

# Conversion formula for OPS DN to input radiance

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## 1. Introduction

NASDA's OPS products whose product levels are higher than or equal to level 1 are related to the input radiance and also expressed in eight bit binary value of integer type, which is called DN, Digital Number hereafter. Although the conversion from DN to the input radiance in the unit of [mW/str/m<sup>2</sup>/μm] is indicated in the CCT format description using the onground measurement, the possible sensitivity change in the OPS detector, optics, and electronics may deviate the above mentioned conversion method from the truth. Actually, same problems were reported by CNES for the HRV's sensitivity degradation (refer to "Satellite Intercalibration General Consideration and Detailed Results" by G. Begni, CNES, Cospar '92 in Washington Dc.). Based on this concern, several underflights of AVIRIS, which is the NASA's Airborne Visible and InfraRed Spectrometer frequently calibrated during the flights and ground, for OPS were made over several US western test sites in California and Nevada last year. Estimated input radiance at the height of OPS, which is extrapolated by calibrated AVIRIS data using atmospheric model applied to between AVIRIS flight height of 20,000m and 568 Km, is compared to OPS DN. Then, the conversion formula for OPS DN to input radiance is derived.

This document introduces the conversion method.

## 2. method.

The conversion formula is given in the following equation.

$$Q = DN \frac{A}{A'} + B [W / str / m^2 / \mu m] \quad (1)$$

where, DN : Digital Number of eight bits binary of integer type in OPS products whose product level is higher than or equal to level 1

A' : conversion coefficient, which is revised as soon as the underflight experiments are conducted.

A : absolute calibration coefficients

B : offset

These values are given in the following table.

OPS system-1

	Normal Gain			High Gain		
	A'	A	B	A'	A	B
Band 1	0.7099	1.146	-0.6928	2.253	1	0
Band 2	0.9200	1.184	-4.445	2.968	1	0
Band 3	0.9597	1.176	-4.066	2.992	1	0
Band 4	0.9623	1	0	2.958	1	0
Band 5	4.354	1.277	-6.162	13.15	1	0
Band 6	8.427	1.410	-2.585	24.78	1	0
Band 7	10.58	1.569	-3.213	31.90	1	0
Band 8	13.61	1.993	-4.502	42.78	1	0

Accuracy RMS error MAX. 4 [count] TBD  
 Term of since Dec. 1992 since Dec. 1992  
 validity

OPS system-2

	Normal Gain			High Gain		
	A'	A	B	A'	A	B
Band 1	0.6975	1	0	2.216	1	0
Band 2	0.9360	1	0	3.016	1	0
Band 3	0.9597	1	0	3.040	1	0
Band 4	0.9456	1	0	2.958	1	0
Band 5	4.595	1	0	14.35	1	0
Band 6	8.371	1	0	25.34	1	0
Band 7	10.73	1	0	34.31	1	0
Band 8	13.33	1	0	41.76	1	0

Accuracy TBD TBD  
 Term of since Dec. 1992 since Dec. 1992  
 Validity

3. Reference

- (1) CCT format description for OPS, NASDA document
- (2) "Satellite Intercalibration General Consideration and Detailed Results" by G. Begni, CNES, Cospar '92 in Washington Dc