

# Digital Radio Update

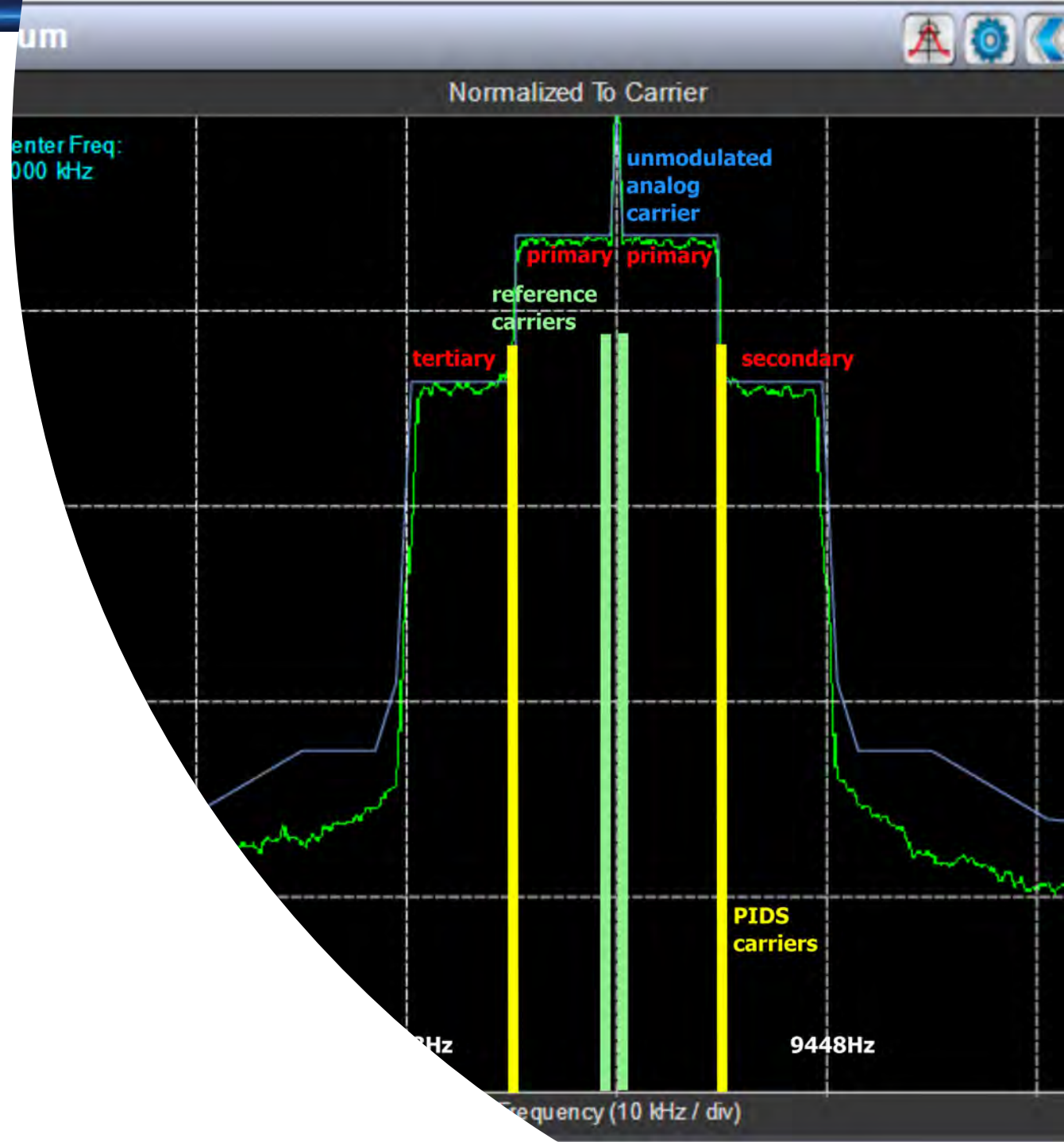
Philipp Schmid

April 7, 2019

# All Digital AM

## Quick Poll

1. How many AM broadcasters do we have with us today?
2. Do you operate FM translators?
3. Is the majority of your listenership now on the FM translator?
4. Do you want to regain your original AM signal quality and coverage?

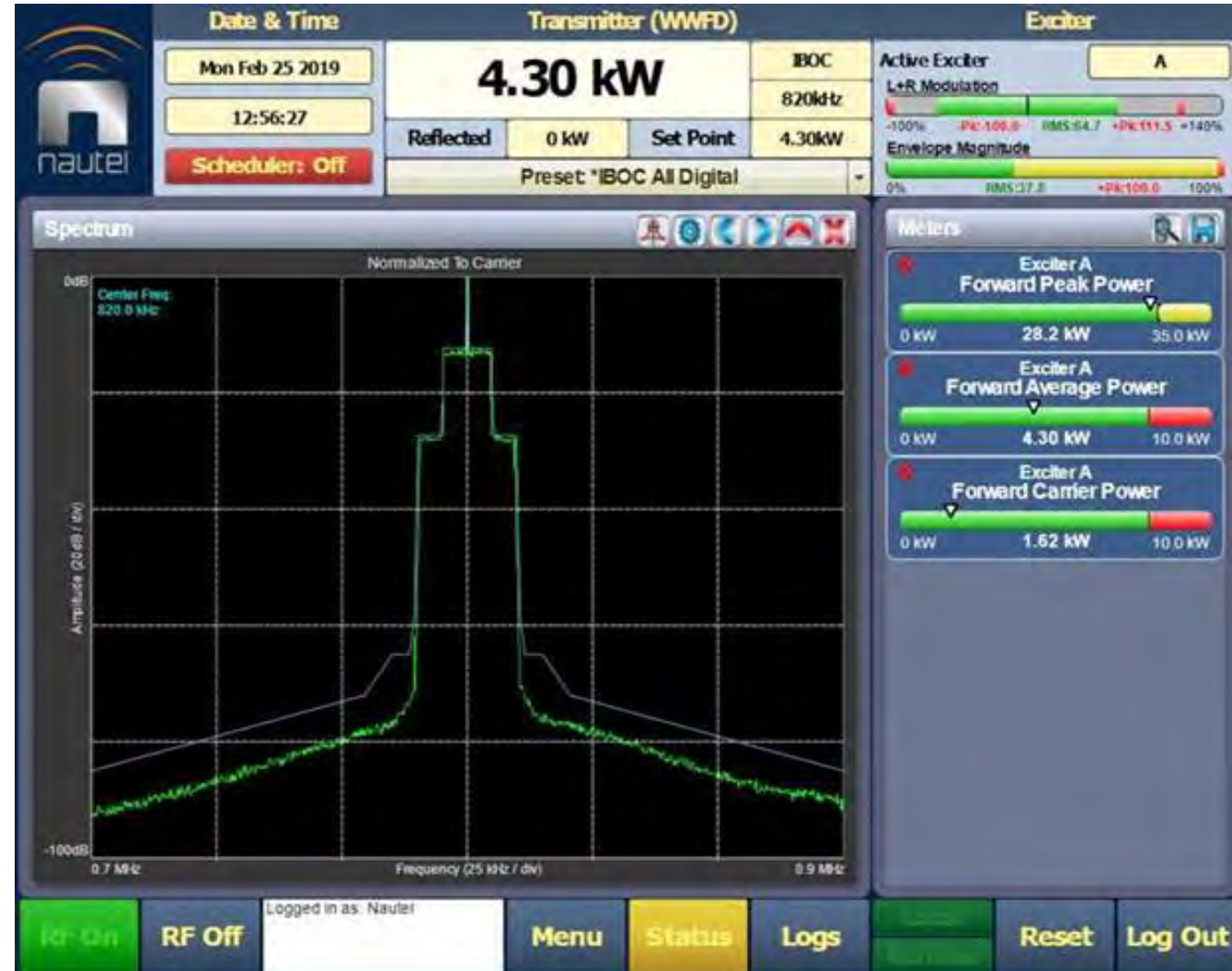


# More Power for All Digital MA3

## 12x more power for MA3

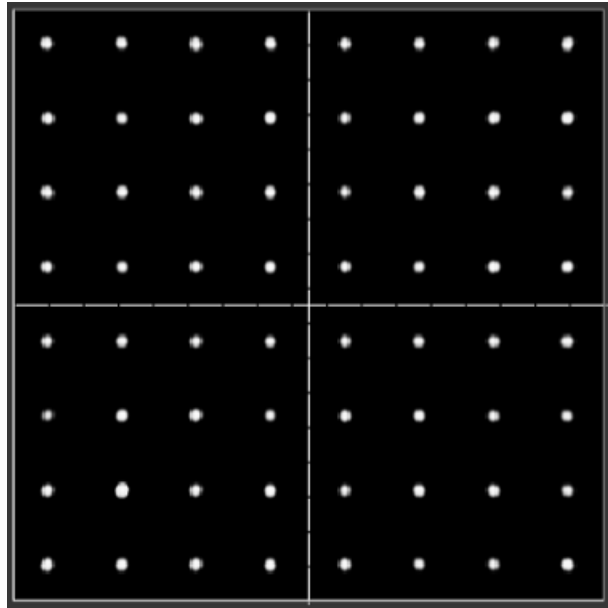
primary carriers over hybrid MA1 in same NX transmitter

- MA1 P1 is -13 dBc
- MA3 P1 is +2 dBc (1.6x carrier)
- AM carrier is backed off to 38% (TX nameplate == RMS power)
  - RMS power: 4.3 / 5.0 kW
  - AM carrier: 1.6 / 1.9 kW
  - Peak power: 28.8 / 28.8 kW

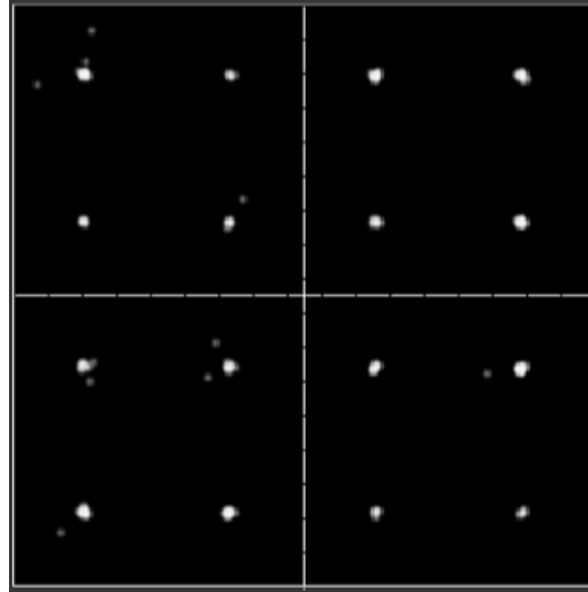


# Nautel NX: Best MA3 Signal Quality

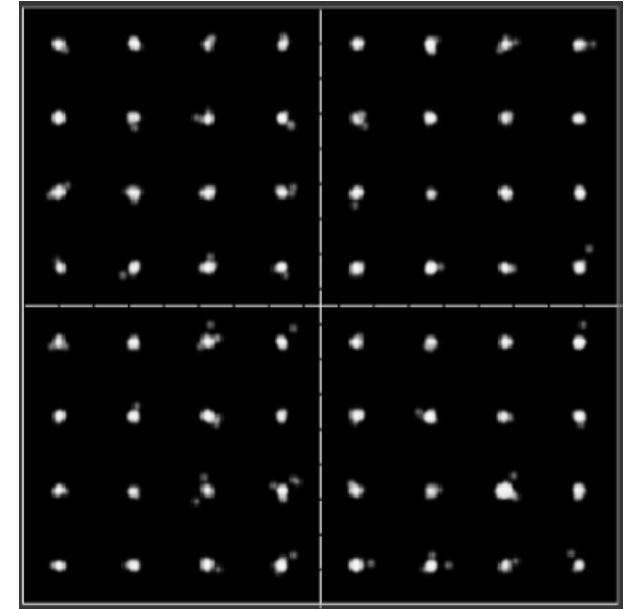
Primary



PIDS



Secondary/Tertiary



Ensures low power secondary and tertiary carriers are received

Expect: MA3 secondary coverage == MA1 Primary coverage

# HD MultiCast brings 4<sup>th</sup> Gen Data Services to AM

- Nautel is the only manufacturer that embraced exgine for AM
  - Shipping exporter and exgine for AM since 2008
- Result: easy upgrade to combined 4<sup>th</sup> gen importer & exporter
- Delivers data services like Station Logo and Artist Experience



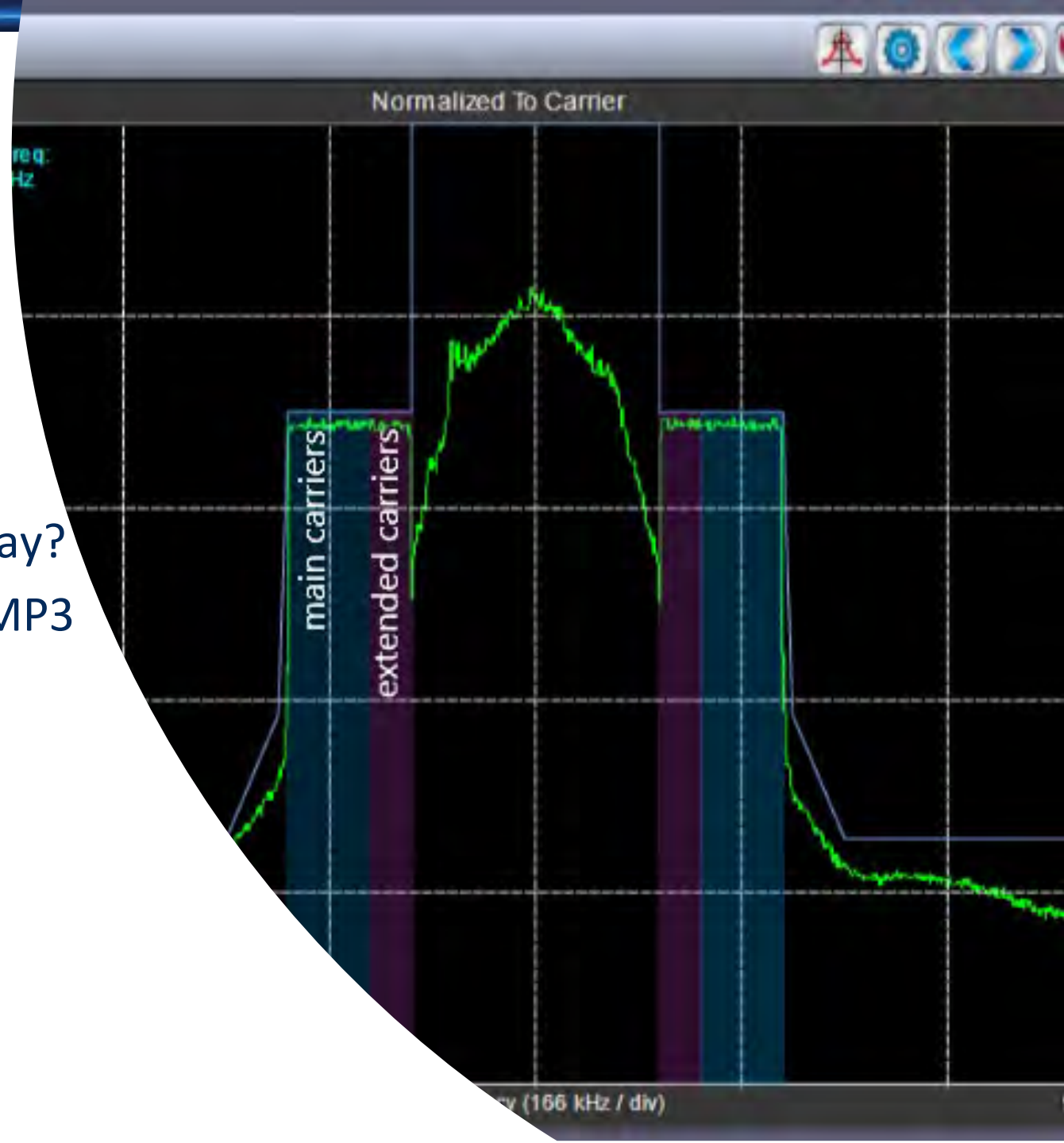


# Extended FM Hybrid Service Mode MP11

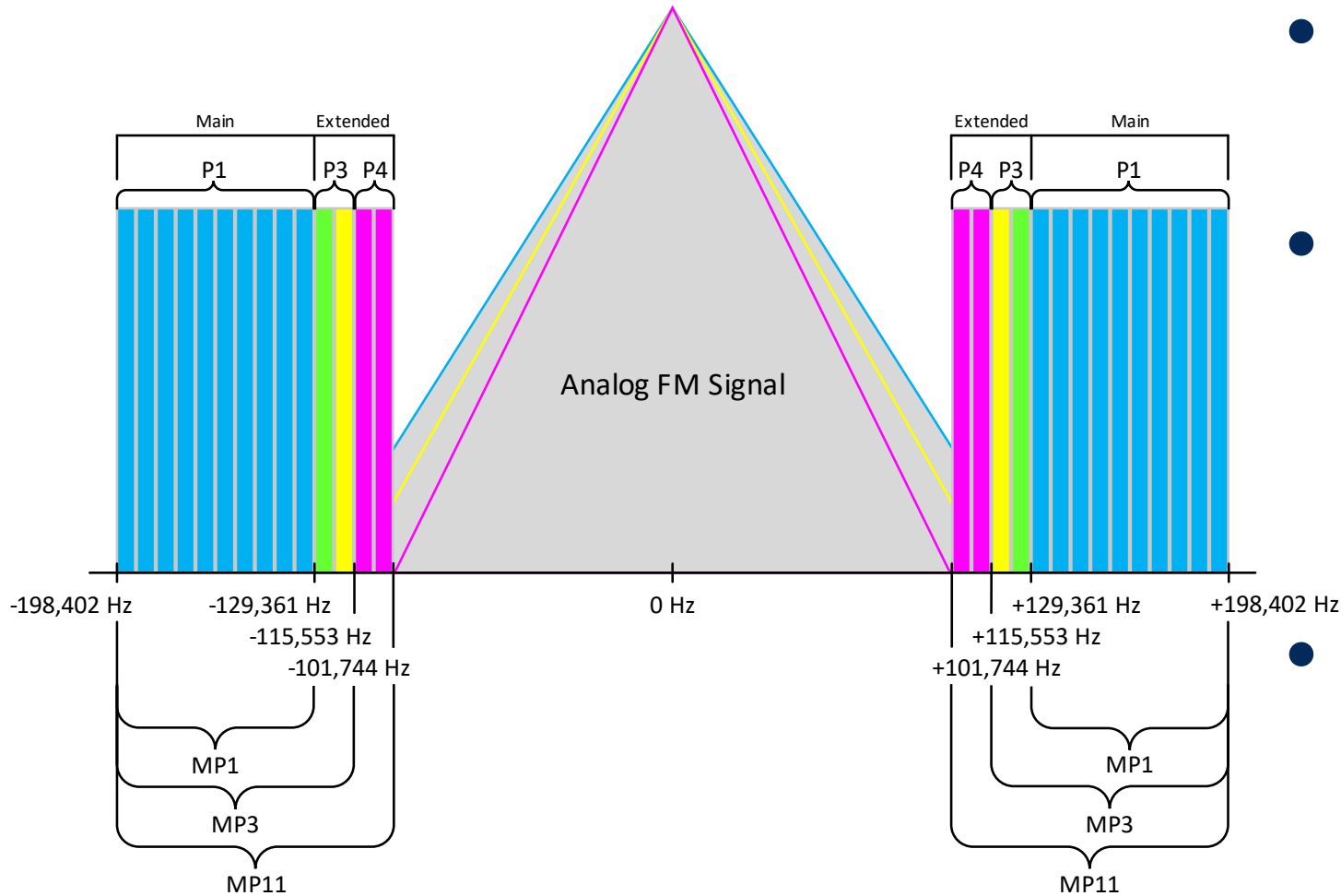
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## Quick Poll:

1. Are you broadcasting FM HD Radio today?
2. Are you using extended service mode MP3 on at least one of your stations?
3. Could you use an additional 24 kbps?
4. Have you heard of MP11?



# HD Radio Extended Service Modes



- MP1 98 kbps
  - 10 frequency partitions per SB
- MP3 124 kbps
  - 12 frequency partitions per SB
  - adds 0.8 dB to injection ratio
  - up to -9.2 dB total injection
- MP11 148 kbps
  - 14 frequency partitions per SB
  - adds 1.5 dB to injection ratio
  - up to -8.5 dB total injection

# IBOC and FM Host Interference

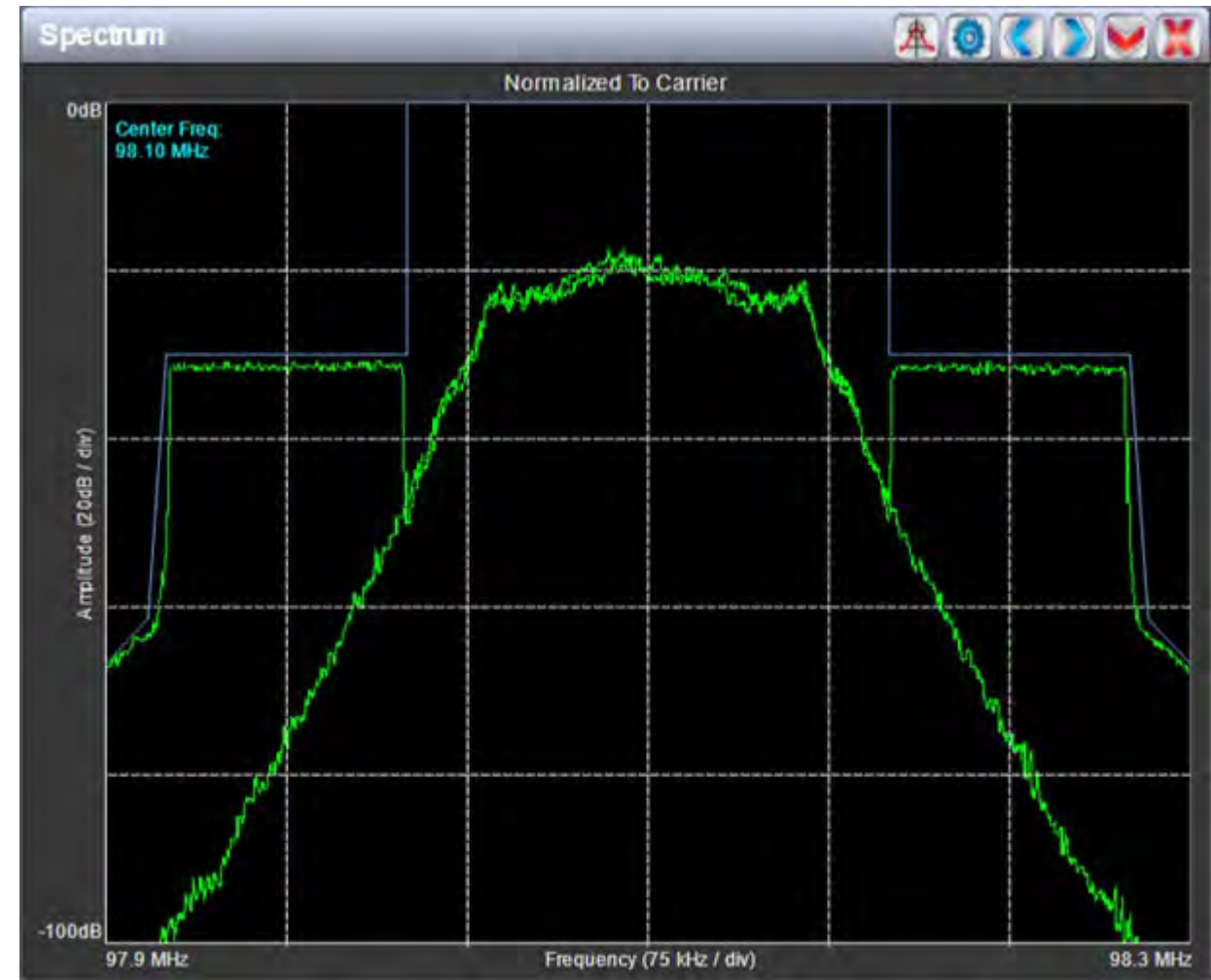
- FM spectrum is modulation dependent.
- Audio processors widen spectrum even at 100% mod
- SCAs impact IBOC



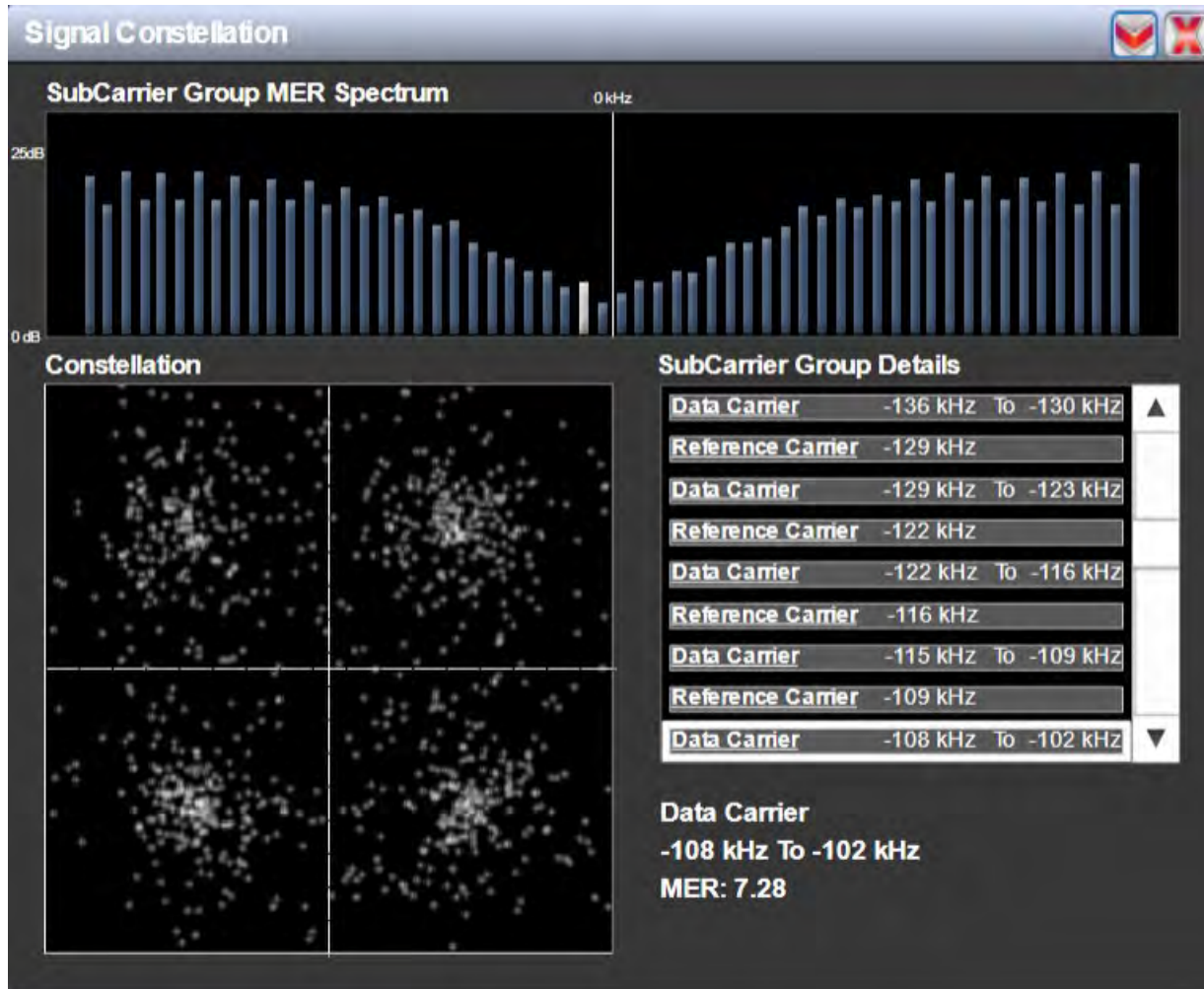


# IBOC and FM Host Interference

- FM spectrum is modulation dependent.
- Audio processors widen spectrum even at 100% mod
- SCAs impact IBOC
- Significant overlap area
  1. Analog to Digital Interference
  2. Digital to Analog Interference



# Analog to Digital Interference

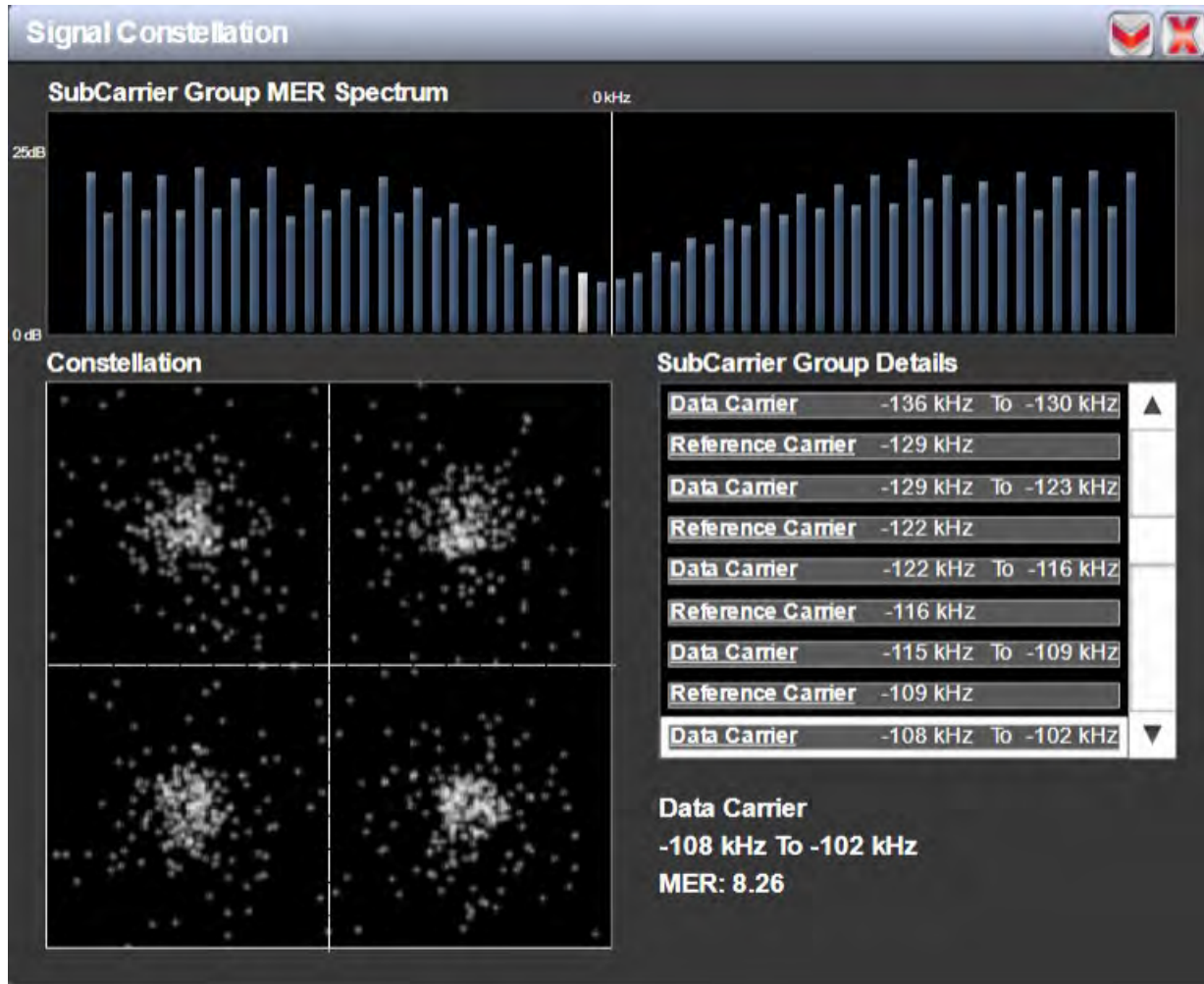


-20 dBc / 1% IBOC Power

Main	P1	15 dB	Good
Extended	P3	10 dB	Impacted
Extended	P4	7 dB	Marginal

(typical MER values)

# Analog to Digital Interference



-17 dBc / 2% IBOC Power

Main	P1	16 dB	Good
Extended	P3	11 dB	Impacted
Extended	P4	8 dB	Marginal

# Analog to Digital Interference

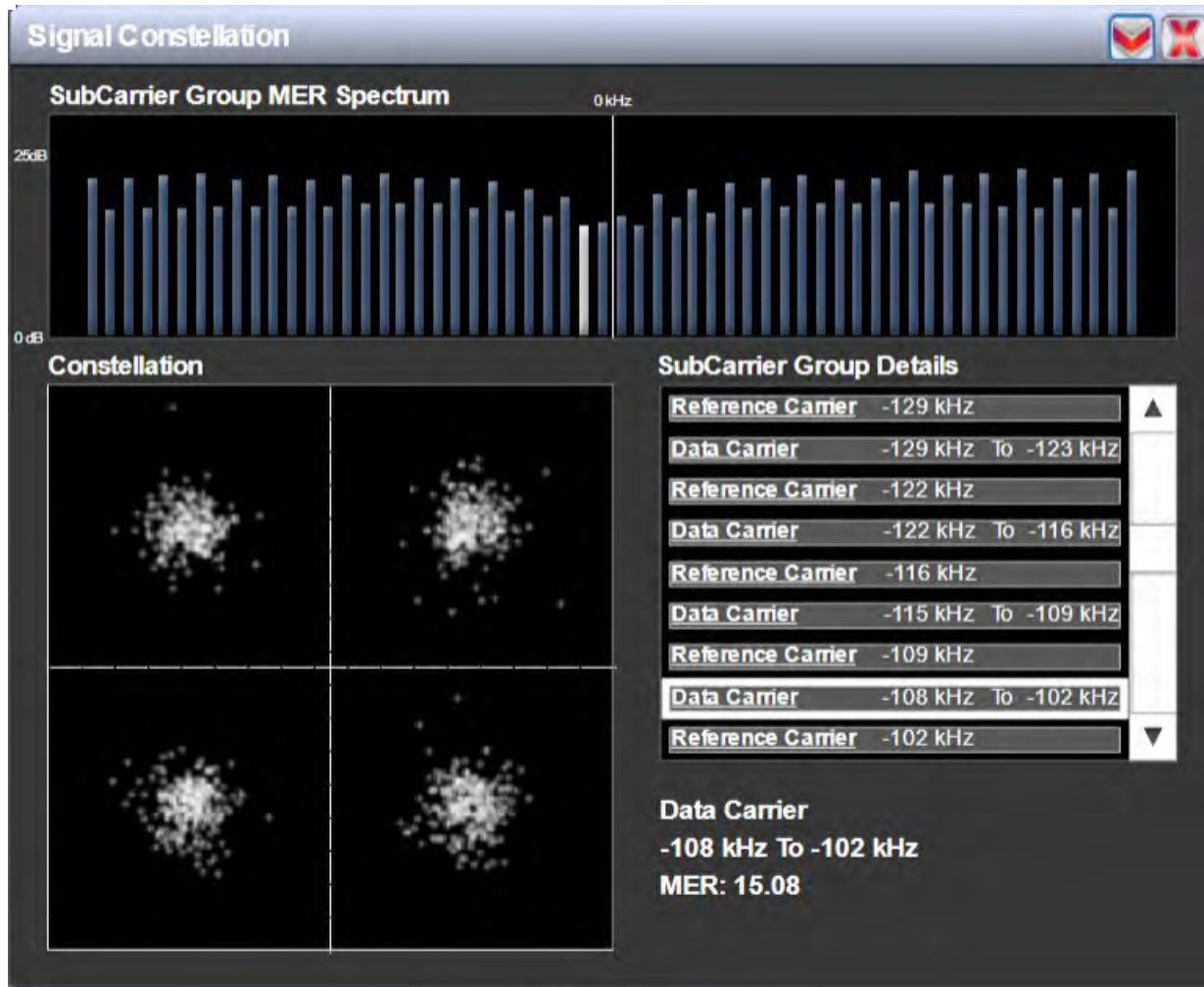


-14 dBc / 4% IBOC Power

Main	P1	17 dB	Good
Extended	P3	15 dB	Good
Extended	P4	11 dB	Impacted



# Analog to Digital Interference

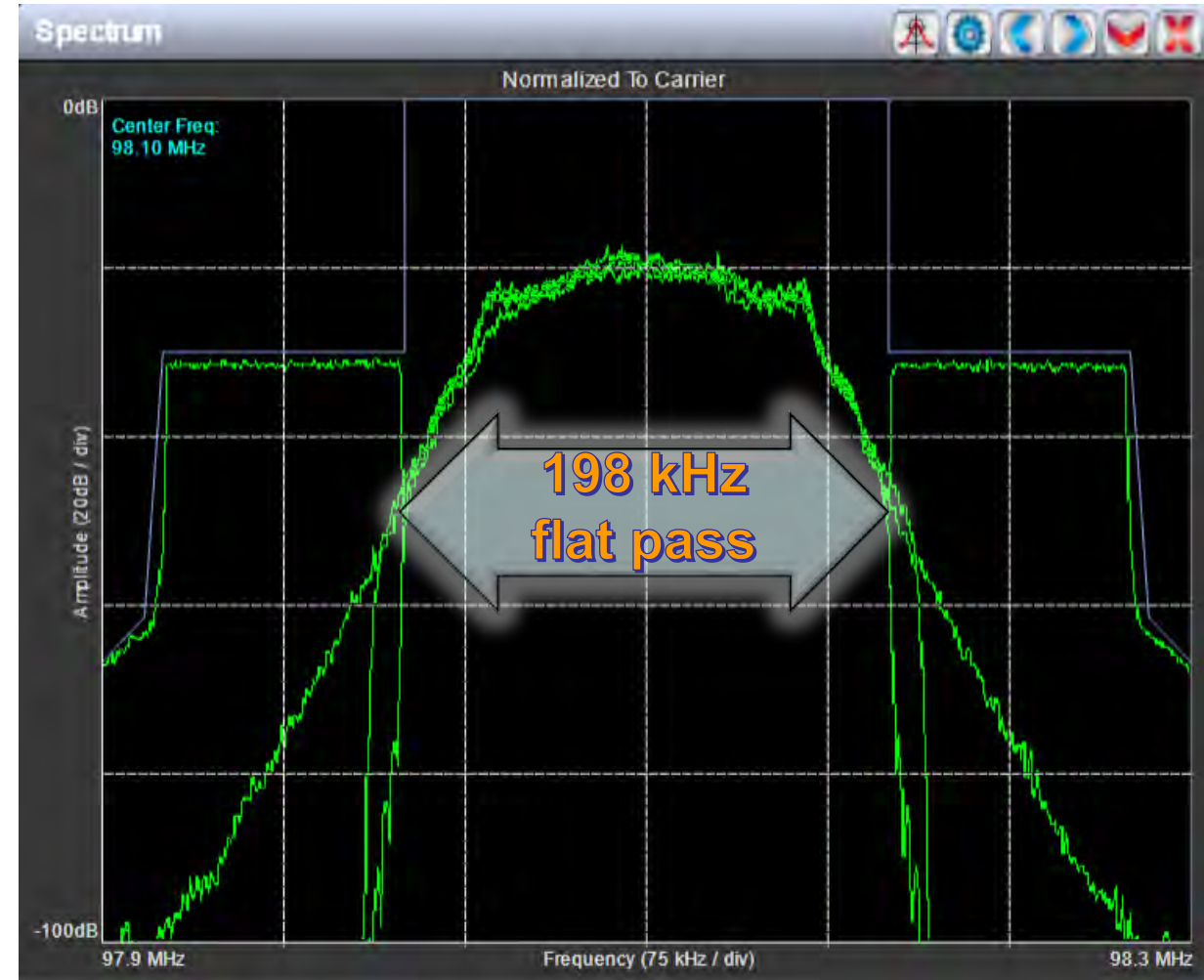
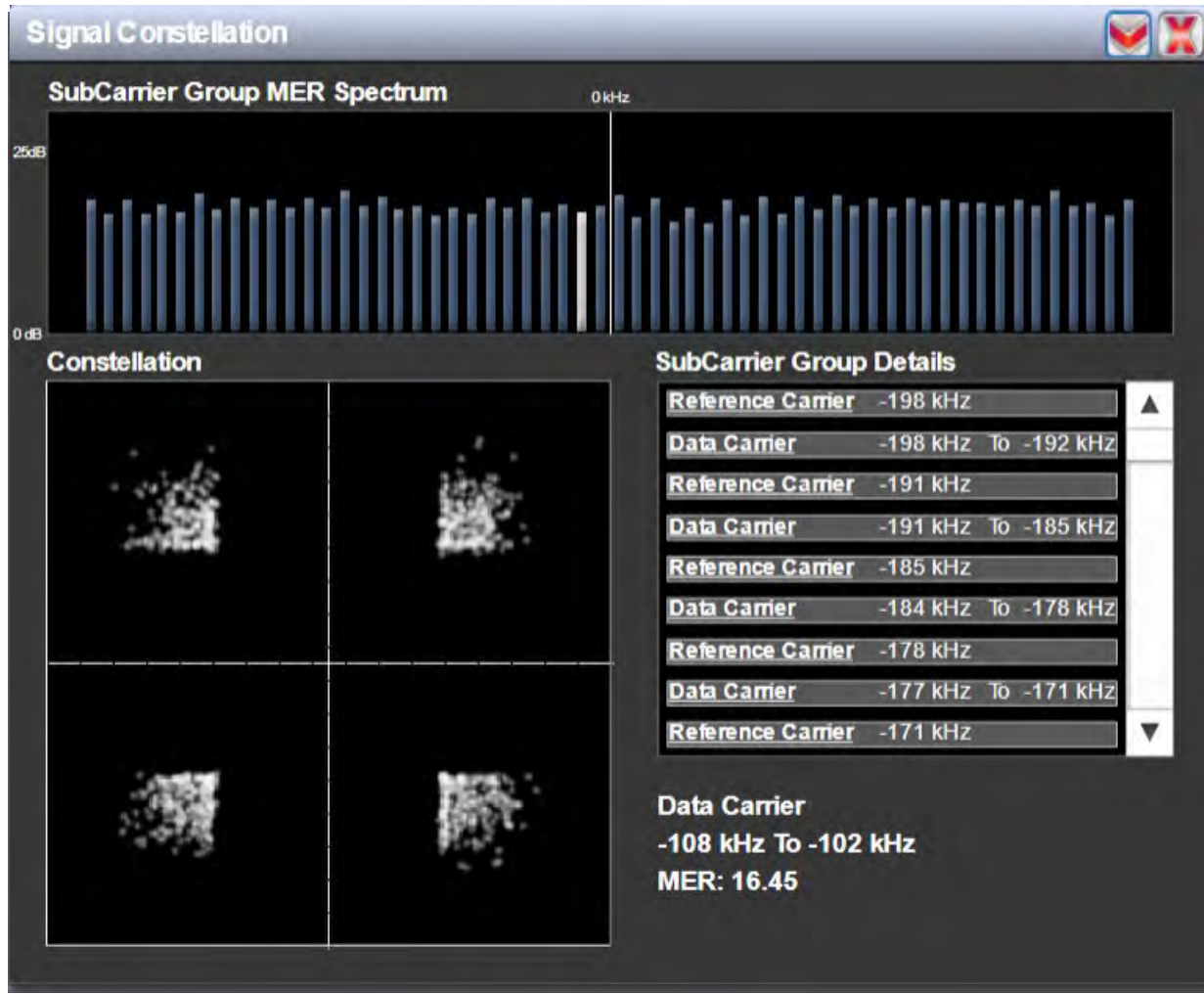


-10 dBc / 10% IBOC Power

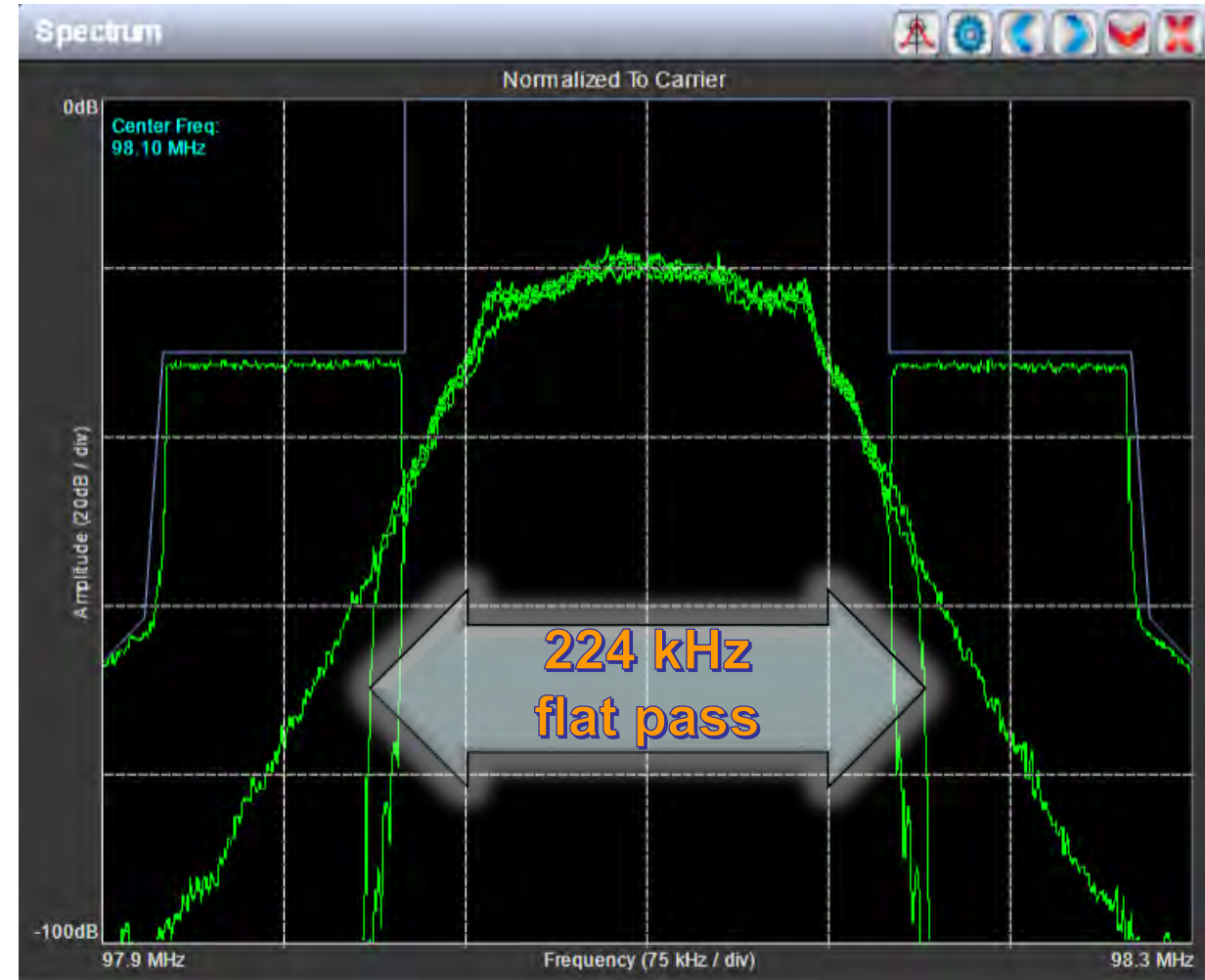
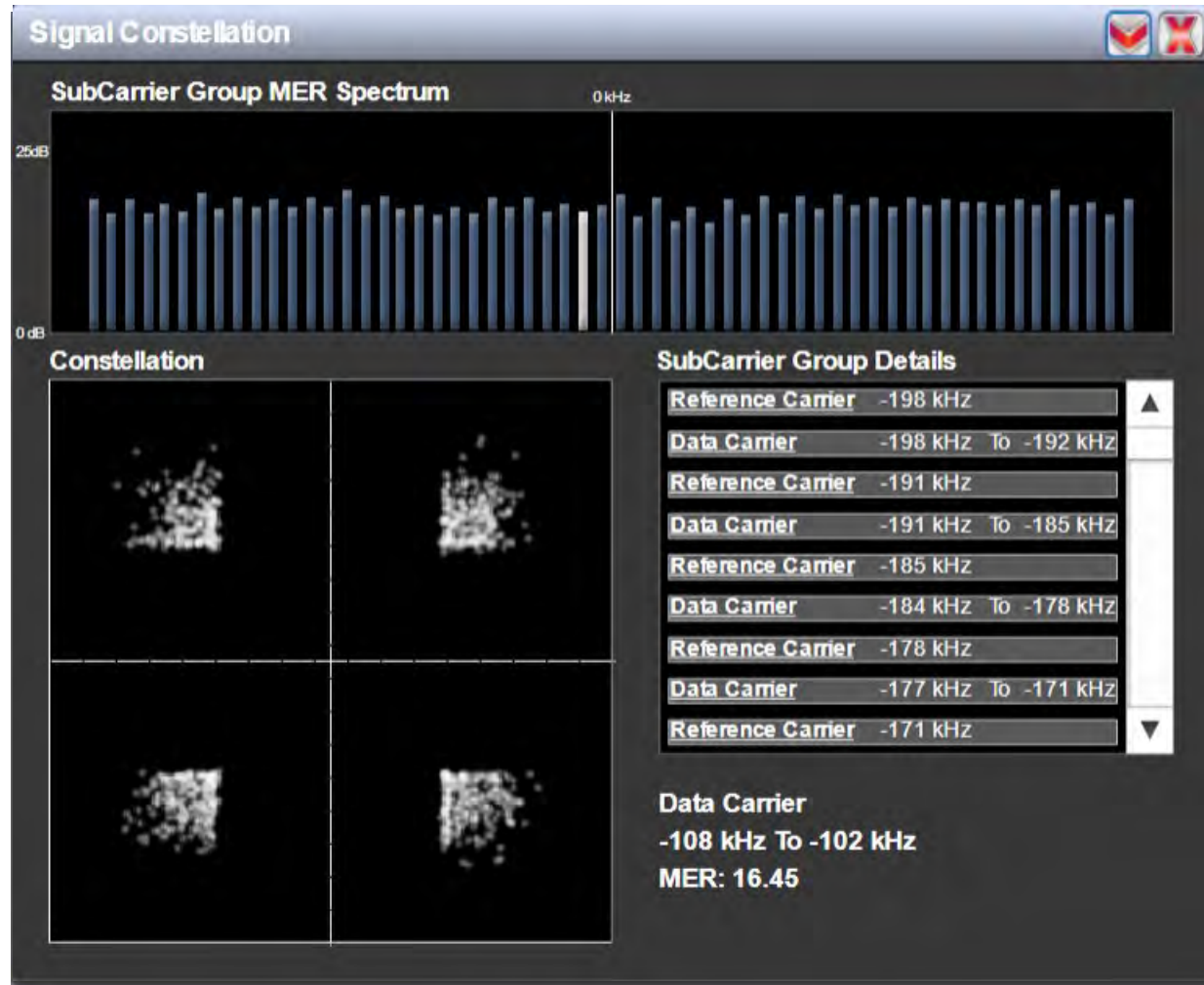
Main	P1	17 dB	Good
Extended	P3	16 dB	Good
Extended	P4	15 dB	Small impact



# Nautel HD PowerBoost Inner Carrier Protection

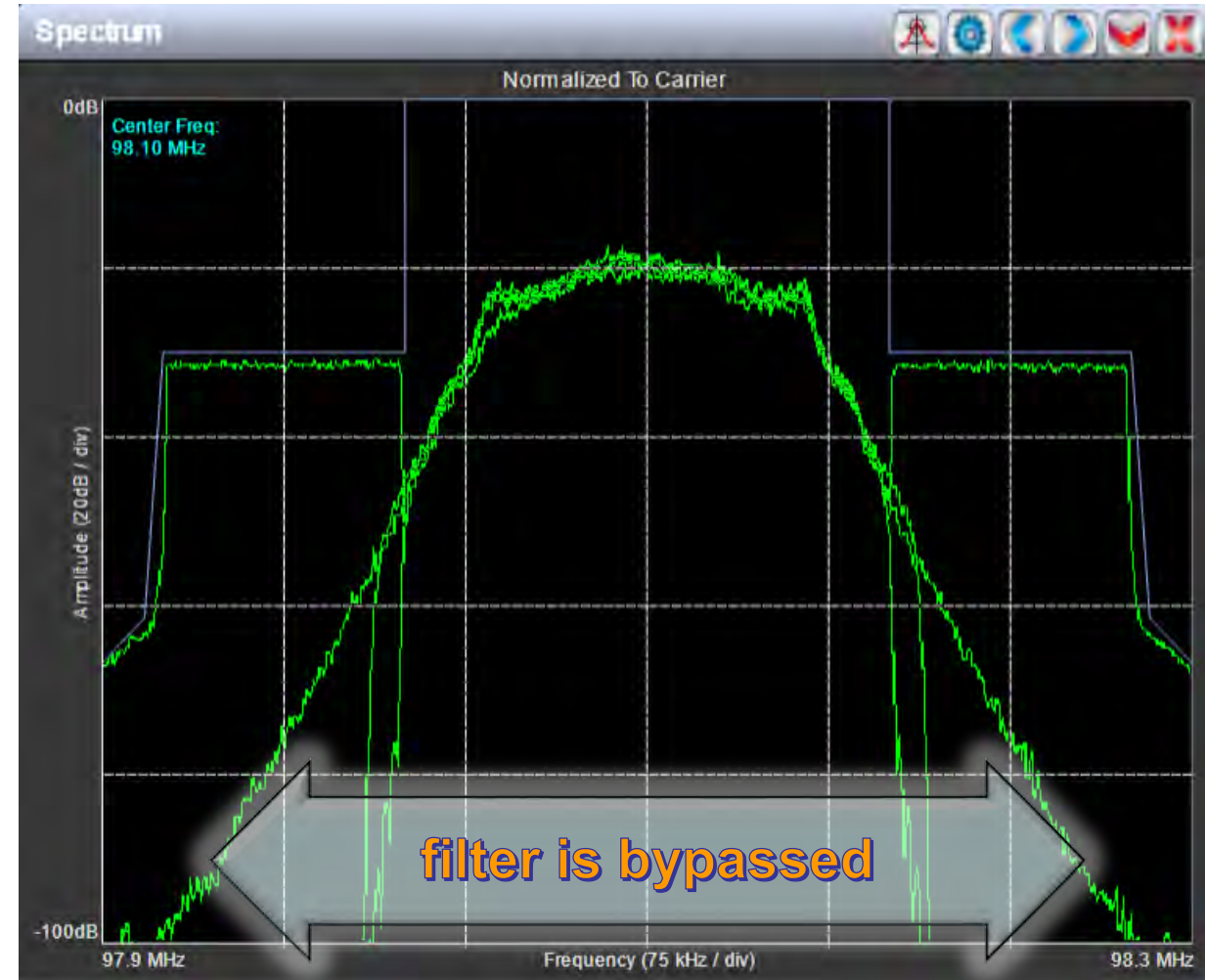
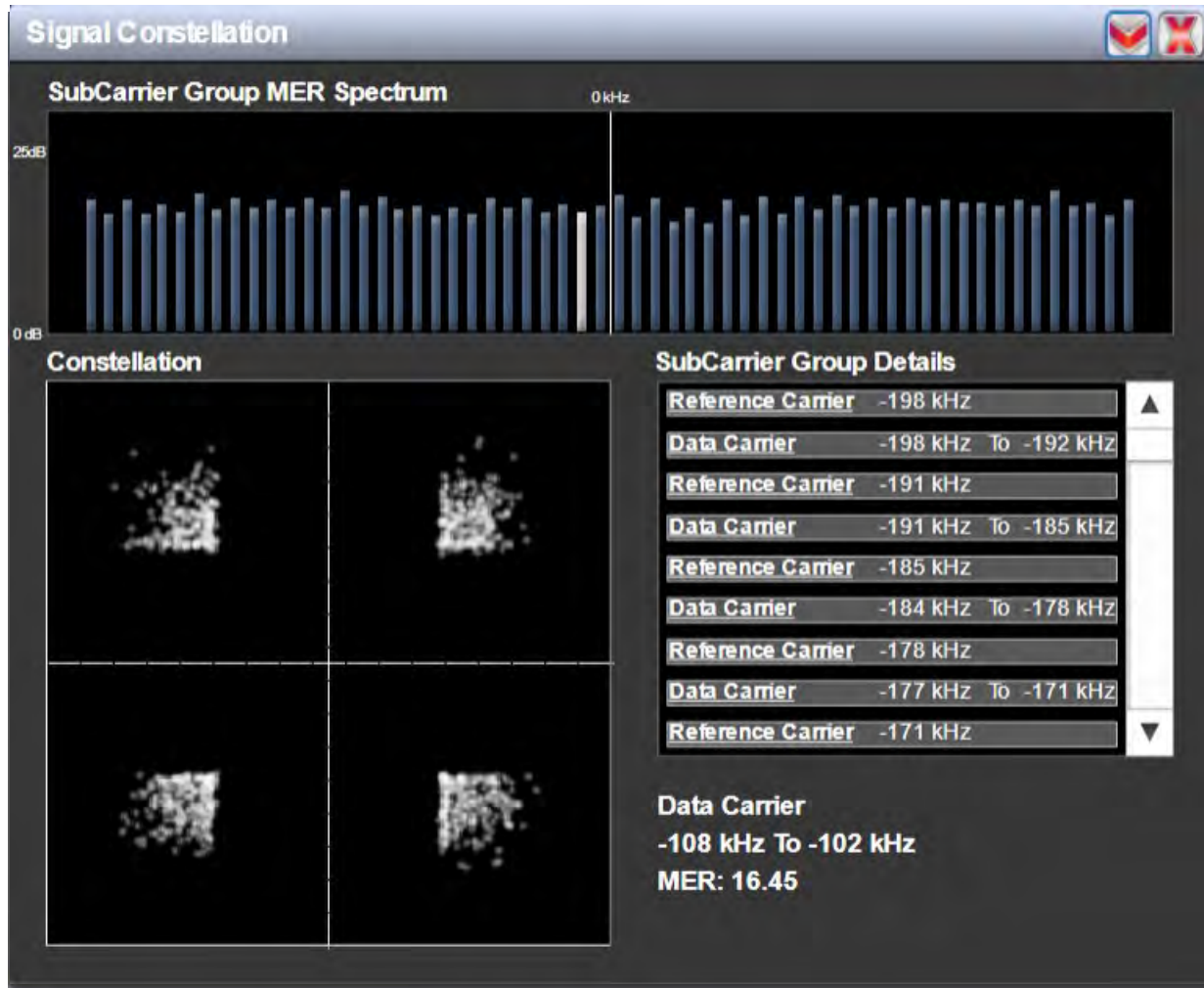


# Nautel HD PowerBoost Inner Carrier Protection





# Nautel HD PowerBoost Inner Carrier Protection



# Digital to Analog Interference

- Nautel worked with NAB Pilot to test MP11, mark your calendar:

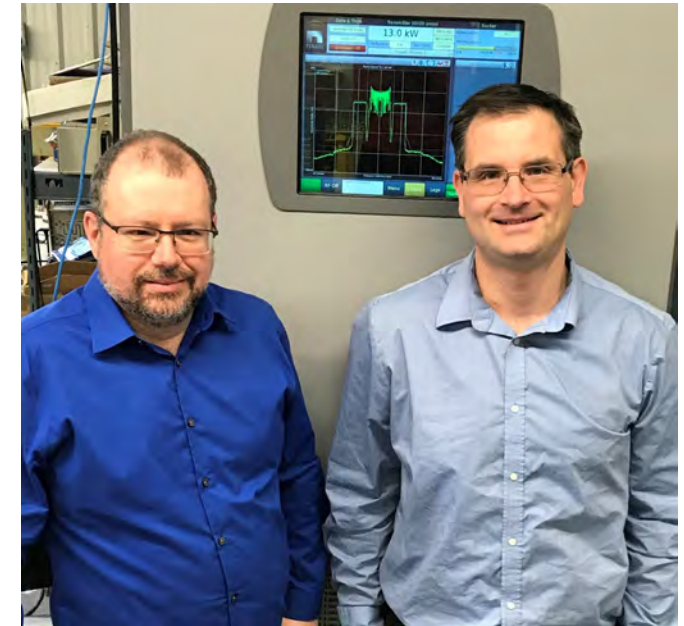
## PILOT MP11 Lab Test Project

Wednesday, April 10 | 3:20 pm - 3:40 pm | N256

- Small but measurable impact on FM audio quality
  - Highly analog FM receiver dependent (receiver selectivity)
- NAB tests at KKLZ last year already exercised extended carriers
  - No real subjective FM signal degradation was noted

# MP11 Transmitter Performance

- Nautel studied the transmitter power impact of MP11 on leading 4<sup>th</sup> Gen Peak to Average Power Reduction (PAR) algorithms.
  - PAR2 as part of Xperi Gen4 code base
  - Nautel HD PowerBoost
- See the MP11 demonstration on our booth
- Mark Dr. Scott Melvin's paper presentation in your calendar:



**Transmitter Considerations for Extended IBOC Service Modes**

Wednesday, April 10 | 4:20 pm - 4:40 pm | N256



# HD PowerBoost: +13% TPO at -14 dBc MP11



- HD PowerBoost also provides +8% TPO at -14 dBc injection MP3
- AC-RF Efficiency: 3.8% PAR2 @15.8 kW  
4.2% PAR2 @18 kW in larger transmitter  
\$23,892 savings over 10 years (12.5c/kWh)

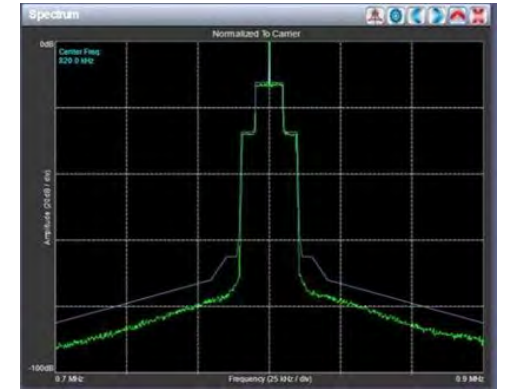
# HD PowerBoost: +25% TPO at -10 dBc MP11



- HD PowerBoost also provides +15% TPO at -10 dBc injection MP3
- AC-RF Efficiency:
  - 5.6% PAR2 @10.0 kW
  - 8.3% PAR2 @12.5 kW in larger transmitter
  - \$44,231 savings over 10 years (12.5c/kWh)

# In Summary

- All-Digital AM is ready for prime time
  - NX Series
    - offers improved signal quality
    - delivers all HD Radio services
  - HD Multicast now available for All-Digital AM operation
- Nautel delivers best MP11 performance
  - up to 25% more TPO at -10 dBc injection
  - up to 8% more efficiency at -10 dBc injection
- MP11 field trials via easy GV software upgrade





# Thank You

