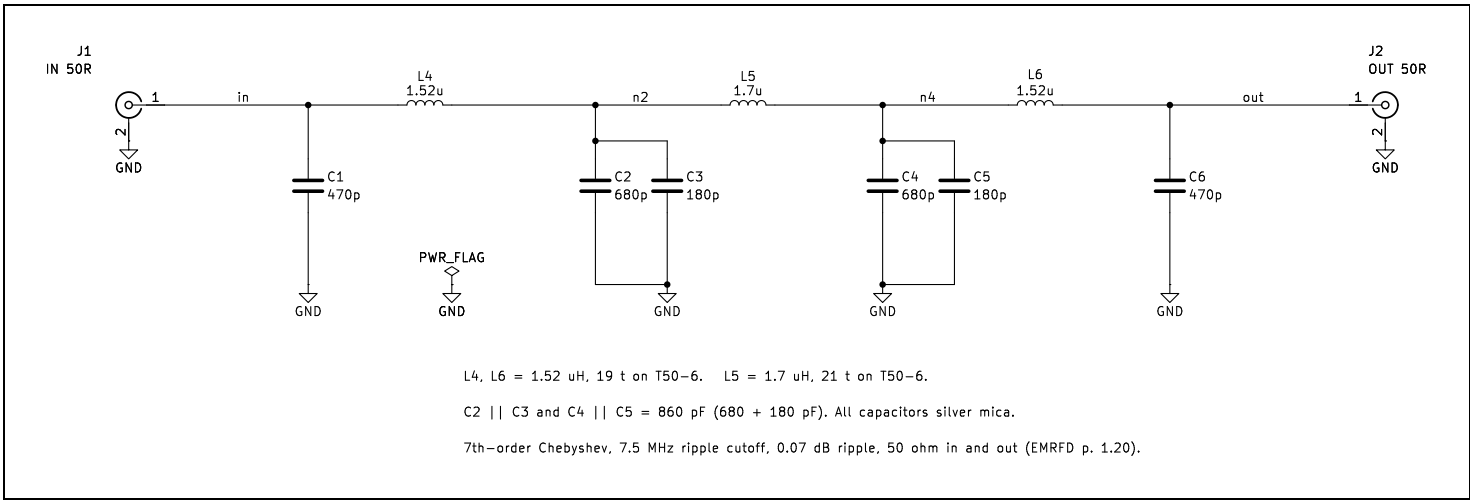
40 m 7th-order Chebyshev Low-Pass Filter (7.5 MHz)

40m · 50 Ω · sim-pass
EMRFD p. 1.20

It cleans up a 40 m QRP transmitter's output. It passes 7.0–7.3 MHz with almost no loss and cuts the harmonics (14, 21, 28 MHz) by 50 to 100 dB.



BUILD LIST: TICK AS YOU GO

	Ref	Value	Qty	Part / notes
☐	C1, C6	470 pF	2	470 pF silver mica
☐	C2, C4	680 pF	2	680 pF + 180 pF silver mica in parallel (860 pF)
☐	C3, C5	180 pF	2	680 pF + 180 pF silver mica in parallel (860 pF)
☐	J1	IN 50 Ω	1	50 ohm coax jack
☐	J2	OUT 50 Ω	1	50 ohm coax jack
☐	L4, L6	1.52 µH	2	T50-6 iron-powder toroid; 19 t on T50-6
☐	L5	1.7 µH	1	T50-6 iron-powder toroid; 21 t on T50-6

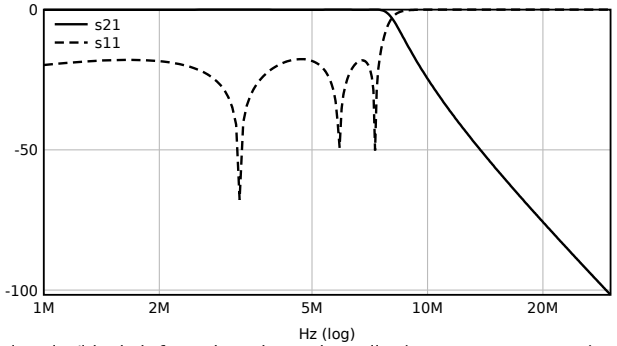
BUILD NOTES

- Silver mica capacitors; each 860 pF is a 680 pF and a 180 pF in parallel.
- L4 and L6: 19 turns on T50-6 (1.52 µH). L5: 21 turns on T50-6 (1.7 µH). Spread or squeeze the turns to tune.
- The book housed it in a small aluminum box with coax connectors and found the shielding important.

Test: Sweep with a 50 Ω generator and detector, or a NanoVNA, from 1 to 30 MHz. Expect under 0.25 dB loss at 7 MHz and a return loss better than about 17 dB across 40 m.

CHECK AGAINST

Check	Expect	Basis
Cutoff fc	7.5 MHz · sim 7.52 MHz ± 0.1	book
Passband ripple	0.07 dB · sim 0.0756 dB ± 0.03	book
Insertion loss at 7 MHz	0.11 dB · sim 0.236 dB ± 0.05	book
−3 dB point	8.08 MHz ± 0.05	simulated
Return loss	17.6 dB ± 1	simulated
Stopband attenuation at 14 MHz	51.4 dB ± 1.5	simulated
Stopband attenuation at 21 MHz	78.9 dB ± 2	simulated



ngspice sim/ideal.cir from the schematic netlist (not a measurement)

Full page:
https://qrpedia.com/circuits/filters/lpf-7th-chebyshev-7mhz/
Interactive sim, KiCad project, netlist and errata.

SPECIFICATIONS (FULL)

Spec	Value	Basis	Reference
Cutoff fc	7.5 MHz	book	EMRFD p. 1.20 (ripple cutoff)
Passband ripple	0.07 dB	book	EMRFD p. 1.20
Insertion loss at 7 MHz	0.11 dB	book	EMRFD p. 1.20 (authors' measurement)
Cutoff fc	7.52 MHz ± 0.1	simulated	sim/ideal.cir (ripple edge)
−3 dB point	8.08 MHz ± 0.05	simulated	sim/ideal.cir
Passband ripple	0.0756 dB ± 0.03	simulated	sim/ideal.cir, 1-7.5 MHz
Insertion loss at 7 MHz	0.236 dB ± 0.05	simulated	sim/q200.cir, inductor Q=200 at 7 MHz
Return loss	17.6 dB ± 1	simulated	worst case 1-7.3 MHz
Stopband attenuation at 14 MHz	51.4 dB ± 1.5	simulated	2nd harmonic
Stopband attenuation at 21 MHz	78.9 dB ± 2	simulated	3rd harmonic

Simulated values are this build's ngspice results (± the build's check tolerance); book and measured values are as published.

HOW IT WORKS

It's a 7-element Chebyshev low-pass: four shunt capacitors and three series toroid inductors, designed for 50 Ω at both ends. The odd 0.07 dB ripple was chosen so standard capacitor values fit (EMRFD p. 1.20). The LC filter designer gives 467 pF / 1.521 µH / 859 pF / 1.696 µH for the same specification, within 1% of the book.

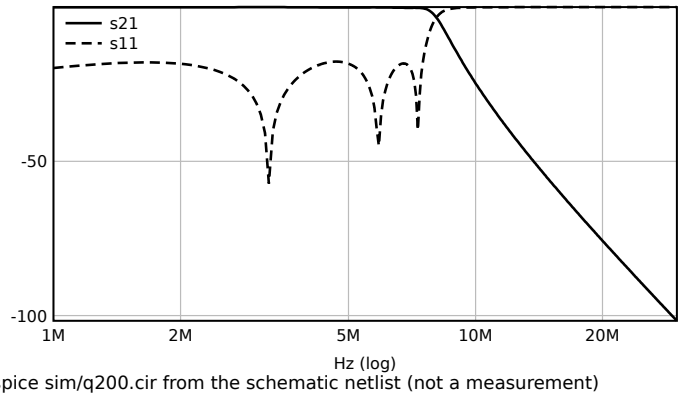
WHERE IT COMES FROM

The low-pass filter for the beginner's experimental transmitter in Experimental Methods in RF Design, Chapter 1.

SOURCES

- EMRFD Fig 1.37, p. 1.20

MORE SIMULATION



ngspice sim/q200.cir from the schematic netlist (not a measurement)