

ATSC 3.0 Real World Experience

April 23, 2017

GatesAir Connect @ NAB Show 2017

GatesAir's



Steven Rossiter TV Systems Applications Engineer



Connecting What's Next

ATSC 3.0 Real World Experience



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ATSC 3.0 On Air



Summer 2016, WRAL

WRAL begins broadcasting in next-gen TV technology

WRAL begins broadcasting in next-gen TV technology

AUBURN



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LIVE

O 5 Reactions

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ATSC 3.0 A World Series Hit



World Series 2016 broadcast in Cleveland with hometown Indians



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

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ATSC 3.0 MBC Korea

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



Yongmoon Air Cooled UAXT Transmitter





Gwanak Liquid Cooled Transmitter Proprietary and confidential



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ATSC 3.0 MBC Korea





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ATSC 3.0 is a OFDM modulation, similar to:

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



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Coverage & Planning



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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







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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.

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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

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ATSC 3.0 coverage is still based on the following variables the same a 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)

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

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

Field strength coverage Field strength coverage 28/1/2017 20:51:53 28/1/2017 20:7:55 Site: Salina, KS Site: Salina, KS Modulation: ATSC 3.0 Modulation: ATSC 3.0 Model: ITU-1812-4 Model: ITU-1812-4 Frequency: 539Mhz Ch25 Frequency: 539Mhz Ch25 TPO: 36.4kW pre-filter TPO: 36 4kW pre-filter Antenna Gain: 13.0dBd Antenna Gain: 13.0dBo Antenna Type: Omn /Slot antenna Antenna Type: Omn (Slot antenna) Antenna Beam Tilt: -1.25* Antenna Beam Tilt: -1.25° Antenna Null Fill: 20% Antenna Null Fill: 20% AHAGL: 311.9m (1023.4ft) AHAGL: 311.9m (1023.4ft) Line Type: 6-1/8" 500hm rigid Line Line Type: 6-1/8" 50Ohm rigid Line Line Losses 1 32dB Line Losses:-1.32dB Mask Filter Losses:- 30dB Mask Filter Losses', 30dF ERP: 500kW ERP: 500kW Map coverage: 34.7% Map coverage: 60.0% C/N Ratio: 23.05dB (4096QAM) C/N Ratio: 1.97dB (QPSK) _____ 50 km db.//m -78 dBr 26 dBuV/m -99 dBm dBu///m -71 dBr 35 dBullim -90 dBo t dBullion 44 dBa 44 dBuV/m -81 dBm 24 (0.10m A7 (0m 53 dBuV/m -72 dBm A da Alim AD da 62 dBuV/m -63 dBm 02 db/V/m -43 dBr 1 dBuV/m -54 dBm 69 40-A/m -36 40-80 dBuV/m -45 dBm of all other de alle 89 dBullin -26 dBm 03.48.00m-22.48 98 dBuV/m -27 dBm C -D -D -D -D -D -D -107 dBuV/m -18 dBm t7 dBoWm .4 dBm 116 dBuV/m -9 dBm 124 dBuV/m -1 dBm 125 dBuV/m 0 dBm

All that changed was the Modulation parameters

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Questions

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Thank You!

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