Spheres Fact Sheet

Synchronized **P**osition **H**old **E**ngage and **R**eorient **E**xperimental **S**atellites

Last Revision Date: **2007/05/20**

SPHERES UNIT							
Mass		*Wet*	*Dry (no tank)*	*Dimension*		*X*	*Y*	*Z*
	kg	4.16	3.55	Maximum Span	cm	21.3	21.3	22.9
CO2 Mass	kg	0.17		*CM offset from GC (Wet)*	mm	0.48	-1.19	1.08
				CM offset from GC (Dry)	mm	0.49	-1.24	3.98

Inertia - Relative to CM		*Wet*	*Dry*		**Inertia - relative to GC**		*Wet*	*Dry*
I_{xx}	kg m^2	2.30E-02	2.19E-02		I_{xx}	kg m^2	2.29E-02	2.18E-02
I_{yy}	kg m^2	2.42E-02	2.31E-02		I_{yy}	kg m^2	2.42E-02	2.31E-02
I_{zz}	kg m^2	2.14E-02	2.13E-02		I_{zz}	kg m^2	2.14E-02	2.13E-02
I_{xy}	kg m^2	9.90E-05	9.90E-05		I_{xy}	kg m^2	9.65E-05	9.64E-05
I_{xz}	kg m^2	-2.95E-04	-2.95E-04		I_{xz}	kg m^2	-2.93E-04	-2.87E-04
I_{yz}	kg m^2	-2.54E-05	-2.54E-05		I_{yz}	kg m^2	-3.11E-05	-4.61E-05

Sensors							
Global Metrology			*IMU - Accelerometers*	No.	3	*IMU - Gyroscopes*	No.	3
Max Update Rate	Hz	5	Max Update Rate	Hz	1000	Max Update Rate	Hz	1000
Nom Update Rate	Hz	3-4	Range	mg	±25.6	Range	deg/s	±83
Max Range	m	3	Resolution	µg/count	12.5	Resolution	deg/s/count	0.0407
Position Accuracy	mm	tbd (~10)	Bandwidth	Hz	300	Bandwidth	Hz	50
Position Variability	mm	2	Noise (0 to 10 Hz) - 1 σ	µg rms	< 7	Noise (0 to 100 Hz) - 1 σ	deg/s/(Hz)$^{1/2}$	< 0.05
Angular Accuracy	deg	tbd (~3)	Noise (10 to 500 Hz) - 1 σ	µg rms	< 70			
Angular Variability	deg	1						

Thrusters	No.	12		**Communications**			
Thrust/Thruster	kgms^{-2}	0.11		Communication Scheme		TDMA	
Thrust variability	kgms^{-2}	0.01		Frame Length	ms	200	
				User Data	bytes/packet	32	
Processors							
DSP				Spacecraft to Spacecraft			
Speed	Mhz	167		Effective Data Rate	kbps	16	
FLOPS (std/peak)	MFLOPS	167 / 1000		*Available*	packets/s	62	
RAM - total	MB	16					
RAM - available	MB	9.7MB free, 6MB heap		Spacecraft to Laptop			
ROM - total	K Words (32bit)	57		Effective Data Rate	kbps	16	
ROM - available	K Words (32bit)	24		*Available*	packets/s	50	

BEACONS								
Fixed Beacons	No.	5		Onboard Beacons	No.	1 Per Sphere		
Timing from IR						Software Prog 10, 30, 50, 70, 90, 110, 130, 150, 170, OFF		
- Beacon No. 1	ms	10		Timing from IR	ms			
- Beacon No. 2	ms	50	Hardware Programmable 10, 30, 50, 70, 90, 110, 130, 150, 170					
- Beacon No. 3	ms	90						
- Beacon No. 4	ms	130		OnBoard Beacon Location (GC)		*X*	*Y*	*Z*
- Beacon No. 5	ms	170			cm	-10.7	0	0