

***WSPRLITE* Low Pass Filter**

The **WSPRlite Low Pass Filter** allows you to explore the full potential of your WSPRlite by providing filtering for 160, 80 and 40 metres.

The **WSPRlite Low Pass Filter** is as an easy-to-make kit. It can either be used unboxed or mounted in your own enclosure.

Building the **WSPRlite Low Pass Filter** is easy and fun. It will take an evening to build and is suitable for a beginner.



Revision History

16 December 2016	First issued Rev A.
17 January 2016	Rev B. Minor changes for V1.1 compact PCB.
19 April 2017	Revised toroid winding details
11 May 2017	Added warning about making tail
6 June 2017	Added a note about winding toroids

WSPRlite Low Pass Filter Packing List

It's a good idea to check that you have all the parts before you get started:

Item	Number
PCB	1
SMA socket	1
SMA plug tail	1
Jumper (on headers)	2
Headers 2 x 3	2
Toroids T50-6 yellow	6
Toroid T50-2 red	3
Capacitor 470pF - one black line	2
Capacitor 820pF - two black lines	4
Capacitor 1200pF - two blue lines	2
Capacitor 1500pF - one blue line	6
En Cu wire	4.5 m
Cable tie	1

If anything is missing, just get in touch for help.

Richard@sotabeams.co.uk

Errata

None

WSPRLITE LOW PASS FILTER Instructions

The WSPRLITE LOW PASS FILTER kit is easy to make. It will be a great addition to your WSPRlite, giving you access to three additional bands.

Step by step instructions together with lots of photographs will make it easy to build your WSPRLITE LOW PASS FILTER. It will take around 2 hours work.

Spotted a mistake or need help?

Please let me know!

Email Richard@sotabeams.co.uk, telephone +44 (0) 7976 688359

Step by step instructions

1. Inductors

The inductors are the things that take the most effort so start with getting them wound.

Genesis Radio provides a helpful tutorial on winding toroids (and some nice kits) at:

http://www.genesisradio.com.au/help/toroid_winding.html

Notes:

- We have provided the wire lengths listed for each of the inductors below. Cut the wire to these lengths. This will allow for the appropriate number of turns along with approximately 4cm of wire at the start and finish of the windings.
- The turns are counted INSIDE the toroid. Each time the wire passes through the inside is one turn. In our case, the windings will mostly fill the toroids.
- Toroids can be wound clockwise or anticlockwise. In most kits this actually matters, however on our PCB we have put two holes on each side of the toroid so it doesn't matter which way round you wind your toroid.

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Inductor	Core	Turns	Wire length (cm)	Inductance (uH)
L1	T50-6 YELLOW	18	40	1.4
L2	T50-6 YELLOW	20	40	1.6
L3	T50-6 YELLOW	18	40	1.4
L4	T50-6 YELLOW	24	50	2.5
L5	T50-6 YELLOW	25	50	2.7
L6	T50-6 YELLOW	24	50	2.5
L7	T50-2 RED	32	60	4.5
L8	T50-2 RED	34	60	5
L9	T50-2 RED	32	60	4.5

Once you have wound all the toroids (be careful not to mix them up), cut the wire ends to about 2 cm long and tin them.

Fireicer Cooper has a great video <https://www.youtube.com/watch?v=RMdISh4urII> that shows how to tin the ends of the wires of your toroids. You will need a hot soldering iron for this (we recommend 355 - 400 degrees C).

Next insert and solder all the toroids using whichever of the four holes that seem best.

Now is a good time to do a test to make sure that they are soldered correctly. Use a continuity meter to check that there is continuity. We will be using the unoccupied capacitor pads as test points.

Probe points	Inductor tested	Tick if continuity
Top of C1 to top of C3	L1	
Top of C3 to top of C5	L2	
Top of C5 to top of C7	L3	
Top of C1 to top of C8	L1+L2+L3	
Top of C9 to top of C11	L4	
Top of C11 to top of C13	L5	
Top of C13 to top of C15	L6	
Top of C9 to top of C15	L4+L5+L6	
Top of C17 to top of C19	L7	
Top of C19 to top of C21	L8	
Top of C21 to top of C23	L9	
Top of C17 to top of C23	L7+L8+L9	

If you don't get continuity the problem is almost certainly that you have not removed the enamel properly from the wire on the toroid.

2. Capacitors

These are the little blue things. We soon realised that it was virtually impossible to read the writing on them without a magnifying glass so we have marked the cardboard carrier to make your life easier. Occasionally we supply them in marked bags.

Capacitor value	Card Marking	Board Locations
470pF "471"	One black line	C2, C7
820pF "821"	Two black lines	C4, C6, C10, C15
1500pF "152"	One blue line	C12, C14, C18, C23, C20, C22
1200pF "122"	Two blue lines	C19, C21
Not Used		C1, C3, C5, C8, C11, C13, C9, C16, C17, C24

3. Connectors

J1 and J2 are 3 x 2 header pins. We have supplied them with the jumpers installed so that the jumpers don't get lost. Remove the jumpers are put them carefully to one side.

PCB V1.0 only: The installation of the header pins is slightly unusual. Install the header pins from the underside of the board with the long pins poking through. Push them through so that the black plastic pin carrier sits flush against the bottom of the PCB. Solder all six pins on the top surface of the board. Finally trim the short pins on the underside of the board flush against the plastic carrier.

PCB V1.1 install the header pins on the top surface of the board so that the longer pins face upwards (shorter pins through the board).

The co-ax tail is the next item to install. Remove the black sheath 15 mm from the open end. Tease off the braid and twist. Remove 5 mm from the centre insulation.

NOTE: do not pull the centre insulation when stripping it. If you do so, you will pull the centre pin of the SMA plug out. Install as shown in the photograph below. Use the cable tie as strain relief as shown.

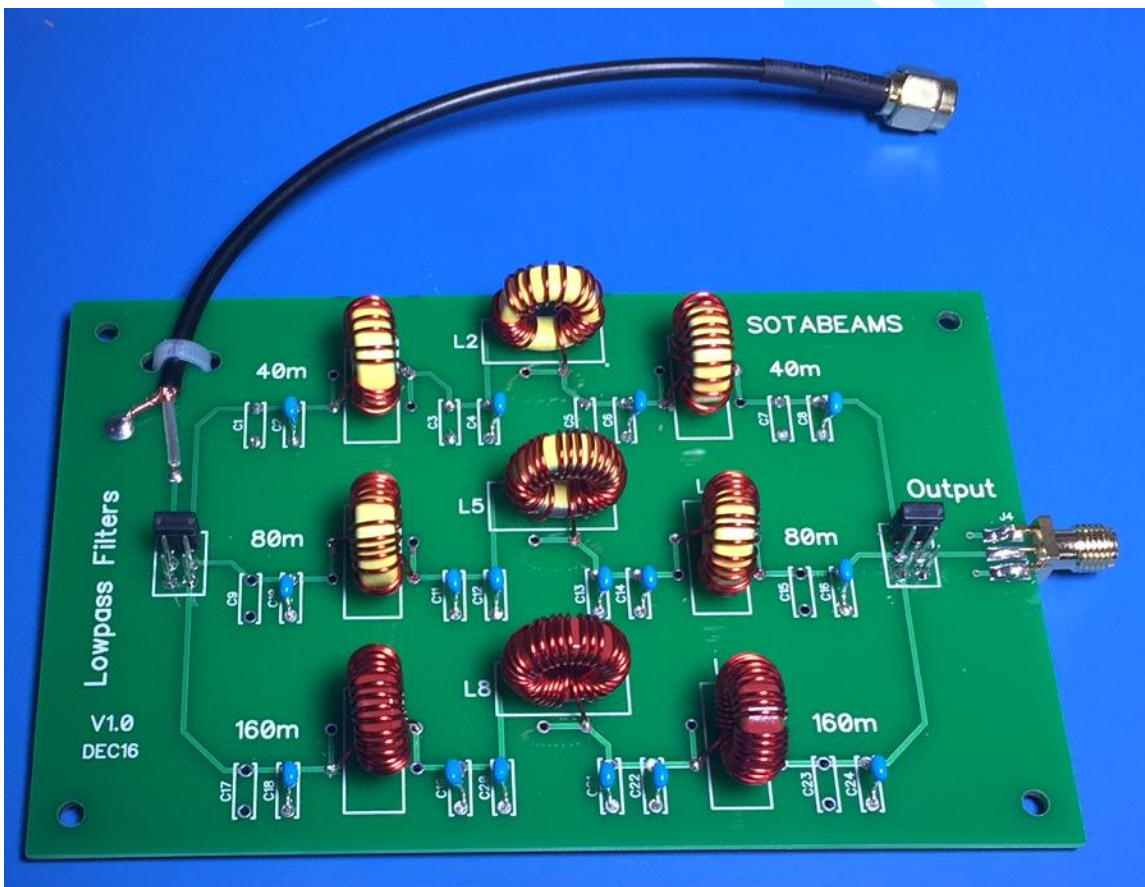
Solder on J4 the SMA socket. This must be the correct way up (obvious) and should be soldered on both sides of the PCB.

Install the jumpers for your band of choice and you are good to go!

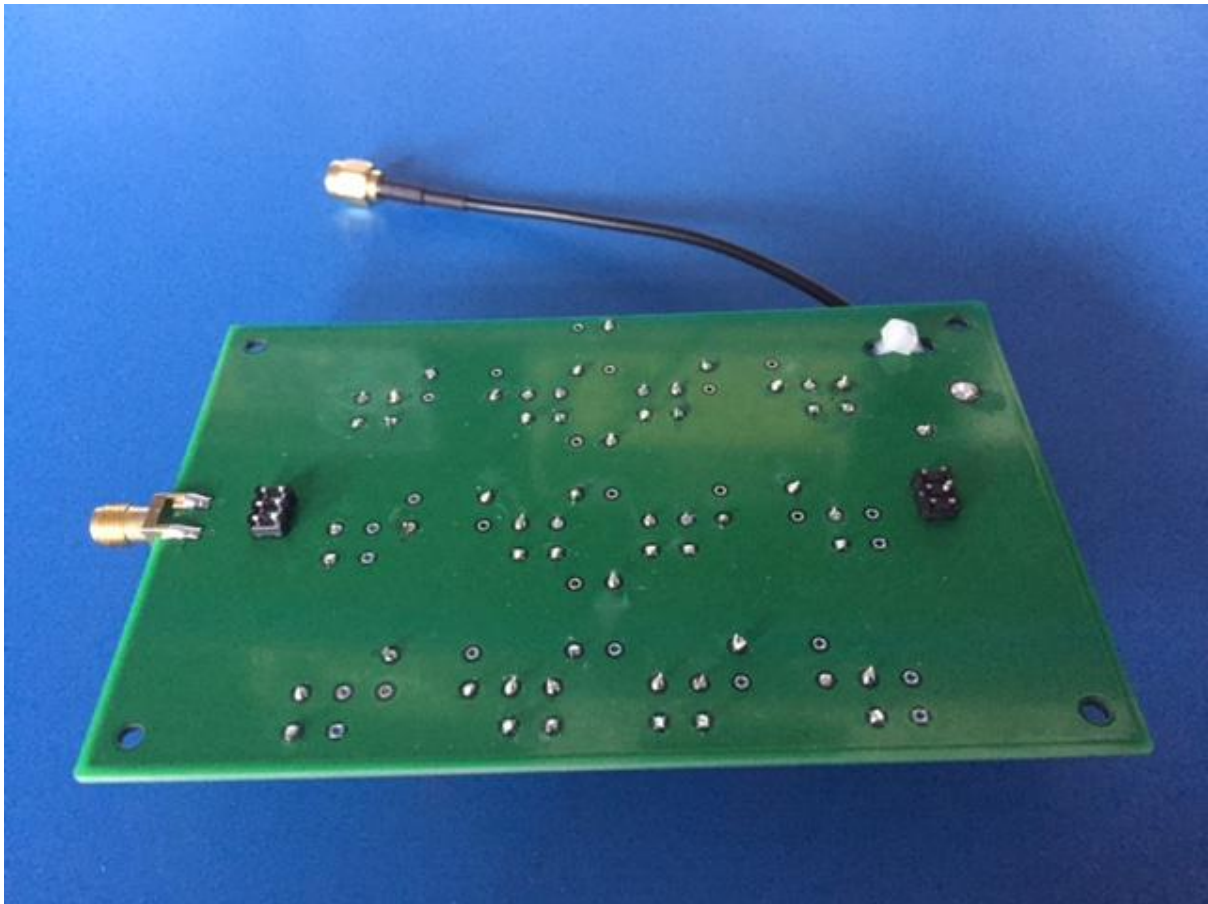
PCB V1.1 only: mark the bands in the boxes on the PCB with a permanent marker.

- 40m in the boxes adjacent to L1 and L3,
- 80m in the boxes adjacent to L4 and L6 and finally
- 160m in the boxes adjacent to L7 and L9.

The coax tail connects to your WSPRlite and the antenna connects to the board-mounted SMA socket.



Note: this is our prototype as the capacitors are in different positions to those described in the instructions. PCB V1.1 is more compact.



PCB1.0 illustrated, PCB 1.1 is more compact.

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