

# Kii THREE

MARTIN COLLOMS GETS TO TRY THIS ACTIVE DSP LOUDSPEAKER WITH KII CONTROL AT LAST! AND IF YOU EVER WANTED A POWERFUL DEMONSTRATION OF THE IMPORTANCE OF MUSICAL TIMING IN AUDIO...

Despite repeated requests over a couple of years, we're late reviewing this loudspeaker, perhaps because of my well known historic, critical view of 'switching' amplifiers and power supplies, as this active loudspeaker is crammed full of them.

However, the current UK distributor finally arranged delivery of these little beasts during Autumn 2018, their ultra-modern exterior reflecting complex beating hearts that combine DSP (digital signal processing) with multiple power amps. (Most conventional loudspeakers, in contrast, consist only of an enclosure with a few drivers, some wires and wadding, plus a passive crossover network to divide the audio range between the loudspeaker drive units.)

The £11,000/pair *Kii THREE* is a compact, modern, narrow-front, stand-mount stylish loudspeaker with six drive units, each with its own 250W power amplifier. (That's 3kW of stereo power!) Extensive external heat-sinks comprise matt black conductive metal plates, making up a good proportion of the enclosure area. The loudspeakers

have switchable analogue or digital inputs on XLR AES/EBU sockets, and can handle digital signals up to 24-bit/192kHz; some useful tuning settings for location and timbre are also available on their rear panel. The extended length of this review is simply because this is such a ground-breaking design it deserves an exhaustive appraisal.

When installed domestically the usual signal inputs are primarily designed around another interface, accessible to the user *via* a cable linked electronic box, a compact, wired remote control that includes a volume facility. The latter may be both manually and wirelessly actuated, *via* several formats including RC5 and Apple Remote. This compact unit, known as *Kii CONTROL* (£1,500) may even be placed beside the listener, if somewhat limited by a 5m umbilical cable, but only if other auxiliary input socket facilities (for example USB, phono and optical S/PDIF) are not required.

*CONTROL*'s USB socket supports 24-bit PCM up to 384kHz, plus DSD up to 128x. Volume may be set in 200 steps of 0.5dB resolution, and it has source selection, 'exact' phase setting, and mute. It has a central knob and seven pushbuttons that set the very versatile boundary and contour filtering options. These are computed in the DSP and are shown on a small OLED display.

Since the design as a whole does not have WiFi connectivity for sources, App control and track selection (if needed) must be supplied by an accessory 'bridge' such as an Auralic *Aries G10*, which may stream digital audio to *CONTROL*'s USB input. (Besides DSD, PCM replay is also possible up to 384kHz sample rate.) Digital inputs are re-sampled and re-clocked using a proprietary Kii jitter rejection algorithm which is said to maintain the source resolution.

The comprehensive manual has very detailed descriptions, specifications and operational details. In my view, the most important technical feature is the directional low frequency radiation, which works a little like a phased array radar aerial. A substantial 4.8dB worth of forward axis directivity or 'throw' is available from 80Hz to 1kHz, which really is a big deal in controlling bass uniformity, in view of room standing modes and reflections. Furthermore, this



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speaker's 'tone controls' are so versatile it's hard to imagine that an installation cannot be tailored to a wide range of settings and locations. Even if these *CONTROL* features are not required, they may be used to calibrate the speakers during the installation and room tuning process, and then retired.

Our speakers were supplied with well-designed matching steel stands (£1,000/pair). These were acoustically dead, mineral-loaded, floor-spiked and fitted properly to the loudspeakers.

### Setting Up

So well do they drive the room, even in the poorer of my two main locations, the *Kii THREEs* were installed with minimal fuss and worked very well straight out of the box. The bass immediately sounded deep, extended, tuneful and boom-free at normal sound levels, while the sound in the front stage was clean, detailed and well balanced. One could believe it was 'job done' at this point. Eyes shut, one could imagine a tower speaker of considerable power and a well extended bass, but are then reminded by just how well coordinated the sound is – more like the proverbial point source.

It resembles the Quad *ESL 63*, in the fine coherence, focused timing, lack of coloration and the near point source focus, with as sharp imaging as the programme sources provide. Some subtle sound quality differences were audible over the different inputs. Co-axial S/PDIF from a good CD drive seemed a bit 'digital', being slightly abrasive in the high treble and with sometimes larger than life, out-of-the-box imaging. (Perhaps I wouldn't have noticed that effect if I hadn't tried other sources!) USB drive gave convenient access to hi-res material (on PCM and DSD), facilitated by the well regarded Auralic *Aries G2* (*HIFICRITIC Vol12 No2*) running its own control App (Lightning DS). Here the stereo rendition was more familiar and actually quite excellent.

### Sound Quality

Finding the bass lines coming in late, I was initially concerned about musical timing, even though a sealed box design such as this ought theoretically to be superior in this regard. However, it turned out that this behaviour was due to inherent internal processor delays. The latency switch (processor time delay) had been set 'Low' (to synchronise better with video sources). I changed it to 'Exact', whereupon I cannot imagine a better demonstration of the audibility of correct time alignment; in particular the fabled linear phase promise.

Now all was in place and the bass timing was actually very good indeed. Virtual sources were very well focused and differentiated, in both width and

depth. Furthermore, compared with most designs the sound varied very little with angle or even head height (within reason) confirming the previously observed excellent phase integration. Well recorded ECM jazz was simply a revelation through this design. Bass was quick, punchy and tuneful – more like a great pair of cans than speakers in a room.

Protecting against overload damage, soft limiters efficiently avoid LF 'knocking' and consequent gross distortion. Their action is so subtle that I found I could play the *Kii THREEs* progressively louder until the bass audibly softened and compressed, at the sort of volume levels that seemed implausible from such small objects. (At which point one simply backed off and behaved more sensibly.)

At more moderate sound levels the speakers sound as though a pair of 250mm (10in) bass drivers per channel are operating, though eventually the laws of physics take control and encroaching compression alters the programme dynamics. It won't knock, clip, or distort: excess volume drives it towards a softer 'cushion-like' effect, which might sound like failure in the bass, but is not; it is simply being driven beyond its limits. It doesn't shout or knock; merely softens and doesn't get much louder.

So how good is it? Considering the usual alternative complement of audiophile cables, DACs, racks, amps and speakers, it sounds more like £25,000 worth of gear. Yet it also does things which even such a stack cannot do, such as taking control of LF room acoustics, adapting to different room placements, and enabling near perfect time alignment, a feature that I found particularly valuable, once heard properly. Separate audiophile accessories or supports are not required, and full control facilities (including highly refined Baxandall tone adjustment of frequency over the whole audible range) are built in. Subtle adjustment is possible, for personal hearing characteristics, for room acoustics, and for sources.

However, LP listening requires conversion to digital audio to feed the controller input, or if in analogue, accessing the XLR analogue inputs at the back, which I also tried. The results were impressive nonetheless, making a more than capable sound fed from an LP system (Linn Sondek *LP12* with Naim *SuperLine* phono stage). A conventional pre-amplifier may be used, with a DAC and/or a tuner.

The low frequency behaviour is undoubtedly remarkable. Set up for my fairly open space location, broadside to the room and not aided by side walls, not only is the bass deep, tuneful and well balanced for the listener, it is better all over the room compared with conventional designs (and also propagates with less boom around the

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Wired remote

house). (My large, semi-open-plan room is hard to drive, benefitting from large sealed box designs, and interacting rather more antagonistically with ported models.)

However, the *Kii THREE* just got on with the job delivering extended, tuneful, crisp, rhythmic and notably even-sounding bass. The mid-treble section has almost uniform directivity compared with nearly all loudspeaker systems, so the sound quality barely changes with modest changes in ear height or toe-in.

For many users the matching BXT subwoofer (£15,000/pair) won't be required, though it can help when driving large spaces or operating at very high levels. This low frequency extension module supports the *Kii THREE*, with 16 additional bass drivers fed by a total of 7,000W. It should increase the overall dynamic range substantially, and certainly provides much higher power for extended bass.

From experience (in my case reviewing many hundreds of loudspeakers), few really impress, but this one did. While one is aware of power handling limits, largely to do with its sheer compactness, it continues to surprise, covering its tracks so well one is hardly ever aware of the speedy internal corrective computations until it's really pushed. And when

those limits are reached it behaves so gracefully, it's more like punching a cushion than knocking against end stops. A little before that point the low frequencies show some boxy coloration and begin to lack extension and definition, but even this is surprisingly subtle. Perhaps surprisingly it excels on classical organ, playing bass scales for the deep pedal pipes tunefully and with character, yet without any 'room boom' masking.

Taken overall there is a hint of extra sweetness in the midrange, and it somehow just softened the leading edge attack, for example on concert piano, which the technologically not dissimilar KEF *R50W* had reproduced so well.

Clarity is very high, with very good resolution across the board, and bass tune-playing is reminiscent of the best sealed-box designs at more than double the price, with extra credit for bass uniformity over frequency and the room space. Furthermore, the very well balanced midrange has very low coloration, with essentially seamless crossover joins.

The stereophony is very close to holographic, painting very well focused images in space and depth, without the usual mild ambiguity. For a well-recorded orchestra (not a multi-mike version), performers are laid out over a large stage, clearly differentiated spatially, with their harmonics correctly focused on their respective virtual sources. Listener fatigue is greatly reduced by these levels of outstanding image stability, clarity and resolution. It ruthlessly decodes how recordings are mixed and at times you have to let the track get going and then readjust to the particular production mix that has been laid down. Naturally mastered recordings sound very natural!

### Conclusions

Purchase of this design needs some thought regarding a partnering system, specifically asking questions about how little else one may need. It is very good straight out of the box, driven from an existing system *via* an analogue pre-amp. It may then be expanded *via* the AES digital inputs and used with a volume-controlled digital audio feed. (Usually this would use a Streamer App with included volume control.)

The tethered remote *CONTROL* might be slightly awkward, but extra facilities become available, including volume and a wider choice of digital inputs, sample rates and formats. It also includes extensive adjustment for location, and for fine-tuning the bass and the timbre, which makes the combination exceptionally versatile and adaptable. The overall sound is undoubtedly very good, while the stereo imaging, bass definition and musical



*Kii THREE on BXT subwoofers*

timing are state of the art. Designer Bruno Putzeys and his team has hit our mark head on, scoring a top *HIFICRITIC* Audio Excellence rating.

### Technicalities

The most recent DSP active loudspeaker we reviewed was the little two-way KEF *R50W* at £2,000 a pair. These used a single 110mm (5in) UniQ coaxial driver, had a powerful DSP engine including phase correction, and performed well for its size. By contrast the complete £13,500 *Kii THREE* package is a three-way, with four 170mm (6in) chassis, alloy-cone bass drivers each powered by 250W of uniquely tailored audio drive, plus a 110mm (5in) pistonic midrange and a 25mm directivity controlled tweeter. Even from such a compact enclosure, there is clearly potential for serious dynamic range.

Objectively, the project has at its heart the creation of a powerful compact loudspeaker suited for professional monitoring but also for home audio use. Here, within understandable limitations of the laws of physics and acoustics, the obstacles to accurate sound reproduction in a given space have been comprehensively addressed. And as far as this audio critic is concerned, it is less to do with picking over the details but rather standing back and viewing the achievement as a whole.

The designer, the talented Bruno Putzeys (of Class D amplifier fame, including the *Hypex* and *Mola Mola* series) has clearly viewed the whole project with fresh eyes, well supported by his ambition and confidence in the power of DSP engines and his own very high power compact modular amplifiers. Deep bass from a compact enclosure requires immense power, but this he has at his disposal. Phase controlled directional bass requires multiple drivers, and there are four here: two at the sides and two at the rear of the enclosure. Good directivity requires, compact well placed mid and treble drivers and these are conventionally located on the front panel, vertically-in-line. All are time-corrected in the DSP.

Most compact loudspeakers have reflex-loaded ported enclosures, for greater efficiency and sound power at low frequencies, frequently at a cost in both coloration and timing. Despite its ultra-compact dimensions, this box is sealed and dispenses with port gain, as it uses four bass units.

The next problem is to do with acoustics. The behaviour of sound waves in a room is hugely dependent on frequency, simply because the wavelength of sound covers a massive range, from almost 20m in the low bass to less than 20mm in the high treble. This wide range of wavelengths has to be radiated reasonably evenly into the room

space for us to hear our music recordings to high standards. However the efficiency of sound radiation is highly dependant on source size, and that is before we try and account for the directionality (beaming), from radiators of finite size at higher frequencies.

Many designers find reasonably effective compromises: larger enclosures and larger drivers for the bass, smaller drivers for the mid frequencies, and tiny devices for the trebles. Yet the problems of distributing the much larger bass wavelengths in the room remains, because a room is a large box at low frequencies, with complex and uneven sound reflections, modes, excited and even partly pressurised at lowest frequencies when driven by a loudspeaker source. Ideally the latter should have directional bass radiation, selectively illuminating the listening region and thus reducing the excitation of the room modes. Putzeys has comprehensively addressed this problem with sophisticated computer processing for directional bass provided by the phased driver array.

It is programmed to have much weaker side and rear drive to the room boundaries, so the *Kii THREE* throws the bass forward towards the listener. With far less stray drive to the room modes the resulting bass can sound faster, cleaner, more uniform, and more tuneful.

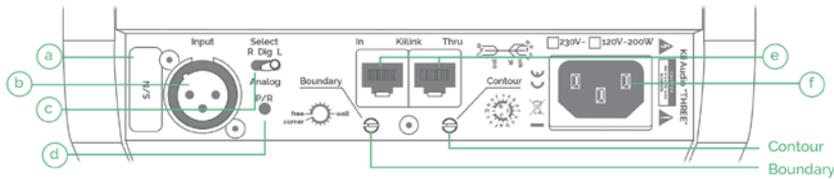
Furthermore, the time-aligned combination of the mid and treble in this design provides near perfect crossover integration for the chosen alignment (in this case that pioneered by the late Siegfried Linkwitz, with the mid-to-treble crossover following the classic fourth-order Linkwitz-Riley.) Here is the opportunity to phase-correct the entire design to achieve a linear phase characteristic, for theoretically more natural sound reproduction and improved musical timing, including beat and rhythm. Putzeys has grasped this opportunity too, a switch allowing us to hear the difference between the *minimum delay* mode (usually for crisper lip sync with video), and the fully aligned *phase linear* state for music. (This facility also conveniently provides us with the proof that such time-alignment is both audible and worthwhile.) When time-corrected, the inherent latency (or instantaneous time delay) is close to 1ms.

Despite the high efficiency of the off-line switch-mode power supplies and the matching PWM Class D power amplifiers, the casework runs quite warm. Each loudspeaker consumes about 40W in idle, reaching a surface temperature of about 33°C (depending on ambient). When driven hard they do not get significantly warmer, as the power efficiency actually improves.

Putzeys includes current feedback from the working drivers to the amplifiers, helping to compensate for



## Installation + Connector Panel



**Power** - The Kii THREE has no power switch. Simply plug the power cable into the IEC socket (f). If no audio signal is present at the input for more than 15 minutes the speaker will automatically go into **standby mode**.

As soon as the input detects an audio signal it will automatically power on. This can take up to seven seconds.

Here is an overview of the connector panel from left to right:

- (a) **SERIAL NUMBER** - This is the individual Serial No. for each speaker.
- (b) **XLR INPUT** - This is the single XLR Input connector which can be set to process analog or digital audio signals, depending on how the Select switch (c) is set.

### Review System:

Constellation *Inspiration 1.0* pre-amp, Townshend *Allegri* control unit; Naim *NAP500DR* power amplifier, Naim *SuperLine* phono pre-amp, Linn LP12 player (with *Keel* chassis and *Radikal* motor control), Naim *Aro* arm, Lyra *Delos* cartridge; Naim *UnitiServe* network server and S/PDIF source; Linn Klimax *Katalyst*, Naim *NDS+555 PS(DR)* streamer-DAC; Auralic *Aries G-2* USB streamer; Meridian *200* CD drive; Wilson Audio *Sabrina*, Magico *S-5II*, Quad *ESL63*, BBC *LS3/5a* speakers; Naim *FRAIM* racks; Transparent *XL MM2*, Naim *NAC A5* speaker cables, Naim *Super Lumina*, Transparent *MM2*, Van Den Hul *Carbon TFU* interconnects.

distortion and voice-coil heating. The innate frequency response of each driver is held in the DSP library to help compute accurate equalisation; this operating model includes overload limits so that damage and audible overload are avoided.

Where the *BXT* subwoofers are not used, the matching stands will be essential, as they are wholly functional and complement the design well. Note that the boundary settings include semi-free space (near wall), on-wall and even when located in a corner.

### Test Results

#### Frequency Responses

Early versions were reported as having some minor frequency response irregularities, but my results indicate that these have largely been addressed, and the design now demonstrates remarkably accurate acoustic output. (Note that these test results are time-window-gated, in-room measurements.) Local reflections cannot be wholly mitigated, yet it was possible to observe exceptionally accurate  $\pm 1.5\text{dB}$  from 25Hz to 25kHz, without smoothing or averaging (see graphs). This fine result is due to both phase and amplitude correction for the drivers, a low diffraction enclosure, and a radiation-focused, infinite baffle bass that is powerfully boundary independent. The output from my samples continued evenly to a high 30kHz  $-3\text{dB}$ , which is also an improvement on earlier production.

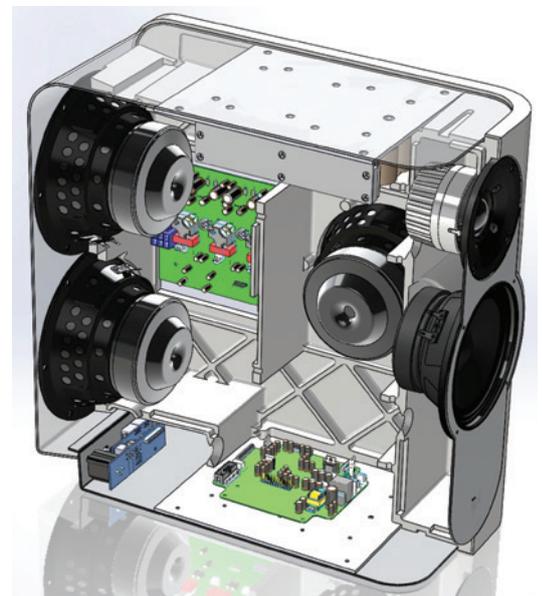
The close time alignment of the mid-treble drivers is seen in the vertical axis  $\pm 15^\circ$  results, which are almost identical, showing good conformity with the welcome symmetry promised for a time aligned set up following Linkwitz-Riley teaching. The unavoidable minor off-axis dips at crossover over the vertical span are barely audible at just  $-2\text{dB}$ , and are desirably symmetrical.

The slightly poorer sounding above-axis response shows a mildly rising treble output, but it's still very well integrated. Note that the fairly high matching stand places the seated listener's ear a little below the mid-to-treble axis, which is clearly (and audibly) just right.

Thanks to the digitally processed time alignment of the array and the low diffraction enclosure, amazingly good lateral off-axis responses were obtained. There is only 3dB of loss right out to 12kHz, even for  $60^\circ$  off-axis, thanks to the enclosure narrowness and the anti-diffraction curvature, but credit is also due to the useful waveguide fitted to the high frequency unit. These results are orders of magnitude better than those of the loudspeaker industry in general.

The *Kii THREE* sounded at its best when slightly toed out by  $7.5^\circ$ , and at a height that's just above the midrange driver. Note the astonishingly close agreement between the  $15^\circ$  lateral output and the axial result. (Black trace presented in third-octave analysis from 30Hz to 20kHz, and measuring  $\pm 1\text{dB}$ ) (Happily I have a precision 12.5mm B&K condenser microphone, to qualify these results accurately.)

One would anticipate that such a uniform acoustic output, allied to low frequency boundary compensation, would generate good results for the room driven response over the listener region. The spatially averaged assessment resulted in one of the most uniform and extended room responses so far recorded, an amazing 25 Hz to 12kHz  $\pm 3\text{dB}$ , and it sounded much like this response curve. Furthermore, the quite exceptional pair matching is better than  $\pm 0.25\text{dB}$  right out to 10kHz, which helps explain the observed pin-point image focus.



This loudspeaker's inherent low frequency directional control is in my view rather more successful than the more usual alternative of conventional omni-directional bass combined with DSP room correction for peaks and dips at the listener location.

### Distortion

Regardless of the number of drivers, it's not really surprising that this compact loudspeaker runs out of puff at higher powers and lower frequencies. While 96dB SPL was possible in the midband at 2kHz short term, with second harmonic distortion at 0.3% and third at an impressive 0.2%, down at 40Hz it was in limited overload, with 20% second harmonic and 10% of third harmonic distortion. It could just manage 100dB SPL at 500Hz in the midband with an audible 2% of second and third, with the fourth harmonic also at an audible 0.7%.

Overall, at more reasonable levels, second harmonic was higher than average for more recent high end designs, but still considered satisfactory. At 86dB SPL, second averaged 0.15% to 0.2%, while for frequencies above 500Hz third was also nicely held to 0.1% or better. At lower frequencies third harmonic rose somewhat: at 125Hz, 86dB SPL I measured 0.35%, and considered that this was marginally audible. By 90dB, 125 Hz it was approaching 0.5% and distortion was audible on music program at this level. Certainly at higher powers some lower frequency coloration did seem to be associated with moderate levels of harmonic distortion, which I also associated with a mild loss of attack and definition; backing off the loudness confirmed this observation.

By comparison, a larger passive design of typical 90dB sensitivity may well accept 40W at 40Hz for 106dB SPL with just audible distortion, while the compact *Kii THREE* will begin audibly compressing at a 10dB lower sound level, if a still quite loud 96dB SPL. It cannot quite do the impossible!

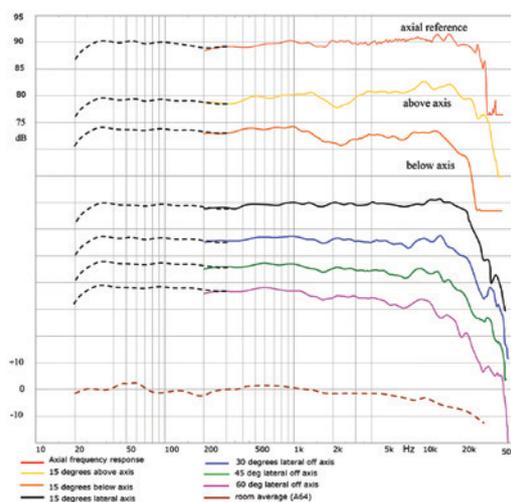
### Time Response

Within the limitations of a non-anechoic test environment, the energy decay waterfall result is exemplary. The uniformly fast and even decay from the back of the graph ( $t=0$ ) shows that all frequencies are in phase, with no inherent delays, confirming linear phase. The transient response is desirably rapid and noise at the decay floor is largely due to measurement limitations. However, closer hands-on examination revealed some audible mild lower midrange coloration emanating from the moulded side panels of the enclosure, which are a little resonant.

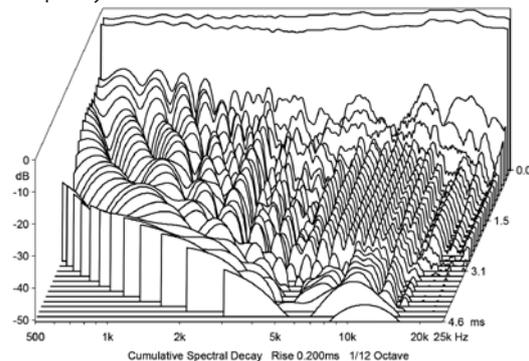
### HIFICRITIC Measured Test Results October 2018

Make	Kii Audio
Country	made in Germany
Model	Kii THREE
Finishes	Gloss white, metallic graphite (plus special order colours)
Accessories	Matching stands CONTROL (wired remote) BXT LF power base
Type	Moving-coil; six driver 3-way stand mount; sealed IB loading; 4.8dB cardioid LF directivity (55Hz-1kHz)
Drivers	4x16cm alloy cone LF, 11cm cone MF, 25mm dome HF (waveguide)
Inputs	Analogue and digital XLRs; Cat 5 to CONTROL adds USB plus S/PDIF (co-axial, optical)
Frequency response measured	30 Hz-20kHz $\pm 1.0$ dB (on listener axis; excellent tolerance)
Frequency response, off-axis	Very good: see graphs and in-room response
Pair match	$\pm 0.25$ dB 40 Hz-10kHz; excellent
Bass extension	18Hz -6dB (25Hz practical in-room limit)
Max loudness, in-room	100dBA for a stereo pair (more with BXT base)
Placement	Free space, near wall, corner, on-wall
Power consumption	44W each (idle) (1W in standby)
Size (HxWxD)	40x20x40cm
Weight (spkr only)	15kg (33lbs)
Prices	£11,000 (speaker/pair), £1,000 (stands/pair), £1,500 (1x CONTROL interface) £15,000 (active BXT subwoofer stand/pair)

Kii 3 Master Graph Frequency Responses



Kii 3 Waterfall Display of Energy Decay with Time and Frequency



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