In video #66 and # 69 I introduced the new A6 module from AI thinker. Now, I can introduce an even better module: The A7. It is an A6 GSM module enhanced with a GPS module in one case. And it costs less than 10 dollars! But does it really work?

I got mine last week in the mail and did some initial tests and I thought, I want to share it with you.

During unpacking I discovered one module and two antennas. I had no idea, which antenna should be used for which applications. To decide that, we have to know the frequency range of the two applications and then, we have to measure the range of the delivered antennas.

The GSM frequencies are printed on the module’s top: In Europe 900 and 1800 MHz. But what is the operating frequency of the GPS satellites? They are 1575 and 1227 MHz. Most GPS antennas I found only cover 1575. So, all three or four bands are considerable different. Let’s check now the antennas.

Just a little theory about antennas: Antennas are basically connectors to the aether, the space around them. These connectors are only good at certain frequencies and bad at others, usually depending on the dimensions of the antenna. As a rule of thumb, long antennas are good for lower frequencies and short antennas are good for higher frequencies. If the connector is good, it transmits the energy from the sender to the Aether. If it is not good, it does not transmit the energy, but reflects it back to the sender. This has two disadvantages:

1. The energy is not transferred and the reach or performance of your equipment is reduced
2. The reflected energy heats your sender and can destroy it. This is not the case for our small modules, but for stronger senders, this can be the case.

The same effect takes place for receiving antennas. A bad antenna does not transfer the energy to the receiver attached and diminishes its performance.

Enough theory. I measure now this effect by injecting a signal to the antenna and measuring the reflected power. Because I vary the frequency, we immediately see the areas of small reflections and bigger reflections. Zero dBm means, that 100% of the energy is reflected. Just that you can drop a word in your next small talk with your colleagues: This is done with a directional coupler and a Spectrum Analyzer.

And here are the results: The small antenna has two areas of small reflections: 990 and 1750 MHz. At 900 and 1800 it is not completely bad. So, we can classify this as the GSM antenna.

So, the longer antenna must be the GPS antenna. Is this true? Its lowest reflection is at 2340 MHz. At 1227 and 1575 MHz it reflects nearly 100% of the energy. Completely useless for GPS applications. 2.4 GHz is the WLAN frequency. So, this is an ordinary Wi-Fi antenna. At least, we can use it for something…

Fortunately, I have a GPS antenna from earlier times. It is marked as “active” which implies, that there is an amplifier built in. Unfortunately, I have no additional information. Because it has only one cable, I assume, that the power should be supplied via the coax cable. Looking at the A7 module we see, that it does not supply any voltage. So, for the moment, I use it without the amplifier and hope, it will not attenuate too much.

This antenna has the lowest reflection at 1514 MHz. At 1227 it is still usable. So, this is definitively the better choice for GPS. Later, I have to do a tear down to find out, what’s in this antenna...

Enough about antennas. Let’s concentrate now on the module. The A6 was connected through a serial connection with 115200 bauds. This connection is still there. The A7, in addition, has a second serial channel for GPS. It has the standard baud rate for GPS receivers: 9600 bauds. It only has a TXD pin, because it only sends data via this channel. The commands are given by the other serial. So, we need two serial connections to test it.

And of course, I have to go outside to test this module, because I need free sight to the GPS satellites.

Here you see the A7 module connected to two USB to serial adapters. Because it has a 5V regulator on board, I can supply it with a normal power bank. But the serial adapters have to be set to 3.3 volts. The operating voltage of the A7 is rated 3.3 – 4.2 volt and I do not know, if the pins are 5 volt tolerant.

To make it easy for you to distinguish the two channels I use a Realterm terminal emulator for Serial 1 and Putty for Serial 2. The GPS data is displayed in Putty and the commands are given with Realterm.

To start the GPS, we have to send the command AT+GPS=1 and to stop it AT+GPS=0. And really, after a few seconds, the position is displayed in Putty. So, the GPS seems to work.

The module should also support the AGPS mode, which reduces the startup time, because it downloads actual satellite data via the much faster mobile network. In normal GPS mode, this data has to be downloaded by a very slow connection from the satellites itself. Unfortunately, this mode is not working right now. I do now know if it has to be enabled somehow or if my mobile network provider does not support it.

So, let’s quickly test the GSM part of the module. I call my mobile, and really, it works, too. So, this is a really good deal.

If we connect now this module with an Arduino pro Mini or an ESP8266 with switched off Wi-Fi and a battery, we can build a GPS tracker for about 15-20 dollars. Which opens up many applications.

Maybe you will see one of these in a future video. Stay tuned!

I hope, this video was useful or at least interesting for you. Bye.