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PRASAR BHARATI
(BROADCASTING CORPORATION OF INDIA)
DIRECTORATE GENERAL: DOORDARSHAN

Spec: No: SATD/1.8m_400W_ Flyaway_ C_DSNG_JAN_2010

SPECIFICATIONS
FOR
Flyaway C Band DSNG (1+1) System

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Specification for Flyaway C Band DSNG System

This specification lays down the performance characteristics of C-band DSNG Flyaway system *in 1+1 mode*. The System comprises of encoder, modulator , C-band Block up converter, 400W TWTA (1:1) outdoor unit, 1.8 Mtr – 2 Mtr Fly away antenna with associated accessories like wave guides, Inter facility Links, Digital PLL LNBCs, 3 Port Feed, Dummy load, TLT and measuring equipment .

The specification mainly gives the representative requirements with MPEG-4 MPEG-2 DVB-S2 (HP@L4 (only for two DSNG), MP@ L3, 422P @ ML & MP@ML) standards.

The scope for flyaway C band DSNG system is detailed in specifications as given below:

1 INTRODUCTION

The scope of this includes Supply of the complete flyaway C band DSNG system. This specification envisages providing a digital uplink facility in 1+1 configuration. The digital chain consists of Encoder, digital Modulator & Upconverter as a 1+1 system feeding to 400W Hermetically Sealed / Weather Proof HPA (1+1) and 1.8 Mtr to 2 Mtr PDA.

I. A detailed block diagram showing the equipment layout and wiring should be given along with the offer for approval.

II. The output of the HPA should be taken to an antenna of 1.8 Mtr to 2 Mtr through a flexible waveguide of suitable length. The antenna should be provided with a 3 port linear feed along with C band Digital ready LNBC, Two IRD & IFL (Interconnection Facility Links) etc. along with adjustments for azimuth, elevation and polarisation. One down converter from C- band uplink frequency to L band is required for monitoring of uplink signal.

III The DSNG unit should also have input, output audio & video monitoring.

IV. A Hand held Spectrum analyser (3GHz), which should be able to resolve the telemetry of INSAT series of satellite and other satellite on Indian sky in C band (down converted to L band). WFM (Digital) should be supplied with the unit.

V. The system offered should contain all the accessories like compass, inclinometer, GPS receiver and necessary tools for integration / installation and maintenance.

VI. The system should have a security scheme (addressing ability / encryption) (BISS Mode 1 and BISS-E (DSNG-CA) support), so as to eliminate open access to the transmitted service.

VII. The full complement of the DSNG system should be packed in lightweight weather proof; shockproof containers **(Hard cases) made of Carbon Fibre with Honey Comb Structure of thickness 20 mm Minimum** of suitable size for airfreight, meeting the IATA accompanied baggage requirements to ensure reliable operation.

VIII. The equipment boxes with shock absorber mounted sub frame should be made of lightweight alloy. Rubber gasket between sides of the case and sub frame should be provided. The front and back panel should be fully weather proof. One should be able to use the equipment without removing it from the boxes, after removing the front and back panels of boxes. The front of the equipment box should have translucent rain cover. All connectors should be of military type.

IX. **The total weight of the complete system (in 1+1 configuration) including antenna along with the boxes but excluding Gen set and UPS should be kept as low as possible. The offer with the minimum overall system weight will be taken as the reference and the offers exceeding 30 kg above this reference will be rejected.**

X. The supplier should give **total number of boxes used for the complete system including size and weight of each box.**

XI. The equipment should be mounted in an ergonomical and orderly fashion. Easy access should be available to the PDP board.

XII. The entire system designing should be able to withstand a rough handling during transportation, set -up, dismantling and packing.

XIII. The system design should take care of operator safety as a prime consideration.

XIV. The offer should include the supply of four sets of detailed technical manuals for operation, maintenance and servicing of all the equipment.

XV. The specifications given are representative in nature and system will be selected on the basis of completeness.

XVI. Technical compliance of each parameter including features with supporting documents should be given. Any offer with non compliance of this requirement may be summarily rejected

XVII. The offer should include the maximum wind load at which the DSNG system will be stable and operate at the specified pointing stability.

XVIII. A detailed acceptance test report procedure should be given with the offer.

XIX. Training should be given to Doordarshan Engineers in operation and maintenance of the system at each consignee's site.

XX. Compliance should include antenna / system approval certificate from reputed international organisations.

XXI. Tenderer will have to give demonstration of their product if required and asked for, by Doordarshan with in one month of the request.

XXII. Tenderer can offer any option **either with BUC in HPA or BUC & HPA as separate units.**

XXIII. Tenderer may suggest One or two (max) models of equipment to meet complete requirement

XXIV. Encoder cum Modulator is also acceptable.

XXV. All software should be perpetual

2. Specification for Compression Equipment

2.1 HD Encoder	
2.1.1 Design Standards	
The system shall be designed to meet the international standards for digital broadcasting by satellite known as the MPEG-4 standards (HP@L4, selectable without any hardware changes. It should be possible to provide programme specific information, service name, language description and other related routine data. The system should have a security scheme (encryption) BISS Mode 1 and BISS-E, so as to eliminate open access to the transmitted service. HD Encoders with MPEG-4 (H .264) should have 4:2:2 and 4:2:0 compression format support	
2.1.2 Basic Configuration	
The basic requirement is for a 1+1 system. Each system shall be complete and fully wired and installed in equipment cabinets to simplify the installation and commissioning process.	
2.1.3 MPEG-4 Digital Video Encoder Specifications	
The Encoder should support following features: (as per EN 300 421 standards)	
1. BISS Mode 1 and BISS-E	
2. Low delay	For MPEG-4 - Bidder to specify for Their product
2.1.4 Video Inputs	
Video Input - The encoder shall be capable of accepting HD SDI and embedded HD SDI inputs.	
2.1.5 Serial Digital Input Specifications	
Parameter	**Specification**
(a) Serial Interface	SMPTE 292M, 1.485 Gbit/s (10bit),
(b) Format	**1080i and 720p**
(c) Connector	BNC female
(d) Input Level	800 mV p-p nominal +/- 10%,HD-SDI input
(e) Return Loss	better then 15 dB, 5 MBPS-1.5Gbit/s
2.1.6 Video Compression Parameters	
Parameter	**Specification**
(a) Video Resolutions (PAL)	1080x1920/1440/ i 25 720 x 1280/ p 50
(b) Profiles and Levels	HP@L4, (H.264 Part 10) with embedded audio
(c)Video Bit-rate	3.0 to 15 Mbps for 4:2:0 Profiles. 5.0 to 30 Mbps for 4:2:2 Profiles.
(d) Temporal Processing	To support low delay mode.
(e) Coding of Interlaced Video	Adaptive Field/Frame Processing supported
(f) Spatial Redundancy	Discrete Cosine Transform (DCT) Reduction
(g) Chrominance Format	4:2:0 and 4:2:2 (also refer 2.1 above)
(h) Aspect Ratio	4:3 and 16:9

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2.1.7 Audio Inputs	
The encoder shall be capable of accepting analog, AES/EBU or AES/EBU embedded digital inputs.	
2.1.8 AES/EBU Digital Audio Input Specifications	
Parameter	**Specification**
(a) Sample Rates	SAMPLE Rate- 48KHz
(b) Serial Interface	AES/EBU format
(c) Connector	XLR / with adapter for XLR
(d) Format, No. of Input	AES/EBU, 4 channels
2.1.9 Embedded Serial Digital Audio Input Specifications	
Parameter	**Specification**
(a) Serial Interface	
(b) Format	AES/EBU, 4 channels
(c) Connector	BNC female
2.1.10 Audio Compression Technique	
Parameter	**Specification**
(a) Audio Encoding Method	**MPEG1 layer 2, Digital LC-AAC, HE-AAC V1 (with capability for at least one 5.1surround sound encoding)**
	MUSICAM MPEG audio coding standard layer 2
(b) Data rate	**64-256 kbps (MPEG-1, layer 2 Audio)** **64-128 kbps (MPEG-4 AAC Encoding)** **48-128 kbps (MPEG-4 HE-AAC Encoding)**
2.1.11 DATA INPUT	**OPTIONAL**
2.1.12 Auxiliary Data Multiplexing	
The encoder shall be capable of the transmission of broadcast data signals along with video and audio.	
2.1.13 Asynchronous Serial Data Input Specifications (Optional)	
Parameter	**Specification**
(a) Physical Interface (Connector)	9 pin subminiature 'D' type, female
(b) Electrical Interface	RS-232C or IP
(c) Data Rate	up to 38.4 kb/s, asynchronous
2.1.14 Synchronous Serial Data Input Specifications (Optional)	
Parameter	**Specification**
(a) Physical Interface (Connector)	15 pin subminiature 'D' type, male
(b) Electrical Interface	RS-422
(c) Data Rate	up to 2048 kb/s, synchronous

2.2 SD Encoder

SD Encoder_2.21.**Design Standards**
The system shall be designed to meet the international standards for digital broadcasting by satellite known as the MPEG-4 / DVB-S2 standards (MP@ L3, 422P @ ML & MP@ ML, selectable without any hardware changes. It should be possible to provide programme specific information, service name, language description and other related routine data. The system should have a security scheme (encryption) BISS Mode 1 and BISS-E, so as to eliminate open access to the transmitted service. **4:2:2 is required for SD MPEG-2 only.** **4:2:0 is required for SD MPEG-2 & MPEG 4(H.264)**

2.2.2 Basic Configuration	
The basic requirement is for a 1+1 system. Each system shall be complete and fully wired and installed in equipment cabinets to simplify the installation and commissioning process.	
2.2.3 The Encoder should support following features: (as per EN 300 421 standards)	
1. BISS Mode 1 and BISS-E	BISS Mode 1 and BISS-E
2. Low delay	For MPEG-2 - 100msec For MPRG-4 - Bidder to specify for their product
2.2.4 Video Inputs	
The encoder shall be capable of accepting **SDI and embedded SDI inputs.**	
2.2.5 Serial Digital Input Specifications	
Parameter	**Specification**
(a) Serial Interface	SMPTE 272M, 270 Mb/s(10 bit) with embedded audio
(b) Format	ITU(R)-601
(c) Connector	BNC female,75 ohm
(d) Input Level	800 mV p-p nominal +/- 10%, SDI input
(e) Return Loss	better then 15 dB, 10 – 270 Mbps
2.2.6 Video Compression Parameters	
Parameter	**Specification**
(a) Video Resolutions (PAL)	720 x 480, 720 x 576, 704 x 576, 544 x 576,480 x 576, 352 x 576,
(b) Profiles and Levels	MP@ L3, 422P @ ML
(c)Video Bit-rate	1 to 10 Mbps for 4:2:0 Profile. 1 to 25 Mbps for 4:2:2 Profile.
(d) Temporal Processing	I, B, B, P frames structure to support low delay mode.
(e) Coding of Interlaced Video	Adaptive Field & Frame Processing support
(f) Spatial Redundancy	Discrete Cosine Transform (DCT) Reduction
(g) Chrominance Format	For MPEG -2 , 4:2:0 & 4:2:2 selectable, For MPEG-4, 4:2:0 Only (Refer 2.1 above)
(h) Aspect Ratio	4:3

2.2.7 Audio Inputs	
The encoder shall be capable of accepting analog , AES/EBU or AES/EBU embedded digital inputs.	
2.2.8 AES/EBU Digital Audio Input Specifications	
Parameter	Specification
(a) Sample Rates	48.0-kilo samples/second
(b) Serial Interface	AES/EBU format
(c) Connector	XLR / with adapter for XLR
(e) Format, No. of Input	AES/EBU, 4 channels
2.2.9 Embedded Serial Digital Audio Input Specifications	
Parameter	**Specification**
(a) Serial Interface	
(b) Format	AES/EBU, 4 channels
(c) Connector	BNC female
2.2.10 Audio Compression Technique	
Parameter	**Specification**
(a) Audio Encoding Method	**MPEG1 layer 2, (with capability for at least one 5.1surround sound encode) LC-AAC, HE-AAC V1**
	MUSICAM MPEG audio coding standard layer 2
(b) Data rate	**64-256 kbps (MPEG-1, layer 2 Audio)** **64-128 kbps (MPEG-4 AAC Encoding)** 48-128 kbps (MPEG-4 HE-AAC Encoding)
2.2.11 DATA INPUT OPTIONAL	
2.2.12 Auxiliary Data Multiplexing	
The encoder shall be capable of the transmission of broadcast data signals along with video and audio.	
2.2.13 Asynchronous Serial Data Input Specifications (Optional)	
Parameter	**Specification**
(a) Physical Interface (Connector)	**15 Pin D type or MPE (RJ45) connector**
(b) Electrical Interface	RS-232C or IP
(c) Data Rate	up to 38.4 kb/s, asynchronous
2.2.14 Synchronous Serial Data Input Specifications (Optional)	
Parameter	**Specification**
(a) Physical Interface (Connector)	15 pin subminiature 'D' type, male
(b) Electrical Interface	RS-422
(c) Data Rate	up to 2048 kb/s, synchronous

2.3 MODULATOR

2.3 DVB-S2 Satellite Modulator Specifications	
2.3.1 ASI Inputs	
Parameter	**Specification**
(a) No. of Inputs	2 nos.
(b) Compliance	**DVB-S2, 302307 Should be capable of emitting signals using following modes: 1. Backward compatible mode. 2. Constant Coding and Modulation (CCM).**
(c) Inputs bit-rate	upto 65 Mbps
(d) Byte stuffing modes	Byte & Signals Packet Burst modes.
(e) Connector	BNC
2.3.2 Forward Error Correction and Modulation Scheme	
Parameter	**Specification**
(a) FEC Coding(LDPC)	1/3,2/5,1/2,3/5,2/3,3/4,4/5,5/6,8/9,9/10
(b) Spectrum Roll off factor	25% and 35% selectable
(c) Modulation Format	QPSK & 8PSK
(d) Transmission Rates	**(d1) Variable, 1.0 to 35 M symbols / sec (For stand alone Modulator) (d2) Variable, 1.0 to 15 M symbols / sec (For Combined Encoder and Modulator)**
(e) MPEG Format Support	Modulator should be able to modulate MPEG-2,MPEG-4 (H .264 part 10) for streams of HD & SD

2.3.3 IF Output Interface Specifications(In case of 70 Mhz Upconverter)

Parameter	Specification
(a) Output Frequency Range	52 to 78 MHz tunable
(b) Synthesizer Step Size	1 kHz, step
(c) Frequency Stability	< + 1Khz (all causes over 10 years)
(d) Output Impedance	75 ohms unbalanced
(e) Connector	BNC, female
(f) Output Return Loss	>20 dB (50 – 90 MHz)
(g) Output Level Range	-20 to 0 dBm
(h) Level Step Size	0.1 dB, steps
(i) Spurious Outputs	<-65 dBc/4KHz@-10dBm
(j) Synthesizer Phase Noise	Meets requirements of IESS-308
(k) CW mode	Selectable
(l) Noise floor (C/ No)	< -120 dBc/Hz
(m) Spectrum sense	Normal/Inverted

OR

2.3.4 L-Band Output Option (In case of L band BUC)

S.No.	Parameters	Specification
1.	Frequency	950 to 1500 MHZ, step size 125 KHz
2.	Return loss	> 10 dB
3.	Compliance	EN 302307
4.	Output Connector	SMA(F)
5.	L band output impedance	50 ohm
6.	output level	- 20 to + 5dBm
7.	1 dB compression output	+10 dBm
8.	Output Gain	0 dBm + 5 dBm
9.	Output Gain step size	0.1 dB
10.	Phase Noise 10 Hz	< -30dBc/Hz
	100 Hz	< -60dBc/Hz
	1 KHz	< -70dBc/Hz
	10 KHz	< -80dBc/Hz
	100 KHz	< -90dBc/Hz
11	Spurious	<-60 dBm, and <-55 dBc/4KHz

3. SPECIFICATION FOR UPCONVERTERS

3.1 C band Up-converter (in case of 70 MHz Modulator as per specification at Sl. No. 2.3.3)

1. Input Frequency	:	70 ± 18 MHz
2. Output B/W	:	+/- 18 MHz
3. Frequency Steps Size	:	Synthesized 125 KHz
4. Input Power	:	-20 dBm nominal
5. Output Frequency range	:	5.85 to 6.425 GHz GHz
6. Frequency Accuracy	:	+/- 200 Hz
7. Frequency Stability	:	+/- 1000 Hz from 0 to 50 Deg. C
8. Output Power	:	15 dBm
9. Gain Adjustment	:	25 dB
10. Phase Noise		
10 KHz	:	-80 dBc per Hz
100 KHz	:	-90 dBc per Hz
1 MHZ	:	-110 dBc per Hz
11. Spurious	:	-65 dBc modulated < -70 dBm unmodulated (Non carrier related)

OR

3.2 Block Upconverter (In case of L band Modulator as per specification at Sl. No. 2.3.4)

S.No.	Parameter	Specification
1	Type	Single conversion
2	Output Frequency	5.85 to 6.425 GHz
3	Input Frequency	950 to 1500 MHz
4	Impedance	50 ohms
5	VSWR	1.5:1 maximum
6	Non-damage	+15 dBm minmum
7	**External reference characteristics**	
a	Location	Input center conductor or reference connector
b	Frequency	10 MHz
c	Level	-5 to + 5 dBm
8	**Output characteristics**	
a	Impedance	50 ohms
b	VSWR	1.3:1 maximum
c	Power output (1 dB compression)	+10 dBm minmum
d	Power Attenuator	0 to 20 dB in 1 dB step size
9	**Transfer characteristics**	
a	Noise figure	15 dB typical (with minimum attenuation)
b	Gain	26 ± 1 dB at 23 degree C
c	Gain flatness	±0.2 dB/any 40 MHz, ±0.25 dB/any 80 MHz, ±0.5dB/RF-band
10	**Gain stability**	
a	Constant temperature	±0.25 dB/24 hours
b	Attenuation control	32 dB / 0.1 dB step remote control or 0 to 10 volts DC
11	Group delay	
a	Slope (any 80 MHz segment)	0.0125 ns/MHz
b	Parabolic (any 80 MHz segment)	0.000625 ns/MHz^2
c	Ripple (any 80 MHz segment)	0.5 ns
d	Total	1 ns peak-to-peak over RF-band
12	**Spurious output**	
a	Signal related	65 dBc minimum
b	IF signal second harmonic	-55 dBc maximum at 0 dBm output power
c	Signal independent (in band)	-100 dBm maximum
d	Signal independent (out-of-band)	-70 dBm maximum
e	Image rejection	-60 dB minimum
f	Second harmonic output (P1 dB)	-40 dBc maximum
g	Intermodulation distortion	With two in band output signals at 0 dBm, third order intermodulation products are less than 46 dBc
13	Mute	60 dB minimum

4. SPECIFICATION FOR LINEARISED HIGH POWER AMPLIFIER

The high power amplifier is to be used for the final power amplification of the digital RF signal in C band, to be fed to the antenna after proper processing through filters etc. The following will give a standard specification of the amplifier Amplification has to be carried out in two stages i.e SSIPA and TWTA.

4.1	Type	:	Outdoor type 400 Watt TWT
4.2	Frequency	:	5.85 to 6.425 GHz,
4.3	Output Power	:	at flange 350 Watt (Min.)
4.4	Gain at rated power	:	43 dB minimum 73 dB minimum (with SSIPA)
4.5	Gain Variation		
4.5.1	Narrow Band	:	1 dB max. over any 40 MHz
4.5.2	Full Band	:	3 dB max.
4.6	Gain Slope	:	+/- 0.04 dB per MHz (Max.)
4.7	Gain Stability	:	+/- 0.25dB (Max.) over 24 hrs. +/- 1.0 db max. over operating temp. range at any frequency.
4.8	Inter Modulation		:With linearizer: -24 dBc or better with two equal carriers at 4 dB output back off. Without Linearizer: -18 dBc or better with two equal carriers at 4 dB output back off.
4.9	Second Harmonic Output	:	-60 dBc
4.10	Group Delay		
	(a) Linear	:	0.01 nSec. Per MHz across any 40 MHz
	(b) Parabolic	:	0.005 ns /MHz^2 over any 40 MHz band
	(c) Ripple	:	0.5 ns p-p over any 40 MHz band
4.11	VSWR	:	input 1.3: 1(max.) Output 1.3:1 (max.)
4.12	Power Supply	:	180to 245 V AC, Single Phase
4.12.1	Frequency	:	47 to 53 Hz
4.13	Power factor	:	0.95 (Min.)
4.14	Spurious (Max.)		
	Receive Band (3.7 to 4.2GHz)	:	-120 dBW / 4 KHz
	Transmit Band (5.85 to 6.2 GHz)	:	-65 dBW / 4 KHz

4.15	Controls	:	HV on, Fault reset, heater standby
4.16	Power Consumption	:	less than 1500 watts.
4.17	Monitoring Digital	:	HV on, Heater timeout, standby, summary fault, Helix current/ Arc fault, Helix current latched fault, Over voltage fault, Temp fault, Fan lock
4.18	Monitor Analog	:	Helix current, TWT Temp. RF output
4.19	Altitude	:	3000 Meter AMSL
4.20	Shock vibration	:	Air transportation and Mechanized material handling e.g. Fork lifts
4.21	Cooling	:	Forced Air

5. Specification for 1.8 Mtr –2 Mtr Uplink Antenna.

INTRODUCTION

This antenna would be used to uplink TV signals & it is required for uplinking digital channels through 400W TWTA, hence the feed handling capacity should be as given in the specifications below.

1. It should have at least **1 Uplink port and 2 downlink ports** (i.e. both for Vertical & Horizontal Pol.)
2. Antenna should be made of lightweight **carbon composite fiber with Honey Comb Structure of thickness 20 mm Minimum**
3. The antenna should conform to latest CCIR recommendations, ITU-R Rec. 580- 5, satisfying the $29 - 25 \log(\theta)$.
4. Technical offer should include **antenna system type approval certificate or antenna performance verification report from reputed International organisations or satellite operators like NOCC or INTELSAT or EUTELSAT or NSS etc.**

5.1 ANTENNA SPECIFICATION FOR THE C BAND ANTENNA .

1.	Size	:1.8 Mtr to 2 Mtr (nominal circular equivalent)
2.	Mount	: Elevation - Azimuth
3.	Frequency of operation	
	Transmit	: 5.85 GHz to 6.425 GHz.
	Receive	: 3.7 GHz to 4.2 GHz
4.	Gain	:
	Transmit	: 39.0 dB (Min.) for 1.8 Mtr / 41.0 dB (Min) for 2 Mtr @6 GHz
	Receive	: 34.0 dB (Min.) for 1.8 Mtr/ 36 dB (Min) for 2 Mtr @ 4 GHz
5.	Off-axis gain	
	Transmit	: 29-25 Logθ, (100 λ/D) Deg<θ<20 Deg. &
		: -3.5 dBi 20 Deg<θ<26.3 Deg
6.	Polarisation Type	: Linear Orthogonal,

7. Polarisation Adjustment	: +/-90 Deg. fine (Calibrated graduation, absolute)
8. Azimuth Adjustment	: +/-180Deg. (including +5^0 **fine adjustment**) (Calibrated graduation, relative)
9. Elevation Adjust	: 10 Deg to 80 Deg. (including +5^0 **fine adjustment**) (Calibrated graduation, absolute)
10. Cross Polar Isolation	: 35 dB relative to co-polar gain within 1 dB **Contour (Factory test report to be submitted at the time of inspection along with spectrum plots)**
11. VSWR	
Transmit	: 1.3: 1
Receive	: 1.3: 1
12. Port to port isolation	
Transmit to receive	: 40 dB (100 db with TRF)
Receive to transmit	: 30 dB
13. Wind Speed	
Operational	: 60 KMPH
Survival	: 100 KMPH.(in deployed condition)
14. Pointing Stability	: < + / - 0.2 deg.
15. Wave guide Flanges	: Tx CPR137 and Rx CPR 229

6. SPECIFICATION FOR LNBC (DIGITAL PLL C BAND)

These LNBCs are to be used for the reception of digital video/audio signals through the satellite:

1. Input frequency range	3.7 GHz to 4.2 GHz
2. Local Oscillator frequency	5.150GHz
3. L.O. Stability	± 10 PPM
4. L.O. Phase noise	Better than 75 dBc/Hz @ 1KHz Better than 85 dBc/Hz @ 10KHz Better than 90 dBc/Hz @ 100KHz
5. Output frequency	950 MHz to 1450 MHz
6. Conversion gain	55 dB
7. Gain response	Better than ± 1 dB/40 MHz
8.Output level at 1dB compression point	6dBm
9. Output Connector	F connector
10. Input VSWR/Output VSWR	Better than 2.5:1
11. Noise Temp.	Better than 30 deg K
12. Power supply requirement	Should work between + 15V to +24V with current consumption of about 350 mA
13. Input flange	CPR229

7. MPEG 2/MPEG 4/DVB Prof. IRD Specifications

The IRD should have a front panel display and one should be able to enter or edit all the parameters for a perfect reception of the signals. **There should be provision for observing the BER of the signal and signal level on the front panel. IRD should be able to descramble BISS mode 1 and BISS-E signals. Also the IRD should be able to store at least 20 channels in memory.**

7.1 RF Parameter Specifications

Parameter	Specification
(a) Input Frequency Range	950 - 1750 MHz
(b) No. of Inputs	1 nos.
(c) Tuning Step Size	125 kHz, maximum
(d) Satellite Frequency Band	C- & KU-Band, selectable
(e) Input Impedance	75 Ohms
(f) Input Connector	F-Type female
(g) Input Power Range	-30 to -65 dBm per carrier
(h) Image Rejection	>30 dB
(i) Input Return Loss	7 dB, minimum
(j) Noise Figure	20 dB, maximum
(k) AFC Tuning Range	± 5 MHz
(l) De-Modulation Method	DVB-S QPSK, DVB-S2 8PSK demodulation
(m) Variable Symbol Rates	1.0 to 44.5 M symbol/Sec for (DVB-S) 1.5 to 30 Msymb/sec, (minimum) for (DVB-S2)
(n) Convolutional Inner FEC Rates selectable	**R= 1/2, 2/3, 3/4, 5/6, 7/8(DVB-S option QPSK)** **R= 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 (DVB-S- 2, QPSK),** **R= 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 (For DVBS2, 8PSK)**
(o) IF Filter Bandwidth	Automatic Selection (dependent on Symbol Rate).

7.2 Audio and Video Decompression Parameters

Parameter	Specification
(a) Video Resolution (all resolutions shall be capable of I, P & B frame decoding) (other standard resolution should be selectable)	**For HD 1080x1920/1440/ i 25 , 720x1280/ p 50 and for SD** 720 x 576, 704 x 576, 544 x 576, 480 x 576, 352 x 576,
(b) Video Decompression Type	HP@L4, MP@ L3, 422P @ ML & MP@ML (H.264 Part 10)
(c) Television Standard	PAL-B (EN50083-9)
(d) Audio Decompression Type	MPEG-1 Layer-II audio (Stereo/ Musicam, i.e. Single Mono, Dual Mono, Stereo, and Joint Stereo) Digital AAC (HE, LE Mode) AC-3 passes through Firm has to demonstrate, as and when asked, as part of technical evaluation of Tender.

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7.3 Transport Stream O/P **MPEG-2 DVB-ASI on BNC**

7.4 Video Output Specifications

a) **The IRD shall have one composite video output, one SD-SDI and one HD-SDI**

b) **There should be a genlock input** (Firm has to demonstrate during the demo, as and when asked as part of technical evaluation of Tender.

7.4.1.1 Analog Video Output Specifications

Parameter	Specification
(a) Connector Type	BNC (75 Ohms)
(b) Quantity	1 Nos. of analog composite PAL-B CCIR Standard
(c) Level	1.0 V p-p +/- 5%

7.4.1.2 Digital Video Output Specifications (SD-SDI)

Parameter	Specification
(a) Serial Interface	SMPTE 259M ,270 Mb/s & SMPTE 272-1994 (10 bit), Note: ASI to SDI conversion should take place directly, i.e. not through Analog to Digital converter.
(b) Connector Type	BNC (75 Ohms)
(c) Quantity	1 Nos. of DIGITAL output compliant to ITU-R BT.656 Standard
(d) Level	800mV p-p for SDI As per ITU-R BT.601 (part A)

Note: ASI to SDI decompression should take place directly, i.e. not through Analog to Digital converter.

7.4.1.3 Digital Video Output Specifications (HD-SDI)

Parameter	**Specification**
(a) Serial Interface	SMPTE 292M, 1.485 Gbit/s (10bit),
(b) Connector Type	BNC (75 Ohms)
(c) Quantity	1 Nos. of DIGITAL output compliant to **1080i and 720p**
(d) Level	800mV p-p for SDI As per ITU-R

7.4.2 Video Performance Specifications

Parameter	Specification
(a) Frequency Response	with in 2 dB at 5 MHz
(c) Chroma-Luma Delay	±30 ns, maximum
(d)Field Time Distortion	< 2%
(e) Line Time Distortion	< 1%
(f) Short Time distortion	< 2%
(g) Differential Gain	< 4%
(h) Differential Phase	< 2°
(i) Signal to Noise Ratio	>55 dB (luminance weighted)

7.4.3 VBI Signal Reinsertion Specifications

Parameter	Specification
(a) VBI Formats Supported	WST VITC
(b) Range of VBI Lines	Field 1 lines 7 to 22 (PAL) and corresponding lines of Field 2
© Synchronization with video	With in ± 1 frame
(d) Preservation of line numbering	VBI data shall be reinserted on the Original line number

7.5 Audio Output

7.5.1 Analog Audio

Each analog audio output shall be presented as a stereo pair. In the event of "Mono" transmissions, the same encoder input channel will be output to both left and right connectors. In other modes ("Stereo", "Joint Stereo" and "Dual Mono"), the two encoder input channels will be output as left and right.
Means shall be provided to combine the left and right channels on the IRD output to produce a mono output from stereo transmissions to accommodate those sites not equipped for stereo transmission.

7.5.1.1 Analog Audio Output Specifications

Parameter	Specification
(a) Output Impedance	600Ω (balanced)
(b) Number of Outputs	4, configurable as Stereo, Joint Stereo, Single mono, Dual mono.
(c) Connector Type	XLR Male Socket or with suitable XLR Adapter

7.5.2 Digital Audio Output Specifications

Parameter	Specification
(a) Output Level	2 to 7 volts
(b) Output Format	AES/EBU
(c) Load Impedance	110 Ohms
(d) Connector Type	XLR male Socket or with suitable XLR adapter (i.e. no terminal block)
(b) Number of Outputs	2, Stereo Channels

7.5.2.1 Audio Performance Specifications

Parameter	Specification
(a) Peak Output Level	+ 18 dBm into 600Ω balanced
(b) Clipping Level	S/W Selectable to be provided (demo has to be given)
(c) Sampling Rates	32, 44.1 and 48 KHz
(d) Frequency Response	40 Hz to 20 kHz ± 2 dB
(e) THD	<0.3 % at 1 kHz
(f) Dynamic range	80 dB (ITU-R/Arm weighting)
(g) Cross talk at 1 kHz	60 dB, full scale (20 Hz to 20 kHz)
(i) Signal to noise ratio	55 dB (min) at 0 dBm

7.6 LNB Power Supply & Control

(a) LNB Voltage	+ 13 V (Vertical)/ 18 V (Horz) polarizations switching or 19 V fixed.
(b)Power Consumption	400 mA. (Max.)
(c) Over Current protection	Fold back current limiting.
(d) LNB Power Supply & Control	Receive Polarization Control by electrical Command Via LNB-IF feeder (High & Low band switching Pulse for KU-Band operation).

7.7 Size

Mount — 19" Rack Mount

7.9 Audio/ Video monitoring with 5" to 6" TFT monitors

To monitor the audio and video quality multiple Monitor with corresponding Audio Bar Graph panels are required.

7.9.1 Specifications for Monitors

1.	Display (Viewing Area)	5" or more
2.	Resolution (Pixels)	480H x 234V (min)
3.	Dot Pitch	0.171mm x 0.264mm (min)
4.	Brightness	Better than 250cd/m^2
5.	Aspect ratio	4: 3 and 16:9
6.	Composite Video I/P per monitor	One
7.	Video Input	**SDI**

7.9.2 Specifications for Dual Stereo Bar-Graph (Two Stereo Audio per channel) (5.1 Surround Sound HE-AAC for HD video[$$])

1.	Input Source Type	**AES/ EBU and Analog**
2.	Frequency Response	100 Hz to 15 kHz +/- 0.5dB
3.	Level Meter stereo channel viewing	>25 Segment level display, High resolution
4.	Standard Scale	-30 to +15dB

[$$] ***Bar Graph should be able to Show 6 mono audio channels decoded by IRD / STB in case of 5.1 Surround Sound audio.***

9. Physical, Environmental & Mechanical Specifications

9.1 Power Supply

All Equipments shall operate from a wide range of power supply voltages without interruption or damage.

Parameter	Specification
(a) Voltage Range	180 to 245 VAC
(b) Frequency	47-53 Hz

9.2 Environmental Specifications

Indoor Type of Equipment

Parameter	**Specification**
(a) Operating Temperature	0°C to 45°C
(b) Storage Temperature	-20°C to 75°C
(c) Humidity	0 to 95% non-condensing
(d) Altitude	0 to 3000 m

Outdoor

Parameter	**Specification**
(a) Operating Temperature	-20°C to 55°C
(b) Storage Temperature	-20°C to 75°C
(c) Humidity	0 to 100% non-condensing
(d) Altitude	0 to 3000 m

9.3 Mechanical Specifications

Parameter	**Specification**
(a) Construction	Modular, equipment boxes with shock absorbers. The front and back panel should have fully enclosed weather proofing panel. The equipments can be used without removing from the boxes, after removing the front and back panels of box
(b) Cooling	Internal circulation fans

10. General Requirement

1. Supplier should give a certificate from OEM for providing spares and maintenance support for this system for the next seven years.
2. All the essential items which the manufacturer feels are necessary to complete the equipment/chain for the full exploitation of all the features of the equipment offered, may also be quoted.
3. Equipment from renowned and well-known firms of the industry with proven track record only will be accepted. The tenderer should enclose a list of organizations to which same equipment as is in this tender has been supplied.
4. The system/equipment should be mounted in industry standard boxes.
5. Cost of all the equipment and items which are necessary to complete the configuration to meet the specifications/requirement should be very clearly specified and will be included for commercial evaluation.
6. The system offered should be complete in all respect even if missed in the specification.
7. **Tender without the consent / counter signature of OEM representative in respect of compliance statement and associated part of Bill of Material (corresponding to respective sub systems including OEM items and associated third party items) will be treated as in complete proposal and will be summarily rejected without any reference of it to the firm.**
8. If required, one sample of complete system in all respects or sub system along with operation & technical manuals would be made available for technical evaluation.
9. **The firm should have supplied installed and successfully commissioned Earth stations for TV uplink/ DSNG in India or abroad and should have been in the field for at least 3 years.**

10a. DOCUMENTATION

Offer should include the supply of four complete (including manuals for options, if any) set of documents (in original) of operation and maintenance (i.e. two with the equipment with each unit, one additional set for Design Directorate and one each for respective Zonal offices). All the documents should also be supplied in CDROM with each set of document. The CDROMs supplied should have full features of find & search of Microsoft. Cost if any may be included in the offer. One set of the above manuals for each equipment should be enclosed along with the tender for technical evaluation. Offers without the manuals for evaluation are liable to be rejected.

10b. GUARANTEE

i) The equipment shall be guaranteed against any manufacturing defects for a period of two year from the date of supply.

ii) Any parts failing during the guarantee period shall be repaired/replaced free of charge by the supplier at site i.e. no transportation charges would be paid by DD for transporting the defective / repaired items if required to be removed from site during the guarantee period.

iii) Guarantee period is to be extended corresponding to the outage period if the failure rectification takes more than 15 days time.

11. GENERAL INFORMATION

1. A point-by-point compliance statement **from the principal manufacturer in respect of all the points, sub-points and paras laid down in this specification from page 1 onwards** is to be enclosed along with the offer. Mere signature on a copy of our specification shall not be accepted as a compliance statement. **Page no. of location of data sheet should be given in page no. column. One copy of compliance statement and Bill of material (in MS Excel format) should also be given on CD-ROM.**

(a) Compliance statement in the format as indicated below only shall be accepted.

Sr. No. of DD specs.	DD specs.	Compliance (Yes/No)	Performance fig. of equipment offered.	Deviations, in case of non-compliance	Optional items if any required to make the system Compliant to DD specs.	Features in the system offered Which exceed DD specs.	Page No.	Remarks
1	Introduction							
2	Specifications							
3	Essential features (a)----- (b)-----							

(b) The manufacturer should also record the performance figures of the equipment offered in the quote for which the compliance statement is enclosed.

(c) The compliance statement should be supported by highlighted record of these in the technical literature/data sheets enclosed with the tender **and a clear reference to the attached supporting document should be given in the remarks column against each & every specs.** Any offer without proper supporting document of each & every specs and containing only a commercial hand out/pamphlet will be rejected. In case the parameters given in the data sheet / technical literature is different from the one mentioned any where else or in the compliance statement of the offer, the one mentioned in the data sheet / technical literature will be considered to be authentic.

(c) Any deviation from the specifications detailed in the compliance statement is to be highlighted separately.

(d) Offers without the proper & duly completed compliance statement are likely to be rejected with the sole responsibility of tenderer and no further claim/correspondence will be entertained.

2. Ordering Information

One soft copy of ordering information / Bill of material, in **MS Excel format**, should be provided along with the quote. The sequence of item should be kept same as tabulated in the equipment list of DD Specification.

3. SPARES

1. A complete **recommended spare list** with price quote should be offered, along with the bid.
2. The cost of spares shall not be taken into account for deciding lowest tenderer.

4. ACCESSORIES

1. All essential accessories like cables, connectors and power cord etc. should be included in the offer. Optional accessories should be quoted separately.

5 INSPECTION

1. All the equipment to be supplied against the supply order for this tender shall be subjected to inspection at New Delhi / manufactures facility by Doordarshan.
2. ATP is to be provided by the Tenderer for approval by Doordarshan before inspection.

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12. EQUIPMENT LIST

The quantities indicated are provisional. Bidder should quote for quantities as required to complete the system.

Sr. No.		DESCRIPTION	QTY per Unit	MAKE	MODEL
1		**FLYAWAY 1.8 Mtr to 2 Mtr Antenna System**	**1Set**		
	a	Lightweight 1.8 / 2 meter segmented antenna and 3 axis mount system	1		
	b	C band 3 port feed (Tx range 5.7 to 6.2GHz)*	1		
	c	Diplexer for 3 port operation	1		
	d	Transmit reject filter (With > 80 db isolation)	1		
	e	Cross axis waveguide kit	1		
	f	Interconnecting cables	1 set		
	g	System tools	1		
	h	Compass	1		
	i	Inclinometer	1		
	j	Hand held GPS receiver (Equivalent to Garmin) and Satellite tracker (equivalent to Horizon Global, Prodig)	1		
	k.	Antenna flight case **(Hard case –Carbon Fiber)**	1 set		
	L	NOCC Clearance of above Antenna System	1 set		
	m	Essential Additional Item (if any) to Complete the antenna System * (Factory test report for cross pole isolation to be submitted at the time of inspection along with spectrum plots)			
2		**HIGH POWER AMPLIFIER**	**1Set**		
	a	400 watt (350watt flange) C band TWT amplifier (outdoor unit)	**2**		
	b	Lineariser for 400 watt C band TWT amplifier	**2**		
	c	Amplifier Redundancy controller	1		
	d.	Wave guide Switch for 1+1 redundancy & Dummy load.	1		
	e.	RF Equipment case **(Hard case –Carbon Fiber)**	1		
	f.	Essential Additional Item (if any) to Complete the HPA System	1 set		
3	a	**Upconveter**	2		
	b	Up converter Redundancy Switch (controller)	1		
	c	Essential additional items (if any) for Up converter system	1set		
	d	Hard case for transportation	1 set		
4		**Digital Equipment ****			
	a	Encoder (for SD MPEG-4 & MPEG-2)	2		
	b	BISS-E scrambling (H/W & S/W) for Encoders	2		
	c	4:2:2 option for encoder	2		
	d	Modulator #	2		
	c	Digital Equipment Case **(Hard case –Carbon Fiber)**	1 set		
	d	Essential additional items (if any) for Encoder& Modulator	1 set		
		# Tenderer can also quote encoder cum modulator			

5		**Digital Equipment ****			
	a	Encoder (for HD MPEG-4)	2		
	b	BISS-E scrambling (H/W & S/W) for Encoders	2		
	c	Hard case for Transportation	2		
		****Two DSNGs** will have 1 set of HD-MPEG-4 Encoders in 1+1 mode in addition to SD encoders. (Other 3 DSNGs should have blank space for 2 encoders of 1 RU each for future upgrade as and when required) $ HD encoders should be supplied as separate units in separate hard case, so that HD encoders can be shifted to other DSNGs in case of requirements.			
6		**Receiving Setup equipment**	**1 Set**		
	a	IRD (Integrated Receiver Decoder) for MPEG-2 & MPEG-4(H .264) (4:2:0 for HD MPEG-4 , SD MPEG-2 & MPEG-4 and 4:2:2 for HD MPEG-4 & SD MPEG-2) with BISS-E De-scrambling Facility and SDI output	2		
	b	LNBC (3.625 GHz to 4.2 GHz)	2		
	c	Essential additional item (if any) to complete the receive set up	1 set		
7		**Monitoring Set up consisting of**			
	a	C-band Uplink frequency to L Band Down Converter (TLT)	1		
	b	DUAL Picture TFT monitor with size 5" to 6" (which can fit in the 19" rack) with SDI, CCVS, AES EBU inputs)	1		
	c	Dual AES and Dual Analogue Audio Monitor with bar graph & Speakers (which can be fit in the 19" rack below the TFT monitor) (Two stereo Audio per video) (AAC 5.1 for HD DSNG)	1		
	d	Waveform Monitor Hand held for HD-SDI input (similar to WFM 5000 or equivalent)	1		
	e.	SDI equalizer (up to 200 meter length) (MIRANDA, KRAMER, GVG, or equivalent.)	2		
	f.	SDI / (AES/EBU) input matrix switcher 4X4 (for Video with associated Audio) (LEITCH, NETWORK, Probel, Kramer or equivalent)	1		
	g.	Colour bar and tone generator (Tektronix, KRAMER , R&S or equivalent)	1		
	h.	Audio (analogue and Digital) Embedder (similar to Miranda, Crystalvision, Snell & Wilcox etc.) (2 AES/ EBU channels per card)	2		
	i	Analog Video to SDI Converter	3		
8		**Measuring Equipment**			
	a	Handheld Spectrum Analyzer (100KHz to 3GHz with standard Accessories), which should be able to resolve the Telemetry of INSAT series of satellite in C-band (Down converted to L band.) (Noise floor should be better than -105 dB at 1khz RBW) (With LCD Display)	1		
	b	Handheld satellite tracker	1		
	c	Hard case for transportation	1 set		

9		**Maintenance Tool Kit**	**1 Set**		
	a	Set of Tools for maintenance including soldering station (similar to Weller make)	1set		
	b	Flexible wave guide with flange (1 meters each) (Additional)	5		
	c	Tool box **(Hard case type)**	1		
	d	Essential Additional items (if any) for maintenance work	1set		
	e	Hard case for transportation of Audio-Video cables as per IATA regulation	1		
10	a	UPS of 5.0 KVA (Min) with 15 Min backup	1		
	b	Essential additional item (if any) to complete the UPS system	1 set		
	e	Hard case for transportation	1 set		
11	a	System Integration & System Engineering	1set		
12		**Manuals & CDs (for S/w) of all The Equipments offered**			
	a	CD ROM for all the software required in the System	1set		
	b	System Manuals (Operation and Maintenance/ Service Manuals)	1set		
	c	**Software upgrades within two year of installation should be supplied free of cost.**			
13		**Training**			
	a	Training for Doordarshan Engineers in India at each consignee's site	1 job		
14		Any other item to Complete the Specification, Installation and commissioning of the system.			

Note 1: All software backups should be supplied on CDs. Software upgrades within three year of installation should be supplied free of cost. Doordarshan should be registered as a ultimate user with perpetual validity at the time of purchase of all software licenses.

Note 2: Tender without the consent / counter signature of OEM representative in respect of compliance statement and associated part of Bill of Material (corresponding to respective sub systems including OEM items and associated third party items) will be treated as in complete proposal and will be summarily rejected without any reference of it to the firm.

1. Any incomplete proposal is liable to be rejected.
2. The prices for Software & Hardware wherever required should be given along with the equipment.
3. All the **relevant options of all the equipments** to utilize the equipments to its full capacity must be quoted.

BLOCK SCHEMATIC DIAGRAM OF C BAND DSNG