OPHELIA
SENSORS

Geocube installation manual

Version : 1.01
Date : March 2020

SUMMARY

I. INTRODUCTION

This document describes the different steps necessary to install a Geocube system on site. To define and launch a process, you should also refer to the Project Administrator Manual.

To navigate in this document, you can directly access a given chapter by clicking the corresponding entry in the summary page 2.

To go back to the summary, you can click on the following icon, , on the top left hand side of every page.

II. PREPARING FIELD DEPLOYMENT

II.A. PRE-CONFIGURING SYSTEM

Before you head out to the field, it might be useful to check all Geocubes and Geoport are functional and correctly configured in office, so as to limit deployment time once on site. To do so, please refer to the “Project Administration Manual”.

If you have a Deployment Pack, you have been provided with a set of cables to power the different devices. You have also been invited, through mail, to create your administrator profile on the coordinator corresponding to your latest project.

II.B. CHECKING TOOLS

Before going on site, best is to make sure you have the necessary set of tools. In addition to any particular tools needed for your specific installation, if you are using Ophelia Sensors power pack, you will be needing the following :

Allen key 8mm

Allen key 6mm

If you are using Ophelia Sensors masts, you will needing the following :

Allen key 8mm

Allen key 6mm

Allen key 5mm

n°13 wrench

III. SETTING UP MASTS

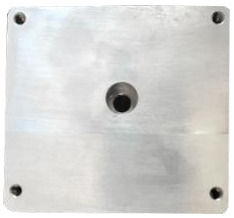
STEP 1 – assembling the mast & fixing the Geocube

First step for installing an Ophelia mast, is to fix the Geocube. To do so, you will need the following tools :

Allen key 8mm

Allen key 6mm

Items provided for each mast are the following :

			
1x long M8 hex bolts	4xM6 hex bolts	1x150cm strut profile	1x metal plate

Only one of the sides of the mast is threaded.

Use the M8 bolt to attach the metal plate to the mast.

There is only one position for the Geocube to perfectly match the metal plate. Once you have figured how the Geocube should be positioned, simply use the 4 M6 bolts to fix the Geocube.

STEP 2 – attaching the mast

With the mast, you have been provided two 50mm clamps to fix it either to the provided Ophelia stand or to any pole with a diameter inferior to 40mm.

2x 50mm clamp with 13 mm bolts

To fix the mast to the stand or a pole, simply install both clamps as indicated in the photos below :

In order to ensure optimal stability, clamps should be installed over 40 cm from one another.

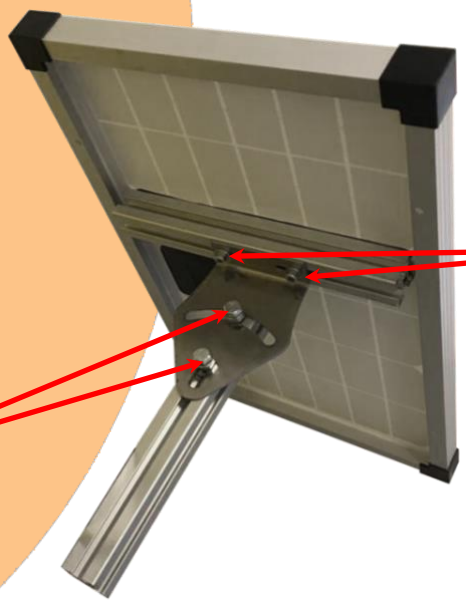
IV. SETTING UP 10W SOLAR PANELS

STEP 1 – preparing the solar panel

When solar panels are provided through a power pack, they come with the necessary equipment to attach them to a pole or an Ophelia mast, depending on the requested order. Additional to the solar panel come a number of items :

			
2xM8 hex bolts 2xM8 sliding blocks	2xM6 hex bolts 2xM6 sliding blocks	1x24cm strut profile	1x rotating fixation

Assemble elements as shown :



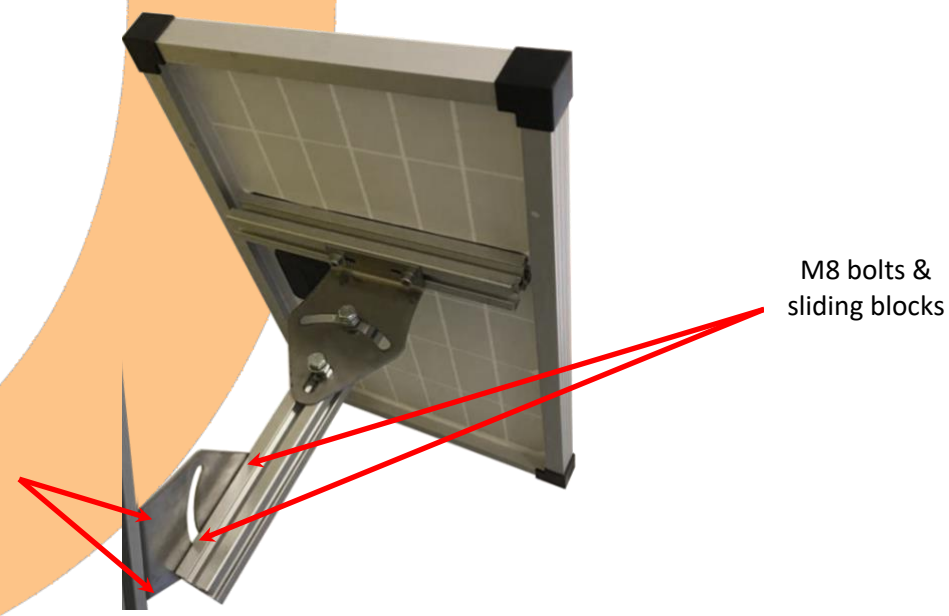
STEP 2 – fixing the solar panel

a) Fixing the solar panel to an Ophelia mast

To connect the assembled solar panel to the Ophelia mast, you have been provided one of the following :

			or	
2xM8 hex bolts 2xM8 sliding blocks	2xM6 hex bolts 2xM6 sliding blocks	1x rotating fixation		1x rotating fixation including 1xmetal frame 1xM8 hex bolts 1xblack handle+1 large M8 washer 2xM8 sliding blocks 2xM6 hex bolts+2xsmall M6 washer+2xM6 sliding blocks

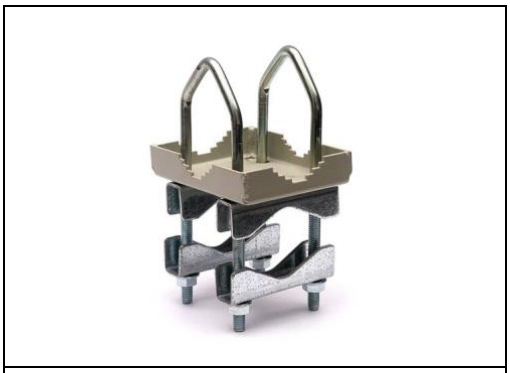
In the first case, install the rotating fixation as indicated below.



If you have been provided a rotating fixation with handle, please refer to the 20W solar panel fixing to see how to proceed.

b) Fixing the solar panel to a pole

If you are attaching the solar panel to a pole, use the provided double clamp. You will need a n°13 wrench.



1x double clamp

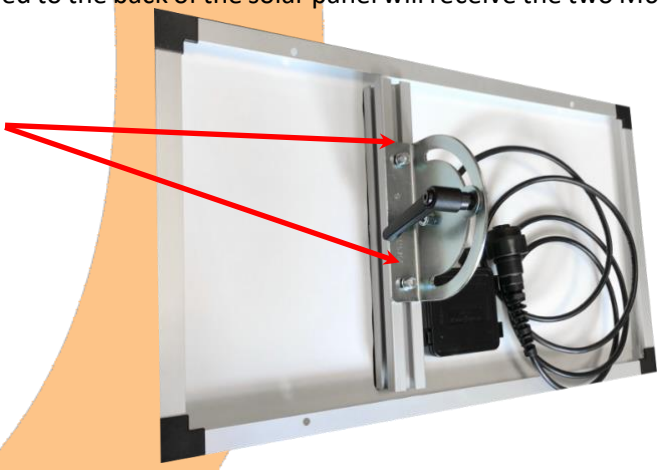
V. SETTING UP 20W SOLAR PANELS

As with 10W solar panels, 20W solar panels are provided with the necessary equipment to fix them either to an Ophelia mast or to whatever pole.

	
1x24cm strut profile	1x rotating fixation including : 1xmetal frame 1xM8 hex bolts 1xblack handle+1 large M8 washer 2xM8 sliding blocks 2xM6 hex bolts+2xsmall M6 washer+2xM6 sliding blocks

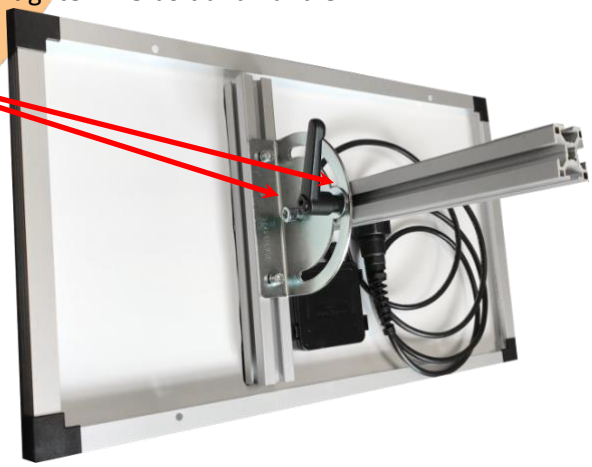
Strut profile attached to the back of the solar panel will receive the two M6 sliding blocks to attach the rotating fixation :

M6 bolts & sliding blocks



Slide the extra strut profile and tighten M8 bolt and handle :

M8 bolt, handle & sliding blocks



a) Fixing the solar panel to an Ophelia mast

If you are using an Ophelia mast, you will have been provided the following :

1x rotating fixation including :
1xmetal frame
1xM8 hex bolts
1xblack handle+1 large M8 washer
2xM8 sliding blocks
2xM6 hex bolts+2xsmall M6 washer+2xM6 sliding blocks

Simply attach, the rotating fixation to the mast, using the 2 M6 hex bolts, washers and sliding blocks. Then slide the strut profile supporting the solar panel on the rotating fixation using the M8 bolt and the handle, to fix it to the mast, as shown below.

b) Fixing the solar panel to a pole

If you are attaching the solar panel to a pole, use the provided double clamp. You will need a n°13 wrench.

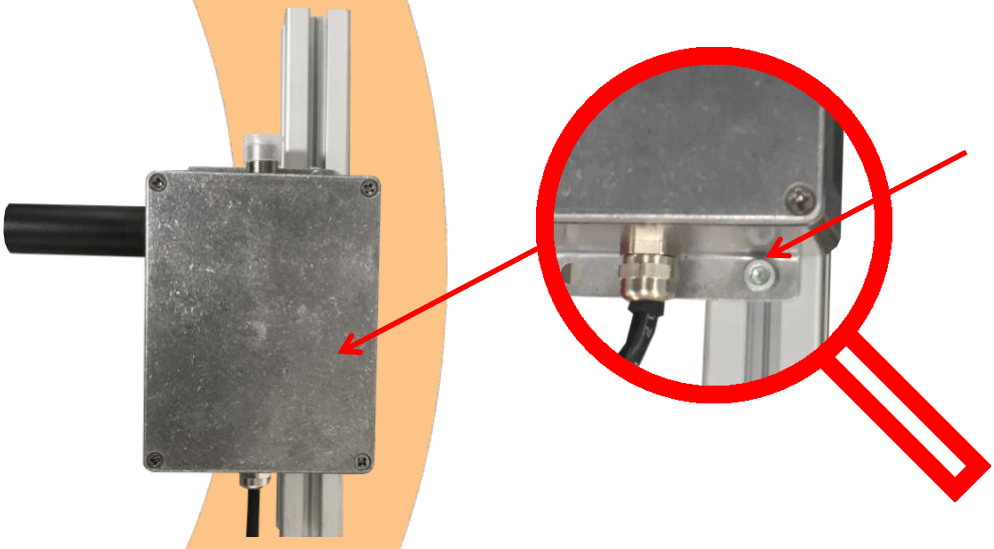
1x double clamp

VI. FIXING A GEOPORT TO A MAST

To attach your Geoport to an Ophelia mast, you have been provided the following :

2xM5 hex bolts
2xM5 sliding blocks

Place the two bolts in the holes on the side of the Geoport, insert the sliding blocks in the mast and tighten.



VII. INSTALLING ANTENNAS

Geocubes use a wide variety of antennas, using different systems to fix them. You will find hereafter a list of how to fix the specific antenna you are using.

VII.A. ANTENNA FIXED DIRECTLY ON THE GEOCUBE/GEOPORT

a) Omnidirectional 6-7 dBi RF antenna

Simply bolt the antenna to the N-plug on the Geocube, either directly or using the 90° adaptor.

VII.B. ANTENNAS FIXED DIRECTLY ON THE MAST/POLE

a) 90° sector 15 dBi RF antenna

The antenna comes with a clamp to be fixed directly to the mast/pole. Installation instructions are provided in the antenna box.

b) 60° sector 8 dBi RF antenna

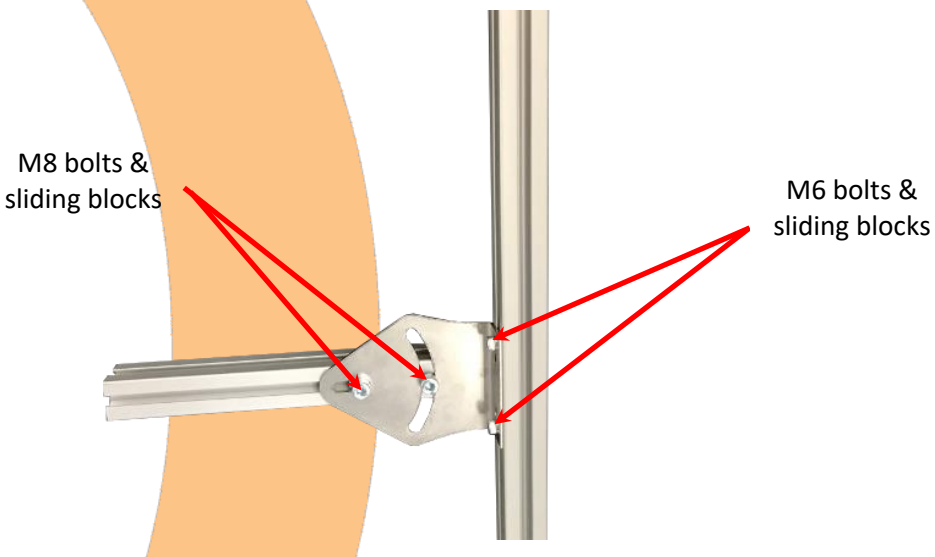
The antenna comes with a clamp to be fixed directly to the mast/pole. Installation instructions are provided in the antenna box.

VII.C. ANTENNAS ATTACHED TO AN EXTENSION

To attach these antennas, you will first have to fix an appendix to the mast. To do so, use the following items :

			
4xM8 hex bolts 4xM8 sliding blocks	2xM6 hex bolts 2xM6 sliding blocks	1x24cm strut profile	1x rotating fixation

Assemble the extension to the mast as indicated in the photo below :



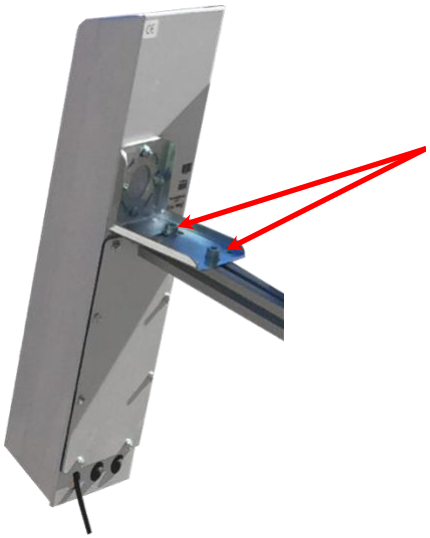
Once the piece is assembled, you can attach the clamps provided in the antennas to attach the to the 24 cm strut profile.

a) Directional 17dBi RF antenna

Fix the back of the antenna to the strut profile using provided fixation and 2 M8 bolts and sliding blocks

b) Sector 120° 14 dBi and sector 180° 14 dBi RF antennas

Fix the back of the antenna to the strut profile using provided fixation and 2 M8 bolts and sliding blocks

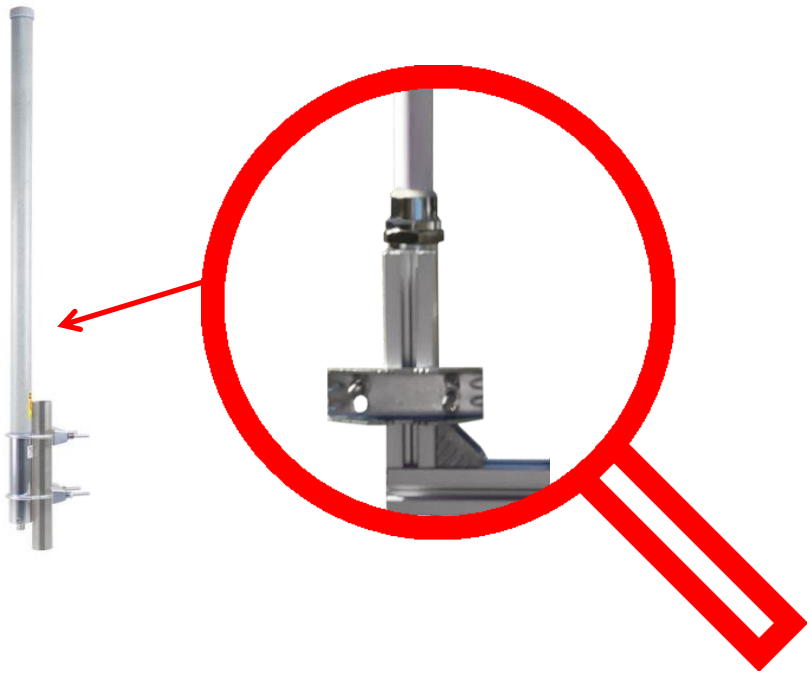


c) Omnidirectional 15 dBi RF antenna

Additional items are provided with this antenna in order to install it properly.

On the end of the 24 cm strut profile, install the flat angle bracket and fix the extra strut profile.

Will the 50mm clamp, attach the antenna as shown in the photos below.



VIII. INSTALLING A POWERPACK

To install a powerpack, simply insert the battery in the provided case.

Use the M8 bolt and nut to attach cables inside the case to the battery.

Remove the transport security according to indications provided with the battery.

Plug-in both the solar panel cable and the Geocube/Geoport cable to the case (these two connectors are different so as to prevent any error as to which goes where).

IX. USEFUL TIPS AND INFORMATION

IX.A. POWERING

Correct powering is crucial for a smooth long term operation. Dimension of battery and solar panel (if needed) must be carefully chosen to make sure devices will function throughout the year. Here is a list of a few deployment characteristics which might affect the size of batteries (i.e. the maximum available stock of energy) and power of solar panel (i.e. the speed at which you can recharge your battery).

a) Monthly average sun radiation

Solar powering devices should be dimensioned to last through winter, given it is the moment with least available sun radiation. In higher latitudes (either north or south), hours of sunlight diminish considerably. This should represent the threshold your system has to be set for. Monthly sun radiation averages should be used rather than yearly averages given the important variation between winter and summer.

b) Orientation

If possible, solar panels should, in any case, always be facing south (i.e. when sun radiation is strongest). The sun does not follow the same path in summer and winter, where it is lower on the horizon. As in the previous point, this phenomenon is increased in higher latitudes. Given solar panel efficiency is greatest when the sun radiation hits it at a right angle, solar panel should be pointing to the elevation of the sun in winter, which is roughly the latitude of the project+20°.

c) Vegetation cover/building shadow

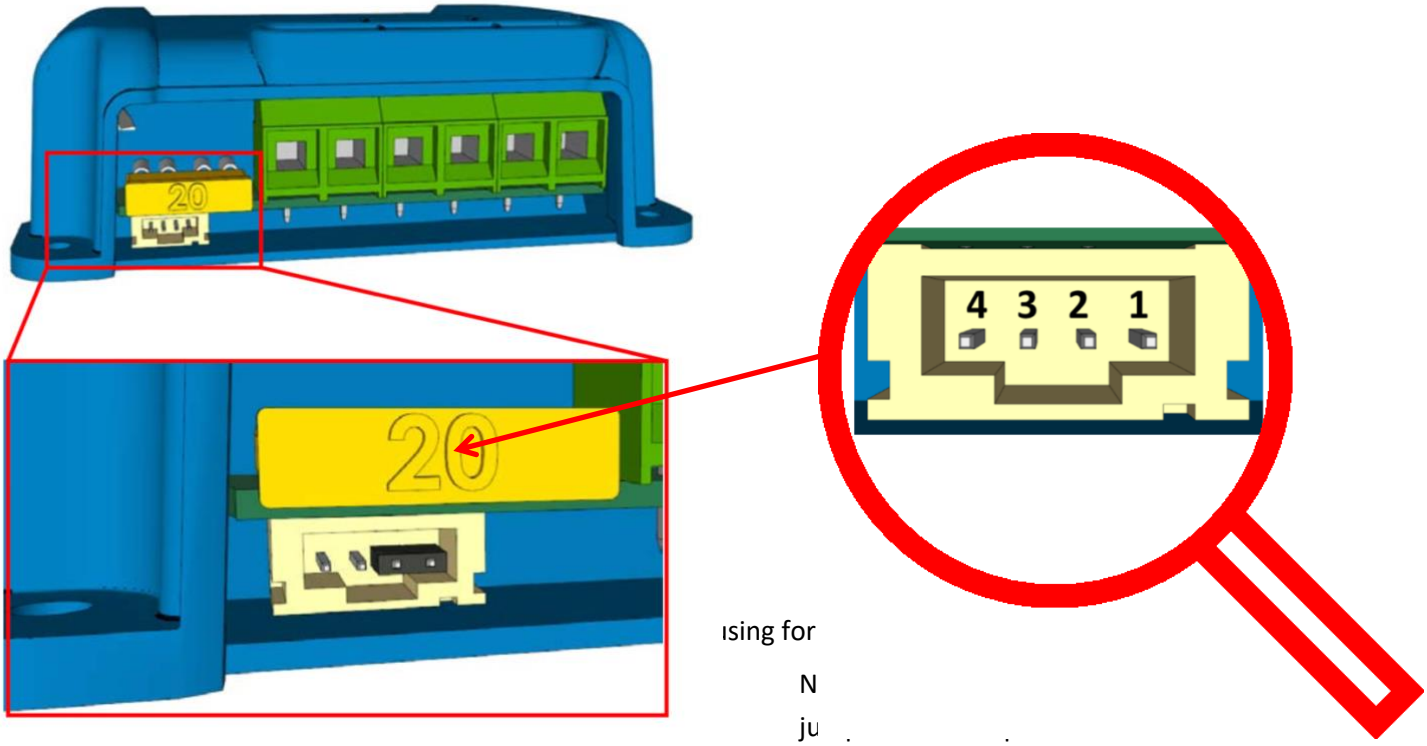
If the solar panel is installed next to trees or buildings, the shadow of the vegetation cover will very probably considerably diminish the efficiency of the battery charge (even though the shadow of the vegetation covers only a fraction of the solar panel). In order to avoid any problematic interruption of measures, make sure to take this effect into account when dimensioning the batteries and solar panel you will be using. The same applies if a nearby building or construction obstructs sun radiation for part of the day.

d) Battery protection

To ensure proper operation overtime, a battery needs to be regularly fully recharged and not be overly discharged. To protect the battery, Ophelia powerpacks are equipped with SmartSolar charge controllers (blue device within the battery case). These charge controllers automatically cut output power if the battery voltage goes below certain thresholds, thereby interrupting position calculation. The higher the battery protection, lower the “usable” energy in the battery and therefore higher the probability calculations will be interrupted in case of insufficient sun radiation. Three settings are possible :

- Battery Life algorithm (high battery protection) ensures that the battery is fully charge at least once a week. Adapts the output discharge accordingly
- Conventional battery protection : power output is disconnected if the battery voltage falls below 11,8V. It automatically resumes once battery voltage is above 14V.
- Low battery protection : power output is disconnected if the battery voltage falls below 11,1V. It automatically resumes once battery voltage is above 13,1V

To select the best setting for your project (depending on accessibility, emergency or long term operation, etc.), a jumper is installed on the charge controller, as shown below :



ısing for

N

ju . .

- Low battery protection : jumper between pins 1 and 2

For full information, please consult the documents corresponding to this component :

https://www.victronenergy.fr/upload/documents/Manual-BlueSolar-charge-controller-MPPT-75-10-75-15--100-15-EN-NL-FR-DE-ES-SE-ul.pdf

IX.B. RADIO

Geocubes form a meshed radio network in which data flows both ways between every Geocube and the server/Geocoord. It is therefore compulsory that radio signal be stable enough to ensure proper communication. Hereafter a few indications on how to enhance your radio network.

a) Internal antenna Geocubes

The internal antenna in the corresponding models is located as shown below :

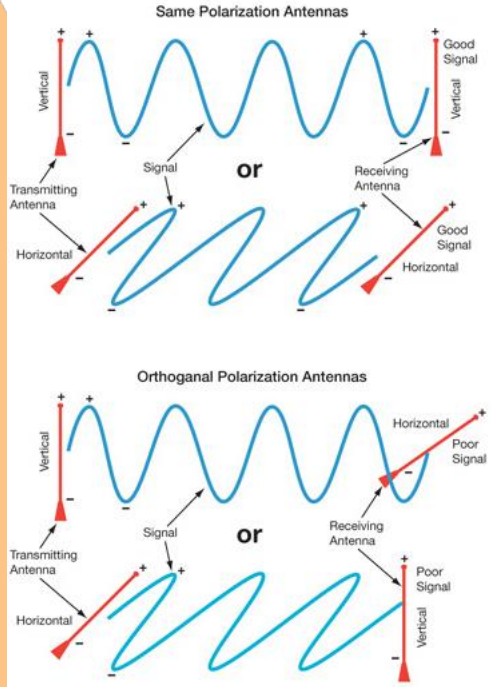
Polarization is therefore horizontal and “nose” of the Geocube should be aimed at the destination point for better results.

b) Antenna installation

Antennas should be installed as high as possible above the ground since it enables better communication (Fresnel zone). Whenever possible, obstacles between two devices should obviously be avoided.

c) Antenna polarization

Radio waves can be polarized either horizontally or vertically. This is totally independent from the direction of said radio waves. Devices connect better if the polarization of their antennas match (note that they can also connect with different polarizations, but signal strength will be lesser).



Omnidirectional antennas are necessarily polarized in the direction of their greater length.

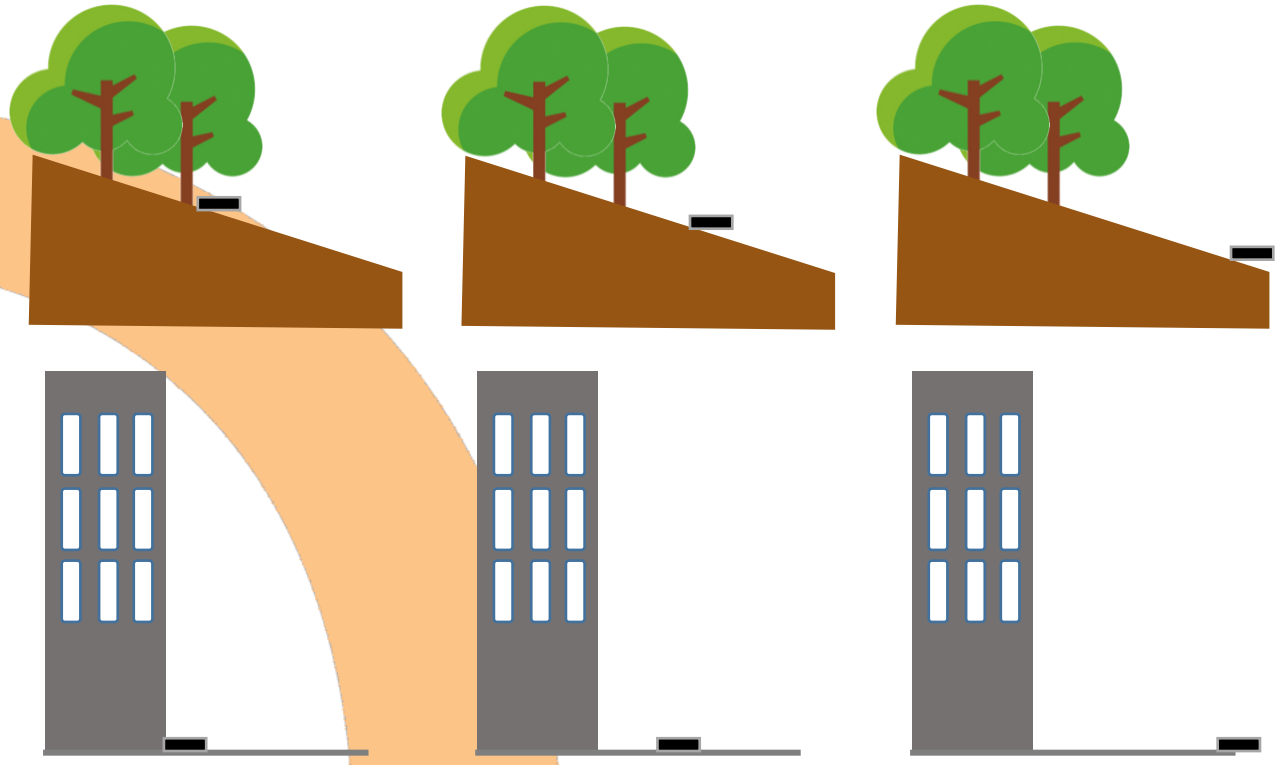
Sector and directional antennas often have two settings for the polarization (horizontal and vertical). It is best to try and keep all antennas of a single system polarized in the same direction.

IX.C. GNSS & SKY

Geocubes’ basic information is the data they receive from GNSS satellites. The more satellites are visible and locked, the better the calculation robustness and precision.

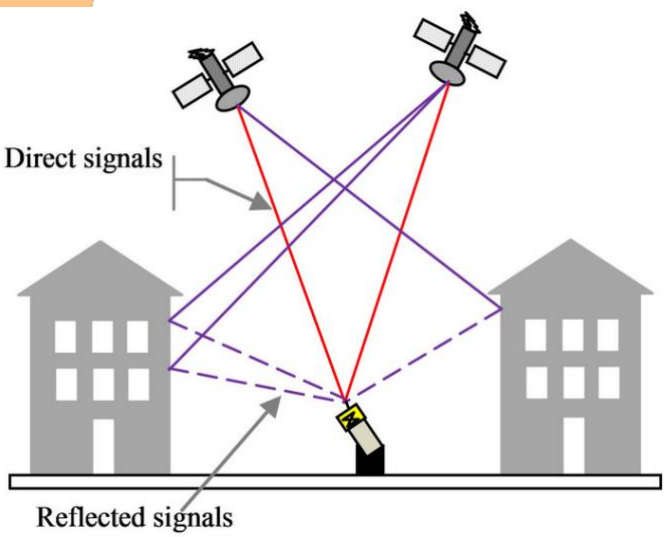
a) Open sky

The clearer the sky view above the Geocube, the better. If possible try to avoid any overhanging objects or buildings.



b) Multipath

GNSS systems use signal flight time to compute a position. Like all signals, satellite signals can be reflected by surrounding objects. This is particularly true of certain materials (metal, glass, asphalt, water, etc.). Such reflections lead to imprecisions in calculations, due to this multipath effect.



This explains why the rain temporarily increases imprecision of measurement. If possible, place Geocubes at a distance from large reflecting areas to limit multipath effects.