

INDIA BANGALORE LEOLUT COMMISSIONING REPORT

1. ACTION REQUIRED

The Joint Committee is invited to:

- a. review the Bangalore LEOLUT commissioning test results presented at Attachment 1, which is provided in the format specified in C/S T.005 (LEOLUT commissioning);
- b. note that the data required by C/S T.005 Annex E have been supplied in electronic file format to the Secretariat; and
- c. recommend that the new upgraded India LEOLUT located at Bangalore, India be commissioned into the Cospas-Sarsat System.

2. COMMENTS

The Bangalore LEOLUT was completely upgraded (hardware and software) in November 2002, therefore, complete re-commissioning was conducted as per Cospas-Sarsat procedure to ensure that the upgraded LUT comply with the Cospas-Sarsat specifications.

**INDIA BANGALORE LUT
COMMISSIONING REPORT**

November 2002

INMCC
COSPAS-SARSAT
ISTRAC
BANGALORE, INDIA

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India Bangalore LUT Commissioning Report

Technical File

A.1 GENERAL

This section of the commissioning report provides the general technical information for the Local User Terminal (LUT) installed at Bangalore, India.

A.2 LUT HARDWARE DESCRIPTION

A.2.1 Antenna Characteristics

- a. Type and number of antennas
One 1.22 meter parabolic dish operating in a radome.
- b. Gain/temperature ratio (G/T) at 5
2.11 dB/K at 5⁰ elevation angle.
- c. Operational limitations
None.
- d. Dedicated or shared
Dedicated.

A.2.2 General LUT Indoor Equipment Description

- a. Equipment complement
Antenna
Antenna Control Unit
Receiver
Input Processor
121.5 MHz Processor
243 MHz Processor
2.4kb and 406 MHz Processor
Master Control Processor
GPS Receiver
- b. Stand alone, shared, or collocated with MCC

The LUT is stand-alone operating fully automatic and unattended for indefinite periods of time without any intervention from the operator or the MCC.

LUT manufacturer and model number

TSI Third-Generation Ground Station, Model III.

a. Status and alarm functions

The LUT provides to MCC its complete status and all its alarms constantly.

A.2.3 General Capabilities

a. Processing capability (121.5 MHz, 243 MHz, 406 MHz SARP and SARR)

All available bands are processed including 121.5 MHz, 243 MHz, 406 MHz SARP, and 406 MHz SARR.

b. Interference-monitoring capability

Capable of interference monitoring in all bands including full 80 kHz of 406 MHz SARR band.

c. Redundancy/Availability

Parallel processing for redundancy and availability in excess of 99.5 %.

A.3 PROCESSING

a. Specific-performance capability

b. Parallel architecture that enables efficient utilization of algorithms and concurrent 121.5 MHz, 243 MHz, 406 MHz SARP, and 406 MHz SARR processing with average processing time of less than 60 seconds.

c. Manufacturer specifications

d. All requirements of the Cospas-Sarsat LUT performance specifications are exceeded.

e. Bit error rate on PDS channel at Eb/No of 13 dB

A bit error rate less than one bit error in 10^6 .

d. List of orbitography beacons used for orbit updating during the global-mode test

<u>Beacon ID</u>	<u>Latitude</u>	<u>Longitude</u>
9C60000000000001	43.561	1.481
9C63EC2AACD35D0	-49.351	70.256

- e. G-SARP parameters (processing bandwidth, signal sensitivity and beacon processing capacity)

The LUT processes full 80 kHz bandwidth of 406 MHz G-SARP. It is able to detect and located 406 MHz interferer signals that are received with a C/N_0 of 18 dB-Hz at the satellite. A maximum of 100 beacons per pass is the G-SARP beacon capacity.

A.4 COMMUNICATIONS CAPABILITY

- a. Primary-mode configuration: Direct Link
- b. Backup-mode configuration: Serial dedicated local Link

A.5 COVERAGE

- a. Site-horizon profile

The antenna visibility is clear to 2.0 degrees above horizon in any directions.

- b. Operational-tracking (elevation) limits

Full tracking from 0 to 90 degrees of elevation.

A.6 LOCATION

- a. Latitude and longitude (of antenna)
- b. Altitude

Latitude:	13.0350°	North
Longitude:	77.5120°	East
Altitude:	840 meters	above sea level

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ANNEX A**LEOLUT Commissioning Report**

Country or national Administration: India

Location of LEOLUT: Bangalore, India

Cospas-Sarsat Identifier: 4191

Operational Configuration 121.5, 243, SARP, SARR

Start of Commissioning Period: 11-23-2002

End of Commissioning Period: 12-02-2002

Section 1.0 contains a summary of the commissioning results as well as the declarations (D) and verifications (V), by the national Administration, for requirements not specifically measured.

The organization of the summary table follows the requirements contained in document C/S T.002. Annexes B, C and D contain the measurements (M) that support the results presented in section 1.0 below, a copy of the associated data is provided in ASCII format as required by document C/S T.005.

1.0 Summary Table

Paragraph in C/S T.002	Requirement or Test	Pass Criteria	Result	Pass/Fail	Method of Compliance	Declaration/ Verification or Comments
3.1	LEOLUT Data Availability	$A \geq 95$	97.1	Pass	M	
3.2	Data Requirements	n/a	N/a	Pass	V	Verified
3.3	Data Channels	Minimum 406 MHz Channel	N/a	Pass	V	121.5, 243 MHz 406 MHz SARP, SARR
3.4	Satellite Tracking Capability	ST>99	1.00	Pass	M	
3.5	Satellite Visibility/Signal Lock	L=0	L=0	Pass	M	
3.6	Status and Alarm	n/a	N/a	Pass	D	Include description in technical file
3.7	RF Radiation/Emissions	n/a	N/a	Pass	D	Declared

Paragraph in C/S T.002	Requirement or Test	Pass Criteria	Result	Pass/Fail	Method of Compliance	Declaration/ Verification or Comments
3.8	Data Archiving	N/a	N/a	Pass	D	Declared
4.1.1	Antenna and RF Subsystem	N/a	N/a	Pass	V	Verified
4.1.2	Time and Frequency Reference Subsystem	N/a	N/a	Pass	V	Verified
4.1.3	Orbit Maintenance Subsystem	Maintenance for up to 8 Satellites. Update using 2 Methods.	N/a	Pass	D	Verified
4.1.4	MCC Interface	N/a	N/a	Pass	V	Verified
4.2.2.1	406 MHz SARP Channel Data Recovery	N/a	N/a	Pass	V	Verified Ability to recover global and local-mode PDS data
4.2.2.2	406 MHz SARR Channel Data Recovery	Exact Match on 9 Bit Frame Synch	N/a	Pass	D	Declared Achieve identical match on 9 bit frame synchronization
4.2.3	Bit Verification Test – BV1	See Annex D to C/S T.005	N/a	Pass	M	USA Simulator
	Bit Verification Test – BV2	See Annex D to C/S T.005	N/a	Pass	M	USA Simulator
4.2.4	Beacon Message Validation Test – MV1	See Annex D to C/S T.005	N/a	Pass	M	USA Simulator
	Beacon Message Validation Test – MV2	See Annex D to C/S T.005	N/a	Pass	M	USA Simulator
	Beacon Message Validation Test – MV3	See Annex D to C/S T.005	N/a	Pass	M	USA Simulator
	Beacon Message Validation Test – MV4	See Annex D to C/S T.005	N/a	Pass	M	USA Simulator
4.2.5	Beacon Message Validation Test – LP1	See Annex D to C/S T.005	N/a	Pass	M	French Simulator
	Beacon Message Validation Test – LP2	See Annex D to C/S T.005	N/a	Pass	M	French Simulator
	Beacon Message Validation Test – LP3	See Annex D to C/S T.005	N/a	Pass	M	USA Simulator
	Beacon Message Validation Test – LP4	See Annex D to C/S T.005	N/a	Pass	M	USA Simulator
	Beacon Message Validation Test – IV1	See Annex D to C/S T.005	N/a	Pass	M	French Simulator
4.2.6	Time and Frequency Requirements	N/a	N/a	Pass	D	Declared
4.2.7	Doppler Processing and Validation Test – DP1	N/a	N/a	Pass	M	French Simulator

Paragraph in C/S T.002	Requirement or Test	Pass Criteria	Result	Pass/Fail	Method of Compliance	Declaration/ Verification or Comments
4.2.7.1	Selection of Data Points	--	--	--	--	Requirement the same as requirement 4.2.4 in C/S T.002
4.2.7.2	Rejection of Data Points Test – DP2	See Annex D to C/S T.005	N/a	Pass	M	USA Simulator
4.2.7.3	Combining Global/Local-mode SARP Data	N/a	N/a	Pass	D	Declared
4.2.7.4	Combining SARR/SARP Data	N/a	N/a	--	D	Declared
4.2.7.5	Combining LEO/GEO Data	--	--	--	N/A	N/A
4.2.7.6	Validation of Doppler Locations	N/a	N/a	Pass	D	Declared
4.2.7.7	Beacon Message Assignment	--	--	--	--	Requirement the same as requirement 4.2.5 in C/S T.002
4.2.8	Transmission of alert Data	--	--	--	--	Requirement the same as requirement 3.2 in C/S T.002
4.3.1	121.5 MHz Signal Detection and Doppler Location	N/a	N/a	Pass	D	Declared
4.3.2	121.5 MHz Doppler Processing	N/a	N/a	Pass	D	Declared
5.1.1	RF Signal Margin	N/a	N/a	Pass	D	Declared
5.1.2	Processing Time	PT<15 min for 99% of passes	PT < 1 min	Pass	M	Requirement applicable to all processing combinations
5.1.3	Orbit Determination	Error≤2 km	N/a	Pass	D	Declared
5.1.4	Ambiguity Resolution	A + B = 100	100	Pass	V	Verified
5.1.5	406 MHz SARP Error Ellipse Nominal Solutions	M/N > 0.40 and M/N < 0.60	0.42	Pass	M	
	406 MHz SARP Error Ellipse Marginal Solutions	M/N > 0.40 and M/N < 0.60	0.61	Failed	M	
	406 MHz SARR Error Ellipse Nominal Solutions	M/N > 0.40 and M/N < 0.60	0.43	Pass	M	
	406 MHz SARR Error Ellipse Marginal Solutions	M/N > 0.40 and M/N < 0.60	0.48	Pass	M	
	121.5 MHz Error Ellipse	M/N > 0.40 and M/N < 0.60	0.55	Pass	M	

Paragraph in C/S T.002	Requirement or Test	Pass Criteria	Result	Pass/Fail	Method of Compliance	Declaration/ Verification or Comments
5.2.1	406 MHz SARP Data Recovery	$DR \geq 1.0$	1.23	Pass	M	
5.2.2	406 MHz SARP Time and Frequency Calculation	1 millihertz and 1 millisecond resolution	Complied	Pass	D	Declared
5.2.3	406 MHz SARP Beacon Capacity	90 Beacons in local-mode 200 beacons in global-mode	Complied	Pass	D	Declared
5.2.4	406 MHz SARP Location Accuracy Nominal Solutions	$M/N \geq 0.95$ (5km)	0.985	Pass	M	
		$M/N \geq 0.98$ (10km)	1.0	Pass	M	
	406 MHz SARP Location Accuracy Marginal Solutions	$M/N \geq 0.60$ (5km)	0.860	Pass	M	
		$M/N \geq 0.80$ (20km)	0.982	Pass	M	
5.2.5	406 MHz SARP Ambiguity Resolution Nominal Solutions	$M/N \geq 0.90$	0.999	Pass	M	
	406 MHz SARP Ambiguity Resolution Marginal Solutions	$M/N \geq 0.60$	0.936	Pass	M	
5.3.1	406 MHz SARR Signal Sensitivity	Signal Sensitivity better than 36dB-Hz	27-28 dB-Hz	Pass	D	Declared
5.3.2	406 MHz SARR Beacon Message Throughput	$T \geq 0.75$	0.91	Pass	M	
5.3.3	406 MHz SARR Probability of Doppler Location	$PDL \geq 0.95$	1.00	Pass	M	
5.3.4	406 MHz SARR Time and Frequency Calculation	350 millihertz and 10 ms	Complied	Pass	D	Declared
5.3.5	406 MHz SARR Beacon Capacity	10 beacons	$\gg 10$	Pass	D	Declared
5.3.6	406 MHz SARR Location Accuracy Nominal Solutions	$M/N \geq 0.95$ (5km)	0.979	Pass	M	
		$M/N \geq 0.98$ (10km)	0.995	Pass	M	
	406 MHz SARR Location Accuracy Marginal Solutions	$M/N \geq 0.60$ (5km)	0.700	Pass	M	
		$M/N \geq 0.80$ (20km)	1.0	Pass	M	

Paragraph in C/S T.002	Requirement or Test	Pass Criteria	Result	Pass/Fail	Method of Compliance	Declaration/ Verification or Comments
5.3.7	406 MHz SARR Ambiguity Resolution Nominal Solutions	$M/N \geq 0.90$	0.984	Pass	M	
	406 MHz SARR Ambiguity Resolution Marginal Solutions	$M/N \geq 0.60$	0.825	Pass	M	
5.3.8	406 MHz False Alert Prevention	False Alerts Caused by Processing Anomalies $< 1 \times 10^{-4}$	None	Pass	D, V	Declared & Verified
5.3.9	406 MHz Processing Bandwidth	406.010 to 406.090 MHz	Full 80kHz	Pass	D	Verified
5.4	Combined SARP and SARR Processing	As per document C/S T.002	--	--	D	Only applicable to LEOLUTs which combine SARP and SARR data
5.4.a	Combined SARP and SARR Location Accuracy Nominal Solutions	$M/N \geq 0.95$ (5km)	--	--	M	Only applicable to LEOLUTs which combine SARP and SARR data
		$M/N \geq 0.98$ (10km)	--	--	M	
	Combined SARP and SARR Location Accuracy Marginal Solutions	$M/N \geq 0.60$ (5km)	--	--	M	
		$M/N \geq 0.80$ (20km)	--	--	M	
5.4.b	Combined SARP and SARR Ambiguity Resolution Nominal Solutions	$M/N \geq 0.90$	--	--	M	Only applicable to LEOLUTs which combine SARP and SARR data
	Combined SARP and SARR Ambiguity Resolution Marginal Solutions	$M/N \geq 0.60$	--	--	M	
5.4.c	Combined SARP and SARR Error Ellipse Nominal Solutions	$M/N > 0.40$ And $M/N < 0.60$	--	--	M	Only applicable to LEOLUTs which combine SARP and SARR data
	Combined SARP and SARR Error Ellipse Marginal Solutions	$M/N > 0.40$ And $M/N < 0.60$	--	--	M	
5.5	Combined SARP/GEO SAR or SARP/SARR/GEOSAR Processing	As per document C/S T.002	--	--	D	Only applicable to LEOLUTs which combine LEOSAR and GEOSAR data

Paragraph in C/S T.002	Requirement or Test	Pass Criteria	Result	Pass/Fail	Method of Compliance	Declaration/ Verification or Comments
5.5.1.a	Combined SARP/GEOSAR or SARP/ SARR/GEOSAR Processing Location Accuracy Nominal Solutions	$M/N \geq 0.95$ (5km)	--	--	M	Only applicable to LEOLUTs which combine LEOSAR and GEOSAR data
		$M/N \geq 0.98$ (10km)	--	--	M	
	Combined SARP/GEOSAR or SARP/ SARR/GEOSAR Processing Location Accuracy Marginal Solutions	$M/N \geq 0.60$ (5km)	--	--	M	
		$M/N \geq 0.80$ (20km)	--	--	M	
5.5.2	Combined SARP/GEOSAR or SARP/ SARR/GEOSAR Processing Location Accuracy Minimum Point Solutions	$M/N \geq 0.60$ (5km)	--	--	M	Only applicable to LEOLUTs which combine LEOSAR and GEOSAR data
		$M/N \geq 0.80$ (20km)	--	--	M	
5.5.1.b	Combined SARP/GEOSAR or SARP/ SARR/GEOSAR Processing Ambiguity Resolution Nominal Solutions	$M/N \geq 0.90$	--	--	M	Only applicable to LEOLUTs which combine LEOSAR and GEOSAR data
	Combined SARP/GEOSAR or SARP/ SARR/GEOSAR Processing Ambiguity Resolution Marginal Solutions	$M/N \geq 0.60$	--	--	M	
5.5.1.c	Combined SARP/GEOSAR or SARP/ SARR/GEOSAR Processing Error Ellipse Nominal Solutions	$M/N > 0.40$ And $M/N < 0.60$	--	--	M	Only applicable to LEOLUTs which combine LEOSAR and GEOSAR data
	Combined SARP/GEOSAR or SARP/ SARR/GEOSAR Processing Error Ellipse Marginal Solutions	$M/N > 0.40$ And $M/N < 0.60$	--	--	M	
5.5	Combined SARR/GEOSAR Processing	as per document C/S T.002	--	--	D	Only applicable to LEOLUTs which combine SARP and GEOSAR data
5.5.1.a	Combined SARR/GEOSAR Location Accuracy Nominal Solutions	$M/N \geq 0.95$ (5km)	--	--	M	Only applicable to LEOLUTs which combine SARP and GEOSAR data
		$M/N \geq 0.98$ (10km)	--	--	M	
	Combined SARR/GEOSAR Location Accuracy Marginal Solutions	$M/N \geq 0.60$ (5km)	--	--	M	Only applicable to LEOLUTs which combine LEOSAR and GEOSAR data
		$M/N \geq 0.80$ (20km)	--	--	M	

Paragraph in C/S T.002	Requirement or Test	Pass Criteria	Result	Pass/Fail	Method of Compliance	Declaration/ Verification or Comments
5.5.2	Combined SARR/GEOSAR Location Accuracy Minimum Point Solutions	$M/N \geq 0.60$ (5km)	--	--	M	Only applicable to LEOLUTs which combine LEOSAR and GEOSAR data
		$M/N \geq 0.80$ (20km)	--	--	M	
5.5.1.b	Combined SARR/GEOSAR Ambiguity Resolution Nominal Solutions	$M/N \geq 0.90$	--	--	M	Only applicable to LEOLUTs which combine SARR and GEOSAR data
	Combined SARR/GEOSAR Ambiguity Resolution Marginal Solutions	$M/N \geq 0.60$	--	--	M	
5.5.1.c	Combined SARR/GEOSAR Error Ellipse Nominal Solutions	$M/N > 0.40$ And $M/N < 0.60$	--	--	M	Only applicable to LEOLUTs which combine SARR and GEOSAR data
	Combined SARR/GEOSAR Error Ellipse Marginal Solutions	$M/N > 0.40$ And $M/N < 0.60$	--	--	M	
5.6.1	121.5 MHz SARR Signal Sensitivity	Locate Signals with C/N_0 23 dB-Hz	$\ll 23$ dB-Hz	Pass	D	Declared
5.6.2	121.5 MHz SARR Beacon Capacity	10 beacons	N/a	Pass	D	Declared
5.6.3	121.5 MHz SARR Location Accuracy Nominal Solutions	$M/N \geq 0.70$ (20km)	0.852	Pass	M	
		$M/N \geq 0.95$ (40km)	0.989	Pass	M	
5.6.4	121.5 MHz SARR Ambiguity Resolution	$M/N \geq 0.70$	0.72	Pass	M	

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ANNEX B

Statistics for Operational Requirements

B.1 LEOLUT Data Availability (A)

LEOLUT data availability measures the probability of receiving complete and accurate LEOLUT data at the MCC. Whenever a LEOLUT does not perform any of its functions, downtime (DT) is measured from LOS of the last successful satellite pass to AOS of the next successful satellite pass. Availability (A) is expressed as a percentage and is calculated by dividing the amount of operational time (OT) by the time required to be in operation (OTR). The time required to be in operation (OTR), expressed in hours, is 24 times the number of days in the commissioning period inclusive of all maintenance downtime. Downtime is that period of time when the LEOLUT fails to perform any of its basic functions. Therefore:

$A = (OT / OTR) * 100 = (1 - (DT / OTR)) * 100$ and shall be greater than 95.

$A = 97.1\%$ with $OTR = 10 * 24 = 240$, $DT = 7.23$ hrs for maintenance and backup

B.2 Satellite Tracking (ST)

$ST = N/M * 100$ and shall be greater than 99, where M = number of non-conflicting passes visible to the LEOLUT with a maximum elevation angle of 5° above the horizon during the commissioning period, and N = number of successfully tracked passes.

$N = 194$

$M = 194$

$ST = 194 / 194 = 100 \%$

B.3 Satellite Visibility/Signal Lock (L)

L = number of passes that the LEOLUT lost carrier lock on the satellite downlink carrier signal while the satellite was above a 5° elevation angle (except where local obstructions prevent this). L shall be equal to 0.

$L = 0$

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ANNEX C

Statistics for Performance Requirements

SUMMARY

India Bangalore LUT performed well. It exceeded all the requirements of the Cospas-Sarsat LUT performance specifications. They are listed briefly here.

1. 121.5 MHz data (Nominal Solutions): India LUT showed location accuracy of 85.2% and 98.9% within 20 km and 40 km, respectively. The Cospas-Sarsat specification requires 70% within 20 km and 95% within 40 km.
2. 406 MHz G-SARP (Nominal Solutions): India LUT exhibited location accuracy of 97.9% and 99.5% within 5 km and 10 km, respectively. The LUT specification requires 95.0% within 5 km and 98.0% within 10 km.
3. 2.4KB Local PDS (Nominal Solutions): India LUT had location accuracy of 99.5% and 100.0% within 5 km and 10 km, respectively. The specification is for 95% within 5 km and 98% within 10 km.
4. 2.4KB Global PDS (Nominal Solutions): India LUT exhibited location accuracy of 98.5% and 99.9% within 5 km and 10 km, respectively. The specification requires 95% within 5 km and 98% within 10 km.
5. 406 MHz G-SARP (Marginal Solutions): India LUT exhibited location accuracy of 70.0% and 97.5% within 5 km and 10 km, respectively. The LUT specification requires 60% within 5 km and 80.0% within 20 km.
6. 2.4KB Local PDS (Marginal Solutions): India LUT had location accuracy of 82.8% and 91.4% within 5 km and within 10 km, respectively. The specification is for 60% within 5 km and 80% within 20 km.
7. 2.4KB Global PDS (Marginal Solutions): India LUT exhibited location accuracy of 86.0% and 93.8% within 5 km and 10 km, respectively. The specification requires 60% within 5 km and 80% within 20 km.

The detailed results are provided in the following sections.

2.4 KB PDS STATISTICS (SARP)

Number of processed passes = 78
Number of processed solutions = 4086

Minimum processing time = 7.27 seconds
Average processing time = 19.03 seconds
Maximum processing time = 32.60 seconds

Data Recovery (DR) = 1.23

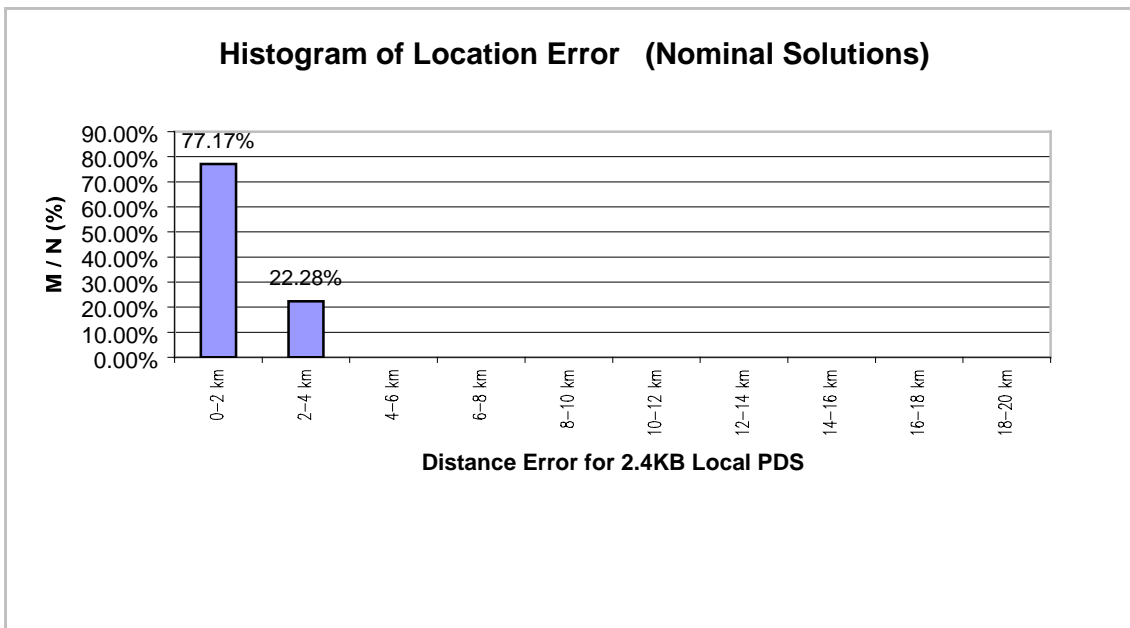
Beacon IDs and Locations :

Beacon ID	Latitude	Longitude
ADC389B8AA1B9D0	-77.846	+166.711
A0234BF8A7335D0	+78.229	+15.395
9B62197CA7035D0	+77.465	-69.218
9D1FCFA7AB0D990	+51.170	-4.051
A79EEE26E32E1D0	+53.679	-113.315
B47C12121212121	+13.035	+77.512
B47C03434343434	+13.035	+77.512
A79F09F434D3430	+13.717	+100.533
A79F09F434D74D0	+13.717	+100.533
A79F09F434D7590	+13.717	+100.533
A79F09F434D75D0	+13.717	+100.533

Nominal Solutions

Local Mode

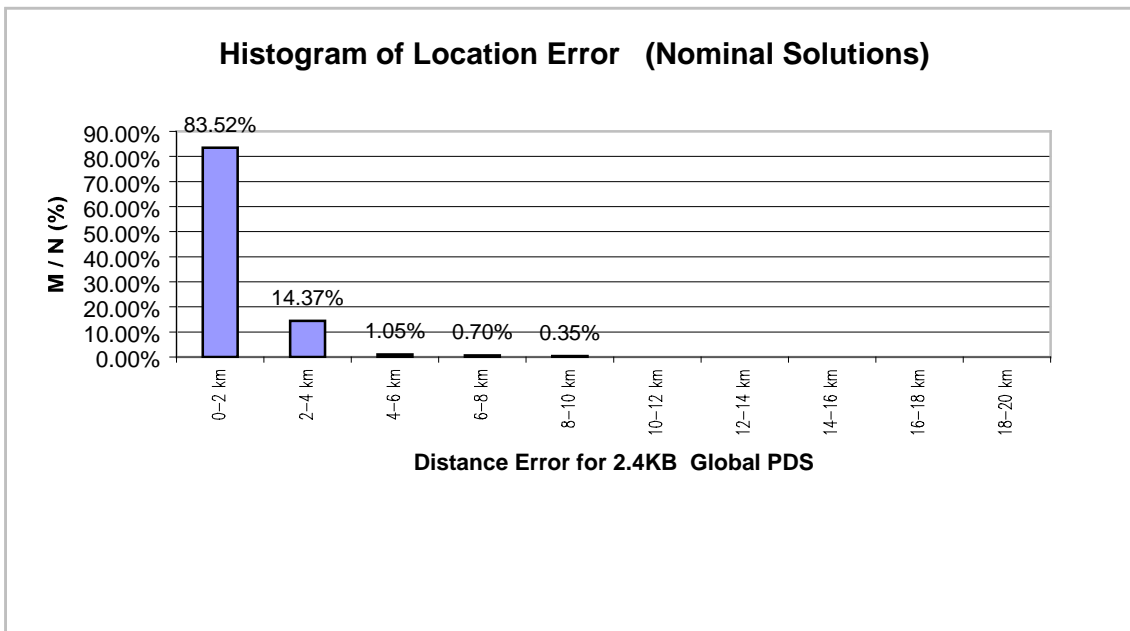
Number of Solutions = 184
 Number of solutions within 5 km = 183
 Location accuracy = 183 / 184 = 0.995 within 5 km
 Ambiguity resolution = 184/184 = 1.00
 Error Ellipse = 76/184 = 0.413



Nominal Solutions

Global Mode

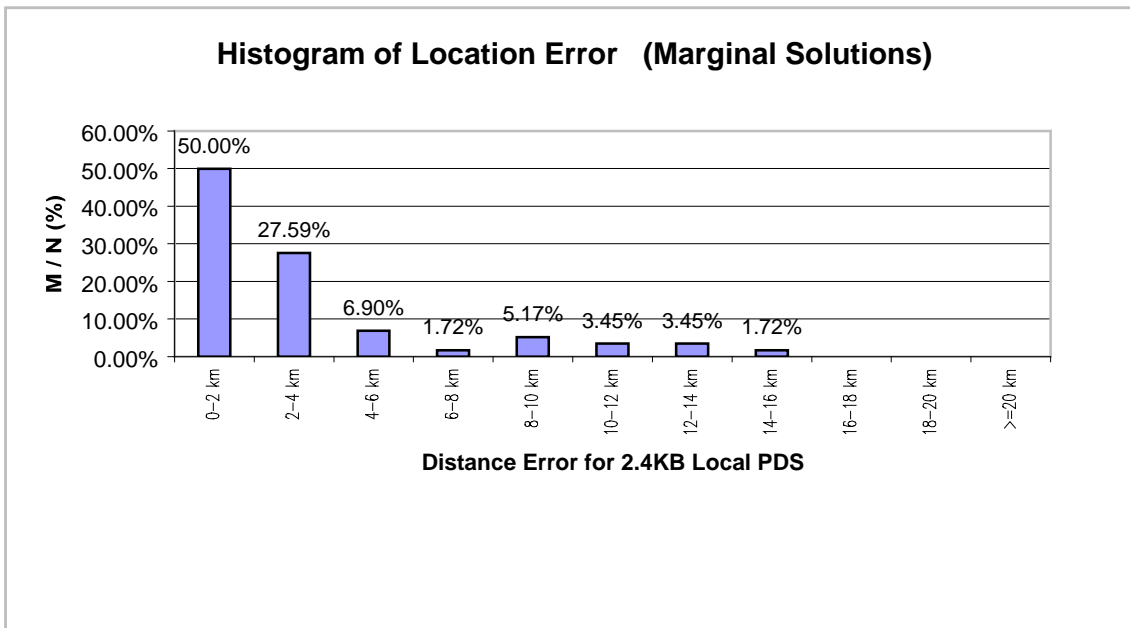
Number of Solutions = 1141
 Number of solutions within 5 km = 1124
 Number of solutions within 10 km = 1141
 Location accuracy = $1124 / 1141 = 0.985$ within 5 km
 Location accuracy = $1141 / 1141 = 1.00$ within 10 km
 Ambiguity resolution = $1140 / 1141 = 0.999$
 Error Ellipse = $473 / 1141 = 0.415$



Marginal Solutions

Local Mode

Number of Solutions = 58
 Number of solutions within 5 km = 48
 Number of solutions within 10 km = 53
 Location accuracy = 48 / 58 = 0.828 within 5 km
 Location accuracy = 53 / 58 = 0.914 within 10 km
 Ambiguity resolution = 53/58 = 0.914
 Error Ellipse = 34 / 58 = 0.586



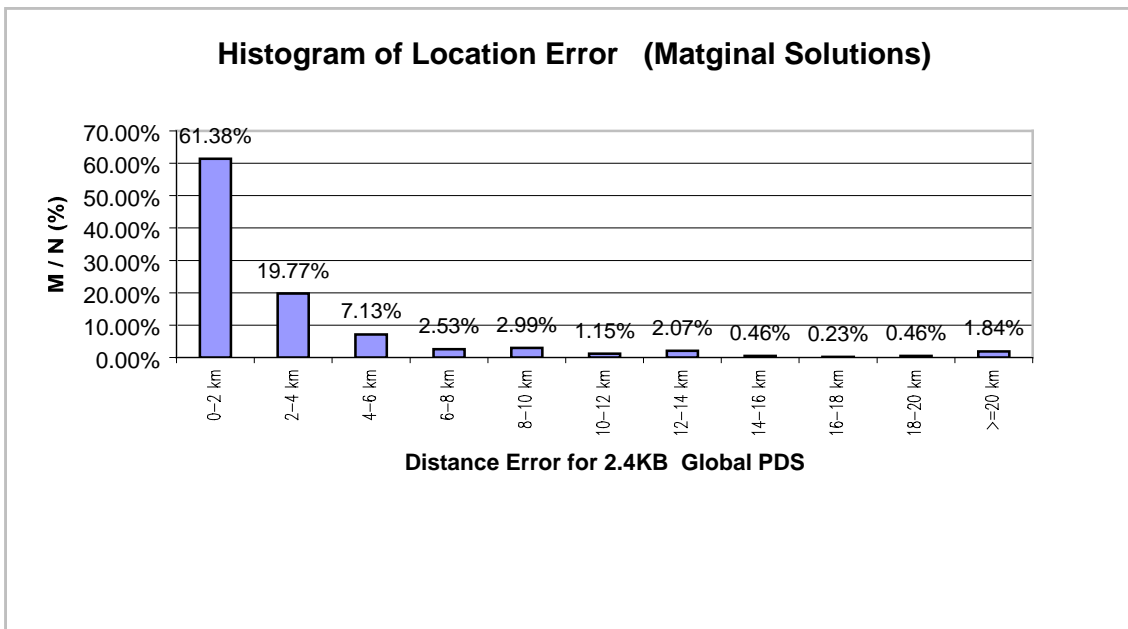
Locations with distance errors greater than 50 km:

N Beacon ID Latitude Longitude CTA Pnts Error Comments.....

Marginal Solutions

Global Mode

Number of Solutions = 435
 Number of solutions within 5 km = 374
 Number of solutions within 10 km = 408
 Location accuracy = 374 / 435 = 0.860 within 5 km
 Location accuracy = 408 / 435 = 0.938 within 10 km
 Ambiguity resolution = 407 / 435 = 0.936
 Error Ellipse = 267 / 435 = 0.614



Locations with distance errors greater than 50 km:

N	Beacon ID	Latitude	Longitude	CTA	Pnts	Error	Comments.....
1	A79F09F434D7590	14.12	101.41	-25.0	3	97.82	High CTA Angle, Few data points

406 MHZ G-SARP STATISTICS

Test Beacon ID and Location :

Beacon ID	Latitude	Longitude
B47C1212121212121	+13.035	+77.512
B47C0343434343434	+13.035	+77.512
A79F09F434D3430	+13.717	+100.533
A79F09F434D74D0	+13.717	+100.533
A79F09F434D7590	+13.717	+100.533
A79F09F434D75D0	+13.717	+100.533

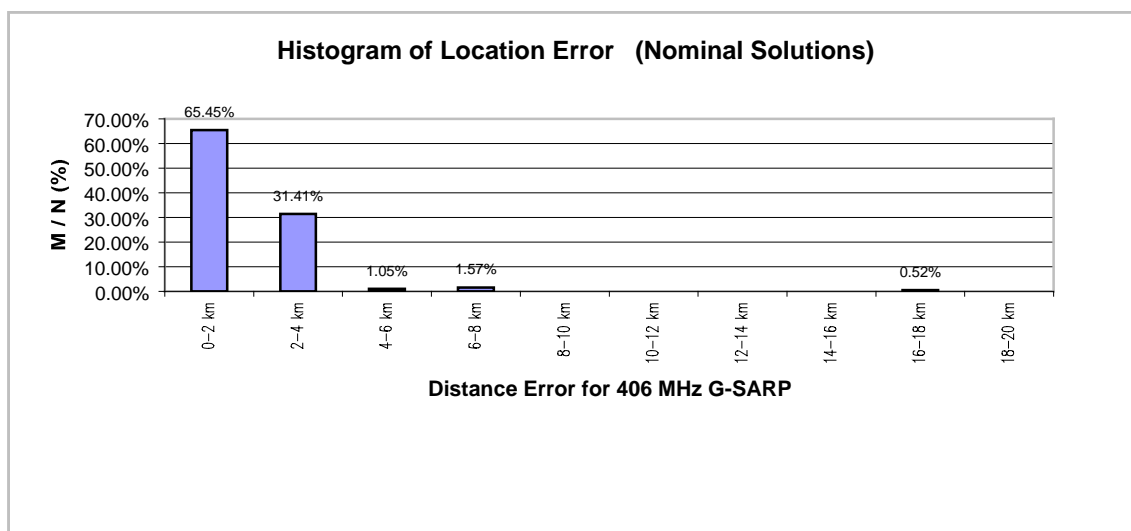
Nominal Solutions

- Number of Solutions = 191
- Number of solutions within 5 km = 187
- Number of solutions within 10 km = 190
- Location accuracy = 187 / 191 = 0.979 within 5 km
- Location accuracy = 190 / 191 = 0.995 within 10 km
- Ambiguity resolution = 188/191 = 0.984
- Error Ellipse = 82 / 191 = 0.429

- SARR Throughput = 0.910

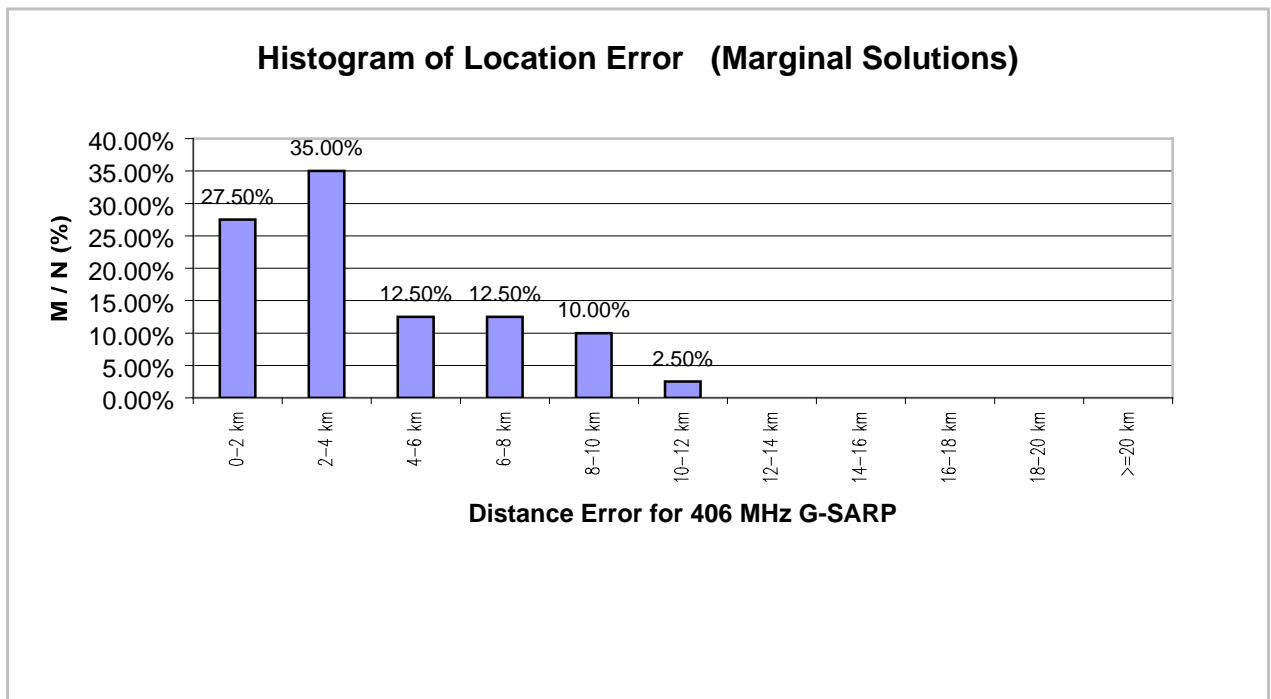
- Probability of Doppler Location = 1.00

- Minimum processing time = 6.12 seconds
- Average processing time = 14.21 seconds
- Maximum processing time = 27.93 seconds



Marginal Solutions

Number of Solutions	=	40
Number of solutions within 5 km	=	28
Number of solutions within 10 km	=	39
Location accuracy = 28 / 40	=	0.700 within 5 km
Location accuracy = 39 / 40	=	0.975 within 10 km
Ambiguity resolution = 33 / 40	=	0.825
Error Ellipse = 19 / 20	=	0.475
SARR Throughput	=	0.809



121.5 MHZ STATISTICS

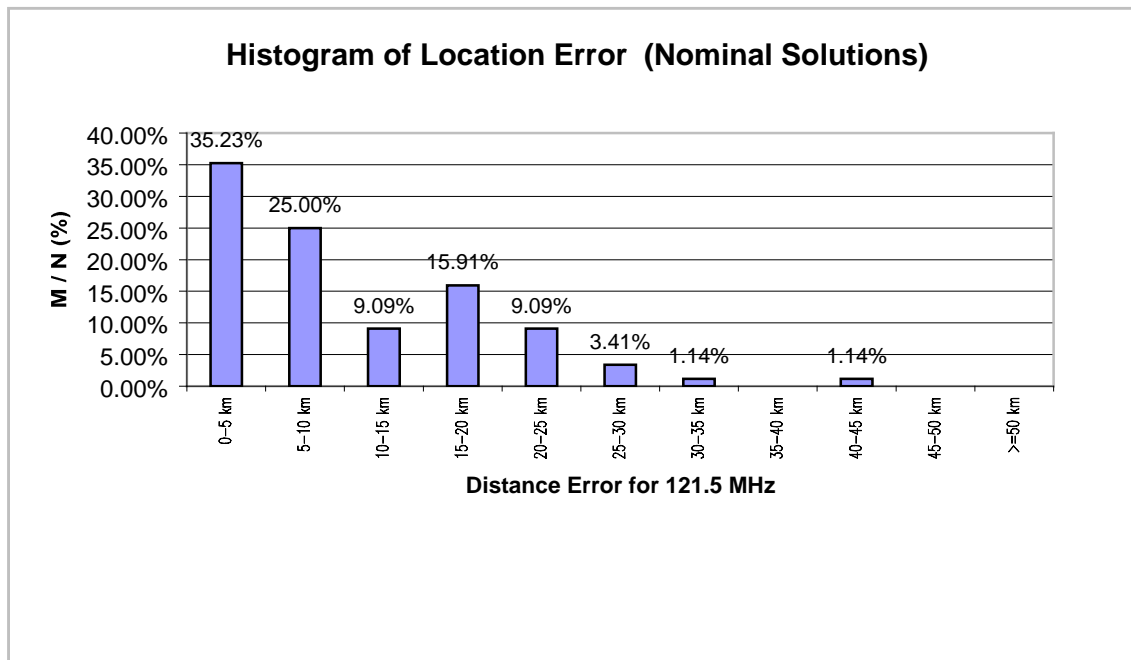
Nominal Solutions

Number of processed passes = 103
 Number of processed solutions = 263
 Minimum processing time = 63.05 seconds
 Average processing time = 65.83 seconds
 Maximum processing time = 71.58 seconds

Test Beacon Location = 13.065 77.512

Number of nominal Solutions = 88
 Number of solutions within 20 km = 75
 Number of solutions within 40 km = 87
 Location accuracy = 75 / 88 = 0.852 within 20 km
 Location accuracy = 87 / 88 = 0.989 within 40 km
 Ambiguity resolution = 63 / 88 = 0.716
 Error Ellipse = 48 / 88 = 0.545

The 121.5 MHz test beacon used for these tests satisfied the requirements stated in document C/S T.005.



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ANNEX D**Beacon Simulator Test Script**

The USA simulator data were used for this test script.

Test Code Sequence	Message Transmitted by LEOLUT	Calculated Doppler Position	Encoded Position	Pass/Fail
BV1	56EE000000000037E54000000000	N/a	N/a	Pass
BV2	D6E10E1A4324920458B9D555555555	N/a	N/a	Pass
MV1	D6EE000000000265F1424FFFFFFFF	N/a	N/a	Pass
MV2	96EE0000002729A5E22BB61B842E0A	39.000, -76.853	38.884,-76.931	Pass
MV3	N/a	N/a	N/a	Pass
MV4	N/a	N/a	N/a	Pass
LP1	8E320000002B8036568C768E010B65	43.559, 1.476	43.559, 1.483	Pass
LP2	8E3800000AE20177ECCB360F380F6B	43.546, 1.481	43.559, 1.483	Pass
LP3	D6EE1E1E1E1E1E06A383E4FFFFFFFF	39.995,-76.855	40.000,-256.00	Pass
LP4	96EF000049C14CD260D5F608380389	38.989,-76.833	38.996,-76.851	Pass
IV1	8E3FF0004AE2017493D436FFFFFFFF	43.560, 1.487	43.633, 1.533	Pass
DP1	4E3EAAAAAAAAAAAA057FD800000000	43.538, 1.511	N/a	Pass
DP2	56EE0000000000477BEAC000000000	38.962,-76.811	N/a	Pass

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ANNEX E**Data Format**

The India LUT commissioning data format provided on two electronic zip files to the Cospas-Sarsat Secretariat is in full compliance with the C/S T.005 Specification, Annex E. The two files were for the data sets 121.5 MHz and 406 MHz, respectively.