146MHz 3 PETAL CLOVER LEAF ANTENNA

146MHz 3 Petal Cloverleaf tower mounted antenna. September 2016

Requiring a horizontally polarised 2 metre band antenna for SSB (Single Side Band) work and also needing to develop a horizontally polarised omnidirectional (HPOD) antenna for both the 2 metre band and 70 centre-metre band for a proposed beacon site, I decided that a 3 Petal Cloverleaf or sometimes referred to as a Big Wheeled antenna could be constructed as a robust unit that would be easily replicated and require little maintenance.

Construction

The antenna is constructed around a standard male N connector with a 100mm diameter aluminium radial mounting disk with a 15mm centre hole to attach to the N connector with the standard coax gland screw cap as shown in Figure 4 and Photos 2 ~ 7. The elements have been attached with 3mm diameter pop-rivets to the mounting disks

The smaller upper disk is fitted to a standard male N connector's coax centre pin and positioned in the N connector and secured with two part epoxy. A small rubber grommet has been fashioned to fit tightly in the end of the N connector body with a smearing of marine grade silicon to make to assembly water proof.

The antenna mounting is a standard antenna mirror mount bracket with a female to female N connector bulkhead socket fitted for a range of similar antennas that are constructed around male N connectors. See: Generic Antenna Mount.
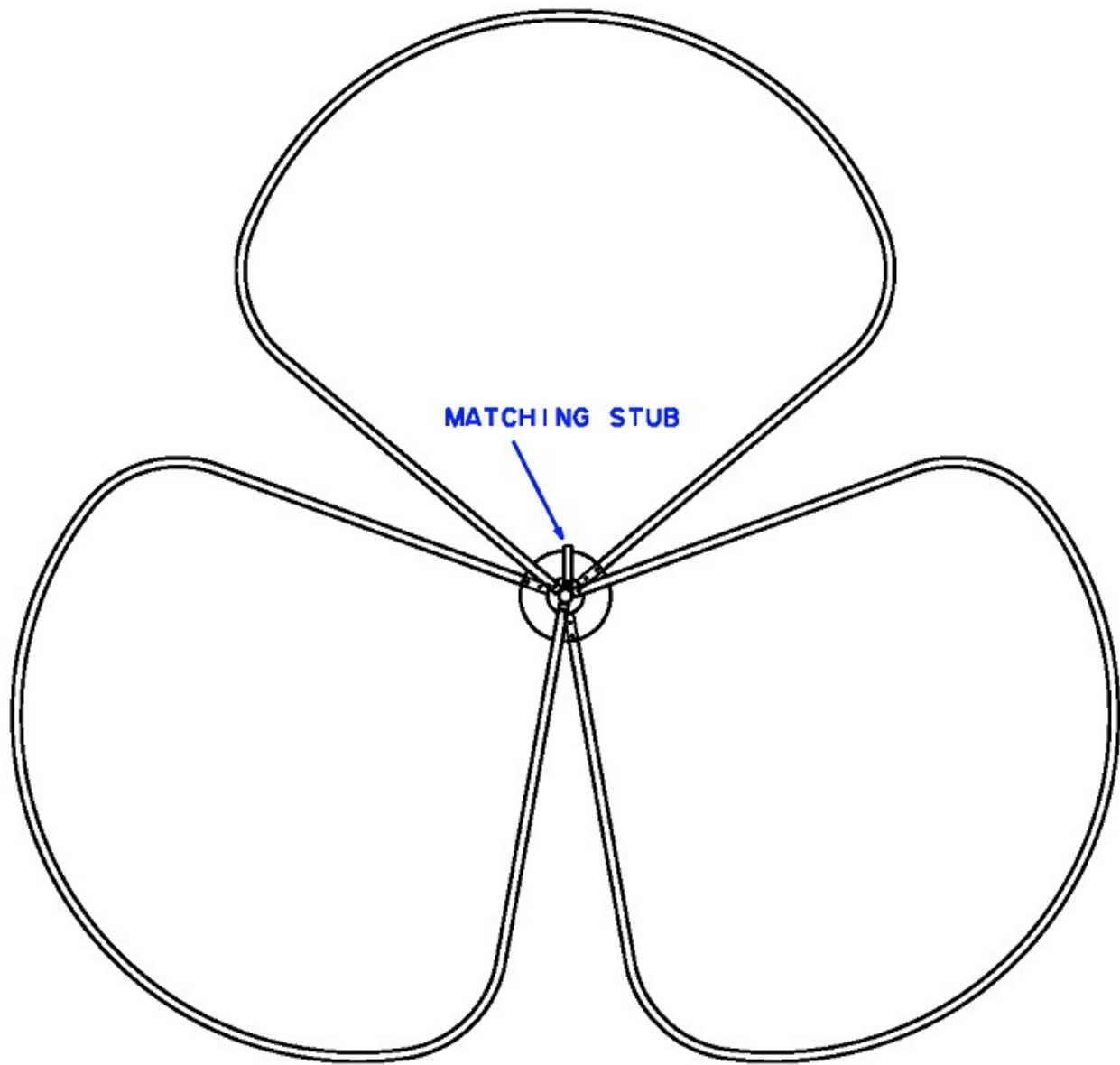

Photo 1 146MHz 3 Petal Cloverleaf assembled.

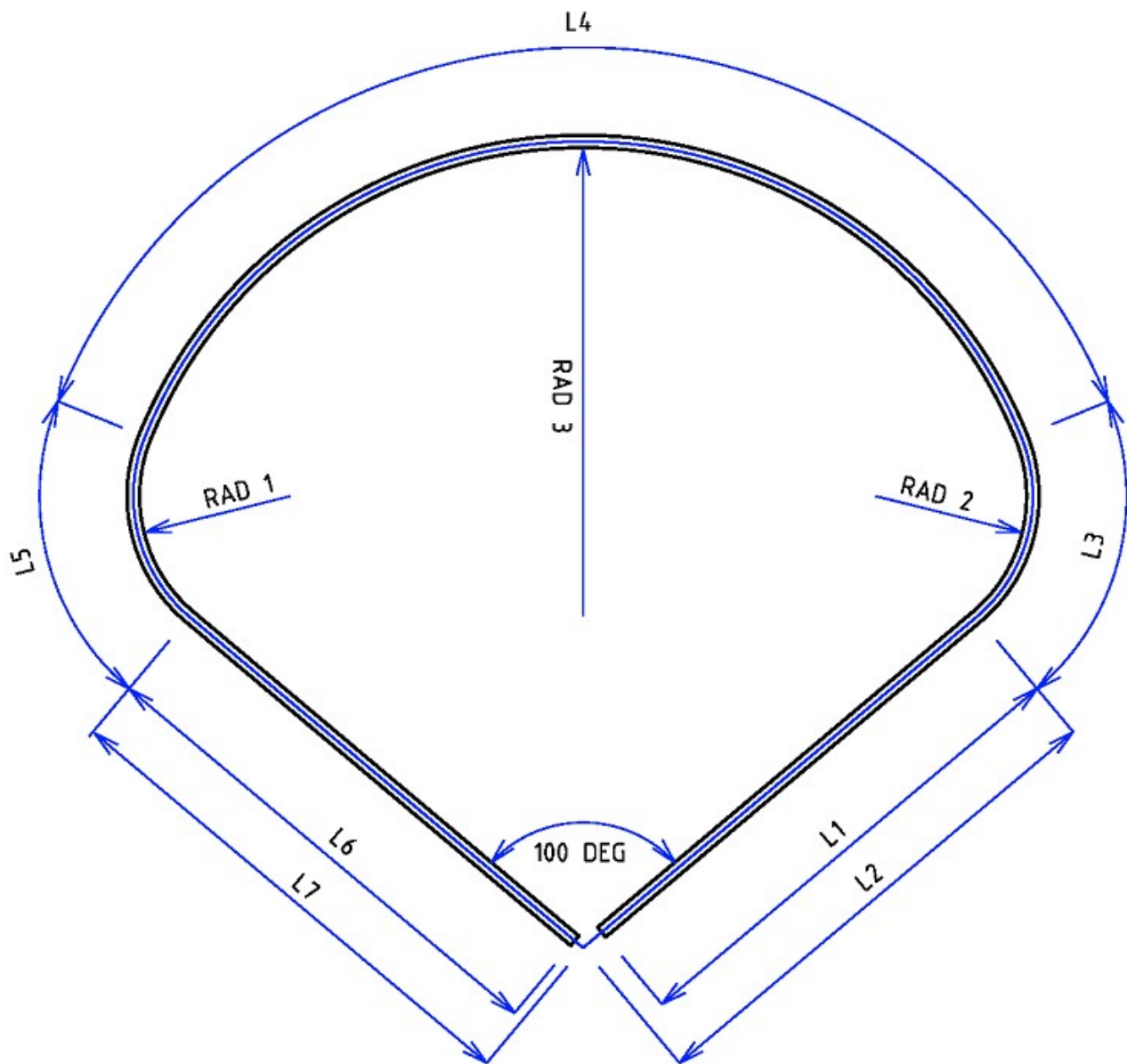**Figure 1** 3 Petal Cloverleaf general layout.

Figure 2 Cloverleaf element dimensions.

SECTIONS	FREQUENCY MHz						
	144.5	145.5	146.5	222	430	435	440
	mm	mm	mm	mm	mm	mm	mm
L1	398	395	392	252	121	119	118
L2	417	414	411	271	140	138	137
L3	161	160	159	105	54	54	53
L4	908	902	896	591	305	302	298
L5	161	160	159	105	54	54	53
L6	408	405	402	262	131	129	128
L7	417	414	411	271	140	138	137
TOTAL SECTION LENGTH	2036	2022	2008	1316	666	658	650
RAD 1	127	126	125	82	43	42	42
RAD 2	127	126	125	82	43	42	42
RAD 3	383	381	378	249	129	127	126

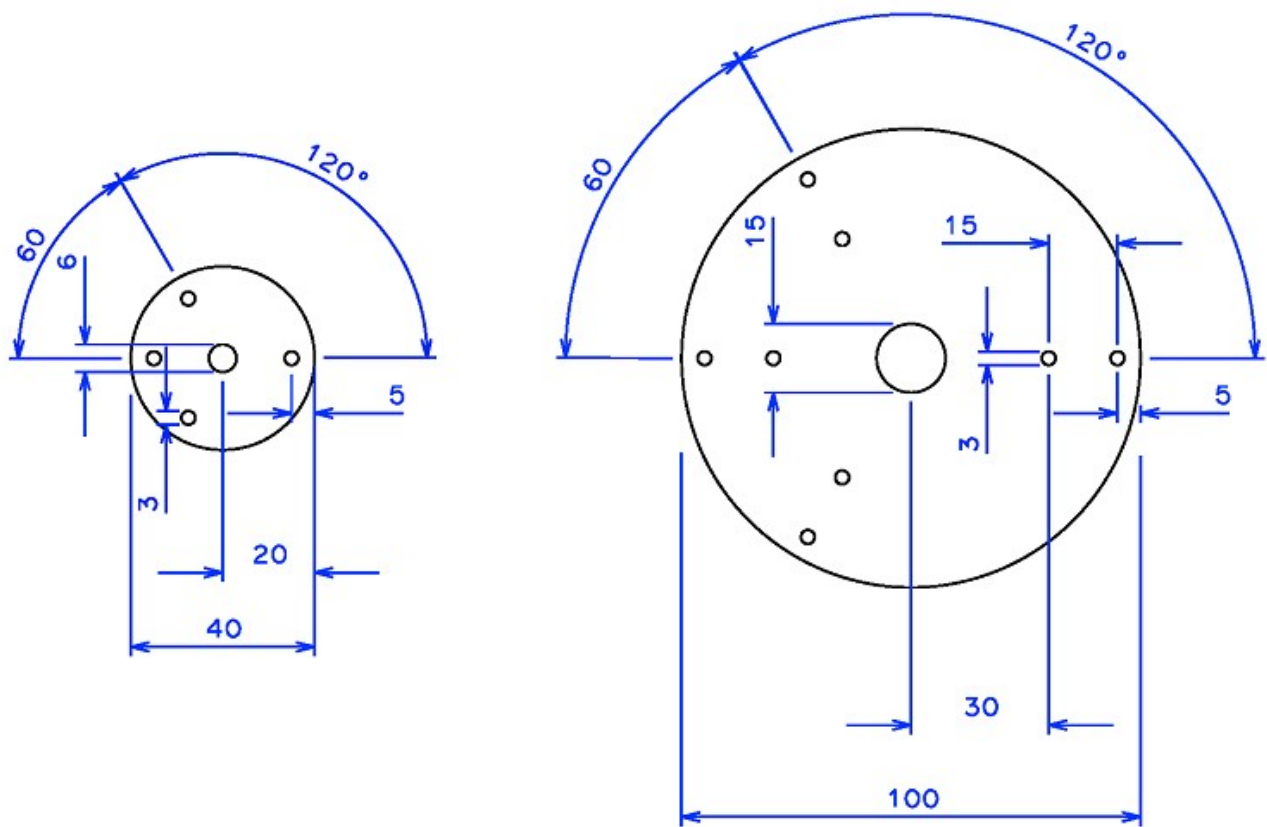**Figure 3** Cloverleaf element dimensions table.

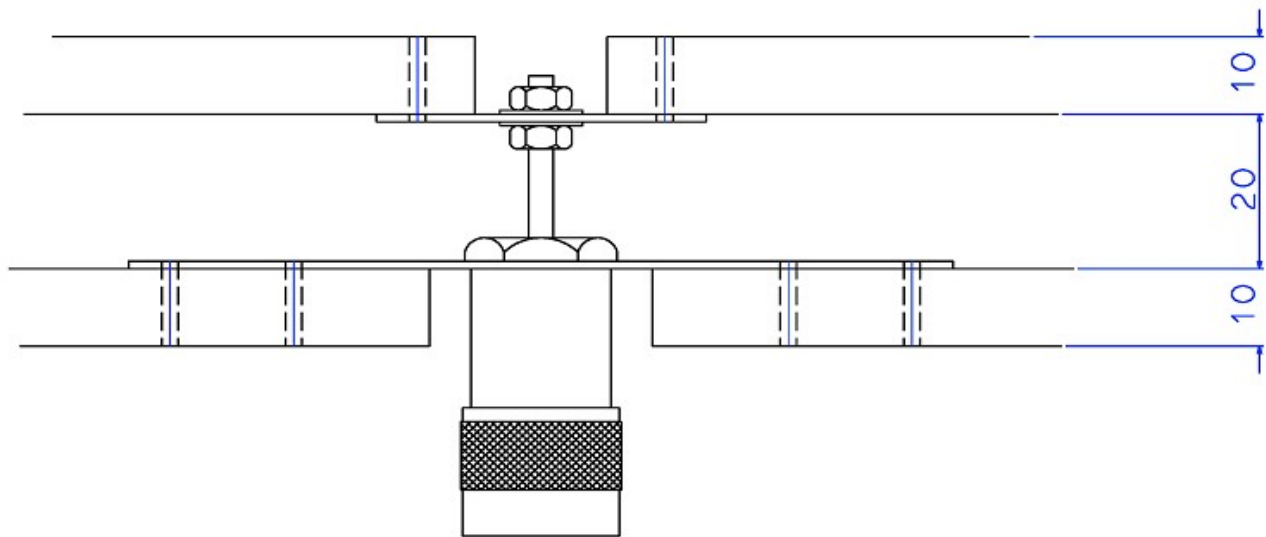**Figure 4** Cloverleaf antenna hub plates dimensions.

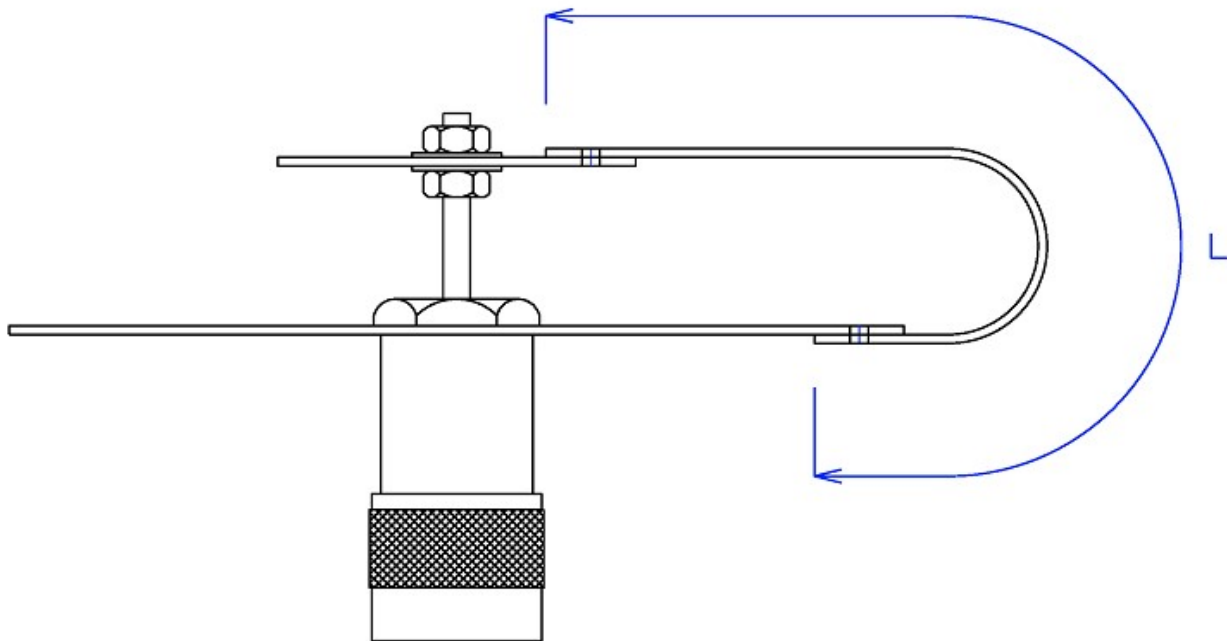**Figure 5** Cloverleaf hub assembly with element attachment.

Figure 6 Cloverleaf matching stub

Photo 2 3 Petal Cloverleaf hub plates.

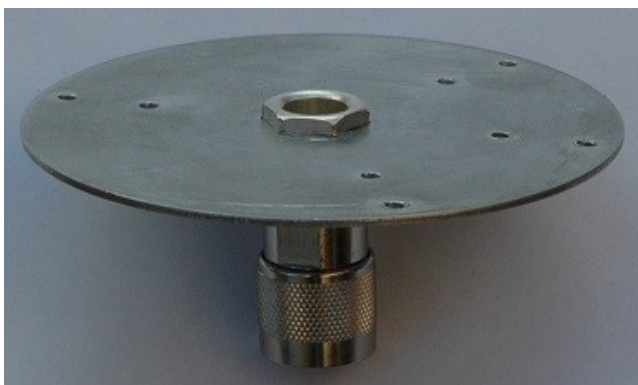**Photo 3** 3 Petal Cloverleaf lower hub plate assembled.

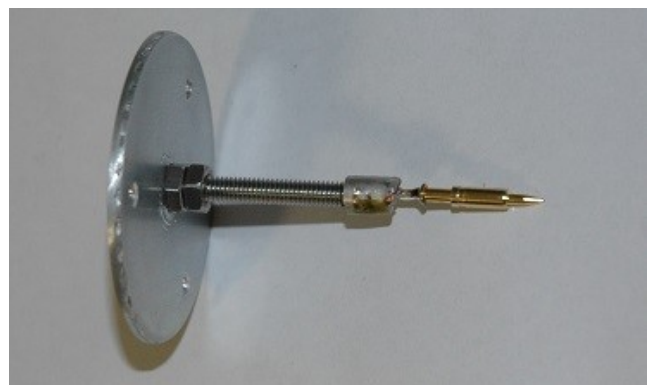**Photo 4** 3 Petal Cloverleaf lower hub plate assembled.

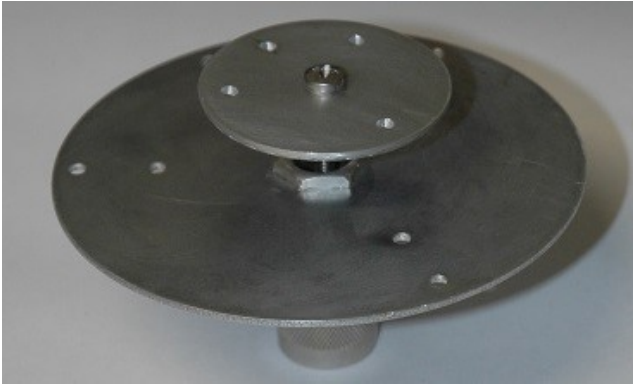**Photo 5** 3 Petal Cloverleaf upper hub plate assembled.

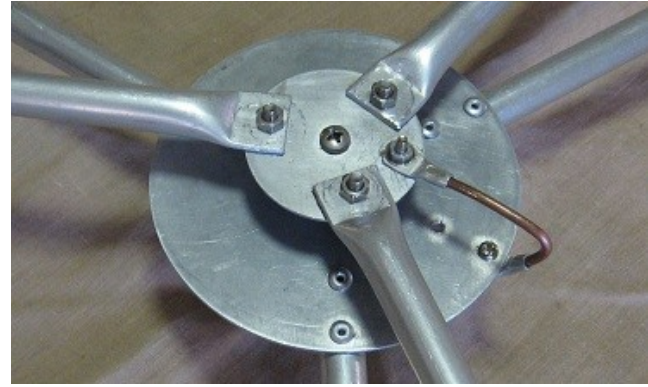**Photo 6** 3 PetalCloverleaf hub plates assembled.

Photo 7 146.5MHz 3 Petal Cloverleaf hub plates and matching stub.

Antenna testing

With the antenna assembled on an easily accessible test mast well clear of the ground and surrounding metallic objects, the antenna was connected to an AIM 4170C antenna analyser to ascertain how the antenna loaded up.
The goal here is to find the lowest SWR for the operating frequency of 146.5MHz and ideally have the resonant frequency as close as is possible to the same frequency
The AIM 4170C produces a display of all relevant data and most importantly it can project it's analysis to the antenna end of the coax giving a truer picture of the antenna.
With modest adjustment of the matching stub length an SWR of 1.7 was realised at 146.50MHz with a resonant frequency at 146.357MHz. The SWR was low across the full 2m band with only maximum of 2.0 at 144MHz. The phase angle shown in purple displays a shallow zero angle crossing at 146.357MHz indicating the resonant frequency of the antenna.
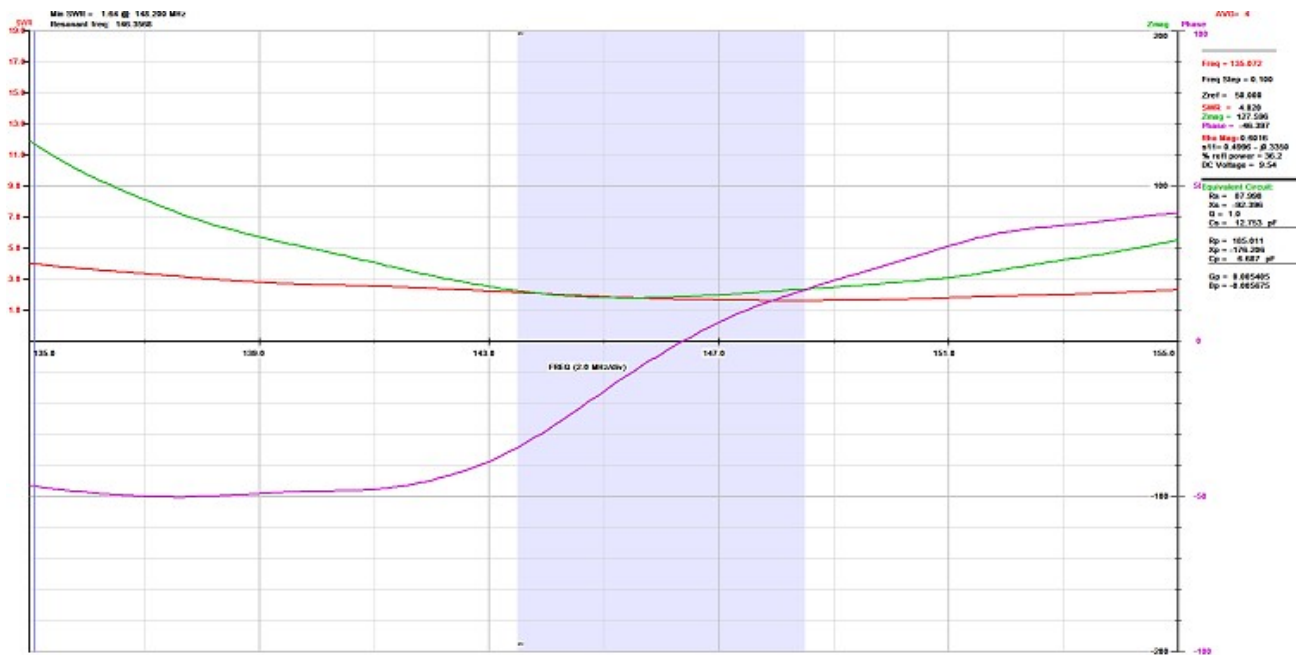

Figure 7 146MHz Cloverleaf AIM 4170C antenna analyser plot.

.

AIM 4170C antenna analyser explanation;

SWR	Standing Wave Ratio.
Zmag	Total Impedance.
Phase	Phase angle between voltage and current.

Details of the generic antenna mount. See: Generic Antenna Mount.

TOP OF PAGE

Page last revised 27 September, 2016

ACTIVITIES | ARTICLES | EQUIPMENT | HOME | LINK | MAIL | PROJECTS

Web design by Peter Miles

All content may be used for unlimited distribution with credits.

This site has been designed to cater for 800 x 600 resolution.
Site is best viewed with Internet Explorer 5.5 or Netscape 6 or higher.