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Institute of Sound and
Communications Engineers

Winter 2016

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Comments on articles and letters are invited.

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Introduction from our President

Phil Price *MinstSCE*



Well, Christmas is almost here. How many of you will end up doing last minute shopping on Christmas Eve?

This edition again features some interesting articles which I hope you will find informative.

I would like to use this introduction to let you know about our ISCEx 2017 Exhibition preparations. We are starting a campaign to let as many relevant people know about ISCEx with the aim of hopefully attracting new visitors that want to meet up and network with our exhibitors and regular members.



ISCEx 2017 As you read this edition we will have launched a new dedicated website for ISCEx – www.ISCEx2017.org.uk – This is linked to our main website but will start to show more relevant information for visitors and seminar delegates.

f We have also activated a new ISCE **Facebook** page, which we urge you to share among your audio friends.

in Our **LinkedIn** has also been refreshed.

Twitter Likewise our **Twitter** feed will feature regular relevant tweets.

Please click on the icons to look at the new content.

This has been possible thanks to our newly engaged PR and Marketing organisation – Nick Spalding Ltd. Nick will also be contacting our 2017 exhibitors offering 'personalised email blasts' that can be used to email their own contacts for publicising ISCEx.

Please log on and save the ISCE Facebook page and ISCE Group on LinkedIn. Please also 'like' and feel free to 'share' amongst your audio industry colleagues and friends. It will be really important to address as many people for inviting to the ISCEx event.

Furthermore with the LinkedIn group please consider asking audio related questions for hopeful answers etc, on the page.

You will also notice a new style fresh and more modern approach to the ISCEx logo and this transfers across the social media pages.

If you have not yet noted the date of **ISCEx** then please book in your diaries now Wednesday 8 March. With our AGM and **Networking Dinner** on Tuesday 7 March. The Dinner event is becoming more popular each year. Please enquire to reserve your seats with Ros.

ISCE will again be exhibiting at ISE in Amsterdam between 7 and 10 February, we hope to see many of you at the show.

Finally I would like to take this opportunity to wish you and your families a joyful Christmas and a happy new year. I look forward to meeting many of you at ISCEx in March. ♦

Phil Price

Forthcoming events diary

18–19 January 2017

PLASA Focus
SECC, Glasgow, UK

19–22 January 2017

NAMM
Anaheim Convention Center,
Anaheim, USA

26 January 2017

**Designing for speech
intelligibility – using the
speech transmission index**
Production Park, Nr Leeds, UK

7–10 February 2017

ISE 2017
RAI, Amsterdam, NL

28 February – 8 March 2017

BVE
ExCel, London, UK

1–2 March 2017

Events Production Show
Olympia, London, UK

7 March 2017

ISCE AGM
Coombe Abbey,
Binfield, Nr Coventry, UK

7–8 March 2017

ISCEx2017
Coombe Abbey,
Binfield, Nr Coventry, UK

4–7 April 2017

Prilight & Sound
Frankfurt am Main,
Frankfurt, Germany

9–10 May 2017

PLASA Focus
The Royal Armouries,
Leeds, UK



Audio processing principles

By Martin Bonsoir

In the 1980s a slighter younger (and hairier) me walked into a recording studio. It was a very simple setup even for those days, but I was immediately marvelled by all the flashing lights, faders, and buttons. To me, they were the embodiment of cool and I had the urge to learn how to operate them and thus, look cool by proxy. I was a teenager, after all.

Most of the machines I was staring at were audio signal processors, and that day marked the beginning of my journey learning what they do, how they do it, and why we need them. The following are brief answers to these questions.

Of course, volumes of educational multimedia have been created on the subject, and I strongly encourage you to seek out this information. It is beyond the scope of this article to describe in detail every technique and method out there; the emphasis being instead on providing a brief account of the basic principles.

But first, we must agree on what audio is, and how can we process it.

For the purpose of this article, we will define sound as 'the propagation of a vibration through a medium'. Sound has a number of properties and depending which field of science or industry you approach the

subject from, some of these properties may seem more relevant than others. For AV professionals, I would argue the two we care most are frequency (typically associated with pitch) and amplitude (which helps define loudness).

"But what about phase?" I hear you ask. Well, that too, but since few professional audio processing units include dedicated tools to deal with phase alone, we will leave that for another day.

A dynamic approach

One of the ways in which we can process sound is by altering its amplitude. We can do so in a 'static' way, by increasing or decreasing its level by a fixed amount, or we can get more creative and apply the changes in a dynamic way. This is where the term 'dynamic processors' comes from, and this approach can offer a wide range of solutions.

All dynamic processors apply the same principles, automatically adjusting the gain of an audio signal as a function of a detection circuit, often referred to as the 'side-chain.' This side-chain detection samples the signal and uses the ensuing result to control the gain applied. There are multiple settings and fancy ways in which we can fine-tune the way dynamic processors operate, but the essence remains the same. ▶

The most common dynamic processors are called compressors, limiters, and gates, with more specialist versions like duckers and automatic gain control (AGC) also being widely available. Let's have a brief look on what they offer.

Gates apply attenuation to a signal until it reaches a predetermined level, as sensed by the side-chain. One typical example of its use is to ensure that a microphone will be 'open' only when someone speaks directly into it.

Compressors and limiters, which are really compressors operating in a more severe manner, restrict the audio signal's dynamic range* by reducing the loud parts and leaving the quieter ones unaffected. This helps achieve a more consistent sound, which is easier to manage, and if applied correctly it can have the perceived effect of making an audio signal seem louder and more stable.

Limiting helps protect a sound system from distortion and even damage, with peak limiters usually applied to shelter amplification stages from blowing up and speakers from turning into confetti.

The beautifully named duckers offer a twist on the concept above. By making the controlling side-chain signal different to the signal having its level attenuated, duckers can provide a simple method of achieving priority between two signals. Ideal when we want the background music level to automatically lower (duck) whenever an announcement is made.

The AGC process regulates the level of an audio signal by adding or subtracting gain, as required, in order to bring the level of the input signal closer to a target level. This helps maintain a relatively constant output level, even if the input level fluctuates. This process can be of immense help when trying to ensure that background music levels remain constant from one song to the next, or that a person's voice is heard at a consistent level even if he or she changes position or has a noticeable variation in their speech volume.

AGC can excel as a tool when the device implementing it is sophisticated enough to distinguish if the audio signal about to be modified is indeed the true signal desired, or just noise picked up by the microphone. For example, the last thing we would want is for an AGC-controlled microphone in a conference room to suddenly receive a huge

boost just because someone flicked through pages of paper nearby. Specialist algorithms like Tesira's SpeechSense™ help prevent this kind of unwanted side-effects.

Some are more equal than others

Filtering is an audio processing technique that aims to alter the frequency content of an audio signal. Filters are used to adjust the amplitude of a specific band of frequencies, and can be employed for a number of very useful purposes. With filters and equalisers we can remove unwanted sounds, combat feedback, enhance certain properties of a sound, and compensate for deficiencies in the sound reproduction equipment or the acoustic environment. While looking impeccably cool and effortless.

There are many ways of implementing audio filters, with low pass, high pass, and shelving filters arguably being the most commonly offered in modern audio equipment. Low/high pass filters allow us to gradually reduce the level of audio frequencies below or above a user-defined one, called the 'cutoff' frequency.

Shelving filters not only allow us to reduce the level above or below the cutoff frequency, but they also permit increasing it. Unlike the low/high pass filters, which apply gain or attenuation progressively, shelving filters aim to apply an equal amount of gain or attenuation to the selected frequencies.

Filters can, and commonly are, combined into a single tool, and graphic and parametric equalisers are amongst the most common ways of delivering this capability. Having several filters in one processor has the advantage of facilitating multiple changes to a sound signal in an efficient.

It is worth mentioning that while filters are wonderful tools to employ in our efforts to provide natural sounding audio solutions, when they change the level of frequency ranges they may also alter the relative phase of those frequencies. This can have a detrimental effect in the perceived sound quality, so moderation is always recommended when equalising an audio signal. Attenuating, rather than boosting, usually helps achieve a better result. Lastly, should you find yourself having to apply extreme settings it is usually because there is another problem further up the audio chain. The effect of extreme equalisation can often be more destructive than constructive and so the problem would be better resolved at its source. ▶

* The ratio of the quietest to the loudest bits of that sound.

Automatic transmission

Combining multiple microphones brings a series of challenges, chiefly amongst them is the increase of ambient noise or 'room sound' and the reduction of both gain before feedback and intelligibility. Fortunately, automatic mixers come to our rescue by providing the means of ensuring that only those microphones that are being used are receiving significant gain, while the unused ones are turned down or gated.

As with the dynamic processors discussed above, there are multiple ways in which automixers can be tuned to perform more efficiently in a given set of circumstances, as indeed there are different philosophies by which automatic mixing can be implemented. But the essence is the same: only those microphones being used are heard, while the rest are attenuated until they are needed and active. All of this is done automatically, without the need of a live operator. Talk about automation stealing our jobs!

But wait, there's more

There are quite a number of audio processing techniques which I haven't covered in this article: not least adaptive filtering techniques like acoustic echo cancelling, or noise suppression; automatic adjustment of level based on ambient noise, cross-overs, and yes, FIR and all pass filters (happy, phase freaks?). And we haven't even talked about delay. Let's not go there.

But that only goes to show how a seemingly simple occurrence like the transmission of a vibration through the air can become something so cool as to besot an impressionable teenager, and remain his passion well into (semi)responsible adulthood. Let alone be the reason why projects succeed or fail, why businesses are done or missed, and of enjoyment or frustration.

Because the answer to why we need audio processing was the most difficult one for me to find out, and one I believe we often fail to understand for no other reason than it is so obvious and powerful we can easily miss it.

Audio signal processors improve the way we communicate.

And, I will argue that our ability to do so defines who we are, and directly affects our capacity to realise our potential. How cool is that? ♦

www.biamp.com



ISCEx2017

www.iscex2017.org.uk

Networking Dinner

Tue 7 March 2017 · 7pm

ISCE will be hosting a networking dinner in the elegant dining suite of Coombe Abbey on the eve of the exhibition. Guests can enjoy a fine-dining experience and mingle with the good company of industry friends and colleagues, as well as being introduced to some new business contacts. Starting at 7pm with pre-dinner drinks.



Exhibition and Seminar Day

Wed 8 March 2017 · 9.30am–4.30pm

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ISCEx2017



Networking Dinner Tue 7 March 2017
Exhibition and Seminar Day Wed 8 March 2017

Seminar programme

www.iscex2017.org.uk

10.00am – Hopkins-Baldwin Lecture

Digital amplifiers, are they too well designed?

Alberto Fueyo MInstSCE *Acoustic Engineer, AMS Acoustics*

Tony Stacey MInstSCE *Principal, AMS Acoustics*

Usually the signals you want to amplify in the real world are not in any way represented by the 1kHz sine wave signal that is used to rate an amplifier's power output capability. Bandwidth, frequency response and crest factor need to be considered. This seminar gives the results of measurements of some digital amplifiers.

Voice alarm systems over the years have been implemented using analogue amplifiers with their large, perhaps unintended, high peak power response to our benefit. The peak power response of these amplifiers allowed us to drive them hard and achieve rms powers above 1/3 with 'real-life' signals. They were like the Incredible Hulk, big, strong and heavy but not very efficient. Following the super hero analogy, digital amplifiers are like Ironman, high tech, well-designed, super-efficient machines but without the high peak power 'strength' of their analogue counterparts. Perhaps for some situations these 'high tech, well-designed, super-efficient' digital amplifiers don't give you as much as you may have thought. This is especially true for PA/VA systems where the amplifiers are driven significantly harder than they otherwise would be.

What are the implications of this when trying to predict the maximum SPL in computer modelling? Can the required sound pressure level be achieved for VA systems? How much power would we need to achieve the same level we could otherwise have achieved previously with big heavy analogue amplifiers? Are digital amplifiers really more efficient than their equivalent analogue counterparts under all circumstances?

11.30am – Warren-Barnett Memorial Lecture

Hearing the invisible

The acoustic side effects of ultrasonic PA system monitoring

Dr Peter Mapp HonFInstSCE *Principal, Peter Mapp Associates*

Line surveillance and the functional monitoring of signal transmission paths are integral to the operation of voice alarm and emergency sound systems and have been commonplace for nearly 40 years. Many national and international standards require such monitoring in order to provide confidence that a PA system will be operable, when required, in an emergency or life safety situation. Most monitoring

systems operate at ultrasonic frequencies and are inaudible to the majority of people. However, situations can occur where such monitoring can become audible and annoying to highly sensitive listeners. This seminar will discuss the potential audibility of typical PA surveillance systems and the measures that might be taken to mitigate such effects. Along the way the seminar will challenge a number of popular beliefs and will be illustrated throughout with audio demonstrations and examples. The results of a recent survey and associated research conducted by the author will also be discussed and whether action needs to be taken by the PA industry.

Peter Mapp is an international authority on PA systems design and speech intelligibility and is a member of several national and international standards committees. Whilst known for his pragmatic approach, no one working with Peter is left in any doubt that this is firmly based on the appliance of science. Peter Mapp is the recipient of a number of awards and honours in recognition of his research and contributions to acoustic and audio standards. He is also a committed educator and is renowned for his relaxed and often humorous style of lecturing and legendary demonstrations.

2.30pm

Taking noise off the menu

Changing the acoustic environment for diners in commercial settings

Gillian Rollason

Social Policy Manager, Action on Hearing Loss

Background music, environmental noise and minimalist design trends in restaurants, cafes and pubs are all contributing to producing noise levels that are uncomfortable for both customers and staff. This seminar will look at research, carried out for Action on Hearing Loss's Speak Easy campaign, which examines the customer experience of noise levels. We investigate the impact of noisy dining environments for people with hearing loss and those without, and discover how customers are abandoning noisy venues and not returning.

Action on Hearing Loss is the charity formerly known as RNID. Its vision is of a world where deafness, hearing loss and tinnitus do not limit or label people and where people value and look after their hearing.

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Join us at ISCEx2017

Sound Insulation and Room Acoustics — NORMAN BONE

SECTION I — SOUND INSULATION

The study of sound, sound insulation, and acoustics, commenced hundreds of years ago and even the ancient Greeks had considerable knowledge of the subject. Maybe they were unaware of the reason, but their large earthenware water urns formed perfect Helmholtz resonators, while the acoustic response of some of the ancient amphitheatres needs to be heard to be believed, even today.

The twentieth century however, has brought increased problems. Traffic noise, passing aeroplanes, sonic booms, underground and overground railways, and many other current noise causes more and more unwanted sound intrusions into our homes, and when it becomes necessary to plan and construct either a new broadcasting centre or even a number of broadcasting studios in or adjacent to a busy town or city centre the problems involved reach gigantic proportions, and extremely costly cures or preventions become necessary.

When the dozens or so sound studios were constructed in the new Broadcasting House Extension in London some five or six years ago, it was decided that because of the high ambient external noise, their proximity to the Bakerloo underground railway (only some 30 feet away), and also because they were to be contained within an existing steel and concrete structure, the only possible solution was to completely isolate or "float" them from the existing structure. This was achieved, and in fact the whole of the technical areas (i.e. studios, control rooms and recording channels) are boxes, constructed within other boxes formed by the existing structure. The floors are concrete slabs resting on large rubber pads and springs, and the walls are built on the edges of the sprung concrete slabs, and then roofed. The results were excellent though the cost was high, some £10,000 per studio suite, but as a result the B.B.C. now has an additional twelve first-class talks, music and drama studios in the centre of London which are almost certainly among the finest in the world today.

You will now be saying, and justifiably, that the P.A. engineer and trader who requires a small sound studio or recording channel could not maintain such costs, and does not require such perfect standards, and indeed this is so. Even less can the average householder afford any great expense when he wants to reduce unwanted noise in his own home albeit from the television set, radiogram or transistor set from the flat over or below his own, or from the house next door or even from the traffic in the street outside. In these days of pathetically thin walls, floors and ceilings, this is a frequent complaint.

The object of this article then is to set out some simple basic facts, ideas, and suggestions which can be adopted by the P.A. engineer or householder to improve listening or broadcasting con-

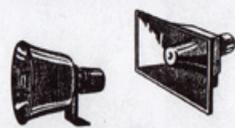
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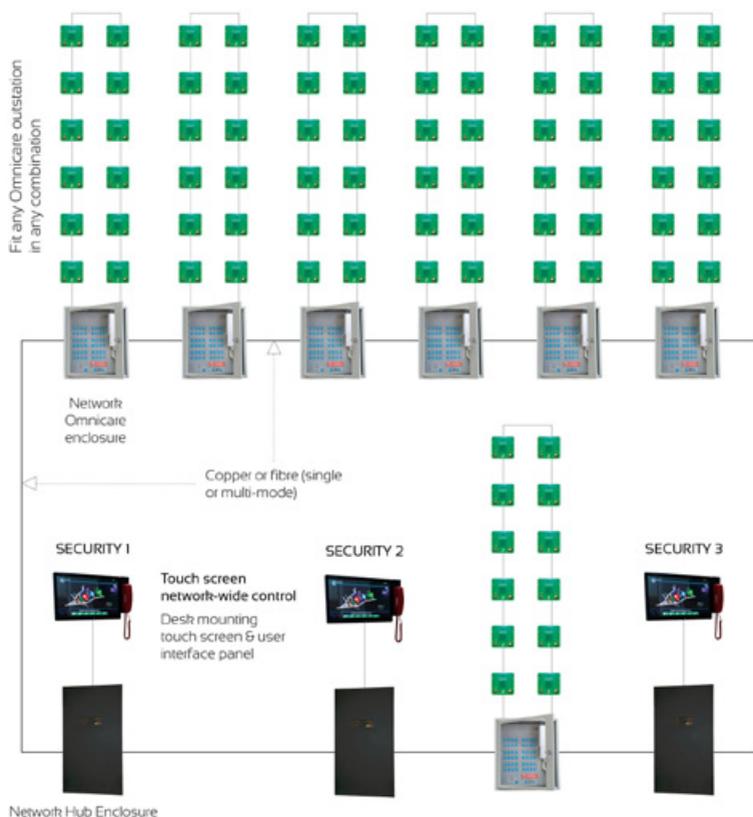
By Harold Smart *FirstSCE*

I was (and still am) on the management committee of the Coventry Sea Cadets and in 1994 we were forced to move headquarters across the city. The person next door complained that noise from parades would create a disturbance and so the Planning Authority refused planning permission. However, I remembered an article in the ISCE magazine (formerly known as the Public Address Engineers Journal) entitled 'Sound insulation and room acoustics' written by Norman Bone, a BBC engineer and member of the APAE (now ISCE). The article described in detail the construction of 'Camden Partitions' which the BBC used to construct sound proofed walls, suitable for broadcasting purposes.

I therefore submitted a copy of the article to the Coventry Planning Authority with the suggestion that we could cover the adjoining wall with Camden Partitions, which would provide sufficient sound deadening for the complainants.

This was approved, but I was very surprised to receive from the Local Authority Norman Bone's article stamped with 'City of Coventry. Approved for planning purposes only.'

Surely this must be a unique occasion where a local Authority has approved an item from our journal? ♦



OmnicarePLUS

Baldwin Boxall has announced that its popular Omnicare EVC system can now be extended to include up to an incredible 8,064 outstations. The company admits that it is extremely unlikely that a system on this scale would be needed, but it does mean that previous limitations no longer exist. Known as OmnicarePLUS, the system provides a touchscreen interface as the master point of control, with local areas taken care of via standard style panels.

Should a site require it, additional touchscreen control points can be added to the system; enabling placement in alternative control or security rooms. These will be 'slave' or 'mimic' panels unless full control is transferred due to comprise of the master control point or as required by the user(s).

Each local area control panel can handle up to 64 outstations and these can be any combination of any of the outstation types available for the Omnicare system. Site network cabling can be via copper, single mode fibre or multi-mode fibre. Features include multi-layer graphical touchscreen control, automatic call queuing, multiple touchscreen control locations with optional mimicking of status, incoming call logging, audio recording and more.

For those not familiar with Omnicare – it is a well-established, high quality system which is designed and manufactured in the UK by Baldwin Boxall. Outstation options for the system include: disabled refuge, Advance disabled refuge, fire telephones, steward telephones, combined unit (disabled refuge and fire telephone) and disabled toilet alarms. ♦

www.baldwinboxall.co.uk



Nebula Audio – open for business

Supporting member Nebula Audio, manufacturers of the iKON AVS range of AV equipment, have recently moved into 14,000 sq ft of purpose-built manufacturing, sales and distribution units on the outskirts of Worcester, just two minutes from Junction 7 of the M5 and adjacent to the forthcoming Worcester Parkway station. The move, two years in the planning, brings all manufacturing and sales operations under the same roof.

Spread over five interconnecting units, the facility incorporates comprehensive metalwork, woodwork and spray shops, electronic assembly including automated SM production machinery and the latest ATE test equipment along with in-house EMC testing. Admin, Sales, Accounts and R&D are accommodated on the mezzanine level running over units 2 and 3.

At present, unit 5 is only used for storage but this is to be fitted out as meeting and training rooms in the near future.

Dr David Tyas, Managing Director of Nebula Audio said “While most people in our industry will know us for our award winning range of AV control, audio and connection products, we also design and manufacture for a growing number of OEM clients within the UK. Bringing all aspects of the business under the same roof allows the different areas of the business to work more closely together spreading the design/development and production costs not only for our own iKON AVS products but also for our OEM clients. We aim to offer on-shore manufacturing to rival that available in the Far East without the long and often protracted communications this entails. We are open for business.” ♦

New contact details

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www.nebulaaudio.co.uk
www.ikonavs.com



The end of conference audio

Roland Hemming *MInstSCE* predicts the end of the audio system as we know it

Cue dreamy music...

I remember back in late 2016 the small package arrived. It was a pair of Apple AirPods. These were the latest headphones from Apple, designed to compensate for the lack of audio jack on the new iPhone 7. All my friends laughed at me for buying such an expensive gimmick. But they turned out to be the future and had the same impact on corporate AV as the iPhone had on Nokia and Ericsson.

Just two small pods in a tiny charging case. Headphones with built in beamforming microphones and a nifty means of instantly switching between audio on my iPhone, Mac and Apple Watch.

Looking back, the original models were really clunky but they slowly improved. Now the Airpod 5 series are well established and never need charging because of their kinetic chip. But it is what has gone on behind the scenes that has changed everything.

Yesterday was just a typical day. I had a meeting at the ISCE. I was driven to Baldwin Towers, the gleaming headquarters building. I stepped out, popped in my AirPods and my car went off to find a space to park.

'Welcome to ISCE' breathed the soothing message that everyone hears as they cross the threshold. No loudspeakers anywhere, the system detected my AirPods. At the same time my smartphone automatically downloaded the contextual app for my location. Its so funny to think that we used to

download apps. These days all organisations have a services app that's downloaded and disposed of as required. These give you way finding information, menus, meeting content, connectivity and much else besides.

The app directed me to the Price-Smith advanced research complex, letting me access the correct floor and doors appropriate to where I was going.

As we greeted each other, our Airpods all connected to the same audio channel. There were twelve of us, so we were provided with just the subtlest of amplification to our voices. Then we connected into the videoconference and heard crystal clear audio from the remote participants too. We were shown the new Institute video. It played on the screen nearby, into our ears and for good measure onto everyone's portable device.

We didn't have a meeting room, we were sat around a table in a busy office with other similar meetings nearby. There were also a few solo workers, some of whom were on their own conference calls. You couldn't hear others outside of our group because of the small modules located around the office area, playing noise for sound masking.

None of us had to do anything for all this to work. All of the connectivity is made possible by the 'AirPods for AV' agreement. Manufacturers pay a licence fee to enable their technology to connect. ▶

Our calendars determined members of the meeting and put us in a group. Otherwise just a double tap on the earphone within a few seconds of each other and in close proximity, connects you all together. Large conferences have a beacon that makes everyone connect.

Once you've set up group connection, other devices can access your audio and video as they need to. The videoconference system mixed all our microphones and routed everything to the remote locations. Meanwhile our smartphones each have enough processing power to carry out acoustic echo cancellation and noise reduction.

During one part of the meeting it broke up into several sub-conversations. The software analysed the pauses between the smaller groups to identify who was speaking to whom. It then provided more amplification for the members of each smaller group so they could hear each other more clearly. When it was time to get back to be a combined group the chairman pushed a button, muted everyone's microphone temporarily and grouped us back together.

The breakthrough was when they worked out how to deal with local microphones. If you've ever had a mobile phone conversation with a person standing right opposite you know there is a long delay. This was a significant problem to solve.

AirPods use two simultaneous methods of audio communication: a direct connection for local spoken audio and networked audio for everything else where a time delay isn't important. The distributed sound masking modules contain the electronics to act as hubs for the direct, low latency wireless audio connections.

The seamless mixing and switching of audio sources takes very little getting used to. I tend to keep one AirPods in all the time and then put the other in only when I really need to concentrate on something.

This has all been a natural progression to 'bring your own device', but now we come to work with a personalised audio system that just connects to any technology in a variety of environments.

The conferencing world was the first to roll this out because it enabled a fine tuned experience. It eliminated all the problems we used to have with conference microphones. Nowadays everyone is the same distance from their microphone and we don't have problems with poor room acoustics. The settings are tuned for each voice. It has saved a lot of money too. No more expensive signal processors, racks of amplifiers or loudspeakers.

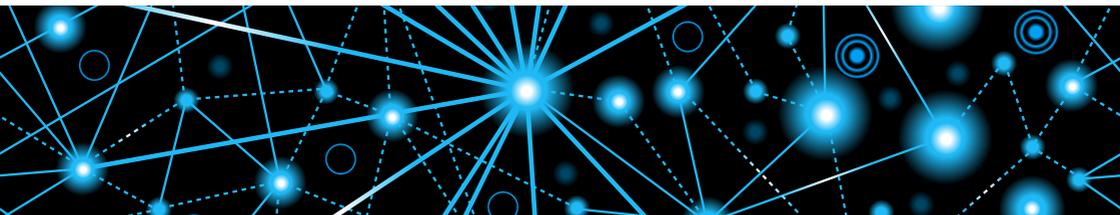
The audio manufacturers that survived moved to a software and services model some time ago with the vast majority of the audio processing being handled by our portable devices.

With ISCE being truly international, they get a lot of foreign visitors. Whilst some of the automatic translation apps are quite good these days, ISCE uses a more personalised translation service and conferences simply connect to an available online remote translator. The translation company deals with confidentiality issues for their workers.

There is an encryption option for users who want to pay for that. We each used a retina scan on our phone to authenticate and the participants share a secure stream.

After a few years of the conference world deploying this technology, the price has dropped and its now being rolled out to ticket machines and digital signage that just connects to your ear when you are nearby. The Audio Privacy Act of 2026 allowed us to opt out of automatic audio streams, before then it was a nightmare walking through a shopping centre.

I've just noticed that cash machines are starting to be equipped with AirPods connections too. People back in 2016 would wonder why in today's cashless world why we still have such machines, but they didn't know about the unexpected medical revolution they would bring about, but that's another story... ♦





Security & Fire Excellence Awards

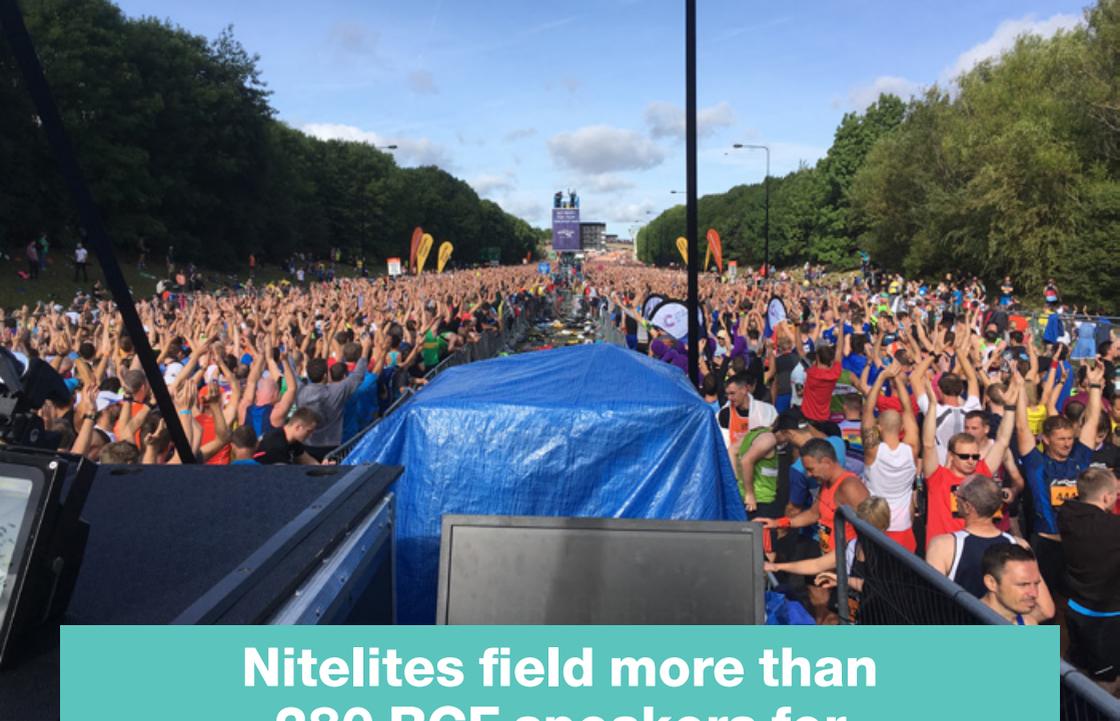
Wednesday 23 November 2016
London Hilton on Park Lane

Security & Fire Excellence Awards have consistently broken new ground in highlighting the very best people, projects and processes that the security and fire sectors have to offer.

As a media partner for the event, ISCE were proud to be asked to present the Communication Product of the Year award at 18th Awards ceremony, at the London Hilton last month.

Kevin Sherwood MInstSCE of CIE Group took to the stage on our behalf, to present the award to SIRV Systems Ltd for their SIRV incident reporting software product.

Kevin said : “I had a great evening representing the ISCE and meeting Jimmy Carr was a bonus. It was interesting to meet so many contacts in the industry and have a chance to tell them about the ISCE and how we can help improve their business”. ♦



Nitelites field more than 280 RCF speakers for 'the world's biggest half marathon'

Billed as 'the world's biggest half marathon' the Great North Run (GNR) has taken place annually between Newcastle-upon-Tyne and South Shields since 1981, and is one of the major events in the runner's calendar.

For around two decades the public address and part of the technical infrastructure have been provided by locally-based technical service company Nitelites. And as the event has exploded from the original 12,000 participants to today's 57,000 runners so the logistical challenges of supplying a vast inventory of loudspeakers and building infrastructure through the night – once the main motorway through the city has closed off – have grown exponentially.

With Nitelites MD Jamie Moore project managing the event, this year the company provided over 280 RCF enclosures, including 56 x TTL55-A, 24 x TTL33-A, 24 x TTS56-A, 24 x TTS36-A, 12 x TT22-A from the touring and theatre series – and a large fleet of HDL20-A and HDL10-A from the D-Line series.

Working for event founder Brendan Foster's Great Run Company, Nitelites director Andy Magee said the sound system really came of age around a decade

ago "when we convinced the organisers that they should move up from a 100V line distributed system to a full range system." Today this has become a fully-fledged line array system.

He stated that the biggest challenge had been loading in the equipment overnight without lighting, and loading out again within three hours of the finish to allow the carriageway to be reopened. On top of that, equipment specified the previous day, on the Newcastle side of the Tyne for the Junior and Mini runs, need to be redeployed. Add to that the eight hangs of four flown RCF HDL20-A used along the 200m specially constructed sprint track on the Quayside, for the Great North CityGames – another popular new event.

For the GNR itself, most of the activity covered the mile around the Start line, where Nitelites also provided staging, and at the Finish.

Speaking of the system design, Andy Magee said, "We have half a dozen flat bed trucks carrying generators, power distros and control racks, and we fly the PA from these trucks on HIAB cranes, with ▶

nine TTL55-A and 6 x TTS56-A subs on each truck.” Further up the course are six ground stacks of TTL-33A – and the total delay time was around 4 seconds. In addition, ground stacks of six HDL10-A and HDL20-A are also dispersed towards the rear behind the start line. The entire system receives motivational music and presenter mic feeds while at the Finish, many of the feeds consist of pre-recorded stings, appropriate to those clad in fancy dress costume, such as Superman attire.

Nitelites also link with broadcasters on a separate zone, where they specify RCF TT22-A Mk2. “These are great in sensitive broadcast areas as they can be tightly controlled for live links, so we can turn them down when requested,” says the Nitelites man. “There are personnel out on the course with

Sennheiser 3732-COM-ii radio systems. The radio mic receiver has two outputs — pressing the button cuts the main and routes audio to the second output for talkback etc.”

Summing up, he says the company had again pulled off a major feat. He praised the crew and in particular system engineers, Tom Geoghegan and Lee Saddington — who were responsible for designing the complex cable topology

“RCF’s onboard RDNet [dedicated networking board] was a great asset,” he concluded. “We ran the network over 2000 metres of standard multicore and all loudspeakers across that first mile were on line via RDNet,” ♦

www.rcfaudio.co.uk



Microphone sensitivity

J M Woodgate BSc(Eng) C.Eng MIET SMIEEE FAES HonFInstSCE, Honorary Associate IHLMA

Background

Many times, you can use even a newly-acquired microphone without being concerned about its sensitivity, because it doesn't seem to vary very much between models. But occasionally it matters, and you may look for the information in vain, or not find it informative if you do find it.

Now we go back to ancient history, well, the mid-1960s anyway, when audio engineers across Europe decided to try to remedy the chaotic situation with incompatible and uninterpretable published specifications of sound system equipment by writing the multi-part standard IEC 60268. (The '60' was added in 1998.) The Scope clause of Part 1 tells what it is about, albeit in the rather wordy language of standards at that time:

This standard applies to sound systems of any kind, and to the parts of which they are composed or which are used as auxiliaries to such systems.

This standard deals with the determination of the performance of sound system equipment, the comparison of these types of equipment and the determination of their proper practical application, by listing the characteristics which are useful for their specification and laying down uniform methods of measurements for these characteristics.

The standard is confined to a description of the different characteristics and the relevant methods of measurement; it does not in general specify performance (except in Part 10).

These days, I think we would use the Introduction of the standard to explain that in order to standardise the format and content of specifications, we have to decide which characteristics should be specified and standardize how to measure them. That is, in fact, how most Parts of 60268 are written.

Microphone standard

The Part of 60268 that deals with microphones is Part 4. It was last updated in 2014. For sensitivity, we need to look at Clause 11. First of all, it says that the sensitivity is expressed in volts per pascal. 'Pascal' is far better understood now than it was 50 years ago, but it's still more obscure than the familiar '94 dB SPL'.

It is allowed to express the sensitivity level in decibels referred to 1 V/Pa.

However, there isn't just one 'sensitivity'. There are five different versions that can be applied to microphones of different design or in different applications:

- free-field sensitivity (for a microphone exposed to a plane wave field in an anechoic room)
- diffuse-field sensitivity (for a microphone exposed to a diffuse field in a reverberation chamber)
- pressure sensitivity (where the sound pressure is measured very close to the microphone's sound entrance)
- close-talking sensitivity (where the microphone is within about 3 cm of the sound source) and near-field sensitivity (where the microphone is within about 30 cm of the sound source).

The last two share a bullet point because of a translation problem; there appears no distinction possible between 'near' and 'close' in German. But the two characteristics are not the same; the sensitivities at 1 kHz and below are usually quite different.

The standard doesn't restrict the specification of sensitivity to a frequency of 1 kHz, in fact it doesn't even recommend it, which it probably should.

What happens in practice?

Well, all sorts of things. I have seen the sensitivity given as '60 dB'. Make what you can of that. I blame the Marketing Department. But I've learned to interpret. An incomprehensible minus sign was obviously not seen or simply left out, so we should read '-60 dB', and it's probably referred to 1 volt, not 775 mV (0 dBu). Now this is a typical 10 mm diameter electret capsule, so the sound pressure level involved isn't 94 dB for sure, but 74 dB. Why 74 dB? Because, after all this time, people are still using CGS units (as the magnetic materials people also do). 74 dB SPL is 1 dyne per square centimetre, but that isn't all. Enter a Norwegian meteorologist, who wanted a CGS unit of atmospheric pressure of a convenient size, probably to replace 'millimetres of mercury'. He settled on 1 million dyn/cm², and called it '1 bar'. ▶

Perversely, of course, meteorologists now talk about '1000 millibars'. For some (non-alcoholic?) reason, the 'bar' became a popular unit, so much so that 1 dyn/cm² turned into '1 μbar', although it already had the name '1 barya' (1 Ba).

So you can still find sensitivity specifications expressed in 'mV/μbar or, much worse, in dB/μbar, because decibels are log units but μbar is a linear unit. I don't think it will ever be possible now to stop people using these outdated units of measurement, even though we have practically eliminated some 'agricultural' units such as the bushel and furlong. But the Marketing department has missed a trick. If they followed IEC 60268-4 and used 94 dB SPL, they could claim 20 dB more sensitivity and, perhaps more significant, a 20 dB better signal to input-referred noise ratio. Although 94 dB SL is very loud, it's typical of the sound levels that microphones are exposed to these days.

Simple electret microphones

By 'simple', I mean that the output is taken directly from the 'head amplifier' in the capsule, and not passed to a transformer or a further integrated amplifier to produce a balanced, low-impedance output. This head amplifier is necessary because the capsule itself is a capacitor of a few picofarads, one plate of which vibrates with the incoming sound. We need to convert the very high impedance of this capacitor to something manageable, and that is done

with a FET. Early electret microphones had the FET as a source follower, but that requires three wires, drain voltage, 'earth' and output from the source. The source impedance was effectively the source resistor, 1 kΩ to 3 kΩ.

Modern mics have two wires, 'open drain' and 'earth'. So the output is a current source, and this has interesting effects if you feed the mic into the inverting input of an op-amp through a series resistor. If you vary the resistor value over quite a wide range, you find that the output from the op-amp hardly varies. The resistor is connected between the inverting input and 'earth', and the non-inverting input of the op-amp is also 'earthed'. The resistor thus has almost no voltage across it, so it doesn't surprise that its value appears to have no effect.

But in fact it does have an important effect. The fact that the output voltage hardly changes indicates that the closed-loop gain must be varying to compensate for the changes of input voltage (capsule output current multiplied by the series resistor value). With a low value of resistor, and a slow, low-noise or low voltage op-amp, the op-amp may run out of gain well below 20 kHz, maybe even as low as 1 kHz (an op-amp with 1 MHz gain-bandwidth product asked to produce 60 dB gain). What this means is that the bandwidth of the microphone input stage increases with the value of the series resistor, but the output voltage for a given SPL at the microphone doesn't. A bit puzzling at first. ♦

Disclaimer

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A guide to voice alarm systems

Neil Voce MInstSCE of Application Solutions (Safety and Security) reviews the second edition of RH Consulting's Guide to Voice Alarm Systems

Originally published in *Installation* magazine and reproduced with permission.

An old anecdote suggests that 'the great thing about standards is that there are so many of them', and one of the key selling points of RH Consulting's e-tome on voice alarm systems is that it shares a lot of knowledge on those many standards. It de-mystifies the history of the standards that we have, their inter-relations and hierarchy and forewarns us of future standards such as a German standard for active loudspeakers. It even gives some guidance on how one might get involved in shaping the legal structure and standards. We need to know this because that's what the EU's CPR (Construction Products Regulations) now control – the laws regulating how a PA system can instruct occupants to leave a building and therefore qualify as a voice alarm (VA).

On a practical level, the guide includes a wealth of information in easy-to-digest sections on the history of the technologies and what makes a voice alarm and how it should perform. It provides information suitable to get an audio engineer who's never stepped beyond a public address system into the world of voice alarm. The authors, Roland Hemming and Richard Northwood, make the point that reading the book doesn't make you an expert or even someone who should set about installing a system without having experts on hand, but it would give you all the background to ask the right questions and – if you use the study card system in the glossary, enough acronyms to give anyone a run for their money with VA tech-speak.

In addition to the general text, the use of the e-book format allows for a considerable number of simple ▶

and nicely animated illustrations demonstrating system performance and connectivity.

One potential difficulty for the book is that it does cover a lot of ground aimed at a variety of levels of reader. When I shared the guide with a colleague who doesn't work with VA every day, they couldn't quite summon enthusiasm for digging into the interpretation issues of EN54; but for those who are interested in that aspect, they are likely to fly through the chapters devoted to VA basics and elementary system design. One imagines that if a company involved in PA/VA were to purchase the book, then there's something for everyone, but as a personal purchase you aren't likely to need it all.

It is revealed that even for Hemming, who sits on EN54 committees and helps to draft the regulations, there isn't always a clear way forward to comply. There are a number of hints of legal uncertainty around certain types of solutions and products.

Mentioned in that list are individually tested products, IP switches, powered speakers and free-form DSP – all of which are found in the market and in installs in the UK and EU generally. There is also the statement that “it is currently almost impossible to make any large project EN54 compliant” which as a summary to a lengthy section on EN54 generally, leaves one to wonder if that means every large building is failing in its legal duty to the Essential Safety Requirement of the CPR to provide “safety in case of fire”. If so, surely that leaves all practitioners of VA open to legal proceedings – which is certainly thought provoking.

If you have any active role in VA, this book is almost certainly going to tell you something you didn't know. It's a valuable addition to your library, and, if you are involved in the voice alarm business internationally, the comprehensive comparative tables on standards requirements alone justify the investment of the time and money. ♦

Special discounts exclusive to ISCE Members

A high-quality printed version of the Guide is available for ISCE Members to order at a 40% discounted rate at just £59.00 including postage to the UK.

An electronic version of the Guide is available for ISCE Members to download with a code at a 40% discounted rate at just £15. Please note this is for MacOS, iPhone, iPad or iPod only.

**Please order direct from Roland Hemming MInstSCE,
Consultant, RH Consulting; roland@rhconsulting.eu**



Launch event at Cundall for new CSM Qt® active sound masking emitter

On 25 October 2016, Sound Directions Ltd, Chessington based distributor for Cambridge Sound Management sound masking products, hosted a launch event for the new Cambridge Sound Management Qt® active sound masking emitter at Cundall, London.

The new Qt® active emitter is a powerful all-in-one sound masking, paging and background music emitter with a broad frequency range, high SPL capability and good quality music and paging reproduction.

The launch event for the new emitter, attended by sound masking resellers, audio consultants and media, took place at Cundall, the international multi-disciplinary engineering consultancy with over 700 staff and offices in 11 countries across the globe. Cundall is the world's first consultancy to be endorsed as a One Planet Company, successfully implementing a number of sustainable initiatives on projects around the world, as well as in their offices and homes.

Cundall's new London office at One Carter Lane is one of the first projects in Europe registered to pursue the WELL Building Standard™. Its WELL Building Standard™ registration is an expression of Cundall's belief that sustainable design can forge a workspace that promotes individual well-being as well as inspiring creativity and collaborative working.

The 15,400 ft² One Carter Lane office is a showcase for how a first class (CAT-A) office fit-out can apply a host of carefully thought out features to create a healthy, efficient and future-proof space that is kind to the environment whilst putting the well-being of the occupants at the heart of the design.

By taking a holistic approach to using sustainability standards and tools, Cundall has been able to create a unique office space, achieving BREEAM Excellent and SKA Gold ratings, as well as being BCO compliant.

The WELL Building Standard is a new international evidence-based system for measuring, certifying ▶

and monitoring the performance of building features impacting health and well being. The standard presents an exhaustive set of compliance requirements, ultimately measured in seven key areas including: air, water, nourishment, light, fitness, comfort and mind.

After a series of presentations and an interactive Q&A session at the launch event, guests were invited to experience the new Qt® active emitter first hand. Cundall recently installed sound masking and directional sound reinforcement solutions at the London offices. (situated in a beautiful location just opposite St Paul's Cathedral).

Matthew Hyden, Acoustics Associate at Cundall, said: "At Cundall, we recognise the importance of research & development, and in keeping with this approach, the WELL Building Standard and the BREEAM assessment process, we are proud to be one of the first acoustic consultancies to have installed an in-house speech masking and soundscaping system. We are excited by the future research potential this presents and are delighted to have the opportunity to demonstrate and promote the benefits of speech masking and soundscaping first-hand."

"With larger-scale projects and new builds we recognise an increased emphasis on wellbeing in the workplace and green buildings when designing sound masking systems", said Hanieh Motamedian, Business Development for Sound Directions Ltd.

"Sound masking solutions are proving to be one of a number of elements now considered for improving employee wellbeing. Due to the ability to provide improved confidentiality and reduced distractions in the workplace we have experienced first hand reports of reduced stress and less frenetic environments as some of the very real benefits of sound masking installations", adds Motamedian.

"With these synergies in mind, I was delighted to host this launch event at Cundall's offices and I'm indebted to the team at Cundall for their generosity" continues Motamedian.

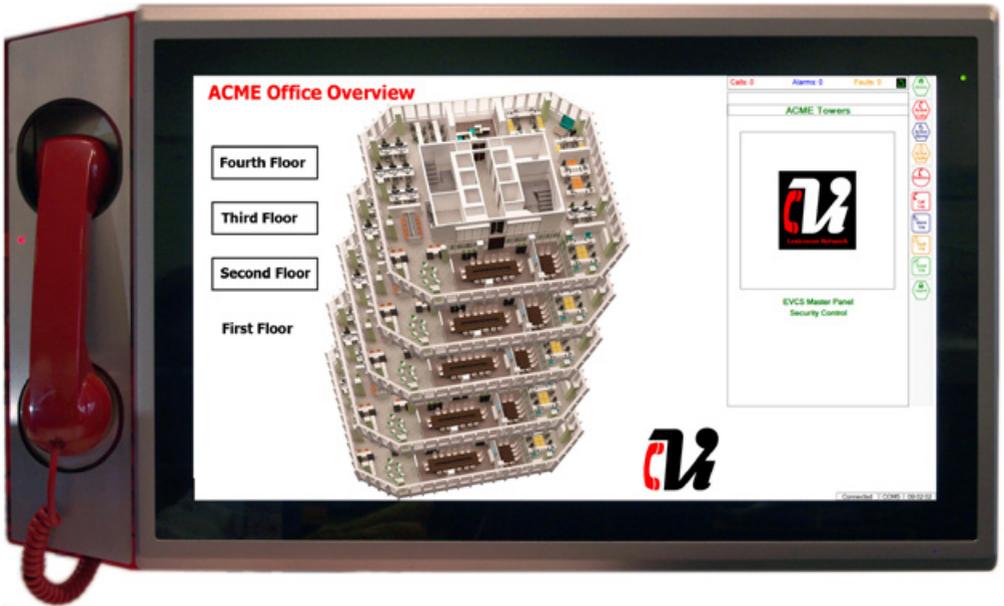
About Qt® active emitter

The new Qt® active emitter is a single-source emitter capable of both sound masking and simultaneous clear reproduction of paging and music signals. It provides higher SPL and a broader frequency range than previous direct field emitter offerings in a small, powerful speaker that's virtually invisible once deployed in finished or open structure ceilings.

- Active electronics power the speaker
- Ported enclosure design allows lower frequency extension down to 125 Hz octave band for sound masking and 115 Hz for paging and music
- 17 dB louder than previous direct field emitter offerings
- Plenum-rated, UL-listed, and complies with UL 2043
- Delivers four uncorrelated audio channels to reduce phasing/comb-filtering
- Comes standard with a slip-ring mount for acoustical tile mounting
- Rear DIP switches reduce volume by 4.5 dB in 1.5 dB increments, if needed
- Compatible with the Qt 300 and Qt 600 control modules
- Control via web-based management from any device. ♦

www.sounddirections.co.uk
www.cundall.com





ViLX Commander released

Vox Ignis Limited announces the release of their ViLX Commander, a GUI supplied as a complete package, with an EN54-4 power supply and an industrial panel PC with a telephone handset integrated.

ViLX Commander forms the front end to the Lexicom Network, and can control up-to 64 network panels, which can be master panels or system expanders, multiple LX Commander's can be utilized for complex sites.

The application comes complete with an editor allowing the engineer to place bitmaps or jpegs, and place buttons for EVCS outstations, and Assist Call systems, as well as area buttons, allowing multiple screens to be interlinked.

Once a call comes in, ViLX Commander switches to the specific screen for that call, allowing the operator to visualise the location of the call, reducing training for the staff.

The system distinguishes between Disabled Refuge points and Fire Telephone points if they are combined, allowing easy integration, the software also allows the BS8300 accept for Emergency Assist Alarm calls, so the person calling knows help is on the way.

The GUI connects to a standard network through the ViLX-EX8 system expander allowing easy integration into the network solution from Vox Ignis.

For more information contact Vox Ignis 0191 516 6030 or email info@vox-ignis.com

Vox Ignis Limited is a company located in the North East of England who specialise in the design and manufacture of emergency voice communication systems (EVCS) and Emergency Assist Alarm Systems, with brushed stainless finishes on outstations. ♦

www.vox-ignis.com

ISCE Training

After a break during the summer holiday period, our training courses were back in full swing, thanks to Catherine, Ros and the training committee.

It is really pleasing to see that our courses are getting such good main stream magazine coverage, which is already giving the ISCE and our training courses a much higher profile. In particular, the December issue of AV Magazine (page 35) has published a superb article on our Live sound engineering training course.

We continue to receive excellent feedback from our delegates and attendance has been really good. All our training courses are CPD accredited, which is something many businesses are looking for.

Of course, we wouldn't enjoy such success without the hard work and dedication of our presenters – so our thanks go to you. ♦



Our next training course on *Designing for speech intelligibility* is scheduled for 26 January 2017 at Production Park in Leeds. See page 26 for details.

Introduction to live sound engineering

Presenter – Brian Hilson AMInstSCE

6 October 2016

High Leigh Conference Centre, Hoddesdon



Making waves – acoustics for sound engineers

Presenter – Tony Stacey MInstSCE

15 September 2016

Production Park, Wakefield, Leeds

Voice alarm systems fundamentals

Presenter, Bob Howard MInstSCE

3 November 2016

Production Park, Wakefield, Leeds

New Supporting Members

MEDIA VISION

The Conference Company

Media Vision is a leading provider of conference technology solutions. The company has eight offices across North America and Europe with operations in the United States, Canada, Mexico, France and, just recently, in the United Kingdom.

As an established organisation branching out into the UK and Ireland, we didn't hesitate in making the decision to join as a Supporting Member of the Institute of Sound and Communications Engineers because we wanted to reach out to potential re-sellers by expanding our network of professional installers and Integrators. Membership also allowed us access to continuous professional development within our industry, and contribute through knowledge sharing, while keeping abreast of important industry news.

I would highly recommend ISCE membership to any audio visual professional or organisation looking for support or to gain knowledge in this exciting fast growing high tech industry. ♦

Jason Williams
Director of Sales, UK & Ireland
Media Vision
www.media-vision.com

ISCE

The Institute of Sound and
Communications Engineers

Supporting Member
Committed to technical excellence

If you want to join a select group of companies who have chosen to encourage us in our efforts to improve technical standards and practices within the sound industry, contact Ros for an application form or go to www.isce.org.uk/supporting-members/

Opportunity to upgrade your membership

At ISCEx2017 in March, there will be an opportunity for you to attend an upgrade interview with the membership committee.

If you feel you meet the criteria to upgrade, please get in touch with Ros, who will arrange an appointment.

Our membership guidelines have recently been revised, so take a look **here** and see how it might affect you.

Of course, you can always submit a technical report if you are unable to attend an interview, where you can write about a project in which you were involved, research you have carried out, a piece of original theory or even a solution to a hypothetical situation. Whatever you choose, it must demonstrate that you are technically competent to the required level in the area of your choice. ♦

ISCE

The Institute of Sound and
Communications Engineers

www.isce.org.uk

26 January 2017

Production Park, Nr Leeds
www.productionpark.co.uk

Non-member £225

Member £180

**Three or more persons
from the same company:
10% off each individual fee**

All fees exclude VAT

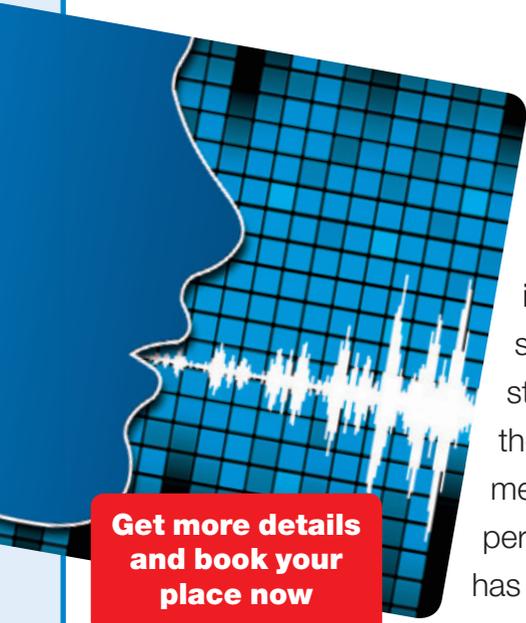
Designing for speech intelligibility

Using the speech
transmission index

Presenter:

Tony Stacey MInstSCE

**Learn the factors that
affect and limit the speech
intelligibility in a space
and how they can be
overcome or controlled.**



This course takes a detailed look into the factors affecting speech intelligibility and how they can be controlled. As well as giving an interpretation of the requirements of some relevant British and European standards for voice alarm systems, the course introduces the two methods of verifying the intelligibility performance of a system once it has been installed.

**Get more details
and book your
place now**

Training Courses

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CONTENTS

EN 303 348

induction loop systems intended to assist the hearing impaired in the frequency range 10 Hz to 9 kHz

This has to be written to enable Induction loop amplifiers and receivers to continue to be CE marked and placed on the market after the Radio Equipment Directive comes into force in June 2017.

There were some comments from the German equivalent of Ofcom.

These comments have been resolved and the draft has been sent to ETSI to be checked.

EN54-24

(voice alarm) loudspeakers

CEN TC72 WG23 started work on the requirements and test clauses at the last meeting in November.

The next meeting is planned for February.

EN 54-16

voice alarm control and indicating equipment

EN TC72 WG23 has set up a task group to work on the comments which has held two three-day meetings so far and will meet again in February.

EN 50849

sound systems for emergency purposes that are not part of a fire alarm system

This has received a positive vote and is expected to be published soon.

BS5839-8

voice alarm system installation etc

When the Draft for Public comment is published, it will be reviewed to see if any changes are relevant to BS 5839-8.

It is likely that it will be revised in order to incorporate some of the elements of its European cousin, CEN/TS 54-32, Fire detection and fire alarm systems - Part 32: Planning, design, installation, commissioning, use and maintenance of voice alarm systems.

Disclaimer

This information is believed to be correct but it is not guaranteed and neither the ISCE nor its officers can accept any responsibility in respect of the contents or any events arising from use of the information contained within this article. ♦

Membership subscription payment by direct debit

Several members have asked if it would be possible to pay subscriptions by direct debit. In order to facilitate such payments, Council has agreed to set up an account with GoCardless (<https://gocardless.com/>).

When our application process is complete and the system is fully set up, this will allow members to sign up for payments by direct debit. At first this will be limited to membership subscriptions but may be expanded in the future to include other payments.

The member sign-up process is very simple and will take place on a fully secured web page. All the normal direct debit features and guarantees will apply to the system.

GoCardless is authorised by the Financial Conduct Authority under the Payment Services Regulations 2009, registration number 597190, for the provision of payment services and their system has been recommended to us. ♦

Further details and an invitation to sign up will be sent by email to all members who have provided an email address, as soon as the system is set up and tested.

New Members December 2016

Senior Technician

Phil Barker
Video Inn Production Ltd
Jonathan Burton
Freelance Sound Engineer

Member

Adrian Stewart
Clockwork Audio Visual Ltd

Robin Dibble
Martin Audio

Jude Dimantha
Dynamic AV Technologies Pty

Alan Gray
Adelbry IT Services

Affiliate Member

Craig Buckley
Tidy AV

Annual General Meeting

The 20th AGM for ISCE will take place on Tuesday 7 March 2017 – 3pm at Coombe Abbey, Binley, Nr Coventry. Be sure to note the date in your diary and further information will follow in due course.

We welcome your contributions to the magazine with editorial and advertising.

Please send news or articles to **Ros**



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www.boschsecurity.co.uk
Mr A Osborne *AMInstSCE*

Broadcast Sound Systems Ltd, Lancashire
matthew@broadcastsounds.co.uk
Mr M Tugwell

Canford Audio Plc, Tyne & Wear
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