

Stack Match

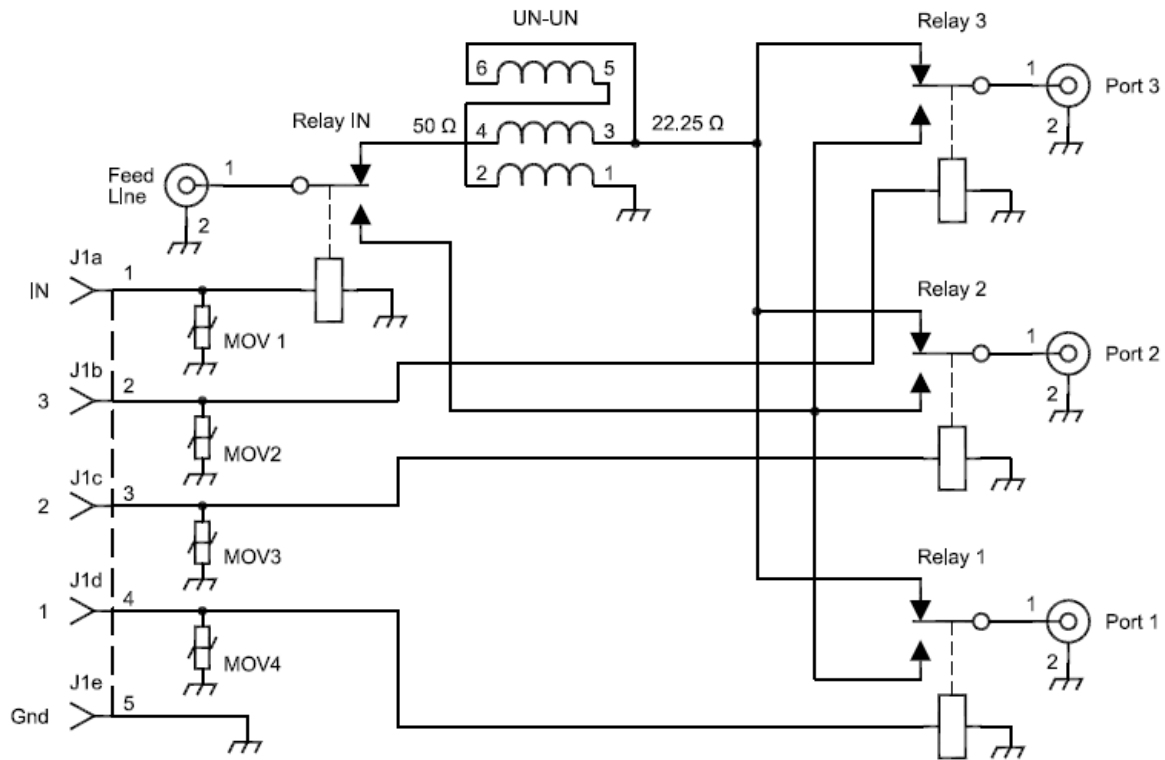


Photo.1 Circuit diagram

Stack Match matches the input impedance of 50Ω ; via broadband

Impedance matching transformer with output impedance 22.25Ω ; for 3 YAGI antennas in a vertical stack.

All possible combinations of antenna connection allowed, there may be 7th

If you use any single antenna with an impedance of 50Ω , it is directly connected to the input jack / without matching transformer /, in this situation relays are working Relay 1, Relay 2, Relay 3 and Relay Input Relay IN. Line wave impedance is equal to the antenna impedance and its is 50Ω ; SWR equal to 1.0:1 .

If we select one of three combinations of any two antennas / 1 - 2, 1 - 3, 2 - 3 / which are connected in parallel to the impedance is $50/2 = 25 \Omega$ In this case the antenna which is not currently in use has to be unplug from the other /relay to which it is hooked up must work /. SWR is $25 / 22.25 = 1.1:1$.

When using three antennas simultaneously / parallel / relays Relay 1; Relay 2; Relay 3; Relay IN are capable of NO such as in the diagram and their impedance is $50/3 = 16.67 \Omega$; and the SWR is $22.25 / 16.67 = 1.3:1$.

The transformer is wound on a toroidal core Amidon type FT240-61 permeability Ω ; $i = 125$ th Wiring consist of three double enamel wounded wires DNE 3 x 1.35 - 1.6 mm. Wiring wires must adhere closely to each other and as well as strictly adhere to the core.

Due to the fact that purposes for which the system is used Stack Match /

It is about power supplied from the transmitter / we used coaxial jack with a Teflon insulator UC-1 or N. Personally, I recommend the use of N-type connectors because they have only Teflon insulator and plug for them is produced for all types of antenna cables on the market, both for soldering /soft wires such as RG214U/dry assembly /rigid cables such as LDF-4-50A /. Relays that are used type RM85 RELPOL company, they have a pair of Switching contacts rated at 16A 250V AC performed airtight. For controlling Match Stack simple rotator switch is used with diode array / recommended when working with high powers / or processor controller , and 5 strand control cables with protection . After assembling the whole thing was secured with a double layer of electrically insulating varnish.

Laboratory tests

The study involved two copies of Stack Match

Measurements were performed with the antenna analyzer and capacitor value On output was selected in such manner to get the XS in the border-j10. For This purpose, the measuring system is made so that you could change R / Antennas impedance / and capacitor capacity on output to receive Xs in the border-j10.

At 50 Ω; everything is ok. Changing capacitor value at the output from 5 to 30pF); Xs can be nicely compensated. When match for the 14 MHz was perfect for 28MHz was worse /it applies to multiband antennas 14-21-28. /. As we know, Stack Match has impedance 22.25 Ω;. When you change antenna resistance to less than 50 ohm everything is perfect. However, if we have antennas with impedance higher than 50 ohms it is a problem. SWR after phasing is growing rapidly.

This problem occurs when antenna has impedance higher than 50 Ω.

1. External description

Stack Match was prepared very carefully.

Circuit boards are made of laminated two-sided epoxy-based glass, path layout and circuit board itself is very well made with maintaining impedance conductive path / 50 and 25 Ω;. For installation we have used relays for cross mounting/ adapted them to surface mounting/; mounting the antenna terminals UC-1 to lower cover was performed using rivets, printed circuit board is soldered to the center pin. The entire circuit plate is covered with a double layer of electrically insulating varnish which is a good protection against ruptures. We were doing rupture resistance test at $U_{max}=2kV$ - attempt was positive. The cover is made of chrome-nickel steel, corrosion-resistant which allows for mounting the switch directly to the mast without the use of additional protection

2. Measurement

The purpose of the measurements was to check the basic parameters / Rs, Xs, SWR / Stack Match for amateur bands / 7 - 28 MHz /. Measurements were Made using antenna analyzer on an artificial load. The measurements are summarized in Tables 1 and 2

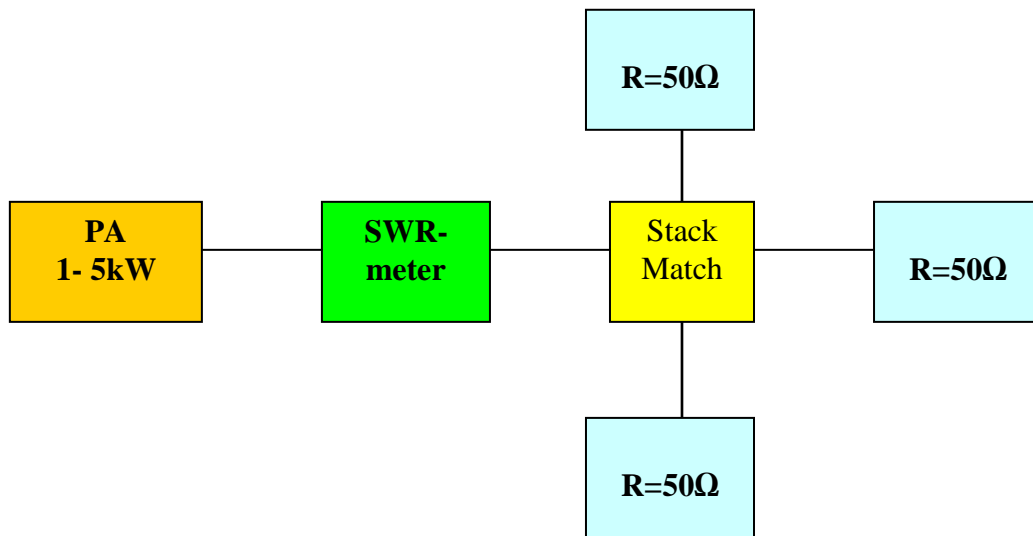
Table No. 1 Measuring the Stack Matcha No. 1

Band		1	2	3	1+2	1+3	2+3	1+2+3
7 MHz	R	45	44	45	50	49	49	38
	SWR	1:1.0	1:1.0	1:1.0	1:1.1	1:1.1	1:1.1	1:1.3
	X _s	0	0	0	6	7	6	5
14 MHz	R	40	40	41	47	45	45	45
	SWR	1:1.1	1:1.1	1:1.1	1:1.1	1:1.1	1:1.0	1:1.3
	X _s	0	0	0	4	2	0	15
18 MHz	R	39	40	40	41	39	39	49
	SWR	1:1.1	1:1.1	1:1.1	1:1.1	1:1.1	1:1.1	1:1.3
	X _s	0	0	0	0	0	0	13
21 MHz	R	38	39	39	40	38	39	54
	SWR	1:1.2	1:1.2	1:1.1	1:1.1	1:1.2	1:1.2	1:1.3
	X _s	0	0	0	0	0	0	13
24 MHz	R	38	39	39	40	39	39	56
	SWR	1:1.2	1:1.2	1:1.2	1:1.1	1:1.2	1:1.2	1:1.2
	X _s	0	0	0	0	0	0	12
28 MHz	R	38	39	38	46	45	46	56
	SWR	1:1.2	1:1.2	1:1.2	1:1.0	1:1.0	1:1.0	1:1.2
	X _s	4	3	0	0	0	0	11

Table No. 2 Measuring the Stack Matcha No. 2

Band		1	2	3	1+2	1+3	2+3	1+2+3
7 MHz	R	44	45	45	49	49	49	38
	SWR	1:1.0	1:1.0	1:1.0	1:1.1	1:1.1	1:1.1	1:1.3
	X _s	0	0	0	6	6	7	5
14 MHz	R	41	41	41	42	41	40	43
	SWR	1:1.1	1:1.1	1:1.1	1:1.1	1:1.1	1:1.2	1:1.3
	X _s	0	0	0	0	0	0	11
18 MHz	R	39	39	40	40	38	37	48
	SWR	1:1.1	1:1.1	1:1.1	1:1.1	1:1.1	1:1.2	1:1.3
	X _s	0	0	0	0	0	0	13
21 MHz	R	39	38	39	39	38	37	51
	SWR	1:1.2	1:1.2	1:1.1	1:1.1	1:1.2	1:1.2	1:1.3
	X _s	0	0	0	0	0	0	13
24 MHz	R	39	38	39	39	38	37	54
	SWR	1:1.2	1:1.2	1:1.2	1:1.2	1:1.2	1:1.2	1:1.2
	X _s	0	0	0	0	0	0	12
28 MHz	R	40	39	39	40	40	39	57
	SWR	1:1.2	1:1.2	1:1.2	1:1.2	1:1.2	1:1.3	1:1.2
	X _s	5	4	0	0	5	7	11

Next, we have taken "power" measurements in the circuit shown in the following photo



The measured values of SWR did not exceed 1:1.2, core temperature increase did not exceed 10 ° C. / We tested every range for about 10 minutes./

3. Summary

As a result of the tests we found out that this circuit is useful in Amateur use due to reproducible parameters.



Photo.2 Prepared Stack Match 2 without top cover / SP8CUW & SP8CUR /



Photo.3 2 x 28MHz antennas on the station SP8CUW & SP8CUR powered by Stack Match

Stack Match was made and practically tested in competition SN0HQ 2012 on SP3GEM stations and also SP8BRQ SP8CUW & SP8CUR.

First version was tested by Andrew SP8BRQ and he made some comments. Modifications were included. After competition IARU HF 2012, CQ WW / SSB/-2012 and CQWW/RTTY/-2012 users did not have any objections ,everything worked fine.

I would like to thank: Jurek - SP3GEM, Andrew - SP8BRQ, Luke-SP8CUR for their assistance and valuable comments on the design and testing antennas and Stack Matcha.