Measurement by MSA338 before installing wireless LAN

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The radio wave environment around the installation place must be measured before the wireless LAN is installed, and then the spot installed and the channel used are decided.

The setting of MSA338 is as follows when not specified especially.
　　Center frequency[FREQ]：2.44GHz
　　Frequency span[SPAN]：100MHz
　　Resolution bandwidth[RBW]：1MHz
　　Video bandwidth[VBW]：OFF
　　Reference level[REFER]：-30dBm
　　Sweep time[SWEEP]：0.1s
　　Calculation[CALC]：MAX

However, the channel number 14 of the wireless LAN goes outside right of the screen if the center frequency is not changed to 2.45GHz, because the number of channels is assumed thirteen at the above setting. Moreover, it is necessary to increase or decrease the reference level by about 10dBm depending on the environment.

The electric field strength measurement can be done by pushing [MEAS] key and by selecting the electric field strength measurement mode by [F4] key, and then by selecting [M304] as an antenna by [F1] key.

However, it is not necessary to use the electric field strength measurement mode if the unit of standard is dBm or W. It is better that the receiving power is measured in the channel power measurement mode because the antenna gain changes little at the span 100MHz.

The channel power measurement can be done by pushing [MEAS] key and by selecting the channel power measurement mode by [F1] key, and then by selecting BAND by [F1] key. Secondly, the center (CNTR) and width (BAND) of the measured channel are set. The width, usually, is fixed to 20MHz.

With the setting mentioned above, the receiving power of the specified channel is displayed on the screen. However, if the channel power measurement mode is not turned off while measuring, the measurement time becomes long.

Moreover, in the environment of the installation place where the disturbance noise is intermittently generated, the measurement should be done for ten seconds or a few minutes by using the MAXHOLD function according to the state and the maximum value in this period should be observed.

However, set the calculation node [CALC] to NORM when it is necessary that the radio wave state is observed in real time.
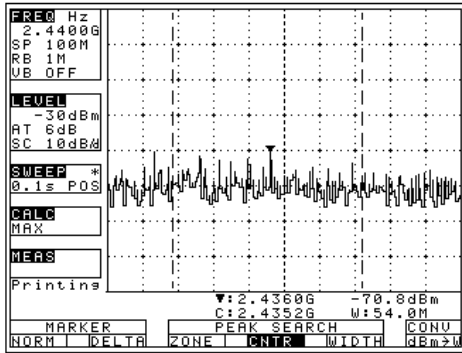
[1] Radio wave environment measurement
　　The radio wave state is confirmed at four corners and the center of the floor where the installation of the access point is required. However, increase the measurement point according to the area of the floor. It is confirmed whether the disturbance noise and other access points exist by observing the radio wave in the range from 2400 to 2483.5MHz.

●Photo 1 ： Stable environment because of low noise floor
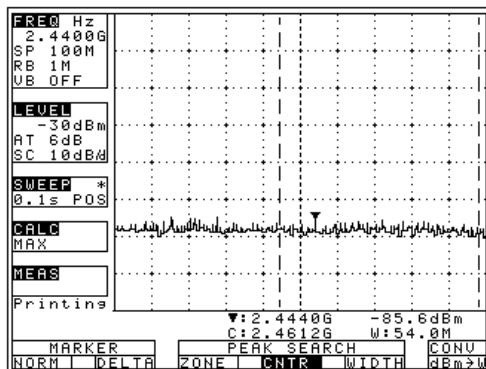
The radio wave is hardly observed in the frequency band for wireless LAN. The access point can be installed without trouble.
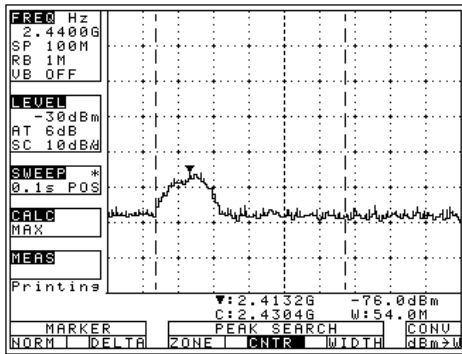
●Photo 2 ： The high noise floor in the whole / Some fine spectra

```
FREQ Hz
 2.4400G
SP 100M
RB 1M
VB OFF

LEVEL
  -30dBm
AT 6dB
SC 10dB/d

SWEEP  *
0.1s POS

CALC
MAX

MEAS

Printing
           ▼:2.4360G    -70.8dBm
           C:2.4352G    W:54.0M
    MARKER      PEAK SEARCH    CONV
NORM  DELTA  ZONE  CNTR   WIDTH  dBm→W
```

The disturbance noise is observed in the whole of the frequency band where the wireless LAN is used. Moving a spectrum analyzer, the place where the disturbance noise becomes bigger is found, and then the place and the cause are specified.
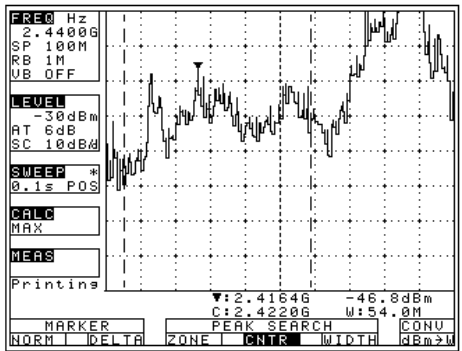
　　※　When the place is specified, set the calculation [CALC] to NORM so that the data is updated at each scanning.
　　　　Try the means to reduce the disturbance noise if possible. If impossible, move the access point to a point which is away enough from the initial place.
　　　　There seems to be no influence to the communication if the level of the disturbance noise is very lower than output of the access point.

●Photo 3 ： The upsurge in a part

```
FREQ Hz
 2.4400G
SP 100M
RB 1M
VB OFF

LEVEL
  -30dBm
AT 6dB
SC 10dB/d

SWEEP  *
0.1s POS

CALC
MAX

MEAS

Printing
           ▼:2.4132G    -76.0dBm
           C:2.4304G    W:54.0M
    MARKER      PEAK SEARCH    CONV
NORM  DELTA  ZONE  CNTR   WIDTH  dBm→W
```

When another access point exists near, a new access point should be installed at the place without interference after the frequency used (channel) is specified.

●Photo 4 ： The spectrum like a big mountain

```
FREQ Hz
 2.4400G
SP 100M
RB 1M
VB OFF

LEVEL
  -30dBm
AT 6dB
SC 10dB/d

SWEEP  *
0.1s POS

CALC
MAX

MEAS

Printing
           ▼:2.4164G    -46.8dBm
           C:2.4220G    W:54.0M
    MARKER      PEAK SEARCH    CONV
NORM  DELTA  ZONE  CNTR   WIDTH  dBm→W
```
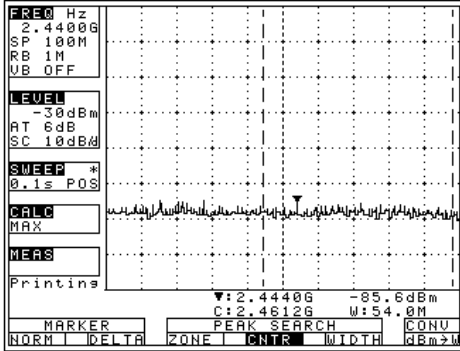
When the equipment such as a microwave oven exists near, the radio wave of large level as shown in photo 4 is discharged while it is used.
Therefore, install the access point in a place as possible as away from such equipment.

[2] Decision of channel

The frequency band where there is little disturbance noise is found by measuring the radio wave state, and then the channel number is decided.

Refer to "Channel table of wireless LAN" in Table 1 regarding the relation of channel and frequency.
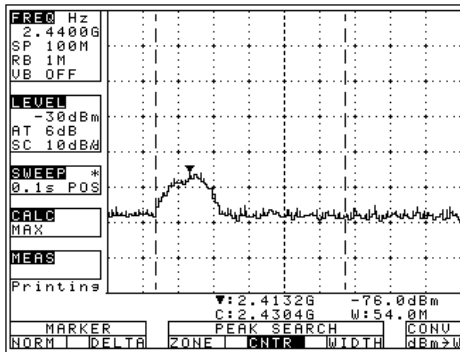
● Photo 5 ： Stable environment because of low noise floor

```
FREQ  Hz
 2.4400G
SP  100M
RB  1M
VB  OFF

LEVEL
  -30dBm
AT  6dB
SC  10dB/

SWEEP    *
0.1s POS

CALC
MAX

MEAS

Printing
                ▼:2.4440G   -85.6dBm
                C:2.4612G    W:54.0M
     MARKER        PEAK SEARCH        CONV
NORM   DELTA   ZONE   CNTR   WIDTH   dBm→W
```

The channel can be freely set when there is no disturbance noise.

When two or more access points are installed, select the channels which are away from each other at 20 MHz or more so that each radio wave isn't interfered.

● Photo 6 ： The upsurge in a part

```
FREQ  Hz
 2.4400G
SP  100M
RB  1M
VB  OFF

LEVEL
  -30dBm
AT  6dB
SC  10dB/

SWEEP    *
0.1s POS

CALC
MAX

MEAS

Printing
                ▼:2.4132G   -76.0dBm
                C:2.4304G    W:54.0M
     MARKER        PEAK SEARCH        CONV
NORM   DELTA   ZONE   CNTR   WIDTH   dBm→W
```
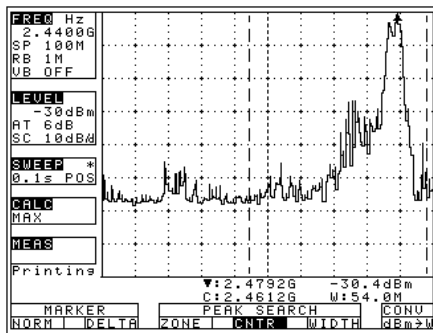
When there is an access point around, set the channel which is away from the center frequency of the existed access point at 20MHz or more.

When the same channel as the existed access point is used, install in the plach which is away enough from the access point so that there is no interference.

In case of photo 6, use the channel number of five or more because the center frequency is 2.4132GHz (channel 1).

● Photo 7 ： The spectrum like a big mountain

```
FREQ  Hz
 2.4400G
SP  100M
RB  1M
VB  OFF

LEVEL
  -30dBm
AT  6dB
SC  10dB/

SWEEP    *
0.1s POS

CALC
MAX

MEAS

Printing
                ▼:2.4792G   -30.4dBm
                C:2.4612G    W:54.0M
     MARKER        PEAK SEARCH        CONV
NORM   DELTA   ZONE   CNTR   WIDTH   dBm→W
```

When the noise of the specific frequency (in this case, it is a microwave oven) is discharged, install the access point in the place which is away from the noise source and where there is no noise.

However, the communication state becomes bed if the level of the disturbance noise is not low enough. In photo 7, the channel 5 can be used because the noise level in the frequency band from 2.42GHz to 2.44GHz is low.

● Table 1　Channel table of wireless LAN

Channel	Center frequency (GHz)	Frequency range used (GHz)
Channel 1	2.412	2.402 to 2.422
Channel 2	2.417	2.407 to 2.427
Channel 3	2.422	2.412 to 2.432
Channel 4	2.427	2.417 to 2.437
Channel 5	2.432	2.422 to 2.442
Channel 6	2.437	2.427 to 2.447
Channel 7	2.442	2.432 to 2.452
Channel 8	2.447	2.437 to 2.457
Channel 9	2.452	2.442 to 2.462
Channel 10	2.457	2.447 to 2.467
Channel 11	2.462	2.452 to 2.472
Channel 12	2.467	2.457 to 2.477
Channel 13	2.472	2.462 to 2.482
（Channel 14）	2.484	2.474 to 2.494

※　The range of center frequency ±10MHz is used in each range.