

Adjusting to the event

Paddy Baker reports on one of Europe's first installations of the Constellation active acoustic system – which lets users vary the sonic characteristics of a space

The Mumuth hall at the University of Music and Performing Arts in Graz, Austria is remarkable for a number of reasons. Visually, the €19 million building is striking: the interior consists of a concrete and steel spiral the ends of which are interwoven with its middle, and which divides the building into its component parts. The exterior bulges, almost as if the building had been over-inflated. But if the venue is striking from a visual perspective, it's just as exciting aurally – due to its being the site of one of the earliest European installations of Meyer Sound's Constellation acoustic system.

According to its architect, Ben van Berkel, the vision was to make a building that was “as much about music as a building can be”. So while Mumuth – the name is derived from ‘house for Music and Music Theatre’ – could scarcely be more modern architecturally, its musical repertoire – which includes electronic, jazz, classical, opera and more – spans the centuries. In addition, being part of a university, the hall is not simply a performance space, it is also used for teaching and research.

Given the multipurpose nature of the performance space, the university also sought flexibility in the way that the main hall sounds, as these different types of music require different acoustics.

To provide the required adjustable acoustic, project



Meyer Sound speakers are positioned throughout – but you shouldn't hear any individually

acoustician Thorsten Rohde thought of the Constellation system, and called in the Berkeley, California-based manufacturer. The system uses a dense array of microphones and speakers in conjunction with digital processing to reduce the absorption of the venue and increase the apparent cubic volume of the space.

John Pellowe, project director, Constellation at Meyer Sound, explains: “Like all good active acoustic

installations, if you hear a loudspeaker – if you can at any time detect any electronic artefact, or even tell that you're in an active acoustic environment – then we have failed completely. Our policy is generally to double reverb times, but not go much further than that – because if what you see and hear don't correlate, then it makes no sense.

“If we were to take a small hall like Mumuth and make it sound like a cathedral, then you would know immediately

that you were in an active acoustic environment. So we try to make a credible link between what you see and what you hear – unless of course it's for special effects.”

He points out that where Cirque du Soleil uses Constellation in its major shows in Las Vegas and elsewhere, “when the hall is super-reverberant, it's nearly always when the environment is closely controlled by the lighting, so you're not aware of where the boundaries are”.

Building properties

The hall is 34m in length, 16m wide and 9m high. It can accommodate an audience of around 600 people in a conventional seating pattern, although more adventurous patterns reduce audience sizes to around 300. Pellowe says: “It has a very low natural reverb time – approximately 1.2 seconds, although that reduces when the hall is occupied. With Constellation we can take that up to 2.2 or 2.3 seconds.”

He continues: “The brief was to put a Constellation system into the hall not just so that they could have variable acoustics, but also so that they could operate on the north, south, east and west walls of the venue – and in the centre as well.”

If this weren't enough of an acoustic challenge, the profile of the hall is also variable. The entire floor is divided into 2m x 1m sections, each of which is on a scissor lift, so the floor can be angled and shaped in an

almost limitless variety of ways. This also means that just about any arrangement of performers and audience can be achieved.

Pellowe gives an example: “When they performed Bach's *St John Passion*, they had an orchestra halfway down the hall, and a figure-of-eight walkway going all the way round it, with the stage in the middle. This means the singers could perform in different places in the hall, and there were seats in the centre of the figure of eight.

“They arranged the floor like a boat, so it went up at both ends and the sides, with a dip in the middle. We had to make special adjustments to make sure that early reflections and reverberations arrived at the right times for different people in different places – so in that respect it was a very complex setup.”

The set-up

So, how's it done? Twenty-four component cardioid microphones pick up the sound in the auditorium, which is passed to the processing system: this consists of five Constellation processors: one primary processor, three VRAS processors and one expansion processor. On the output side, there are 64 MM-XP speakers – 36 overhead and 28 laterally positioned in the walls – and eight UMS-1P subwoofers. “They also have six UPJuniors that they can use if they want to enhance the lateral reflections,” adds Pellowe. “But so far they've decided that they're happy with the sound as it is – although they might find applications for them as time goes by.”

For economy reasons, some processor outputs are shared between speakers. However, “we never put two adjacent speakers on the same output,

Making the case for active acoustic systems

It wouldn't be completely accurate to say that the desire to change the acoustics of performance spaces is completely new: as Meyer Sound's John Pellowe observes: “Concert halls built in Mozart's time aren't suitable for a Mahler symphony.”

However, the idea of adjusting the acoustic to suit the music seems to be gaining currency. For one thing, performance spaces increasingly programme different styles of

music to attract more diverse audiences. For another, modern composers such as John Adams frequently combine orchestral and electronic music within the same piece, which may benefit from a change in the acoustic even during a movement.

As Pellowe points out, active acoustics provide a means of changing the sound of a room more accurately, quickly and with less manpower than adding or

removing acoustically absorbent materials from the space. “With Constellation we can make adjustments without disturbing the building fabric – you don't need jackhammers – and we can do it at the press of a button.”

He sees these systems as a more sensible alternative to spending millions on (physically) variable room acoustics “that may or may not achieve what is wanted”.

Although he sees “a definite, growing marketplace” for active acoustic systems, Pellowe believes there is still a marketing job to be done, particularly in countries with a rich classical music heritage – partly because of the poor performance of some systems that have been installed in the past. “People aren't saying ‘no’, but ‘take us to a space where it works’. That's why we have feel such a sense of responsibility with installations such as Gijon [Constellation's first European installation, at

Laboral University in Spain] and Mumuth.”

While there's no limit on the size of hall where the technology can be applied, Pellowe doesn't underestimate the amount of persuasion that lies ahead before uptake of Constellation in major venues becomes widespread: “The trick here is to get architects, acousticians and musicians to experience the system. The good news is that we have some big projects in the pipeline and the number is steadily growing.”



Each 2m x 1m section of floor has its own scissor lift, making the space hugely flexible

as the signals would correlate – they would act as one speaker below a certain frequency”, he explains. In many cases, shared outputs

are linked to a speaker and the next speaker but one.

The floor shaping had a slight consequence for the speaker positioning, explains

Pellowe: “I would have loved to put 30 to 40 speakers lower down in the wall to enhance the lateral reflections, but we couldn’t do that as, because the floor goes up so high, they would have been masked some of the time. Although there’s a small degree of compromise there, it actually works really well – it comes as a pleasant surprise because the speakers are so high up.”

The Constellation software can communicate with “any number of laptops – so four people can program the system at the same time”, he continues. The CueStation software user

interface resembles that of many digital mixers, although this one can be expanded to have several hundred inputs and outputs on the matrix.

User presets

Most users make use of presets: these have been programmed for speech lift, chamber music, opera, and for medium and large symphony concerts. Each of these also has settings for the stage being elevated at the north or south ends of the hall, and with a different calibration. In addition, each setting has been calculated for both an occupied and unoccupied hall.

Installed

Audio

All Meyer Sound

- ▶ Five-processor Constellation system
- ▶ MM-XP miniature speakers
- ▶ UMS-1P subwoofers
- ▶ UPLJunior compact speakers
- ▶ CueStation software

Most Constellation customers, Pellowe explains, would only be given access to the presets. However, another part of Mumuth’s function is as a kind of laboratory for the exploration of sound synthesis. So, he says, “we’ve password-protected the calibration settings to ensure that the mics and speakers act as a coherent system, but there are many settings that can be adjusted by educated users”.

Also befitting Mumuth’s status as a sound laboratory, physical changes continue to be made. Recently the unenhanced acoustic of the hall was adjusted: some absorptive material was removed to increase the presence of bass frequencies – so Pellowe will be visiting again to review Constellation’s settings.

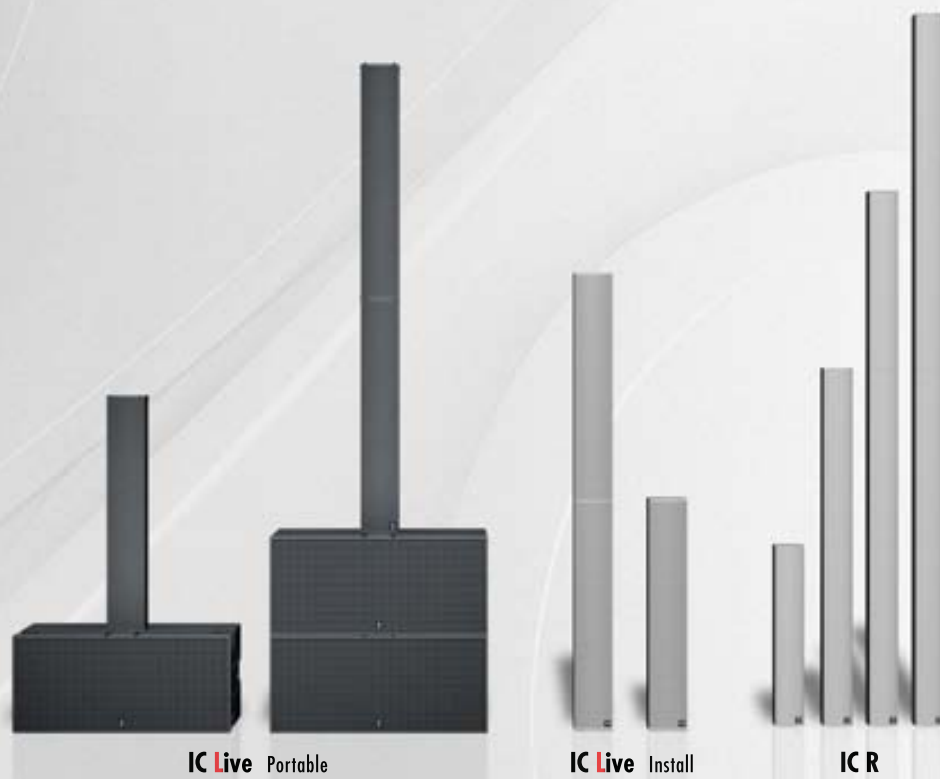
As for acoustician Rohde, he is delighted with his work with Meyer Sound. “Regarding Constellation, I most like its complete new approach at looking at the acoustics of a music hall,” he says. “From a technical point of view, it’s fascinating to adjust the room acoustics to the event and not the other way round.”

While, he says, it has been difficult to make performers understand that Constellation is not a conventional sound reinforcement system, “the process to integrate the system into the artistic daily routine is on the way. More artists understand that Constellation helps them perform better – it’s not a tool to put them under the authority of the sound engineer.”

He also reports a pleasing secondary effect – in that the Constellation installation has made people without a background in acoustics suddenly interested in the subject: “For example, we use the room to demonstrate what ‘reverberation time’ means. In particular, some students told me that they found a new hearing dimension while listening to a concert after lectures in the hall with different acoustic surroundings.” **IE**

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