

## GNSS and LTE Antennas

- please refer to the dedicated datasheet for details -

General hints for antenna installation:

- Use a sufficient ground plane directly under the GNSS antenna if the antenna is not mounted already directly on a grounded surface. The metal ground plane (connected with “earth” of the vessel) shall have not less than 20 cm diameter to prevent any reflection from the bottom side.
- Use only high quality GNSS Antennas from well known manufacturers, with a preferred antenna gain of at least +30dB and good “Out-of-Band” filtering (e.g. if an Inmarsat communication is operated close-by).
- When installing multiple GNSS Antennas, separate them by at least 1 m.
- When installing GNSS Antennas near other transmission antennas, separate them if possible in height by at least 3m, above or below each other.
- If the antenna cable (coax) is longer than about 10 m, use low-loss cable RG-59 (~15 dB / 50 m) for up to 50 m distance instead of RG-58 (~30 dB / 50 m). For length up to 100 m use LMR-400 cable (~8.1 dB / 50 m). This is especially important when using high accurate GNSS (L1L2, RTK, dual-antenna). Do not bend the cable strongly as it increases the loss and hence leads to significant degradation.
- Only important for highest accurate time measurements: An RG58/59 cable leads to a typical propagation delay of ~40 ns / 10 m – i.e. keep the cable length always as short as possible!

The following pictures show an overview about GNSS antennas iMAR Navigation provides as standard equipment.

- Formfactor: Diameter 3.5” or 2.6” diameter or ARINC743 (note: the smaller the antenna, typically the lower the performance)
- L1 and L1L2L5 GPS + GLONASS + GALILEO + BEIDOU + SBAS + L-Band
- Screwed, bolt threaded, bulkhead (with sealing) and magnetic foot GNSS Antennas
- LNA, 33-35dB Gain (standard), 40 dB on request
- Central TNC bulkhead with sealing, SMA or MCX connector
- colour gloss white or other on request (lusterless grey, olive crab green, lusterless black)
- For specific additional filtering ask iMAR sales engineers (e.g. to reduce distortions from near-by INMARSAT antennas)

Furthermore nearly all versions of devices are deliverable – ask iMAR sales engineers if the following standard antennas would not match to your requirements.

[www.imar-navigation.de](http://www.imar-navigation.de)

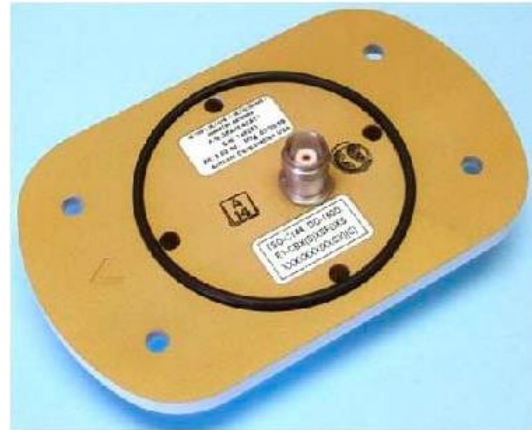
Managing Partner:  
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The following pictures show only type examples. Refer always to the individual drawing related to your specific GNSS antenna!



Left: Example for threaded antenna with threaded bolts from top  
 Right: Example for ARINC743 antenna



Left: Example for magnetic foot mounted antenna with SMA connector  
 Right: Example for bulkhead mounted antenna



Left: Magnetic foot mounted L1 GNSS antenna with integrated cable  
 Right: L1L2 GPS-GLONASS L5 UMTS GSM WLAN antenna for rail vehicles

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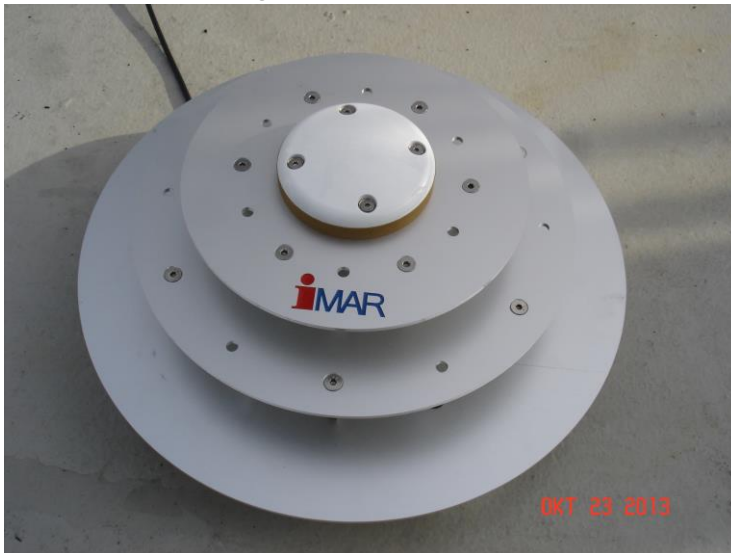


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Antenna with ground plane, with vacuum fixation foot:  
 left: GNSS antenna with SMA connector – it is recommended to use a bulkhead antenna (central connector downside, e.g. 90° MCX to save space); right: LTE antenna



Semi-Chokering-Antenna for GNSS for multipath reduction:



Design rule for L1L2 antenna:

Distance between plates:

$$\text{Lambda} / 4 \times \cos 45^\circ = 33.6 \text{ mm}$$

Difference of radius between each plate:

$$\text{Lambda} / 4 \times \cos 45^\circ = 33.6 \text{ mm}$$

(i.e. linear distance between outer edge of neighborhooded plates shall be  $\text{lambda} / 4$  of L1 and shall have a slope of  $45^\circ$ ).

Lambda (L1) = 190.5 mm (wavelength).

The plate's inner diameter shall not be smaller than 200 mm (larger than lambda).