



Approved by
Tehcnical Executiv Director

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TECHNICAL REQUIREMENTS

MEDIUM WAVE (MW) TRANSMITTER PURCHASES

Medium Wave transmitter 50 kW: 3 pcs.
Medium Wave transmitter 25 kW: 2 pcs.

CONTENTS:

- KEY EVALUATION CRITERIAS
- LOCATIONS AND DELIVERY CONDITIONS
- QUOTATION
- TECHNICAL SPECIFICATIONS
- FACTORY ACCEPTANCE TESTS FOR MW TRANSMITTER
- SITE ACCEPTANCE TESTS FOR MW TRANSMITTER

Table for Key Criteria evaluation

No.	Key Criteria	Minimum required	Maximum Points offered for the most performant value (H) from all offers	Calculated Points for offers with lower performance value (L)<(H)
1	Technical performances	according with table below	40	
2	Delivery time	<8 months	10	Formula: $H/L \times 10$ Example $H=3$ $L=8$ Calculated point= $(3/8) \times 10$
3	Price Offer [Lei]	<7.000.000	50	Formula: $H/L \times 60$ Example $H=150.000$ $L=260.000$ Calculated point= $(150.000/260.000) \times 50$
	TOTAL		100	
	Table for Technical Performances			
	Features	Minimum required	Maximum Points offered for the most performant value from all offers	Calculated Points formula
	Modulation Capability	$\geq 125\%$ peak program capability	10	min. point (1) for minimum required value (c) max. points (10) for most performant value (b) span = 9 x is vendor value MC=Modulation Capability Formula: $10 - ((MCx-MCb)/(MCc-MCb)) \times \text{span}$
	THD (Total Harmonics Distortion) 30 Hz - 10 kHz, modulation 80%	$\leq 1\%$	10	min. point (1) for minimum required value (c) max. points (10) for best value (b); span = 9 x is vendor value THD=Total Harmonics Distortion Formula: $10 - ((THDx-THDb)/(THDc-THDb)) \times \text{span}$
	S/N ratio, referred to fmod=1 kHz, modulation 100%	≥ 60 dB	10	min. point (1) for minimum required value (c) max. points (10) for best value (b); span = 9 x is vendor value SNR=Signal/Noise Ratio Formula: $10 - ((SNRx-SNRb)/(SNRc-SNRb)) \times \text{span}$
	Overall efficiency	$\geq 85\%$	10	min. point (1) for minimum required value (c) max. points (10) for best value (b); span = 9 x is vendor value OE=Overall Efficiency Formula: $10 - ((OEx-OEb)/(OEc-OEb)) \times \text{span}$
	Total for Technical performances		40	

04

I. Locații livrare echipamente (Delivery location)

No	Site	Delivery adress
1	Valu lui Traian	Statia AM si US Valu lui Traian, loc. Valu lui Traian, jud. Constanta, Romania
2	Herastrau	Centrul de emisie Herastrau, Str. Carpati nr.100, sector 1, Bucuresti, Romania
3	Rontau	Statia AM si US Rontau, Com. Sanmartin, jud. Bihor

II. Termenul de livrare va fi de cel mult 8 luni. (Delivery time: maxim 8 months)

III. Garanția tehnică a produselor va fi de minimum 24 luni. (Guaranteee periode: 24 months)

①

QUOTATION LIST

A. FULL SOLID STATE MW TRANSMITTER

No	FURNITURE	REQUIREMENTS	Q-ty	PRICE [LEI] site Valu lui Traian
1	Medium wave transmitter, according with technical specification requirement	Power: 50 kW, mode:AM, DRM30 simulcast Operating Frequency:1458 kHz Monitoring and audio program input equipment Rack	1 Pc.	
2	RECOMMENDED SPARE PARTS *The offerer will provide a complete list with the spare parts and price for each item. The total value of the recommended spare parts set will be 5% of the transmitter value.	The set will contains recommended minimum spare parts set (electronic boards/modules, power supply, power amplifiers, air filters, air fan, calibrated fuse, RF power transistor, display, etc).	1 Set	
3	COMMISSIONING AND SITE ACCEPTANCE TESTS	No of supplier specialist & working days Supplier will support all cost for travelling, accommodation, daily expenses.	1 set	
			Total	

No	FURNITURE	REQUIREMENTS	Q-ty	PRICE [LEI] site Valu lui Traian
1	Medium wave transmitter, according with technical specification requirement	Power: 50 kW, mode:AM, DRM30 simulcast Operating Frequency:1314 kHz Monitoring and audio program input equipment Rack	1 Pc.	
2	RECOMMENDED SPARE PARTS *The offerer will provide a complete list with the spare parts and price for each item. The total value of the recommended spare parts set will be 5% of the transmitter value.	The set will contains recommended minimum spare parts set (electronic boards/modules, power supply, power amplifiers, air filters, air fan, calibrated fuse, RF power transistor, display, etc).	1 Set	
3	COMMISSIONING AND SITE ACCEPTANCE TESTS	No of supplier specialist & working days Supplier will support all cost for travelling, accommodation, daily expenses.	1 set	
			Total	

No	FURNITURE	REQUIREMENTS	Q-ty	PRICE [LEI] site Rontau
1	Medium wave transmitter, according with technical specification requirement	Power: 50 kW, mode:AM, DRM30 simulcast Operating Frequency:603kHz Monitoring and audio program input equipment Rack	1 Pc.	
2	RECOMMENDED SPARE PARTS *The offerer will provide a complete list with the spare parts and price for each item. The total value of the recommended spare parts set will be 5% of the transmitter value.	The set will contains recommended minimum spare parts set (electronic boards/modules, power supply, power amplifiers, air filters, air fan, calibrated fuse, RF power transistor, display, etc).	1 Set	
3	COMMISSIONING AND SITE ACCEPTANCE TESTS	No of supplier specialist & working days Supplier will support all cost for travelling, accommodation, daily expenses.	1 set	
			Total	

No	FURNITURE	REQUIREMENTS	Q-ty	PRICE [LEI] site Valu Traian
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2

1	Medium wave transmitter, according with technical specification requirement	Power: 25 kW, mode:AM, DRM30 simulcast Operating Frequency:909 kHz. Monitoring and audio program input equipment Rack	1 Pc.	
2	RECOMMENDED SPARE PARTS *The offerer will provide a complete list with the spare parts and price for each item.The total value of the recommended spare parts set will be 5% of the transmitter value.	The set will contains recommended minimum spare parts set (electronic boards/modules, power supply, power amplifiers, air filters, air fan, calibrated fuse, RF power transistor, display, etc).	1 Set	
3	COMMISSIONING AND SITE ACCEPTANCE TESTS	No of supplier specialist & working days Suplier will support all cost for travelling, accommodation, daily expenses.	1 set	
			Total	

No	FURNITURE	REQUIREMENTS	Q-ty	PRICE [LEI] site Herastrau
1	Medium wave transmitter, according with technical specification requirement	Power: 25 kW, mode:AM, DRM30 simulcast Operating Frequency:630 kHz Monitoring and audio program input equipment Rack	1 Pc.	
2	RECOMMENDED SPARE PARTS *The offerer will provide a complete list with the spare parts and price for each item.The total value of the recommended spare parts set will be 5% of the transmitter value.	The set will contains recommended minimum spare parts set (electronic boards/modules, power supply, power amplifiers, air filters, air fan, calibrated fuse, RF power transistor, display, etc).	1 Set	
3	COMMISSIONING AND SITE ACCEPTANCE TESTS	No of supplier specialist & working days Suplier will support all cost for travelling, accommodation, daily expenses.	1 set	
			Total	

B. FACTORY TRAINING and FACTORY ACCEPTANCE TESTS

1	FACTORY TRAINING and FACTORY ACCEPTANCE TESTS	6 persons/ 5 working days Air fare tickets, Accomodation and Living Expenses taken in charge of Supllier: _Hotel Accomodation _Lunch on working day _Living expenses: 100 eur / day / person _Local transport _Insurances	1 Set	
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TECHNICAL FEATURES FOR MEDIUM WAVE AM SOLID STATE TRANSMITTER

I. Configuration

- Digitally μ P controlled transmitter
- Solid state transmitter, modular architecture, hot-pluggable power amplifiers
- Front Panel Diagnostic Display with detailed system information
- Variable carrier level depending by modulation level (ACC, DCC, etc); the carrier reduction up to 6dB will be provided.
- DRM capabilities
- DRM30 modulator including: A, B, C and D modes; QAM modes (MSC 64/16QAM and SDC 16 /4QAM); channel bandwidths 4.5/5kHz, 9/10kHz, 18/20kHz; modulation inputs: MDI and audio analogic and digital AES; easy switching between analog mode and DRM mode, without hardware adjustments

II. RF characteristics

- | | |
|------------------------|--|
| 1. Frequency range | -531 kHz to 1610 kHz
-later frequency change possible |
| 2. Exciters | -two exciters in stand-by configuration with automatic change in fault case.
-digital controlled oscillator.
-external reference input |
| 3. Frequency stability | +/-2ppm; |
| 4. Operating mode | AM (A3E)/DRM30/simulcast |

III. RF Output

- | | |
|---------------------------|---|
| 1. Output impedance | 50 Ω (Unbalanced); |
| 2. Carrier power | according with quotation request; |
| 3. Output power steps | adjustable from 20% to 100% |
| 4. VSWR | a. up to min. 1.3 with nominal power,
automatic power reduction above limit
threshold
b.transmitter should be protected for
short and open circuit conditions |
| 5. Harmonics and spurious | According to ITU-R SM.329-12 |
| 6. Carrier shift | 1% or less (for 95% modulation) |
| 7. Connector | 3 1/8" EIA; |

IV. Modulation Inputs

- | | |
|--------------------------|---|
| 1. Input | - analog input: 600 Ω balanced line
input level from -10 dBu to +10 dBu
-AES/EBU digital input 110 Ω ;
input level from -20 dBFS to 0 dBFS for
digital; |
| 2. Modulation Capability | 100% continuously sinusoidal wave
min. 125% peak program capability |

V. Transmission characteristics

- | | |
|--|---|
| 1. Modulation frequency range | 30 Hz to 10 kHz |
| 2. Amplitude-frequency characteristic referred to $f_{\text{mod}}=1$ kHz, 30 Hz to 10 kHz, modulation= 90% | +0.5 / -0.8 dB |
| 3. THD (Total Harmonics Distortion) 30 Hz to 10 kHz, modulation 80% | $\leq 1\%$ |
| 4. Intermodulation distortion | 1.0% or less 1:1, 60/7000Hz; 2% or less 4:1 at 95% modulation |
| 5. S/N ratio referred to $f_{\text{mod}}=1$ kHz, modulation=100% | ≥ 60 dB |

VI. Supply, cooling, environment

- | | |
|--------------------------------|--|
| 1. Supply voltage | 3 phase, 400 V a.c. $\pm 5\%$, transmitter providing full performance; $\pm 10\%$ transmitter operational; 50 Hz ± 3 Hz; 4 wires + ground |
| 2. Power factor | ≥ 0.95 ; |
| 3. Overall efficiency | $\geq 85\%$ |
| 4. Cooling | Air-cooling with built-in blowers; automatic foldback and shut down of the RF output power has to be provided in case of temperature fault. |
| 5. Operating temperature range | 0°C to + 45°C; |
| 6. Maximum relative humidity | to 90% non-condensing; |

7. Altitude

up to 2000 m;

VII. Specific requirements

- 1. The AM transmitter should assure an uninterrupted and unattended operation during 24 hours/ day.
The RF module has to be hot pluggable.**
- 2. The transmitter shall be characterized by high reliability, high MTBF (15000 hours). A statement need to be provided by manufacturer.**
- 3. Transmitter should display various parameters on LCD display.**
- 4. The AM transmitter must to be provided with calibrated sample port for power measurements and RF measurements.**
- 5 The AM transmitter must to be provided with full local and remote monitoring and control system with web GUI interface for remote operation. The transmitter will be provided with web user interface. The transmitter should be controlled independently of any external software.**

Minimum requirements:

a) Remote interface

All necessary devices and software to integrate the transmitter into the customer (RADIOCOM) monitoring system (e.g. SNMP protocol, MIB files, etc); TCP/IP interface

Full transmitter parameters control and indication

b) Local:

Display of following parameters:

Transmitter operating parameters (frequency, output and reflected power, RF currents, main power supply voltage and currents, audio input status, alarm list and history);

Fault diagnostic: RF chain and exciter, power amplifier stage, VSWR, temperature, interlock, main power supply

Alarms: no carrier, no audio, active fold-back

Exciter operating parameters

- 6. Fully wired rack for audio program inputs and monitoring equipment, including:**

a. Audio processor for AM operation

-analog and digital AES audio inputs with automatic switching between input sources and silence detection according to user configurable thresholds

b. AM demodulator with modulation depth meter

c. Audio monitor with loudspeaker, with selector for multiple audio inputs: audio processor output, demodulator output, main audio line, back-up audio line

d. DRM30 demodulator

7. The AM transmitter will be provided only with air cooling system.

8. Following are the typical requirements regarding the protection matter:

- Over- load protection
- Protection against over temperature
- Protection against high VSWR including open and short conditions at output.
- Immediate power fold-back under severe/damaging fault conditions. Details of fold-back to be provided.
- Personnel protection:

-Key Interlock System for dangerous areas in transmitter. Adequate protection of the operating personnel by means of interlock system which ensure that no doors can be opened until the high voltage are switched off; all main terminal which remain alive have to be suitable screened

-The operating staff must be protect to high voltage of the capacitors or other parts of the transmitter by ground-connection circuits and ground-sticks

9. The AM transmitter must to be provided with automatic switch-on at short interrupting of the main power supply (3 interrupts up to 1 second (in 5 seconds interval)). An statement need to be provided by manufacturer. This need to be confirmed by factory test report supplied with the transmitters.

10. The transmitter should have adequately protection against fire, rust and corrosion. An statement need to be provided by manufacturer.

11. Adequate protection system shall be provided to safe guard the transmitter from damage under fault conditions. The protection system should be fast acting to safe guard the components

12. A proposal for site acceptance tests is required (no of persons/day).

13. A proposal for training on factory and factory acceptance is required (see Quotation list)

14. A proposal for recommended spare parts kit is required. Must be provided complete list with the spare parts and price for each item.
The total value of the recommended spare parts set will be 5% of the transmitter value

15. Must be provided as "technical documentation", for all equipment, the following items:

- Documentation for the mechanical-electrical fitting,
 - Technical manuals containing:
 - Specifications,
 - Installation* & initial turn on,
 - Operators guide,
 - Controls and indicators,
 - Overall system theory,
 - Maintenance & alignments,
 - Troubleshooting,
 - Overall system & transmitter diagram
 - Electronic Boards Diagrams
 - Parts list, etc.
- * All necessary information for onsite installation by customer teams.

16. All equipment must be conform to the articles of Directive 2014/53/UE (RED) of the European Parliament and of the council of 9 March 1999 and its amendment acts on radio equipment and telecommunications terminal equipment, and to all European Community standards that apply to the respective type of equipment (including standards for toxic substances), otherwise the equipment cannot be imported under the Romanian law.

All equipment must be "CE" and "RoHS" certified. The offerer has to supply the conformity certificates for all equipment.

The manufacturer has to be certified ISO 9001:2015 and ISO 14001:2015

17. All above requirements are mandatory and must be specified in the technical specifications documentation, released by manufacturer, and will be attached as reference.

Must be indicated pages for each required parameter for reference.

18. Must be quoted prices for each item in quotation lists, including spare parts kit. The parts included in the spare parts kit will be quoted individually.

19. Guarantee period: 24 months for transmitters and auxiliary equipment.

TECHNICAL FEATURES FOR MEDIUM WAVE AM SOLID STATE TRANSMITTER

IP input capability

The provider must offer, within the transmitter system, the possibility to use IP input technology utilizing redundant WAN networks, with instant replacement of packets that may be lost on WAN1 by packets delivered on WAN2. This must take place seamless without switching between streams. Additionally, the technology must support similar functionality on a single WAN as well by utilizing delivery of delayed streams, where packets from second stream replace lost packets from the first stream.

Additionally, and at the same time, the IP source must be selectable between primary and secondary source.

Encoding and decoding for IP signals:

- MPEG2/4: AAC-LC
- Linear PCM
- Opus
- MPEG-TS

Must be able to upgrade with following algorimths:

- MPEG 1/2 Layer II
- MPEG4: AAC-LD/ELD , AAC-HE v1/v2
- E-APT-x

Technical compliance for AM medium wave transmitter
TECHNICAL FEATURES

Features	Details	Mandatory	Customer Offer	Reference pages
I. Configuration				
a) Digitally μ P controlled transmitter		Yes		
b) Solid state transmitter, modular architecture, hot-pluggable power amplifiers		Yes		
c) Front Panel Diagnostic Display with detailed system information		Yes		
d) Variable carrier level depending by modulation level (ACC, DCC, etc); the carrier reduction up to 6dB will be provided		Yes		
e) DRM capabilities		Yes		
f) DRM30 modulator including: A, B, C and D modes; QAM modes (MSC 64/16QAM and SDC 16/4QAM); channel bandwidths 4.5/5kHz, 9/10kHz, 18/20kHz; modulation inputs: MDI and audio analogic and digital AES; easy switching between analog mode and DRM mode, without hardware adjustments		Yes		
II. Frequency				
1. Frequency range	531 +1610 KHz digitally	Yes		
	later frequency change possible	Yes		
2. Exciter	-two exciters in stand-by configuration with automatic change in fault case. -digital controlled oscillator. -external reference input	Yes		
Digital controlled oscillator	included	Yes		
External reference input	included	Yes		
3. Frequency stability	+/- 2ppm	Yes		
4. Operating mode	AM (A3E)/DRM30/simulcast	Yes		
III. RF Output				
1. Output impedance	50 Ω unbalanced;	Yes		
2. Carrier power	according with quotation request	Yes		
3. Output power steps	adjustable from 20% to 100%	Yes		
4. VSWR	a. up to min. 1.3 with nominal power, automatic power reduction above limit threshold b. transmitter should be protected for short and open circuit conditions	Yes		
5. Spurious emissions (including harmonics)	according to ITU-R SM.329-12	Yes		
6. Carrier shift	1% or less (for 100% modulation)	Yes		
7. Connector	3 1/8" EIA;	Yes		
IV. Modulation Inputs				
1. Input	analog input: 600 Ω balanced line input level from -10 dBu to +10 dBu AES/EBU digital input 110 Ω input level from -20 dBFS to 0 dBFS for digital	Yes		
2. Modulation Capability	100% continuously sinusoidal wave min. 125% peak program capability	Yes		
V. Transmission characteristics				
1. Modulation frequency range	30 Hz to 10 kHz;	Yes		
2. Amplitude-frequency characteristic referred to fmod=1 kHz, 30 Hz to 10 kHz, modulation 90%	+0.5 / -0.8 dB	Yes		
3. THD (Total Harmonics Distortion) 30 Hz - 10 kHz, modulation 80%	$\leq 1\%$	Yes		
4. Intermodulation distortion	1.0% or less 1:1, 60/7000Hz; 2% or less 4:1 at 95% modulation	Yes		
5. S/N ratio, referred to fmod=1 kHz, modulation 100%	≥ 60 dB	Yes		
VI. Supply, cooling, environment				
1. Supply voltage	3 phase, 400 V a.c. +/- 5%, transmitter providing full performance; +/- 10% transmitter operational; 50 Hz +/- 3 Hz; 4 wires + ground	Yes		
2. Power factor	≥ 0.95 ;	Yes		
3. Overall efficiency	$\geq 85\%$	Yes		
4. Cooling	Air-cooling with built-in blowers; automatic foldback and shut down of the RF output power has to be provided in case of temperature fault	Yes		
5. Operating temperature range	0°C to +45°C;	Yes		
6. Maximum relative humidity	95% non condensing;	Yes		
7. Altitude	up to 2000 m;	Yes		

VII. Specific requirements				
1. The AM transmitter should assure an uninterrupted and unattended operation during 24 hours/ day		Yes		
The RF module has to be hot pluggable		Yes		
2. The transmitter shall be characterized by high reliability, high MTBF (15000 hours). A statement need to be provided by manufacturer.		Yes		
3. Transmitter should display various parameters on LCD display.		Yes		
4. The AM transmitter must to be provided with calibrated sample port for power measurements and RF measurements		Yes		
5. The AM transmitter must to be provided with full local and remote monitoring and control system with web GUI interface for remote operation. The transmitter will be provided with web user interface. The transmitter should be controlled independently of any external software		Yes		
Minimum requirements:				
a) Remote interface	All necessary devices and software to integrate the transmitter into the customer (RADIOCOM) monitoring system (e.g. SNMP protocol, MIB files, etc); TCP/IP interface	Yes		
	Full transmitter parameters control and indication	Yes		
b) Local				
Display of following parameters	1. Transmitter operating parameters (frequency, output and reflected power, RF currents, main power supply voltage and currents, audio input status, alarm list and history);	Yes		
	2. Fault diagnostic: RF chain and exciter, power amplifier stage, VSWR, temperature, interlock, main power supply	Yes		
	3. Alarms: no carrier, no audio, active fold-back	Yes		
	4. Exciter operating parameters	Yes		
6. Fully wired rack for audio program inputs and monitoring equipments, including:		Yes		
a. Audio processor for AM operation	- adjustable audio gain, limiter, selectable audio filter, audio presets and user defined presets	Yes		
	-analog and digital AES audio inputs with automatic switching between input sources and silent detection according to user configurable thresholds	Yes		
b. AM demodulator with modulation depth meter		Yes		
c. Audio monitor with loudspeaker, with selector for multiple audio inputs: audio processor output, demodulator output, main audio line, back-up audio line		Yes		
d. DRM30 demodulator		Yes		
7. The AM transmitter will be provided only with air cooling system		Yes		
8. Following are the typical requirements regarding the protection matter:				
	Over- load protection	Yes		
	Protection against over temperature	Yes		
	Protection against high VSWR including open and short conditions at output.	Yes		
	Immediate power fold-back under severe/damaging fault conditions. Details of fold-back to be provided.	Yes		
	Personnel protection:			
	-Key Interlock System for dangerous areas in transmitter. Adequate protection of the operating personnel by means of interlock system which ensure that no doors can be opened until the high voltage are switched off; all main terminal which remain alive have to be suitable screened	Yes		
	-The operating staff must be protect to high voltage of the capacitors or other parts of the transmitter by ground-connection circuits and ground-sticks	Yes		
9. The AM transmitter must to be provided with automatic switch-on at short interrupting of the main power supply (3 interrupts up to 1 second (in 5 seconds interval)). An statement need to be provided by manufacturer. This need to be confirmed by factory test report supplied with the transmitters.		Yes		
10. The transmitter should have adequately protection against fire, rust and corrosion. An statement need to be provided by manufacturer.		Yes		



11. Adequate protection system shall be provided to safe guard the transmitter from damage under fault conditions. The protection system should be fast acting to safe guard the components		Yes		
12. A proposal for site acceptance tests is required (no of persons/day).		Yes		
13. A proposal for training on factory and factory acceptance is required (see Quotation list).		Yes		
14. A proposal for recommended spare parts kit is required. Must be provided complete list with the spare parts and price for each item. The total value of the recommended spare parts set will be 5% of the transmitter value		Yes		
15. Must be provided as "technical documentation", for all equipment, the following items:		Yes		
a) Documentation for the mechanical-electrical fitting,		Yes		
b) Technical manuals containing:				
- Specifications		Yes		
- Installation* & initial turn on		Yes		
- Operators guide,		Yes		
- Controls and indicators,		Yes		
- Overall system theory,		Yes		
- Maintenance & alignments,		Yes		
- Troubleshooting,		Yes		
- Overall system & transmitter diagram		Yes		
- Electronic Boards Diagrams		Yes		
- Parts list, etc.		Yes		
* All necessary information for onsite installation by customer teams.		Yes		
16. All equipments must be conform to the articles of Directive 2014/53/UE (RED) of the European Parliament and of the council of 9 March 1999 and its amendment acts on radio equipment and telecommunications terminal equipment, and to all European Community standards that apply to the respective type of equipment (including standards for toxic substances), otherwise the equipments cannot be imported under the Romanian law.		Yes		
All equipments must be "CE" and "RoHS" certified. The offerer has to supply the conformity certificates for all equipments		Yes		
The manufacturer has to be certified ISO 9001:2015 and ISO 14001:2015		Yes		
17. All above requirements are mandatory and must be specified in the technical specifications documentation, released by manufacturer, and will be attached as reference.		Yes		
Must be indicated pages for each required parameter for reference.				
18. Must be quoted prices for each item in quotation lists, including spare parts kit. The parts included in the spare parts kit will be quoted individually.		Yes		
19. Guarantee period: 24 months for transmitters and auxiliary equipment		Yes		

Technical compliance for AM medium wave transmitter
TECHNICAL FEATURES

Features	Details	Mandatory	Customer Offer	Reference pages
The provider must offer, within the transmitter system, the possibility to use IP input technology utilizing redundant WAN networks, with instant replacement of packets that may be lost on WAN1 by packets delivered on WAN2. This must take place seamless without switching between streams. Additionally, the technology must support similar functionality on a single WAN as well by utilizing delivery of delayed streams, where packets from second stream replace lost packets from the first stream. Additionally, and at the same time, the IP source must be selectable between primary and secondary source. Encoding and decoding for IP signals: - MPEG2/4: AAC-LC - Linear PCM - Opus - MPEG-TS Must be able to upgrade with following algorithms: - MPEG 1/2 Layer II - MPEG4: AAC-LD/ELD , AAC-HE v1/v2 - E-APT-x		Yes		



MW TRANSMITTER TEST

TX s.n.....

Date.....

- **FACTORY TESTS**
- **SITE TESTS**

I. FACTORY TESTS
to be performed on Dummy Load

1.PERFORMANCE

A) Carrier Frequency: Pass/ Fail

Limit: +/-2ppm

Carrier Frequency is kHz (according with requested by technical specifications for each transmitter)

Exciter 1 Frequency.....kHz

Exciter2 Frequency.....kHz

B) Audio Input Level for 100% Modulation: Pass/ Fail

Limit: -10 dBu to +10 dBu/ -20 dBFS to 0 dBFS

C) Positive Peak Modulation Measurement: Pass/ Fail

Limit: 125%

Peak modulation obtained _____%

D) Amplitude Frequency Response: Pass/ Fail

referred to fmod=1 kHz, 30 Hz to 10 kHz, modulation= 90%

Limit: +0.5 / -0.8 dB

Frequency	Measured (dB)
30 HZ	
50 HZ	
100 HZ	

200 HZ	
500 HZ	
1 KHz	
2 KHz	
3 KHz	
5 KHz	
6 KHz	
7 KHz	
9 KHz	
10 KHz	

E) Total Harmonic Distortion: Pass/ Fail

30 Hz to 10 kHz modulation 80%.

Limit: $\leq 1\%$

Frequency	Measured (%)
30 HZ	
50 HZ	
100 HZ	
200 HZ	
500 HZ	
1 KHz	
2 KHz	

3 KHz	
5 KHz	
6 KHz	
7 KHz	
9 KHz	
10 KHz	

F) S/N ratio : Pass/ Fail

referred to $f_{mod}=1$ kHz, modulation=100%

Limit: ≥ 60 dB

S/N ratio measured.....(dB)

G. Intermodulation distortion

referred to 4:1 at 95% modulation (60/7000Hz)

Limit: ≤ 2 %

H) Harmonics and Spurious: Pass/ Fail

Limit: According to ITU-R SM.329-12

Harmonics of the Carrier frequency

HARMONIC	DB below carrier
2 nd	
3 rd	
4 th	
5 th	
6 th	
7 th	
8 th	
9 th	
10 th	

Spurious emissions located within 10th harmonic range

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FREQUENCY	DB below carrier	Source (If Known)

I) ACC/DCC Mode Test: Pass/ Fail

Transmitter at nominal power, no modulation. Record carrier level from demodulator and forward power from wattmeter.

Limit: 6dB carrier reduction

ACC/CCM LEVEL	Carrier Level, %	Power Level, kW
OFF		
ON		

J) Overall Efficiency : Pass/ Fail

transmitter at full assigned carrier power and modulation into the load. The efficiency will be calculated from RF power readings against AC power consumption.

Limit: $\geq 85\%$

Overall Efficiency measured.....(%)

K) Power Factor: Pass/ Fail

Transmitter at full assigned carrier power and modulation into the load. Record the power factor on power meter.

Limit: ≥ 0.95

Power Factor measured.....(%)

2. OPERATING, ELECTRICAL AND MECHANICAL CHECKS: Pass/ Fail

A. System Tests

DRM30 operation
AM/DRM30/simulcast changeover

Transmitter Internal and External Interlock

Automatic AC Restart Test

VSWR Manual Foldback Test

Exciter Changeover Test

B. Visual Inspection

Transmitter Cabinet

Transmitter Components

Electrical Boxes and Wiring

C. 24 Hours Heat Run Test

Performed with Program Audio Modulation for 24 Hrs into the Dummy Load.

Start Time _____

Stop Time _____

D. Dummy Load Impedance Test

Check the Dummy load with meter on ohm's scale.

Dummy Load Impedance is _____

3.METERING

A) Operating metereing

Modulation		Power Measured	PA Vdc	PA Idc
0%	Low Power			
60%				
100%				
0%	Med Power			
60%				

100%				
0%	High Power			
60%				
100%				

B) Diagnostic metering

-to be detailed by supplier according with transmitter architecture for: VOLTAGES, CURRENTS

TEST EQUIPMENT

MAKE/MODEL

S / N

- 1.
- 2.
- 3.
- 4.



ACCEPTANCE CERTIFICATE

The above listed tests have been successfully completed on the following transmitter and the results are compliant with the specifications.

Transmitter Serial Number _____

Frequency _____

Date of Manufacture _____

CUSTOMER REPRESENTATIVE

Name _____

Title _____

Date _____

SUPPLIER REPRESENTATIVE

Name _____

Title _____

Date _____

Comments:

II. SITE TESTS

All tests listed under factory tests item would be repeated on dummy load except that the twenty-four hours heat run test.

All tests will be repeated also into the antenna. These tests will include the twenty-four hours endurance test.

NOTE: IT IS MANDATORY AS THE TENDER TO CONTAINES A DETAILED "ACCEPTANCE TESTS PROTOCOL" INCLUDING THE INDIVIDUAL PROCEDURE AND TEST EQUIPMENTS USED TO MEASURE AND TESTING EACH PARAMETER AND FUNCTIONALITY OF THE TRANSMITTERS.

1. TESTING OF ACCESSORIES

The associated equipment like Dummy Load shall be tested and inspected as per mutually acceptable Acceptance Test Protocols at the manufacturer's works as well as at the site. The tenderer shall enclose the ATP for each equipment type along with the tender.

ON SITE SYSTEM CHECKS: PASS/FAIL

Transmitter Internal and External Interlock

Grounding Switch

Automatic AC Restart Test

VSWR Manual Foldback Test

Exciter Changeover Test

VISUAL INSPECTION

Transmitter Cabinet

Transmitter Components

Dummy Load

RF Transmission Lines

Patch Panel

Program Input Equipment

Electrical Boxes and Wiring

5. TEST EQUIPMENT

MAKE/MODEL

S / N

- 1.
- 2.
- 3.
- 4.


29.