

Tuned active antenna for 5 to 22 MHz

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During the past few years I have tried Frame Aerials, Ferrite rod aerials, I even tried the lightning arrestor at one point (not bad but difficult to resonate and a bit lethal in a thunderstorm) and active whip aerials.

A one metre whip in free space will develop a fair signal voltage on HF but there is next to no current ie the impedance is high. A means of matching to 50 ohms is required. This can be accomplished by transformer matching but results will not be as good as amplifying the signal at source. Tuning the whip to resonance is also desirable since any non linearities in the amplifier stage will tend to cause cross modulation. If the whip is resonant then it will respond best to the wanted (and often weak) amateur station and tend to reject the more powerful commercial traffic on adjacent frequencies. If the system is tuned then indifferent receivers with a poor image response will show remarkable improvement.

Circuit Description. The whip which is 1 Metre in length is connected to the hot end of a tuned circuit formed by L1 and VC1, VC2 (2 back to back varicap diodes). These are biased by a variable voltage (1 to 9 volts) fed remotely to the unit via R5, R7, R8 and C5, C6. This network maintains the Q of the tuned circuit and also filters out any hum and noise picked up en route. The tuned circuit feeds the gate of TR1, a Field effect transistor in common source mode which has a very high input impedance and a moderately low output impedance. The amplified RF is fed to the primary tap on T2, which along with VC3, VC4 and TC1 from a second tuned circuit. TC1 compensates for the input capacitance of the FET and also the self capacitance of the whip antenna. RF output is available from the secondary of T2. Bias for TR1 is achieved by virtue of R3. C3 and R4 partially bypass R3 at HF and the value of R3 may be increased if the unit has a tendency to self oscillate. 12 Volts is fed to the amplifier via R1, R2, C1 and C2, another line noise filter. And that's it. Obviously it needs a remote 12 volt PSU. Something along the lines of a 3 VA transformer and a 78L12 should be more than adequate as the unit only draws a few milliamps. The Varicap tuning voltage can also be derived from a potentiometer across the 12 Volt regulated line.

Alignment. Set TC1 to it's mid point. Set the varicap tuning voltage to 1.0 Volts and Adjust T1 and T2 for maximum received noise at 5.0 MHz. Reset the receiver to 12 MHz and adjust the varicap tuning voltage to give maximum noise (about 9 volts. Now trim TC1 for maximum noise. Reset to 5.0 MHz and 1.0 Volts, adjust T2 for maximum noise. Reset to 12 MHz and readjust Varicap voltage and TC1 for best signal. Repeat procedure until no further improvement can be achieved.

For the 12/22 MHz version replace 5/12 MHz with 12/22 MHz.

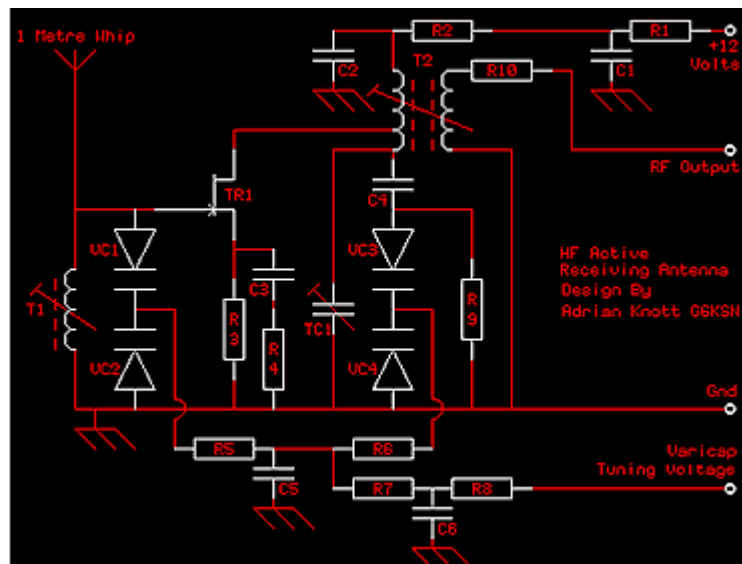
Components.

R1.....100 Ohm. C1.....22nF.
R2.....1K. C2.....22nF.
R3.....330 Ohm. C3.....22nF.
R4.....100 Ohm. C4.....22nF.
R5.....1M. C5.....22nF.
R6.....1M. C6.....22nF.
R7.....100K. VC1.....1/3 KV1236.
R8.....100K. VC2.....1/3 KV1236.
R9.....47K. VC3.....1/3 KV1236.
R10....47 Ohm. VC4....1/3 KV1236.
TR1....2N3819. Whip...Telescopic 1.0 metre.
T1.....KANK3334. TC1....22pF Trimmer.
T2.....KANK3334.

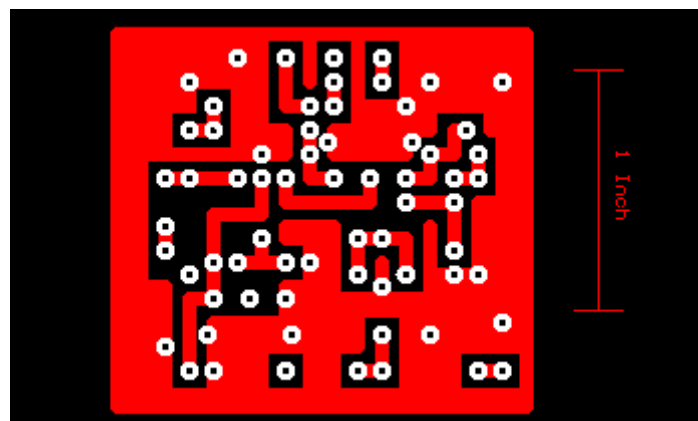
Notes.

(1) The KV1236 is a triple varicap diode. It is necessary to literally 'saw' the device into three (be careful) a couple of strokes with a junior hacksaw in the two notches should be sufficient. The device will then snap into three. The coil and the varicaps are available from Cirkit Distribution Ltd in Broxbourne (I have no connection with the aforementioned company).

(2) For 12/22 MHz operation replace T1/T2 with KANK3335.



Schematic diagram (click for larger picture)



PCB foil (click for larger picture)

