

Lothar of the Hill Peoples expanded and revised cabling guide for SDR freaks, propeller heads, balloon trackers and L band ACARS fans

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REVISION 1

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Lothar, What is this? -What cable to use is a common question that is asked so often I decided to come up with a semi-stock answers. This table shows the typical cable lengths you should never exceed for RX / RO only use at various frequencies, generally at the -3dB loss point, but shorter cables are better of course. Think of it as a max length assuming you have and SDR with an amplified RF front end that is before any SAW filter for a narrow signal lobe 1090 MHz. Take 2/3rds of the footages shown for 2 dB loss for example at any frequency. As we used to say in my commercial days "What's 2 dB among friends?"

More: When sizing cable consider your cable flat losses and filter flat loss for 1090 ADS-B as an example. Flat loss is useable for many single or small span frequency uses but does not apply to wideband intermediate frequencies (IF) signals like C or Ku band LNB/LNC IF frequencies. The span of these are 950 to 1450 MHz or 950 to 2150 MHz typical of C-Band ACARS is too wide for flat loss only calculations and this require more detailed calculations and equalization for long cable runs. For ADS-B which is a narrow channel without slope loss, the lower the filter loss in front of the LNA, the longer you can run a cable before running afoul of the 3 dB (or whatever cable acceptable loss you set) rule. Example: the FA "Blue Tube" filter has a loss of -2.5 dB a cavity filter can have a loss of 0.5 dB. This means you can have a 2 dB longer cable with equal performance, or improve performance with the same cable length by changing to a cavity filter.

Why? - There are often cost trade offs in setting up RX only SDR systems. A lower loss cable may eliminate the need for LNAs, bias tees, adapters and jumper cables, resulting in lower overall system noise figure, lower costs and obviously better reliability by having fewer connections and less active equipment. Local cable availability is really important as well. These are example cables that I can get in the USA without excessive shipping costs, or can scrap out from other sources. For those of you in the EU, there are local clones of LMR cable that may be worth a look but compare them to LMR first. One French cable maker uses copper clad aluminum (CCA) center conductors and Lothar does not approve of that because of the difficulty of stripping CCA cable without damaging the Cu cladding.

What Else? - Don't overlook 75 ohm cables. They are readily available and usually much less expensive because of the volumes they are made in for DBS and CATV use compared to RF cables made for transmit applications like LMR. Use only satellite rated RG-6 or 11 that has a solid copper center conductor, NOT Cu clad steel or aluminum. Use Tri or Quad shielded RG cables. The 75 to 50 Ohm mismatch loss is minor and the adapters to go from F to SMA are 30-50 cents each if fairly small quantities. Worst case loss is 0.14 dB for mismatch and under .2 dB for a pair of F adapters.

What cables are missing here? - RG-58 and 59 cables because they are shit for almost all uses above 30 MHz, except as very short jumper cables. Also, I'm not including any cables that are not commonly available in the USA, or vendors who are reselling private labeled cables made by the original manufacturers. The Chinese maker HDG Telecom (KMR-XXX cable) are willing to private brand cables under various names for example. I have no doubt that HDG Telecom is selling cables that did not pass QC to third parties with MookerREEF or other branding. To be included here, all data has to be traceable to a real cable manufacturer that publishes data.

Any other factors to consider? - Of course! Strictly speaking, under USA National Electric Code (NEC), PE (polyethylene) jacketed cables may not be used in occupied buildings in general without rated conduit for more than 10' from a exterior entrance point. The shit burns like a candle! That is why you will never see a CM or CMR rated PE jacketed cable. PE is preferred in outdoor use for superior moisture and UV resistance, but all of the CM and CMR rated cables are PVC. If you have to make a long run through your attic then choose a PVC cable.

| Use / Frequency >>> | | Air band 128 MHz | AIS 162 MHz | Sondes 403 MHz | ADS-B 1090 MHz | L-Band 1550 MHz | Notes |
|------------------------------|-----------------|------------------|------------------|------------------|------------------|------------------|---------|
| Maker / Country | Type | 3dB loss footage | 3dB loss footage | 3dB loss footage | 3dB loss footage | 3dB loss footage | |
| Times Microwave Systems (US) | LMR-240 | 98 | 85 | 53 | 32 | 26 | |
| | LMR-400 | 190 | 170 | 105 | 62 | 50 | |
| | LMR-600 | 300 | 270 | 165 | 96 | 78 | |
| HDG Telecom (CN) | KMR-240 | 94 | 82 | 50 | 28 | 23 | 1,2,4 |
| | KMR-400 | 186 | 166 | 100 | 92 | 46 | 1,2,4 |
| | KMR-500 | 243 | 216 | 145 | 94 | 52 | 1,2,4 |
| | KMR-600 | 294 | 266 | 160 | 96 | 74 | 1,2,4 |
| Belden (US) | (RG-8) 9913 | 210 | 180 | 115 | 65 | NA | 1 |
| | (RG-8) 9914 | 210 | 180 | 115 | 65 | NA | 1 |
| | (RG-6) 1694A | 135 | 112 | 78 | 44 | 38 | 1,3 |
| | (RG-6) 7916A | 125 | 124 | 82 | 42 | 36 | 1,3 |
| | (RG-11) 7731A | 230 | 185 | 115 | 64 | 52 | 1,3 |
| | (RG-11) 9292 | 196 | 186 | 82 | NA | NA | 1,3 |
| CommScope | (500) P3 500JCA | 356 | 320 | 196 | 112 | 91 | 1,3,5,7 |

Notes

1 -Linear Interpolated from closest known manufacturer's published frequency data points.

2 - Includes corrections found from real tests. KMR is NOT equal to LMR.

3 - Includes 0.14 additional loss for 75 ohm mismatch.

4 - Metric data converted to Imperial.

5- Copper Clad Aluminum Center conductor that requires careful stripping, usually special tooling.

6 - Copper Clad Steel center conductor.

7- Only included because scrap lengths are available from my cable company, and maybe yours.