ADVANTEST®

ADVANTEST CORPORATION

INSTRUCTION MANUAL

TR1711

Log.Periodic Antenna

MANUAL NUMBER 0776 EA 109

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TR 1711

LOG PERIODIC ANTENNA

OPERATING MANUAL

1. INTRODUCTION

TR-1711 LOG PERIODIC ANTENNA is used in combination with TR-4110/4111 or TR-4110/4113 for measuring field strength and performing panoramic reception in a wide frequency band of 80MHz ~ 1000MHz.

2. SPECIFICATIONS

Gain	Approx. 5dB
Frequency range	80MHz ~ 1000MHz
Front-to-back ratio	Less than 14dB
VSWR	More than 2.5
Impedance	50Ω

3. COMPOSITION

(1)	Log periodic antenna	Elements 31 x 2
(2)	Angle adjuster	1 (45° ~ 0° ~ 90°)
(3)	Poles	1 set (2 poles)
(4)	Tripod	1 set
(5)	Measuring cable (N type connector)	5D-2W (10 m)
(6)	Elements bag	1
(7)	Antenna body bag	1
(8)	Container bag	1

4. ASSEMBLING THE ANTENNA

Assemble the antenna according to the following procedure while refering to Fig. 1.

(1) Attach elements to the log periodic antenna.

(2) Scale for indicating the height is attached to the poles.
Mount the angle adjuster at the height to be used.

(3) Wide open the tripod and errect so that its legs are securely fixed.

(4) Connect the pole on which the angle adjuster is mount to the pole mounted to the tripod.

(5) Pass the cable through the balancer and connect with the cable coming out from the log periodic antenna.

(6) Mount to the balancer to the log periodic antenna with screws.

(7) Mount the log periodic antenna to the angle adjuster.

(8) Direct the log periodic antenna towards the object of measurement.

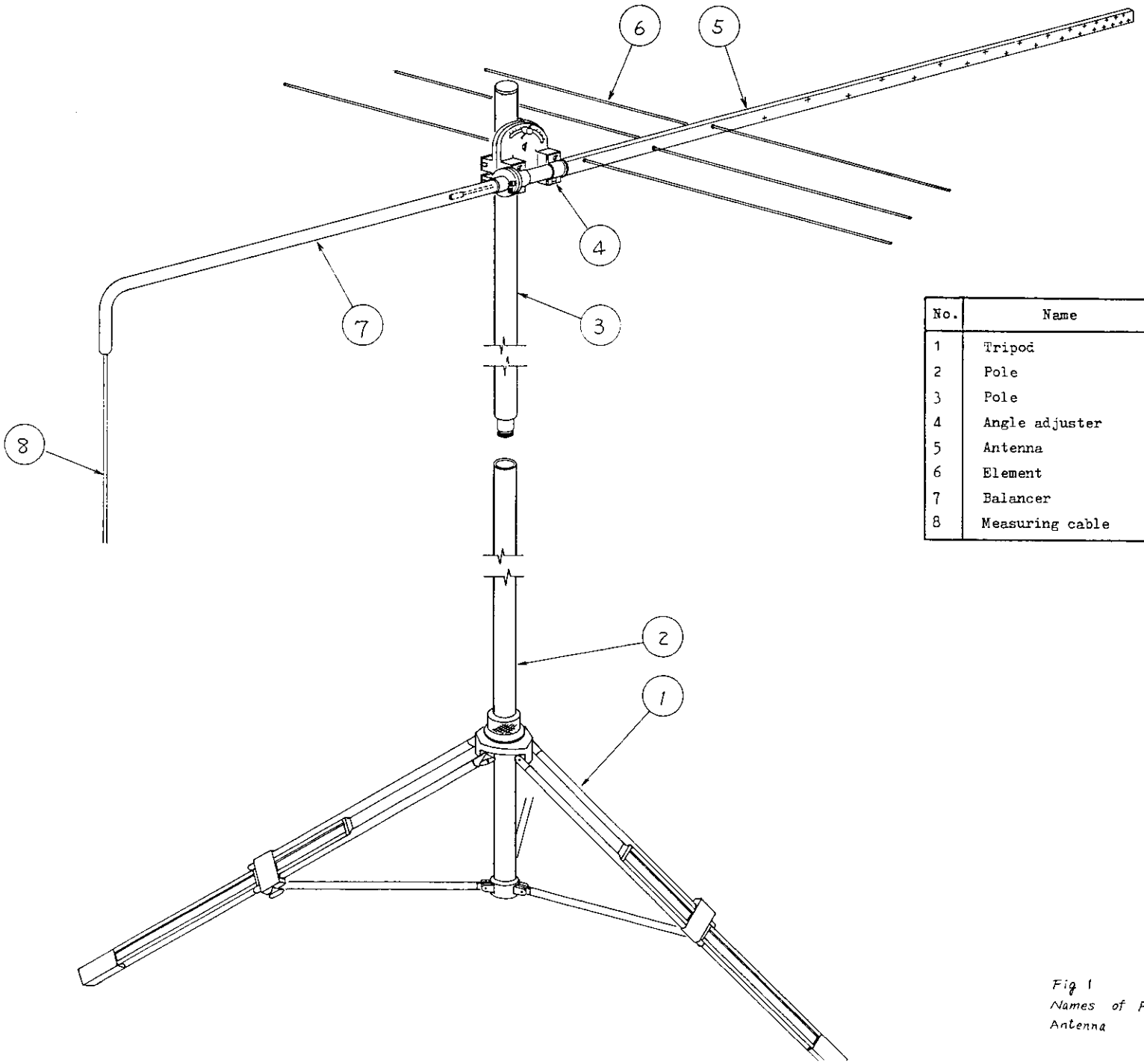
[NOTE]

When mounting the log periodic antenna to the angle adjuster, use a stand or table.

The log periodic antenna to the angle adjuster, use a stand or table.

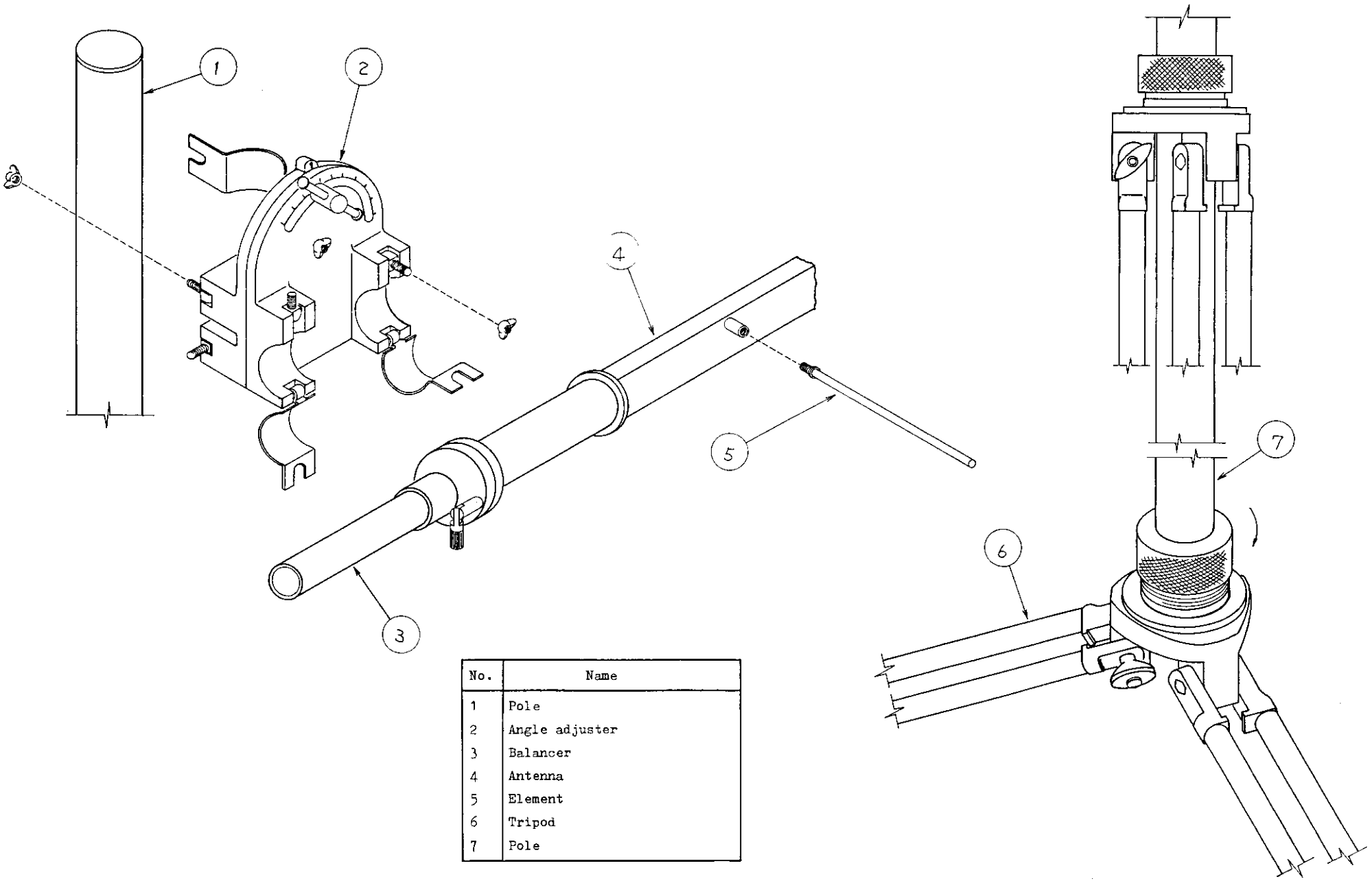
The log periodic antenna may be connected to the pole mounted to the tripod after mounting to the angle adjuster.

However, in this case, when connecting to the pole, be careful not to hit the log periodic antenna to surrounding things.



No.	Name
1	Tripod
2	Pole
3	Pole
4	Angle adjuster
5	Antenna
6	Element
7	Balancer
8	Measuring cable

Fig 1
Names of Parts of Log Periodic Antenna



No.	Name
1	Pole
2	Angle adjuster
3	Balancer
4	Antenna
5	Element
6	Tripod
7	Pole

Fig 2
Log Periodic Antenna Assembly

5. MEASUREMENT

The method of measuring field strength with the TR 1711 and TR 4110 Series Tracking Scope is described in this section. Refer to the tracking scope instrument manual for the tracking scope operating instructions. Moreover, check the level display system of the tracking scope beforehand. (TR 4110 level display may be dBm display or optional dBμ display.)

(1) Field strangth measurement using the dBm display tracking scope is described below.

1 Connect the cable from the TR 1711 log-periodic antenna to the INPUT connector of the tracking scope.

2 Read the input voltage and frequency in dBm from the CRT display of the tracking scope.

When the input signal is modulated, the peak value can be read by reading the peak value of the spectrum.

3 Find the field strength EX (dBμ/m) by means of the following equation, using the input voltage value Em (dBm) read at the tracking scope and the conversion coefficient K1 (see Fig. 3) for a $\lambda/2$ dipole antenna from the frequency and the gain K2 ($\lambda/2$ dipole ratio) of the TR 1711 log periodic antenna (see Fig. 4).

$$Ex\ (dB\mu/m) = Em\ (dBm) + 107\ (dB) + K1\ (dB) - K2\ (dB) \quad (1)$$

4 As an example, if the level read at the tracking scope when an 80MHz FM broadcast signal was with the TR 1711 log periodic antenna + 10m cable is assumed to be -61dBm, from Eq. (1),

$$Ex\ (dB\mu/m) = Em\ (dBm) + 107(dB) + K1\ (dB) - (dB)$$

Here, Em = -61kBm, K1 = 6.6dB from Fig. 3, and K2 = 4.2dB from Fig. 4. Therefore, field strength Ex is,

Ex (dBμ/m) = -61 (dBm) + 107 (dB) + 6.6 (dB) -4.2 (dB) =48.4 (dBμ/m)

5 The measurable field strength when the TR 4110/4113 and TR 1711 are used becomes the characteristic shown in Fig. 5.

(2) Field strength measurement using the dBμ display tracking scope

The measurement method is the same as for dBm display except that the conversion equation is different.

1 Connect the cable from the TR 1711 to the INPUT connector of the tracking scope.

2 Read the input voltage and frequency in dBμ from the tracking scope CRT display.

When the input signal is modulated, the peak value can be read by reading the peak value of the spectrum.

3 Find the field strangth (dBμ) by means of the following equation, using the input voaltage value Em (dBμ) read at the tracking scope and the conversion coefficient K1 (see Fig. 3) for a $\lambda/2$ dipole antenna from the frequency and the gain ($\lambda/2$ dipole ratio) of the TR 1711 log periodic antenna.

Ex (dBΩ/m) = Em (dBμ) + K1 (dB) - K2 (dB) (2)

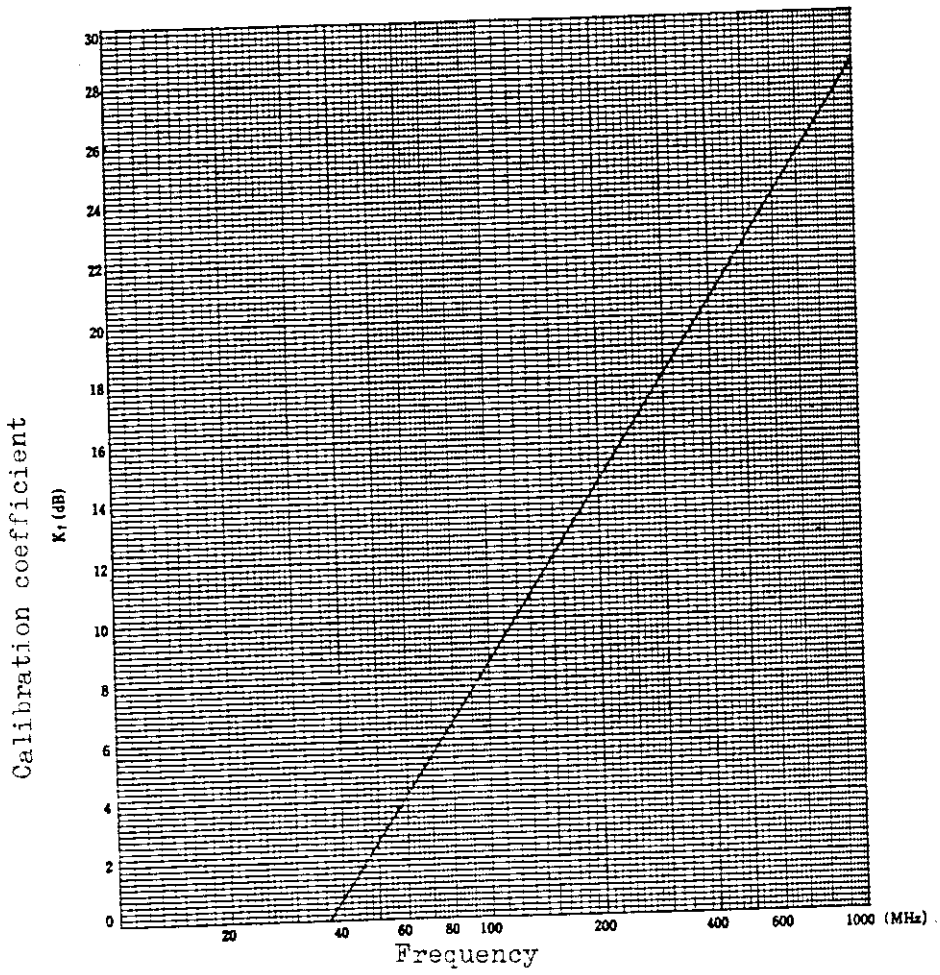


Fig. 3 Field strength measurement calibration coefficient of $\lambda/2$ dipole antenna

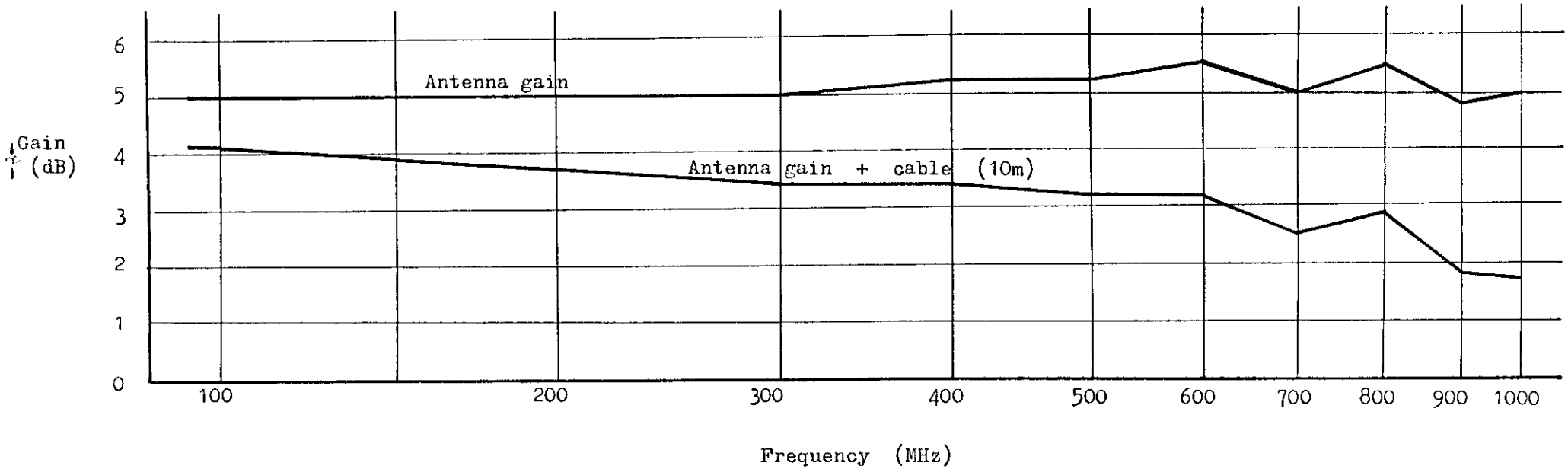


Fig. 4 Antenna gain and antenna gain + cable calibration curve

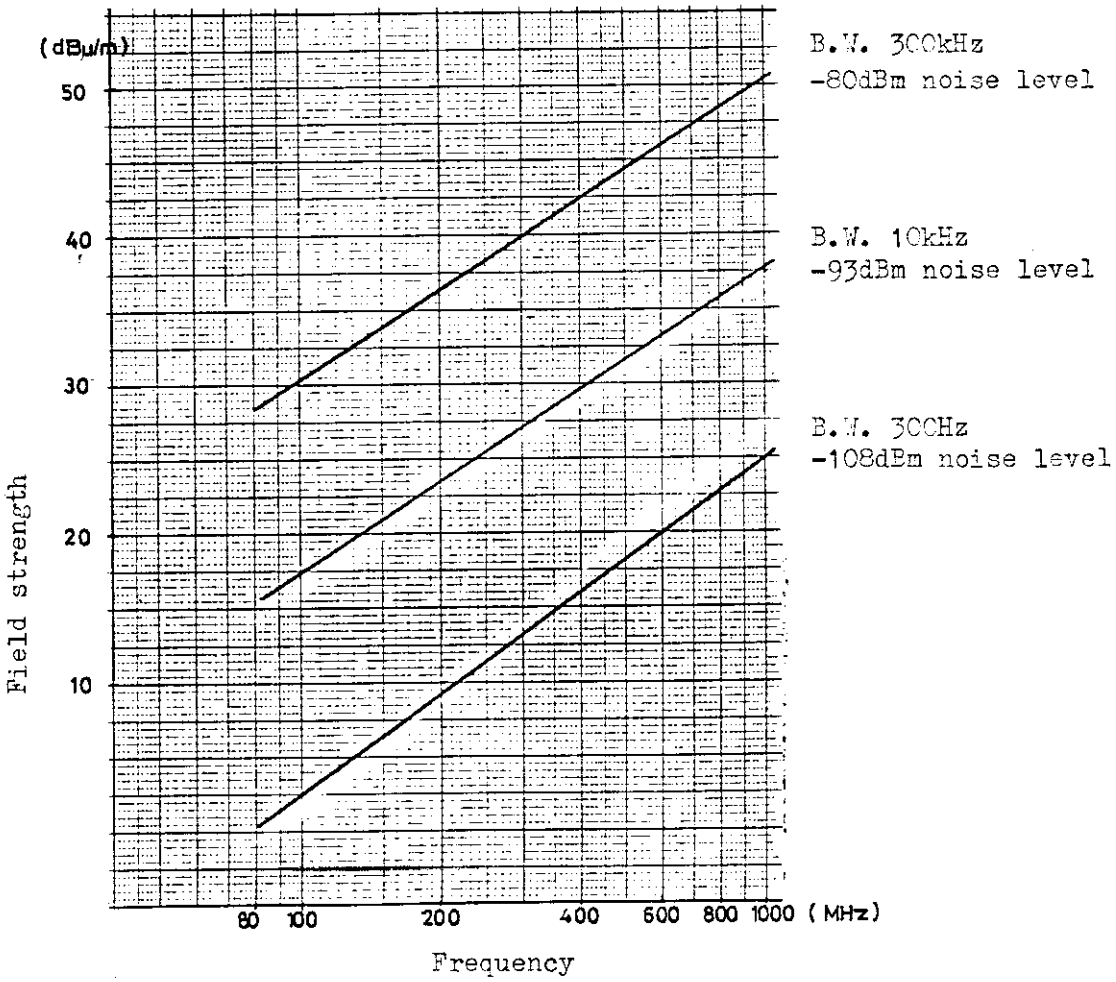


Fig. 5 Measurable fieldstrength with TR 4110/4113 and TR 1711

6. CONVERSION EQUATIONS

Eq. (1) of the preceding item can be found as follows:

(1) Conversion from dBm to dBμ

$$Em\ (dB\mu) = Em\ (dBm) + 107 \qquad (3)$$

(2) Voltage - field strength conversion when λ/2 dipole antenna used.

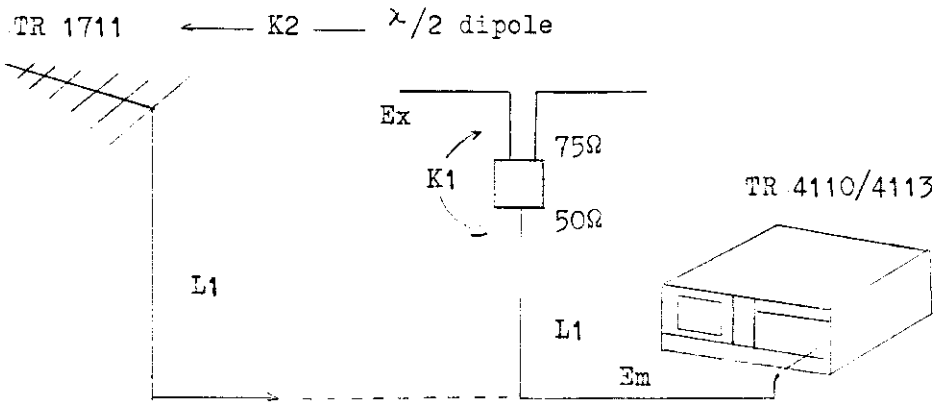


Fig. 6 Field strength measurement with λ/2 dipole antenna

From Fig. 6, if

Voltage at tracking scope input terminal	Em (dB)
Cable loss between antenna - tracking scope	L1 (dB)
λ/2 dipole antenna effective height	He (dB)
Field strength (antenna end)	Ex (dBμ/m)

Then,

$$Ex\ (dB\mu/m) = Em\ (dB\mu) - He\ (dB) + L1\ (dB) \qquad (4)$$

If the cable loss is considered to include the antenna,

$$Ex\ (dB\mu) = Em\ (dB\mu) - He\ (dB) \qquad (5)$$

$$= Em\ (dB\mu) + K1\ (dB) \qquad (6)$$

Where, K1 = -He

K1 is given in Fig. 3 as the $\lambda/2$ dipole antenna conversion coefficient. (See NOTE1)

(3) $\lambda/2$ dipole antenna - log periodic antenna conversion

The gain of the TR 1711 is indicated by $\lambda/2$ dipole ratio and is given in Fig. 4 with the cable loss added.

Therefore, if the gain of the log periodic antenna is made K2, then

Ex (dBμ/m) $\lambda/2$ dipole antenna measured value - k2 = Ex (dBμ/m) log periodic antenna (7)

From Eqs. (3), (6) and (7) above, the field strength when a log periodic antenna is used can be found by means of the following equation.

Ex (dBμ/m) = Em (dBm) + 107 (dB) + K1 (dB) - K2 (dB)

This is the same as Eq. (1).

(NOTE1)

Voltage - field strength conversion when $\lambda/2$ dipole antenna used

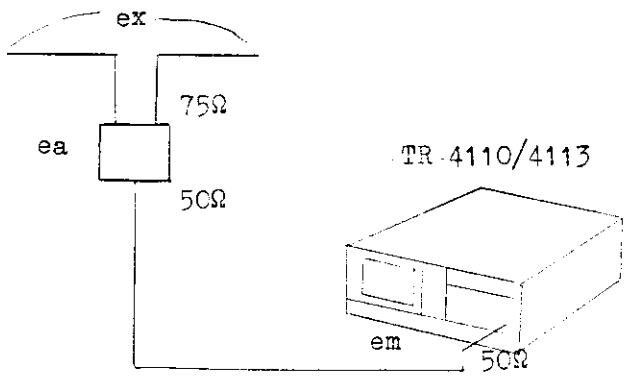


Fig. 7 Measurement of field strength with $\lambda/2$ dipole antenna

1 The relationship between the field strength [ex (μV/m)] and voltage across terminals "ea (μV)] at a $\lambda/2$ dipole antenna is,

$$ea = \frac{\lambda}{\pi} ex \qquad (8)$$

2 The relationship between the output impedance (75Ω) of the $\lambda/2$ dipole antenna and the input impecance (50Ω) of the tracking scope when the input terminal volatage of the tracking scope is made em (μV) is,

$$em = \frac{1}{2} ea \frac{50}{75} \qquad (9)$$

3 From Eq. (8) and Eq. (9),

$$ex = \frac{2\pi}{\lambda} \sqrt{\frac{75}{50}} em \qquad (10)$$

Expressing this by logarithmetic voltage,

$$20 \log ex = 20 \log \left(\frac{2\pi}{\lambda} \sqrt{\frac{75}{50}}\right) + 20 \log em \qquad (11)$$

Therefore,

$$Ex\ (dB\mu/m) = 20 \log \left(\frac{2\pi}{\lambda} \sqrt{\frac{75}{50}} + Em\ (dB\mu) \right) \qquad (12)$$

(1μV = 0dBμ)

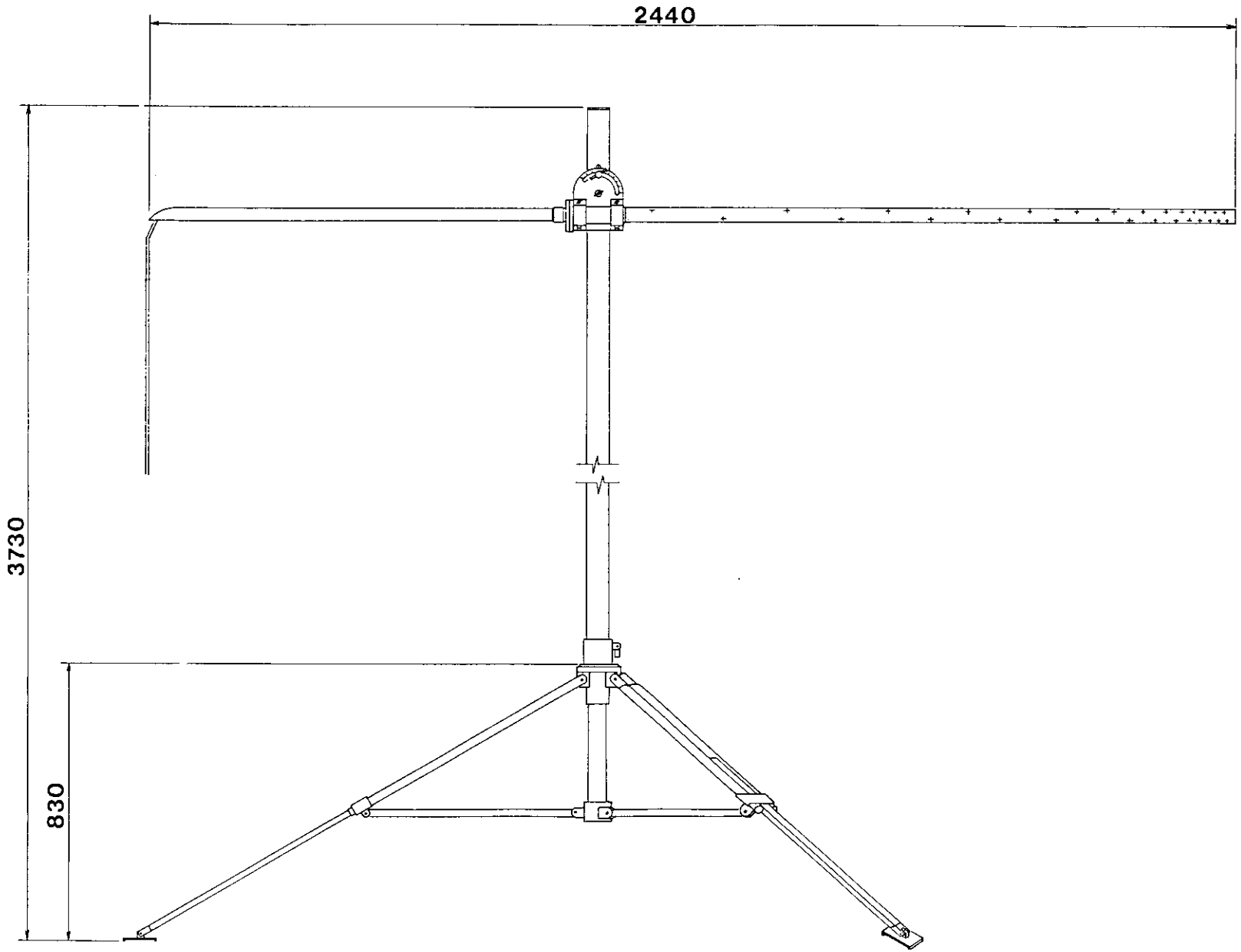
If,

$$K1 = 20 \log \left(\frac{2\pi}{\lambda} \sqrt{\frac{75}{50}} \right) \qquad (13)$$

Then,

$$Ex\ (dB\mu/m) = Em\ (dB\mu) + K1 \qquad (14)$$

K1 is given in Fig. 3.



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TR 1711
EXTERNAL VIEW

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