Antenna Designs For Band 1 45-70 MHz DX TV

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Introduction

This article is intended as an introduction to practical examples of designs for 45-70 MHz band 1 TV DX aerials. The designs range from a simple dipole, to a 5 element yagi. These designs can also be modified to cover the 88-108 MHz FM band.

DXers have the option of either using a 45-70 MHz or 45-220 MHz wide band band yagi or log-periodic aerial. It is not recommended that a combination wide band VHF/UHF aerial, be used for long distance TV reception. Seperate aerials for VHF and UHF will provide higher gain, thus better reception, compared to combined VHF/UHF aerials.

The most simple aerial for DX TV reception is the half wave dipole. This includes a single aluminium rod cut to the appropriate operating frequency. When the dipole is mounted vertically, reception of signals from all directions (omnidirectional) will be possible. This arrangement is ideal for the DXer who does not yet have an antenna rotator. It is preferred that the dipole should be mounted outdoors, with a height of at least 15-20 ft AGL. A half wave dipole mounted horizontally will receive horizontally polarised signals at maximum strength is broadside to the signal path.

Simple wideband 48-68 MHz band 1 dipole

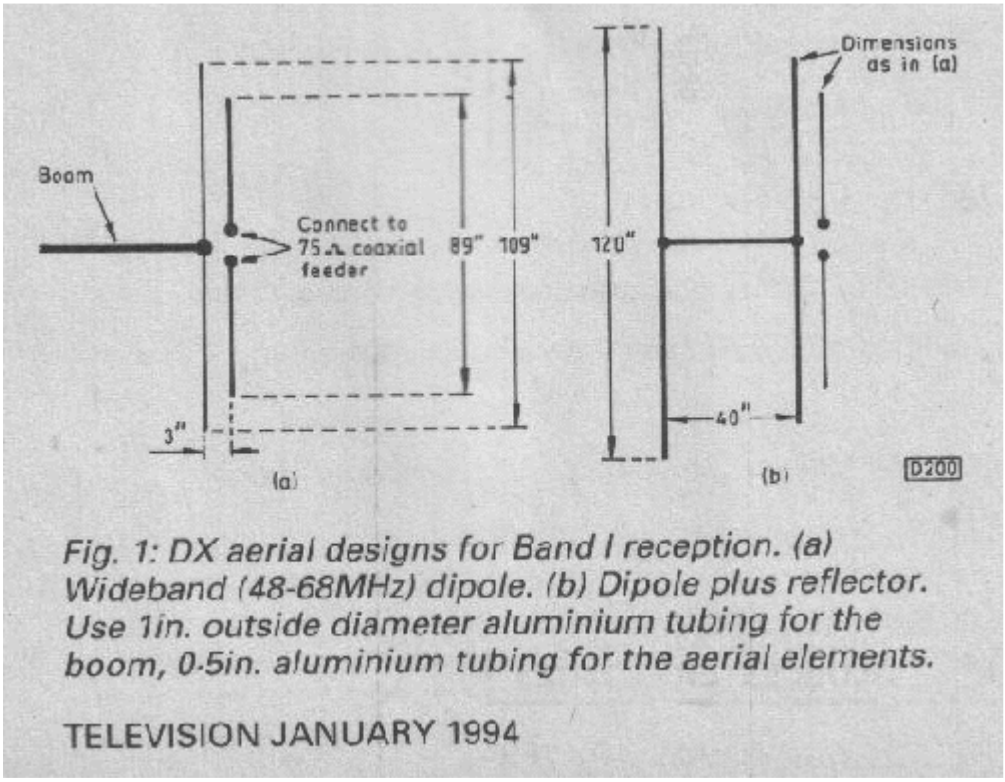

Fig. 1: DX aerial designs for Band I reception. (a) Wideband (48-68MHz) dipole. (b) Dipole plus reflector. Use 1in. outside diameter aluminium tubing for the boom, 0·5in. aluminium tubing for the aerial elements.

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To calculate the length of a half wave dipole at a given frequency, use the following simple formula: 468 divided by the frequency = half-wavelength in feet. (468/f (MHZ) = (answer in feet).

For DXers who are not using a aerial rotator, and require reception of 45-70 MHz band 1 DX TV, a dipole cut to approximately 55 MHz is recommended. Use the following formula: 468/55 = 8.5 ft. Obtain a plastic dipole insulator, and use two 4.25 ft lengths of aluminium tubing. For 88-108 MHz FM DX, a dipole cut to 100 MHz is recommended, use: 468/100 = 4.6 ft.

The half wave dipole is satisfactory when operated in a field of relatively high strength, but enhanced pain is required when signal strengths fall to a low value. An improvement in gain can be obtained by mounting another longer element a distance from the dipole (usually 1/4 to 1/2 wavelenth spacing). This element reflects signals back to the dipole thus increasing the signal strength. Further elements, called directors, shorter than the dipole, can be mounted in front of the dipole. By using a reflector, dipole, and directors, considerable gain is obtained. The sharpness of the main forward lobe will depend upon the number of elements used within the aerial system.

In all calculations relating to reflector, dipole, or director element lengths, the 468/f(MHZ) formula should be used.

The output connection from the dipole is usually via a balun, and this is connected to 75 ohm coaxial cable. If a single rod dipole is used, the output impedance will be approximately 75 ohms. If a folded dipole is used, the output impedance will be approximately 300 ohms. Balun transformers are used to match impedances. A 4:1 balun will convert a 300 ohm unbalanced folded dipole to balanced 75 ohm coaxial cable. A 1:1 balun will convert a 75 ohm unbalanced dipole to balanced 75 ohm coaxial cable. Balun transformers are available from most TV aerial installation companies.

For the purpose of long distance TV reception when a number of channels have to be covered efficiently, a wide band aerial should be used. The design of such an aerial follows a basic formula of tuning the various elements comprising the array to certain frequencies within the operating bandwidths. Usually the directors are tuned to the high frequency end, the dipole midway, and the reflector elements to the lower frequency end of the band.

Because of being designed for lower frequencies, the elements of a band 1 aerial will be much longer than a UHF aerial.

Crossed dipoles for omni-directional reception

If space is restricted, where antenna rotators can't be used, a crossed dipole aerial will provide multi-directional (omni-directional coverage). Some enthusiasts use a crossed-dipole system for detection of meteor scatter signals. Another application is for 360 degree coverage of sporadic-E signals.

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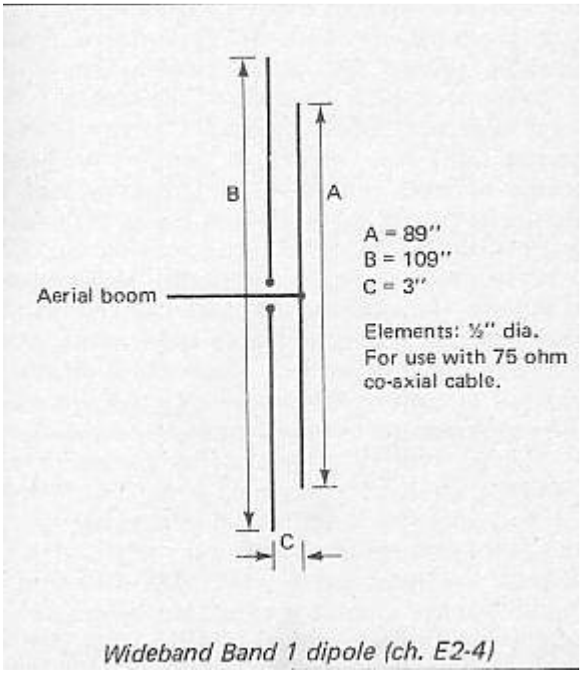
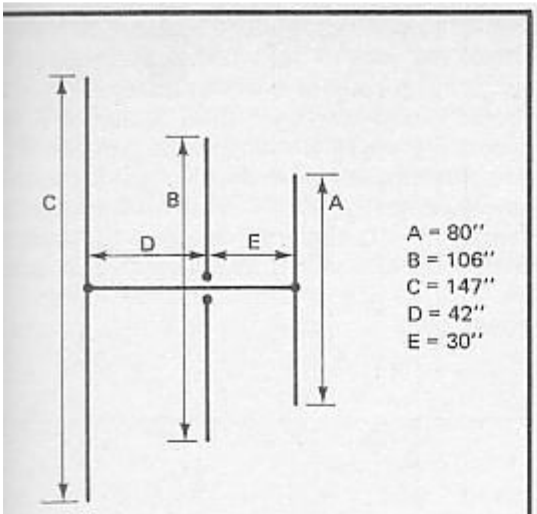
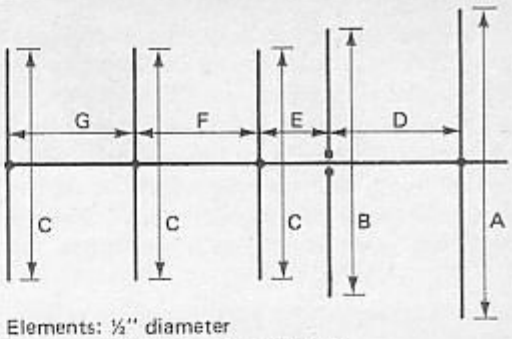


Wideband Band 1 dipole (ch. E2-4)



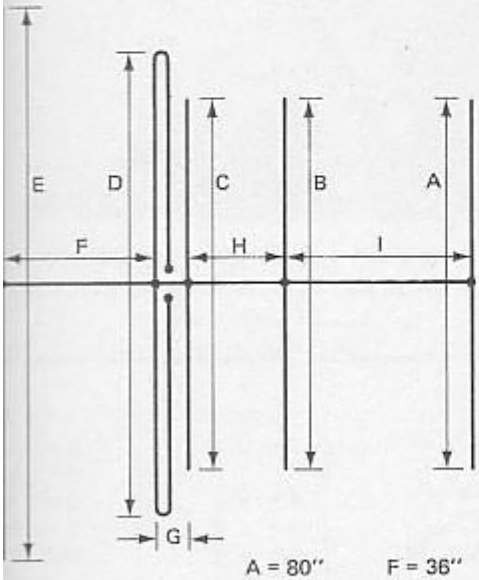
eband Band 1 array by Jaybeam (40-70MHz)



Elements: ½" diameter
For use with 75 ohm co-axial cable

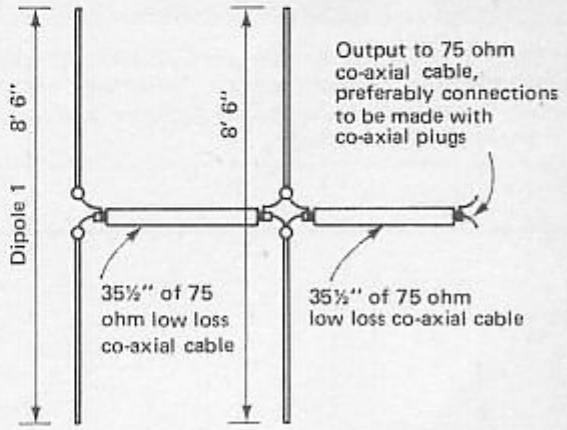
Dimension	Length in inches	
	Band 1 45—70MHz	Band 2 70—93MHz
A	121	80
B	99	68
C	80	60
D	40	34
E	24	18
F	40	32
G	42	33

Wideband aerial design

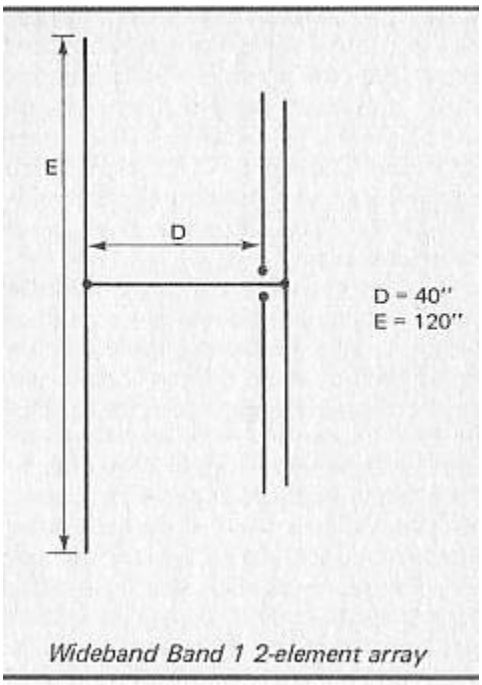


A = 80"
B = 80"
C = 80"
D = 100"
E = 120"
F = 36"
G = 3"
H = 21"
I = 40"

Wideband Band 1 array (47-70MHz)



Omni-directional aerial (Band 1)



Wideband Band 1 2-element array

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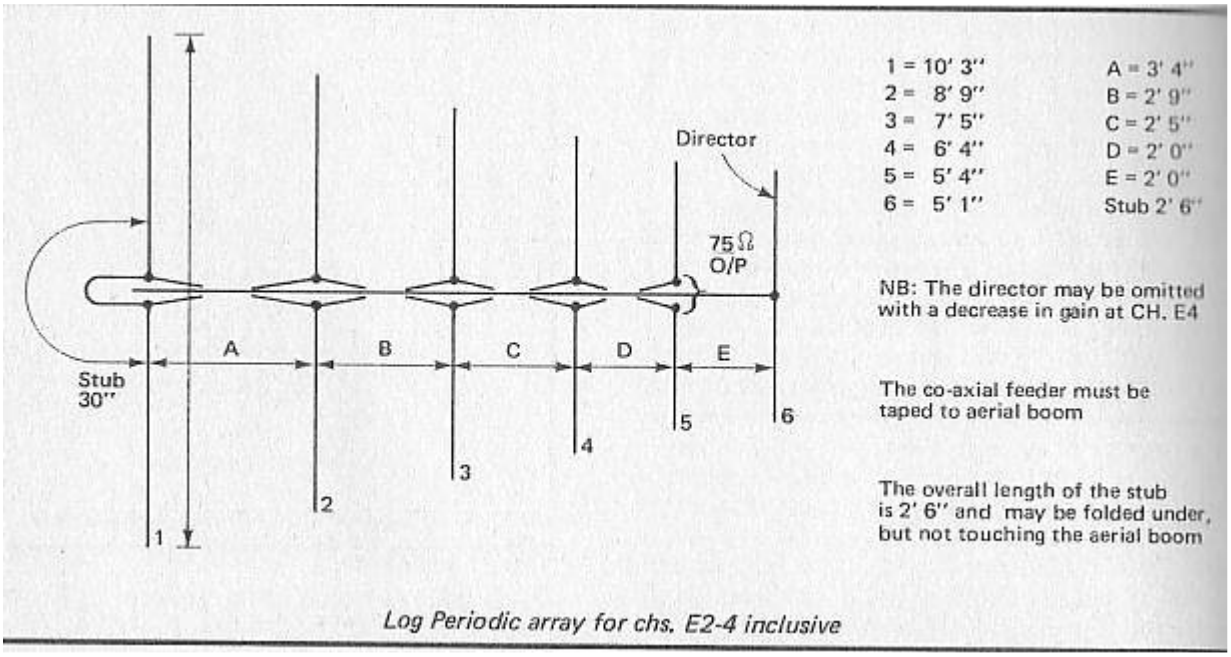

Log Periodic array for chs. E2-4 inclusive

References and acknowledgements

The material in this article was based on Roger Bunney's book *A TV DXers Hanbook*, published in 1986 by Bernard Babini BP176.

Wide band 1 DX TV aerials are available from HS Publications, 7 Epping Close, Derby, DE3 4HR, England. HS Publications catalogue PDF,