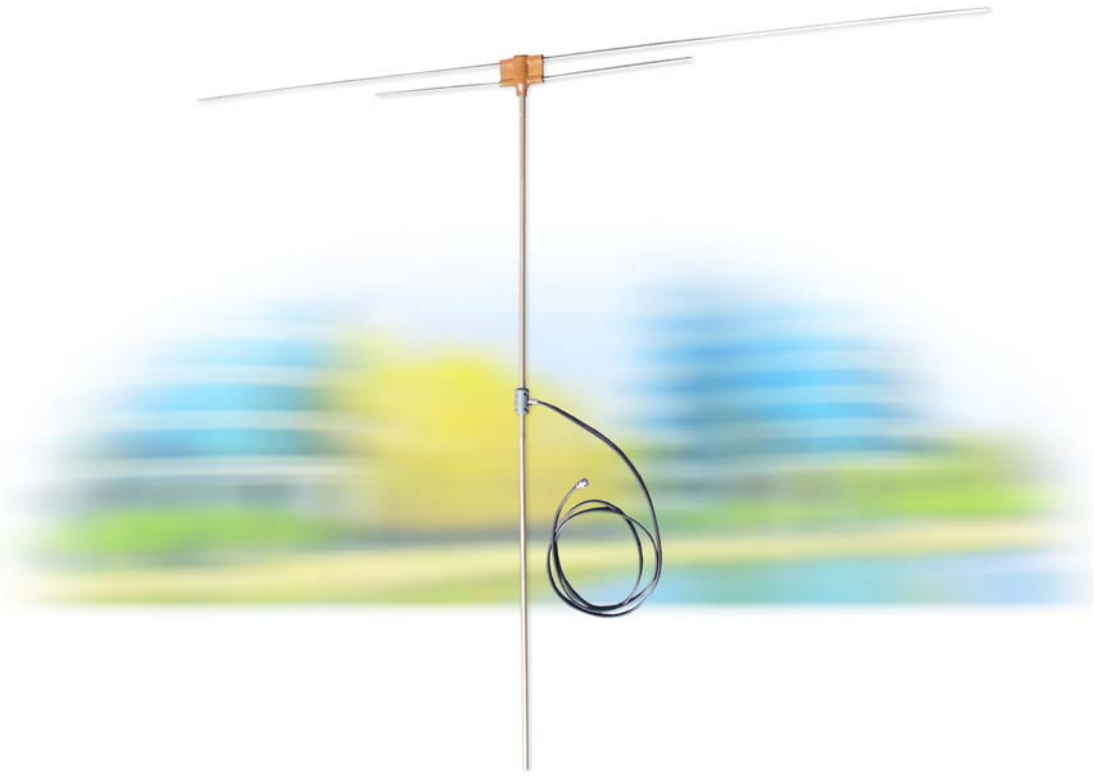
AM-030

Master Aerial



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PROMAX

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1. WHAT IS FIELD STRENGTH

Field strength is the parameter that tells us the magnitude with which an electromagnetic wave radiated by a radiating antenna or system reaches any point in space. Field strength is normally measured in voltage/length units, for example:

- Volts/meter
- dBµV/meter
- dBmV/meter

If we measure the field strength radiated by a transmitting antenna while we move around it, always keeping the same distance from it, and we plot the values obtained on a polar chart (field strength as a function of our angular position with respect to the antenna), we get the radiation pattern of the antenna. For example, Figure 1 is the radiation pattern of the reference antenna PROMAX AM-030.

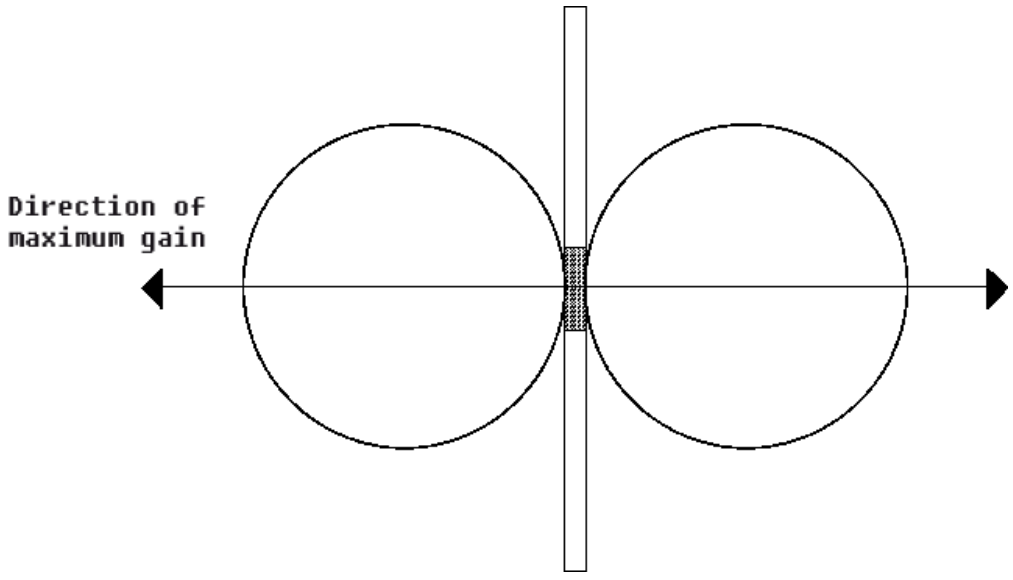

Figure 1. The radiation pattern of the **AM-030**

2. HOW FIELD STRENGTH IS MEASURED

To measure the field strength radiated by a radiating system, all you need is a measurement reference antenna, like the PROMAX AMC/1, a signal level meter or a spectrum analyzer, and the correction factors of the antenna used.

The ratio of the field strength, which is the parameter we want to measure, and the voltage in the reference antenna terminals is called the **antenna factor**. This factor is normally designated by the letter **K**, and is characteristic of every antenna. Therefore, the user only has to connect the reference antenna to a signal level meter or a spectrum analyzer, measure the level received and then apply the correction factor **K**, taking into account the attenuation or gain of the instruments used to take the measurement. The AM-030 antenna impedance is 75 ohms.

To connect the AM-030 to the signal level meter or the spectrum analyzer, proceed as shown in Figure 2.

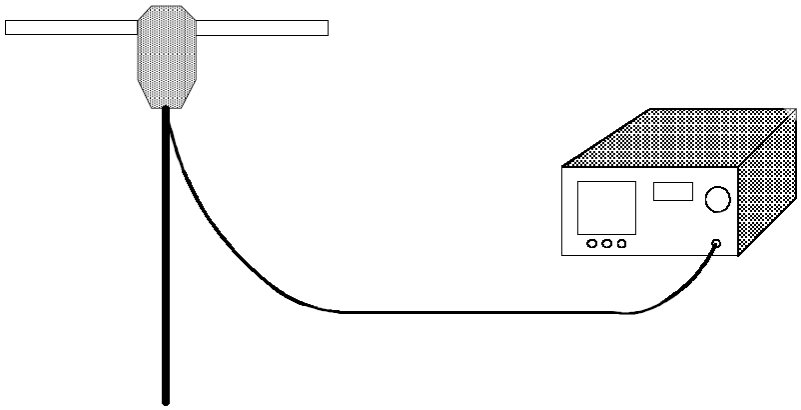

Figure 2. Connection of the AM-030

The AM-030 is a half-wave dipole with interchangeable arms that consists of the following components:

1. An anchoring mast
2. A coaxial cable with a BNC connector
3. A balun (located in the core of the antenna)
4. Two short rods
5. Two medium-length rods
6. Two long rods

The antenna has been designed to give best results within a frequency range that covers the TV and FM (BI, BII, BIII, BIV and BV) bands, divided into tour parts for which it is configured by combining the sets of rods.

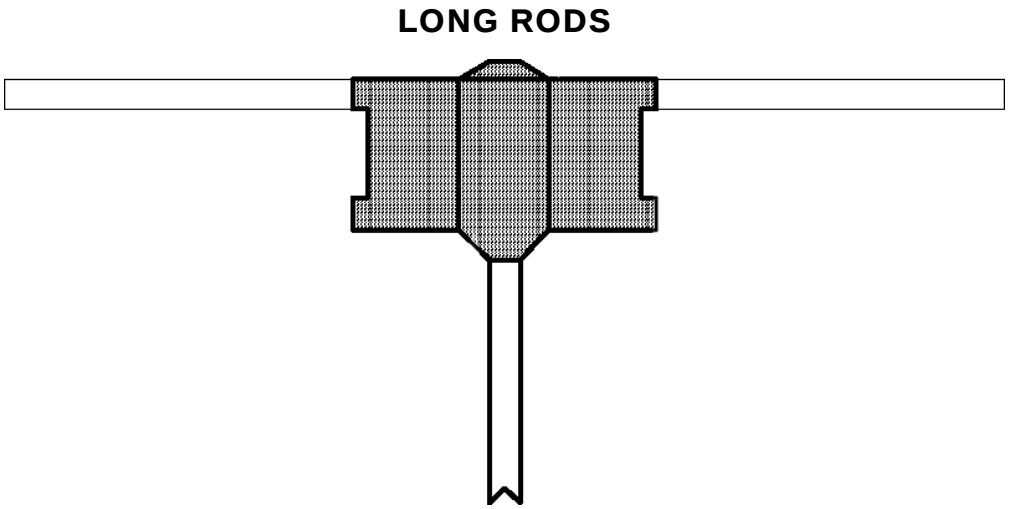

Figure 3. Configuration 1 for BI (45 to 70 MHz)

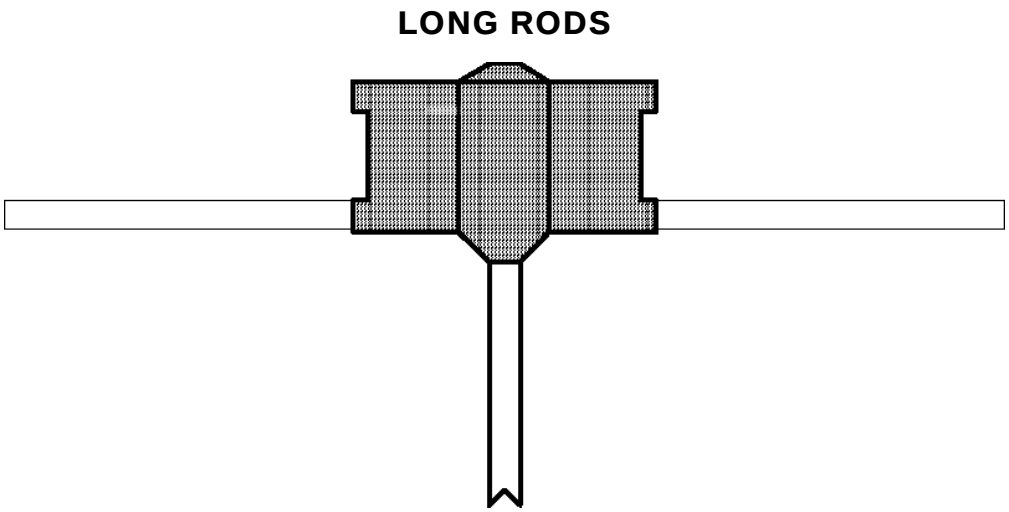

Figure 4. Configuration 2 for BII (85 to 110 MHz)

MEDIUM-LENGTH RODS

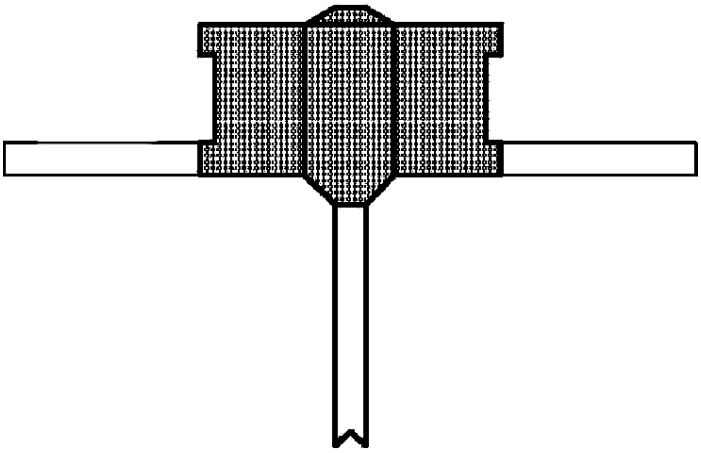

Figure 5. Configuration 3 for BIII (175 to 230 MHz)

SHORT RODS

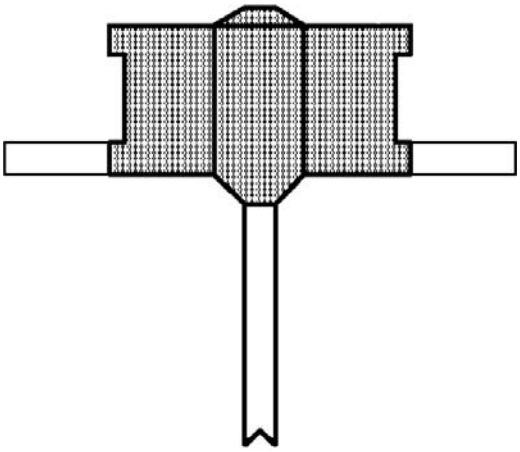

Figure 6. Configuration 4 for BIV and BV (470 to 860 MHz)

The rods are fitted to the core of the antenna by pressing them in, and to replace them, simply pull them out as shown in Figure 7. The configuration to be used depends on the frequency of the signal to be measured.

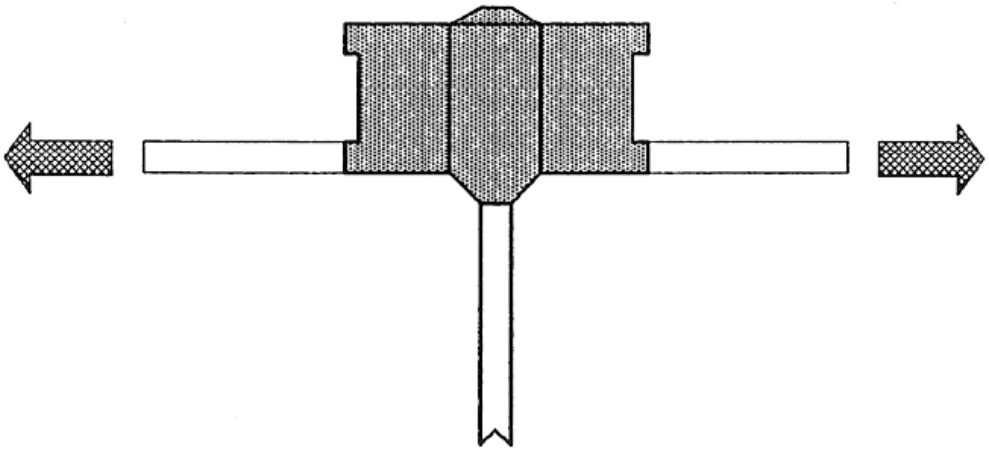

Figure 7. Replacement of the rods.

Once the antenna has been connected as shown in Figure 2, tune the signal level meter or the spectrum analyzer to the desired frequency and measure the amplitude of the signal received, which we shall call, for example, **ME** dBµV. The field strength value **FS** in dBµV/m can now easily be found using the following equation:

FS = ME + K

when **K** is expressed in dB/m

K = 20.log **f** + **CL** + **BL** - 33.6

with :

CL: Losses of the cable utilized in dB.

BL: Losses of the balun utilized in the antenna in dB.

f: Working frequency in MHz.

3. ANTENNA FACTOR OF THE AM-030

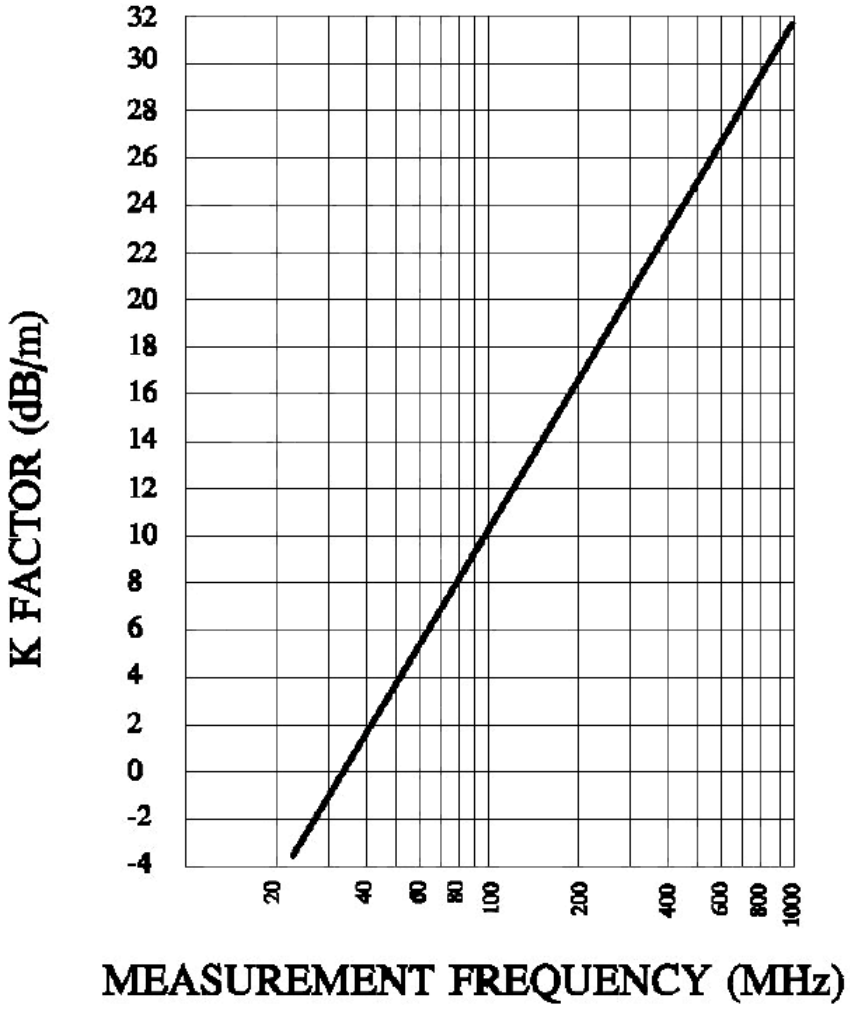

Figure 8.

4. TABULATION OF THE ANTENNA FACTOR K FOR THE AM-030

FREQUENCY (MHz)	ANTENNA FACTOR K (dB/m)
50	5,4
75	8,9
100	11,4
125	13,3
150	14,9
175	16,3
200	17,4
225	18,4
250	19,4
275	20,2
300	20,9
325	21,6
350	22,3
375	22,8
400	23,4
425	23,9
450	24,5
475	24,9
500	25,4
525	25,8
550	26,2
575	26,6
600	26,9
625	27,3
650	27,7
675	28,0
700	28,3
725	28,6
750	28,9
775	29,2
800	29,5
825	29,7
850	30,0
875	30,2
900	30,5
925	30,7
950	31,0
975	31,2
1000	31,4

Figure 9. Antenna factor table.

5. EXAMPLE

We have just installed a radio transmitting antenna that works at a frequency of 103.6 MHz. We want to measure the field strength value received in a nearby city. To do this, we take the AM-030 reference antenna and a signal level meter or a spectrum analyzer to the location where the signal will be measured. We configure the AM-030 to measure a frequency of 103.6 MHz (for a frequency of 85 to 110 MHz, configuration 2 must be used), and we connect it to the measuring instrument, as shown in Figure 2. After tuning the 103.6 MHz frequency, we find an amplitude for the signal received of 54 dBµV.

Consulting the table in Figure 9, we see that for configuration 1 of the antenna, working at 103.6 MHz (100 MHz is the nearest tabulated value), the correction factor is 11.4 dB, which means that the field strength received at the measurement point is:

54 dBµV + 11.4 dB = 65.4 dBµV/m

We can also find the value of the antenna factor by consulting the graph, asshown in Figure 10.

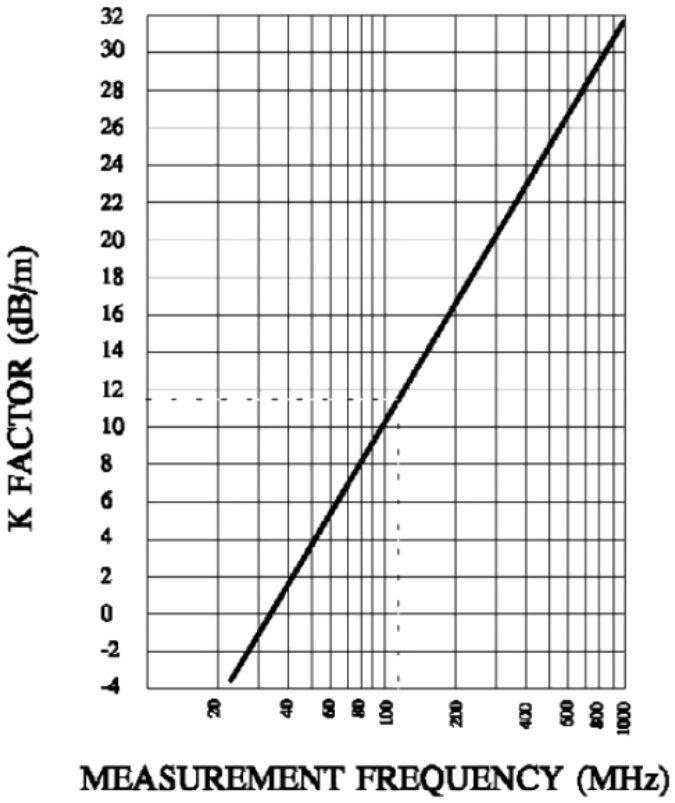

Figure 10. Location of the antenna factor of the example.

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