CubeSat High Speed Downlink Meeting

AstroDev Products and Development

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<table>
<thead>
<tr>
<th>Traditional Spacecraft Approach</th>
<th>AstroDev Approach</th>
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</thead>
<tbody>
<tr>
<td>• Buy 1 or 2 Flight Units ($50k)</td>
<td>• Buy 10 Flight Units ($50k)</td>
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<tr>
<td>• Buy 1 Qual Unit ($25k)</td>
<td>• Radios are a commodity</td>
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<td>• Radios are application specific</td>
<td>• Radios are agnostic</td>
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<td>• Radios fit only one place</td>
<td>• Open Software/Example Implementations</td>
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<tr>
<td>• Closed Software/No Examples</td>
<td>• <strong>Fighting to keep costs low</strong></td>
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<tr>
<td>• <strong>Fighting to keep costs high</strong></td>
<td>• ‘Why build 1 when you can build 5 for the same price?’</td>
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</tbody>
</table>

‘Why build 1 when you can build 2 for double the price?’
Helium

• UHF/VHF Duplex
• Bands:
  – 120-150 MHz
  – 400-450 MHz
  – Or Custom 200-600 MHz
• 9600 - 38400bps
• CubeSat Kit Form
• GFSK
Lithium

- UHF or VHF Half Duplex
- Bands:
  - 120-150 MHz
  - 400-450 MHz
  - Or Custom 200-600 MHz
- Small PCB Mount
- 9600-38400 bps
- GFSK
Beacons

Hydrogen
- VHF or UHF
- Small PCB Mount
- GFSK

Neon
- UHF
- GFSK/PSK
- Small, Easy, Cheap
Beryllium

- In Prototyping
- S-Band Transmitter
  - 2100-2400
  - 2400-2700
- BPSK, 10-1000’s kbps
- 30 dBm
- Open protocol
- Ettus SDR Example
  - benchmark_tx.py
- ETA 04/2010
Spectrum Licensing

• Gauging Industry Interest in Commercial Approach
  – Sell Radio + Spectrum Lease + FCC Experimental App
  – Spectrum Width + Contract Length + FCC Experimental App

• Asking feedback:
  – kevin@astrodev.com or info@astrodev.com
  – Comments welcome

• Current Frequencies:
  – 10 MHz at L Band
  – >400 MHz at 28 GHz