TAOGLAS®

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bike computer
Antenna Integrator

22-January-2026

Report ID: 20260122_135206-Szwdna9G9L

Contents

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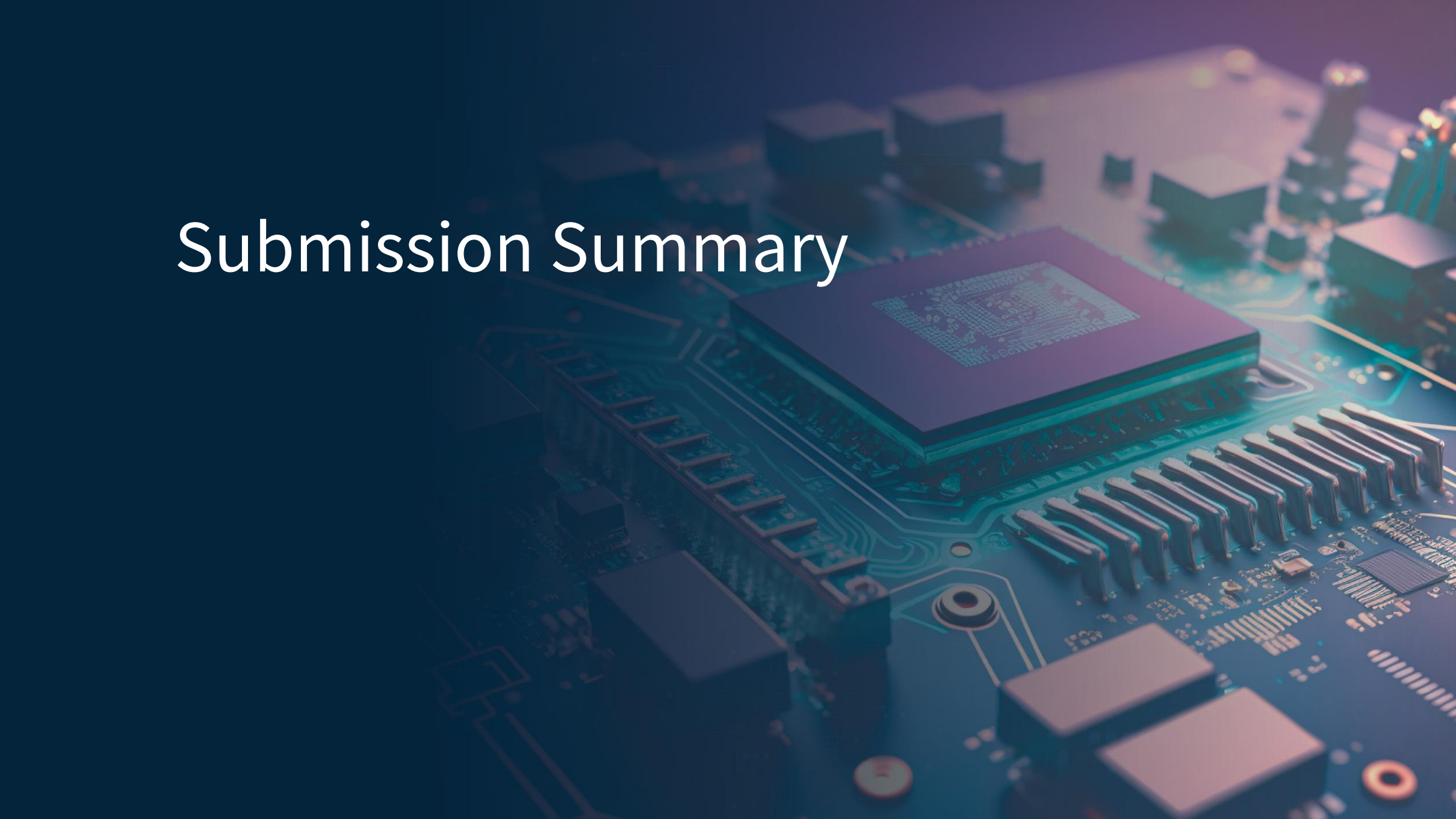
Submission Report Contents

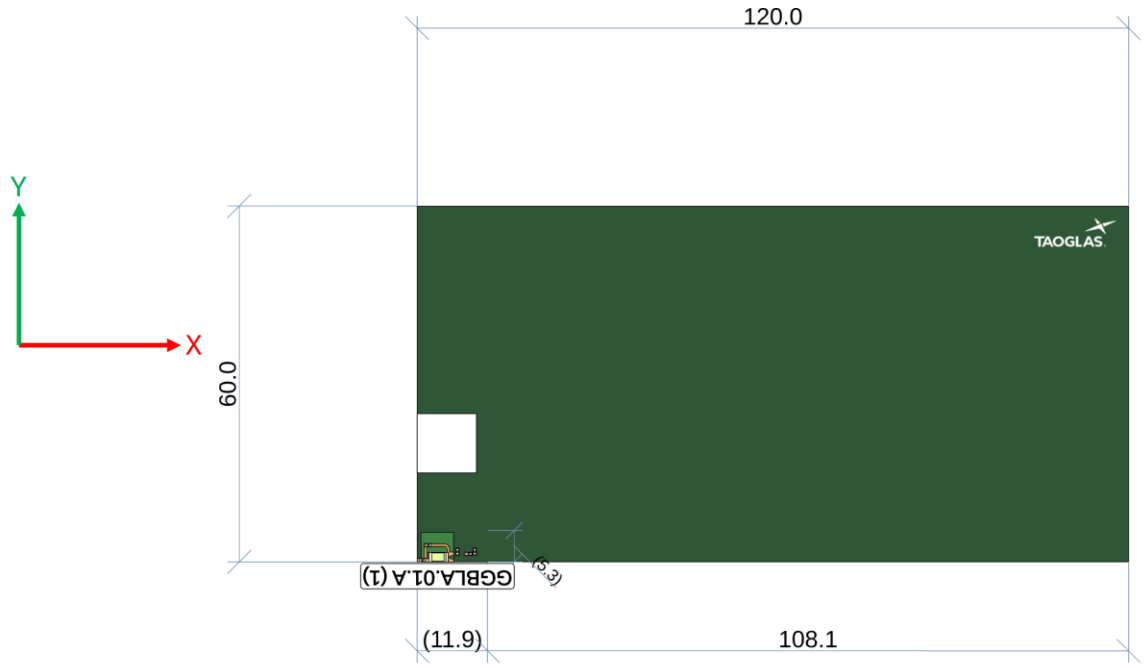
Submission Summary



Submission Summary

PCB	
Thickness	0.8mm
Width	60mm
Length	120mm

Antennas	
Antenna	RF Technology
GGBLA01 (1)	GNSS



Reference Bands

GNSS Bands	
B1C [1575.42 MHz]	1559 - 1592 MHz
B1I [1561 MHz]	1559 - 1565 MHz
E1 [1575.24 MHz]	1563 - 1588 MHz
G1/L1OC [1600.995 MHz]	1596 - 1610 MHz
L1 [1575.42 MHz]	1565 - 1586 MHz

GGBLA.01.A

Antenna

GGBLA.01.A
GNSS antenna
Preffered PCB Position: Longest Edge
GPS (L1), GLONASS (G1), Galileo (E1), BeiDou (B1C, B1I)

See Reference Slide for a full description of the bands.

Downloads

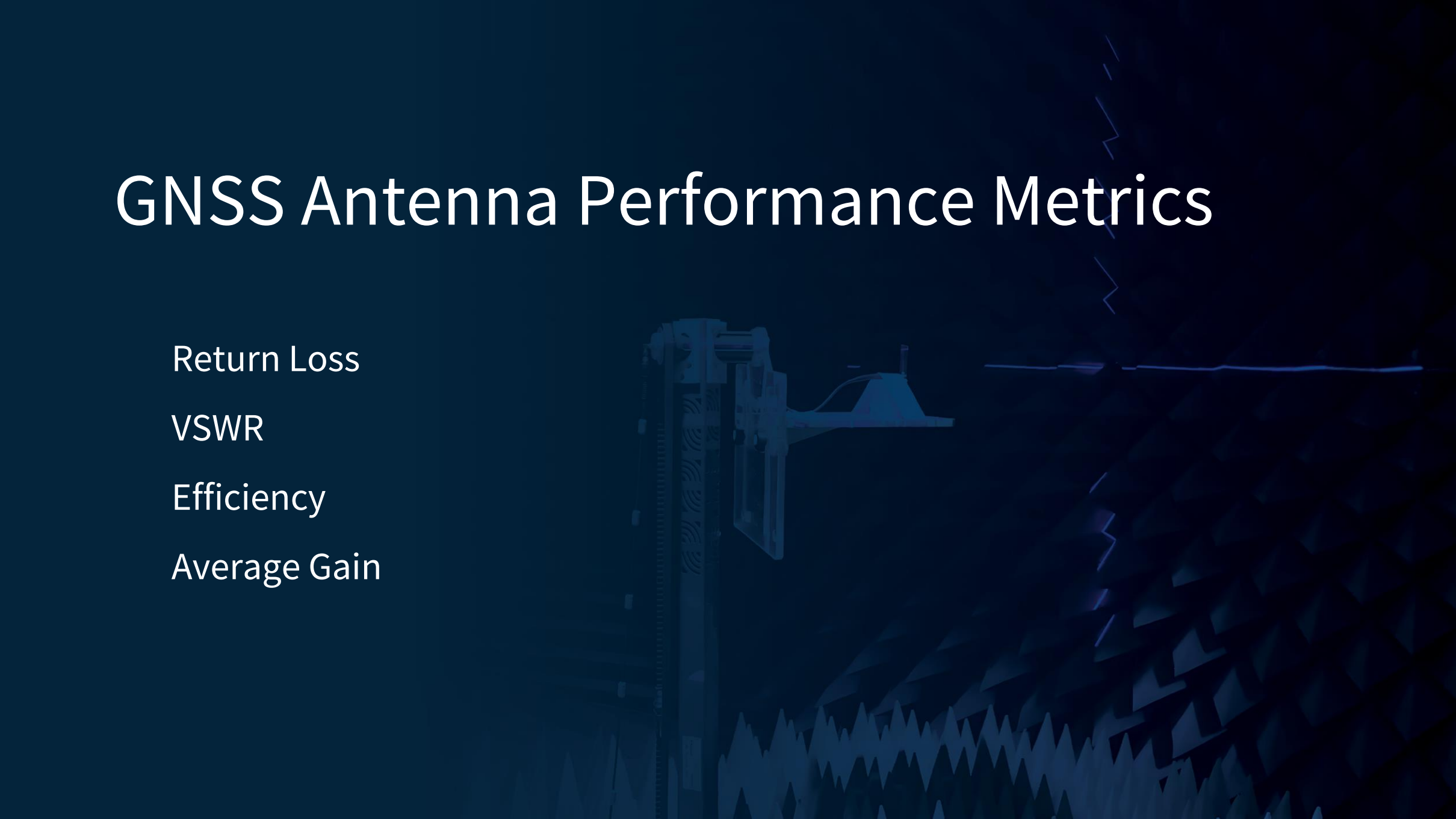
Datasheet

CST

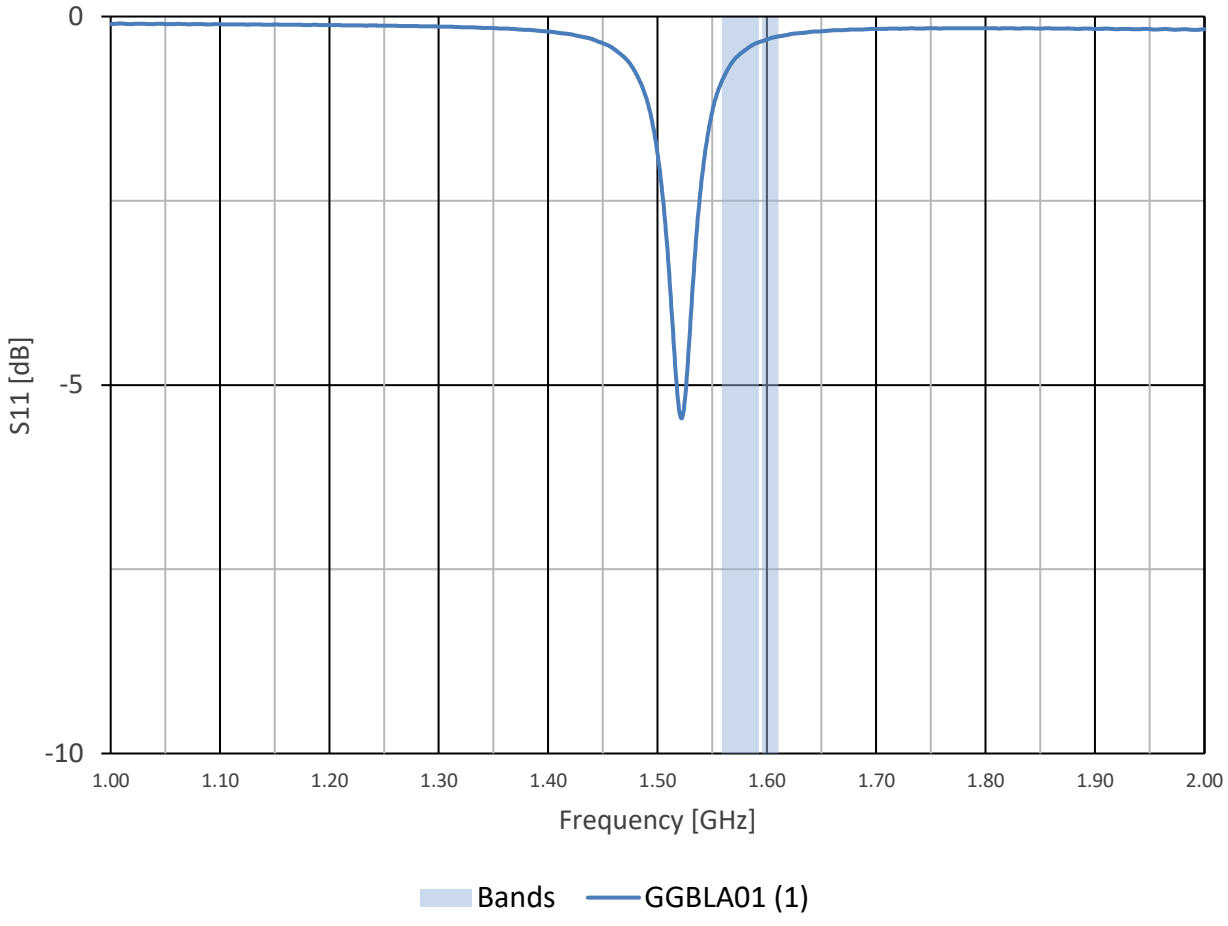
Altium

GNSS Antenna Performance Metrics

- Return Loss
- VSWR
- Efficiency
- Average Gain



Return Loss (S11) - GNSS

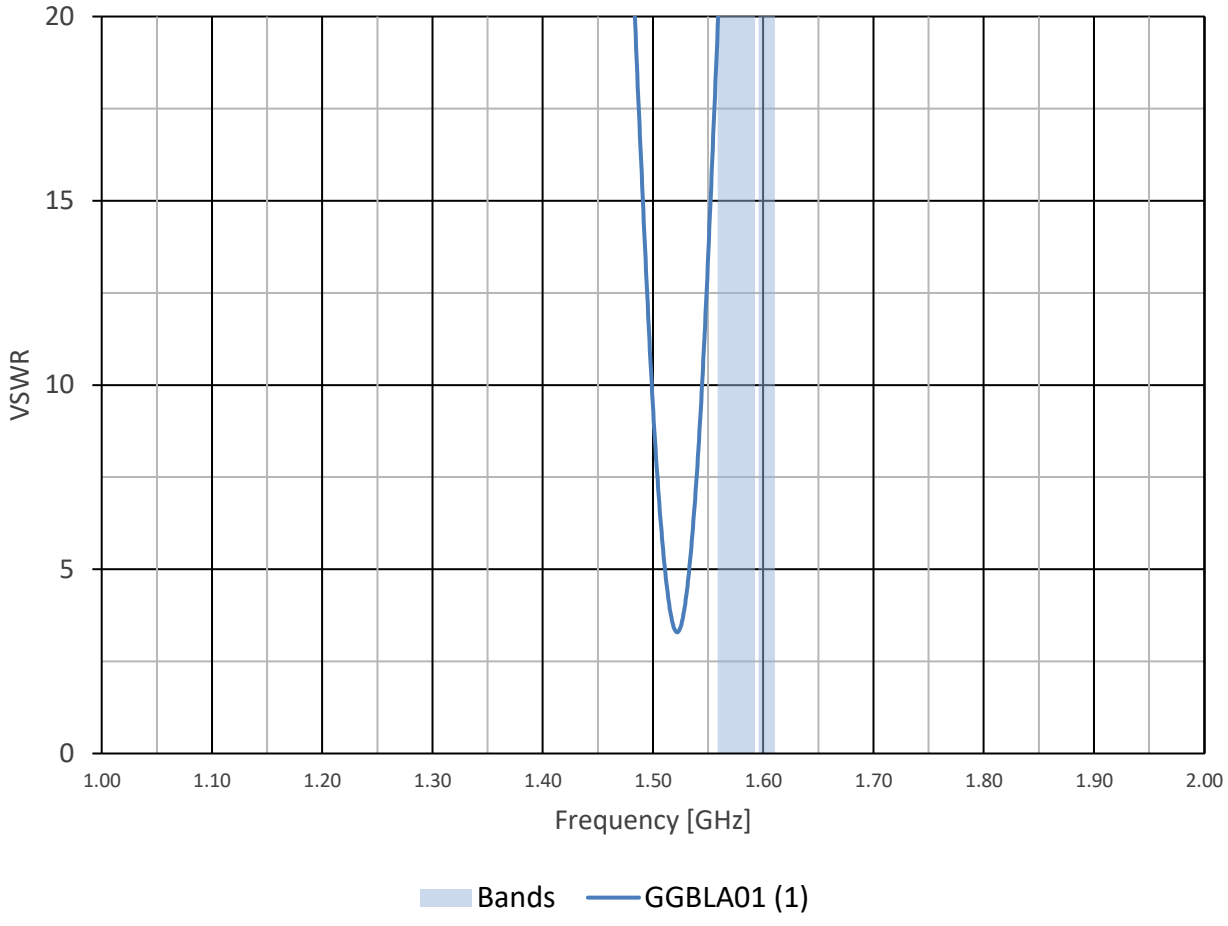


- The Return Loss of an antenna is defined as the ratio of the amount of power returned or reflected due to an impedance mismatch between the source and the antenna.
- The antenna Return Loss, Reflection Coefficient and VSWR are all related to the impedance of the antenna.
- Return Loss and Reflection Coefficient are often used interchangeably, and presented as S_{11}, a term used in S-parameter calculations.
- S_{11} is the negative of the Return Loss.
- A value of 0 dB equates to all the power inserted into an antenna being reflected back to the source. Any value < 0 dB means that some power has not been reflected back to the source.
- Acceptable S_{11} values will vary depending on the type of radio technology and application area.
- It is generally recommended that the S_{11} in the bands of interest should be at least < -4 to -6 dB, and ideally < -10 dB in band.

Tabulated Return Loss (S11) - GNSS

	B1C [1575.42 MHz] 1559-1592 MHz	B1I [1561 MHz] 1559-1565 MHz	E1 [1575.24 MHz] 1563-1588 MHz	G1/L1OC [1600.995 MHz] 1596-1610 MHz	L1 [1575.42 MHz] 1565-1586 MHz
GGBLA01 (1)	-0.5	-0.8	-0.5	-0.3	-0.5

VSWR - GNSS

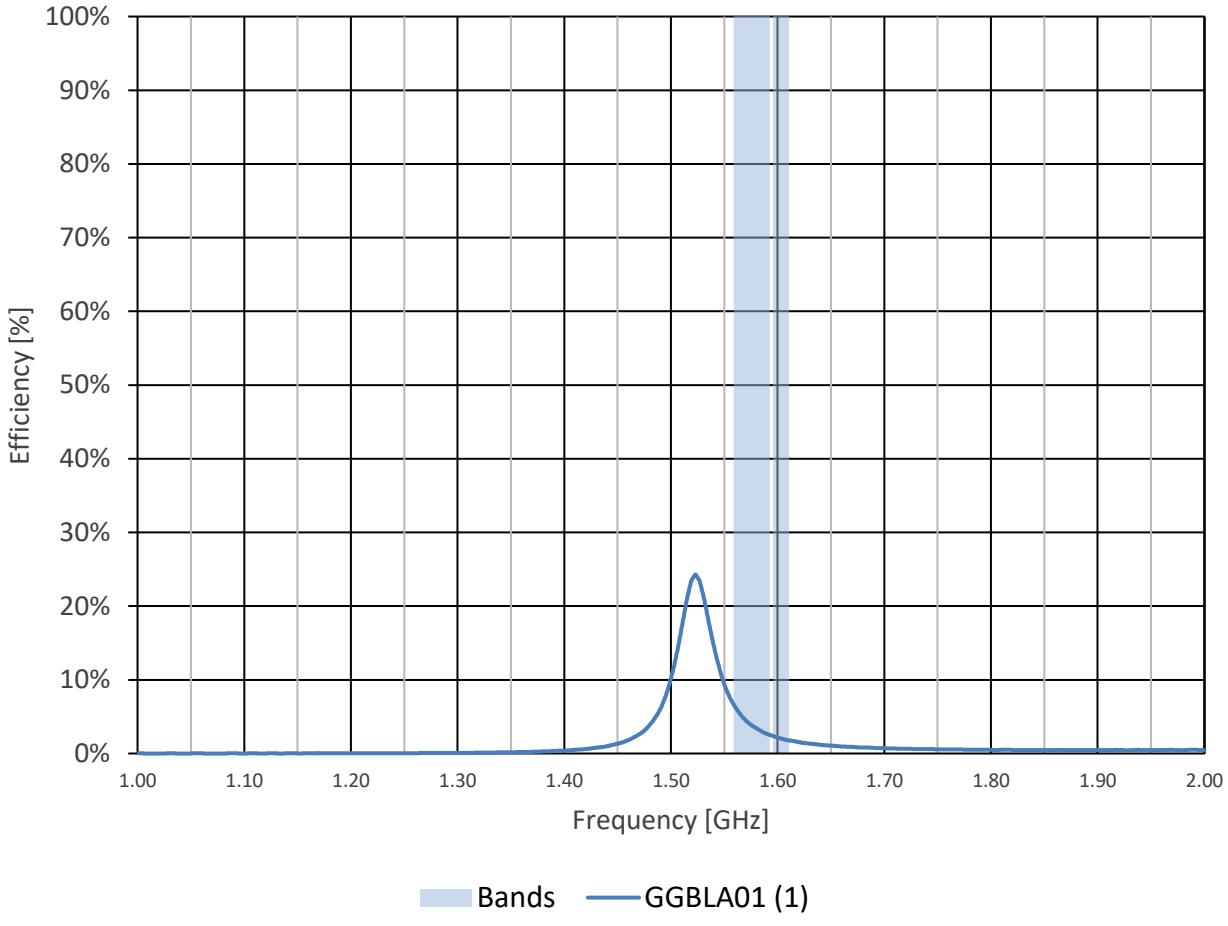


- The VSWR of an antenna is defined as the ratio of the minimum and maximum voltage levels on a transmission line leading to the antenna.
- The VSWR is a numerical value which described how well matched the antenna is to the transmission line (or other element) connected to it.
- VSWR is a ratio, which means a minimum value of 1. For a value of 1, none of the power is reflected from the antenna, which is the ideal case. As power is reflected, so the VSWR value will increase.
- Acceptable VSWR values will vary depending on the type of radio technology and application area.
- It is generally recommended that the VSWR in the bands of interest should be at least <= 3 to 5, while ideally <= 2 in band.

Tabulated VSWR - GNSS

	B1C [1575.42 MHz] 1559-1592 MHz	B1I [1561 MHz] 1559-1565 MHz	E1 [1575.24 MHz] 1563-1588 MHz	G1/L1OC [1600.995 MHz] 1596-1610 MHz	L1 [1575.42 MHz] 1565-1586 MHz
GGBLA01 (1)	34.3	22.3	34.5	58.6	34.5

Efficiency - GNSS

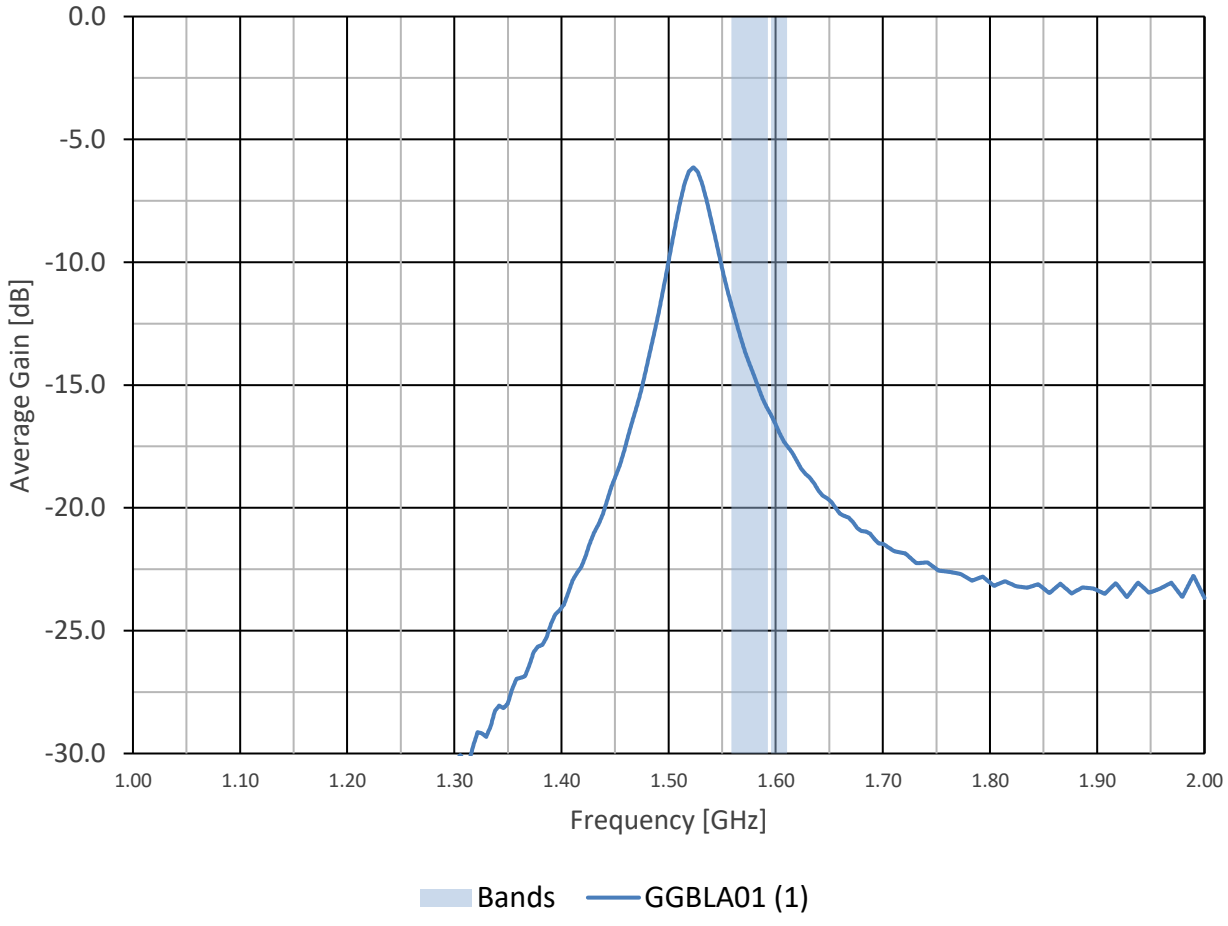


- Antenna Efficiency is defined as the ratio of power radiated by the antenna to the power supplied to the antenna.
- The Antenna Efficiency is typically presented as a percentage, where **100%** indicates that all the power delivered to an antenna was radiated.
- For most applications and radio technologies, a minimum value of **20 to 40%** is required for successful device operation.
- For **Cellular** applications, the required Antenna Efficiency values will depend on the region of operation and selected carrier.
  - For Non-US regions, the required values are **>= 20 to 40%** in bands **<= 960 MHz**, and **>= 30 to 50%** in bands **>= 1700 MHz**.
  - For US regions, the required values are **>= 32 to 50%** in bands **<= 894 MHz**, and **>= 50%** in **bands >= 1700 MHz**.
  - To ensure your device meets the required carrier regulations for US certification, consult the carrier literature on applicable **TRP** and **TIS** targets.

Tabulated Efficiency - GNSS

	B1C [1575.42 MHz] 1559-1592 MHz	B1I [1561 MHz] 1559-1565 MHz	E1 [1575.24 MHz] 1563-1588 MHz	G1/L1OC [1600.995 MHz] 1596-1610 MHz	L1 [1575.42 MHz] 1565-1586 MHz
GGBLA01 (1)	4.1	6.0	4.0	2.0	3.9

Average Gain - GNSS

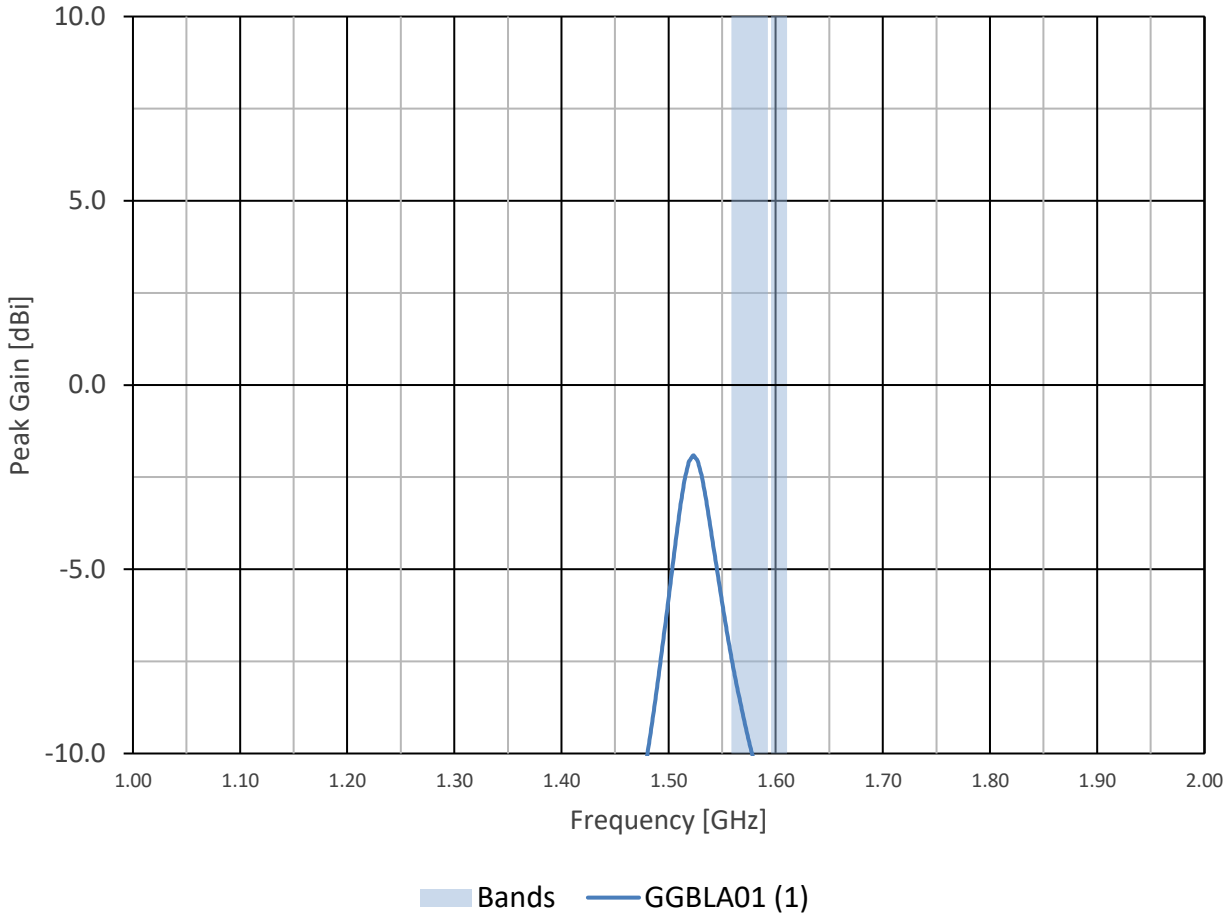


- Average Gain is a logarithmic interpretation of the Antenna Efficiency.
- Since the Antenna Efficiency is a ratio with a maximum value of 1, the Average Gain will always be negative with a maximum value of 0 dB.
- For most applications and radio technologies, a minimum value of <= -7 to -4 dB is required for successful device operation.
- For Cellular applications, the required Average Gain values will depend on the region of operation and selected carrier.
  - For Non-US regions, the required values are >= -7 to -4 dB in bands <= 960 MHz, and >= -5 to -3 dB in bands >= 1700 MHz.
  - For US regions, the required values are >= -5 to -3 dB in bands <= 894 MHz, and >= -3 dB in bands >= 1700 MHz.
  - To ensure your device meets the required carrier regulations for US certification, consult the carrier literature on applicable TRP and TIS targets.

Tabulated Average Gain - GNSS

	B1C [1575.42 MHz] 1559-1592 MHz	B1I [1561 MHz] 1559-1565 MHz	E1 [1575.24 MHz] 1563-1588 MHz	G1/L1OC [1600.995 MHz] 1596-1610 MHz	L1 [1575.42 MHz] 1565-1586 MHz
GGBLA01 (1)	-14.1	-12.3	-14.1	-16.9	-14.1

Peak Gain - GNSS

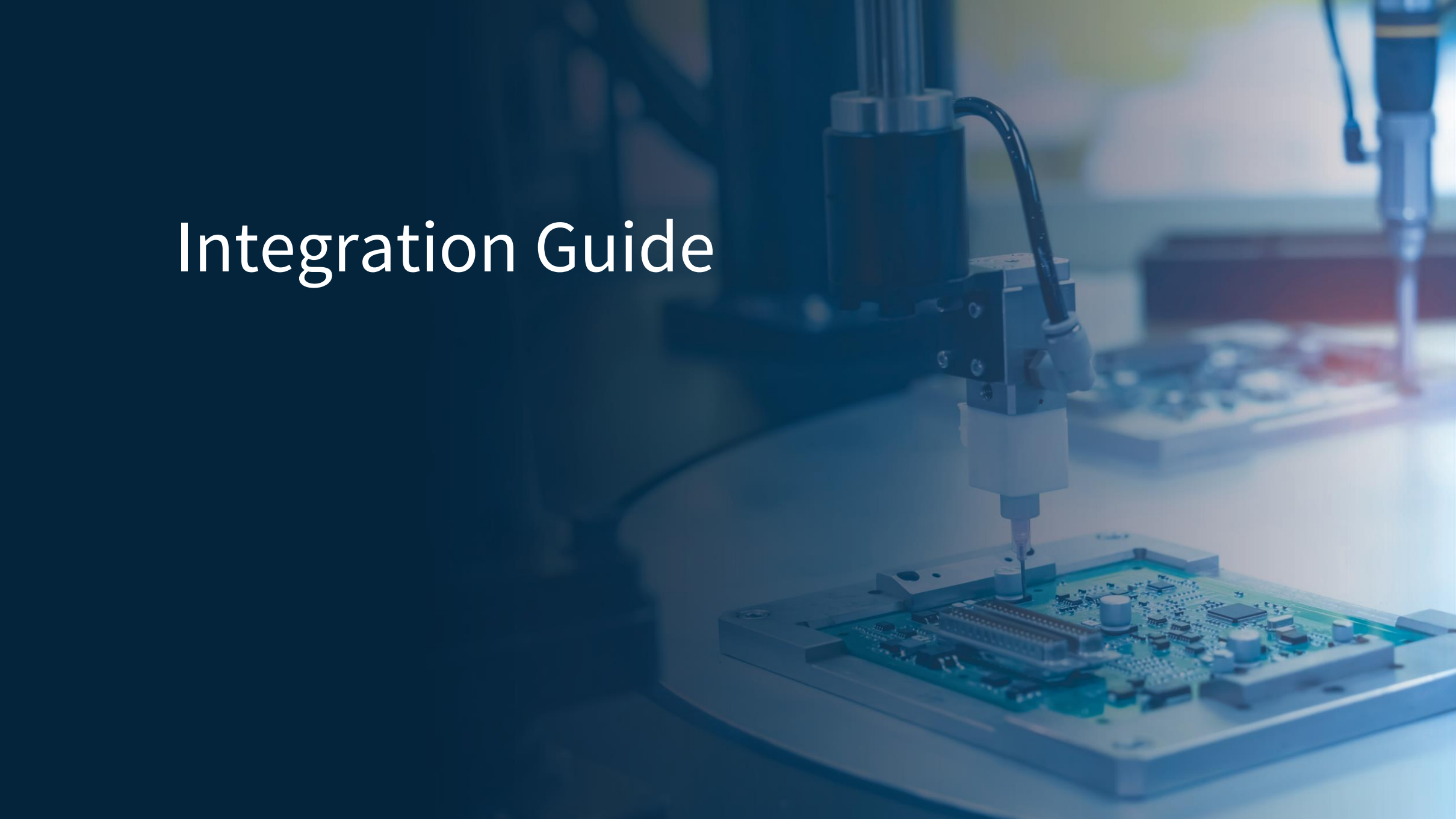


- Peak Gain is a measure of directionality of an antenna. Higher peak gain values indicate a more directive antenna.
- Peak gain is measured in dBi, which is the radiated power level relative to an ideal isotropic radiator.
- An ideal isotropic radiator radiates equally in all directions, and has a peak gain of 0 dBi.
- Whether peak gain values are “good”, depends on the particular use case.
- Cellular antennas are required to be omni-directional, due to the varying orientations of cellular devices. Thus a low peak gain is required. Other radio technologies can require low or high peak gain depending on the applications.
- High precision GNSS and point-to-point Wi-Fi require high peak gain, while mobile device GNSS and Wi-Fi require low peak gain.
- The EIRP (Equivalent Isotropic Radiated Power) is the sum of power from the radio module in dBm and the peak gain. Some regions may have EIRP limits for certain radio technologies.
- Peak gain limits are sometimes defined in the radio module datasheet. Please refer to the module datasheet for more information.

Tabulated Peak Gain - GNSS

	B1C [1575.42 MHz] 1559-1592 MHz	B1I [1561 MHz] 1559-1565 MHz	E1 [1575.24 MHz] 1563-1588 MHz	G1/L1OC [1600.995 MHz] 1596-1610 MHz	L1 [1575.42 MHz] 1565-1586 MHz
GGBLA01 (1)	-9.6	-7.9	-9.7	-12.4	-9.7

Integration Guide



Integration Guide - PCB & General Recommendations

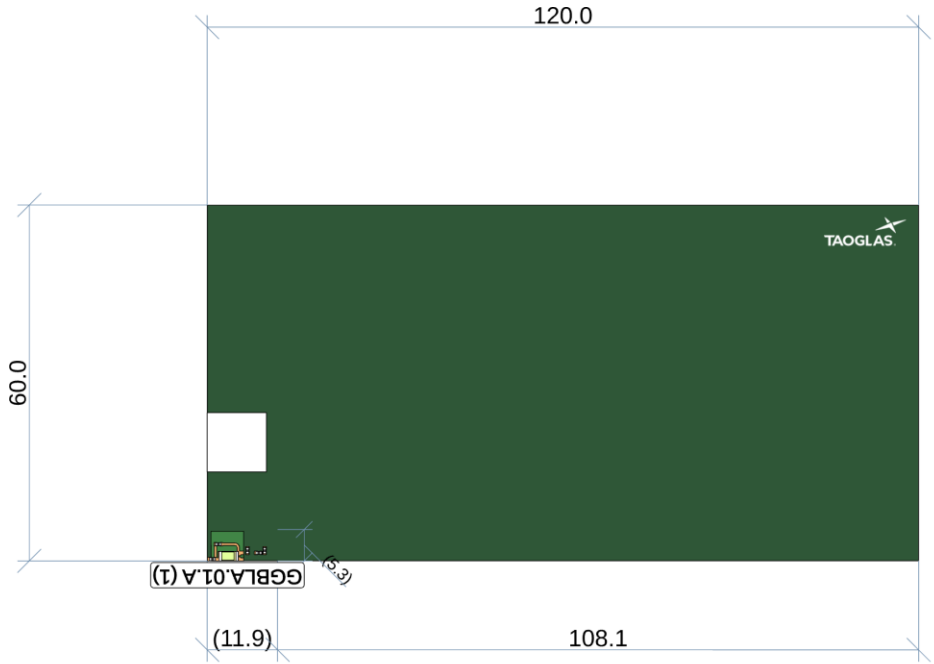
General Recommendations

Ensure >15mm of metallic clearance for all antennas in all directions.

Ensure antenna is placed in recommended position (longest edge, shortest edge or centre).

Ensure the ground-plane length is approximately equal to the recommended ground-plane length for each antenna.

Refer to the antenna datasheet for matching/tuning component values. Taoglas advises performing matching/tuning optimization to account for the impact of other components, enclosure material and non-standard PCB sizes.



For a full integration guide for each antenna please refer to the antenna datasheets available on the Taoglas website.

Contact & Support

Contact & Support

If you would like to provide feedback on the Antenna Integrator, please do not hesitate to contact us here.

If you would like to place an order, get a quote or request a sample, see below:

GGBLA.01.A

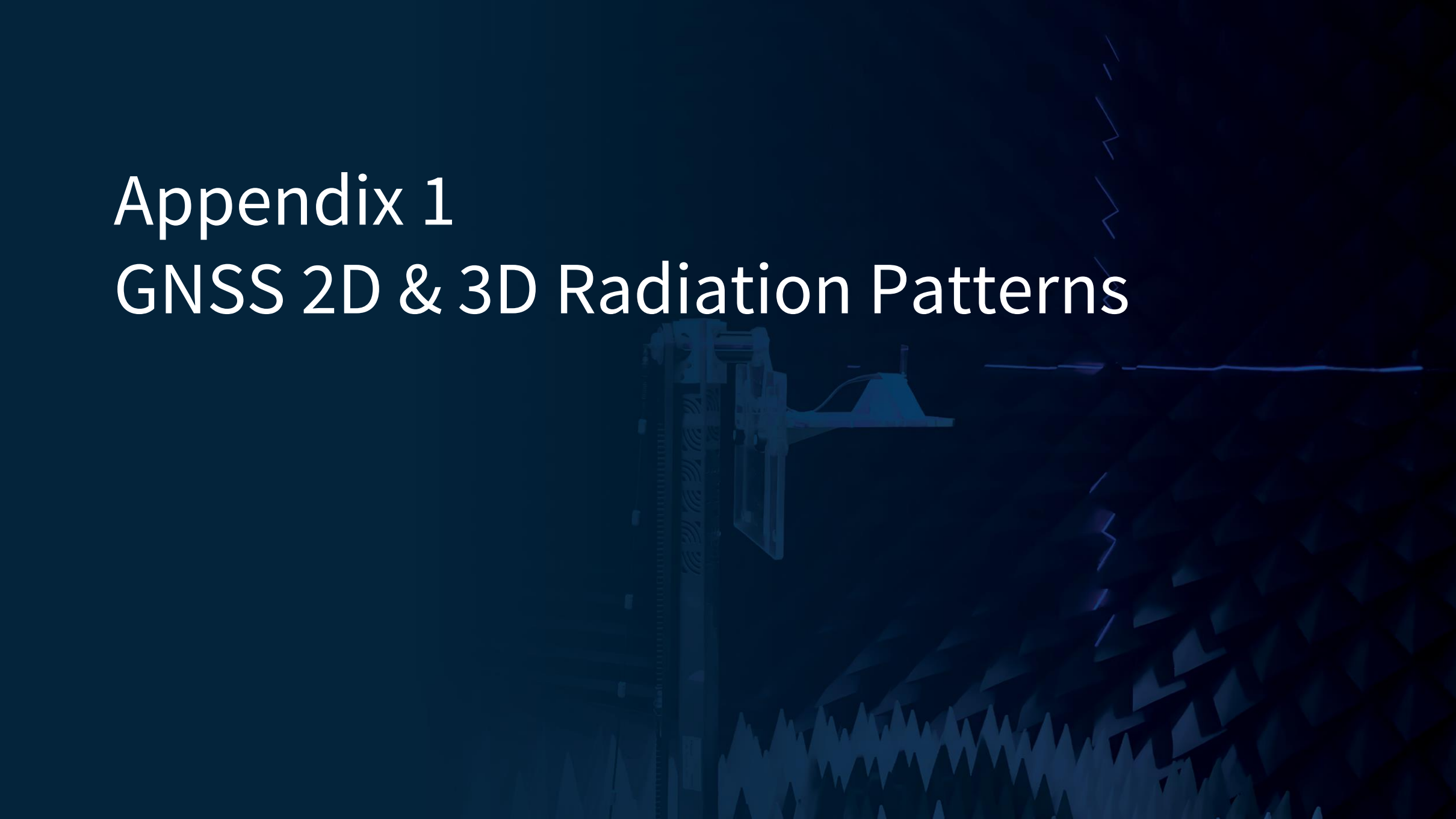
Overview of our Engineering and RF Services

Antenna and RF Services
Helping you design and optimize RF and antenna performance from initial system requirements to final optimized board design ready for carrier certification.

Antenna and Cable Builders
Use our industry first online tools to customize your antenna or cable assemblies, designed specifically to your requirements, and have them shipped to you within as little as 24 hours.

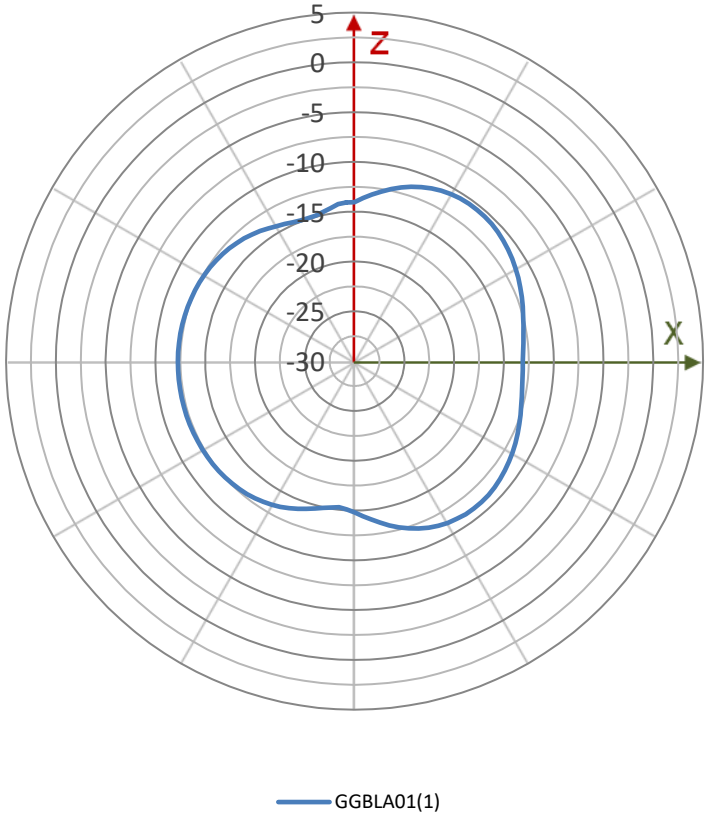
Manufacturing
We operate our own fully implemented high spec ISO and IATF16949 approved production & assembly facility in Taiwan. This allows us to maintain full control over the manufacturing processes as well as out testing & quality control.

Appendix 1
GNSS 2D & 3D Radiation Patterns

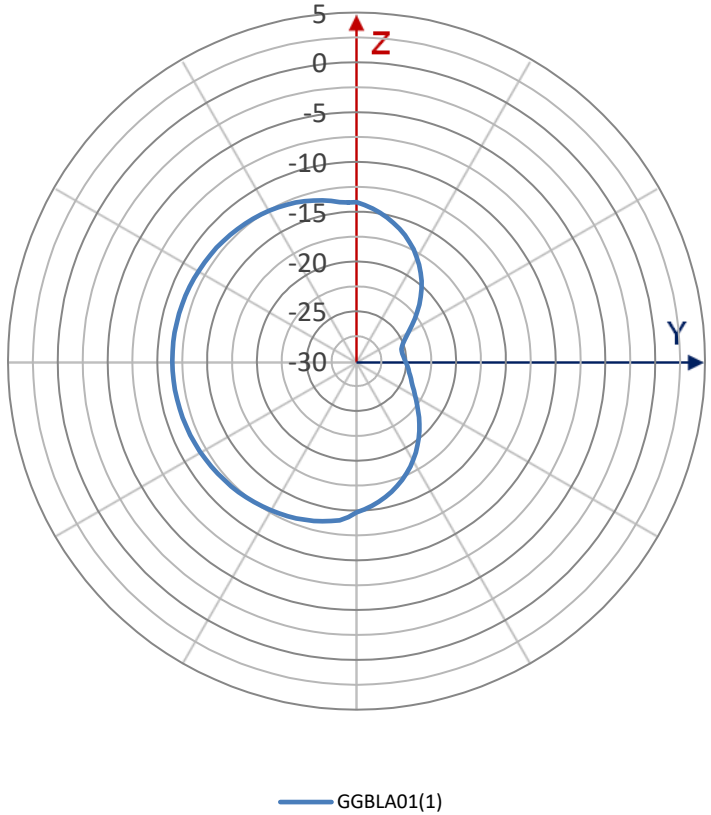


GNSS 2D Radiation Pattern @1561 MHz

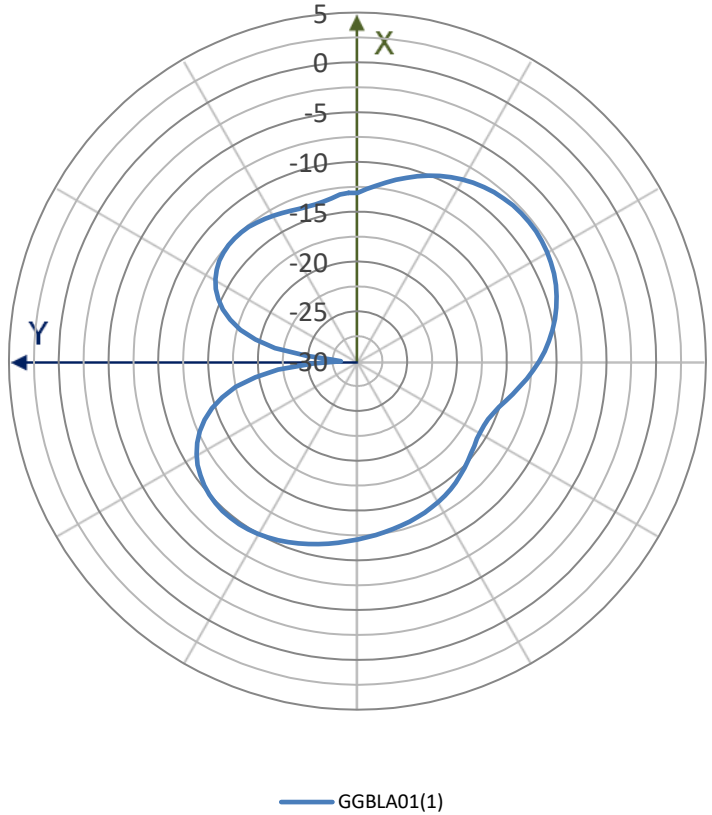
phi = 0



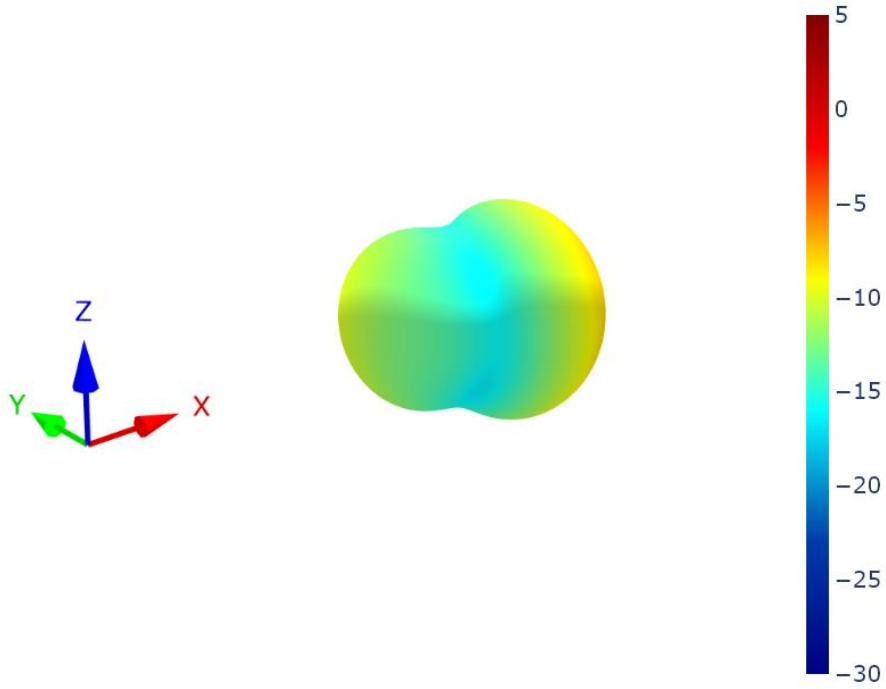
phi = 90



theta = 90



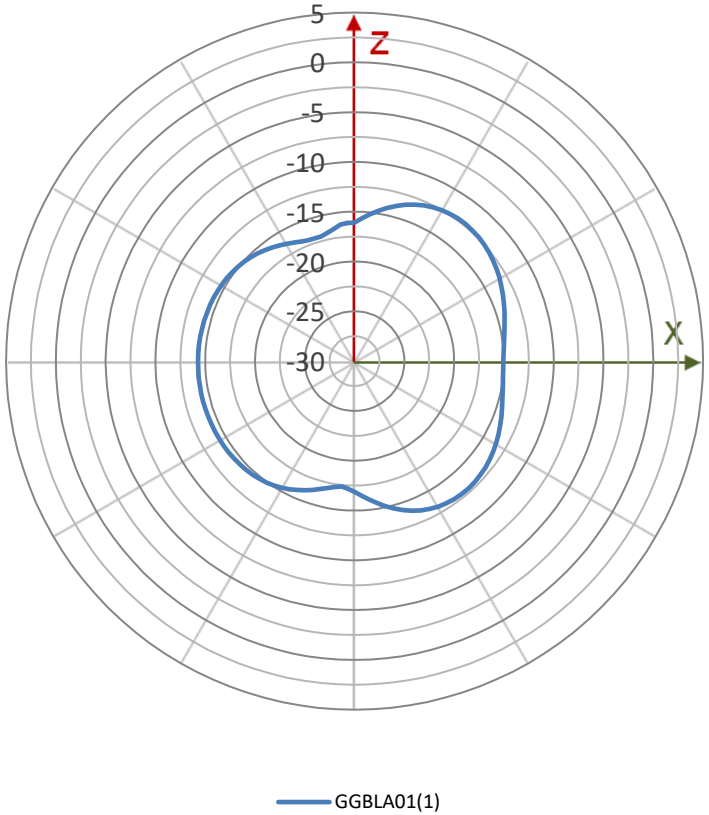
GNSS 3D Radiation Pattern @1561 MHz



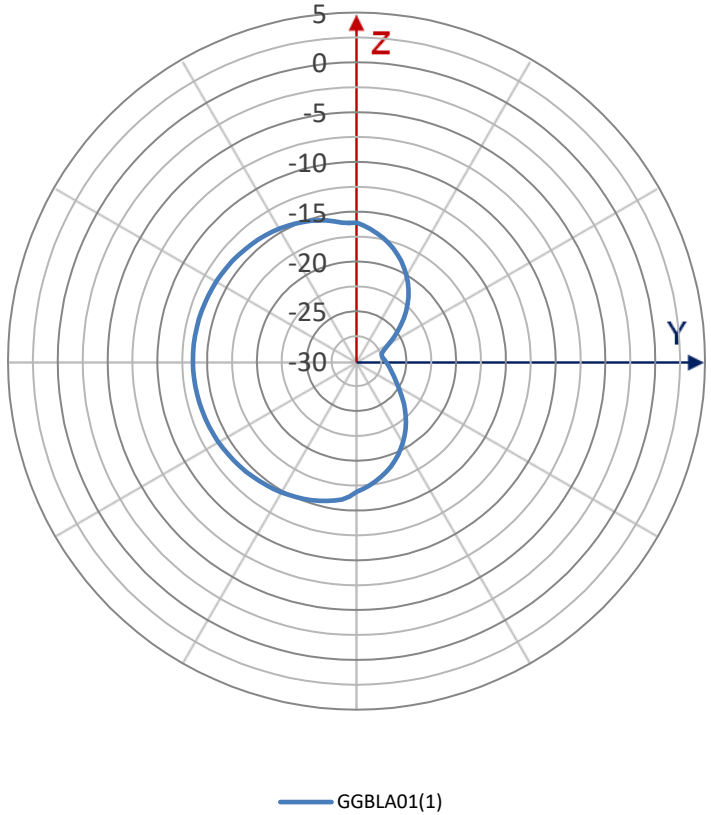
GGBLA01(1)

GNSS 2D Radiation Pattern @1575 MHz

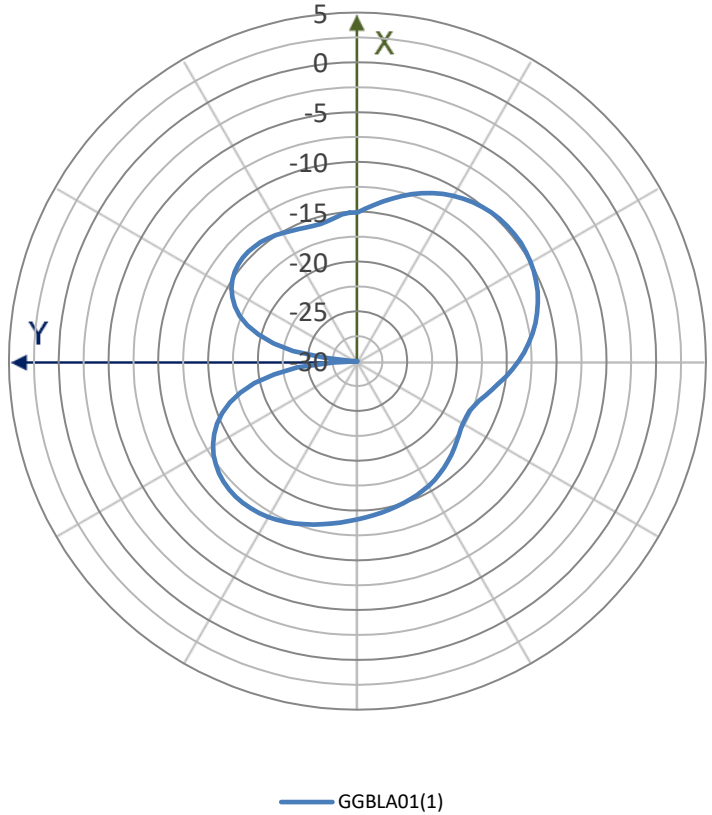
phi = 0



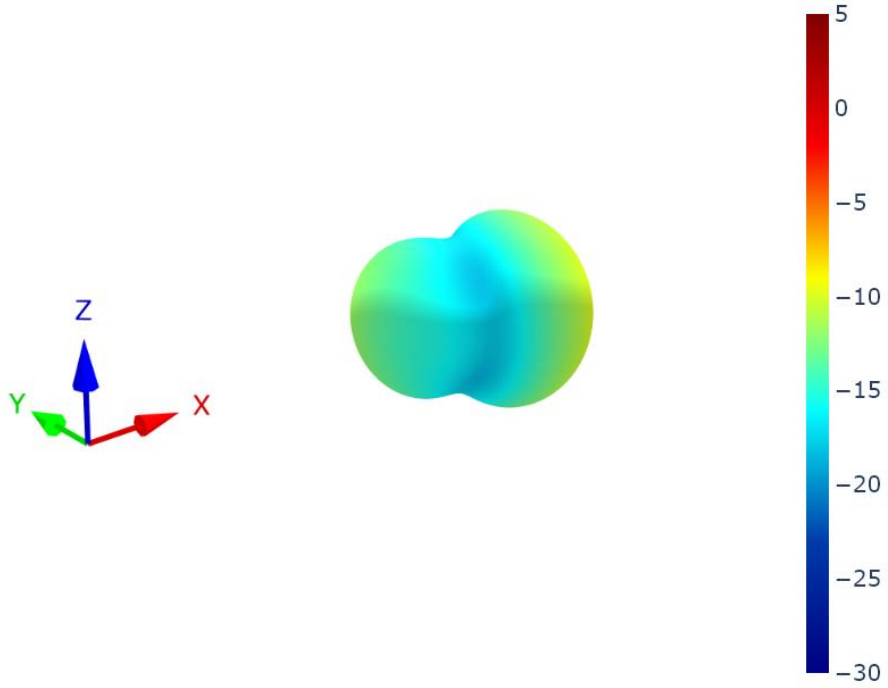
phi = 90



theta = 90



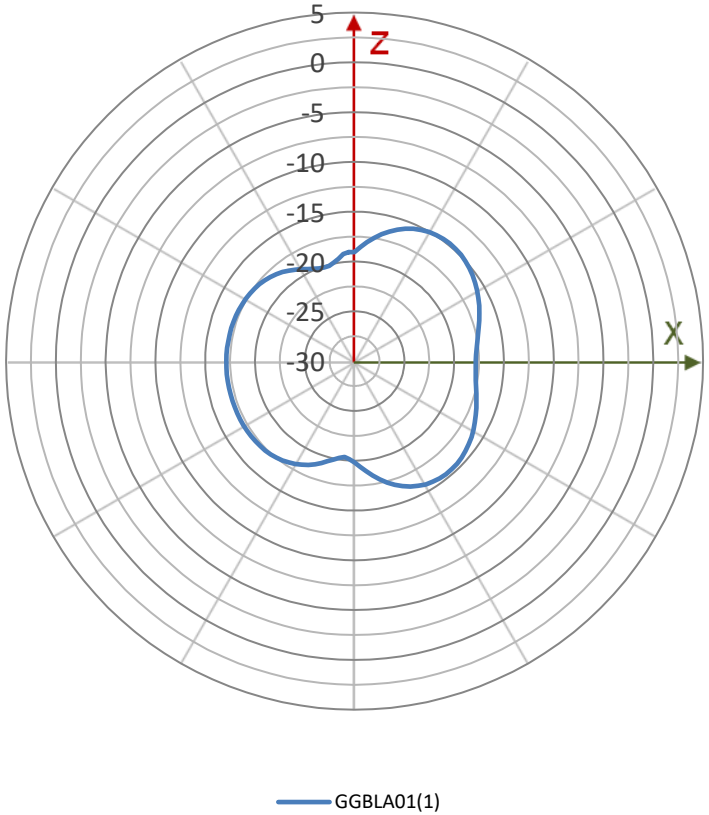
GNSS 3D Radiation Pattern @1575 MHz



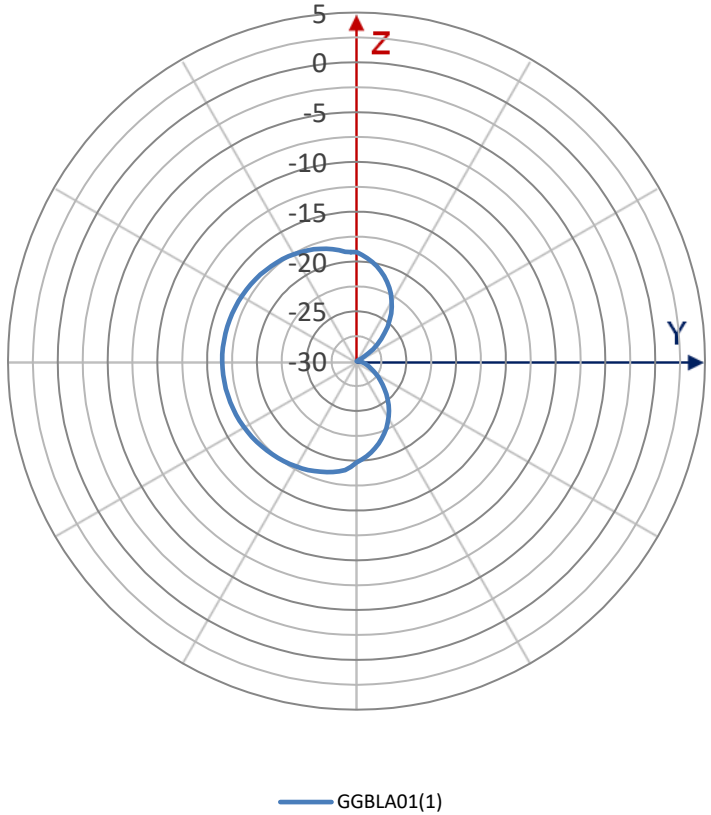
GGBLA01(1)

GNSS 2D Radiation Pattern @1602 MHz

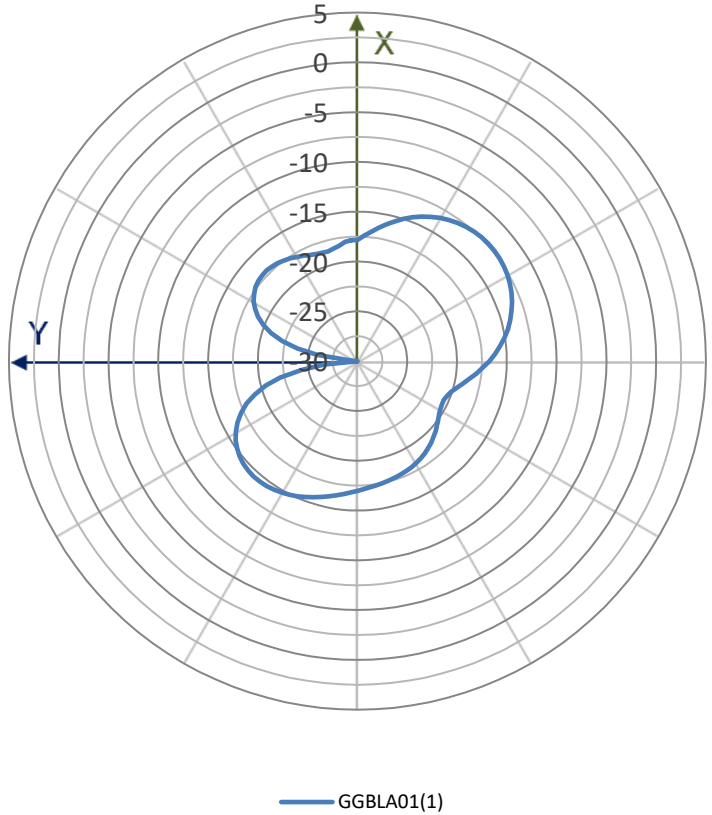
phi = 0



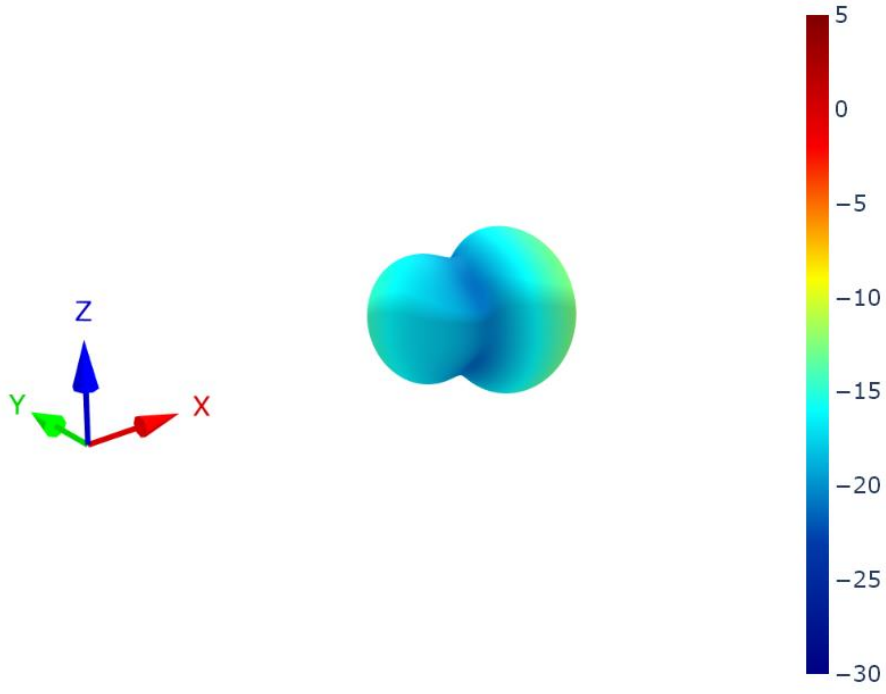
phi = 90



theta = 90



GNSS 3D Radiation Pattern @1602 MHz



GGBLA01(1)