



“New Shortwave Technology from Ampegon”



Peter Streader

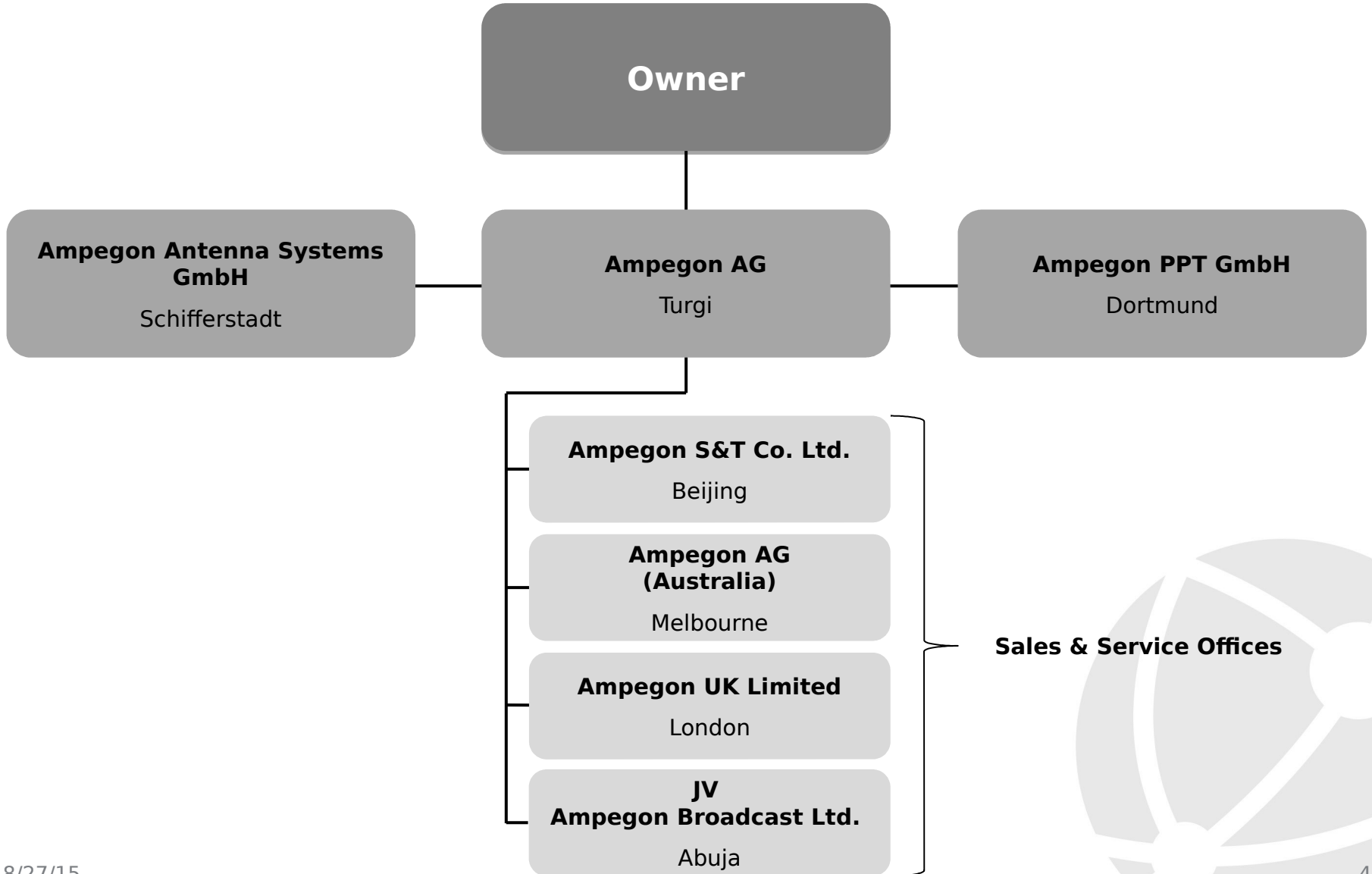
*Regional Manager, Oceania and S.E. Asia
Ampegon AG*

Contents

- **Ampegon Mini Overview**
- **New DRM applications :-**
 - **Cost effective information to the high seas!**
 - **Disaster Recovery - DRM to FM rebroadcast**
- **DRM over SW - Signal coverage and energy advantages**
- **Updated High Power SW transmitter range (100 – 500kW)**
- **New fully solid state “low power” Shortwave Transmitter series.**
TXW-2006-SSA
TXW-2012-SSA
TXW-2025-SSA



Group-Organization



Ampegon Group Product Portfolio

Transmission Systems



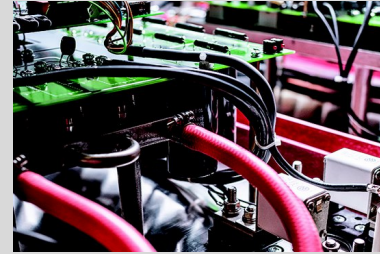
- Shortwave Transmitters
- Medium wave/ Long wave Transmitters
- DRM Equipment
- Broadcast Control Systems
- Transmission Auxiliaries

Antenna Systems



- SW Broadcast Antennas
- LW/MW Broadcast Antennas
- LF/VLF Antennas
- Towers and Masts

Scientific Applications



- RF Amplifiers
- High Voltage Power Supplies & Modulators
- Digital Low Level RF
 - Products for Industrial

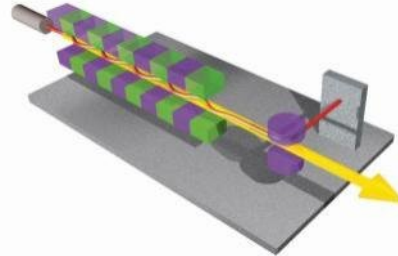
and Medical Applications

Green Technologies



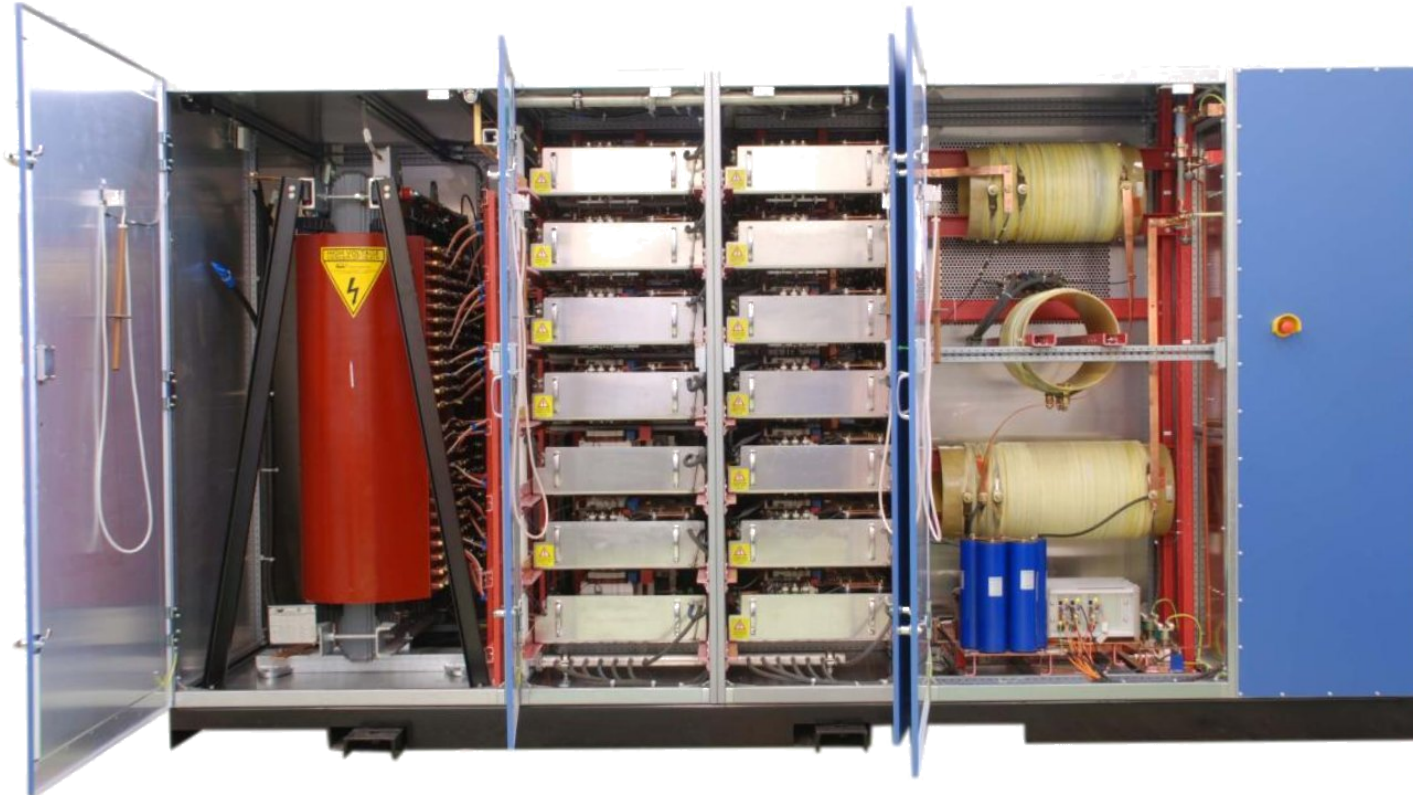
- Photovoltaic (PV) Power Plants
- Development of Project Rights

European X-FEL Hamburg, Germany: DESY



- Project Overview Europe's longest x-ray source (3.4 km)
 - Electron energy: 10 GeV to 17.5 GeV, expandable to 20 GeV
 - Total costs: 986 M€ (10 beamlines)
 - Time plan
 - Construction begin: Summer 2008
 - Commissioning: 2013
 - First experiments: 2014
- Development and delivery of Prototype Klystron Modulator System, 2008
 - 12 kV, 2000 A
 - 1.7 ms pulse duration at 10 Hz repetition frequency
 - 24 switching modules, each providing min. voltage of 545 V
 - Design criteria: maximum modularity and maximum redundancy

European X-FEL Hamburg, Germany: DESY



- Full system configuration tests of prototype at DESY site including cable, pulse transformer and klystron: 2009 / 2010
- Delivery of 22 units within 2012 / 2013
- Delivery of 7 more units 2013 / 2014

Customer References in Science and Research

Fusion Research	Industrial Applications	Medical Applications	Accelerator Research Labs
 <p>  Max-Planck-Institut für Plasmaphysik      </p>	 <p>    </p>	 <p>        </p>	 <p>              </p>



Transmission Systems



Engineering - System Optimization



Transmitter



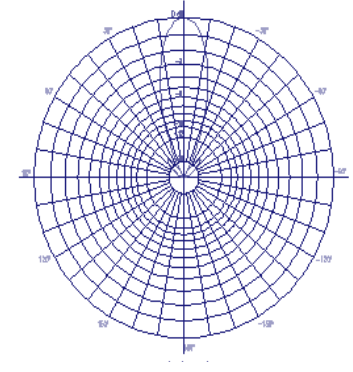
Feeder Lines



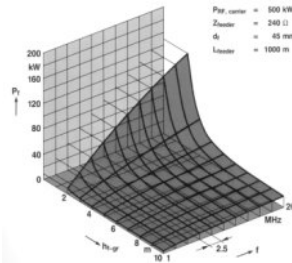
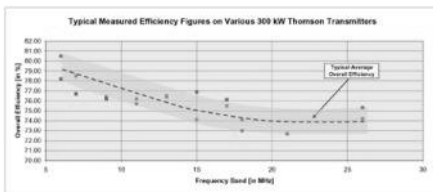
Antenna



Radiation

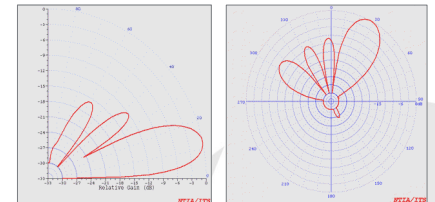


Perfect Coverage !



- ground losses
- ohmic losses
- Radiation losses

Reality with slewing "rotating beams"

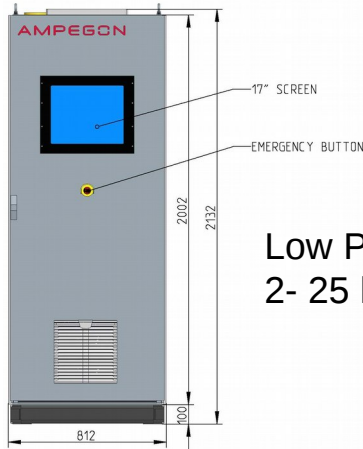


η_{TX}		η_{Feeder}		$\eta_{Antenna}$		$\eta_{Radiation}$		η_{Total}	
Modern TX:	75 to 80 %	Best:	95 %	Best:	98 %	Perfect Design:	99 %	Best:	~ 70 %
Older TX:	50 to 55 %	Very Often:	70 %	Very Often:	95 %	With Shielding:	70 %	Very Often:	~ 25 %

$$\text{System Efficiency} = \eta_{\text{Transmitter}} \times \eta_{\text{Feeder}} \times \eta_{\text{Antenna}} \times \eta_{\text{Radiation}}$$

Shortwave Transmitter Range

- Exceptional overall efficiency
- Menu-driven control system
- Computer assisted operation
- Digital signal processing
- Full remote control facilities
- All transmitters DRM capable



Low Power Solid State:
2- 25 kW



High Power :
100 kW, 250/300 kW, 500 kW

SW Broadcasting Antennas

A full spectrum of frequency ranges & configurations

Shortwave Broadcasting Antennas

- Fixed curtain antennas
- Rotatable curtain antennas
- Fixed log-periodic antennas
- Rotatable / Inclined log-periodic antennas
- Omni-directional antennas
- Associated RF circuits



Station Control System: Master Series II

Offering solutions tailored to meet any automation needs



Off shore Data and Voice delivery



News on the ship via Digital Radio Mondiale

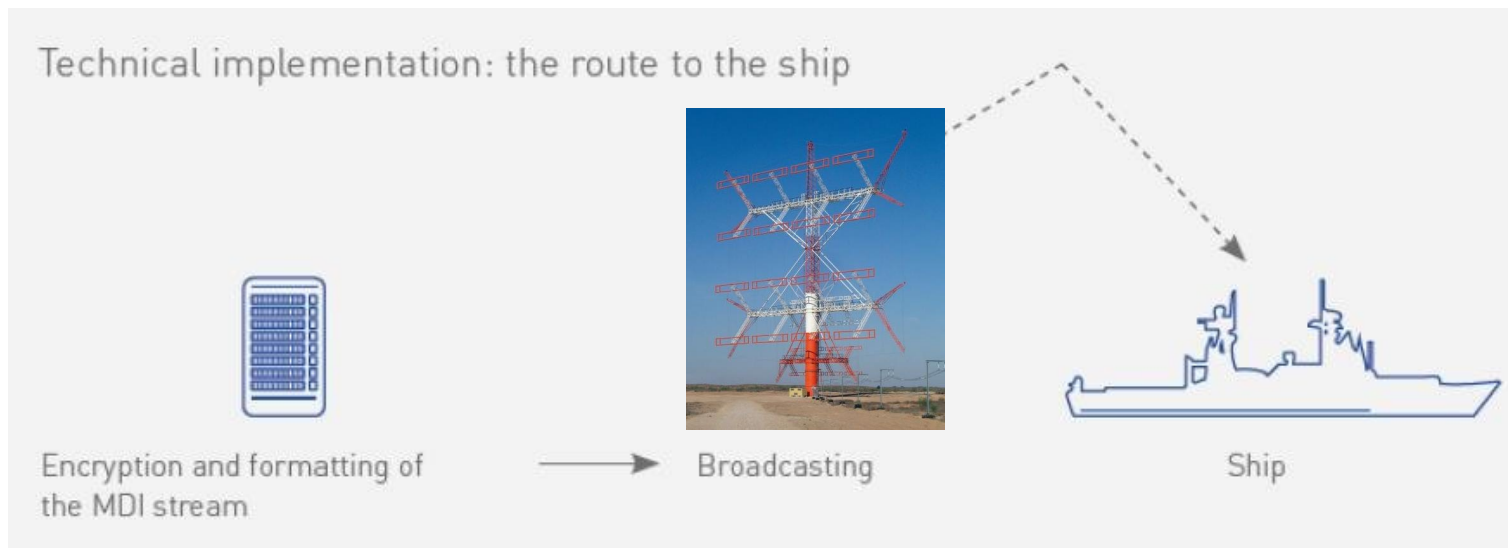
Digital Shortwave

ENABLING MEDIA INNOVATION



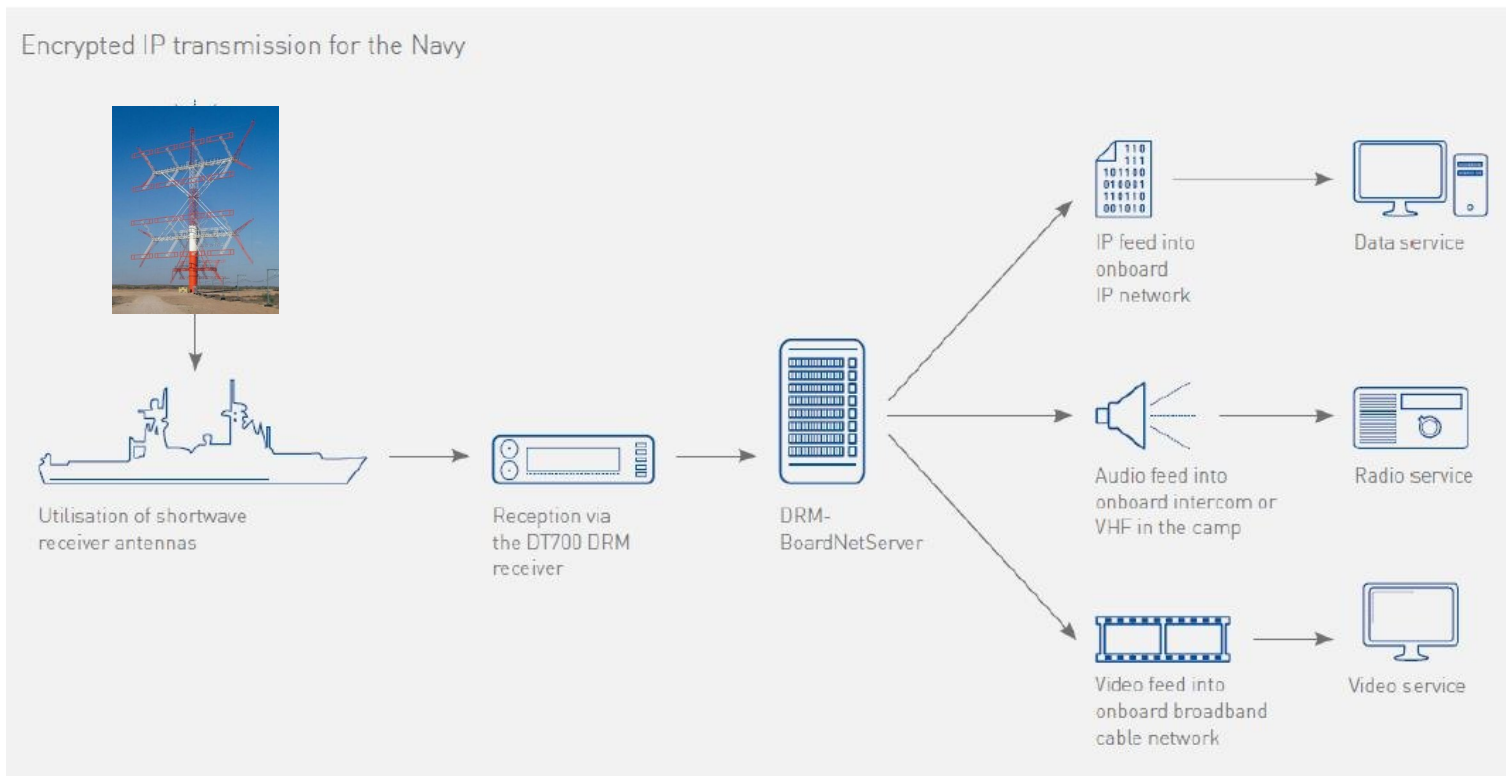
NAVY and Off shore broadcast

- Current Situation Poor information available at sea
(to late, to slow, too expensive)
- The Solution DRM wide coverage and digital transmission
- The Advantage High Quality and cost efficient and live broadcast
- The Service High level service and encryption also possible



Off shore broadcast services

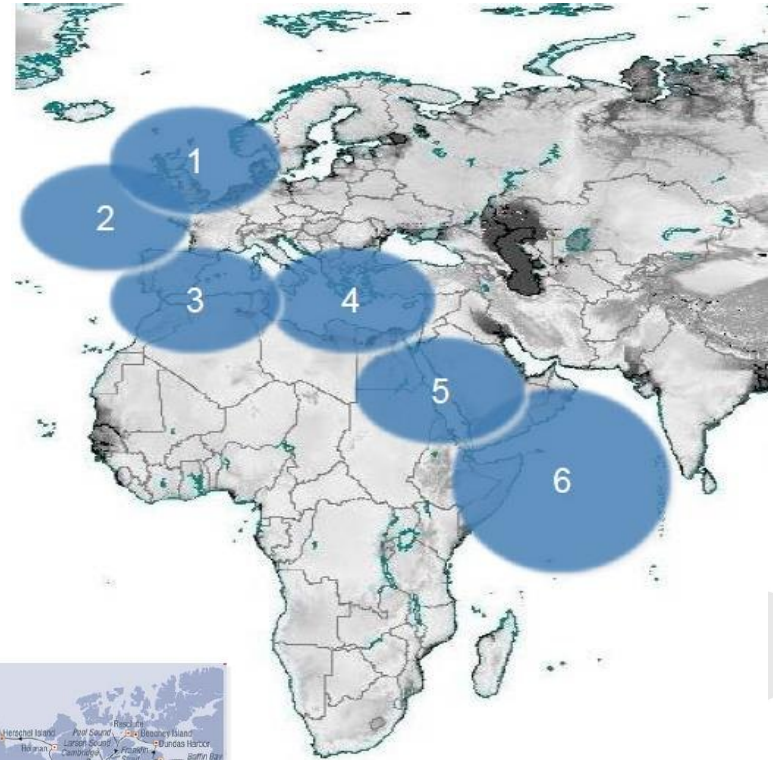
- DRM solution Wide range of audio, data or small scale video service for on board usage



Off shore broadcast coverage

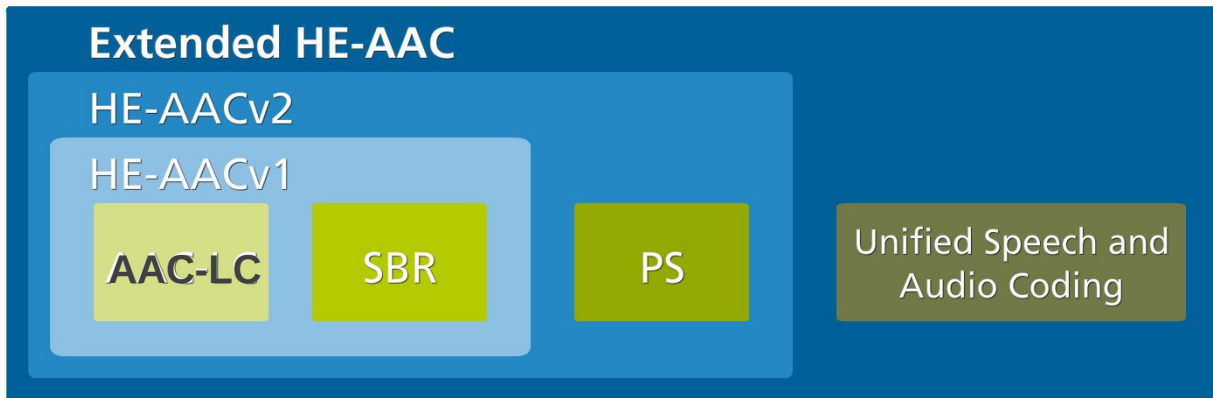
- DRM coverage for wide area
- Free selectable coverage with rotatable antenna system
- Independent broadcast and local broadcasting centre at home base
- Civil and other ships like Cargo are included in the coverage

Cruise ship "MS-Bremen" from Travemünde to Nome



Reference: Volker Behling and Michael Pütz Media Broadcast Germany

MPEG xHE-AAC - Extended HE-AAC



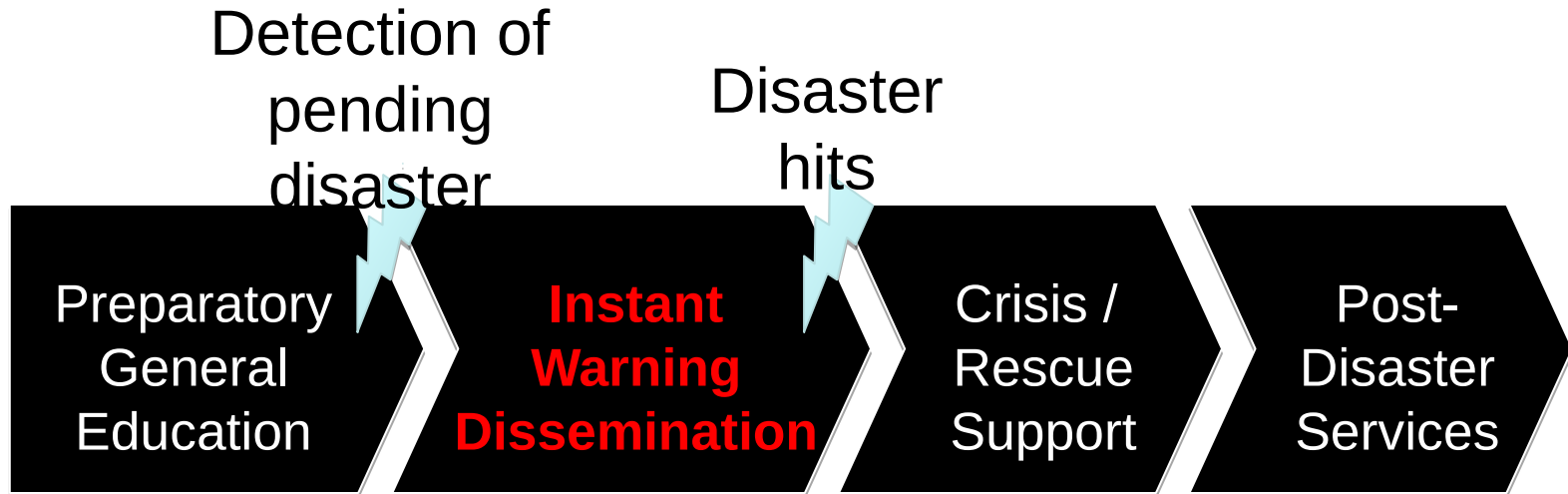
- Equally suits **speech and music coding at very low bit rates**
- MPEG/ISO standardised in 2012
- Applications:
Media download (mobile devices), Streaming, Digital Radio, Mobile TV

DRM Key Features

- **More choice** for listeners
 - Up to 4 programmes on 1 frequency
 - Simulcast analog / digital
- **Excellent audio** quality
 - No distortion
 - Stereo and 5.1 surround sound
- **Multimedia Applications**
 - Great listener benefits
 - Extra revenue opportunities for broadcasters
- **Good coverage** area and robust signal
 - Supporting SFN (Single Frequency Networks)
 - Green and energy efficient
- **Automatic tuning**
 - by station name, no longer by frequency
 - re-tunes when leaving coverage area
- **Emergency warning & alert**
 - All stations switch, present audio and text information



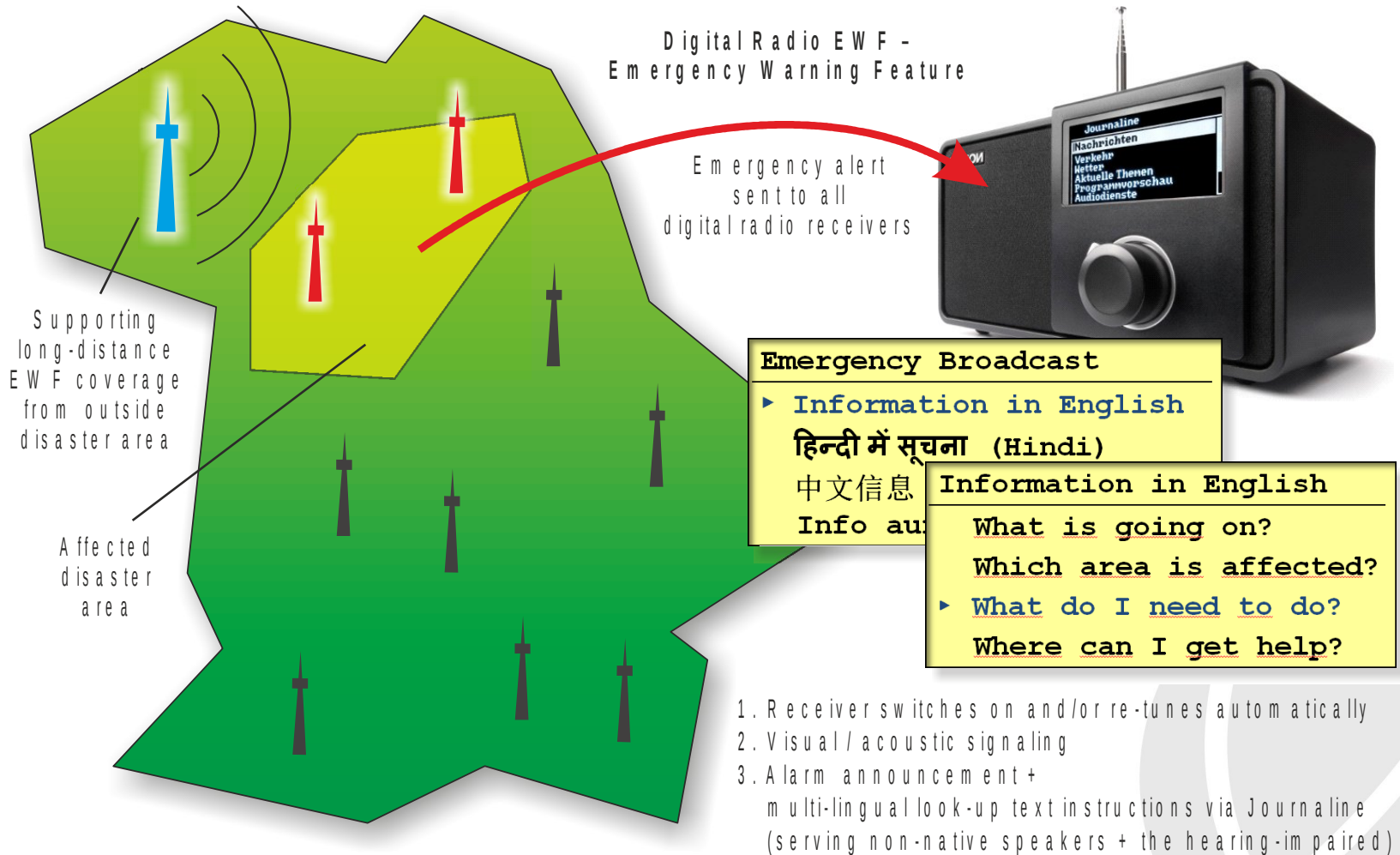
EWI for Digital Radio - Disaster Stages



Digital Radio provides essential services in all these stages, as it:

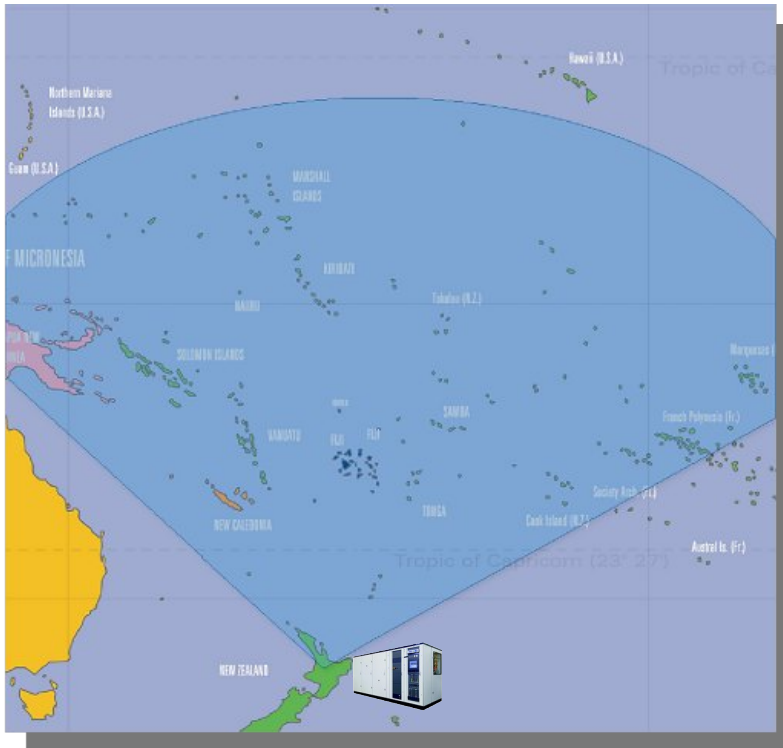
- reaches the affected people reliably
- enables detailed **multi-lingual text infos**

DRM EWF - Functional Overview



Example of DRM Rebroadcasting

Radio New Zealand International



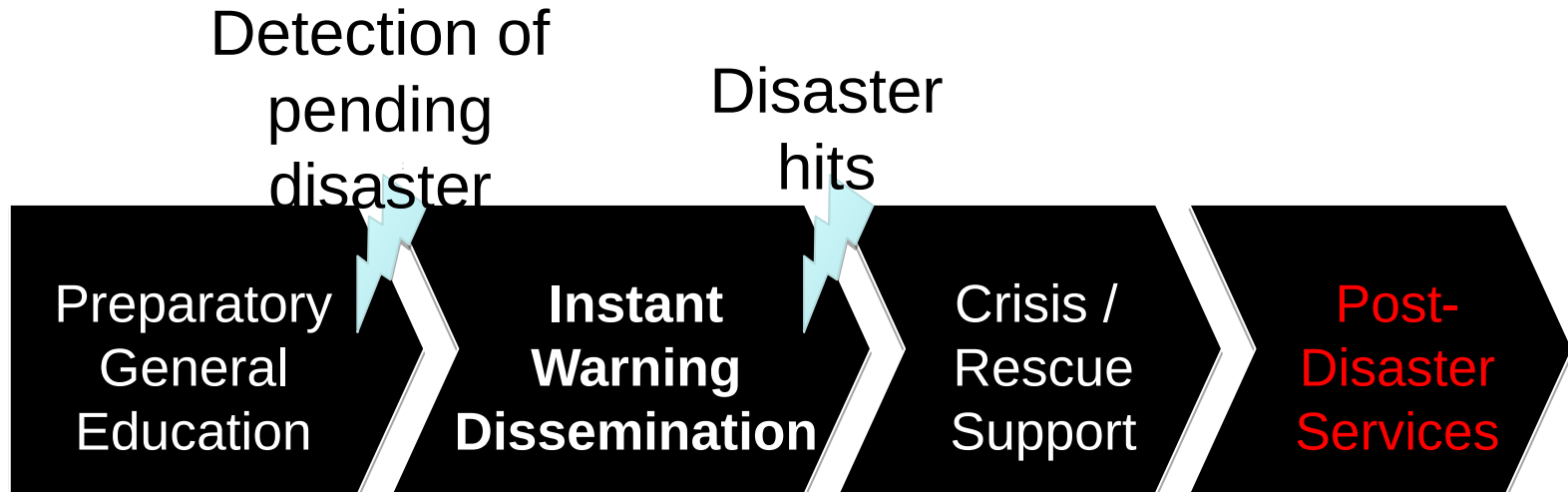
Operating in DRM since 2006 for approx 19 hrs each day.

Servicing 10 islands with the Ampegon 100 kW shortwave DRM transmitter installed near Taupo, New Zealand.

Re-broadcast on AM and FM via RNZ's partners in the Pacific.

Easily received on portable DRM receiver with simple whip or wire antenna.

EWF for Digital Radio - Disaster Stages

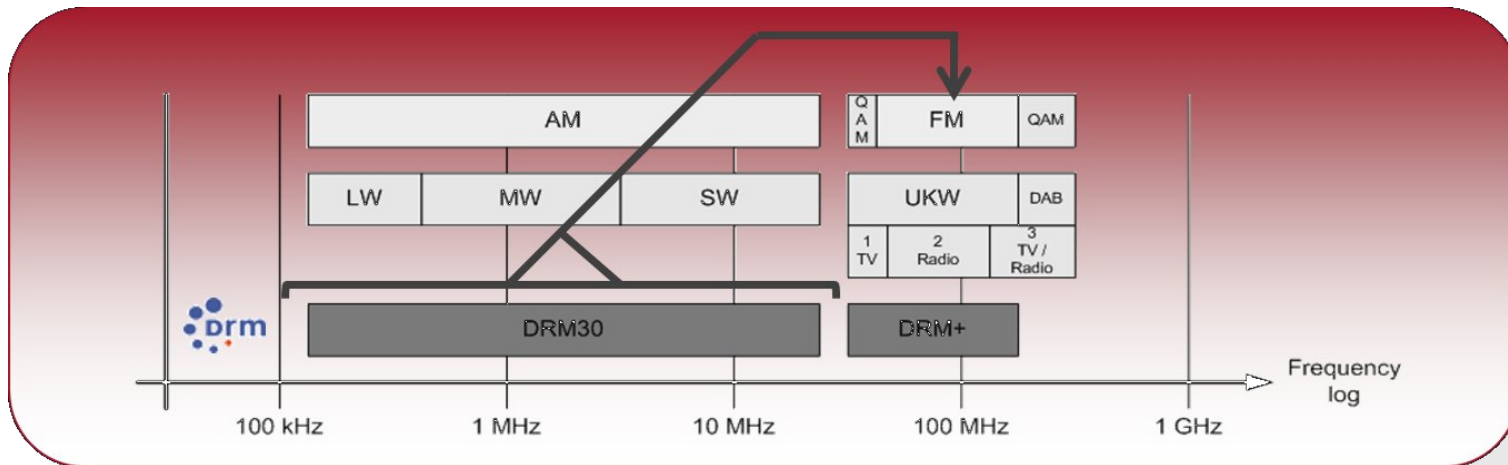


Digital Radio provides essential services in all these stages, as it:

- reaches the affected people reliably
- enables detailed **multi-lingual text infos**

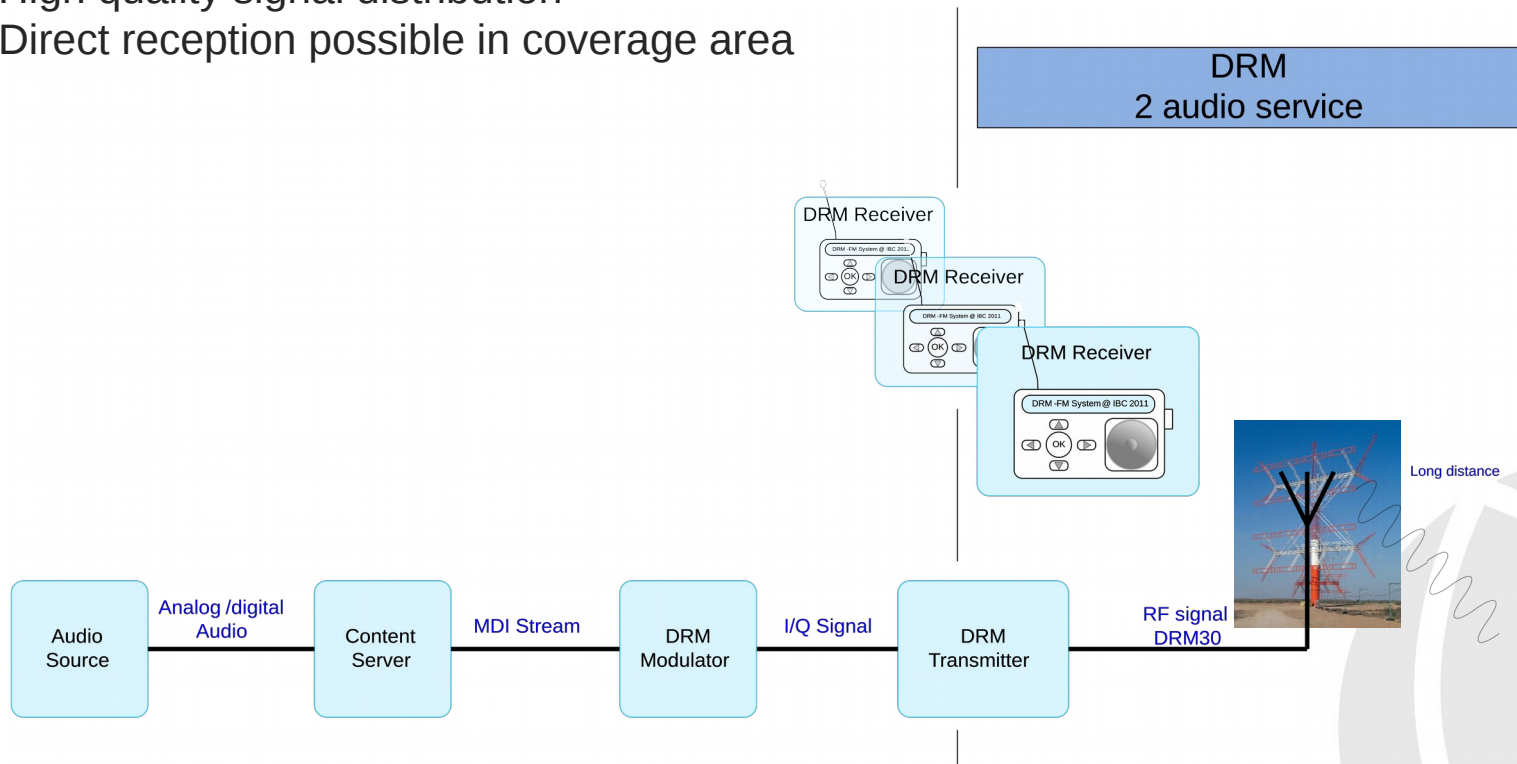
DRM to FM rebroadcast for Disaster Recovery

- DRM to FM audio transmission chain
- Use wide coverage with DRM
- Receive in the DRM signal direct in the coverage area
- Rebroadcast in FM at local are with two audio channels possible



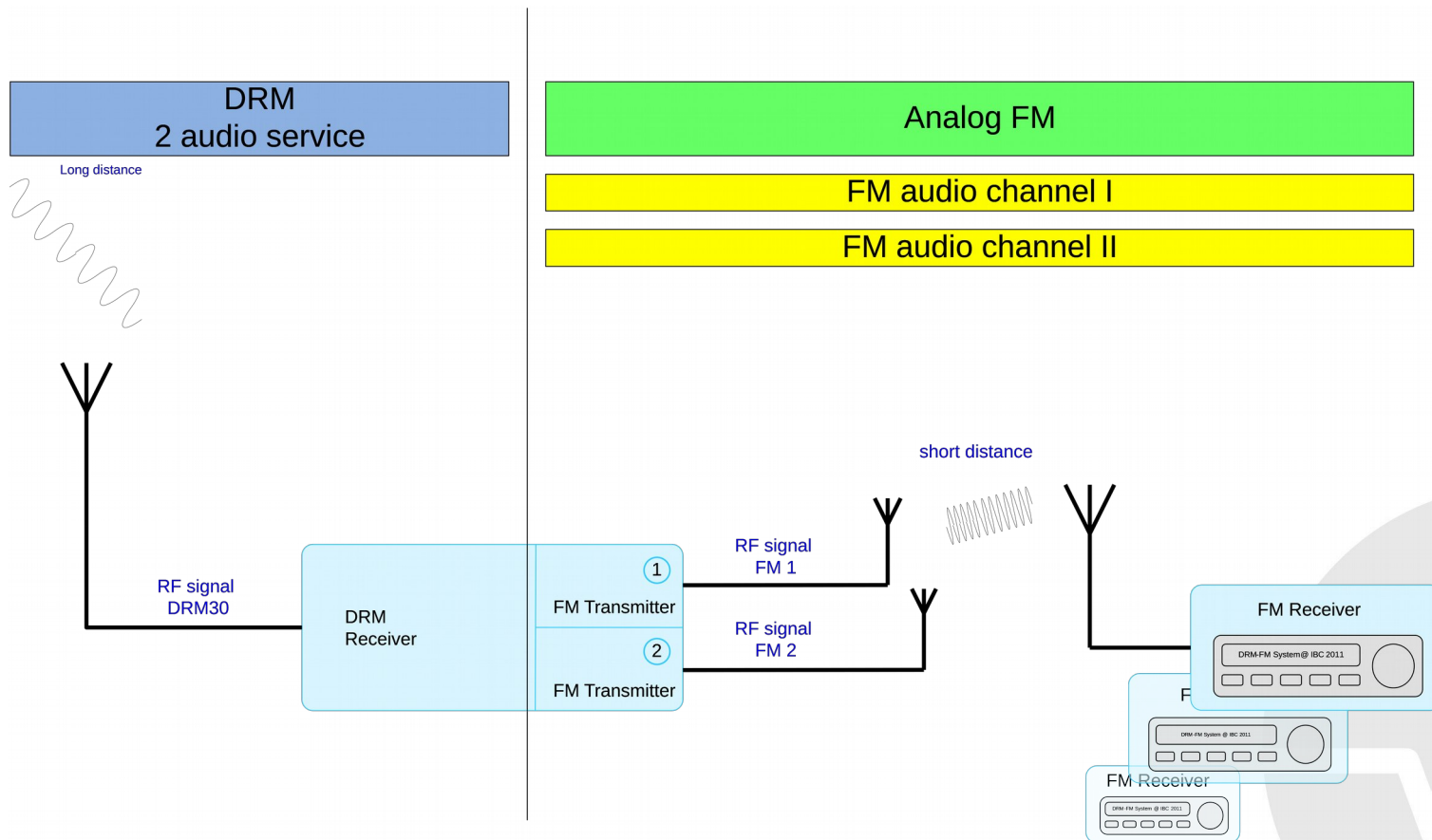
DRM broadcast transmission

DRM broadcasting chain
 High quality signal distribution
 Direct reception possible in coverage area



DRM broadcast reception

- Reception and conversion to two FM audio Service



DRM broadcast setup

- DRM configuration with one Multiplex in the Ampegon Content Server
- Two audio service possible with additional data service included lie Journaline and text messages
- Two audio encoding in HE-AAC parametric stereo or **xHE-AAC full stereo service or very rugged MONO. (for disaster recovery)**
- Standard 10kHz RF broadcast bandwidth

The screenshot shows the configuration for a DRM 10kHz 2 Service Multiplex. It includes controls for Edit, Remove, and Check+Save. The interface is divided into four service slots: A, B, C, and D.

Service Slot	Service Name	Language	Service ID	Audio	Text	Data
A	DRM Service A	English (English)	Education from Switzerland (4097)	Audio_1 [Audio]	+ Text_Message_1 [Text/Message]	Journaline_1 [PAD-Data]
B	DRM Service B	English (English)	News from Switzerland (4098)	Audio_2 [Audio]	+ Text_Message_2 [Text/Message]	Journaline_2 [PAD-Data]
C				not used		
D				not used		

DRM Channel Parameters: Robustness mode A (DRM), 10 kHz, long (2s) interleaver, MSC mode 64-QAM, SDC mode 4-QAM, Protection level EEP: PL=3 [0.78] (lowest protection, highest bitrate)

DRM Channel Capacity: Max. net bitrate: 34760 bps Unassigned bitrate: +120 bps

15880 bps	15880 bps	2880 bps (27120)
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MDI Output:

- dcp.udp.pft://10.11.152.99:50000?fec=1&spread=0.4
- Transmission offset: 1.2 s

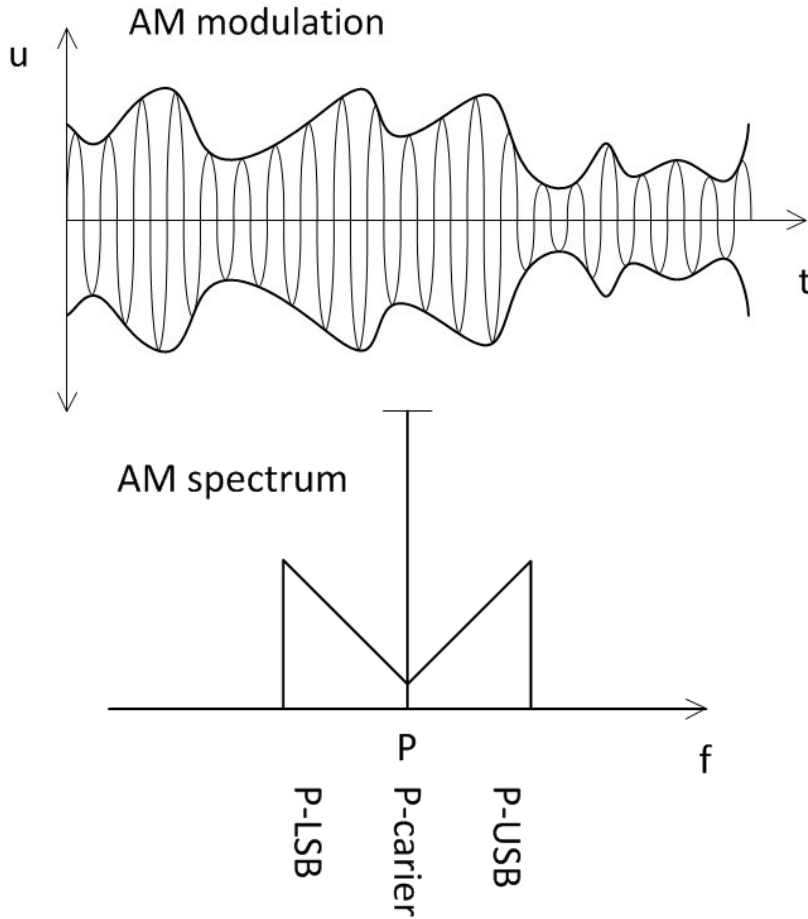
Ampegon DRM-RD broadcast system

- Professional receiver DRM receiver front end equipment
- Audio decoding in HE-AAC or xHE-AAC
- Two service reception and direct processing possible
- Complete rack and outdoor system and photovoltaic supply available
- System TFM-3-30 with DRM reception and audio decoding service and 30W FM power for local distribution



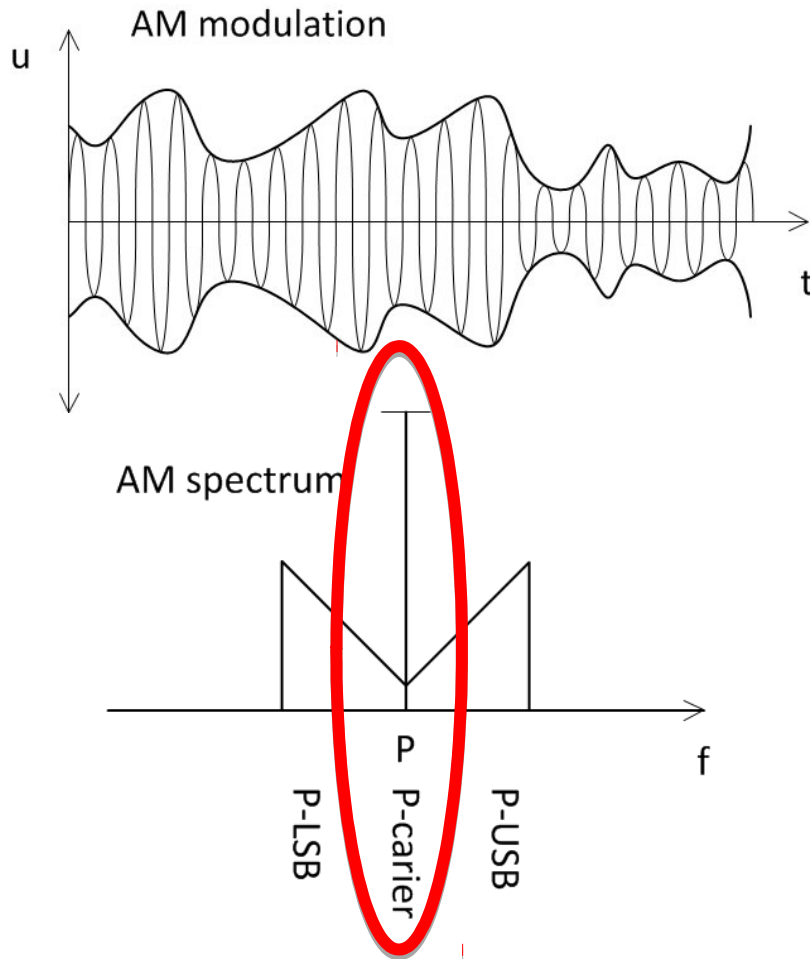
Available options		B x H x T
Indoor	TFM3-30	56cm x 53cm x60cm
Outdoor (air conditioned)	TFM3-30 - AC	56cm x 53cm x70cm
Photovoltaic supply	TFM3-30 - AC - PV	56cm x 90cm x70cm + PV module

AM Energy consumption (MW or SW)



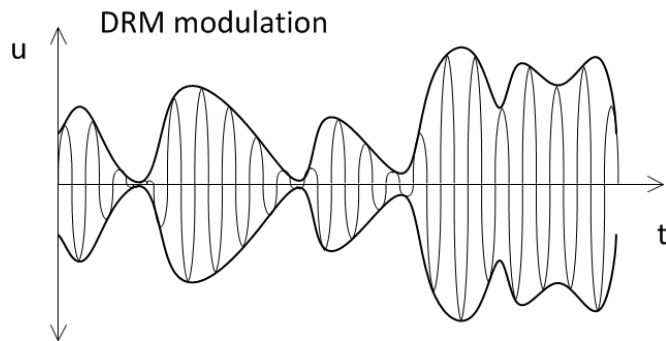
- **AM Carrier > 66% of energy**
- **P-USB and P-LSB <33% energy**
- **AM reception level > 47dByV**

Analog Energy consumption (MW or SW)

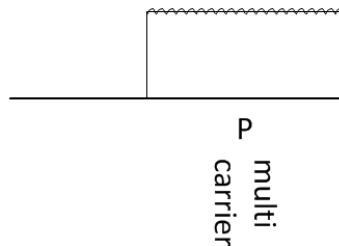


- **AM Carrier > 66% of energy (no content)**
- **P-USB and P-LSB <33% energy (content)**
- **AM reception level > 47dByV**

DRM energy consumption -



DRM spectrum



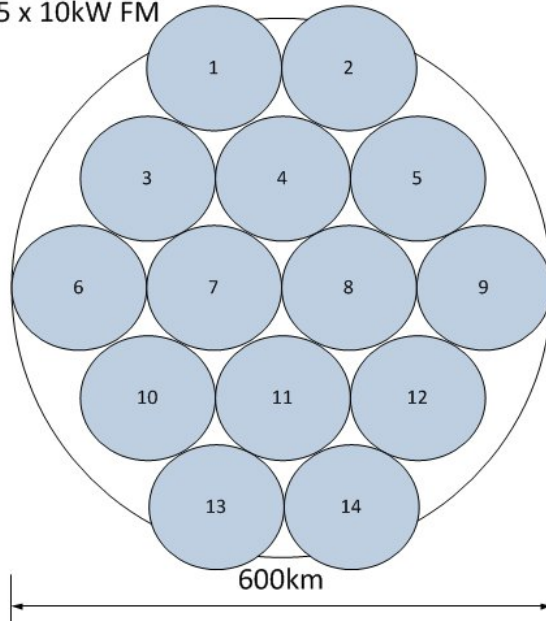
- **Eliminates wasteful AM carrier!**
- **All energy carries information (content)**
- **33% of analogue power. (17% per programme!)**
with 2 programs via XHE-AAC
- Also DRM reception level > 35dByV (16QAM most robust) or 39dByV (64QAM) according ITU BS1615

Coverage – FM vs DRM30

15 FM transmitter

FM Coverage

Min. 15 x 10kW FM

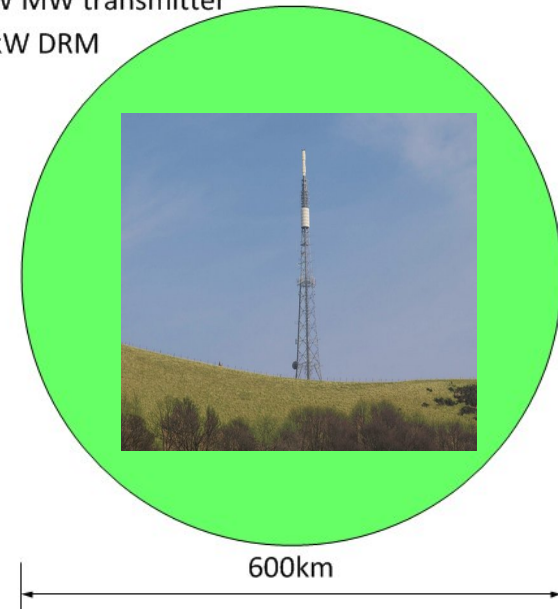


1 DRM transmitter (MW)

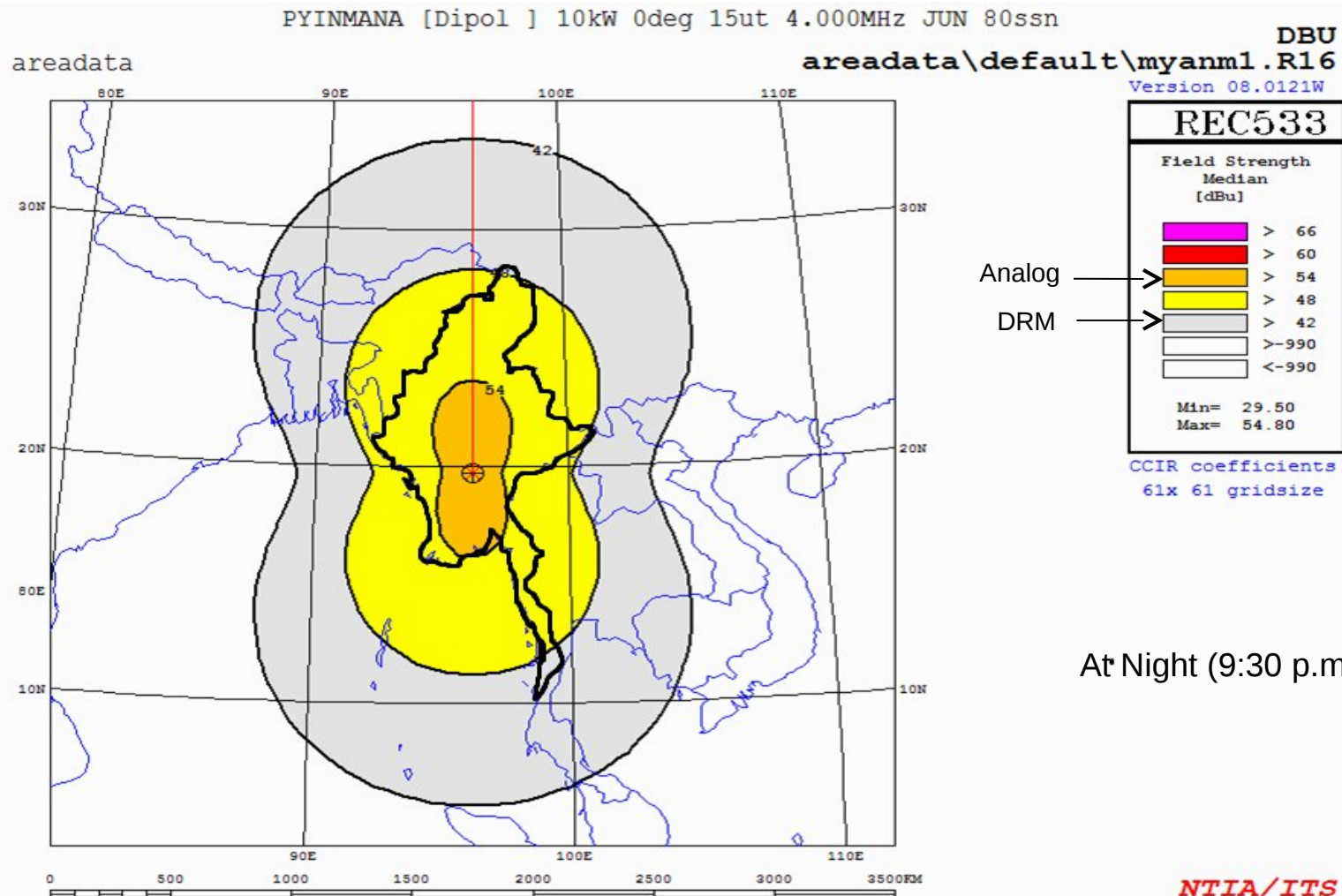
DRM Coverage

100kW MW transmitter

-> 40kW DRM

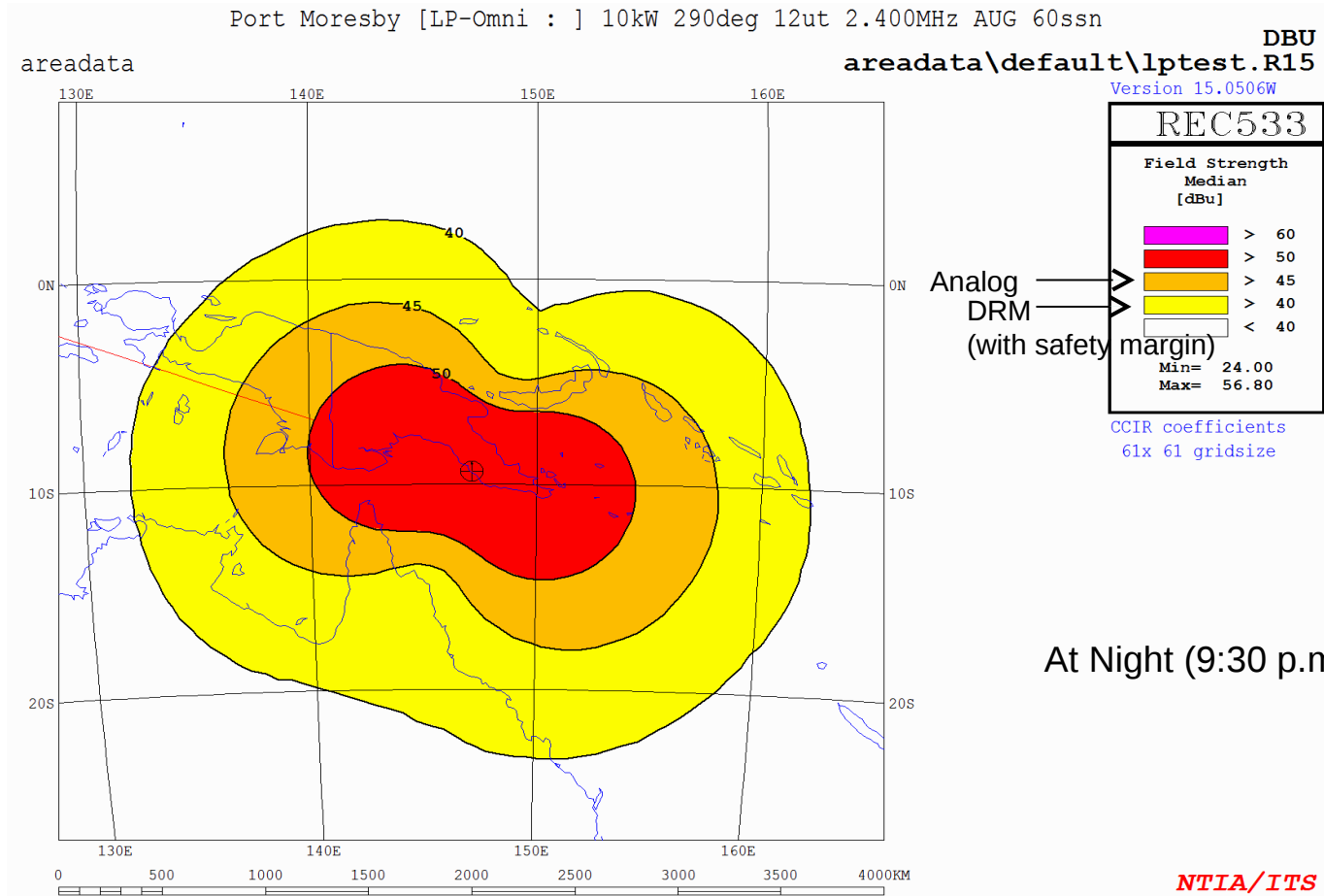


Coverage Example – 10 kW TX'er (5kW DRM power) Short Wave (Myanmar)



At Night (9:30 p.m.)

Coverage Example – 10 kW Short Wave (PNG)



Tube based shortwave transmitter

- Updated tube based High Power
TXW-2100
TXW-2200 / TXW2300
TXW-2500
- **New** control system platform
 - embedded DRM modulator
 - audio signal processing
 - audio filtering and
 - modulation mode selection
 - analogue and digital fast acquisition measurements
 - fast supervision
- **New** tuning
 - drive and motor positioning system

“old”



“new”



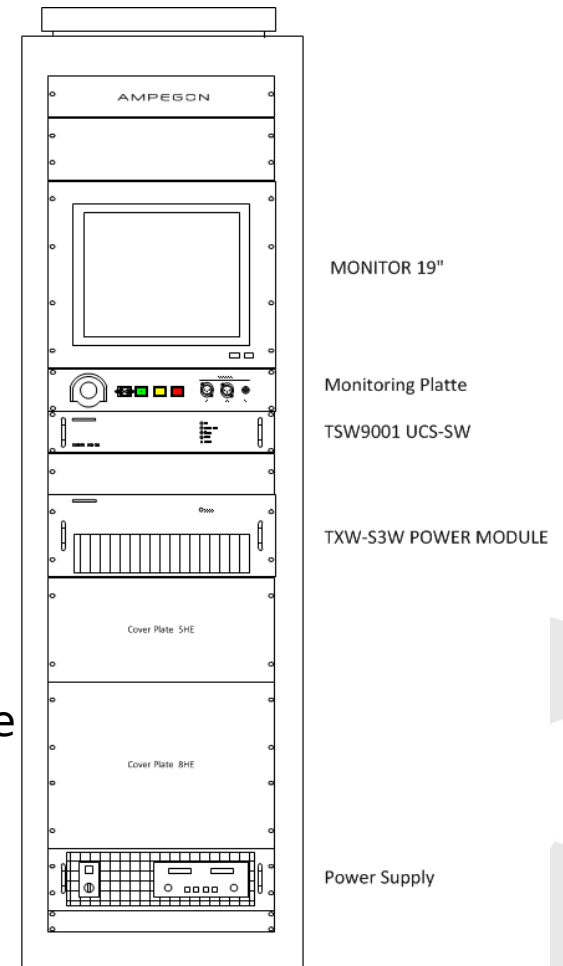
New full solid state Shortwave transmitter

- **Broadcast transmitter for shortwave service**
- **New technology approach**
- **Step forward in solid state technology**
- **UCS - Universals Control System platform usage**



Solid state shortwave transmitter

- New full solid state RF amplifier unit
- Modular concept based on combining of type E-class switch mode RF-amplifier
- Top audio and system performance
- Redundant system approach
- Up to 4 adjusted broadcast band covered
- New low power antenna available to match best system performance and coverage



Solid state RF-module

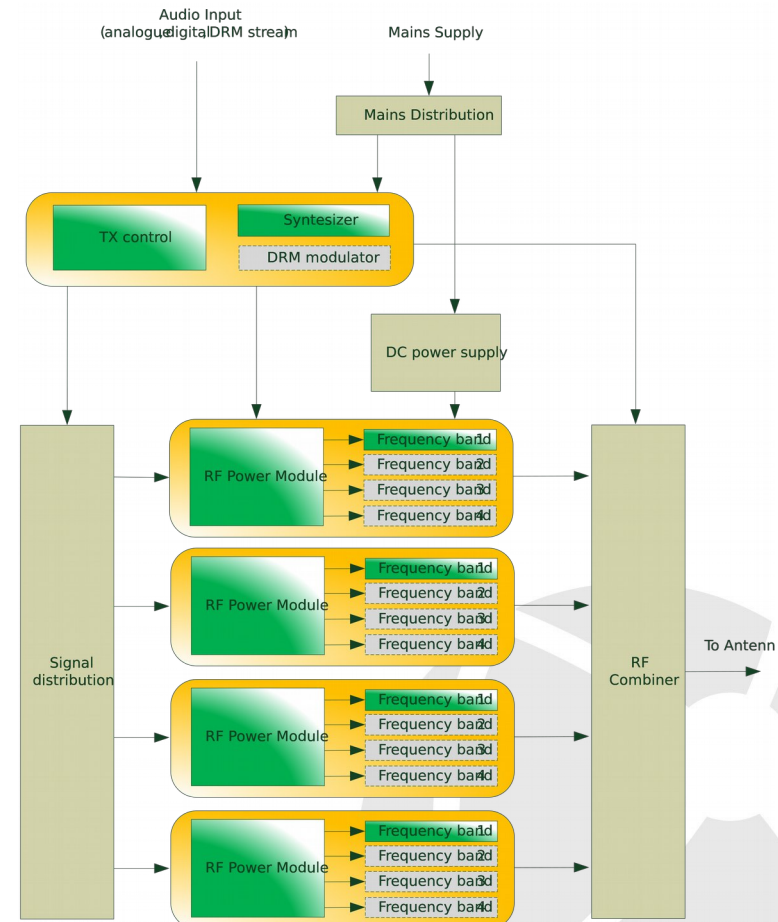
Size H / L / B : 4HE(177mm) / 19"(483mm) / 755mm
weight : 15-20kg (depending on the nr. of output filter equipped)

- Up to 4 pluggable RF broadcast band filters
- Complete broadcast band is covered with one filter
- Free selectable broadcast frequency inside the filter band



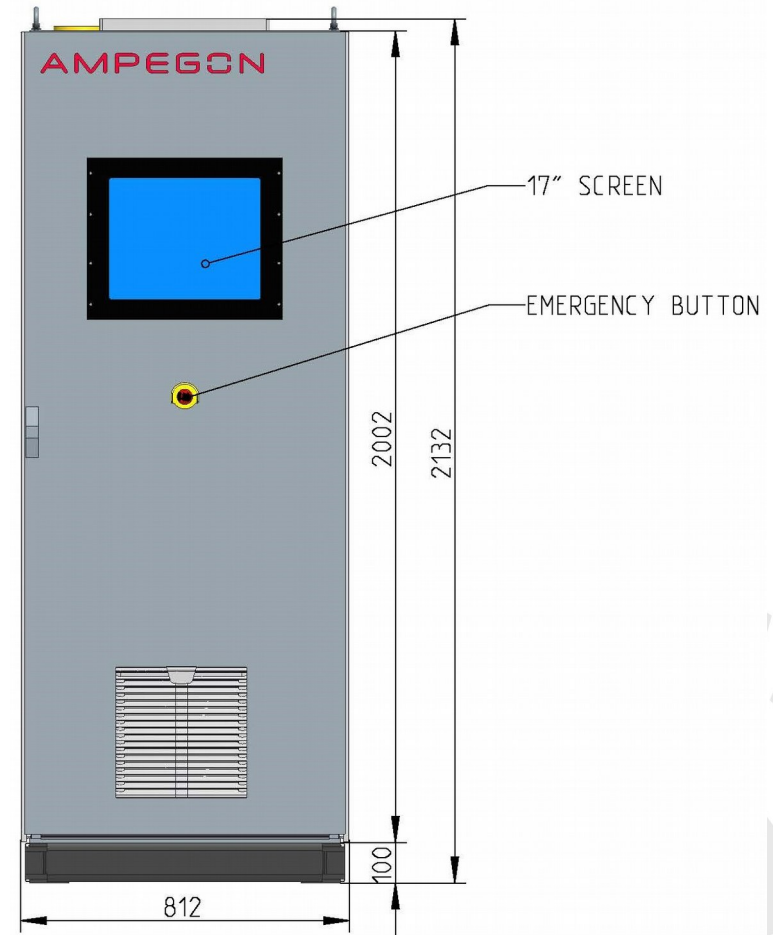
Solid state transmitter blockdiagram

- Existing UCS from tube based transmitter family, DRM and Remote capability embedded
- New modular type E-class switch mode RF-amplifier
- Wide RF broadcast band coverage with one TX
- Flexible and robust system design
- RF protection included
- Wide range and redundant mains voltage supply available



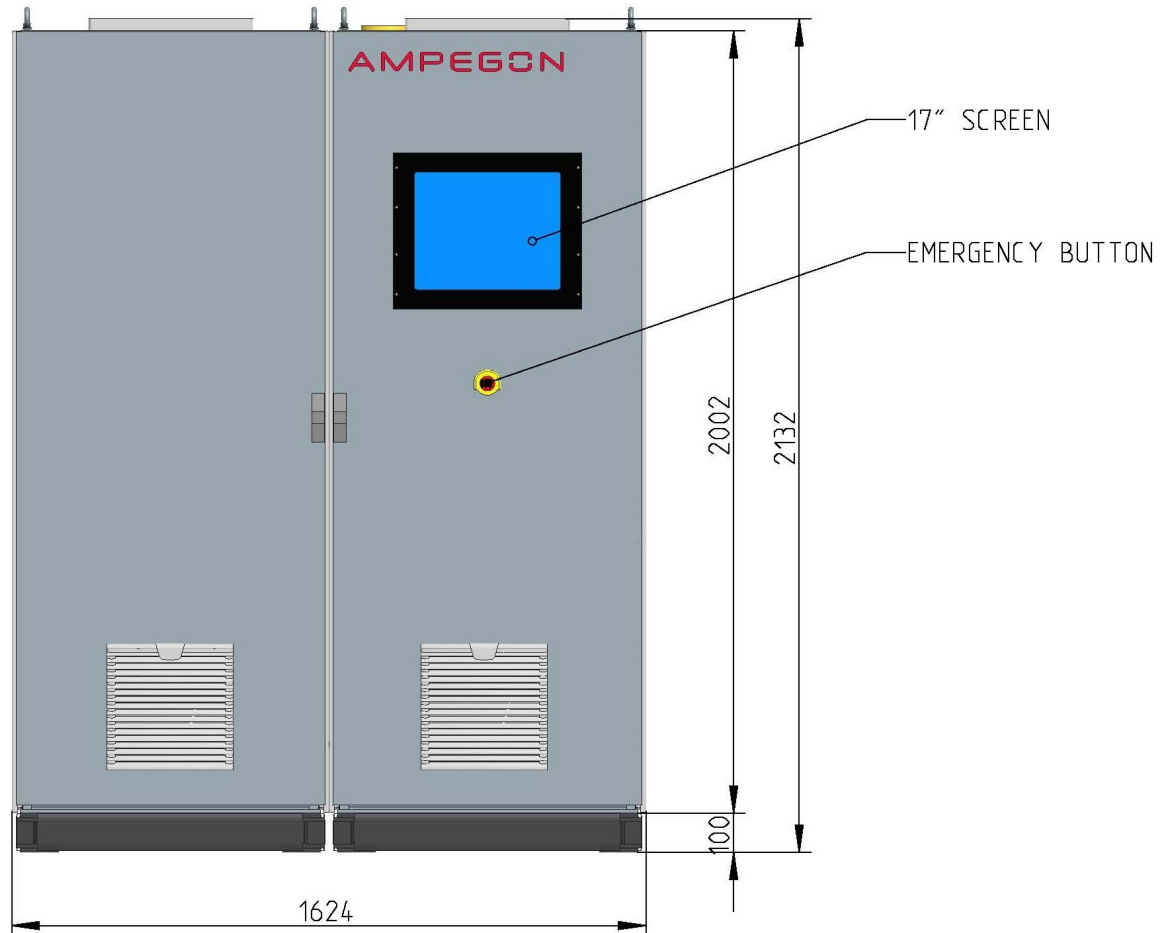
Solid State transmitter 6kW or 12kW

- TXW-2006-SSA
Transmitter with 4 RF class E-modules
6.0 kW AM carrier power
26 kW peak output power
3.2 kW DRM mean power
> 85% over all efficiency
- TXW-2012-SSA
Transmitter with 8 RF class E-modules
12.0 kW AM carrier power
52 kW peak output power
6.4 kW DRM mean power
> 85% over all efficiency



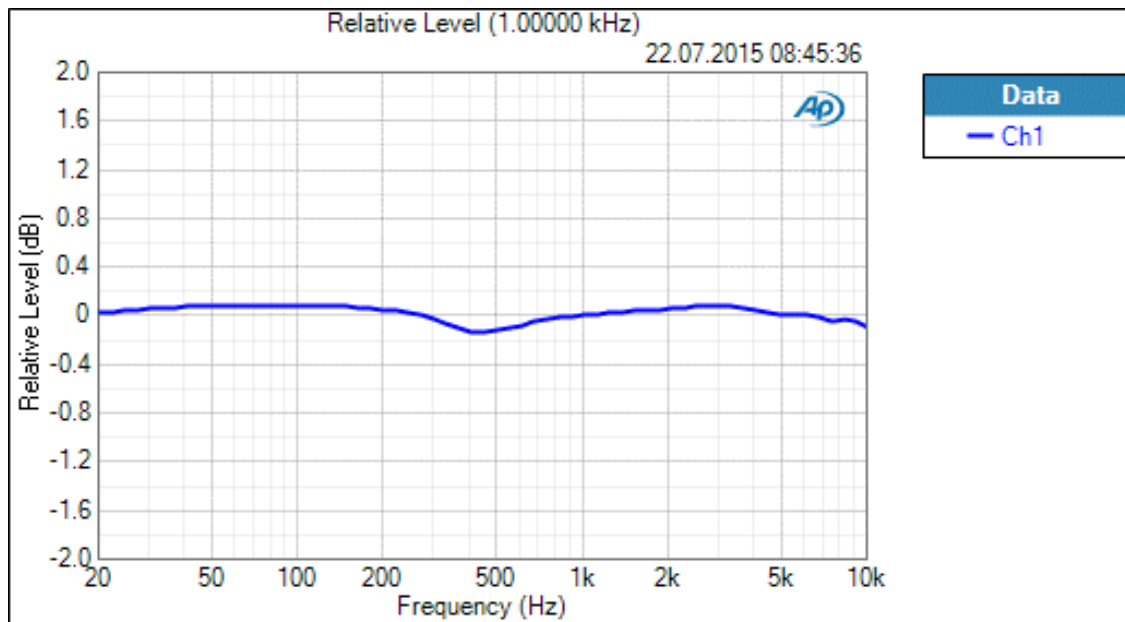
Solid State transmitter 25kW

- TXW-2025-SSA
Transmitter with
16 RF class E-modules
25.0 kW AM carrier power
104 kW peak output power
12.8 kW DRM mean power
> 85% over all efficiency

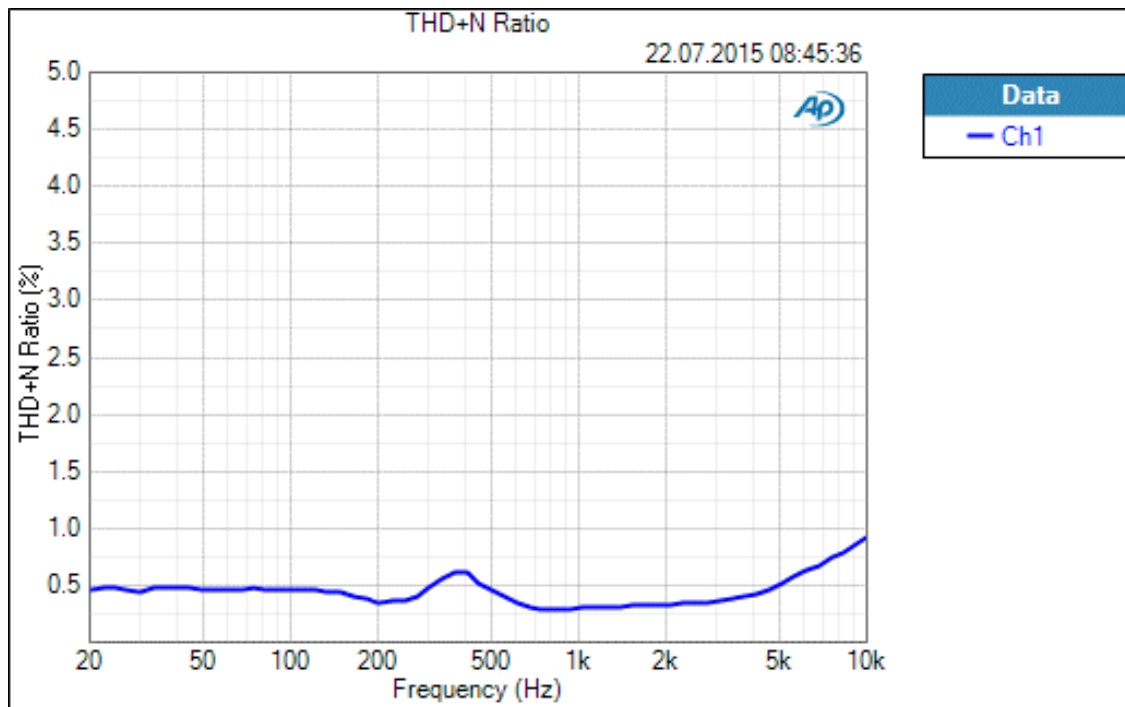


Solid State transmitter key performance

- Excellent Audio and RF linearity over the broadcast frequency



Solid State transmitter key performance

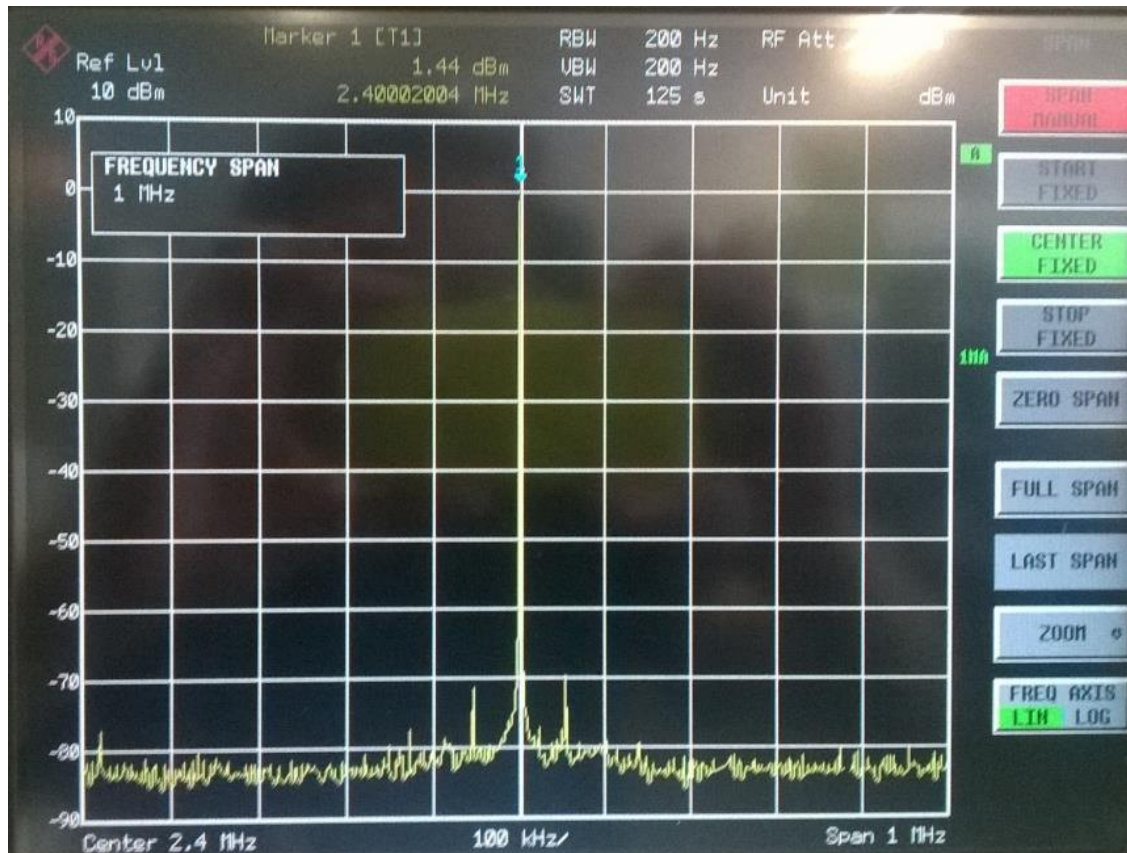


- Excellent Distortion and noise figure below 1% 10kHz
- Average 0.5% THD+N



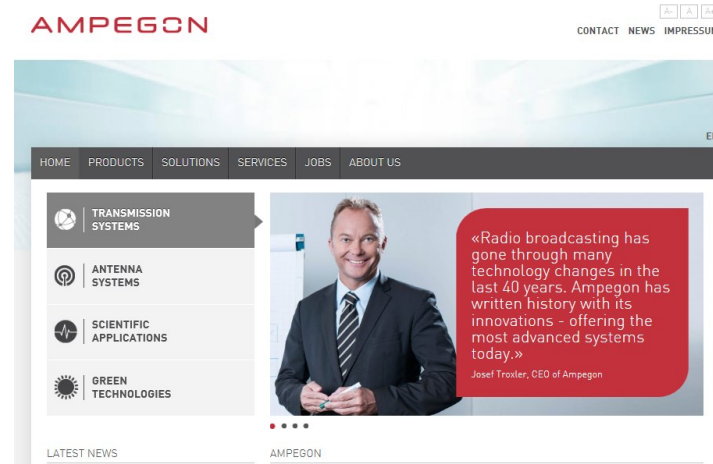
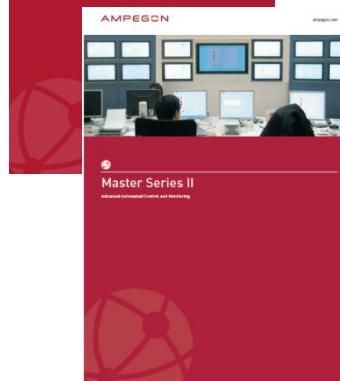
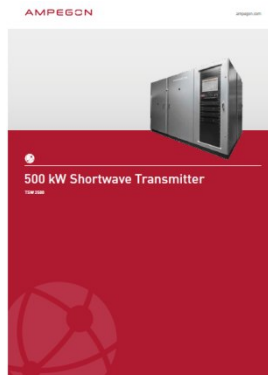
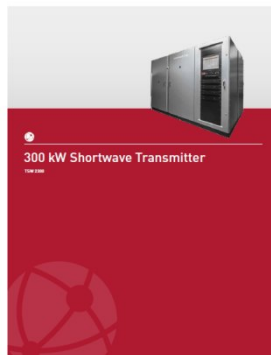
Solid State transmitter key performance

- Excellent RF spectrum measured at 2.4MHz full power 1.5kW module

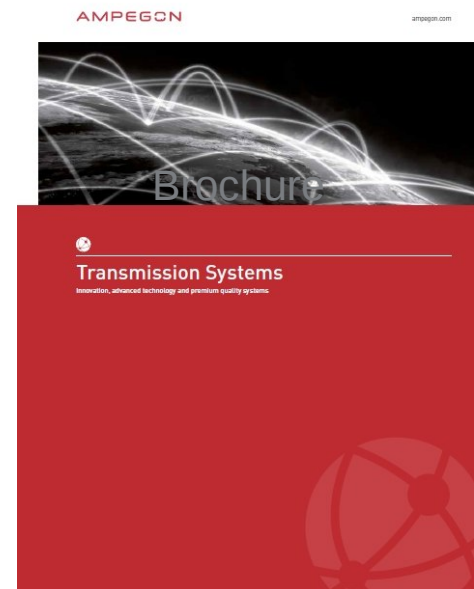


More Information is available

Leaflets



Homepage





Thank you!

Questions?



Transmission
Systems



Antenna
Systems



Scientific
Applications



Green
Technologies