

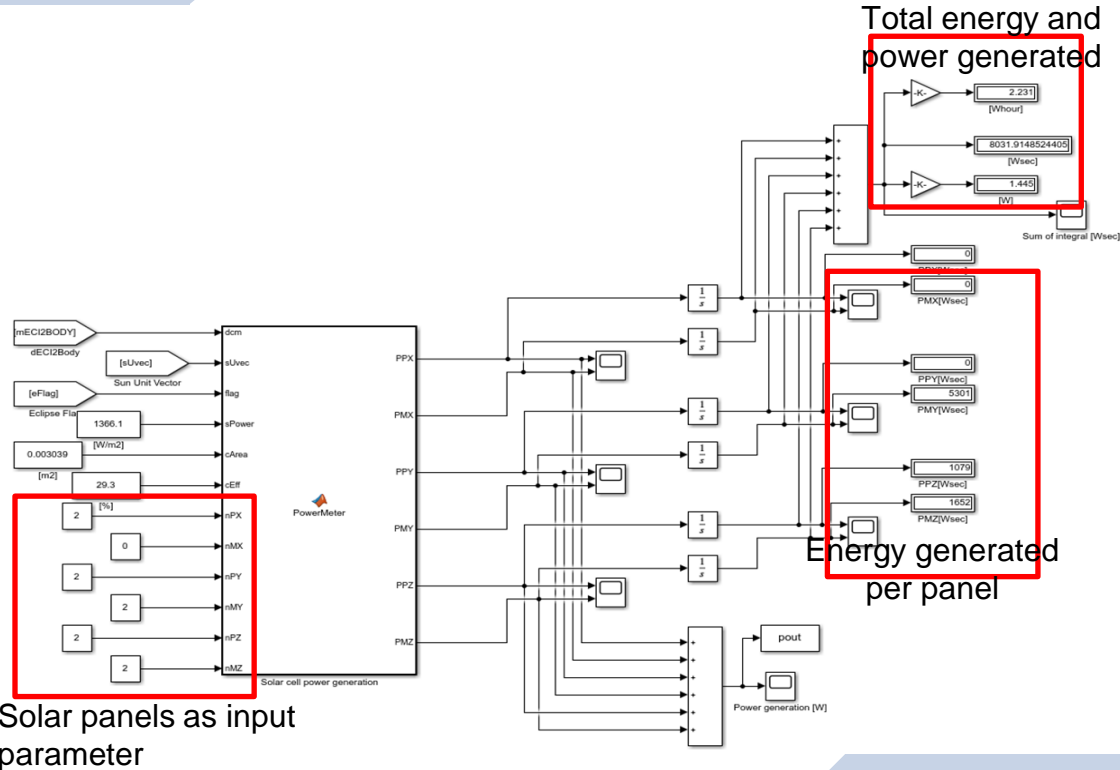
Power generation simulation using MATLAB

There were three simulation conditions considered:

- 1. when all 5 panels are working
- 2. when 4 panels are working (no +Z)
- 3. when 3 panels are working (no -Z)

Based on the conditions, MATLAB shall output total energy and power generated for a 90-minute orbit.

Sunlit and eclipse time are considered in the simulation.



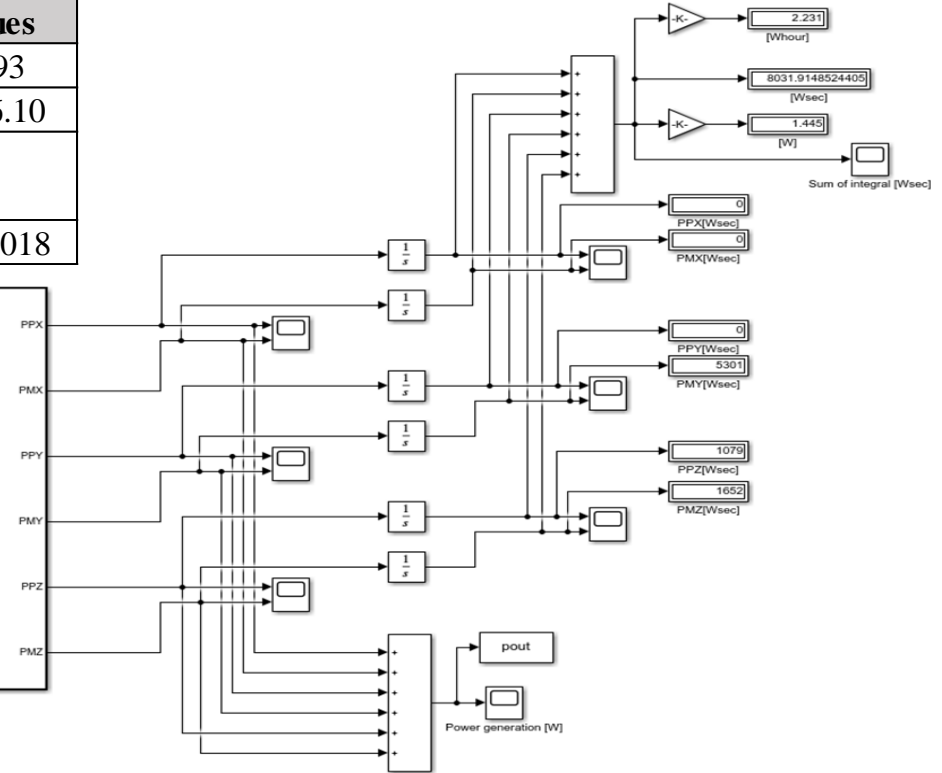
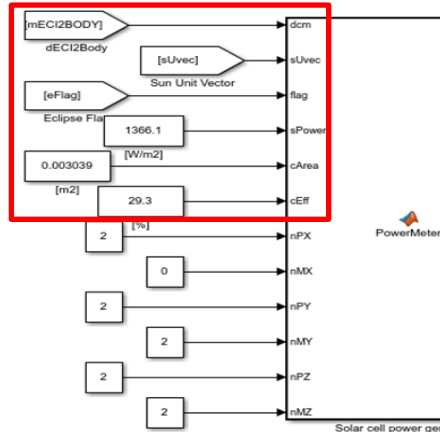


Power generation simulation using MATLAB

MATLAB simulation has the following fixed parameters:

Parameters	Abbreviations/Units	Values
Solar cell efficiency	cEff	0.293
Solar constant	sPower,[w/m ²]	1,366.10
Number of solar cells per panel	nPX, nPY, nMY, nPZ, nMZ	2
Solar cell area per panel	cArea,[m ²]	0.003018

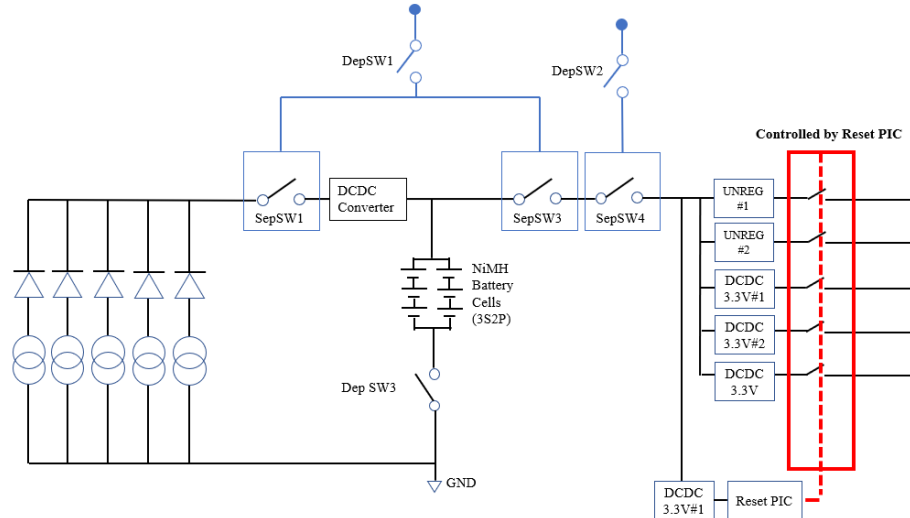
Input
parameters
to the
simulation



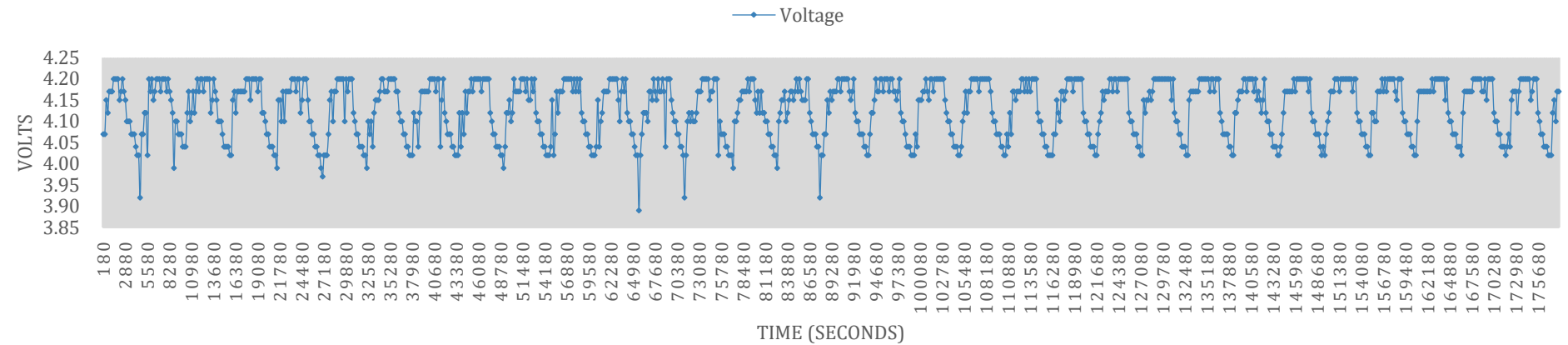
Result Summary

Result Summary	Unit	Conditions		
		5 solar panels	4 solar panels	3 solar panels
Total generated energy (from MATLAB simulation), A	mWh	2,184	1,887	1,428
Energy consumed by blocking diode, B	mWh	360		
BCR efficiency (based on buck-boost dc/dc converter specification), C	%	80		
Total energy after BCR	mWh	1,411	1,178	821

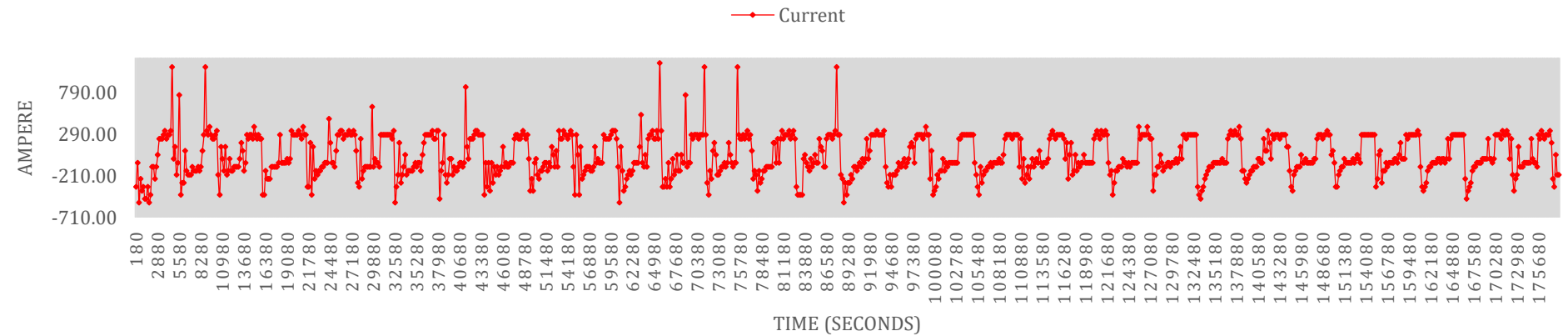
Total energy after BCR = $(A - B) \cdot C$



VOLTAGE



CURRENT



Power consumption calculation using EM

COMPONENTS	OBC- EPS and FAB	COM UHF (RX)	COM UHF (TX- CW)	COM UHF (TX- Telemetry)	APRS- DP SF- WARD (RX)	APRS- DP SF- WARD (TX)	CAM Module	ICU(C AM MCU also ON) Mission	TMCR Mission(all device s ON)	PSC Mission	HNT Mission	ADCS (Stabilization- MTQ, MCU, sensors ON)	ADCS (MCU and sensors ON)	ADCS (Pointing RW,MT Q,MCU, sensors ON)	GPS(A DCS chip ON)	Detumbling Mode (MCU and MTQ)	Mission Boss	Battery heater	TOTAL ENERGY CONSUMPTION per Mission (mWh)
Maximum power allocated (mW)	428	144	280	4620	135	1400	300	0.891	50	16.5	500	0.75	188	1000	240	467	80	440	
Duration per orbit (h)	1.5	1	0.5	0.13	0.25	0.11	0.017	0.056	1.5	1.5	0.25	1	1.5	0.5	1.5	1.5	1.5	0.25	
Energy per Orbit (mWh)	642	144	140	600.6	33.75	154	5.1	0.0499	75	24.75	150	0.75	282	500	360	700.5	120	110	1438
Command uplink and Beacon	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON	ON	

Energy Generation/Consumption Summary

	Energy generation			Energy consumption per orbit
	5 panels	4 panels	3 panels	
Calculation	1411	1178	821	1438 (BIRDS4-EM)
BIRDS-3 (orbit measurement)	1396	1116*	837.6*	1310
BIRDS-4 (orbit measurement)	1513	1210*	953*	1483 (w/ heater)

*estimated from the 5 panels value