

**Attachment B**

Ground Station Exhibit

## Ground Station Exhibit

*Table 1. List of ground stations.*

| Licensee  | Location                      | Latitude      | Longitude      | Dish Size (m) | Uplink Frequencies | Downlink Frequencies | Purpose |
|-----------|-------------------------------|---------------|----------------|---------------|--------------------|----------------------|---------|
| Leaf      | Peterborough, Australia       | 32° 57' 43" S | 138° 50' 58" E | 3.7           | S                  | S, X                 | Primary |
| Leaf      | Nangetty, Western Australia   | 29° 00' 37" S | 115° 20' 32" E | 3.7           | S                  | S, X                 | Primary |
| KSAT      | Mingenew, Australia           | 29° 00' 39" S | 115° 20' 29" E | 3.7           | S                  | S, X                 | Primary |
| Leaf      | Absheron, Azerbaijan          | 40° 27' 59" N | 49° 29' 10" E  | 3.7           | S                  | S, X                 | Primary |
| Leaf      | Punta Arenas, Chile           | 53° 02' 30" S | 70° 50' 45" W  | 3.7           | S                  | S, X                 | Primary |
| KSAT      | Punta Arenas, Chile           | 52° 56' 08" S | 70° 52' 24" W  | 3.7, 3.9      | S                  | S, X                 | Primary |
| AnySignal | Punta Arenas, Chile           | 53° 07' 03" S | 70° 53' 39" W  | 3.7           | S                  | UHF, S, X            | Backup  |
| KSAT      | Punta Arenas, Chile           | 52° 56' 32" S | 70° 50' 59" W  | 5.4           | S                  | S, X                 | Primary |
| Leaf      | Santiago, Chile               | 33° 21' 53" S | 70° 46' 20" W  | 3.7           | S                  | S, X                 | Primary |
| Leaf      | Blonduos, Iceland             | 65° 38' 50" N | 20° 14' 21" W  | 3.9           | S                  | S, X                 | Primary |
| AnySignal | Selfoss, Iceland              | 64° 03' 04" N | 20° 25' 18" W  | 3.7           | S                  | UHF, S, X            | Backup  |
| Leaf      | Kandy, Sri Lanka              | 07° 16' 27" N | 80° 43' 29" E  | 3.7           | S                  | S, X                 | Primary |
| Leaf      | Mon Loisir, Mauritius         | 20° 08' 22" S | 57° 41' 13" E  | 3.9           | S                  | S, X                 | Primary |
| KSAT      | Bel Ombre, Mauritius          | 20° 30' 02" S | 57° 27' 03" E  | 3.7           | S                  | S, X                 | Primary |
| Leaf      | La Paz, Mexico                | 24° 05' 59" N | 110° 23' 11" W | 3.7           | S                  | S, X                 | Primary |
| Leaf      | Awarua, New Zealand           | 46° 31' 41" S | 168° 22' 45" E | 3.7           | S                  | S, X                 | Primary |
| KSAT      | Awarua, New Zealand           | 46° 31' 42" S | 168° 22' 44" E | 3.7, 3.9      | S                  | S, X                 | Primary |
| AnySignal | Awarua, New Zealand           | 46° 31' 44" S | 168° 22' 51" E | 3.7           | S                  | UHF, S, X            | Backup  |
| Leaf      | Santa Maria, Azores, Portugal | 36° 59' 51" N | 25° 08' 14" W  | 3.7           | S                  | S, X                 | Primary |
| Leaf      | Pretoria, South Africa        | 25° 51' 37" S | 28° 27' 13" E  | 3.7           | S                  | S, X                 | Primary |
| AnySignal | Pretoria, South Africa        | 25° 45' 08" S | 28° 14' 23" E  | 3.7           | S                  | UHF, S, X            | Backup  |
| KSAT      | Hartebeesthoek, South Africa  | 25° 53' 10" S | 27° 42' 22" E  | 3.7           | S                  | S, X                 | Primary |
| Leaf      | Nova Scotia, Canada           | 45° 19' 04" N | 61° 02' 09" W  | 3.7           | S                  | S, X                 | Primary |
| Leaf      | Al Ain, UAE                   | 24° 11' 56" N | 55° 41' 00" E  | 3.7           | S                  | S, X                 | Primary |
| Leaf      | Talkeetna, AK, United States  | 62° 19' 55" N | 150° 01' 57" W | 3.7           | S                  | X                    | Primary |

|           |                                     |               |                |                      |   |           |            |
|-----------|-------------------------------------|---------------|----------------|----------------------|---|-----------|------------|
| AnySignal | Colorado Springs, CO, United States | 38° 50' 25" N | 104° 43' 15" W | 3.7                  | S | UHF, X    | Backup     |
| AnySignal | Torrance, CA, United States         | 33° 50' 02" N | 118° 18' 48" W | 3.7                  | S | UHF, X    | Backup     |
| AnySignal | Pitea, Sweden                       | 65° 20' 16" N | 21° 25' 31" E  | 3.7                  | S | UHF, S, X | Backup     |
| AnySignal | Umea, Sweden                        | 63° 49' 20" N | 20° 15' 17" E  | 3.7                  | — | UHF       | Backup     |
| AnySignal | North Pole, AK, United States       | 64° 46' 34" N | 147° 22' 52" W | 3.7                  | S | UHF, X    | Backup     |
| KSAT      | Jeju, South Korea                   | 33° 23' 14" N | 126° 19' 01" E | 3.7                  | S | S, X      | Primary    |
| KSAT      | Puertollano, Spain                  | 38° 40' 20" N | 04° 09' 46" W  | 3.7                  | S | S, X      | Primary    |
| KSAT      | Athens, Greece                      | 37° 50' 43" N | 22° 37' 26" E  | 3.7                  | S | S, X      | Primary    |
| KSAT      | Tromso, Norway                      | 69° 39' 44" N | 18° 56' 29" E  | 3.0                  | S | S, X      | Primary    |
| KSAT      | Fairbanks, AK, United States        | 64° 49' 04" N | 147° 43' 30" W | 3.9                  | S | X         | Primary    |
| KSAT      | Puunene, HI, United States          | 20° 49' 02" N | 156° 27' 17" W | 3.7                  | S | X         | Primary    |
| KSAT      | Dublin, Ireland                     | 53° 24' 24" N | 06° 13' 28" W  | 5.4                  | S | S, X      | Primary    |
| KSAT      | Singapore, Singapore                | 01° 18' 59" N | 103° 42' 03" E | 5.4                  | S | S, X      | Primary    |
| KSAT      | Stockholm, Sweden                   | 59° 38' 57" N | 16° 35' 05" E  | 5.4                  | S | S, X      | Primary    |
| KSAT      | Sydney, Australia                   | 32° 10' 31" S | 148° 36' 56" E | 5.4                  | S | S, X      | Primary    |
| KSAT      | Cape Town, South Africa             | 34° 01' 39" S | 18° 43' 07" E  | 5.4                  | S | S, X      | Primary    |
| KSAT      | Columbus, OH, United States         | 40° 06' 03" N | 83° 11' 51" W  | 5.4                  | S | X         | Primary    |
| KSAT      | Boardman, OR, United States         | 45° 51' 16" N | 119° 37' 55" W | 5.4                  | S | X         | Primary    |
| KSAT      | Kapolei, HI, United States          | 21° 20' 12" N | 158° 05' 24" W | 5.4                  | S | X         | Primary    |
| KSAT      | Deadhorse, AK, United States        | 70° 12' 14" N | 148° 28' 24" W | 5.4                  | S | X         | Primary    |
| Northwood | Bismarck, ND, United States         | 46° 52' 56" N | 100° 48' 17" W | 2.4                  | S | X         | Primary    |
| Northwood | Loring, ME, United States           | 46° 56' 01" N | 67° 54' 34" W  | 2.4                  | S | X         | Primary    |
| Northwood | Kihei, HI, United States            | 20° 44' 44" N | 156° 26' 13" W | 2.4                  | S | X         | Primary    |
| Northwood | Vodno, Bulgaria                     | 43° 51' 41" N | 27° 09' 03" E  | 2.4                  | S | S, X      | Primary    |
| Northwood | Neu Poserin, Germany                | 53° 33' 15" N | 12° 13' 27" E  | 2.4                  | S | S, X      | Primary    |
| Northwood | Rio Gallegos, Argentina             | 51° 40' 03" S | 69° 15' 51" W  | 2.4                  | S | S, X      | Primary    |
| Northrop  | Aurora, CO, United States           | 39° 33' 34" N | 104° 49' 39" W | 1.2                  | — | L         | Experiment |
| Northrop  | Rolling Meadows, IL, United States  | 42° 06' 10" N | 88° 01' 47" W  | 0.6<br>(boom length) | — | UHF, L    | Experiment |

*Table 2. Ground station antenna RF specifications.*

[illegible]

|                                             |       |       |      |       |      |      |                   |             |
|---------------------------------------------|-------|-------|------|-------|------|------|-------------------|-------------|
| Receive Gain (dBi)                          | 47.0  | 49.5  | 47.6 | 43.7  | 51.1 | 40.0 | N/A               | N/A         |
| G/T (dB/K)                                  | 24.65 | 26.5  | 26.2 | 27.57 | 29.8 | 23   | N/A               | N/A         |
| Beamwidth (deg)                             | 0.6   | 0.576 | 0.66 | 0.85  | 0.49 | 1.0  | N/A               | N/A         |
| Efficiency (%)                              | 70    | 70    | 60   | 70    | 60   | 65   | N/A               | N/A         |
| <b>Experimental Payload UHF Downlink</b>    |       |       |      |       |      |      |                   |             |
| Frequency Range (MHz)                       | N/A   | N/A   | N/A  | N/A   | N/A  | N/A  | 500 - 1300        | N/A         |
| Receive Gain (dBi)                          | N/A   | N/A   | N/A  | N/A   | N/A  | N/A  | 4 dBi @ 750MHz    | N/A         |
| G/T (dB/K)                                  | N/A   | N/A   | N/A  | N/A   | N/A  | N/A  | -21.5             | N/A         |
| Beamwidth (deg)                             | N/A   | N/A   | N/A  | N/A   | N/A  | N/A  | 120 deg @ 750MHz  | N/A         |
| Efficiency (%)                              | N/A   | N/A   | N/A  | N/A   | N/A  | N/A  | 90                | N/A         |
| <b>Experimental Payload L-Band Downlink</b> |       |       |      |       |      |      |                   |             |
| Frequency Range (MHz)                       | N/A   | N/A   | N/A  | N/A   | N/A  | N/A  | 500 - 1300        | 1000 - 1300 |
| Receive Gain (dBi)                          | N/A   | N/A   | N/A  | N/A   | N/A  | N/A  | 2.5 dBi @ 1100MHz | 21          |
| G/T (dB/K)                                  | N/A   | N/A   | N/A  | N/A   | N/A  | N/A  | -21.5             | -1.5        |
| Beamwidth (deg)                             | N/A   | N/A   | N/A  | N/A   | N/A  | N/A  | 145               | 16          |
| Efficiency (%)                              | N/A   | N/A   | N/A  | N/A   | N/A  | N/A  | 90                | 70          |

**Notes:**

1. G/T values reported at 5° elevation.
2. KSAT Fairbanks uses a 3.9 m dish; KSAT Tromso uses a 3.0 m dish. Table 2 specs reflect the primary 3.7 m KSATlite configuration.
3. Northwood stations at Bismarck, Loring, and Kihei receive X-band only (no S-band downlink at those sites).