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# DAN A DIGITAL

## (ACT:EVE) 108:dB ACTIVE LOUDSPEAKERS



**D**an A Digital is a relatively new company on the Australian scene. Originally created exclusively to manufacture active loudspeakers, it has since branched out and now creates a range of products, including active and passive pre-amplifiers, buffer amplifiers and vibration isolation platforms called [iso:form]s. A range of cables is waiting in the wings. Although this review is of the [act:eve] 108:dB, there are five other speakers in the range, the 110:dB, 112:dB, 114:dB, 120:dB and 130:dB.

### THE EQUIPMENT

As you've probably already guessed, the three valves poking through the top of the 108:dB are not there for show. The [act:eve] 108:dB is not just an active loudspeaker system that does not require external amplifiers, it's a *valve-based* active loudspeaker. The par-

ticular type of amplifier involved is a pure Class-A triode type, rated at 40-watts continuous. (The use of Class-A mode is significant. Almost all solid-state amplifiers operate in Class-AB mode, where the audio signal is 'shared' between two or more output devices. The problem with this is that distortion is introduced every time the audio signal switches from one device to the other. In a pure Class-A design, a single device—it can be a valve or a semiconductor—handles the entire audio signal.)

This Class-A triode amplifier drives only the single, forward-firing midrange driver, which has a mineral-filled polypropylene cone with a rated diameter of 114mm. In fact, the cone diameter is 97mm, and the Thiele/Small diameter is 105mm. (Overall, the driver is 140mm in diameter across the chassis.) The use of triodes enables Dan A

Digital to achieve high power output from valves while still operating in Class-A mode. The amplifier's efficiency (and purity) is increased further because it's handling only a very small part of the audio range, between 92Hz and 4kHz.

I should clarify the above paragraph by saying that throughout this review I will refer to this driver as a 'midrange' driver but in fact you only have to look at the frequency range it covers (92Hz to 4.096kHz—about which more later) to see that it does almost *all* the work, covering the six most important octaves, and leaving the bass driver to handle the bottom two octaves and the tweeter the top two. Dan A Digital prefers to call this driver a 'main' driver, and I agree that this is more appropriate, but force of habit and the need to ensure that readers aren't confused means that I have persisted with the word 'midrange', however inappropriate it may be in this particular situation.

Above 4kHz, audio signals are routed to a 20-watt semiconductor amplifier that's also running in Pure Class-A, this time possible because the power requirements above 4kHz are relatively low. This amplifier is driving a very unusual 25mm fabric dome tweeter. It's 'very' unusual because it's made right here in Australia, in-house at Dan A Digital. The soft fabric used to form the dome has an excellent 'memory', so it can recover its shape automatically if it's accidentally deformed, such as by a calous reviewer poking it with his finger. (Don't try this at home, incidentally, because it's still not good for the tweeter! I tried it on a special sample of the tweeter supplied by Dan A Digital.) The tweeter suspension nestles in a vibration-absorbing 'ring' of felt-like material. The magnet is neodymium. The small size of the tweeter means that it can be mounted sufficiently close to the midrange driver that the two act as a point source in the crossover region.

Frequencies below 92Hz are routed to a fairly conventional

solid-state Class-AB power amplifier, which in turn drives a side-firing paper-coned bass driver that's nominally 210mm in diameter (cone diameter is 150mm, Thiele/Small diameter is 168mm, and if you include the whole roll surround, 180mm.) The roll surround has an 'external' roll (i.e., not inverse) and is made from foam. The central dust-cap is not dome-shaped, but flattened-off, and appears to incorporate some form of mass-loading. The use of Class-AB output circuitry enables this amplifier to be the most powerful of the three inside each of the cabinets, producing 70-watts continuous. There's the inevitable switching distortion of this type of amplifier, of course, except that it's not audible because the distortion occurs at higher frequencies than the bass driver is able to reproduce, and because the amplifier comes *after* the crossover network (rather than before it, as in normal designs) the high-frequency distortion can't get to the midrange or tweeter.

Using a separate amplifier for each driver has many advantages. The greatest of them is that there's no need for the large, passive crossover network that's essential in conventional speaker designs. Such networks absorb amplifier power and introduce phase distortion. In an active design, all the amplifier's power is delivered directly to the speaker and there's no phase distortion.

Active loudspeakers are rarities in the world of high fidelity. Unlike ordinary passive loudspeakers, which must be connected to a hi-fi amplifier or receiver, active loudspeakers are self-powered. All you need to do is connect your source component directly to the speakers. The beauty of using powered speakers in this way is that there's an obvious upgrade path. If, for example, you buy a DVD-Audio player, you can start with just two speakers connected to the player and listen to the two-

channel stream. Then, if you start hankering after multi-channel sound, you can buy another pair of active speakers for the rear channels, and another for the centre-channel without having to worry about upgrading your processor and/or amplifiers.

One aspect of installation that might be puzzling is how you go about controlling volume, since the [act:eve] 108:dBs don't have a volume control, and very few CD, DVD, DVD-A or SACD players have them. One method is to use an outboard passive volume control. Dan A Digital makes one as part of its [iso:form] line, which sells for around \$599. If you need to be able to switch between different source components, the [iso:form] line also contains a passive source selector (also \$599). Another method, of course, is to use a conventional pre-amp (or multi-channel processor) to interpose between the source components and the loudspeakers.

There is some adjustment possible, via the rear panel of the speakers where there are two level controls, one for the treble and the other for the bass. Both are detent-style, to ensure accurate channel balance and each allows eleven variations in level, five positions

**Brand:** Dan A Digital  
**Model:** [act:eve] 108:dB  
**Category:** Active Loudspeakers  
**Suggested Price:** \$14,990.00  
**Warranty Period:** One Year  
**Distributor:** Dan A Digital Pty Ltd

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For additional information, turn to page 98 and circle 0200 on our Reader Information Service Card.

DAN A DIGITAL

lower than the nominal '0dB' and five higher. Curiously, both also have 'Off' positions so if you like, you can use the [acteve] as a two-way speaker, running either the mid and tweeter, or the bass and mid. This may sound a little odd, but if you're listening late at night, and you don't want the powerful bass (about which more later) to disturb the neighbours or other members of your household, the sound-quality with just the midrange and tweeter operating is amazingly good!

There are two options for signal input: unbalanced via a gold-plated RCA input socket, or balanced via an XLR connector. A switch between them (*Select Input*) must be set appropriately. The 240V mains power input is right at the bottom of the rear panel, below the rear-firing bass reflex ports. Alongside the IEC mains socket is a mini-XLR socket that can be used as a remote trigger for power-switching.

Although it's not essential, I'd strongly suggest you connect the remote trigger arrangement so that you can easily turn both speakers off when you're not using them. Why? You'll quickly find out when you hold your hand to the uppermost reflex port after the speaker has been running for a few hours. It'll give you a pretty good idea of how much heat is generated by the Class-A amplifier that's tucked away inside the cabinet. The idea is that the amplifier is convection-cooled, with cold air being forced into the lower of two ports, and the warm (hot!) air exiting through the uppermost port. This means of course, that you should ensure the vent holes are never blocked.

It is possible for the amplifiers to overheat (playing the system when the ambient room temperature is 40°C or more will do it, for example, and is not recommended), but it could also happen with lower ambient temperatures and unusual signal demands, in which case the amplifier (s) will shut down. Dan A Digital recommends you keep the room cool wherever practical to avoid heat-stressing the speakers.

Heat isn't the only reason I'd recommend switching the speakers off whenever they're not being used. The other reason is the simple one that your valves will last longer. On this subject, Dan A Digital says that if you listen to the speakers eight hours a day, seven days a week, it would expect the valves to require replacement after about two years, at which time the bias must be adjusted. Dan A Digital provides training in correct biasing procedures.

### INTERNAL ELECTRONICS

The three amplifiers inside each cabinet are beautifully built, though it's difficult to see because of the density of the component packing that results from Dan A Digital's design philosophy of minimum signal path, which means components are packed in four layers, all within an area of 150 x 74mm and star-grounded. All signal capacitors are high-quality Beyschlag polypropylene foil (not film!) and all others are organic semiconductive PSU capacitors. All resistors are metal film (Beyschlag). There are 10 independently regulated power supplies per channel (so there are 20 in a stereo pair). The amplifiers are what Dan A Digital calls 'distortion compensated' by the simple but expensive method of mirroring all components in the positive signal path in the negative signal path. When developing a valve amp, the biggest problem is usually the design of the output transformer, and this was no different with the [acteve] 108:dB. Dan A Digital's unusual (and very costly) solution was a C-core using grain-oriented Australian steel and 10 individual windings in a coil.

The crossover networks are all phase linear at the crossover frequencies to ensure that harmonics are in-phase with their fundamentals, and the crossover points are specially selected to be out of the way of the frequency range of most classic instruments and human voices (excluding harmonics, of course). The bass driver has a low

cut at 13Hz (12dB/octave) and a high cut at 92Hz (18dB/octave). The midrange has a low cut at 92Hz (12dB/octave) and a high cut at 4096Hz (18dB/octave), and the tweeter has a low cut at 4096Hz (18dB/octave) and a high cut at 200kHz (12dB/octave).

### LISTENING SESSIONS

For my listening sessions, I used a passive volume control, to ensure the least possible electronics between the front end (a Marantz DV-8300 DVD-A/SACD player) and the speakers and placed the speakers so they fired straight up the room (that is, not angled-in to face the listening position), with the speakers about 20cm from a rear wall.

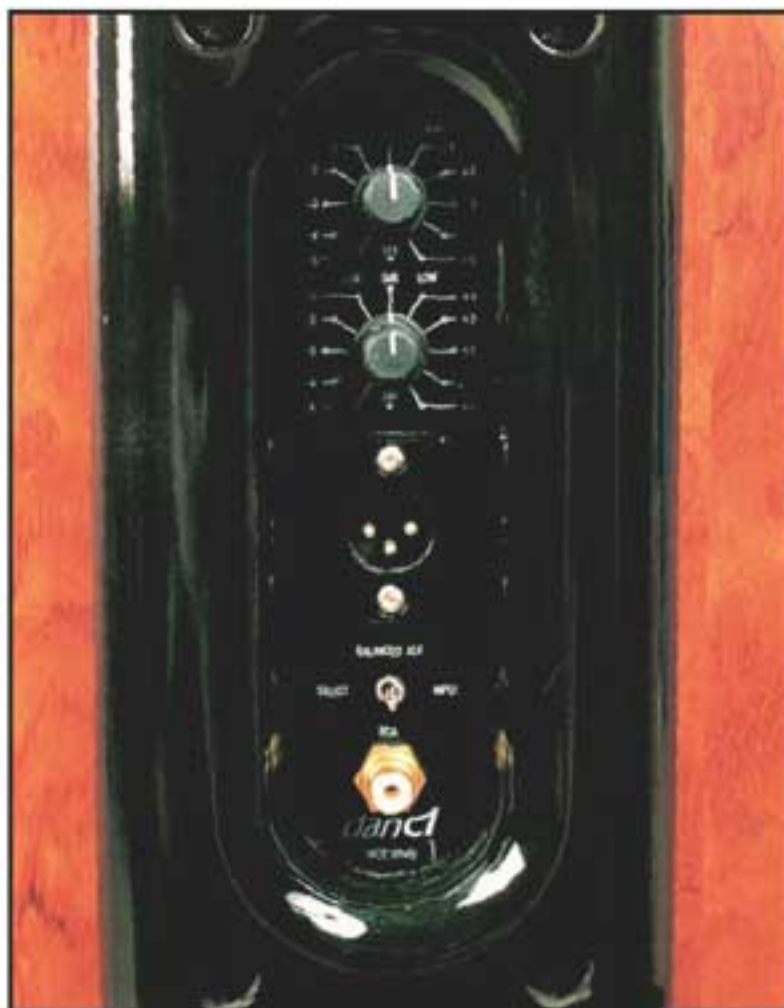
Long ago, when I was covering a CES show in Chicago for another magazine, I was part of a conference session in which the audience consisted almost entirely of hi-fi reviewers from all around the world, at which the question was posed 'How quickly can you tell whether a particular speaker has superior sound?' The consensus around the room was—and this may surprise you—that experienced speaker reviewers can tell almost instantly whether they'll be writing a good review of a pair of speakers.

I was reminded of this conference session just thirty seconds into the first piece of music I played on the [acteve] 108:dBs (Beethoven's Ninth Symphony, the version recorded by Karajan in 1977), because the sound was so effortless, so natural, and so beautifully pure that I totally forgot I was listening to loudspeakers, and found myself enraptured by the glory of the music. It was immediately obvious that I was hearing a product that deserved to get a 'rave' review, one that requires regular recourse to a thesaurus to find synonyms for 'fabulous', 'amazing' and other words of praise, to avoid too much repetition.

The stand-out area of performance for me was the remarkable clarity of what I was hearing. This clarity is difficult to describe in words, but it's something you'll

hear when you listen to an active loudspeaker design that makes you realise why manufacturers of ordinary loudspeakers are forever trying to minimise the effects of their crossover networks. (If you asked any speaker designer in the world how they could most significantly improve the sound of their speakers, the answer will invariably involve the crossover, rather than the drivers or the cabinet.)

If I were to attempt to describe what I mean by clarity in this context I'd be tempted to resort to visual analogies, such as looking in the crystal-clear water of a pool in an underground cave, where the water is so pure, and the atmosphere so still, that you literally cannot see there's water there at all, even after you've been told it's right in front of you. To the ear, the clarity isn't so much evident in the sound of individual instruments, as



### Warranty

In these litigious times, I am becoming accustomed to warranties that attempt to exclude every possible event, but Dan A Digital's warranty includes some clauses I thought were a real hoot. Dan A Digital says (amongst many, many other things) that it is not responsible for 'permanent or temporary loss of hearing, noise-related disputes, structural damage to buildings including but not limited to minor or major wall cracks, items falling off shelves due to vibration, loudspeakers falling onto persons or other items, persons tripping over cables, burns caused by hot valves, electric shock, burns and death caused by smashing valve glass envelope while under power, cuts caused by broken glass of valve envelope, fire caused by having combustible items in the vicinity of the valves etc'

The manual also contains other sage advice. Under the heading **DIY**, for example, is the single word 'Don't!!!', a word that also appears under the heading **Experimenting**. (Dan A Digital does not recommend substituting its valves with any other valve types.)

when many instruments are playing at the same time—the more the better. At moments like this (and there are many of them in music!) the [act:eve] 108:dBs excelled, producing a soundscape in which the various instrumental sounds were reproduced with uncanny and unerring accuracy, and a complete freedom from blurriness.

Over and above this clarity, I was taken by the tonal colour of the speakers, which across the midrange was particularly rich and warm whilst remaining at all times detailed and transparent. Reproduction of female vocalists was outstanding, and for once I couldn't nit-pick about the speakers favouring one vocal 'type' over another (a Ricky Lee Jones vocal style, for example, versus a Jenny Morris vocal style). The [act:eve] 108:dBs treated all equally well, letting all sound their best. For example, when playing The Corrs' *Leave Me Breathless*, that distinctive nasality (which I don't much like) came through all the over-engineering and made me wince. The accuracy of tone is amazing. Listen to Ray

Kennedy's piano on *From Monday On* (from Pizzarelli's *Kisses in the Rain*) and you'll know from the first few notes that you're listening to a Yamaha grand. And before you move to another track, take the time to admire the sharp, focused sound of Pizzarelli's guitar. His voice is captured beautifully, to the point that the [act:eve] 108:dBs capture the essential 'femaleness' of his vocal style like no other speakers I've heard, including Quad's new electrostatics. Listen carefully to this vocal and hear how it's projected beyond the confines of the cabinets.

Another reason for the good sound is the seemingly peculiar choice of crossover frequency (4,096Hz). According to Goran Velimirovic, Dan A Digital's designer, he selected this frequency because that's the resonant frequency of the human ear. *That means our brain has to compensate for extra loudness at that frequency and discard most of information there, meaning humans do not notice sound reproduction anomalies at this frequency very well. It is for this reason that 4096Hz*

will remain the preferred crossover point for all Dan A Digital designs.'

If you want further reasons for the good sound, it's because there is no crossover at all (passive or active) anywhere near the midrange, and that the use of the one midrange (main!) driver ensures absolute tonal uniformity and controlled and uniform dispersion of sound. This does mean, of course, that the midrange driver is doing an enormous amount of work, but I couldn't overload it, or even get it to start breaking up, even at lease-busting listening levels. I eventually did get the volume so high (i.e., painfully loud) that the sound started to get hard, but I suspect that what I was hearing was my ears overloading, not the speakers! A quick check with a sound pressure level meter showed that Dan A Digital is being rather conservative with its '108:dB' rating. Dan A Digital says of the 108:dBs: 'they can play most music material reasonably loud in rooms of up to 100 cubic metres. We make larger units for more SPL.'

Bass response was extended and powerful; you'll have no need to add a subwoofer to these speakers for either two-channel applications or home theatre use. Indeed I thought at many times that the bass was a touch *too* prominent, but since these are active speakers, this was easily fixed by adjusting the level controls on the rear panel downwards. For example, in my room, I had to go down five notches to get a nice balance on the double bass in Van Morrison's *If You Love Me*, and on Tracy Chapman's *The Thrill is Gone* this was still too much (though in this case, the fault is with the recording).

It turns out that although the speakers are aligned using Thiele/Small alignments, Dan A Digital also incorporates into its designs the ideas of Swedish electrical engineer, loudspeaker designer (and magazine editor!) Ingvar Öhman, who published a study



outlining the audibility of different bass alignments, resulting in an article identifying optimum frequency response curves in the bass range (published in *Musik och Ljudteknik*, Sweden.) [Velimirovic also acknowledges the assistance of award-winning Australian acoustical consultants Glenn Leembruggen and David Connor.]

If I wanted to be picky about the bass, I could say that the very, very deep bass was somewhat recessed, so the low pedal note in the first bar of Bach's *Tocatta and Fugue in D Minor* was 'way back, but this note is a big ask even for a subwoofer! The speed in the bass was exceptionally good. The drum solo on Tanaka's 'Blizzard'-Variations was totally immediate, with a dry naturalistic sound from the kit, with no overtones or mixing of sounds.

High-frequency performance was superb. Triangles, chimes, high-hats—all high-frequency instrumental and percussive sounds were reproduced with a lovely delicacy that was partly caused by the purity of the sound and partly by the accompanying 'air' around each note. The end result was a smooth,

silky sound that remained perfectly under control irrespective of the power levels. The sound of muted trumpet is simply spine-tingling—beautifully musical.

The [act:eve] 108:dBs are one of those rare speakers that will let you rediscover your music collection. I sat entranced as I heard the sound of the venue when listening to Sara K, the first time I can ever remember being able to hear the reflected sound coming back from the venue's walls, and again listening to Dick Hyman, with the drums in their own space, slightly right, but the piano recorded depthily, with the sound coming through like a dream sequence. Then there was Herbie Hancock's close-miked piano sound, more forceful and percussive than ever before.

## CONCLUSION

I'd be the first to admit that for most people—including this reviewer!—the price Dan A Digital is asking for the [act:eve] 108:dBs (up-front, because they're made to order) will be a not-insubstantial hurdle, so it's as well to remember that not only are you getting a pair of limited production, hand-crafted three-way speakers, but also two Class-A valve amplifiers, four solid-state amplifiers, six electronic filters and twenty power supplies. Put it this way and the package starts looking like a bargain... **AM**

greg borrowman

Readers interested in a full technical appraisal of the performance of the Dan A Digital [act:eve] 108:dB Loudspeakers should continue on and read the 'LABORATORY REPORT' published on the following pages. All readers should note that the results mentioned in the report, tabulated in performance charts and/or displayed using graphs and/or photographs should be construed as applying only to the specific sample tested.

lab report

## TEST RESULTS

The frequency response of the Dan A Digital [act:ve] 108:dB was extraordinarily extended, with *Australian HI-FI Test Laboratories* reporting a measured response of 23Hz to 20kHz  $\pm 3$ dB. Perhaps most remarkable is the output below 100Hz, where the level actually *increases* down to 50Hz before it starts rolling off quite slowly, so there's still appreciable output as low as 15Hz.

Higher up in the response, the suck-out between 100 and 400Hz is partly a room effect and partly because the lab measures loudspeakers at a distance of one metre, rather than the more usual two or three metres, which tends to introduce cancellation problems that would not exist at the listening position. Without these measurement artefacts, the response of the [act:ve] 108:dB would have measured as being even more linear than it already is: 43Hz to 20kHz  $\pm 2$ dB.

The second graph [Figure 2] shows the effect of the bass and treble level controls on the response. The degree of boost and cut available varies with frequency, as you can see, but the total maximum variation is 5dB in the treble, and 6dB in the bass, so each 'step' of either control is equivalent to approximately 0.5dB. This is quite a small increment (or decrement) so you may be hard-pressed to hear any change in sound with just one step of either control.

Figure 3 shows the near-field response of the side-firing woofer and the output from the lower two ports. This graph shows that the bass alignment is a little different to normal, with the maximum output of the port at 19–20Hz just a little below the null point in the bass driver's response at 22Hz. There appears to be a cabinet resonance just below 200Hz that shows up on the traces of both ports and the bass driver. The peak visible on the bass driver's trace is very narrow, and 18dB down, so is exceedingly unlikely to be audible.

The final graph [Figure 4] is a composite graph where the various nearfield and gated sine responses have been overlaid to show the raw 'fit' of the three drivers and port (only one port was shown for clarity). The responses across the crossover frequencies sum, so you can get a fair idea of the actual response simply by mentally drawing lines across the 'valleys'.

Steve Holding



Figure 1: Pink noise frequency responses at one watt at one metre.

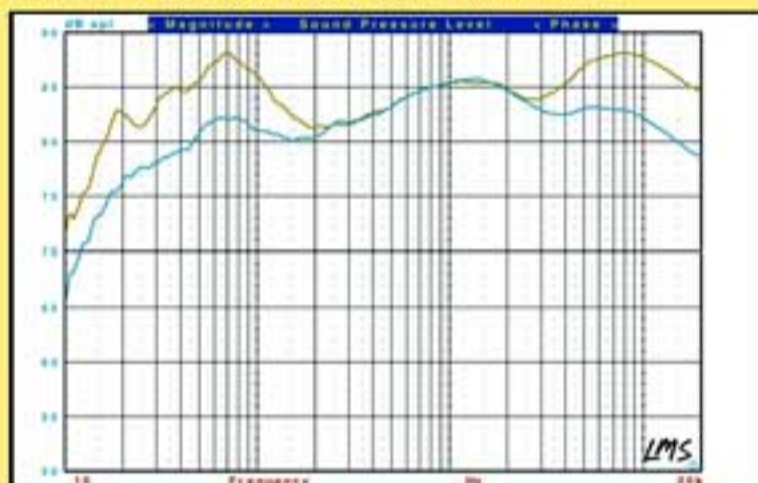


Figure 2: Pink noise frequency responses at one watt at one metre showing effect of bass and treble level controls (see copy).

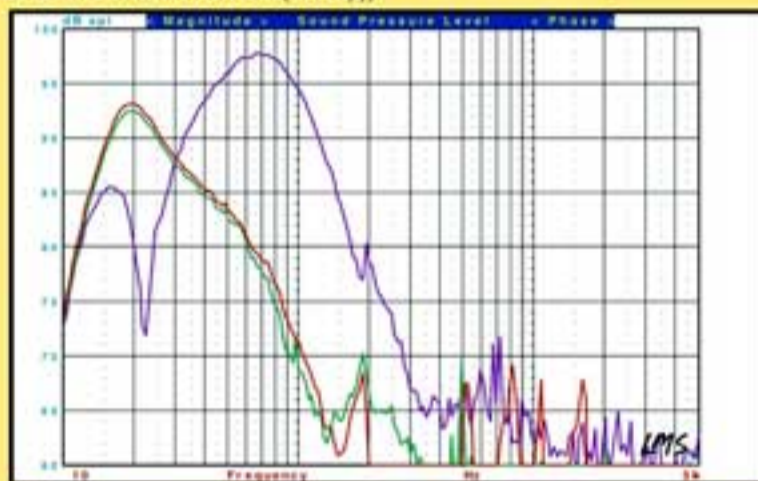


Figure 3: Nearfield frequency responses, showing bass driver response and port responses. (Note data for ports has not been re-scaled to compensate for difference in radiating area.)

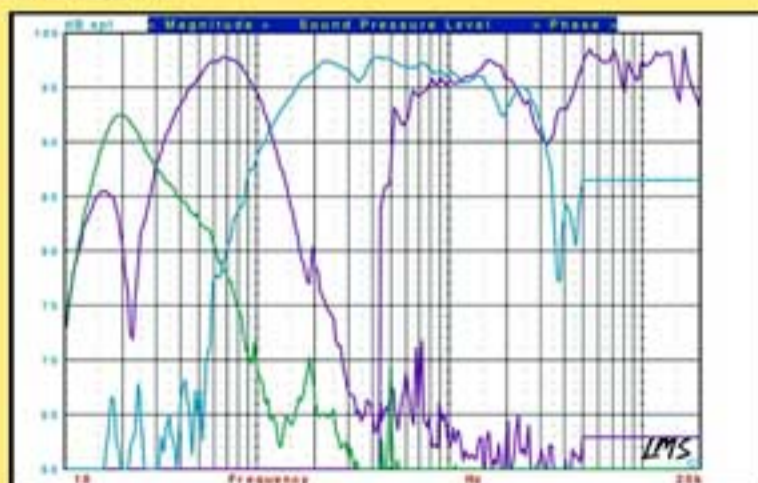


Figure 4: Composite graph showing nearfield responses for one port, woofer and midrange and gated response for tweeter (see copy).