

PSLV-C29

TeLEOS-1

VELOX-CI



VELOX-II

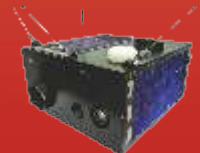


Athenosat-1

Galassia



Kent Ridge-1



PSLV-C29



PSLV-C29 at First Launch Pad

India's Polar Satellite Launch Vehicle, in its thirty second flight (PSLV-C29), will launch six satellites of Singapore into a 550 km circular orbit inclined at 15 degrees to the equator. Of these six satellites, TeLEOS-1 is the primary satellite weighing 400 kg whereas the other five are co-passenger satellites which include two microsattellites and three nanosatellites. PSLV-C29 will be launched from the First Launch Pad at Satish Dhawan Space Centre (SDSC) SHAR, Sriharikota. This is the eleventh flight of PSLV in 'core-alone' configuration (without the use of solid strap-on motors).

PSLV-C29 at a glance (Vehicle lift-off Mass: 227.6 tonne Height: 44.4 m)

	Stage-1	Stage-2	Stage-3	Stage-4
Nomenclature	PS1	PS2	PS3	PS4
Propellant	Solid (HTPB based)	Liquid UH25 + N ₂ O ₄	Solid (HTPB based)	Liquid (MMH + MON-3)
Mass (tonne)	138.2	41.35	7.6	0.82
Stage Dia (m)	2.8	2.8	2.0	1.34
Stage Length (m)	20	12.8	3.6	3.0

HTPB : Hydroxyl Terminated Poly Butadiene

UH25 : Unsymmetrical Dimethyl Hydrazine + 25% Hydrazine Hydrate

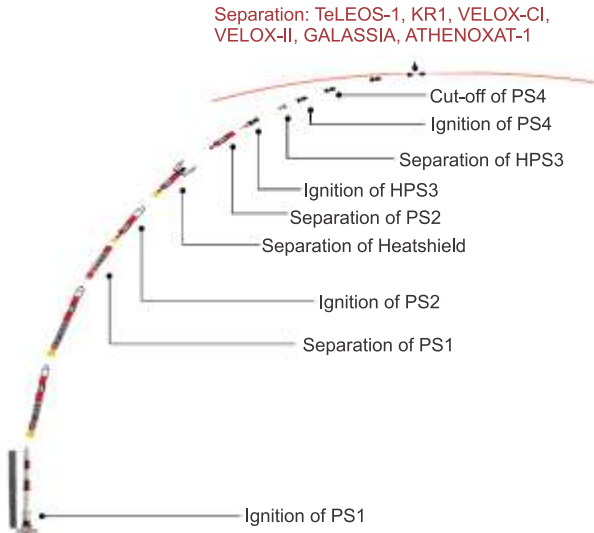
N₂O₄ : Nitrogen Tetroxide

MMH : Mono Methyl Hydrazine, MON-3: Mixed Oxides of Nitrogen

PSLV-C29

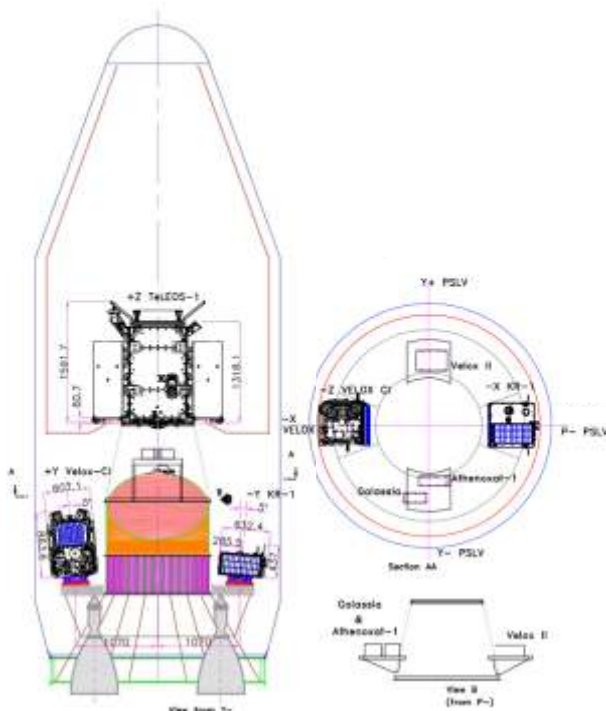
Mission Characteristics:

Orbit: 550 km circular
 Inclination: 15 deg
 Lift-off: 18:00 Hrs IST



Event Name	Time after lift-off (second)	Altitude (kilometre)	Velocity (metres/second)
Fourth Stage restart Cut-off	67 min 29.5 sec	524.0	7607.4
Fourth Stage restart	67 min 25.5 sec	523.9	7610.0
Athenoxat-1 Separation	21 min 2.0 sec	550.1	7585.6
Galassia Separation	20 min 7.0 sec	550.1	7585.4
VELOX-II Separation	19 min 12.0 sec	550.2	7585.3
VELOX-C1 Separation	18 min 42.4 sec	550.2	7585.3
Kent Ridge-1 Separation	18 min 42.0 sec	550.2	7585.3
TeLEOS-1 Separation	18 min 12.0 sec	550.2	7585.3
Fourth Stage Cut-off	17 min 25.0 sec	550.2	7581.5
Fourth Stage Ignition	15 min 7.5 sec	527.3	7348.9
Third Stage Separation	9 min 44.1 sec	379.9	7518.1
Third Stage Ignition	4 min 21.2 sec	200.6	4324.4
Second Stage Separation	4 min 20.0 sec	199.7	4326.3
Heat Shield Separation	2 min 53.3 sec	117.1	2251.8
Second Stage Ignition	1 min 53.3 sec	56.1	1648.7
First Stage Separation	1 min 53.08 sec	55.9	1649.8
First Stage Ignition	0.0	0.026	451.9

PSLV-C29 Typical Flight Profile



Satellites Mounting configuration



PSLV-C29 First Stage assembly

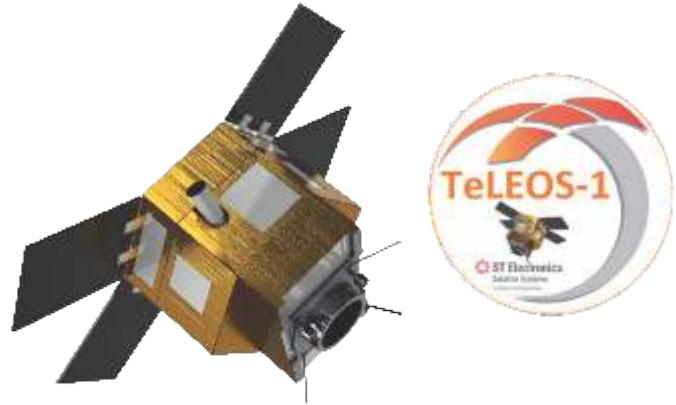
International Customer Satellites

Primary Satellite

TeLEOS-1

ST Electronics

TeLEOS-1 is the first Singapore commercial Earth observation satellite designed and developed by ST Electronics. This electro-optical satellite is to be launched into a low Earth orbit for remote sensing applications.



TeLEOS-1

TeLEOS-1 Features

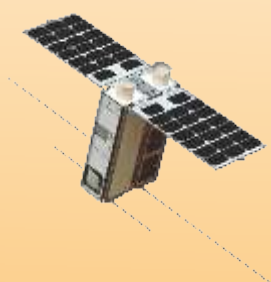
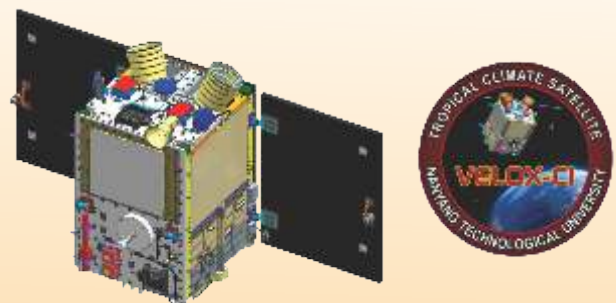
Satellite mass	400 kg
Orbit (Near Equatorial Orbit)	Period: 96 min, Inclination: 15°, Altitude: 550 km
Stowed Dimensions	1.9 m x 2.0 m x 1.6 m (H)
Imaging Resolution	1 m Panchromatic (at Nadir)
Swath Width	12 km (at Nadir)
Communications	S-Band Telemetry / X-Band Downlink
Mission Life	5 Years

Co-passenger Satellites

VELOX-CI

Nanyang Technological University (NTU), Singapore

VELOX-CI is a 123 kg microsatellite for research in tropical environmental monitoring using radio occultation techniques. The satellite will be operated from the ground station located in NTU.



VELOX-II

Nanyang Technological University (NTU), Singapore

VELOX-II is a 13 kg 6U-Cubesat technology demonstrator with three payloads: Communications Payload, GPS Experimental Payload and Fault Tolerant Payload. This satellite will also be operated from the ground station in NTU.

International Customer Satellites

Athenoxat-1

Nanyang Technological University (NTU), Singapore

Athenoxat-1 has been designed, developed and built by Microspace Rapid Pvt Ltd in its Singapore laboratory. It is a technology demonstrator nanosatellite for Earth remote sensing based on a 3U-Cubesat form factor and launched as piggyback on a slot arranged by NTU.



Kent Ridge-1

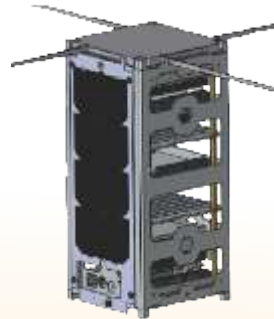
National University of Singapore (NUS), Singapore

Kent Ridge-1 is an 78 kg microsatellite with two primary payloads: a Medium resolution VNIR Hyperspectral Camera (GSD 44m) and Short Wave Infrared (SWIR) Hyperspectral Camera (GSD 110m). Its secondary payload is a Real-time High Resolution Video (resolution 6m) camera. The modes of communication are UHF Telemetry link and X-band data downlink.

Galassia

National University of Singapore (NUS), Singapore

Galassia is a 3.4 kg 2U-Cubesat. It carries two payloads. One measures the total electron count in the ionosphere above Singapore and the other is a Small Photon-Entangling Quantum System to acquire quantum correlation data in space. The modes of communication are UHF uplink and VHF downlink.



Antrix Corporation Limited

Antrix Corporation Limited (Antrix), incorporated in 1992, is a wholly owned Government of India Company under the administrative control of Department of Space (DOS) and is the commercial arm of Indian Space Research Organisation (ISRO). Antrix promotes and commercially exploits the products and services emanating from the Indian Space Programme. Antrix was awarded the 'MINIRATNA' status in the year 2008.

So far, Antrix has provided launch services on-board PSLV for 51 customer satellites from 20 countries. In addition to providing launch services for international customer satellites, Antrix provisions communication satellite transponders for broadcasting and telecommunication services, markets data from Indian Remote Sensing (IRS) satellites, builds and markets satellites and satellite subsystems and extends mission support services for satellite launches.

Satellites of other countries launched by PSLV

SL. NO.	NAME	COUNTRY	DATE OF LAUNCH	MASS (kg)	LAUNCH VEHICLE
1	DLR-TUBSAT	GERMANY	26-05-1999	45	PSLV-C2
2	KITSAT-3	REPUBLIC OF KOREA	26-05-1999	110	PSLV-C2
3	BIRD	GERMANY	22-10-2001	92	PSLV-C3
4	PROBA	BELGIUM	22-10-2001	94	PSLV-C3
5	LAPAN-TUBSAT	INDONESIA	10-01-2007	56	PSLV-C7
6	PEHUENSAT-1	ARGENTINA	10-01-2007	6	PSLV-C7
7	AGILE	ITALY	23-04-2007	350	PSLV-C8
8	TECSAR	ISRAEL	21-01-2008	300	PSLV-C10
9	CAN-X2	CANADA	28-04-2008	7	PSLV-C9
10	CUTE-1.7	JAPAN	28-04-2008	5	PSLV-C9
11	DELFI-C3	THE NETHERLANDS	28-04-2008	6.5	PSLV-C9
12	AAUSAT-II	DENMARK	28-04-2008	3	PSLV-C9
13	COMPASS-I	GERMANY	28-04-2008	3	PSLV-C9
14	SEEDS	JAPAN	28-04-2008	3	PSLV-C9
15	NLS5	CANADA	28-04-2008	16	PSLV-C9
16	RUBIN-8	GERMANY	28-04-2008	8	PSLV-C9
17	CUBESAT-1	GERMANY	23-09-2009	1	PSLV-C14
18	CUBESAT-2	GERMANY	23-09-2009	1	PSLV-C14
19	CUBESAT-3	TURKEY	23-09-2009	1	PSLV-C14
20	CUBESAT-4	SWITZERLAND	23-09-2009	1	PSLV-C14
21	RUBIN-9.1	GERMANY	23-09-2009	1	PSLV-C14
22	RUBIN-9.2	GERMANY	23-09-2009	1	PSLV-C14
23	ALSAT-2A	ALGERIA	12-07-2010	116	PSLV-C15
24	NLS6.1 AISSAT-1	CANADA	12-07-2010	6.5	PSLV-C15
25	NLS6.2 TISAT-1	SWITZERLAND	12-07-2010	1	PSLV-C15
26	X-SAT	SINGAPORE	20-04-2011	106	PSLV-C16
27	VesselSat-1	LUXEMBOURG	12-10-2011	28.7	PSLV-C18
28	SPOT-6	FRANCE	09-09-2012	712	PSLV-C21
29	PROITERES	JAPAN	09-09-2012	15	PSLV-C21
30	SAPPHIRE	CANADA	25-02-2013	148	PSLV-C20
31	NEOSSAT	CANADA	25-02-2013	74	PSLV-C20
32	NLS8.1	AUSTRIA	25-02-2013	14	PSLV-C20
33	NLS8.2	AUSTRIA	25-02-2013	14	PSLV-C20
34	NLS8.3	DENMARK	25-02-2013	3	PSLV-C20
35	STRAND-1	UNITED KINGDOM	25-02-2013	6.5	PSLV-C20
36	SPOT-7	FRANCE	30-06-2014	714	PSLV-C23
37	AISAT	GERMANY	30-06-2014	14	PSLV-C23
38	NLS7.1(CAN-X4)	CANADA	30-06-2014	15	PSLV-C23
39	NLS7.2(CAN-X5)	CANADA	30-06-2014	15	PSLV-C23
40	VELOX-1	SINGAPORE	30-06-2014	7	PSLV-C23
41	DMC3-1	UNITED KINGDOM	10-07-2015	447	PSLV-C28
42	DMC3-2	UNITED KINGDOM	10-07-2015	447	PSLV-C28
43	DMC3-3	UNITED KINGDOM	10-07-2015	447	PSLV-C28
44	CBNT-1	UNITED KINGDOM	10-07-2015	91	PSLV-C28
45	De-OrbitSail	UNITED KINGDOM	10-07-2015	7	PSLV-C28
46	LAPAN-A2	INDONESIA	28-09-2015	76	PSLV-C30
47	NLS-14 (Ev9)	CANADA	28-09-2015	14	PSLV-C30
48	LEMUR	USA	28-09-2015	7	PSLV-C30
49	LEMUR	USA	28-09-2015	7	PSLV-C30
50	LEMUR	USA	28-09-2015	7	PSLV-C30
51	LEMUR	USA	28-09-2015	7	PSLV-C30