HASP Payload Specification and Integration Plan

Payload Title: Micro Scale Space Radiation Detectors

Payload Class: **Small** Large (circle one)

Payload ID: #06

Institution: La Tech University

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Submit Date: 16 June 2008

I. Mechanical Specifications:

A. Measured weight of the payload (not including payload plate)

2lb

B. Provide a mechanical drawing detailing the major components of your payload and specifically how your payload is attached to the payload mounting plate

The major components of the radiation detection system are a circuit board and four photomultiplier tubes. The circuit board will be completely enclosed in an electrical box with dimensions 5.75 inches long, 4.5 inches wide and 6 inches tall. The box will be mounted on the payload mounting plate with four stainless steel machine screws. The narrow box side will have four BNC and four SHV bulkhead connectors installed to provide connectivity to the photomultiplier tubes. (See attached basic diagram) The photomultiplier tubes will be mounted parallel to the top of the box. The tubes are 14 mm in diameter with an overall length of 115mm.

C. If you are flying anything that is potentially hazardous to HASP or the ground crew before or after launch, please supply all documentation provided with the hazardous components (i.e. pressurized containers, radioactive material, projectiles, rockets…)

Since we are flying a radiation detector system, we would like to know if any of the other payloads will contain radioactive material.

D. Other relevant mechanical information

II. Power Specifications:

A. Measured current draw at 30 VDC

The total input current for the system will be 460 mA.

B. If HASP is providing power to your payload, provide a power system wiring diagram starting from pins on the student payload interface plate EDAC 516 connector through your power conversion to the voltages required by your subsystems.

The EDAC 516 power channels will provide 30 V to four DC/DC converters. Two DC/DC converters will step down the 30V to 9 V to power the system pulse shaping circuitry while the other two DC/DC converters will step down the 30V to 5 V to power the system microcontroller and the photomultiplier tubes. An additional DC/DC converter will step up the 5 V to 1000 V to supply the high voltages required by the photomultiplier tubes. (See attached wiring diagram) The input current to the converters are 115 mA each. The total input current for the system is 460 mA.

C. Other relevant power information

III. Downlink Telemetry Specifications:

A. Serial data downlink format: **Stream** Packetized (circle one)

B. Approximate serial downlink rate (in bits per second)

We will be sending the HASP system 16 bytes each second (see byte format below in section C), so this works out to a bit rate of 128 bits per second.

C. Specify your serial data record including record length and information contained in each record byte.

Our serial data record will contain 16 bytes, specified as follows:

Byte	Description
1	Weekday
2	Year 1
3	Year 2
4	Month 1
5	Month 2
6	Day 1
7	Day 2
8	Hour 1
9	Hour 2
10	Minute 1
11	Minute 2
12	Second 1
13	Second 2
14	Temperature 1
15	Temperature 2
16	Checksum

D. Number of analog channels being used:

None

E. If analog channels are being used, what are they being used for?

F. Number of discrete lines being used:

Other than those mentioned in the interface manual for power on and off commands, no other discrete lines are required.

G. If discrete lines are being used what are they being used for?

H. Are there any on-board transmitters? If so, list the frequencies being used and the transmitted power.

No onboard transmitters.

I. Other relevant downlink telemetry information.

IV. Uplink Commanding Specifications:

A. Command uplink capability required: Yes **No** (circle one)

B. If so, will commands be uplinked in regular intervals: Yes **No** (circle one)

C. How many commands do you expect to uplink during the flight (can be an absolute number or a rate, i.e. *n commands per hour*)

D. Provide a table of all of the commands that you will be uplinking to your payload

E. Are there any on-board receivers? If so, list the frequencies being used.

No onboard receivers.

F. Other relevant uplink commanding information.

V. Integration and Logistics

A. Date and Time of your arrival for integration:

4 August 08

B. Approximate amount of time required for integration:

One hour.

C. Name of the integration team leader:

Scott Pellegrin

D. Email address of the integration team leader:

smp019@latech.edu

E. List **ALL** integration participants (first and last names) who will be present for integration with their email addresses:

Dr Scott Forrest scott.forrest@barksdale.af.mil sforrest9123@yahoo.com

Dr Davis Harbour dharbour@latech.edu

F. Define a successful integration of your payload:

Successful integration will be defined as follows:
1) **Turn power on and off to the payload.**
2) **Verify system microcontroller operation i.e. receive time of day and temperature data.**

G. List all expected integration steps:
1) **Connect payload to mounting outrigger.**
2) **Hook up power and serial data connections.**
3) **Turn power on.**
4) **Turn power off.**

H. List all checks that will determine a successful integration:

1) Verify temperature sensor and system microcontroller operation by receiving time of day and temperature data from system microcontroller.

I. List any additional LSU personnel support needed for a successful integration other than directly related to the HASP integration (i.e. lifting, moving equipment, hotel information/arrangements, any special delivery needs…):

No other personnel support will be required.

J. List any LSU supplied equipment that may be needed for a successful integration:

None.

Additional Notes:

Detector Data

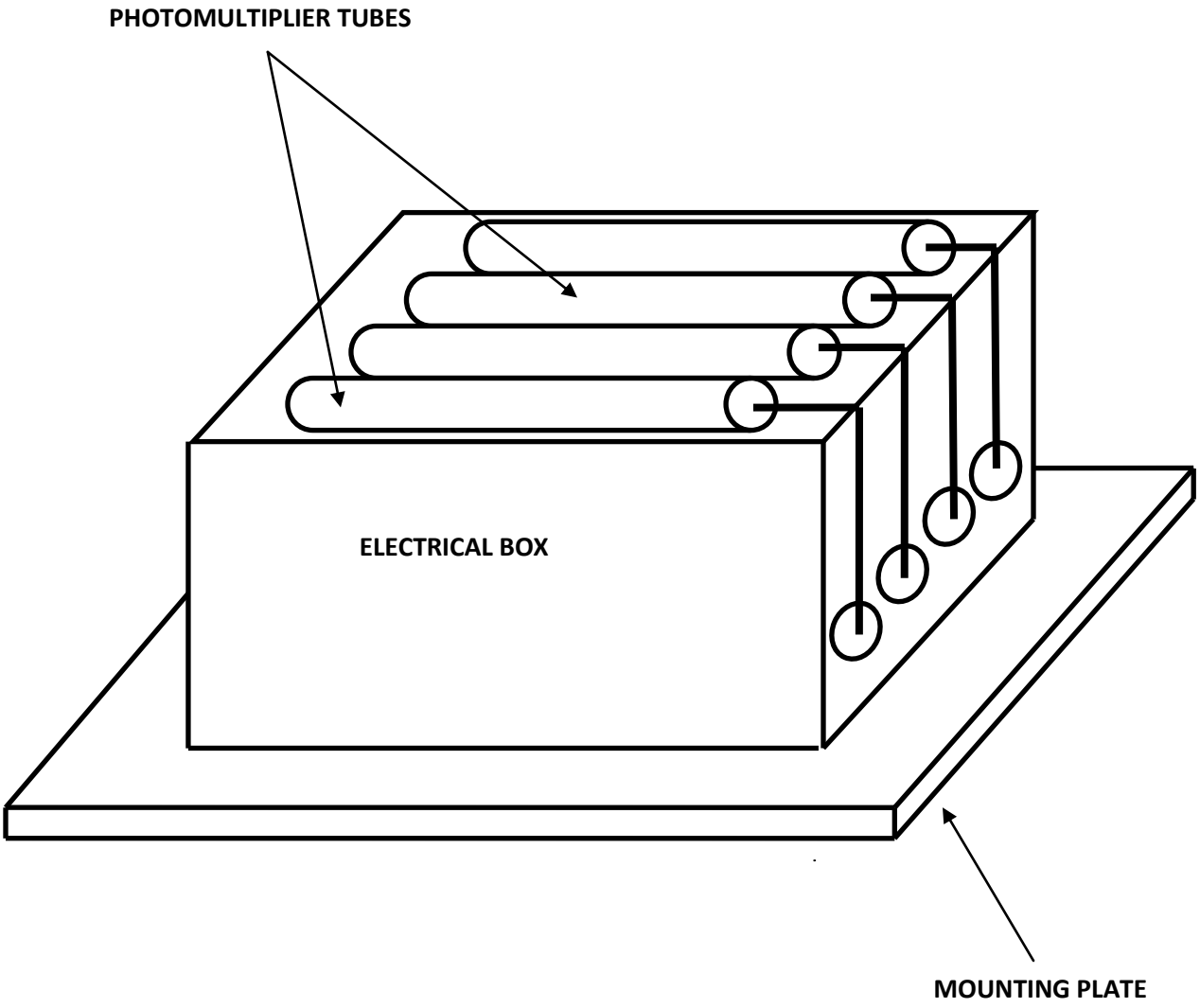
Our payload contains a system microcontroller that will store data received from the radiation detectors on a hard drive. The 1200 baud rate for small payloads is not fast enough for the count rates we will be receiving from the detectors. Therefore, we will depend on the time of day and temperature data received through the serial port to ensure the microcontroller is operating properly.

Temperature Control

All components inside the electrical box are rated down to - 55 C except the microcontroller which is only rated to - 20 C. We believe that the heat generated from the DC/DC converters and other components inside the box will keep the temperature well above - 20 C.

BASIC DIAGRAM – PAYLOAD #6

(DRAWING NOT TO SCALE)



WIRING DIAGRAM - EDAC 516/PAYLOAD #6 POWER INTERFACE