
Bowers & Wilkins

Carbon Braced Tweeter

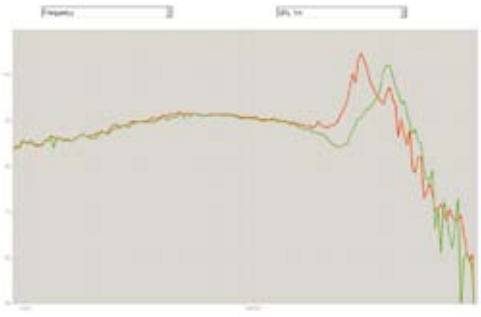
The audible benefits of stiff domes have been appreciated for many years, yet initially there was the belief that, providing the lowest dome break-up frequency was above the 20kHz upper limit of human hearing, it could not be heard. Subsequent work revealed that it was not enough simply to consider the central peak frequency of the resonance and that non-pistonic behaviour below that frequency, which might extend into the audible frequency range, could indeed be heard. Over the years, the first resonance frequency of our aluminium dome tweeters has been pushed up to 30kHz and this results in a high level of performance.

For the true audiophile, however, greater refinement is demanded and the development of the diamond dome, with its first resonance at 70kHz, brought a new level of performance. However, incorporating a diamond dome was outside the remit for this project and so an intermediate solution was sought that would raise the resonance frequency in a more cost-effective way.

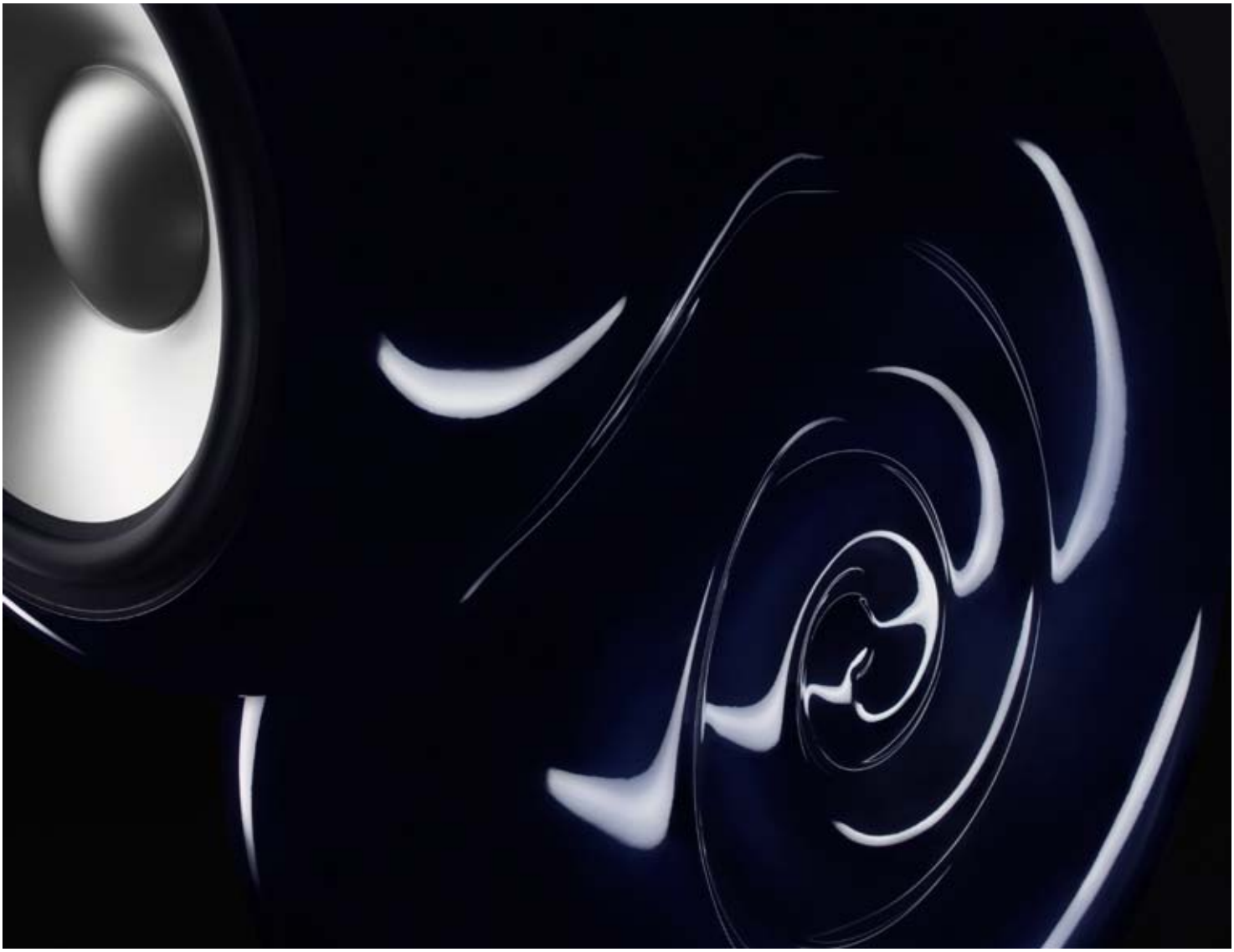
From a cursory glance, the tweeter looks no different from that used on the 805S. It uses the familiar aluminium dome. The same method of rear loading the unit with a tapering tube, so effective in dissipating the unwanted backward radiation is there, too. Even the gloss black housing looks the same, although in fact it is a slightly different shape to match the smaller cabinet. Only a more thorough examination of what lies behind the dome reveals the important difference.

Nautilus technology

It was found during the development of the original Nautilus speaker that a useful rise in the break-up frequency of an aluminium dome from 30kHz to 40kHz could be realised by using a carbon fibre ring to brace the voice coil bobbin and thus the whole dome and voice coil assembly. The method employed on Nautilus is to fit this ring at the front of the unit, in the cusp between the dome and surround. The process is delicate, tricky and time consuming and so a sub-project to adapt the concept to mass manufacture was embarked upon. In this unit, the bracing ring is out of sight behind the dome, close to its junction with the coil bobbin. The success of the work is embodied in the new tweeter and a comparison of performance is shown in the following graph:



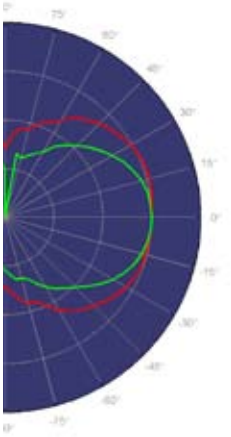
As with the diamond dome, the improvement in sound quality comes not from having a higher break-up frequency per se, but from the more coherent dome movement that results at audible frequencies below 20kHz.



New surround material

As with the 800 Series Diamond models, this drive unit uses a surround material that gives wider dispersion at higher frequencies than earlier units. This is illustrated in the 15kHz polar plot to the right where the 805S tweeter is in green and the PM1 tweeter in red.

However, as with the more expensive Series' diamond dome drivers, this wider dispersion brings with it lower on-axis sensitivity. The total energy is the same, but it is re-distributed in space. To avoid the overall sound becoming dim, this loss of sensitivity has to be recovered and the answer once again lies in providing more magnetic energy in the narrow gap where the voice coil sits. However, as the overall system sensitivity is somewhat lower than the smallest model in the 800 Series, only one extra magnet is required and this is placed on the back of the magnet assembly back plate and magnetised with opposite polarity to the main magnet.



Red: 805S tweeter
Green: PM1 tweeter

On axis response, of course, is only a part of what makes a good tweeter. As important is to imbue the unit with a wide dispersion and minimise the usual narrowing of this dispersion as the frequency increases. Doing this makes the harmonic structure of instruments and voices more consistent with the angle of listening and enables the listener to pinpoint the position of the performers with greater accuracy and stability.