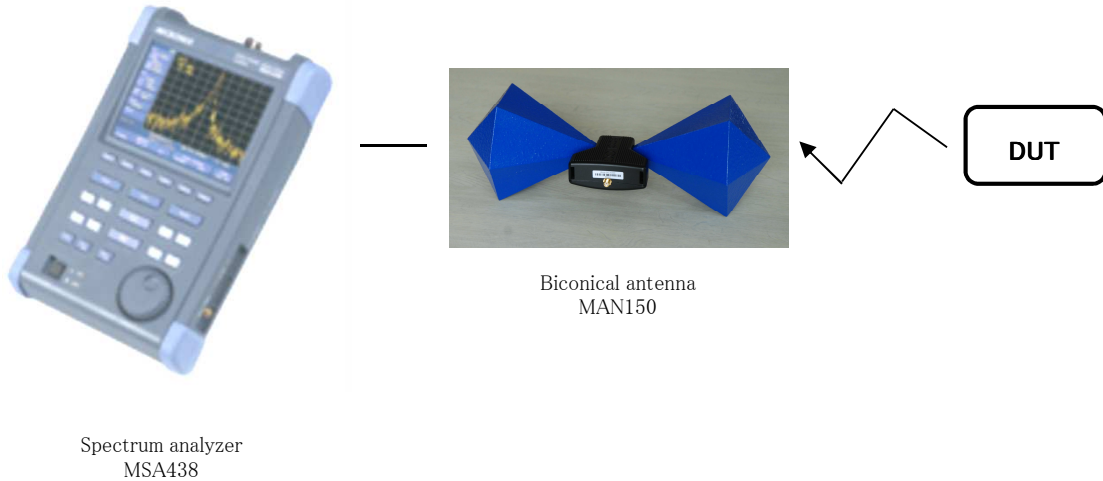


# Calculation of antenna factor and gain

◇The calculation equation useful for mutual conversion of an antenna factor and gain is presented.

## \* Application \*

Connection block diagram



## \* Solution \*

■ When measuring the electric field strength by combining a spectrum analyzer with an antenna, calculating an antenna gain from an antenna factor, or the contrary may be needed. The calculation equation is shown below. In MSA438, the electric field strength can be read directly by registering the antenna gain in it.

■ The following equation is used to calculate the antenna factor Af (dB/m) from the antenna gain Ga (dBi) in a 50-ohm system.

$$Af = 20 \log \left[ \frac{2\pi}{\lambda} \sqrt{\frac{2.4}{10^{(Ga/10)}}} \right]$$

But,  $\lambda$  : wave length(m)

■ Similarly, the following equation is used to calculate the antenna gain Ga (dBi) from the antenna factor Af (dB/m) in a 50-ohm system.

$$Ga = 10 \log \left[ 2.4 \left[ \frac{2\pi}{\lambda 10^{(Af/20)}} \right]^2 \right]$$

But,  $\lambda$  : wave length(m)

■ The following table is a calculation example.

Frequency [MHz]	30	50	100	200	500	1000	1500	2000	3000
Antenna factor [dB/m]	38.5	32.5	27.8	22.6	23.3	29.5	40.2	47.3	50.5
Antenna gain [dBi]	-38.7	-28.3	-17.6	-6.4	0.9	0.7	-6.4	-11.1	-10.7

## \* System configuration \*

■ A tool that can measure the electric field strength easily will be gotten at inexpensive cost.

Spectrum analyzer[MSA438]	×1
Calibration of MSA438	×1
Biconical antenna[MAN150]	×1