GEOCUBE DATASHEET

## I. DESCRIPTION

The Geocube system is a deformation monitoring system. It is based on GNSS signals : and provides millimetre deformation information.

GNSS configuration	
Satellites signals tracked	GPS L1C/A *BeiDou B1* *(not presently integrated in calculation algorithm)* *GLONASS L1OF* *(not presently integrated in calculation algorithm)* *Galileo E1B/C* *(not presently integrated in calculation algorithm)*
Channels	72
Raw data format	RINEX

It works in network of several devices all connected by radio to a computing unit: the coordinator.
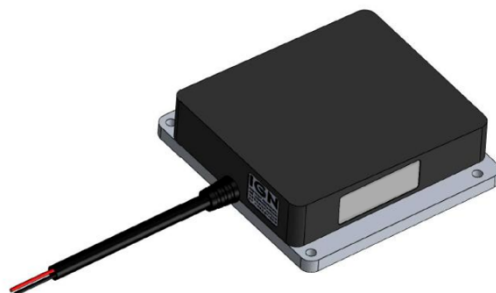
Each Geocube receives the GNSS signal coming from several satellites, computes its position and transfers it to the base station that computes the position of each member of the network and summarizes it into a list.

or
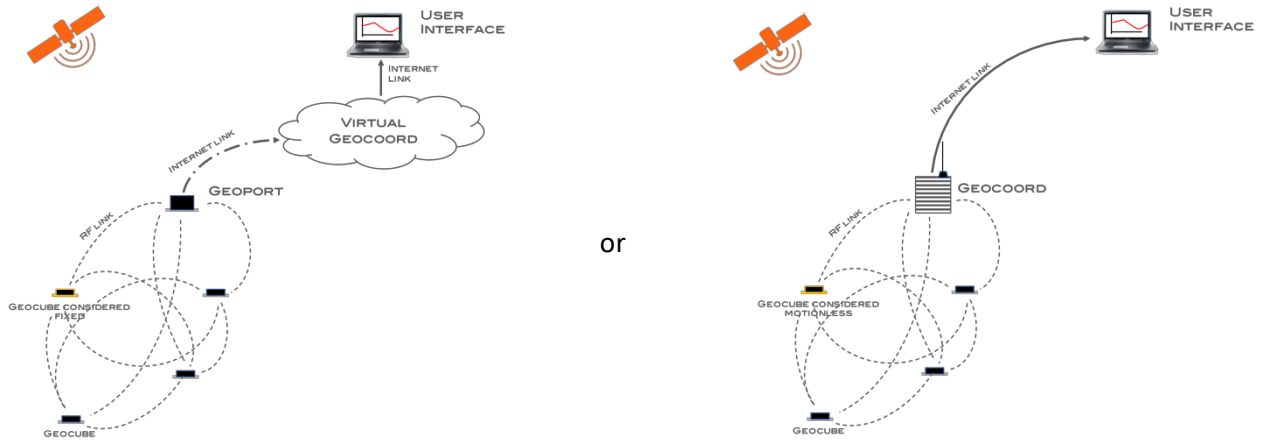
II. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Typ.	Max	Unit	Remarks/Conditions
Ingress Protection Rating	IP		IP69			
Storage temperature range	STR	-40		80	°C	
Shock resistance	IK		IK7			
Number Geocubes in a network	NGN	2		50		
Supply voltage	VS	3.3	3.7	20	V	

III. OPERATING CONDITIONS

Parameter	Symbol	Min	Typ.	Max	Unit	Remarks/Conditions
Operating temperature range	OTR	-40		65	°C	
Positional dilution of precision	PDOP			5		
Stability zone around each Geocube		5			m	
Masks limit angle from ground				15	°	
distance between geocubes				10	km	

IV. SPECIFICATIONS

Parameter		<1 km baseline*	>1 km baseline*	Remarks/Conditions
East, North precision,	sliding average over sidereal day	1 mm	1 ppm	Dry weather
height precision	sliding average over sidereal day	2 mm	2 ppm	
East, North precision,	differential over sidereal day	2 mm	2 ppm	Dry weather
height precision	differential over sidereal day	4 mm	4 ppm	
East, North precision,	sliding average over sidereal day	5 mm	5 ppm	All weather
height precision	sliding average over sidereal day	10 mm	10 ppm	
East, North precision,	instantaneous	20 mm	20 ppm	All weather
height precision	instantaneous	40 mm	40 ppm	
Power consumption active mode		0.50 W		
Power consumption sleeping mode		0.004 W		
Radio frequency		2.4 GHz		
Radio range (without external antenna)		200 m		

* Distance between mobile and fixed Geocube


Precision vs. distance to fixed Geocube
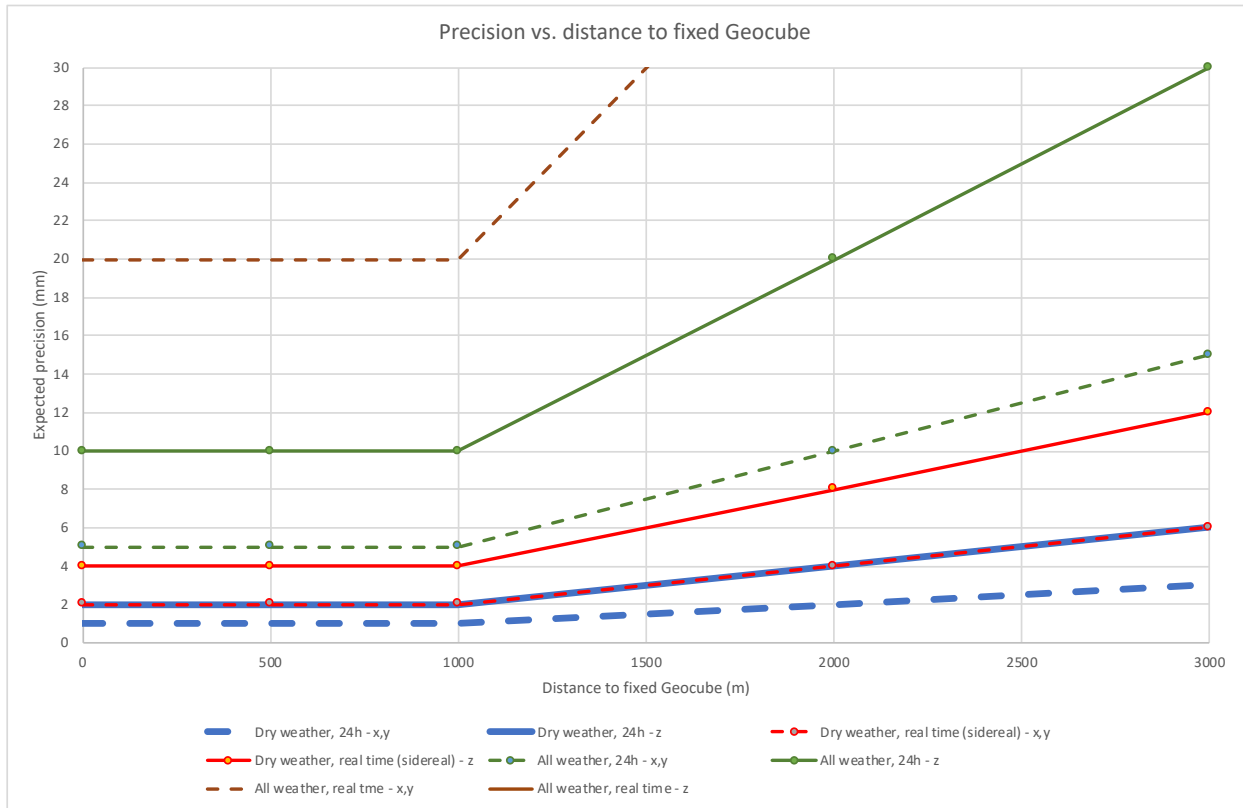
V. PRECISION

Precision is expressed as the standard deviation of the position. Note that this is not the accuracy on precision since some bias can arise, due to phase centring of the antenna etc. But the values of the move measurement accuracy are the same as precision.

The position measured has a bias caused by multipath of the GNSS signal that is time dependant, not position dependent (at the first order). This bias has a pattern that repeats every sidereal day. This is due to the fact that the satellite constellation has such a cycle.

The bias has a Gaussian profile and a repetitive pattern.
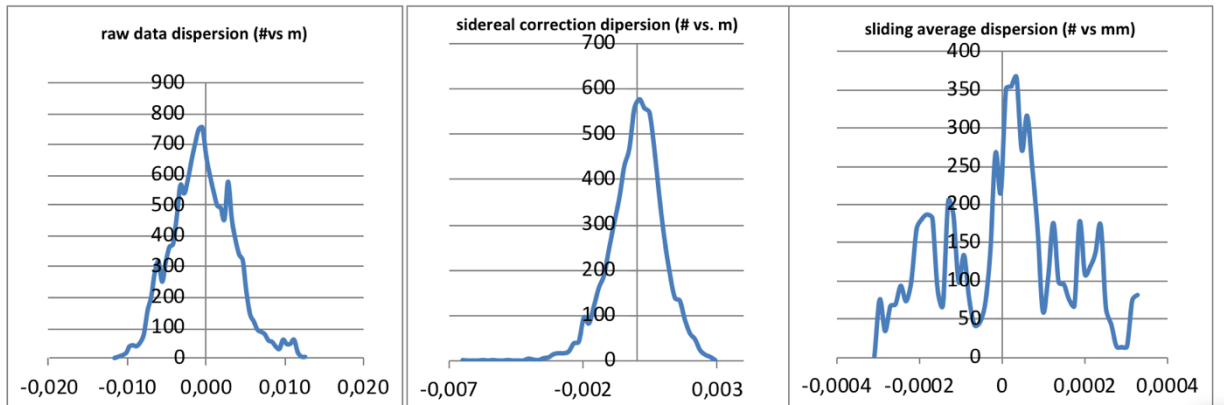
Histogram of a static Geocube over 7 days (dry weather) with different processing. Abscises are in meter.

Rain, snow, and mist will change the bias pattern, amplitude and average. This is why the "all weather" specifications are degraded.

VI. GEOPORT

The Geoport enables to connect the Geocubes to the virtual coordinator:
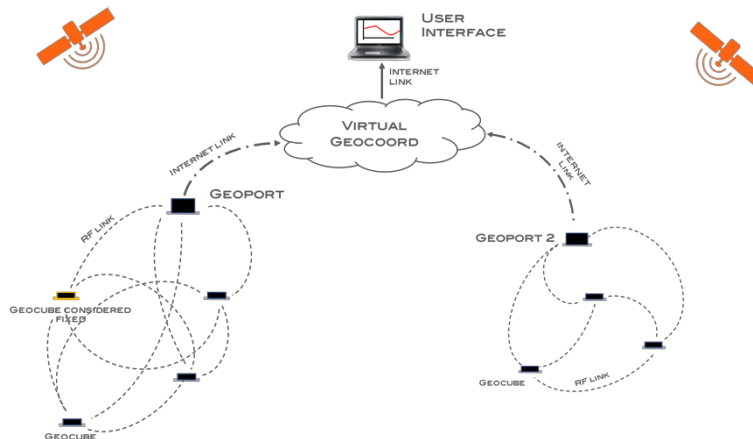
The Geoport is described in a specific datasheet.

In case a Geocoord (i.e. physical coordinator) is used, no Geoport is required.

VII.   COORDINATOR

Coordinator is a physical (Geocoord) or virtual (Virtual Geocoord placed on a server) device receiving data from Geocubes through Geoports. It hosts the precise computing software and enables the user to exploit the solution through comprehensive web interface.

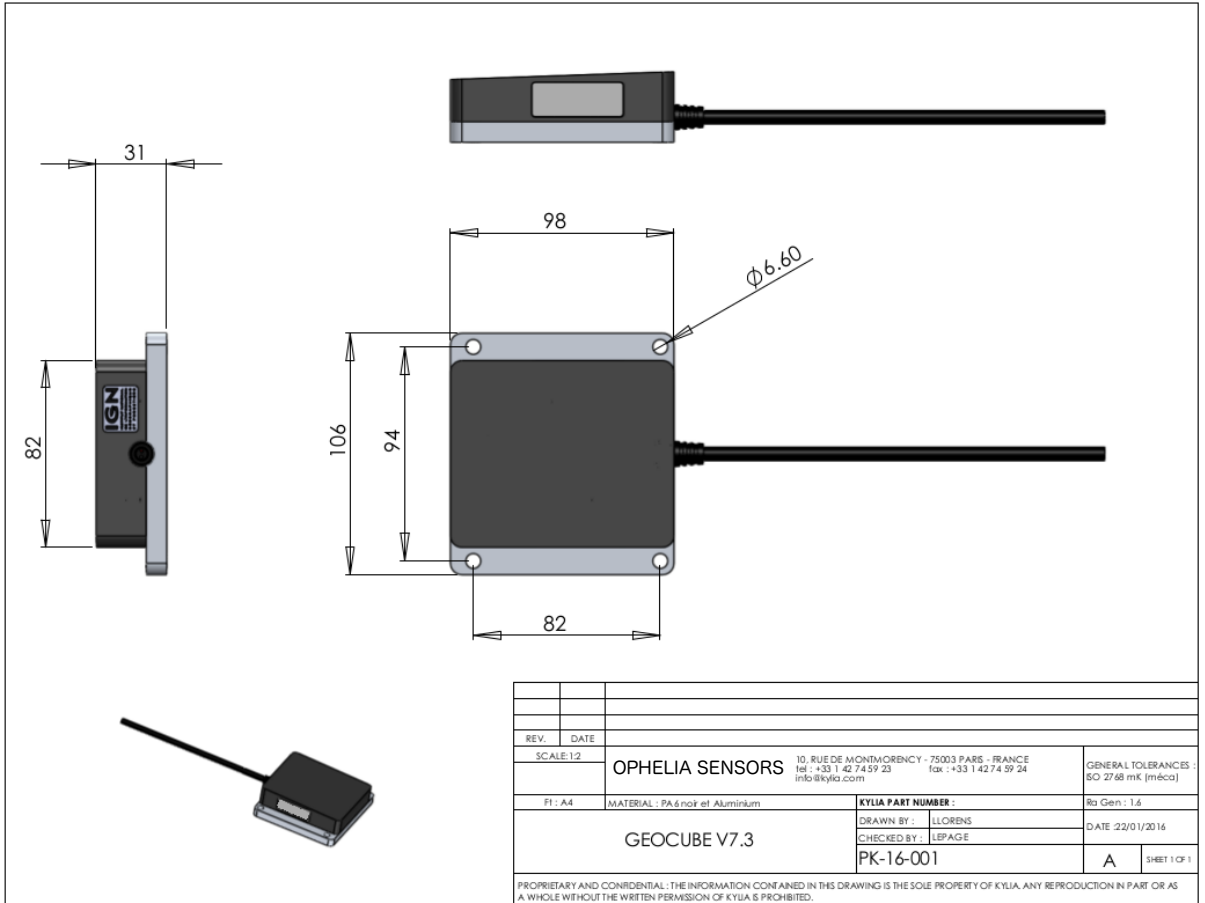The Geocoord is described in a specific datasheet.

VIII.   RADIO COMMUNICATIONS

Geocubes, Geoports and Geocoords communicate with radio signal, in a meshed, self-healing, redundant topology.

Parameter	Value	Unit	Remarks/Conditions
Protocol	Meshed Zigbee		
Radio frequency	2.4	GHz	other frequencies available
Radio range	2-10000	m	depends on antenna
Channel	11 to 26		according to IEEE 802.15.4
power	-7 to +18	dBm	
sensitivity	-100 dBm		

Radio range depends on antenna height: minimum antenna height (in meter) is defined by $h=0.5*sqrt(0.125*D)$, where D is the distance (in meter) between antennas

Sub networks are possible, making the deployment of several systems on a same area possible. Encryption is possible.

OPHELIA
S E N S O R S

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Ø6.60

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94

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REV.	DATE					

SCALE:1:2

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GENERAL TOLERANCES :
ISO 2768 mK (méca)

F1 : A4   MATERIAL : PA 6 noir et Aluminium

KYLIA PART NUMBER :   Ra Gen : 1.6

DRAWN BY : LLORENS   DATE :22/01/2016

CHECKED BY : LEPAGE

GEOCUBE V7.3

PK-16-001   A   SHEET 1 OF 1