Microwave

IFR 6813/6815 Microwave Generator

Low Phase Noise Synthesized Source with 1Hz resolution

- Three models covering frequencies:
  10 MHz to 20 GHz
  10 MHz to 40 GHz
  10 MHz to 46 GHz
- Optional step attenuators
- Integrated FM option, external FM standard, swept, CW and CW list mode available
- Optional trigger board
- Modular design for rapid service
- Built-in user level calibration

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 <-55 dBc.

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. External FM can be applied by connecting an AF source to the rear panel. With the FM option, an internal generator provides frequency modulation of the source.

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

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 floppy disks.

By using a 6230A or L series detector it is possible to carry out level calibration.

SPECIFICATION

SOURCE

Functionality

Synthesized CW
Frequency List mode
External frequency modulation
Synthesized sweeper
CW Power sweep
Internal frequency modulation with Option 023

Frequency Range

6813	*10 MHz to 20 GHz*
6815	*10 MHz to 46 GHz*
6815R	*10 MHz to 40 GHz*

Resolution (Settable)

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

CW Accuracy

(Frequency Standard error x Frequency) ± 10 Hz

Swept Accuracy (Typical)

300 ms Step Time

10 MHz to 3 GHz	*<20 kHz*
3 GHz to 46 GHz	*<200 kHz*

1 ms Step Time

10 MHz to 3 GHz	*<1 kHz*
3 GHz to 46 GHz	*<10 kHz*

10 ms Step Time

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

6813	*10 MHz to 20 GHz*	*-10 to +10 dBm*	
6815	*10 MHz to 8 GHz*	*-10 to +8 dBm*	*+10 dBm typ*
	8 GHz to 20 GHz	*-10 to +5 dBm*	*+7 dBm typ*
6815R	*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*

6813 + Option 011 (70 dB Step Attenuator)

10 MHz to 3 GHz	*-80 to +8 dBm*
3 GHz to 20 GHz	*-80 to +7 dBm*

6813 + Option 012 (90 dB Step Attenuator)

10 MHz to 3 GHz	*-100 to +8 dBm*
3 GHz to 20 GHz	*-100 to +7 dBm*

6815/6815R + Option 013 (70 dB Step Attenuator)

10 MHz to 8 GHz	*-10 to +6 dBm*	*+8 dBm typ*
8 GHz to 20 GHz	*-10 to +2 dBm*	*+4 dBm typ*
20 GHz to 24 GHz	*-10 to +1 dBm*	*+3 dBm typ*
24 GHz to 40 GHz	*-10 to -3 dBm*	*0 dBm typ*

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

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

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*

Internal Modulation Generator Option 023 & 022 (Group Delay)

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*
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 ref 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 dependant upon trigger mode. TTL level*

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 ± 2% of attenuator setting in dB whichever is greater)

3 GHz to 24 GHz <±1 dB
(± 1 dB ± 4% of attenuator setting in dB whichever is the greater)

24 GHz to 40 GHz <±1.5 dB
(± 1 dB ± 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 24 GHz, <-55 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)

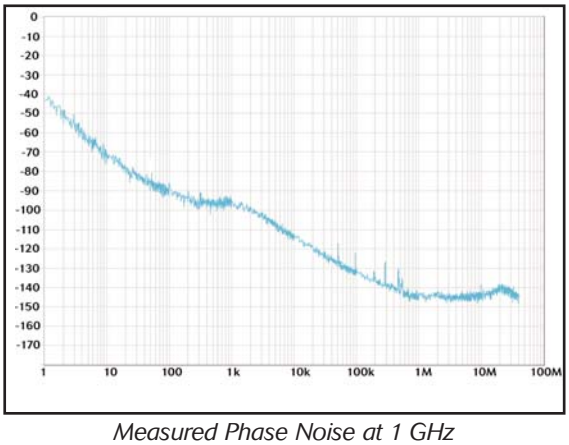
For carrier frequencies <375 MHz

Offset:	*30 kHz to 150 kHz, <-50 dBc*
	150 kHz to 1 MHz, <-55 dBc
	> 1 MHz, <-55 dBc

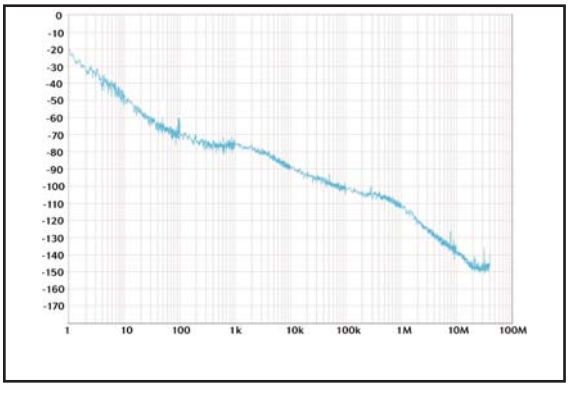
For carrier frequencies >375 MHz
Offset: 30 kHz to 150 kHz, <-50 dBc
150 kHz to 1 MHz, <-60 dBc
> 1 MHz, <-60 dBc

Phase Noise <dBc/Hz in CW mode

CW Freq (GHz)	Frequency offset 100 Hz	1 kHz	10 kHz	100 kHz	1 MHz
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

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

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

3.5" floppy disc drive, 1.44 Mb

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 with the protection requirements of the EEC Council Directive 89/336/EEC. Conforms with the limits specified in the following standards:
IEC/EN61326-1 : 1997, RF Emission Class B, Immunity Table 1, Performance Criteria B

SAFETY

Conforms with the requirements of EEC Council Directive 73/23/EEC (as amended) and the product safety standard IEC/EN 61010-1 : 2001 + C1 : 2002 + C2 : 2003 for class 1 portable equipment, for use in a Pollution Degree 2 environment. The instrument is designed to be operated from an Installation Category 2 supply.

VERSIONS AND OPTIONS

When ordering please quote the full ordering number information.

Ordering Numbers	Versions
6813	10 MHz to 20 GHz Generator
6815	10 MHz to 46 GHz Generator
6815R	10 MHz to 40 GHz Generator

Supplied Accessories

46882/662	Operating 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 (6813), 2.92 mm (f) 6815, 6815R
011	20 GHz 70 dB Step Attenuator (only available for 6813)
012	26.5 GHz 90 dB Step Attenuator (only available for 6813)
013	40 GHz 70 dB Step Attenuator (only available for 6815)
023	Internal Modulation
024	Trigger board

Complementary Product

6146	500 MHz to 18 GHz Pulse Modulator
6147	70 MHz to 40 GHz Pulse Modulator
54441/019	AC Power Supply for 6146 & 6147

Note : All specifications quoted are for operation at calibration temperature ±3°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
46880	Service Manual
46882/351	Maintenance Manual
84501	Soft Carrying Case
46662/695	Flight Case
54152/001	3.5 mm Torque Wrench
54211/008	Compact Keyboard

CHINA Beijing
Tel: [+86] (10) 6467 2761 2716
Fax: [+86] (10) 6467 2821

CHINA Shanghai
Tel: [+86] (21) 6282 8001
Fax: [+86] (21) 62828 8002

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 Burnham
Tel: [+44] (0) 1682 604455
Fax: [+44] (0) 1682 662017

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

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A passion for performance.

www.aeroflex.com
info-test@aeroflex.com

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