

SECRETS of Home Theater and High Fidelity

A SECRETS
Subwoofer
Review

atlantic
TECHNOLOGY

Product Review

Atlantic Technology 642e SB Subwoofer

May, 2005 • Ed Mullen



Specifications:

- Sealed Enclosure
- 12" Driver
- Power: 300 Watts RMS
- MFR: 25 Hz – 300 Hz ± 3dB
- Crossover: 40 Hz – 140 Hz
- 18 dB/Octave Low-Pass Output
- Peak Output: 107 dB SPL into 2000 Ft3
- Dimensions: 21" H x 19" W x 18.5" D
- Weight: 65 Pounds
- MSRP: \$920 USA

Introduction

While wandering through the sea of humanity and electronics at CES 2005, I came across the Atlantic Technology display. I checked out dual 642e SB subwoofers running in the gaming booth and was impressed with the sound quality and impact.

I managed to sneak in a few minutes with Atlantic Technology President and Founder Peter Tribeman, and his passion was evident for designing and building affordable high performance home theater systems.

"We're our own toughest critics," he said.

"We won't offer any product unless we'd be happy personally owning it. We spend a lot of time in the best cinemas to ensure the Atlantic Technology products truly bring theater into the home."

The conversation turned to the revised 642e SB subwoofer.

Peter mentioned, "While many truly excellent subs can be found from other companies using other bass alignment methods, we like the superb transient and group delay characteristics afforded by a correctly executed acoustic suspension design. Many people have called our subs "fast" or "detailed" or "musical". To us, those terms are somewhat inexact; we feel they are simply reacting to the sound of a good sealed sub, and the advantages that design can deliver. I'm confident you'll like the 642e SB."

Peter's confidence was well founded; the 642e SB is a darn good subwoofer – read on to find out why.

The Design

The 642e is an acoustic suspension design, with a front-firing 12" driver. This new driver features a stamped steel basket, double stack magnets, a four-layer 2" aluminum VC (voice coil), heavy duty spider, and a composite fiber cone with an inverted dust cap and butyl rubber surround. The free air resonance of this driver is 25 Hz.



The Atlantic Technology design studio worked hard on the aesthetic presentation to ensure this subwoofer was more than just a "big black box", and I think they succeeded. The sides of the subwoofer feature a subtle horizontal convex geometry, with shaved top edges and arches at the bottom. The top, rear, and bottom surfaces are flat black, and the sides are painted in a silver metallic finish.

The 642e looks pretty imposing sitting in the corner; the cabinet is about 20" in all dimensions. The cabinet walls are 3/4" thick MDF on the sides, while the front baffle is 1" thick, which helps explain the substantial 65 pound weight.

The grille features a horizontal convex face, a classy metal nameplate, and an injection molded lattice framework that looks like it could withstand a heavy kick or a collision with a running dog or child. The six grille grommets are rubber to minimize vibration.

There are four permanent heavy duty rubber feet on the bottom of the cabinet. This rugged and durable floor interface solution will work well for any kind of mounting surface. The subwoofer never vibrated or wandered, even at high playback volumes.

The interior of the cabinet is lined with fiberglass, and features horizontal as well as vertical cross braces. There is also a single vertical shelf brace spanning the entire interior cabinet width. The digital BASH amp is secured to the cabinet with 12 wood screws, and all screw holes are well sealed.

The Owner's Manual is well written and comprehensive, with occasional humorous one-liners, detailed descriptions of all features, informative diagrams, and good set-up and fine-tuning advice.

Details on the Amplifier

- Digital BASH (Indigo-licensed) 300 watts continuous
- On/Off Main Power Switch
- Off/On/Auto (3-way toggle switch)
- Low Level L/R RCA Inputs
- Low Level L/R RCA Outputs
- Low Pass Filter (40 Hz - 140 Hz, 3rd order)
- Low Pass Filter Disable Switch (2-way toggle)
- High Pass Filter (23 Hz, 2nd order)
- Gain/Volume (front face rotary)
- Phase Control (00/1800 2-way toggle)
- Adjustable Line Voltage (110/220)
- Limiting and Soft Clipping Protection
- Detachable Power Cord



The control layout is logical, and the toggle switches and rotary knobs have a quality feel and smooth operation. I really appreciated the convenient flush mount (with finger dish) rotary volume knob on the front cabinet face. This control also features a green/red LED to indicate on and standby/off. The auto-on circuit was very easy to initialize at low volumes. If no signal is present, there is a 7-10 minute shut-off delay.

The amplifier incorporates Clear Filter Technology™. Originally developed for the Atlantic Technology 8200 System, CFT is designed to counteract cabinet coloration and resonances through reciprocal filtration.

On the Bench

Set-Up: All objective tests were conducted outside away from any reflective structures, with the microphone on the ground, facing the subwoofer, at a distance of 2 meters from the width and depth center point. I set the low pass filter control to Bypass, and set the phase control to 00 (this resulted in a non-inverted impulse response).

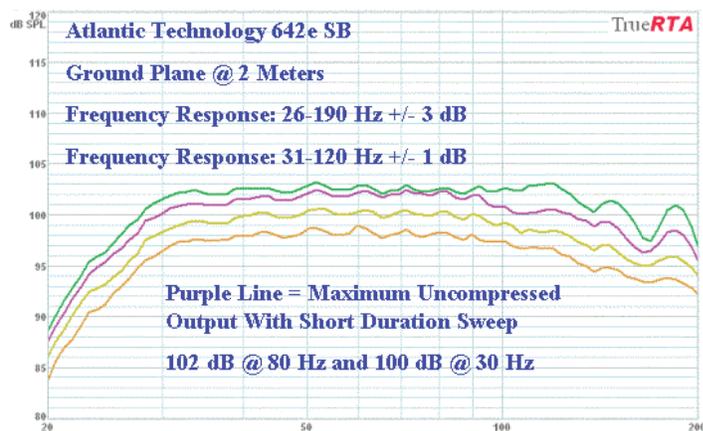
This test environment is often referred to as ground plane, 2 pi, or half space. An anechoic chamber (or suspended in free air) would be considered a 4 pi or full space environment. Compared to full space, the ground plane adds 6 dB to the test results, but otherwise does not affect the frequency response. So testing a subwoofer at 2 meters ground plane is equivalent (in both output and frequency response) to testing it at 1 meter in an anechoic chamber.

Frequency Response: A short-duration (about 0.5 seconds), digitally synthesized logarithmic sine sweep was used to evaluate the frequency response of the subwoofer. The 642e frequency response measured 26 Hz - 190 Hz ± 3 dB.

But the real story is the almost ruler flat response across most of the pass band, measuring 31 Hz - 120 Hz ± 1 dB. An FR this flat is a highly commendable achievement.

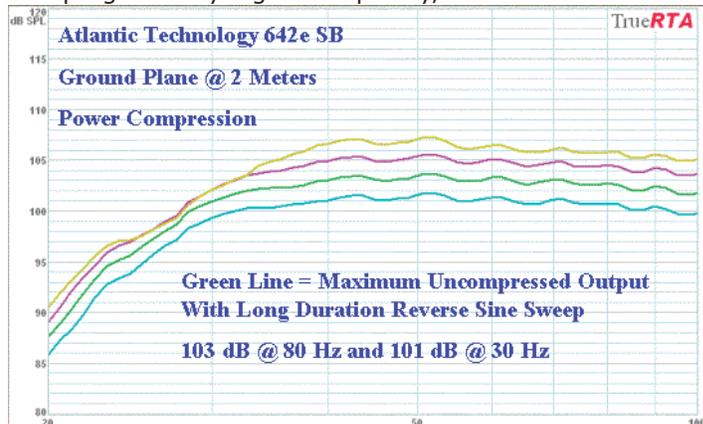
Peak Dynamic Output: This test measures how loud the subwoofer can play across its pass band with a short-duration signal representative of typical music and movie transients. Short duration frequency response sweeps were conducted at progressively louder (2 dB increments) levels until dynamic compression was noted.

In the graph shown below, the purple curve represents the maximum uncompressed dynamic output of the 642e, with 102 dB at 80 Hz, and 100 dB at 30 Hz. The highest curve (green) showed dynamic compression in the 40 Hz - 90 Hz bandwidth, and the test was subsequently terminated.



Power Compression: This test measures how loud the subwoofer can play across its pass band with a longer duration signal. A sustained bass passage in an action movie can create excessive heat in the voice coil, reducing longer term output capability. Power compression (which occurs when increasing the amplifier power does not result in increased bass output) was evaluated with a slow reverse sine sweep from 100 Hz - 10 Hz. Sweeps were conducted at progressively louder (2 dB increments) levels until power compression was observed.

The 642e held steady up to the green curve (graph shown below), with 103 dB at 80 Hz and 101 dB at 30 Hz. The next higher curve (purple) showed about 1.5 dB of power compression below 30 Hz (meaning that the purple line is 1.5 dB closer to the green line than the green line is close to the blue line at those frequencies), but otherwise looked linear. The next higher curve (yellow) showed more severe power compression occurring at a progressively higher frequency, and the test was



subsequently terminated.

The fact that the dynamic output and power compression levels approached parity suggests the woofer and the amplifier are well matched, the amplifier has effective limiters, and the woofer has good thermal power handling characteristics.

Total Harmonic Distortion (THD): Harmonic distortion occurs when multiples of the fundamental signal are produced due to non-linear driver behavior. A subwoofer with low THD will sound clean and distinct, especially at the deepest frequencies. THD was evaluated with sine waves (about 5 seconds duration), and was limited to approximately 10% unless otherwise noted.

Clean output from the 642e was a bit better than average in the important 20 Hz -40 Hz bandwidth, and leveled off in the 40 Hz - 80 Hz region.

Frequency (Hz)	SPL (dB)	THD (%)
20	76.9	10.5
22	81.3	10.0
25	85.3	10.4
32	96.4	10.3
40	101.3	10.0
50	101.8	10.2
63	101.5	10.0
80	101.2	10.2

Bandwidth Linearity: Bandwidth linearity is calculated by dividing the average distortion-limited SPL by the maximum distortion-limited SPL, and expressing the result as a percentage. A score of 100% means the subwoofer exhibits perfect clean output linearity across a given bandwidth. The 642e performed very well, scoring 92% or better for all test bandwidths.

Bandwidth (Hz)	Average SPL (dB)	Bandwidth Linearity
20-80	93.2	92%
22-80	95.5	94%
25-80	97.9	96%

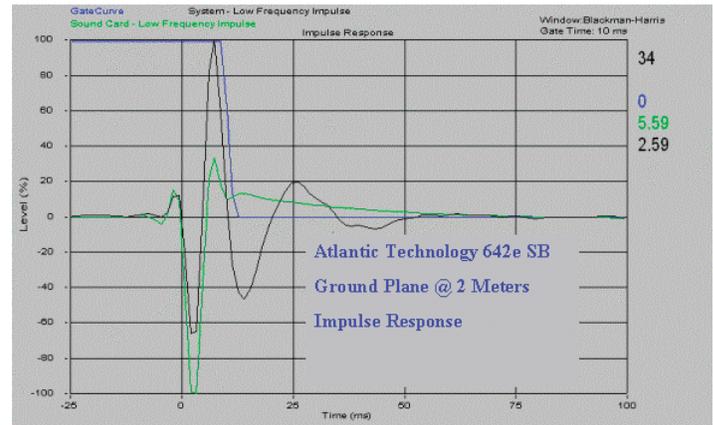
Phase Response and Group Delay: A sufficiently large and abrupt phase shift may cause the perception of time smearing at the affected frequencies. Group delay is used to quantify this phenomenon, and was calculated at select music note frequencies. The approximate audibility thresholds are based on extrapolations of existing group delay audibility studies.

Group delay from the 642e remained below the approximate audibility thresholds at each tested frequency. It should be noted from an academic standpoint that the GD numbers for the 642e are somewhat lower (lower is better) than those from a typical bass reflex subwoofer.

Musical Note/ Frequency	Group Delay (ms)	Approximate Audibility Threshold (ms)
F2 / 87 Hz	1.1	15
G1 / 49 Hz	11.8	25
C1 / 33 Hz	7.9	35
A0 / 27 Hz	32.6	42

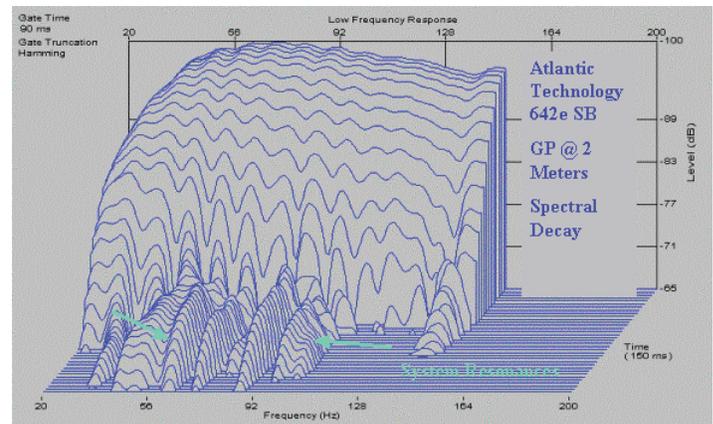
Impulse Response: A phase switch setting of 00 on the 642e resulted in a non-inverted impulse response. The impulse response (black line) shows transient overshoot and system ringing for about 40 ms. This is a normal

performance for a subwoofer.



Spectral Decay: Spectral decay was evaluated to the -35 dB level, relative to the test volume. Several minor system resonances were noted in the 30 Hz - 100 Hz bandwidth. None of the resonances exceeded -25 dB in amplitude, and they all dropped below the test floor after about 150 ms, indicating they won't be audible under normal use.

The 150 ms resonance decay time is shorter than most subwoofers I've tested, indicating a well-braced and rigid enclosure, and the positive effect of the Clear Filter Technology.



In-Room Frequency Response

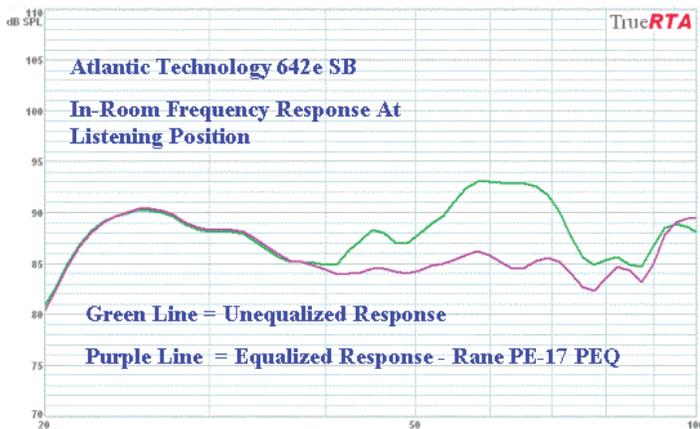
The 642e was placed near the front left corner of my 2,000 ft3 room. For digital bass management, the main speakers were set to "Small" with a crossover frequency of 80 Hz. The digital bass management circuit imposes a 2nd order high pass filter on the speakers, and a 4th order low pass filter on the subwoofer. The low pass filter switch on the 642e was set to Bypass.

The in-room frequency response was measured at the primary listening position (about 11 feet from the subwoofer) with the main speakers and the subwoofer operating. Setting the subwoofer phase to 00 provided the best results, with no obvious cancellation at the crossover frequency.

The in-room frequency response showed a pronounced peak in the 50 Hz - 75 Hz region. This peak is the com-

bined result of room acoustics and the asymmetrical filters in the digital bass management circuit. I used my Rane PE-17 parametric equalizer to eliminate this mid-bass peak.

As expected, room gain helped considerably to improve deep extension, with the 642e exhibiting a rising response to about 25 Hz, and then sharply dropping 10 dB by 20 Hz. The final in-room FR at the listening position was approximately 22 Hz -100 Hz ± 4 dB.



With Movies

I played several action-oriented DVDs, evaluating the 642e for mid-bass dynamics, audible artifacts (muddiness, cone cry, rattling), deep extension, and deep compression. My overall subjective home theater ratings for the 642e are provided in the table below, with a rating of 5 being the best score:

Evaluation Criteria	Rating (1-5)	Summary Comments
Mid-Bass Dynamics	3.75	Strong output in the 30-60 Hz region.
Audible Artifacts	4.50	Transparent limiters; no obnoxious noises.
Deep Extension	3.50	Digs to 23-24 Hz in-room.
Deep-Bass Compression	2.50	Compresses high-amplitude deep bass peaks at higher playback volumes.

Provided below are my listening notes from I, Robot in DTS 5.1. To give readers an idea of how loud the 642e can comfortably play in my mid-size room, I increased the master volume until the subwoofer started to exhibit either audible artifacts or deep-bass compression on the most demanding passages, and then I backed off a few dB. I monitored the sound pressure level at the listening position with a B&K meter set to C-weighted fast. The SPL peaks listed are straight meter readings, with no correction factors added.

Sonny Robot Bursts From Parts Supplies, 0:20:14, 106 dB: The 642e displayed good dynamics on this scene, punching out a quick burst of sound pressure that helps make this scene so startling.

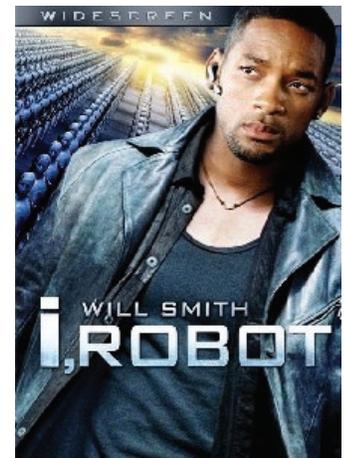
Sonny Robot Lands On Pavement, 0:21:19, 106 dB: Here the 642e did a good job of convincing the viewer that a heavy robot had just landed on the sidewalk after an extended free fall.

Demolition Robot Trashes House, 0:39:32-0:41:10, 104-

109 dB: The 642e dished out a whopping 109 dB when the demolition robot first comes to life, indicating good mid-bass output capability.

While the 642e definitely provided solid foundation to this exciting sequence, it rounded off the very deepest bass when the demo robot first bursts into the house, and also when detective Spooner lands in the swimming pool.

"You Are Experiencing A Car Accident", 0:52:17-0:55:18, 104-107 dB: As the USR robot carrier menacingly approaches, the 642e shook the room with authority, but omitted some of the infrasonic undercurrent. At higher playback levels, I noticed some deep-bass compression on the high amplitude 20 Hz - 25 Hz peaks which occur at 52:45, 54:30, and 54:43. To its credit though, the 642e remained very well behaved at these points, with no audible signs of distress.



With Music

I evaluated the 642e on several music selections for balance, definition, pitch, coherence, and deep extension. This subwoofer does all the right things with music; bass instruments sound natural, with good detail and pitch. The sonic presentation has good coherence and exceptional octave-to-octave balance, making extended listening sessions non-fatiguing. My overall subjective music ratings for the 642e are provided in the table below.

Evaluation Criteria	Rating (1-5)
Balance	4.5
Definition	4.5
Pitch	4.5
Coherence	4.5
Deep Extension	3.5

Here are are some listening notes from a few CDs:

1) *Moondance* – Van Morrison, Warner Brothers Records, 1970, 1990. Without question the bass line is the heart and soul of the title cut, with bassist John Klingberg masterfully alternating between lead and rhythm and displaying fabulous range and timing. The 642e sounded excellent and lively on this track, with perfect pitch and definition.

2) *Still Bill* – Bill Withers, Columbia Records 1972, Legacy Records 2003. In addition to the trademark keyboard hook, Use Me Up features a funky bass foundation and a complex single/double syncopated kick drum line. The 642e exhibited realistic timbre on the bass guitar, and easily separated the kick drum strikes, sounding tight and percussive.

3) *Live Bullet* – Bob Seger and the Silver Bullet Band, Capitol Records, 1972, 1999. Recorded in front of nearly 25,000 rabid Detroit fans, Live Bullet remains one of the most significant live rock recording in the last 30 years. "I've Been Working" and "Bo Diddley" contrast bass guitar

and drum mini solos against a classic hard driving rock line. I pushed the 642e hard on these tracks, and it rose to the challenge, providing good detail and separation of bass notes during the most demanding and complex passages.

4) *Tchaikovsky 1812 Overture* - Cincinnati Pops Orchestra (Erich Kunzel conducts), Telarc International, 2001 High Resolution SACD. Without drawing attention to itself, the 642e provided the requisite undercurrent and foundation so critical to making any orchestral movement realistic and convincing. Strong and quick-repeating kettle drum strikes were well handled, with good impact, depth, and tympanic timbre. At aggressive playback levels, the 642e didn't falter on the famous cannon blasts, although it did omit the infrasonic decay products.

Conclusions

I usually don't assign human traits to subwoofers, but the best way to describe the Atlantic Technology 642e SB is that it's honest and unpretentious. While the 642e is a fairly straightforward design, it's also very well executed.

The 642e relies on a big sealed enclosure and a strong woofer to make good bass the old fashioned way. Its anechoic frequency response is exceptionally flat, and with natural boundary gain, it will provide usable extension to about 25 Hz in most mid-size rooms. Instead of using excessive amounts of equalization, the design engineers allowed the 642e to roll-off around 30 Hz anechoic, and this preserves dynamic headroom. In addition, clean output is quite uniform across the usable pass band.

The BASH digital amplifier has engineered performance features like the Clear Filter Technology, a high pass filter to protect the woofer from over-excursion, and sophisticated and sonically transparent amp limiters. These features combine to make the 642e very well behaved, and if its limits are exceeded, it gracefully goes into compression without signs of audible distress.

The 642e is a versatile performer, handling music exceptionally well, and also doing a yeoman's job on HT. It is rated to deliver 107 dB bass peaks in a 2000 ft³ room, and that correlates well with my listening observations. At higher playback volumes, the 642e will occasionally compress deep bass passages, so readers who like to listen at/near Dolby Reference Level might want to consider dual 642e subs for maximum uncompressed impact.

Overall, enthusiasts shopping for a traditional sealed subwoofer for both music and HT applications will find a lot to like about the Atlantic Technology 642e SB.

- Ed Mullen -

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