Abstract

The design of power subsystem for low earthing orbit satellite "LEO" which includes solar array, battery, power conditioning unit and cables. This is performed by determining the area and mass of solar array, the capacity and mass of battery, the mass of power conditioning unit, and the mass of cables used in electrical power subsystem. This thesis presents comparison between using Silicon solar cell, single junction gallium arsenide solar cell, and multi- junction gallium arsenide solar cell, as applied to Egyptsat-1 satellite to determine the best solar cell in spacecraftengineering.

This thesis presents a method of simulating photovoltaic module by tacking the manufacturer specified data sheet at standard test condition as inputs. A method for estimating the unknown parameters of the generalized single diode solar cell model is described. The three parameters $I_{ph}, I_s, and\ R_s$ of the photovoltaic module are calculated with the aid of three remarkable points on the photovoltaic I-V characteristics.

A method for estimating the unknown parameters of the general single diode solar cell model using Newton's raphson method is described. The four parameters $I_{ph}, I_s, R_s, and\ R_{sh}$ of the photovoltaic module are calculated with the aid of three remarkable points on the photovoltaic I-V characteristics and make $P_{max,m} = P_{max,e}$, and explain the relation of $I_{ph}\ and\ I_s$as a function of $R_s\ and\ R_{sh}$. The developed model allows the predication of photovoltaic module behavior with respect to changes on environmental and physical parameters. The main idea of this thesis is to make a computer digital model instead of real model for photovoltaic module used in Egyptsat-1 satellite.