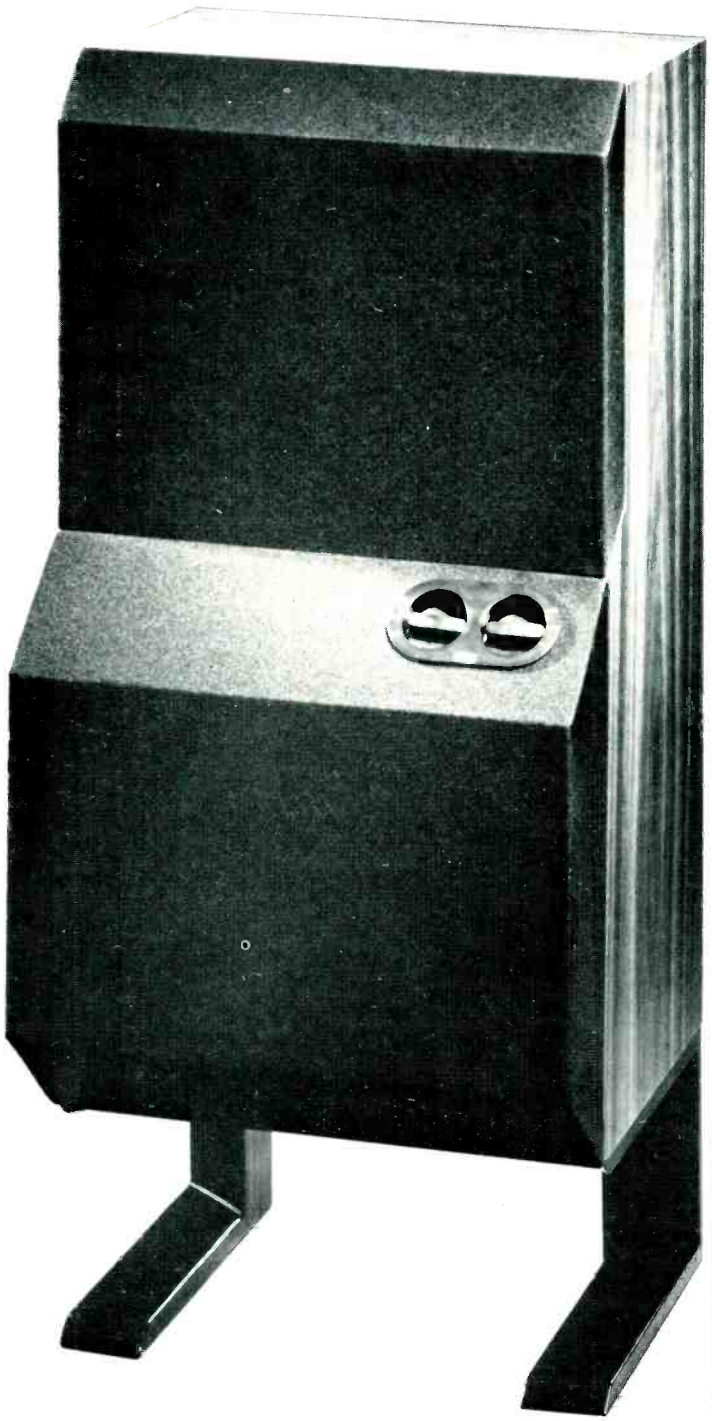
B & W DM-6 Speaker System



MANUFACTURER'S SPECIFICATIONS

System Type: Linear phase dynamic.
Speaker Complement: 10 in. (25 cm) woofer; 6 in. (15 cm) midrange, and ¾ in. (2 cm) dome tweeter.
Crossover Frequencies: 500 Hz and 5 kHz.
Impedance: 8 ohms, nominal.
Dimensions: 36¾ in. (93.1 cm) H x 16½ in. (41 cm) W x 15 in. (38 cm) D.
Weight: 79½ lbs. (36.1 kg).
Price: $625.00, with limited five-year parts and labor warranty.

The DM-6, made by B & W Loudspeakers Ltd., West Sussex, England, is one of the newer breed of time delay equalized loudspeakers. The tweeter, midrange, and woofer are physically offset relative to each other in such a way as to compensate for the differential time delay for the sound from each of them. The midrange speaker is mounted above the woofer and placed on a panel offset 84 mm behind the woofer panel. The tweeter is similarly placed above and 36 mm back from the plane of the midrange speaker.

A two-piece fabric covered metal grille protects the loudspeaker cones from damage. Some user assembly is required, as two metal feet are provided to raise each DM-6 system above floor level, and these must be attached by the use of the bolts and allen key which is supplied. The DM-6 uses sockets for electrical connection to the rear of the loudspeaker. Two 4-mm plugs are supplied with each unit, which are to be attached to the speaker wires by the user and then plugged into the DM-6.

When assembled, the DM-6 can readily be moved from one position to another by use of the smooth metal stands. However, I caution that these speakers should not be placed where there is moderate foot traffic which could cause them to be bumped or where toddlers may be tempted to push them over. The DM-6 is definitely top heavy and the diminutive feet do not, in my personal opinion, provide sufficient stability against tipping over when severely bumped.

When assembled, these speakers stand 93 cm (37 in) high, are 41 cm (16 in) wide, and 39 cm (15 in) deep. Finished in walnut with black trim, these speakers are quite attractive, although I must admit that standing rigidly at attention on their metal feet, with the pot belly protuberance caused by the woofer housing, I could not help but think of them as the 'droid R2D2 from "Star Wars."

Three equalizer controls are provided for adjustment of response level, each control having three switch positions. A *LF CONTOUR* control mounted on the rear tapers the response below 400 Hz. A *CONTOUR* control mounted on the front changes the signal level in the 500 Hz to 5 kHz band by about 2 dB per position. While a *HF ENERGY* control, also on the front, varies the frequency response by about the same amount above 5 kHz.

An excellent instruction book is supplied which can be easily followed for best setup by the user. In addition, each loudspeaker comes with a calibration certificate. This is an individual ink recording of the frequency response of that particular loudspeaker. Unfortunately, the response curve did not specify where the test microphone was placed, which dB scale was applicable, or whether third octave or continuous tone sound was used to generate the curve. A small point perhaps, but after all B & W did go to a lot of bother to use the highest quality B & K test equipment for that response curve. *[Editor's Note: We have been informed that the scale on the graph is in 2 dB increments. The microphone was placed at three meters, on axis, and aligned with the center of the listening window (approximately the tweeter). A third octave sound source was used to generate the curve.]*

Technical Measurements

There are 27 possible combinations of equalizer positions on the DM-6, each of which changes the terminal impedance by some small amount. Figure 1 is the magnitude of impedance for two of those positions, nominal equalizer settings and the settings giving the lowest impedance at 10 kHz. This latter condition occurred when both the contour and energy control were set to the plus position.

The lowest value of impedance within the audio band is around 4.5 ohms and occurs at 12 kHz. The polar impedance plot is shown in Fig. 2, which reveals that a lagging phase

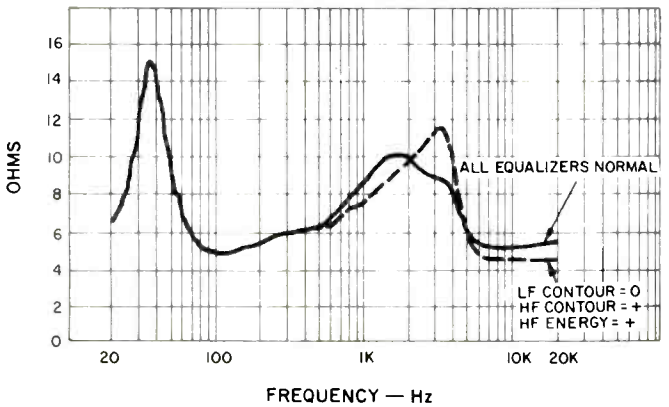


Fig. 1—Magnitude of impedance for nominal equalizer setting and also for worst-case amplifier load equalizer setting.

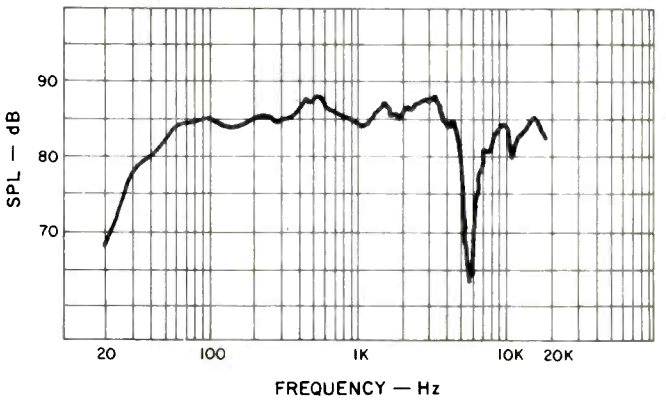


Fig. 3—One-meter-axial anechoic amplitude response for constant voltage drive corresponding to one-watt average power in a 4-ohm resistor, with equalizer settings at nominal.

angle of almost 45 degrees occurs at 4.5 kHz. I consider that this highly capacitive reactive load is a potentially more serious source of difficulty from the standpoint of amplifier distortion than the 4.5 ohm resistive load at higher frequencies. To minimize the possibility of amplifier distortion for strong sibilant peaks, such as might occur with female vocals, I recommend the use of a high-quality amplifier for the DM-6 with a peak power capability of at least 50 watts. *(Editor's Note: B&W notes that the current DM-6 no longer has the shelving-type tone control using a transformer and thus should not exhibit reactive loading of the amp.)*

The amplitude of the anechoic frequency response, measured axially at one meter and with one-watt average drive for a nominal 4 ohm load, is shown in Fig. 3. This curve is taken with all equalizer positions set to their indicated nominal conditions. Since this curve deviates in substantial detail from the measured frequency response supplied by B & W, the measurement came as quite a surprise. Extensive experimentation revealed the following observations: the dip at 5.8 kHz occurs for the one meter axial position and extensively changes its properties with microphone position, particularly elevation angle relative to the axial position. At an angular depression 5 degrees below this position, the dip moved to 5 kHz, while a 5 degree upward angular position removed the dip completely and gave a curve more nearly like that supplied by B & W. (Thus the perils of measurement.—*Ed.)* This higher elevation angle places the microphone more nearly in line with the tweeter. Other measurements, not presented here, show that the high frequency energy control provides a nominal 2 dB variation above and below the standard setting for frequencies above 5 kHz, as B & W states, with a similar verification of the 2 dB contour effect between 500 Hz and 5 kHz. *(Editor's Note: In subsequent conversation, B&W stated that their measurement position was at three meters on axis with the tweeter. This position and distance, they feel, are much more normal for a listening position, and the speaker was designed to provide optimum frequency and phase response at or immediately beyond three meters.)*

The phase response for the one meter axial position is shown in Fig. 4. Two curves are shown, one corrected for the time delay of components above 6 kHz and the other corrected for the time delay of components below 4 kHz. At this, the axial position, the tweeter sound arrives approximately 0.14 milliseconds after the midrange signal. The acoustic position of the tweeter lies approximately 4.5 cm behind that of the midrange driver for the one-meter axial position. Raising the microphone brings the two into closer time alignment,

Fig. 2—Polar plot of impedance for worst-case amplifier load at high frequencies.

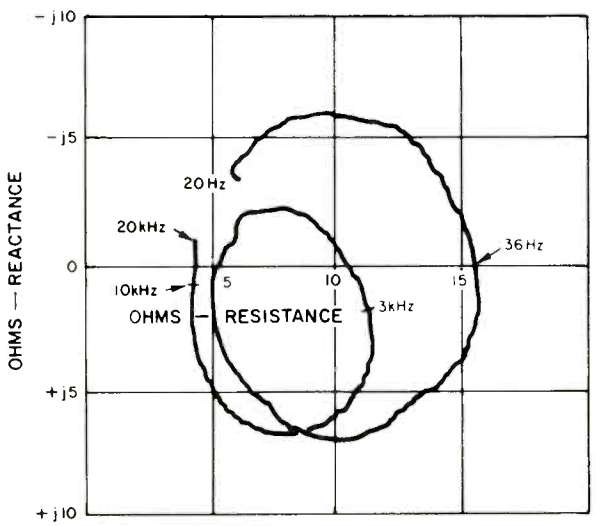
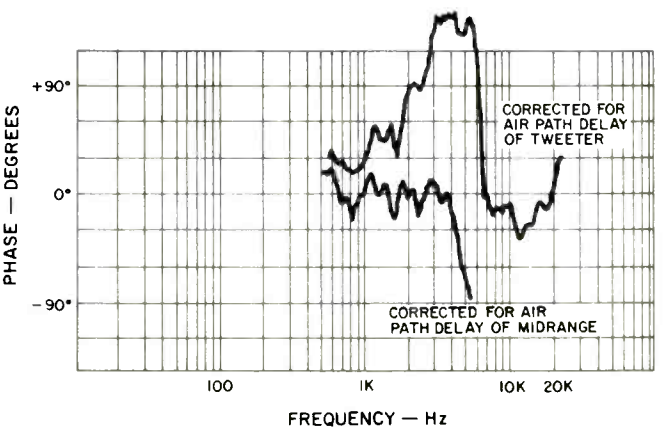


Fig. 4—One-meter-axial phase response corrected for air path delay of tweeter and midrange.



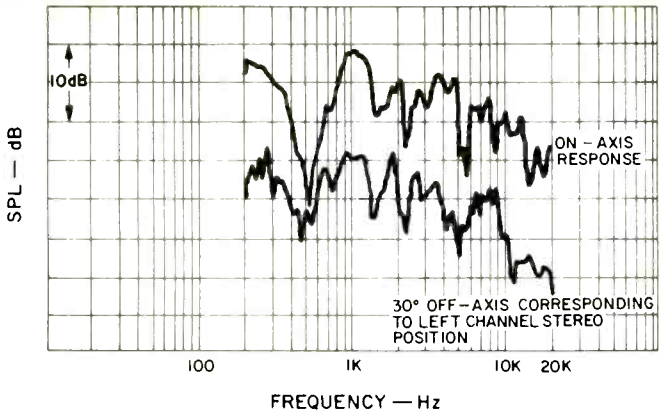


Fig. 5—Three-meter "room" response for the DM-6 braced against the back wall with all equalizers set to the nominal position.

which explains the response aberration at around 5 kHz. This means that a better transient response will be evident for the DM-6 if the location of the listener is elevated 5 to 10 degrees above the axial position.

The DM-6 tweeter has an outstanding frequency response. It goes out to over 35 kHz on axis, but the grille, while both attractive and supplying physical protection to the midrange and tweeter, is a source of internal multiple reflections which can color the response above 6 kHz in a way strongly dependent upon angular position. In the frequency response, this shows up as 3-dB ripples on an otherwise uniform characteristic. The most uniform response is obtained when the grille is removed entirely. The DM-6 is principally minimum phase throughout most of its frequency range.

The three-meter room response of the DM-6 is shown in Fig. 5 for a frontal position and 30-degree stereo-left-channel position. The responses are displaced 10 dB on this chart for clarity of presentation. The equalizer controls were all set to their nominal position for this test, and the speaker was placed against a wall as recommended in the instruction manual which comes with this speaker.

It is apparent that the room response of the DM-6 is not strongly dependent on the azimuth angle for direct sound. However, substantial floor and ceiling scatter of sound is evident in this measurement. Because of this, I recommend that the DM-6 not be placed on a hard floor. The average response drops slightly with increasing frequency, but the peaks and dips about this average are stronger than I would have liked to see on such an otherwise high-quality system.

The polar energy response for the three positions of high frequency energy equalizer are shown in Figs. 6 and 7. The azimuth response is quite uniform within the normal stereo angle ranges, and there is no left-right asymmetry to cause stereo concern. The vertical response is stronger at positive launch angles but does have indication of some slight vertical beaming. Because of the strong energy for vertical angles up to 45 degrees, the DM-6 should definitely not be placed immediately under projecting shelves or surfaces that can cause reflected sound to interfere with the more uniform direct sound.

Harmonic distortion for the tones of E_1 (41.2 Hz), A_2 (110 Hz), and A_4 (440 Hz) is shown in Fig. 8. The second harmonic distortion is stronger than the third harmonic distortion at almost all sound pressure levels, and the distortion rises in a uniform fashion with increasing drive. These properties, as well as the generally low value of distortion, are a sign of clean sound. The DM-6 does, however, have a problem handling very low bass at high sound levels, and care should be taken to prevent overdrive on strong low frequency signals. This speaker is not a window rattler and should not be driven as such.

This is also evident in the intermodulation distortion measurement shown in Fig. 9. In this case we are measuring the crossmodulation of A_4 (440 Hz) by E_1 (41.2 Hz) when both are mixed at equal level. Distortion is moderately low for power levels below 10 watts average, but rises rapidly above that power level. The nature of this crossmodulation is such that there is principally a phase modulation of the 440 Hz together with an average drop of sound level compared to what it would be without the low tone. At 100 watts average, this phase modulation amounts to about 3 degrees peak to peak in the 440-Hz tone. There is, in addition, a slight retardation of arrival time with increase in drive level.

The transfer characteristic of the DM-6 is such that there is a one-half dB drop of gain at 20 watts average power relative to the gain at 1 watt. There is a similar drop in gain with random noise, but the crescendo limit on this speaker is still

Fig. 6—Horizontal polar energy response.

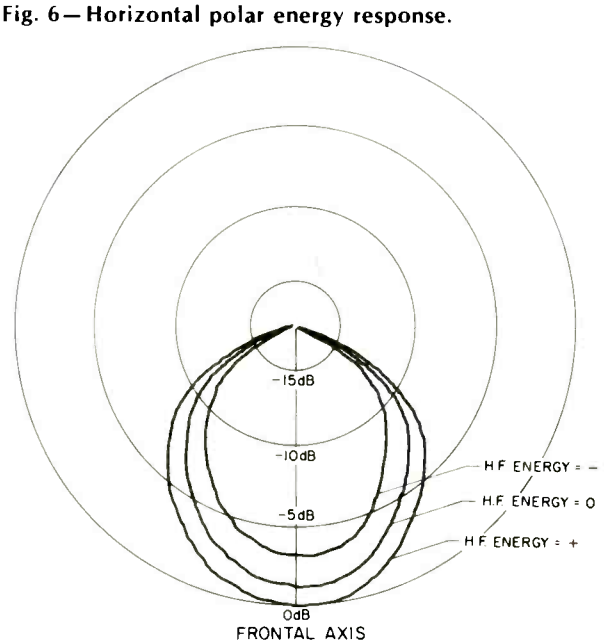
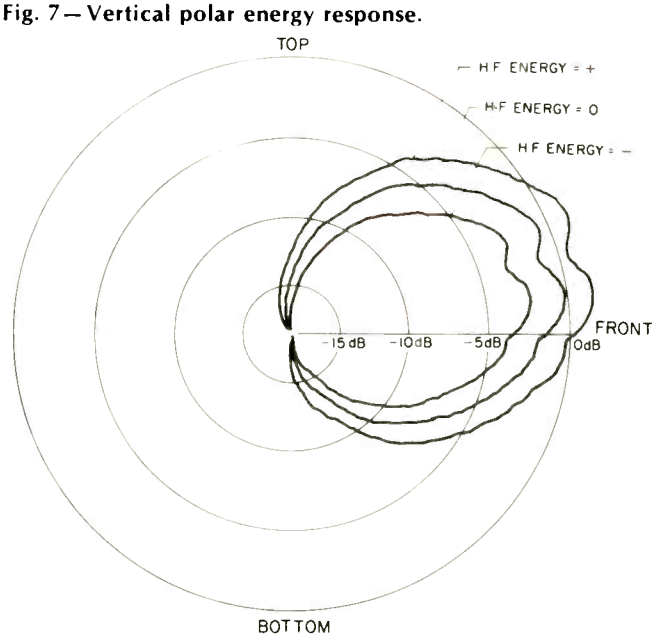


Fig. 7—Vertical polar energy response.



quite high at around 500 watts peak for momentary noise spikes. This measurement confirms the listening evaluation that there was some midrange ducking at high sound levels.

The energy-time curve of Fig. 10 shows that the impulse response has a few problems. These problems are principally related to the separation in arrival time of the midrange and tweeter sound, and to the internal reverberation from the grille in front of these drivers. This data is taken one meter axially. The first peak at 3.06 milliseconds is due to the midrange driver and the second peak at 3.2 milliseconds is due to the tweeter. Subsidiary peaks at 3.5, 3.9, 4.4, and 4.8 milliseconds are due to the grille. If the grille were removed the transient response would be much better. *(Editor's Note: B&W tells us that the current models have the following improvements: The baffle board has been changed into an irregular surface, and V-shaped foam has been added around the tweeter. The combination, says B&W, substantially reduces distortion at high levels due to standing waves between the front baffle board and the metal screen.)*

Listening Evaluation

The DM-6 was auditioned in several different room positions during the listening tests performed before the measurements. In my opinion, the best position for realism of the stereo illusion was obtained when the speakers were placed flat against a wall and facing directly outward. I did not find that there was any reasonable improvement to be obtained with these speakers angled either toward or away from the listening position. Of course, rooms and taste differ, so experimentation may be worthwhile for each individual setup.

In my opinion, the extreme low bass end of the spectrum is down in level in the DM-6. I preferred the balance obtained when the rear-mounted bass contour equilizer was set to its zero, or maximum, position; the contour control set to the plus position, and the *HF energy* control set to minus. These may be weird settings, but that is what I preferred for best subjective realism.

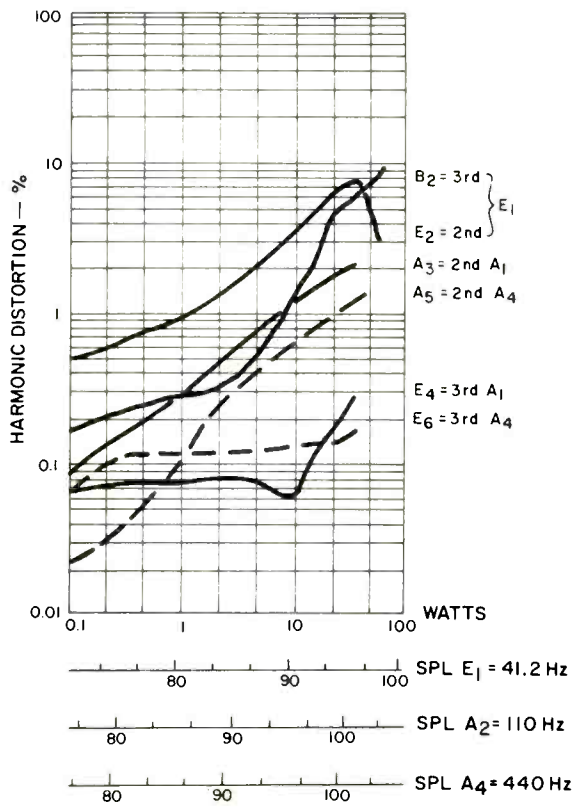


Fig. 8—Harmonic distortion for the tones E_1 (41.2 Hz), A_2 (110 Hz), and A_4 (440 Hz).

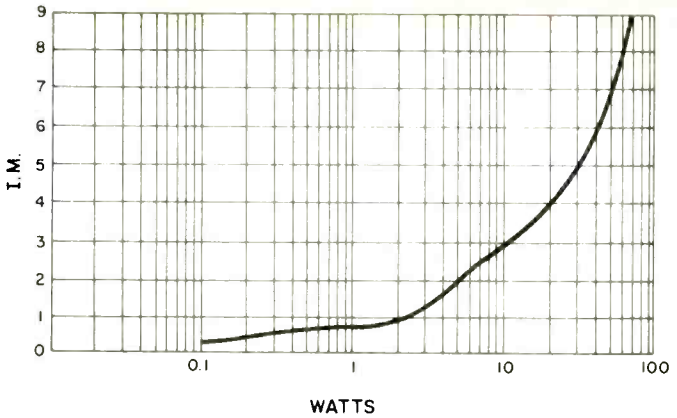
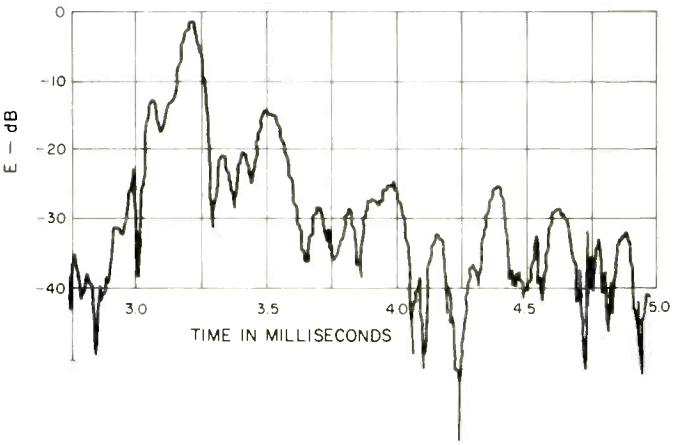


Fig. 9—Intermodulation distortion of A_4 (440 Hz) by E_1 (41.2 Hz), mixed one-to-one.

Fig. 10—Energy-time response.



The top end response was clean as far as discernible distortion at moderate levels, but had a crispness which indicated some mild response peaks in the highest register. At high sound levels I sensed some midrange ducking, or compression, and there was a form of distortion which sounded much like cone cry, or cone breakup. This occurred on the brightest transients of material such as the new Sheffield **King James Version** recording. Unless you like to break leases, I do not suspect you would subject the DM-6 to the levels where this becomes apparent.

Stereo imaging is extremely good for lateralization and moderately good for depth. Kick drum and pipe organ sound thin, to my ears, on the DM-6. Piano music is crisp but lacks a bit on the lower registers. Vocals sounded reasonably accurate, if a bit sibilant.

Since the DM-6 is one of the first speakers I have tested in which the tweeter, midrange, and woofer are physically offset to provide proper transient arrival time, I was considerably more critical in my evaluation of its transient capability. Generally, I felt there was an improvement in articulation of orchestral voices over several other speakers I have tested in this price range. But in honesty, I cannot say that my impressions might not be due to the fact I knew an attempt had been made to make it more accurate. In other words, it did not jump out at me as a "wow" impression. It was better, but just better. In sum, I think the DM-6 is a good sounding speaker.

Richard C. Heyser