|  |  |  |
| --- | --- | --- |
|  | **P/I-Band** | **L-Band** |
| Science  Reqs. | Root Zone Soil Moisture:  - P-band or I-band  - Anywhere with soil (-70 to 70 lat)  - 3-day revisit for standard  - 2-day revisit for boreal forest (50 - 70 lat)  - **Addressed by Both Orbit Planes**  Snow-Water Equivalent:  - P-Band Phase  - Up to 60 degs latitude  - **Addressed by Orbit Plane 2** | Freeze-Thaw:  - Garrison will give upper/lower lat bounds (60 - 80)?  - **Addressed by Both Orbit Planes**  Surface Soil Moisture:  - Anywhere with soil (-70 to 70 lat)  - 3-day revisit for standard  - 2-day revisit for boreal forest (50 - 70 lat)  - **Addressed by Both Orbit Planes**  Snow-Water Equivalent:  - L-Band Phase  - Up to latitude corresponding to 85% coverage  - **Addressed by Both Orbit Planes** |
| Antenna Specs | - 60 deg cones for both direct and specular antennas  - Two antennas, pointing along same axis, opposite directions | - 21 deg cone for specular antenna  - 62.5 deg cone for direct transmitter antenna  - Two antennas do not need to be pointing along the same vector |
| Constellations | - MUOS (P)  - SWARM (I or P???)  - ORBCOMM (I) | - GPS  - GLONASS  - Galileo  - Iridium |

**Feasible Orbit Design Options:**

* Orbit Plane 1:
  + 300 km altitude
  + 80 deg inclination
  + Includes coverage of:
    - ORBCOMM, SWARM, Iridium
  + Covers Reqs:
    - All but P-Band Phase SWE if SWARM is I-Band
    - Low altitude means poor overall coverage area, but targets high-latitude requirements
* Orbit Plane 2:
  + 7,000 km altitude
  + 55 deg inclination
  + Includes Coverage of:
    - GPS, Galileo, GLONASS, MUOS
  + Covers Reqs:
    - All Reqs, but low inclinations (does not cover all of SWE or Freeze/Thaw)
    - High altitude, great overall coverage of Earth
* Orbit Plane 2; Option 2:
  + 2,000 km altitude
  + ~62 deg inclination
  + Includes all GEO satellite coverage, easy to reach orbit, visibility to ~67 degs latitude (sufficient for most coverage, missing spots filled in by Orbit Plane 1.

**Plots:**

|  |  |
| --- | --- |
|  |  |
|  |  |

Above plots are all for 80 deg latitude visibility, lowering visibility to 65-70 degs latitude for Orbit Plane 2 makes Option 2 of Orbit Plane 2 feasible.

**Baseline Orbit Selection (Assumes Nadir Pointing)**

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Trade Space

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Trade Space

Chart, line chart

Description automatically generated

Additional Trade Space with 20 deg slew

Initial Trade Space

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Trade Space

Trade Space

Trade Space

Trade Space

Trade Space

****

Trade Space

Trade Space

Trade Space

Trade Space

Trade Space