## NTIA Space Record Data Form

NTIA requires the following data for space related experiments using government shared spectrum. For each transmit frequency, please provide the data for both ends of the transmit-receive link. Use Part A to describe the satellite to ground information. Part B is for all ground to space transmit links.

## Part A: Space to Earth Downlink Data

Satellite Transmitter Data (Required for Each Frequency)

Transmit Frequency	: 401.50 MHz	
Satellite Name: CTC-0		
Data Field	Data Answer	Description/Comments
Transmit Power (PWR)	PWR = 0.9W	TRANSMIT POWER SUPPLIED TO THE ANTENNA INPUT TERMINAL, EXAMPLE, PWR01 W2 TRANSMIT POWER UNITS INCLUDE: W = WATT, K = KILOWATT, M = MEGAWATT
Necessary Bandwidth	25 kHz	THE WIDTH OF FREQUENCY BAND WHICH IS JUST SUFFICIENT TO SUCCESSFULLY TRANSFER DATA. FORMULAS CAN BE FOUND IN ANNEX J OF THE NTIA MANUAL.
RF Emissions Data	Telemetry and telecommand	2-SIDED EMISSION BANDWIDTH VALUES
-3 dB bandwidth	< 25 kHz	
-20 dB bandwidth	< 25 kHz	
-40 dB bandwidth	< 50 kHz	
-60 dB bandwidth	< 50 kHz	
Modulation Type	2GFSK	THE METHOD USED TO SUPERIMPOSE DATA ON THE CARRIER, EXAMPLE, BPSK, QPSK, GMSK.
Data Rate	<9600 bps	INFORMATION DATA RATE
Forward Error	Is FEC used? Yes ☐ No V	
Correction Coding	FEC Type: n/a	
Total Symbol Rate	9600 sps	DATA RATE COMBINED WITH FEC AND FRAME OVERHEAD RESULTING IN THE TOTAL SYMBOL RATE AT THE INPUT TO THE SYMBOL MAPPER/MODULATOR.

Does transmitter	Yes V	BEACON MODE IS NORMALLY
have a beacon		CONSIDERED A REGULAR AND PERIODIC
mode?	No □	
moder		SHORT DURATION TRANSMISSION THAT
		IS OFTEN USED TO ASSIST WITH
		TRACKING, DOPPLER COMPENSATION,
		OR SMALL SATELLITE IDENTIFICATION
		WHOSE TRANSMISSIONS ARE NOT
		LIMITED TO DURATIONS WHEN
		SUPPORTING GROUND STATIONS ARE
		VISIBLE.
If transmitter has a	Yes V	
beacon mode, can	No □	
the beacon be		
commanded off?		
Transmit Antenna	XAP = T	POLARIZATIONS INCLUDE:
Polarization (XAP)		H = HORIZONTAL,
		V = VERTICAL,
		S = HORIZONTAL AND VERTICAL,
		L = LEFT HAND CIRCULAR,
		R = RIGHT HAND CIRCULAR,
		T = RIGHT AND LEFT HAND CIRCULAR,
		J = LINEAR POLARIZATION
Transmit Antenna	XAZ = EC	NB= NARROWBEAM
Orientation (XAZ)	78.2 20	EC = EARTH COVERAGE
Transmit Antenna	ANTENNA GAIN 0 dBi,	NTIA FORMAT (XAD), EXAMPLE, FOR 16
Dimension (XAD)	BEAMWIDTH 360°,	DBI ANTENNA GAIN AND 30 DEGREE
Difficusion (AAD)	XAD = 00G360B	BEAMWIDTH
	AAD = 000300B	XAD01 16G030B
		XAD01 100030B
Type of satellite	Type = NONGEOSTATIONARY	CHOOSE EITHER:
(State = SPCE)	Type - NONGLOSTATIONART	GEOSTATIONARY OR
(City = Geo or		NONGEOSTATIONARY
' ·		NONGEOSTATIONARY
Nongeo)		
For Geostationary	N/A	IF ANY SATELLITES ARE
Satellites	.4	GEOSTATIONARY, REPORT ITS LATITUDE
- Catamica		AS 000000N (XLA AND/OR RLA) AND
		REPORT ITS LONGITUDE IN DDDMMSS
		FORMAT (XLG AND/OR RLG).
		FUNIVIAT (ALG AND/UK KLG).

For Nongeostationary (Orbital Data)	INCLINATION ANGLE 45 deg, APOGEE IN KILOMETERS 510 km, PERIGEE IN KILOMETERS 510 km, ORBITAL PERIOD IN HOURS 1 AND FRACTIONS OF HOURS IN DECIMAL .594, THE NUMBER OF SATELLITES IN THE SYSTEM, 1  ORB = ORB,45.0IN00510AP00510PE001H.594NRT01	IF ANY SATELLITES ARE NONGEOSTATIONARY, REPORT ITS INCLINATION ANGLE, APOGEE IN KILOMETERS, PERIGEE IN KILOMETERS, ORBITAL PERIOD IN HOURS AND FRACTIONS OF HOURS IN DECIMAL, THE NUMBER OF SATELLITES IN THE SYSTEM, THEN T01, EXAMPLE, REM04 *ORB,98.0IN00510AP00510PE001.58H0 1NRT01, AND FOR SPACE-TO-SPACE COMMUNICATIONS WITH ANOTHER NONGEOSTATIONARY SATELLITE ADD AN ADDITIONAL *ORB FOR IT ENDING IN R01, EXAMPLE, REM05 *ORB,72.9IN03209AP00655PE013.46H0 1NRR01
For SunSynchronous Nongeostationary Orbits	Mean Local Time of Ascending Node (MLTAN) = N/A	MLTAN IS THE ANGLE BETWEEN AN ORBIT'S ASCENDING NODE AND THE MEAN SUN, OFTEN EXPRESSED AS UNIT OF TIME (HH:MM)
Earth Station Data (R	eceiver) at Each Earth Station Location	
State (RSC)	<ol> <li>RSC = Scotland</li> <li>RSC = Bulgaria</li> </ol>	
City Name (RAL)	<ol> <li>RAL = Dundee (RBC Signals)</li> <li>RAL = Plana (EnduroSat)</li> </ol>	
Latitude (DDMMSS)	1) Lat = 562416.25 (56° 24' 16.25" N) 2) Lat = 422858.6 (42° 28' 58.6" N)	
Longitude (DDDMMSS)	1) Lon = 0031032.94 (3° 10' 32.94" W) 2) Lon = 0232643.0 (23° 26' 43.0" E)	

RAP = T	POLARIZATIONS INCLUDE:
	TO DITUIL TO THE TOTAL THE TOTAL TO THE TOTAL THE TOTAL TO THE TOTAL THE TOTAL TO T
	H = HORIZONTAL,
	V = VERTICAL,
	S = HORIZONTAL AND VERTICAL,
	L = LEFT HAND CIRCULAR,
	R = RIGHT HAND CIRCULAR,
	T = RIGHT AND LEFT HAND CIRCULAR,
	J = LINEAR POLARIZATION
RAZ1 = V05	THE EARTH STATION RECEIVER
RAZ2 = V05	ANTENNA MINIMUM OPERATING ANGLE OF
	ELEVATION (RAZ), V00 TO V90, EXAMPLE, RAZ01 V00
	EXAMPLE, RAZUI VUU
1) RAD1 = 14G035B001-360A00005H008	
2) RAD2 = 14G035B001-360A00194H007	EXAMPLE ASSUMING NONGEOSTATIONARY, 16 DBI GAIN, 30 DEGREE BEAMWIDTH, AZIMUTHAL RANGE FROM 001-360, SITE ELEVATION OF 357 METERS, AND ANTENNA HEIGHT ABOVE TERRAIN OF 6 METERS:
	RAD01 16G030B001-360A00357H006
	10.1501 1000302001 300.10033711000
ANTENNA DIAMETER 1.8 meters  ANTENNA EFFICIENCY 65%  (for all stations)	NOTE: ~1.8m long Yagi antenna, not a dish
Up to 2 contacts per Earth station location per day	NUMBER OF TIMES THE SATELLITE WILL COMMUNICATE WITH THE EARTH STATION IN THE SPACE TO EARTH DIRECTION (DOWNLINKS) EACH DAY
	RAZ2 = V05  1) RAD1 = 14G035B001-360A00005H008  2) RAD2 = 14G035B001-360A00194H007  ANTENNA DIAMETER 1.8 meters  ANTENNA EFFICIENCY 65% (for all stations)  Up to 2 contacts per Earth station location per

Expected Duration of Each Contact	10 minutes	AVERAGE DURATION OF EACH CONTACT
Supported Operations	SATELLITE HEALTH AND STATUS TELEMETRY AND MISSION PAYLOAD DATA	SATELLITE HEALTH AND STATUS TELEMETRY AND/OR MISSION PAYLOAD DATA
FCC notes:		

Transmit Frequency: 2240.5 MHz		
Satellite Name: CTC-0		
Data Field	Data Answer	Description/Comments
Transmit Power (PWR)	PWR = 0.2W	TRANSMIT POWER SUPPLIED TO THE ANTENNA INPUT TERMINAL, EXAMPLE, PWR01 W2 TRANSMIT POWER UNITS INCLUDE: W = WATT, K = KILOWATT, M = MEGAWATT
Necessary Bandwidth	62.5 kHz	THE WIDTH OF FREQUENCY BAND WHICH IS JUST SUFFICIENT TO SUCCESSFULLY TRANSFER DATA. FORMULAS CAN BE FOUND IN ANNEX J OF THE NTIA MANUAL.
RF Emissions Data	Telemetry and telecommand	2-SIDED EMISSION BANDWIDTH VALUES
-3 dB bandwidth	<62.5 kHz	
-20 dB bandwidth	<125 kHz	
-40 dB bandwidth	<250 kHz	
-60 dB bandwidth	<250 kHz	
Modulation Type	4FSK	THE METHOD USED TO SUPERIMPOSE DATA ON THE CARRIER, EXAMPLE, BPSK, QPSK, GMSK.
Data Rate	<62.5 kbps	INFORMATION DATA RATE
Forward Error Correction Coding	Is FEC used? Yes V No □ FEC Type: Convolutional encoding with Viterbi decoding FEC Rate: ½ rate	
Total Symbol Rate	<62.5 ksps	DATA RATE COMBINED WITH FEC AND FRAME OVERHEAD RESULTING IN THE TOTAL SYMBOL RATE AT THE INPUT TO THE SYMBOL MAPPER/MODULATOR.
Does transmitter have a beacon mode?	Yes □ No V	BEACON MODE IS NORMALLY CONSIDERED A REGULAR AND PERIODIC SHORT DURATION TRANSMISSION THAT IS OFTEN USED TO ASSIST WITH TRACKING, DOPPLER COMPENSATION, OR SMALL SATELLITE IDENTIFICATION WHOSE TRANSMISSIONS ARE NOT LIMITED TO DURATIONS WHEN SUPPORTING GROUND STATIONS ARE VISIBLE.
If transmitter has a beacon mode, can the beacon be commanded off?	Yes  No	

Transmit Antenna	XAP = R	POLARIZATIONS INCLUDE:
	AAP - K	
Polarization (XAP)		H = HORIZONTAL,
		V = VERTICAL,
		S = HORIZONTAL AND VERTICAL,
		L = LEFT HAND CIRCULAR,
		R = RIGHT HAND CIRCULAR,
		T = RIGHT AND LEFT HAND CIRCULAR,
		J = LINEAR POLARIZATION
Transmit Antenna	XAZ = EC	NB= NARROWBEAM
Orientation (XAZ)		EC = EARTH COVERAGE
Transmit Antenna	ANTENNA GAIN = 3.5 dBi	NTIA FORMAT (XAD), EXAMPLE, FOR 16
Dimension (XAD)	BEAMWIDTH = 180°	DBI ANTENNA GAIN AND 30 DEGREE
,	XAD = 03.5G180B	BEAMWIDTH
	74.5	XAD01 16G030B
		A ROOT TOGOSOD
Type of satellite	Type = NONGEOSTATIONARY	CHOOSE EITHER:
' '	Type - NONGLOSTATIONANT	GEOSTATIONARY OR
(State = SPCE)		NONGEOSTATIONARY
(City = Geo or		NUNGEUSTATIONARY
Nongeo)		
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For Geostationary		IF ANY SATELLITES ARE
Satellites		GEOSTATIONARY, REPORT ITS LATITUDE
		AS 000000N (XLA AND/OR RLA) AND
		REPORT ITS LONGITUDE IN DDDMMSS
		FORMAT (XLG AND/OR RLG).
For	INCLINATION ANGLE 45 deg,	IF ANY SATELLITES ARE
Nongeostationary	APOGEE IN KILOMETERS 510 km,	NONGEOSTATIONARY, REPORT ITS
(Orbital Data)	PERIGEE IN KILOMETERS 510 km,	INCLINATION ANGLE, APOGEE
,	ORBITAL PERIOD IN HOURS 1 AND	IN KILOMETERS, PERIGEE IN
	FRACTIONS OF HOURS IN DECIMAL583,	KILOMETERS, ORBITAL PERIOD IN
	THE NUMBER OF SATELLITES IN THE	HOURS AND FRACTIONS OF
	SYSTEM1,	HOURS IN DECIMAL, THE NUMBER OF
	STOTEWI,	SATELLITES IN THE SYSTEM, THEN TO1,
	ORB =	EXAMPLE,
	ORB,45.0IN00510AP00510PE001H.583NRT01	REM04
		*ORB,98.0IN00510AP00510PE001.58H0
		1NRT01, AND FOR SPACE-TO-SPACE
		COMMUNICATIONS WITH ANOTHER
		NONGEOSTATIONARY SATELLITE ADD
		AN ADDITIONAL
		*ORB FOR IT ENDING IN R01, EXAMPLE,
		REM05
		*ORB,72.9IN03209AP00655PE013.46H0
		1NRR01
For	Mean Local Time of Ascending Node	MLTAN IS THE ANGLE BETWEEN AN
SunSynchronous	(MLTAN) = N/A	ORBIT'S ASCENDING NODE AND THE
Nongeostationary		MEAN SUN, OFTEN EXPRESSED AS UNIT
Orbits		OF TIME (HH:MM)
Farth Station Data /	Receiver) at Each Earth Station Location	
Earth Station Data (I	neceiver) at Each Earth Station Location	

State (RSC)	3) RSC = Scotland	
State (RSC)	4) RSC = Bulgaria	
	5) RSC = Portugal	
City Name (RAL)	3) RAL = Dundee (RBC Signals)	
City Name (NAL)	4) RAL = Plana (EnduroSat)	
	5) RAL = Santa Maria, Azores (Leaf	
	Space)	
Latitude (DDMMSS)	3) Lat = 562416.25 (56° 24' 16.25" N)	
Editade (BBIVIIVISS)	4) Lat = 422858.6 (42° 28' 58.6" N)	
	5) Lat = 365951.2 (36° 59' 51.2" N)	
Longitude	3) Lon = 0031032.94 (3° 10' 32.94" W)	
(DDDMMSS)	4) Lon = 0232643.0 (23° 26' 43.0" E)	
(	5) Lon = 0250814.3 (25° 8' 14.3" W)	
Receive Antenna	RAP = R	POLARIZATIONS INCLUDE:
Polarization (RAP)		H = HORIZONTAL,
, ,		V = VERTICAL,
		S = HORIZONTAL AND VERTICAL,
		L = LEFT HAND CIRCULAR,
		R = RIGHT HAND CIRCULAR,
		T = RIGHT AND LEFT HAND CIRCULAR,
		J = LINEAR POLARIZATION
Receive Antenna	RAZ1 = V05	THE EARTH STATION RECEIVER
Orientation (RAZ)	RAZ2 = V05	ANTENNA MINIMUM OPERATING
	RAZ3 = V05	ANGLE OF
		ELEVATION (RAZ), V00 TO V90,
		EXAMPLE, RAZ01 V00
Receive Antenna	3) RAD1 = 35G002B001-360A00005H008	
Dimensions (RAD)	4) RAD2 = 34.6G002.4B001-360A00194H007	EXAMPLE ASSUMING
	5) RAD3 = 35.8G002.2B001-360A01250H005	NONGEOSTATIONARY, 16 DBI GAIN, 30
		DEGREE BEAMWIDTH, AZIMUTHAL
		RANGE FROM 001-360, SITE ELEVATION
		OF 357 METERS, AND ANTENNA HEIGHT
		ABOVE TERRAIN OF 6 METERS:
		RAD01 16G030B001-360A00357H006
Receive Antenna	ANTENNA DIAMETER 3.7 meters	
Additional	ANTENNA EFFICIENCY 65%	
Information (For	(for all stations)	
Parabolic Antennas)	(101 dil stations)	
Number of Satellite	Up to 2 contacts per Earth station location per	NUMBER OF TIMES THE SATELLITE WILL
Contacts Supported	day	COMMUNICATE WITH THE EARTH
Per Day		STATION IN THE SPACE TO EARTH
		DIRECTION (DOWNLINKS) EACH DAY
Expected Duration	10 minutes	AVERAGE DURATION OF EACH
of Each Contact		CONTACT
Supported	SATELLITE HEALTH AND STATUS TELEMETRY	SATELLITE HEALTH AND STATUS
Operations	AND MISSION PAYLOAD DATA	TELEMETRY AND/OR MISSION PAYLOAD
F - 1 - 1 - 1 - 1		DATA
FCC notes:	1	1
2.		

Transmit Frequency: 2185.0 MHz (center freq)  Satellite Name: CTC-0		
Transmit Power (PWR)	PWR = 6W	TRANSMIT POWER SUPPLIED TO THE ANTENNA INPUT TERMINAL, EXAMPLE, PWR01 W2 TRANSMIT POWER UNITS INCLUDE: W = WATT, K = KILOWATT, M = MEGAWATT
Necessary Bandwidth	200KHz, 100KHz	THE WIDTH OF FREQUENCY BAND WHICH IS JUST SUFFICIENT TO SUCCESSFULLY TRANSFER DATA. FORMULAS CAN BE FOUND IN ANNEX J OF THE NTIA MANUAL.
RF Emissions Data	5G-NTN NR, 3GPP standard	2-SIDED EMISSION BANDWIDTH VALUES
-3 dB bandwidth	<200 kHz	
-20 dB bandwidth	<400 kHz	
-40 dB bandwidth	<800 kHz	
-60 dB bandwidth	<800 kHz	
Modulation Type	QPSK, 16QAM, 64QAM, 256QAM (OFDM for multiplexing)	THE METHOD USED TO SUPERIMPOSE DATA ON THE CARRIER, EXAMPLE, BPSK, QPSK, GMSK.
Data Rate	Estimated 200kbps at 200KHz bandwidth	INFORMATION DATA RATE
Forward Error Correction Coding	Is FEC used? Yes V No □ FEC Type: LDPC and Polar Codes FEC Rate: Variable (ACM)	
Total Symbol Rate	Estimated 200ksps, 100ksps	DATA RATE COMBINED WITH FEC AND FRAME OVERHEAD RESULTING IN THE TOTAL SYMBOL RATE AT THE INPUT TO THE SYMBOL MAPPER/MODULATOR.
Does transmitter have a beacon mode?	Yes  No V	BEACON MODE IS NORMALLY CONSIDERED A REGULAR AND PERIODIC SHORT DURATION TRANSMISSION THAT IS OFTEN USED TO ASSIST WITH TRACKING, DOPPLER COMPENSATION, OR SMALL SATELLITE IDENTIFICATION WHOSE TRANSMISSIONS ARE NOT LIMITED TO DURATIONS WHEN SUPPORTING GROUND STATIONS ARE VISIBLE.

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If transmitter has a	Yes 🗆	
beacon mode, can	No 🗆	
the beacon be		
commanded off?		
Transmit Antenna	XAP = R	POLARIZATIONS INCLUDE:
Polarization (XAP)		H = HORIZONTAL,
		V = VERTICAL,
		S = HORIZONTAL AND VERTICAL,
		L = LEFT HAND CIRCULAR,
		R = RIGHT HAND CIRCULAR,
		T = RIGHT AND LEFT HAND CIRCULAR,
		J = LINEAR POLARIZATION
Transmit Antenna	XAZ = EC	NB= NARROWBEAM
Orientation (XAZ)		EC = EARTH COVERAGE
Transmit Antenna	ANTENNA GAIN = 8 dBi	NTIA FORMAT (XAD), EXAMPLE, FOR 16
Dimension (XAD)	BEAMWIDTH = 70°	DBI ANTENNA GAIN AND 30 DEGREE
	XAD = 08G070B	BEAMWIDTH
	N. 15 = 0000705	XAD01 16G030B
		AAD01 100030B
Type of satellite	Type = NONGEOSTATIONARY	CHOOSE EITHER:
(State = SPCE)	Type - NONGLOSTATIONANT	GEOSTATIONARY OR
•		
(City = Geo or		NONGEOSTATIONARY
Nongeo)		
For Geostationary	N/A	IF ANY SATELLITES ARE
Satellites	N/A	GEOSTATIONARY, REPORT ITS LATITUDE
Satellites		AS 000000N (XLA AND/OR RLA) AND
		REPORT ITS LONGITUDE IN DDDMMSS
-	INCURATION ANGLE 45 I	FORMAT (XLG AND/OR RLG).
For	INCLINATION ANGLE 45 deg,	IF ANY SATELLITES ARE
Nongeostationary	APOGEE IN KILOMETERS 510 km,	NONGEOSTATIONARY, REPORT ITS
(Orbital Data)	PERIGEE IN KILOMETERS 510 km,	INCLINATION ANGLE, APOGEE
	ORBITAL PERIOD IN HOURS1AND	IN KILOMETERS, PERIGEE IN
	FRACTIONS OF HOURS IN DECIMAL583,	KILOMETERS, ORBITAL PERIOD IN
	THE NUMBER OF SATELLITES IN THE	HOURS AND FRACTIONS OF
	SYSTEM1,	HOURS IN DECIMAL, THE NUMBER OF
		SATELLITES IN THE SYSTEM, THEN T01,
	ORB =	EXAMPLE,
	ORB,45.0IN00510AP00510PE001H.583NRT01	REM04
		*ORB,98.0IN00510AP00510PE001.58H0
		1NRT01, AND FOR SPACE-TO-SPACE
		COMMUNICATIONS WITH ANOTHER
		NONGEOSTATIONARY SATELLITE ADD
		AN ADDITIONAL
		*ORB FOR IT ENDING IN R01, EXAMPLE,
		REM05
		*ORB,72.9IN03209AP00655PE013.46H0
		1NRR01
	I .	

For SunSynchronous Nongeostationary Orbits	Mean Local Time of Ascending Node (MLTAN) = N/A	MLTAN IS THE ANGLE BETWEEN AN ORBIT'S ASCENDING NODE AND THE MEAN SUN, OFTEN EXPRESSED AS UNIT OF TIME (HH:MM)
Farth Station Data (R	eceiver) at Each Earth Station Location	
State (RSC)	6) RSC = Nigeria 7) RSC = Nigeria	
City Name (RAL)	6) RAL = Abuja 7) RAL = Mobile	
Latitude (DDMMSS)	6) Lat = 065823 (6° 58' 23" N) 7) Lat = N/A	
Longitude (DDDMMSS)	6) Lon = 0034105 (3° 41' 5" E) 7) Lon = N/A	
Receive Antenna Polarization (RAP)	RAP06 = T RAP07 = J	POLARIZATIONS INCLUDE: H = HORIZONTAL, V = VERTICAL, S = HORIZONTAL AND VERTICAL, L = LEFT HAND CIRCULAR, R = RIGHT HAND CIRCULAR, T = RIGHT AND LEFT HAND CIRCULAR, J = LINEAR POLARIZATION
Receive Antenna Orientation (RAZ)	RAZ06 = V05 RAZ07 = V45	THE EARTH STATION RECEIVER ANTENNA MINIMUM OPERATING ANGLE OF ELEVATION (RAZ), V00 TO V90, EXAMPLE, RAZ01 V00
Receive Antenna Dimensions (RAD)	6) RAD6 = 31G004B001-360A00116H008 7) RAD7 = N/A MSS	EXAMPLE ASSUMING NONGEOSTATIONARY, 16 DBI GAIN, 30 DEGREE BEAMWIDTH, AZIMUTHAL RANGE FROM 001-360, SITE ELEVATION OF 357 METERS, AND ANTENNA HEIGHT ABOVE TERRAIN OF 6 METERS: RAD01 16G030B001-360A00357H006
Receive Antenna Additional Information (For	ANTENNA DIAMETER 3.7 meters (Abuja) ANTENNA EFFICIENCY 65%	
Parabolic Antennas)	N/A MSS	
Number of Satellite Contacts Supported Per Day	Up to 2 contacts per Earth station location per day	NUMBER OF TIMES THE SATELLITE WILL COMMUNICATE WITH THE EARTH STATION IN THE SPACE TO EARTH DIRECTION (DOWNLINKS) EACH DAY
Expected Duration of Each Contact	2 Minutes	AVERAGE DURATION OF EACH CONTACT
Supported Operations	Mission Payload Data, 5G-NTN NR	SATELLITE HEALTH AND STATUS TELEMETRY AND/OR MISSION PAYLOAD DATA

3.

## Part B: Ground Stations, Earth to Space link data:

Earth Station Transmitter Data (Required for Each Frequency at Each Earth Station Location)

Transmit Frequency:		
402.50 MHz	T	
State (XSC)	1) XSC1 = Scotland	
	2) XSC2 = Bulgaria	
City Name (XAL)	1) XAL1 = Dundee	
	2) XAL2 = Plana	
Latitude (DDMMSS)	1) Lat1 = 562416.25 (56° 24' 16.25" N)	
	2) Lat2 = 422858.6 (42° 28' 58.6" N)	
Longitude	1) Lon1 = 031032.94 (3° 10' 32.94" W)	
(DDDMMSS)	2) Lon2 = 0232643.0 (23° 26' 43.0" E)	
Transmit Power	1) PWR1 = 0.2W	TRANSMIT POWER SUPPLIED
(PWR)	2) PWR2 = 0.2W	TO THE ANTENNA INPUT
		TERMINAL, EXAMPLE, PWR01
		W2
		TRANSMIT POWER UNITS
		INCLUDE:
		W = WATT,
		K = KILOWATT,
		M = MEGAWATT
Necessary	1) 25 KHz	THE WIDTH OF FREQUENCY
Bandwidth	2) 25 KHz	BAND WHICH IS JUST
		SUFFICIENT TO SUCCESSFULLY
		TRANSFER DATA. FORMULAS
		CAN BE FOUND IN ANNEX J OF
		THE NTIA MANUAL.
RF Emissions Data		2-SIDED EMISSION
-3 dB bandwidth	1) <25 KHz	BANDWIDTH VALUES
	2) <25 KHz	
-20 dB bandwidth	1) <25 KHz	
	2) <25 KHz	
-40 dB bandwidth	1) <50 KHz	
	2) <50 KHz	
-60 dB bandwidth	1) <50 KHz	
	2) <50 KHz	
Modulation Type	1) 2GFSK	THE METHOD USED TO
	2) 2GFSK	SUPERIMPOSE DATA ON THE
		CARRIER, EXAMPLE, BPSK,
		QPSK, GMSK.
Data Rate	1) 9600bps	INFORMATION DATA RATE
	2) 9600bps	

Forward Error	Is FEC used? V No □ Yes	
Correction Coding	FEC Type: n/a	
	1 - 2 - 1/10 - 1/10	
Total Symbol Rate	1) 9600sps 2) 9600sps	DATA RATE COMBINED WITH FEC AND FRAME OVERHEAD RESULTING IN THE TOTAL SYMBOL RATE AT THE INPUTE TO THE SYMBOL MAPPER/MODULATOR.
Transmit Antenna	1) XAP = T	POLARIZATIONS INCLUDE:
Polarization (XAP)	1) XAP = T 2) XAP = T	H = HORIZONTAL,  V = VERTICAL,  S = HORIZONTAL AND  VERTICAL,  L = LEFT HAND CIRCULAR,  R = RIGHT HAND CIRCULAR,  T = RIGHT AND LEFT HAND  CIRCULAR,  J = LINEAR POLARIZATION
Transmit Antenna Orientation (XAZ)	1) XAZ1 = V05 2) XAZ2 = V05	THE EARTH STATION TRANSMITTER ANTENNA MINIMUM OPERATING ANGLE OF ELEVATION (XAZ), V00 TO V90, EXAMPLE, XAZ01 V00
Transmit Antenna Dimensions (XAD)	ANTENNA GAIN, BEAMWIDTHdeg, AZIMUTHAL RANGEdeg, THE SITE ELEVATION ABOVE MEAN SEA LEVEL IN METERS m, THE ANTENNA HEIGHT ABOVE TERRAIN IN METERS m,  1) XAD1 = 14G035B001-360A00005H008 2) XAD2 = 14G035B001-360A00194H007	EXAMPLE ASSUMING NONGEOSTATIONARY, 16 DBI GAIN, 30 DEGREE BEAMWIDTH, AZIMUTHAL RANGE FROM 001-360, SITE ELEVATION OF 357 METERS, AND ANTENNA HEIGHT ABOVE TERRAIN OF 6 METERS: XAD01 16G030B001- 360A00357H006
Transmit Antenna Additional Information (For Parabolic Antennas)	ANTENNA DIAMETER 1.8M ANTENNA EFFICIENCY 65% (all)	NOTE: ~1.8m long Yagi antenna, not a dish
Number of Satellite Contacts Supported Per Day	Up to 2 contacts per Earth station location per day	NUMBER OF TIMES THE EARTH STATION WILL COMMUNICATE WITH THE SATELLITE IN THE EARTH TO SPACE DIRECTION (UPINKS) EACH DAY
Expected Duration of Each Contact	10 minutes	AVERAGE DURATION OF EACH CONTACT
Satellite Receive Spe	cifications	

	4) DAD T	DOLARIZATIONS INCLUDE
Receive Antenna	1) RAP = T	POLARIZATIONS INCLUDE:
Polarization (RAP)	2) RAP = T	H = HORIZONTAL,
		V = VERTICAL,
		S = HORIZONTAL AND
		VERTICAL,
		L = LEFT HAND CIRCULAR,
		R = RIGHT HAND CIRCULAR,
		T = RIGHT AND LEFT HAND
		-
		CIRCULAR,
		J = LINEAR POLARIZATION
Receive Antenna	RAZ = EC	NB= NARROWBEAM
Orientation (RAZ)		EC = EARTH COVERAGE
Receive Antenna	ANTENNA GAIN 0 dBi	NTIA FORMAT(RAD), EXAMPLE,
Dimension (RAD)	BEAMWIDTH 360 deg	FOR 16 DBI ANTENNA GAIN
Diffictision (NAD)		AND 30 DEGREE BEAMWIDTH
	1) RAD1 = 0G360B	
	2) RAD2 = 0G360B	RAD01 16G030B
Type of satellite	Type = Nongeostationary	CHOOSE EITHER:
(State = SPCE)		GEOSTATIONARY OR
City = Geo or		NONGEOSTATIONARY
Nongeo		
For Geostationary	Longitude = N/A	IF ANY SATELLITES ARE
	Longitude - N/A	
Satellites		GEOSTATIONARY, REPORT ITS
		LATITUDE AS 000000N (XLA
		AND/OR RLA) AND REPORT ITS
		LONGITUDE IN DDDMMSS
		FORMAT (XLG AND/OR RLG).
For	INCLINATION ANGLE 45 deg,	IF ANY SATELLITES ARE
Nongeostationary	APOGEE IN KILOMETERS 510 km,	NONGEOSTATIONARY, REPORT
(Orbital Data)	PERIGEE IN KILOMETERS 510 km,	ITS INCLINATION ANGLE,
(Orbital Bata)	ORBITAL PERIOD IN HOURS 1	APOGEE
	AND FRACTIONS OF HOURS IN DECIMAL .594,	IN KILOMETERS, PERIGEE IN
	THE NUMBER OF	KILOMETERS, ORBITAL PERIOD
	SATELLITES IN THE SYSTEM, 1	IN HOURS AND FRACTIONS OF
		HOURS IN DECIMAL, THE
	ORB = ORB,45.0IN00510AP00510PE001H.594NRT01	NUMBER OF SATELLITES IN THE
		SYSTEM, THEN T01, EXAMPLE,
		REM04
		*ORB,98.0IN00510AP00510PE0
		, and the second
		01.58H01NRT01, AND FOR
		SPACE-TO-SPACE
		COMMUNICATIONS WITH
		ANOTHER
		NONGEOSTATIONARY
		SATELLITE ADD AN
		ADDITIONAL
		*ORB FOR IT ENDING IN R01,
		EXAMPLE, REMO5
		I
		*ORB,72.9IN03209AP00655PE0
		13.46H01NRR01

For	Mean Local Time of Ascending Node	MLTAN IS THE ANGLE
SunSynchronous	(MLTAN) = N/A	BETWEEN AN ORBIT'S
Nongeostationary		ASCENDING NODE AND THE
Orbits		MEAN SUN, OFTEN EXPRESSED
		AS UNIT OF TIME (HH:MM)

Transmit Frequency:		
2067.5 MHz		
State (XSC)	3) XSC3 = Scotland	
State (ASC)	4) XSC4 = Bulgaria	
	5) XSC5 = Portugal	
City Name (XAL)	3) XAL3 = Dundee	
City Name (AAL)	4) XAL4 = Plana	
	5) XAL5 = Santa Maria, Azores	
Latitude (DDMMSS)	3) Lat3 = 562416.25 (56° 24' 16.25" N)	
Latitude (DDIVIIVISS)	4) Lat4 = 422858.6 (42° 28' 58.6" N)	
	5) Lat5 = 365951.2 (36° 59' 51.2" N)	
Longitude	3) Lon3 = 031032.94 (3° 10' 32.94" W)	
_	4) Lon4 = 0232643.0 (23° 26' 43.0" E)	
(DDDMMSS)	5) Lon5 = 250814.3 (25° 8' 14.3" W)	
Transmit Dawer		TRANSMIT DOWER SUIDBUIED
Transmit Power	3) PWR3 = 20W	TRANSMIT POWER SUPPLIED TO THE ANTENNA INPUT
(PWR)	4) PWR4 = 20W	
	5) PWR5 = 20W	TERMINAL, EXAMPLE, PWR01 W2
		TRANSMIT POWER UNITS
		INCLUDE:
		W = WATT, K = KILOWATT,
		M = MEGAWATT
Nococcom	3) 62.5 KHz	
Necessary Bandwidth	3) 62.5 KHz 4) 62.5 KHz	THE WIDTH OF FREQUENCY BAND WHICH IS JUST
Danuwiutii	5) 62.5 KHz	SUFFICIENT TO SUCCESSFULLY
	3) 02.3 KHZ	TRANSFER DATA. FORMULAS
		CAN BE FOUND IN ANNEX J OF
		THE NTIA MANUAL.
RF Emissions Data		2-SIDED EMISSION
-3 dB bandwidth	3) C3 F KII-	BANDWIDTH VALUES
-3 db bandwidth	3) 62.5 KHz	BANDWIDTH VALUES
	4) 62.5 KHz	
	5) 62.5 KHz	
-20 dB bandwidth	3) 125 KHz	
-20 ub balluwlutii		
	4) 125 KHz	
	5) 125 KHz	
-40 dB bandwidth	3) 250 KHz	$\dashv$
TO GE DANGWIGHT	4) 250 KHz	
	5) 250 KHz	
-60 dB bandwidth	3) 250 KHz	$\dashv$
-oo ab banawiatii	4) 250 KHz	
	5) 250 KHz	
	3/ 230 KHZ	

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Modulation Type	3) 4FSK 4) 4FSK 5) 4FSK	THE METHOD USED TO SUPERIMPOSE DATA ON THE CARRIER, EXAMPLE, BPSK, QPSK, GMSK.
Data Rate	3) <125kbps 4) <125kbps 5) <125kbps	INFORMATION DATA RATE
Forward Error Correction Coding	Is FEC used? Yes V No □ FEC Type: Convolutional encoding with Viterbi decoding FEC Rate: ½ rate	
Total Symbol Rate	3) 62.5ksps 4) 62.5ksps 5) 62.5ksps	DATA RATE COMBINED WITH FEC AND FRAME OVERHEAD RESULTING IN THE TOTAL SYMBOL RATE AT THE INPUTE TO THE SYMBOL MAPPER/MODULATOR.
Transmit Antenna Polarization (XAP)	3) XAP = R 4) XAP = R 5) XAP = R	POLARIZATIONS INCLUDE: H = HORIZONTAL, V = VERTICAL, S = HORIZONTAL AND VERTICAL, L = LEFT HAND CIRCULAR, R = RIGHT HAND CIRCULAR, T = RIGHT AND LEFT HAND CIRCULAR, J = LINEAR POLARIZATION
Transmit Antenna Orientation (XAZ)	3) XAZ3 = V05 4) XAZ4 = V05 5) XAZ5 = V05	THE EARTH STATION TRANSMITTER ANTENNA MINIMUM OPERATING ANGLE OF ELEVATION (XAZ), V00 TO V90, EXAMPLE, XAZ01 V00
Transmit Antenna Dimensions (XAD)	ANTENNA GAIN, BEAMWIDTHdeg, AZIMUTHAL RANGEdeg, THE SITE ELEVATION ABOVE MEAN SEA LEVEL IN METERS m, THE ANTENNA HEIGHT ABOVE TERRAIN IN METERS m,  3) XAD3 = 35G002.2B001-360A00005H008 4) XAD4 = 34.6G002.76B001-360A00194H007 5) XAD5 = 35.8G002.2B001-360A01250H005	EXAMPLE ASSUMING NONGEOSTATIONARY, 16 DBI GAIN, 30 DEGREE BEAMWIDTH, AZIMUTHAL RANGE FROM 001-360, SITE ELEVATION OF 357 METERS, AND ANTENNA HEIGHT ABOVE TERRAIN OF 6 METERS: XAD01 16G030B001- 360A00357H006
Transmit Antenna Additional Information (For Parabolic Antennas)	ANTENNA DIAMETER 3.7M ANTENNA EFFICIENCY 65% (all)	

Number of Satellite Contacts Supported	Up to 2 contacts per Earth station location per day	NUMBER OF TIMES THE EARTH STATION WILL COMMUNICATE
Per Day		WITH THE SATELLITE IN THE
,		EARTH TO SPACE DIRECTION
		(UPINKS) EACH DAY
Expected Duration	10 minutes	AVERAGE DURATION OF EACH
of Each Contact		CONTACT
Satellite Receive Spe	cifications	
Receive Antenna	3) RAP = R	POLARIZATIONS INCLUDE:
Polarization (RAP)	4) RAP = R	H = HORIZONTAL,
	5) RAP = R	V = VERTICAL,
		S = HORIZONTAL AND
		VERTICAL,
		L = LEFT HAND CIRCULAR,
		R = RIGHT HAND CIRCULAR,
		T = RIGHT AND LEFT HAND
		CIRCULAR,
		J = LINEAR POLARIZATION
Receive Antenna	RAZ = EC	NB= NARROWBEAM
Orientation (RAZ)		EC = EARTH COVERAGE
Receive Antenna	ANTENNA GAIN 4 dBi	NTIA FORMAT(RAD), EXAMPLE,
Dimension (RAD)	BEAMWIDTH 180 deg,	FOR 16 DBI ANTENNA GAIN
	3) RAD3 = 4G180B	AND 30 DEGREE BEAMWIDTH
	4) RAD4 = 4G180B	RAD01 16G030B
	5) RAD5 = 4G180B	
Type of satellite	Type = Nongeostationary	CHOOSE EITHER:
(State = SPCE)		GEOSTATIONARY OR
City = Geo or		NONGEOSTATIONARY
Nongeo		
For Geostationary	Longitude = N/A	IF ANY SATELLITES ARE
Satellites		GEOSTATIONARY, REPORT ITS
		LATITUDE AS 000000N (XLA
		AND/OR RLA) AND REPORT ITS
		LONGITUDE IN DDDMMSS
		FORMAT (XLG AND/OR RLG).

For	INCLINATION ANGLE 45 deg,	IF ANY SATELLITES ARE
Nongeostationary	APOGEE IN KILOMETERS 510 km,	NONGEOSTATIONARY, REPORT
(Orbital Data)	PERIGEE IN KILOMETERS 510 km,	ITS INCLINATION ANGLE,
	ORBITAL PERIOD IN HOURS 1	APOGEE
	AND FRACTIONS OF HOURS IN DECIMAL .594,	IN KILOMETERS, PERIGEE IN
	THE NUMBER OF	KILOMETERS, ORBITAL PERIOD
	SATELLITES IN THE SYSTEM, 1	IN HOURS AND FRACTIONS OF
		HOURS IN DECIMAL, THE
	ORB = ORB,45.0IN00510AP00510PE001H.594NRT01	NUMBER OF SATELLITES IN THE
		SYSTEM, THEN T01, EXAMPLE,
		REM04
		*ORB,98.0IN00510AP00510PE0
		01.58H01NRT01, AND FOR
		SPACE-TO-SPACE
		COMMUNICATIONS WITH
		ANOTHER
		NONGEOSTATIONARY
		SATELLITE ADD AN
		ADDITIONAL
		*ORB FOR IT ENDING IN R01,
		EXAMPLE, REM05
		*ORB,72.9IN03209AP00655PE0
		13.46H01NRR01
		25.15.16211111162
For	Mean Local Time of Ascending Node	MLTAN IS THE ANGLE
SunSynchronous	(MLTAN) = N/A	BETWEEN AN ORBIT'S
Nongeostationary	\(\text{V''=\cdots'}\)	ASCENDING NODE AND THE
Orbits		MEAN SUN, OFTEN EXPRESSED
0.010		AS UNIT OF TIME (HH:MM)
		7.5 STATE OF THIS (THE ANNUAL)

Transmit Frequency: 1995.0 MHz		
State (XSC)	6) XSC6 = Nigeria 7) XSC7 = Nigeria	
City Name (XAL)	<ul><li>6) XAL6 = Abuja</li><li>7) XAL7 = Mobile</li></ul>	
Latitude (DDMMSS)	6) Lat6 = 065823 (6° 58' 23" N) 7) La7 – N/A	
Longitude (DDDMMSS)	6) Lon6 = 034105 (3° 41' 5" E) 7) Lon7 = N/A	
Transmit Power (PWR)	6) PWR6 = 20W 7) PWR7 = up to 2W (MSS)	TRANSMIT POWER SUPPLIED TO THE ANTENNA INPUT TERMINAL, EXAMPLE, PWR01 W2 TRANSMIT POWER UNITS INCLUDE: W = WATT, K = KILOWATT, M = MEGAWATT

HOF FREQUENCY CH IS JUST ITO SUCCESSFULLY DATA. FORMULAS UND IN ANNEX J OF MANUAL. MISSION TH VALUES
TH VALUES
OD USED TO OSE DATA ON THE XAMPLE, BPSK, SK.
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IONS INCLUDE:
ONTAL,
AL,
NTAL AND
AND CIRCULAR,
HAND CIRCULAR,
AND LEFT HAND
POLARIZATION
STATION
TER ANTENNA
OPERATING ANGLE
1 ()(A7) 1/00 TO 1/00
I (XAZ), V00 TO V90,
XAZ01 V00

Transmit Antenna Dimensions (XAD)	ANTENNA GAIN,  BEAMWIDTHdeg,  AZIMUTHAL RANGEdeg,  THE SITE ELEVATION ABOVE MEAN SEA LEVEL IN  METERS m,  THE ANTENNA HEIGHT ABOVE TERRAIN IN METERS m,  6) XAD6 = 31G004B001-360A00116H008  7) XAD7 = N/A MSS	EXAMPLE ASSUMING NONGEOSTATIONARY, 16 DBI GAIN, 30 DEGREE BEAMWIDTH, AZIMUTHAL RANGE FROM 001-360, SITE ELEVATION OF 357 METERS, AND ANTENNA HEIGHT ABOVE TERRAIN OF 6 METERS: XAD01 16G030B001- 360A00357H006
Transmit Antenna Additional Information (For Parabolic Antennas)	ANTENNA DIAMETER 3.7M ANTENNA EFFICIENCY 65%  N/A for MSS terminal	
Number of Satellite Contacts Supported Per Day	Up to 2 contacts per Earth station location per day	NUMBER OF TIMES THE EARTH STATION WILL COMMUNICATE WITH THE SATELLITE IN THE EARTH TO SPACE DIRECTION (UPINKS) EACH DAY
Expected Duration	2 minutes	AVERAGE DURATION OF EACH
of Each Contact Satellite Receive Spe	cifications	CONTACT
Satellite Receive Spe	tinications	
Receive Antenna Polarization (RAP)	6) RAP = R 7) RAP = R	POLARIZATIONS INCLUDE: H = HORIZONTAL, V = VERTICAL, S = HORIZONTAL AND VERTICAL, L = LEFT HAND CIRCULAR, R = RIGHT HAND CIRCULAR, T = RIGHT AND LEFT HAND CIRCULAR, J = LINEAR POLARIZATION
Receive Antenna	RAZ = EC	NB= NARROWBEAM
Receive Antenna Dimension (RAD)	ANTENNA GAIN 8 dBi BEAMWIDTH 100 deg 6) RAD6 = 8G100B 7) RAD7 = 8G100B	EC = EARTH COVERAGE  NTIA FORMAT(RAD), EXAMPLE, FOR 16 DBI ANTENNA GAIN AND 30 DEGREE BEAMWIDTH RAD01 16G030B
Type of satellite (State = SPCE) City = Geo or Nongeo	Type = Nongeostationary	CHOOSE EITHER: GEOSTATIONARY OR NONGEOSTATIONARY
For Geostationary Satellites	Longitude = N/A	IF ANY SATELLITES ARE GEOSTATIONARY, REPORT ITS LATITUDE AS 000000N (XLA AND/OR RLA) AND REPORT ITS LONGITUDE IN DDDMMSS FORMAT (XLG AND/OR RLG).

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For	INCLINATION ANGLE 45 deg,	IF ANY SATELLITES ARE
Nongeostationary	APOGEE IN KILOMETERS 510 km,	NONGEOSTATIONARY, REPORT
(Orbital Data)	PERIGEE IN KILOMETERS 510 km,	ITS INCLINATION ANGLE,
	ORBITAL PERIOD IN HOURS 1	APOGEE
	AND FRACTIONS OF HOURS IN DECIMAL .594,	IN KILOMETERS, PERIGEE IN
	THE NUMBER OF	KILOMETERS, ORBITAL PERIOD
	SATELLITES IN THE SYSTEM, 1	IN HOURS AND FRACTIONS OF
		HOURS IN DECIMAL, THE
	ORB = ORB,45.0IN00510AP00510PE001H.594NRT01	NUMBER OF SATELLITES IN THE
		SYSTEM, THEN TO1, EXAMPLE,
		REM04
		*ORB,98.0IN00510AP00510PE0
		01.58H01NRT01, AND FOR
		SPACE-TO-SPACE
		COMMUNICATIONS WITH
		ANOTHER
		NONGEOSTATIONARY
		SATELLITE ADD AN
		ADDITIONAL
		*ORB FOR IT ENDING IN R01,
		EXAMPLE, REM05
		*ORB,72.9IN03209AP00655PE0
		13.46H01NRR01
For	Mean Local Time of Ascending Node	MLTAN IS THE ANGLE
SunSynchronous	(MLTAN) = N/A	BETWEEN AN ORBIT'S
Nongeostationary		ASCENDING NODE AND THE
Orbits		MEAN SUN, OFTEN EXPRESSED
		AS UNIT OF TIME (HH:MM)