

BIRDS-4 Power Budget

April 7, 2019

BIRDS-4 Power Generation

Parameters	Abbreviations/Units	Values
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, nPZ, nMZ)	2
Area per one solar panel of satellite	(cArea,[m ²])	0.003018
CubeSat Power Generation	[mW]	1640
Energy available per one orbit	[mWh]	1640
Energy loss in blocking diode	[mWh]	360
Efficiency of Electronics devices{dc/dc}	$[\eta_1]$	0.8
Total energy available per orbit	[mWh]	1024

BIRDS-4 Sybsystem Level Power Budget

COMPONENTS	Maximum power allocated (mW)	Duration per orbit (h)	Energy per Orbit (mWh)
OBC-EPS and FAB	410	1.5	615
COM UHF (RX)	160	1.05	168
COM UHF (TX-CW)	450	0.45	202.5
COM UHF (TX-Telemetry)	4200	0.117	491.4
APRS-DP & SF-WARD (RX)	430	0.25	107.5
APRS-DP & SF-WARD (TX)	1070	0.11	117.7
CAM Module	300	0.017	5.1
ICU(CAM MCU also ON) Mission	100	1	100
Mission Boss	20	1.5	30

COMPONENTS	Maximum power allocated (mW)	Duration per orbit (h)	Energy per Orbit (mWh)
TMCR Mission(all devices ON)	50	1.5	75
PSC Mission	25	1	25
HNT Mission	100	1.5	150
ADCS Stabilization(MTQ, MCU, sensors ON)	100	1	100
ADCS Determination (MCU and sensors ON)	200	1.5	300
ADCS Pointing (RW,MTQ,MCU,sensors ON)	700	0.12	84
GPS(ADCS chip ON)	160	1.5	240
Burner Circuit	12600 (one time)	2.78×10^{-4}	3.5

Mission Power budget

Command uplink and Beacon	985.5
Image and sensor data Downlink	1476.9
Camera Mission (mode 1 and 2)	1290.6
Camera Mission (mode 3 and 4)	1314.6
ADCS Determination	1525.5
ADCS Stabilization	1625.5

APRS-DP and SF-WARD Mission	1240.7
HNT Mission	795
PSC Mission	1040.5
TMCR Mission	1330.5
ICU Mission	1085.5
Deployment(30 mins)	618.5
Average Energy consumption	1194.10833