Se aprobă,
Director Executiv Tehnic,
Alin TERCHILĂ

CAIET DE SARCINI

EMIȚĂTOARE FM 5/ 10 KW

CUPRINS:

LOCAŢIE ŞI CONDIŢII DE LIVRARE

I. Locaţie livrare echipamente

No	Site	Tx power	Sucursala S.N.R.	Adresa livrare
1	Herastrau	3 x 10kW	DR Bucuresti	Statia de emisie Herastrau, Bucuresti, Str. Carpati, nr. 100, sector 1
2	Costila	1 x 10kW	DR Bucuresti	Statia de emisie Bucegi Costila SNR, vf Costila, muntii Bucegi, jud Prahova
3	Feleac	2 x 5kW	DR Cluj	Statia de emisie Feleac, Comuna Feleacu, jud.Cluj
4	Pietraria	2 x 10kW	DR Iasi	Statia de emisie Pietraria, Dealul Repedea, Comuna Barnova, jud.Iasi
5	Urseni	2 x 5kW	DR Timisoara	Statia de emisie Urseni, com Giroc, jud.Timis

II. Termenul de livrare:

a) pentru amplasamentele Herăstrău, Urseni, Feleac, Pietrăria în maxim de 4 luni de la semnarea contractului,

b) pentru amplasamentul Coştila în maxim de 6 luni de la semnarea contractului, dacă condiţiile meteo permit transportul în amplasament.

Cu acordul părţilor, termenul de livrare se poate prelungi până când va fi posibilă efectuarea transportului, dar nu mai mult de 3 luni de la data expirării termenului iniţial.

III. Garanţia tehnică a produselor: ≥ 36 luni.

QUOTATION LIST FOR FULL SOLID STATE
FM-VHF TRANSMITTER Herastrau site

No	FURNITURE	REQUIREMENTS	Q-ty	PRICE (EURO) CIP Herastrau site
1	FM TRANSMITTER 10 kW 105,30 MHz 98,30 MHz 101,30 MHz	According with Technical Specifications	3 Pcs	
2	INTERFACE FOR MONITOR AND REMOTE AND "PC" MONITOR AND REMOTE OPERATION Device enclosed in pos.1	- PC remote and monitor facilities: hardware+software firmware; -All necessary devices and software to integrate the transmitter into the Radiocomunicatii monitoring system (e.g. SNMP protocol, MIB files, etc);	3 Pcs	
3	RDS ENCODER , fully compliant with CENELEC 50067(including TMC operation) Device enclosed in pos.1 or External Device	- Scrolling PS and radio text messaging - PS 8 charactes and up to 128 characters scrolling messaging - TCP/IP port -25 AF (alternate frequencies) at least	3 Pcs	
4	AUDIO PROCESSOR Device enclosed in pos.1 or External Device	- Multiband processing, EQ, AGC, Clipping - on/ bypass selectabile For external device: - analog input : 600 ohm/>10kohm selectable - analog output: 600 ohm, balanced, (-10 dBu to +15 dBu adjustable) - digital input 110 ohm - digital output: 110 ohm (-20 dBFS to 0 dBFS adjustable) - MPX output - XLR conectors for audio input/output - all necesary interconecting cables	3 Pcs	
5	AUDIO and MODULATION MONITOR	- FM demodulator with stereo and RDS decoder - Modulation monitor and metering - Audio monitor	3 Set	
6	RECOMMENDED SPARE PARTS *The offerer will provide a complete list with the spare parts and price for each item.	The set will contains factory recommended spare parts kit such: electronic boards/modules, power suply, power amplifiers, air filers, air fan, calibrated fuse, display,etc.	1 Set	
7	TECHNICAL MANUAL AND COMPLETE DOCUMENTATION	In English	3 Pcs	
8	COMMISSIONING AND SITE ACCEPTANCE TESTS	No of supplier specialist &days for 3 Txs	1 Set	
			TOTAL	

QUOTATION LIST FOR FULL SOLID STATE
FM-VHF TRANSMITTER Costila site

No	FURNITURE	REQUIREMENTS	Q-ty	PRICE (EURO) CIP Bucegi-Costila site
1	FM TRANSMITTER 10 kW 102,20 MHz	According with Technical Specifications	1 Pc	
2	INTERFACE FOR MONITOR AND REMOTE AND "PC" MONITOR AND REMOTE OPERATION Device enclosed in pos.1	- PC remote and monitor facilities: hardware+software firmware; -All necessary devices and software to integrate the transmitter into the Radiocomunicatii monitoring system (e.g. SNMP protocol, MIB files, etc);	1 Pc	
3	RDS ENCODER , fully compliant with CENELEC 50067(including TMC operation) Device enclosed in pos.1 or External Device	- Scrolling PS and radio text messaging - PS 8 charactes and up to 128 characters scrolling messaging - TCP/IP port -25 AF (alternate frequencies) at least	1 Pc	

4	AUDIO PROCESSOR Device enclosed in pos.1 or External Device	- Multiband processing, EQ, AGC, Clipping - on/ bypass selectabile For external device: - analog input : 600 ohm/>10kohm selectable - analog output: 600 ohm, balanced, (-10 dBu to +15 dBu adjustable) - digital input 110 ohm - digital output: 110 ohm (-20 dBFS to 0 dBFS adjustable) - MPX output - XLR conectors for audio input/output - all necesary interconecting cables	1 Pc	
5	AUDIO and MODULATION MONITOR	- FM demodulator with stereo and RDS decoder - Modulation monitor and metering - Audio monitor	1 Set	
6	RECOMMENDED SPARE PARTS *The offerer will provide a complete list with the spare parts and price for each item.	The set will contains factory recommended spare parts kit such: electronic boards/modules, power suplly, power amplifiers, air filers, air fan, calibrated fuse, display,etc.	1 Set	
7	TECHNICAL MANUAL AND COMPLETE DOCUMENTATION	in English	1 Pc	
8	COMMISSIONING AND SITE ACCEPTANCE TESTS	No of supplier specialist &days for 1 Tx	1 Set	
			TOTAL	

QUOTATION LIST FOR FULL SOLID STATE FM-VHF TRANSMITTER Feleac site

No	FURNITURE	REQUIREMENTS	Q-ty	PRICE (EURO) CIP Feleac site
1	FM TRANSMITTER 5 kW 88,80 MHz 101,00 MHz	According with Technical Specifications	2 Pcs	
2	INTERFACE FOR MONITOR AND REMOTE AND "PC" MONITOR AND REMOTE OPERATION Device enclosed in pos.1	- PC remote and monitor facilities: hardware+software firmware; -All necessary devices and software to integrate the transmitter into the Radiocomunicatii monitoring system (e.g. SNMP protocol, MIB files, etc);	2 Pcs	
3	RDS ENCODER , fully compliant with CENELEC 50067(including TMC operation) Device enclosed in pos.1 or External Device	- Scrolling PS and radio text messaging - PS 8 charactes and up to 128 characters scrolling messaging - TCP/IP port -25 AF (alternate frequencies) at least	2 Pcs	
4	AUDIO PROCESSOR Device enclosed in pos.1 or External Device	- Multiband processing, EQ, AGC, Clipping - on/ bypass selectabile For external device: - analog input : 600 ohm/>10kohm selectable - analog output: 600 ohm, balanced, (-10 dBu to +15 dBu adjustable) - digital input 110 ohm - digital output: 110 ohm (-20 dBFS to 0 dBFS adjustable) - MPX output - XLR conectors for audio input/output - all necesary interconecting cables	2 Pcs	
5	AUDIO and MODULATION MONITOR	- FM demodulator with stereo and RDS decoder - Modulation monitor and metering - Audio monitor	2 Set	
6	RECOMMENDED SPARE PARTS *The offerer will provide a complete list with the spare parts and price for each item.	The set will contains factory recommended spare parts kit such: electronic boards/modules, power suplly, power amplifiers, air filers, air fan, calibrated fuse, display,etc.	1 Set	
7	TECHNICAL MANUAL AND COMPLETE DOCUMENTATION	In English	2 Pcs	
8	COMMISSIONING AND SITE ACCEPTANCE TESTS	No of supplier specialist &days for 2 Txs	1 Set	
			TOTAL	

QUOTATION LIST FOR FULL SOLID STATE
FM-VHF TRANSMITTER Pietraria site

No	FURNITURE	REQUIREMENTS	Q-ty	PRICE (EURO) CIP Pietraria site
1	FM TRANSMITTER 10 kW 101,10 MHz 103,10 MHz	According with Technical Specifications	2 Pcs	
2	INTERFACE FOR MONITOR AND REMOTE AND "PC" MONITOR AND REMOTE OPERATION Device enclosed in pos.1	- PC remote and monitor facilities: hardware+software firmware; -All necessary devices and software to integrate the transmitter into the Radiocomunicatii monitoring system (e.g. SNMP protocol, MIB files, etc);	2 Pcs	
3	RDS ENCODER , fully compliant with CENELEC 50067(including TMC operation) Device enclosed in pos.1 or External Device	- Scrolling PS and radio text messaging - PS 8 charactes and up to 128 characters scrolling messaging - TCP/IP port -25 AF (alternate frequencies) at least	2 Pcs	
4	AUDIO PROCESSOR Device enclosed in pos.1 or External Device	- Multiband processing, EQ, AGC, Clipping - on/ bypass selectabile For external device: - analog input : 600 ohm/>10kohm selectable - analog output: 600 ohm, balanced, (-10 dBu to +15 dBu adjustable) - digital input 110 ohm - digital output: 110 ohm (-20 dBFS to 0 dBFS adjustable) - MPX output - XLR conectors for audio input/output - all necesary interconecting cables	2 Pcs	
5	AUDIO and MODULATION MONITOR	- FM demodulator with stereo and RDS decoder - Modulation monitor and metering - Audio monitor	2 Set	
6	RECOMMENDED SPARE PARTS *The offerer will provide a complete list with the spare parts and price for each item.	The set will contains factory recommended spare parts kit such: electronic boards/modules, power suply, power amplifiers, air filers, air fan, calibrated fuse, display,etc.	1 Set	
7	TECHNICAL MANUAL AND COMPLETE DOCUMENTATION	In English	2 Pcs	
8	COMMISSIONING AND SITE ACCEPTANCE TESTS	No of supplier specialist &days for 2Txs	1 Set	
			TOTAL	

QUOTATION LIST FOR FULL SOLID STATE
FM-VHF TRANSMITTER Urseni site

No	FURNITURE	REQUIREMENTS	Q-ty	PRICE (EURO) CIP Urseni site
1	FM TRANSMITTER 5 kW 106,40 MHz 100,70 MHz	According with Technical Specifications	2 Pcs	
2	INTERFACE FOR MONITOR AND REMOTE AND "PC" MONITOR AND REMOTE OPERATION Device enclosed in pos.1	- PC remote and monitor facilities: hardware+software firmware; -All necessary devices and software to integrate the transmitter into the Radiocomunicatii monitoring system (e.g. SNMP protocol, MIB files, etc);	2 Pcs	
3	RDS ENCODER , fully compliant with CENELEC 50067(including TMC operation) Device enclosed in pos.1 or External Device	- Scrolling PS and radio text messaging - PS 8 charactes and up to 128 characters scrolling messaging - TCP/IP port -25 AF (alternate frequencies) at least	2 Pcs	

4	AUDIO PROCESSOR Device enclosed in pos.1 or External Device	- Multiband processing, EQ, AGC, Clipping - on/ bypass selectabile For external device: - analog input : 600 ohm/>10kohm selectable - analog output: 600 ohm, balanced, (-10 dBu to +15 dBu adjustable) - digital input 110 ohm - digital output: 110 ohm (-20 dBFS to 0 dBFS adjustable) - MPX output - XLR conectors for audio input/output - all necesary interconecting cables	2 Pcs	
5	AUDIO and MODULATION MONITOR	- FM demodulator with stereo and RDS decoder - Modulation monitor and metering - Audio monitor	2 Set	
6	RECOMMENDED SPARE PARTS *The offerer will provide a complete list with the spare parts and price for each item.	The set will contains factory recommended spare parts kit such: electronic boards/modules, power suplly, power amplifiers, air filers, air fan, calibrated fuse, display,etc.	1 Set	
7	TECHNICAL MANUAL AND COMPLETE DOCUMENTATION	In English	2 Pcs	
8	COMMISSIONING AND SITE ACCEPTANCE TESTS	No of supplier specialist &days for 2 Txs	1 Set	
			TOTAL	

QUOTATION LIST FOR FACTORY ACCEPTANCE TESTS AND TRAINING ON FACTORY FOR FM-VHF TRANSMITTER

No	Factory acceptance tests and training on factory	REQUIREMENTS	Q-ty	PRICE (EUR)
1	Factory Acceptance Tests for each type of transmitter and training in factory for each type of transmitter (5 kW and 10 kW)	7 persons/ 10 working days Air fare tickets, Accommodation and Living Expenses taken in charge of Supplier: -Hotel Accommodation -Lunch on working day -Living expenses (80 Euro/ day/person) -Insurances -Local transport	1 Set.	
			TOTAL	

TECHNICAL FEATURES FOR VHF FM SOLID STATE TRANSMITTER

I. Configuration

- **Full Solid State, air cooled transmitter**
- **Digitally μP controlled transmitter**
- **Front Panel Diagnostic Display with detailed system information**
- **One rack with 2 exciters configuration**

II. Frequency

1. Frequency range	: 87.5 ÷ 108 MHz software digitally programmable
2. Exciter	2 exciters in stand-by configuration, with automatic changeover system in fault case, containing oscillator, stereo encoder and RF driver amplifier.
2.1 Digital controlled oscillator	: included
2.2 Stereo encoder	: included
2.3 Digital Composite Limiter	: included
2.4 RDS coder	: external device (fully compliant with CENELEC 50067), IEC standard 62106 – Edition 3 and RDS 2.0 standard
3. Frequency stability	: +/-150Hz
4. Nominal frequency deviation	: ± 75 kHz (CCIR 450 - 1)
5. Maximum frequency deviation	: ± 150 kHz
6. Class of emission	: F8EH
7. Stereo emissions	: according to CCIR recommendation 450, section 2 (pilot tone procedure)

III. RF Output

1. Output RF power	: according with quotation request
2. Output impedance	: 50 Ω (Unbalanced)

3. **VSWR** : Automatic power reduction beyond 1.4:1
Transmitter should be protected for short and open circuit conditions

4. **In band spurious emission (87,5-137 MHz)** : better than 85 dBc, tx power=10kW
: better than 82 dBc, tx power= 5kW

5. **Out of band Harmonics and Spurious emissions (30-87,5 MHz and 137MHz-1GHz)** : better than 70 dBc

6. **Output Connector** : EIA 1 5/8

IV. Modulation Inputs

: - Analog LEFT, RIGHT;
- Digital AES/EBU (32 to 96 kHz sampling frequency).
- MPX (**digital over AES** and analogic);
- RDS input (for external encoder)

The transmitters will be provided with:

- auto and user selectable switching of audio inputs

V. Transmission characteristics

Stereo operation

1. **Modulation frequency range** : 30 Hz to 15 kHz

2. **Input impedance** : 600 ohms, balanced for analog
110 ohms for digital

3. **AF input level** : 0 dBu to +10 dBu for analog
-10 dBFS to 0 dBFS for digital

4. **Pre emphasis** : 0 µs, 50 µs and 75µs selectable

5. **Amplitude-frequency characteristic referred to f_{mod}=400 Hz, 30 Hz to 15 kHz, left channel, right channel** : ± 0.2 dB (without pre-emphasis)
: ± 0.2 dB (with pre-emphasis)

6. **Crosstalk between left and right channels 100% modulation, 30 Hz to 15 kHz**
Linear : > 50 dB
Non-linear : > 55 dB

7. **THD, 30 Hz to 15 kHz,**

- with 75 kHz frequency deviation : < 0.05%
- with 100 kHz frequency deviation : < 0.05%
  left channel, right channel

8. Intermodulation distortion (L or R) : < 0.2%
   60Hz/ 7kHz, 4:1, +4dBu

9. FM S/N ratio, referred to f_{mod}=400 Hz at
   75 kHz frequency deviation, peak value
   measurement, left channel, right channel

   - weighted : ≥ 80 dB

   Mono operation

10. Amplitude frequency characteristic : ± 0.2 dB (without pre-emphasis)
    referred to f_{mod}=400 Hz, : ± 0.2 dB(with pre-emphasis)
    30 Hz to 15 kHz

11. FM S/ N ratio, referred to f_{mod}=400 Hz at
    75 kHz frequency deviation
- weighted : ≥ 80 dB

12. Asynchronous AM Noise
    referred to 100% AM modulation at 400 Hz,
    50 µs Pre-emphasis and without FM modulation : > 55 dB

13. Synchronous AM Noise
    referred to 100% AM modulation at 400 Hz,
    50 µs Pre-emphasis with FM modulation at 75 kHz : > 50 dB;

VI. Supply, cooling, environment

1. Supply voltage : 400 Vac (– 15%/ +14%), 50 Hz ± 3 Hz;
   4 wires + ground (3 phase)

2. Power factor : > 0.95;

3. Overall efficiency : > 70%

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 or air pressure fault.
5. Operating temperature range	: 0°C to + 45°C;
6. Maximum relative humidity	: 95%, non condensing;
7. Altitude	: up to .3000 m;
8. The acoustic noise in the transmitter room, for 2 m distance of the front of transmitter	: less than 65 phones;
9. Permissible electric stray field strength	: < 10V/m measured at one meter in front of the transmitter cabinets during normal operation
10. Permissible magnetic stray field strength	< 4 A/ m measured at one meter in front of transmitter cabinets during normal operation

VII. Specific requirements

1. The FM transmitter should assure an uninterrupted and unattended operation during 24 hours/ day.

2. The FM Transmitter should be user friendly and simple to operate.

3. The equipment quoted must conform to the latest international standards of safety and EMC. The conformance to such standards must be stated in compliance statement (Oferrer will indicate Standard's Name and Number).

4. The transmitter shall be characterized by high reliability, high MTBF (15000 hours).

5. The transmitter must have the final stage with modular architecture; in event of power amplifiers failure the transmitter must operate with acceptable parameters.

6. The transmitter should have adequately protection against fire, rust and corrosion.

7. Transmitter should display various parameters on LCD display.

8. 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.

9. Typical requirements regarding the protection matter:

- Over- load protection for transmitter.
- Protection against over temperature.
- Main power supply protection.
- 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

10. The FM transmitter must to be provided with probe for power measurements.

11.Automatic switching between input sources with silent detection according to user-configurable thresholds.

12.Integrated sound processor that can limit the audio signal level and can correct the frequency amplitude feature on a minimum of 3 bands.

13. The FM 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)).

14. The FM transmitter will be provided only with air cooling system.

15. A proposal for commissioning (verifying the installation made by customer) on site and site acceptance tests is required (no of persons/ day).

16. A proposal for recommended spare parts kit (included in the offer price) is required.

17. The FM transmitter must to be provided with local and full remote monitoring and control system with web/ GUI interface for remote operation. The transmitter will be provided with web user interface.

Minimum requirements:

a) Remote

1. Remote control	• full transmitter parameters control
2. Remote indication	• on / off status • RF forward and reflected power • Audio input status • Deviation meter

• alarms: no carrier, no audio, active fold-back, -3dB carrier
• fault: RF chain and exciter, power amplifier stage, VSWR, temperature, interlock, main power supply.

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);
2. **Fault diagnostic**: RF chain and exciter, power amplifier stage, VSWR, temperature, interlock, main power supply
3. **Alarms**: no carrier, no audio, active fold-back
4. **Exciter operating parameters, including power level.**
5. **Deviation meter**

c) Monitoring equipment

Remote interface:

•PC remote and monitor facilities: hardware + software firmware;
•All necessary devices and software to integrate the transmitter into the Radiocomunicatii monitoring system (e.g. SNMP protocol, MIB files, etc);

Audio and modulation monitoring:

- FM demodulator with stereo and RDS decoder
- Modulation monitor and metering
- Audio monitor

18. In the furniture the supplier will provide as "technical documentation", for all furniture, 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,
  - Boards Diagrams
  - Parts list, etc.

19. All equipments must be conform to the articles of Directive of 1999/5/EC 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.
All equipments must be "CE" and "RoHS" certified. The offerer has to supply the conformity certificates for all equipments.

20. All parameters and values 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.

21. 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.

ANNEX A : RDS Specific Requirements

22. Data connectors :	RS232/USB 2.0 and UTP Ethernet port
23. Signal connectors :	Input BNC Audio/ Pilot/ MPX Input external TA Output unbalanced BNC – MPX + RDS
24. Network protocols :	HTTP, SNTP, TCP, UDP, DHCP, DNS, SNMP, UPnP
25. UECP protocol :	Fully compliant EBU SPB490 Version 7.05
26. Network connectivity :	Minim 2 TCP ports; 2 UDP ports (configurable)
27. Remote control :	Via Telnet/SSH, Web Server, SNMP ASCII and UEPC commands
28. Alert/ manage :	Embedded SNMP agent with active tasks SNMP Traps and/ or e-mails
29. Dynamic RDS :	Mandatory
30.RDS Services :	PI, PS, PTY (RDS/RBDS), REG, AF, TP, TA, DI, M/S, RT, RT+, TMC, EON, TDC, ECC, LIC, IH, CT, EWS, ODA, TMC
31. RDS Group supported :	All
32. RDS Group sequence :	Configurable
33. RDS Software :	ASCII CLI commands GUI Based control and monitoring software Windows 7, 8, 10 compatible

Technical compliance for FM transmitter
TECHNICAL FEATURES

Features	Details	Mandatory	Customer Offer	Reference pages
I. Configuration				
Full Solid State, air cooled transmitter		Yes		
Digitally µP controlled transmitter		Yes		
Front Panel Diagnostic Display with detailed system information		Yes		
• One rack with 2 exciters configuration		Yes		
II. Frequency				
1. Frequency range	87.5 +108 MHz software digitally programmable	Yes		
2. Exciter	2 exciters in stand-by configuration, with automatic changeover system in fault case, containing oscillator, stereo encoder and RF driver amplifier	Yes		
Digital controlled oscillator	included	Yes		
Stereo Encoder	included	Yes		
Digital Composite Limiter	included	Yes		
RDS coder	external, fully compliant with CENELEC 50067 , IEC standard 62106 - Edition 3 and RDS 2.0 standard	Yes		
3. Frequency stability	+/-150Hz	Yes		
4. Nominal frequency deviation	± 75 kHz (CCIR 450 - 1);	Yes		
5. Maximum frequency deviation	± 150 kHz;	Yes		
6. Class of emission	F8EH	Yes		
7. Stereo emissions	according to CCIR recommendation 450, section 2 (pilot tone procedure)	Yes		
III. RF Output				
1. Output RF power	according with quotation request	Yes		
2. Output impedance	50 Ω unbalanced;	Yes		
3. VSWR	a. Automatic power reduction beyond 1.4:1	Yes		
	b. Transmitter should be protected for short and open circuit conditions	Yes		
4. In band spurious emission (87,5-137 MHz)	better than 85 dBc, tx power=10kW better than 82 dBc, tx power= 5kW	Yes		
5. Out of band Harmonics and Spurious emissions (30-87,5 MHz and 137MHz-1GHz)	better than 70 dBc	Yes		
6. Output Connector	EIA 1 5/8	Yes		
IV. Modulation Inputs				
Inputs	Analog LEFT, RIGHT;	Yes		
	Digital AES/EBU digital (32 to 96 kHz sampling frequency).	Yes		
	MPX (digital over AES and analogic)	Yes		
	RDS input (for external encoder)	Yes		
	The transmitters will be provided with auto and user selectable switching of audio inputs.	Yes		
V. Transmission characteristics				
Stereo operation				
1. Modulation frequency range	30 Hz to 15 kHz;	Yes		
2. Input impedance	600 ohms, balanced for analog 110 ohms for digital	Yes		
3. AF input level	- 0 dBu to + 10 dBu, for analog - 10 dBFS to 0 dBFS for digital;	Yes		
4. Pre emphasis	0 µs, 50 µs and 75µs selectable	Yes		
5. Amplitude-frequency characteristic referred to fmod=400 Hz, 30 Hz to15 kHz,left channel, right channel	± 0.2 dB (without pre emphasis), ± 0.2 dB (with pre emphasis)	Yes		
6. Crosstalk between left and right channels 100% modulation, 30 Hz to 15 kHz	> 50 dB liniar; > 55 dB nonliniar.	Yes		
7. THD, 30 Hz - 15 kHz, left channel, right channel		Yes		
- with 75 kHz frequency deviation	< 0.05%	Yes		
- with 100 kHz frequency deviation	< 0.05%;	Yes		

8. Intermodulation distortion (L or R) 60Hz/ 7kHz, 4:1, +4dBu	< 0.2%	Yes		
9. FM S/N ratio, referred to fmod=400 Hz at75 kHz frequency deviation, peak value measurement, left channel, right channel		Yes		
- weighted	≥ 80 dB	Yes		
Mono operation				
10. Amplitude-frequency characteristic referred to fmod=400 Hz, 30 Hz to15 kHz		Yes		
-without pre emphasis	± 0.2 dB	Yes		
-with pre emphasis	± 0.2 dB	Yes		
11. FM S/N ratio, referred to fmod=400 Hz at 75 kHz frequency deviation, peak value measurement		Yes		
- weighted	≥ 80 dB	Yes		
12. Asynchronous AM noise	> 55dB	Yes		
13. Synchronous AM noise	> 50dB	Yes		
VI. Supply, cooling, environment				
1. Supply voltage	400 Vac (-15%/ +14%), 50 Hz ± 3 Hz , 4 wire + ground (3 phase)	Yes		
2. Power factor	> 0.95;	Yes		
3. Overall efficiency	> 70%	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 or air pressure fault	Yes		
5. Operating temperature range	0°C to+ 45°C;	Yes		
6. Maximum relative humidity	95% non condensing;	Yes		
7. Altitude	up to 3000 m;	Yes		
8. The acoustic noise in the transmitter room, for 2 m distance of the front of transmitter	less than 65 phones;	Yes		
9. Permissible electric stray field strength	< 10V/m measured at one meter in front of the transmitter cabinets during normal operation	Yes		
10. Permissible magnetic stray field strength	< 4 A/ m measured at one meter in front of the transmitter cabinets during normal operation	Yes		
VII. Specific requirements				
1. The FM transmitter should assure an uninterrupted and unattended operation during 24 hours/ day		Yes		
2.The FM Transmitter should be user friendly and simple to operate.		Yes		
3.The equipment quoted must conform to the latest international standards of safety and EMC. The conformance to such standards must be stated in compliance statement (Oferrer will indicate Standard's Name and Number).		Yes		
4. The transmitter shall be characterized by high reliability, high MTBF (15000 hours).		Yes		
5. The transmitter must have the final stage with modular architecture, in event of power amplifiers failure the transmitter must operate with acceptable parameters.		Yes		
6. The transmitter should have adequately protection against fire, rust and corrosion.		Yes		
7. Transmitter should display various parameters on LCD display.		Yes		
8.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		

9.Typical requirements regarding the protection matter: - Over- load protection for ransmitter. - Protection against over temperature. - Main power supply protection. - 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.		Yes		
10.The FM transmitter must to be provided with probe for power measurements		Yes		
11. Automatic switching between input sources with silent detection according to user-configurable thresholds.		Yes		
12. Integrated sound processor that can limit the audio signal level and can correct the frequency amplitude feature on a minimum of 3 bands.		Yes		
13. The FM 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)).		Yes		
14. The FM transmitter will be provided only with air cooling system.		Yes		
15. A proposal for commissioning (verifying the installation made by customer) on site and site acceptance tests is required (no of persons/ day).		Yes		
16. A proposal for recommended spare parts kit (included in the offer price) is required.		Yes		
17. The FM transmitter must to be provided with web/ GUI local and full remote monitoring and control system with interface for remote operation. The transmitter will be provided with web user interface.		Yes		
Minimum requirements:				
a) Remote		Yes		
1. Remote control	• full transmitter parameters control	Yes		
2. Remote indication	• on / off status • RF forward and reflected power • Audio input status • Deviation meter • alarms: no carrier, no audio, active fold-back,-3dB carrier • fault: RF chain and exciter, power amplifier stage, VSWR, temperature, interlock, main power supply.	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, including power level	Yes		
	5. Deviation meter	Yes		
c) Monitoring equipment	Remote interface :	Yes		
	• PC remote and monitor facilities: hardware + software firmware;	Yes		
	• All necessary devices and software to integrate the transmitter into the Radiocomunicatii monitoring system (e.g. SNMP protocol, MIB files, etc)	Yes		
	Audio and modulation monitoring:	Yes		
	• FM demodulator with stereo and RDS decoder	Yes		
	• Modulation monitor and metering	Yes		
	• Audio monitor	Yes		
18. In the furniture the supplier will provide as "technical documentation", for all furniture, the following items:	Documentation for the mechanical-electrical fitting	Yes		
	Technical manuals containing:	Yes		

	- Specifications			
	- Installation & initial turn on			
	- Operators guide			
	- Controls and indicators			
	- Overall system theory			
	- Maintenance & alignments			
	- Troubleshooting			
	- Boards Diagrams			
	- Parts list, etc			
19. All equipments must be conform to the articles of Directive of 1999/5/EC 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. All equipments must be "CE" and "RoHS" certified. The offerer has to supply the conformity certificates for all equipments.		Yes		
20.All parameters and values 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.		Yes		
21. 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		
ANNEX A : RDS Specific Requirements:				
22. Data connectors	RS232 /USB 2.0 and UTP Ethernet port	Yes		
23. Signal connectors	Input BNC Audio/ Pilot/ MPX	Yes		
	Input external TA	Yes		
	Output unbalanced BNC – MPX + RDS	Yes		
24. Network protocols	HTTP, SNTP, TCP, UDP, DHCP, DNS, SNMP, UPnP	Yes		
25. UECP protocol	Fully compliant EBU SPB490 Version 7.05	Yes		
26. Network connectivity	minim 2 TCP ports; 2 UDP ports (configurable)	Yes		
27. Remote control	via Telnet/SSH , Web Server, SNMP	Yes		
	ASCII and UECP commands	Yes		
28. Alert / manage	embedded SNMP agent with active tasks	Yes		
	SNMP Traps and/or e-mails	Yes		
29. Dynamic RDS	mandatory	Yes		
30. RDS Services	PI, PS, PTY (RDS/RBDS), REG, AF, TP, TA, DI, M/S, RT, RT+, TMC, EON, TDC, ECC, LIC, IH, CT, EWS, ODA, TMC	Yes		
31. RDS Group supported	All	Yes		
32. RDS Group sequence	Configurable	Yes		
33. RDS Software	ASCII CLI commands	Yes		
	GUI Based control and monitoring software	Yes		
	Windows 7,8, 10 compatible	Yes		

FM TRANSMITTERS TESTS

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

I. FACTORY TEST (on dummy load)

TX s.n.....
Exciter no.....(s.n.....)
Date.....

1.PERFORMANCE

A) OPERATING FREQUENCY

Carrier stability: ____better than +/-150Hz

Pilot tone stability: _____kHz (19 kHz ± 1 Hz)

B) FREQUENCY RESPONSE

LIMIT: WITHOUT PRE –EMPHASIS: WITHIN ± 0.2 dB
0 dB REF LEVEL = 400 Hz @ 75 kHz DEVIATION

Freq.	Tx @ 75 kHz		
	WITHOUT PRE-EMPHASIS		WITHOUT PRE-EMPHASIS
	LEFT CHANNEL	RIGHT CHANNEL	MONO
30 Hz			
60 Hz			
125 Hz			
1 kHz			
2 kHz			
6 kHz			
10 kHz			
12 kHz			
15 kHz			

LIMIT: **WITH PRE –EMPHASIS: WITHIN ± 0.2 dB**
0 dB REF LEVEL = 400 Hz @ 75 kHz DEVIATION

Freq.	Tx @ 75 kHz		
	WITH PRE- EMPHASIS		WITH PRE-EMPHASIS
	LEFT CHANNEL	RIGHT CHANNEL	MONO
30 Hz			
60 Hz			
125 Hz			
1 kHz			
2 kHz			
6 kHz			
10 kHz			
12 kHz			
15 kHz			

C) STEREO CROSS TALK

LIMIT: 30 Hz TO 15 kHz: Linear - BETTER THAN 50 dB
NonLinear - BETTER THAN 55 dB

FREQUENCY	Tx @ 75 kHz	
	LEFT TO RIGHT	RIGHT TO LEFT
30 Hz		
60 Hz		
125 Hz		
400 Hz		
1 kHz		
2 kHz		
6 kHz		
10 kHz		
12 kHz		
15 kHz		

D) THD

LIMIT: <0.05% @ 75 kHz DEVIATION

	Tx @ 75 kHz		
FREQUENCY	STEREO		MONO
	LEFT	RIGHT	
30 Hz			
60 Hz			
125 Hz			
400 Hz			
1 kHz			
2 kHz			
6 kHz			
10 kHz			
12 kHz			
15 kHz			

LIMIT: 0.05% @ 100 kHz DEVIATION

	Tx @ 100 kHz		
FREQUENCY	STEREO		MONO
	LEFT	RIGHT	
30 Hz			
60 Hz			
125 Hz			
400 Hz			
1 kHz			
2 kHz			
6 kHz			
10 kHz			
12 kHz			
15 kHz			

E) INTERMODULATION DISTORSION

LIMIT: better than 0.2% USING 60Hz/7 kHz TONES, 4:1, +4dBu

STEREO		MONO
LEFT	RIGHT	
%	%	%

F) SIGNAL TO NOISE RATIO

LIMIT : BETTER THAN 80 dB (weighted)
0 dB REF LEVEL = 400 Hz @ 75 kHz DEVIATION RMS DETECTOR

	STEREO		MONO
	LEFT	RIGHT	
WEIGHTED			

G) AM NOISE

LIMIT: ASYNCHRONOUS: BETTER THAN 55 dB/ Pilot OFF
SYNCHRONOUS: BETTER THAN 50 dB/ Pilot ON
0 dB REF LEVEL = 400 Hz @ 75 kHz DEVIATION

ASYNCHRONOUS	**dB**
SYNCHRONOUS	**dB**

H) HARMONICS AND SPURIOUS OUT OF BAND EMISSION:

(30-87,5 MHz and 137MHz-1GHz)

LIMIT: BETTER THAN 70 dBc

HARMONIC	LEVEL
2^{nd}	
3^{rd}	
4^{th}	
5^{th}	
6^{th}	
7^{th}	
8^{th}	
9^{th}	
10^{th}	

SPURIOUS (frequency)	LEVEL

I) SPURIOUS EMISSION IN BAND 87,5-137 MHz:

LIMIT: better than 85 dBc, tx power=10kW
better than 82 dBc, tx power= 5kW

SPURIOUS (frequency)	LEVEL

2.METERING

A) FWD AND REFLECTED POWER METERING

FWD PWR		**kW**
REFL PWR VSWR		**W**

TOTAL OPERATING **P.A. CURRENT** **.....AMPS**
P.A. VOLTAGE **.....VOLTS**

B) DIAGNOSTIC METERING

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

1) CURRENTS
2) VOLTAGES
3) TEMPERATURES

C) DRIVE

	EXCITER
FWD POWER	WATTS
REF PWR	WATTS
PA	AMPS
PA	VOLTS

D) POWER CONSUMPTION

-to be detailed by supplier according with transmitter architecture

Line 1 _____Volt	Line 1 _____Amps	Line 1 _____Watts
Line 2 _____Volt	Line 2 _____Amps	Line 2 _____Watts
Line 3 _____Volt	Line 3 _____Amps	Line 3 _____Watts

TOTAL POWER _____Watts

3. ELECTRICAL AND MECHANICAL CHECKS

1. **Check for full compliance with technical specification requested.**
2. **Check of the main parameters stability for the maximum variation of the input voltage.**
3. **Check of the main parameters in case of switch-off of one , or more power amplifiers .**
4. **Check of the protections.**
5. **Check of the main parameters at different operating frequencies.**
6. **Check of the monitoring equipment.**
7. **Check for operating RDS System**
8. **General mechanical checks.**

4. HEAT RUN TEST

The transmitter will be modulated during 24 hours with audio program on antenna system

Time		Incident Observed

Pass / fail criteria.

After the heat run test check for excessive temperature rise.

5. ACOUSTIC NOISE

Limit:65 phones
A compliance certificate will be issued by the producer.

6. PERMISSIBLE ELECTRIC STRAY FIELD STRENGTH

Limit: less than 10 V/m measured at 1 m in front of the transmitter, during normal operation
A compliance certificate will be issued by the producer.

7. PERMISSIBLE MAGNETIC STRAY FIELD STRENGTH

Limit: less than 4 A/m measured at 1 m in front of the transmitter, during normal operation
A compliance certificate will be issued by the producer.

Customer signature **Supplier signature**

II. SITE TESTS (on dummy load)

TX s.n.....
Exciter no.....(s.n.....)
Date.....

All tests listed under factory tests procedure to be repeated except that 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.

2 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.