SUMMARY

This issue of the ALSEP Array E Power Budget provides the Best Estimate Information on the power distribution within the components of the Data, Power and Experiment Subsystems.

The information is presented as follows:

Table I  Data Subsystem Power
Table II  Experiment Power
Table III System Power Distribution
Figures I through V  Experiment Power Profiles

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Approved by:  O. M. J. Delmian
<table>
<thead>
<tr>
<th>Component</th>
<th>Day</th>
<th>Night</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receiver</td>
<td>0.90</td>
<td>0.90</td>
</tr>
<tr>
<td>Command Decoder</td>
<td>0.65</td>
<td>0.65</td>
</tr>
<tr>
<td>Data Processor</td>
<td>2.30</td>
<td>2.30</td>
</tr>
<tr>
<td>Transmitter (Teledyne)</td>
<td>9.00</td>
<td>9.00</td>
</tr>
<tr>
<td>Diplexer Switch</td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>Harness Losses*</td>
<td>0.30</td>
<td>0.35</td>
</tr>
<tr>
<td>PDU**</td>
<td>1.75</td>
<td>2.50</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>15.00</td>
<td>15.80</td>
</tr>
</tbody>
</table>

* Manganin insert losses plus arbitrary 0.25 watts for copper and connector losses.

** Includes 0.075 watts for quiescent load of PDU active circuits.

All powers are in watts.
### TABLE II A

**STEADY STATE EXPERIMENT POWERS**

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Operate Power (watts)</th>
<th>Standby Power (watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day</td>
<td>Night</td>
</tr>
<tr>
<td>LSG</td>
<td>2.75**</td>
<td>8.75***</td>
</tr>
<tr>
<td>LMS</td>
<td>10.01</td>
<td>11.00*</td>
</tr>
<tr>
<td>LEAM</td>
<td>3.16</td>
<td>6.6</td>
</tr>
<tr>
<td>HFE</td>
<td>3.90</td>
<td>10.70</td>
</tr>
<tr>
<td>LSPE</td>
<td>5.3</td>
<td>5.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>25.12</td>
<td>42.35</td>
</tr>
</tbody>
</table>

* Includes 1.5 watts backup heater.  
** Minimum (LSG proportional heater see Figure 5B)  
*** Maximum (LSG proportional heater see Figure 5B)

### TABLE II B

**MAXIMUM TRANSIENT EXPERIMENT POWERS** *

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Operate Power (Watts)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day</td>
<td>Night</td>
</tr>
<tr>
<td>LSG</td>
<td>10.0</td>
<td>8.75**</td>
</tr>
<tr>
<td>LMS</td>
<td>10.5</td>
<td>11.0**</td>
</tr>
<tr>
<td>LEAM</td>
<td>3.16**</td>
<td>6.6**</td>
</tr>
<tr>
<td>HFE</td>
<td>6.12</td>
<td>10.7**</td>
</tr>
<tr>
<td>LSPE</td>
<td>6.97</td>
<td>6.97</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>36.75</td>
<td>44.02</td>
</tr>
</tbody>
</table>

* Does not include turn on transients.  
** Same as Steady State Experiment Powers
## TABLE II

**SYSTEM POWER DISTRIBUTION**

<table>
<thead>
<tr>
<th></th>
<th>Day (watts)</th>
<th>Night (watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LSPE On</td>
<td>LSPE Off</td>
</tr>
<tr>
<td></td>
<td>Steady</td>
<td>Transient</td>
</tr>
<tr>
<td>Data Subsystem</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Table I)</td>
<td>15.00</td>
<td>15.00</td>
</tr>
<tr>
<td></td>
<td>15.00</td>
<td>15.00</td>
</tr>
<tr>
<td>Experiments (Table II)</td>
<td>25.12</td>
<td>36.75</td>
</tr>
<tr>
<td></td>
<td>42.35</td>
<td>44.02</td>
</tr>
<tr>
<td>Total PCU Load</td>
<td>40.12</td>
<td>51.75</td>
</tr>
<tr>
<td></td>
<td>58.15</td>
<td>59.82</td>
</tr>
<tr>
<td>PCU Losses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2.25 W + 10% Load)</td>
<td>6.26</td>
<td>7.43</td>
</tr>
<tr>
<td></td>
<td>8.07</td>
<td>8.23</td>
</tr>
<tr>
<td>Minimum Reserve Watts</td>
<td>2.00</td>
<td>2.00</td>
</tr>
<tr>
<td></td>
<td>2.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Total Power Required</td>
<td>48.38</td>
<td>61.18</td>
</tr>
<tr>
<td></td>
<td>68.22</td>
<td>70.05</td>
</tr>
<tr>
<td>Assumed RTG EOM Power</td>
<td>72.00</td>
<td>72.00</td>
</tr>
<tr>
<td>Reserve Power Available</td>
<td>23.62</td>
<td>10.82</td>
</tr>
</tbody>
</table>

* Transients include all transients in excess of 128 mS, for example power consumption due to motors operating for short periods of time.
Figure 1: LEAM Power Profile

- Power (Watts)
  - 12
  - 10
  - 8
  - 6
  - 4
  - 2

- Typical
  - 5.4 W

- 320 mA Allowable

- Dust Cover

- Mirror Cover

- 0.46 W Allowable

- 6.60 W

- On at 0°F

- Off at 9°F

- Heater

- Day

- Night

- Standby

- Day or Night

- 5.0 W

- Increase due to extra power consumption by logic.
Figure 2 LMS Power Profile
Figure 3: LSPE Power Profile

- **5.3W**
  - LSP Power ON
  - 1 pulse every 30s

- **6.1W**
  - Geophone Cal. Pulses ON
  - Transmitter Cal. Pulses ON

- **5.3W**
  - Passive Listening Mode

Additional annotations:
- Turn on transient < 2ms
- 30 hours
- 1.5 sec
Figure 4. HFE SN7 - ARRAY E
MEASURED POWER PROFILE.

Legend:
- Lunar Day
- Lunar Dawn/Dusk
- Lunar Night

Thermal plate temperature:
- > 27-33°C
- > 17-23°C
- < 27-33°C

Power (Watts)

- 11.23W
- 10.46W
- 10.26W
- 8.8W
- 5.16W
- 5.12W
- 5.1W
- 4.65W
- 4.35W
- 2.31W
- 2.05W
- 1.51W

54 sec

90th frame mark

Power

- Off
- Standby
- Survival

Initialised in mode 1
Full sequence

Mode 1:
- Probe heater off

Mode 2:
- Probe heater on

Mode 3:
- Probe heater off

Probes:
- L.K. select
- Probe heater advance

Frame marks:
- 0-15
- 16-90

Average power:
- 3.69W
- 3.89W
- 1.15W
- 0.33W
Figure 5A LSG normal operating power curve.

Operation of mass change motors must be prohibited at low reserve power situations.

Lunar noon

Lunar day

Lunar night

Days

Watts (max)
Figure 58 LSG
Initial turn on & First Lunar Day Power Curve

Instrument turn on

Lunar Noon

Mass change motor

Watts (worst case)

LSG Command Decoder Operational

Hours