BROADCAST & LOCATION SOUND
From application-specific microphones to advanced wireless system. Conquer your toughest spectrum challenges in the studio and on location and capture it all with confidence.

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In the studio, the last thing you want is unreliable wireless audio. World-class sound. Simplified setup. Flawless operation. Always.

For professional productions that demand flawless execution, Axient Digital offers unprecedented signal stability and audio clarity, plus flexible hardware options, advanced connectivity, and comprehensive control. Up to 184 MHz tuning bandwidth across all receivers and transmitters. Transmitter form factors include handheld, bodypack, and micro-bodypack.

SHURE.COM/AXIENT-DIGITAL
Musicals to me are not only challenging, but there’s a great energy on the set, like “The Greatest Showman” and “Across the Universe,” there was tremendous energy on the sets. But they also had a great challenge for sound, you know, because now you’re dealing with live vocals on a lot of people, and you have to give them earpieces that nobody can see.

I had never worked with Steven Spielberg before, and I got a call to do a screen test for West Side Story. I did the screen test with him and at the end of the screen test, he asked me if I would do the movie and I said, of course I would do the movie. I’d be happy to.

When I finally got the script, the 175-page script with 20 to 22 characters singing live, singing playback, talking, all in the same scenes, I realized that what I had been working with was not going to fly. So that really led to this long process with Peter at Gotham Sound. He said, “There’s something I want you to come and check out. It’s a new system that hasn’t really been used in film before, but I think it might be able to solve a lot of the issues that you’ve been - that you’re feeling worried about as you approach the film.”

So, we tested out Axient Digital and were super impressed. It exceeded actually my expectations in terms of what I thought it was going to do. I understood that the frequency coordination element of it would work really well, which it did, but I hadn’t understood how well it would perform in terms of the sound. The audio quality is fantastic. Also, the Axient Digital system has made my job much easier. It’s still not easy. It’s just become slightly less hard because there’s a segment of worry and frustration and just logistical difficulty that I am trying not to have to deal with anymore and that’s allowed me to concentrate my psychic energy elsewhere. In all seriousness, I didn’t realize when I first adopted it how much it would remove those worries from my, my daily work, and that’s been great.

We became so confident with these units, I never listened to them. As long as I saw that they were into the mixer and saw the needle going, I would just send them out. And that was a game changer. You know, I mean, not having to baby them, not having to sit there and line them up and go through each one of them.

And then be able to read back at my board, the quality of the RF, and know that even sometimes when they’re going far, far, you know, down what looked like they would go out of range. Still, the quality meter was still showing that the quality was there. I could see one blip on each one going, ding, ding, ding. But the quality meter was still up. And it was true. It never went away.

But what I’ve said as soon as I’ve started using these, is that there’s no way that I could use any other system, honestly, because it just was so easy. There is no other way to do it. There really is no other way to do it. I think that honestly, it is without a doubt the best system out there. There is nothing that compares in reliability and quality and ease of operation.
I guess the first big show I got on was “Weeds.” My first season on the show, I ended up winning an Emmy. The show “Lucifer” was a lot of fun and I feel that the pace and structure we did on that show prepared me for coming to Chicago. I love being here in Chicago and working on “Chicago PD.” This show is incredible.

Honestly, I was very resistant to switching to Axient Digital. I’d been with the wireless I had for 20 plus years. I knew it worked. It was solid. Getting me to change was a tough thing. But one day on a day off I came in and said, “You know what, I’ve got to do it.” I’d lost all my channels and I needed more frequencies. So, with no manual, no guidance. I hooked it up, powered it up, and within about an hour it was up and running. It was a pretty easy setup. There’s a lot of little things that I learned after reading the manual afterwards, but I was using it the next day on set without knowing what I was doing. And it worked great.

The ADX5D portable receiver is an incredible tool that I’ve got now in my bag. I have three units and last week, the perfect example, I was trying to find frequencies and I had nothing available when I did a scan. I turned on the ADX5D and bam there are six channels ready to go. We move very, very fast on our show. A lot of times what I’ll have to do is grab my bag or my mini cart and I’ll take that into a location that I can’t get my big cart into. Having six channels with the ADX5D available makes it very easy to just grab and go and stay within my Axient Digital system.

Also, we use the ADX1M micro bodypack about 90 percent of the time. Actors really like the ADX1M because of the size, the shape, the lack of heat and also no antennas on it. Not having antennas is a big thing and it also makes it a lot easier to hide. When I do have actors that are going to be a little further away out of my range of the cart with my passive antennas on the cart or even out of the range of my powered antennas, then we’ll use the AD1X. The range on those are incredible.

The performance of the ADX5D has far surpassed what I was expecting. I do put external antennas on which then I can run out to wherever they need to be on set. But even the built-in whips are great. I think the biggest benefit of the ADX5D is the ability to pull any channel from a wide band frequency, send it to the transmitter via ShowLink and never have to leave your cart or bag. It’s a game changer.

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SUPPORTING SOFTWARE

A rich user interface and robust features help to manage and monitor wireless system performance over the network, from pre-show planning through post-performance analysis.

ULX-D®
DIGITAL WIRELESS SYSTEMS

Extremely efficient RF performance, networked control, Dante™ and AES67 digital audio, and AES-256 encryption for professional broadcast applications.

SHUREPLUS™ CHANNELS

Roam the event space while monitoring key Shure wireless system parameters from your iOS or Android smart device.

SHURE.COM/ULXD

SHURE.COM/WWB6
SHOTGUN MICS

Capture sounds near and far. Shure shotgun microphones feature state-of-the-art preamplifiers and outstanding off-axis rejection to bring out all the environmental details.

VP89L
30° pickup angle. For targeting sound sources over longer distances such as sporting events and wildlife.

VP89M
50° pickup angle. Capture greater degree of ambience such as audience response and talk shows.

VP89S
70° pickup angle. Best for near-field, wide-aperture capture including interviews and field recording.

VP82
50° pickup angle. Compact and lightweight with a wide aperture and excellent off-axis rejection for focus and flexibility in a wide variety of production types.
One of the most misunderstood types of microphones is the interference-type line microphone, commonly referred to as a "shotgun" microphone. It’s pretty clear how it got this nickname. It’s much longer than a typical end-address microphone and resembles the barrel of a shotgun. You may have seen them at press and sporting events or on movie sets, mounted to a boom pole or strapped to the top of a camera.

Why is it so long? Why are there so many lengths available? When do you need a shotgun mic? Which length is right for you? This post will answer all of those questions.

SHOTGUN MICROPHONES: USES AND MISCONCEPTIONS

Shotgun microphones fall into a category called “high-directionality microphones.” They are more directional than a typical cardioid or supercardioid microphone. This means that they reject unwanted sounds coming at the microphone from the sides, thus allowing clearer pickup of the desired sound source at which the microphone is pointed, or the “on-axis” source. A typical use for a shotgun microphone is to pick up a desired sound source located some distance away, and that, for whatever reason, cannot be approached or close miked. Think of the bat crack from a Major Leaguer or a lion’s roar.

A common misconception is that they magically reach out and grab the sound coming from a source, however, in reality, shotgun mics merely reject more of the undesirable off-axis sound (see The Myth of Microphone Reach in the FAQs on shure.com for details). This could be noise from a busy street or excessive room sound in a space where you’re recording dialog. Shotguns are also used in voiceover work, typically in situations where you don’t have a proper non-reverberant vocal booth and you need a really close and present voiceover sound. Again, the shotgun will reduce the reflected room sound that comes into the mic off-axis.

CHARACTERISTICS OF SHOTGUN MICROPHONES

The main characteristic we’ve talked about so far is high directionality. Other things to look for in a shotgun microphone are high sensitivity and low self-noise. (“Self-noise” is the noise introduced to the audio path by the microphone’s circuitry. Using a microphone with too high a self-noise to capture very quiet sounds will result in audible hiss.) As mentioned earlier, shotguns typically are used when capturing sources at a distance. This often means trying to pick up a low-level signal, which is why a proper shotgun microphone needs to have a higher sensitivity than microphones designed to pick up close sources. Since the low-level sound will need to be amplified to a usable signal level, having a mic with low self-noise is critical.

WHAT “LOBAR” MEANS (AND MORE MISCONCEPTIONS)

If you’ve looked at shotgun mic specifications, you’ve likely seen microphones specified as “supercardioid/lobar” or “hypercardioid/lobar.” Understanding those terms requires knowing a little bit more about how a shotgun microphone gets its characteristic directionality. This is the result of an interference tube, which is mounted to the front of the microphone capsule (typically a condenser). It has several openings along its length, which are designed to allow sound to enter the tube.

The interference tube enables the microphone to discriminate between on-axis and off-axis sounds by forcing each type of sound to arrive at the capsule in a different manner.

On-axis sounds share a uniform path length to the microphone capsule. Because they arrive at the same time, they end up being what we call “in phase” and are thus accepted by the mic element and passed down the audio circuit.

Off-axis sounds arrive at the openings of the interference tube at the same time, but they will have different paths to the capsule depending upon where they enter the tube.

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Sounds that enter farther down the tube have a longer path length than those entering nearer to the capsule. These waves arrive at different times and are thus “out of phase,” which results in the phase cancellation of that sound. Maximum cancellation occurs at frequencies where the phase difference is ½ wavelength. The result is a narrow, highly directional lobe of sound pickup at the front of the microphone. Shotgun polar patterns, characterized by such lobes, are thus called “lobar.”

It’s important to note that the lowest frequency that can be adequately cancelled is directly related to the length of the interference tube. The longer the tube, the lower the frequency at which the tube is effective in reducing off-axis sound. To reject sound down to, say, 100 Hz would require a tube 5.5 feet long!

Many people think that the length of the tube determines only the overall sound acceptance angle. While that is somewhat true, it’s very much a frequency-dependent relationship. Below the frequency at which the interference tube is effective, the directional pattern comes from the microphone cartridge itself, usually a hypercardioid. The composite polar response would be specified as hypercardioid/lobar: hypercardioid at low frequencies and lobar at frequencies where the tube is working. As the frequency increases, the directionality of the microphone pickup pattern becomes much tighter. Because the VP89L interference tube is quite long, the microphone is able to maintain directionality to fairly low frequency, but by around 250 Hz, the polar response is mostly hypercardioid. Also, note the smooth polar response at high frequencies and minimal undesirable side-lobes.

“A short shotgun (mic) is less directional than its longer siblings...”
Expressively natural sound, low sensitivity, high max SPL, interchangeable sweat-resistant frequency caps, and standard-setting Shure PLEX cable make TwinPlex the standard in broadcast and film capture. Available in four lavalier variations and headset.

DuraPlex subminiature lavalier and headset microphones are consistent, long-lasting, and resistant to dust, dirt, water, and sweat. Features the Shure PLEX cable that excels in the harshest environments. Available in lavalier and headset.
AN INTERVIEW WITH STEVE WATSON

PRODUCTION MIXER

A mainstay in the New York City TV world (Emeril Live, Rachel Ray, Will & Grace, Spin City, Sesame Street, Montel Williams and ABC and CBS News to name a few), Steve Watson is currently the A1 production mixer for The Wendy Williams Show, the Last Week Tonight with John Oliver show, and the Full Frontal with Samantha Bee show. Following is an excerpt of an on-camera interview with Mr. Watson after he had opportunity to use and test the new Shure TwinPlex microphones.

“TWINPLEX FIELD TEST

TELL US ABOUT YOUR INTRODUCTION TO THE TWINPLEX MICROPHONES.

The TwinPlex microphone was brought to my attention at CBS, where I tape Samantha Bee, and we were trying a whole bunch of different microphones on Sam. Sam has a specific sound of her voice that we were trying to find the right microphone pair with her voice. I said, “Well let’s put it on for the rehearsal,” and we put it on. And, I instantly fell in love with this microphone.

WHAT MADE THEM WORK FOR YOU ON THAT SHOW?

It has a bold rich texture to it which actually made Sam sound like herself, and I had to do so much less EQing and manipulating the sound for her, and it was just - well, thank you. We’ve been using it ever since. Another thing is, Sam has long hair and she wears blazers, and so it’s difficult to put a microphone in the sweet spot every time. Every night, it was a dance to try to, you know, get the microphone to sound like it did the week before. Since we’ve been using this new Shure microphone, we don’t have to do that anymore. We put it in one spot. And when she turns her head, I don’t lose her.

HOW WOULD YOU DESCRIBE THE SOUND?

The first thing I would tell you about TwinPlex is that it doesn’t sound like a lav. It sounds like a real microphone. This little microphone has a big diaphragm sound, and it’s consistent, and it has a high SBL level. And I would try it on any show. And when you put your main talent on this microphone, it doesn’t sound small. With other mics, when you go to a music performance, it sounds really big and you come back to your host, and it sounds small. You won’t have this problem with the TwinPlex microphone.

WOULD YOU RECOMMEND THEM TO OTHER PROFESSIONALS IN BROADCAST?

I would absolutely recommend this microphone for everybody to try, and then you’re going to end up wanting it. You’re going to want to keep it. It’s a full sounding microphone. It’s actually going to change the way television sounds.

“I instantly fell in love with this microphone.”
INTERVIEW & PRESS MICS

GOOSENECK MICROPHONES

MX415
15" stylish, modular gooseneck for press room surface, desktop, or wireless installations.

VP64A
HANDHELD MICROPHONE
Omnidirectional handheld interview microphone with tailored frequency response for speech and water-resistant mesh grille. 7.9" and 9.6" lengths.

MX405
MX410
10" length
5" length

INTERVIEW & PRESS

VP64AL

SM63
HANDHELD MICROPHONE
Omnidirectional remote microphone designed for professional applications where performance and appearance are critical.

SM63 5.7” length. Champagne finish.
SM63L 9” length. Champagne finish.
SM63LB 9” length. Black finish.

SHURE.COM/PRESSMICS
Getting the right sound means hearing the sound right. Shure Professional Headphones deliver studio-quality accuracy across an extended range and provide a comfortable fit that lets you keep going until your audio is every bit as good as, if not better than, your video.

**SRH1540**
- Superior acoustic performance for an expansive soundstage with extended highs and warm bass
- Frequency Range: 5 Hz - 25 KHz
- Type: Closed-back
- Driver: 40mm Dynamic Neodymium
- Sensitivity: 99 dB/mW
- Impedance: 46 Ω
- Cable Length: 1.8 m / 6 ft
- Cable Type: Dual-exit, detachable oxygen-free copper with MMCX connectors
- Accessories Included: Threaded 1/4” (6.3 mm) gold-plated adapter, zippered hard storage case, two detachable cables, additional pair of Alcantara® ear pads

**SRH840A**
- Precisely tailored frequency response delivers rich bass, clear mid-range and extended highs
- Frequency Range: 5 Hz - 25 KHz
- Type: Closed-back
- Driver: 40mm Dynamic Neodymium
- Sensitivity: 97 dB/mW
- Impedance: 40 Ω
- Cable Length: 3 m / 9.84 ft
- Cable Type: Detachable, straight oxygen-free copper
- Accessories Included: Threaded 1/4” (6.3 mm) gold-plated adapter, detachable straight cable, carrying bag

**SRH440A**
- Transparent, natural sound signature with accurate audio across an extended range
- Frequency Range: 10 Hz - 22 KHz
- Type: Closed-back
- Driver: 40mm Dynamic Neodymium
- Sensitivity: 97 dB/mW
- Impedance: 38 Ω
- Cable Length: 3 m / 9.84 ft
- Cable Type: Detachable, straight oxygen-free copper
- Accessories Included: Threaded 1/4” (6.3 mm) gold-plated adapter, detachable straight cable
**Shure Sound Isolating Earphones**

**IMMERSE YOURSELF**
Shure Sound Isolating Earphones provide award-winning sound in a secure, over-the-ear design for long-lasting comfort and immersive audio.

**SE215**
Single dynamic driver produces clear sound with deep bass in a convenient and portable package.

**SE425**
Dual high-definition drivers deliver accurate and natural sound.

**SE535**
Triple high-definition drivers deliver spacious sound and rich bass for cinematic audio.

**SE846**
Four high-definition drivers for extended high-end clarity and a groundbreaking low-pass filter for true subwoofer performance.

**DETACHABLE CABLE**
Detachable cable system enables long-term device compatibility, upgrades, and ease of maintenance.
**PERSONAL MONITOR SYSTEMS**

Legendary Shure audio quality. Pristine RF. More on-air channels and breakthrough automated features that vastly simplify setup and operation. Shure PSM® systems are quickly becoming the ideal choice for IFB solutions in professional audio applications.

**PSM TRANSMITTERS**

- **P9RA+** Stereo bodypack receiver with unparalleled audio quality.
- **P10R+** Twin-antenna diversity bodypack receiver with advanced digital signal processing technology dramatically improves signal reception and range.

**PSM SYSTEMS**

- **PSM 900** Single-channel, stereo. Up to 20 compatible frequencies per band.
- **PSM 1000** Dual-channel, networkable. Up to 49 compatible frequencies per band. Diversity bodypack.

**IN THE FIELD**

P9RA+ P10R+

The EAC-IFB Accessory Cable is a single-sided mono 1/8” (3.5 mm)-to-MMX cable for use with Sound Isolating™ Earphones in professional intercom and monitoring applications.
PSM® 1000, THE ULTIMATE WIRELESS IFB

As a market development specialist for Shure, part of my role is to expose influential end users to our state-of-the-art products. In essence, I travel the U.S. and meet with power users in broadcast, production, and related fields, demonstrating Shure solutions to some of the most vexing problems. I take a hands-on approach that allows potential customers to prove to themselves what works best in their situation. When you’ve got the right products, it works like a charm.

One product that has been enthusiastically embraced is the PSM 1000 wireless in-ear monitor system. With its true diversity bodypack receiver and resulting ability to operate reliably in the most challenging stage environments, this product has proven itself to be a reliable performer even on stages full of competing RF signals from microphones, moving lights, and video walls. As a result, it has become the unquestioned go-to IEM system in touring sound, to the point where it is routinely specified at major live broadcast events like the GRAMMY®s and the Academy Awards.

One trend that we’ve noticed over the past several years is that the PSM 1000 has been selling in large quantities into the world of broadcasting, including major news, sports, and network production facilities. Literally hundreds of channels. It’s been great to see this pro music product gain acceptance into the broadcast world, but we wanted to know why.

What’s interesting is that a lot of these systems are not being used for in-ear monitoring. Because, as it turns out, the PSM 1000 is being embraced as the ultimate wireless system for interruptible foldback (IFB) applications as well.

IFB is essentially a one-way transport system for bringing audio from a production’s intercom system to the talent. It’s what feeds the little curlicue earpieces you see on-air hosts wearing. Typically, the default audio is the program feed, but its real function is to allow key production personnel to cut off that feed and speak directly to the talent.

Traditionally, IFB systems have been bandwidth-limited to focus on speech, with both the wireless transmission and the earpiece being notorious for having high RF reliability (usually through high transmitter power) but relatively poor fidelity (voiceband audio with high noise floor). As it turns out, the design of the PSM 1000 meets (and exceeds) all the requirements of a traditional IFB system, but with fantastic fidelity.

As a result, broadcasting has become a new and vibrant vertical market for in-ear monitors. Here are some of the key design features that make the PSM 1000 the ultimate IFB system.

DIVERSITY RECEPTION UTILIZING TRUE ¼-WAVE ANTENNAS

Other IEM systems (and traditional IFBs) use a single ¼-wave antenna or a combination of a ¼-wave antenna and the earphone cable as the secondary (diversity) antenna, but Shure engineers know better. An earphone cable never performs better than a true ¼-wave antenna. In predictive switching diversity scenarios, if the system switches to the earphone cable as the secondary antenna there is a high likelihood that side is receiving a highly degraded signal as compared to a true ¼-wave. This results in poor performance in high RF environments.

With its twin quarter-wave antennas, the P10R receiver still functions reliably even in high-noise environments. This explains why so many systems are being sold into RF-intensive markets like New York City.

SPECTRAL EFFICIENCY

PSM 1000 can fit 16 channels of stereo IEMs into a single TV channel (8 MHz) of bandwidth. Then it doubles down: With exceptional stereo separation/isolation, it’s possible to run two independent IFB feeds on a single PSM 1000 carrier, simply by feeding Left and Right inputs with IFB1 and IFB2 (respectively). Utilizing MixMode® on the receiver and panning hard L or R gives you isolated feeds. The result is that you halve the number of frequencies required, or you can cram twice as many IFBs in the same amount of spectrum that traditional IFB system use.

WIRELESS WORKBENCH® (WWB)

Another huge advantage of the PSM 1000 is that it is part of the Shure ecosystem, the centerpiece of which is our free Wireless Workbench software. WWB handles sophisticated frequency coordination and monitoring, plus set-up, calibration, and diagnostics – and not just for PSM 1000, but for the full range of wireless microphones as well.

Basically, by engineering the PSM 1000 to ensure flawless operation as a touring IEM, Shure has designed the perfect wireless IFB system. This extra layer of utility has resulted in significant sales – and not just for PSM 1000, but for the full range of wireless microphones as well.

Troubleshooting: When you’re looking for a wireless IFB system, you want something that prevents common wireless problems, and are compatible with "wet line" inputs from daisy-chained systems. The Automatic Gain Control for RF reduces signal fluctuations and prevents RF overload when getting too close to the transmitter antennas, while the squelch automatically detects and mutes RF noise before it becomes audible. Eliminating noise bursts in their ears makes talent very happy.

HIGH FIDELITY

Musicians require in-ear monitors with fantastic fidelity and negligible latency. This turns out to be highly desirable in an IFB system. Studio technicians and talent may not require full-bandwidth response and low noise floor, but they sure do appreciate having it! More and more I am hearing from A1’s that talent wants to hear music during breaks. Giving broadcast talent the same quality that is afforded a world class musican on tour is something that is appreciated by both the talent and the mixers.

As the talent that need high isolation and high fidelity, Shure’s new EAC-IFB cable provides the perfect path for combining Shure’s award-winning SE Series earphone line with PSM 1000 in IFB applications. Let’s face it, the curlicue acoustic tube driven by a remote transducer is less than desirable audio quality. Shure’s products provide hi-fidelity sound with reliability that is unsurpassed in our industry.

“...the design of the PSM 1000 meets (and exceeds) all the requirements of a traditional IFB system...”

WRITTEN BY BILL OSTRY

This page is a part of the PSM® 1000, THE ULTIMATE WIRELESS IFB content. It discusses the design and features of the PSM 1000, highlighting its suitability for in-ear monitoring in broadcast environments. The text elaborates on the PSM 1000’s performance, with a focus on its ability to handle high RF reliability and high fidelity, making it a preferred choice for broadcast and production applications.