Handheld 3.3GHz Spectrum Analyzer
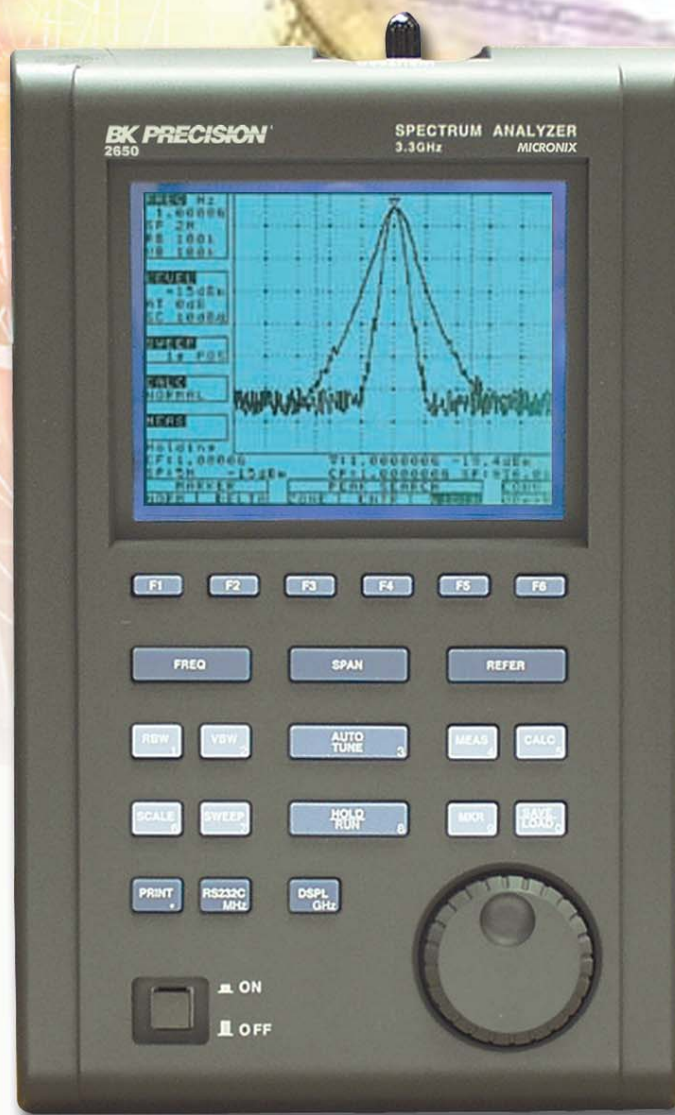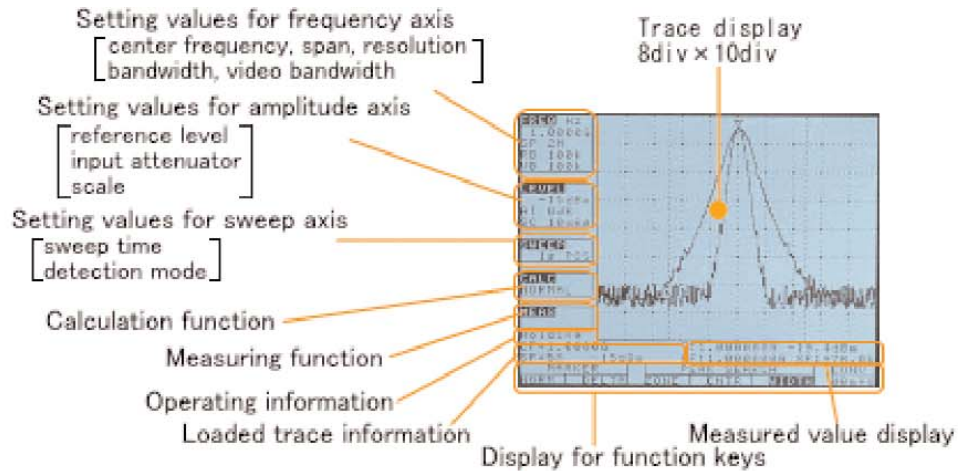
Optimum for evaluation of

- W-CDMA
- CDMA
- GSM
- PDC
- PHS
- Wireless LAN
- Bluetooth

2650

B+K PRECISION
ELECTRONIC TEST INSTRUMENTS

Setting values for frequency axis
[center frequency, span, resolution
bandwidth, video bandwidth]

Trace display
8div × 10div

Setting values for amplitude axis
[reference level
input attenuator
scale]

Setting values for sweep axis
[sweep time
detection mode]

Calculation function

Measuring function

Operating information

Loaded trace information

Display for function keys

Measured value display

Function key

Input connector
SMA (J)

Input connector for
DC power source
Connects AC adaptor BC 2650

Frequency span
200kHz to 2GHz,
ZERO and FULL span.

Reference level
Sets +10 to −40dBm
in 1dB step.

Center frequency
Sets center frequency
in 100kHz resolution.

Measuring functions
Available for Channel power,
Adjacent channel power,
Occupied bandwidth, Electric
field strength and Magnetic
field strength measurement.

Video bandwidth
100Hz to 300kHz and OFF.

Resolution bandwidth
3kHz to 3MHz.

Calculation functions
Available for Max hold,
Min hold, Average and
Over write.

Sweep
Sets 10ms to 30s sweep
time and detection mode.

Save/Load
Saves 100traces and
100setups, and loads
1trace and 1setup.

Scale
2dB/div and 10dB/div.

RS-232C
Sets baud rate and transfers
a current or saved trace.

RS-232C connector
9 pin D-sub connector
to connect to an optional
printer or PC.

Print
When pressing this key,
the image is printed with
a printer (optional) as it is.

Marker and peak search
functions
Displays the frequency and
level at the marker point
or between two markers.

Display control
Sets contrast, backlight
ON/OFF, brightness of
backlight and invert display

Hold/Run
Stops or restarts
capturing data.

AUTO tuning
Tunes to the maximum level
spectrum within full bandwith.

Rotary encoder

BK PRECISION
by MICRONIX

SPECTRUM ANALYZER
3.3GHz

1 Compact and lightweight 3.75 lb (1.7 kg)

The dimensions are as small as WxHxD 6.4 x 2.75 x 10.25" (162 x 70 x 260 mm), and the weight is only 3.75 lb (1.7 kg) including the battery. It is very convenient for outdoor use and while on business trips.

2 Measuring frequency range 50kHz to 3.3GHz

This bandwidth covers those of W-CDMA, CDMA, PDC, PHS, GSM, 2.4GHz band wireless LAN, Bluetooth.

3 Operation with battery for 100 minutes

When the battery is fully charged, Model 2650 operates for about 100 minutes (with the back light turned off). It is extremely convenient for outdoor use and for measuring wireless LAN installation environment.

4 Performance that is comparable to large-size bench type

Model 2650 guarantees a highly stable frequency axis by PLL synthesizer system. The center frequency setting resolution is 100kHz. Furthermore, the average noise level of -110dBm (typical) provides a wide dynamic range and the reference level can be set in 1 dB step.

5 Abundant functions

❑ Measuring functions
- Channel power measurement
- Adjacent channel power measurement
- Occupied bandwidth measurement
- Electric field strength measurement
- Magnetic field strength measurement

❑ Calculation functions
- MAX HOLD
- MIN HOLD
- AVERAGE
- OVER WRITE

❑ Marker and peak search

❑ Save / Load
- Electric field strength meas. ⋯ Optimum for measurement of cellular phone and wireless LAN working environment.
- Magnetic field strength meas. ⋯ Optimum for EMI design of PCBs and for evaluation of signal quality.

6 Auto tuning

The center frequency is set at the spectrum of the maximum level in the 3.3GHz band, and in addition, optimum reference level, resolution bandwidth, video bandwidth and sweep time are set when the AUTO TUNE key is pressed. This function is very convenient for measurement of an unknown signal.

7 Auto range operation

The resolution bandwidth, video bandwidth and sweep time are automatically set based on the frequency span. It is also possible to set auto range operation only one or two out of resolution bandwidth, video bandwidth and sweep time.

8 Hard copy of the image

Connect a printer (PT 2650 optional) and press the PRINT key on Model 2650. The image on the screen is printed as it is.

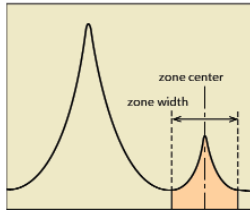## 9 High resolution display on the PC screen

The spectrum waveform is displayed at high resolution, 1000 points in the horizontal axis, on the PC screen when "PC Software AK 2650" (optional) is used.

Model 2650 is a compact, lightweight, high performance spectrum analyzer that provides signal analysis and functionality comparable to larger bench type models.
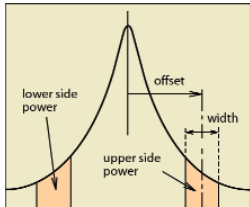
Channel power measurement

Measures the sum of the power in the zone specified by the zone center and zone width (slash area in figure). In short, it is possible to measure the total power in the specified frequency band. Of course it is possible to measure the noise power.

As the magnetic field detection portion of PR 26M is of a shielded loop structure that adopts glass ceramic multi-layer board technology of excellent high frequency characteristics, it is possible to take measurement at high reproducibility by detecting magnetic field components only. The measuring frequency range is as broad as 10MHz to 3GHz, and the measured value is calibrated in the instrument.
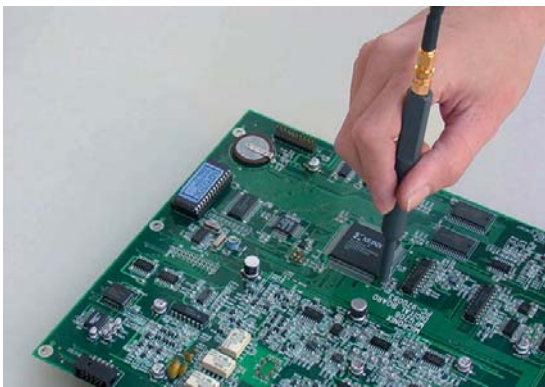
Adjacent channel power measurement

Capable of measuring the adjacent channel power leakage as the ratio of the power in the range specified by offset frequency and bandwidth (slash area in figure) to the carrier wave power. Both the upper and lower side power leakage are measured.
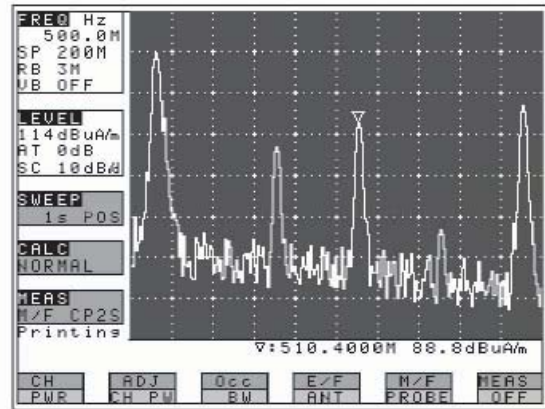
Furthermore, the method for measurement may be selected out of three methods, i.e., total power method, reference level method and in-band method, from the classification of definition of carrier wave power.

Evaluation of effectiveness of the bypass capacitor located at the power supply terminal of an LSI and evaluation of wiring rule on a printed circuit board can be raised as typical use of PR 26M. PR 26M is not affected by adjacent patterns because of high space resolution.

Magnetic field strength measurement

Model 2650 is capable of precisely measuring the magnetic field distribution on an LSI or a printed circuit board using magnetic field probe PR 26M (optional)

Occupied bandwidth measurement

It is possible to measure the occupied frequency bandwidth as the bandwidth of the point that is lower by X (dB) than the peak level or as the bandwidth of the point of Y (%) of the total power.
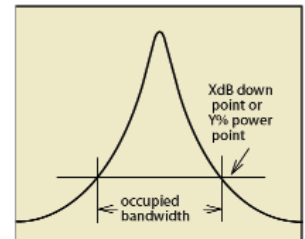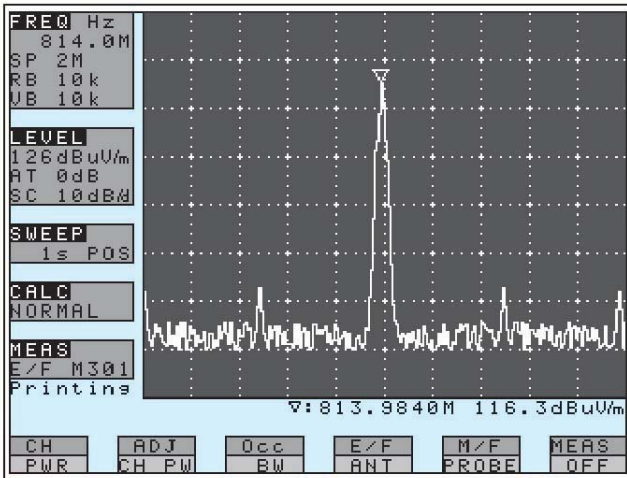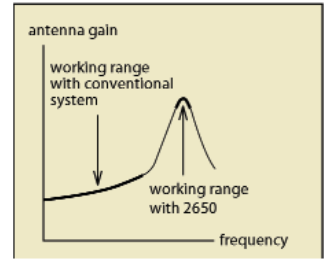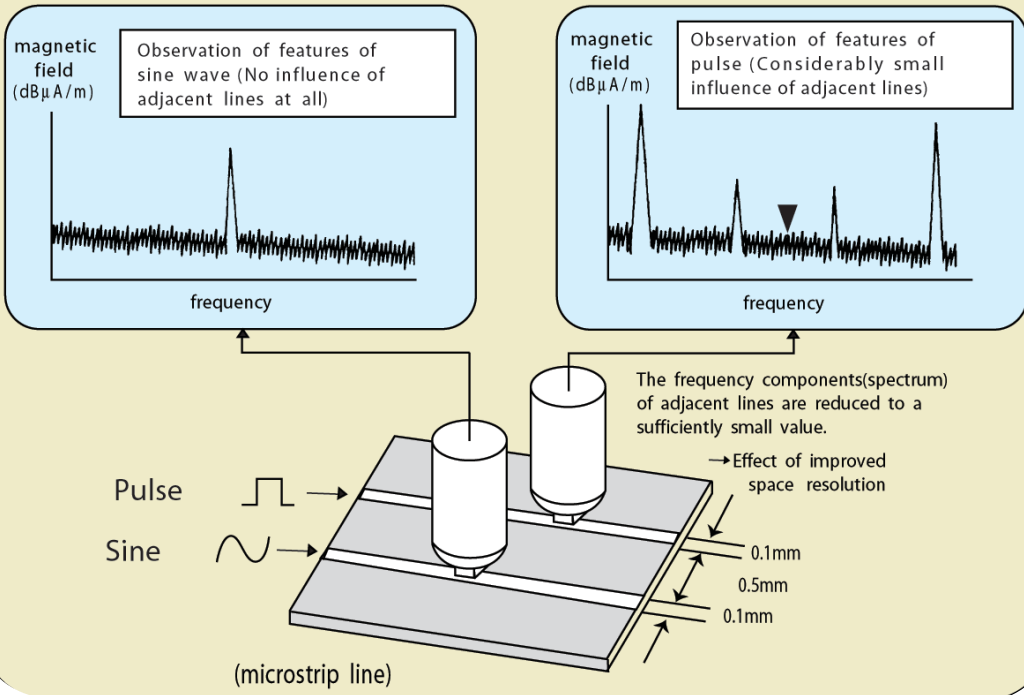
Electric field strength measurement

It is possible to measure the electric field strength by connecting dipole antennas (optional) to the input connector. A dipole antenna that suits the use is available. AN301 is mainly for PDC 800MHz and GSM 900MHz band, AN302 is mainly for PDC 1500MHz band, AN303 is mainly for PHS, W-CDMA and GSM 1800 / 1900MHz band, and AN304 is mainly for 2.4GHz wireless LAN and Bluetooth. AN304 is capable of measuring direct sequence spread spectrum, frequency hopping and Bluetooth system by 10 ms sweep time and MAX HOLD function.

The conventional method covering low frequency through high frequency with a single antenna results in low antenna gain because of using a range deviating from the antenna resonance point, and the dynamic range largely worsens as a result. Model 2650, however, provides an antenna for each frequency band and uses a resonance point of high gain only, and accordingly, it is capable of securing a wide dynamic range. Antennas of other bands will be also prepared if requested.
As the electric field strength is calibrated for each antenna in Model 2650, it is possible to directly read the measured value.

●Measurement of adjacent microstrip line

magnetic field (dBµA/m) — Observation of features of sine wave (No influence of adjacent lines at all)

magnetic field (dBµA/m) — Observation of features of pulse (Considerably small influence of adjacent lines)

frequency

frequency

Pulse

Sine

The frequency components(spectrum) of adjacent lines are reduced to a sufficiently small value.
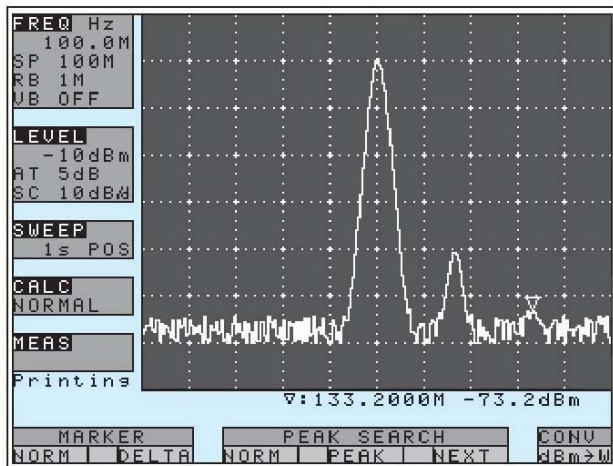
→Effect of improved space resolution
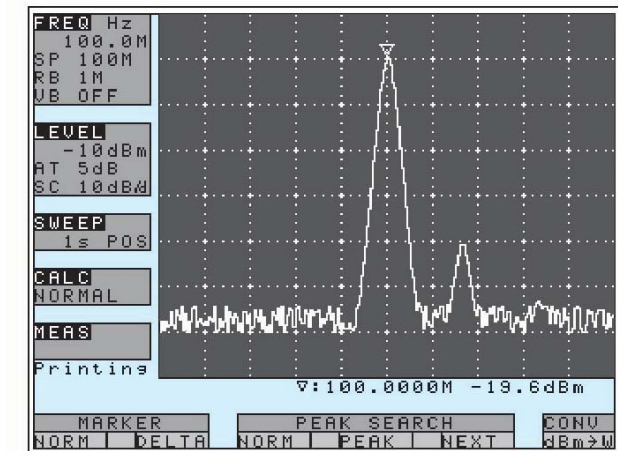
0.1mm
0.5mm
0.1mm

(microstrip line)
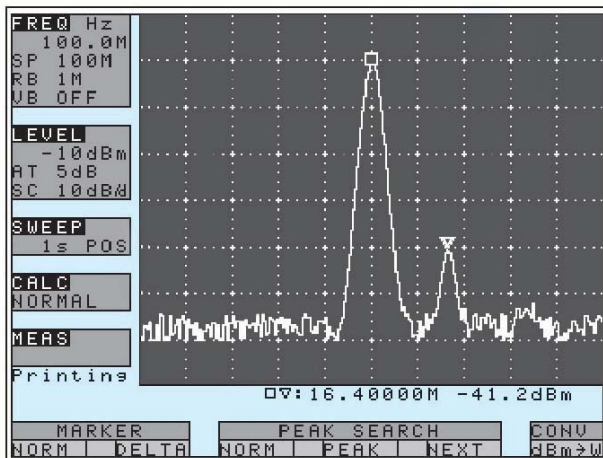
Marker measurement

Two different modes are available for marker measurement. One is normal marker mode to measure and display the frequency (maximum effective number of digits : 7) and level (maximum effective number of digits : 3) of the marker point, and another is delta marker mode to measure and display the frequency difference and level difference between two markers (one of which is a reference marker).

Peak search

Two different modes are available for peak search. One is normal peak search mode to search for the peak level with all of 10div of the frequency axis as the search range, and another is in-zone peak search mode to search for the peak level in the range specified by the center value and width. NEXT search (search for the next smaller level) of up to 9 is permitted in the normal peak search mode. The marker moves to the peak level at each sweep in the in-zone peak search mode.

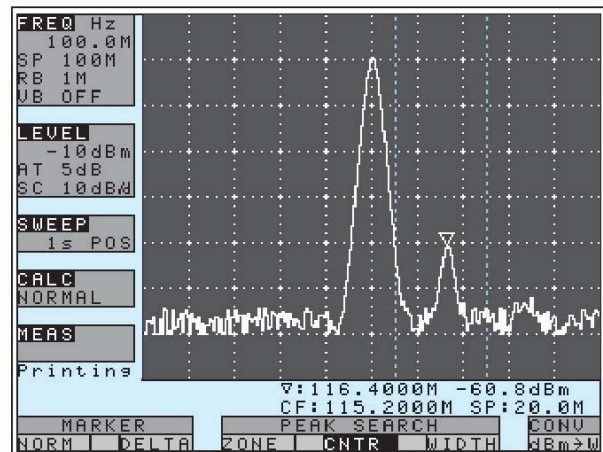

Normal marker measurement

Normal peak search

Delta marker measurement

Zone peak search

The search for the signal of the maximum level in the 3.3GHz band is executed and the result is displayed in the specified frequency span when the AUTO TUNE key is pressed. The spectrum is tuned to the vicinity of the center of the screen, and the reference level, resolution bandwidth, video bandwidth and sweep time are automatically set at optimum values.
This function is very convenient when used for measurement of an unknown signal.

Detects the maximum level in the full span

Displays the result in the specified frequency span
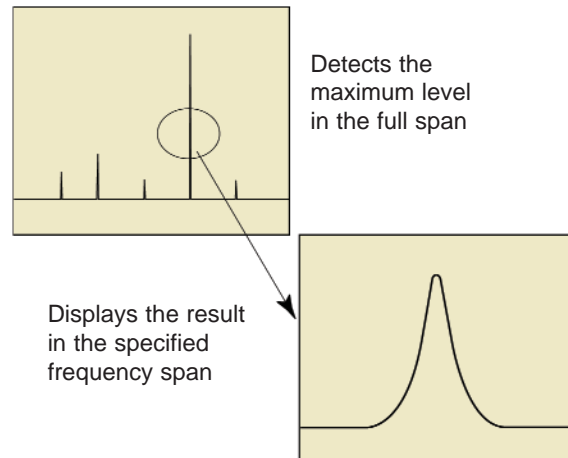
Resolution bandwidth, video bandwidth and sweep time are set automatically based on the specified frequency span. Furthermore, it is also possible to automatically set one or two of either resolution bandwidth, video bandwidth and sweep time.
The operator is released from troublesome operation because these three parameters that accompany the frequency span are set automatically.

It is possible to save 100 traces and 100 setups. Using the optional AK 2650 software and interface cable. This function may be used when various data are acquired and they are evaluated later, or when it is wanted to make a comparison with formerly acquired data. The saved traces and setups can be transferred to a PC through RS-232C.
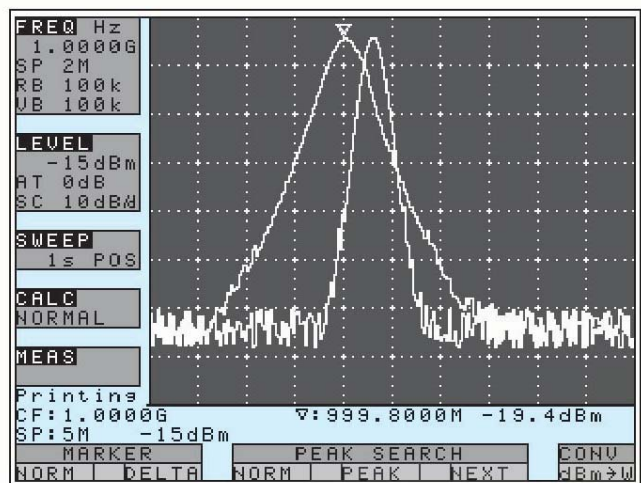
Hard copies of the image on the screen can be produced if a printer (model PT 21650, optional) is connected, using the RS-232C port.
Printing begins when the PRINT key is pressed. The printer is of dual power supply scheme, i.e., AC adaptor and battery, and it is possible to easily produce hard copies of measured data even outdoors where no AC power supply is available. The operating time of the battery-powered printer is about 30 minutes (when used continuously), and it is possible to produce about 80 hard copies of images on the screen.

Print

Spectrum Analyzer

Printer
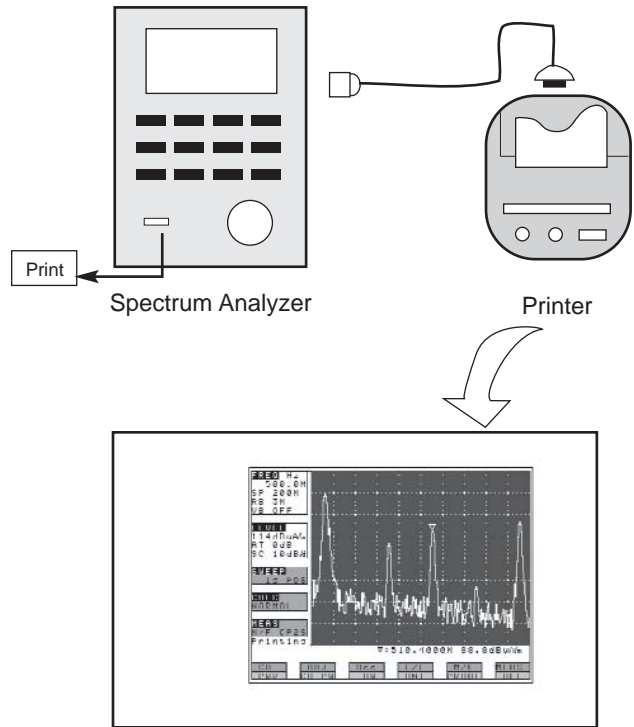
Although the spectrum is displayed by 250 points on the horizontal axis on the spectrum analyzer screen, it is fetched by 1000 points per sweep in the instrument. When PC Software (AK 2650, optional) is used, all of these 1000 points are transferred to a PC (the maximum transfer rate is 38,400 bps) and are displayed on the PC screen. The image, therefore, becomes clearer. Furthermore, setup of spectrum analyzer can be made from the PC side
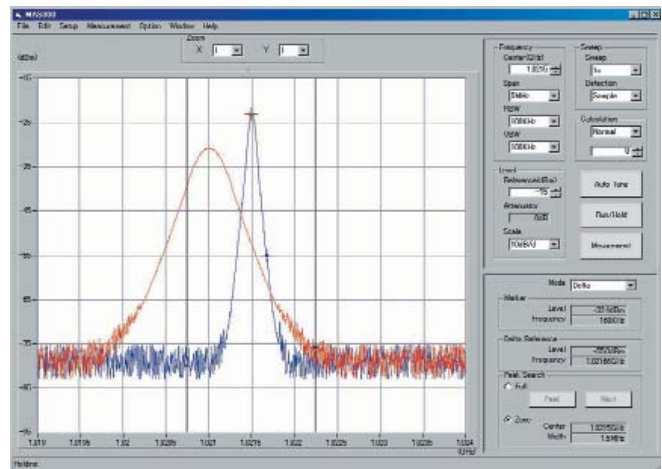
Max hold

The update spectrum data is compared with that of last time for each point of the X-axis, and the larger one is retained and displayed. The number of times of sweep can be set in the range from 2 to 1024 times by steps, which is a power of 2, or by infinite. It is possible to observe burst signal and frequency drift.

Average

Simple averaging processing is executed at each sweep. The number of times of averaging can be set from a range of 2 to 256 times by steps, which is a power of 2. The signal components buried in the noise can be measured.
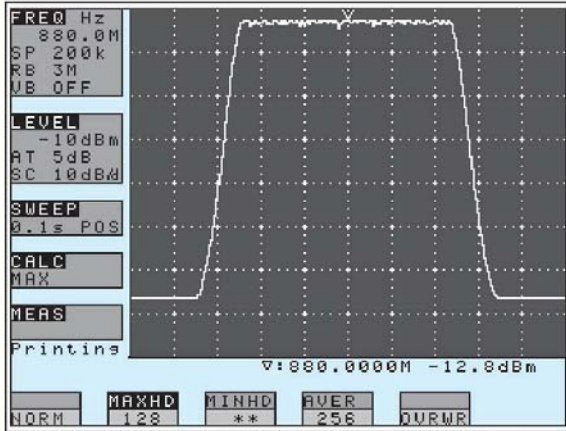
Min hold

The update spectrum data is compared with that of last time for each point of the X-axis, and the smaller one is retained and displayed. The number of times of sweep can be set in the range from 2 to 1024 times by steps, which is a power of 2, or by infinite.
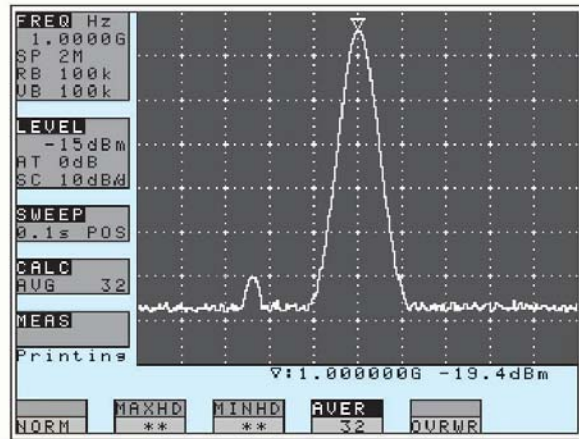
Over write

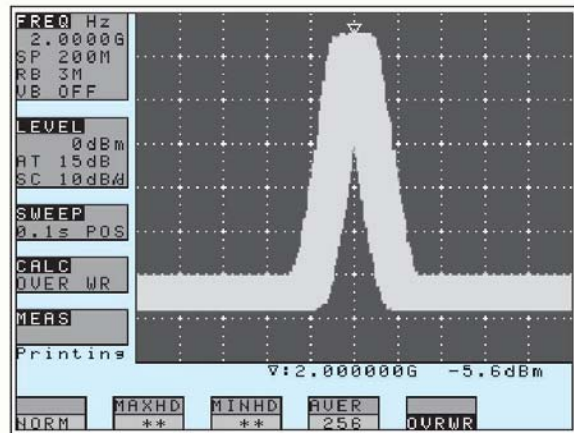The image on the screen is not cleared for each sweep, and overwriting display is executed. It is, therefore, possible to observe the process of changes in the signal.

● AC Adaptor

BC 2650

● Ni-MH battery

BP 2650

● Soft carrying case

LC 2650

● Accessory
pouch

● Fuse

● Operating
manual

Optional accessories   2650

● Dipole antenna

AN 301 AN 302 AN 303 AN 304 AN 305

● Magnetic field pole

PR 26M

(with dedicated double
shielded coaxial cable)

● Coaxial adaptor
kit

CT 2701

● SMA to BNC
Connector

AD 26

● PC software

Ak 2650

● SMA coaxial cable
DC to10GHz(VSWR<1.5)
Cable Terminations are
SMA(P) to see below

CC 301: 1.6 ft	SMA(P)
CC 302: 3.2 ft	SMA(P)
CC 303: 4.92 ft	SMA(P)
CC 304: 6.5 inches	N(J)
CC 305: 6.5 inches	N(P)
CC 306: 6.5 inches	BNC(J)
CC 307: 6.5 inches	BNC(P)

● Printer   PT 2650

● Roll paper for printer
PX 2650

(with AC adaptor
4 pcs of batteries
a roll paper)

Specifications for optional accessories   2650

■ Magnetic Field Probe Model PR 26M

Items	Specifications
Frequency Range	10MHz to 3GHz
Space Resolution	approx. 0.25mm (depending on objects)
Dimensions	Outside: 12Δ x 135mm
	Probe tip: 2mm (W) x 1mm (T)
Connector	SMA(P)

■ Printer

Items	Specifications
Printing method	Thermal serial dot method
Paper	80mm width thermal paper
Power source	internal: alkaline battery (4pcs)
	External: DC6V/1.5A
Dimensions	(WxHxD)134 x 58 x 180mm
Weight	approx. 550g (mainframe only)

■ Dipole Antennas (antenna gain and VSWR are specified at a center of frequency range)

Items	AN 301	AN 302	AN 303	AN 304	AN 305
Frequency Range	0.8 to 1GHz	1.25 to 1.65GHz	1.7GHz to 2.2GHz	2.25GHz to 2.65GHz	390 to 410MHz
Antenna Gain	>1dBi	>1dBi	>1dBi	>1dBi	>1dBi
VSWR	<1.5	<1.5	<1.5	<1.5	<1.5
Dimensions	7.5Δ x 250mm	7.5Δ x 250mm	7.5Δ x 250mm	7.5Δ x 250mm	7.5Δ x 250mm
Weight (approx.)	20g	20g	20g	20g	20g

■ Frequency Section

Frequency range   50kHz to 3.3GHz

Center frequency

Setting resolution	100kHz
	(Allows rotary encoder, numeric key and function key)
Accuracy	within ±(30+100T)kHz±1dot T : Sweep time (s)
	(frequency span: 200kHz to 10MHz, RBW : 30kHz, 23 ±5°C)
	within ±(100+700T)kHz±1dot T : Sweep time (s)
	(frequency span : 20MHz to 3.3GHz, RBW : 100kHz, 23 ±5°C)
RBW frequency error	within ±6% of RBW (RBW : 3kHz, 30kHz) within ±30% of RBW (RBW : 100kHz to 3MHz)

Frequency span

Setting range	0Hz (zero span), 200kHz to 2GHz (1-2-5step) and 3.3GHz (full span)
Accuracy	within ±3% ±20TkHz ±1dot (Frequency span : 200kHz to 10MHz, 23 ±5°C)
	within ±3% ±200TkHz ±1dot (Frequency span : 20MHz to 3.3GHz, 23 ±5°C) T : Sweep time (s)
Display resolution	Frequency span/250
	Frequency span/1000 (only the measurement by RS-232C communication)
Display dot number	251dots, 1001dots (only the measurement by RS-232C communication)
	(The unit displays data in 251 horizontal dots, but it internally captures the trace in 1001 dots)

Resolution bandwidth 3dB bandwidth

Setting range	3kHz to 3MHz (1-3step) and AUTO
Accuracy	within ±20%
Selectivity	1 : 12 (typical, 3dB : 60dB)

Video bandwidth	100Hz to 300Hz (1-3step), OFF and AUTO
SSB Phase noise	-90dBc / Hz (typical, 100kHz offset, RBW : 3kHz, VBW 100Hz,Sweep time : 0.3s)
Spurious response	less than -60dBc
Harmonics	less than -40dBc (50kHz to100MHz)
	less than -45dBc (100MHz to 3.3GHz)

■ Amplitude Section

Reference level

Setting range	+10 to -40dBm (1dB step)
Accuracy	within ±0.8dB ±1dot (center frequency : 100MHz, RBW : 3MHz, VBW : OFF, ATT : 0dB, 23 ±5°C)
Unit	dBm, dBV, dBmV, dBµV, dBµV/m, dBµA/m (dBµV/m and dBµA/m is used the measuring function)
Average noise level	-110dBm (typical, center frequency : 100MHz RBW : 3kHz, VBW : 100Hz)
Frequency Characteristic	within ±2.0dB ±1dot (50kHz to100MHz) within ±1.0dB ±1dot (100MHz to 3.3GHz)
Input impedance	50ohm
Input VSWR	less than 2.0
Input attenuator	
Operating range	0 to 25dB (1dB step), coupled with reference level
Switching error	within ±0.6dB
RBW switching error	within ±0.6dB
Display resolution	0.4dB (10dB/div), 0.08(2dB/div)
Display dot number	200dot
Display scale	
Scale	10dB / div, 2dB / div
Accuracy	within ±0.2dB / 2dB ±1dot
	within ±0.8dB / 10dB ±1dot
	within ±1.6dB / 70dB ±1dot
Input damage level	+20dBm (CW average power), 25VDC
Input connector	SMA (J)

■ Sweep Section

Sweep time	
Range	10ms to 30s (1-3step, frequency span : 0 to 2GHz) and AUTO
	30ms to 30s (1-3step, frequency span : full span) and AUTO
Accuracy	within ±0.1% ±1dot (frequency span : 0 to 2GHz)
	within ±1.5% ±1dot (frequency span : full span)
Trigger mode	AUTO (frequency span : zero span)
Detection mode	Positive peak, Negative peak, Sample (when sweep time is 10ms or 30ms, only Sample can be set)

■ Functions

Marker	NORM : displays frequency (7 digits max) and level (4 digits max) at marker point.
	DELTA : displays difference frequency and level between 2 markers.
Peak search	NORM : searches a peak point within 10div. Available NEXT peak (10max).
	ZONE : searches a peak point within a zone designated by center and width. Marker moves to a peak point each sweep.
Calculation	NORM, MAX HOLD, MIN HOLD, AVERAGE, OVER WRITE
	* MAX/MIN HOLD : 2 to 1024 times, AVERAGE : 2 to 256
Measuring	Channel power, Adjacent channel power, Occupied frequency bandwidth, Electric field strength (needs optional antenna), Magnetic field strength (needs optional magnetic field probe) measurement.
AUTO tuning	When pressing AUTO TUNE key, the maximum level spectrum within 3.3GHz bandwidth is adjusted to center, and reference level, RBW, VBW and sweep time are adjusted to optimum values.
Save / Load	
Save	Saves 100 traces and 100 setups
Load	Loads 1 trace and 1 setup

■ General

Communication	
Interface	RS-232C
Baud rate	2,400 to 38,400bps
Hard copy	Allows direct hard copy with an optional printer
Display	
Display	LCD
Backlight	CFL backlight
Resolution	320 (H) _ 240 (V) dots
Power source	
Battery	Ni-MH Battery (included)
External DC	Pin jack, DC5V / 4A (BC 2650 included)

■ Other

Operating temperature	0 to 40°C (Guaranteed at 23 ±10°C, without soft carrying case)
Operating humidity	less than 40°C / 80%RH (Guaranteed at less than 33°C / 70%RH,without soft carrying case)
Storage temperature	-20 to 60°C, less than 60°C / 70%RH
Dimensions	(WxHxD) 6.4 x 2.75 x 10.25 (162 _ 70 _ 260 mm)
Weight (approx.)	3.75 lb. (1.7kg) included battery
	3.3 lb.(1.5kg) without battery

Specifications subject to change without notice