Project #	Project Name	Project Track	Project Family
P13271	AMSAT-MPPT	Vehicle Systems and Technologies	Vehicle Systems and Technologies
Start Term	**Team Guide**	**Project Sponsor**	**Doc. Revision**
2012-2	Leo Farnand, Vince Burolla	AMSAT	A

Project Description

Project Background:

The AMSAT Maximum Power Point Tracker (MPPT) project originated from interactions between team members and the Radio Amateur Satellite Corporation (AMSAT). The project has tasked team members to design and build an MPPT for implementation on the FOX-2 satellite to be launched in 2015. The AMSAT MPPT must be able to maximize the amount of power from the FOX-2 photovoltaic panels and survive the harsh environment of Low Earth Orbit (LEO). The goal of this project is to design a more efficient and capable MPPT for the FOX-2 spacecraft.

Team members have previously worked with AMSAT on other projects that support the FOX series satellites. In addition, team members worked on the RITCHIE-1 high altitude balloon project built by the RIT Amateur Radio Club (K2GXT) that flew to 96,305 feet above sea level.

Problem Statement:

The proposed MPPT circuit must find and track the maximum power point of the solar panels during flight and provide system status telemetry to the Internal Housekeeping Unit (IHU). The project deliverables include a working engineering prototype designed for flight that should be capable of withstanding the expected temperature and radiation environment.

Objectives/Scope:

1. Locate and track the solar panel's maximum power point efficiently
2. Provide the specified output bus voltage
3. Provide health and status data to the FOX-2 Internal Housekeeping Unit

Deliverables:

- MPPT Printed Circuit Board (Engineering Model)
- All Documentation
- Schematics/PCB Layout/Firmware

Expected Project Benefits:

- AMSAT will receive a more capable and efficient MPPT design
- Modifiable design for implementation into future FOX satellites

Core Team Members:

- Brenton Salmi (EE - Chief Engineer)
- Bryce Salmi (EE - Project Manager)
- Ian MacKenzie (EE - Documentation Manager)
- Dan Corriero (EE - Team Facilitator)

Strategy & Approach

Assumptions & Constraints:

1. Engineering board must meet current FOX-2 mission requirements in planned orbit

2. Radiation testing is not possible due to budget – radiation tolerance design consideration is acceptable

Issues & Risks:

- Failure of the MPPT feedback design
  - Efficiency & tracking accuracy
- MPPT Circuit utilizes too much PCB area for FOX-2 specifications
- Part lead times may hinder construction
- Extreme Environmental Conditions
  - Radiation (30 krad TID)
  - Temperature (-60° C to 60° C)
- MPPT and IHU communications failure