



National Aeronautics and
Space Administration



*NASA Search and Rescue
MEOSAR Demonstration and Evaluation
Phase II Technical Test Preliminary Results*

May 8, 2015

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D&E Phase II Technical Tests



- Phase II Technical Tests performed
 - T1 – MEOLUT Single Burst Detection Threshold
 - T3 – MEOLUT Throughput
 - T4 – Location Performance
 - T5 and T5/T7 – Performance with commercial beacons, without and with networking
- Data analysis still ongoing, preliminary results available



T1



MEOLUT Single Burst Detection Threshold

Power	NTB	C/No_LinAve	C/No_LogAve	NVIM	NCM	TP(NVM)	TP(NCM)	C/No_Min	C/No_Max	C/No_Std
37	1728	44.5632769	42.84282605	0	1656	96%	96%	30.19	53.31	4.01
36	1728	43.3741368	41.61937465	12	1604	94%	93%	29.36	52.82	3.91
35	1728	42.8643316	41.20019516	25	1605	94%	93%	29.26	51.36	3.90
34	1728	42.4187452	40.81102693	15	1514	88%	88%	29.52	52.60	3.80
33	1728	41.0380423	39.26280474	33	1475	87%	85%	27.90	52.34	3.94
32	1728	40.8168109	39.38912567	26	1376	81%	80%	26.69	49.14	3.60
31	1728	40.09616	38.47248061	38	1202	72%	70%	27.63	49.80	3.73
30	1728	39.2015025	37.71261509	31	1176	70%	68%	27.35	48.28	3.58
29	1728	38.8970467	37.79288014	11	1032	60%	60%	28.30	47.22	3.08
28	1728	37.9274966	36.62331025	38	885	53%	51%	27.42	46.72	3.30
27	1728	37.3931108	36.30740669	19	786	47%	45%	27.62	45.18	3.05
26	1728	36.8459073	35.92821471	19	612	37%	35%	27.14	46.77	2.77
25	1728	36.0173343	35.10690598	29	455	28%	26%	26.91	43.59	2.80
24	1728	35.6055952	34.86382629	13	343	21%	20%	29.10	42.08	2.49
23	1728	35.0193088	34.31026148	12	249	15%	14%	27.06	41.59	2.46
22	1728	34.6009256	33.95065201	8	174	11%	10%	28.50	39.69	2.37



T3 – 37 dBm

Beacon Emission Power	Slot No	NTBI	NVIM after 7bursts	NCM after 7bursts	%NVIM after 7bursts	%NCM after 7th	Satellites	Channels
37	1	50	25	25	50	50	[324 315 329 327]	[1 2 3 4]
37	3	50	50	50	100	100	[324 318 319 327]	[1 2 3 4]
37	5	50	50	50	100	100	[324 318 319 419]	[1 2 3 4]
37	7	50	50	50	100	100	[312 324 318 419]	[1 2 3 4]
37	9	50	50	50	100	100	[312 324 419 301]	[1 2 3 4]
37	11	50	50	50	100	100	[312 303 419 301]	[1 2 3 4]
37	13	50	50	50	100	100	[419 303 329 316]	[1 2 3 4]
37	15	50	50	50	100	100	[323 303 329 316]	[1 2 3 4]
37	17	50	50	50	100	100	[316 303 329 323]	[1 2 3 4]
37	19	50	50	50	100	100	[316 303 327 309]	[1 2 3 4]
37	21	50	50	50	100	100	[316 330 327 309]	[1 2 3 4]
37	23	50	50	50	100	100	[316 330 319 309]	[1 2 3 4]
37	25	50	50	50	100	100	[316 330 301 309]	[1 2 3 4]
37	27	50	50	50	100	100	[319 330 301 317]	[1 2 3 4]
37	29	50	50	50	100	100	[319 330 303 317]	[1 2 3 4]
37	31	50	50	50	100	100	[306 330 303 317]	[1 2 3 4]
37	33	50	50	50	100	100	[324 306 303 317]	[1 2 3 4]
37	35	50	50	50	100	100	[324 306 303 317]	[1 2 3 4]
37	37	50	50	50	100	100	[317 306 323 312]	[1 2 3 4]
37	39	50	50	50	100	100	[302 309 323 312]	[1 2 3 4]
37	41	50	50	50	100	100	[302 309 306 312]	[1 2 3 4]
37	43	50	50	50	100	100	[302 315 329 306]	[1 2 3 4]
37	45	50	50	50	100	100	[302 315 318 330]	[1 2 3 4]
37	47	50	50	50	100	100	[329 324 318 330]	[1 2 3 4]



T3 – 33 dBm

Beacon Emission Power	Slot No	NTBI	NVIM after 7bursts	NCM after 7bursts	%NVIM after 7bursts	%NCM after 7th	Satellites	Channels
33	2	50	50	50	50	100	100 [324 318 315 327]	[1 2 3 4]
33	4	50	50	50	50	100	100 [324 318 319 419]	[1 2 3 4]
33	6	50	50	50	50	100	100 [312 318 315 419]	[1 2 3 4]
33	8	50	50	50	50	100	100 [312 324 419 301]	[1 2 3 4]
33	10	50	50	50	50	100	100 [312 318 419 301]	[1 2 3 4]
33	12	50	50	50	50	100	100 [419 303 329 301]	[1 2 3 4]
33	14	50	50	50	50	100	100 [323 303 329 316]	[1 2 3 4]
33	16	50	50	50	50	100	100 [323 303 329 327]	[1 2 3 4]
33	18	50	50	50	50	100	100 [316 303 327 309]	[1 2 3 4]
33	20	50	50	50	50	100	100 [316 319 327 309]	[1 2 3 4]
33	22	50	50	50	50	100	100 [316 330 319 309]	[1 2 3 4]
33	24	50	50	50	50	100	100 [316 330 319 309]	[1 2 3 4]
33	26	50	50	50	50	100	100 [319 330 327 317]	[1 2 3 4]
33	28	50	50	50	50	100	100 [319 330 301 317]	[1 2 3 4]
33	30	50	50	50	50	100	100 [306 330 301 317]	[1 2 3 4]
33	32	50	50	50	50	100	100 [324 306 303 317]	[1 2 3 4]
33	34	50	50	50	50	100	100 [324 306 303 317]	[1 2 3 4]
33	36	50	50	50	50	100	100 [324 306 323 317]	[1 2 3 4]
33	38	50	50	50	50	100	100 [302 306 323 312]	[1 2 3 4]
33	40	50	49	44	44	98	88 [302 309 306 312]	[1 2 3 4]
33	42	50	50	50	50	100	100 [302 309 306 312]	[1 2 3 4]
33	44	50	50	50	50	100	100 [302 315 329 330]	[1 2 3 4]
33	46	50	50	50	50	100	100 [329 315 318 330]	[1 2 3 4]
33	48	50	50	50	50	100	100 [329 324 318 315]	[1 2 3 4]



T4 – 37 dBm

Independent Location Errors: 95th Percentile									
Number of MEOLUT Satellite Channels: 4									
Beacon Simulator Location: Maryland									
Time of first Transmission for Test Period: 2015-03-24 17:00:00									
Slot No	DOP Av	Tx Pow	13 burst	7 burst	5 burst	3 burst	2 burst	1 burst	
1	5.374977	37	6.88921	7.803464	13.28557	11.40843	38.41709	15.88187	
3	4.257164	37	26.29903	14.99761	11.49169	6.564201	10.68784	16.44198	
5	1.93414	37	4.500523	4.30602	4.940645	6.355394	7.313993	8.090952	
7	3.341957	37	8.433979	4.899506	6.161026	13.07616	14.54657	23.48832	
9	2.682002	37	4.792176	5.372951	5.174034	10.67835	8.97066	9.792547	
11	1.97393	37	3.443833	4.416732	4.381748		6.14348		
13	2.714235	37	3.545247	4.976508	5.374545	10.63214	24.75489	23.91773	
15	2.85215	37	4.068134	3.894614	4.436447	5.470322	7.772148	5.303532	
17	1.693282	37	1.712235	1.780998	0.756656	3.443368		6.7755	
19	9.285	37	3.857219	29.95583	26.85702	32.92653	30.32116	17.82652	
21	3.521175	37	5.535422	5.248554	6.154953	5.506202	7.450676	7.773814	
23	2.069799	37	2.312564	4.839965	5.163204	4.344228	5.961227	3.74192	
25	3.278016	37	3.60359	6.50293	5.393129	6.967136	7.438981	18.98296	
27	4.082944	37	6.069145	10.25817	8.325067	12.16739	6.418175	9.959325	
29	2.189539	37	2.951227	2.773284	4.12087	5.218142	4.43524	11.01411	
31	3.760684	37	4.052272	4.167003	12.31814	27.02398	16.58668	44.81862	
33	2.478747	37	2.250005	2.460032	3.197107	3.780474	3.292872	5.904017	
35	1.898496	37	2.661515	2.35032	2.819137	5.145212	5.438121	4.896433	
37	2.684434	37	3.539008	2.922144	3.638568	4.807877	7.260896	9.42573	
39	7.63232	37		22.22452	8.606342	11.41515	9.593445	13.29677	
41	2.453427	37	1.999517	3.621131	3.394519	4.98366	4.67096	5.014995	
43	3.058926	37	2.932961	4.864834	11.1887	11.38255	8.502198	9.634392	
45	1.790597	37	2.147961	3.038973	2.714572	5.358626	6.182702	6.433073	
47	1.765822	37	1.603293	2.095211	3.369043	2.718145	5.209445	4.706208	



T4 – 33 dBm

Independent Location Errors: 95th Percentile									
Number of MEOLUT Satellite Channels: 4									
Beacon Simulator Location: Maryland									
Time of first Transmission for Test Period: 2015-03-24 17:00:00									
Slot No	DOP Av	Tx Pow	13 bur	7 burst	5 burst	3 burst	2 burst	1 burst	
2	4.102861	33	12.33524	17.71836	13.68025	25.65252	25.16377	25.02932	
4	2.850773	33	5.467119	5.912025	7.617691	5.539111	15.0272	13.15107	
6	3.800177	33	17.63718	14.97629	13.69767		9.975046	1.175589	
8	5.027179	33	7.71345	7.083311	10.95945	90.57906	9.281646	23.38866	
10	2.524589	33	4.358455	3.920103	4.297851	11.06678	20.64983	8.523062	
12	3.143466	33	7.780483	4.983941	7.814833	10.55155	25.29785	16.75073	
14	4.099888	33	5.224028	26.92778	13.1133	41.76152	14.50392	9.927841	
16	1.955987	33	2.732957	2.761059	3.369164	4.381594	3.708332	5.833264	
18	2.45599	33	6.412343	4.086882	3.654702	6.633552	5.593491	5.810187	
20	4.584126	33	8.018143	11.96378	10.05616	11.87353	24.88866	17.44302	
22	3.511386	33	4.365195	8.856635	12.05559	20.46515	10.82716	8.099509	
24	2.668069	33	3.599219	3.658532	8.631814	6.866484	6.046482	4.923647	
26	4.860285	33	9.409418	10.47962	14.15462	6.819573			
28	2.481437	33	3.803423	4.370623	4.392821	5.321742	7.137252	8.432802	
30	2.152383	33	2.347277	2.832688	5.128518	7.984611	7.186377	16.10735	
32	3.254332	33	3.981454	4.454058	6.73005	9.088069	7.481903	15.40692	
34	2.061603	33	1.435604	3.163909	8.78674	4.828165	7.686064	6.442265	
36	2.570564	33	3.501618	2.525373	3.524419	5.052576	7.963311	9.081986	
38	3.479642	33	4.052043	6.299387	8.007771	8.032905	11.88192	15.65118	
40	3.371544	33	7.453357	6.069708	6.639042	4.461937	9.360157	8.592107	
42	2.578901	33	2.511379	2.905932	5.046934	5.381176	7.05952	7.084206	
44	2.48197	33	4.398039	3.494288	5.55959	4.623366	5.847476	6.33275	
46	2.067697	33	2.712704	3.599112	2.957102	2.915192	5.208644	6.750827	
48	1.579349	33	1.986439	2.847968	4.720765	4.810354	4.729919	8.545732	



T4 Summary

- Average error over entire test period (24 hours) for:
 - 95 percentile after 10 minutes (13 bursts)
 - each beacon power level
 - average including both beacon power levels

	Column Labels <input type="button" value="v"/>		
	33	37	Grand Total
Average of 13 burst	5.551523347	4.747829128	5.158226176



T5 - Performance with commercial beacons



- UK Beacons – quick look
 - location accuracy of locations generated from a 10 minute window of data
 - Maryland MEOLUT standalone
 - average error = 3.22 km
 - Maryland MEOLUT sharing data with Florida MEOLUT
 - average error = 4.39 km
 - however, probability of location is higher