

IRS 1D

IRS - 1D was launched on September 29, 1997 by PSLV - C1. IRS - 1D, a follow on satellite. IRS – 1D was launched on September 27, 1997 by PSLV – C1. IRS – 1D, a follow on satellite to IRS – 1C belongs to the second generation of IRS series of Satellites. It has 3 payloads viz., PAN, LISS 3 & WiFS. It has similar capabilities as IRC – 1C in terms of spatial resolution, spectral bands, stereoscopic imaging, wide field coverage and revisit capability. The improvements carried out in the IRS – 1D satellite taking into account the IRS – 1C experiences have resulted in better quality imageries. Mission completed during January 2010 after serving for 12 years and 3 months.

IRS 1D Specifications

Resolution	Operational Remote Sensing
Launch Date Category	27 September 1997
Launch Site Category	SHAR Centre Sriharikota India
Launch Vehicle	PSLV-C1
Weight	1250 kg
Onboard Power	809 Watts (generated by 9.6 sq.metres Solar Panels)
Communication	S-band, X-band
Stabilization	Three axis body stabilized (zero momentum) with 4 Reaction Wheels, Magnetic torquer
RCS	Monopropellant Hydrazine based with sixteen 1 N thrusters & one 11N thrusters
Payload	Three solid state Push Broom Cameras: PAN (6 metre resolution) LISS-3 (23.6 metre resolution) and WiFS (189 metre resolution)
Onboard tape recorder	Storage Capacity : 62 G bits
Orbit	Polar Synchronous
Altitude	740 x 817 km
Inclination	98.60 Degrees
Local Time	10.30 a.m.
Sensor	PAN, LISS III, WiFS

Mission Completed	January 2010
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IRS 1D Sensors

Linear Imaging Self Scanning Sensor - 3 (LISS-3)

This sensor is configured to provide imageries in three visible bands as well as in short-wave infrared band. The resolution and swath for visible bands are 23.5 m and 142 km, respectively. The detector is a 6000 element CCD based linear array with a pixel dimension of 10µm by 7 µm. The detector is placed at the focus of a refractive type optical system consisting of eight lens elements, which provides a focal length of 360 mm. The processing of the analogue output video signal is similar to that of PAN. For this camera, a 7-bit digitization is used which gives an intensity variation of 128 levels.

Characteristics of LISS III Sensor

Sensor	LISS III
Resolution	21.2 to 23.5 m (Visible and Near IR Region) 63.6 to 70.5 m Shortwave IR Region
Swath	127 to 141 Visible and near IR Region. 63.6 to 70.5 m Shortwave IR Region
Repetivity	25 days
Quantization	7 bits
Spectral Bands	0.52-0.59 microns(B2) 0.62-0.68 microns(B3) 0.77-0.86 microns(B4) 1.55-1.70 microns(B5)

Panchromatic sensor (PAN)

The PAN sensor is configured to provide the imageries of the Earth in visible spectrum, in a panchromatic band (0.5-0.75 m) with a geometric resolution of greater than 10 m and a swath of 70 km. The camera uses an off-axis reflective type optics system consisting of three mirrors for providing the required focal length. A 7µm pixel sized CCD is being used as the detector element. Using three linear array charge-coupled detectors covers the total swath of 70 km and each of these detectors covers a swath of about the central detector is offset from the other two detectors by a distance in focal plane that

corresponds to 8.6 km on the ground. The other two detectors cover swath of 24 km each adjacent to the central CCD. These two detectors are aligned with an accuracy of 30 arc sec-1. The overlap of the central swath with the side swaths is 600 m on the ground. Each of the detectors provides four analogue outputs, which are independently processed by video chains, converted to digital and providing a data handling system for formatting. For a PAN data compatible with the expected signal to noise ratio, a 6-bit digitization is used which gives 64 radiometric gray levels. Characteristics of PAN camera
 Geometric resolution from altitude of 817 km 5.8 m Effective focal length for optics 980 mm Swath 70 km Field-of-view for optics $\pm 2.5^\circ$ (across track) $\pm 0.3^\circ$ (along track)
 Spectral band 0.5-0.75 μm

Characteristics of PAN Sensor

Sensor	PAN
Resolution	5.2 to 5.8
Swath	63 to 70 km
Revisit	Five days by tilting the camera
Quantization	6 bits
Spectral Bands	0.50-0.75 microns
Steerability	+/-26 degrees

Wide Field Sensor (WiFS)

This sensor operates in two bands B3: 0.62 μm to 0.68 μm (Red) and B4: 0.77 μm to 0.86 μm (NIR). Each band uses a 2048 element CCD with an element size of 13 μm by 13 μm . A wide-angle refractive optics system with 8-lens elements is used with a focal length of about 56 mm. This payload required to cover a ground swath of 770 km with a resolution of 188 m. This ground swath with the selected 817 km orbit can provide the required repetivity for the intended application. To cover the 770 km, two separate band assemblies are used for each band. Thus the entire swath in each band is covered by two detectors. Each of the detectors covers half of the swath. The signal processing chain is similar to LISS-3 wherein the analogue video signal is converted to 7 bits and given to data handling system for formatting.

Characteristics of WiFS

Band 3 0.62-0.68 μm Band 4 0.77-0.86 μm Resolution 188.3 m Swath 810 km

Radiometric resolution 7 bits Band-to-band registration ± 0.25 pixel

Characteristics of WiFS Sensor

Sensor	WiFS
Resolution	169 to 188 meter
Swath	728 to 812 Km
Revisit	3 days (By combining Paths)
Quantization	7 bits
Spectral Bands	0.62-0.68 microns(Visible) 0.77-0.86 microns(Near Infrared)

Data Products

Sensor	Resolution / Number of Bands	Coverage Km X Km	Type	Media	Scale Achievable
PAN	5.8 m / 1	70 X 70	Full Scenes with SAT Precision Coded 7 1/2 X 7 1/2	Digital Black and White	Digital Black and White
LIS III	23.5 /	Sensor	WiFS	WiFS	