



# All India Radio



प्रसार भारती  
PRASAR BHARATI  
आकाशवाणी महानिदेशालय  
DIRECTORATE GENERAL : ALL INDIA RADIO  
टेलीकॉम प्रभाग  
( TELECOM DIVISION)  
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## SPECIFICATIONS COVER SHEET

TITLE : Mobile Digital Satellite News Gathering (DSNG) Equipment

SPECIFICATION NO. : TC/SPEC/12/06/CES-DSNG\_NE

DATE OF LAST UPDATION : October, 2006

NO.OF PAGES : 24

SCHEME : Provision of Mobile Digital Satellite News Gathering Equipment in North East.

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**No.TC/SPEC/12/06**

**Subject: Specification for the Mobile Digital Satellite News Gathering (DSNG) Equipment & Measuring Equipment in North East Region.**

**1. INTRODUCTION:**

**Name of the Project/ Scheme:**

**Procurement of Mobile DSNGs Terminals & Measuring Equipment for North East Region.**

**DSNG System:**

The DSNG Terminals comprise of a medium sized vehicle having satellite antenna mounted on the top and equipment housed inside the body of the vehicle. The equipment component will be fully digital and compatible with the existing C-Band RN-System of AIR (Annexure-A). The programme uplinked through these Mobile DSNG Terminals will be received directly by the stations with the C-Band receive terminals at Stations.

A block diagram showing the DSNG set up is enclosed as Annexure-B.

Configuration and general requirements of DSNG are detailed in Section-A.

The technical specification/ requirements are detailed in Section 'B'.

The Draft ATP for DSNG equipment is given in Section - 'C'

## SECTION 'A'

### 2. CONFIGURATION:

Satellite News Gathering Equipment for each location will be as per the configuration given below:

#### ITEMS REQUIRED FOR EACH MOBILE DSNG

##### A. Main Equipment:

Sl. No.	Item	Quantity	Reference
1.	1.2 meter parabolic dish antenna, foldable, easily transportable & deployable atop the DSNG vehicle.	1 No.	Section B -1
2.	100 W C-band Solid State Power Amplifier 1+1 with auto-changeover Unit for SSPA along with Dummy-load.	1 Set	B - 2
3.	Synthesized IF to C-Band Up-converter 1+1 with auto-changeover Unit.	1 Set	B - 3
4.	Digital Encoder (1+1) and Digital IF Modulator (1+1) with auto-changeover Unit	1 Set	B - 4
5.	Note Book / Lap Top required for Digital Encoder, Digital IF Modulator and Digital Receiver.	1 No.	B - 5
6.	Inter-facility links including Wave guides, couplers, cables and other accessories for Antenna connection to SSPA	1 Set	B - 6
7.	Monitoring system: (i) LNBC(1+1) HSB C-Band (ii) Digital Receivers (iii) Stereo audio Monitoring equipment (iv) Interconnecting cables connectors & accessories	1 Set 2 Nos 1 Set 1 Set	B - 7 B-7 (A) B-7 (B) B-7 (C) B-7 (D)
8.	Satellite Phone	1 No.	B - 8
9.	DSNG Van	1 No.	B - 9
10.	Wired racks for equipment	1 Set	B -10
11.	Portable Petrol Generator with Stabilizer (4 KVA)	1 No. each	B -11
12.	Miscellaneous items for system integration	1 Set	B -12
13.	UPS 3 KVA (Rack Mount Type)	1 No.	B-13
14.	Integration & Commissioning of the above as DSNG Van	1 set	--

##### B. List of Items required for DSNG Hub Station.

Sl. No.	Item	Quantity	Reference
1	Digital Satellite Receivers with LNBCs	2 no. each	Section B-7(ii)
2	Stereo Audio Monitoring Equipment	1 set	Section B-7(iii)

### C. Measuring Equipment for DSNG Van

Sl. No	Item	Quantity	Reference
1.	Spectrum Analyzer	1 No.	Section B-14 (B)
2.	GPS Meter	1 No.	Section B-14 (C)

D. Inspection and Training of DSNG setup.

E. Details of other items, if any required for complete integration, operation and testing of equipment (not included in these specifications) may be furnished with the tender.

### 3. LOCATION FOR SUPPLY:

The mobile DSNG will be provided at O/o Chief Engineer (NEZ), Guwahati.

### 4. SCOPE:

The scope of supply of DSNG – involves integration of equipment from different manufacturers to build up a rugged and professional DSNG van on turnkey basis. The tenderer should evolve a professional design keeping in view the quality, reliability and long life of the DSNG van and should furnish full details of the same. The supplier shall ensure that the equipment assembly and integration are in accordance with international quality standard ISO 9002 through the accredited manufacturer.

4.1 The Scope of this tender supply includes

- a) Supply & integration of the equipment as per requirements and specifications given in Section A and Section 'B'.
- b) Acceptance testing of the equipment as per Draft ATP given in Section 'C'.

4.2 The indenter will provide

- a) Technical requirements (as at Section 'B')
- b) General requirements (as at Section 'A' Point 5)

4.3 The tenderer should provide full

- a) Detailed configuration of the equipment being supplied.
- b) Details of input/output requirements of the equipment being supplied.
- c) Details of power supply and air-conditioning requirements.
- d) Mechanical mounting/installation details of the equipment.

The offer should include preliminary design of the DSNG equipment layout in the van and drawings showing the layout of Racks, Equipment system etc.

4.4 The tenderer shall ensure that the equipment offered fully incorporate standard features for safety and protection.

4.5 After the acceptance of the tender by the indenter, the supplier shall be submitting the ATP for approval on the guidelines of Draft ATP. After the approval of ATP, the entire equipment shall be inspected as per this approved ATP. The supplier has to make all the arrangements including the test equipment in this regard.

- 4.6 **Inspection** : Inspection will be carried out at Supplier/ integrator's Works by engineer(s) (minimum two) of All India Radio. It may take four/ five working days/ per van. The supplier shall put up all the equipment for test on the test bench at his premises before the AIR Representative and shall provide electric energy, consumable materials, tools, testing instruments, labour and assistance of every kind for carrying out acceptance tests.

Complete specifications & details will be checked and all parameters values will be measured as per approved ATP.

- 4.7 Supplier shall give intimation to the indenter for carrying out Inspection at supplier's Works at least 6 weeks in advance. Following expenses are to be quoted separately.

- i) Inspection charges.
- ii) Any other charges.

To and fro journey, DA and lodging as per Govt. of India norms will be borne by AIR in respect of Engineers deputed for inspection.

- 4.8 The technical offer of the tender should contain, apart from the technical compliance statement, all original data sheets of the manufacturer in support of the technical compliance statement. The tenders containing only technical compliance statement without the original data sheet/pamphlets of the equipment offered in full shall be rejected.

## 5 GENERAL REQUIREMENTS

### 5.1 Technical/ General Details

The tender/offer should also include the following details:

- i) The tenderer, in order to enable the indenter carry out the full technical evaluation of the tender, should give all the details required to ascertain full merits and demerits of the technical offer.
- ii) Sufficient information should be furnished with the tender to technically evaluate the offer and to assess full merits/demerits of the same.
- iii) Apart from printed technical data/specs of the equipment, Block schematic up to the sub-system, interconnection, equipment placement in rack and wiring diagram, photograph etc. should also be attached with the offer.

### 5.2 Optional items

Tenderer should separately quote for the optional items given in the tender or offered by the supplier to improve the performance.

### 5.3 Spares

Tenderer must quote separately for recommended essential spares including their quantities and cost.

#### 5.4 Training (Optional)

The tenderer shall be required to provide 3 days training to about five AIR Engineers on **Operation & Maintenance** of the equipment.

In addition to above five working days training for four engineers on servicing of equipment will be required to be arranged at manufacturer/suppliers works. The expenses on to & fro journey and DA, etc. will be borne by AIR.

#### 5.5 Compliance

While complying with AIR specifications, it may please be noted that just mentioning 'complied' in the compliance statement will **NOT** suffice. The compliance should be supported by proper published data/documentation from original equipment manufacturer substantiating the compliance in respect of the specs. Deviations, if any, may be brought out clearly in the compliance statement.

#### 5.6 Schedule of Material

A comprehensive schedule of material as well as price bid should be offered in the format as prescribed in Section 'A'.

#### 5.7 Maintenance support

Maintenance support including availability of spares and repairs/ service is to be ensured for at least 10 years.

#### 5.8 Manual:

**Total 12 Sets** [Two nos. for each van, Two for Directorate (Telecom Division), One for Hub Station, One for Zonal Office, One for STI (T) & One for R&D].

**Manual for complete DSNG:** Original manuals for Installation, Operation & Maintenance and Servicing of the System as well as sub-systems & accessories, both drawings & wiring diagram for the complete system in Hard and Soft copy.

#### 5.9 Environmental & power supply

- a) Ambient Temperature : 0°C to +50°C
- b) Relative Humidity : 95% non-condensing at 45°C
- c) Safety : Standard features for safety & protection have to be built in/ incorporated for both personnel/ equipment.
- d) Power supply : 230 V AC  $\pm 10\%$ , 1 $\Phi$ , 50 Hz  $\pm 4\%$

## SECTION - B

### TECHNICAL SPECIFICATIONS/REQUIREMENTS

#### MAIN EQUIPMENT SPECIFICATIONS FOR MOBILE DSNG EQUIPMENT

1. **1.2 M PARABOLIC DISH ANTENNA, EASILY TRANSPORTABLE, FOLDABLE & DEPLOYABLE ATOP THE DSNG VEHICLE**

a)	Material	Light weight rugged material like carbon fiber/ carbon composite
b)	Type	Elevation over Azimuth
c)	Nominal Diameter	1.5 Meter
d)	Frequency Range a) Transmit b) Receive	5.850 to 6.425 GHz 3.700 to 4.200 GHz
e)	Antenna gain	i) Transmit : $\geq 37$ dB at 5.85 GHz ii) Receive : $\geq 34$ dB at 4 GHz
f)	Antenna Noise Temp.	30°K to 50°K for 60° to 20° elevation angles
g)	3dB Beam width	$\leq 2.5^\circ$ at 5.850 GHz
h)	Side lobes (Transmit and Receive)	As per ITU-R Recs.580-5 (latest amendments)
<b>Note : Antenna radiation pattern conformity to ITU-R standard to be got cleared by the tenderer/ firm from NOCC/DOT before acceptance and commissioning).</b>		
i)	Feed and Feed Port	2 Port feed i) Transmit VLP/HLP ii) Receive HLP/VLP
j)	Cross polarization isolation for transmit receive ports a) On axis b) Within 1° Beam width	$\geq 30$ dB $\geq 26$ dB
k)	Feed mounting/ configuration	Prime focus/ offset
l)	Feed insertion loss	$< 0.35$ dB
m)	VSWR (Return loss) a) Transmit ports b) Receive ports	$\leq 1.30 : 1$ $\leq 1.30 : 1$
n)	Output wave guide flange interface a) Transmit ports b) Receive ports	CPR - 137 G CPR - 229 G
o)	Power handling capacity	$\geq 1$ KW CW

p)	Antenna orientation	Manual & motorized version for AZ, EL & POL. Alignment.
q)	Polarization adjustments	$\pm 90^\circ$
r)	Antenna steerability a) Elevation b) Azimuth	15° to 90° (continuous) $\pm 180^\circ$ (continuous) (Scale(s) to be provided for indication)
s)	Wind Speed a) Operational b) Survival	60 kmph 100 kmph
t)	Pointing Stability	$\pm 0.2^\circ$
u)	Weight	Less than 95 kg (including Antenna & Mounting Structure)
v)	Lightening Protection	For antenna as well as for vehicle

The antenna would be mounted on the rooftop of the vehicle. It would normally remain folded on the roof and should have adequate protection from wind while vehicle is driven. When the vehicle is positioned on OB spot the antenna would be unfolded and deployed to required satellite look angle orientation. No portion of the antenna should protrude out on the top of the vehicle.

## 2. 100 W C-BAND SOLID STATE POWER AMPLIFIER (1+1) WITH AUTO CHANGE-OVER UNIT FOR S.S.P.A. ALONG WITH DUMMY LOAD.

SSPA shall be of compact and composite construction lightweight and rack mounted with front access for operation and control etc. It should be available along with its inbuilt/ associated power supply unit. It should also have front panel meter to monitor Forward power, VSWR alarm, Reverse power and indications for status, alarm, faults, over temperature, etc. The SSPA should have its own cooling arrangements. It should not require any external cooling.

- a) Type : SSPA
- b) Rated output power at the output of wave-guide flange : 80 W continuous
- c) Frequency range : 5850 - 6425 MHz
- d) Gain Frequency Response :  $\pm 1$  dB over any 40 MHz  
 $\pm 3$  dB over full band
- e) Saturated output power : Nominal +50 dBm
- f) R.F. level control : 0-20 dB continuous
- g) Gain stability :  $\pm 2$  dB over 0° to 50° Celsius  
for constant temp. & drive :  $\pm 0.5$  dB (24 hour)
- h) Input VSWR :  $\leq 1.3 : 1$

- |    |   |   |   |
|----|---|---|---|
| i) | Output VSWR   | : | ≤ 1.25 : 1  |
| j) | Phase Noise   | : | Should meet IESS 308/309<br>at 100 Hz offset : -60 dBc<br>at 1 KHz offset : -80 dBc<br>at 10 KHz offset : -90 dBc |
| k) | Harmonic  | : | Better than : - 50 dBc (at rated output)  |
| l) | Spurious (in band)  | : | Better than : - 60 dBc (at rated output)  |
| m) | S.S.P.A. standby operation  | : | 1 + 1 hot redundancy auto change-over with manual over ride.  |
| n) | Mounting  | : | 19" Rack  |
| o) | Two tone inter-modulation<br>at 3dB total back off from<br>1 dB compression point | : | Better than -25 dBc   |
| p) | Monitor   | : | RF (O/P) - 30 dB or better w.r.t output   |

### 3. SYNTHESIZED IF TO C- BAND UPCONVERTER (1+1) WITH AUTO CHANGEOVER UNIT

It should be possible to operate the upconverter manually. The upconverter should not require a PC or a controller for normal operation and control. Any interface required for operation in 1+1 hot standby mode should be included in the offer.

- |    |                            |   |   |
|----|----------------------------|---|---|
| a) | Input Frequency            | : | 52 MHz to 88 MHz  |
| b) | Output Frequency           | : | 5850 MHz to 6425 MHz  |
| c) | Frequency setting          | : | Synthesized, 125 KHz step size  |
| d) | Frequency stability        | : | Better than $\pm 1 \times 10^{-8}$ over temp. 0° to 50°C & $\pm 1 \times 10^{-9}$ or better per day |
| e) | Input impedance            | : | 75 Ω  |
| f) | Output Impedance           | : | 50 Ω  |
| g) | Input level                | : | -20 dBm to +1 dBm   |
| h) | Input connector            | : | BNC-F   |
| i) | Input Return loss          | : | 20 dB or better   |
| j) | Output level               | : | +10 dBm or more at 1 dB compression   |
| k) | Overall Conversion gain    | : | 30 dB or more   |
| l) | Gain control Step Size     | : | 0.2 dB step or smaller.   |
| m) | Gain Slope                 | : | ± 0.05 dB/MHz   |
| n) | Output Return loss         | : | 19 dB or better   |
| o) | Amplitude / Gain stability | : | ± 0.25 dB per day at constant temp.   |
| p) | Type of conversion         | : | Dual conversion spectrum non-inverted   |

q)	Amplitude response	:	$\pm 0.5$ dB over the input frequency range of 52 MHz to 88 MHz.
r)	Third order IMD Product	:	-40 dBc with two equal carriers at 10 dB total output Back off.
s)	Phase noise	:	-70 dBc/Hz, 100 Hz away from carrier -80 dBc/Hz, 1 KHz away from carrier -100 dBc/Hz, 1 MHz away from carrier
t)	Spurious (in band)	:	-60 dBc below carrier (un-modulated)
u)	Standby operation	:	1 + 1 hot redundancy auto change-over with manual over ride feature.
v)	Mounting	:	19" Rack
w)	Test Port	:	IF and RF
x)	Remote Interface	:	RS232, RS485 parameter setting: Freq., Gain, Fault Status, Attenuation, RF On/Off etc.
y)	Front Panel Indications	:	Power, Standby, Fault, Remote/Manual

#### 4. DIGITAL ENCODER (1+1) AND DIGITAL IF MODULATOR (1+1) WITH AUTO-CHANGEOVER UNIT

##### A. AUDIO BASE BAND DIGITAL ENCODER

a)	No. of Analog audio inputs	:	Two mono/one stereo
b)	Digital Audio input	:	AES/EBU Standard (Professional) Connector DB-15/XLR
c)	Audio Signal Bandwidth	:	20 Hz to 20 KHz
d)	Input Impedance	:	600 $\Omega$ (bal)/ >100 k $\Omega$ (Analog) 110 Ohm (digital)
e)	Input level	:	+12 dBm (peak)
f)	Dynamic range	:	$\geq 80$ dB.
g)	Compression	:	ISO/MPEG-1 layer 2
h)	Data rates	:	64, 96, 112, 128, 192, 256 & 384 kbps selectable
i)	Modes	:	Mono, Dual Mono, Joint stereo
j)	Sampling rate	:	48 KHz
k)	End to End stability (from input of encoder in the uplink to receiver output in the downlink).	:	$\pm 0.5$ dB, 20 Hz-20 KHz, w.r.t. input and output levels at 1 KHz, no gain adjustment
l)	End to End gain (from input of encoder in the uplink to receiver output in the down-link)	:	$\pm 0.5$ dB at 1 KHz, no adjustment
m)	Total Harmonic Distortion (THD)	:	$\leq 0.2\%$ at 1 KHz for +8 dBm output from the receiver.

- |    |   |   |  |
|----|---|---|--|
| n) | Signal to Noise Ratio                         | : | ≥ 75 dB at 1 KHz for +12 dBm output from the receiver    |
| o) | Idle Channel Noise                            | : | ≤ -65 dBm (unweighted)                                   |
| p) | Cross talk Isolation between the two Channels | : | ≥ 70 dB w.r.t. +12 dBm output from the receiver at 1 KHz |
| q) | Stereo phase deviation                        | : | 1° at all frequencies                                    |
| r) | Auxiliary data channel                        | : | ≥ 4.8 kbps   |
| s) | Interface for aux.                            | : | Asynchronous, RS-232                                     |
| t) | Operation                                     | : | Encoder & Decoder independently                          |
| u) | Interface Type                                | : | Transformer Coupled, balanced                            |

## B. DIGITAL IF MODULATOR

- |    |                                |   |  |
|----|--------------------------------|---|--|
| a) | Type of Modulation             | : | QPSK/BPSK user programmable  |
| b) | IF Frequency                   | : | 52 to 88 MHz continuously adjustable in 10 Hz steps  |
| c) | Frequency Accuracy & Stability | : | Accuracy : ± 10 Hz<br>Stability : ± 1 ppm over the temp. range 0 to 50°C over a period of a year     |
| d) | Output level                   | : | 0 to -20 dBm adjustable in 0.1 dB steps.   |
| e) | Channel coding                 | : | a) Viterbi 1/2, 3/4, 7/8 and 1<br>b) Sequential 1/2, 3/4, 7/8 and 1 (optional)                       |
| f) | Spurious                       | : | -50 dBc (in band); -45 dBc (out of band)   |
| g) | Data rate                      | : | 64, 96, 112, 128, 192, 256, 384 kbps (programmable)  |
| h) | Interface                      | : | V.35   |
| h) | Configuration                  | : | 1 + 1 in hot-standby with auto c/o unit in connection with digital encoder and with manual override. |

## 5. NOTE BOOK COMPUTERS

A computer (with windows X-P Professional or upgraded version) similar to IBM/DELL/Compaq/HP is required for Digital encoders and Digital IF Modulators. This computer should be compatible with Digital Encoder and Digital IF Modulator for control and setting of the operational parameters. The computer should be a Note Book / laptop model.

a)	Display	38.1 cm (15"), Resolution $\geq$ 1024 x 768 pixels Intel® Extreme Graphics media accelerator 900 with shared video memory.
b)	CPU	Intel, Centrino Mobile Technology. Intel®, Pentium®- M Processor 735, 1.6 GHz or latest.
c)	RAM	256 MB (DDR, $\geq$ 333MHz).
d)	Hard Disk Drive	40 GB HDD.
e)	Net Work Interface Card	10/100 Mbps Network Card.
f)	Sound Card	Industry standard professional Sound Card along with professional quality speakers, and also mic input socket for recording purpose. (Complete multimedia Kit).
g)	Optical Drive	CD-RW / DVD Combo.
h)	Modem	56 kbps.
i)	Ports	i Serial Comm.: 1 no. or more (RS232) ii Parallel: 1 no. iii USB 2.0 : 3 nos. or more.
k)	Battery Pack	6 Cell (Li-Ion).
l)	Media Reader & Mouse	Integrated 6 in 1 media reader, touch pad with scroll zone and Optical scroll mouse.
m)	Software	Pre loaded Microsoft® Windows® XP professional, Recovery CD Media including all drivers etc, Norton Anti-virus, Fully loaded configuration.
n)	Communication	Intel® Pro/Wireless, 802.11b (Mini-PCI) pre-installed, Wireless LAN, Integrated blue tooth.
o)	Standard Features	2 years comprehensive Warranty. At least 3 Hrs. Battery back-up, light weight ( $\leq$ 3 kg., Including batteries), ultra High-brightness ultimate leather Bag with overnigher, AC power adopter/ charger, head set with mic.
p)	Warranty	1 year on site (both hardware and software).

## 6. INTER FACILITY LINKS

The tenderer should quote for Wave guides, couplers, adaptors, cables and other accessories required for Antenna connection to the output of SSPA. All these accessories should be professional standard and compatible with the system. Technical specifications and detailed quantity should be mentioned in the offer.

## 7. MONITORING SYSTEM FOR ANALOG AND DIGITAL UPLINK

The monitoring system is required for subjective monitoring and for measurements on the downlinked signals from the satellite in C-band (3.7 - 4.2 GHz). The monitoring system should have C-Band reception facility as detailed below.

**A. C-BAND LNBC**

a)	Input frequency	3700 – 4200 MHz
b)	Input impedance	50 $\Omega$
c)	Input connector	WR 229 G Flange
d)	Input/output return loss	$\geq 12$ dB
e)	Output frequency	950 - 1450 MHz
f)	L.O.Stability	PLL, better than $\pm 5$ PPM over the temperature range 0° to 50°C and over 24 hrs.
g)	Noise temperature	35°K
h)	Conversion gain	$\geq 60$ dB
i)	Gain flatness	$\pm 2$ dB over full band
j)	Min. Image rejection	-60 dB
k)	Spurious/harmonics	50 dB below carrier
l)	Phase Noise 1 KHz 100 KHz	-60 dBc/Hz -80 dBc/Hz
m)	Output impedance	75 $\Omega$
n)	Power supply	+ 15 V to + 24 V through output connector

**B. DIGITAL SATELLITE RECEIVER WITH L- BAND INPUT**

i)	<b>Input</b> a) Freq. Range b) Freq. Tuning c) Impedance d) Signal Level	950 - 1450 MHz Resolution $\leq 25$ KHz Local (remote control optional) 75 $\Omega$ -25 to -70 dBm
ii)	Modulation	QPSK (Optional BPSK user selectable)
iii)	Carrier lock range	$\geq \pm 500$ KHz (Selectable)
iv)	FEC decoding	a) Rate 1/2, 3/4 Viterbi-decoding b) Rate 1/2, 3/4 sequential-decoding (optional) (Selectable Rate preferred)
v)	Audio coding	ISO/MPEG-I/Layer-2 (MUSICAM)
vi)	Data rates (Selectable)	64, 112, 128, 192, 256 & 384 kbps (QPSK) 64, 96, 128, 192 & 256 kbps (BPSK)
vii)	Modes	Mono, Dual mono & Joint stereo
viii)	L-Band output	Buffered L-Band output should be available for additional receiver

ix)	<b>Audio output</b> a) Impedance b) Level (Maximum) c) T.H.D. (at 1 KHz) d) Audio signal bandwidth e) Frequency response f) Signal to Noise ratio g) Dynamic range h) Cross-talk ratio i) Audio output channels	600 $\Omega$ (Bal) + 12 dBm (adjustable) $\leq 0.2\%$ (at +8 dBm output) 20 Hz to 20 KHz $\pm 1.0$ dB (20 Hz to 20 KHz) $\geq 75$ dB (at 256kbps, Eb/No $\geq 9$ dB, +12 dbm) $\geq 80$ dB $\geq 70$ dB w.r.t. +12 dBm input in Encoder Two mono/one stereo
x)	Required Eb/No (B.E.R. $\leq 10^{-5}$ )	$\leq 5$ dB (BPSK), 5.5 dB (QPSK)
xi)	B.E.R. Immunity	$1 \times 10^{-4}$ for no subjective loss in quality
xii)	Audio Sampling Rate	48 KHz
xiii)	Stereo Phase deviation	Less than $1^\circ$ for 20 Hz to 10 KHz; Less than $3^\circ$ for 10 KHz to 20 KHz.
xiv)	<b>Auxiliary data channel</b> a) Data rate b) Interface	$\geq 4.8$ Kbps RS - 232
xv)	Supply for LNBC	Provision for power supply to compatible LNBCs

### C. STEREO AUDIO MONITORING EQUIPMENT

The Tender should include a hi-fi 10+10 W professional stereo monitoring amplifier and two matching professional stereo speakers (8").

### D. INTER-CONNECTING CABLES, CONNECTORS AND ACCESSORIES

Interconnecting cables, power supply cables, connectors and other accessories required for the monitoring system should be included in the tender.

## 8. SATELLITE PHONE

Satellite Phone/Mini-M terminal must be INMARSAT approved. Copy of the certificate is required to be submitted along with tender.

S.No.	Parameter	Specification
a)	Function	Voice, Data, Fax, hand free, SIM card dialing
b)	Display	LCD display preferred 64*240 pixel
c)	Key board	12 alpha numerical keys
d)	Power	10-24 volts with AC/ DC adopter
e)	Interface(s)	RJ-11, SIM card interface

f)	Interface specs.	Speech level : + 2.5 dBm Receive level : - 9 dBm Dial tone : 425 Hz, -19 dBm Signaling : Hook off:>20mA/ Hook on:<9mA
g)	Data communication	Bitrate : 1.2-38.4 kbps Parity : No Parity Data bits : 8 bits Stop bits : 1 bit
h)	Frequency	1626.5 to 1660.5 MHz (transmitting) 1525.0 to 1559.0 MHz (receiving)
i)	Antenna	Patch type, Gain: Tx. 9dB, Rx. 9dB, EIRP+13dB W with the cable (RG-214) length of at least 30 M.
j)	Optional	Cable type antenna
k)	Features	Robust, light weight, portable, compact size
l)	Environmental	-10 °C to 55°C, 40°C 95% humidity (non-condensing)

## 9. DSNG Van

One medium size vehicle (SUV) similar to *Innova/Safari/Travera/Scorpio* is required for mounting the DSNG Antenna and Equipment. The body of the vehicle will need to be modified to suit the requirements for housing the equipment racks, uplink equipment, power supply equipment, cable & accessories, antenna and petrol generator etc. Appropriate provision for sitting of operating personnel and internal fittings etc. would have to be made. The price should include the spare wheel and tool kit as in practice. The price of the vehicle should be inclusive of insurance, lifetime road tax and registration etc.

1.	Engine Type	≥ 2.5 liter, 4 cylinder
2.	Fuel	Diesel
4.	Ground clearance	≥175 mm
5.	Max Power	≥75 kW (102 bhp)
6.	Gear	Manual, 5 forward & 1 reverse
7.	Fuel Tank Capacity	≥ 55 Liters.
8.	Air-conditioning	Heater, Ventilation & AC (Powerful for vehicle as well equipment cooling).
9.	Emission Norms	Bharat-II or Bharat-III standard (as per latest emission norms amendments)
10.	Suspension	The vehicle should have very good suspension system to withstand about 600 Kg of weight. a) Front: Double wishbone type / Torsion Bar b) Rear: Leaf Spring, Rigid or 4-Link, Coil Spring.
11.	Size	The vehicle should have sufficient space to house the entire equipment. The dimension should be around: Length : ≥ 4400 mm Width : ≥ 1650 mm Height : ≥ 1750 mm

12.	Jacks	As the vehicle has to be used for uplink purpose, there shall be a provision of four hydraulic jacks, one each near each wheel, so that vehicle can be evenly put on jacks whenever required. The jack should be powerful enough to lift the vehicle (wheels) from the ground about 1" or more, when deployed.
13.	Misc.	Fog lamps, towing hooks (Front & back)
<b>Note :</b> The tenderer must specify the make & Model of the vehicle being offered.		

## 10. WIRED RACKS FOR EQUIPMENT

All the above equipment should be installed in the wired racks along with requisite jack -strip & other item. The rack must be properly fitted in the van itself. The suitable shock absorbing arrangements shall be made to save the entire equipment from jerks and shocks during travel.

## 11. LIGHT WEIGHT PORTABLE PETROL GENERATOR WITH STABILIZER

- i) Out put Rating : 4 KVA, 17.4 Amp.
- ii) Out put : 230 Vac; 1 $\Phi$ ; 50Hz  
(optional additional output :12 Vdc  $\geq$  7 A)
- iii) Output Stability : Voltage:  $\pm$  2%, Freq:  $\pm$  2 Hz
- iv) Engine Type : 4 Stroke
- v) Fuel Capacity : At least 15 liters
- vi) Weight (Dry) : 80 Kg.
- vii) Continuous operation : At least 5 hours.
- viii) Start Mode : Self-Start (provision for manual as well)
- ix) Displays : Fuel level, output voltage & current

## 12. ACCESSORIES FOR SYSTEM INTEGRATION

Interconnecting cables, power supply cables, connectors, magnetic compass on tripod stand, inclinometer and other accessories required for the integration of the complete DSNG system should be included in the tender.

## 13. UPS (RACK MOUNT TYPE)

a)	Type	Line interactive, sine wave
b)	Power rating	3 KVA, Single phase
c)	Battery back up	> 5 minutes (full load) & > 12 minutes (half load)
d)	Type of battery	Sealed Maintenance Free (Internally fitted)
e)	Input Voltage	160 – 270 Vac, 230 Vac (Nominal); 50 $\pm$ 3 Hz, 1 $\Phi$
f)	Transfer Time	< 5 ms.
g)	Output voltage	230V $\pm$ 10%, 50 $\pm$ 3 Hz, 1 $\Phi$
h)	Efficiency	$\geq$ 85 %
i)	Type approval	ISO certified, standard, reputed make
j)	Rack Height	3 RU

k)	Net Weight	< 60 kg.
l)	Metering & Indicators	Meters/LCD Display should be there to monitor input/output voltage & current etc., must have all types of alarm indicators, LED bar/ LCD indications for Load and Battery charge/discharge.
<b>Note:</b> DC Voltage of the battery bank should be furnished by the tenderer.		

#### 14. MEASURING EQUIPMENT

##### i) SPECTRUM ANALYZER

1.	<b>FREQUENCY</b> a) Range b) Counter Resolution c) Span d) Accuracy e) Response	: 100KHz to $\geq 6.7$ GHz : 1 Hz : 100 Hz to 6.7 GHz; 0 Hz (for Zero Span) : Better than $\pm 100$ Hz (Stable Temp.) : $\pm 0.5$ dB (100 KHz to 3.0 GHz) : $\pm 2.0$ dB (3.0 GHz to 6.7 GHz)
2.	<b>BAND WIDTH</b> a) Resolution BW b) Video BW	: 10 Hz to 3.0 MHz in 1-3 Steps : 10 Hz to 3.0 MHz in 1-3 Steps
3.	<b>SWEEP TIME</b> a) Zero Span b) Non Zero Span c) Sweep Trigger	: 50 $\mu$ s to 2000 s. : 100 ms to 2000 s. : Free Run, Single, Video, External
4.	<b>AMPLITUDE</b> a) Range b) Input Attenuator c) Max. input d) Ref. Level Range e) Dynamic Range f) Overall Accuracy g) Average Noise i) CF 1 GHz ii) CF 6 GHz h) Log Scale i) Disp. per Division j) Linear Scale k) Grids l) Measurement Units i) Log ii) Linear	: <b>Displayed Average Noise Level + 30 dBm.</b> : 0 dB to 60 dB in 10 dB Steps Size. : +30 dBm (RF Attenuation 10dB) : -130 dBm to +30 dBm : $\geq 85$ dB : $\pm 2.0$ dB (at 0 dB attenuator, 10 Hz VBW & RBW) : -135 dBm : -130 dBm : 0 dB to -120 dB from Ref. Level : 2 dB to 15 dB (adjustable in 1 dB step) : 10 % of ref. Level per division : 10 x 10 Divisions : dBW, dBm, dB $\mu$ W, dBV, dBmV, dB $\mu$ V : V, mV, $\mu$ V, nV, W, mW, $\mu$ W, nW,
5.	<b>SPECTRAL PURITY</b> a) 10 KHz offset from CF b) 100KHz offset from CF c) Residual Spurious	SSB Phase Noise (@ 1KHz RBW) : -90 dBc/Hz : -100dBc/Hz : -84 dBm (Preamp Off), 100KHz– 6.5 GHz
6.	a) <b>Third order inter-mod.</b> for two -30dBm tones b) Residual FM	: - 80dBc (@ >50 KHz separation) : 2 Hz (F = 500 MHz, RBW = 1 KHz)

7.	<b>DISPLAY</b> a) Screen Size b) Traces i) Function ii) Detection	: $\geq 16$ cm, high resolution, coloured : Min. of two Traces per diagram/sweep : Clear/write, Max. Hold, Min. Hold, Average : Max. Peak, Min. Peak, Auto Peak, Sample RMS, average, Quasi Peak
8.	<b>DEMODULATION</b>	: AM and FM (Optional)
9.	<b>DIRECT MEASUREMENT FUNCTIONS</b> a) No. of Markers b) Marker Functions	: Adjacent Channel Power Ratio, C/I, Occupied Bandwidth, C/No, C/N : Three or More. : Standard, Delta, Marker to Peak, Marker to Center, Marker to Reference Level, Next Peak Level, Next Peak Right, Next Peak Left, All Markers Off, Noise Marker, Frequency Marker.
10.	<b>Memory</b>	: Should have provision for storing $\geq 200$ Setups/Traces in Internal / External memory (Flash card).
11.	<b>Calibration and Self Test</b>	: In-built diagnostics system for self-tests and calibration routines for the instrument to remain within defined tolerances and maintain its accuracy of measurement
12.	<b>INTERFACES</b> a) USB 2.0 or equivalent b) RF Input c) Coupling d) IF Input e) AF output	: For Data transfer to & from PC. : N female, 50 $\Omega$ & 75 $\Omega$ Both (Selectable) : AC & DC (Selectable) : BNC Female connectors for external frequency reference and external trigger : Jack / inbuilt speaker.
13.	<b>ENVIRONMENTAL</b> a) Operating b) Storage c) Relative Humidity d) Power requirement	: 5° to + 45° C : - 40° to +70° C : 96% at + 40° C : 200 to 240 V, 48-52 Hz (AC)

## ii) GPS RECEIVER

This system is required for finding out the exact six figures geographical co-ordinates, Height above Mean Sea Level of sites and to accomplish mapping during field strength survey. The equipment should be user friendly and based upon latest state of art design using microprocessors.

GPS Receiver System will acquire its signals from NAVSTAR group of 24 Satellites, which have been launched by US Department of Defense. The GPS System should be able to receive, process and store the Almanac transmitted from these satellites for processing the Data obtained at different locations. After processing of data the result should be indicated on processor screen to be supplied along with.

The GPS receiver system should be able to receive and process the signals received from the visible set of satellites. The system should have an inbuilt processor and suitable software for data collection and management. It should have a minimum of 2 MB ROM and 4 MB flash memory card. The system should be able to operate in Averaging mode also for enhancing accuracy when Selective Availability is ON in the Satellites System.

The system should be able to receive and process a minimum of six channels simultaneously.

The GPS System should have the following additional facilities:-

- a) It should be possible to down load the required data as well as the processed data from the system to any other computer by means of RS 232 Serial Port / USB 2.0 Port.
- b) It should be capable of being used for mapping purposes along with recording of vehicle movement path.
- c) The output data format should be compatible so that it can be imported by popular GIS packages for interpretation.
- d) The receiver should consist of two antennae - One inbuilt and the other external type, which should be mountable on a vehicle, along with cables.
- e) The GPS system should be able to operate on dry batteries.
- f) The system should be able to record time and date of measurements.
- g) The system should retain the stored values / maps while replacing batteries.

## SPECIFICATIONS

- a) **TRACKING CAPABILITY** - Minimum 6 channels simultaneously.
- b) **ACCURACY** :
  - (i) Auto Mode with SA ON :  
Position :  $\pm 50$  m
  - (ii) Averaging Mode with SA ON :  
Position :  $\pm 20$  m over 5 minutes  
Elevation :  $\pm 20$  m over 5 minutes
  - (iii) The Receiver should have option to enhance accuracy upto  $\pm 5$  m by means of Post Processing Differential Mode by comparison with a stationary Reference.
- c) **DISPLAY** :
  - (i) Latitude : 6 figures, degree, minutes, seconds
  - (ii) Longitude : 6 figures, degree, minutes, seconds
  - (iii) Height Above Mean Sea Level - Meters.
  - (iv) Vehicle movement with direction - user definable.
- d) **ACQUISITION TIME** : Less than 30 seconds with current Almanac in memory (in clear weather).

- e) **WEIGHT** : Maximum 1 Kg (Without batteries)
- f) **OPERATING VOLTAGE** : 3V to 9V dc - Dry batteries (AA/AAA cells or 9V<sub>DC</sub> battery), easily field replaceable.  
[Optional: 9V to 16V dc External DC supply (like car battery supply) along with adopter if any may be furnished]
- g) **OPERATING TEMPERATURE** : 0° to 50°C.
- h) **RELATIVE HUMIDITY** : 95% non-condensing.

The equipment should be supplied with all necessary cables, carrying case, 2 set of rechargeable batteries, battery charger and other accessories. Details to be given in tender.

## SECTION - 'C'

### DRAFT ATP FOR DSNG

#### 1 INTRODUCTION

This document describes the Acceptance Test Procedure (ATP) for testing the various units of the DSNG Equipment under procurement. It covers the details of the item to be tested, list of equipment required for testing and the tests required to be carried out.

#### 2 ITEMS TO BE TESTED

The items to be tested first individually and then integrated are as follows:-

- a) **Individual Items**
  - i) Solid State Power Amplifier (SSPA).
  - ii) Up-converter.
  - iii) Digital Encoder and Modulator.
  - iv) Monitoring System comprising of LNBC, and Digital Receiver.
  - v) Spectrum Analyzer.
  - vi) GPS receiver.
  - vii) Satellite Phone.
  - viii) Lap top Computer.
- b) **Integrated Setup**
  - i) Other peripheral equipment such as Vehicle, Petrol Generator, UPS and Air-conditioning equipment etc.
  - ii) Complete integrated setup from Audio input point to modulator, up-converter, and SSPA.
  - iii) Receiving setup from Antenna in receiving mode to LNBC, Demodulators and Analog O/P.

#### 3 TEST EQUIPMENT

- a) All requisite test equipment conforming to the required standard for testing and commissioning shall have to be provided by the supplier.
- b) List of the test & measuring equipments :

(This is a tentative list. Additional equipment may be specified by the indenter if needed).

- i) Spectrum Analyzer (>8 GHz range)
- ii) Power Meter with sensor & Attenuator etc.
- iii) Frequency counter
- iv) Signal Generator
- v) Noise figure meter with noise source.
- vi) Digital Modulation Analyzer
- vii) Plotter
- viii) PC with Printer

- ix) Any other equipment and standard reference source/setup necessary for measurements.
- x) Directional coupler, inter-connecting cables, Attenuators, combiner, Dividers etc. as may be necessary for the tests.

#### **4. TESTS REQUIRED TO BE CARRIED**

(NOTE: This is only a tentative list, Additional items of tests may be specified by the indenter if needed)

##### **4.1 S.S.P.A.**

- i) Functionality test for individual SSPA and in (1+1) configuration.
- ii) Power output check
- iii) Gain check
- iv) Gain flatness check
- v) Frequency response
- vi) I.M.P.
- vii) Spurious
- viii) Any other tests to check the conformity to the specs.

##### **4.2 UP-CONVERTER :**

- i) Functionality test for individual up-converter and in (1+1) configuration
- ii) Output frequency check
- iii) Output level and stability check
- iv) Frequency stability
- v) Spurious check
- vi) Phase Noise check
- vii) Any other test to check the conformity to the specs.

##### **4.3 DIGITAL MODULATOR**

- i) Functionality test for individual modulator and in (1+1) configuration
- ii) I.F. Range
- iii) O/P Frequency stability and accuracy
- iv) O/P level stability
- v) Coding standard, data rates check
- vi) Digital modulator check
- vii) All Base-band measurements alongwith receivers
- viii) Return loss.
- ix) Spurious Check
- x) Any other test to check the conformity to the specs.

##### **4.4 MONITORING SYSTEM**

- i) Functionality check for individual monitoring setups for Analog Demodulator and Digital demodulator.
- ii) Test for LNBC - output frequency level, L.O. stability, Noise Temp., phase and spurious noise, gain etc.
- iii) Tests for Analog Demodulator/Receiver including carrier lock range, audio output level, THD, Noise level, frequency response, cross talk etc.

- iv) Test for Digital Demodulator/Receiver including, carrier lock range, Eb/No, Analogue and digital (AES/EBU) outputs, level, THD, Noise level, Freq. Response and Cross Talk for both stereo channels, BER immunity test etc.

#### 4.5 INTEGRATED SETUP

- a) After the individual tests the equipment will be installed and integrated to work as DSNG as per specs. The integrated setup will then be tested for complete system performance and functions.
- b) The tests for commissioning would include the integration check and conformity to system specs including:
  - i) EIRP Capability
  - ii) EIRP Stability
  - iii) Radiation conformity to Standard specified
  - iv) Emissions conforming to International Standard for Satellite transmission.
  - v) Overall uplink/down-link check and performance measurements to meet the specs.
  - vi) Any other tests necessary to check the conformity to specs.

#### 4.6 PERIPHERAL EQUIPMENT

All peripheral equipment shall be tested for the various functionalities prescribed and conformity with the specification.

- 4.7 In addition all the manuals/ drawings will be inspected for completeness.

#### 5. GENERAL

- i) Based on above supplier is required to give a detailed ATP document giving procedure for tests of individual item as well integrated setup. This should include test setup, equipment details, inter-connection diagram and the Format for test reports
- ii) The indenter will examine the same and then it will be finalized after mutual discussion.

## ANNEXURE - 'A'

## EXISTING AIR - RN SYSTEM PARAMETERS

<b>Type of Receive Terminals</b>		
S-Band	Size G/T Polarisation	3.66 M 11 dB/°K LHCP
C-Band	Size G/T Polarisation	6.1 M 24 dB/°K Linear H/V
<b>System Characteristics :</b>		
	Mode RN Channel Band-Width	SCPC 200 KHz
<b>Analog System :</b>		
	Modulation Base-Band Compression Pre/De-emphasis Peak deviation	Companded FM 10/15 KHz 2 : 1 75µ Sec. ± 75 KHz at +9 dBm
<b>Digital System :</b>		
	Modulation FEC  Base-Band Compression  Base-Band Modes	QPSK 1/2, Convolution coding and sequential/Viterbi decoding ISO MPEG - I layer-II MUSICAM - Selectable Rates 20 Hz - 20 KHz Stereo, Joint Stereo, Mono, Voice/Data Channel
<b>INSAT SYSTEM DETAILS</b>		
Satellite Locations : Different locations from 55°E to 105°E (Presently 55°, 74°, 83°, 93.5°)		
<b>CXS - Band Transponder</b>		
	Uplink freq. Downlink freq. Polarization Downlink Sat. EIRP S.f.d.	<b>S1</b> <b>S2</b> 5852-5862    5892-5902 MHz 2552-2562    2592-2602 MHz Uplink : Linear H/V or circular L.H.C.P. or circular 42 dBw (max.) -90 dBw/ m <sup>2</sup>
<b>CXC-Band Transponder</b>		
	Uplink Freq. Band Downlink Freq. Band Sat. EIRP S.f.d. Polarisation Uplink Downlink	5925 – 6425 MHz 3700 – 4200 MHz 38 dBw -85 dBw/ m <sup>2</sup>  Linear H/V or circular Linear H/V or circular

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