FIVE AND NINE PLUS

THE OFFICIAL NEWSLETTER OF THE APPLEDORE AND DISTRICT AMATEUR RADIO CLUB

Club Callsigns: G2FKO and GX2FKO
Web Site : www.adarc.co.uk

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June 2021

EDITORIAL

Welcome to another Club Newsletter.

Many thanks to Mike (G4KXQ) for organising this month's Zoom talk on **June 14th**. entitled **'ICQPODCAST and its background' by Martin Butler (M1MRB)** who is an active member of the Sutton and Cheam Radio Society and a committee member. Having an 'outside speaker' is a first for our Club and it is hoped to have others. This is a subject about which I have little knowledge and therefore am looking forward to learning what it's all about.

As always, the 'Waiting Room' will be open from 7pm with the Meeting starting at 7.30pm - see you all there.

So please try to attend and support this venture and in doing so have a really enjoyable, entertaining and informative evening all in the comfort of your own home.

Some members have raised whether we will be soon able to recommence Meetings at the Appledore Football Club. Your Committee have approached the Club on this matter but they feel that until Government policy re fully opening up the rules is decided, then such Meetings are not possible.

I know of at least of one other Club who have started Meetings' outdoors - ie bring your own chair/refreshments and meet up somewhere in the open (hopefully on a warm evening!). This is something that could be pursued if members are interested - just let any Committee member know your thoughts.

In the mean time - keep safe and keep healthy

Terry (G4CHD)

CLUB MEETINGS

Due to the present Covid 19 pandemic, **ALL** meetings scheduled to be held at the Appledore Football Social Club have been **CANCELLED** until further notice

Until Meetings are reinstated a programme of '**virtual Zoom Meetings**' has been arranged :-

Date	Topic
June 14th	**'ICQPODCAST and its background' by Martin Butler (M1MRB)**

MAY MEETING

A VISUAL HISTORY OF ROBERTS RADIO

by Graham (M1GRA)

Everyone who joined this Zoom Meeting was rewarded by a fascinating illustrated talk by Graham on the history of Roberts Radio. Graham showed many examples of notable Roberts radios from his extensive collection which for many members, brought back fond memories of times past.
If anyone missed the talk and would like to watch a recording, please contact me and I can send you a link to download the mp4 file.

LOCAL REPEATERS

2m Stibb Cross Repeater (GB3DN)
http://www.g0rql.co.uk/gb3dn.htm
User: Listen 145.6375 MHz - Transmit 145.0375 MHz.
Access 1750 Hz Tone or 77 Hz CTCSS
Repeater keeper is Tony (G1BHM)

Fusion/C4FM/WiresX Gateway (MB6DT)
Frequency 144.8125 MHz.
Keeper Darren (2E0LVC)

Fusion/C4FM/WiresX Gateway (MB6DN)
Frequency 144.825 MHz.
Keeper Drew (M0MFS)

LOCAL NETS

Weekday Zepp FM Net:	Mon/Tues/Thurs/Fri : 145.450MHz - 4pm - 5pm Wed via GB3DN - 4pm - 5pm Net Control : Len (M0SXY)
2m Elevenses FM Net:	Mon/Tues/Thurs : 11 - 12.00 noon 145.475MHz Wed/Fri : 11 - 12.00 noon via GB3DN Net Control ; Mike (G3PGA)
Friday Night 2m Net:	Friday : 145.450 FM, 8 - 9pm
Sunday Top Band Net:	Sunday 1.860 MHz 9.30 - 10.15am (LSB - 32W pep max)
2m SSB Nets:	Wed: 8 - 9pm 144.260MHz USB SSB (Vertical polarised) Sun: approx 10.30am (follows Top Band Net) 144.260MHz USB SSB (Vertical polarised)
Sunday FM Net:	Sunday: 11 to noon via GB3DN Net Control ; Chris (G0FJY)

CROSSWORD

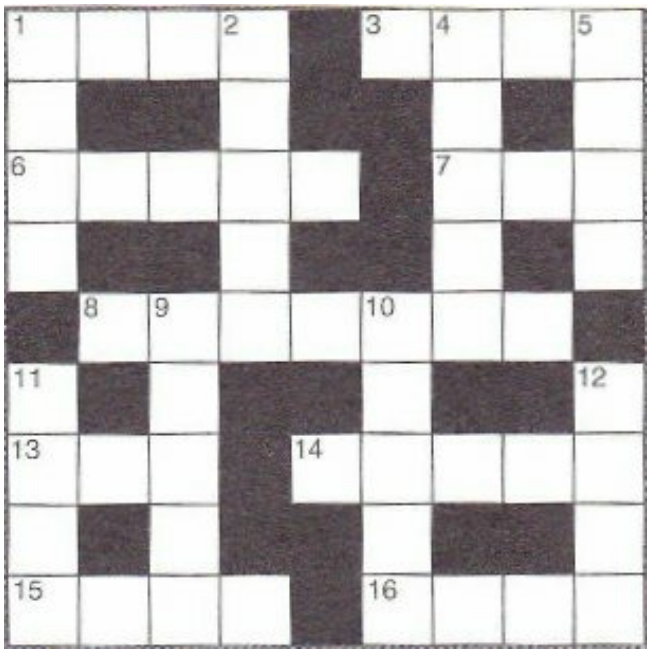
Many thanks to Stuart (M1FWD) for this month's Crossword.
The answers are in next month's Newsletter. Good luck !

CLUES ACROSS

1) Tube for conveying cable (4)
3) Lightweight sub-machine gun (4)
6) Donald ?, former president of the USA (5)
7) ? Gillen, lead singer of the rock band Deep Purple (3)
8) ? and St. Brandon Islands, Three Bravo Six (3B6) (7)
13) In computing, part of a browser window showing other websites in use (3)
14) The last letter of the Sierra Victor (SV) land alphabet (5)
15) ? and Frederick, Danish-Dutch singing duo, late 1950s and early 1960s (4)
16) ? line, a band around the Earth that separates daylight from darkness (4)

CLUES DOWN

1) Facts and statistics collected together for reference or analysis (4)
2) City in Florida, USA (5)
4) Market town in Hertfordshire, UK (5)
5) Cats are said to have this many lives (4)
9) Tango Romeo (TR) land (5)
10) Audio and video equipment manufacturer in Oscar Echo (OE) land, 1919-1982 (5)
11) ? Laurel (1890-1965), English comic actor (4)
12) Not difficult (4)



Last month's answers :-

ANSWERS ACROSS: 1) rheostats 6) Freud 7) ion 8) Anna 10) pier 13) myo 14) Libya 15) noise gate

ANSWERS DOWN: 2) heron 3) soda 4) Alibi 5) sonar 8) Amman 9) Naomi 11) Egypt 12) blue

FOR SALE

The following items are for sale by Graham (G1ZTJ)

Pair of Watson HP100 Communication Headphones good condition £5

Funcube Dongle £45

Contact G1ZTJ on Bideford (01237) 479661

SUDOKU PUZZLE

The aim is to enter a number into each cell so that any column, or any row, or any block of cells contain all the numbers from 1 to 9

5				1	7			
	7		8				1	
9		3	4					
4							9	1
		2				5		
6	9						2	
			2			9	7	
8			9					4
				3	5		6	

Terry (G4CHD

ARTICLE EXAMINING THE END FED WIRE

by Terry (G4CHD)

I have included a recent article I have written which although not yet fully complete, hopefully makes interesting reading for some members.

I tend to write such an article to try to focus in my mind how I *think* such an antenna works using as simplified approach as I can. It's not intended to be a definitive detailed analysis but a basis for further study. I also need to put things down on paper as after a month or two - the old memory starts playing tricks!!

So that's it for this month

Very Best 73s and hope you enjoy the Newsletter

Terry (G4CHD)

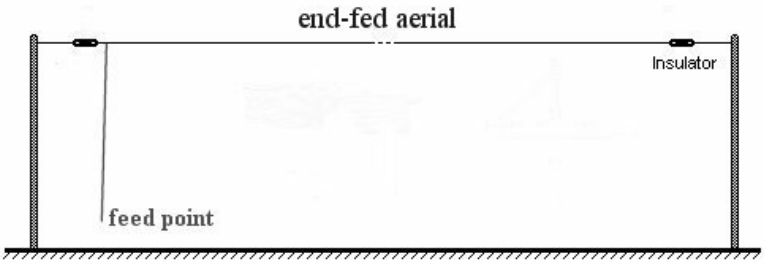
END FED ANTENNA - A DISCUSSION

by Terry (G4CHD)

First let me admit that I am certainly no expert on electromagnetic theory etc but what follows is my personal attempt to understand in hopefully a simplified way just how an End Fed Wire antenna works.

I have always to be honest, preferred balanced antenna systems eg centre fed dipoles, loops etc.
However, at my present qth, for a number of reasons an end fed antenna system is the only sensible option.

Basically an end fed wire antenna system consists of a length of antenna wire fed via an Unun Transformer (hereafter referred to simply as an Unun) which in turn feeds a length of coax back to the transceiver. The wire can take a variety of configurations eg inverted L as shown opposite, inverted V, or a simple vertical etc.

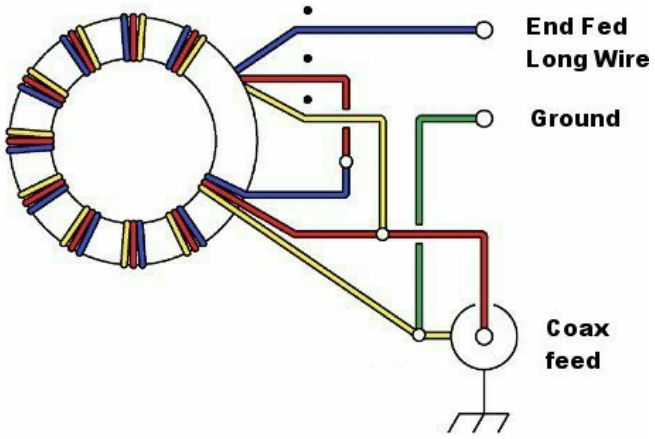


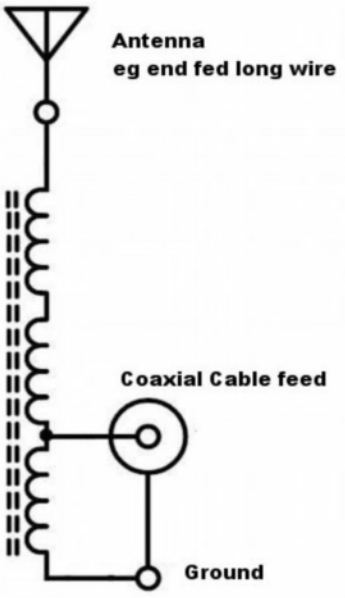
Consequently the feed point can be either elevated or near ground level. Also the antenna length can be a resonant length (ie multiple of half wavelengths) or non resonant which will influence what bands the antenna can operate on.

However, whatever the design details, the feed impedance at the end of such an antenna will be high particularly if a resonant length is used. Therefore a matching transformer is required and as the antenna effectively only has one terminal, an **Unun Transformer** (Unbalanced to Unbalanced) is needed which will hereafter be simply referred to as an Unun..

Design of an Unun :-

An Unun is required to match the high impedance at the end of the wire to the 50 ohms coaxial cable.
As can be seen from the following diagrams, an Unun is effectively an Autotransformer and is constructed using a trifilar winding.

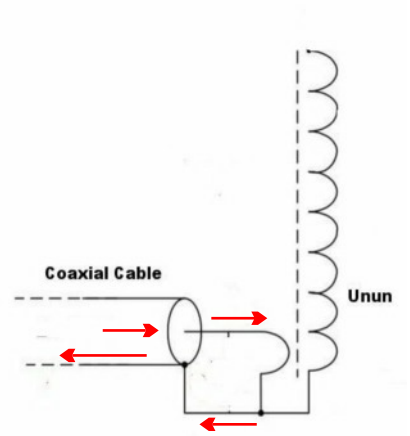




Commonly used impedance ratios are 9:1, 49:1 and 64:1. As will be explained later, 9:1 Ununs are used with non resonant multiband end fed antennas, whereas resonant end fed antennas with their much higher end impedance require a 49:1 or 64:1 Unun.

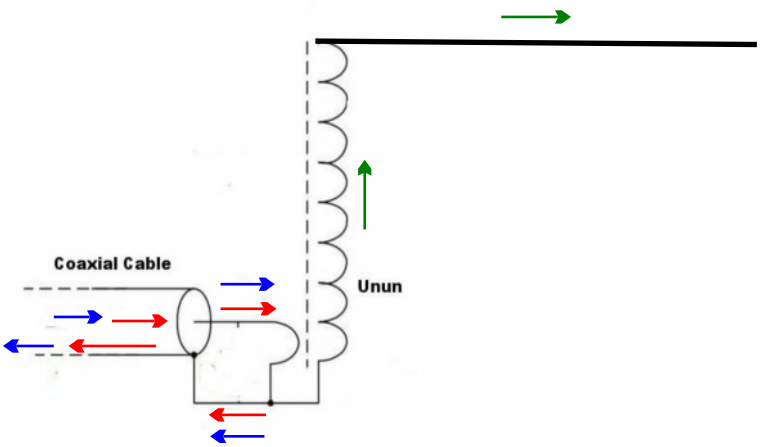
Feeding an End Fed Wire Antenna via an Unun

Consider a theoretical situation of a transceiver feeding an Unun via coax with no antenna connected to the Unun as shown in the diagram opposite :- (**NOT** something you should do in practice as this would result in a **high SWR** in the coax due to the high mismatch and risk possible damage to the transceiver)



The coax 'sees' the primary winding of the Unun and **SHOULD** you in theory energise the transceiver, current would flow along the coax central wire throug the primary Unun winding and return on the inner surface of the coax outer braid as shown by the red arrows. (The current flows on the inner surface of th coax braid due to the skin effect). The current in the Unun primary winding produces magnetic flux in the core and since the Unun secondary winding is also wound on this core, an emf is induced in the secondary winding.

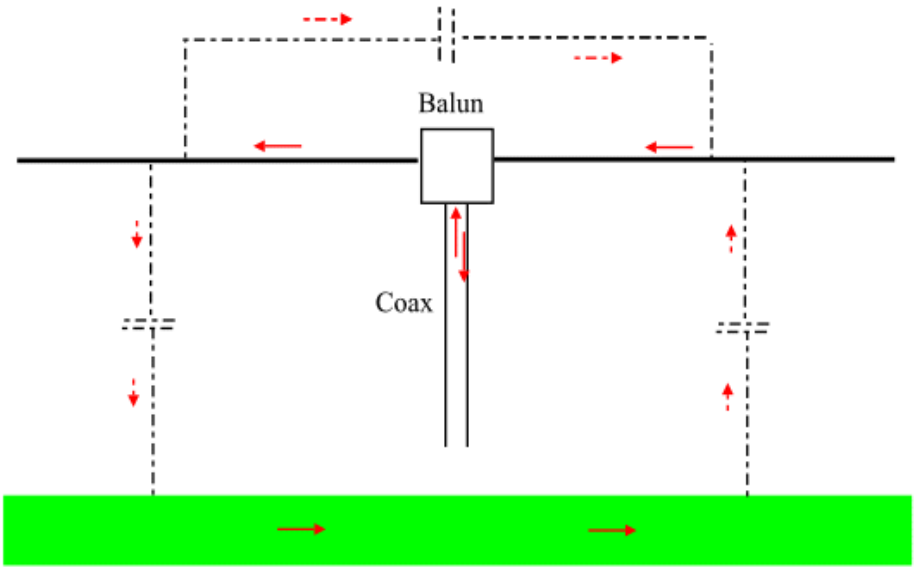
Now connect the end fed antenna wire to the Unun :- (Note there is no direct earth connection between the Unun Ground terminal and earth)



The emf in the secondary winding will now cause current (green arrow) to flow in the antenna wire causing it to radiate. This current also flows in the Unun secondary winding - changing the flux level in the core resulting in additional current (blue arrow) to flow in the Unun primary winding to restore the flux level in the core back to its original value (normal transformer action).

However, the current in the antenna wire will only flow **if there is a complete circuit** which begs the question as to how the circuit is completed.

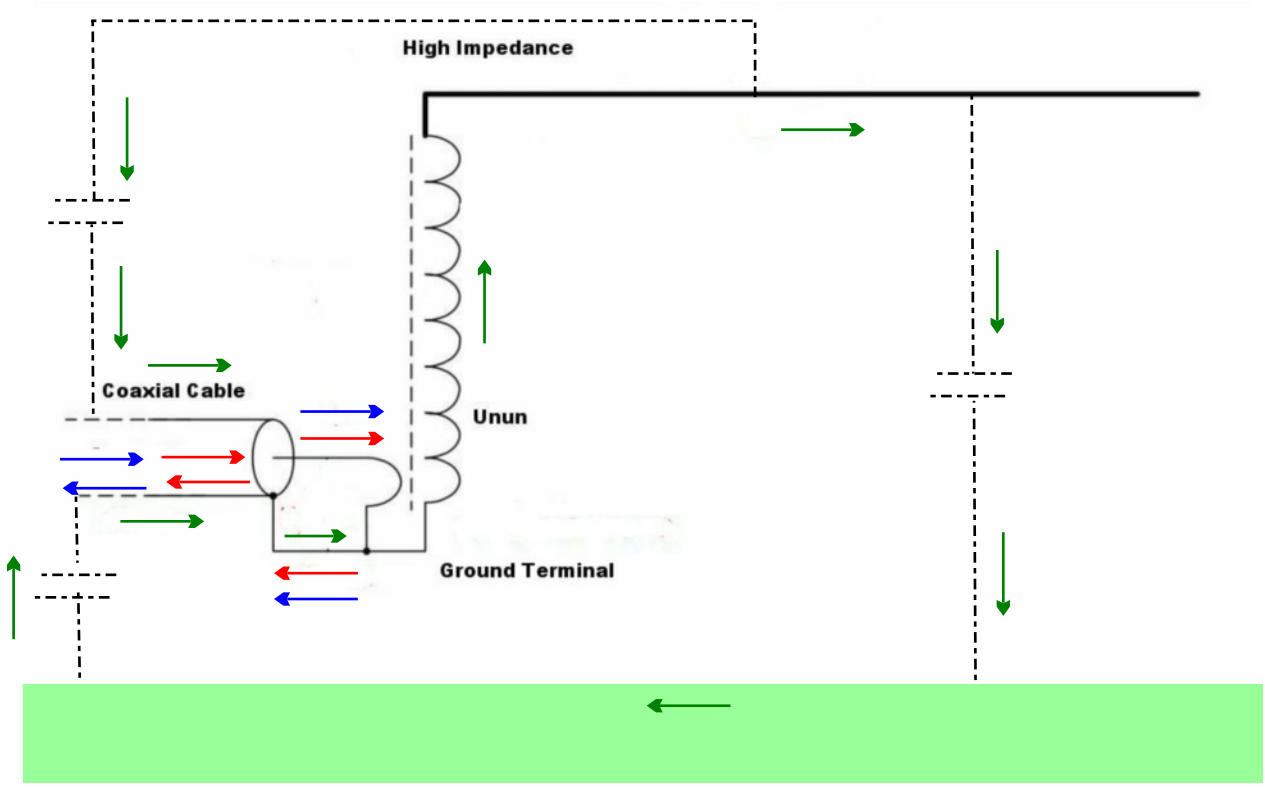
Consider a simple centre fed half wave dipole :-



The current flows from the transceiver via the central wire of the coax and into the left arm of the dipole and the return current from the right arm flows back to the transceiver via the inner surface of the coax outer. But how is the circuit completed? Two possibilities are shown in the above diagram :-

Namely via capacitive coupling directly between the dipole arms or via the ground. Obviously in outer space, no ground option exits suggesting that direct coupling must take place.

Returning now to the end fed wire antenna :-



Assuming that the analysis of current flow in a dipole is correct ie the current circuit is completed via either direct capacitive coupling or via the ground then as shown in the diagram above, there appear to be two possible ways in which the circuit is completed - namely by direct capacitive coupling between the antenna and the coax outer, or via capacitive coupling with the ground.

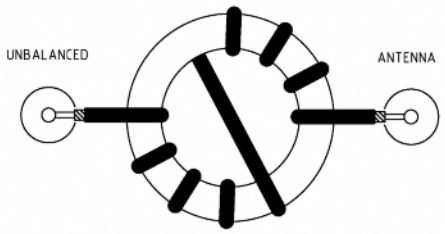
Either way, it results in **Common Mode Currents** flowing on the **OUTER** of the coax braid (green arrows in the above diagram) which can cause rf interference within the shack.

The current path via ground will be very dependent upon local earth conductivity (and I assume antenna height) but such a route will inevitably introduce losses.

It can thus be seen that whichever route is used, common mode currents flow on the coax outer making the coax feed PART of the antenna system and thus contributing to some degree to the radiated signal.

As mentioned earlier, although common mode currents are part of end feeding an antenna, they can cause rfi problems if allowed into the shack. The solution is to use a **1:1 Isolator**.

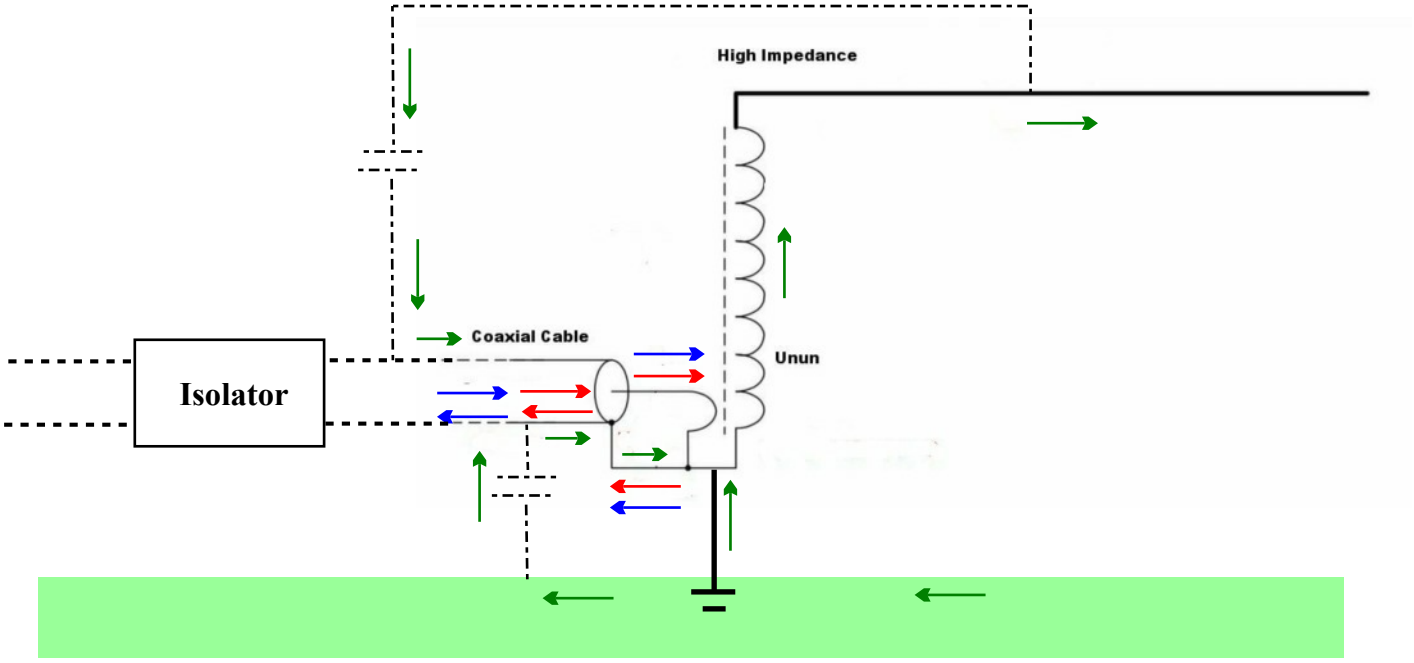
1:1 Line Isolator



One way to **prevent common mode currents flowing in the shack**, is to insert a **1:1 Line Isolator** in the coax cable at least a quarter of a wavelength from the Unun to still allow the coax braid between the isolator and the Unun to couple to ground. The length should be for the lowest frequency band used eg 10m for the 40m band.

Use of Earth Rod

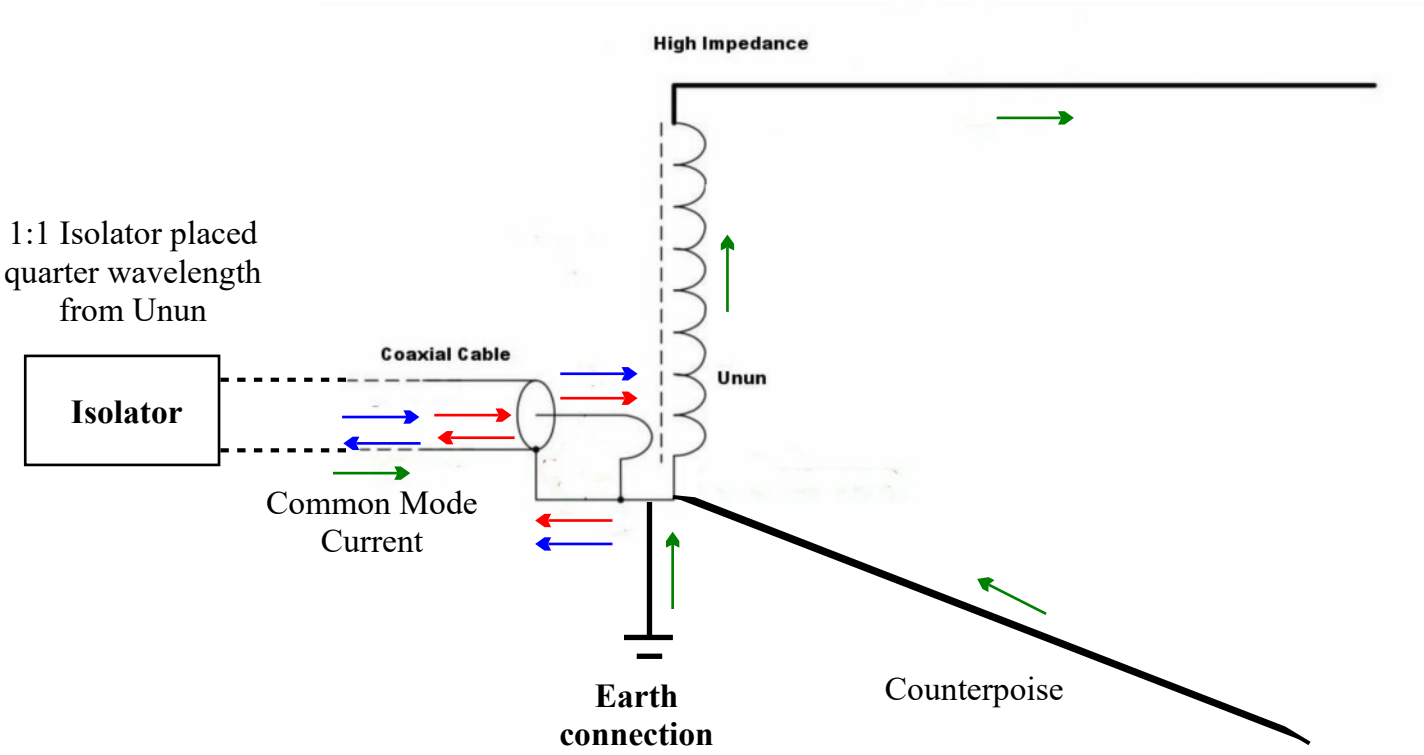
Another option is to connect a **direct earth** between the Unun and a ground spike as shown in below :-



The earthing wire from the Unun Ground terminal to the Earth rod should be as short as possible and definitely much shorter than a quarter of a wavelength at the lowest frequency in use. This may prove difficult for an antenna system using an elevated feed.

If the earth connection wire is significantly shorter than a quarter of a wavelength at the lowest frequency used and the earth connection is low loss (eg several earth rods used) then this becomes the preferred current route and thus minimises common mode currents on the coax outer indicating the importance of a good earth system.

Finally, in poor earth situations and to minimise common mode currents on the coax outer, separate counterpoise(s) for each band can be connected to the ground terminal of the Unun :-



Resonant or Multiband End Fed

Previously the choice in length of the end fed wire hasn't considered. There are 2 options which basically are as follows :-

Multiple of electrical half wavelengths - ie a **resonant antenna** giving operation on eg 40/20,15/10m

Non resonant allowing multiband operation eg 40/30/20/17/15/12/10m (with the aid of an ATU)

The advantage of a **resonant antenna system** is that the end impedance is very high- typically 2-5 kohms. This results in the need for a 49:1 or even 64:1 Unun. The very high end impedance also results in very low antenna and return currents and hence little common mode current and earth losses. The disadvantage is the absence of 30/17/ and 12m which may only be possible with a good ATU and accepting a relatively high SWR on the coax feed. A typical wire length for a 40/20/15/10m band antenna would be 20.5m (allowing for a slight velocity factor effect using coated wire).

Hence a resonant end fed antenna eg an End Fed Half Wave (EFHW) has a very low feed current resulting in minimal common mode currents and the possibility to operate without either a good earth or the need for a counterpoise. The downside is that the antenna can only operate on the harmonically related bands and that the Q of the system is high leading to a narrow bandwidth.

Using a **non resonant antenna** wire length eg 24m, leads to a lower end impedance - typically 500 ohms needing only a 9:1 Unun. However, the higher antenna and common mode currents together with higher earth losses makes the need for a good earth and counterpoise(s) as detailed earlier so important. The advantage is the ability to operate multiband and with a wider bandwidth. However, an ATU (possibly remote after the Isolator) will be needed.