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1000

USO

side	-A	-B		
USO xtal	4.832000	4.832099 MHz	-B = -A + 99 Hz	
x2x4	8	8	2^3	
USO out GPA	38.656000	38.656792 MHz		
x2x2x3	12	12	2^2*3	
USO out Ka	57.984000	57.985188 MHz		

Ka-Band

Ka mult.	564	564	2^2*141	
Ka Out	32702.976000	32703.646032 MHz		
IF = diff	0.670032	-0.670032 MHz	219.56842	258.9402721
carrier wavelength	9.167131	9.166943 mm.	1.458994178155820	1.458964286296480
IF wavelength	447.430060	-447.430060 m.		
samples / integrator	386560	386560		
time per integration	20.000000000	19.999590240 msec		
dead time	1.000000000	0.999979512 msec		
non-dead time	19.000000000	18.999610728 msec		
integrations / sec	50.000000	50.001024	#####	
20 msec. lap time	976.161616	sec		bits to represent
day-hr-min-sec	0	0	16	16.16161617 976.1616162 10
1 sec lap time	48808.080808			
day-hr-min-sec	0	13	33	28.08080838 48808.08081 16
both on int second	241600000			
day-hr-min-sec	2796	7	6	40.0014627 241600000 28
years	7.655842016			

X-Band

synthesizer ratios				
add	109	109		
mul	83385	83476		
div	262144	262144	2^18	
RSB Tx	8451.600061	8451.800059	#####	#####
carrier wavelength	0.035472	0.035471 m.	0.005645493309025	0.005645359717480

S-Band

synthesizer ratios				
add	52.5	57	27564453	29932738
mul	39333	48322		
div	524288	524288	2^19	
Transmit	2032.340041	2207.000021 MHz	#####	#####

Receive carrier wavelength	2207.000021 0.135837	2032.340041 MHz 0.147511 m.	0.021619144152560	0.023477100603691
Sample time	19.328000 0.051738	19.328396 MHz 0.051737 microseconds	because we throw away half the 38 MHz samples	
subharmonic virtual LO	114	105		
Carrier Offset	2203.392000 3.608021	2029.481580 MHz 2.858461 MHz	3.6080207071227100	2.8584605273440500
PN Code div	20	19 bits/chip	bits means samples	
PN Code Rate	966400	1017284 chips/sec.		
PN chip length	0.000001035	0.000000983 seconds		
PN chip length	0.310216	0.294699 km		
chip rate reg. up	13421773	14128182	divisor of 0x10000000 used by ASIC	
chip rate reg. down	13421772	14128181	See "GRAIL S-Band Transmitter" section of	
hex of up	CCCCCD	D79436 hex	GRAIL_TTA_rogstadDoc.doc	
hex of down	CCCCCC	D79435 hex	for a different presentation of this.	
used up	8	17		
used down	2	2		
used total	10	19		
check	10000000	10000000 hex	268435456	
code cycle	1023	1023		53 usec.
cycle rate	944.672532	994.412512 cycles / sec.	0.001058567881	0.001005618883 52.94899757
cycle length	0.001058568	0.001005619 sec.		
cycle length	317.351	301.477 km		
databit length	20	20 cycles/databit		
databit length	20460	20460 chips		
databit length	409200	388740 bits		
databit length	0.021171358	0.020112378 seconds		
databit rate	47.233626588	49.720625611 Hz		
databit length	6347.013	6029.539 km		
databit beat freq.	2.487	Hz		
cycle rate	944	994 cycles / secor	code cycle 0.001059322	B diff, if both 0.001006036
code mismatch	688	422 remainder	317576.7564	5.32858E-05 0.00206536
cycle ambiguity	966400	1017284 cycles / 1023 sec.	ambiguity, meters 301602.0704	
day-hr-min-sec	0	17	3	15974.68593 619178.827
databits	48320	50864.2	bits to represent 1023 10	
databit ambiguity	5115	5115 seconds		

day-hr-min-sec	0	1	25	15	5115	13
databits	241600	254321	databits / 5115 sec.			
fortnight	1309440	1309440	256 databit ambiguities is a fortnight			
day-hr-min-sec	15	3	44	0	1309440	21
databits / message	256	256				
databits/fortnight	61849600	65106176	databits			
messages/fortnight	241600	254321	messages (Excel rounding problem)			18
	3AFC0	3E171	hex			
bits left in a long repeat count	14		fortnights in GRAIL ambiguity			
GRAIL ambiguity	16384		seconds			
day-hr-min-sec	21453864960	14	56	0	21453864960	35
	248308		Julian years			
ambiguities in 2^32	679.8133445		interesting...			
	4.995117188					
message length	5.419868	5.148769	seconds			
message beat freq.	0.009715		Hz			
lap period	102.935		seconds		12721	
laps per fortnight	12721		12721 is prime, there is no shorter message synch on an integer second			

Brook's eqn. for 1 micron in Ka

3.25616E-10	seconds	2618880	Two fortnights
9.167131			
0.000109085			
1.49247E-06			
76.3597702			
0.013095901			

Ticket 32 overflow values, 2/2/11

end with databit	chips	count overflow	cumulative	chips hex	cumulative hex	amount ahead
-A						
	0	0	0			
	1	20460	81840	81840 4FEC	13FB0	1.57739E-11
	2	40920	81840	163680 9FD8	27F60	3.15478E-11
	3	61380	81840	245520 EFC4	3BF10	4.73217E-11
	4	81840	81840	327360 13FB0	4FEC0	6.30956E-11
	5	102300	-327360	0 18F9C	0	0
-B						
	0	0	0			
	1	20460	40920	40920 4FEC	9FD8	7.88678E-12

2	40920	40920	81840 9FD8	13FB0	1.57736E-11
3	61380	40920	122760 EFC4	1DF88	2.36604E-11
4	81840	40920	163680 13FB0	27F60	3.15471E-11
5	102300	40920	204600 18F9C	31F38	3.94339E-11
6	122760	40920	245520 1DF88	3BF10	4.73207E-11
7	143220	40920	286440 22F74	45EE8	5.52075E-11
8	163680	40920	327360 27F60	4FEC0	6.30943E-11
9	184140	40920	368280 2CF4C	59E98	7.09811E-11
10	204600	-347820	20460 31F38	4FEC	3.94339E-12
11	225060	40920	61380 36F24	EFC4	1.18302E-11
12	245520	40920	102300 3BF10	18F9C	1.9717E-11
13	265980	40920	143220 40EFC	22F74	2.76037E-11
14	286440	40920	184140 45EE8	2CF4C	3.54905E-11
15	306900	40920	225060 4AED4	36F24	4.33773E-11
16	327360	40920	265980 4FEC0	40EFC	5.12641E-11
17	347820	40920	306900 54EAC	4AED4	5.91509E-11
18	368280	40920	347820 59E98	54EAC	6.70377E-11
19	388740	-347820	0 5EE84	0	0