duntech

sovereign
2001

duntech sovereign 2001

"THE WORLD'S MOST ACCURATE LOUDSPEAKER"

A challenge – to pursue excellence

To claim a speaker to be the world's most accurate, technically and musically, is bound to invite challenges. That is why Duntech has fully documented the performance of its new Sovereign 2001 using one of the world's best equipped audio labs. Unlike most other speaker manufacturers, Duntech has chosen to share its measurements and to certify their accuracy by providing a warranty that the performance of each pair of Sovereign 2001s will equal or exceed all published specifications for a full, five years after purchase. We encourage all serious competitors to accept our challenge: to abandon the usual marketing hype in favour of honest specifications and accurately documented measurements of performance. The claim of some that measurements are incapable of predicting how a speaker sounds is pure myth; today's advanced measurement techniques are capable of fully characterising every audible property of loudspeaker reproduction. Of course, Duntech scientists and engineers also spend a good bit of time comparing their creations with live voices and musical instruments, to savour the harmony which exists between theory and practice and between objective measurements and subjective listening.

The important "Bottom Line" is that the Duntech Sovereign 2001 loudspeakers are capable of reproducing music with an overall accuracy and musicality unequalled by any other known loudspeaker, regardless of cost, size, or country of origin.

The quest for perfection

The design of the Sovereign 2001 is the culmination of extensive and costly technological research begun by Duntech in 1972 to discover what properties of sound are used by humans in determining "realism". This research program discovered and confirmed the following:

(1) The most important parameter for ensuring realism is, of course, a flat amplitude vs. frequency response. But it is important that this response be measured at a distance of 3 to 4 metres, on axis, in an anechoic environment, rather than the usual 1 metre. Almost as important is the ratio of the on-axis amplitude response to the total radiated power response. For a speaker to accurately mimic a live performance, its on-axis amplitude response must not vary more than +/−2 dB over the audio spectrum. The "total-power-response" should show a slight rise at lower frequencies.

(2) Flat phase vs. frequency is almost as important as flat amplitude vs. frequency. This requires that all drivers be "path-aligned" and that the cross-over network be of the minimum-phase type.

(3) Angular dispersion, especially horizontally, must simulate (on average) that of most musical instruments and the human voice, if the reproduced sound is not to be heard as either dull or bright. In other words, perceived spectral balance is very much dependent upon angular dispersion (beamwidth), the smoothness of the off-axis response, and the symmetry of the radiation patterns.

(4) Truly accurate reproduction requires that the loudspeaker exhibit "point-source" radiation, that is, sound at all frequencies must appear to emanate from a single point in space whose height above the floor is about equal to the height of the listener's ears.

(5) A wide dynamic range, without audible distortion, is extremely important to the accurate reproduction of most musical instruments, especially brass and percussion types.

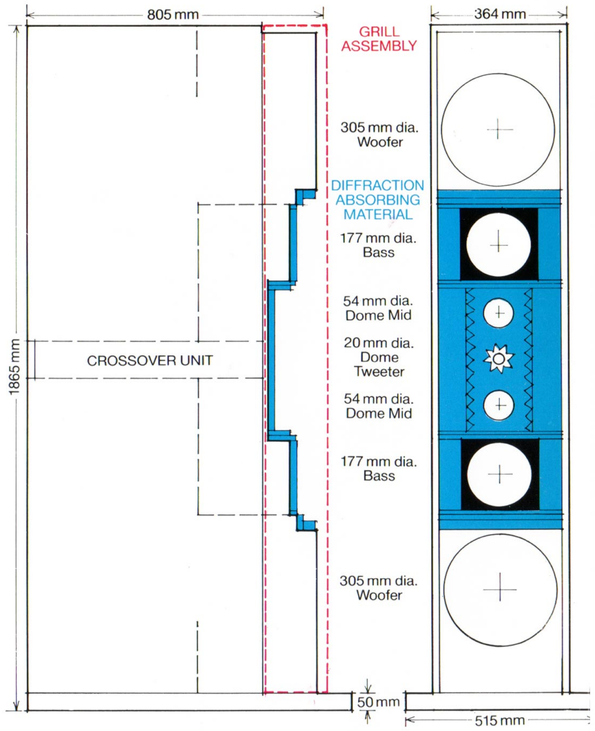
(6) The response of a speaker to a "step-function" signal (analogous to a battery turned on by a switch), measured at a distance of 3 to 4 metres (normal listening distance), correlates very well with how realistic it sounds compared to live music.

(7) Diffraction distortion, that is, distortion due to sound diffracted off enclosure edges, etc., produces a very audible deterioration in the reproduction of musical transients.

(8) The response of the loudspeaker to short pulses and tone-bursts should reveal little or no ringing, overshoot, or waveform distortion.

(9) The walls of the speaker enclosure should be stiff and non-resonant. They should contribute no sound of their own if uncoloured reproduction is to be attained.

(10) The quality of the inductors, capacitors, and resistors in the cross-over network and the type of wire used for interconnecting the drivers is important to achieving very low levels of distortion and the best possible definition of subtle musical transients.



SPECIFICATIONS[1]

A. ELECTRICAL

Frequency Response: 27 Hz to 20 KHz, +/−2 dB (measured on axis at a distance of 3.5 metres).
Phase Response: Relative phase varies less than about +/−30 degrees from 50 Hz to 20 KHz. (Measured on axis at a distance of 3.5 metres).
Impedance: Nominal 4 ohms (varies from a min. of 3.0 ohms to about 4.5 ohms, except for impedance at bass resonance which rises to approximately 7.5 ohms).
Efficiency: 90 dB SPL referenced to 1 metre on axis is achieved with an input voltage of 2.83 volts, RMS (1 watt at 8 ohms).
System Bass Resonance: Approx. 27 Hz (See plot of impedance below).
Low Frequency Q and Damping: System is critically damped and exhibits an "ideal" low-end roll-off of approx. 12 dB/octave below resonance.
Pulse Coherency Factor: All drivers are collimated to obtain a differential propagation (path distance) error of less than about 20 uS at a distance of 3 to 4 metres along the geometric axis of the speaker.
Harmonic Distortion: Less than 0.3% THD at frequencies above about 50 Hz for an SPL of 90 dB (re: 1m, on axis). Max. THD is about 1.5% at 30 Hz for same conditions.
Diffraction Distortion: Loss of fidelity due to sound energy diffracted from the edges of the enclosure is virtually eliminated by the use of efficient acoustical absorbing material surrounding the drivers.[2]
Cross-over Frequencies: Approximately 300 Hz, 2 KHz, and 6 KHz.
Cross-over Design: Minimum-phase type using Polypropylene caps and Hi-Q, Air-core inductors.
Drivers: Two 305 mm dia. woofer drivers; Two 177 mm dia. bass drivers; Two 54 mm dome mid-range drivers; and One 20 mm dia. tweeter.
Power Rating: All drivers are rated at 1 kW for 10 m.Sec.
Recommended Amplifier Power: Approx. 100 Watts minimum (for maximum enjoyment).

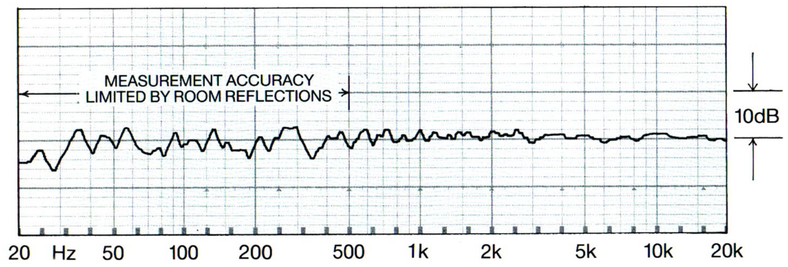
B. MECHANICAL

Size: 1865 mm (74 in) high; 364 mm (14 in) wide; 805 mm (32 in) deep.
Weight: Approx. 170 kilos (375 lbs.), each
Material: Enclosure walls are approx. 38 mm (1½ in.) thick, fabricated of laminated, high-density "custom-wood" and high-density particle-board, designed to reduce resonances and vibration to a minimum. The inside surfaces of the woofer chambers are reinforced with angle-iron to achieve further stiffness.
Finish: Selected, matched, hand-rubbed, natural wood-veneers. Standard woods are Walnut, Rosewood, and Sapele (a beautiful, light, hardwood, native to Australia).

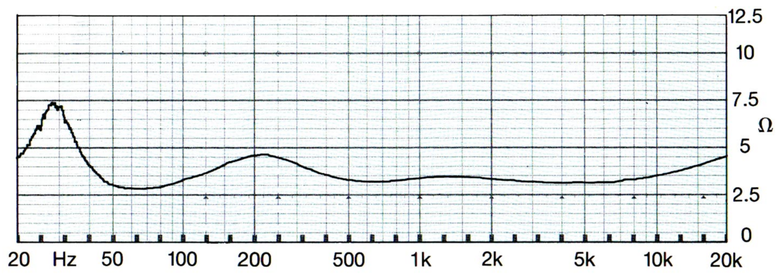
[1]See documentation of Performance.
[2]Protected by U.S. Patent #4,167,985, issued to Duntech on 18 September 1979.

KEY ENCLOSURE FEATURES

(1) Symmetrical arrangement of drivers creates a point-source of radiation at all frequencies, along with perfectly symmetrical radiation patterns.
(2) Use of highly-absorbent organic-felt surrounding bass, mid, and tweeter drivers virtually eliminates diffraction distortion.
(3) All drivers are path-aligned (time-collimated) at a distance of 4 metres (typical listening distance) to ensure precise reproduction of complex musical transients.
(4) A narrow-width enclosure increases angular dispersion of sound horizontally, resulting in better off-axis response, much improved stereo imaging, and a "sound stage" that extends well beyond the speaker boundaries.
(5) Enclosure walls, fabricated of high-density wood laminates, are approximately 38 mm thick, with angle iron bracing to reduce "wall-resonances" and vibrations to an inaudible level.
(6) Separate, sealed enclosures for each of the woofer and bass drivers are filled with special acoustical foam to achieve optimum damping and a Q of 0.7.
(7) A welded, aluminium grill-frame (with acoustical absorbing material lining internal reflecting surfaces) supports a beautiful, black, acoustically-transparent grill cloth.



AMPLITUDE RESPONSE Vs. FREQUENCY
measured at a distance of 3.5 metres.



IMPEDANCE Vs. FREQUENCY

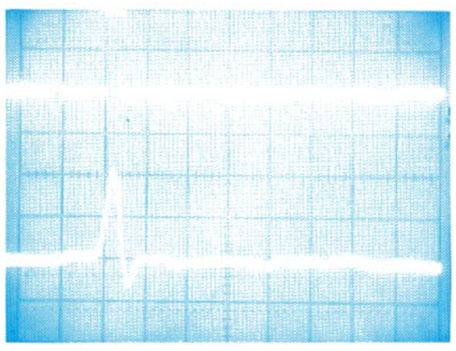
A technologically superior design

Integrating all of the foregoing criteria into a practical loudspeaker design was an arduous and demanding technological task. But the result was more than worth the effort — a speaker which exhibits nearly "textbook" performance. A level of performance which truly approaches perfection and permits, for the first time, the recreation of music with such stunning realism that even experts have been unable to discern between live and recorded instruments during demonstrations.

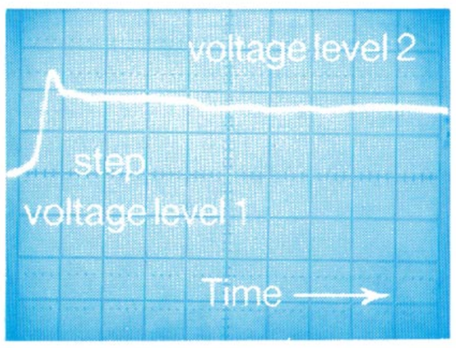
In appearance, the Sovereign 2001 exemplifies true elegance, derived from clean, simple lines, beautiful proportions, and the use of only the best natural wood veneers, hand-rubbed to a faultless finish. Even the grill-cloth is an attractive, specially made, double-knit polyester jersey which is acoustically transparent at even the highest frequencies, where other materials begin to show undesirable characteristics.

sovereign 2001

PULSE AND STEP-FUNCTION

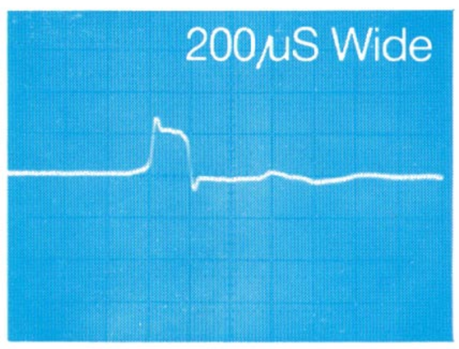


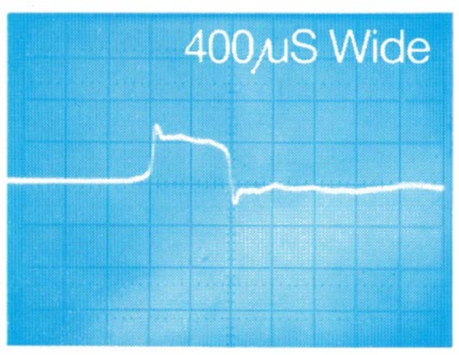
Response to a 20μS wide pulse with a repetition rate of approx. 400/sec.

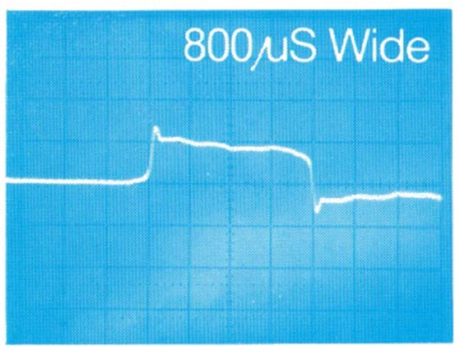


Response to a step-function. (Abrupt change in level of a D.C. signal from 0 volts to approx. +1 volt.)

RESPONSE TO A RECTANGULAR PULSE

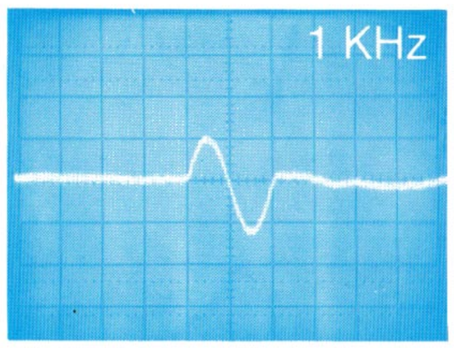


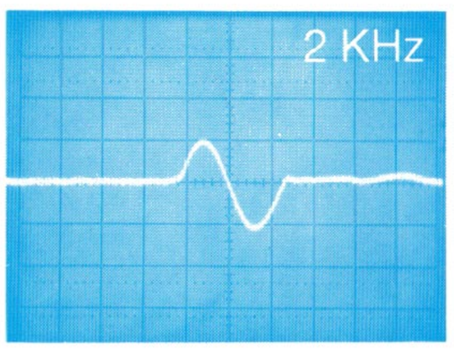


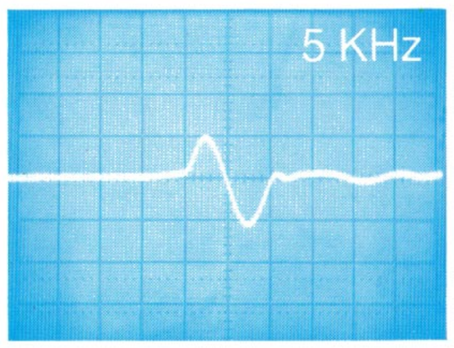


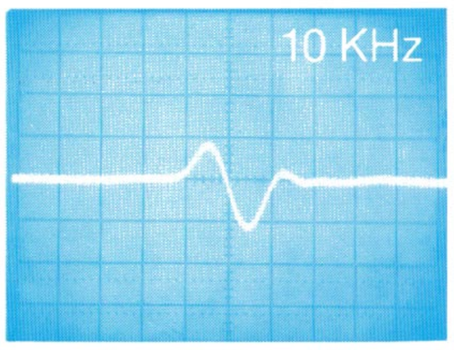
SINGLE-CYCLE TONE BURST

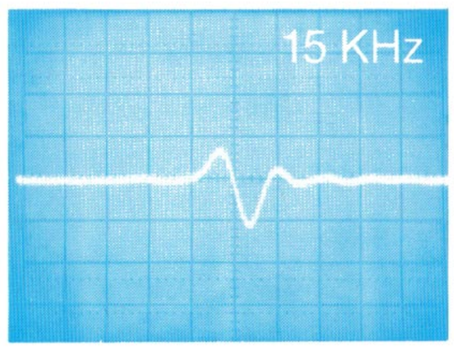
measured at a distance of 3 m. on axis.







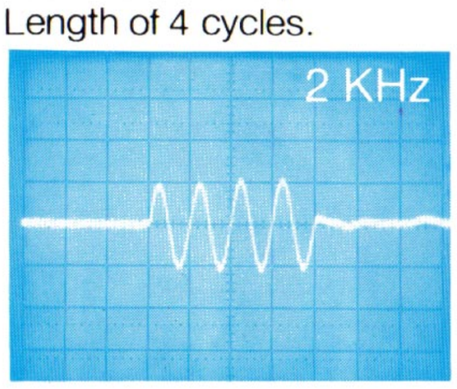


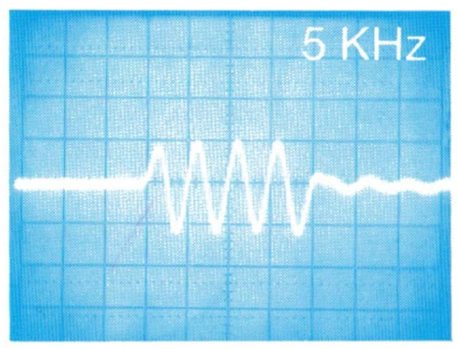


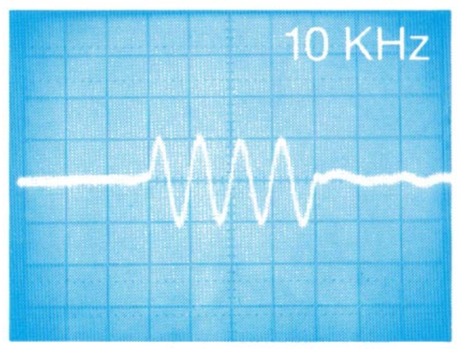
REPRODUCTION OF MULTI-CYCLE TONE BURSTS

(Note the nearly full "start-up" on 1st half-cycle and the near absence of any ringing at end of burst. Most of the energy after the end of the burst is due to room reflections.)

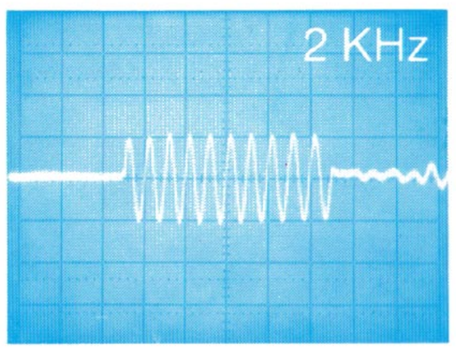
Length of 4 cycles.

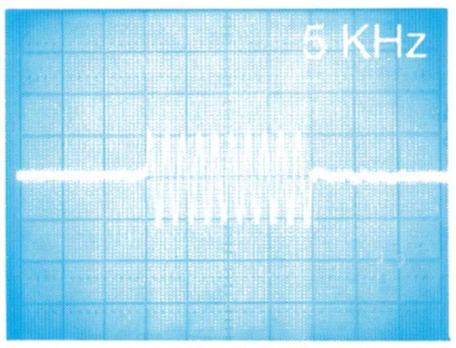


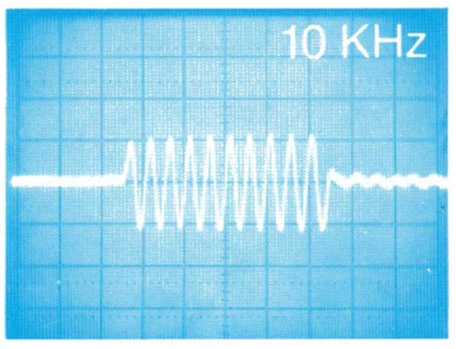




Length of 10 cycles.

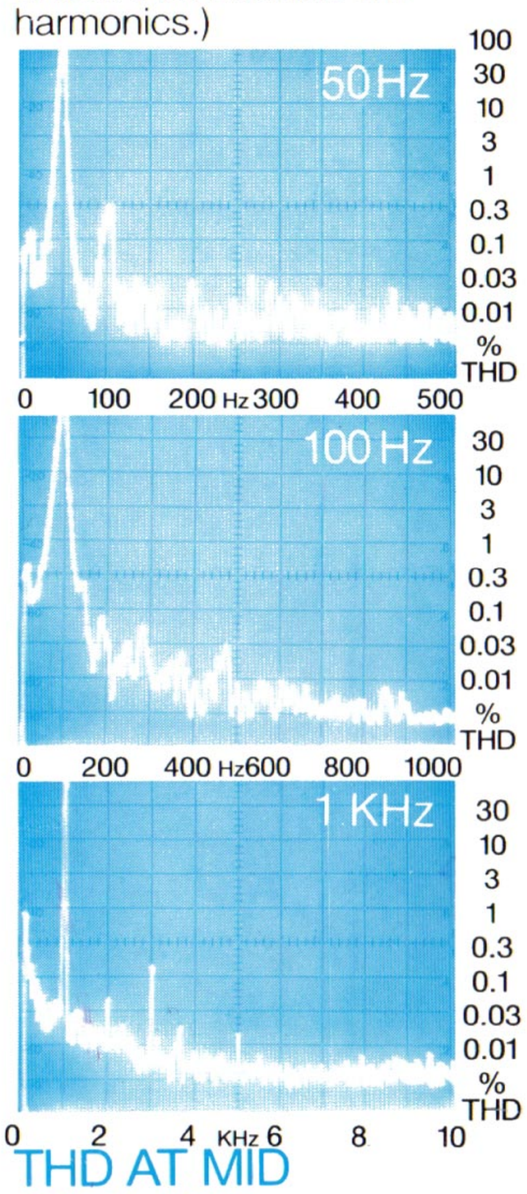




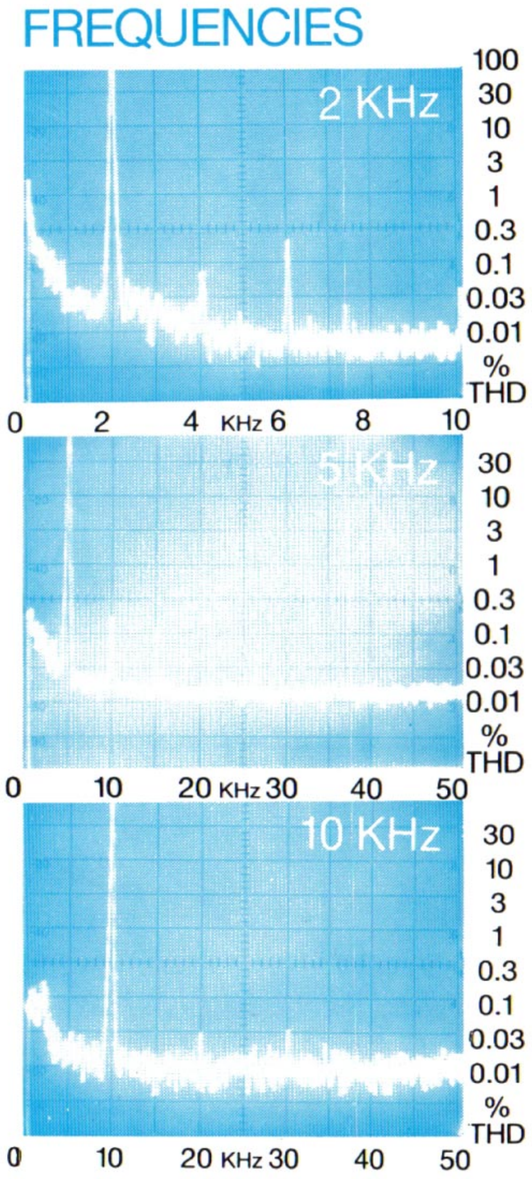


THD AT LOW AND MID FREQUENCIES

Harmonic distortion produced at a SPL of 90 dB (1 metre, on axis) (Note very low maximum of 0.3% for 2nd and 3rd harmonics.)



THD AT MID AND HIGH FREQUENCIES



duntech INTERNATIONAL PTY. LTD.

AUDIO STANDARDS CORPORATION DIVISION. P.O. BOX 421, SALISBURY, SOUTH AUSTRALIA 5108
PHONE: ISD (61) (8) 349 5188, STD (08) 349 5188 TELEX TPACOR 88556