

# Spectrum Analyzers

## 3280 Series 3 Hz to 26.5 GHz Spectrum Analyzers

**AEROFLEX**  
A passion for performance.



The NEW 3280 series spectrum analyzers...  
...performance far beyond the price tag.

- 3 Hz to 26.5 GHz frequency range
  - 3281 3 Hz to 3 GHz
  - 3282 3 Hz to 13.2 GHz
  - 3283 3 Hz to 26.5 GHz
- High level accuracy  $\pm 0.15$  dB up to 3 GHz
- Digital IF offers resolution bandwidths from 5 MHz to 1 Hz
- Low DANL of  $< -150$  dBm/Hz
- +18 dBm third order intermodulation performance
- Excellent LO phase noise  $< -115$  dBc/Hz, 1 GHz/10 kHz offset
- Large TFT, 26.4 cm (10.4 inch) color display
- Marker readout via up to 9 selectable markers
- Windows XP™ operating system
- Comprehensive data interfaces - CD ROM, USB, LAN
- Optional tracking generator - all models

The NEW 3280 series has been designed to achieve the best performance whilst keeping the cost to an affordable level. Ideally suited to design and production applications the 3280 series uses a Windows XP™ operating system and a large color TFT LCD, making the 3280 very easy to operate with exceptional connectivity. RF and microwave performance that employs the very latest digital

signal processing technology enables superb level accuracy and a wide choice of resolution bandwidths.

### Very Wide Signal Measurement Range

The combination of a DANL of  $< -150$  dBm/Hz and a 1 dB compression point of +5 dBm at 26.5 GHz provides for a large signal measurement range over a wide range of frequencies.

### Low LO Phase Noise

The Local Oscillator (LO) is fully synthesized and provides 1 Hz resolution. The LO phase noise is specified as  $< -115$  dBc/Hz at 10 kHz offset for an input frequency of 1 GHz. This low level allows evaluation of the phase noise of oscillators and systems and sub-systems.

### Large Color Display

The 10.4 inch TFT LCD display provides a comfortably large viewing area even with more than one window open. The display may be viewed as either full screen or dual window and up to 3 traces can be displayed in each display window. Up to 9 markers can be selected and a marker table can be displayed in the alternative window.

### Information Storage

The internal hard drive provides internal data storage and retrieval while external data storage is accomplished by use of either the built-in CD ROM drive or via the USB interface.

### Interfaces

The use of a Windows XP™ operating system allows for a wide range of interfaces. Included in the unit are: USB, LAN, Centronics parallel printer port, RS-232, IEEE 488 (GPIB) and VGA output. A wide range of printers can be installed and updated by the installation of drivers from the CD ROM supplied with the printer.

## Signal Demodulation

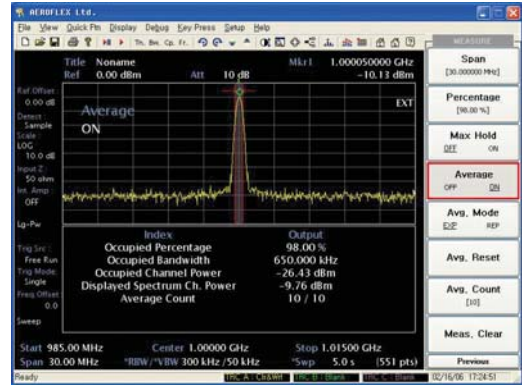
In addition to the standard demodulation feature of AM and FM the 3280 series also supports digital modulation standards through the use of an internal option module with appropriate software suites.

## Semi-Automated Measurements

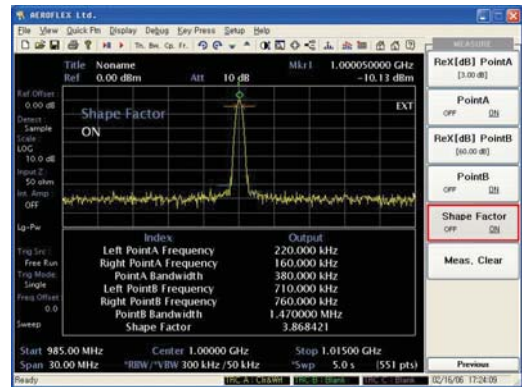
The evaluation of many of the common measurements can be simplified by the use of built-in measurement functions. These include: channel power, adjacent channel power, occupied bandwidth, spectrum emission mask, TOI measurement, harmonic distortion, X dB down and phase noise measurement.

## Optional Tracking Generator

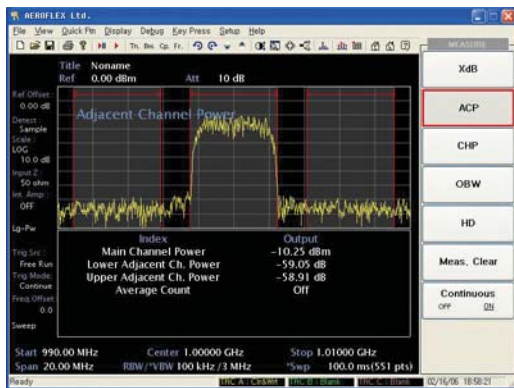
A tracking generator option is available for all three frequency models. The tracking generator has a specified frequency range of 9 kHz to 3 GHz and a level range from 0 dBm down to -70 dBm with 0.1 dB resolution. The tracking generator can be used to make high dynamic range measurements on components and devices, particularly filters. A normalize function is available to allow the markers to display relative flatness/frequency response.



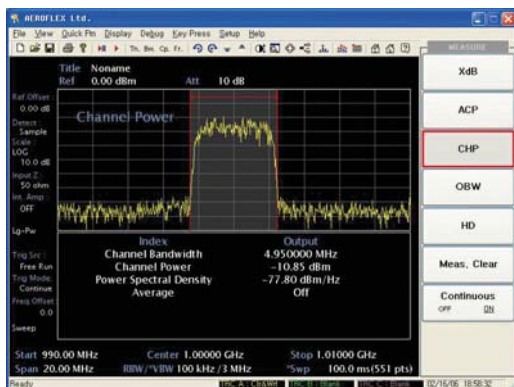
Occupied Bandwidth



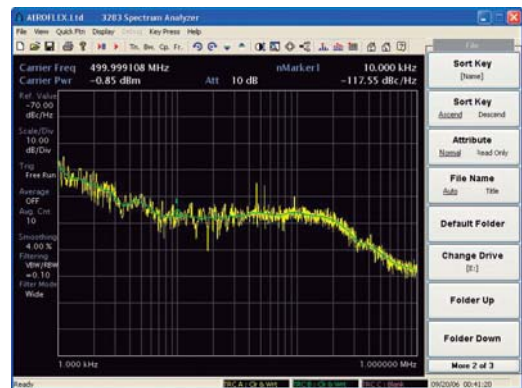
X dB down



Adjacent Channel Power



Channel Power



Phase noise

# SPECIFICATION

## FREQUENCY

### Frequency Range

DC coupled 3 Hz ~ 3 GHz / 13.2 GHz / 26.5 GHz  
AC coupled 10 MHz ~ 3 GHz / 13.2 GHz / 26.5 GHz

### Resolution

1 Hz

### Frequency Reference

Temperature Drift 0°C ~ 50°C ± 0.1 ppm  
Aging per year ± 0.3 ppm

### Frequency Readout

Marker resolution depending on span and measurement points (1 Hz minimum)

### Accuracy

± (marker frequency \* reference error + 0.5% span + 5% RBW + 0.5 \* horizontal resolution)

Horizontal resolution is span / (sweep points - 1)

### Frequency Counter

Resolution 1 Hz / 10 Hz / 100 Hz / 1 kHz

### Accuracy

± (reference frequency accuracy \* marker frequency + counter resolution ± 1 LSB) + 0.5 \* last digit

Sensitivity (for spans < 3 MHz)

<-60 dBm for frequencies >2 MHz and <3 GHz  
<-55 dBm for frequencies >3 GHz and <13.2 GHz  
<-50 dBm for frequencies >13.2 GHz and <26.5 GHz

## FREQUENCY SPAN

### Range

0 Hz (Zero Span), 10 Hz ~ 3 GHz, 13.2 GHz, 26.5 GHz

### Resolution

1 Hz

### Accuracy

±1%

### Sweep

Zero span 1 ms to 2000 sec, ± 0.5 %  
Span = 10 Hz, 5 ms to 2000 sec, ± 0.5 % nominal

### Sweep Points

Number of points

3 to 8192 (Span = 0 Hz)  
101 to 8192 (Span ≥10 Hz)

### Span Trigger

≥10 Hz  
Source external, line, video, free run, RF burst  
Offset 1 μs to 500 ms  
Span = 0 Hz  
Source external, line, video, free run, RF burst  
Offset -150 ms to +500 ms

### Spectral Purity

SSB phase noise, dBc/Hz at offset:

### CW Freq Frequency Offset

|          | 100 Hz | 1 kHz | 10 kHz | 100 kHz | 1 MHz |
|----------|--------|-------|--------|---------|-------|
| 10 MHz   | <-78   | <-102 | <-113  | <-113   | <-135 |
| 100 MHz  | <-76   | <-110 | <-113  | <-113   | <-135 |
| 1 GHz    | <-76   | <-100 | <-113  | <-113   | <-136 |
| 3 GHz    | <-68   | <-98  | <-110  | <-111   | <-135 |
| 6 GHz    | <-60   | <-83  | <-107  | <-110   | <-135 |
| 13 GHz   |        |       |        |         |       |
| 20 GHz   |        |       |        |         |       |
| 26.5 GHz |        |       |        |         |       |

|                         |                         |
|-------------------------|-------------------------|
| At 1 GHz: 100 Hz offset | < -76 dBc/Hz            |
| 1 kHz offset            | < -97 dBc/Hz            |
| 10 kHz offset           | < -115 dBc/Hz (Typical) |
| 100 kHz offset          | < -115 dBc/Hz (Typical) |
| 1 MHz offset            | < -136 dBc/Hz           |
| 10 MHz offset           | < -144 dBc/Hz           |

### Residual FM

Accuracy, <10 \* N Hz p-p in 1 sec

### Resolution Bandwidth (RBW)

3 dB bandwidths 30 Hz to 5 MHz in a 1-2-3-5 sequence  
Bandwidth accuracy:

500 Hz to 500 kHz filters ± 1.5 %  
1 MHz to 5 MHz filters ± 6 %

Shape factor - 60 dB / - 3 dB < 5 (500 Hz to 5 MHz filters)

Bandwidth switching uncertainty at 100 MHz CF reference to 5 kHz  
RBW ± 0.05 dB nominal

### FFT Filters

3 dB bandwidths 1 Hz to 300 Hz, in 1-2-3-5 sequence  
Bandwidth accuracy < 1 %, nominal  
Shape factor: - 60 dB / - 3 dB < 4.5, nominal

### Video Bandwidth (VBW)

1 Hz to 3 MHz and none in a 1-2-3-5 sequence

### Amplitude

Display range, DC coupled  
DANL to + 30 dBm

### Maximum Input Level

DC (AC coupled) ±50 V DC (Option)  
DC (DC coupled) 0 V

CW RF power +30 dBm  
Preamp on +20 dBm

### 1 dB Compression Point

0 dB RF attenuation  
0 dBm 100 MHz to 3 GHz  
-5 dBm up to 26.5 GHz  
Preamp on - 22 dBm at 1 GHz

### Third-Order Intermodulation Distortion (TOI)

For two tones of -30 dBm tones at the input mixer with a tone separation of >100 kHz  
+15 dBm from 100 MHz to 26.5 GHz, +18 dBm (Typical)

### Second Harmonic Intercept (SHI)

with - 30 dBm at the input  
+ 30 dBm for frequencies <100 MHz  
+ 40 dBm for frequencies 100 MHz to 1.5 GHz  
+ 80 dBm for frequencies 1.5 GHz to 26.5 GHz

## Displayed Average Noise Level (DANL)

0 dB RF attenuation, RBW 1 Hz, average detector, 50 Ohms termination.

|                     |                         |
|---------------------|-------------------------|
| -90 dBm/Hz nominal  | from 3 Hz to 1 kHz      |
| -100 dBm/Hz nominal | from 1 kHz to 10 kHz    |
| -120 dBm / Hz       | from 10 kHz to 100 kHz  |
| -125 dBm/Hz         | from 100 kHz to 300 kHz |
| -132 dBm/Hz         | from 300 kHz to 500 kHz |
| -137 dBm/Hz         | from 500 kHz to 700 kHz |
| -142 dBm / Hz       | from 700 kHz to 10 MHz  |
| -151 dBm / Hz       | from 10 MHz to 1 GHz    |
| -147 dBm / Hz       | from 1 GHz to 2 GHz     |
| -146 dBm / Hz       | from 2 GHz to 6.4 GHz   |
| -143 dBm / Hz       | from 6.4 GHz to 18 GHz  |
| -138 dBm / Hz       | from 18 GHz to 22 GHz   |
| -136 dBm / Hz       | from 22 GHz to 24 GHz   |
| -133 dBm / Hz       | from 24 GHz to 26.5 GHz |

## Response to Unwanted Signals

Image frequency <-70 dBm with -10 dBm at the input  
Intermediate frequency <-70 dBm with -10 dBm at the input

Residual responses (input terminated, 0 dB attenuation)  
<-95 dBm from 1 MHz to 6.4 GHz  
<-95 dBm typical from 6.4 GHz to 26.5 GHz

Other input related spuri  $\leq$  -60 dBc with -30 dBm at the input

## Amplitude Scale

Log Scale

0.1 to 1 dB /div in 0.1 dB steps  
1 to 20 dB / div in 1 dB steps  
Linear scale 10 divisions

## Level Units

dBm, dB $\mu$ V, dBmV, dBpW (log level display)  
 $\mu$ V, mV, pW, nW (linear level display)

## RF Input Attenuator

Range 0 dB to 55 dB in 5 dB steps

Switching Accuracy  $\pm$  0.5 dB at 100 MHz (3281)  
 $\pm$  0.5 dB at <13.2 GHz (3282, 3283)  
 $\pm$  0.8 dB from 13.2 GHz to 26.5 GHz (3282, 3283)

## Reference Level

Logarithmic range -170 dBm to +30 dBm, 0.1 dB steps

Linear range 7.07 nV to 7.07 V in 1 % steps

Accuracy  $\pm$ 0.15 dB at 0 dBm ref level

## Traces

Number of traces: 3

Trace detectors : Normal, peak, sample, negative peak, log power  
average, RMS, average and voltage average

Trace Functions : Clear / Write, Max Hold, Min Hold, View, Blank,  
Average

## Frequency Response

With 10 dB input attenuation, preselector centering applied, preamp off

|              |                          |
|--------------|--------------------------|
| $\pm$ 0.5 dB | from 1 MHz to 3.0 GHz    |
| $\pm$ 1.0 dB | from 3.0 GHz to 6.4 GHz  |
| $\pm$ 1.5 dB | from 6.4 GHz to 13.2 GHz |
| $\pm$ 2.0 dB | from 13.2 GHz to 22 GHz  |
| $\pm$ 2.5 dB | from 22 GHz to 26.5 GHz  |

Preamp on  $\pm$ 1.0 dB from 1 MHz to 3.0 GHz

## Display Non-Linearity

Logarithmic level display

$\pm$  0.1 dB total for an input mixer level of  $\leq$ -20 dBm  
 $\pm$  0.13 dB total for mixer levels between -20 dBm and -10 dBm

## Linear Level Display

5 % of reference level

Bandwidth switching uncertainty 10 kHz RBW reference  $\pm$ 0.05 dB

## Demodulation Audio output

AM & FM, loudspeaker, phone jack

## INPUTS AND OUTPUTS - FRONT PANEL

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### RF INPUT

Type N female, 50  $\Omega$  (3.0 GHz, 13.2 GHz)

APC 2.92 mm, 50  $\Omega$  (26.5 GHz)

VSWR with >10 dB input attenuation

<1.5:1 at 10 MHz to 3 GHz

<1.8:1 at 3 GHz to 13.2 GHz

<2.0:1 at 13.2 GHz to 26.5 GHz

### TRACKING GENERATOR OUTPUT (OPTIONAL VERSION, 328X/1)

#### Connector

Type N female, 50  $\Omega$

#### Frequency Range

9 kHz to 3.0 GHz

#### Output Level Range

0 dBm to -70 dBm

#### Output Level Resolution

0.1 dB

#### Level Accuracy

$\leq$   $\pm$  1.0 dB

#### Level Flatness at -10 dBm - Before Normalization

9 kHz to 100 kHz  $\leq$   $\pm$  4.0 dB

100 kHz to 3 GHz  $\leq$   $\pm$  2.0 dB

#### Level Flatness at -10 dBm - After Normalization

9 kHz to 3 GHz  $\leq$   $\pm$  1.0 dB

#### Spurious Output Levels

Harmonics  $\leq$ -15 dBc

Non-Harmonics  $\leq$ -30 dBc

Leakage Signal  $\leq$ -100 dBm

#### Output VSWR

$\leq$ 1.5:1 at -10 dBm output level

## ADDITIONAL INPUTS AND OUTPUTS

### 1st LO Output (for external mixer option)

SMA female, 50  $\Omega$  nominal

Frequency 3321.4 ~ 6821.4 MHz

Level +10 dBm, nominal

### 2nd IF Input (for external mixer option)

SMA female, 50  $\Omega$  nominal

Frequency 421.4 MHz

Level -20 dBm

### Probe Power Supply

+15 V, -12 V, GND

### Cal Output

BNC female, 50  $\Omega$  nominal

Frequency 100 MHz  
Level -20 dBm  $\pm$ 1.0 dB

#### Audio Output

Front panel phone jack

#### USB 2.0 Interface

Front panel connector  
Type 1.1 or higher (2.0)

#### Mouse Connector

6-pin mini DIN connector  
PS2 compatible

#### External Keyboard Connector

6-pin mini DIN connector  
PS2 compatible

### INPUTS AND OUTPUTS - REAR PANEL

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#### 3rd IF Output

BNC female, 50  $\Omega$  nominal  
Frequency 21.4 MHz  
Bandwidth 16 MHz  $\pm$  Selected RBW  
Level +3 dBm nominal, Top of screen

#### 2nd IF Output

SMA female, 50  $\Omega$  nominal  
Frequency 421.4 MHz  
Bandwidth 40 MHz  
Level 0 dBm nominal, Top of screen

#### Ext Trigger Input

BNC female, 10 k $\Omega$  nominal  
Trigger level TTL nominal

#### Sweep Gate Output

BNC female  
Trigger level TTL nominal

#### Reference Frequency Output

BNC female  
Frequency 10 MHz  
Level +5 dBm, nominal

#### Reference Frequency Input

BNC female  
Frequency 10 MHz  
Required level -5 to +15 dBm nominal

#### GPIB

24 pin female connector  
GPIB is IEEE 488 and 488.2 compatible  
Command set SCPI 1997.0  
Interface functions  
SH1, AH1, T6, L4, SR1, RL1, PP0,  
DC1, C0, LEO, TEO

#### RS-232 Serial Interface

9 way D-type connector, male

#### LAN Interface

10/100 Base T, Connector RJ45

#### USB 2.0 Interface

2 rear panel connectors

#### Printer Interface

Parallel interface, 25 way female D-type connector

#### External Monitor Output

Standard VGA, 800 x 600 color output  
15 way high density D-type female connector

### GENERAL SPECIFICATIONS

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#### Display

Size 10.4" (26.4 cm) color TFT LCD  
Resolution 800  $\times$  600 pixels

#### Mass Memory

Hard disk

#### Power Supply

AC supply  
88 V to 135V AC, 45 to 66 Hz  
100 V to 135V AC, 360 to 440 Hz  
193 V to 269V AC, 45 to 66 Hz  
or 273 V to 381 V DC, automatically selected  
600 W maximum

#### ENVIRONMENTAL CONDITIONS

##### Rated Range of Use (MIL-PRF-28800F, Class 3)

Temperature 0°C to +55°C  
Humidity 5% to 95% at +30°C  
Altitude up to 4,600 meters (15,000 feet)\*\*\*\*

##### Conditions of Storage and Transportation (MIL-PRF-28800F, Class 3)

Temperature -40°C to +71°C  
Humidity 5% to 95% at +30°C  
Altitude up to 12,192 meters (40,000 feet)

##### Vibration and Shock (MIL-PRF-28800F, Class 3)

Vibration, sinusoidal MIL-PRF-28800F, Class 3  
Vibration, random 5 Hz to 500 Hz  
Shock 30G, half-sine shock pulse

#### Electromagnetic Compatibility

EN61326, 1997 + Appendix 1, 1998  
RFI suppression (EMC) EN 55011: 2001 Group 1 Class A

#### Safety

IEC / EN61010-1, 2001

#### DIMENSIONS AND WEIGHT

##### Dimensions (W x H x D)

430 mm  $\times$  222 mm  $\times$  467 mm (17 in  $\times$  8.7 in  $\times$  18.4 in)  
Without handles and feet

485 mm  $\times$  240 mm  $\times$  489 mm (19.1 in  $\times$  9.5 in  $\times$  19.2 in)  
With handles and feet in down position

##### Weight

3281 <18 kg (39.5 lb)  
3282, 3283 <19.5 kg (43 lb)

##### Recommended calibration interval

1 year

##### Standard Warranty

2 years





## ***VERSIONS, OPTIONS AND ACCESSORIES***

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*When ordering please quote the full ordering number information.*

### **Ordering**

| <b>Numbers</b> | <b>Versions</b>  |
|----------------|--|
| 3281/0         | 3 Hz to 3 GHz spectrum analyzer                            |
| 3281/1         | 3 Hz to 3 GHz spectrum analyzer with tracking generator    |
| 3282/0         | 3 Hz to 13.2 GHz spectrum analyzer                         |
| 3282/1         | 3 Hz to 13.2 GHz spectrum analyzer with tracking generator |
| 3283/0         | 3 Hz to 26.5 GHz spectrum analyzer                         |
| 3283/1         | 3 Hz to 26.5 GHz spectrum analyzer with tracking generator |

### **Supplied Accessories**

CD ROM operating manual

Mains supply lead

### **Accessories**

|           |   |
|-----------|---|
| 43129/189 | Standard GPIB cable                                 |
| 59999/170 | RF bridge 5 MHz to 3 GHz                            |
| 80011     | Connector adapter kit with cable                    |
| AC4250    | BNC to Type N adapter (75 $\Omega$ to 50 $\Omega$ ) |
| AC5008    | Type N DC block                                     |

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*Specifications are subject to change without prior notice.*

*\* After 30 days of continuous operation.*

*\*\* Valid for temperature range 20°C to 30°C, <0.6 dB for temperature range 5°C to 45°C.*

*\*\*\* Valid for temperature range 20°C to 30°C and span <1 GHz; add <0.5 dB for temperature range 5°C to 45°C or span >1 GHz.*

*\*\*\*\* Altitude, operating not to MIL-PRF-28800F, Class 3*



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