

APPENDIX-A

A.1 SI Units

Base Quantity	SI Base Unit	
	Name	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Temperature	kelvin	K
Amount of substance	mole	mol
Luminous intensity	candela	cd

A.2 Some Derived SI Units

Quantity	Name	Symbol	Expression in Terms of Base Units	Expression in Terms of SI Units
Plane angle	radian	ω	m/m	
Frequency	hertz	Hz	s^{-1}	
Force	newton	N	$kg \cdot m/s^2$	J/m
Pressure	pascal	Pa	$kg/m \cdot s^2$	N/m^2
Energy	joule	J	$kg \cdot m^2/s^2$	$N \cdot m$
Power	watt	W	$kg \cdot m^2/s^3$	J/s
Electric charge	coulomb	C	$A \cdot s$	
Electric potential	volt	V	$kg \cdot m^2/A \cdot s^3$	W/A
Capacitance	farad	F	$A^2 \cdot s^4/kg \cdot m^2$	C/V
Electric resistance	ohm	Ω	$kg \cdot m^2/A^2 \cdot s^3$	V/A
Magnetic flux	weber	ϕ	$kg \cdot m^2/A \cdot s^2$	T · m
Magnetic field	tesla	B	$kg/A \cdot s^2$	Nb/m ² or tesla
Inductance	henry	L	$kg \cdot m^2/A^2 \cdot s^2$	T · m ² /A

APPENDIX-B

B.1 Conversion Factors

Length

	m	cm	km	in.	ft	mi
1 meter	1	10^2	10^{-3}	39.37	3.281	6.214×10^{-4}
1 centimeter	10^{-2}	1	10^{-5}	0.3937	3.281×10^{-2}	6.214×10^{-6}
1 kilometer	10^3	10^5	1	3.937×10^4	3281×10^3	0.6214
1 inch	2.540×10^{-2}	2.540	2.540×10^{-5}	1	8.333×10^{-2}	1.578×10^{-5}
1 foot	0.3048	30.48	3.048×10^{-4}	12	1	1.894×10^{-4}
1 mile	1609	1.609×10^5	1.609	6.336×10^4	5280	1

Mass

	kg	g	slug	u
1 kilogram	1	10^3	6.854×10^{-2}	6.024×10^{26}
1 gram	10^{-3}	1	6.852×10^{-5}	6.024×10^{23}
1 slug	14.59	1.459×10^4	1	8.789×10^{27}
1 atomic mass unit	1.660×10^{-27}	1.660×10^{-24}	1.137×10^{-28}	1

Note : 1 metric ton = 1000 kg.

Time

	s	min	h	day	yr
1 second	1	1.667×10^{-2}	2.778×10^{-4}	1.157×10^{-5}	3.169×10^{-8}
1 minute	60	1	1.667×10^{-2}	6.944×10^{-4}	1.901×10^{-6}
1 hour	3600	60	1	4.167×10^{-2}	1.141×10^{-4}
1 day	8.640×10^4	1440	24	1	2.738×10^{-5}
1 year	3.156×10^7	5.259×10^5	8.766×10^3	365.2	1

Speed

	m/s	cm/s	ft/s	mi/h
1 meter per second	1	10^2	3.281	2.237
1 centimeter per second	10^{-2}	1	3.281×10^{-2}	2.237×10^{-2}
1 foot per second	0.3048	30.48	1	0.6818
1 mile per hour	0.4470	44.70	1.467	1

Note : 1 mi/min = 60 mi/h = 88 ft/s.

Force

	N	lb
1 newton	1	0.2248
1 pound	4.448	1

Energy, Energy Transfer

	J	ft · lb	eV
1 joule	1	0.7376	6.242×10^{18}
1 foot-pound	1.356	1	8.464×10^{18}
1 electron volt	1.602×10^{-19}	1.182×10^{-19}	1
1 calorie	4.186	3.087	2.613×10^{19}
1 British thermal unit	1.055×10^3	7.779×10^2	6.585×10^{21}
1 kilowatt-hour	3.600×10^6	2.655×10^6	2.247×10^{25}

	cal	Btu	kWh
1 joule	0.2389	9.481×10^{-4}	2.778×10^{-7}
1 foot-pound	0.3239	1.285×10^{-3}	3.766×10^{-7}
1 electron volt	3.827×10^{-20}	1.519×10^{-22}	4.450×10^{-26}
1 calorie	1	3.968×10^{-3}	1.163×10^{-6}
1 British thermal unit	2.520×10^2	1	2.930×10^{-4}
1 kilowatt-hour	8.601×10^5	3.413×10^2	1

Pressure

	Pa	atm
1 pascal	1	9.869×10^{-6}
1 atmosphere	1.013×10^5	1
1 centimeter mercury ^a	1.333×10^3	1.316×10^{-2}
1 pound per square inch	6.895×10^3	6.805×10^{-2}
1 pound per square foot	47.88	4.725×10^{-4}

	cm Hg	lb/in. ²	lb/ft ²
1 pascal	7.501×10^{-4}	1.450×10^{-4}	2.089×10^{-2}
1 atmosphere	76	14.70	2.116×10^3
1 centimeter mercury ^a	1	0.1943	27.85
1 pound per square inch	5.171	1	144
1 pound per square foot	3.591×10^{-2}	6.944×10^{-3}	1

At 0°C and at a location where the free-fall acceleration has its “standard” value, 9.80665 m/s².

B.2 Conversions of useful physical quantities

Length

1 in. = 2.54 cm (exact)
 1 m = 39.37 in. = 3.281 ft
 1 ft = 0.3048 m
 12 in. = 1 ft
 3 ft = 1 yd
 1 yd = 0.9144 m
 1 km = 0.621 mi
 1 mi = 1.609 km
 1 mi = 5280 ft
 1 μm = 10^{-6} m = 10^3 nm
 1 light-year = 9.461×10^{15} m

Area

1 m^2 = 10^4 cm^2 = 10.76 ft^2
 1 ft^2 = 0.0929 m^2 = 144 in^2
 1 in^2 = 6.452 cm^2

Volume

1 m^3 = 10^6 cm^3 = 6.102×10^4 in^3
 1 ft^3 = 1728 in^3 = 2.83×10^{-2} m^3
 1 L = 1000 cm^3 = 1.0576 qt = 0.0353 ft^3
 1 ft^3 = 7.481 gal = 28.32 L = 2.832×10^{-2} m^3
 1 gal = 3.786 L = 231 in^3

Mass

1000 kg = 1 t (metric ton)
 1 slug = 14.59 kg
 1 u = 1.66×10^{-27} kg = 931.5 MeV/ c^2

Force

1 N = 0.2248 lb
 1 lb = 4.448 N

Velocity

1 mi/h = 1.47 ft/s = 0.447 m/s = 1.61 km/h
 1 m/s = 100 cm/s = 3.281 ft/s
 1 mi/min = 60 mi/h = 88 ft/s

Acceleration

1 m/s^2 = 3.28 ft/s^2 = 100 cm/s^2
 1 ft/s^2 = 0.3048 m/s^2 = 30.48 cm/s^2

Pressure

1 bar = 10^5 N/ m^2 = 14.50 lb/ in^2
 1 atm = 760 mm Hg = 76.0 cm Hg
 1 atm = 14.7 lb/ in^2 = 1.013×10^5 N/ m^2
 1 Pa = 1 N/ m^2 = 1.45×10^{-4} lb/ in^2

Time

1 yr = 365 days = 3.16×10^7 s
 1 day = 24 h = 1.44×10^3 min = 8.64×10^4 s

Energy

1 J = 0.738 ft · lb
 1 cal = 4.186 J
 1 Btu = 252 cal = 1.054×10^3 J
 1 eV = 1.602×10^{-19} J
 1 kWh = 3.60×10^6 J

Power

1 hp = 550 ft · lb/s = 0.746 kW
 1 W = 1 J/s = 0.738 ft · lb/s
 1 Btu/h = 0.293 W

Some Approx imations Useful for Estimation Problems

1 m $\approx$ 1 yd	1 m/s $\approx$ 2 mi/h
1 kg $\approx$ 2 lb	1 yr $\approx$ $\pi \times 10^7$ s
1 N $\approx$ $\frac{1}{4}$ lb	60 mi/h $\approx$ 100 ft/s
1 L $\approx$ $\frac{1}{4}$ gal	1 km $\approx$ $\frac{1}{2}$ mi

APPENDIX-C

C.1 Important Constants

Symbol	Meaning	Best Value	Approximate Value
c	Speed of light in vacuum	2.99792458×10^8 m/s	3.00×10^8 m/s
G	Gravitational constant	$6.67408(31) \times 10^{-11}$ N · m ² /kg ²	6.67×10^{-11} N · m ² /kg ²
N_A	Avogadro's number	$6.02214129(27) \times 10^{23}$	6.02×10^{23}
k	Boltzmann's constant	$1.3806488(13) \times 10^{-23}$ J/K	1.38×10^{-23} J/K
R	Gas constant	$8.3144621(75)$ J/mol · K	8.31 J/mol · K = 1.99 cal/mol · K = 0.0821 atm · L/mol · K
σ	Stefan-Boltzmann constant	$5.670373(21) \times 10^{-8}$ W/m ² · K	5.67×10^{-8} W/m ² · K
k	Coulomb force constant	$8.987551788... \times 10^9$ N · m ² /C ²	8.99×10^9 N · m ² /C ²
q_e	Charge on electron	$-1.602176565(35) \times 10^{-19}$ C	-1.60×10^{-19} C
ϵ_0	Permittivity of free space	$8.854187817... \times 10^{-12}$ C ² /N · m ²	8.85×10^{-12} C ² /N · m ²
μ_0	Permeability of free space	$4\pi \times 10^{-7}$ T · m/A	1.26×10^{-6} T · m/A
h	Planck's constant	$6.62606957(29) \times 10^{-34}$ J · s	6.63×10^{-34} J · s

C.2 Submicroscopic Masses

Symbol	Meaning	Best Value	Approximate Value
m_e	Electron mass	$9.10938291(40) \times 10^{-31} \text{ kg}$	$9.11 \times 10^{-31} \text{ kg}$
m_p	Proton mass	$1.672621777(74) \times 10^{-27} \text{ kg}$	$1.6726 \times 10^{-27} \text{ kg}$
m_n	Neutron mass	$1.674927351(74) \times 10^{-27} \text{ kg}$	$1.6749 \times 10^{-27} \text{ kg}$
u	Atomic mass unit	$1.660538921(73) \times 10^{-27} \text{ kg}$	$1.6605 \times 10^{-27} \text{ kg}$

C.3 Solar System Data

Sun	mass	$1.99 \times 10^{30} \text{ kg}$
	average radius	$6.96 \times 10^8 \text{ m}$
	Earth-sun distance (average)	$1.496 \times 10^{11} \text{ m}$
Earth	mass	$5.9736 \times 10^{24} \text{ kg}$
	average radius	$6.376 \times 10^6 \text{ m}$
	orbital period	$3.16 \times 10^7 \text{ s}$
Moon	mass	$7.35 \times 10^{22} \text{ kg}$
	average radius	$1.74 \times 10^6 \text{ m}$
	orbital period (average)	$2.36 \times 10^6 \text{ s}$
	Earth-moon distance (average)	$3.84 \times 10^8 \text{ m}$

C.4 Metric Prefixes for Powers of Ten and Their Symbols

Prefix	Symbol	Value	Prefix	Symbol	Value
tera	T	10^{12}	deci	d	10^{-1}
giga	G	10^9	centi	c	10^{-2}
mega	M	10^6	milli	m	10^{-3}
kilo	k	10^3	micro	μ	10^{-6}
hecto	h	10^2	nano	n	10^{-9}
deka	da	10^1	pico	p	10^{-12}
–	–	$10^0 (= 1)$	femto	f	10^{-15}

C.5 Selected British Units

Length	1 inch (in.) = 2.54 cm (exactly)
	1 foot (ft) = 0.3048 m
	1 mile (mi) = 1.609 km
Force	1 pound (ld) = 4.448 N
Energy	1 British thermal unit (Btu) = $1.055 \times 10^3 \text{ J}$
Power	1 horsepower (hp) = 746 W
Pressure	1 lb / in ² = $6.895 \times 10^3 \text{ Pa}$

C.6 Other Units

Length	1 light year (ly) = $9.46 \times 10^{15} \text{ m}$
	1 astronomical unit (au) = $1.50 \times 10^{11} \text{ m}$
	1 nautical mile = 1.852 km
	1 angstrom ($\text{\AA}$) = 10^{-10} m
Area	1 acre (ac) = $4.05 \times 10^3 \text{ m}^2$
	1 square foot (ft ²) = $9.29 \times 10^{-2} \text{ m}^2$

	1 barn (b) = 10^{-28} m^2
Volume	1 liter (L) = 10^{-3} m^3
	1 U.S. gallon (gal) = $3.785 \times 10^{-3} \text{ m}^3$
Mass	1 solar mass = $1.99 \times 10^{30} \text{ kg}$
	1 metric ton = 10^3 kg
	1 atomic mass unit (u) = $1.6605 \times 10^{-27} \text{ kg}$
Time	1 year (y) = $3.16 \times 10^7 \text{ s}$
	1 day (d) = 86,400 s
Speed	1 mile per hour (mph) = 1.609 km/h
	1 nautical mile per hour (naut) = 1.852 km/h
Angle	1 degree ($^\circ$) = $1.745 \times 10^{-2} \text{ rad}$
	1 minute of arc ($'$) = 1 / 60 degree
	1 second of arc ($''$) = 1 / 60 minute of arc
	1 grad = $1.571 \times 10^{-2} \text{ rad}$
Energy	1 kiloton TNT (kT) = $4.2 \times 10^{12} \text{ J}$
	1 kilowatt hour (kW · h) = $3.60 \times 10^6 \text{ J}$
	1 food calorie (kcal) = 4186 J

	1 calorie (cal) = 4.186 J
	1 electron volt (eV) = 1.60×10^{-19} J
Pressure	1 atmosphere (atm) = 1.013×10^5 Pa
	1 millimeter of mercury (mm Hg) = 133.3 Pa
	1 torricelli (torr) = 1 mm Hg = 133.3 Pa
Nuclear decay rate	1 curie (Ci) = 3.70×10^{10} Bq

C.7 Useful Formulae

Circumference of a circle with radius r or diameter d	$C = 2\pi r = \pi d$
Area of a circle with radius r or diameter d	$A = \pi r^2 = \pi d^2/4$
Area of a sphere with radius r	$A = 4\pi r^2$
Volume of a sphere with radius r	$V = (4/3)(\pi r^3)$

C.8 The Greek Alphabet

Alpha	A	α	Eta	H	η	Nu	N	ν	Tau	T	τ
Beta	B	β	Theta	Θ	θ	Xi	Ξ	ξ	Upsilon	Υ	υ
Gamma	Γ	γ	Iota	I	ι	Omicron	O	o	Phi	Φ	ϕ
Delta	Δ	δ	Kappa	K	κ	Pi	Π	π	Chi	χ	χ
Epsilon	E	ϵ	Lambda	Λ	λ	Rho	P	ρ	Psi	ψ	ψ
Zeta	Z	ζ	Mu	M	μ	Sigma	Σ	σ	Omega	Ω	ω

APPENDIX-D

Symbols, Dimensions, and Units of Physical Quantities

Quantity	Common Symbol	Unit	Dimensions	Unit in Terms of Base SI Units
Acceleration	$\vec{a}$	m/s ²	L/T ²	m/s ²
Amount of substance	n	MOLE		mol
Angle	θ, ϕ	radian (rad)	1	
Angular acceleration	$\vec{\alpha}$	rad/s ²	T ⁻²	s ⁻²
Angular frequency	ω	rad/s ²	T ⁻¹	s ⁻¹
Angular momentum	$\vec{L}$	kg.m ² /s	ML ² /T	kg . m ² /s
Angular velocity	$\vec{\omega}$	rad/s	T ⁻¹	s ⁻¹
Area	A	m ²	L ²	m ²
Atomic number	Z			
Capacitance	C	farad (F)	Q ² T ² /ML ²	A ² .s ⁴ /kg.m ²
Charge	q, Q, e	coulomb (C)	Q	A.s
Line Charge density	λ	C/m	Q/L	A.s/m
Surface Charge density	σ	C/m ²	Q/L ²	A.s/m ²
Volume Charge density	ρ	C/m ³	Q/L ³	A.s/m ³
Conductivity	σ	1/Ω . m	Q ² T/ML ³	A ² .s ³ /kg.m ³
Current	I	AMPERE	Q/T	A
Current density	J	A/m ²	Q/TL ²	A/m ²
Density	ρ	kg/m ³	M/L ³	kg/m ³
Dielectric constant	κ			
Electric dipole moment	$\vec{p}$	C . m	QL	A.s.m
Electric field	$\vec{E}$	V/m	ML/QT ²	kg.m/A.s ³

Electric flux	Φ_E	$V \cdot m$	ML^3/QT^2	$kg \cdot m^3/A \cdot s^3$
Electromotive force	ε	volt (V)	ML^2/QT^2	$kg \cdot m^2/A \cdot s^3$
Energy	E, U, K	joule (J)	ML^2/T^2	$kg \cdot m^2/s^2$
Entropy	S	J/K	ML^2/T^2K	$kg \cdot m^2/s^2 \cdot K$
Force	$\vec{F}$	newton (N)	ML/T^2	$kg \cdot m/s^2$
Frequency	f/ν	hertz (Hz)	T^{-1}	s^{-1}
Heat	Q	joule (J)	ML^2/T^2	$kg \cdot m^2/s^2$
Inductance	L	henry (H)	ML^2/Q^2	$kg \cdot m^2/A^2 \cdot s^2$
Length	ℓ, L	Meter	L	m
Displacement	$\Delta x, \Delta \vec{r}$			
Distance	d, h			
Position	$x, y, z, \vec{r}$			
Magnetic dipole moment	$\vec{\mu}$	$N \cdot m/T$	QL^2/T	$A \cdot m^2$
Magnetic field	$\vec{B}$	tesla (T) (=Wb/m ²)	M/QT	$kg/A \cdot s^2$
Magnetic flux	Φ_B	weber (Wb)	ML^2/QT	$kg \cdot m^2/A \cdot s^2$
Mass	m, M	Kilogram	M	kg
Molar specific heat	C	J/mol · K		$kg \cdot m^2/s^2 \cdot mol \cdot K$
Moment of inertia	I	$kg \cdot m^2$	ML^2	$kg \cdot m^2$
Momentum	$\vec{p}$	$kg \cdot m/s$	ML/T	$kg \cdot m/s$
Time Period	T	S	T	s
Permeability of free space	μ_0	N/A^2 (=H/m)	ML/Q^2	$kg \cdot m/A^2 \cdot s^2$
Permittivity of free space	ε_0	$C^2/N \cdot m^2$ (=F/m)	Q^2T^2/ML^3	$A^2 \cdot s^4/kg \cdot m^3$
Potential	V	volt (V) (=J/C)	ML^2/QT^2	$kg \cdot m^2/A \cdot s^3$
Power	P	watt (W) (=J/s)	ML^2/T^3	$kg \cdot m^2/s^3$
Pressure	P	pascal (Pa) (=N/m ²)	M/LT^2	$kg/m \cdot s^2$
Resistance	R	ohm (Ω) (=V/A)	ML^2/Q^2T	$kg \cdot m^2/A^2 \cdot s^3$
Specific heat	c	J/kg · K	L^2/T^2K	$m^2/s^2 \cdot K$
Speed	v	m/s	L/T	m/s
Temperature	T	Kelvin	K	K
Time	t	Second	T	s
Torque	$\vec{\tau}$	$N \cdot m$	ML^2/T^2	$kg \cdot m^2/s^2$
Velocity	$\vec{v}$	m/s	L/T	m/s
Volume	V	m^3	L^3	m^3
Wavelength	λ	m	L	m
Work	W	joule (J) (=N · m)	ML^2/T^2	$kg \cdot m^2/s^2$

APPENDIX-E

Indian Space Research Organisation (ISRO) - - - [1975 to 2020]

India has been successfully launching satellites of many types since 1975.

Satellites have been launched from various vehicles, including those launched by American, Russian and European rockets, as well as those launched indigenously by India.

The organization responsible for India's satellite program is the **Indian Space Research Organisation (ISRO)**.

Satellites	Launch Date	Launch Vehicle
Aryabhata	19-Apr-75	u-11 Interkosmos
Bhaskara-I	07-Jun-79	C-1 Interkosmos
Rohini Technology Payload	10-Aug-79	SLV-3
Rohini RS-1	18-Jul-80	SLV-3
Rohini RS-D1	31-May-81	SLV-3
Ariane Passenger Payload Experiment	19-Jun-81	Ariane-1 (V-3)
Bhaskara-II	20-Nov-81	C-1 Interkosmos
INSAT-1A	10-Apr-82	Delta 3910 PAM-D
Rohini RS-D2	17-Apr-83	SLV-3
INSAT-1B	30-Aug-83	Shuttle [PAM-D]
Stretched Rohini Satellite Series (SROSS-1)	24-Mar-87	ASLV
IRS-1A	17-Mar-88	Vostok
Stretched Rohini Satellite Series (SROSS-2)	13-Jul-88	ASLV
INSAT-1C	21-Jul-88	Ariane-3
INSAT-1D	12-Jun-90	Delta 4925
IRS-1B	29-Aug-91	Vostok
INSAT-2DT	26-Feb-92	Ariane-44L H10
Stretched Rohini Satellite Series (SROSS-C)	20-May-92	ASLV
INSAT-2A	10-Jul-92	Ariane-44L H10
INSAT-2B	23-Jul-93	Ariane-44L H10+
IRS-1E	20-Sep-93	PSLV-D1
Stretched Rohini Satellite Series (SROSS-C2)	04-May-94	ASLV
IRS-P2	15-Oct-94	PSLV-D2
INSAT-2C	07-Dec-95	Ariane-44L H10-3
IRS-1C	29-Dec-95	Molniya
IRS-P3	21-Mar-96	PSLV-D3
INSAT-2D	04-Jun-97	Ariane-44L H10-3
IRS-1D	29-Sep-97	PSLV-C1
INSAT-2E	03-Apr-99	Ariane-42P H10-3
Oceansat-(IRS-P4)	26-May-99	PSLV-C2
INSAT-3B	22-Mar-2000	Ariane-5G
GSAT-1	18-Apr-01	GSLV-D1
Technology Experiment Satellite (TES)	22-Oct-01	PSLV-C3
INSAT-3C	24-Jan-02	Ariane-42L H10-3
Kalpana-1(METSAT)	12-Sep-02	PSLV-C4
INSAT-3A	10-Apr-03	Ariane-5G
GSAT-2	08-May-03	GSLV-D2
INSAT-3E	28-Sep-03	Ariane-5G

RESOURCESAT-1(IRS-P6)	17-Oct-03	PSLV-C5
EDUSAT	20-Oct-04	GSLV-F01
HAMSAT	05-May-05	PSLV-C6
CARTOSAT-1	05-May-05	PSLV-C6
INSAT-4A	22-Dec-05	Ariane-5GS
INSAT-4C	10-Jul-06	GSLV-F02
CARTOSAT-2	10-Jan-07	PSLV-C7
Space Capsule Recovery Experiment(SRE-1)	10-Jan-07	PSLV-C7
INSAT-4B	12-Mar-07	Ariane-5ECA
INSAT-4CR	02-Sep-07	GSLV-F04
CARTOSAT-2A	28-Apr-08	PSLV-C9
IMS-1 (Third World Satellite – TWsat)	28-Apr-08	PSLV-C9
Chandrayaan-1	22-Oct-08	PSLV-C11
RISAT-2	20-Apr-09	PSLV-C12
ANUSAT	20-Apr-09	PSLV-C12
Oceansat-2(IRS-P4)	23-Sep-09	PSLV-C14
GSAT-4	15-Apr-10	GSLV-D3
CARTOSAT-2B	12-Jul-10	PSLV-C15
StudSat	12-Jul-10	PSLV-C15
GSAT-5P /INSAT-4D	25-Dec-10	GSLV-F06
RESOURCESAT-2	20-Apr-11	PSLV-C16
Youthsat	20-Apr-11	PSLV-C16
GSAT-8 / INSAT-4G	21-May-11	Ariane-5VA-202
GSAT-12	15-Jul-11	PSLV-C17
Megha-Tropiques	12-Oct-11	PSLV-C18
Jugnu	12-Oct-11	PSLV-C18
RISAT-1	26-Apr-12	PSLV-C19
SRMSAT	26-Apr-12	PSLV-C18
GSAT-10	29-Sep-12	Ariane-5VA-209
SARAL	25-Feb-13	PSLV-C20
IRNSS-1A	01-Jul-13	PSLV-C22
INSAT-3D	26-Jul-13	Ariane-5
GSAT-7	30-Aug-13	Ariane-5
Mars Orbiter Mission (MOM)	05-Nov-13	PSLV-C25
GSAT-14	05-Jan-14	GSLV-D5
IRNSS-1B	04-Apr-14	PSLV-C24
IRNSS-1C	16-Oct-14	PSLV-C26
GSAT-16	07-Dec-14	Ariane-5
IRNSS-1D	28-Mar-15	PSLV-C27
GSAT-6	27-Aug-15	GSLV-D6
Astrosat	28-Sep-15	PSLV-C30
GSAT-15	11-Nov-15	Ariane 5 VA-227
IRNSS -1E	20-Jan-16	PSLV-C31
IRNSS -1F	10-Mar-16	PSLV-C32
IRNSS-1G	28-Apr-16	PSLV-C33
Cartosat-2C	22-Jun-16	PSLV-C34
CartoSat-2E	8 September 2016,	INSAT-3DR
Pratham	26 September 2016,	PSLV-C35

GSAT-18	6 October 2016,	Ariane-5 ECA
ResourceSat-2A	7 December 2016,	PSLV-C36
CartoSat-2D	15 February 2017,	PSLV-C37
South Asia Satellite (GSAT-9)	5 May 2017,	GSLV Mk.II[3
GSAT-19	05-Jun-17	GSLV Mk.III-D1
NIUSat[	23-June 2017,	PSLV-C38
GSAT-17	29 June 2017,	Ariane-5 ECA
IRNSS-1H	02-Sep-17	PSLV-C39
CartoSat-2F	10-January 2018,	PSLV-C40
GSAT-6A	29-Mar-18	GSLV-F08
IRNSS-11	12-Apr-18	GSLV-F08, PSLV-C41
GSAT-29	01-Nov-18	GSLV Mk III D2
HySIS	29-Nov-18	PSLV-C43
GSAT-7A	19-Dec-18	GSLV Mk.II-F11
Microsat-R	23-Jan-19	PSLV-C44
EMISAT	01-Apr-19	PSLV-C45
PS4 Stage attached with ExseedSat-2, AMSAT, ARIS and AIS payloads	01-Apr-19	PSLV-C45
Risat-2B	21-May-19	PSLV-C46
Chandrayaan-2	22-Jul-19	GSLV MkIII-M1
Chandrayaan-3	14-Jul-23	LVM3

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