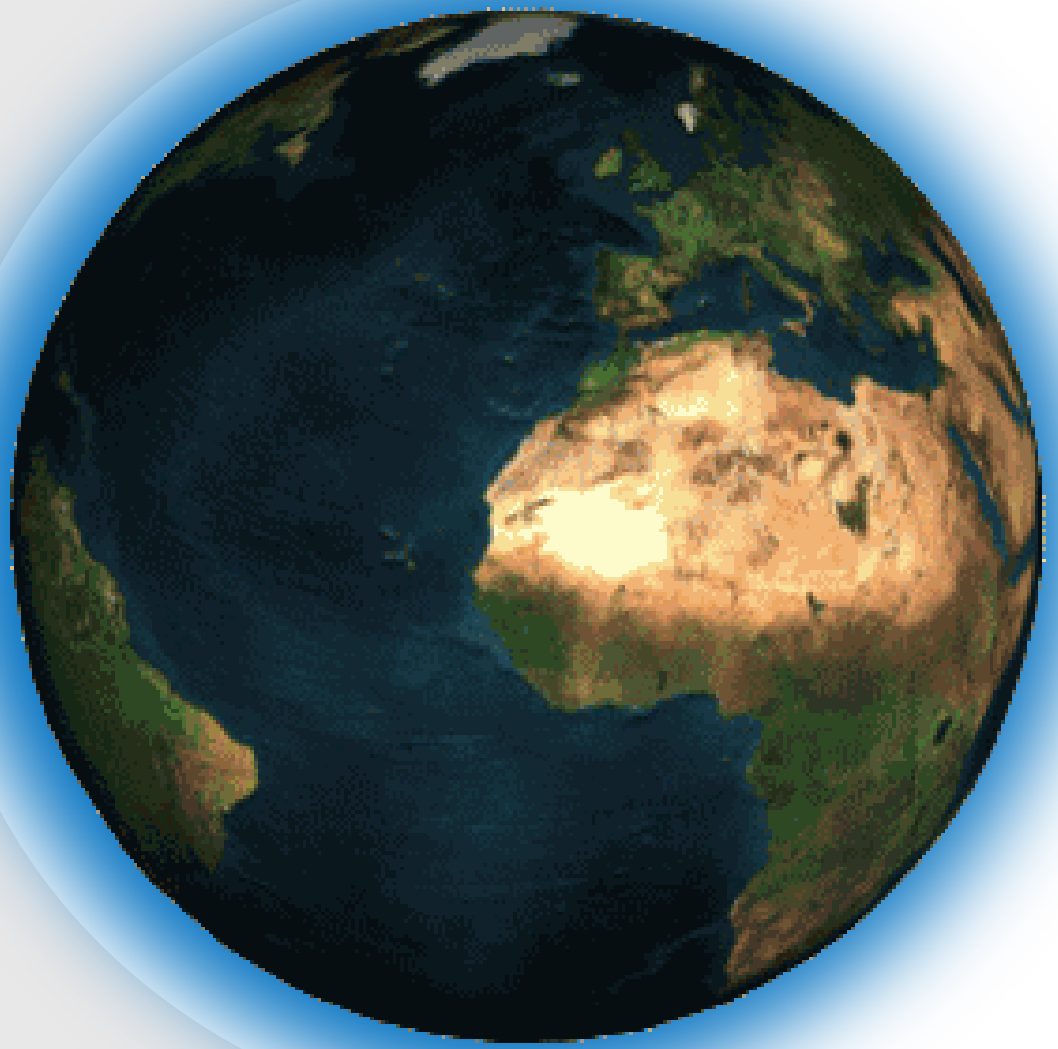


GATESAIRCONNECT VIRTUAL events

ADVANCES IN TELEVISION TRANSMISSION SOLUTIONS

MARTYN HORSPOOL
PRODUCT MANAGER –TV
MASON, OHIO, USA

ADVANCES IN TELEVISION TRANSMISSION SOLUTIONS

Todays Virtual Event Topics:

- Innovative High-Efficiency TV Transmitters
  - VHF & UHF, Air-Cooled Low Power to Liquid-Cooled High Power
- Intuitive HTML GUI's - Advanced Security
- Integrated Satellite Receivers
- Integrated IP Content Distribution

Future Virtual Events (not covered today):

- Flexible Low-Power TV Transmission Systems
- PMTX-1 Outdoor Transmitter and Applications Review
- Total Cost of Ownership - The Economics of Deploying High-Efficiency Transmitters

GATESAIR IN USA + ITALY

Bruce Swail

CEO – GatesAir

USA

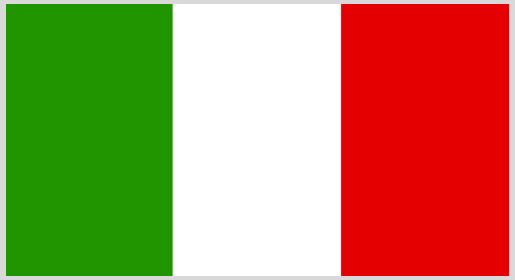
United to Create One Company

- GatesAir USA had a long-term relationship partnering with Onetastic Italy for low power products for over 5 years.
- Italy has some of the finest RF engineers in the World.
- Top-notch support from all major component suppliers.
- Onetastic customers very enthusiastic regarding product quality and design and GA ownership.
- Engineering from both sides are now integrated - The best technology from Europe is being combined the best technology from the USA

Luca Saleri

General Manager - GatesAir Srl.

Italy



TWO MANUFACTURING LOCATIONS

QUINCY, IL USA

BRESCIA, LOMBARDY, ITALY

PRODUCTS FOR TV TRANSMISSION

GatesAir USA – Quincy, IL

Digital TV	✓
Analog TV	✗
Translators / SFN GF	*partial*
Supports ATSC 3.0	✓
Liquid-Cooled UHF	✓
Liquid-Cooled VHF	✗

XTE Exciter

Maxiva™
UAXT / VAXT

Up to 200W

Maxiva™
UAXT / VAXT

Up to 600W

Maxiva™
Air-Cooled
UAXTE (UHF)
VAXTE (VHF)

1.2kW to 19.2kW

1.4kW to 93kW

Maxiva™
Liquid-Cooled
ULXTE (UHF)

GatesAir S.r.l. - Brescia (*Italy*)

Ultra-Compact

Up to 150W

Up to 400W

Up to 700W

UAX/VAX-OP Series

Up to 2,000W

LPTV Products – Virtual Event April 16/17th

Digital TV	✓
Analog TV	✓
Translators / SFN GF	✓
Supports ATSC 3.0	*(In dev.)*
Liquid-Cooled UHF	✓
Liquid-Cooled VHF	✓

UAX/VAX OP Series

Up to 7kW

ULX/VLX-OP Series

Up to 44kW

USA MANUFACTURED TV PRODUCTS

Maxiva Air-Cooled (XTE / UAXTE / VAXTE)

Maxiva Liquid-Cooled (ULXTE)

UHF Band IV/V

100mW 200W 600W 600W – 4.8kW Up to 19.2kW

Maxiva™ XTE

Maxiva™ UAXTE-1P/2P/3P-C

Maxiva™ UAXTE-10/50/100/150/200

Maxiva™ UAXTE

1.2kW 19.2kW 56.4kW >>150kW

Maxiva™ ULXTE

VHF Band I/III

100mW 400W 800W (DAB 1kW) 6.4kW 12.8kW 25.6kW/30kW

Maxiva™ XTE

Maxiva™ VAXTE-1P/2P

Maxiva™ VAXTE-100

Maxiva™ VAXTE

DVB T2

DVB

DAB DigitalAudioBroadcasting

ATSC 3.0

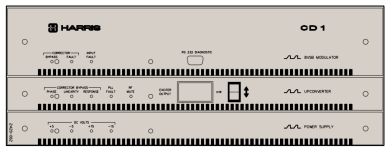
ATSC ADVANCED TELEVISION SYSTEMS COMMITTEE

ISDB-T

MAXIVA XTE EXCITER

5th Generation Digital TV Exciter

5 GENERATIONS OF DTV EXCITERS

CD-1	CD-1A	Apex	Apex M2X	Maxiva XTE
1996	1999	2003	2008	2016
Manual Correction	Linear Adaptive Manual Non-Linear	Linear + Non-Linear Adaptive	Linear + Non-Linear Adaptive	Improved Linear + Non-Linear Adaptive
4 RU	4 RU	3 RU	2RU	1RU
First ATSC Exciter	2nd generation	3rd Generation	4th Generation	5th Generation
			S/W defined Modulation	S/W defined Modulation
ATSC only	ATSC only	ATSC only, added ISDB-T	Most DTV modulations	Added ATSC-3.0
			 V1  V2	 *¼ the size, ~100x more processing power!*

All designed by Harris/GatesAIr

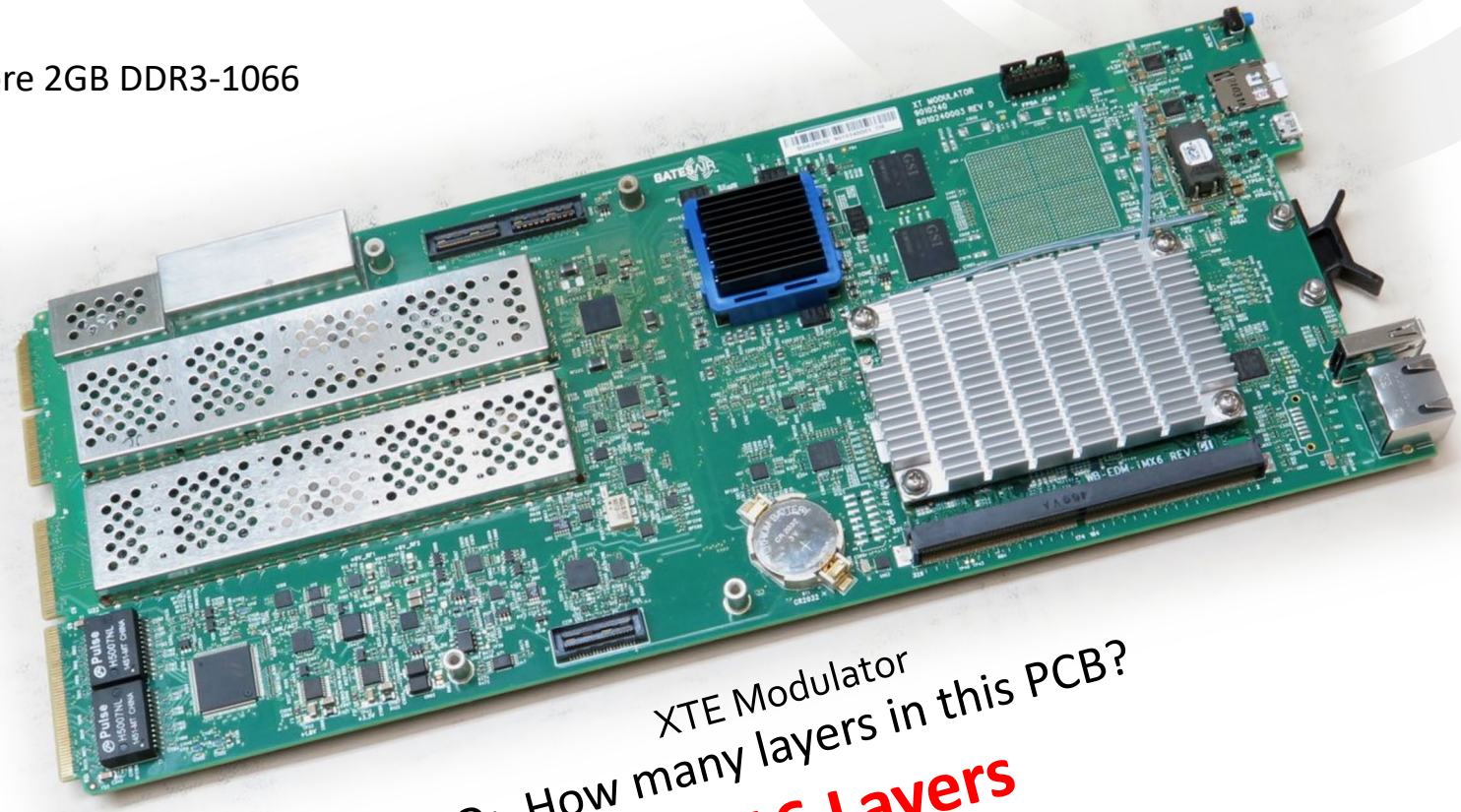
MAXIVA™ XTE EXCITER

- Basis of all USA GA TV & DAB Transmitters
- Compact 1RU, 19” size
- Flexibility of software-defined modulation
- Advanced digital signal processing power
- Dual-redundant Transport Stream inputs
- Seamless auto-switching with user-settable buffer length
- Supports TV digital modulations and DAB+
- Frequency agile – covers all TV/DAB bands
- Very fast turn-on time (< 35 seconds)
- Internal battery UPS (15 minutes for all low-level circuits)

XTE MODULATOR BOARD

- The heart of the XTE Exciter - Modern architecture and devices:

- **Micro-Processor**
  - Freescale 1.0 GHz Quad ARM Cortex™ A9 core 2GB DDR3-1066
  - uSD Card Slot – 32GB
- **FPGA 1**
  - Xilinx: 254,200 6-input LUTs,
  - 508,400 Flip flops
    - 28,620Mb Block RAM
    - 1540 DSP Blocks
  - External Memory
    - 2 – 128Mx16 DDR3L
    - 2 – 1Mx18 SBSRAM
- **FPGA 2**
  - Xilinx Kintex7
  - External Memory
    - 2 – 128Mx16 DDR3L

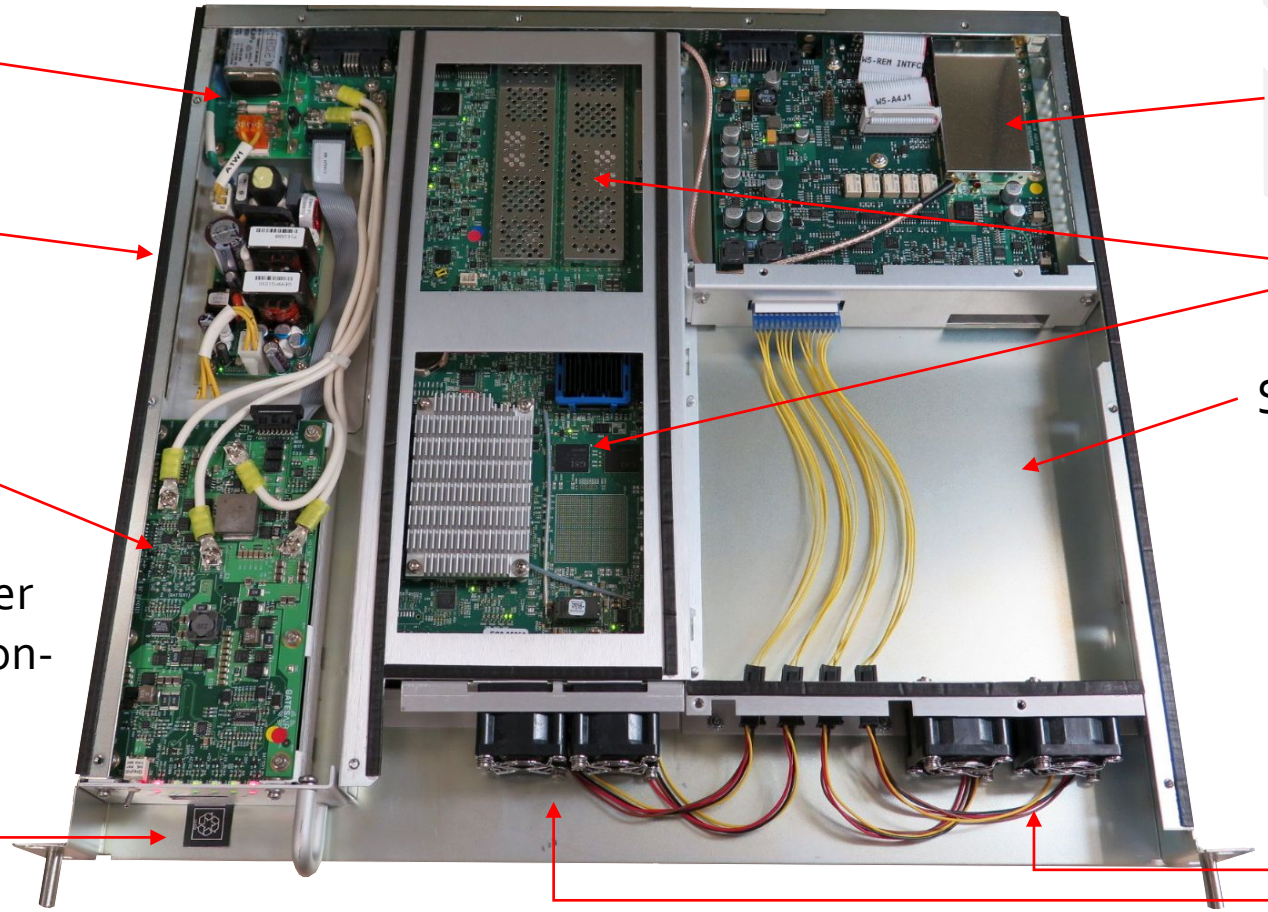


XTE Modulator

Q: How many layers in this PCB?

A: 16 Layers

INSIDE THE XTE EXCITER



AIR-COOLED TV TRANSMITTERS

USA Manufactured - Maxiva UAXTE / VAXTE Series

LOW POWER 2RU TRANSMITTERS

KEY FEATURES

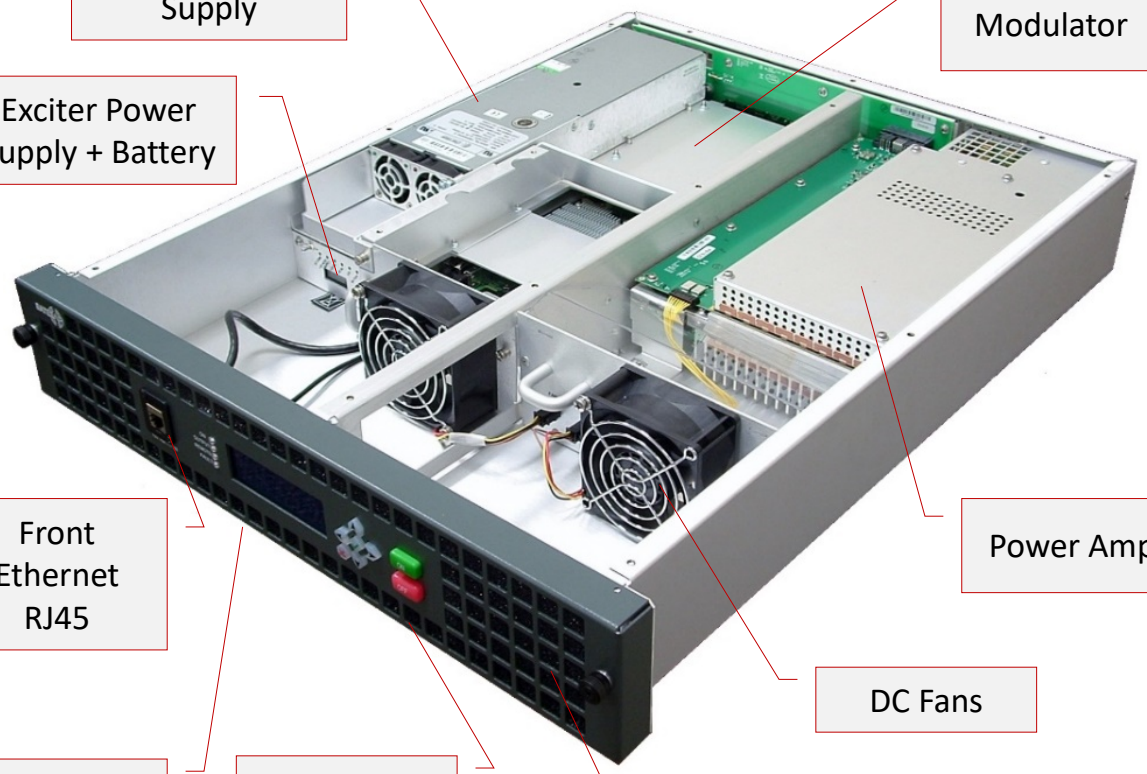
- 2 RU Chassis, XTE exciter + PA
- Stand-alone UHF/VHF transmitter
- Exciter/driver for high power air-cooled systems
- Battery UPS for Exciter
- Supports all digital modulations
- High-efficiency 100, 200W (Doherty)

PRODUCTS

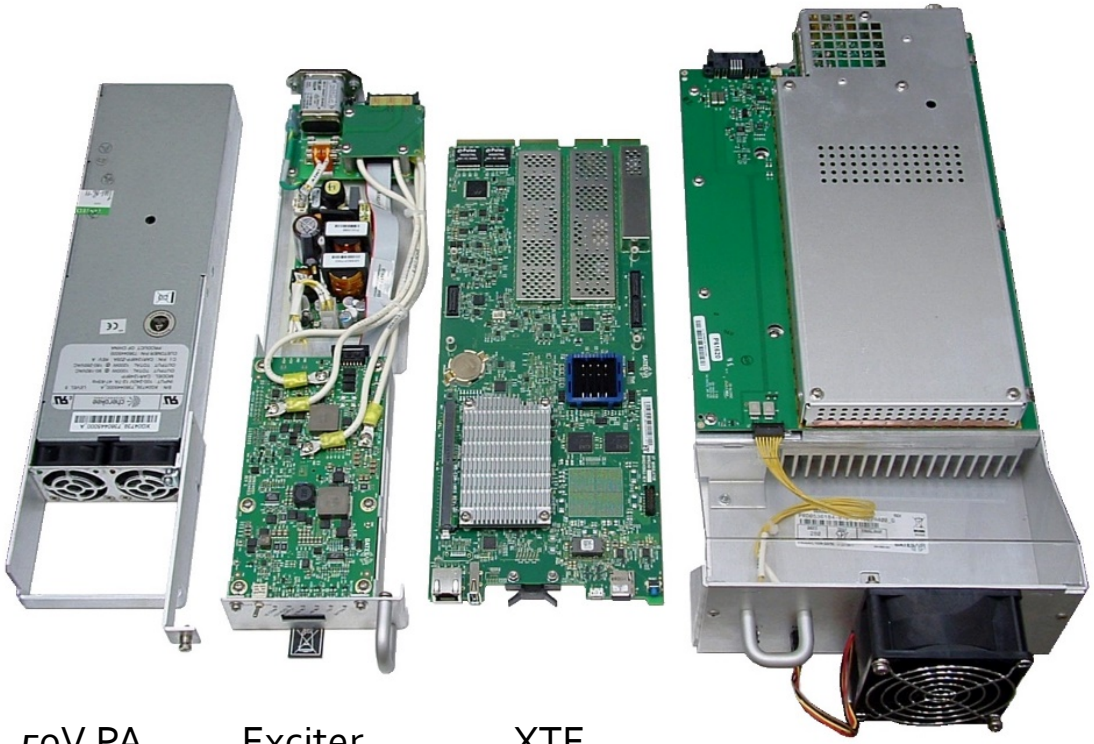
Band	Models	Power
UHF	UAXTE-10-C	16W
UHF	UAXTE-50-C	75W
UHF	UAXTE-100-C	150W
UHF	UAXTE-100HE-C	100W
UHF	UAXTE-200HE-C	200W
VHF	VAXTE-10-C	16W
VHF	VAXTE-100-C	150W
VHF	VAXTE-100HE-C	100W
VHF	VAXTE-200HE-C	200W

INSIDE THE 2 RU TX

Cover off



Major Sub-Assemblies



50V PA Power Supply | Exciter Power Supply | XTE Modulator Board | PA Assembly

LOW POWER 4RU TRANSMITTER

KEY FEATURES

- Rackmount 4 RU Chassis with XTE exciter + PA
- Stand-alone UHF/VHF transmitter
- Supports all digital modulations
- High-efficiency Doherty PA
- Battery UPS for Exciter section
- 1+1 Power Supply (option)

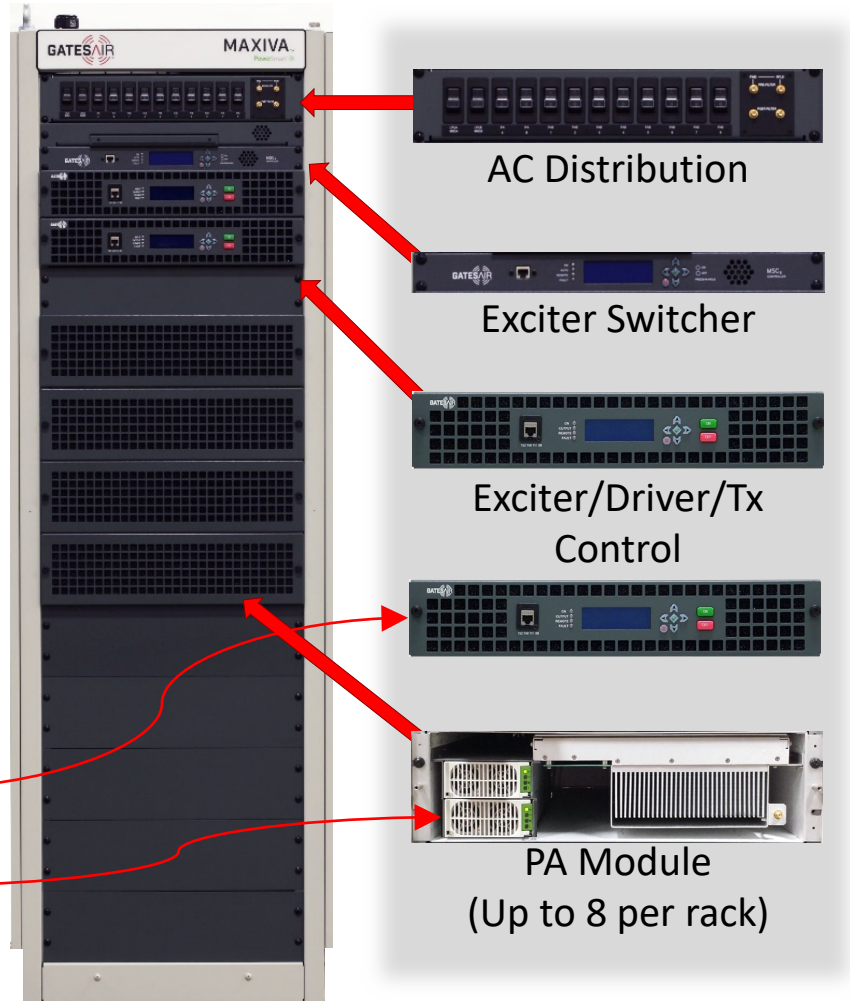
PRODUCTS

Band	Models	Power
UHF	UAXTE-1P-C	200W
UHF	UAXTE-2P-C	400W
UHF	UAXTE-3P-C	600W
VHF BIII	VAXTE-1P-C	400W
VHF BIII	VAXTE-2P-C	800W

HIGH POWER AIR-COOLED TRANSMITTERS - UAXTE

KEY FEATURES

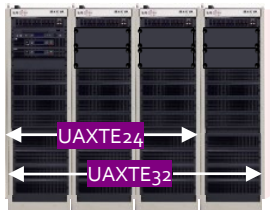
- UHF: 600W to 4.8kW per Rack
- VHF Band III: 800W to 6.4kW per Rack
- VHF Band I: 1.25kW to 10kW per rack
- High-efficiency using Doherty PA's
- Same Power Supplies as liquid-cooled
- Full control redundancy when dual drive selected
- Redundant power supply option per PA



PRODUCTS

Band	Models	Power
UHF	UAXTE-1	600W
UHF	UAXTE-2	1.2kW
UHF	UAXTE-8	4.8kW
UHF	Up to UAXTE-32	19.2kW
VHF BIII	VAXTE-1	800W
VHF BIII	VAXTE-2	1.6kW
VHF BIII	Up to VAXTE-32	25.6kW
VHF BI	VAXTE-1L	1.25kW
VHF BI	Up to VAXTE-24L	30kW

AIR-COOLED MODEL SUMMARY



UHF		VHF BAND III (HIGH)		VHF BAND I (LOW)	
Model	Power Pre-Filter (W)	Model	Power Pre-Filter (W)	Model	Power Pre-Filter (W)
UAXTE-10-C	16	VAXTE-10-C	15	VAXTE-10L	10
UAXTE-50-C	75				
UAXTE-100-C	150				
UAXTE-100HE	100	VAXTE-100-C	100	VAXTE-100L	100
UAXTE-200HE	200	VAXTE-200-C	200	VAXTE-200L	200
UAXTE-1P-C	200	VAXTE-1P-C	400		
UAXTE-2P-C	400	VAXTE-2P-C	800		
UAXTE-3P-C	600				
UAXTE-1-1P	200	VAXTE-1-1P	400		
UAXTE-1-2P	400				
UAXTE-1	600	VAXTE-1	800	VAXTE-1L	1,250
UAXTE-2	1,200	VAXTE-2	1,600	VAXTE-2L	2,500
UAXTE-3	1,800	VAXTE-3	2,400	VAXTE-3L	3,750
UAXTE-4	2,400	VAXTE-4	3,600	VAXTE-4L	5,000
UAXTE-6	3,600	VAXTE-6	4,800	VAXTE-6L	7,500
UAXTE-8	4,800	VAXTE-8	6,400	VAXTE-8L	10,000
UAXTE-12	7,200	VAXTE-12	9,600	VAXTE-12L	15,000
UAXTE-16	9,600	VAXTE-16	12,800	VAXTE-16L	20,000
UAXTE-24	14,400	VAXTE-24	19,200	VAXTE-24L	30,000
UAXTE-32	19,200	VAXTE-32	25,600		

LIQUID-COOLED UHF TRANSMITETRS

Maxiva ULX Series

GATESAIR

GATESAIRCONNECT VIRTUAL events

HIGH POWER TRANSMITTERS - ULXTE

KEY FEATURES

- 1.4kW to *150kW* Liquid-cooled PA's, power combiners and dividers
- Supports all digital modulations
- UHF High-efficiency using Doherty PA's

6.6kW

19.2kW

PRODUCTS

Band	Models	Power
UHF	UlXTE-2	1.4kW
UHF	ULXTE-4	2.8kW
UHF	ULXTE-6	4.3kW
UHF	ULXTE-8	5.5kW
UHF	ULXTE-10	6.6kW
UHF	ULXTE-12	8.5kW
UHF	ULXTE-16	10.8kW
UHF	ULXTE-150	92.8kW
UHF	ULXTED-240	

GATESAIR VIRTUAL events

ULXTE MODELS

- Models available for a wide range of power levels:
  - 1 rack to 5 racks
  - 2 PA's to 150 PA's
  - **Single tx: 1.4kW to 92kW**
  - **Dual transmitters to 150kW**

Maxiva ULXTE Model	Number of PAs	Number of Power Blocks	Total Number of Racks	Pre-Filter Average Power (Watts) Type E PAs
ULXTE-2	2	1	1	1,440
ULXTE-4	4			2,880
ULXTE-6	6			4,320
ULXTE-8	8			5,520
ULXTE-10	10			6,600
ULXTE-12	12	2		8,500
ULXTE-16	16			10,900
ULXTE-20	20			12,900
ULXTE-24	24	3		16,100
ULXTE-30	30			19,200
ULXTE-40	40	4	2	25,300
ULXTE-50	50	5		31,700
ULXTE-60	60	6		38,000
ULXTE-72	72	9	3	47,200
ULXTE-80	80	8		50,100
ULXTE-90	90	9		56,400
ULXTE-100	100	10	4	62,700
ULXTE-120	120	12		75,100
ULXTE-150	150	15	5	92,800
ULXTED-160 [1]	160	8x2	6 + 1 Control	100,300
ULXTED-180 [1]	180	9x2	6 + 1 Control	112,900
ULXTED-240 [1]	240	12x2	8 + 1 Control	150,200

ULXTE-120 INSTALL

- Location: Charlotte, NC
- Tx Power rating 75.1kW (ATSC-1.0 *and* ATSC 3.0)
- On-air at 67kW (customer TPO)
- Model: Maxiva ULXTE-120
- 4 Racks, 120 PA's, 120 PA Power Supplies

ULXTE-120 INSTALL

Photo's taken during the install

LIQUID-COOLED VHF TRANSMITTERS

Maxiva VLX-OP Series

GATESAIR®

GATESAIRCONNECT VIRTUAL events

MAXIVA VLX-OP SERIES

KEY FEATURES

- 1.8kW to 43kW Liquid-Cooled VHF
- High-efficiency ≥ 40% (inc. cooling)
- Integrated dual pumps in rack
- Compact external heat exchanger, 24V DC power
- Automatic coolant refilling, reduces on-site maintenance
- Each PA has 100% Power Supply Redundancy
- ATSC 1.0 (with 3.0 upgrade path), DVB-T, DVB-T2, ISDB-T & Analog supported
- DAB/DAB+ also supported

PRODUCTS

Band **	Models	Power
VHF BIII	VLX-OP-1800-R36	1.8kW
VHF BIII	VLX-OP-3600-R36	3.6kW
VHF BIII	VLX-OP-5400-R36	5.4kW
VHF BIII	VLX-OP-7200-R36	7.2kW
VHF BIII	VLX-OP-9000-R42	9.0kW
VHF BIII	VLX-OP-10800-R42	10.8kW
VHF BIII	VLX-OP-14400-R42	14.4kW
VHF BIII	VLX-OP-18000-R42	18kW
VHF BIII	VLX-OP-21600-R42	21.6kW
VHF BIII	VLX-OP-28800-R42	28.8kW
VHF BIII	VLX-OP-36000-R42	36kW
VHF BIII	VLX-OP-43200-R42	43.2kW

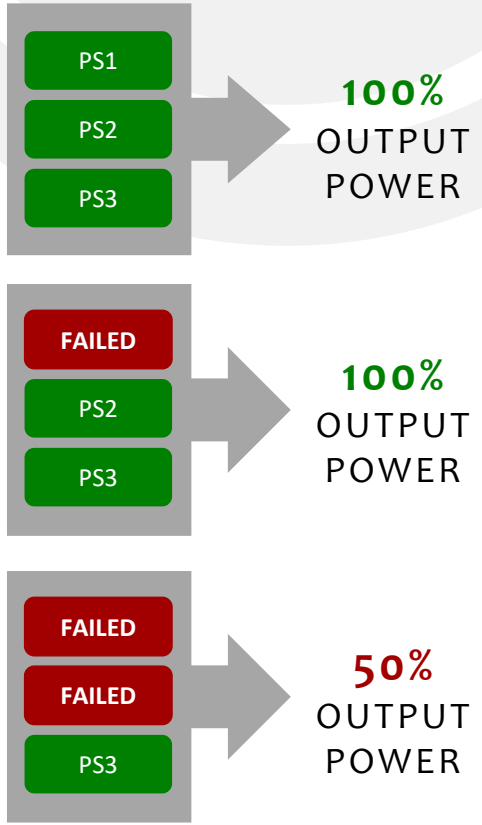
*** Band I (Low Band) also available*

PA POWER SUPPLY REDUNDANCY

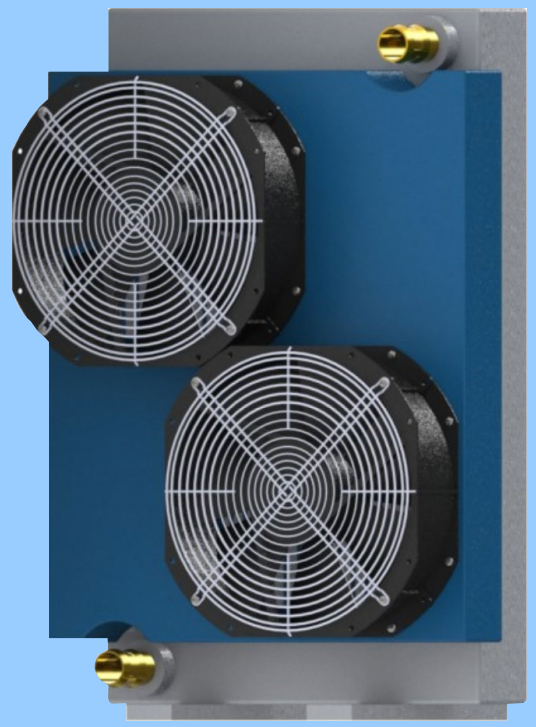
Liquid-cooled PA module with front cover removed

- Same Power supply as USA FAX/FLX:
  - GE Power CP2725 (2.725kW)
  - 450,000 hrs. MTBF
  - > 96% efficient
- Hot-swap, front access

2 of 3 High Redudancy Power Supply System



VLX-OP HEAT EXCHANGERS



Fans 24V DC
Speed-controlled

Programmable
auto-reversing to
clear debris

61 cm W x 80 cm H x 26 cm D
(24” W x 31.5” H x 10.2” D)

72 cm W x 96 cm H x 27 cm D
(28.3” W x 37.8” H x 10.6” D)

VLX-OP LIQUID-COOLING SYSTEM

Lower part of liquid-cooled
Tx Rack

Automatic Liquid Refilling System
(8 litres capacity)

VLX-OP LIQUID-COOLED (BAND III MODELS)

Model Digital	Model Analog	Power OFDM-TV	Power DAB	Power ATSC-1	Power Analog	# PA's	# Internal Pumps	# Heat Exchangers	Rack Info	RF Output Connector
VLX-OP-1800-R36	VLX-OP-AN-4000-R36	1,800W	1,900W	2,300W	4,000W	1	2	1	1 x 36RU	7/8"
VLX-OP-3600-R36	VLX-OP-AN-8000-R36	3,600W	3,800W	4,600W	8,000W	2	2	1	1 x 36RU	1-5/8"
VLX-OP-5400-R36	VLX-OP-AN-12000R36	5,400W	5,700W	6,900W	12,000W	3	2	1	1 x 36RU	1-5/8"
VLX-OP-7200-R36	VLX-OP-AN-16000R36	7,200W	7,600W	9,200W	16,000W	4	2	1	1 x 36RU	1-5/8"
VLX-OP-9000-R42	VLX-OP-AN-20000R42	9,000W	9,500W	11,500W	20,000W	5	2	1	1 x 42RU	3-1/8"
VLX-OP-10800-R42	VLX-OP-AN-24000R42	10,800W	11,400W	13,800W	24,000W	6	2	1	1 x 42RU	3-1/8"
VLX-OP-14400-R42	VLX-OP-AN-32000R42	14,400W	15,200W	18,400W	32,000W	8	2	2	1 x 42RU	3-1/8"
VLX-OP-18000-R42	VLX-OP-AN-40000R42	18,000W	19,000W	23,000W	40,000W	10	2	2	2 x 42RU	3-1/8"
VLX-OP-21600-R42	VLX-OP-AN-48000R42	21,600W	22,800W	27,600W	48,000W	12	2	2	2 x 42RU	3-1/8"
VLX-OP-28800-R42	VLX-OP-AN-64000R42	28,800W	30,400W	36,800W	64,000W	16	2 x 2	4	2 x 42RU	3-1/8"
VLX-OP-36000-R42	VLX-OP-AN-80000R42	36,000W	38,000W	46,000W	80,000W	20	2 x 2	4	4 x 42RU	4-1/2"
VLX-OP-43200-R42	VLX-OP-AN-96000R42	43,200W	45,600W	55,200W	96,000W	24	2 x 2	4	4 x 42RU	4-1/2"

VLX-OP LIQUID-COOLED (BAND I MODELS)

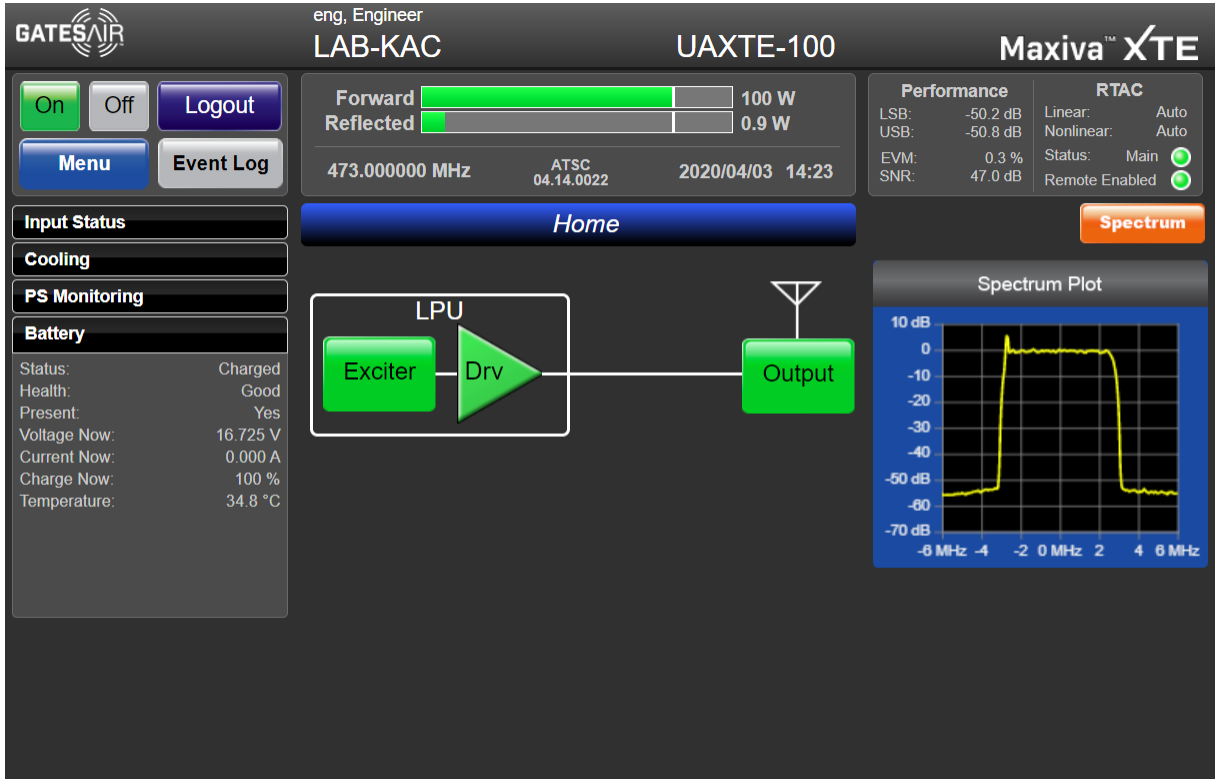
Model Digital	Model Analog	Power OFDM-TV	Power ATSC-1	Power Analog	# PA's	# Internal Pumps	# Heat Exchangers	Rack Info	RF Output Connector
VLX-OP-1500L36	VLX-OP-AN-3500L36	1,500W	2,000W	3,500W	1	2	1	1 x 36RU	7/8"
VLX-OP-3000L36	VLX-OP-AN-7000L36	3,000W	4,000W	7,000W	2	2	1	1 x 36RU	1-5/8"
VLX-OP-4500L36	VLX-OP-AN-10500L36	4,500W	6,000W	10,500W	3	2	1	1 x 36RU	1-5/8"
VLX-OP-6000L36	VLX-OP-AN-14000L36	6,000W	8,000W	14,000W	4	2	1	1 x 36RU	1-5/8"
VLX-OP-9000L42	VLX-OP-AN-21000L42	9,000W	12,000W	21,000W	6	2	1	1 x 42RU	1-5/8"
VLX-OP-12000L42	VLX-OP-AN-28000L42	12,000W	16,000W	28,000W	8	2	2	1 x 42RU	1-5/8"
VLX-OP-18000L42	VLX-OP-AN-42000L42	18,000W	24,000W	42,000W	12	2	2	2 x 42RU	3-1/8"
VLX-OP-24000L42	VLX-OP-AN-56000L42	24,000W	32,000W	56,000W	16	2 x 2	4	2 x 42RU	3-1/8"
VLX-OP-36000L42	VLX-OP-AN-84000L42	36,000W	48,000W	84,000W	24	2 x 2	4	4 x 42RU	3-1/8"

GATESAIRCONNECT VIRTUAL events

INTUITIVE GUI AND ENHANCED SECURITY

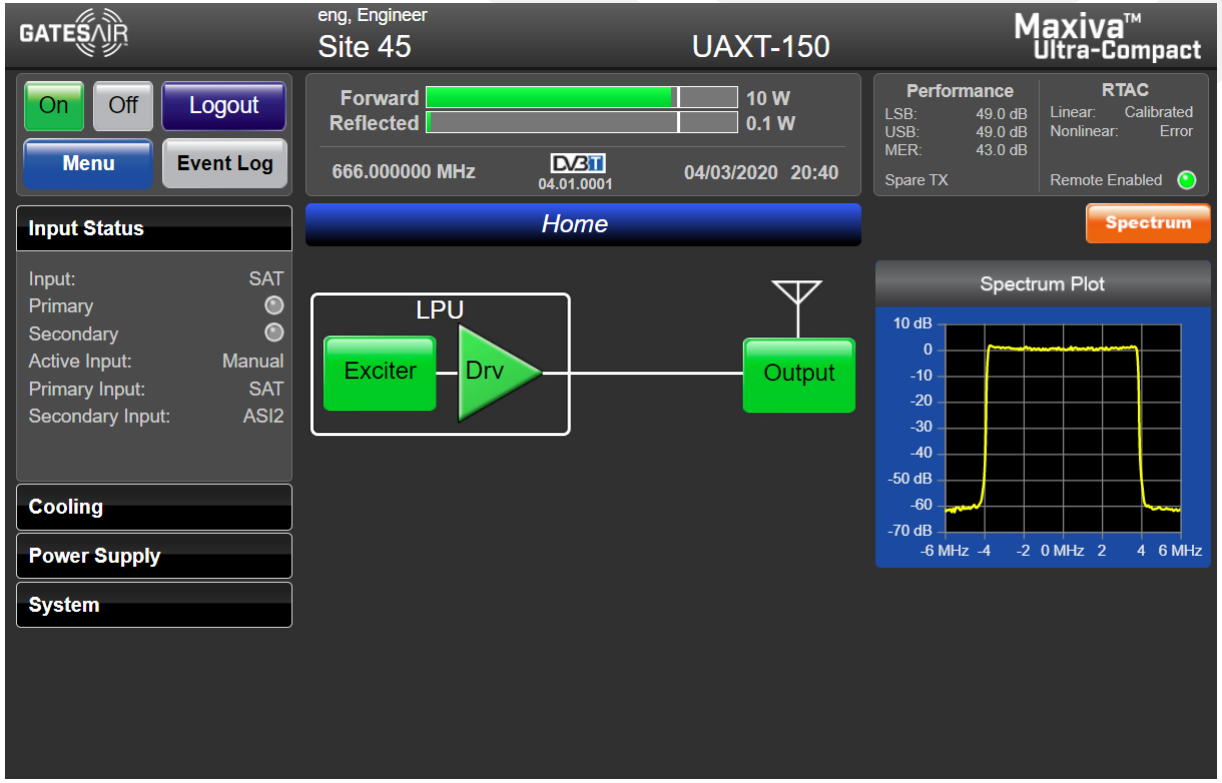
REMOTE GUI SCREENS

Captured April 3rd remotely:
Quincy Lab unit – UAXTE-100-C



Home Screen

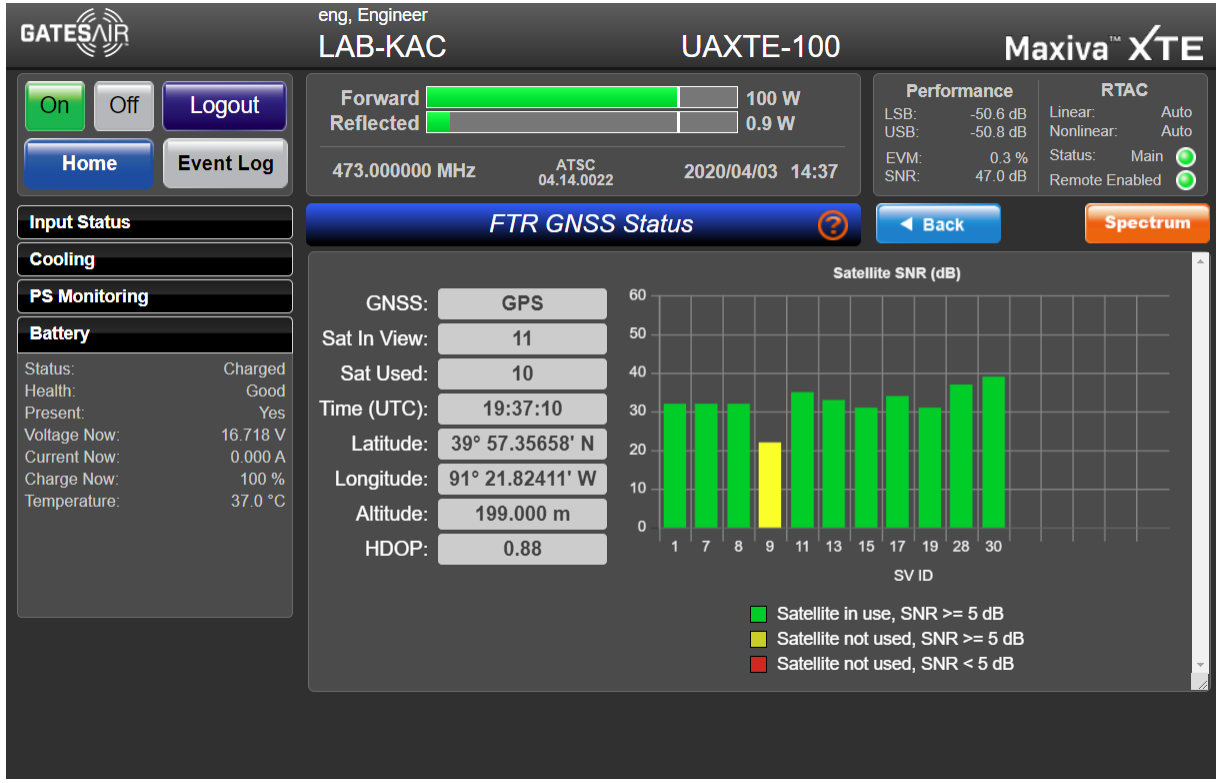
Captured April 3rd remotely:
Brescia (Italy) Lab unit – UAXT-150-UC



Home Screen

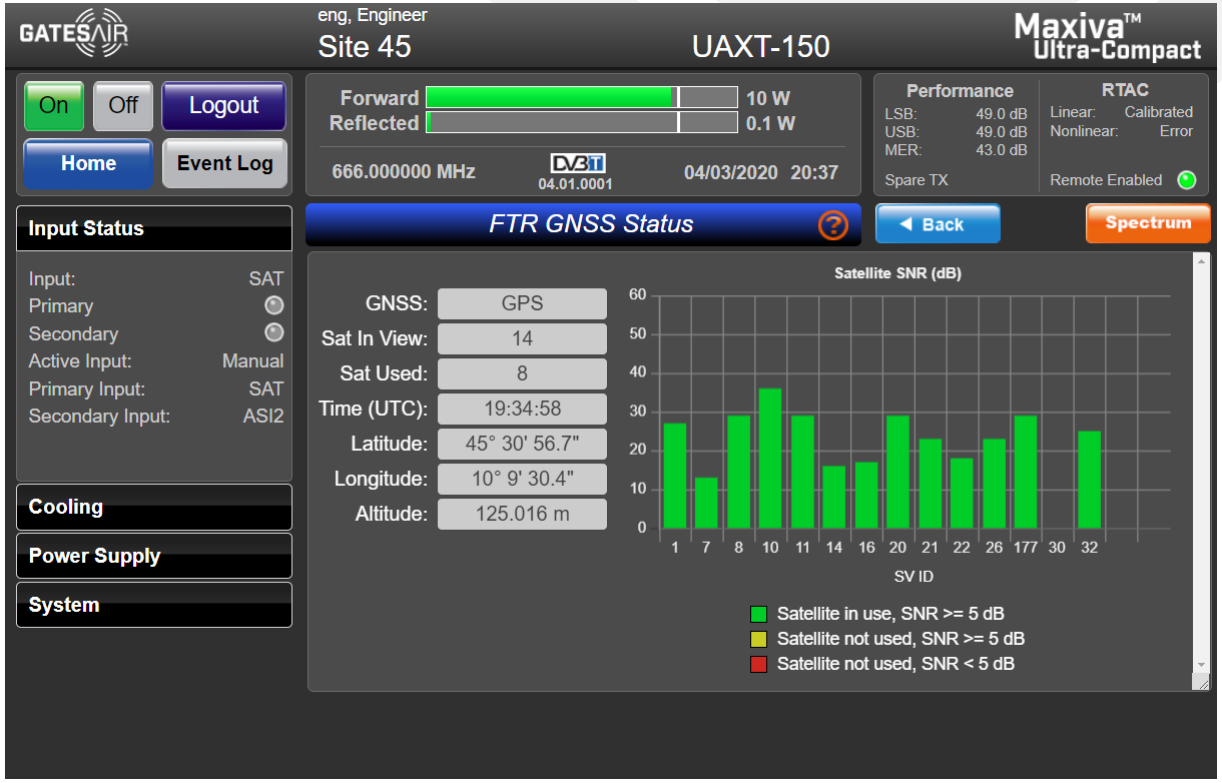
REMOTE GUI SCREENS

Captured April 3rd remotely:
Quincy Lab unit – UAXTE-100-C



FTR GNSS Status

Captured April 3rd remotely:
Brescia (Italy) Lab unit – UAXT-150-UC



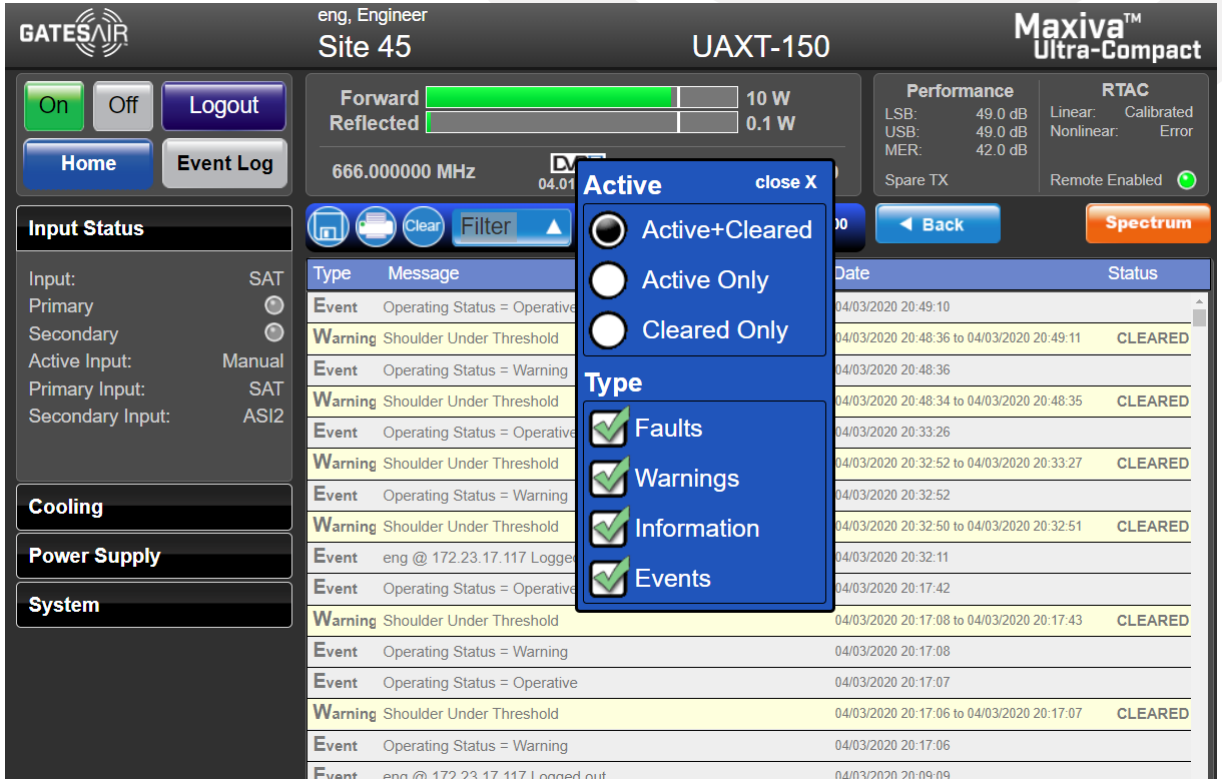
FTR GNSS Status

REMOTE GUI SCREENS

Captured April 3rd remotely:
Quincy Lab unit – UAXTE-100-C

Event Log

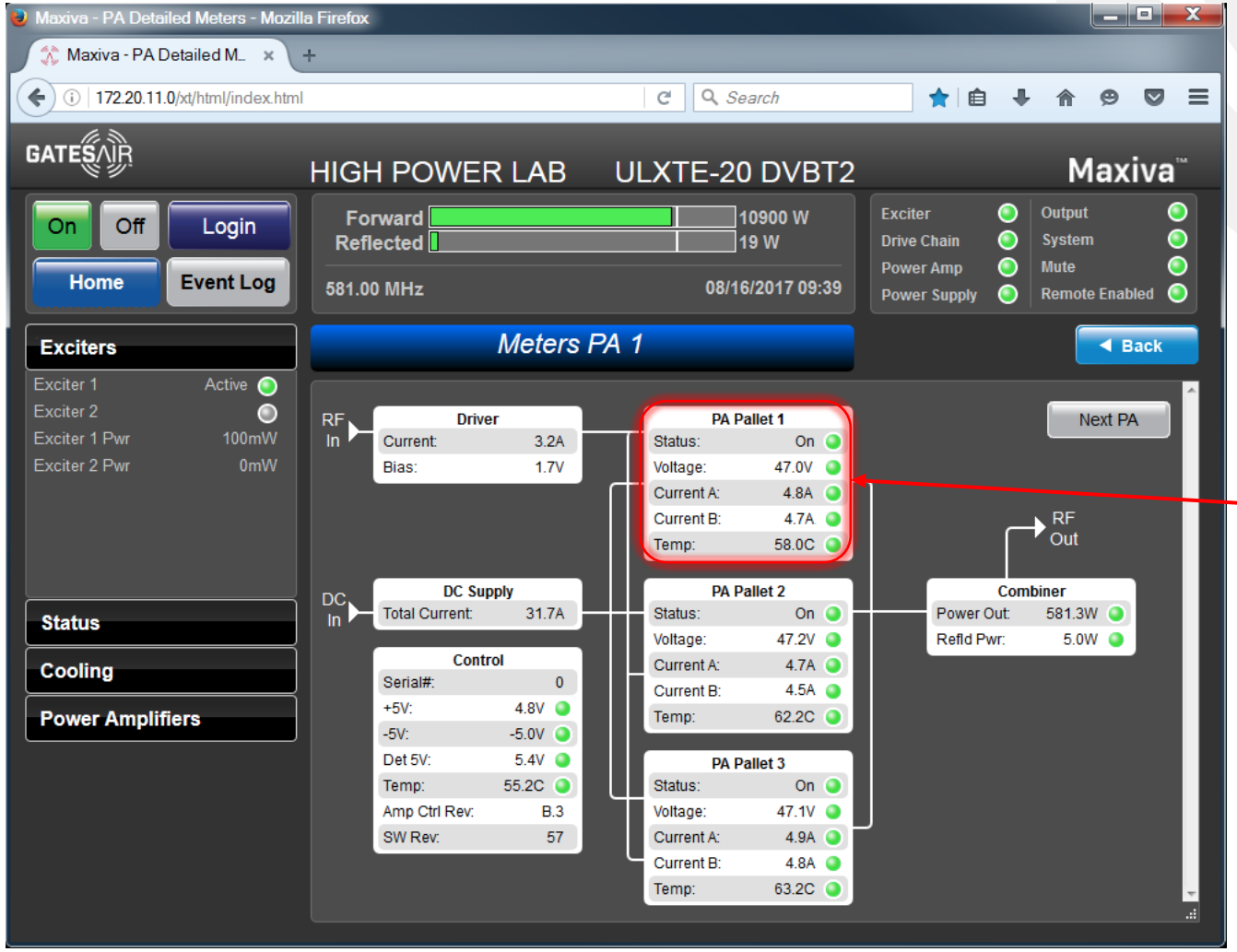
Captured April 3rd remotely:
Brescia (Italy) Lab unit – UAXT-150-UC



Event Log

REMOTE GUI SCREENS

ULXTE-20
Metering Screen
PA 1

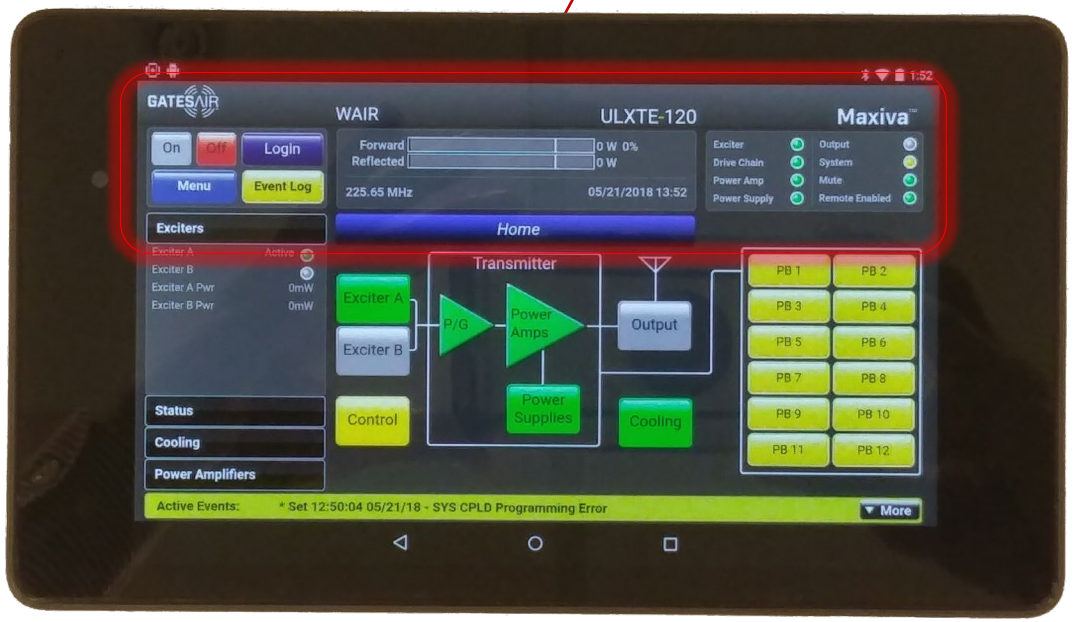


Note the ability to drill down to individual pallets:

- ✓ On/Off
- ✓ Voltage
- ✓ RF device currents
- ✓ Pallet temperature
- ✓ On this Tx that's 60 pallets

REMOTE GUI SCREENS

Header auto-fits mobile tablet and phone devices



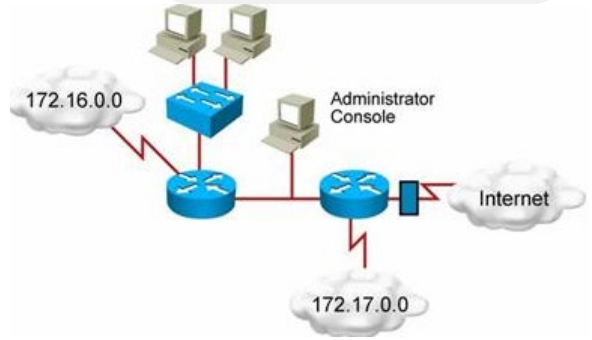
Android Tablet

iPhone 8

ADVANCED SECURITY FEATURES

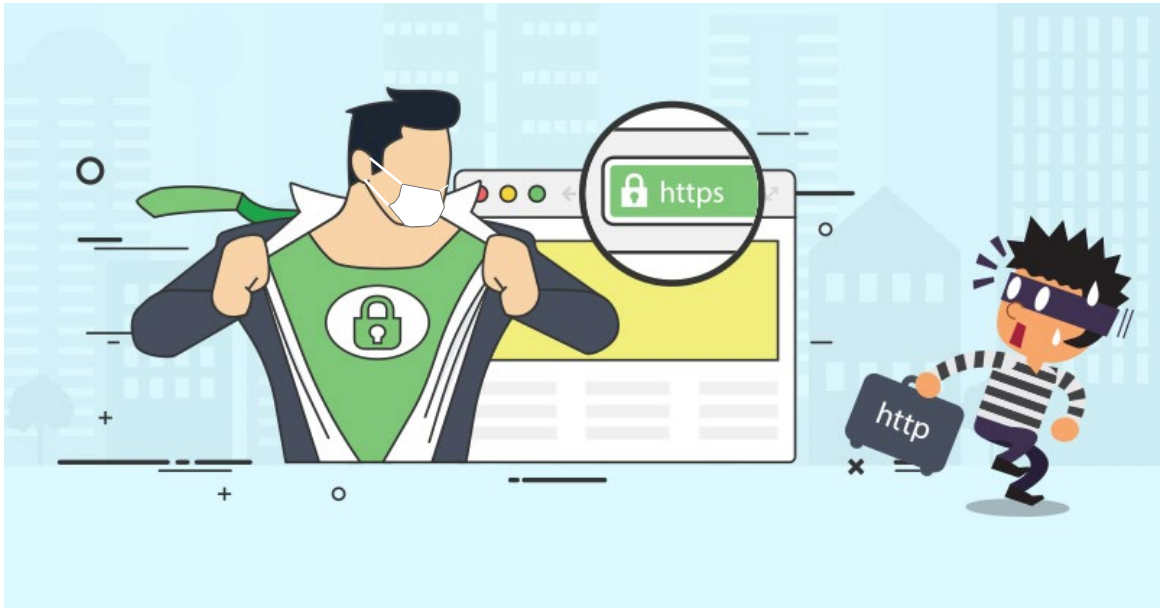
1. **E-mail with encrypted security features**
   - Transmitters will have the ability to send an e-mail to up to 5 addresses, when a fault and/or warning occurs. Encryption can be enabled/disabled. In addition, a fault log can be optionally attached.

2. **Access Control List**
   - Customers can limit who can access the transmitter management interfaces. The user adds the IP address and subnet mask of systems allowed to access the transmitter in the IP access table. Using the subnet mask, you can open it to every computer on a particular subnet, or limit it to single computer using a 255.255.255.255 subnet mask.



3. **LDAP** (***L**ightweight **D**irectory **A**ccess **P**rotocol*)
   - For those customers using LDAP on their network, we've added a LDAP client. If LDAP is enabled on the transmitter, login credentials are first sent to the configured LDAP server to be validated before allowing access to changing system parameters. If the LDAP server can't be reached, the credentials are checked against the local user accounts and access is allowed if they match.

ADVANCED SECURITY FEATURES



4. **Secure Web GUI**
   - A customer can now select if they want a secure web GUI. On our Linux based products, it's a typical **https** (*Hypertext Transfer Protocol Secure*) connection. All data and commands flow through the **https** connection.
5. **Secure Websockets**
   - On some products with less processing power, we are using a technology called "**Secure Websockets**". All commands and configuration data are passed through the encrypted socket. Non-critical data such as meter information are passed as before using unencrypted sockets.

GATESAIRCONNECT VIRTUAL events

INTEGRATED SATELLITE RECEIVER

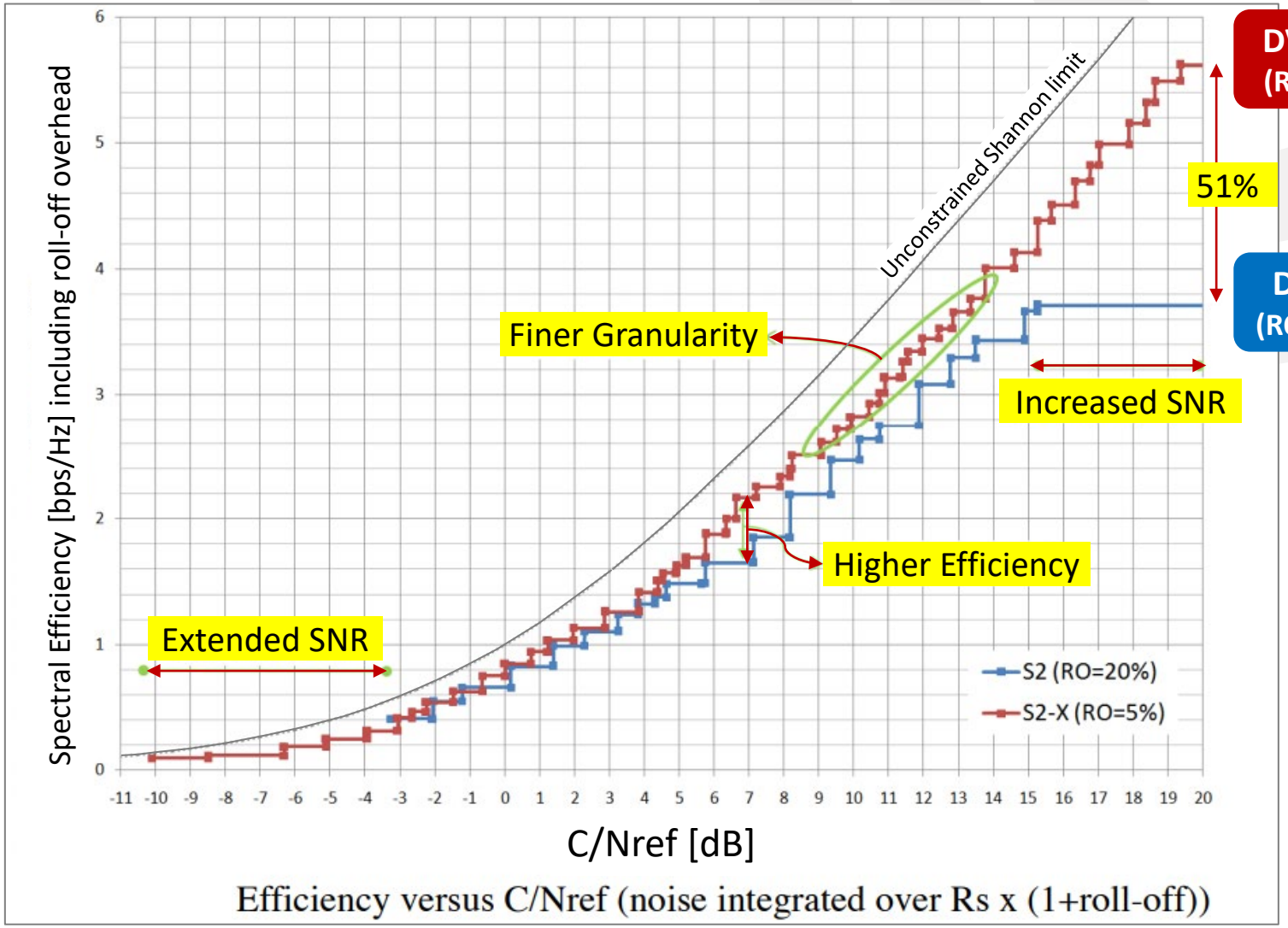
INTEGRATED DVB-SX2 RECEIVER

- Satellite distribution of TV programming is popular in many regions (DTH and Networks)
- DVB-S and later DVB-S2 used
- Today more demand for HEVC, UHD-TV and much higher throughput
- 51% efficiency gain with DVB-S2X achieved
- VL SNR MODCOD's added to improve operation in poor SNR:
  - Operates with signal-to-noise ratio values as low as -10dB

DVB-S MIGRATION TO DVB-S2X

DVB-S2X adds:

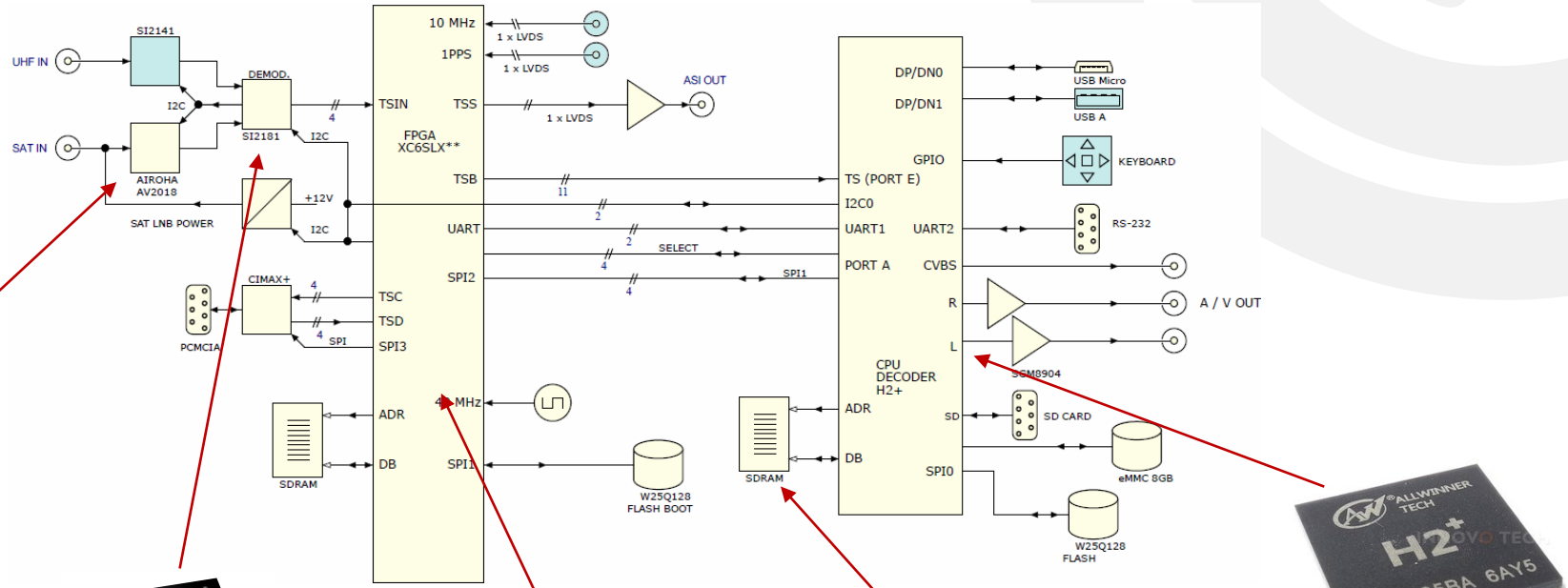
- More granularity of modulation and coding modes (116 MODCOD's)
- Smaller filter roll-off options of 5%, 10%, 20%, and 35%
- New constellation options for linear and non-linear channels
- Channel Bonding up to 3 channels
- More scrambling options
- Very low SNR operation supporting C/N of down to -10dB
- Super Frame option



Courtesy DVB.ORG Doc A172: https://dvb.org/wp-content/uploads/2019/12/a172_dvb-s2x_highlights_-_white_paper.pdf

GATESAIR DVB-S2X RECEIVER

Key Components



AIROHA

AV2018
Integrated silicon tuner for DVB-S2/S2X standard

SILICON LABS

Si2181-A5
DVB-S2/S2X
Demod

XILINX

XC6SLX Series
FPGA

winbond

SDRAM - DDR3 1Gb
(64M x 16) Parallel

Allwinner Technology

H2+
Quad Core Cortex A7
CPU / Decoder

DVB-S2/S2X RECEIVER SUMMARY SPECS

- Integrated DVB-S2-S2X tuner/demodulator with single input. (ETSI EN302 307-2 V1.1.1) - QPSK/8PSK, 8/16/32APSK.
- Decoding of single (MPEG-2/H.264/H.265) service
- CVBS* output (HD services must be appropriately scaled to SD, VBI signal management if present) for Analog Transmitter

HEVC

- Analog output with audio PID selection (audio 1, audio 2) and level output adjustment
- CAM support & management
- OTA management (for updating FW and for receiving specific commands that modify some parameters of the receiver)

150W Transmitter with Satellite Receiver option

*CVBS= Composite Video Baseband Signal

GATESAIRCONNECT VIRTUAL events

INTEGRATED IP CONTENT DISTRIBUTION

WHY INTEGRATED IP DISTRIBUTION?

- Why is TS over IP and Native IP Transport a good thing for Broadcasters?
  - Very cost-effective compared to traditional distribution methods, wire, fiber, microwave
  - High bandwidth available to handle all needs
  - Low-latency
  - Robust using modern error correction techniques
  - Good for point to point and point to multipoint distribution
  - Can be made secure - VPN
  - Adds flexibility and scalability

SMPTE ST 2022 STANDARDS

- SMPTE 2022 comprises 7 standards
- For Broadcast OTA Television, the first two are the most critical:

ST 2022-1:2007 - Forward Error Correction for Real-Time Video/Audio Transport Over IP Networks

ST 2022-2:2007 - Unidirectional Transport of Constant Bit Rate MPEG-2 Transport Streams on IP Networks

ST 2022-3:2010 - Unidirectional Transport of Variable Bit Rate MPEG-2 Transport Streams on IP Networks

ST 2022-4:2011 - Unidirectional Transport of Non-Piecewise Constant Variable Bit Rate MPEG-2 Streams on IP Networks

ST 2022-5:2013 - Forward Error Correction for Transport of High Bit Rate Media Signals over IP Networks (HBRMT)

ST 2022-6:2012 - Transport of High Bit Rate Media Signals over IP Networks (HBRMT)

ST 2022-7:2013 - Seamless Protection Switching of SMPTE ST 2022 IP Datagrams

ST 2022-8:2019 - SMPTE Standard - Professional Media Over Managed IP Networks: Timing of ST 2022-6 Streams in ST 2110-10 Systems

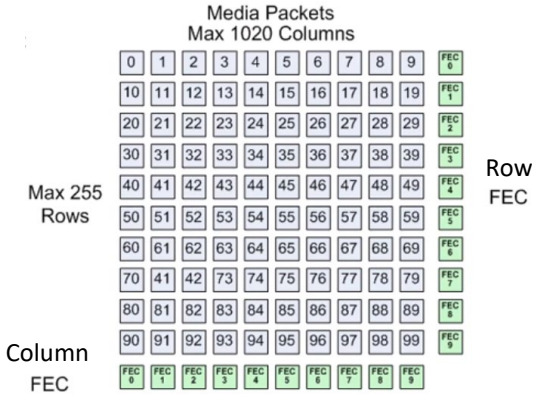
SMPTE 2022 is an important technology enabling the transition of broadcast systems to IP networking.[2]

SMPTE 2022-1 / 2

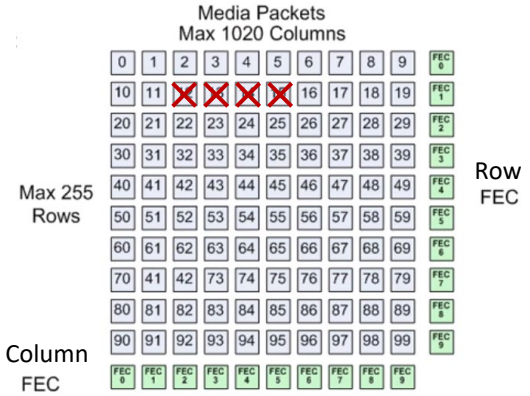
2022-1 "*Forward Error Correction for Real-Time Video/Audio Transport Over IP Networks*"

2022-2 "*Unidirectional Transport of Constant Bit Rate MPEG-2 Transport Streams on IP Networks*"

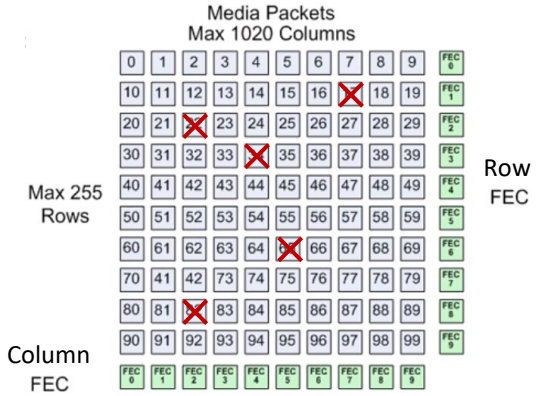
- MPEG-2 TS adaptation to IP / Ethernet networks
- Support for CBR, MPEG-2, H.264 & J2K Coded Video, with Audio and ancillary data
- Focused at low and mid bit rate contributon applications
- Robust configurable 2D FEC - well-suited for short duration outages
- Both of these standards are implemented into current GatesAir TV transmitter products



No loss



Burst losses handled by column FEC stream



Random losses handled by Row FEC stream

GA TV PRODUCTS WITH IP INPUTS

- Maxiva XTE Exciter
  - Used in all UAXTE, ULXTE, VAXTE transmitter systems
  - XTE incorporates two redundant IP Transport Inputs
  - Each input can be used for:
  - **TSoIP** (or ASI over IP) - Encapsulates the native Transport Stream into IP packets.
  - **Native IP** – ATSC 3.0 is based on a native IP transport layer and utilizes the DASH delivery protocol for OTA channels. DASH allows broadcasters to feed both the broadcast OTA delivery chain using ROUTE (Real-time Object delivery over Unidirectional Transport) for transmission over an IP network, and the OTT delivery chain using the HTTP adaptive streaming format

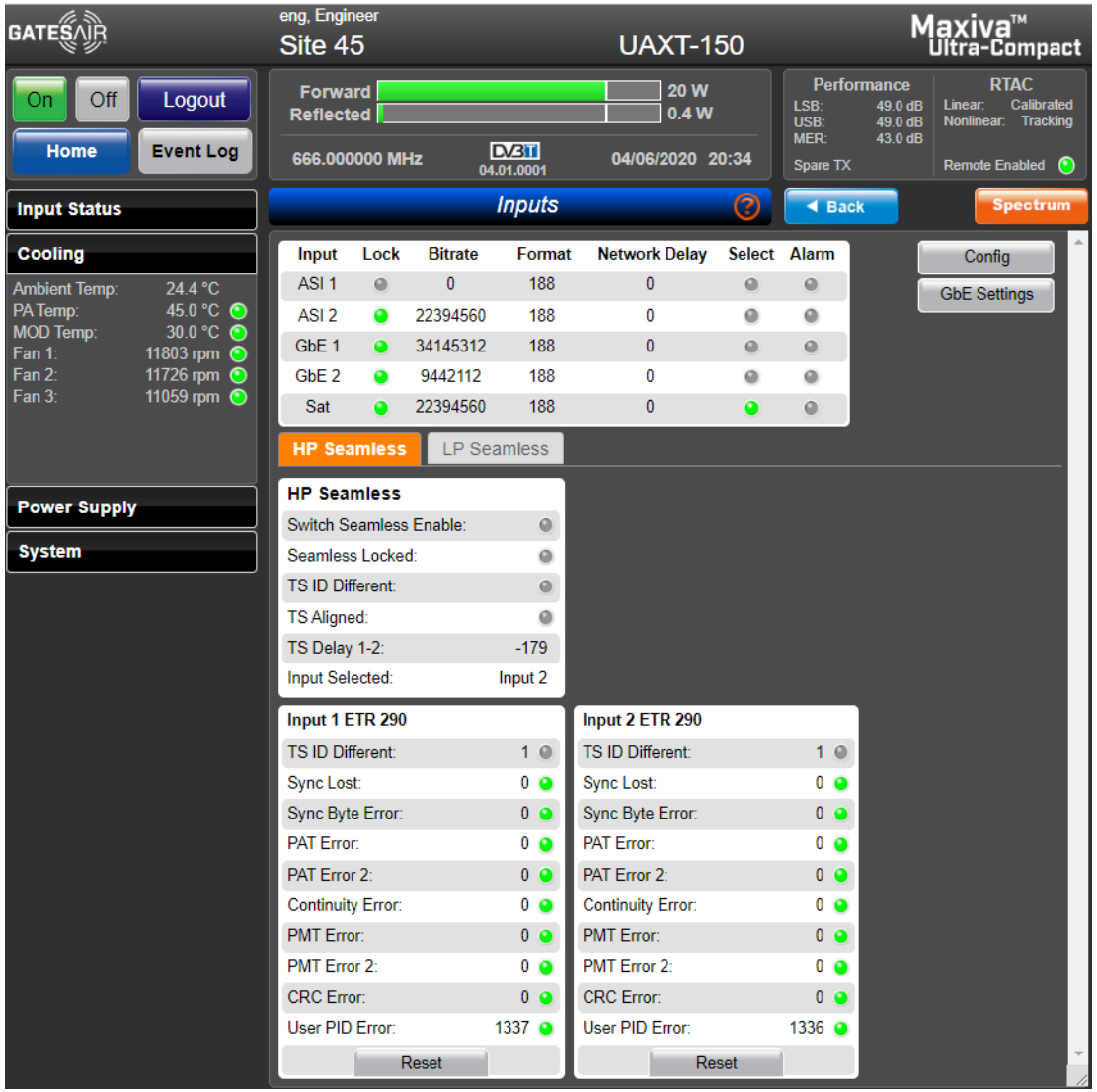
- Maxiva UltraCompact Series
  - Used in UltraCompact, UAX-OP, VAX-OP, UAX-OP and ULX-OP Transmitter systems
  - XTE incorporates two redundant IP Transport Inputs
  - Each input can be used for:
  - **TSoIP / a.k.a. GBE** (or ASI over IP) - Encapsulates the native Transport Stream into IP packets.

GA TV PRODUCTS WITH IP INPUTS

XTE Exciter (Rear)

UltraCompact Exciter/Driver

GUI SCREENS FROM UAXT-150 TRANSMITTER



THANKS FOR WATCHING
QUESTIONS?

More Upcoming Virtual Events: https://go.gatesair.com/virtual-events.html

Martyn Horspool
Product Manager, TV Transmission
martyn.horspool@gatesair.com

GATESAIR

GATESAIR CONNECT VIRTUAL events