Description of CAMEX-4 HAMSR 2-km binary data files

Filename: ‘HAMSR _2km_yymmdd_m_nnnn.bin’
‘yymmdd’: date of beginning of data set
‘m’: data set number (starting with 1)
‘nnnn’: number of data records (see ‘dim3’ below)

Format
All data items (listed below) are stored as ‘big-endian’ 2-byte integers. To read them on Intel-based machines, the byte order must be reversed.

Content
Header
1. Year           
2. Day of year    
3. Hour           
4. Minute         
5. Second         
6. No. of items per record (nominally 240)
7. Record length in bytes (nominally 480)
8. dim1: first dimension - no. of channels (nominally 15)
9. dim2: second dimension - no. of cross-track samples (nominally 15)
10. dim3: third dimension - no. of along-track records (varies)

Data record (repeats until EOF, for a total of ‘dim3’ records)
1) Record no. (starting at 1)
2) Navigation
   1. Year
   2. Day of year
   3. Hour
   4. Minute
   5. Second
   6. Nav-time – HAMSR-time in seconds
   7. Latitude (deg*100)
   8. Longitude (deg*100)
   9. Altitude (m)
10. Heading (deg*100)
11. Pitch (deg*100)
12. Roll (deg*100)
13. Ground speed (m/s*100)
14. Air temperature (°C*100)
3) Brightness temperature array: dim1 (channels) x dim2 (scan positions)
   1. Scan pos. 1 (‘dim1’ Tb*10)
   2. Scan pos. 2 (‘dim1’ Tb*10)
   3. …. 

Note: A value of 0 indicates invalid data

Instrument characteristics
Channels
1. 50.3 GHz (BW = 0.340 GHz)
2. 51.76 GHz (BW = 0.400 GHz)
3. 52.8 GHz (BW = 0.400 GHz)
4. 53.481 & 53.711 GHz (BW = 2x0.170 GHz)
5. 54.4 GHz (BW = 0.400 GHz)
6. 54.94 GHz (BW = 0.400 GHz)
7. 55.5 GHz (BW = 0.330 GHz)
8. 56.02 & 56.67 GHz (BW = 0.270 & 0.330 GHz)
9. 166.0 GHz (2x2.0 GHz)
10. 183.31 ± 10 GHz (2x3.0 GHz)
11. 183.31 ± 7.0 GHz (2x2.0 GHz)
12. 183.31 ± 4.5 GHz (2x2.0 GHz)
13. 183.31 ± 3.0 GHz (2x1.0 GHz)
14. 183.31 ± 1.8 GHz (2x1.0 GHz)
15. 183.31 ± 1.0 GHz (2x0.5 GHz)

**Scanning**
- Scan plane: perpendicular to flight direction
- Scan direction: right to left, through nadir (i.e. scan axis points in the flight direction)
- Swath is approximately symmetric around nadir

**Sampling**
- Beam width: approximately 6° (FWHM) – corresponds to 2 km at nadir (from 20 km)
- Raw sampling:
  - Cross-track: approximately every 3° - corresponds to 1 km at nadir
  - Along-track: approximately every 1.3 sec – corresponds to .27 km (at .21 km/sec)
- Integration time: 11 ms

**Polarization**
- All channels detect a single linear polarization. At nadir, the polarization direction corresponds to V polarization (i.e. the polarization vector lies in the plane of incidence).
- As the beam scans away from nadir, the polarization vector rotates out of the plane of incidence. This results in a mix of V and H polarizations. With V corresponding to a polarization angle of 90° and H to 0°, the polarization angle for a scan angle $\phi$ is $90° - \phi$.

**2-km data characteristics**
- Channels: Full set of 15
- Swath: 15 cross-track samples - subset of raw data
  - Approximately centered around nadir (nadir ≈ center sample, no. 8 of 15)
  - Approximate swath width: ±42° between sample centers; ±46° between 3-dB edges
- Sampling: Each sample is average of 2 cross-track x 8 along-track raw samples
  - Cross-track increment: approximately 6° - 2 km at nadir
  - Along-track increment: 10.4 sec – corresponds to 2.2 km (at .21 km/sec)
  - Corresponding equivalent integration time: 178 ms
- Navigation: Subset of raw nav data
  - 5th of every 8 samples
  - Corresponds to near-center of averaged sample cell
  - Header data copied from first nav data record

**Contact information**
- Bjorn Lambrigtsen; lambrigtsen@jpl.nasa.gov; (818)354-8932