



Hsu VTF-2 MK4 Subwoofer

Variable Tuning Hybrid Subwoofer

Gary Reber

Hsu Research has been designing and selling high-value subwoofers directly to the consumer for about as long as *Widescreen Review* has been published. The VTF-2 MK4 model submitted for review is the latest refinement by its designer Dr. Poh Ser Hsu. As with other Hsu models, the VTF-2 MK4 offers outstanding performance for the extraordinary value price of \$559. Additionally, this newest version of the VTF-2 is attractively styled and finely finished in custom satin black paint.

Outside

The Hsu VTF-2 MK4 is 15 inches wide and 22 inches deep with a height profile of 20.5 inches. The enclosure's four cone-pointed feet raise the enclosure off the floor in order to provide air clearance for the downward-firing 12-inch driver. There are two 3-inch flared ports on the back of the cabinet positioned above the electronics control panel. A foam plug is furnished for each port, which can be used to block zero, one, or both ports to adjust the tuning frequency of the enclosure.

The black anodized control/connector plate on the rear of the enclosure features two line-level inputs and outputs, two loudspeaker level inputs, a level control, a bypassable low-pass frequency control (30 Hz to 90 Hz), a phase switch (0/180), an EQ switch, and a Q level control (0.3 to 0.7), which is used in conjunction with the port plugs to vary the tuning of the cabinet. A power switch, an LED to indicate on/standby, a removable fuse holder, and an IEC power cord and socket complete the back panel.

Inside

The 12-inch custom-built, pulp-cone driver is magnetically shielded and capable of very long excursion. The internal BASH amplifier is rated at 1,000 watts output short term and 250 watts continuous, and uses discrete FET output devices with class A/B output stage. A soft-clipping circuit and subsonic filtering are included. The low-pass filter is continuously variable from 30 Hz to 90 Hz with a Linkwitz-Riley 24 dB/octave slope (fourth-order). This controls what frequencies are handled by the subwoofer when Crossover is IN. The 24-dB/octave slope stays steep at all available frequencies below and above the selected crossover frequency. If you are using a Subwoofer or LFE output, the crossover should be set to the OUT position so that the processor/controller handles the crossover between the subwoofer and the other loudspeakers in the system. When using the High Level loudspeaker connections, set the crossover slightly above the lowest-frequency output capability of the main left and right loudspeakers.

The VTF-2 MK4 takes advantage of the new technologies Hsu developed for the VTF-15 H and includes Hybrid tuning variable Q and sealed and ported operating modes. The flexibility enables the subwoofer to be better integrated according to preferences. With the added Q control and sealed mode options, even higher sound quality is now possible.

The unique twin-ported Variable Tuning Frequency technology (VTF) is designed for each port to use the air generated from the long-throw woofer to dramatically boost the deeper frequencies. The VTF-2 MK4 succeeds down to a very deep 18 Hz with one port open (in maximum extension mode EQ1, Q = 0.7) or 25 Hz with two ports open (EQ2, Q = 0.7).

Hsu's excellent manual describes how variable tuning works by adding or removing a foam port plug(s) and flipping a switch on the subwoofer amplifier. There are five different hybrid operating modes:

- 1) Ported Max Output Mode: two ports open, and operating mode switch set to EQ2. This mode is ideal for those with medium-to-large room sizes who listen at high playback levels and want the strongest mid-bass possible.
- 2) Ported Max Extension Mode: one port open, and operating mode switch set to EQ1. This mode is ideal for those with medium-to-large room sizes, or small-to-medium rooms but who listen at low-to-moderate playback levels where the rising low bass from room gain

Subwoofer Ratings

Music Rating	■ ■ ■ ■ ■
Effect Rating	■ ■ ■ ■ ■
Impact	■ ■ ■ ■ ■
Tonal definition	■ ■ ■ ■ ■
Overhang	■ ■ ■ ■ ■
Rhythm and Pace	■ ■ ■ ■ ■
Midrange Coloration	■ ■ ■ ■ ■
Box Integrity	■ ■ ■ ■ ■
Distress	■ ■ ■ ■ ■
Subjective Deep Bass	■ ■ ■ ■ ■
105 dB @ 35 Hz?	Yes
25 Hz?	Yes

will help compensate for the ear's insensitivity to bass as lower ears.

3) Ported Max Headroom Mode: one port open, and operating mode switch set to EQ2. This mode is ideal for those with medium-to-large room sizes who listen at high playback levels and want the deepest bass extension.

4) Sealed Max Extension Mode: No ports open, and operating mode switch set to EQ1. This mode is ideal for those who prefer a sealed box sound and deepest bass extension.

5) Sealed Max Headroom Mode: No ports open, and operating mode switch set to SQ2. This mode is ideal for those who want the sealed box sound and listen at high playback levels.

According to Hsu, the reason for variable tuning is that all subwoofer designs, especially consumer-level subwoofers, involve tradeoffs in design. You cannot have a small subwoofer that goes very low, plays very loud, and costs very little. Traditionally, the engineer decides what tradeoff he or she thinks is best for the consumer. The consumer has to take it or leave it.

The VTF-2 MK4 was designed to facilitate flexibility and allow the end user to choose the tradeoff. If you enjoy music that is loud but does not have much deep bass, set the VTF series for maximum output. That way, you get maximum dynamic range with the lowest distortion. If you like music with deep bass, set it for maximum bass extension to reproduce the deep bass accurately. You can even switch between the two modes, depending on what you play. That means effectively you get a subwoofer that can play loudly and can play low, all in one, at a reasonable price.

Setup

I evaluated the VTF-2 MK4 using bass management in the crossover-bypass mode (using an 80-Hz crossover in our Classé controller tuned to the "small" designated surround Magnepan loudspeakers in our reference system). The VTF-2 MK 4 was connected to the Classé Audio SSP-880 Controller via a single-ended RCA connector from the subwoofer pre out to the input on the subwoofer and used the bass-management capability of the pre/pro. Thus, the Classé was used to merge any .1 LFE with the bass from the other seven loudspeakers and manage the delay of all loudspeakers and the subwoofer through a distance/time delay function.

I positioned the subwoofer near my sweet spot listening position, not in a corner.

I also used an SPL (sound-pressure level) meter to adjust levels. I set the Q level (Qtc) at the preferred 0.5 in the sealed (both ports) configuration (EQ2) to achieve a "critically damped" alignment with a step response that has no overshoot. The total Q of the system (Qtc) has a big effect on measured performance, and ultimately on what you hear. Qtc defines the shape of the response curve and the amount of damping to overshoot or ringing (oscillation after the signal stops) that the system will provide.

While numerous fine-tuning controls are provided, every room has its quirks, and there is no way to know the best combinations of settings for your room without measurements. The results you get after measurements will change how you perceive the performance of the VTF-2 MK 4, or any other subwoofer. Thus, adding one or two (or

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.. the listener will distort (..) before the VTF-15H does.'

'Not only was the output incredible, the entertainment experience it delivered was singular.'

'Ultra-low bass (20-31.5Hz) average: 119.2 dB
Low-bass (40-63 Hz) average: 123.2 dB'

— Brent Buttenworth, Sound + Vision, www.soundandvisionmag.com, February 2011

'If this sequence (Space Shuttle launch) on your present system doesn't induce panic about a subwoofer-induced-damage clause in your home owner's insurance, you need a better sub. Like the Hsu.'

'It's hard to visualize a subwoofer priced this low that needn't apologize for the quality of its bass, its low end extension, or its setup flexibility.'

— Tom Norton, Home Theater Magazine, December 2011

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INNOVATION, PERFORMANCE, & VALUE

more) well-designed subwoofers to your system, and taking the time to make sure that they are properly integrated with the main loudspeakers and the room, can dramatically enhance your enjoyment of music and movies at home. Getting a seamless blend between the subwoofer(s) and the main loudspeakers can be a difficult and time-consuming task. A qualified custom installer can assure you of optimum response in your room based on measurements, listening, and trial-and-error testing. For a comprehensive technical treatise on subwoofer design, please refer to *Widescreen Review's* "The Essential Subwoofer Buyer's Guide" published in 2000/01 or the article "Subwoofers: Presenting The Fundamentals" in Issue 172 (December 2012). These contain all that you need to know in order to make an informed choice when purchasing a subwoofer. You can also refer to them when installing the subwoofer(s) in your system.

Performance


Bass is the foundation of music reproduction, and nothing can pump up the excitement of movie watching more than adding some articulation and impact to the low-frequency sound effects. Not only are subwoofers capable of extending the low-frequency response of the system, importantly, they can lower distortion in the midrange, prevent amplifier clipping and potential loudspeaker damage, and make the whole system play louder with greater dynamic range and less audible strain. All of this is accomplished by relieving your main amplifiers and loudspeakers of the demands of reproducing very low frequencies.

As noted in previous reviews, there are numerous good subwoofers available and most will do a credible job of reproducing the sound of a bomb blowing up a car. The major difference between them will be how loud the bomb can be without sounding unduly distorted, and how deep and visceral the sound effect is.

In most music, the bass player plays a tune that harmonizes with the melody. The easier it is to follow that tune, the better the job that the subwoofer is doing. Bass and percussion set the rhythm and pace of music. The easier it is to tap your foot to the music and respond to the rhythm, the better the subwoofer.

Subwoofers reproduce frequencies with wavelengths that are long in relation to the dimensions of most living rooms or dedicated home

SPECIFICATIONS



Features – Hsu VTF-2 Mk 4 Subwoofer
 Driver: 12-inch downfiring woofer
 Variable Tuning Hybrid Technology: five available setup configuration with ported and non-ported options
 Variable Q Tuning
 Below 20 Hz-capable
 Input Options: Single-ended RCA line level, and amplifier level inputs
 Volume Control (dB)
 Phase Setting: (0 or 180 degrees)

Specifications
 Frequency Response : 18 Hz to 90 Hz
 Crossover Frequency Range: 30-90 Hz, bypassable
 24 dB/octave slope
 Amplifier power: BASH class A/B FET 250 watts
 Q-Control Range: Variable 0.3-0.7
 Power Consumption: 300 watts
 Dimensions (HxWxD): 22.5 x 15 x 23 (inches)
 Weight: 78 pounds
 Warranty: 7 years limited
 Direct Sale Price: \$559
 Designed In: USA
 Manufactured In: USA

Manufactured By:
 Hsu Research
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 Anaheim, California 92806
 Phone: 800 554 0150
 Web site: www.hsuresearch.com

theatre environments. Standing waves may boost or cancel various frequencies at the listening position due to the interaction with room boundaries. Moving a single subwoofer just a little bit in a room may drastically change what you hear at the listening position. Using two widely spaced subwoofers will alleviate most of these problems.

In reviewing the Hsu VTF-2 MK4, my evaluation is based on my subjective impressions under the conditions in our main reference room—a living room dedicated home theatre—which incidentally is very good for bass. As our library of Blu-ray Disc™ releases is extensive (see *Widescreen Review's* searchable Blu-ray Disc database for movies with bass below 25 Hz), as is our music on CD collection, I used a combination of content for the evaluation, including motion picture soundtracks, especially action, thriller, and science fiction movies with enormous bass impact and rhythmic music, including solo drum recordings. The main loudspeakers in the 7.1-channel system are all Magnepan, with the main stereo signal directed to 20.7s and the four surrounds comprised of two 3.7s and two 1.7s plus Magnepan's tri-center CCR/MMC 2s array for the center signal. The single VTF-2 MK4 replaced the three Bag End INFRA D18E-1 subwoofers for this evaluation.

I was pleasantly surprised that the single VTF-2 MK4 performed well against the far-more-expensive Bag End array, except for the deepest and loudest reproduction of bass frequencies below 25 Hz for maximum slam and maximum output. Had I two VTF-2 MK4s, I do not believe this would be a distinguishing factor in the evaluation of movie soundtracks with bass energy below 25 Hz. Music reproduction was exemplary.

When evaluating a subwoofer I consider the following subjective impressions: overall music reproduction, overall sound effects reproduction, impact, tonal definition, freedom from overhang, ability to follow the rhythm and pace of a musical selection, midrange coloration, box integrity (freedom from enclosure resonance), distress (can the subwoofer be easily overdriven?), deep bass response, and measured ability to play at 105 dB @ 35 Hz in the room-listening position, and measured ability to play 25 Hz without substantial reduction in SPL.

As a subwoofer needs to reproduce low-frequency special effects sounds, such energy is usually in the 35 Hz to 60 Hz region because



that's where they have maximum impact. Most anything that occurs below 25 Hz is subharmonic or just noise. As a result, the best subwoofer performance should focus on the range where most signals actually occur.

The VTF-2 MK4 is a "true" subwoofer that delivers effortless and tight bass response with deep, undistorted extension. Explosions in motion picture soundtracks were dynamic sounding and felt with the Hsu, without objectionable boominess and rumble. During low bass acoustic and electric music reproduction the sound was wonderfully clean and accurate and without overhang. The sound was authoritative, even in the mid-bass region and at low volumes.

Motion picture soundtrack sound effects and atmospherics were presented with stunning impact and slam, rivaling the sound from our much larger and more expensive Bag End subwoofers. Music recordings, with both acoustic and electric bass, were well reproduced, with an excellent sense of rhythm and pace and articulated bass. Pitch definition was excellent as well, with no sense of heaviness or mid-bass emphasis.

The Hsu VTF-2 MK4 subwoofer produced full-range bass down to and below 25 Hz. And while most people probably hear little or nothing at 25 Hz and lower, you sure can feel it. This is the realm of subharmonics, as there is little recorded information below 30 Hz. An essential part of the emotional impact and sheer excitement you feel in a home theatre comes from the deep, accurate, and powerful bass that only a great subwoofer can provide. Good subwoofer performance is essential for a great, convincingly visceral home theatre experience.

Speaking of recorded information below 30 Hz, other than subharmonics, there is little recorded information below 30 Hz anyway, except for the Octobass whose low C vibrates at 16 cycles per second (the same as the low C of a 32-foot organ pipe). While quite a sound, it is a rare recording that will output 16 Hz. Still, subharmonics in the low-frequency signal present in motion picture soundtracks greatly enhance the emotional impact of the movie experience.

The VTF-2 MK4 exhibited tight transient control in the ported sealed enclosure design, as well as effortless transparency and usable output well below the nominal cut-off frequency when integrated into the system. With a properly setup VTF-2 MK4 you are never

aware that a subwoofer is present, as the subwoofer can be adjusted to blend seamlessly with the main loudspeakers and make the sound sound bigger, warmer, and more natural, not more bass heavy—making the home theatre experience sound better, not boomier.

With music, the sound from the VTF-2 MK4 was exceptionally tight and tuneful, with superb pitch definition and flawless rendering of the rhythm and pace of music. The ability to deliver bass detail and articulation, and punch and snap is excellent on music and percussion.

To experience the VTF-2 MK4 is to experience a subwoofer that can deliver amazingly loud, deep bass with good control. Output levels in the 25 Hz ported sealed configuration reached 105 dB at 35 Hz and 104 dB at 25 Hz. With both ports open, output increased to 110 dB and 105 dB respectively. While I did not play the subwoofer with just one port open, the response should extend even deeper below 25 Hz. Of course, results will vary because low-frequency sound quality is particularly affected by the interactions between loudspeaker performance and room acoustics.

Preferably a system should have no fewer than two subwoofers operating in stereo, not from a mono subwoofer output. A 5.1-channel system needs at least three so that there is a dedicated subwoofer for the low-frequency effects (LFE) channel. I can just imagine the emotional impact of deep bass reproduction using three Hsu VTF-2 MK4 subwoofers!

Conclusion

Subjectively, the impression of deep bass with the single VTF-2 MK4 was impressive, especially for a subwoofer in this performance/value price range. The VTF-2 MK4 remains the benchmark to which other under-\$1,000 subwoofers must be compared. It is value priced far under the competition and represents an extraordinary performance value.

The Hsu VTF-2 MK4 is among most attractive and best performing Hsu Research subwoofers. It is well made, with a compact composition and fine black satin finish. Its performance qualities are equally suited to both the reproduction of motion picture soundtracks and music recordings. At \$559, it continues to represent the price/performance standard for high value in home theatre subwoofers. [WSR](#)

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