

Microwave 6810A Series Microwave Generators

AEROFLEX
A passion for performance.



Low Phase Noise Synthesized Source with 1Hz resolution

Features

- Models covering frequencies:
 - 10 MHz to 20 GHz
 - 10 MHz to 40 GHz
 - 10 MHz to 46 GHz
- Optional step attenuators
- CW, CW List and swept frequency and power modes of operation
- Optional trigger board
- Modular design for rapid service
- Built-in user level calibration
- Modulation: external FM standard, option generation of internal FM and pulse modulations

Synthesized Generator

The synthesized generator has low phase noise and 1 Hz frequency resolution.

VCOs are used for frequencies above 3 GHz and an integrated RF synthesizer for the 10 MHz to 3 GHz range. Internal filtering results in excellent harmonic performance of < -50 dBc (70 MHz to 24 GHz).

Optional step attenuators are available to set low output powers for amplifier or receiver testing.

In CW mode the generator can be used for local oscillator substitution. A power sweep is provided for amplifier gain compression testing.

When used with a scalar analyzer the generator provides a swept synthesized output for frequency characterization of components and systems.

Modulation

External FM can be applied by connecting an AF source to the rear panel modulation input. With the internal modulation generator option, a modulation generator provides frequency modulation of the source or generates pulse trains that can be applied to a pulse modulator to pulse modulate the source. Pulse trains can be generated as repeating single pulses or as complex multi-pulse patterns. An option for an internal pulse modulator is available, the pulse modulator can be driven with either the optional internal generator or from an external pulse generator connected to the rear panel input connector.

List Mode

Frequency list mode provides up to 1024 frequencies that can be entered into a list and output on receipt of a trigger command. The trigger modes comprise: internal continuous, internal single step, RS-232 control lines and external. The trigger sources can be from either: menu softkey, GPIB or RS-232 command (GET or *TRG) or a TTL trigger if the optional trigger board is fitted.

List mode can be enabled in either forward or reverse direction through the frequency list.

Several lists can be stored as instrument settings to internal memory or USB Flash Memory.

By using a 6230A or L series detector it is possible to perform a re-calibration of the source output level.

SPECIFICATION

SOURCE

Functionality

Synthesized CW Synthesized sweeper
 Frequency List mode CW Power sweep

External FM Modulation

Internal FM + Pulse Driver (Option 23)

Internal Pulse Modulator (Option 25)

Frequency Range

6813A 10 MHz to 20 GHz
 6815A 10 MHz to 46 GHz
 6815AR 10 MHz to 40 GHz

Resolution (Settable)

6813A 1 Hz to 20 GHz
 6815A 1 Hz to 46 GHz

CW Accuracy

(Frequency Standard error x Frequency) ± 10 Hz

Swept Accuracy (Typical)

300 µs Step Time	Frequency Settled Within
10 MHz to 3 GHz	<20 kHz
3 GHz to 46 GHz	<200 kHz
1 ms Step Time	Frequency Settled Within
10 MHz to 3 GHz	<1 kHz
3 GHz to 46 GHz	<10 kHz
10 ms Step Time	Frequency Settled Within
10 MHz to 3 GHz	<100 Hz
3 GHz to 46 GHz	<1 kHz

List Mode Step Time

<500 µs minimum step time per point
 10 MHz to 3 GHz <4 kHz
 3 GHz to 46 GHz <40 kHz

Levelled Power Range

6813A 10 MHz to 20 GHz	-10 to +10 dBm	
6815A 10 MHz to 8 GHz	-10 to +8 dBm	+10 dBm typ
8 GHz to 20 GHz	-10 to +5 dBm	+7 dBm typ
6815AR 20 GHz to 24 GHz	-10 to +4 dBm	+6 dBm typ
24 GHz to 40 GHz	-10 to 0 dBm	+3 dBm typ
40 GHz to 46 GHz	-10 to 0 dBm typ*	

* Excluding the effect of connector moding

6813A + Option 011 (70 dB Step Attenuator)
 10 MHz to 3 GHz -80 to +8 dBm
 3 GHz to 20 GHz -80 to +7 dBm
 6813A + Option 012 (90 dB Step Attenuator)
 10 MHz to 3 GHz -100 to +8 dBm
 3 GHz to 20 GHz -100 to +7 dBm

6815A/6815AR + Option 013 (70 dB Step Attenuator)
 10 MHz to 8 GHz -80 to +6 dBm +8 dBm typ
 8 GHz to 20 GHz -80 to +2 dBm +4 dBm typ
 20 GHz to 24 GHz -80 to +1 dBm +3 dBm typ
 24 GHz to 40 GHz -80 to -3 dBm 0 dBm typ

Note: 1) For option 002 (Field Replaceable connectors) guaranteed levelled output is reduced by 0.5 dB.

2) For option 025, (Internal Pulse Modulation) the guaranteed levelled output is reduced as detailed under the option specification

Settable Power Range*

-110 dBm to +20 dBm *dependant on attenuator option

Settable Power Resolution

0.01 dB

Power Sweep Range (from Maximum Levelled Power) Without Attenuator

>20 dB

Internal Levelling Accuracy at 0 dBm (no options fitted)

10 MHz to 3 GHz, ± 0.7 dB
 3 GHz to 24 GHz, ±1.0 dB
 24 GHz to 40 GHz, ±1.5 dB

Levelled Power Accuracy With Options 011, 012 and 013

10 MHz to 3 GHz < ±1 dB
 (± 0.3 dB or ± 2% of attenuator setting in dB whichever is greater)
 3 GHz to 24 GHz < ±1 dB
 (± 1 dB or ± 4% of attenuator setting in dB whichever is the greater)
 24 GHz to 40 GHz < ±1.5 dB
 (± 1 dB or ± 4% of attenuator setting in dB whichever is the greater)

Linearity (No Options Fitted) Over Levelled Power Range Relative to 0 dBm

10 MHz to 40 GHz < ±0.5 dB

Power Stability With Temperature (Typical)

10 MHz to 40 GHz < 0.1 dB/°C

Harmonics and Sub-Harmonics Over Levelled Power Range

Harmonics

<70 MHz, <-25 dBc
 70 MHz to 3 GHz, <-55 dBc
 3 GHz to 24 GHz, <-50 dBc
 24 GHz to 40 GHz, <-20 dBc

Sub-Harmonics

10 MHz to 3 GHz, <-60 dBc
 3 GHz to 20 GHz, none
 24 GHz to 40 GHz, <-40 dBc

Spurious Signals (Typical)

For carrier frequencies <375 MHz
 Offset:
 30 kHz to 150 kHz, <-50 dBc
 >150 kHz <-55dBc

For carrier frequencies >375 MHz
 Offset:
 30 kHz to 150 kHz, <-50 dBc
 >150 kHz <-60 dBc

Phase Noise <dBc/Hz in CW Mode

Phase Noise <dBc/Hz in CW mode - guaranteed

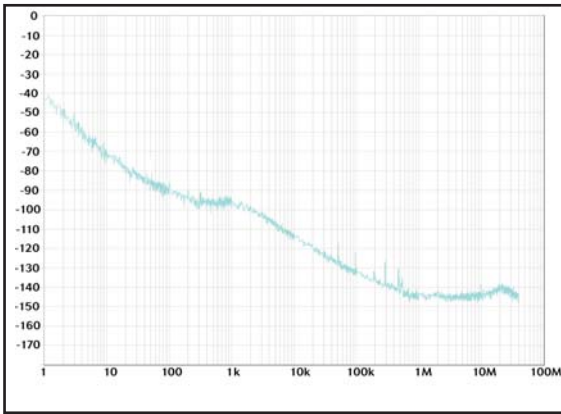
CW Freq Frequency offset

	1 kHz	10 kHz	100 kHz
0.25 GHz	-86	-95	-108
0.5 GHz	-98	-112	-134
1 GHz	-92	-106	-128
2 GHz	-86	-100	-122
4 GHz	-80	-92	-100
10 GHz	-72	-84	-90
20 GHz	-66	-78	-822
40 GHz	-63	-75	-79

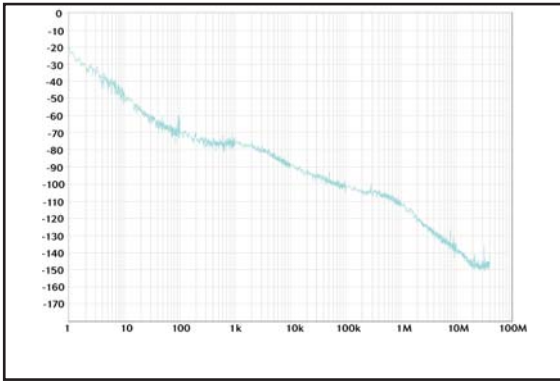
Typical Phase Noise <dBc/Hz in CW mode

CW Freq Frequency offset

(GHz)	100Hz	1kHz	10kHz	100kHz	1MHz
0.3	-88	-90	-101	-110	-135
0.6	-90	-99	-114	-130	-140
1	-87	-92	-109	-129	-140
3	-76	-86	-100	-120	-138
4	-75	-82	-97	-111	-120
6	-71	-80	-94	-101	-110
10	-68	-73	-87	-100	-110
20	-60	-74	-84	-93	-105
24	-58	-64	-76	-80	-103
40	-55	-63	-75	-79	-100



Measured Phase Noise at 1 GHz



Measured Phase Noise at 10 GHz

Source Match (Typical)

- 1 MHz to 3 GHz, <-15 dB
- 3 GHz to 20 GHz, <-10 dB
- 20 GHz to 40 GHz, <-8 dB

Output Connector

- 6813A Precision N type, female (standard) or Precision 3.5 mm, female (option)
- 6815A Precision 2.92 mm female or Field replaceable connectors (option)

Modulation

External Frequency Modulation

Peak deviation (1 V peak input)

- | | |
|-------------------|--------------------|
| 10 MHz - 375 MHz | 1 kHz to 5 MHz |
| 375 MHz - 750 MHz | 250 Hz to 1.25 MHz |
| 750 MHz - 1.5 GHz | 500 Hz to 2.5 MHz |
| 1.5 GHz - 3 GHz | 1 kHz to 5 MHz |
| 3 GHz - 46 GHz | 20 kHz to 1 MHz |

Accuracy (1 kHz modulating frequency) 20-400 kHz deviation
±3 % of indication ±1 Hz excluding residual FM

- 3 dB bandwidth, AC coupled mode
 - 10 MHz - 3 GHz <100 Hz to >1 MHz typical
 - 3 GHz - 46 GHz <100 Hz to >500 kHz typical

- 3 dB bandwidth, DC coupled mode
 - 10 MHz - 3 GHz DC to >1 MHz typical
 - 3 GHz - 46 GHz DC to >500 kHz typical

Option 023 Internal Modulation Generator

FM Source

Modulation signal: sinewave, 0.1 Hz to 500 kHz, resolution 0.1 Hz
Other specifications as for External Frequency Modulation except:
Accuracy (1 kHz modulating frequency) 20 - 400 kHz deviation ±5 %
of indication ±1 Hz excluding residual FM

Pulse Generator Source

- Modes** Single Pulse
- Pulse Pattern** Pulse patterns comprising up to 256 pulse width/PRI pairs can be set up, stored and recalled.
- Trigger Modes** External, Internal continuous
- Pulse Widths (PW)** 120 ns to >1 second
- Resolution** 120 ns
- Pulse Period (PRI)** 240ns to 7 seconds (PRF <1 Hz to 4.16 MHz)
- Resolution** 120 ns
- Pulse Delay** Zero to 100 ms where zero is <120 ns referred to trigger or sync pulse falling edge
- Resolution** 120 ns
- Sync Output** 120 ns pulse referred to trigger. Available at trigger socket

Inputs/Outputs

Trigger in/out Rear panel BNC connector provides either trigger input or sync output dependent upon trigger mode. TTL level

Options 025a & 025b Internal Pulse Modulator

Option 25a (6813A)

- Frequency Range** 50 MHz to 18 GHz
Usable to 20 GHz
- RF Output Range** The levelled power range is reduced by:
<3.5 dB up to 6 GHz
<4.5 dB up to 14 GHz
<5.0 dB up to 18 GHz
when pulse modulation is selected

RF Level Accuracy Adds ± 0.3 dB to the levelled power accuracy specification when pulse modulation is enabled and for powers of <-1 dBm

Source Harmonics (with Pulse Modulation enabled)

- 50 MHz - 2 GHz <-35 dBc
- 2 GHz - 20 GHz <-50 dBc

On/Off Ratio

- 50 MHz - 1 GHz >55 dB
- 1 GHz - 9 GHz >60 dB
- 9 GHz - 17 GHz >70 dB
- 17 GHz - 18 GHz >80 dB
- 18GHz - 20GHz >80 dB (typical)

Rise/Fall Times (measured at 10% and 90% of edge)

- Rise Time <8 ns (Typically < 5 ns)
- Fall Time <12 ns (Typically < 9 ns)

Option 25b (6815A and 6815AR)

- Frequency Range** 50 MHz to 40 GHz (46 GHz for 6815A)
- RF Output Range** The levelled power range is reduced by:
<5 dB up to 20 GHz
<8 dB up to 30 GHz
<9 dB up to 40 GHz
when pulse modulation is selected

RF Level Accuracy Adds ± 0.3 dB to the levelled power accuracy specification when pulse modulation is enabled and for output powers of <-3 dBm

Source Harmonics (with Pulse Modulation enabled)

50 MHz - 375 MHz	<-35 dBc
375 MHz - 24 GHz	<-50 dBc
24 GHz - 40 GHz	<-20 dBc

On/Off Ratio

50 MHz - 10 GHz	>60 dB
10 GHz - 26.5 GHz	>60 dB (typically > 70 dB)
26.5 GHz - 40 GHz	>60 dB (typically > 80 dB)

Rise/Fall Times (measured at 10% and 90% of edge)

Rise Time	<7 ns (Typically < 6 ns)
Fall Time	<11 ns (Typically < 10 ns)

Pulse Modulation Control

Modes

Pulse, Pulse CW

External (via rear panel BNC connector)
Internal (if Opt 23 fitted)

Control

Control of pulse modulation is:

Internal via soft key menu when the modulation generator option (Opt 023) is fitted or

External via the rear panel BNC Mod in/out socket.

Level is TTL, High = On, Low = Off.

When pulse mod Off is selected the output is the selected CW output level.

Pulse CW In both internal or external modes, allows setting of output level in the 'On' condition for reference or calibration.

FREQUENCY STANDARD

Internal 10 MHz OCXO

Drift

± 5 in 10^8 over 0 to 55°C

Ageing

± 2 in 10^7 per year (OCXO)

External Frequency Standard

1 MHz or 10 MHz, Connector: BNC

REAR PANEL CONNECTORS

RS-232

9 way D-type connector, male, Baud rate 300 to 9600

GPIB Interface

GPIB is IEEE 488.1 and 488.2 compatible.

Frequency Standard In/Out BNC

1 MHz or 10 MHz input and 10 MHz output selectable from front panel

Mod In/Out BNC

Mod in/out

Rear panel BNC connector, TTL level. Impedance approx 100 Ω

External Monitor

Standard VGA, 640 by 480 color output, 15 way high density D-type female connector

Voltage Output

Auxiliary 9-pin connector. Settable for 0 to 10 V ramp, fixed voltage

External Levelling Input

Input voltage range: 0 to +1 V, Connector: BNC (f)

TRIGGER BOARD OPTION 24

External Trigger Input

Connector: BNC (f)

TTL input to trigger sweep in frequency list mode, Connector: BNC (f)

Lock Output

Connector: BNC (f)

TTL output indicating source locked

GENERAL FEATURES

Display

Color active matrix TFT liquid crystal display with 16.5 cm (6.5") visible diagonal

Data Storage and Firmware Upgrade

USB Flash Memory

Weight – Model and Option Dependent

16 kg (35 lb)

Size (Not including front handles)

230 mm H x 430 mm W x 570 mm D (9" H x 17" W x 22" D)

Power Supply

Auto-sensing 90 V to 265 V, 45 Hz to 65 Hz AC. Plus 90 V to 110 V, 400 Hz AC. Consumption 150 W

Rated Range of Use

Temperature	6813	0 to +50°C
	6815	+5°C to +45°C
Humidity	Up to 93% RH at +40°C	

Conditions of Storage and Transportation

Temperature	-40 to +71°C
Humidity	Up to 93% RH at +40°C
Altitude	Up to 4570 m (15000 ft)

ELECTROMAGNETIC COMPATIBILITY

Conforms to the protection requirements of EEC Council directive 2004/108/EC.

Conforms to the limits specified in the following standards:

IEC/EN61326-1 : 2006

RF Emission Class A, Immunity table 3.

The instrument is intended for the use in industrial environments. It may not be possible to ensure electromagnetic compatibility in other environments because of conducted or radiated disturbances.

SAFETY

Conforms with the requirements of EEC Council Directive 2006/95/EC (as amended) and product standard IEC/EN61010-1 : 2001 + C1 : 2002 + C2 : 2003 for class 1 portable equipment and is for use in a pollution degree 2 environment. The instrument is designed to operate from an installation category 2 supply.

VERSIONS AND OPTIONS

When ordering please quote the full ordering number information.

Ordering Numbers

Versions

6813A	10 MHz to 20 GHz Generator
6815A	10 MHz to 46 GHz Generator
6815AR	10 MHz to 40 GHz Generator

Supplied Accessories

46886/067	CD-ROM containing:
46892/920	6820A/6840A Series Operating Manual
46892/922	6810A 6820A/6840A Series Getting Started Guide
46892/921	6820A/6840A Series Remote Operating Manual
46892/931	6810A Series Operating/Remote Programming Manual

43123/076	AC Supply Lead
37591/755	Front Panel Cover

Options

002	Field Replaceable Precision N (f) or 3.5 mm (f) RF Connectors (6813A), 2.92 mm (f) 6815A, 6815AR
011	20 GHz 70 dB Step Attenuator (only available for 6813A)
012	26.5 GHz 90 dB Step Attenuator (only available for 6813A)
013	40 GHz 70 dB Step Attenuator (only available for 6815A)
023	Internal Modulation
024	Trigger Board
025	Internal Pulse Modulator (Opt 25a 6813A), (Opt 25b 6815AR)

Note : All specifications quoted are for operation at calibration temperature $\pm 3^{\circ}\text{C}$.

Specifications involving Type N connectors above 18 GHz are not traceable to national standards as these do not exist at present.

Specifications involving 2.92 mm connectors above 40 GHz are not traceable to national standards as these do not exist at present.

Typical specifications are non-warranted.

ACCESSORIES

6230A/L SCALAR DETECTORS

Accessories for level calibration

6230A series Standard Detectors (-65 dBm to +20 dBm) typical

ACCESSORIES

Miscellaneous Electrical Cables

43129/189	GPIB Cable
43139/042	BNC (m) to BNC (m) 1.5 m

Standard Microwave Cables

54351/022	0.5 m, 18 GHz, N (m) to N (m)
54351/025	0.5 m, 26.5 GHz, 3.5 mm (m) to 3.5 mm (m)
54351/027	0.5 m, 40 GHz, 2.92 mm (m) to 2.92 mm (m)

Attenuators

56534/901	Precision Fixed Coaxial Attenuator 3 dB DC to 18 GHz 5 W, N(m) to N(f)
56534/902	Precision Fixed Coaxial Attenuator 6 dB DC to 18 GHz 5 W, N(m) to N(f)
56534/903	Precision Fixed Coaxial Attenuator 10 dB DC to 18 GHz 5 W, N(m) to N(f)

56534/904	Precision Fixed Coaxial Attenuator 20 dB DC to 18 GHz 5 W, N(m) to N(f)
-----------	--

MISCELLANEOUS

46885/038	Rack Mount Kit for 6800/6800A Series
46880/122	Service Manual (consists of maintenance manual (printed) + operating manual (CD-ROM))
46882/931	6810A Series Operating/Remote Programming Manual (printed)
46882/922	6810A and 6820A/6840A Series Getting Started Guide (printed)
84501	Soft Carrying Case
46662/695	Flight Case
54152/001	3.5 mm Torque Wrench
54211/008	Compact Keyboard

For the very latest specifications visit www.aeroflex.com

CHINA Beijing

Tel: [+86] (10) 6539 1166
Fax: [+86] (10) 6539 1778

CHINA Shanghai

Tel: [+86] (21) 5109 5128
Fax: [+86] (21) 5150 6112

FINLAND

Tel: [+358] (9) 2709 5541
Fax: [+358] (9) 804 2441

FRANCE

Tel: [+33] 1 60 79 96 00
Fax: [+33] 1 60 77 69 22

GERMANY

Tel: [+49] 8131 2926-0
Fax: [+49] 8131 2926-130

HONG KONG

Tel: [+852] 2832 7988
Fax: [+852] 2834 5364

INDIA

Tel: [+91] 80 5115 4501
Fax: [+91] 80 5115 4502

KOREA

Tel: [+82] (2) 3424 2719
Fax: [+82] (2) 3424 8620

SCANDINAVIA

Tel: [+45] 9614 0045
Fax: [+45] 9614 0047

SPAIN

Tel: [+34] (91) 640 11 34
Fax: [+34] (91) 640 06 40

UK Cambridge

Tel: [+44] (0) 1763 262277
Fax: [+44] (0) 1763 285353

UK Stevenage

Tel: [+44] (0) 1438 742200
Fax: [+44] (0) 1438 727601
Freephone: 0800 282388

USA

Tel: [+1] (316) 522 4981
Fax: [+1] (316) 522 1360
Toll Free: 800 835 2352

As we are always seeking to improve our products, the information in this document gives only a general indication of the product capacity, performance and suitability, none of which shall form part of any contract. We reserve the right to make design changes without notice. All trademarks are acknowledged. Parent company Aeroflex, Inc. ©Aeroflex 2008.

www.aeroflex.com

info-test@eroflex.com



Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused.

Part No. 46891/330, Issue 1, 10/08