

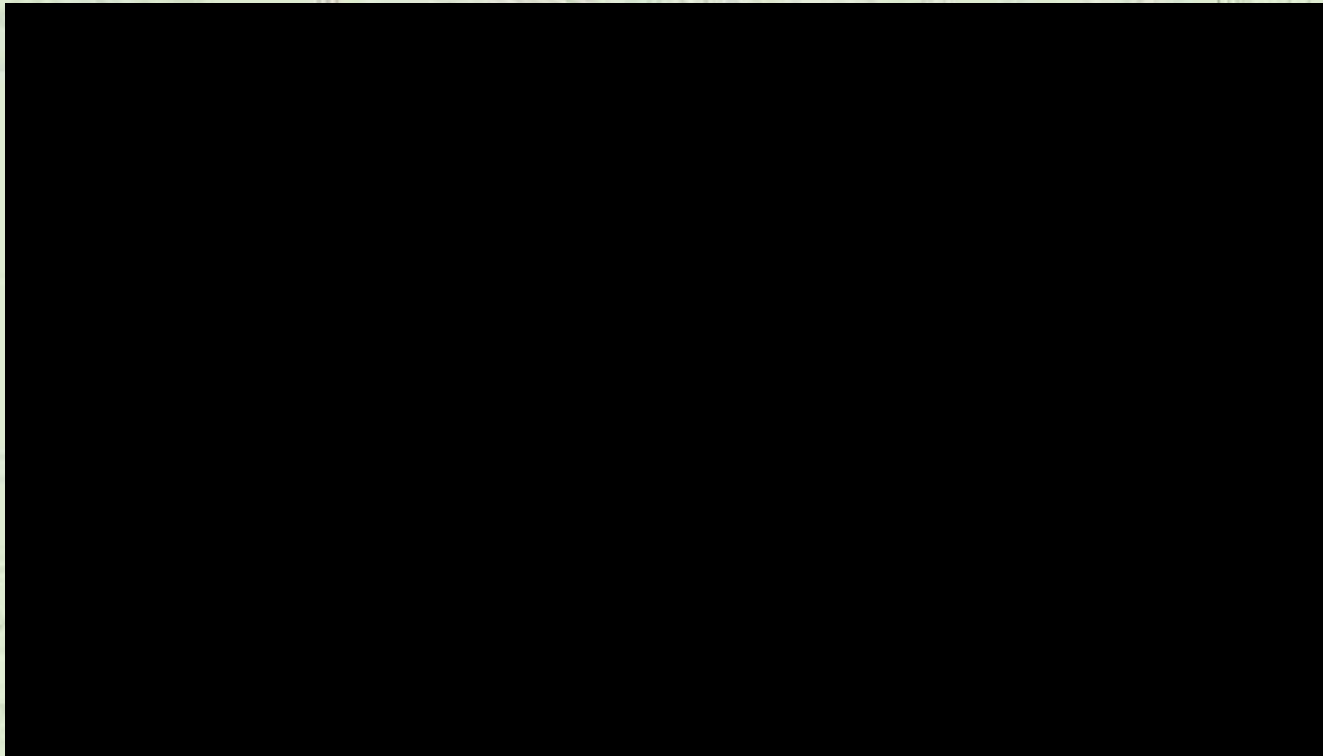
Basic Knowledge of Audio Physics, Wireless Mics and Sound Systems

What everyone should understand

Brian Stith
National Sales Manager
Sound Projections

Knowing your product and it's proper use

IS VERY IMPROTANT!!



6 Main topics to discuss

- Wireless Range and Issues
- Clarity and Quality of Sound
- Watts vs. Decibels (db)
- LFP vs. Lead Acid Battery
- Features and Uses
- Warranty and Repairs

Range of Wireless Transmission

Internal Antenna
150' Transmission

VS.

External Antenna
350' Transmission



Freedom FR-4



Sound Machine SM-5

Distances of transmission based on unobstructed, open field with no TV interference.

Range of Wireless Transmission

Affects on wireless transmission distance

- Other wireless microphones in the area
- 700 mhz (now illegal to use)
- HDTV stations
- **WATER !!**

Example Wireless Transmission

Higher the Frequency = Shorter Transmission

Example: 100 milliwatts, external antenna on receiver open area

Frequency Doubles – Distance cut in half

VHF

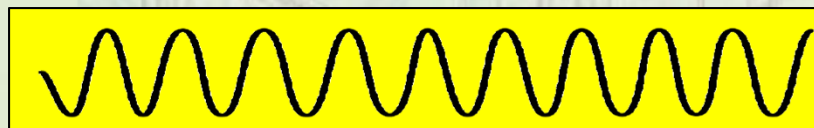
216 Mhz



700 ft

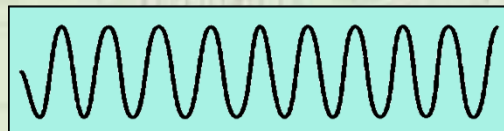
UHF

500 Mhz



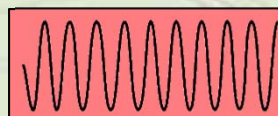
400 ft

900 Mhz



300 ft

1.9 GHz



150 ft

Proper Wireless – UHF or Digital

<http://whitespaces.spectrumbridge.com/whitespaces/home.aspx>

Enter Zip Code of end user to get open TV stations **AND Noise Floor**

The Noise Floor tells us how much outside interference from other sources there is. The lower the noise floor (-80db to -100db) the better but at least -70db.

Los Angeles, CA

Channel Number	Frequency Range (MHz)	Availability	Noise Floor (dBm)
30	566-572	Reserved	-58.8

Dallas, TX

Channel Number	Frequency Range (MHz)	Availability	Noise Floor (dBm)
33	584-590	Reserved	-67.1
47	668-674	Reserved	-60.2
7	174-180	Available	-73.4
10	192-198	Available	-73.5
2	54-60	White Space	-92.0
11	198-204	White Space	-31.1
12	204-210	White Space	-75.7
13	210-216	White Space	-86.1
49	680-686	White Space	-66.8

Oklahoma City, OK

Channel Number	Frequency Range (MHz)	Availability	Noise Floor (dBm)
35	596-602	Reserved	-63.2
38	614-620	Reserved	-57.4
8	180-186	Available	-63.8
12	204-210	Available	-63.8
14	470-476	Available	-61.1
16	482-488	Available	-60.7
18	494-500	Available	-64.7
20	506-512	Available	-65.4
2	54-60	White Space	-138.4
5	76-82	White Space	-174.0
6	82-88	White Space	-174.0
9	186-192	White Space	-73.7
10	192-198	White Space	-80.7
11	198-204	White Space	-73.7
17	488-494	White Space	-27.0
22	518-524	White Space	-65.1
25	536-542	White Space	-55.1
26	542-548	White Space	-57.6
28	554-560	White Space	-52.6
30	566-572	White Space	-53.8
32	578-584	White Space	-53.6
34	590-596	White Space	-53.7
41	632-638	White Space	-30.3
43	644-650	White Space	-76.8
44	650-656	White Space	-76.1
49	680-686	White Space	-62.7
51	692-698	White Space	-13.0

Some cities, it's obvious to recommend Digital. Due to lack of open channels.

Other cities take a little more homework and studying to determine best wireless choice.

Shure UHF vs. Digital Wireless Systems

Shure BLX 123-channel UHF



Benefits of UHF wireless

- 3 different UHF groups
- Better Range of Transmission in good environment
- Auto-Scans all 123 channels for open frequency

Issues with UHF wireless

- Government taking more frequencies (600mhz)
- Poor outdoor trans. distance in heavy HDTV areas

Shure PGX-D 60-channel Digital



Benefits of Digital wireless

- 900mhz band (above UHF)
- Better range vs. weak UHF environment
- Fixed external Antennas

Issues with Digital wireless

- 900mhz - Smart Meters, Video Billboards
- Auto-Scan limited to single groups

Clarity of Sound

- Americans listen to consonants

PROOF



Consonants are in upper frequency of what we hear. Horns reproduce those frequencies.



SM-5 Sound Machine includes voice/loud switch +6db

Quality of Sound



Sound Machine (SM-5)

- Biamped Sound System
- Voice/ Loud Switch (+6db)
- Eminence speaker and drivers
- Shure Mics – minimize distortion

Voice Machine (VM-2)

- Class D – Digital Amplifier
- ElectroVoice PA-60 Driver
- Shure Mics.



Decibels (db) not Watts = Volume

- Human ear perceives 10db = Double Volume
- 90db twice as loud as 80db
- Systems should be 10db louder than competing sound

Decibel Table

137.6 World Record stadium sound Seattle Seahawk (12/2/13)

127 Max volume **Voice Machine**

125 Max volume of **Sound Machine** loud mode

110 150 piece MARCHING BAND

90 Osterizer Blender

80 Stereo/TV Listening Environment

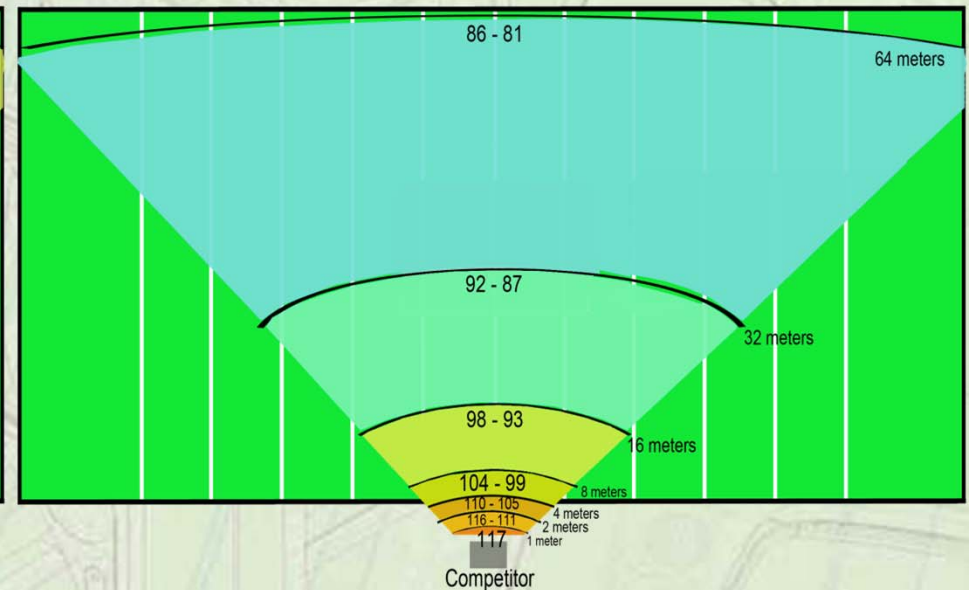
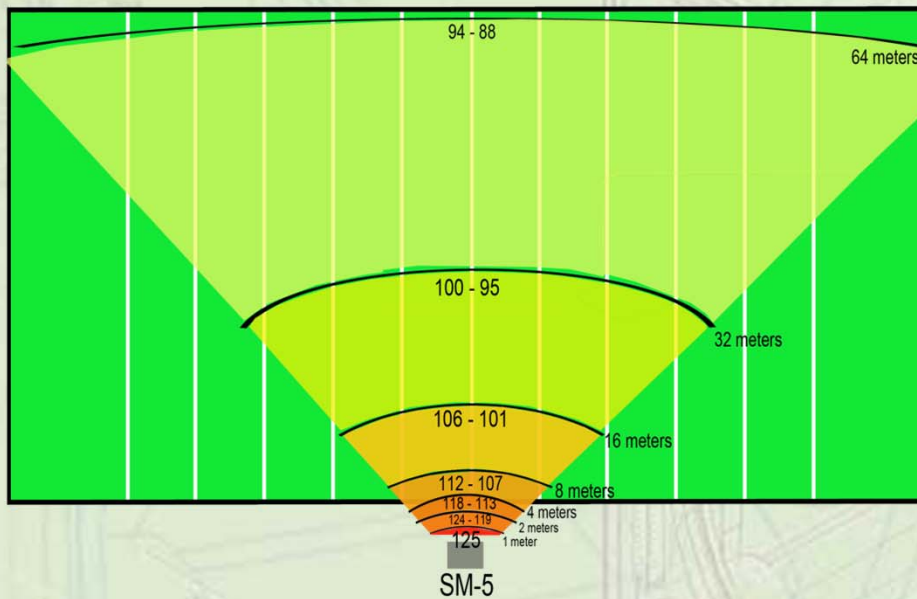
70 Typical Conversation

Decibel Coverage Over Football Field - Example

6db drop in volume every time distance is doubled

Sound Machine Coverage
125 db max output

Competitor
117 db max output



Back half of field with the SM-5 is 94-88 db
almost **2x** as loud as the competing system

LFP vs SLA Battery

Lithium Iron Phosphate (LFP)

VS.

Sealed Lead Acid (SLA)

- Over **2,000** Charging Cycles
- **Replaced 1 battery in 5.5 years**
- Smart battery with internal fuse
- Will **survive** 8 month storage
- **5** year warranty
- 4 pounds
- **Very stable** (compare to Lithium Ion)
- Only **150** Charging Cycles
- Many Directors only get 1 year
- Simple Battery
- Will **die** if stored for 8 months
- 2 year warranty, most 1 year
- 7 pounds
- **Very stable** (compare to Lithium Ion)

Sound Projections will replace any SP system SLA battery with LFP \$400.00

Differences in Portable Systems

Reentrant horn system (VM-2+)

- 4 Month system (July – Oct) then on shelf
- Lightweight (15 pounds)
- Less Expensive
- Great for Metronomes and Voice



Full Range System (SM-5)

- Year Round – Field, Rehearsal Room, Outreach
- Heavier (33 pounds)
- More Expensive
- Full Range system both Voice and Music
- Can use to solo instruments at Friday night games



Both systems use Lithium Iron Phosphate (LFP) batteries

Wireless companion Speaker

Sound Projections has been selling wireless companion speakers for years.

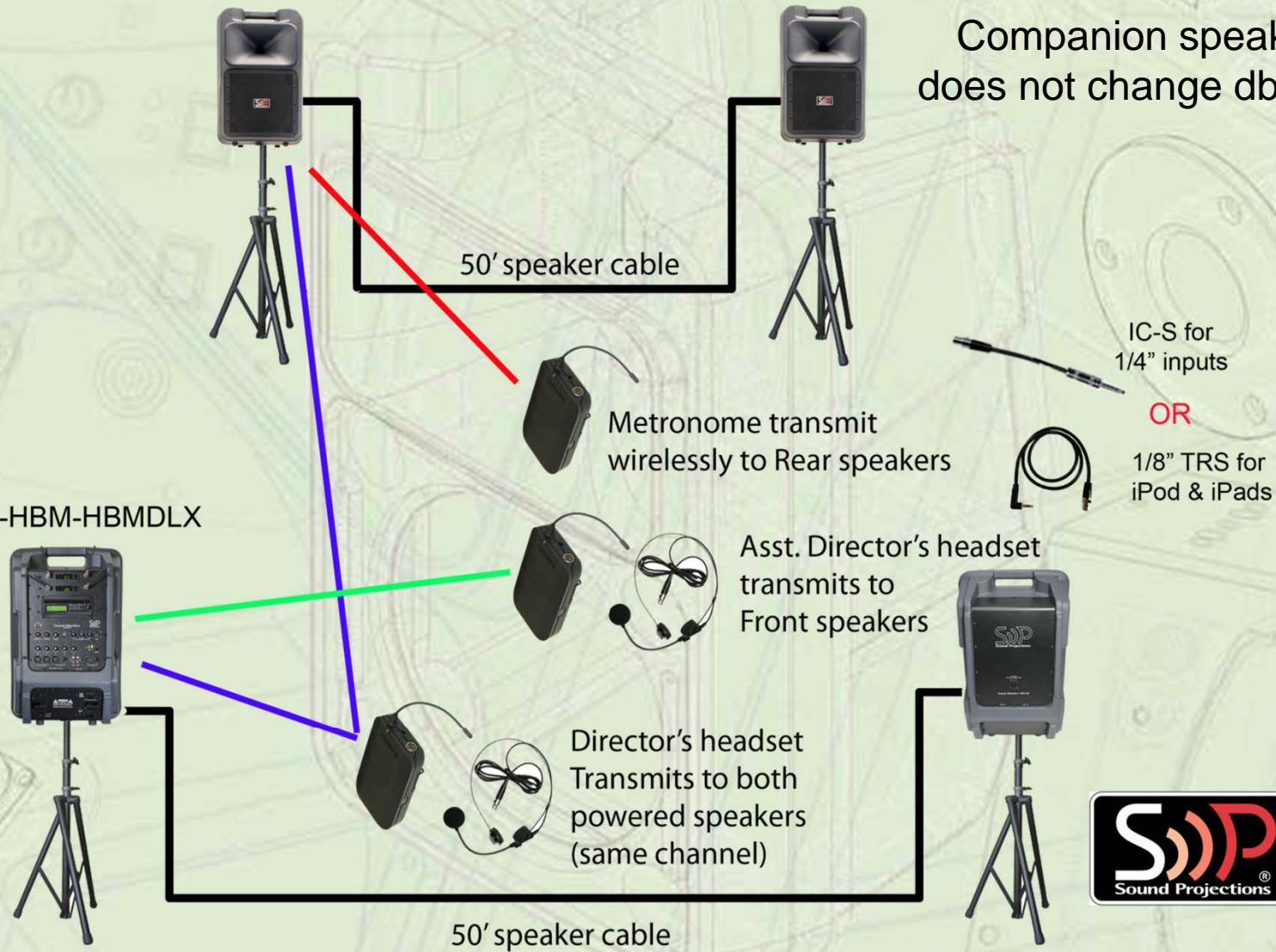


Using 2 systems on the field

SM5-HBM-HBMDLX

Companion speaker
does not change db level

SM5-HBM-HBMDLX



Warranty and Repair of Systems

- 6 year system warranty
- 5 year battery warranty (longest in industry)
- 2 year option warranty (wireless and CD player)
- We will fix systems **AFTER WARRANTY HAS EXPIRED**
- Still have systems over 18 years old in use today
- Always available to speak with customer
- Fix 90% of issues over the phone.

Things to consider when purchasing a portable system

- Wireless system
 - Scanable channels (UHF frequency agile)
 - Digital Display
 - Easy Repair/Replacement of transmitter
- Minimum db output of system
 - Is it at least 120 db minimum
- Clarity of system
 - Does it have a horn to “throw the sound”

Things to consider when purchasing a portable system

- Flexible system – multiple uses
 - Full range system – solos, recording, small venues
 - Horn loaded system – lighter, less expensive
- Type of battery
 - Lead Acid – cheap, shorter life, heavy
(150 cycle will die if stored for long period)
 - Lithium Iron – more expensive, long life, light
(2000 cycle, won't die if not charged)

Things to consider when purchasing a portable system

- Number of inputs for the system
 - Extra microphone or line level inputs
- Is the system American made
 - Repairs or Technical Support
- Warranty of Product
 - Minimum of 2 upwards of 6 years