# 15m ASYMMETRICAL ANTENNA - G3EFY

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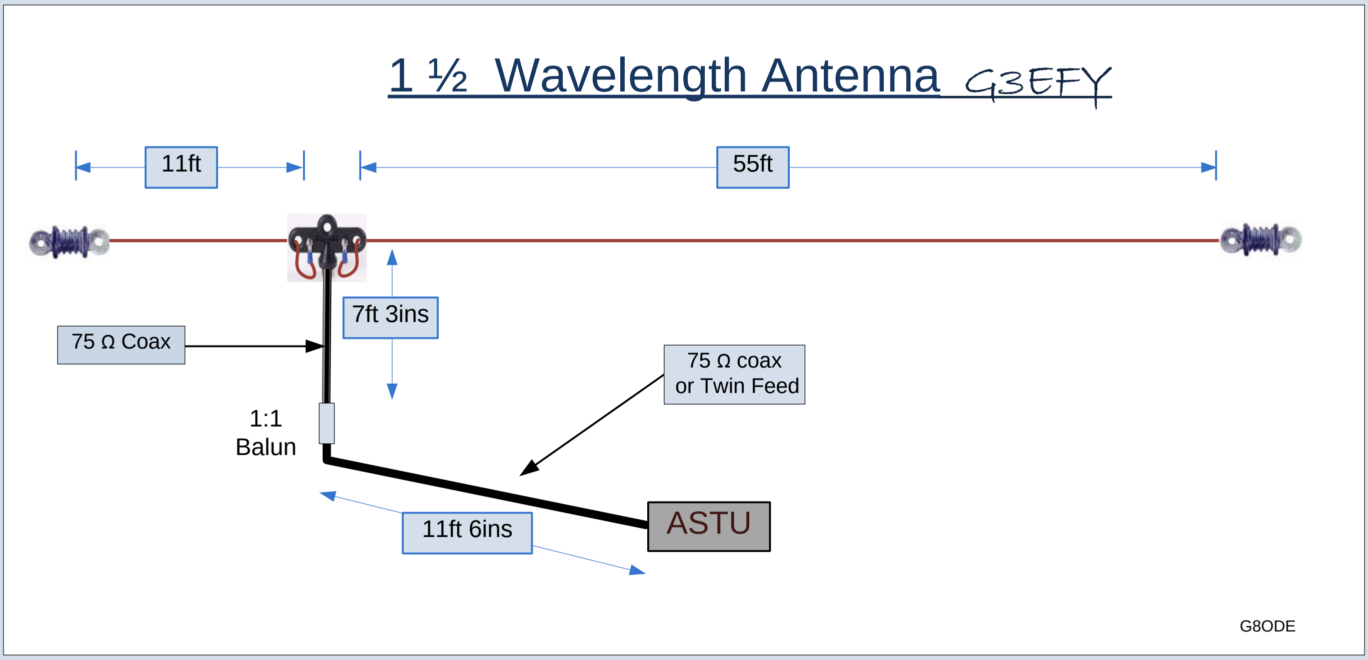
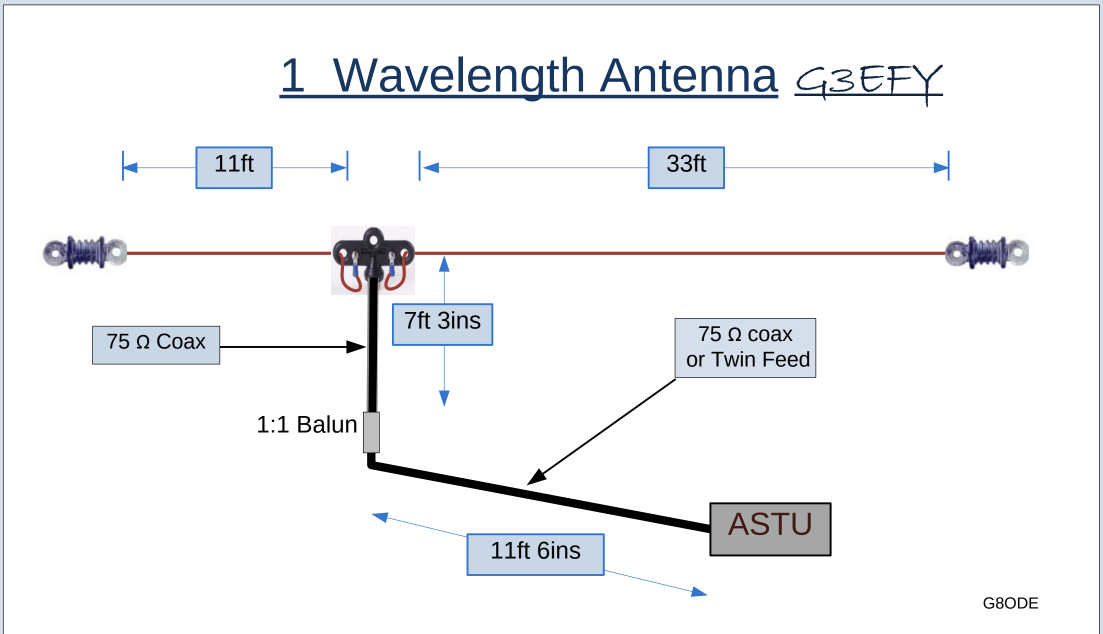
## 21MHz EMPIRICAL ASYMMETRICAL ANTENNA G3EFY

In one of his many articles published in the **RSARS** journal **"MERCURY"** the late T.W.A.(Tom) Smith, G3EFY described his experiments with an asymmetrically fed wire antenna. His original article was detailed and meticulous and can be seen in the archive section of this library **"ARTICLES FROM "MERCURY" AS ORIGINALLY PUBLISHED"** *This is an abridged version of his article, with some additional notes that provide sufficient details to allow further experimentation.*




ASTU - Antenna System Tuning Unit == aka " Tuner "




**Note**
**λ/4 = 11ft**

| **Measurement Conversions** | |
|---|---|
| 7ft 3ins | 2.2m |
| 11ft | 3.35m |
| 11ft 6ins | 3.5m |
| 33ft | 10.0m |
| 55ft | 16.7m |

This mono-band antenna that can be constructed with either with a 1 wavelength (44ft) or 1½ wavelength (66ft) top section. In either case the feedpoint is 11ft from one end. An **A**ntenna **S**ystem **T**uning **U**nit (ASTU) - ( aka "tuner") is used to finally match the antenna to the transceiver.

At 21MHz the 7' 3" length of coax ( VF= 0.67) behaves as a quarter wave matching transformer ( 11'x0.67= 7'3")

G8ODE

**Graphics by G8ODE 30 May 09 iss 1.3**

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This is a monoband antenna for 21MHz (but see below) and can be erected with a one wavelength (44ft) or 1½ wavelength (66ft) top section. In both cases the feedpoint is 11ft from the end.

No balun is used at the feedpoint and the vertical section consists of 7ft 3in of 75 ohm coax, which is a quarter wave matching transformer. This vertical section is terminated in a 1:1 balun. The feeder to the ASTU is constructed from 75 ohm twin, about 11ft 6in long, which is approximately a quarter of a wavelength on 21MHz. The balun is a trifilar winding of 10 turns of 20SWG enamelled copper wire on a piece of ferrite rod, which is 5cm long and 12 mm in diameter. The connections to the coaxial vertical section are waterproofed using a 35mm film container at the top and a plastic pill container for the balun.

It was found that by reducing the top section to 44ft the antenna could also be loaded satisfactorily on the 7 MHz and 14 MHz bands using the ASTU ("Z" Match) with reasonably good performance. Also, by shorting the feeder at the station end and using an L-network match, the 66ft version can be used on 3.5MHz. It is not known if the length of the 75 ohm twin feeder has any effect on the performance of the antenna as the total length of the feeder and the coaxial radiator is approximately half wavelength at 21 MHz.

It was not possible to erect the antenna more than 18ft above ground, therefore the vertical radiator length was limited to a quarter wavelength multiplied by the coax velocity factor. The antenna also had to be bent to fit the available area. However, despite this, and during a period of poor propagation on 21MHz, CW QSOs were made with all continents except Africa.

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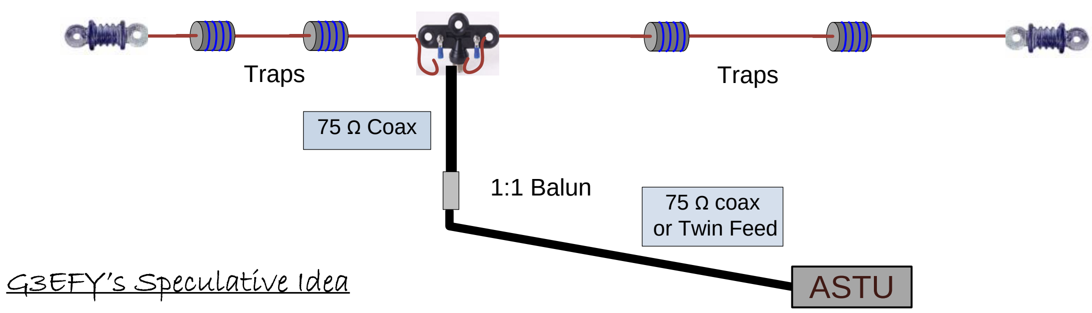


A speculative idea using an trapped version of this antenna, is to replace the usual 50 ohm feeder of a trap dipole with a calculated length of 75 ohm coax with a balun and then a length of 75 ohm twin feed to the ASTU. Thus creating a vertical radiator and possibly increase the DX capabilities of the antenna.

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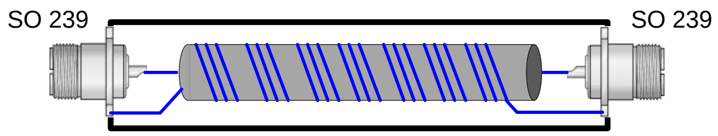
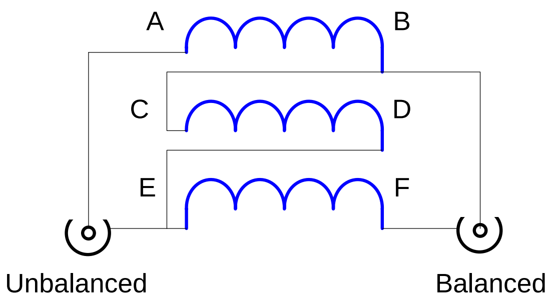
## TRI-FILAR 1:1 Balun Construction




10 turns of 20SWG enamelled copper wire on a piece of ferrite rod, which is 5cm long and 12 mm diam

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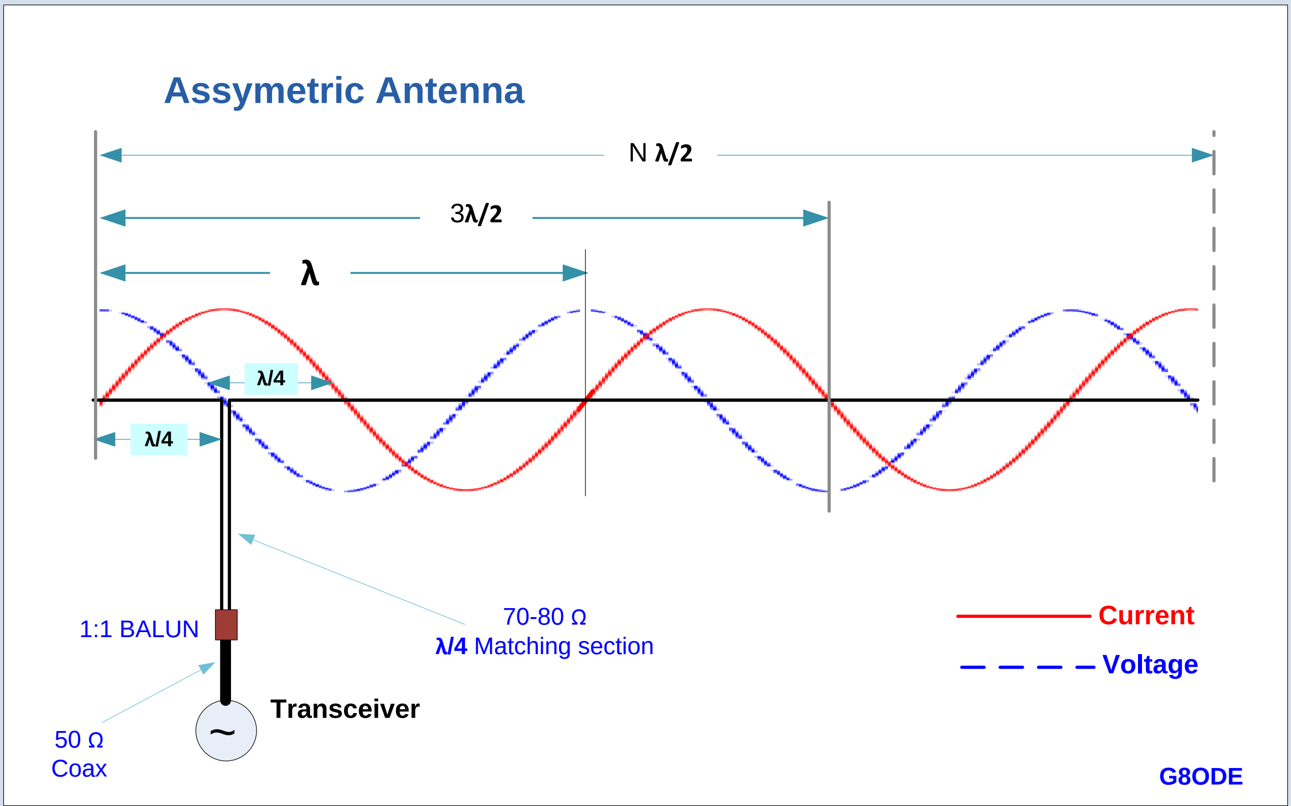
# THEORY BEHIND THE ASSYMETRICAL ANTENNA




An antenna that is two or more half wavelengths long can be fed with a low impedance transmission line of coax at any of the current maximum positions such as the point a quarter of a wave from one end. In such a case a 70-80 ohms feeder could be used though the impedance is slightly greater than for a half wave dipole. If the antenna is designed for 7 MHz. it will also work on 21MHz , but will be badly matched on the even harmonics on 14 & 28 MHz.

The quarter-wave 70-80 ohm transformer section matches the transceiver's 50 ohm output to the antenna. The three half waves will resonate at a slightly higher frequency because the centre half wave is isolated from the antenna's end effects.

To calculate the length of a three half-wave dipole, use the formula 1380.6 / F MHz.

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## Additional notes by G8ODE

Plots were produced using MMANA-GAL Software

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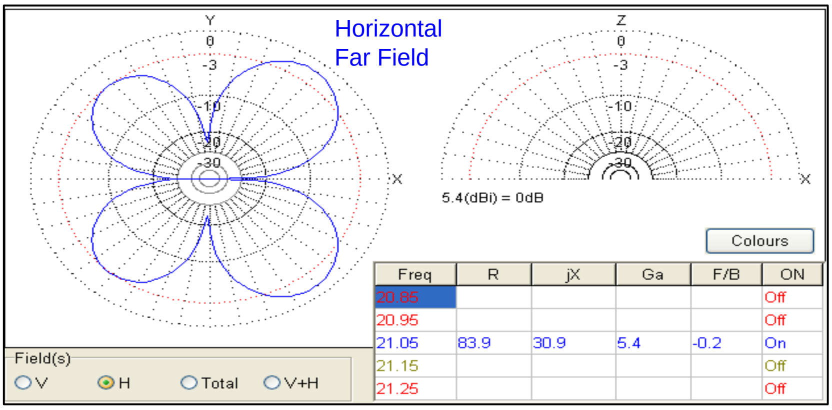
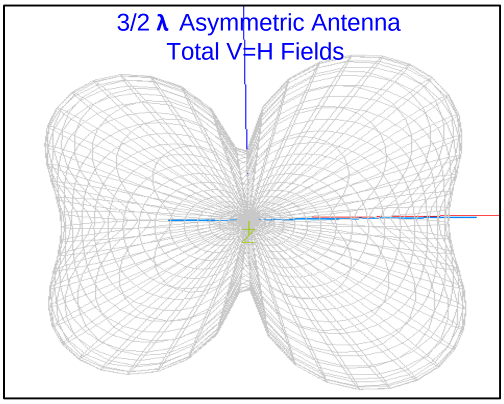
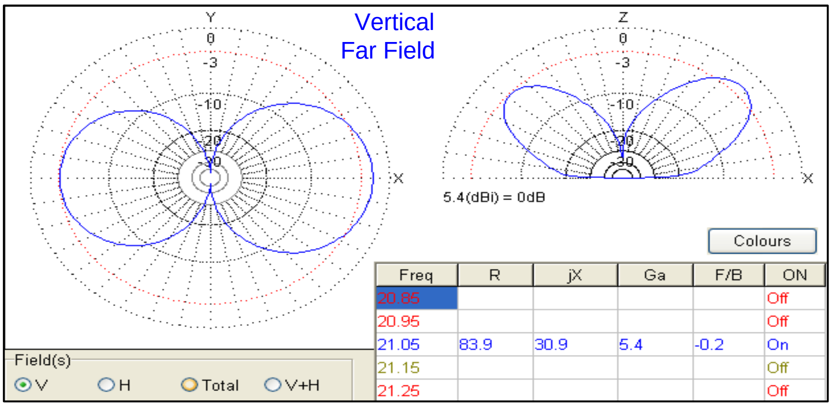



| Freq | R | jX | Ga | F/B | ON |
|---|---|---|---|---|---|
| 20.85 | | | | | Off |
| 20.95 | | | | | Off |
| 21.05 | 83.9 | 30.9 | 5.4 | -0.2 | On |
| 21.15 | | | | | Off |
| 21.25 | | | | | Off |

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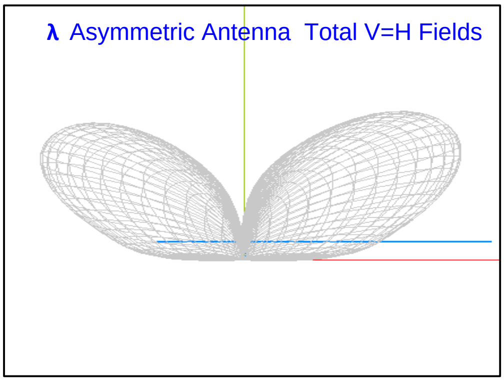
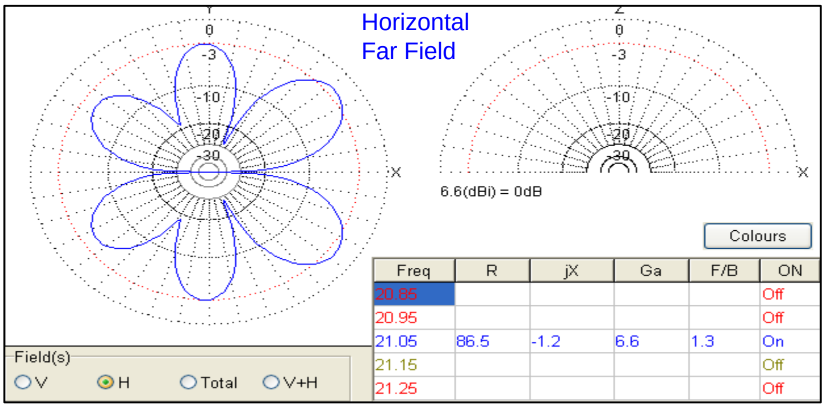
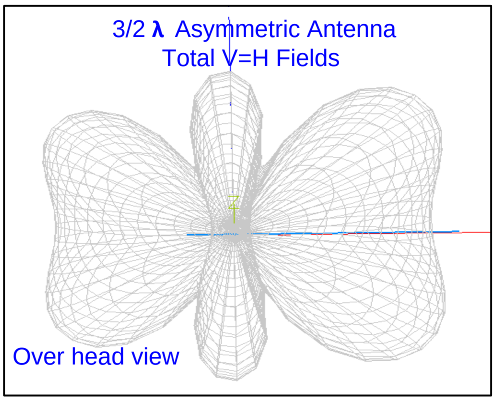
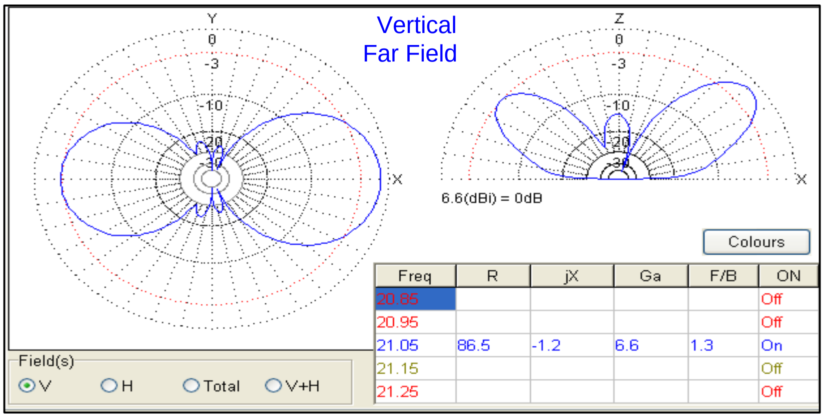



The difference between a one wavelength and one and a half wavelength asymmetrical antenna is fairly obvious when the horizontal far field patterns are observed. The longer antenna has more lobes and improves the DX capabilities of the antenna. The horizontal, fields are very similar with the longer antenna having an additional central lobe.




| Freq | R | jX | Ga | F/B | ON |
|---|---|---|---|---|---|
| 20.85 | | | | | Off |
| 20.95 | | | | | Off |
| 21.05 | 86.5 | -1.2 | 6.6 | 1.3 | On |
| 21.15 | | | | | Off |
| 21.25 | | | | | Off |




| Freq | R | jX | Ga | F/B | ON |
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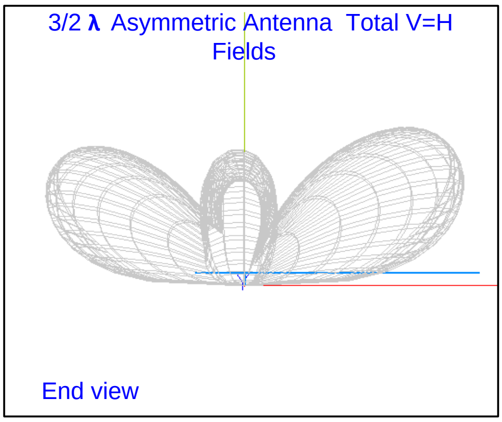


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