



USU/NASA SPACE GRANT/LAND GRANT

Geospatial Extension Program

PERIODIC REPORT

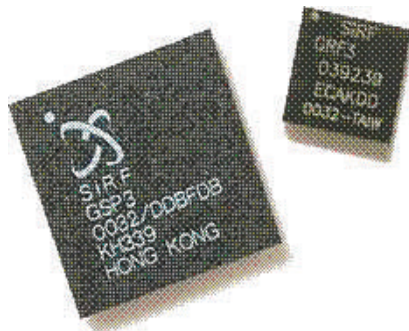
August 2006

Three New GPS Units Tested and Compared

Advances in GPS technology keep pushing the limit on what is possible with consumer handheld units. Faster processors with lower power requirements, advances in software, and improved WAAS implementation promise much better accuracy and improved battery life. Not only are the current crop of GPS units far superior to older models, the price paid for these units keeps creeping down as more and more GPS manufacturers enter the market.

One of the new and exciting things from the industry is the new SiRFstar III chip (<http://www.sirf.com/products-ss3.html>).

This chip contains many firsts for a low power/low cost GPS chipset. Some of these firsts include a “faster than real-time” tracking processor with 200,000+ correlators (this is marketing and



The SiRF III chipset promises many advances in GPS including improved accuracy and the ability to determine position indoors. (Photo courtesy of SiRF Technology Holdings, Inc.)



The i.Trek M3 is a Bluetooth (wireless) GPS that incorporates the new SiRF III chip. This unit retails for about \$135.

technical jargon that means it can calculate a more precise position within a shorter amount of time). Another first is its ability to track over 20 satellites at a time. However, with the current constellation there will be more than 12 satellites visible much less than 0.01 % of the time. The chipset promises faster TTFF (time to first fix) and greater sensitivity in urban areas and indoors. It also comes with support for both WAAS and EGNOS. Overall, it looks like it could be a very formidable competitor in the GPS chipset business.

We wanted to find out how this new chipset compared to some other new units we recently received. We decided to test three new GPS units and compare them to the older Garmin Legend. The three units we tested were the i.Trek M3, a Bluetooth GPS unit with the SiRF III chip; the Garmin GPSmap 60, a black and white version of the great GPSmap 60C; and the StarNet GPS, a GPS unit that uses the SDIO interface found on most Pocket PCs.



Testing Method

The test was conducted by establishing a serial connection between each GPS unit and a Pocket PC unit and gaining a good GPS lock for fifteen minutes to update all almanacs and eliminate any bias brought about by differences from internal clocks. The units were then tested in an open field, under a tree canopy, and beside a building (for multi-path situations) to simulate different environments the GPS units will



The Garmin GPSmap 60 is a black/white version of the GPSmap 60c. It has a very good helicoidal antennae and has the familiar round serial connector found on the Garmin V and III models. This model retails for \$250

encounter. The units were placed in a fixed spot and tested simultaneously to eliminate differences in the satellite constellation that occur over time. The software VisualGPSce was used to monitor and log GPS positions and calculate the standard deviation of position. The average position standard deviation was recorded and graphed.



The StarNet GPS unit is compatible with both Pocket PC and Palm devices. It uses the SDIO interface found on all current handheld computers and is designed to use very little power. This unit retails for \$119.

Results

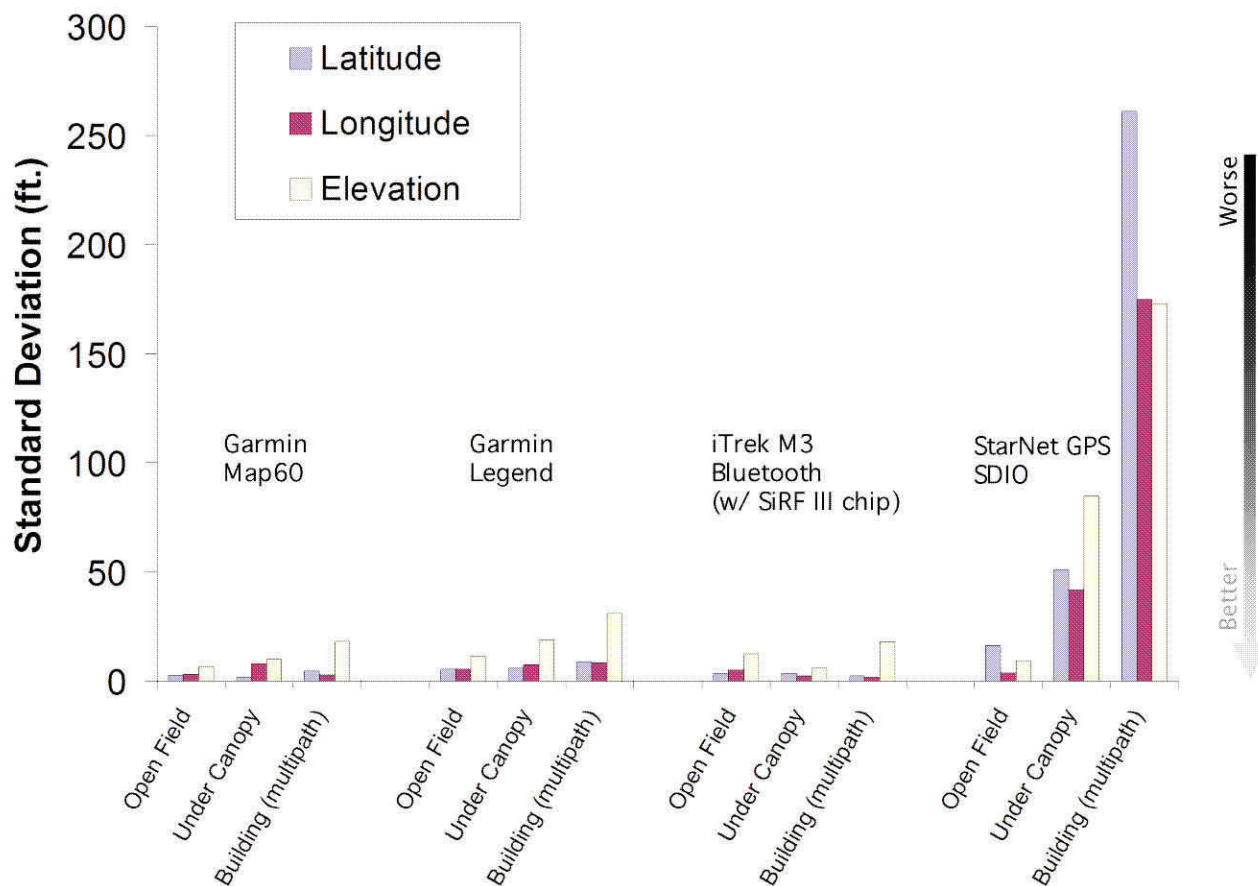
The graphs on the following pages show the standard deviation for each GPS unit under each environment. As you can see by the first graph, the StarNet SDIO unit did much worse than the other three units. In fact, as we were testing, it had the most difficult time keeping a lock on the satellites and always tracked fewer than the other three units. Because it fared poorly compared with the other three, it dominates the graph, making it difficult to see how the others compared. A separate graph was then made with the other three units to illustrate how they compared to each other (following page).

The position error for the Garmin units generally increased as the test environment moved from the open field to the canopy to the multi-path area next to a large building. For each unit during each test, the elevation deviated much more than the latitude and longitude measurements. This would be expected as the vertical measurements have always been less accurate with GPS.

The Map60 did better than the Legend in all tests. The higher gain antenna and improved software helped make it one of the best performing GPS units we have ever tested. In addition to its good performance, the Map60 also has a larger screen



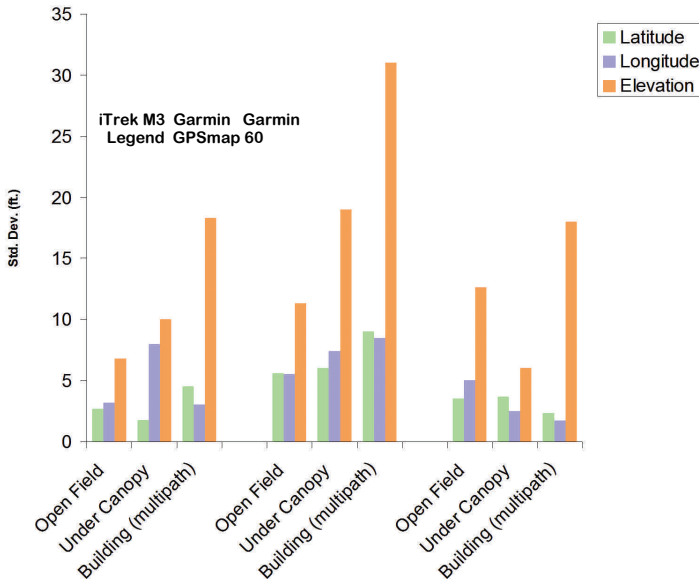
GPS Comparison



than the Legend and improved battery life. Both take 2 AA batteries, but the Map60 with the larger screen, faster processor, and better antenna lasts up to twice as long as the older Legend.

The iTrek M3 was the winner in our GPS shoot-out for accuracy. When it was being tested, it didn't seem to care where it was. In fact, it had its best latitude and longitude score next to the building, the place where other GPS units have struggled. In fact, at one time it was tracking eight satellites while the others were only tracking four. The increased sensitivity also gave it quite an edge under a canopy as it had half the positional standard deviation as the Legend.

The iTrek M3 has a built-in 15-hour Li-ion rechargeable battery and uses the same AC power adapter as the iPaks and most other Pocket PC devices, eliminating the need to buy another adapter for your car. The Bluetooth wireless connection also takes care of the cable mess you get when you connect a Pocket PC to one of the Garmin units. However, it can not be used as a stand alone GPS. It has no screen and there is no way of communicating with it other than through a Bluetooth connection.



better screen, better antenna, better battery life, and more advanced GPS software and hardware. But it also costs \$100 more than the Legend and is slightly larger (due to the antenna). If size or cost mattered the most, the Legend is still the best GPS for both its size and cost. However, if you want a better stand-alone GPS receiver than the Legend and are willing to spend a bit more, the Map60 is a good step up that will not break the bank.



The Garmin eTrex Legend is one of the most popular GPS receivers of all time due to its cost/performance ratio and its small size. This unit retails for \$150 and performs very well compared to other models in its entry level class.

Which unit is the Best?

Each of the units tested could be ‘the best’ depending on the specific needs of the user. Even the lack-luster performing StarNet SDIO unit could be the preferred GPS receiver if the user needed one connected to a Pocket PC or Palm device without cables and only had an SDIO expansion slot.

The iTrek M3 is the most accurate of the units we tested, but it requires a Pocket PC and can only go 12-14 hours on a battery recharge. Furthermore, because Bluetooth is used for serial communication, it will cause the Pocket PC’s battery to drain a lot faster than a separate unit connected by serial cables. However, if you use navigation software to get around in your car and have both the GPS receiver and the Pocket PC connected to power adapters, the iTrek would make a great unit with it placed on the dash and the Pocket PC somewhere on the console.

The Garmin Map60 and the Legend would both make very good stand alone units. The Map60 has a

For More Information:

Garmin International
<http://www.garmin.com>

SiRFstar GPS Chipsets
<http://www.sirf.com/products-ss3.html>

Where to buy these units: (this is for information only, not an endorsement of any kind)

GPS City
<http://www.gpscacity.com/>

Semsons-Inc.
<http://shop.store.yahoo.com/semsons-inc/gpshardware.html>



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