3189 x 104

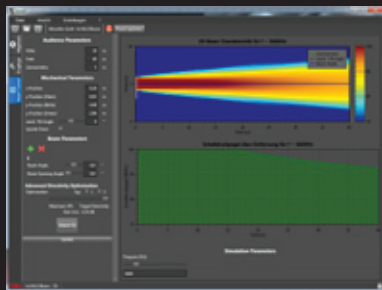
*optional

Shape your Sound

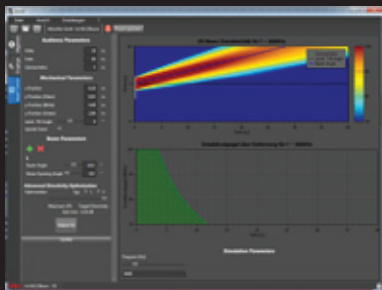
BeamControlParameters

Beam Steering.

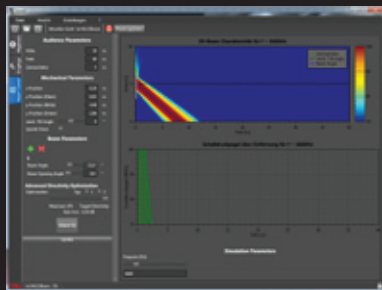
Beam steering is the basic discipline of beam forming where the main lobe is digitally steered up- or downwards. Harmonic Design® Beamforming loudspeakers are capable to adjust the vertically main lobe beam angle up to $\pm 60^\circ$ with an accuracy of $0.1^\circ/\text{step}$.



main beam @ 0°



main beam @ $+10^\circ$

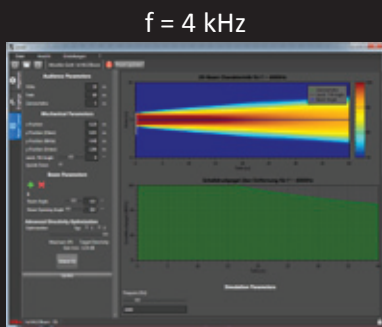
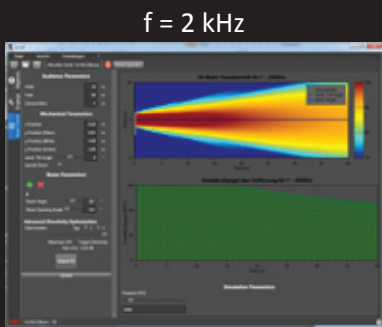
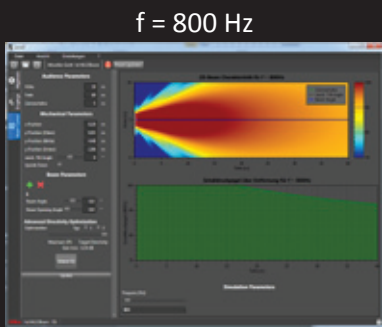


main beam @ -32°

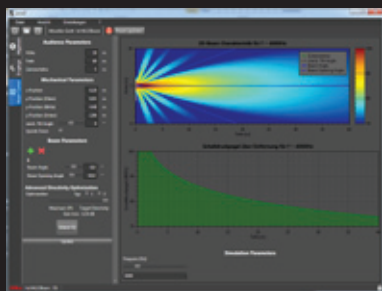
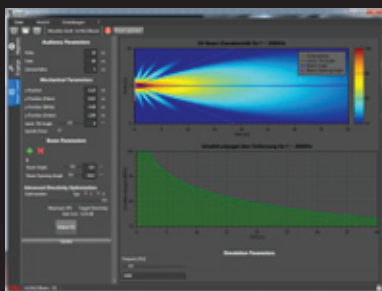
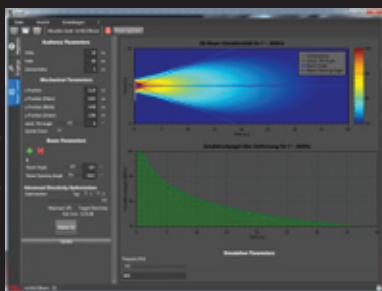
Frequency Independent Opening Angle.

Conventional loudspeaker arrays increase their directivity with increasing frequency resulting in a wide main lobe at low frequencies and a narrow main lobe at high frequencies. A frequency independent opening angle preserves the same opening angle over a great bandwidth within physical limitations and is adjustable from minimum to 90° in 0.1° steps. This guarantees perfect concentration of sound where it belongs and where not.

conventional main beam

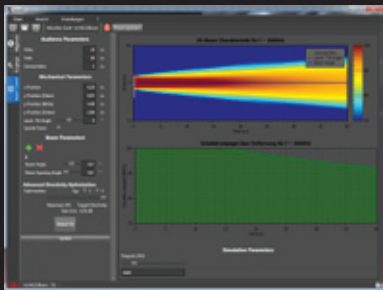


frequency independent opening angle $\theta = 30^\circ$

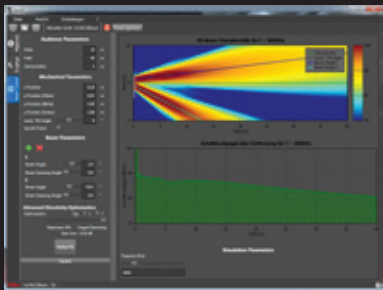


Multiple Beams.

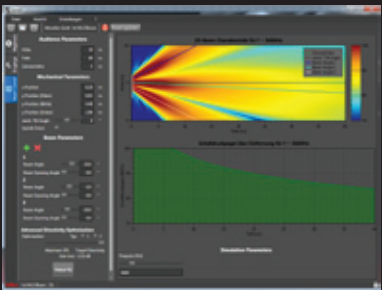
The unique Harmonic Design® Algorithm enables up to 4 separate main beams that can be steered individually and still create a specific frequency independent opening angle.



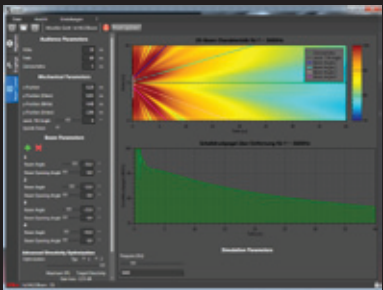
main beam @ 0°



2 beams @ $+5^\circ | -20^\circ$



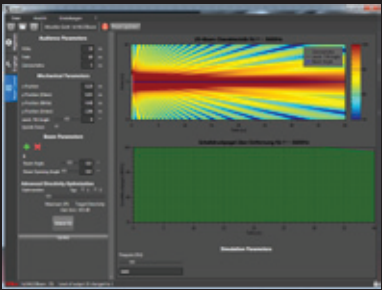
3 beams @ $+20^\circ | -2^\circ | -20^\circ$



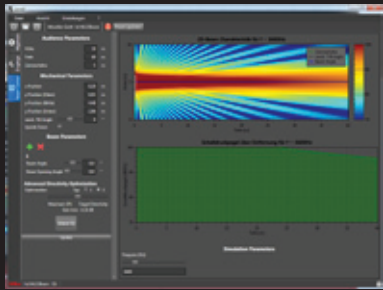
4 beams @ $35^\circ | +12^\circ | -12^\circ | -35^\circ$

Advanced Directivity Optimization.

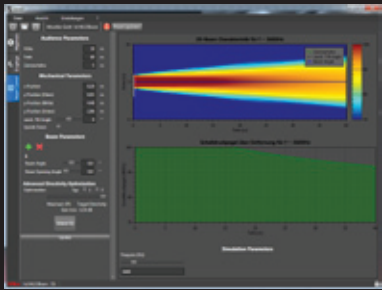
The conventional beam radiation pattern also contains unwanted side lobes that excite the auditorium with disturbing noise while declining the speech intelligibility. By applying special algorithms to the individual DSP channels, an almost optimum, light-beam-like main lobe beam is achievable with an accurate side lobe suppression. The enhancements to improve speech intelligibility in reverberant rooms by applying ADO algorithm are extreme. The strength of the optimization tool may be adjusted by the end-user either towards maximum SPL or optimum target directivity.



conventional beam pattern, ADO off



intermediate ADO



maximum ADO

Focus.

By default the focus point of the wave fronts of the individual loudspeakers is infinity and creates parallel running pressure waves. At the distance infinity all wave fronts are perfectly correlated and coherent meaning they arrive at the same time with the same relative phase. Whenever this large throw is not necessary it may be useful to focus the wave fronts to the front rows in steps of 0.1m to tighten the „sweet spot“.