

KITSUNE Power Budget

20th December 2019

Energy Generation Prediction

Parameters	Abbreviations/Units	Value
Solar cell efficiency	(η_{pv})	0.293
Solar constant	(sPower,[W/m ²])	1366.1
Number of solar cell on each side	(nPX, nPY, nMY, nPY, nMZ)	4,4,12,12,4
Area per one solar panel of satellite	(cArea,[m ²])	0.003018
Energy generation per one orbit	[Wh]	12
Energy loss in blocking diode	[Wh]	2
Efficiency of Electronics devices{dc/dc}	[η_1]	0.95
Total energy available per orbit	[mWh]	9.096

Subsystem/Mission Power Consumption

Payloads and bus	Component / Subsystem	Sub-components/Mods	Operating Voltage [V]	Current [A]	Power [W]	Active Duty Cycle [%]	Power Consumption [W]	Duty Cycle per orbit [h]	Energy [Wh]	
Main Bus System and Camera	Camera board		5	0.250	1.25	2.67	0.03	0.04	0.05	
	Hig Resolution Camera		12	0.450	5.40	1.11	0.06	0.02	0.09	
	Transceiver (C-band)	Standby mode Unreg	7.2	0.139	1.00	100.00	1.00	1.50	1.50	
		Tx Unreg	7.2	1.670	12.02	0.02	0.00	0.04	0.48	
	Transceiver (UHF)	Rx Unreg	7.2	0.022	0.16	70.00	0.11	1.05	0.17	
		Tx Unreg	7.2	0.643	4.63	11.13	0.52	0.17	0.77	
		CW Unreg	7.2	0.061	0.44	30.00	0.13	0.45	0.20	
	OBC and EPS		3.3	0.250	0.83	100.00	0.83	1.50	1.24	
	ADCS	MAI-400		5	0.410	2.05	66.67	1.37	1.00	2.05
		Adapter board PIC18F67J94		3.3	1.00E-02	0.03	66.67	0.02	1.00	0.03
GPS 1			3.3	0.100	0.33	100.00	0.33	1.50	0.50	
SPATIUM-II	CSAC		4.5	0.079	0.36	100.00	0.36	1.50	0.53	
	UHF COM Board	Rx Unreg	7.2	0.022	0.16	80.00	0.13	1.20	0.20	
		Tx Unreg	7.2	0.643	4.63	20.00	0.93	0.30	1.22	
		CW Unreg	7.2	0.061	0.44	30.00	0.13	0.45	0.20	
	EPS/OBC		3.3	0.200	0.66	100.00	0.66	1.50	0.99	
	LoRa	PIC17F1819		3.3	0.030	0.10	11.13	0.01	0.17	0.02
		LoRa Rx		3.3	0.040	0.13	66.67	0.09	1.00	0.13
		Flash Memory		3.3	0.010	0.03	66.67	0.02	1.00	0.03
		LNA		3.3	0.016	0.05	66.67	0.04	1.00	0.05
	TEC Measurement Board PCB	Raspberry Pi		5	0.350	1.75	20.00	0.35	0.30	0.53
SDR (Rx)			5	0.360	1.80	20.00	0.36	0.30	0.54	
SDR (Tx)			5	0.288	1.44	20.00	0.29	0.30	0.43	
GPS 2			3.3	0.100	0.33	20.00	0.07	0.30	0.10	

 Always ON Hardware

Mission Modes – Camera Mission

Payloads and bus	Component / Subsystem	Sub-components/Mods	Operating Voltage [V]	Current [A]	Power [W]	Duty Cycle	Energy(Wh)
Main Bus System and Camera	Camera board		5	0.250	1.25	0.04	0.05
	Hig Resolution Camera		12	0.450	5.40	0.02	0.09
	Transceiver (C-band)		12	1.000	12.00	Low Mode	1.50
	Transceiver (UHF)	Rx Unreg	3.7	0.044	0.16	1.05	0.17
		Tx Unreg	3.7	1.250	4.63	OFF	0.00
		CW Unreg	3.7	0.120	0.44	0.45	0.20
	OBC and EPS		3.3	0.250	0.83	1.50	1.24
	ADCS	MAI-400	5	0.410	2.05	1.00	2.05
		Adapter board PIC18F67J94	3.3	3.93E-07	0.00	1.50	0.00
		GPS 1	3.3	0.100	0.33	1.50	0.50
SPATIUM-II	CSAC		4.5	0.079	0.36	1.50	0.53
	UHF COM Board	Rx Unreg	3.7	0.044	0.16	1.20	0.20
		Tx Unreg	3.7	1.250	4.63	0.30	1.39
		CW Unreg	3.7	0.120	0.44	0.45	0.20
	EPS/OBC		3.3	0.200	0.66	1.50	0.99
	LoRa	PIC17F1819	3.3	0.030	0.10	OFF	0.00
		LoRa Rx	3.3	0.040	0.13	OFF	0.00
		Flash Memory	3.3	0.010	0.03	OFF	0.00
		LNA	3.3	0.016	0.05	OFF	0.00
	TEC Measurement Board PCB	Raspberry Pi	5	0.350	1.75	OFF	0.00
		SDR (Rx)	5	0.360	1.80	OFF	0.00
		SDR (Tx)	5	0.288	1.44	OFF	0.00
		GPS2	3.3	0.100	0.33	1.50	0.50
	Total Consumption						

Mission Modes – C Band Download

Payloads and bus	Component / Subsystem	Sub-components/Mods	Operating Voltage [V]	Current [A]	Power [W]	Duty Cycle	Energy(Wh)
Main Bus System and Camera	Camera board		5	0.250	1.25	OFF	0.00
	Hig Resolution Camera		12	0.450	5.40	OFF	0.00
	Transceiver (C-band)		12	1.000	12.00	0.04+standby	1.98
	Transceiver (UHF)	Rx Unreg	3.7	0.044	0.16	1.05	0.17
		Tx Unreg	3.7	1.250	4.63	OFF	0.00
		CW Unreg	3.7	0.120	0.44	0.45	0.20
	OBC and EPS		3.3	0.250	0.83	1.50	1.24
	ADCS	MAI-400	5	0.410	2.05	Low Power	1.23
		Adapter board PIC18F67J94	3.3	3.93E-07	0.00	1.00	0.00
		GPS 1	3.3	0.100	0.33	1.50	0.50
SPATIUM-II	CSAC		4.5	0.079	0.36	1.50	0.53
	UHF COM Board	Rx Unreg	3.7	0.044	0.16	1.20	0.20
		Tx Unreg	3.7	1.250	4.63	OFF	0.00
		CW Unreg	3.7	0.120	0.44	0.45	0.20
	EPS/OBC		3.3	0.200	0.66	1.50	0.99
	LoRa	PIC17F1819	3.3	0.030	0.10	OFF	0.00
		LoRa Rx	3.3	0.040	0.13	OFF	0.00
		Flash Memory	3.3	0.010	0.03	OFF	0.00
		LNA	3.3	0.016	0.05	OFF	0.00
	TEC Measurement Board PCB	Raspberry Pi	5	0.350	1.75	OFF	0.00
		SDR (Rx)	5	0.360	1.80	OFF	0.00
		SDR (Tx)	5	0.288	1.44	OFF	0.00
		GPS2	3.3	0.100	0.33	1.50	0.50
	Total Consumption						

Mission Modes – SPATIUM Uplink and Mission

Payloads and bus	Component / Subsystem	Sub-components/Mods	Operating Voltage [V]	Current [A]	Power [W]	Duty Cycle	Energy(Wh)
Main Bus System and Camera	Camera board		5	0.250	1.25	OFF	0.00
	Hig Resolution Camera		12	0.450	5.40	OFF	0.00
	Transceiver (C-band)		12	1.000	12.00	Standby	1.50
	Transceiver (UHF)	Rx Unreg	3.7	0.044	0.16	1.05	0.17
		Tx Unreg	3.7	1.250	4.63	OFF	0.00
		CW Unreg	3.7	0.120	0.44	0.45	0.20
	OBC and EPS		3.3	0.250	0.83	1.50	1.24
	ADCS	MAI-400	5	0.410	2.05	1.50	1.23
		Adapter board PIC18F67J94	3.3	3.93E-07	0.00	1.50	0.00
		GPS 1	3.3	0.100	0.33	1.50	0.50
SPATIUM-II	CSAC		4.5	0.079	0.36	1.50	0.53
	UHF COM Board	Rx Unreg	3.7	0.044	0.16	1.20	0.20
		Tx Unreg	3.7	1.250	4.63	OFF	0.00
		CW Unreg	3.7	0.120	0.44	0.45	0.20
	EPS/OBC		3.3	0.200	0.66	1.50	0.99
	LoRa	PIC17F1819	3.3	0.030	0.10	0.17	0.00
		LoRa Rx	3.3	0.040	0.13	1.00	0.00
		Flash Memory	3.3	0.010	0.03	0.00	0.00
		LNA	3.3	0.016	0.05	1.00	0.00
	TEC Measurement Board PCB	Raspberry Pi	5	0.350	1.75	0.50	0.88
		SDR (Rx)	5	0.360	1.80	0.50	0.90
		SDR (Tx)	5	0.288	1.44	0.50	0.72
		GPS2	3.3	0.100	0.33	1.50	0.50
Total Consumption							9.75

Mission Modes – SPATIUM Data Download

Payloads and bus	Component / Subsystem	Sub-components/Mods	Operating Voltage [V]	Current [A]	Power [W]	Duty Cycle	Energy(Wh)
Main Bus System and Camera	Camera board		5	0.250	1.25	OFF	0.00
	Hig Resolution Camera		12	0.450	5.40	OFF	0.00
	Transceiver (C-band)		12	1.000	12.00	Standby	1.50
	Transceiver (UHF)	Rx Unreg	3.7	0.044	0.16	1.05	0.17
		Tx Unreg	3.7	1.250	4.63	OFF	0.00
		CW Unreg	3.7	0.120	0.44	0.45	0.20
	OBC and EPS		3.3	0.250	0.83	1.50	1.24
	ADCS	MAI-400	5	0.410	2.05	1.50	1.23
		Adapter board PIC18F67J94	3.3	3.93E-07	0.00	1.50	0.00
		GPS 1	3.3	0.100	0.33	1.50	0.50
SPATIUM-II	CSAC		4.5	0.079	0.36	1.50	0.53
	UHF COM Board	Rx Unreg	3.7	0.044	0.16	1.20	0.20
		Tx Unreg	3.7	1.250	4.63	OFF	0.00
		CW Unreg	3.7	0.120	0.44	0.45	0.20
	EPS/OBC		3.3	0.200	0.66	1.50	0.99
	LoRa	PIC17F1819	3.3	0.030	0.10	OFF	0.00
		LoRa Rx	3.3	0.040	0.13	OFF	0.00
		Flash Memory	3.3	0.010	0.03	OFF	0.00
		LNA	3.3	0.016	0.05	OFF	0.00
	TEC Measurement Board PCB	Raspberry Pi	5	0.350	1.75	0.50	0.88
		SDR (Rx)	5	0.360	1.80	0.50	0.90
		SDR (Tx)	5	0.288	1.44	0.00	0.00
		GPS2	3.3	0.100	0.33	1.50	0.50
	Total Consumption						

Mission Modes – LoRa S&F Mission

Payloads and bus	Component / Subsystem	Sub-components/Mods	Operating Voltage [V]	Current [A]	Power [W]	Duty Cycle	Energy(Wh)
Main Bus System and Camera	Camera board		5	0.250	1.25	OFF	0.00
	Hig Resolution Camera		12	0.450	5.40	OFF	0.00
	Transceiver (C-band)		12	1.000	12.00	Standby	0.60
	Transceiver (UHF)	Rx Unreg	3.7	0.044	0.16	1.05	0.17
		Tx Unreg	3.7	1.250	4.63	OFF	0.00
		CW Unreg	3.7	0.120	0.44	0.45	0.20
	OBC and EPS		3.3	0.250	0.83	1.50	1.24
	ADCS	MAI-400	5	0.410	2.05	1.50	1.23
		Adapter board PIC18F67J94	3.3	3.93E-07	0.00	1.50	0.00
		GPS 1	3.3	0.100	0.33	1.50	0.50
SPATIUM-II	CSAC		4.5	0.079	0.36	1.50	0.53
	UHF COM Board	Rx Unreg	3.7	0.044	0.16	1.20	0.20
		Tx Unreg	3.7	1.250	4.63	OFF	0.00
		CW Unreg	3.7	0.120	0.44	0.45	0.20
	EPS/OBC		3.3	0.200	0.66	1.50	0.99
	LoRa	PIC17F1819	3.3	0.030	0.10	1.50	0.15
		LoRa Rx	3.3	0.040	0.13	1.50	0.20
		Flash Memory	3.3	0.010	0.03	1.50	0.05
		LNA	3.3	0.016	0.05	1.50	0.08
	TEC Measurement Board PCB	Raspberry Pi	5	0.350	1.75	OFF	0.00
		SDR (Rx)	5	0.360	1.80	OFF	0.00
		SDR (Tx)	5	0.288	1.44	OFF	0.00
		GPS2	3.3	0.100	0.33	1.50	0.50
Total Consumption							6.84