

EB-230 GPS Engine Board
Application Note – Antenna Selection

AN-02



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GPS Antenna selection

1 Types of Antenna

There are many different types of antenna to choose from in GPS applications.

GPS signal is Right-Hand-Circularly Polarized (RHCP), in theory RHCP antenna is best for GPS signal reception. Ceramic patch antenna made of ceramic material is the most widely used commercial GPS antenna. Patch antennas come in different footprint and thickness.

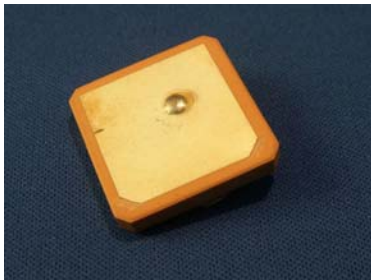


Fig-1 : Passive patch antenna

The second choice is helix antenna. Helix antenna can be designed to use with or without a ground plane. In contrast to helix antenna, patch antenna requires a good ground plane for operation. The third type is linear polarized antenna. Compared to a RHCP antenna, a minimum of 3dB of signal will be lost.

Basic physics tells that a smaller antenna will present a smaller aperture to collect signal energy from sky, resulting a lower overall gain of the antenna. This is the result of pure physics and there is no magic to get around it.

A stage of low-noise-amplifier (LNA) can be added after antenna to give extra boost to the signal when needed. However, amplification of GPS signal after antenna will **NOT** improve signal to noise ratio (SNR). Higher LNA gain could cause GPS receiver saturation.

2 Active and Passive Antenna

Active antenna is a passive antenna with additional stage of LNA (Fig-2). The use of active antenna is always advisable. EB-230 works with 15dB gain active antennas. Care should be taken that gain of LNA (Fig-2) inside the antenna module does not generate an overload condition at GPS receiver. There is no need for higher than 26dB of antenna gain to work with EB-230.

EB-230 is capable of feeding 3Vdc / 30mA max. power into active antenna. There is no need to provide extra power supply to your antenna module in most applications.



Fig-2 : LNA

For EB-230, both passive antenna and active antenna can be used. However, active antenna is recommend for optimal receiving performance. Please use active antenna with 15~20dB gain, Noise Figure less than -1.5dB.

3 Connection from Antenna to EB-230 RF Input

The signal path from antenna to EB-230 RF input (pin#1) should be as short as possible for best system performance. A 50 ohm trace layout is highly recommend. If cable is required for connection from antenna to EB-230, choose 50 ohm RF cable and minimize cable length. A long cable will result signal degradation and affect EB-230 performance.

4 Antenna Tuning

Antenna characteristics will be affected by housing material of end products. Tuning is required when fitting into each new housing to best characterize antenna and system performance. Consult antenna vender for tuning process when needed.