BINGHAM

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November 16, 2012

VIA ELECTRONIC FILING

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

Re: ***EX PARTE* NOTICE**

Revisions to Rules Authorizing the Operation of Low Power Auxiliary Stations in the 698-806 MHz Band, WT Docket No. 08-166; Public Interest Spectrum Coalition, Petition for Rulemaking Regarding Low Power Auxiliary Stations, Including Wireless Microphones, and the Digital Television Transition, WT Docket No. 08-167; Amendment of Parts 15, 74 and 90 of the Commission's Rules Regarding Low Power Auxiliary Stations, Including Wireless Microphones, ET Docket No. 10-24; Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, GN Docket No. 12-268

Dear Ms. Dortch:

On November 14, 2012, Shure Incorporated ("Shure") met with Courtney Reinhard, Legal Advisor to Commissioner Pai, to discuss the above-referenced dockets. Attending this meeting on behalf of Shure were Mark Brunner, Senior Director, Global Public Relations, Ahren Hartman, Director, Axient Wireless Engineering and Edgar Reihl, Director of Spectrum Strategy, along with Catherine Wang and Tim Bransford of Bingham McCutchen LLP, outside counsel to Shure.

During this meeting, Shure provided an overview of wireless microphone use models and technological advancements that have occurred over the last 5-10 years. Shure highlighted the fact that along with advances in microphone technology, demand and use of wireless microphones in increasingly sophisticated media productions have expanded. We explained that audio quality is paramount for professional wireless microphone users, and is affected by a number of technical factors. We discussed Shure's strong view that continued access to clear UHF spectrum is critical to wireless microphone operation, and key to ensuring United States leadership in media and content creation. Finally, we discussed the proposed changes to the Commission's Rules and the UHF frequency allocation under consideration in the Wireless Microphone Proceeding and Incentive Auction docket.

Boston
Hartford
Hong Kong
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Los Angeles
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San Francisco
Santa Monica
Silicon Valley
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If you have any questions regarding this meeting, please do not hesitate to contact the undersigned. A copy of the attached presentation was discussed during the meeting.

Very truly yours,

/s/

Catherine Wang
Tim Bransford

Attachment
CC:

Courtney Reinhard

Wireless Microphone Technology

FCC - OET

14 November 2012

Ahren J. Hartman
Director, Axient Wireless Engineering

SHURE®
LEGENDARY
PERFORMANCE™

Types of UHF Wireless Audio Products

Wireless Microphones

Wireless Personal Monitors

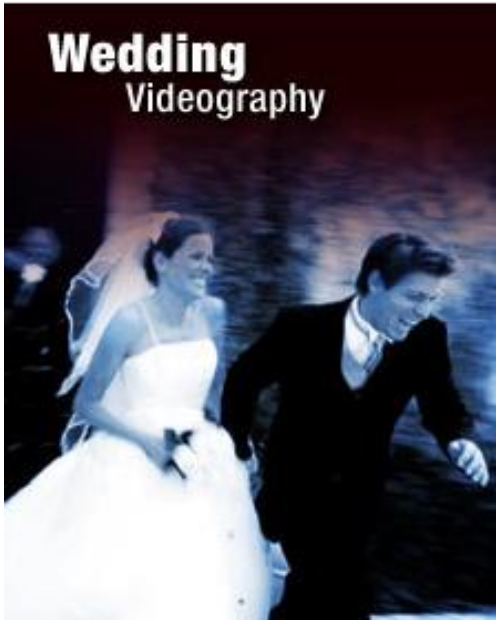
Wireless Intercoms

Wireless IFBs

Small Wireless Venues

School Performances

Event Videography



Medium Wireless Venues

Music Tours

Corporate Meetings

Large Wireless Venues

Houses of Worship

Theater Productions

Extreme Wireless Venues

Global Sporting Events

Auto Shows

Political Conventions

Microphone Spectrum Efficiency

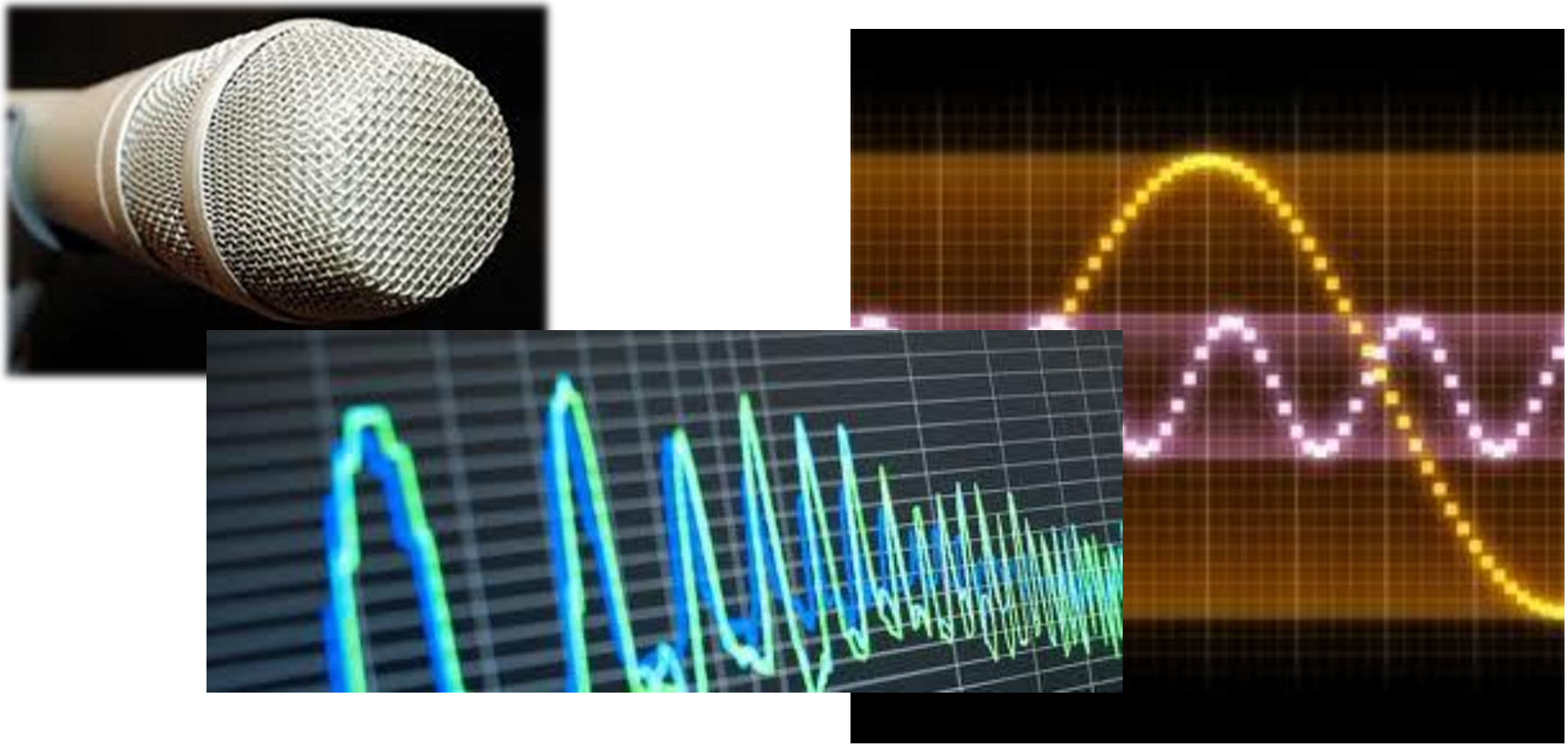
Technical factors affecting microphone spectrum efficiency in the TV bands

- Audio Quality
- RF Output Power
- RX Selectivity
- TX Occupied BW
- TX-TX IMD

Microphone Spectrum Efficiency

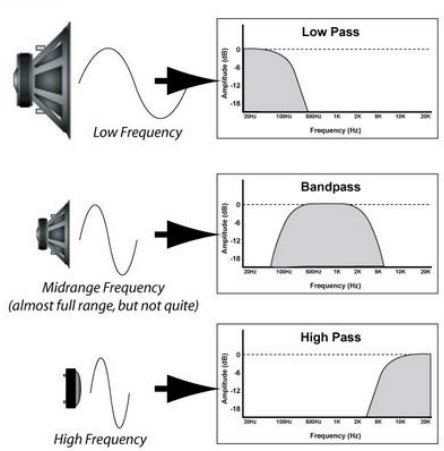
- **Audio Quality**
- RF Output Power
- RX Selectivity
- TX Occupied BW
- TX-TX IMD

Audio Quality

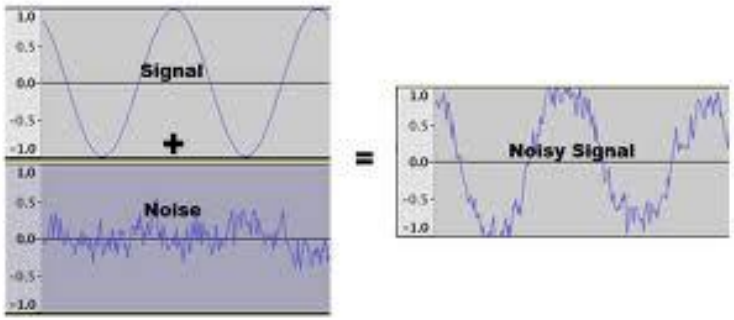


Audio quality is the leading ingredient in wireless microphone performance.

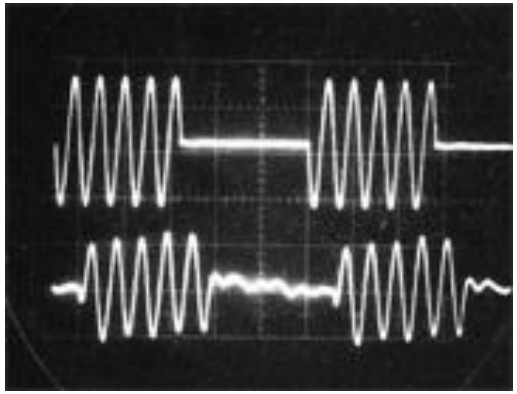
Audio Quality Measures



Signal Bandwidth

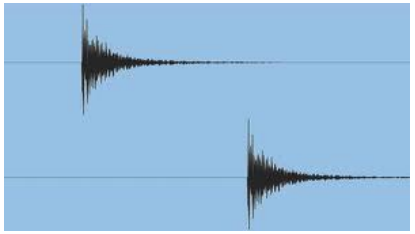


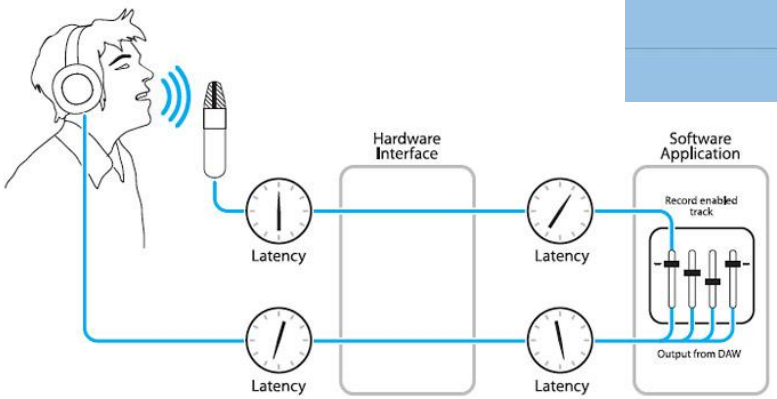
Signal-to-Noise Ratio



Distortion and Transient Response

Transmitter-to-Receiver Latency





Microphone Spectrum Efficiency

- Audio Quality
- **RF Output Power**
- RX Selectivity
- TX Occupied BW
- TX-TX IMD

RF Output Power

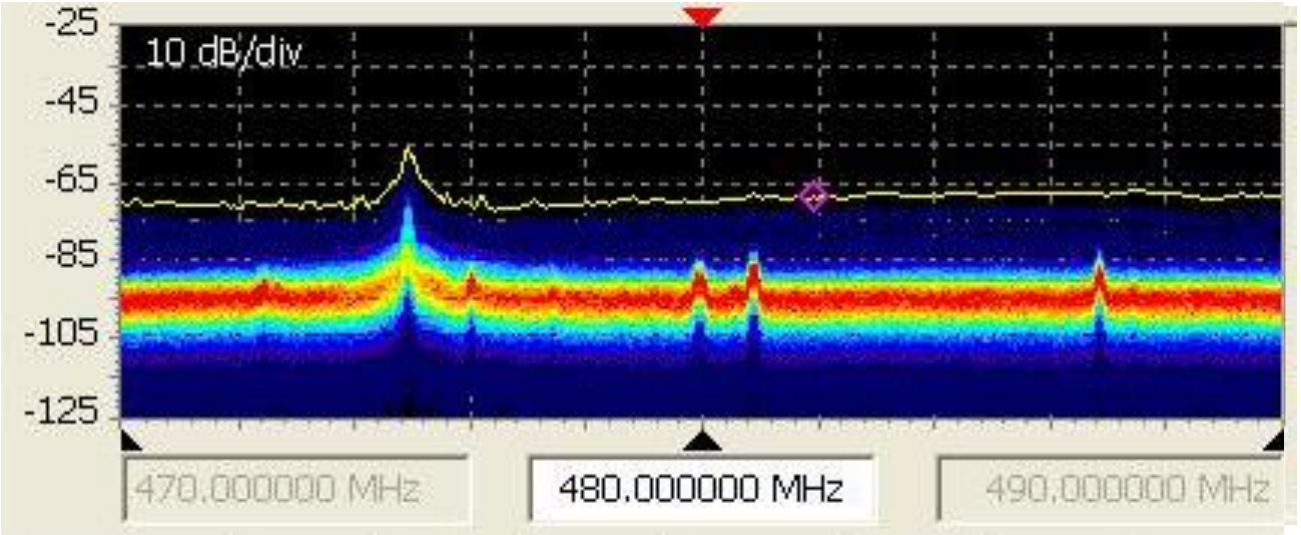
Transmitter RF output power is influenced by operating distance and harmful interference levels

NFL Stadium

Music Video Wall

Broadband Noise

RTA scans from major touring concert venue



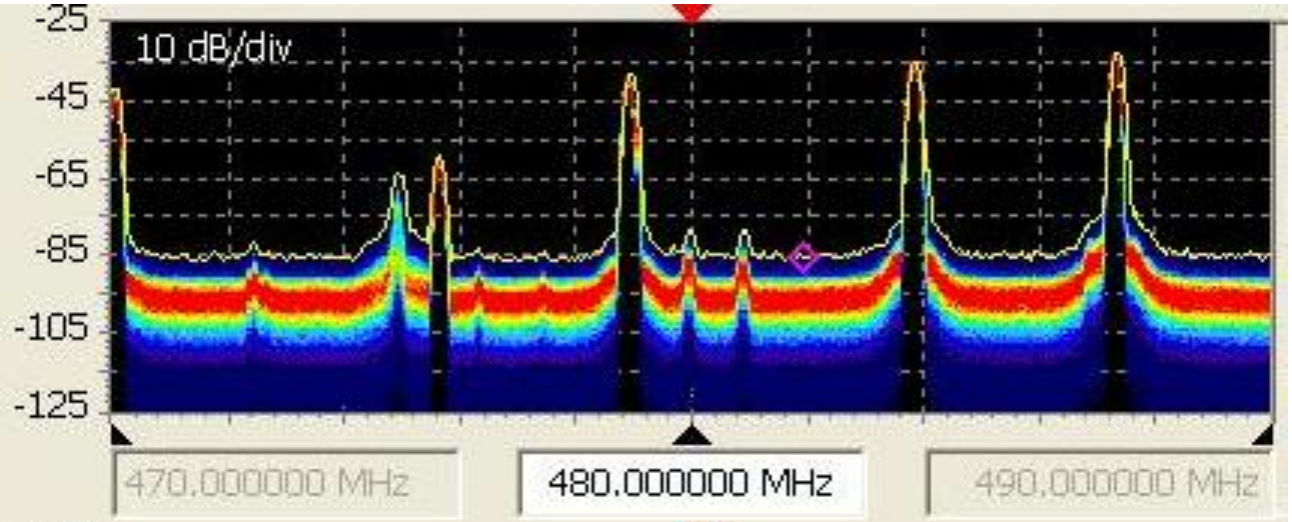
Before Show
Marker = -85dBm

During Show
Marker = -68dBm
(Delta = +18dB)

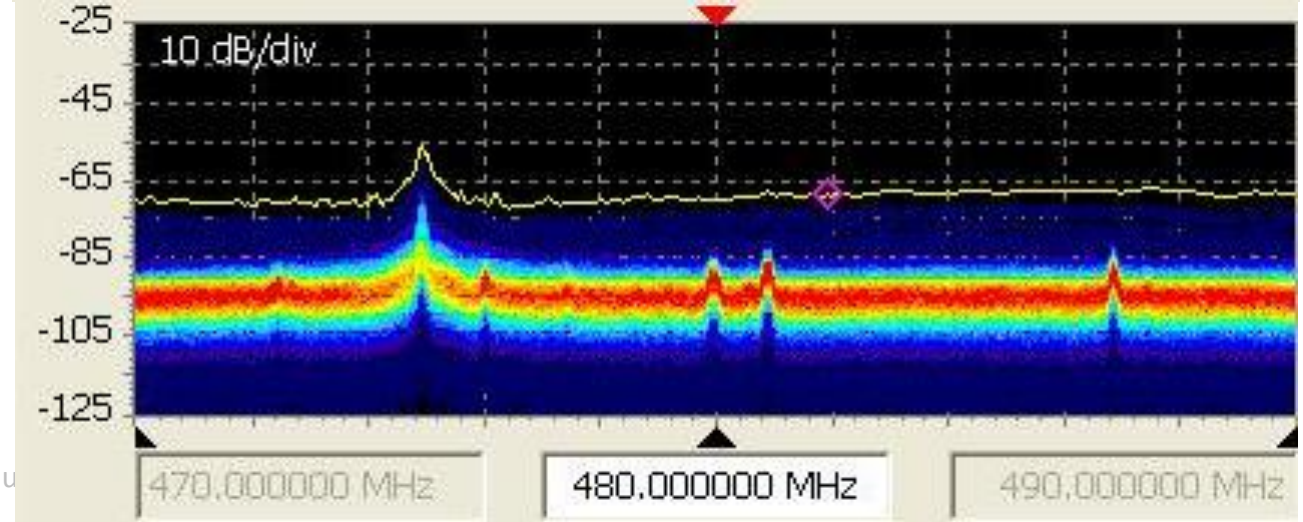
Span = 20MHz
RBW = 100kHz

Broadband Noise

RTA scans from major touring concert venue



Before Show
Marker = -85dBm



During Show
Marker = -68dBm

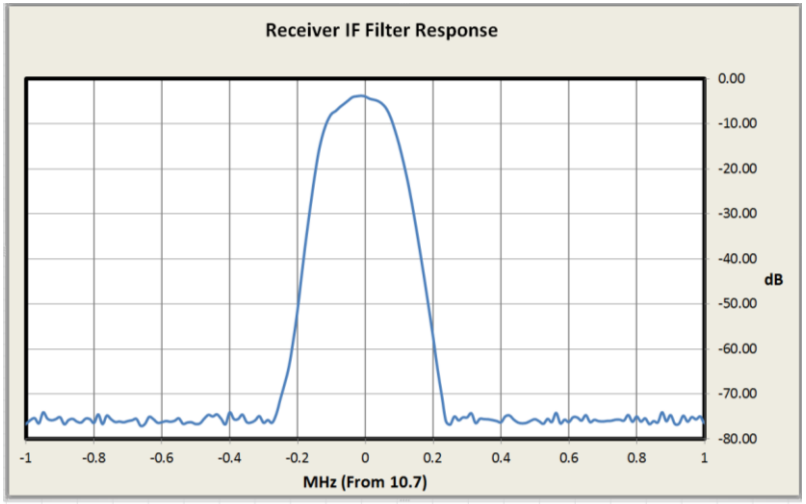
Span = 20MHz
RBW = 100kHz

Microphone Spectrum Efficiency

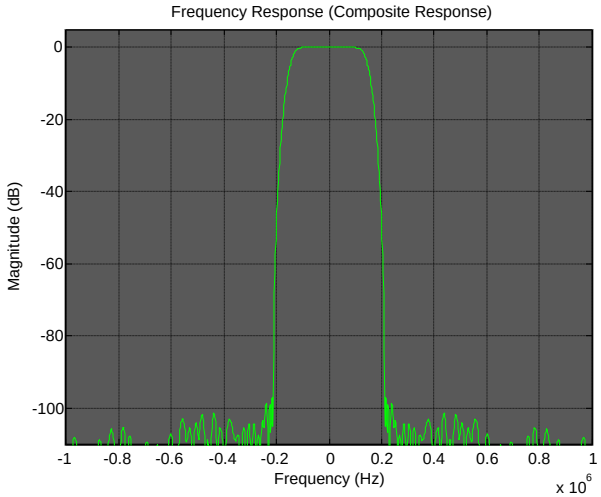
- Audio Quality
- RF Output Power
- **RX Selectivity**
- TX Occupied BW
- TX-TX IMD

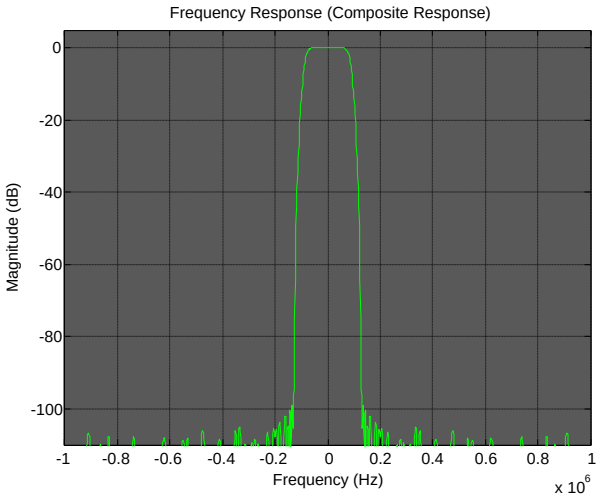
Receiver Selectivity

Receiver IF Filter Example #1



Receiver IF Filter Example #2





Microphone Spectrum Efficiency

- Audio Quality
- RF Output Power
- RX Selectivity
- **TX Occupied BW**
- TX-TX IMD

TX Occupied Bandwidth

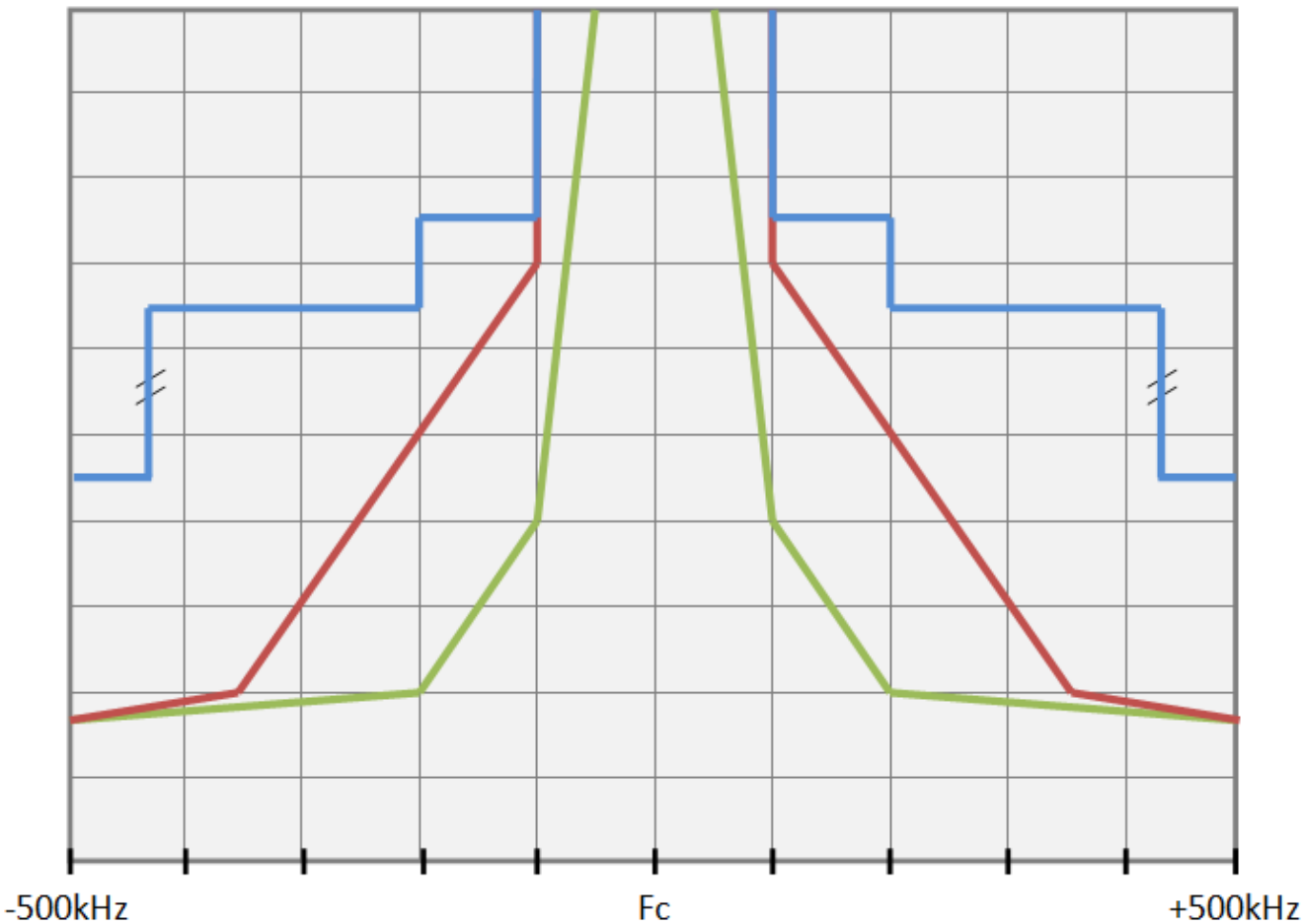
Analog FM (130KF3E)

Digital (165KD1E)

Hybrid Digital-FM (180KF3E)

Digital (171KF1W)

Regulatory TX BW Masks (UHF)

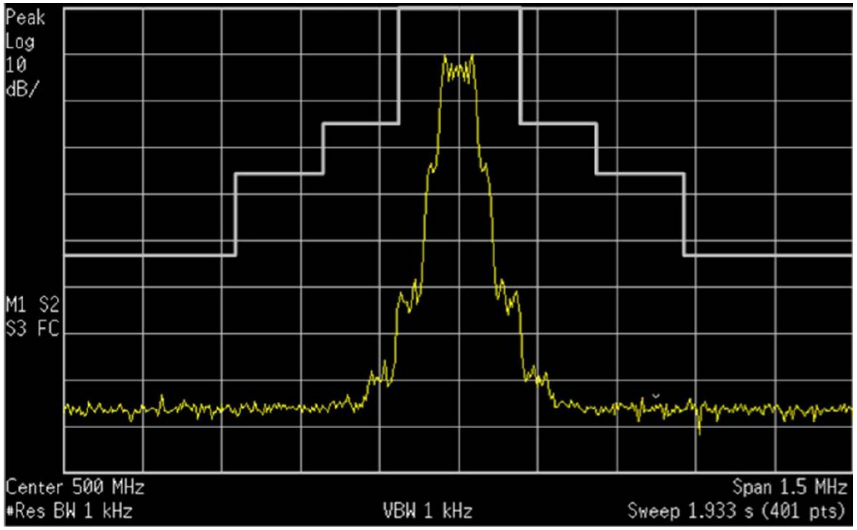


FCC (74.861)

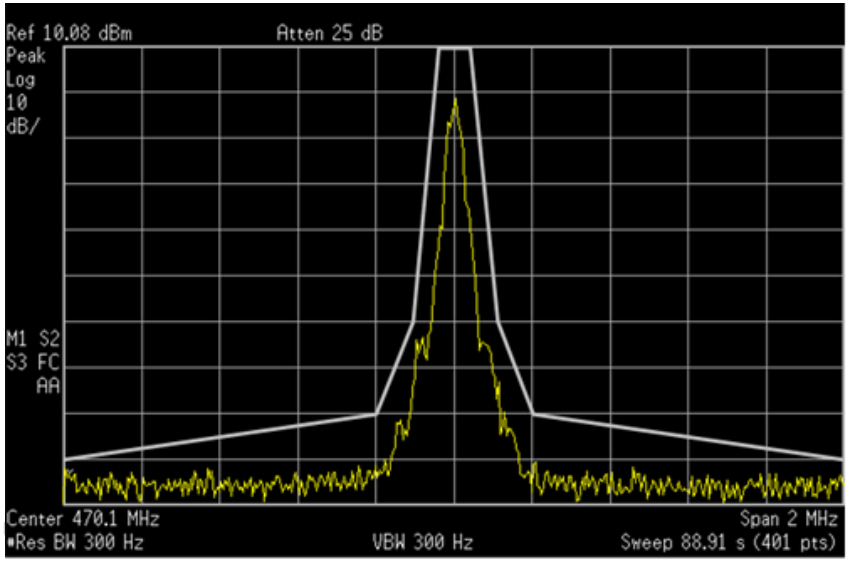
ETSI (EN 300 422 - Digital)

ETSI (EN 300 422 - Analog)

Wireless TX Spectrum

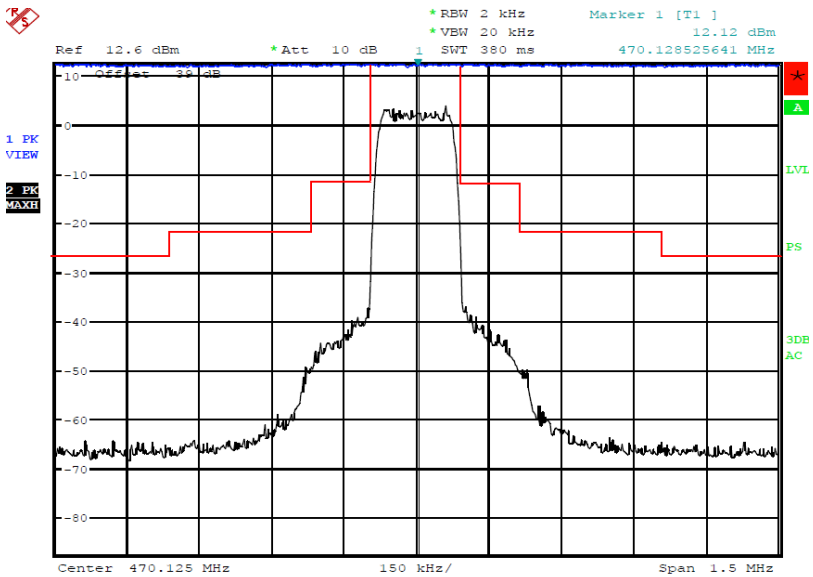


FCC (74.861)
Analog Example

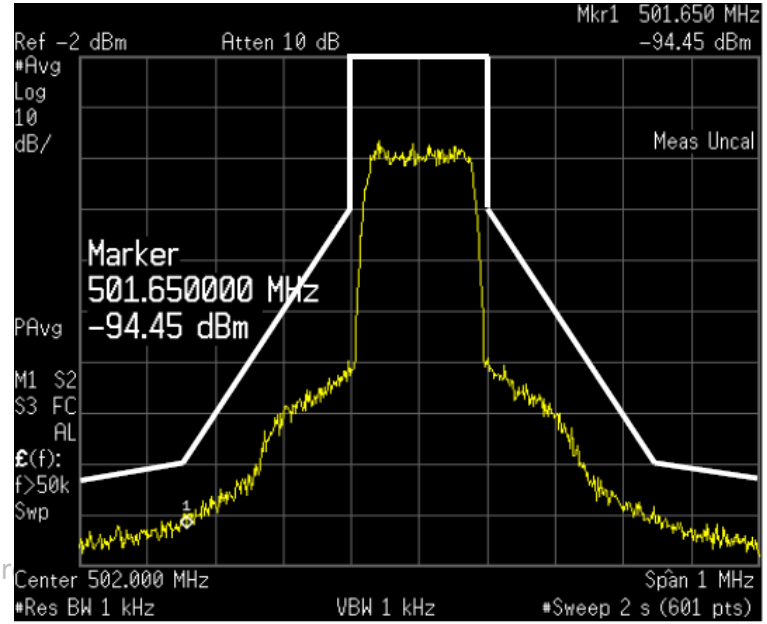


ETSI (EN 300 422)
Analog Example

Wireless TX Spectrum

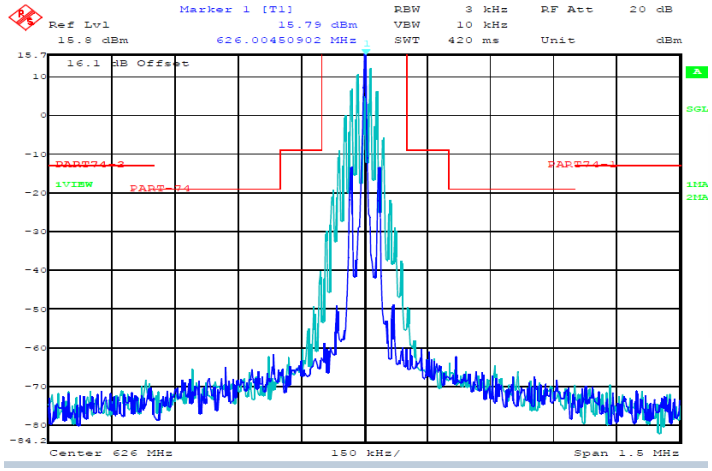


FCC (74.861)
Digital Example

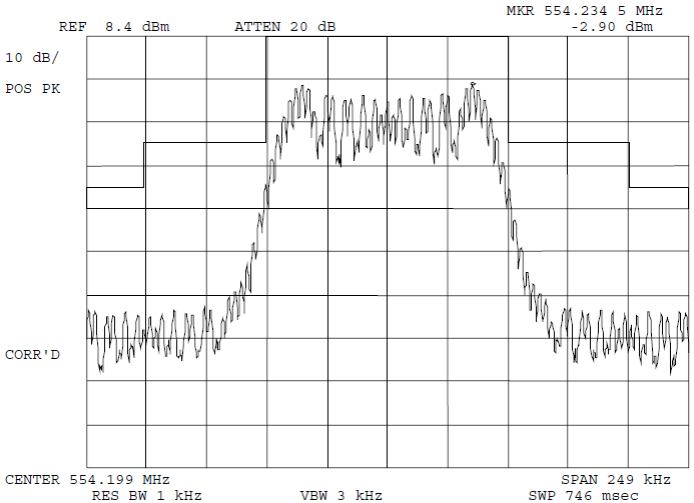


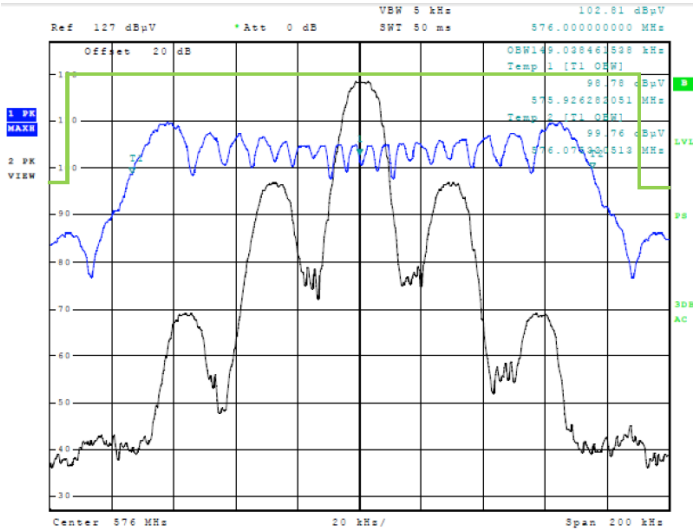
ETSI (EN 300 422)
Digital Example

Wireless TX Spectrum



Analog FM Examples

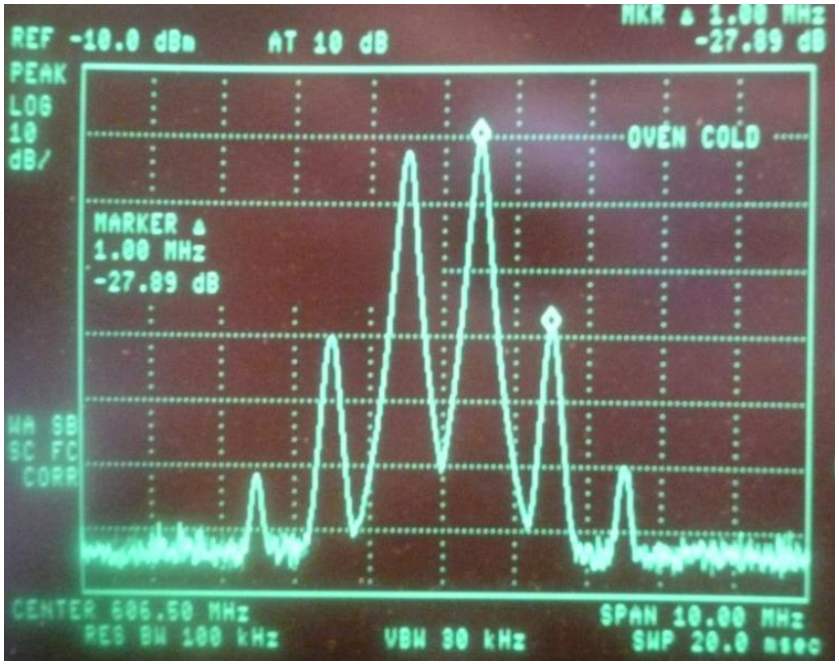




Microphone Spectrum Efficiency

- Audio Quality
- RF Output Power
- RX Selectivity
- TX Occupied BW
- **TX-TX IMD**

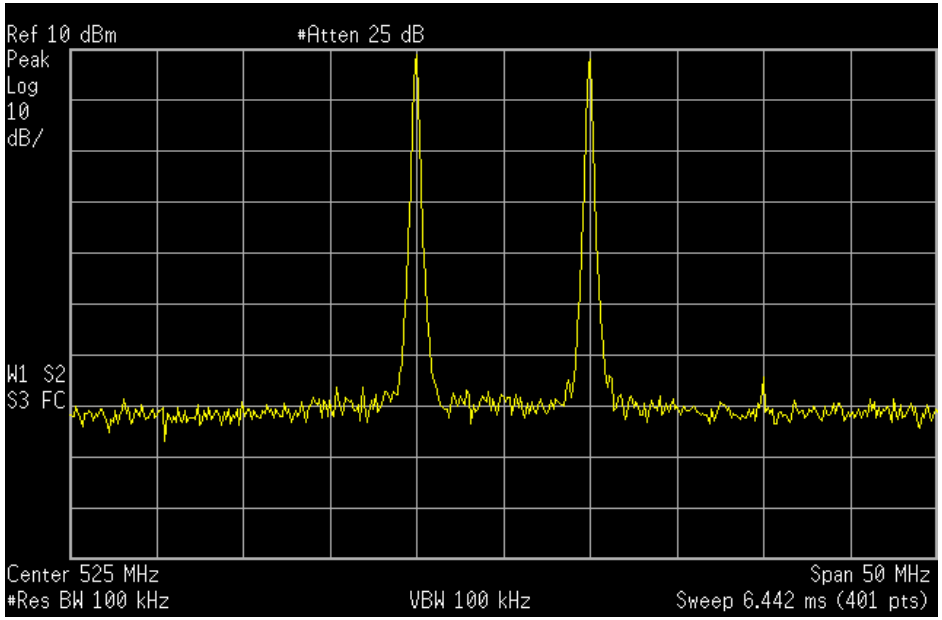
Transmitter-to-Transmitter IMD



Two Transmitter Example #1

Microphone systems are FDMA and therefore always transmitting

Two Transmitter Example #2



Summary

- Audio quality is paramount in wireless microphones
- Microphone technology has advanced dramatically in the last 5-10 years and will continue
- Spectral efficiency is increasing; more channels required in less available spectrum
- Clear UHF spectrum is critical for successful microphone operation