



DETAILED DESIGN OF DETACHABLE PHOTO-VOLTAIC POWER GENERATION PANEL FOR PNSS-1 (PHASE-2)

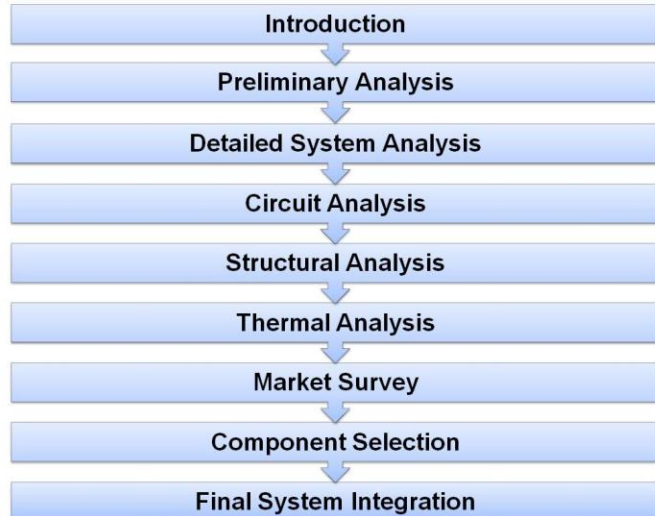


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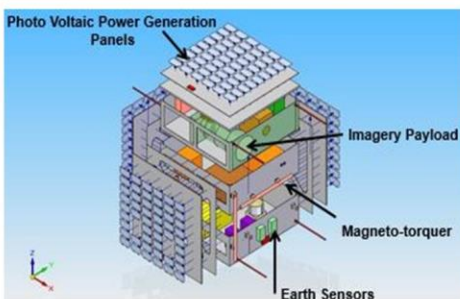
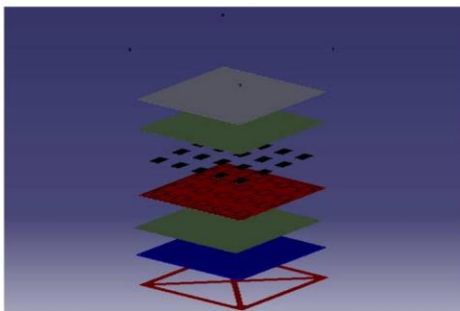
SYNOPSIS

This project is the second phase of Pakistan National Student Satellite (PNSS-1) under patronage of SUPARCO. It is based on MoU signed between NUST (CAE) and SUPARCO for detailed design of detachable photo-voltaic power generation panels. This project produces a detailed design of the solar power unit considering the requirements and constraints of a spacecraft in Low Earth Orbit.

METHODOLOGY

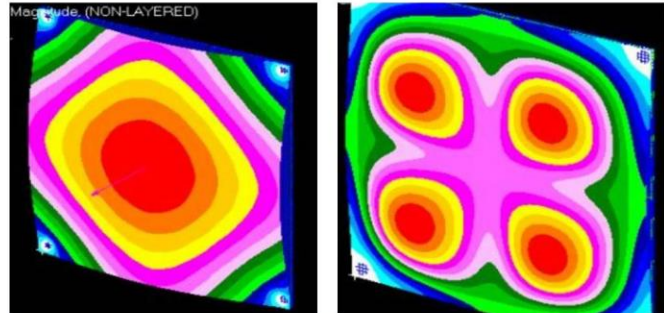


CAD MODELING



STRUCTURAL ANALYSIS

Deformation in different configurations of baseplate



RESULTS

Conditions	No load applied	Maximum load applied	Single cell malfunction
Voltage across solar array	67.5 V	60.27 V	56.02 V
Current produced by solar array	1.04 A	1.008 A	60.75 W
Power at BOL	70.2 W	60.75 W	56.46 W
Computed power at BOL	69.4 W	60.27 W	55.82 W
Power at EOL	68.9 W	58.9 W	54.774 W
Computed power at EOL	67.3 W	58.46 W	54.14 W

Configuration	Mass (kg)	First Modal Frequency (Hz)	Maximum Deformation (mm)	Minimum Deformation (mm)
Thin Shell Hollow	0.578	21.2	38.2	2.54
Thin Shell with Reinforcements (plus)	0.5817	59.61	4.33	0.289
Thin Shell with Reinforcements (diagonal)	0.5824	61.3	4.21	0.24
Square Honeycomb	0.6259	94.49	1.54	0.103
Hexagonal Honeycomb	0.641	99.8	1.51	0.101

CONCLUSIONS

- ❑ A detailed design of dimensions 450 x 450 mm was successfully developed capable of fulfilling 50 W design electric power requirement over a design life of one year
- ❑ Structural and thermal analysis were carried out to confirm the capability of solar panel to withstand thermal and inertial loads