

BGAN ANTENNA POINTING BASICS

vs.3.0 10/31/2016

The Inmarsat Satellites are geostationary.

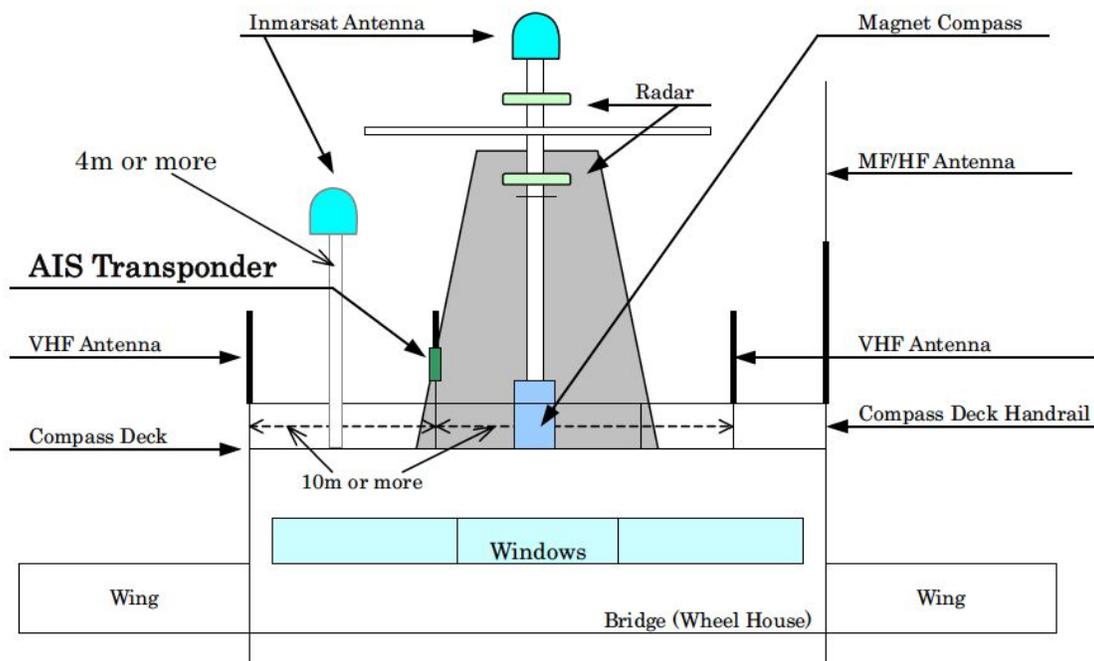
https://en.wikipedia.org/wiki/Geostationary_orbit

This means they are fixed in space relative to earth location points. This requires the BGAN terminal antennas to point within five degrees or so, directly to the regional satellite in space. The satellites located around the Equator at about 26500 km are:

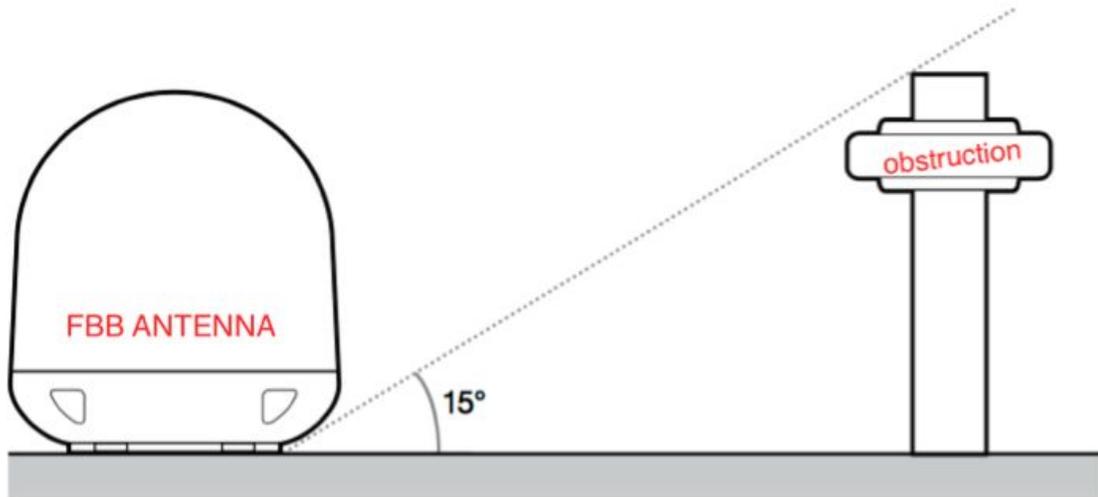
I-4 F1 ASIA-PACIFIC at 143.5E degrees
I-5 F1 MEAS at 63E degrees
I-4 F2 EMEA at 25E degrees
I-4 F3 AMERICAS at 97.6W degrees

All BGAN installation and operator manuals have instructions relating to the need for accurate pointing of the terminal (UT) antenna for maximum signal. This is fairly simple for land portable, because the antenna surface can be seen. This is not the case with vehicle mobile or Fleet Broad Band as the antenna surface is enclosed and points to the satellite automatically.

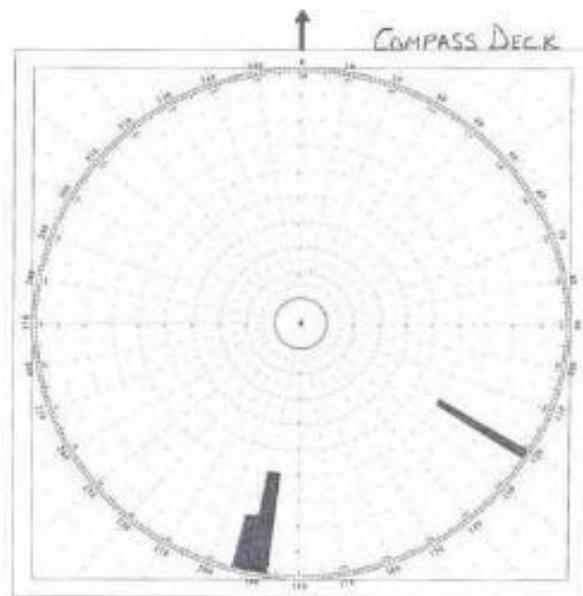
The best placement for all BGAN antenna is in clear line of sight to the satellite with no obstructions in between. For vessels at sea this can be problematic because the best place is as high as possible on the vessel structure. However as high as possible is usually not possible due to vibration and environmental issues. For ease of antenna mounting on vessels the installation location is usually where the antenna can easily be maintained and on or near the bridge and not the highest point. This means that at some points in the vessel's position (Lat/Long) and course at sea there will be blockage of the signal path by the vessels own superstructure or by nearby structures when moored or in port.



There will be signal blockage at some vessel position and sailing course when the satellite location in the geostationary orbit is located behind obstructions that are 15 degrees elevation or more from the base of the antenna .



After the FBB antenna has been installed, it is in the best interest of operations if all possible pointing angles (EL and AZ) that would incur possible signal blockage is mapped and posted near the FBB below deck unit (BDU). An example of such a map (chart) is given in the following figure that shows, for the particular installation, blocking will occur at azimuths of 20-122 and 187-196 degrees.



If blockage is a major issue then consideration should be given to the installation of two antennas, one on either side of the superstructure, with a selector to connect to the antenna with the best line of sight pointing view to the satellite. Antenna signal blockage can be determined by triangulation when the vessel's location is known, and is simplified with available satellite location and pointing website aids. An

illustration of this determination can be seen in the SATLINK 250 Installation Manual which is replicated on the following page:

3.5 ADU Position and Pointing

If you need to know which direction your ADU antenna is pointing, follow the method shown below.

This could be used to determine where the antenna may be blocked due to an obstruction. In this case the signal level will be several dBHz below normal (typical 54dBHz) or 0dBHz if no satellite is visible from the antenna location.

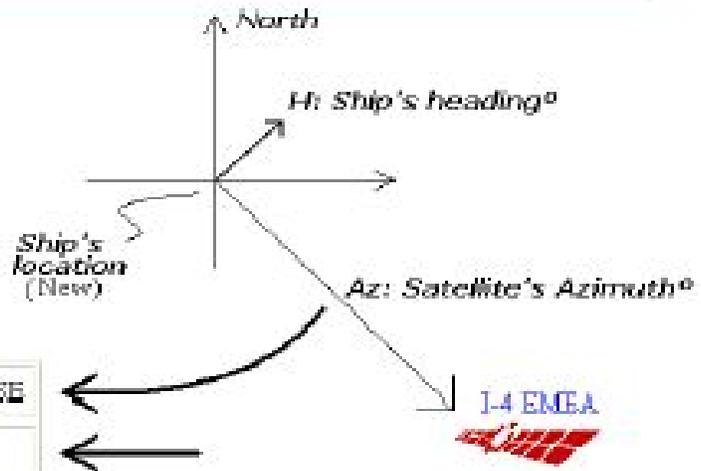
GPS must be working, showing a 3D (New) position, as this is used to calculate Azimuth and Elevation angles during initialisation and antenna pointing.



Sat : 54 dBHz
 [Progress bar]
 Temperat. : Normal
 GPS:
 Lat : 40° 31' 58.65" N
 Long : 3° 39' 21.77" W
 Tip : 3D (New)
 Tim : 10/06/17, 10:21:57 GMT

Pointing Angle (Visible Satellites):

I-4 EMEA	Azimuth	139.82° SE
	Elev	: 34.84°



- 1) If $Az \approx H$ the FB250 antenna is pointing in the bow direct.
- 2) If $Abs[H - Az] \approx 180^\circ$ the FB250 antenna is pointing in the aft direct.
- 3) If $Az > H$ the FB250 antenna is pointing $(Az - H)^\circ$ from the bow to Starboard.
- 4) If $H > Az$ the FB250 antenna is pointing $(H - Az)^\circ$ from the bow to Port

This applies for obstruction free view in Elevation and Azimuth at the current geographic location of the ship. Ship motion should also be considered.

TOOLS FOR DETERMINING LINE OF SIGHT POSSIBLE SIGNAL BLOCKAGE

AIS SHIP TRACKING & SATELLITE FINDER

This is helpful for both land/sea terminals, but most useful for sea-based terminals, like the FBB 250.

These tools combined can help you to locate the UT, and it's line-of-sight to the satellite. Remember, with BGAN, line-of-sight is critical. Anything, like a mountain, tree, ship mast, or crane can be in the way of the radio wave and cause signal attenuation, or block the signal altogether. This is the cause of MANY signal intermittent or loss issues for vessels.

The websites for vessel tracking:

<http://www.marinetraffic.com/ais/home?cb=4236>

These are useful if you haven't the vessel's location from the vessel crew, but you have the SHIP VESSEL NAME and CALLSIGN. You can search and find the latitude, longitude, and even the sailing course (like the degrees on a compass). You can convert from minutes and seconds to a digital format:

<http://www.rcn.montana.edu/resources/converter.aspx>

You can also see where the vessel is, what direction it's going in/likely pointed, and pictures of the vessel. These things help because, for example, if the UT antenna is on the PORT (left), but the satellite is on STARBOARD (right), and there is a big mast in the way, you can tell customer that THAT may be the issue, so, "move the ship," or when vessel changes direction the signal will improve.

SATELLITE FINDER

<http://www.dishpointer.com/>

Is where you can check the pointing to the satellite.

Your location: e.g. streetname, zip code, (lat, lon):
Broadway, New York

Most Popular Satellites in

1. 119W DIRECTV 7S | ECHOSTAR 14 | ECHOSTAR 7
2. 110W DIRECTV 5 (TEMPO 1) | ECHOSTAR 10 | ECHOSTAR 11
3. 97W GALAXY 19 (G-19)
4. 61.5W ECHOSTAR 12 (RAINBOW 1) | ECHOSTAR 16 | ECHOSTAR 3
5. 91W GALAXY 17 (G-17)

All Satellites | Motorized Systems | Multi-LNB Setups:
91W GALAXY 17 (G-17)

Address: Broadway, New York
Latitude: 40.71000

1. Locate the satellite, that corresponds to:
 - a. **I-4 Americas**, at 98 degrees West (satellite 4F3)
 - b. **I-4 EMEA** (Europe, Middle East and Africa), at 25 degrees East (satellite 4F2)
 - c. **I-4 Asia-Pacific**, at 143.5 degrees East. (satellite 4F1)
2. Input the latitude/longitude from above in the location box. That will give you an idea of the line of sight to the satellite, the angle that is best for viewing (or getting a signal- over 60 db is best)
 - a. For example, say you have been given the coordinates by the customer whose vessel is in the port at Hamburg:

Search nearby 53°31'55.9"N 9°57'33.2"E

53°31'55.9"N 9°57'33.2"E
53.532205, 9.959220

Directions

Satellite Finder / Dish Alignment Calculator with Google Maps

Your location: e.g. streetname, zip code, (lat, lon):

53.532205, 9.959220



Most Popular Satellites in 

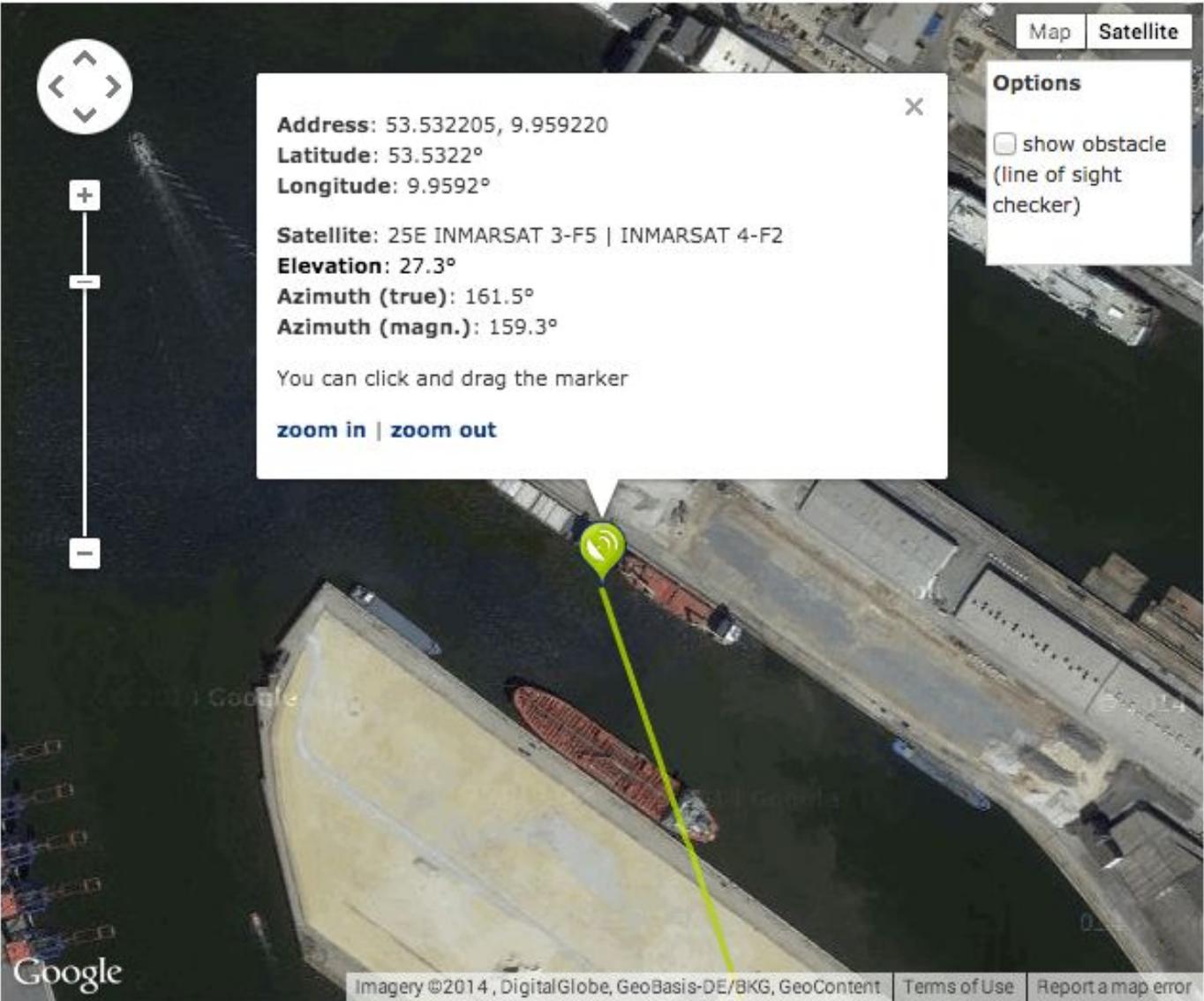
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All Satellites | Motorized Systems | Multi-LNB Setups:

25E INMARSAT 3-F5 | INMARSAT 4-F2



Here you want to input the coordinates and pick the correct satellite. What you will get at this point is a nice map that displays the direction to the satellite. If a vessel is docked as the upper vessel in this picture is and the



Address: 53.532205, 9.959220
Latitude: 53.5322°
Longitude: 9.9592°
Satellite: 25E INMARSAT 3-F5 | INMARSAT 4-F2
Elevation: 27.3°
Azimuth (true): 161.5°
Azimuth (magn.): 159.3°
You can click and drag the marker
zoom in | zoom out

Options
 show obstacle (line of sight checker)

Your Location
Latitude: 53.5322°
Longitude: 9.9592°

Satellite Data
Name: 25E INMARSAT 3-F5 | INMARSAT 4-F2
Distance: 38857km

Dish Setup Data
Elevation: 27.3°
Azimuth (true): 161.5°
Azimuth (magn.): 159.3°
LNB Skew [?]: -10.9°



antenna is located on the starboard side of the bridge, at elevation angle of 27.3 degrees the signal is most likely being blocked or attenuated.