



The magazine of the
Institute of Sound and
Communications Engineers

December 2014

ISCE

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Introduction from our President

Anthony Smith *MInstSCE*



Well here we are again, in the deep midwinter and another year winding to an end. On the plus side the shortest day is nearly on us, and from that point the days just get longer.

Thank you to all those members who responded

to the recent e-magazine survey. We had a terrific response and this has helped Council make their decision on the way forward. From 2015, we will be producing the quarterly magazine in a pdf format and distributing it to our members by email. We have also taken on board your additional comments and will produce a compendium to include the 'best of' our technical reports and features. This compendium can be used at exhibitions and available to any member who would like some copies for their reception areas. We will also be sending annual subscription invoices by email. The few members without email will receive a printed out copy of both the magazine and an invoice by post.

The attention now turns to ISCEx2015, with the new format where the AGM is the day prior to the show, and the industry dinner follows in the evening. For the exhibition day we have a good set of seminars, and a plethora of exhibitors.

Before this we have Intersec in Dubai where some of our supporting members are exhibiting (including myself) and ISE in Amsterdam which is quickly becoming the de-facto international show for our industry.

It only remains to offer the seasons greeting to one and all, and good wishes for the year ahead.

Enjoy the magazine and I look forward to seeing you in the New Year.

Anthony Smith ♦

We welcome your contributions to the magazine with editorial and advertising. Please send news or articles to Ros

Forthcoming events diary

18–20 January 2015

Intersec Dubai

World Trade Centre, Dubai

10–12 February 2015

Integrated Systems Europe 2015

RAI, Amsterdam, Netherlands

3 March 2015

AGM for members

Coombe Abbey Hotel, Warwickshire

ISCEx2015 networking dinner

Coombe Abbey Hotel, Warwickshire

4 March 2015

ISCEx2015

Exhibition and Seminar Day

Coombe Abbey Hotel, Warwickshire

15–18 April 2015

Prolight + Sound

Messe Frankfurt, Germany

12–14 May 2015

PLASA Focus

The Royal Armouries, Leeds

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Comments on articles and letters are invited.

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Flare Audio launches revolutionary new headphone technology

Award winning audio technology company, Flare Audio, has launched what they believe to be the world's first 'fully' open back headphones. The Reference R1, aimed at the pro audio and audiophile market, uses Flare's unique new approach to produce distortion free sound, even at full volume, enabling true transfer and transmission of source material.

Revealed at PLASA 2014 in London, the R1's were nominated for the show's Award for Innovation and are stopping people in their tracks with their undeniably crystal clear sound. This is enabled using Flare's groundbreaking new approach based on 'Waveform Integrity'.

"Traditional headphone designs are based around two main formats, closed and open backed. Both of these traditional approaches suffer from sound distortions in some way caused by enclosed residual pressure interference (ERPI)" explains Flare Managing Director and R1 creator, Davies Roberts.

"Open back designs distort sound information on the compression stroke of the driver and add asymmetry to the waveform. Closed designs distort sound information on both sides of the waveform. This distortion moves the time domain of frequencies, compressing them into the wrong area of generation by the driver. ERPI inside a closed space creates a spring effect on the driver, which limits and distorts driver movement."

Roberts says all drivers create sound by placing higher frequencies inside the movement of lower frequencies, i.e. 21Hz is created within the movement of 20Hz, 22Hz within 21Hz and so on. If a driver's movement is restricted by ERPI the time domain of frequency information is also distorted. Flare describes this driver movement distortion as TDD (Time Domain Distortion).

In a typical headphone with one or more closed areas, the time domain of information will become disrupted. For example, if there is ERPI behind the driver then there will be reduced backward movement.

With the Reference R1, both of Flare's patent-pending technologies (SpaceTM and VortexTM) have been applied to both sides of the driver to create the first 'fully open' true infinite baffle headphone that produces distortion free sound.

Flare's vortex silencing technology spirals around both sides of the 40mm dynamic headphone drivers

to remove all enclosed residual pressure interference (ERPI). ERPI is removed without it travelling across the driver or reflecting inside the headphone enclosure, leading to no audible enclosure based standing wave interference.

Balancing pressures between the front and rear sections enables linear driver movement (LDM), which creates total timbre accuracy. The combination of removing ERPI and creating LDM produces pure, natural sound with a full frequency response that has not been previously possible.

SpaceTM technology reduces enclosure wall vibration through 4 bolts that pull the rear plate and ear pad plates together with a constant compressive force on the DSV (dual sided vortex) disc. Space technology allows the use of lightweight materials to be used in the DSV disc whilst maintaining the structural strength of more rigid materials.

VortexTM technology removes residual air pressure that interferes with the movement of a driver and silences the sound pressure as it escapes into the air. DSV enables linear driver movement providing the listener with a completely natural sound experience. Linear driver movement mimics sound in nature creating highly accurate timbre, phase response, stereo imaging and 3D sound.

As a result, listening through the R1's highlights details previously masked in tracks. Flare also believes they reduce hearing fatigue, and could improve detail awareness with continued use – something the company is currently working on obtaining test information on.

"Flare Reference R1 is a completely new listening experience and a vital tool for those wanting to hear everything in sound, without any listening product distortion," explains Roberts. "Stereo imaging perfectly mimics nature, allowing full 360-degree image placement. Reverb tails and instrument distortion become highly detailed, allowing producers and engineers to have a tool to rely on to perfect their art. We believe the Reference R1 sets a new standard in personal sound listening for both professionals and audiophiles."

www.flareaudio.com ♦



CIE-Group Marks 50th Anniversary Year



In 2014, leading UK audio visual and electronics distributor CIE-Group is celebrating 50 years in business – and what a half-century it has been. This significant milestone is also an opportunity to look forward to new business goals and aspirations that will provide the impetus for future CIE-Group developments.

CIE-Group was established back in 1964 as Canadian Instruments and Electronics, a UK subsidiary of Toronto-based Radio Components. At this time the company specialised in the distribution of electronic testing equipment, components and connectors. Based in the East Midlands from where it still operates today, the company has a firm foundation in the professional audio market, in particular the public address and professional audio sector. More recently however, product portfolio has been further enhanced with a number of key new distribution appointments resulting in the addition of latest AV signal distribution technologies such as HDBaseT and AV / Access Control-over-IP.

“While fifty years in business is a cause for celebration in anyone’s book, for us we are also looking to the future – new challenges, new markets and new solutions,” says Chris Edwards, Marketing Director of CIE-Group. “We have firmly established ourselves as one of the UK’s key distributors in the audio visual sector through the brands we represent, investment in our sales & technical support teams, as well as the high standard of training we offer. These initiatives have certainly paid dividends in terms of existing customer and new business wins, as well as putting us in a great position to service a new generation of buyers, integrators and AV professionals now entering the market.”

In 2009, the CIE-Group management team completed an MBO which has allowed the company to focus on new markets and digital technology

solutions. In tandem with this, CIE-Group has been committed to adding greater value to the supply chain by offering an on-going, UK-wide programme of free technology training seminars to integrators, specifiers and end-users. This initiative has grown out of its hugely successful and growing distribution partnership with CYP Europe, pioneers in AV distribution and connectivity products for systems integrators / installers.

Relationships have always been important to CIE-Group. Among its many distribution partnerships, CIE has been the exclusive UK distributor to Inter-M (formerly Inkel) for almost 30 years, and continues to bring new products to the market including the latest generation of IP-connected PMU amplifiers. CIE has also represented Switchcraft since 1987 and continues to be one of the main UK resellers for the brand’s professional audio connectors.

Alongside its focus on business and technology, CIE-Group is also an active participant in corporate social responsibility and charity support. For the past eight years, the company has undertaken a series of fundraising challenges that have raised almost £15,000 for their three adopted charities – Cancer Research UK, British Heart Foundation and local children’s charity Derby Kids’ Camp. In September of this year CIE-Group directors and members of the AV sales and technical support staff cycled from St Malo in the North of France to Bordeaux in the South, covering more than 550 miles in the saddle. As Chris Edwards concludes, “The last 50 years have been quite a ride and we are excited to move forward - here’s to the next 50!”

www.cie-group.com ♦



Speaking wirelessly

In this second instalment of this mini-series, Jason Williams MInstSCE provides the facts about using wireless technology in the conference room, discusses the advantages and disadvantages of different technologies, and gives some useful tips and advice on about how to get the best from your wireless discussion system.



Wonders of the wireless world

In this episode I would like to explore the innovative use of cutting-edge radio technology currently available to enable us to communicate with more flexibility in the conference environment. There are a number of manufacturers producing wireless conference discussion systems each working with similar technologies but operating in different ways.

When choosing a system for your particular application it is worth remembering that most systems you will evaluate have a number of commonalities. Firstly, most manufacturers have adopted radio systems that operate on the standard Wi-Fi bands. The individual delegate units will all be powered by a rechargeable battery of some description and all units will communicate with an access point or radio base station.

Most importantly, all wireless radio technologies use the same medium to transmit their signals through – air!

Despite the commonalities one main difference in the systems currently available is the way in which they transmit their signals.

As more gadgets and gizmos adopt wireless technology so the airwaves become crammed with more radio signals.

If you could wear a special pair of glasses that enabled you to see radio waves, I am sure you would just see blackness in every direction you looked. This issue with congestion, is becoming more and more of a problem, especially in densely populated areas such as meeting rooms and conference venues where a number of different wireless systems are competing for the same airspace.

Designers and engineers have designed their wireless systems with these congestion issues in mind and most suppliers claim that their systems will work harmoniously with other equipment operating on the same frequencies. This may well be true in controlled environments where frequencies can be managed, but in the real world nobody controls the airwaves and suddenly we have a bunfight on our hands.

Many wireless conference systems available today operate in the digital domain with analogue audio signals being converted into digital information for processing and transmission. Sampling rates are now good enough that not much of the audio quality is lost, but this data now has to be cut up into small chunks (packets) and re-transmitted through the air. Because we are now dealing with data, we are able to process this in some clever ways.

We can encrypt the data so our conversations are difficult to eavesdrop, we can add additional data e.g. to give voting functionality and we can control the method how this data is transmitted and ultimately received. The latter is quite important in dealing with latency and congestion issues and we shall explore this in later episodes of this blog.

Because we are dealing with mainly portable equipment it would be no good having a wireless microphone that needed a wireless connection to a power supply. For that matter all wireless delegate microphones (that I know of) are powered by batteries.

Due to the fact that each microphone unit is acting as both a transmitter and a receiver current drain can be quite high so high capacity battery packs are required. Depending on the particular type of battery used, some of these can be quite weighty and come with safety risks around how they are handled and charged. Each manufacturer will give you an approximate idea of expected battery life from a full charge and life expectancy as remember batteries will always be a consumable item in any system. I would recommend that this is something you should budget for.

In the next mini-series we will start to unravel some of the 'dark science' behind the inner workings of a wireless conference system and aim to give you the knowledge you need to make sensible decisions on how you best make use of the technology for your application. ♦



Note to Editor

Harold Smart *FInstSCE*

I was interested in the article by Jason Williams on wireless communication.

Certainly in my day, whenever we did important events where there were company plans being discussed, the client was very clear that no radio microphones be used as there was a fear of industrial espionage taking place. OK – we were on VHF Hi band and now it is UHF, but I would have thought there would be a similar stance.

My son, who is a project manager for Hewlett Packard in New Zealand, is not even allowed to use a wireless mouse or keyboard in case of industrial espionage! I would like to know from Jason if there are now effective encryption circuits readily available. ♦

Dear Harold

I know that the Brahler Digimic Wireless conference system incorporates advanced frequency hopping spread spectrum (FHSS) into its radio system. This works by splitting the signal into a number of narrow-band channels and hopping them across the wider band using a pseudo-random sequence. The pseudo random sequence must be cracked first before attempting to decode the data which is in turn encrypted to 256bit with continually changing keys. This make for a very secure data transmission method.

Kind regards,
Jason

Thanks for your donations

Bernard Bibby *FInstSCE*

As members, you might be aware of my request for any redundant equipment, both professional audio and any test equipment, that can be used in my small local demonstrations.

I have set-up a small sound lab, in which I am able to test any equipment gratefully donated and also set up systems for demonstration purposes.

I recently received an e-mail from a long standing member with an offer that I could not refuse.

The offer yielded a little gold mine of very useful items that have already been tested and shown to a club that is looking for some amplification for a band.

This also led to a discussion on how to set up live audio systems and get the best sound possible with limited equipment.

I would like to take this opportunity to say a big thanks to our past president, Terry Baldwin, who has really come up trumps on this occasion.

Many thanks Terry, and the boss (Mrs B), who politely pointed out that the garage could really do with being cleaned out. Good on you Mrs B.

So if you have any need to placate your loved ones, or if there are any companies that do regular stock checks with a need to dispose of any audio or test equipment, please think of me. Just drop me an email: bernard@bibbypublishing.com

Kind regards to you all and once again many thanks Terry and Mrs Baldwin. ♦

We can only count up to two

Harold Smart *FInstSCE*

I witnessed an amusing incident the other day which I think typifies the public address industry. I was watching *BBC Breakfast* the other week and they went over to the Tower of London for the weather forecast. It was just before 11 November

and the ceramic poppies were there which made a good background. As the Presenter was giving the forecast in the background a metallic voice was clearly heard. "1, 2, ... 1, 2, ... test" Things never change, we can only count up to two! ♦

EMC – near field immunity tests

a new development

John Woodgate *HonFInstSCE*

We cannot ignore the fact that the everyday electromagnetic environment has greatly changed. Manufacturing of compact wireless phones is now possible, with low weight and a reasonable price. Wireless services (mobile phones, Bluetooth etc.) have come into widespread use.

Equipment for these new technologies is present in nearly any setting, especially places of entertainment, at work and in public transportation. This creates new situations for exposure of equipment to RF energy. The peak pulse power levels have increased significantly. Increased portability of transmitting devices has also drastically reduced the separation distance between sources of radiated RF energy and equipment, particularly professional audio equipment, likely to be disturbed by that energy.

Wireless technology will continue to evolve new applications using increasingly higher microwave frequencies. Immunity testing according to existing standards is not sufficient. The power levels required with such very small separation distances demand new approaches.

Fields emitted from physically-small transmitters

Magnetic field energy-transfer at low (power and audio) and 'near-field' transmission at higher (HF band) frequencies are also being brought into extended use. The fields vary appreciably in both magnitude and direction over even small regions of space and decrease rapidly with distance from the source. A very large part of the frequency spectrum is involved, so it is necessary to use new test methods which consider the physics of magnetic-field coupling in the lower frequency range and electric-field coupling in the higher frequency range. Additionally, the widely diverging physical and electrical characteristics of equipment types that may be affected by portable transmitters in close proximity, as well as the applications for which such equipment is used, indicate a need for multiple test methods.

Standard methods of measurement of immunity are studied by IEC committee SC77B, and it has produced a first draft of a standard for measuring

near-field immunity. It may seem surprising that no standard has existed before, but near-field measurements are notoriously unrepeatable. If a transmitter and 'EMC victim' are far apart, the electromagnetic field has the property $E/H = 120\pi \Omega$ resistive, where E is the electric field strength and H is the magnetic field strength. But closer to the transmitter than $2D/\lambda$, where D is a dimension of the radiator and λ is the wavelength, E and H vary independently and vary greatly from place to place.

New test equipment required

So we can't determine immunity to near-field emissions with existing far-field test set-ups having constant, resistive E/H. We need a way of breaking the 'reproducible' problem. So IEC 61000-4-39 is being written in IEC SC77B, covering 9 kHz to 6 GHz. Similar standards already exist in the automotive field, but the current draft doesn't cover separations below 100 mm. A mobile phone can get a lot closer to the mixer than that. A method of measurement for separations down to 5 mm (that's more like it!) was developed for medical equipment by a committee within IEC TC62, based on Ford Motor Company RI 115 test and ISO 11452-9.

However, the EMC consultant Keith Armstrong noted that the method was of sufficiently general application for it to be submitted by BSI to IEC SC77B, and that has duly happened. It applies where a transmitter in the frequency range 400 MHz to 6 GHz could approach within 50 mm of potential 'victim' equipment. The immunity is tested with an antenna spacing between 5 mm and 50 mm, not further specified in the standard; the spacing is to be specified in Product standards. Unlike in other immunity standards, the necessary test levels are not optional because it doesn't matter what the victim is. The method depends very much on the development of a special antenna, whose characteristics are such that a satisfactory degree of reproducibility of results can be achieved.

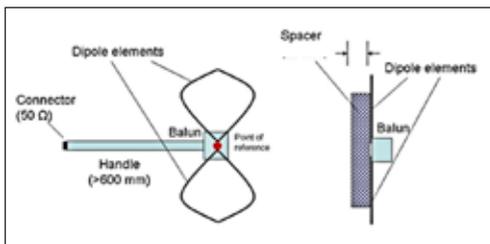


Figure 1 Principle of the special near-field antenna

All surfaces of a table-top product are tested. for each 100 mm square of surface.

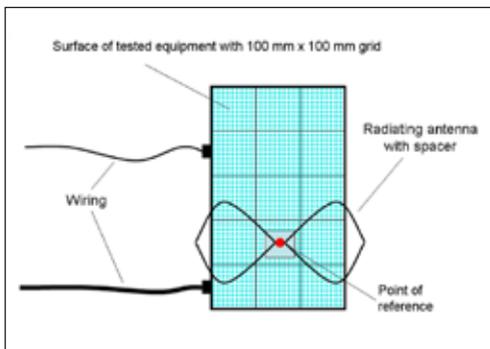
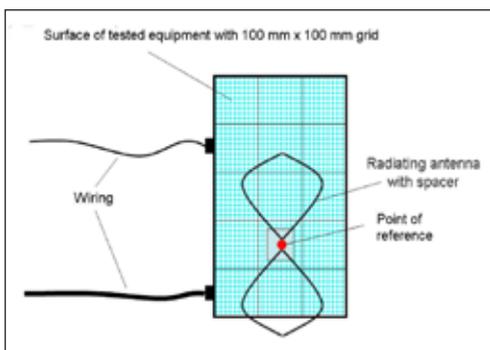


Figure 2 Positions of the special antenna

Cables are also tested by placing the antenna on the cable with a spacer of between 5 mm and 50 mm, as specified in the relevant Product standard. An extra test is required adjacent to each connector.

It will take several years for the standard to go through all its development and approval stages, but the audio industry has the mobile phone problem right now. So what can we do? Our immunity standard is supposed to be CISPR 35/EN 55035, but it is still in trouble. We

can continue to use EN 55103-2 until someone tells us to stop! But how do we add in the new near-field test? We can't amend EN 55013-2 and it's very unlikely that CISPR/I will want to amend CISPR 35 any time soon. We could use the way we 'fixed' IEC 60268-4: add special EMC clauses, more stringent than those in CISPR 35/EN 55035 to our Product standards 'for the preservation of programme quality', but that would take much time.

Manufacturers DON'T want to have to wait about 3 years for the publication of the new near-field immunity standard (IEC 61000-4-39). But until it is published, the committee documents are not in the public domain. So a distributable version of the new method is available at:

<http://www.jmwa.demon.co.uk/Near-field%20EMC%20immunity%20test.pdf>

Note that there is no claim that the published IEC 61000-4-39 will be technically identical to this unofficial distributable version. The antenna specification can be found by going to:

<http://www.schwarzbeck.de/index.php/en/> and searching for '420 NJ'.

References

- IEC SC77B document 77B/717/CD (draft IEC 61000-4-39 without the new material); if you REALLY want a copy, please contact John Woodgate by email: jmw@jmwa.demon.co.uk (T&C apply because such documents are not in the public domain)
- The BSI comments on the draft IEC 61000-4-39 sent to IEC will be circulated with those of other National Committees
- Ford Motor Company's RI115 test, in EMC-CS-2009, 'Component/Subsystem EMC Requirements and Test Methods' (from www.fordemc.com)
- ISO 11452-9:2012, 'Road vehicles – Component test methods for electrical disturbances from narrowband radiated electromagnetic energy – Part 9: Portable transmitters' ♦

ISCEEx2015

Networking Dinner

Tue 3 March 2015 · 7pm

ISCE will be hosting a networking dinner in the elegant dining suite of Coombe Abbey on the eve of the exhibition. Why not book a table and invite your customers along. 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. Pre-dinner drinks from 7pm.



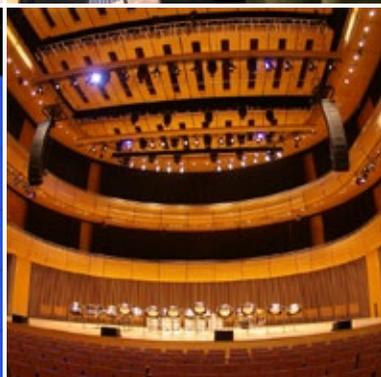
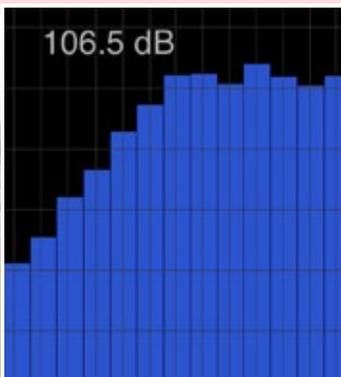
Exhibition and Seminar Day

Wed 4 March 2015 · 9.30am–4.30pm

Mix with the best in the business

At the most relevant event in the sound industry calendar, you will meet the people that matter most to your business, with informative seminars led by industry experts, running alongside the exhibition.

Free entrance to the exhibition and seminars.



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Join us at ISCEEx2015

Seminar programme

10.00am

Is the market really ready for audio-over-IP?

Kevin Sherwood · Sales Director, CIE-Group

Is the installation industry really ready to adopt a whole new way of thinking for public address? Are our clients really ready to let the audio industry loose on their networks? With Air Command Headquarters – RAF High Wycombe – now entirely reliant on an audio-over-IP PA system, this case study-driven seminar will address and overcome the perceived challenges of audio integration into a mission-critical network.

This lecture will detail the project from specification through to implementation and highlight the flexibility and efficiency of network-distributed audio for large scale, multi-zone applications.

Kevin joined CIE-Group in 1984 as a Service & Repair Technician. He transferred to the Audio Sales Division and was promoted to Audio Field Sales to develop the Midlands territory. He had great success in this role and in 2002 was promoted to Business Development Manager for 'special projects'. He was elevated to the Board as Field Sales Director in 2010 and is responsible for the UK-wide field sales team. Kevin has been a member of the ISCE since 2005.

11.30am – Warren Barnett Memorial Lecture

The technology is willing but the spirit is weak

Paul Sarcbrough · Principal AKUSTIKS

Much is made of the convergence of Audio and IT networks. Certainly in corporate environments, great progress has been made to rely upon a shared network infrastructure, but what of the performing arts and other high-end critical listening applications? In these applications the actual acceptance and implementation of convergence strategies remain elusive. Despite advances in hardware and software, parallel network infrastructures persist in professional audio applications. If the technology is willing... what holds convergence back? This lecture will explore these themes and propose that the factors influencing convergence in critical listening applications, go beyond technology and often encompass issues of culture and control.

Paul has developed effective working partnerships with a broad array of architects and theatre planners. His formal training in architecture allows him to appreciate a diverse range of architectural styles and to engage in the design process in a constructive and collaborative fashion. Paul holds memberships in the Acoustical Society of America, Britain's Institute of Acoustics and the United States Institute of Theater Technology.

2.30pm

Architectural defects?

A celebration of acoustic aberrations

Trevor Cox · Professor of Acoustic Engineering, University of Salford

Sound engineers often expend considerable effort fighting the effects of poor room acoustics such as focused echoes from domes, excessive reverberation and flutter echoes from parallel walls. But what if these acoustic phenomena were not viewed as defects, but instead celebrated? There are a few places where a remarkable sound effect is integral to a tourist attraction, such as the multiple echoes from the dome of the Imam Mosque in Isfahan, Iran. This lecture will look at famous and less well-known examples of extraordinary architectural sounds. The acoustic phenomena also play with our perception of sound: in the spherical radome on top of the disused Cold War spy station at Teufelsberg near Berlin, you can whisper into your own ears. Included in the sites will be the disused World War II oil tank, which Guinness awarded with the record for the 'longest echo' in the World. Using modern scientific methods, it is possible to further our understanding of the sound propagation in such spaces.

Trevor carries out research and teaching at the University of Salford, focusing on architectural acoustics, signal processing and audio perception with increasing amounts of research on broadcast audio. He is also an author and radio broadcaster having presented many documentaries on BBC radio and also presented science shows at the Royal Albert Hall, the Purcell Rooms at the South Bank Centre and the Royal Institution. Trevor is former President of the Institute of Acoustics, Honorary Fellow of the IOA and Covenor of ISO Working Group WG25.



Power systems for critical audio installations

Joules Newell *MIOA MInstSCE*

Introduction

There is very little published regarding power systems for professional audio systems and installations.

It is often seen as a bit of a black art and in circumstances where we are presented with a poor power system and resolving problems can become a very hit-and-miss affair.

Often we find a staggering lack of common knowledge between the electrical installer and the audio installer, which often leads to inappropriate demands from either side. This, however, need not be the case as both industries deal with the very same principles. Simple good practice, engineering and an understanding of the true system requirements can result in a safe, well behaved clean audio system that sits as a good neighbour on the power network.

We will not seek here to provide the values or any recommendations as to what system components will be correct for any type of install. There is plenty of literature to help an installer calculate values and loads. Here we will simply deal with the concepts and reasons behind a good electrical supply for audio. Always ensure that you work within any local codes or laws.

The following is an extract taken from the full article that is available to download from the ISCE website under 'Resources' on the home page. www.isce.org.uk

Going loopy

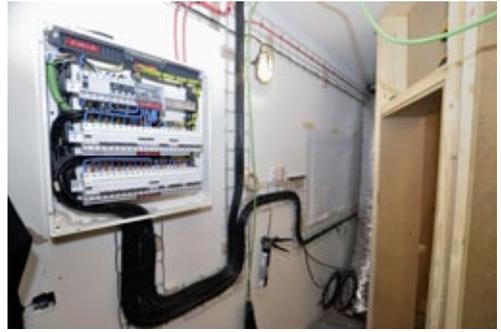
Probably one of the most common situations where an otherwise invisible and forgotten power distribution network becomes apparent is when we experience outside interference within our systems. This usually occurs at the most inopportune moment and is often greeted by bewilderment and panic. This needn't be the case. On a fault-free well cabled system there are only a few ways that outside interference can enter the system - electromagnetic induction, directly conducted interference within the ground line, or radio frequency pick-up are the most common of causes.

With electromagnetic induction, the system needs to be exposed to an adequately strong field of energy to induce a current into the audio cables. The majority of balanced audio cables are largely immune to this kind of low frequency interference. If the cable is well manufactured, any field picked up in the positive line will hopefully be equally picked up in the negative line and the transformer or differential amplifier at the ends of the signal path will simply cancel out the interference current. This method is great for low frequency interference, but often circuit limitations can make this method less effective at higher frequencies. Fortunately the majority of high power electromagnetic energy is in the lower frequency range unless it is highly distorted. High distortion power cables, often related to SCR dimmer or fluorescent lighting circuits are best avoided in closest proximity to any audio lines. In critical audio environments the use of electronic dimmers, fluorescent lighting or electronic fan controllers is also best avoided. It is a bad idea to use fluorescent lighting or SCR dimmers in any critical audio environment, such as studios or control booths. Lights can be dimmed and fans controlled very effectively by the use of variable transformers. In more commercial applications it is better to avoid such lines with all audio, video and data cables. Effective cable screening can, in many cases, protect against this problem, but this will only work well if the screen is able to effectively short down any interference current to ground. The lower the ground impedance the more effective the shield rejection will be.





All technical service cables in a film post production complex following a common route with minor segregation distances to avoid creating a loop in the ground conductors.



A local sub-distribution board in a recording studio service area under construction providing a local radial topology that will match the audio installation layout. (Barcelona)

Where often we worry about ground loops picking up electromagnetic interference, one theoretical solution is to simply break the loop. This is a remedy, but does not remove the cause of the problem which is simply bad cable route design. In complex audio systems this broken loop can lead to system instability. It only requires one person to connect one extra item and the break is bypassed and the whole problem starts all over again. The most effective solution is simply not to make a loop anywhere on the audio or audio power circuit. The common practice of running audio lines far from power lines has a major flaw - by doing this we risk creating a huge loop in the system ground path. A well-balanced, well screened cable should be perfectly capable of passing reasonably close to a clean power line with no ill effect.

This has shown to be true in live concert 'front of house multicore snakes' where the power lines are bundled together with microphone lines over average distances of up to 100m.

Tests have shown that passing power lines down different routes in those cases often proved more problematic in terms of induced ground noise than leaving them bundled in the snake due to the creation of a huge loop of audio screen ground path and the returning power ground path when the lines are separated.

The use of a radial or star configuration of all system cabling is highly recommended and has shown to be very effective. Care should be taken to avoid circumstances where the adjacent lines of the radial configuration, or ends of the radial spokes, could be inter-connected at any point by either audio, video, or shielded network cables as this could recreate the loop. In the UK 'ring main' circuits should be avoided at all costs unless the ring return follows the out cable path, as this is often complex. It is best to just generally not specify a ring circuit for audio. Care should be taken to supply areas likely to be interconnected so they are supplied from a common cable run, tray, or duct, especially when designing studio power and considering performance areas and control rooms. Often installing a sub-distro in the control room or machine room is the most effective solution. On larger entertainment installations consider the options of fitting a local technical sub-distro in the machine (or rack room) which can be fed with an adequate feeder cable and allow subsequent audio and power lines to follow close paths.

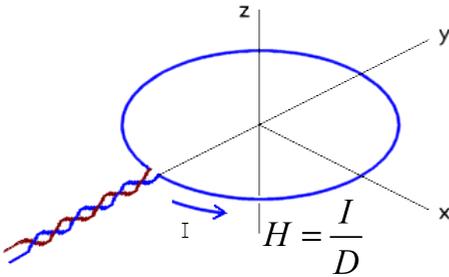
Where it is unavoidable in very large systems to run a signal ground path loop around a venue and there simply isn't an alternative, it is best to design a break-point into that signal ground loop which cannot get re-patched or mistaken for an electrical fault, otherwise a later operator may need to connect an extra line into something that restores the ground path. ♦

Calibrating Your AFILS Meter

Anthony C Smith *MInstSCE MAES*

First a little bit of theory:

The field at the centre of a circular conductor is defined as :



Where H is the field strength, I is the current flowing in the cable and D is the loop diameter.

Making a circular loop is not easy, so to work out the field from a square loop we have to describe the circular path enclosed by a square whose sides are of length a.

$$H = \frac{2\sqrt{2}}{\pi} \cdot \frac{I}{a}$$

So if we choose a square loop of 500 mm per side, we need to know the current required to generate 0 dBV or 400 mA_m-1 RMS in the centre of the loop, re-arranging the equation above gives:

$$I = \frac{\pi a H}{2\sqrt{2}} \quad I = \frac{0.4 \cdot 0.5 \cdot \pi}{2\sqrt{2}}$$

This gives I = 0.222 A

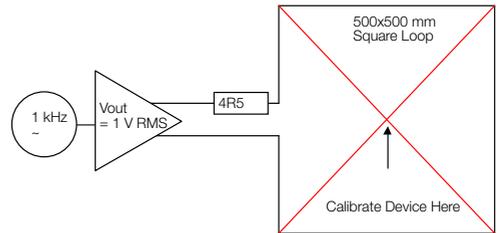
For simplicity we want to use a single turn loop to keep the resistance and inductance low, passing this current, so by simply placing a resistor in series with the loop we can set the current, and to keep the maths simple we choose the voltage to be 0 dBV or 1 V RMS, so from Ohm's Law:

$$R = \frac{V}{I}$$

Since V = 1 V and I = 0.222 A, we get R = 4.5 Ω

This value is easy to achieve with standard 1% resistors, 3R3 + 1R2 in series gives the required value.

The test rig should now look like this:



Remember when calibrating devices to keep away from metal structures and items with transformers; ideally have all items battery powered and do this in a green field site for the ultimate accuracy. ♦

DISCLAIMER

Care is taken to determine that 'Engineering Notes' do not refer to any copyrighted or patented circuit or technique, but ISCE can accept no responsibility in this connection. Users of the information in an 'Engineering Note' must satisfy themselves that they do not infringe any Intellectual Property Rights.

Vintage display For Remembrance Day

Ron Walker *ComplnstSCE*

One of the earliest recorded PA jobs in the UK, was by Fred Warren on Armistice Day in November 1919.

On Remembrance Day this year, my youngest son, Andrew, provided some vintage PA equipment for his Cheddington village remembrance service and used the Godalming trailer as his control base.

The amplifier is a CTH MA51 leading into two NSR jumbo columns. There are 22 watt 100 volt line semi-weatherproof outdoor speakers with a Toa re-entrant horn speaker, with a rola-Celestion 100 volt line 15 watt pressure unit. The input was a Shure UHF radio microphone with an SM-58 head. The last post came from an i Pod with the two-minute silence built in.

The trailer was built in the late 1940s for the General Post Office and allocated to the Telephone Manager at Guildford for use as a small pump or generator carrying trailer suitable for towing behind Morris series Z vans.

Purchased by Godalming Radio services in 1950, it was used to support its outside public address hire service. Godalming Radio provided public address and telephone systems for several county agricultural shows and point-to-point horse races in Surrey and Sussex. The PA hire business was subsequently sold to National Sound Reproducers Ltd of South Harrow, Middlesex in 1970.

On arrival at NSR, it became known as "The Godalming Trailer". It was used occasionally over the next 40 years and was converted from a towing eye to a 50mm ball hitch. When NSR Ltd closed down in 2010, it was passed to the Walker family and is now part of a vintage public address equipment collection.

Despite its age, the whole rig worked very well on the day and after the event, it was driven away to be dismantled. ♦



Andrew Walker at the controls, son of Ron Walker and grandson of Alex J Walker – founder of the Institute



Memorial monument in Cheddington Village

New Members December 2014

Member

Max Hooper

Environmental Noise Solutions

Andrew Mitchell

University of Exeter

Senior Technician

Graham Bennewith

DM Music

Jon Miles

DM Music

Eddie Zych

Cablejog

Technician

Kevin Haddaway

Sarabec

Temporary

Sam Burkinshaw

Ampetronic

Peter McKeag

Ampetronic

Jason Norris

Surrey County Council

CDM 2015: what it **might** mean for the entertainments industry

The CDM Regulations are being revised. The current and proposed CDM Regulations implement a European directive, which does not permit exceptions for the erection and dismantling of temporary structures for the entertainments industry: TV, film and theatre productions and live events. The definition of construction work is broad and does encompass a wide range of activity in the entertainment sectors from high to low risk work. Therefore, while HSE cannot disapply CDM to such work, it is not proposing any changes to CDM, which specifically bear on the entertainment sector. This means that in common with the construction sector, duties are placed on parties as follows:

Clients

Where there is more than one contractor, or it is reasonably foreseeable that there will be, the client has a duty to appoint a Principal Designer and a Principal Contractor. On commercial projects the Client will be deemed to undertake the roles where no appointment is made. In addition, clients will be responsible for notifying the HSE about applicable projects.

Principal Designers will take on the duties previously delivered by the CDM Co-ordinator and must (ensure):

- the project is carried out without risk to health and safety (sfarp)
- assist the client in preparation of pre-construction information
- identify and then elimination or control foreseeable risks to h&s (sfarp)
- that all parties involved in a project cooperate
- that all designers comply with their duties
- the prompt provision of pre-construction information to all designers and all contractors appointed by the client
- that they liaise with the principal contractor for duration of a project.

Prepare a Health and Safety file, which includes information from the client regarding the Control of Asbestos Regulations 2012.

The role of the principal designer replaces the role of the CDM co-ordinator previous defined in the 2007 Regulations.

Designers

Designers still have a duty to eliminate hazards, where it is reasonably practicable to do so. Where it is not possible to eliminate hazards, they have a duty to mitigate the effects of the hazard and, in doing so, must take account the general principles of prevention. However, designers are not expected to account for risks that cannot be foreseen. Finally, for hazards that they cannot eliminate, designers are expected to provide information for the pre-construction information (and ensure information is included in H&S file).

Principal contractors

Very little has changed, but the important changes are:

- construction phase plans no longer need to be checked by client or client's adviser before start on site;
- principal contractor is responsible for updating, reviewing and revising the Health & Safety file.

Contractors

Similarly, little has changed. However, there are a number of things to note:

- if there is no principal contractor, a construction phase plan is still required
- contractor must comply with any directions given by the principal designer or principal contractor.

Implications

Implications for the entertainments industry are as follows:

- you need to understand what CDM 2015 means for you – find a competent person to tell you
- advise your clients about their duties as soon as you are appointed

- think carefully about accepting the PD role; only accept the appointment if you have the capability to do so or can call on the services of someone competent who can help you discharge the duties (remember, employing someone else to do the PD role on your behalf does not transfer your legal liability)
- make sure you have allocated a sufficient fee for discharging the PD role.

Emphasis is on people taking responsibility for risk, not passing it on; larger or more complex projects may require the appointment of a construction health and safety (CDM) consultant to advise and assist the PD or client – but see above re transferring legal duties.

Summary

- Until April 2015 it is business as usual
- from April 2015 (subject to government approval) you must inform your clients about their duties – see above
- you may be asked by clients to be the principal designer (PD).

If you do accept an appointment as PD, it is important to ensure that:

- you only take on the PD role if you are competent to do so
- you and your staff have adequate training
- until your own staff are up to speed, you consider using a specialist H&S consultant for more complex/larger projects (or make this a permanent arrangement)
- you are adequately resourced – including fees, personnel and time
- in anticipation of the Regulations coming into force, you may want your trade association to draw up a standard form of appointment for PD
- it may be worth having a discussion with your PII broker about undertaking the PD role. ♦

New Supporting Member

ATKINS
Acoustics, Noise & Vibration

We are delighted to welcome Atkins ANV as a new supporting member with the ISCE.

Atkins have been working in the fields of acoustics, noise & vibration since the 1960's, initially borne out of the need to support new road designs by assessing their noise impact. The team now has 25 acousticians working in fields including environmental noise, building acoustics and architectural acoustics, with projects in the UK and worldwide.

PAVA and sound systems design have become an increasingly large part of our portfolio in the last decade. Atkins ANV have been involved with PA/VA system designs for rail and underground stations, airports and road tunnels to name a few. Recent major projects include Crossrail Central and Anglia stations and the new Jeddah King Abdulaziz International Airport. Outside of the transport sector they have also worked on live concert noise impact assessment, churches, offices and sports stadia.

They have three specialist electro-acoustic consultants, who concentrate solely on sound systems system design, acoustic modelling and verification testing as well as other team members who provide support for when things get really busy!

Chris Hales MInstSCE, Associate of Atkins, said "we are really excited about becoming supporting members for the ISCE and getting to know some of the other members a bit better."

www.atkinsglobal.com ♦

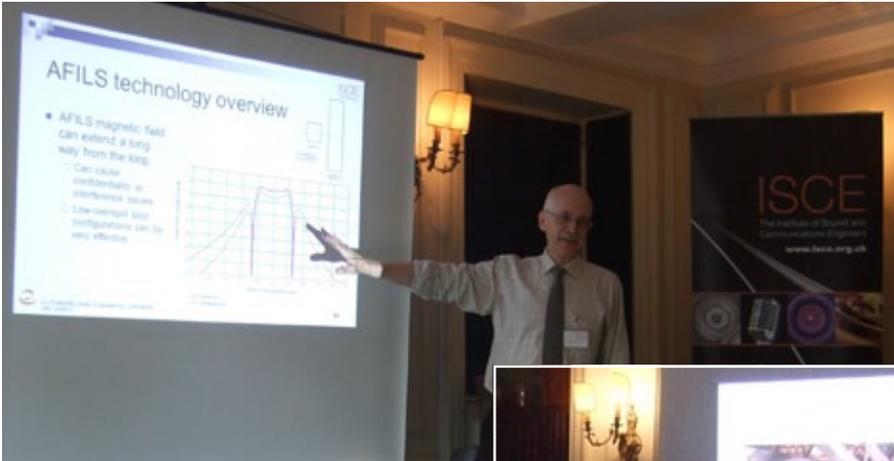


2015 provisional Training dates

The training committee are pleased to announce the provisional dates of ISCE training courses in 2015.

January	Voice alarm fundamentals
February	Designing for speech intelligibility
March	Sound measurement techniques
April	Live sound engineering
May	Induction loop systems – design & installation, measurement & certification
June	Basic electronics for sound engineers
July	Principles of networking
October	Advanced principles of networking
November	Introduction to sound
December	VA commissioning & maintenance

These dates are subject to change, but look out for advanced notice of our courses, with booking forms and location details. ♦



Doug Edworthy presenting the AFILS training course in November



Peter Mapp joins in to share his knowledge with the delegates

Supporting Members

ADS Worldwide, Manchester
www.ads-worldwide.com
Mr J Houldcroft *MInstSCE*

Ambient System Sp. z o.o.
www.ambientsystem.eu
Mr R Siatkowski *AMInstSCE*

Ampetronic Ltd, Nottinghamshire
www.ampetronic.com
Mr J Pieters *MInstSCE*

AMS Acoustics Ltd, London
www.amsacoustics.co.uk
Ms H Goddard *FInstSCE*

Arup Acoustics, Manchester
www.arup.com/acoustics
Mr D Hiller

Atkins Acoustics, Noise & Vibration
www.atkinsglobal.com
Mr C Hales *MInstSCE*

Audio Logic Ltd, Essex
www.audiologic.co.uk
Mr A Lewis

Audio-Technica Ltd, Leeds
www.audio-technica.com
Mr H Roberts

Baldwin Boxall Communications Ltd, East Sussex
www.baldwinboxall.co.uk
Mr N Baldwin *AMInstSCE*

Black Light Ltd, Edinburgh
www.black-light.com
Mr B Dakers

BL Acoustics Ltd, Essex
www.blacoustics.co.uk
Mr B Larcombe *MInstSCE*

Blaydon Communications Ltd, Tyne & Wear
www.blaydoncomms.co.uk
Mr P Dougherty *MInstSCE*

Bosch Security Systems, Middlesex
www.boschsecurity.co.uk
Mr A Osborne

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

Canford Audio Plc, Tyne & Wear
www.canford.co.uk
Mr P Vickers

CIE Group Ltd, Nottinghamshire
www.cie-group.com
Mr K Sherwood *MInstSCE*

Clarity UK Ltd, Essex
www.clarityuk.co.uk
Mr G Palmer *AMInstSCE*

Clever Acoustics
www.prolight.co.uk
Mr A Jeffrey

Cloud Electronics Ltd, Sheffield
www.cloud.co.uk
Mr S Curtis

Commercial Audio Solutions Ltd, Derbyshire
www.commercialaudiosolutions.com
Mr W Mackie *AMInstSCE*

Contacta Systems Ltd, Kent
www.contacta.co.uk
Mr R Dungan *MInstSCE*

C-TEC, Wigan
www.c-tec.co.uk
Mr A Green

CUK Ltd, Glasgow
www.cuk-audio.com
Mr S Thomson

Current Thinking Assistive Listening Ltd, Tyne & Wear
www.current-thinking.com
Mr S Binks

DJ Kilpatrick & Co Ltd, Belfast
www.djkilpatrick.com
Mr J Hooks *AMInstSCE*

Delta Telecom Sound & Security Ltd, Stockport
www.deltatelecom.co.uk
Mr S Ratcliffe *TechnInstSCE*

DNH Worldwide Ltd, Milton Keynes
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Mr K Golds *AMInstSCE*

d&b audiotechnik GB Ltd
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Mr S Hogg

Eaton, Doncaster
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Mr R Campbell

Edworthy Audio Consulting, East Sussex
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Mr D Edworthy *HonFInstSCE*

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Mr A March *MInstSCE*

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www.simcol.biz
Ms C Hurditch

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Mr T George-Tolonen

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www.solentsound.com
Mr R Gatehouse *MInstSCE*

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TOA Corporation (UK) Ltd, Surbiton
www.toa.co.uk
Mr B Downing

Tyco Integrated Systems, Cambridge
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Mr K Blackwell

Univox Audio Ltd
www.univoxaudio.co.uk
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