Mackie HR824 Mk2

KEITH HOLLAND

THE MACKIE HR824 Mk2 is a 2-way active loudspeaker comprising a 222mm woofer and a 25mm titanium-domed tweeter. The drivers are mounted symmetrically on a cast aluminium baffle that incorporates a shallow horn-type waveguide for the tweeter and curved cabinet edges to smooth diffraction. Bass loading is achieved via a rear-mounted, 305mm x 152mm passive radiator, behind which the power amplifiers and crossover electronics are mounted on a frame external to the cabinet.

The cabinet has external dimensions of 279mm wide by 351mm deep by 425mm high and is finished with high-gloss piano black sides and top and a matt black baffle. Mackie claims power outputs of 150W and 100W for the woofer and tweeter amplifiers respectively, and a crossover frequency of 1.9kHz using modified Linkwitz-Riley 4th-order filters.

The rear panel carries an input sensitivity control, three frequency response adjustment switches and a power mode switch. The response adjustments are for acoustic space (whole, half and quarter), low-frequency roll-off (37Hz, 47Hz and 80Hz), and high frequency shelve from 10kHz upwards (-2dB, 0dB and +2dB). This review was conducted with these controls set to whole space, 37Hz roll-off and 0dB HF shelve. The power mode can be set to on, standby or auto on, where the loudspeaker switches on when it detects an input signal of greater than 45dBu. A front-mounted button switches between On and Standby when the mode switch is set to On.

The bottom of the rear panel is recessed to accommodate two balanced input sockets (XLR and TRS), one unbalanced input (phono) and a mains power input socket. The review model accepted only 120V mains input and was supplied with an external transformer for UK use. These loudspeakers are intended to be mounted vertically, in portrait orientation, but they can be mounted horizontally and the Mackie logo on the front can be rotated if so used.

Figure 1 shows the on-axis frequency response and harmonic distortion (at an output level of 90dB at 1m distance) for the HR824 Mk2. The response is commendably flat and is seen to lie within +/-3dB from 40Hz to 20kHz with a 6th-order low frequency roll-off reaching -10dB at around 30Hz. The response from 40Hz to 500Hz is particularly flat and smooth but there is some unevenness at higher frequencies. The harmonic distortion is generally low above about 80Hz but a penalty for having an extended low-frequency response is evident as a peak in 3rd harmonic distortion to 25dB (5·6%) at 38Hz.

The off-axis response in the horizontal and vertical planes can be seen in Figures 2a and 2b respectively. The horizontal dispersion is well controlled with a good match between the woofer and tweeter and the vertical dispersion is characterised by a cancellation dip at the crossover frequency due to the physical separation of the two drivers.

Figures 3 to 5 show the time domain response, in the form of the step response, acoustic source position and the power cepstrum respectively. The step response shows a fast rise and steady decay with the tweeter responding about 0.5ms before the woofer. The acoustic source position is seen to move to around 2m behind the loudspeaker at low frequencies. This is a commendable result considering the rapid low-frequency roll-off, and suggests that the response of this loudspeaker to low-frequency transient signals should be quite fast. The power cepstrum indicates that there is some

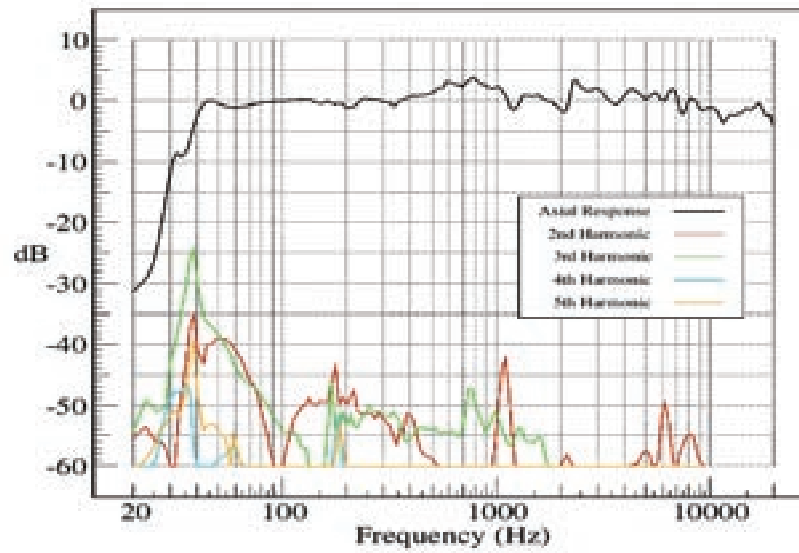
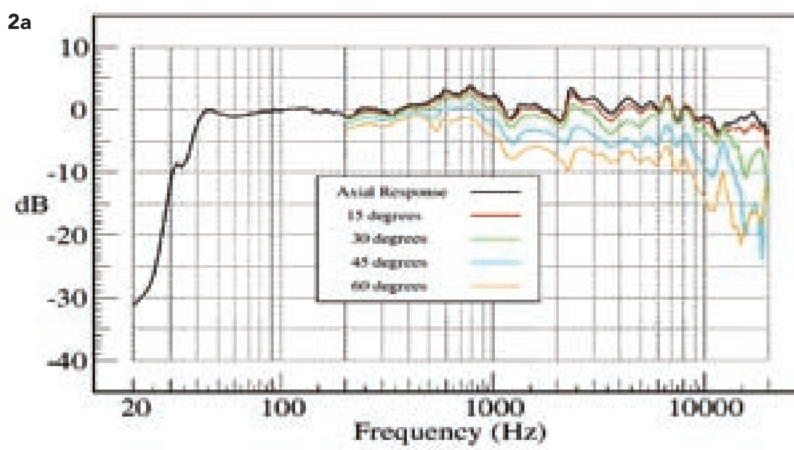


Figure 1. On-Axis Frequency Response and Harmonic Distortion. This shows the variation in output with frequency and the range of frequencies that the loudspeaker can effectively reproduce. Ideally, the response should be smooth and even with no dominant peaks or troughs. The harmonic distortion is measured at an output level of 90dB at a distance of 1m. 2nd, 3rd, 4th and 5th harmonics are shown and these should all be as low in level as possible. Levels below about -40dB relative to the fundamental (1%) are usually considered to be good.

2a



2b

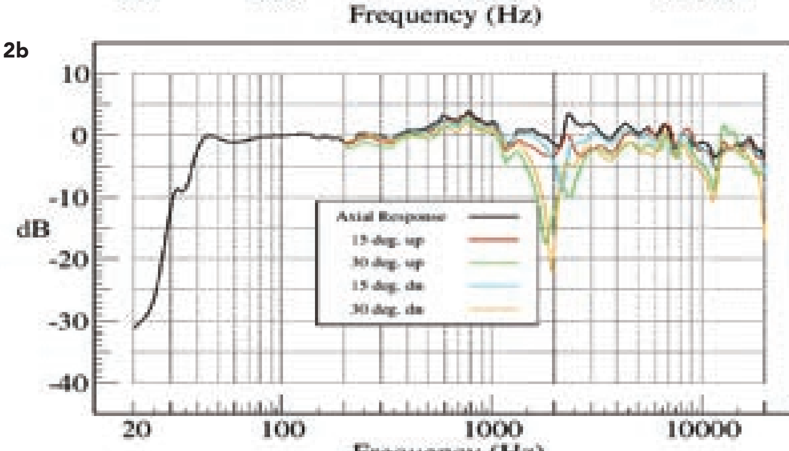
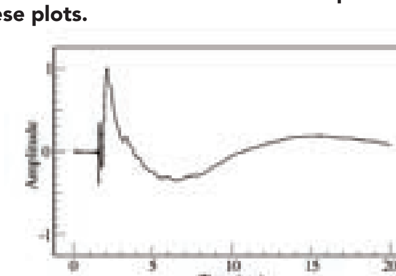


Figure 2a, 2b. Off-Axis Responses. These demonstrate the ability of the loudspeaker to radiate effectively at other angles other than on-axis. Problems such as excessive beaming, side lobes and interference between the outputs of separate drivers are highlighted by these plots.

Figure 3. Step Response. The response of the loudspeaker to an idealised transient input signal (a step). This shows the time alignment between drivers and other phase mis-match problems.



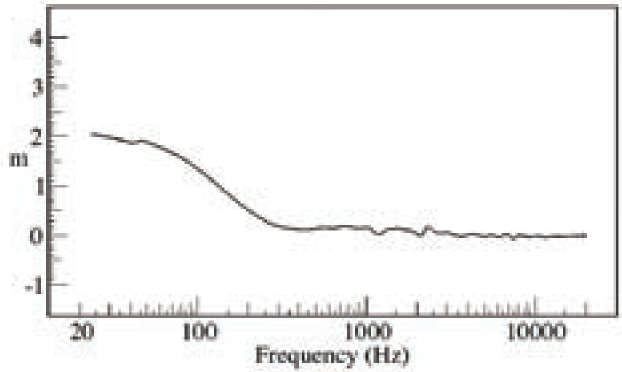


Figure 4. Acoustic Source Position. Due to the roll-off of output at low frequencies (or other phase effects), transient signals containing different frequencies will arrive at the listener at different times (usually later) — a phenomenon known as group delay. These delays are converted to an equivalent source position by taking account of the speed of sound. The closer the acoustic source position is to being the same at all frequencies the better the accuracy of the reproduction of transient signals.

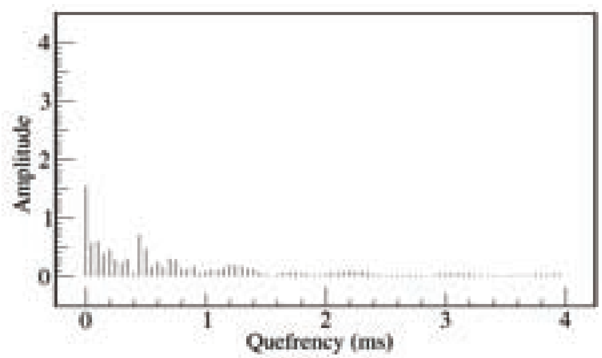


Figure 5. Power Cepstrum. A diagnostic Measure. Used to assist in finding the cause of frequency response unevenness. Distinct echoes and other reflections, such as diffraction from cabinet edges, show up as spikes in the power cepstrum.

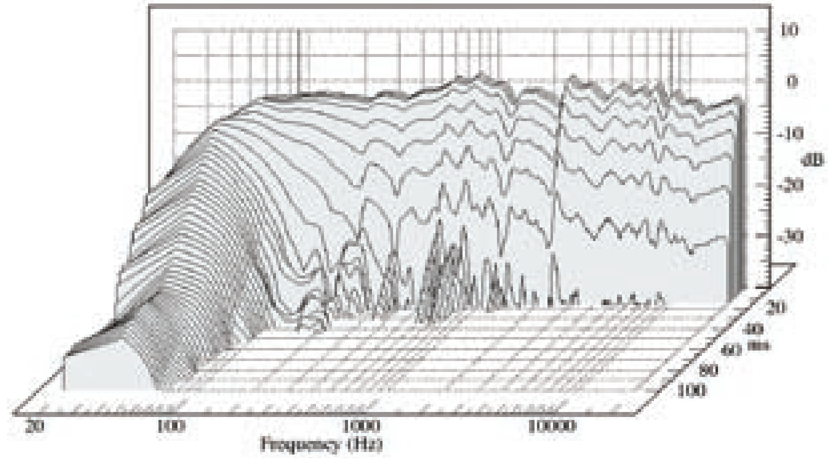


Figure 6. Waterfall Plot. A combined frequency response/time response plot. This shows the time taken for frequency components of the signal to decay to a low level when the signal is stopped. Resonances and some other phase-related problems show up as extended decay times. This is particularly revealing of low-frequency roll-off related ringing.

form of reflection or re-radiation of energy after about 0.5ms that probably gives rise to the slightly uneven mid- and high frequency response noted above. The fact that these response irregularities exist off- as well as on-axis suggests that they are probably driver or cabinet internal reflection effects rather than external diffraction.

Figure 6 shows the waterfall plot for the Mackie. The slow decay at low frequencies is characteristic of higher-order roll-offs, and suggests that some resonant overhang may be heard in very dead control rooms. There is some evidence of low-level resonant activity at around 600Hz and 700Hz but the response falls to -40dB within 40ms at all frequencies above 200Hz.

Overall, the Mackie HR824 Mk2 is a very good performer. The extended low-frequency response and accurate time response are commendable and are let down only by a slightly uneven mid- and high-frequency response. The provision of response tailoring controls should make this loudspeaker suitable for use in a wide variety of situations.