

QFH-Antenna-Kit for L-band (1.6 – 1.7 GHz)

Matthias, DD1US, April 28th 2021, Rev 1.0

For some measurements at antenna feeds for the L-band weather satellite downlinks, I needed a test antenna. As I like QFH antennas and found an offer on Ebay for less than 7 Euros including shipping from China, I decided to try it.

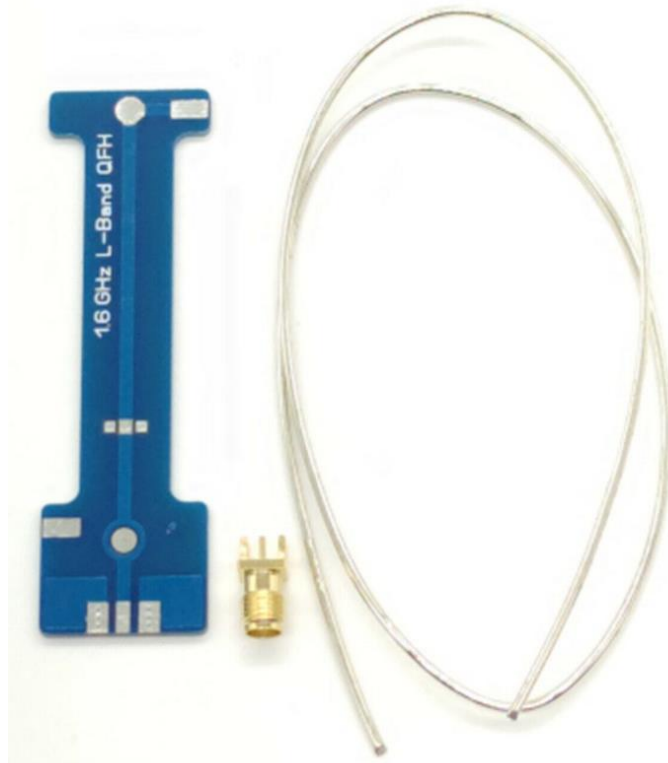
The QFH antenna kit is advertised as:

Feature:

- High quality and professional
- Not easy to break, stable performance and long service life
- Interface: SMA female
- PCB size: about 80X22.5mm
- Weight: about 10g

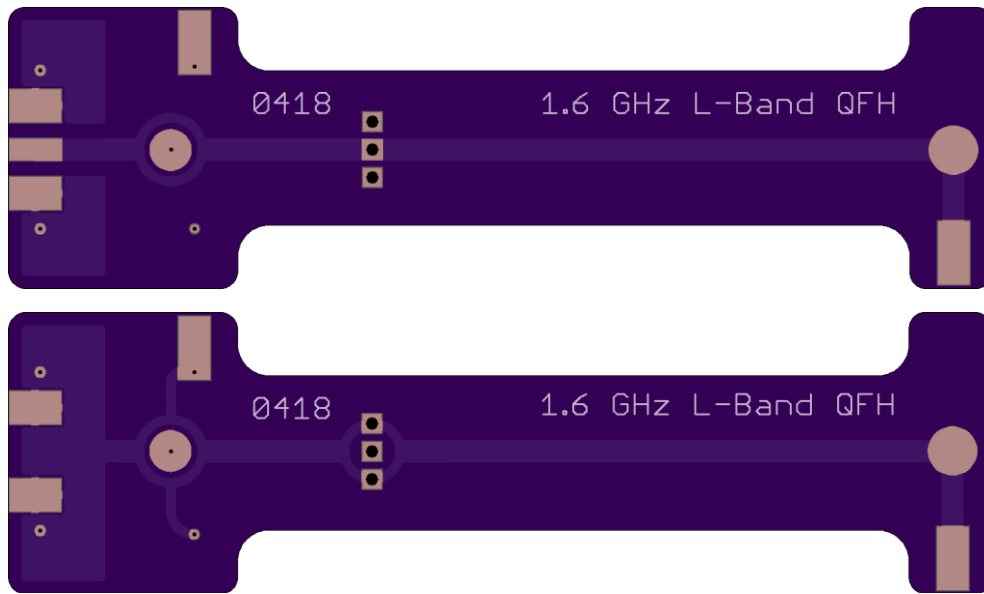
Package:

- 1x Kit 1.6GHz 1.7GHz L-Band QFH antenna



As can be seen on the picture above the kit consists of a small PCB, an SMA-Jack and a piece of silver-coated copper wire with a diameter of 1.2mm.

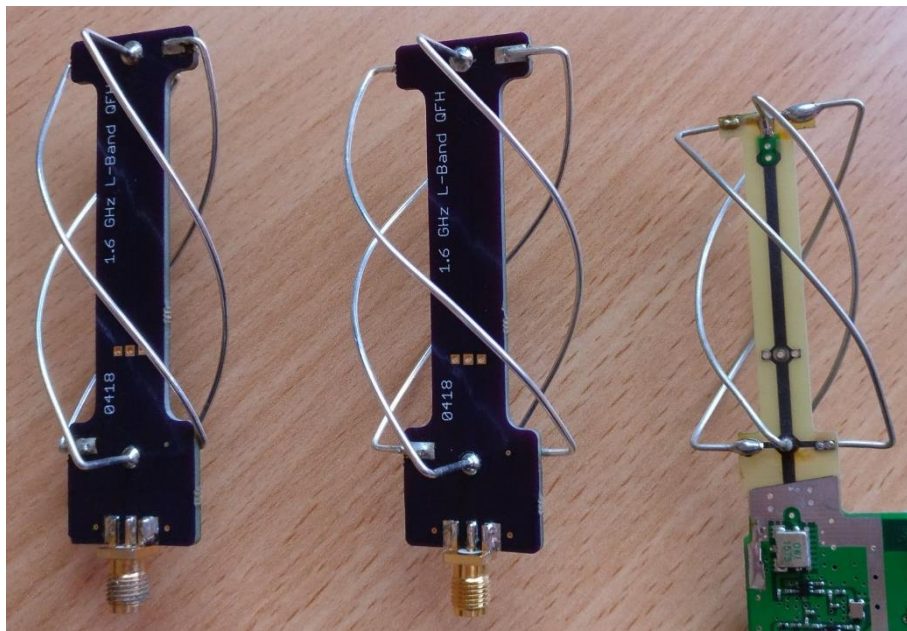
After some searching on the Internet I found out that the design was originally posted by “sam210723” at OSH-Park.



His design called 1.6 GHz L-Band QFH (v0418) was implemented on a 2 layer board of 0.89 x 3.11 inches (22.6 x 79.1 mm). It is a 1.6 GHz Right-hand Circularly Polarized Quadrifilar Helix Antenna he intended to use for Inmarsat L-Band downlinks.

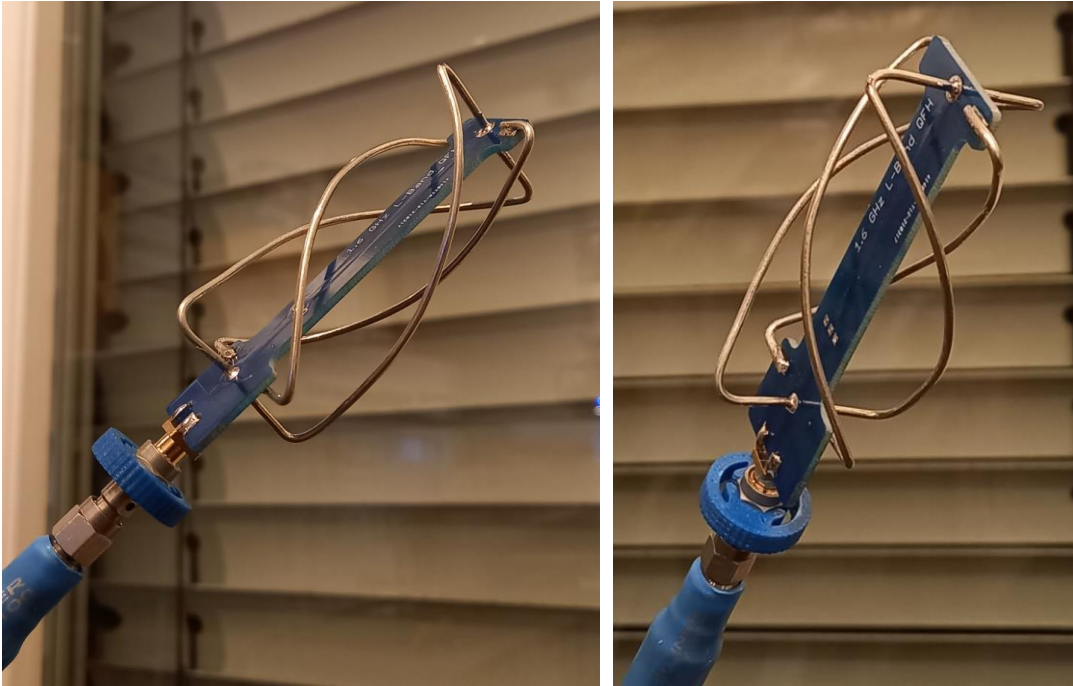
“sam210723” used the element calculator at <https://www.jcoppens.com/ant/qfh/calc.en.php> with the following input data:

Frequency: 1545 MHz, Bend radius: 2mm, Conductor diameter: 1.2mm, Width/height ratio: 0.5, all other settings default

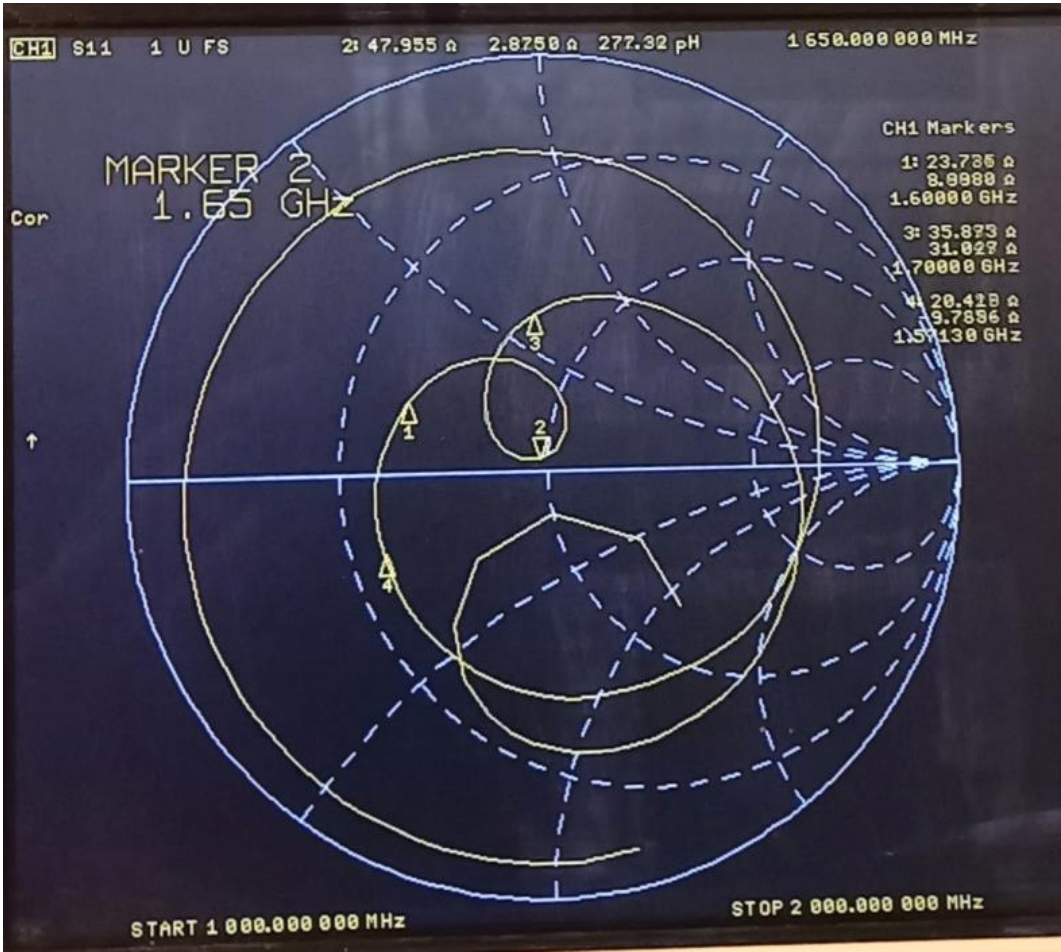


The overall height is 63mm and width is 34mm.

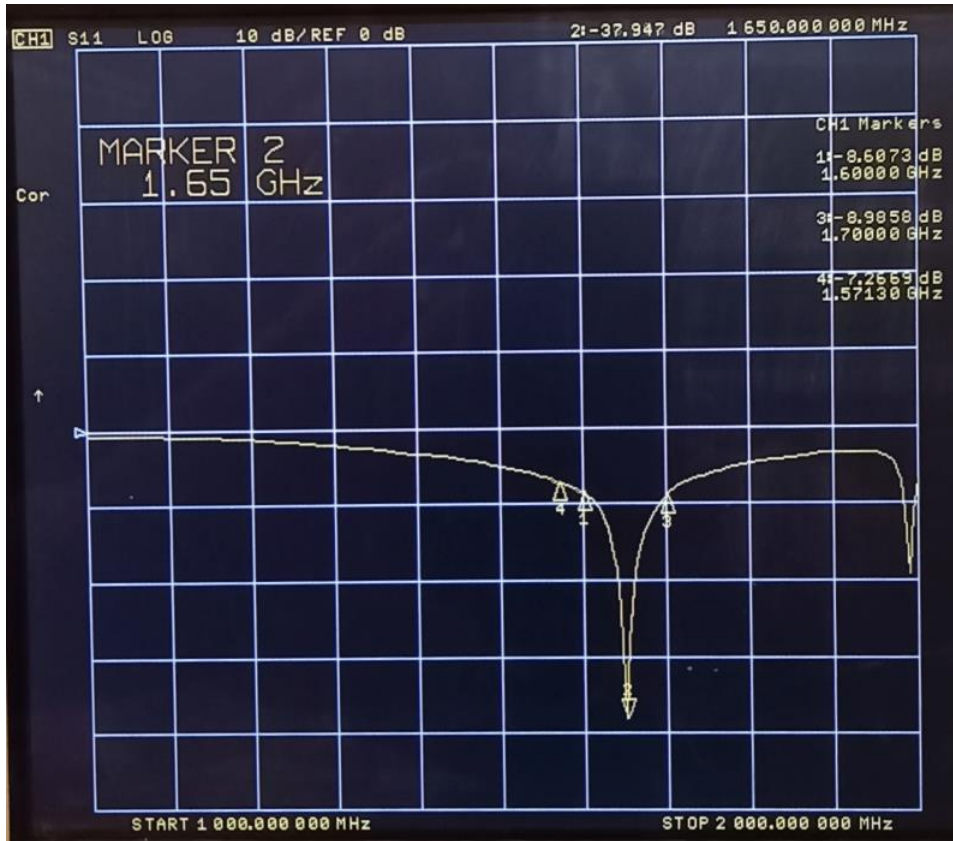
Yesterday I received the kit and immediately assembled and measured it.



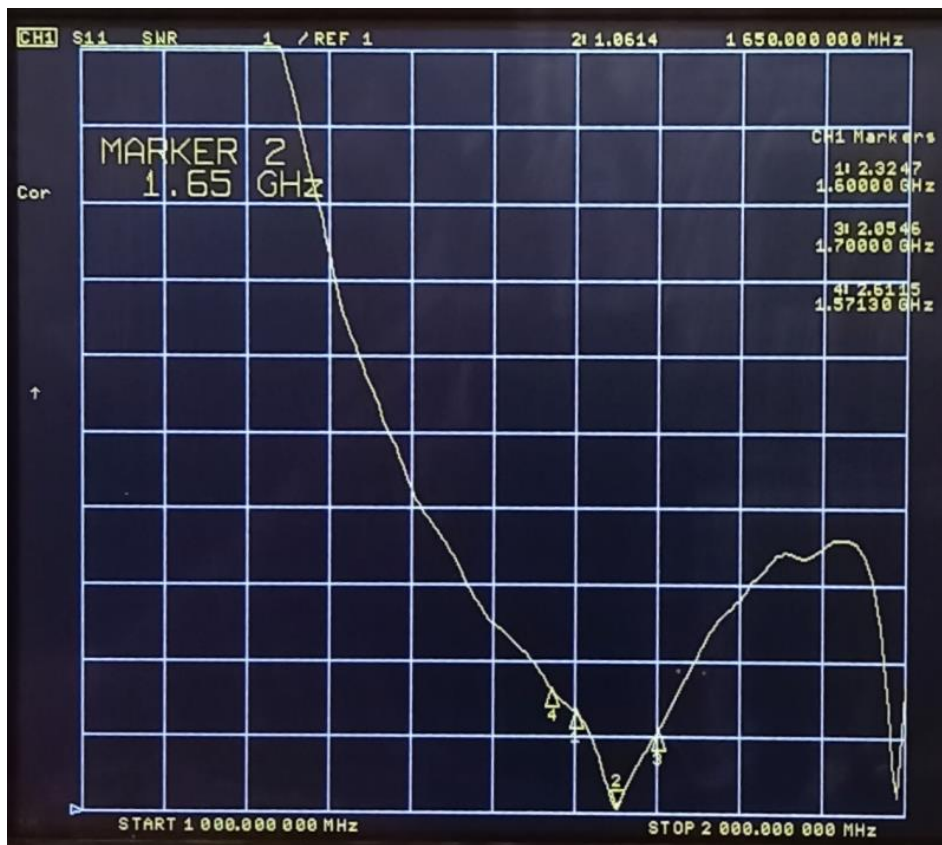
I measured the impedance of the antenna with my HP-8753E VNA.



S11 Smith Chart: markers at 1571 MHz, 1600 MHz, 1650 MHz and 1700 MHz. The chart shows a perfect resonance centered at 1650 MHz, which should result in a perfect circular polarization.



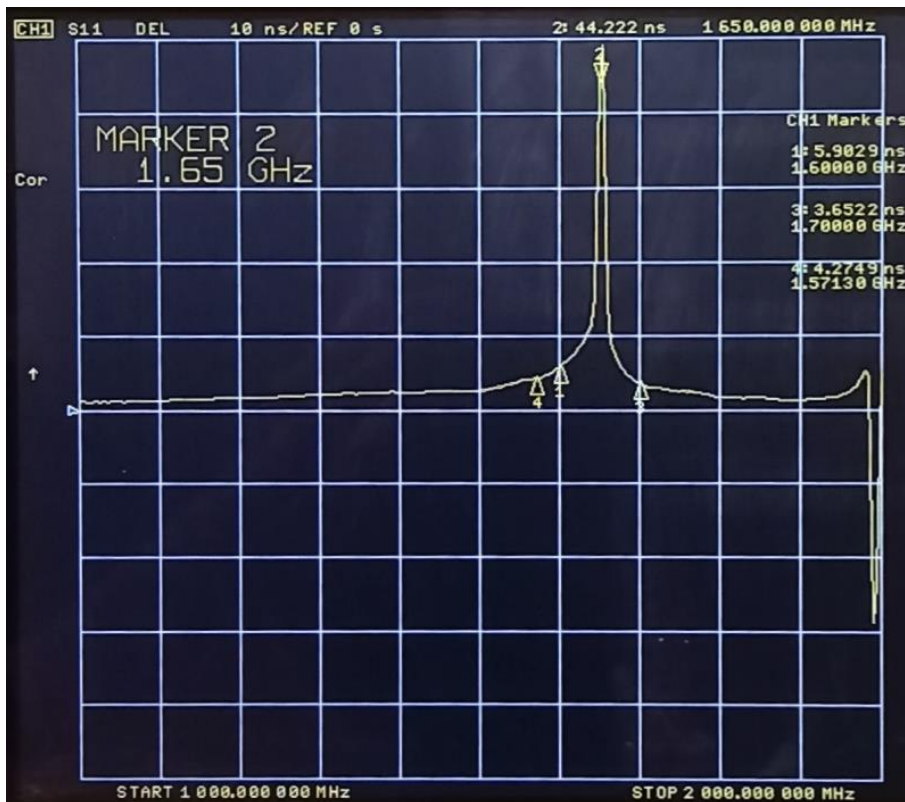
S11 log mag: maximum return loss of 38dB at 1650 MHz



S11 SWR: minimum SWR of 1.06 at 1650 MHz



S11 Phase: one can see that phase change has a positive slope around 1650 MHz +/- a few MHz. This is the result of two resonances slightly above and below the center frequency.



S11 group delay: group delay shows a strong maximum at 1650 MHz

I am very positively surprised by this neat little kit. The measurement results show that the center frequency is at 1650 MHz, which is right in the middle of the advertised range 1600 – 1700 MHz.

I have not yet measured the polarization of this QFH but based on the S11 measurements I have no doubt that it will have a good circular polarization at 1650 MHz.

I have ordered another kit and plan to build another sample with reduced length of the four arms of the QFH slightly so that the resonance will be at 1690-1700 MHz.

Possibly, I will also build a sample for LHCP.

If you have questions or comments please send them to my Email address given below.

Kind regard

Matthias

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