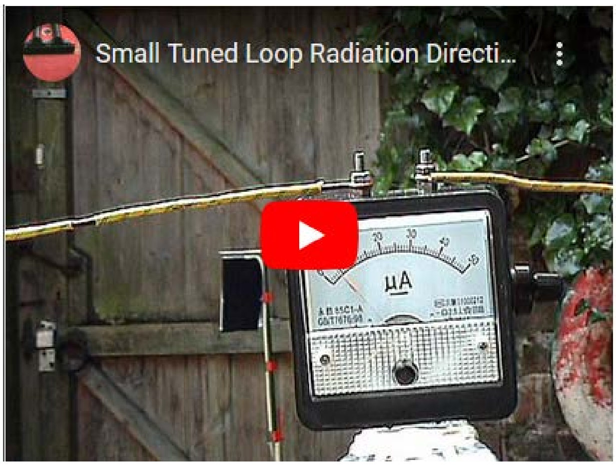
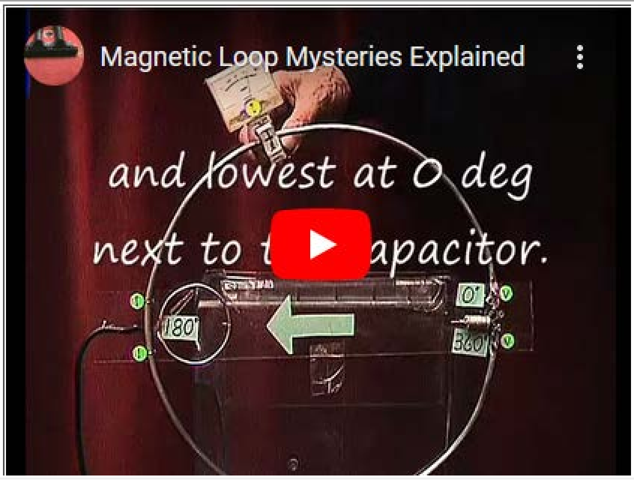
MAGNETIC LOOP ANTENNA



Small Tuned Loop Radiation Direction
Note: This is a long video of four clips, so fast forward when you feel you have seen enough of a particular clip. For the full description, check out the video on YouTube:
https://youtu.be/NdofH6R22Dg



Current & Voltage distribution and the radiation resistance or feed point impedance of the Small Tuned Loop.

https://youtu.be/SUYI81dkEMA

NEW THEORY

PATENT No GB 2285712

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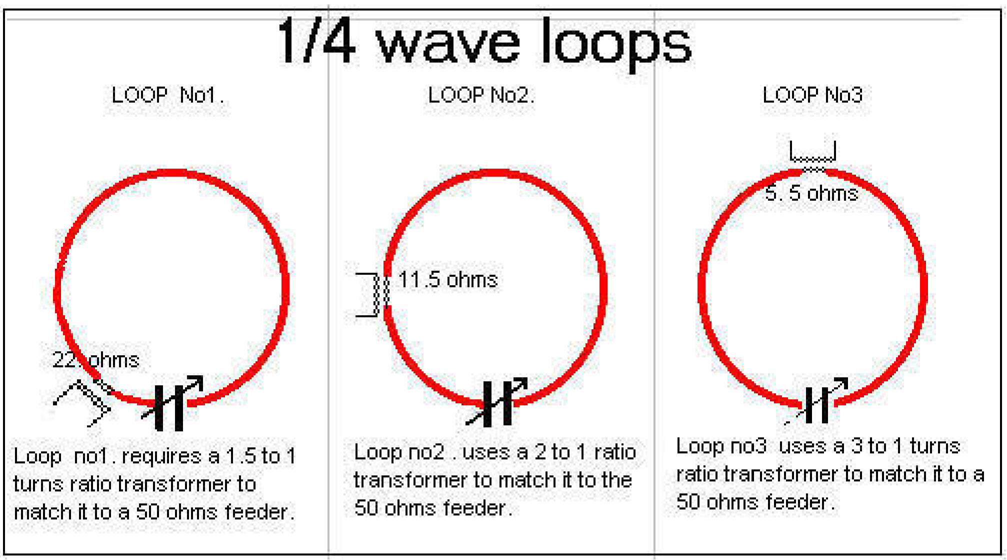
The loops shown are all coupled with a ferrite transformer which is used to match the 50 ohms coaxial feeder to the feed point resistance of the loop.

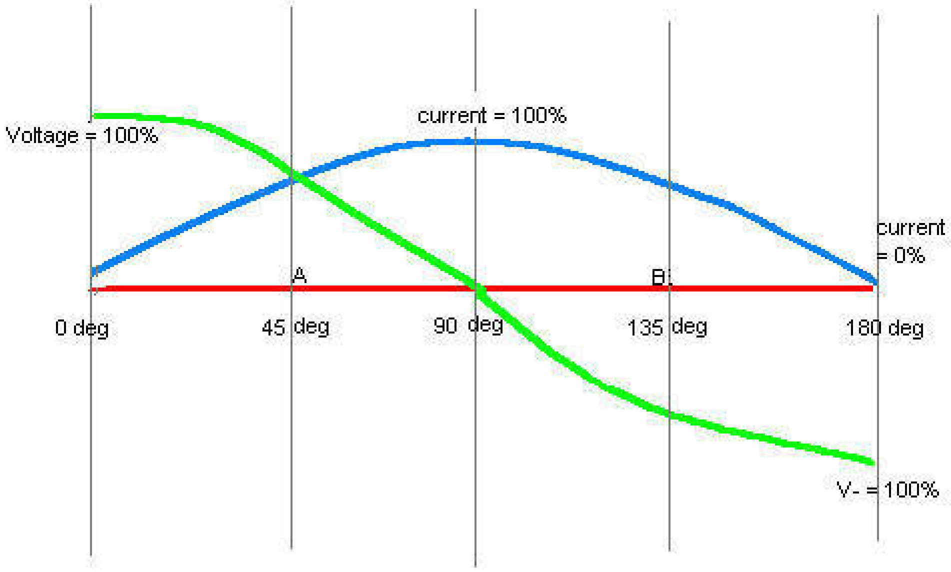
The loop is then resonated with a variable capacitor usually situated in the same container as the transformer to make a tuning and loading unit which can be remotely controlled.

The feed point impedance of the quarter wave wire loop at the point next to the capacitor is very close to 22 .22 ohms. This means that a 1.5 to 1 turns ratio transformer is required for matching the 50 ohms of the coaxial feeder to the loop at this point.

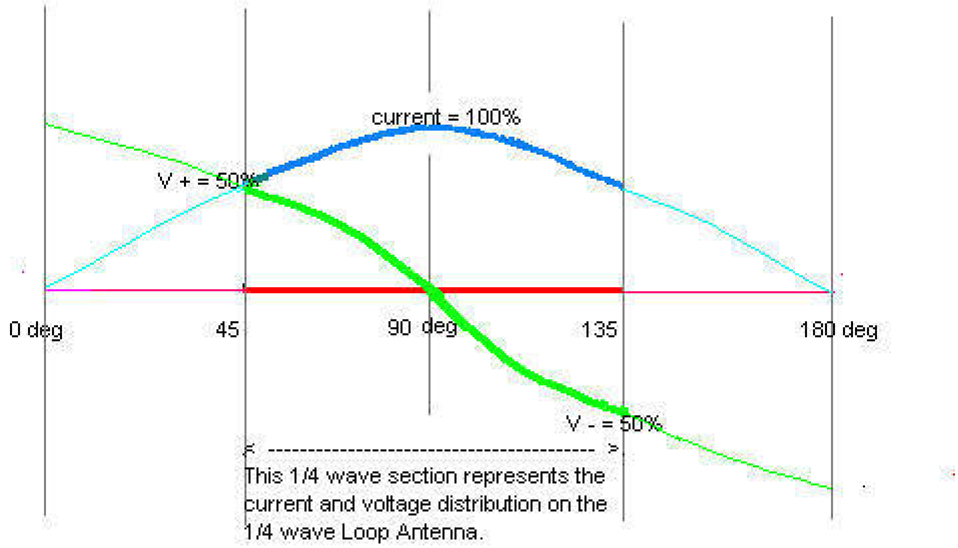
The picture below shows the input or feed point impedance at three points around the 1/4 wave loop.



The best way to explain how the small loop works is to examine the conventional current and voltage distribution on the1/2 wave dipole as shown below, it can be made to relate to the current and voltage nodes that exist on a 1/4 wave loop.

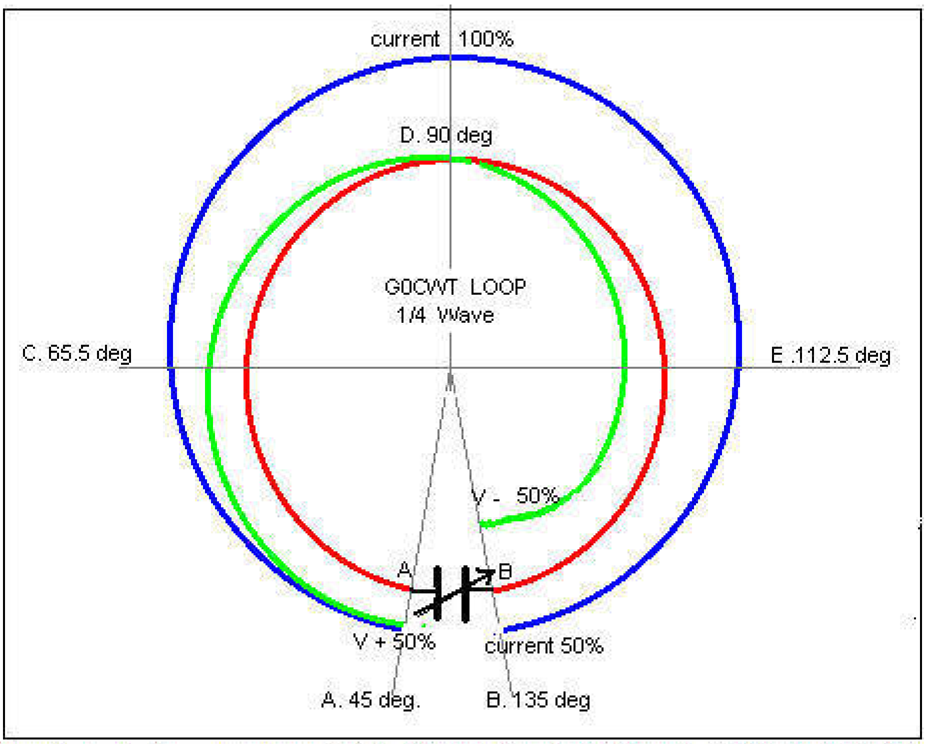


By taking the centre 1/4 wave section of the dipole as shown and bending it around to form a loop .



The capacitance that existed between the end sections were removed and will have to be replaced if the loop is to remain resonant and also for the current maximum to stay at the centre portion of the wire. This is achieved by placing a variable capacitor between the ends of the loop.

I have not included the matching transformer in the picture below because it can be placed at any point in the loop as long as it is designed for the impedance at that point.

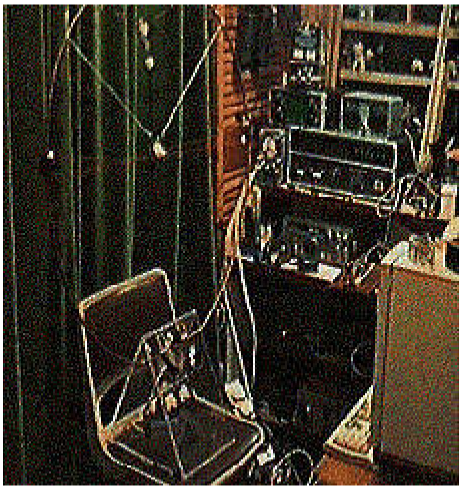


As can be seen in the drawing above I have marked out this example in electrical degrees this is because it makes it easier to relate to the original 1/2 wave dipole.

Theoretically the current never drops to zero and the voltage never rises to maximum but this is not unusual in antenna descriptions take for instance the 1/2 wave dipole drawing were the voltage drops to zero at maximum current if there were no voltage present then there would not be any current. Still we must remember that things happen pretty quickly in an antenna. Putting scope leads around a loop tends to upset things and give false impressions.

----- MEASURING THE CURRENT -----

Measuring the current around the loop to prove the above theory was achieved by cutting the loop at the three point indicated in the above drawings and inserting three thermocouple RF amp meters.



A similar test was devised to check that the current was equal at both sides of the loop. to do this I suspended a thermocouple meter from the top of the loop with cord and placed two split ferrite tubes one on each side of the loop.

On each of these ferrites I wound two turns of wire and then by taking the ends of the wires to the centre of the loop and connecting two of them together and the other two in series with the thermocouple meter then when power was applied to the loop the current from each coupling was added together and gave a reading.

When the connection to one of the couplings was reversed there was no reading in the meter proving that the current in the two split ferrite devices was equal and opposite.

Measuring the peak voltage across the capacitor has proved more difficult because any connections across the capacitor upset the tuning of the loop but all the tests that I have made seem to indicate that the voltages across the capacitor are not as high as is suggested in most articles on the subject.

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