GRANITE SERIES

PRODUCT CATALOG

MEDIUM HIGH POWER AIR COOLED SOLID STATE UHF TV TRANSMITTER

BROADBAND

REDUNDANT POWER SUPPLIES

AIR COOLED

10KW IN A SINGLE CABINET

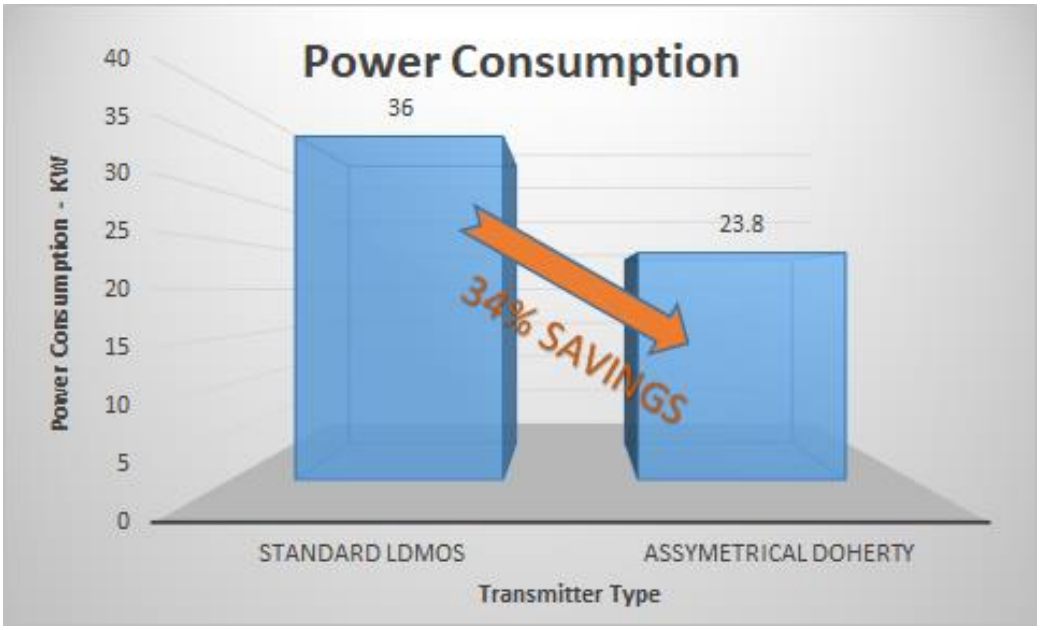
The **Granite Series** – Like a rock

Introduction

The Anywave ***GRANITE*** series of Air Cooled UHF TV transmitters provides the broadcaster with the latest state-of-the-art digital transmitter design. The ***GRANITE*** series delivers the highest levels of performance and reliability without costing you extra. The power capability of these forced air cooled Solid State (50V LDMOS technology) transmitters range from 1.3kW ATSC (1.1kW OFDM) to 10.0kW ATSC (8.8kW OFDM). They operate across all modulation standards including DVB-T/H, DVB-T, DVB-T2, ATSC, ATSC3.0, ISDB-T and DTMB. The ***GRANITE*** series incorporates the powerful correction capabilities of the ACT 5X+ or 9X digital exciter platforms.

Key Facts

- ✓ Multi-standard capability: DVB-T/H, DVB-T, DVB-T2, ATSC, ATSC3.0, ISDB-T and DTMB
- ✓ Transmitter efficiency up to 45% (amplifier efficiency > 50%)
- ✓ Implements latest state-of-the-art Asymmetrical Broadband Doherty Technology
- ✓ 8 x BLF888E (ultra high efficiency, Broadband) transistors provide power densities of 1.3kW (ATSC) per amplifier
- ✓ Modular for better reliability and ease of maintenance
- ✓ Optitune™ technology automatically optimizes performance and efficiency at any power level
- ✓ Redundant hot swappable Power Supply Units
- ✓ Simple and Efficient Front-to-Back Air Cooling with fan speed control and Graphene Enhanced Thermal Management technologies
- ✓ LCD Touch Screen Control System
- ✓ Remote monitoring and control via Web Browser and SNMP



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General Overview

The MHPTV transmitter is easily configured to operate as a standard transmitter or as an RF translator. Innovative DDRF™ (Direct Digital RF) broadband automatic balancing technology achieves near perfect RF performance with shoulder levels exceeding -60 dB and out of band spurious also greater than -60 dB, all based on an ultra low noise floor.

Independent feedback for adaptive SWR optimization function maximizes emission signal quality after the transmitter band-pass filter (BPF). The system level AGC (Automatic Gain Control) function includes both RF and DC AGC feedback obtaining a stable output power and performance.

The transmitter includes a digital ultra-wideband phase noise processing technology that automatically detects and compensates phase noise to achieve unparalleled performance.

The front panel of the transmitter includes a user friendly graphical display for control and status monitoring including a real time measurement and display of the shoulder levels and SNR of the transmitted signal. This control interface provides a quick guide to the operation of the entire transmitter including a real-time temperature display, an over temperature alarm, and the individual voltage and current readings of all the amplifier transistors.

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1,300W ATSC
1,100W OFDM

2,600W ATSC
2,200W OFDM

The **Granite Series** – Like a rock

3,800W ATSC
3,300W OFDM

5,000W ATSC
4,500W OFDM

6,000W ATSC
5,400W OFDM

Granite is a coarse-grained, quartz and feldspar-bearing igneous rock that is made up entirely of crystals. It forms from the slow crystallization of Magma* below the Earth's surface.

The Granite Series, - built to last.

* Magma is Anywave's new series of liquid cooled transmitters

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The **Granite Series** has the highest power density for any high power air cooled transmitter today. Up to 10kW ATSC output with unparalleled performance in a single cabinet, provides a true alternative to a liquid cooled system.

7,500W ATSC	10,000W ATSC
6,500W OFDM	8,600W OFDM

The **Granite Series**
– Like a rock

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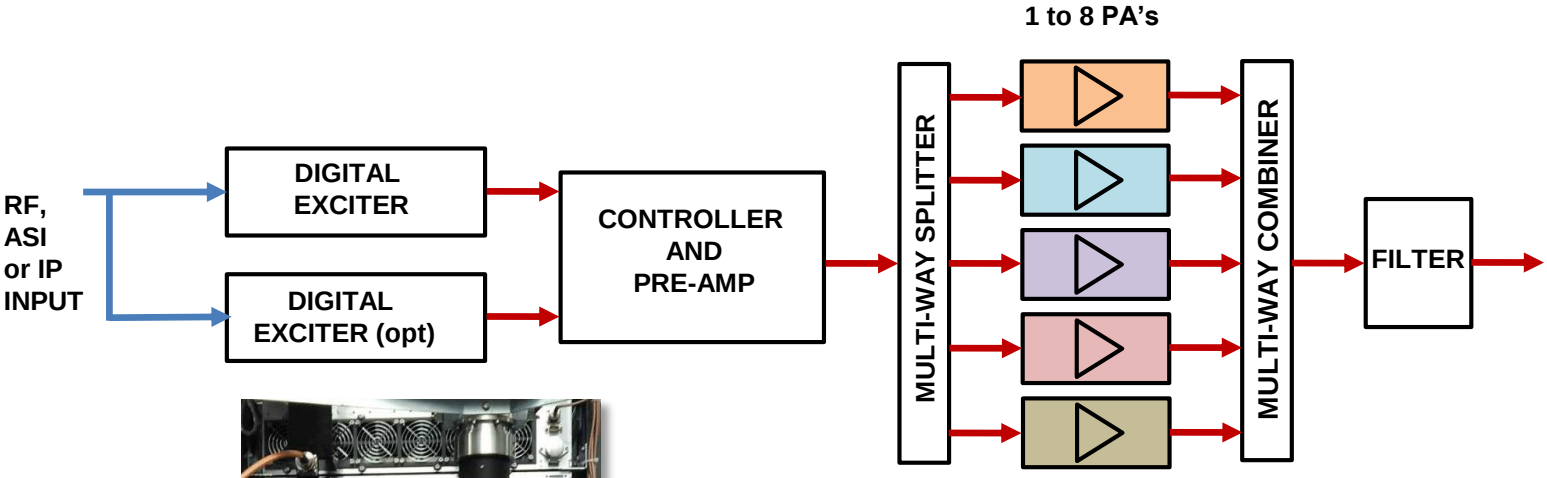
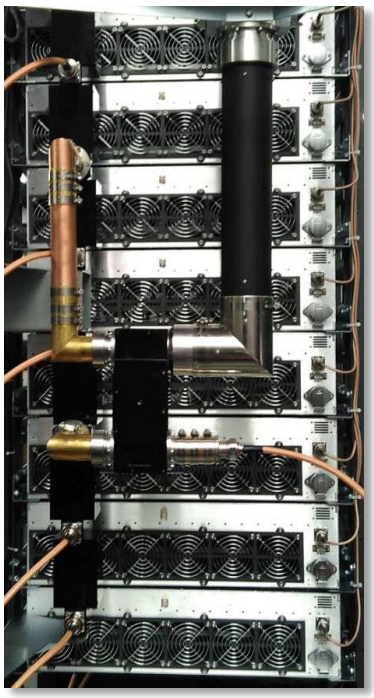
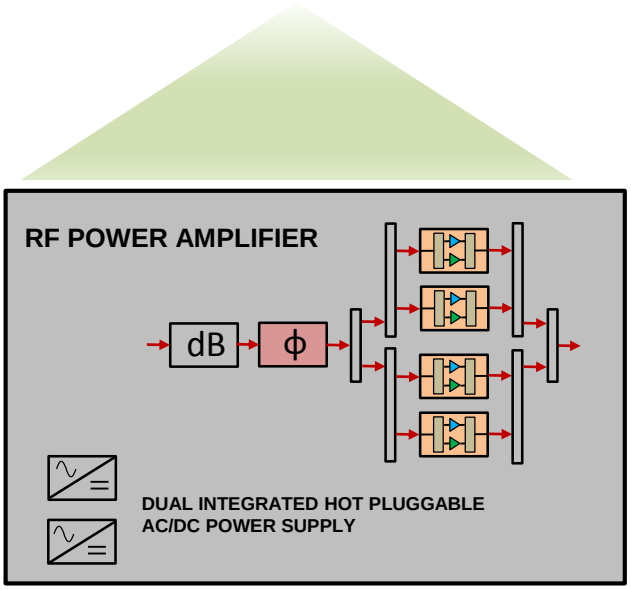
Transmitter Block Diagram







Highest Power Density

- 8 x BLF888E (ultra high efficiency, Broadband) transistors per PA delivers highest power density available today
- 8 PAs in a single rack provides 10kW air cooled TX with smallest footprint available today

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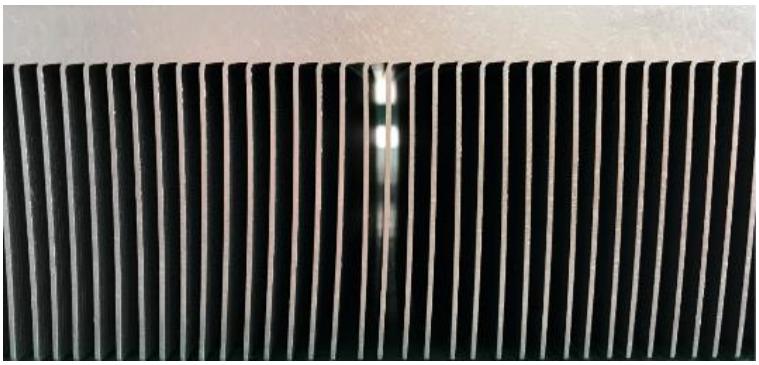
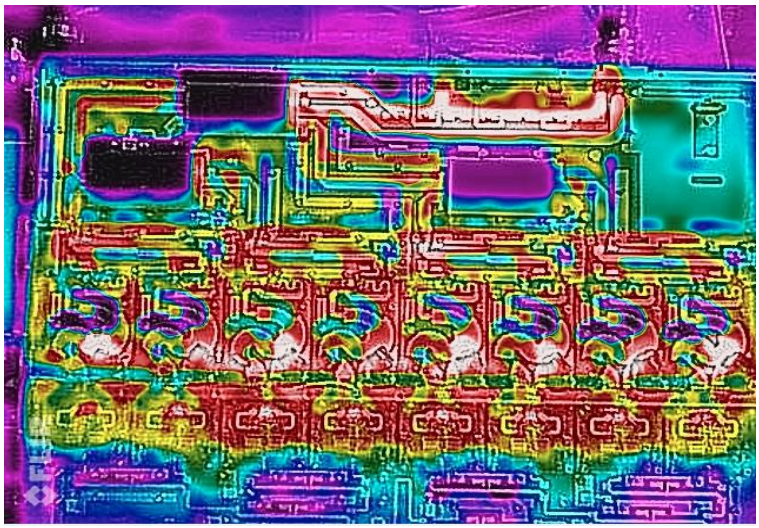
Superior PA Design





- Dual hot-swappable, easily replaceable high-capacity power supplies
- Individual variable speed control for each fan to user configurable target temperature
- Oversized single-piece heat-sink provides even heat distribution and enhanced heat transfer
- Eliminates critical hot-spots…designed to last

Less wasted heat equals lower operating costs

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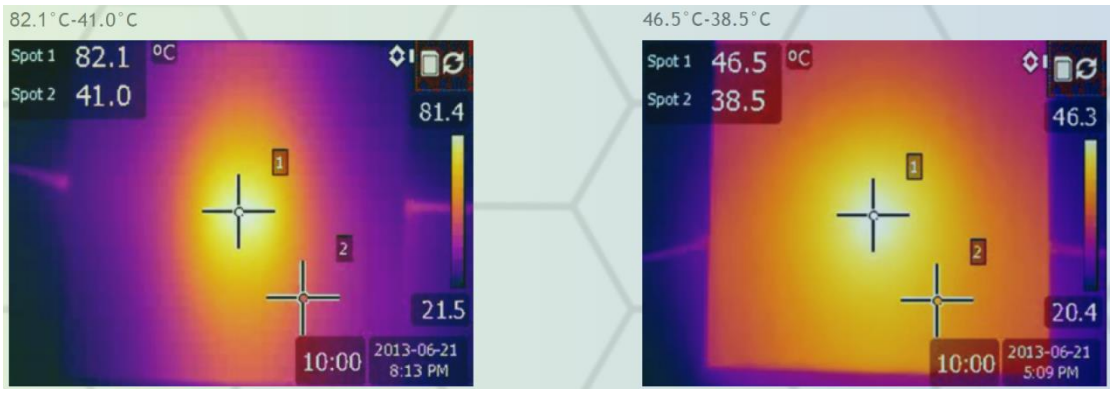
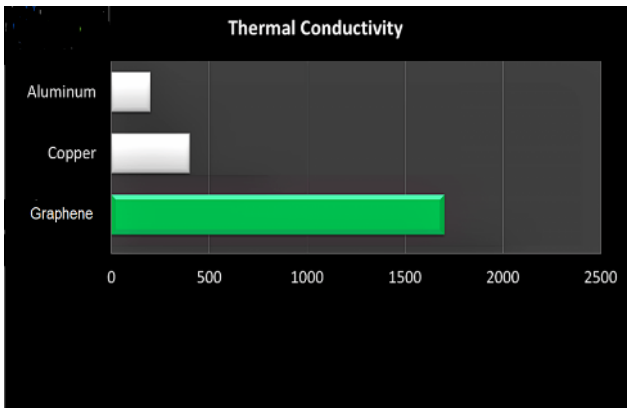
Graphene Enhanced Thermal Management Technology



Without Graphene

With Graphene



- Graphene's heat conductivity is 4 times better than copper and 8 times better than aluminum
- Cooler operation means better performance, higher reliability, and longer life

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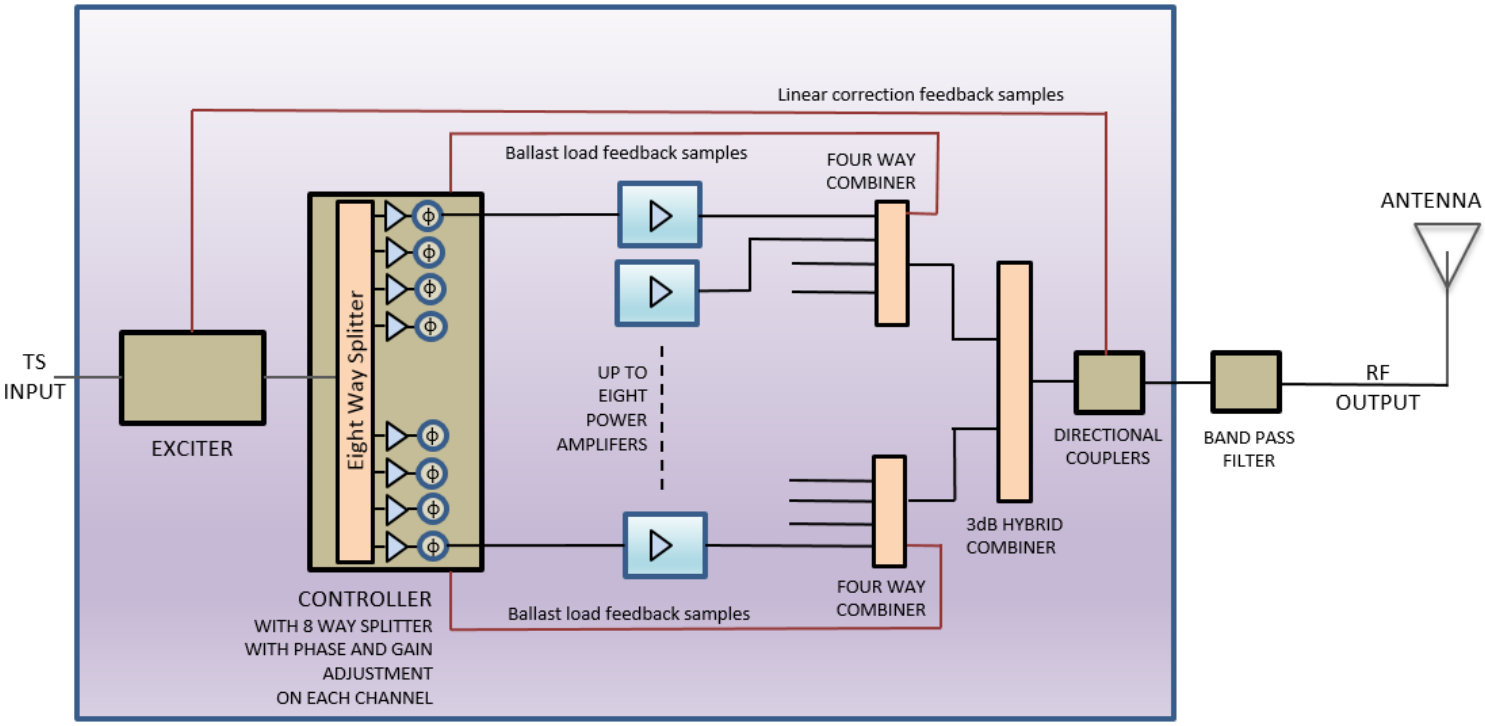
Optitune™ Technology



- Self-calibrating, automatic, adaptive phase and gain matching of all PA modules (up to 8 amplifier modules per rack)

- Automatically balances entire system in gain and phase within 10 minutes to achieve maximum output power (minimizes combiner losses) and optimal operating efficiency (minimizes operating costs)

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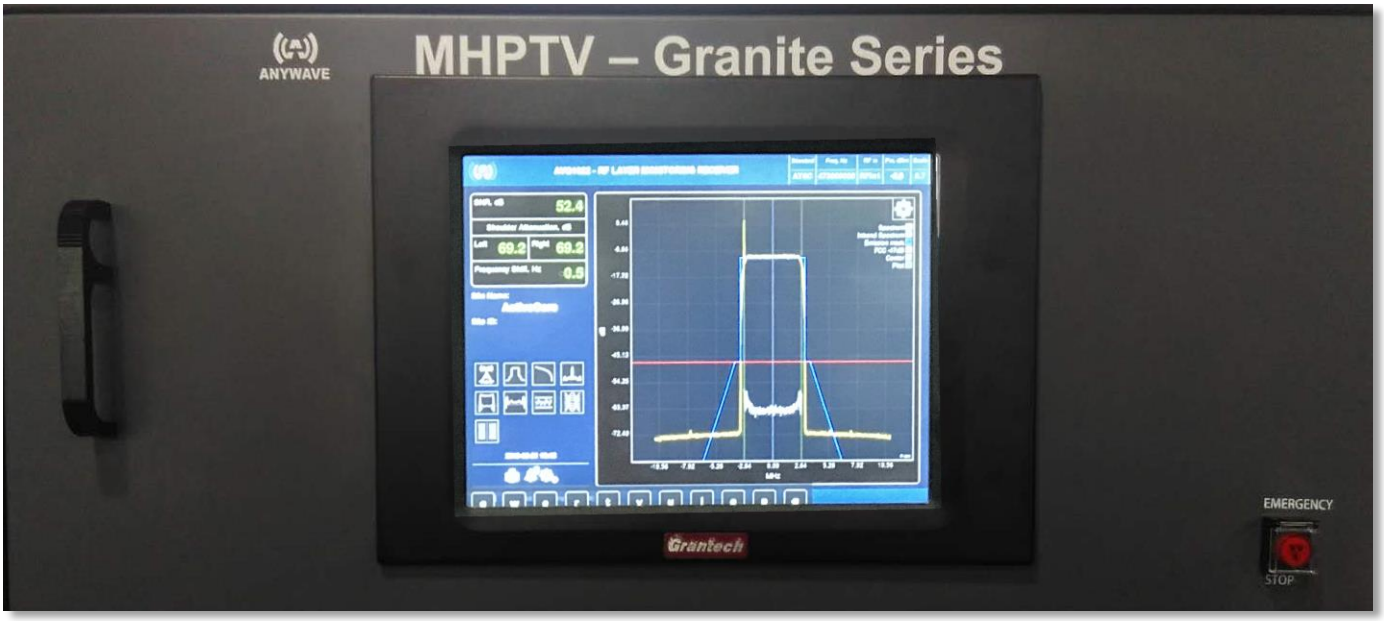
AVQ Monitoring



- Real time signal quality monitoring including spectrum, shoulders, constellation diagram, eye diagram, MER, frequency response, impulse response, group delay, CCDF, etc.
- Built-in performance monitoring eliminates the need for costly test equipment
- Upgradable to ATSC3.0

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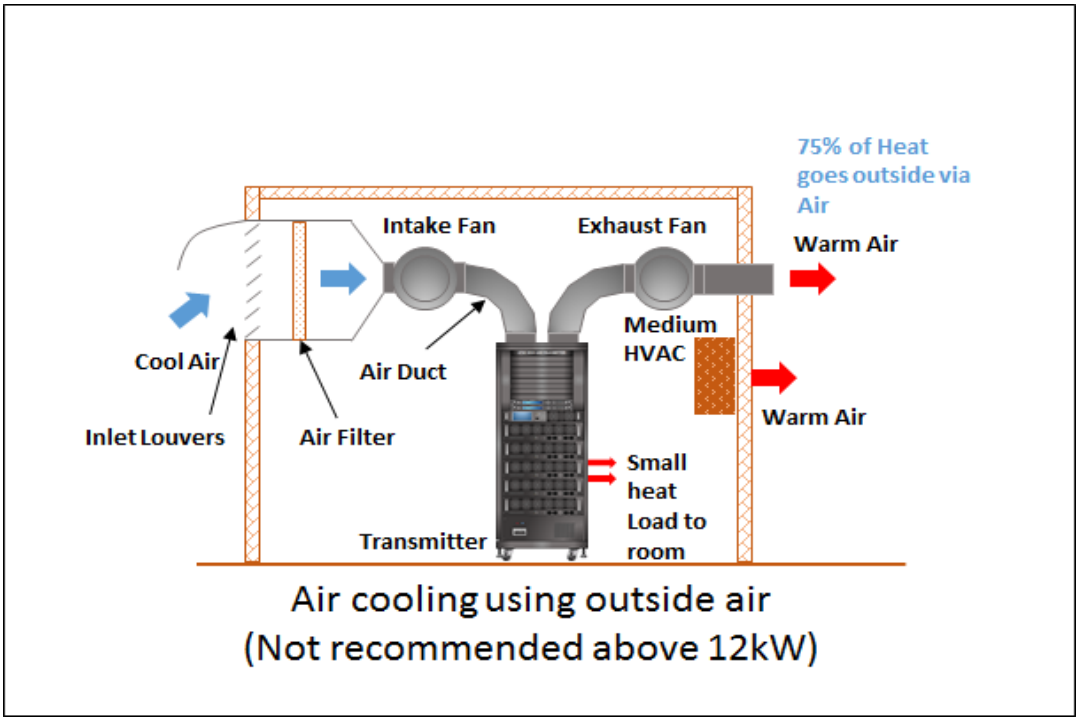
Easy installation and service

Installing or replacing a liquid cooled television transmitter often requires substantial construction work and expertise. In most cases it is necessary to install pipe work, flow meters, gate valves, heat exchangers, pumps, tanks, additional electrical conduit and electrical breakers. In comparison, the installation of an air cooled transmitter is far simpler. Once the RF system and electrical connections are in place, the air cooled system is typically ready to operate in a matter of hours rather than weeks. The initial cost of equipment and installation of a liquid cooled transmitter is higher than that of an air cooled system; in most situations 30% more.

Although liquid cooling has a marginally lower operating cost, the amount of time to pay-back the initial investment difference in most cases could be as much as 12 years. An Air cooled transmitter also has lower spares, replacement and maintenance costs. The new **Granite Series** air cooled transmitter from **Anywave** makes it possible to maintain with lesser qualified staff, achieve space savings and most importantly - significantly reduce initial capital expenses.



Air cooling using outside air
(Not recommended above 12kW)

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Exciter Specifications

Signal Inputs

- TS Inputs: 2 Transport Stream with loop out, DVB-ASI only
  Connector: BNC female 75 Ω
- RF Input: Frequency: VHF or UHF
  Bandwidth: 6 MHz
  Connector: BNC female 50 Ω
  Level: -85 dBm ~ -15 dBm
  AWGN TOV: ≤ 16 dB (A/53 operation)
  Equalization Range (-1 μs ~ 0 μs): ≤ -2 dB
  Equalization Range (0 μs ~ 17 μs): ≤ -3 dB
  Adjacent Channel Rejection (N ± 1): > 30 dB

Signal Processing

- Bandwidth: 6 MHz
- Supported Mode: ATSC
- Network Mode: MFN

RF Output

- Connector (RF Out): N-Type female 50 Ω
- Frequency: VHF/UHF in steps of 1 Hz, spectrum shifting up to ± 50 KHz
- Level: -25 dBm ~ +5 dBm in steps of 0.05 dB
- Level Stability: < ± 0.1 dB
- Frequency Stability: < 0.5 x 10^{-7} (with onboard 10MHz REF), or in accordance with the Ext. GPS accuracy
- Symbol Rate: 10.762238 MHz
- MER: > 40dB
- Amplitude Flatness: < ± 0.5 dB
- IMD Shoulder Level (± 500 kHz): < -60 dB
- Out of Band Spurious: < -60 dB
- Pilot Amplitude Error: < ± 0.1 dB
- Return Loss: > 15 dB
- Phase Noise (@20 kHz): < -107 dBc/Hz

Reference Clock

Internal 10MHz

- Frequency Stability: < ± 0.05 ppm
- Aging: < ± 0.05 ppm/year
- Output level: 0 dBm ± 3 dB

External 10MHz

- Input Level: AC coupled V (p-p) > 300 mV
- Input Connector: BNC female 50 Ω

External 1PPS

- Input Level: TTL
- Input Connector: BNC female 50 Ω

- **Linear and Non-linear ADPC™**
- Dual Feedback Signal: BNC female 50 Ω
- Feedback level: -35 dBm ~ 0 dBm (suggested value: - 15 dBm ~ -5 dBm)
- Correction is Adaptive and Automatic: No additional instruments or manual operations needed
- Continuous measurement and display of SNR and IMD
- Correction of amplitude, phase and group delay
- Up to 10 dB of MER improvement
- Up to 15 dB of shoulder improvement
- In-band flatness: < ± 0.5 dB

Other

- Power Supply: 88 ~ 264 VAC, 50/60Hz
- Operating Temperature: 0° C ~ 50° C (+32°F~+122°F)
- Operating Humidity: ≤ 95%
- Size: 1 RU, 19” Wide
- Weight: 10 LBS (net) / 15 LBS (gross)

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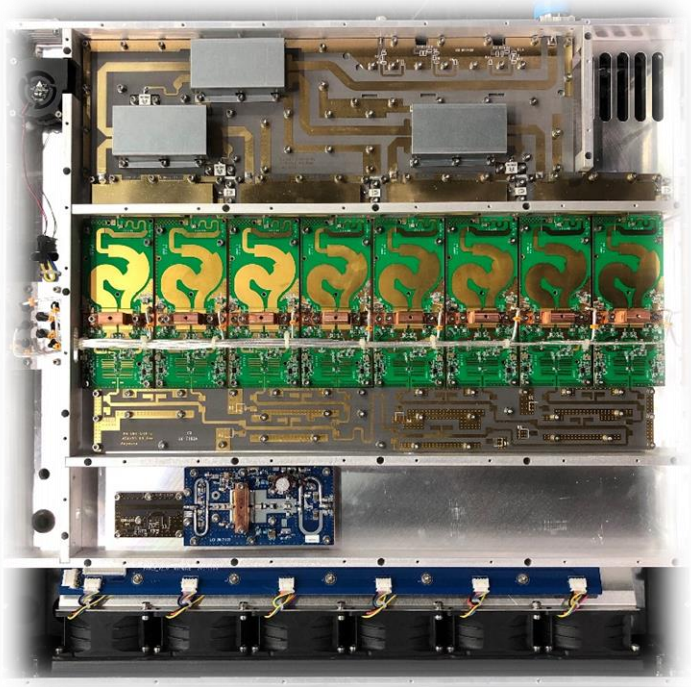
Power Requirements / Dimensions

MHPTV Series - UHF							
Number of Amplifiers	1	2	3	4	5	6	8
Output Power (RMS) ATSC (1)	1,300	2,600	3,800	5,000	6,000	7,500	10,000
Output Power (rms) ATSC (2)	1,100	2,200	3,300	4,400	5,500	6,600	8,800
Output Power (RMS) COFDM (1)	1,100	2,200	3,300	4,500	5,400	6,500	8,600
Output Power (rms) COFDM (2)	930	1,860	2,850	3,800	4,750	5,700	7,600
Output Connector	1 5/8"					3 1/8"	
Height (inches / mm)	49 / 1245		65.6 / 1666			79.6 / 2022	
Width (inches / mm)	28.5 / 724		28.5 / 724			28.5 / 724	
Depth (inches / mm)	33.5 / 851		33.5 / 851			33.5 / 851	
AC Input Voltage (3)	240VAC Single ϕ (1 or 2 PA) or 208VAC / 480VAC Three ϕ						
AC Input Frequency	50 / 60 Hz						
Consumption - Max. - KW	3.3	6.7	9.7	12.8	15.4	19.2	25.6
Consumption - Typical - KW	3.1	6.2	9.0	11.9	14.3	17.9	23.8
Current Rating Per ϕ - Max. (3)	13.8	27.9	27 / 11.7	35.6 / 15.4	42.8 / 18.5	53.4 / 23.1	71.1/ 30.8

(1) Power measured before Band Pass Filter

(2) Power measured after Band Pass Filter

(3) Currents for 1 and 2 PA are 240VAC Single φ , 3PA and higher are 208/480VAC Three φ



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General Specifications

Specifications		
Digital TV		
Standards		DVB-T/H, DVB-T, DVB-T2, ISDB-T, ATSC, ATSC 3.0, DTMB
Channel bandwidth	DVB-T, DVB-H	5 / 6 / 7 / 8 MHz
	DVB-T2	1.7 / 5 / 6 / 7 / 8 MHz
	ATSC	6 MHz
	ISDB-T	6/8 MHz
	DTMB	8 MHz
Inputs	DVB-T, DVB-H, DVB-T2, DTMB	2 × ASI (HP/LP), 75 Ω BNC, 2 × RJ-45
	ATSC ISDB-T	2 × SMPTE310M or 2 × ASI, 75 Ω BNC, 2 × RJ-45 2 × BTS, 75 Ω BNC, 2 × RJ-45
		2 x ETI, BNC 75 Ω/high impedance, 2 x RJ-45
General data		
Frequency range	UHF bands IV/V	470 MHz to 862 MHz
Supply voltage		220 V; Single-phase, 3 wire (L1,L2,GND)
		208 V; 3-phase, 4 wire (L1,L2,L3,GND)
Max. installation altitude	> 2000m on request	2000 m above sea level
Operating temperature range		+1 °C to +45 °C
Relative humidity (max.)		95 %, non-condensing
Synchronization		
Reference frequency		10 MHz, 0.3 V to 5 V (V_{pp}) or TTL, BNC
Reference pulse		1 Hz, TTL, BNC
Operation		
Display unit with touchscreen and LEDs		local operation and display
Ethernet interface, RJ-45		local, remote, standard web browser
		network management interface via SNMP
Parallel remote interface		floating contacts for messages and commands

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Ordering Information

ORDERING INFORMATION			
UHF MHPTV - Granite Series Transmitters - ATSC			
MODEL	PART NUMBER	DESCRIPTION	TPO (W) *
TRN-5X-U-18-C	102917.01	Transmitter, UHF, Air Cooled w/ Exciter & (1) Hi-Eff PA	1,300
TRN-5X-U-28-C	102918.01	Transmitter, UHF, Air Cooled w/ Exciter & (2) Hi-Eff PA	2,600
TRN-5X-U-38-C	102919.01	Transmitter, UHF, Air Cooled w/ Exciter & (3) Hi-Eff PA	3,800
TRN-5X-U-48-C	102920.01	Transmitter, UHF, Air Cooled w/ Exciter & (4) Hi-Eff PA	5,000
TRN-5X-U-58-C	102921.01	Transmitter, UHF, Air Cooled w/ Exciter & (5) Hi-Eff PA	6,000
TRN-5X-U-68-C	102922.01	Transmitter, UHF, Air Cooled w/ Exciter & (6) Hi-Eff PA	7,500
TRN-5X-U-88-C	102924.01	Transmitter, UHF, Air Cooled w/ Exciter & (8) Hi-Eff PA	10,000
UHF MHPTV - Granite Series Transmitters - OFDM			
TRN-9X-U-18-C	102925.01	Transmitter, UHF, Air Cooled w/ Exciter & (1) Hi-Eff PA	1,100
TRN-9X-U-28-C	102926.01	Transmitter, UHF, Air Cooled w/ Exciter & (2) Hi-Eff PA	2,200
TRN-9X-U-38-C	102927.01	Transmitter, UHF, Air Cooled w/ Exciter & (3) Hi-Eff PA	3,300
TRN-9X-U-48-C	102928.01	Transmitter, UHF, Air Cooled w/ Exciter & (4) Hi-Eff PA	4,500
TRN-9X-U-58-C	102929.01	Transmitter, UHF, Air Cooled w/ Exciter & (5) Hi-Eff PA	5,400
TRN-9X-U-68-C	102930.01	Transmitter, UHF, Air Cooled w/ Exciter & (6) Hi-Eff PA	6,500
TRN-9X-U-88-C	102932.01	Transmitter, UHF, Air Cooled w/ Exciter & (8) Hi-Eff PA	8,600
EXCITER			
EXC-INC-DVB	100032.01	Modulation Standard DVB/DVBT2	
EXC-INC-ATSC	100032.02	Modulation Standard ATSC A/65	
EXC-INC-ISDB	100032.03	Modulation Standard ISDBT	
EXC-OPT-PSIP	100033.01	PSIP and TSID Edit	
EXC-OPT-SFN	100033.02	SFN	
EXC-OPT-GPS	100033.03	GPS	
EXC-OPT-TSoIP	100033.04	Transport Stream over IP Input	
EXC-OPT-PQM	100033.06	Performance Quality Monitoring System Software	
EXC-OPT-ANA	100033.07	Analog option for 9X	
EXC-OPT-SPF	100034.08	Still Picture Feature, Full TS gen. 10 programs	
EXC-OPT-RFASI	100034.09	ASI loop thru' from RF Input, RF demodulator to ASI	
EXC-OPT-EASIPS	100037.10	EAS IP/ASI Switch with PSIP Insertion and PID remapping	
EXC-OPT-DIGUP	100035.10	Digital Upgrade of Analog 9X Series Exciter to any standard	
OTHER			
IP-ENP-5	100038.01	IP Encapsulator with ASI input IP-RJ45 Output	
RF-PM-UTV	200820.01	RF Power Meter, UHF input includes FWD, RFL and Temp meas.	
RF-PM-VTV	200821.01	RF Power Meter, VHF input includes FWD, RFL and Temp meas.	
RF-PM-RM	200823.01	RF Power Meter, 19" Rack mount Hardware	
TE-RX-19RU-B	200700.01	RF Monitoring Reciever, Rack Mount - Basic	
TE-RX-19RU-E	200701.01	RF Test Reciever, Rack Mount - Enhanced	
TE-RX-PORT-B	200702.01	RF Monitoring Reciever, Portable - Basic	
TE-RX-PORT-E	200703.01	RF Test Reciever Portable, - Enhanced	
TE-RX-19-B-3.0UPG	200704.01	RF Monitoring Reciever ATSC3.0 SW Upgrade	
TE-RX-19-E-3.0UPG	200705.01	RF Test Reciever ATSC3.0 SW Upgrade	
TE-RX-SW-UPG	200706.01	Additional standards licenses: DVB-T/T2, ISDB-T, DAB, HDR	

** TPO Before Filter*

Cost Effective 100%

Reliable 100%

Scalable 100%

Dependable 100%

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