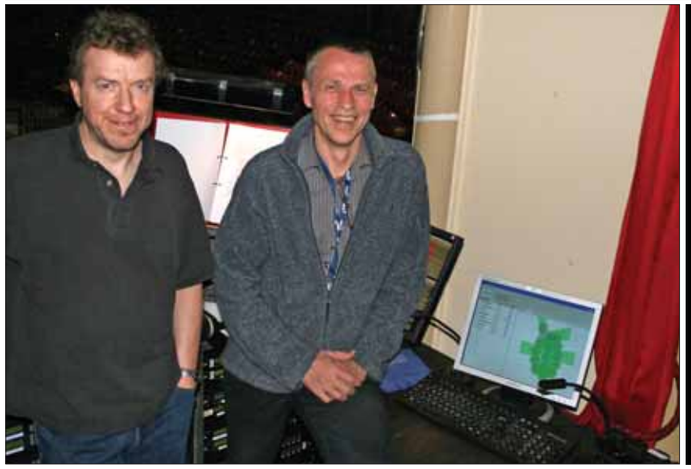

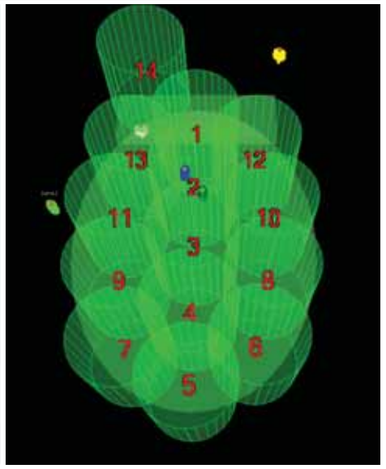

Reinforced concrete . . .

TiMax continues to push the boundaries of theatre sound on Raymond Gubbay's latest opera production, as Phil Ward discovers . . .

A TTT Sensor.

UK - Imagine a world in which stage sound was much closer to film sound. Ambitious, but a worthy goal nonetheless: audiences accept willingly that the discrete, perfectly placed corridors of audio emanating from a cinema surround system relate honestly to the action and speech on the screen, and both eye and ear sit comfortably - with a bucket of ice cream and zero disbelief. You could call it the Häagen-Dazs Effect.

Recently, Cambridge-based digital audio pioneer Out Board Electronics (OE) has been taking steps towards just such a theatrical nirvana. Following a few years of co-development, experimentation with radar tracking and good old-fashioned business risk-taking, OE founder Robin Whittaker and his co-director Dave Haydon attained a new level of achievement for the company's flagship audio imaging product, TiMax, at The Royal Albert Hall during March - when a Raymond Gubbay production of Puccini's opera *Tosca* took to the stage. Or rather, took to the stalls.

Moving into the centre of the arena for a typical in-the-round presentation, Gubbay's 2008 *Tosca* has perfected many of the audio tracking techniques used in previous outings with OE while upping the accuracy ante, thanks to newly discovered radar technology. This comes from Cambridge-based technology firm Ubisense, which has partnered with OE to produce TiMax Talent Tracker (TTT). Picking up the challenge to reinforce the main voices without anyone really noticing, even as the performers wander through 360° of pretend Rome, TTT applies precedence delay to the key channels of a TiMax-driven, multi-channel speaker system designed by Bobby Aitken, installed by Autograph Sound and supervised by Jim Douglas.

As the overall mix is guided through a DiGiCo console to the Meyer Sound and d&b audiotechnik PA, TTT is able to render its processing dynamically and automatically by being linked to the ultra-wideband radar tracking system. Each singer deserving of one wears a transmitter as well as the radio mic, sending

Facing page: Tosca at the Royal Albert Hall. Outboard's Robin Whittaker (right) with sound designer Richard Sharratt. A screen-shot of the TTT system.

location data to six sensors installed at circle level. TTT then uses MIDI to inform TiMax's ShowControl software where the singer is and, therefore, how to adjust the audio image - not merely for the mix, but for the all-important Haas Effect delay techniques on which TiMax's pioneering reputation is based.

Prior to this generation of the technology, precedence delay was applied manually by the sound operator according to Cues within ShowControl. Now, TTT uses Image Definitions that it can switch between freely as the actors move around the set, increasing the psycho-acoustic effectiveness of the system while at the same time simplifying FOH operation. Bearing in mind that Gubbay's productions use English libretto in order to render opera even more accessible to audiences, improvements to vocal intelligibility take even greater priority than usual and TTT, without any doubt, takes a few steps towards that cinematic objective.

But how far can such a system go in the search for sub-atomic sound? Although TTT accommodates up to 60 actors, the sky's the limit with a bit of daisy-chaining of the sensors. However, TiMax itself currently has 32 audio inputs and 32 possible Image Definitions, providing for 16 singers at once. For Gubbay-style productions *du jour* this appears perfectly adequate, and it's the smooth transition between one Image Definition and another that really marks out TTT as a quantum leap - however many stage sources there are.

According to Robin Whittaker, the key to it is a 'soft-pan' algorithm that plays an even stronger psychoacoustic hand than before. "As you switch from one delay scenario to another, even by just 10 milliseconds, it causes a distortion," he explains, "and chance dictates whether that's fairly inaudible or quite a loud click. If the waveforms marry up, you get a smooth transition, just as with looping when you pick zero crossing points or equal amplitude points. So we spent a lot of time softening those delay changes using fairly standard soft mute techniques - 40-50 millisecond ramp-up and ramp-down times.

"But we discovered that if you continuously move a source in space through a distributed loudspeaker system, therefore changing the delay scenario from the projected origin of the signal every 10th of a second or so, it gives rise to a much more audible distortion than a singular event. Singular event distortion can be as high as 20%-30% without you realising that it's happened, whereas continuous distortion can be detectable down to 0.1%. So you can get away with quite big distortions providing they happen infrequently and randomly, and any repetitive distortions are made incredibly slight. The algorithm therefore has to make the most of the things we're fundamentally quite deaf to and minimise the things we're fundamentally quite sensitive to . . ."

This tracking system is more accurate than any used before by OE, so the team has been able to define more on-stage zones for TiMax and use the radar to its full potential. Previously, there may have been 2m-3m of inaccuracy at times, requiring TiMax to deal with fewer and larger stage zones in order to avoid too many shifts in precedence delay. The delicate balancing act performed by the system, therefore, is to exploit the increased number of reference zones while compensating for the added noise created by switching between them.

The other balancing act asked of this type of application is, of course, the one between the bipolar demands of three-dimensional reinforcement and two kinds of invisiblity: literally, the absence of obvious mics and speakers; and sonic transparency. What, finally, does Whittaker feel is needed to enable TiMax and perhaps other technologies to satisfy further these two conflicting requirements? "It requires some different approaches by people who aren't in the sound business," he replies. "The problems we encounter in the theatre mostly involve scenic design. Obviously in The Albert Hall there's no way you can do anything without audiences being able to see it, but we're still quite heavily restricted by sight-lines.

"I'd like to go much more distributed, but then there are cost factors that come into play too. We've got to get the speakers closer to the punters, so the reinforcement can work without exciting the space . . ."

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