

2.4 Radiometry⁴

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As has been the case for AST_L1B, AST_L1T data are offered in terms of scaled radiance. To convert from Digital Numbers (DN) to radiance at the sensor, the unit conversion coefficients (defined as radiance per 1 DN) are used. Spectral radiance is expressed in units of watts divided by meters squared times steradian times micrometer [$W/(m^2 \cdot sr \cdot \mu m)$] per DN. The relation between DN values and radiances is shown below:

- a DN value of zero is allocated to pixels not containing data and can be considered transparent
- a DN value of 1 is allocated to zero radiance
- a DN value of 254 is allocated to the maximum radiance for VNIR and SWIR bands
- a DN value of 4094 is allocated to the maximum radiance for TIR bands
- a DN value of 255 is allocated to saturated pixels for VNIR and SWIR bands
- a DN value of 4095 is allocated to saturated pixels for TIR bands

The maximum radiances depend on **Maximum radiance ($W/(m^2 \cdot sr \cdot \mu m)$)** both the spectral bands and the gain settings as shown in Table 2-2.

Band No.	High gain	Normal Gain	Low Gain 1	Low gain 2
1	170.8	427	569	N/A
2	179.0	358	477	
3N	106.8	218	290	
3B	106.8	218	290	
4	27.5	55.0	73.3	73.3
5	8.8	17.6	23.4	103.5
6	7.9	15.8	21.0	98.7
7	7.55	15.1	20.1	83.8
8	5.27	10.55	14.06	62.0
9	4.02	8.04	10.72	67.0
10	N/A	28.17	N/A	N/A
11		27.75		
12		26.97		
13		23.30		
14		21.38		

Table 2-2. Maximum Radiance Values for all ASTER Bands and all Gains.

The radiance can be obtained from DN values as follows:

$$\text{Radiance at-sensor} = (\text{DN value} - 1) \times \text{Unit conversion coefficient}$$

Table 2-3 shows the unit conversion coefficients of each band

Unit Conversion Coefficient ($W/(m^2 \cdot sr \cdot \mu m)/DN$)				
Band No.	High gain	Normal Gain	Low Gain 1	Low gain 2
1	0.676	1.688	2.25	N/A
2	0.708	1.415	1.89	
3N	0.423	0.862	1.15	
3B	0.423	0.862	1.15	
4	0.1087	0.2174	0.290	0.290
5	0.0348	0.0696	0.0925	0.409
6	0.0313	0.0625	0.0830	0.390
7	0.0299	0.0597	0.0795	0.332
8	0.0209	0.0417	0.0556	0.245
9	0.0159	0.0318	0.0424	0.265
10	N/A	6.822×10^{-3}	N/A	N/A
11		6.780×10^{-3}		
12		6.590×10^{-3}		
13		5.693×10^{-3}		
14		5.225×10^{-3}		