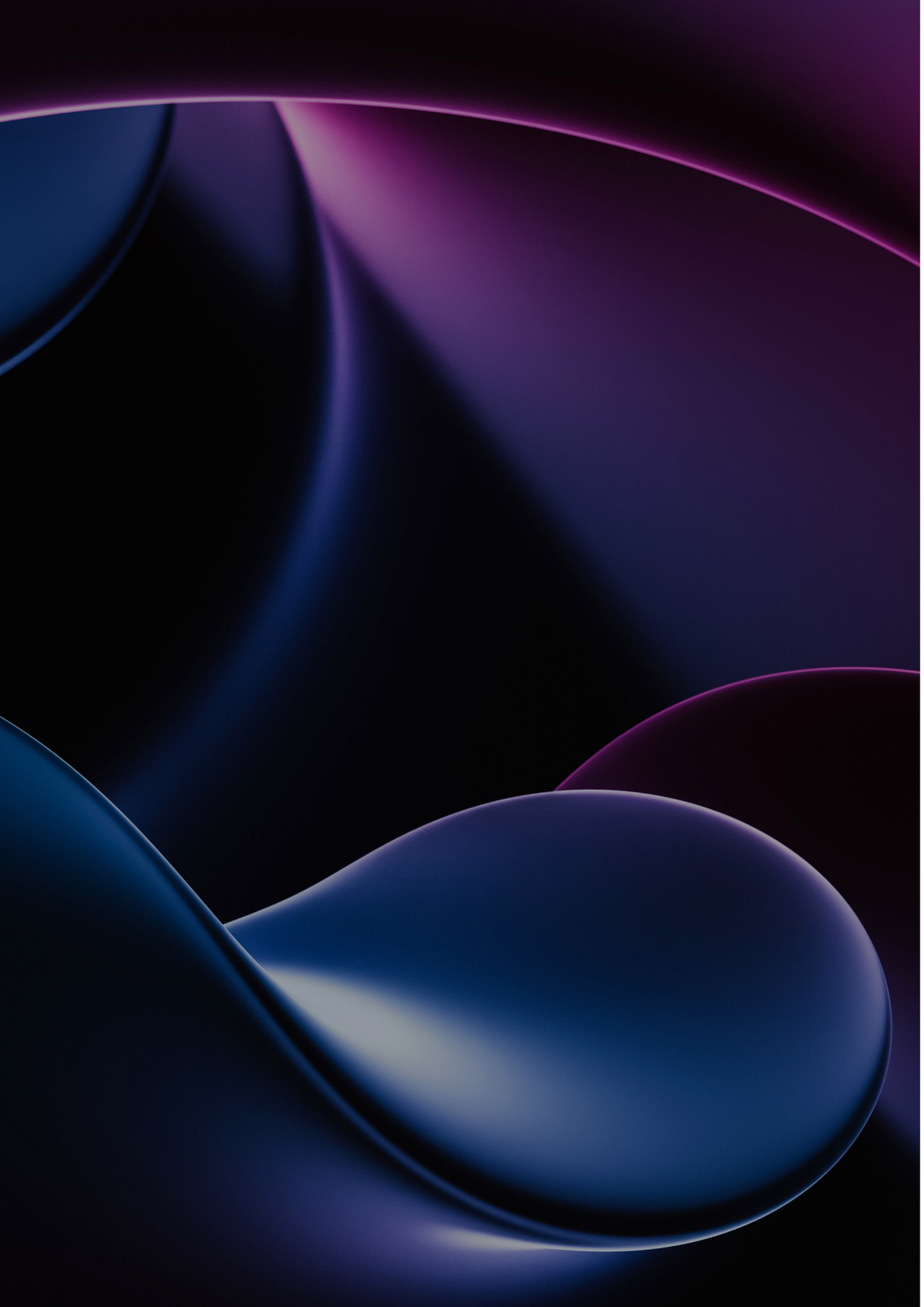

BROADCAST
THE BRIDGE
Connecting IT to Broadcast

Audio For Broadcast

Part 2 - Broadcast Audio Capture

A Themed Content Collection from The Broadcast Bridge

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Series Overview

By Tony Orme. Editor at The Broadcast Bridge.

Audio For Broadcast is a Themed Content Collection which serves as an audio course and reference resource for broadcast technologists.

It covers the science and practical applications of all aspects of audio in broadcast. It is not aimed at audio A1's, it is intended as a resource for the 'all-rounder' engineers and operators who encounter and must deal with audio on a day-to-day basis but who are not audio specialists... and everyone who wants to broaden their knowledge of how audio for broadcast works.

Sometimes you don't need to know everything about something. In our frenetic and challenging working lives more and more jobs are multi-skilled and adaptive, and we're often expected to cover more functions than we are comfortable with. We can't all be experts. Sometimes we just need enough knowledge to get the job done.

Broadcast Audio introduces some basic concepts for people who aren't audio people. While the audio signal chain is very different to what it was a generation ago, some fundamentals remain. Things like signal processing haven't changed and still need to be done well, but the series will also look at how we got to where we are.

It will look at how consumer technology and broadcast intent has influenced the production of content, and what that means for the people who work to put everything together. Because you never know when you might be asked to lend a hand.

Audio For Broadcast is a five part series:

Available now:

Part 1. Theory, The Console, Monitoring & Metering

Part 2. Broadcast Audio Capture

Future parts due in 2023:

Part 3. Audio Processing Tools

- Dynamics, EQ & Filters
- Reverb, Enhancement & Polishing
- Noise Control & Audio Repair

Part 4. Routing, Sync' & Latency

- Routing & Asset Sharing
- Synchronization
- Latency & Delay Compensation

Part 5. Broadcast Audio Workflows

- Traditional Studio Signal Flow
- Outside Broadcast & Distributed Teams
- Cloud Based Audio

Microphones Part 1 - Polar Patterns

By Kevin Emmott. The Broadcast Bridge.

Here we look at microphone polar patterns and what to consider when planning how to capture sounds to create gripping broadcast content.

There are a huge variety of microphones on the market, it's totally overwhelming, and with good reason. Choosing a good microphone isn't like choosing a good bottle of wine.

You know if you have a good bottle of wine straight away; if you like how it tastes you will like how it tastes in a restaurant, in a bar or in your kitchen. Similarly, you might like the sound of a particular microphone on location in a stadium, but it doesn't mean you will like it on a Vox Pop, or in a studio, or in front of a drum kit. Or in a kitchen.

Broadcast is never that simple and microphone choice is always dependent on the application.

Everything about the broadcast will inform your decision, and questions need to be asked before you even get to work; how noisy is the environment? Do the mic's need to be hidden? Are there any physical restrictions in place, will there be audience participation, how much of an issue is foldback, how skilled is the talent, is it live, do you need a backup, what is the weather like, what is the format of the show, what is the talent comfortable with?

The application and what the broadcaster is trying to achieve will always be the first consideration, and answers to questions like these will provide the necessary guidance to mic selection for any environment. For this reason broadcast facilities stock a range of microphones with different polar patterns, electronics and form factors, and before settling on any of them the sound recordist's first job should be a discussion with the production team to ascertain what the story is about.

The Capture

Let's look at some fundamentals.

Sound is the vibration of particles in the air. It happens all around us all the time, and a falling tree in a forest will still vibrate air particles whether we are there to hear it or not. Microphones all do exactly the same thing, converting those vibrations into electronic signals which can be fed into a mixer or a speaker for amplification or manipulation.

But they are all very different and have characteristics which can help define a mix and adapt to your broadcast environment.

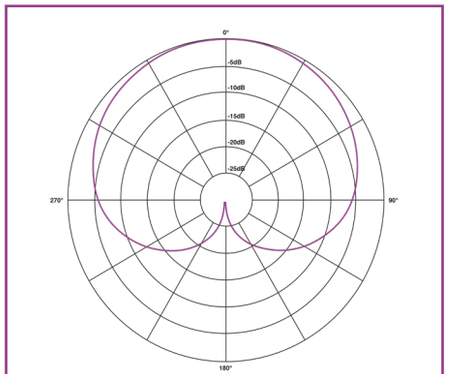
Polar patterns are a good place to start. A polar pattern determines the directional frequency response of the mic's so you can work out which are best suited to your needs; in other words, it tells where it will pick up sound from. For live TV and radio, the aim is generally to capture speech and reduce room noise, so the most common mic patterns used broadcast tend to be unidirectional.

Polar Patterns

Unidirectional microphones are known as cardioid's.

In geometry, a cardioid is a heart-shaped plane, and similarly a cardioid mic has a maximum response on axis and a maximum rejection at 180° off axis; from above it looks like a heart.

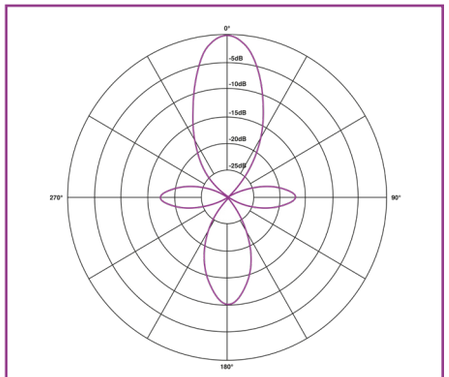
This rejection of off-axis noise makes it a good choice for many broadcast applications, as it is geared to pick up whatever is in front of it and not much



Cardioid Polar Pattern

from the sides or the back. It is a popular all-rounder for broadcast as it rejects a lot of ambient noise, such as an audience or other guests on a panel but is still somewhat forgiving if the main subject is a little off axis.

A lobar pattern takes off-axis rejection to another level, and mics which use this pattern are often used in broadcast. These are sometimes referred to as super-cardioid mics and you will see them all over broadcast productions. They are used on boom poles held above an audience or in the street on a live interview, and they are used to capture on-field action at sports events. Often referred to as shotgun microphones due to their long and thin appearance like a gun barrel, they are even more adept at rejecting ambient noise and off-axis sound sources than a cardioid by providing an even, narrow pickup angle.



Shotgun Polar Pattern

The level of the sound source within this pickup angle is consistent, while sounds coming from outside this angle are reduced. The width of the angle is dependent on the length of the mic; a longer mic barrel produces a tighter pickup angle. This can be useful on outdoor shoots as it means the mic can be located further away, and it works well on audience participation shows when a boom operator can target someone in an audience asking a question, while rejecting the ambient noise from the rest of the room.

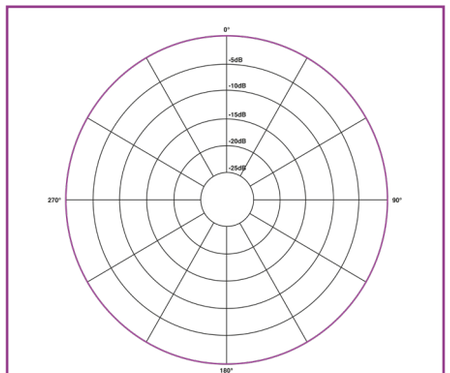
Shotguns In Sports

Outside broadcasts, especially sports, will also often make use of shotgun mics. You can spot them mounted to poles when you watch a UK Premiership

match, covered with fluffy windshields to reduce wind noise and pointing into the pitch from the edge of the field of play (usually one behind each goal, one on each corner, four around the 18-yard boxes and two on the centre lines). The placement allows these highly directional mics to pick up the action across the whole pitch and allow the sound mixer to cross fade between them to best pick up the sound on the field, such as the ball being kicked, while keeping crowd noise at a minimum.

The Sound Is All Around

An omni-directional mic has none of the above traits – it picks up noise from all directions, including any ambient noise, so it provides a very natural representation of the environment.



Omni Polar Pattern

For this reason, omni mics are more often used where the environment can be controlled, or in settings where the environment is part of the story, such as a location shoot in a large space like a church where the acoustics of the room can be used as part of the narrative.

Conversely, omni mics can also be a good option for close miking and they can be useful when working with talent who are untrained in broadcast techniques. While a cardioid mic provides more control over the subject and the environment, close miking a presenter with an omni mic doesn't make much difference and may result in a cleaner sound, and it's even more forgiving than a cardioid mic as there is no off-axis position at all.

Bafta award-winning sound supervisor Robert Edwards notes that when you have a presenter engaging directly with people in an audience, "a cardioid mic must be in close and tight, but if the presenter likes to waft it about a bit, an omni mic is better. It's much better at coping with people."

In The Field

In American Football, omni mics are also used to capture action from pitchside but unlike Premiership football, American football has an entirely different rhythm. It doesn't flow the same; it's fast, it's brutal and it's visceral, and plays go in violent and crunching waves.

To capture on-field action sound supervisors will often use parabolic microphones at pitchside, which is a semi-spherical bowl attached to an omnidirectional mic. The bowl acts like a satellite dish to capture highly directional audio and it reflects the sound waves directly into the mic. As it only reflects what it is pointed at it is perfect for capturing the on-field communication and tackles.

And while it seems somewhat counter-intuitive using an omni mic on a highly directional piece of equipment, it works better because not all the reflected signals will hit the mic at the same angle.

Microphones Part 2 - Types Of Mic

By Kevin Emmott. *The Broadcast Bridge.*

Polar patterns play a big part in designing the sound for a programme, and they apply to all microphones. The next step is to ascertain what kind of microphone to use.

In broadcast there are two types of mic in general use: dynamic mics and condenser mics. While both have membranes that vibrate to capture changes in air pressure and covert these changes into electrical energy, they are very different beasts. Dynamic mics work via electromagnetic induction, while condenser mics work using electrostatic principles, and both have inherent properties which can be used to help define how a broadcast will sound.

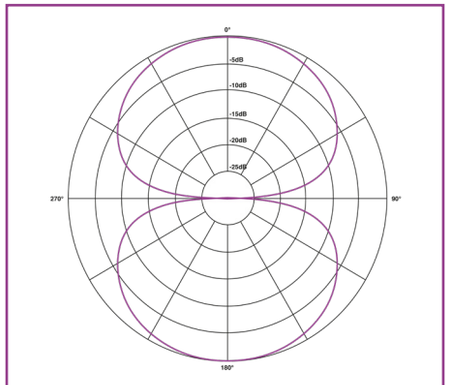
Dynamic Mics

A dynamic microphone converts sound waves into electrical signals using electromagnetism, and this can be done in two ways.

The most common method is with a moving coil. A dynamic mic with a moving coil uses a diaphragm (a thin membrane which registers changes in air pressure) attached to a metal coil suspended in a magnetic field. Sound waves cause this membrane to move and these vibrations are converted into electrical signals.

Dynamic mics are excellent all-rounders. They have no internal electronics, do not require power and are not prone to overloads and distortion. This makes them extremely rugged and can handle a wide range of sound pressure levels – a reliable workhorse for broadcast environments. Its Achilles heel is that due to the weight of the coil it is unable to respond fast enough to capture especially high or low frequencies.

This principal doesn't apply to ribbon mics, which is the second kind of dynamic mic. Although designed around the same principal a ribbon mic uses an extremely thin metal foil ribbon suspended in a magnetic field instead of a heavy metal coil. This makes it much more sensitive to vibration.



Ribbon Mic 'Fig 8' Polar Pattern

Ribbon mics also have a polar pattern which is different to what we have discussed. The nature of the transducer means that ribbon mics are inherently bi-directional (often referred to as "figure of eight"), so they capture sound from the front and back and have phenomenal rejection from the sides. This has benefits for some forms of broadcast (in fact, as you're asking, ribbon mics have been used in broadcast environments since 1931 – they were the first kind of mic to be used) and are especially suitable for podcasters who can use a single mic to record a host and a guest sat opposite at the same time.

Ribbon mics have a high frequency roll off which mimics the way human beings listen to sound, which makes recordings sound very naturalistic. Another benefit is how well they respond to vocals; the proximity effect, which is where lower frequencies become more pronounced the closer the subject is to the mic, is stronger than on any other type of microphone. Combined with its naturalistic sound this makes it perfect for vocals and a good choice for talk radio or voice over booths.

Condenser Mics

Designed on electromagnetic principals, a condenser mic is completely different. It works by pairing its diaphragm with a parallel backplate and applying electricity to both to create a static charge. When the diaphragm vibrates it alters the distance between the two plates to create a change in the voltage, which mimics the changes in the sound waves.

This process requires condenser microphones to have internal electronics, which in turn means they need power to function. In a broadcast environment, this is provided by phantom power delivered via a standard 3-pin XLR cable. All broadcast consoles have built-in phantom power, often labelled as +48V, which can usually be switched in and out on a per channel basis. While we're on the subject, while mostly passive, some ribbon mics also contain active electronics to allow them to output a higher signal. These will also require phantom power.

While we are still on the subject, phantom power is also required to drive another class of condenser mic. RF Capacitor microphones are highly regarded for extremely accurate sound reproduction, rugged nature, wide frequency response and low inherent self-noise. They differ to traditional condenser mics in that they use capacitive capsules as the tuning element of a radio-frequency oscillator; sound waves arriving at the capsule change the capacitance, which changes the frequency of the RF oscillator. After demodulation, an audio frequency signal with low source impedance is produced, capable of driving bipolar transistors which produce less random noise and can capture a wider dynamic range. The advantage of this approach is that the capsule works in a very low-impedance environment (as opposed to the very high-impedance environment of a traditional DC-biased and Electret capacitor mics), making it immune to the effects of humidity which can cause unwanted noise in conventional capacitor mics.

Both types of condenser mic outperform dynamic mics at higher and lower frequencies, and they are far more sensitive and detailed. The reason for this is the same reason as why moving coil mics struggle beyond a certain frequency range; it is much easier to vibrate a strip of metal than it is to move a heavy moving coil.

This makes them a good choice for a variety of broadcast environments, and an excellent choice for music and vocals as its wider range captures more of the nuance and character of the human voice.

Broadcast Use

This huge variety of mics, with multiple polar patterns and multiple mic types, are also available in a variety of form factors

which can be employed in hundreds of different ways.

This all points to our initial assertion: microphone choice must always be dependent on the application. There will always be a variety of ways to mic up any environment, but knowing the basics about how microphones work will give you a head start.

For example, is it appropriate to see a mic? At a press conference it is part of the visual expectation to see mics with colourful mic flags, but this may not apply to an evening news broadcast.

Lavalier mics, otherwise known as lapel mics, can be a good solution for this environment. A lavalier is a tiny microphone that can be clipped to a

person's clothing and is a good option for on-camera shoots where the person needs to move around. Because the distance between the microphone and the talent's mouth is reasonably consistent, the sound level is also reasonably consistent.

But there are still decisions to be made, with lavalier mics available in both dynamic and condenser versions. They can also have different polar patterns: a cardioid lavalier can isolate the talent from the environment, which may be desirable, but as it may have less reach it will require fitting higher up the chest.

An omni lavalier doesn't need to be fitted as conservatively as it will pick up sound from all around, so sound supervisors can be more creative with its location. As it captures more of the room ambiance, it can provide a sense that the viewer is eavesdropping which may add an additional element to the storytelling. It that appropriate? It is also more forgiving if the talent moves their head or the mic slips from its mounting, so it might work better with more inexperienced presenters or subjects in more active environments.

Outside Influences & Noise Pollution

There may be factors outside of your control. Shotgun mics can be either condenser or dynamic as they are only categorized by their lobar - or super-cardioid - pickup patterns, but are the conditions suitable for both kinds? Durability should play a part in the application decision.

If the broadcast is in a noisy environment like a live venue, a reporter may prefer a dynamic handheld cardioid mic due to its ability to reject unwanted noise, but is there be a way to isolate the talent to enable them to use a condenser mic with a different polar pattern?

Does the broadcast need a backup mic? Could that be met with a nearby condenser mic, and if so, does that need to be hidden? Are there any stipulations in the rider of a guest regarding what kind of mic they are willing to use?

Even in more controlled environments, the surrounding environment will also play a role.

For example, live entertainment shows require a lot of thought as the on-stage talent may need foldback to hear inserts from the studio and the production shouldn't have any bleed from this picked up an any mics. Audience bleed might also play a part in the sound design.

On a panel show or a political debate, guests might be sat close to each other so they can hear each other, but they may be spaced apart and cross foldbacks might be necessary to the host can be heard by the guests and vice versa.

Plan And Plan And Plan

With such a variety of options that there are many ways of using microphones to provide value to the broadcast output, but there is seldom a one-size fits all solution.

"You don't want to end up carrying around a bag with all your microphones, but you need to be confident that you've got enough variation," says Bafta award-winning sound supervisor Robert Edwards. "On a fixed installation there might be 20 mics in the rack and that's the show done. But you've got to know what your production is and what it might need visually as well as from an audio point of view."

Wireless Microphones in Broadcasting

By Tobias von Allwörden. Head of Audio for Video Portfolio, Sennheiser.

Wireless microphone technology is a natural fit within broadcast production and TV-UHF technology brings additional reliability through dedicated frequency access.

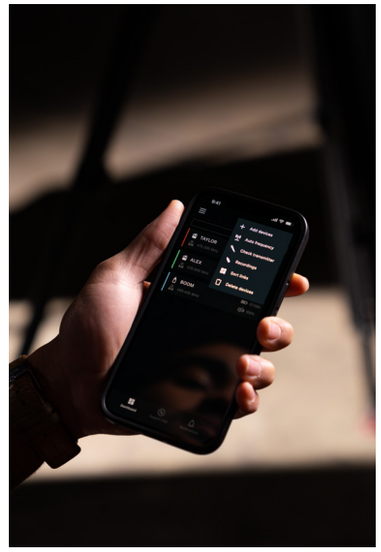
For many decades, wireless microphones have had their firm place in broadcasting, electronic news gathering (ENG), videography, and filmmaking due to the freedom of movement, unobtrusive miking options and quick set-up they provide. This in turn has accelerated the democratisation of content creation and witnessed a leap in creativity and tools, and would suggest, blurred the lines between professional, semi-professional and amateur use of wireless microphones.

Deciding on a system – why and when it makes sense to use TV-UHF

Whether you are working as an independent one-person video team or are part of a broadcaster's ENG crew: The choice of equipment is your starting point and may limit or expand the further development of your audio content. If we disregard "exotic" systems like Sennheiser's AVX which works on 1.9 GHz, the market appears to be split between digital 2.4 GHz systems that promise unique ease of use and quick audio capture, and digital or analogue wireless systems that operate on TV-UHF frequencies, offering maximum transmission reliability and professional accessories.

Where can you benefit from a compact and handy 2.4 GHz system? It can be a valid choice in areas with little wi-fi activity. However, if you are in the city center, a tradeshow or a festival where there is much wi-fi activity, you will find your audio transmission interrupted, buzzing, crackling, or not working at all.

Enter TV-UHF systems, which are far more reliable. They work on a dedicated UHF frequency that you selected, maybe even on one that you paid for to use exclusively, so good audio capture is guaranteed. TV-UHF frequencies generally have better propagation properties than 2.4 GHz frequencies, which can express itself in range, less body attenuation and an ability to more easily transmit through walls, cars or people.



Digital systems enable totally new workflows

TV-UHF systems are physically bigger than their 2.4 GHz counterparts, but the additional size is feature-packed: they give you substantially more control of the audio and the RF. You can use them with a wide variety of professional clip-on microphones. The receiver connects both to 3.5 mm jack inputs and to the more professional XLR camera inputs. Battery life is often longer, and batteries are swappable. Regarding ease of use, a lot has happened in TV-UHF wireless, too, especially with the latest digital models.

Advantages of going digital in TV-UHF

Compared to their analogue counterparts, good digital TV-UHF wireless systems offer audio, RF and workflow advantages that may be important in your work.

Audio: Unlike analogue systems, digital wireless systems do not need a compander (compressor/expander). Therefore the associated noise is gone – and your audio will sound crisper and clearer.

RF: More sophisticated digital wireless systems hardly emit any intermodulation artifacts. These spurious frequencies clog up the available spectrum and will require some planning efforts in spaces with several wireless mics. If you are filming at or reporting from, say, a music festival or a major sporting event, it will be easier to get your digital gear included into the overall frequency plan. While analogue UHF (or lower-quality digital) requires you to calculate intermodulation products, quality digital wireless enables you to simply deploy transmission frequencies at regular intervals.

Workflow: Digital wireless microphones offer unprecedented ease of use and intuitive set-up. Let us take a look at Sennheiser's new EW-DP system - it requires little RF or audio knowledge, and minimal attention from the videographer in general: The receiver or the associated

Smart Assist app finds a free frequency, then the transmitter is synced via Bluetooth. If any issues occur, the system will guide users with Smart Notifications. It sends alerts for audio clipping, low battery (exact read-out in hours and minutes is provided, too), occupied frequencies, muted transmitters, and unlinked devices – and all come with a suggestion of how to quickly solve the issue.

Outlook

Audio for video solutions will continually advance, aiming to make solutions more compact and intuitive. Digital will certainly be the route to go, as it makes workflows so much smarter and faster. Who knows, maybe there will no longer be a microphone receiver in a few years' time?

A few practical tips when working with wireless microphones

Most shoots are done with unobtrusive **clip-on microphones** (also called lavalier or lapel microphones). The most widely used polar pattern is **omni**, as it is very forgiving when it comes to wind noise and plosives and will reliably pick up the audio even when the interviewee moves their head. In very loud environments, you may choose to go with a cardioid mic.

When working with inexperienced interviewees, a clip-on mic is probably the best choice. If you are using a **handheld** and need to be out of the picture, give some instructions on the ideal mic/mouth distance and ask them not to cover the mic's antenna with their hands.

When working with clip-on mics, **correct and secure positioning** is key. The mic should be attached at about 25 cm from the interviewee's mouth. Make sure that there are no scarfs, necklaces, brooches, rustling clothes or hair that could get in the way of the mic. Delicate clothes may require other mounting accessories than a clip. Make sure to bring a range of fastening accessories including tape so that you can make sure the mic and its cable will stay in place firmly. The same goes for the transmitter – make sure it is securely attached. The last thing you want during a shoot is a transmitter that gives in to gravity or your mic sliding down a lapel! The transmitter unit should be attached such that the antenna is at a distance of about 1 cm from the body.

Carefully position and secure the clip-on microphone.

Gain setting is important with wireless mics: Carefully select the sensitivity at the mic (not required with EW-DP) and on the receiver/camera side. EW-DP will send smart notifications if it detects any audio clipping.

When filming **outdoors**, wind noise will be of major concern. Bring blimps and hairy windshields for all of your mics, including the clip-ons. Some microphones have a low-cut filter that helps reduce wind noise – make sure this is activated. Position the interviewee such that their body is a natural shield against the wind.

While you want to make sure that interviewees cannot accidentally operate any mute switches on the transmitters during the shooting, do make sure you respect their **privacy** and mute their transmitters during breaks.

'Be prepared' is the motto of every filmmaker and videographer. Take enough fresh battery packs and replacement clip-on mics with you. Gaffa tape is certainly a firm part of your kit, as well as white tape for marking camera and interviewee positions.

Always switch on the **receiver first**, either to listen in on a frequency you would like to use or to have the receiver do a spectrum scan for you. Be aware that your system will also be emitting intermodulation products when you are using an analogue system or a lower-quality digital system.

When filming at a large event, program your wireless system to the **frequency assigned to you** by the frequency coordinator before you enter the site. Never switch on transmitters whose transmission frequency you do not know during an event.

Try to keep as much **distance** as possible between transmitter and receiver antennas – especially inside a sound bag.

I/O & Recording Devices

By Kevin Emmott. *The Broadcast Bridge.*

We explore the basics of physical connectivity & signal management encountered in broadcast audio systems alongside the destination recording devices.

Television studios are terribly exciting places, full of cool stuff. It's all very glamorous, all this tech with flashing lights and sleek lines, but none of it functions on its own and the technologies which tie it all together onto the same massive network are fundamental to effective broadcast production.

The cables, the wireless RF and the bundles of copper which keep all these disparate parts in sync may be under appreciated, but they are integral elements of the broadcast infrastructure. It's no good having a microphone which will commit to every breathy nuance if there's nothing to plug it into.

What's more, networks are becoming increasingly more complicated, where broadcasters are demanding more flexibility at the same time as transitioning from traditional SDI (Serial Digital Interface) networks to more convenient IP infrastructures.

In live broadcast environments mic sources just need plugging into something to transport those signals to a mixing console. For other television productions, those signals might need to be recorded as isolated inputs for editing and manipulation further down the line in a DAW (Digital Audio Workstation), or much further down the line in a MAM (Media Asset Management) system. In both cases, those signals need to be managed, catalogued and labelled correctly.

But we're getting ahead of ourselves.

Let's Get Physical

In a typical live studio environment there are I/O boxes distributed throughout the building, both permanently installed into walls and in portable racks. They have physical input and output sockets and come in a range of connectivity flavors such as XLR, BNC, D-type, EDAC and Cat5. They may be of a fixed format or made up of modular cards of different formats to allow broadcasters to build exactly what they need.

Inputs and outputs are usually managed on a mixing console where they are labelled and routed appropriately, and the I/O box can be thought of as an extension of the console; for example, if a mic requires phantom power, the I/O box will deliver that power though the XLR cable, so if a condenser mic isn't working it may be a quick fix to switch in the 48v button on the console.

On a digital console the I/O is traditionally managed using a straightforward matrix which connects inputs and outputs, but modern broadcast facilities have much more crossover between IT and traditional broadcast networks, signal management is changing and is influencing how or even if I/O is managed by the console.

As more broadcasters shift to IP environments, broadcast engineers need to appreciate how requirements are changing; even where IP isn't the primary focus there is often some kind of IP connectivity in the mix, such as a Dante network.

While many broadcasters are focused on ST2110 and the encoding and synchronisation of media streams, device discovery and connection management are also key considerations. This sort of thing used to be handled by proprietary I/O systems, often from the console manufacturer, but in this interoperable era of IP there are new requirements.

The Joint Task Force on Networked Media (JT-NM) is a consortium dedicated to this very challenge, and its IS-04 recommendation allows devices to advertise their streams to a controller, while IS-05 forms connections between different devices. As more IP equipment converges and interoperability continues to expand, I/O is increasingly likely to be managed by agnostic stream managers which cover the entire broadcast workflow, irrespective of manufacturer and IP endpoint.

The subject of system wide routing and asset sharing is covered later in this series in a dedicated article.

On Location

Outside of a studio environment, there are even more factors to consider. Outside broadcasts have the same audio requirements as studio-based networks. Signals still need to be transported, intercoms still need to connect people and networks still need to be managed in real time.

Outside of the studio things like geography and weather can get in the way, and distance and power take on even more significance.

Golf is a good example as a major golf tournament has more than its share of challenges when it comes to I/O. The average size of a UK golf course is 111 acres, and in the US it's even bigger. With upwards of 50 effects mics distributed across an entire course cabling can be a challenge, especially as analogue mic level signals suffer from noise and interference on longer cable runs.

Temporary, ad hoc networks like these also require complex management for RF, especially as more and more sports - including golf - are miking up players with wireless mics to expand the narrative of the event. Tools like mic gain and phantom power, signal management and discovery are still essential, and there

are additional considerations for power, security, ruggedness, size and weight.

Down And DAWty

Away from live television, capturing audio for future manipulation, such as in a DAW, introduces additional requirements.

The days when scenes were simply captured by a boom operator onto mono or stereo tracks are long gone. As technology has advanced, television directors have become more creative and audio has become more challenging. Today, programme makers might record a scene using multiple cameras to give them more creative scope in the edit. That's an issue for the poor sound op, who has to keep a boom out of shot, and so wireless lavalier mics might be more commonplace, or mics might be hidden in the scene to capture the audio.

These all need to be isolated (ISO) as individual tracks, because even though you could mix them down into a single mix for post production, what if one has an issue, falls over, or rubs against some clothing? Reshoots can be costly to reschedule, but ISO tracks can be remixed after the event to cover up any shortcomings.

Much of reality TV works in this way. Reality shows are incredibly popular and are cheap to produce, but the stories are all created in the edit. Because it's unscripted the production team can't know what content they will be able to use, which makes recording ISO tracks of every contestant an essential part of the workflow.

Multitrack field mixers and multitrack recorders make this possible and do so in very compact packages, but audio capture is just a small part of what they do. Metadata and timecode are essential to recording television sound of this nature as all the audio must be married to video down the line to ensure tight lip syncing.

Audio recorders and cameras are synced to a common timecode and are timestamped so that when they are imported into a DAW or a non-linear editor the audio and the picture can be snapped together.

Meanwhile, the audio files will also contain metadata which a production sound operator will need to add to the recording so that post-production editors can identify what each recording actually is, as well as descriptive data and workflow information.

The standard audio files which broadcasters use are Broadcast Wav Files (BWF), an EBU-specified format dating back to 1996 which allow files to be exchanged between DAWs in radio and television production (if you are terribly interested, you can read all about it in EBU - Tech 3285).

The BWF is a development of a standard WAV format and includes additional extension "chunks" of data which provide context for each recording. A broadcast extension chunk (known as "bext") contains information on aspects like the title, origination, date and time, while an iXML chunk is an open standard for embedded metadata in production media files which includes scene, take and notes information.

Irrespective of the location of ingest into a workstation, without this extra information the content is largely unusable. Once a template is configured on a DAW such as Pro Tools, it will reliably pull the metadata labels from the tracks, and while this isn't a particularly creative process, configuration of the workstation is a specialist job which must be done.

In The Field

In addition to blackbox recorders, mics on set may also feed into a field mixer. Field mixers are small, rugged and lightweight mixers that are used for bagwork, where sound operators can either strap all the equipment to them for complete mobility, or on a cart where sound operators create their own moveable workstation.

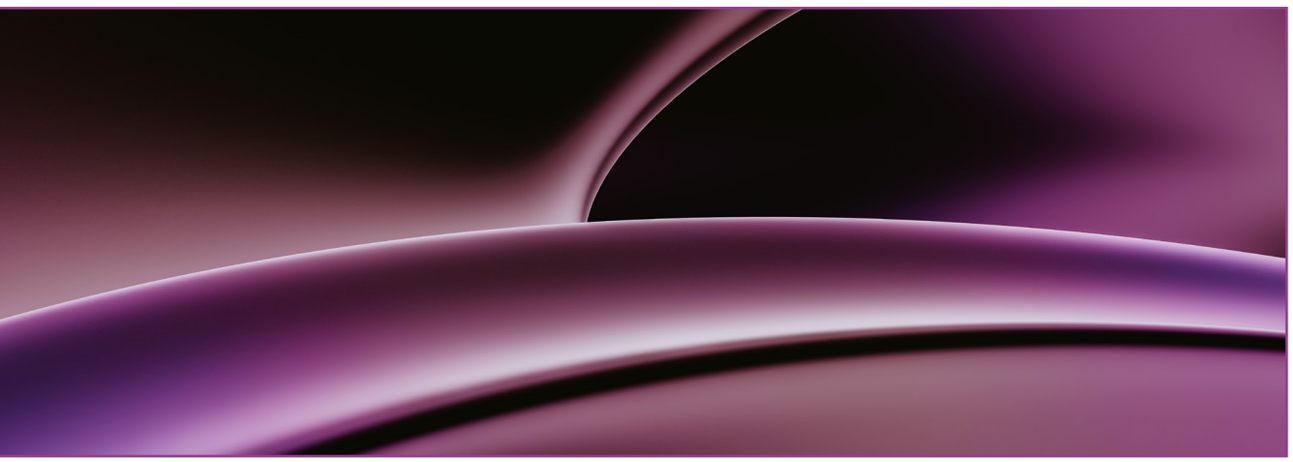
These portable mixers can share many of the same features as the main broadcast mixer, with comprehensive bussing, automix facilities and top-of-the-range mic preamps. In addition to using internal SSDs and/or SD cards/ USB for recording, some can also tap into cellular connectivity to upload deliverables directly to the cloud using a service like Adobe's Frame.IO for even faster collaboration with creative teams.

They will also often use outputs as well as inputs; a sound mixer on location may also have to feed monitor mixes and IFB mixes to various people on set, so multitrack mixers will often have comms and IFB feeds built in. And of course you can be anywhere, so resistance to heat, dust, cold and humidity is important, as is battery efficiency. Remote equipment doesn't always have the luxury of unlimited hard-wired power like its studio-based counterparts.

Many Ways In And Out

Whether on set or on location, there are many ways a production might design its programme infrastructure, but in the same way as mic choice is totally application-led, connectivity will also be defined by the environment.

But those tielines are no less vital to the entire production. They are the central nervous system of the whole thing. Even if they're not especially cool.



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