



ATSC 3.0 Real World Experience

April 23, 2017

GatesAir Connect @ NAB Show 2017

Featuring
GatesAir's



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ATSC 3.0 Real World Experience



ATSC 3.0 On Air

- Summer 2016 , WRAL

WRAL begins broadcasting in next-gen TV technology

Posted 7:19 a.m. today
Updated 12:54 p.m. today

193 5 Reactions



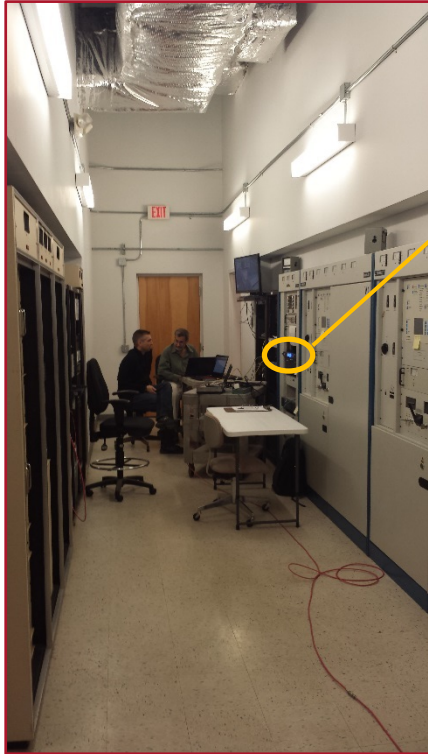
AUBURN
WAKE COUNTY
WRAL-TV

WRAL begins broadcasting in next-gen TV technology



ATSC 3.0 A World Series Hit

- World Series 2016 broadcast in Cleveland with hometown Indians



The New GatesAir XTE Exciter makes another Hit at the World Series 2016



ATSC 3.0 MBC Korea

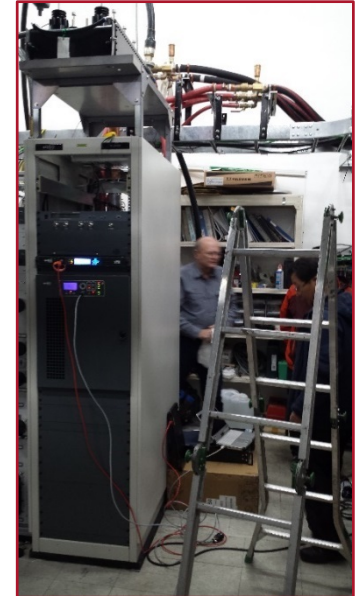
- 4 transmitter SFN for Munhwa Broadcasting Company (MBC), Seoul
 - Gwanak Mtn
 - Namsan
 - Gwangyo Mtn
 - Yongmoon



Yongmoon
Air Cooled UAXT
Transmitter



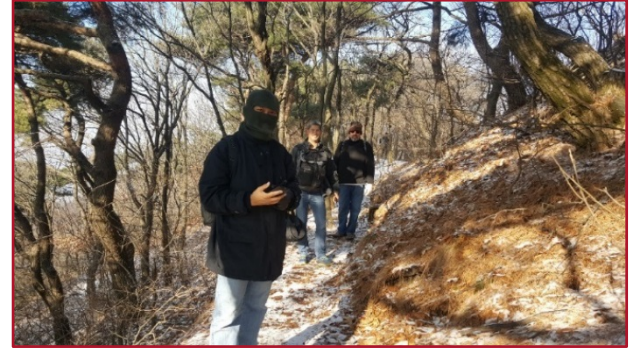
Gwangyo
Air Cooled UAXT
Transmitter



Gwanak
Liquid Cooled
Transmitter



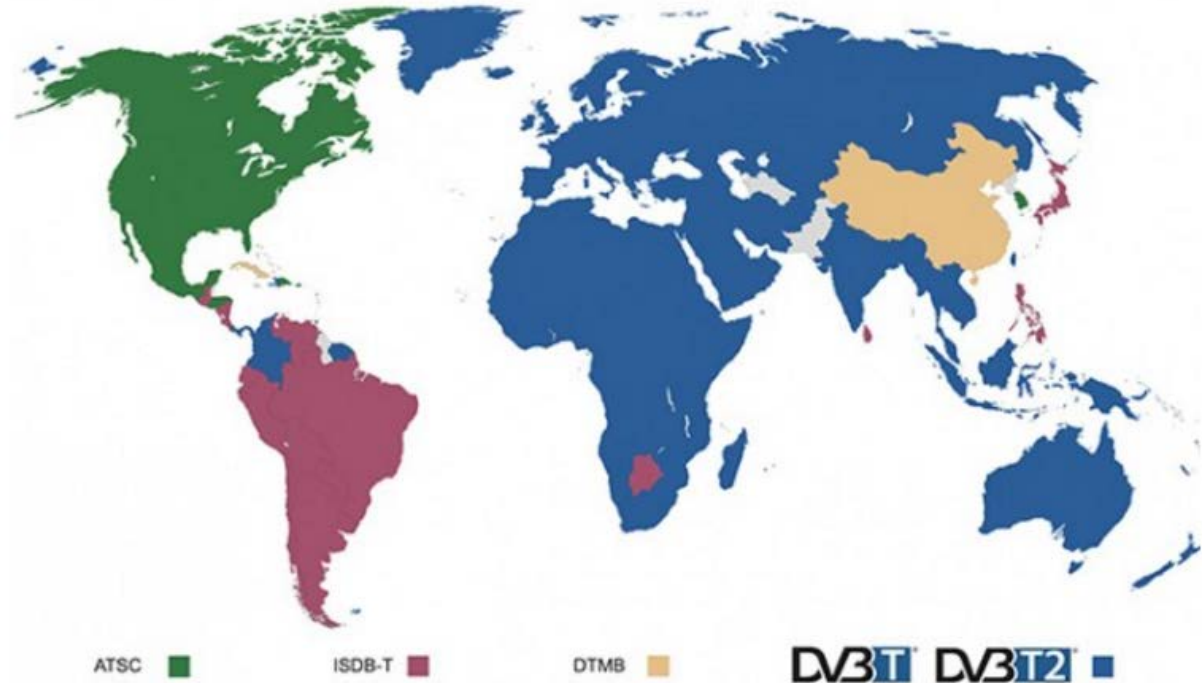
ATSC 3.0 MBC Korea



Real World Experience

ATSC 3.0 is a OFDM modulation, similar to:

- DVB-T
- DVB-T2
- ISDB-T
- And others



Coverage & Planning



Coverage and Planning

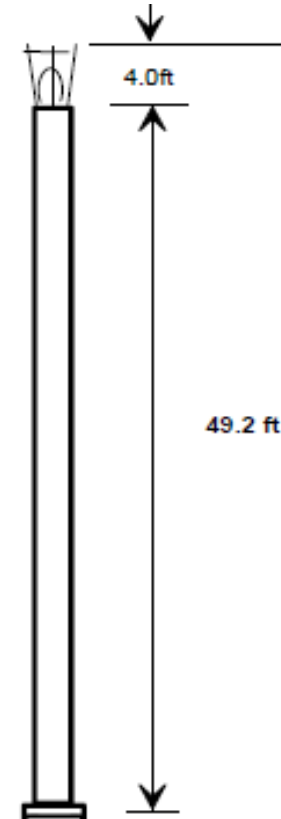
ATSC 1.0

Coverage was calculated by antenna companies, similar to analog.

The Era of Change

ATSC 3.0

The Modulation Parameters now have a large affect on coverage



Modulation Parameters ATSC 1.0 vs ATSC 3.0

ATSC 1.0

- None

ATSC 3.0

- QPSK, 16 QAM, 64 QAM, 256 QAM, 1024 QAM & 4096 QAM

Low Density Parity Check (LDPC) Forward Error Correction (FEC), inner coding:

- Length: 16200 Bits or 64800 Bits
- Code Rates: 2/15, 3/15, 4/15, 5/15, 6/15, 7/15, 8/15, 9/15, 10/15, 11/15, 12/15, and 13/15

Fast Four Transform (FFT size)

- 8k, 16k & 32k

Guard Interval

- 27.7usec, 55.5usec, 74.07usec, 111.11usec, 148.1usec, 222.2usec, 296.3usec, 351.9usec, 444.4usec, 527.8usec, & 592.6usec

Bose, Chaudhuri, Hocquenghem (BCH) outer coding:

- On or Off

Scattered Pilots:

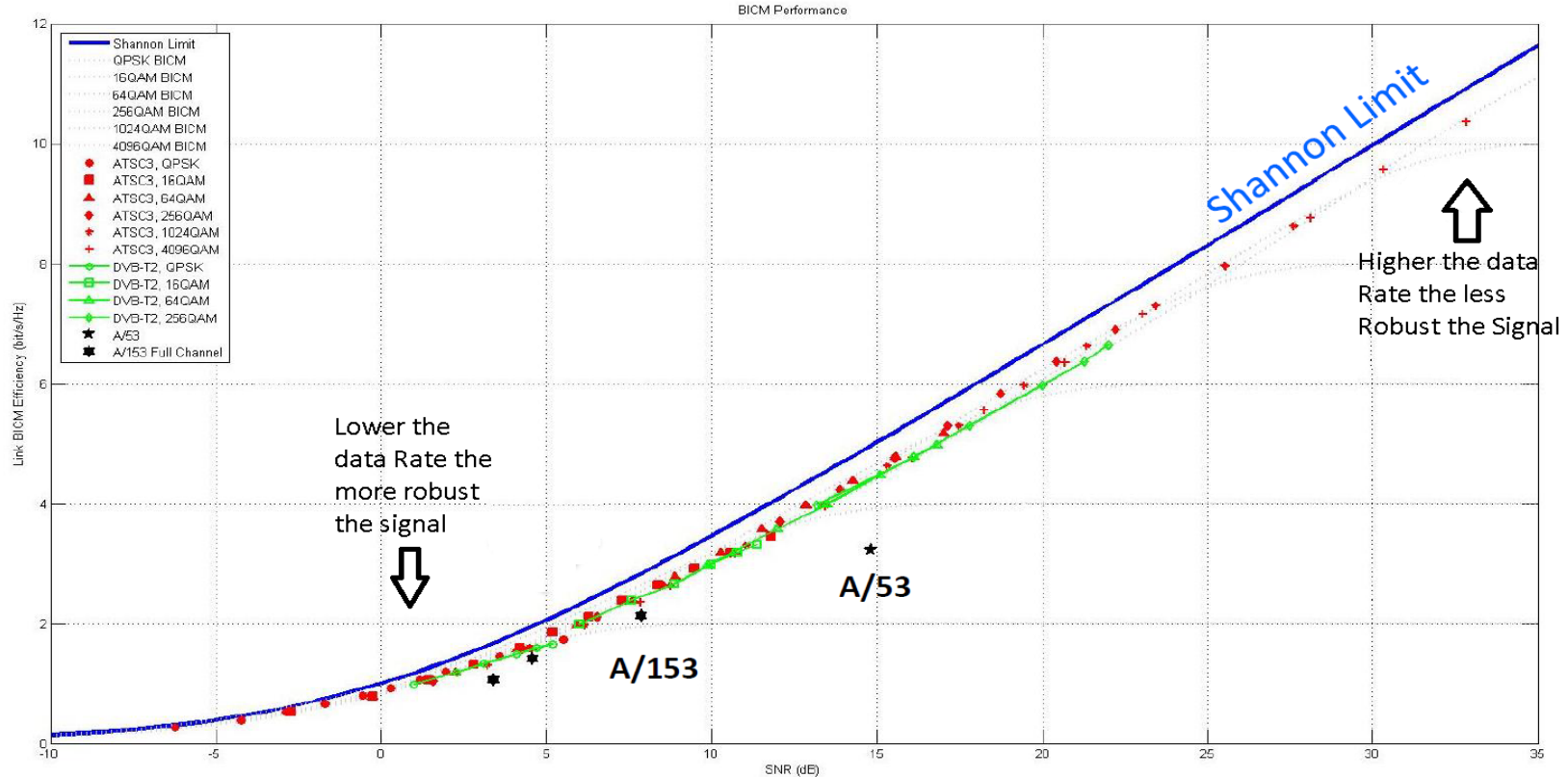
- Time (2 or 4) & Density (normal or dense)

Frame Duration:

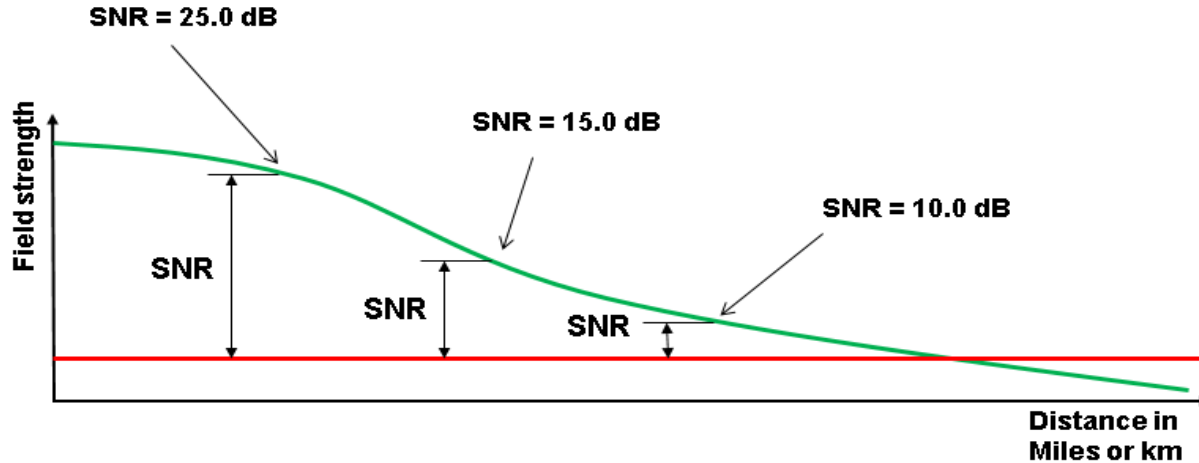
- 100ms, 150ms, 200ms, & 250ms



Coverage and Planning



Coverage and Planning



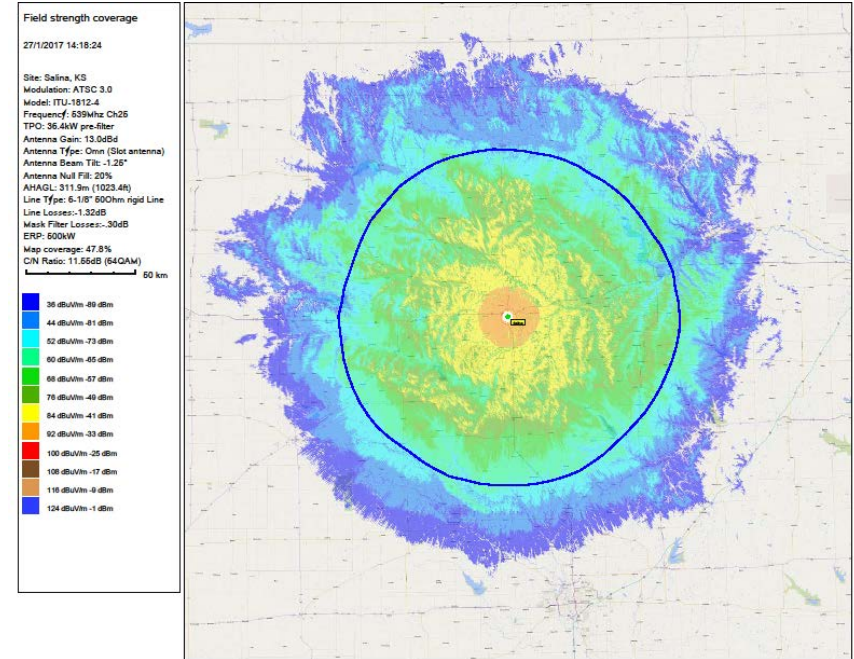
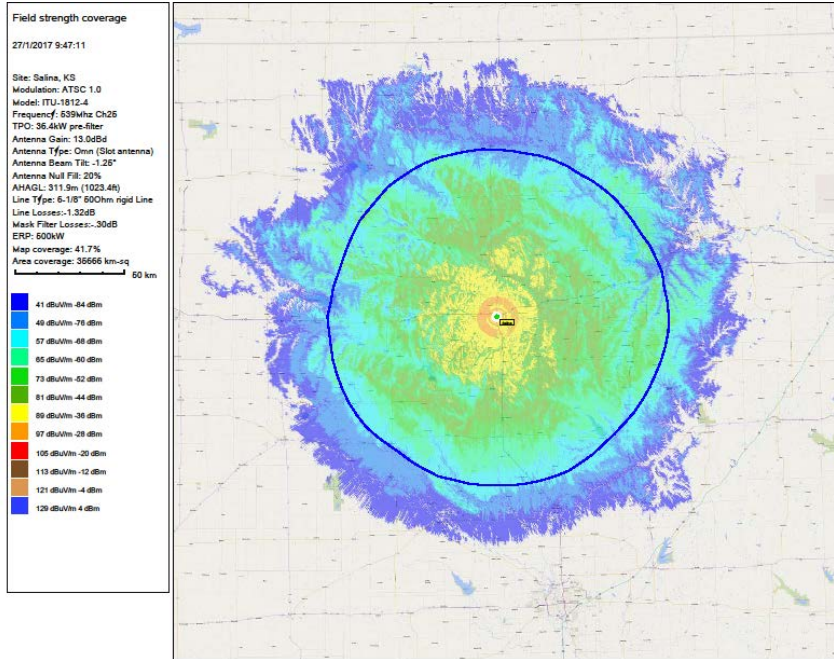
The signal-to-noise ratio (SNR) and the data rate have a direct relationship to the distance the ATSC 3.0 signal can be received. The lower the signal-to-noise ratio (SNR) the further away from the transmission source the signal can be received. The higher the signal-to-noise ratio the less distance from the transmission source the signal be received.



Coverage and Planning

ATSC 1.0 (19.39Mbit/s) 15.2dB SNR

ATSC 3.0 (19.5Mbit/s) 11.5dB SNR



6.1% coverage increase with ATCS 3.0



ATSC 3.0 coverage is still based on the following variables the same as ATSC 1.0:

- Antenna Height above average terrain
- Antenna Gain
- Length and size for the Transmission line (Losses)
- RF System (Losses)
- Transmitter Power Output

ATSC 3.0 Modulation Parameters

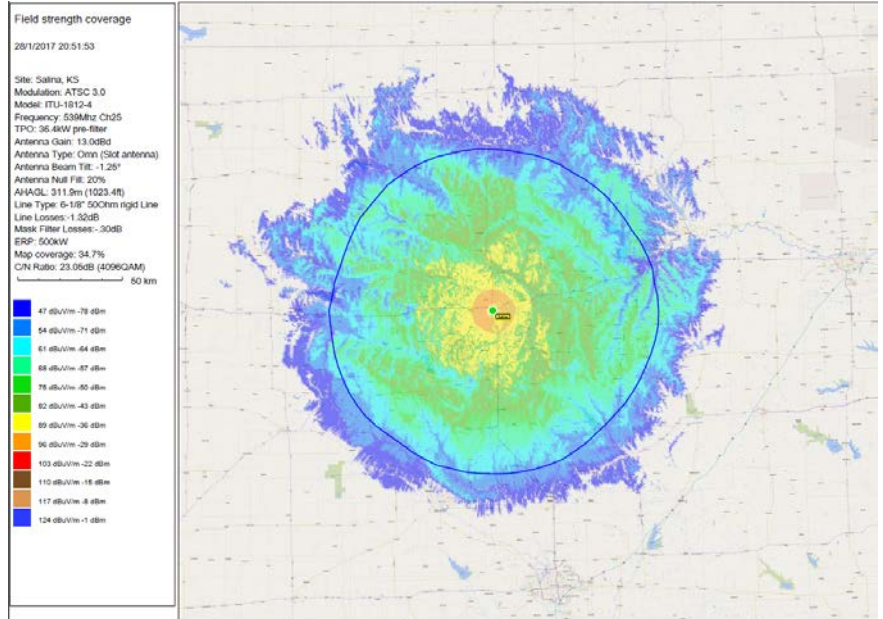
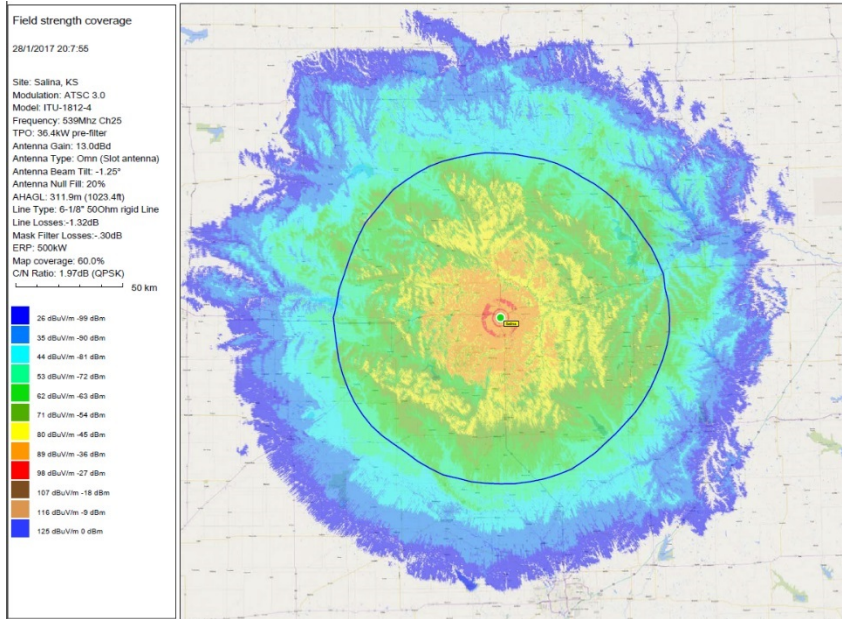
- Data rate 0.83 to 57.0 Mbit/s (dependent on modulation Parameters)
- Signal-to-noise ratio -5.5dB to 36.5dB (dependent on modulation Parameters)



Coverage and Planning

ATSC 3.0, QPSK, 6.5 Mbit/s, 1.97dB SNR

ATSC 3.0 1096QAM(39Mbit/s) 23.05dB SNR



All that changed was the Modulation parameters



Questions



Thank You!

Steven Rossiter

TV Systems Applications Engineer

