

SeaSat-A L-band SAR

highlight shows info to be input into instrument specs json file

[1] Reference: The Seasat-A Synthetic Aperture Radar System, Rolando L.Jordan 1980

- 100-km swath at a resolution of 25 m from an 800-km altitude orbit.
- Table-1:
 - Wavelength 0.235m => operating frequency = 1.2757 GHz
 - RF bandwidth = Chirp bandwidth = 19 MHz
 - Cross track resolution = $c/(2 * chirp\ bandwidth * cos(look\ angle)) = 22.5275$ m (close to the 25 m resolutions)
 - Pulse length = 33.4 us
 - PRF: 1463 Hz - 1640 Hz
 - Antenna dimension = 10.7m x 2.16m
 - Minimum azimuthal resolution = $10.7m/2 = 5.35$ m
 - $N = 4looks = 5.35 * 4 = 21.4$ m azimuth resolution (degrades more perhaps due to offnadir pointing?)
 - Antenna gain = 35 dB
 - Effective aperture area = $\lambda^2 * G/(4 * \pi) = 13.897428$ m²
 - Aperture efficiency = Effective aperture area/ Real area = 0.6
 - Power = 500 W
 - Data recorder bit rate = 110Mbits/sec
- At a nominal 20.5' look angle from nadir, a total beamwidth in elevation of 6.2" is required to illuminate a 100-km swath on the Earth's surface from an 800-km-high orbit,
- This deployed antenna is configured to fly with the long dimension along the spacecraft velocity vector and boresighted at an angle of 20.5' from the nadir direction in elevation (cone) and 90" from the nominal spacecraft velocity vector (clock).
- The approximate amount of data per 10-min pass is 10^{11} bits which, using 5-bit quantization, results in 2×10^{10} pixels of raw data per pass.
- Noise temperature = 650 Kelvin nominal = 5.11 dB Noise Figure
- Electronics weight: 284 lbs = 128.82 kg

[2] Reference:

<https://directory.eoportal.org/web/eoportal/satellite-missions/s/seasat>

- The SAR instrument had a mass of 147 kg and a power consumption of 216 W (1000 W peak power). The instrument could only be operated from 10 minutes per orbit.
- radiometric resolution = 5 bit raw data.
- pixel size = 25 x 25 m (spatial resolution on the surface at 4 looks);
- The antenna beamwidth measures 6.2° in elevation and 1° in azimuth.

[3] Reference: Spaceborne SAR Study: LDRD '92 Final Report

- Table 4.1.1a :
 - Antenna weight: 113 kg
- Typical Sigma NEZO = -24
- Incidence angle to middle of swath = 23 deg
- Electronics dimensions = 120 x 30 x 30 cm³

Determined specs (highlight are “guessed-values”):

- Total weight = Electronics weight + Antenna weight ~ 243 kg

```
{
  "@type": "Synthetic Aperture Radar",
  "name": "Seasat-A",
  "mass": 243,
  "volume": 2.5,
  "power": 500,
  "orientation": {
    "convention": "SIDE_LOOK",
    "sideLookAngle": 20.5
  },
  "dataRate": 110,
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```
"pulseWidth": 33.4e-6,  
"antennaAlongTrackDim": 10.7,  
"antennaCrossTrackDim": 2.16,  
"antennaApertureEfficiency": 0.6,  
"operatingFrequency": 1.2757e9,  
"peakTransmitPower": 1000,  
"chirpBandwidth": 19e6,  
"minimumPRF": 1463,  
"maximumPRF": 1640,  
"radarLosses": 3.5,  
"sceneNoiseTemp": 290,  
"bitsPerPixel": 5,  
"systemNoiseFigure": 5.11,  
"sigmaNEZ0threshold": -10,  
"_comments": ["",  
              ""]  
  
}
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