QARMAN BEACON DEFINITION

Frequency: 437.350 MHz (as coordinated by IARU)

Periodicity: every 2 minutes in nominal modes (Phase 0, Phase 1, Phase 2); every 10 minutes in Safe Mode and Low Power Mode.

Modulation: GMSK 9600 Bd

Protocol: AX.25 (UI frames)

Content (information field): 74 bytes in Phase 0, Phase 1, Phase 2, Safe modes; 39 bytes in Low Power Mode. *Table 1* defines the content of the beacon.

From: ON05BE

To: ON4VKI

Space segment transceiver: Li-100 (Astrodev)

Description	Bits	Units	Conversion	Note
Battery voltage	12	V	= value/4096* 3.3 * 3.133	
Temperature OBC	12	°C	=(value-2133)*55/371+30	
Battery current	10	A	= value*5.4311 + 4636.0085	
Reg.Bus 3V3 current	10	A	= value*5.4311 + 4636.0085	
Reg.Bus 5V0 current	10	A	= value*5.4311 + 4636.0085	
Temperature UHF	16	°C	= value	
OBC Mode	4	-	0 = initialisation, 1 = deployment, 2 = Phase 0, 3 = Phase 1, 4 = Phase 2, 5 = Low Power Mode, 6 = Phase 3, 7 = Phase 4, 8 = safe mode	
Reason for mode change	3	-	0 = system reset, 1 = command, 2 = Timeout, 3 = Under-voltage, 4 = Accelerometer, 5 = IMU, 6 = GPS, 7 = Thermocouple	
OBC uptime	32	s	= value	
OBC boot counter	8	-	= value	
OBC packet counter (sent)	16	-	= value	
OBC TC received (correct frame)	8	-	= value	
OBC TC valid (correct command, executed)	8	-	= value	

Systems on	26	-	Bit 0: Platform I2C, Bit 1: Platform interfacing, Bit 2: UHF , Bit 3: GPS, Bit 4: ADCS , Bit 5: IMU , Bit 6: Pressure sensor, Bit 7: UHF communications, Bit 8: GPS communications, Bit 9: XPL, Bit 10 : AeroSDS 3.3V, Bit 11: AeroSDS 5V, Bit 12: Iridium 3.3V, Bit 13: Iridium 27V , Bit 14: UlG, Bit 15: EGSE, Bit 16: EGSE 1 communications, Bit 17: EGSE 2 communications, Bit 18: XPL power good, Bit 19 : AeroSDS 3.3V power good, Bit 20: AeroSDS 5V power good, Bit 21: UHF1, Bit 22: IMU data ready, Bit 23: Accelerometer data ready, Bit 24: Iridium CTS, Bit 25: Iridium DCD	
Deployable status	13	-	Bit 0: -Y antenna, Bit 1: -X antenna, Bit 2: +Y antenna, Bit 3: +X antenna, Bit 4: deployment enable, Bit 5: +X panel, Bit 6: +Y panel, Bit 7: -Y panel, Bit 8: -X panel, Bit 9: +X panel being released, Bit 10: +Y panel being released, Bit 11: -Y panel being released, Bit 12: -X panel being released	Antenna info valid only if AeroSDS is enable; panel info valid only if deployment bit is 1.
Solar panel current +Xi	10	mA	= value *0.5431+528.5093	i is inside in deployed configuration, o is outside in deployed configuration
Solar panel current +Xo	10	mA	= value *0.5431+528.5093	
Solar panel current -Yi	10	mA	= value *0.5431+528.5093	
Solar panel current -Yo	10	mA	= value *0.5431+528.5093	
Solar panel current -Xi	10	mA	= value *0.5431+528.5093	
Solar panel current -Xo	10	mA	= value *0.5431+528.5093	
Solar panel current +Yi	10	mA	= value *0.5431+528.5093	
Solar panel current +Yo	10	mA	= value *0.5431+528.5093	
SolarPanel Voltage +X	10	V	= value *-0.0148+22.7614	
SolarPanel Voltage -Y	10	V	= value *-0.0148+22.7614	
SolarPanel Voltage -X	10	V	= value *-0.0148+22.7614	
SolarPanel Voltage +Y	10	V	= value *-0.0148+22.7614	
ADCS state	2	-	0 = disabled, 1 = enabled, 2 = triggered	ADCS bytes are not transmitted in Low Power Mode
Attitude Estimation Mode	3	-	0 = no attitude estimation, 1 = MEMS rate sensing, 2 = Magnetometer rate filter, 3 = magnetometer rate filter with pitch estimation, 4 = full-state EKF, 5 = magnetometer and fine sun TRIAD algorithm	
Control Mode	3	-	0 = no control, 2 = detumbling control, 3 = Y-momentum stabilized - Initial pitch acquisition, 4 = Y-momentum stabilized - steady state	
CubeControl 3V3 current	16	mA	= value*0.48828125	

CubeControl 5V current	16	mA	= value*0.48828125	
CubeControl Vbat current	16	mA	= value*0.48828125	
Magnetorquer Current	16	mA	= value * 0.1	
Momentum Wheel Current	16	mA	= value * 0.01	
Magnetic Field X	16	nT	=(MOD(value+2^15,2^16)-2^15)*10/1000	
Magnetic Field Y	16	nT	=(MOD(value+2^15,2^16)-2^15)*10/1000	
Magnetic Field Z	16	nT	=(MOD(value+2^15,2^16)-2^15)*10/1000	
Y Angular Rate	16	°/s	=(MOD(value+2^15,2^16)-2^15)*0.01	
Y Wheel Speed	16	rpm	=(MOD(value+2^15,2^16)-2^15)	
Estimated roll angle	16	°	=(MOD(value+2^15,2^16)-2^15)*0.01	
Estimated pitch angle	16	°	=(MOD(value+2^15,2^16)-2^15)*0.01	
Estimated yaw angle	16	°	=(MOD(value+2^15,2^16)-2^15)*0.01	
Estimated X angluar rate	16	°/s	=(MOD(value+2^15,2^16)-2^15)*0.01	
Estimated Y angluar rate	16	°/s	=(MOD(value+2^15,2^16)-2^15)*0.01	
Estimated Z angluar rate	16	°/s	=(MOD(value+2^15,2^16)-2^15)*0.01	
Temperature ADCS (ARM CPU)	16	°C	= value	
Padding	4	-	0	
	592 bits 74 bytes		In Phase 0, 1, 2, Safe modes.	
	312 bits 39 bytes		In Low Power Mode	

Table 1 : Beacon content and conversion.