

Agilent E6831A GSM/GPRS/EGPRS Calibration Application

For the E6601A Wireless Communications Test Set

Data Sheet



The next generation of mobile phone manufacturing test

E6601A is the newest test set from Agilent Technologies, designed especially for high-volume, test-mode manufacturing. Combining industry-leading measurement speed, selectable formats, flexible licensing, and an integrated open Windows® XP PC, the E6601A helps you achieve the lowest cost of test in mobile phone manufacturing.

The E6601A and its available technology-specific software applications deliver industry leading measurement speed and accuracy for your mobile phone test needs.

The Agilent E6831A GSM/GPRS/EGPRS Calibration Application is a non-signaling application providing functionality optimized for measurements at the intensive calibration stage in the manufacturing of complex mobile phones. The E6831A offers a choice of perpetual, transportable, or term licenses allowing you to maximize asset utilization and reduce your cost per test.

The test set and its applications use emerging advancements such as fast device tune features to deliver fast, high-quality calibration. Because it's Agilent, you can be confident – it operates using trusted, proven measurement methodology ensuring measurement integrity that is never compromised.

E6601A Features

- CW, AM, FM, DSB-SC source modulation
- RF analyzer
- Spectrum monitor
- Transmitter power measurements
- Power versus time measurement
- Frequency error measurement
- Optional IQ capture waveform sampling
- Internal OCXO timebase
- Built-in open Windows XP PC
- Built-in help system
- Run test programs with internal or external PC
- GPIB, USB, and LAN connectivity and control

E6831A Features

Source modulation

- CW, amplitude, frequency, GSM

Power measurements

- Transmit power
- Power versus time

Spectral measurements

- Output RF spectrum

Modulation quality

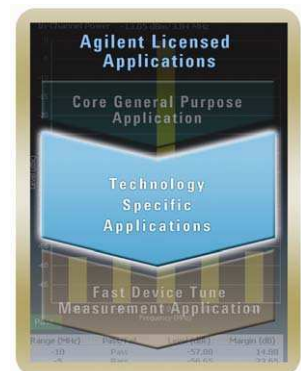
- Phase and frequency error

Fast calibration measurements

- Dynamic power
- Optional phase and amplitude versus time

Optional EGPRS capability

- 8PSK source modulation
- 8PSK power measurements
- 8PSK output RF spectrum
- 8PSK error vector magnitude



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Technical Specifications

These specifications apply to an E6601A mainframe and the E6831A GSM/GPRS/EGPRS Calibration Application firmware revision A.04 or higher. Only feature additions beyond the E6890A General Purpose Application are included in this document. Specifications describe the test set's warranted performance and are valid for the unit's operation within ± 10 °C of the last self alignment. All specifications are valid after a 30-minute warm-up period of continuous operation with valid self alignment. If the unit has been off for longer than 48 hours, a 48-hour warm-up period followed by self alignment is required.

Supplemental characteristics are intended to provide typical, but non-warranted, performance parameters that may be useful in applying the instrument. These characteristics are shown in *italics* and labeled as "typical." All units shipped from the factory meet these typical numbers at +25 °C ambient temperature without including measurement uncertainty.

GSM/GPRS/EGPRS RF Generator

Frequency ranges

GSM/GPRS/EGPRS cellular bands

GSM450	460 to 468 MHz
GSM480	488 to 496 MHz
GSM750	747 to 762 MHz
GSM850	869 to 894 MHz
RGSM	921 to 960 MHz
EGSM	925 to 960 MHz
PGSM or GSM900	935 to 960 MHz
DCS1800	1805 to 1880 MHz
PCS1900	1930 to 1990 MHz

Output level with GMSK or 8PSK modulation

Output level ranges

RF IN/OUT	-130 to 13 dBm, <i>typical over-range to -10 dBm</i>
RF OUT ONLY	-120 to -3 dBm, <i>typical over-range to 0 dBm</i>

Absolute level accuracy

($\leq \pm 10$ °C and ≤ 24 hours from last self alignment)

-108 to -13 dBm at RF IN/OUT	$< \pm 1.0$ dB, <i>typically $< \pm 0.5$ dBm</i>
-108 to -5 dBm at RF OUT ONLY	$< \pm 1.0$ dB, <i>typically $< \pm 0.5$ dBm</i>

Setting resolution 0.01 dB

Maximum applied reverse power

RF IN/OUT	+37 dBm (5 W) peak
RF OUT ONLY	+27 dBm (0.5 W) peak

GMSK modulation

Residual phase error	< 1 degree rms < 4 degrees peak
Frequency error	< 0.01 ppm + timebase accuracy, <i>typically < 0.005 ppm + timebase accuracy</i>
Burst amplitude flatness	Useful part of the burst $< \pm 0.3$ dB

8PSK modulation

Residual EVM	<i>Typically $< 1.5\%$ rms</i>
Frequency error	<i>Typically $< \pm 0.02$ ppm + timebase accuracy</i>
Origin offset suppression	<i>Typically > 45 dB</i>

GSM/GPRS/EGPRS RF Analyzer

Frequency ranges

GSM/GPRS/EGPRS cellular bands

GSM450	450 to 458 MHz
GSM480	478 to 486 MHz
GSM750	777 to 792 MHz
GSM850	824 to 849 MHz
RGSM	876 to 915 MHz
EGSM	880 to 915 MHz
PGSM or GSM900	890 to 915 MHz
DCS1800	1710 to 1785 MHz
PCS1900	1850 to 1910 MHz

Input level ranges

Average power	-40 to +33 dBm
Peak power	-40 to +37 dBm (5 W)

Amplitude capture range $< \pm 3$ dB

Self alignment validity $\leq \pm 10$ °C change and ≤ 30 days from last self alignment

Trigger setup

Delay	-2.31 to +2.31 ms
Sources (varies by measurement)	External, fall, immediate, rise

Power and Modulation Quality Suite

Includes transmit power, phase and frequency error, and power versus time measurements. Normal GMSK and 8PSK bursts or RACH bursts can be measured.

Amplitude capture range
With 1 dB overshoot $\lt; \pm 3 \text{ dB}$ of expected power

Frequency capture range
GMSK and 8PSK $\lt; \pm 100 \text{ kHz}$ of expected frequency

Burst synchronization
GMSK bursts only
(EGPRS off) Midamble, amplitude, none

GMSK and 8PSK bursts
(EGPRS on) Midamble

Transmit power measurement

Input level range
Average power -40 to +33 dBm

Measurement accuracy¹
With $\lt; 48$ hours warm-up before self alignment initiated
$\lt; \pm 0.6 \text{ dB}$, typically $\lt; \pm 0.3 \text{ dB}$
$\lt; \pm 0.7 \text{ dB}$, typically $\lt; \pm 0.3 \text{ dB}$

Measurement repeatability
Returning to same level and frequency, no temperature change and insignificant time change
Typically $\lt; \pm 0.05 \text{ dB}$

Modulation accuracy measurement

The measurement includes GMSK results of phase and frequency error, phase error versus bit, and demodulated bits. Also includes 8PSK results of rms and peak EVM, 95th percentile EVM, frequency error, origin offset, sample EVM histogram, EVM versus symbol, magnitude error versus symbol, phase error versus symbol, and demodulated symbols.

Input level range
Average power -15 to +33 dBm

Phase error accuracy
GMSK bursts $\lt; 1$ degree rms
$\lt; 4$ degrees peak

Frequency error accuracy
Normal GMSK bursts
Within cellular bands at $\lt; 1000 \text{ MHz}$ $\lt; \pm 5 \text{ Hz} + \text{timebase accuracy}$

Within cellular bands at $\geq 1000 \text{ MHz}$ $\lt; \pm 9 \text{ Hz} + \text{timebase accuracy}$, typically $\lt; \pm 6 \text{ Hz} + \text{timebase accuracy}$

RACH bursts
Within cellular bands at $\lt; 1000 \text{ MHz}$ $\lt; \pm 9 \text{ Hz} + \text{timebase accuracy}$, typically $\lt; \pm 6 \text{ Hz} + \text{timebase accuracy}$

Within cellular bands at $\geq 1000 \text{ MHz}$ $\lt; \pm 14 \text{ Hz} + \text{timebase accuracy}$, typically $\lt; \pm 6 \text{ Hz} + \text{timebase accuracy}$

8PSK bursts $\lt; \pm 10 \text{ Hz} + \text{timebase accuracy}$, typically $\lt; \pm 7.5 \text{ Hz} + \text{timebase accuracy}$

Residual EVM
8PSK bursts $\lt; 1\%$ rms

Sample EVM accuracy
8PSK bursts $\lt; 4\%$

Origin offset accuracy
Measured origin offset suppression 25 to 40 dB $\lt; \pm 1.5 \text{ dB}$

¹ Additional accuracy error when using RF OUT ONLY port is $\lt; \pm 0.1 \text{ dB}$.

Power versus time measurement

Input level range

Average power -15 to +33 dBm

Frequency capture range

GMSK bursts only (EGPRS off)
GMSK and 8PSK bursts (EGPRS on)

Linearity

Referenced to average power in the useful part of the burst with narrow bandwidth

Result -40 to +1 dB, < ±0.1 dB
input -15 to +33 dB

Result -60 to < -40 dB, input +4 to +33 dB
< ±0.5 dB

FM to AM ripple

Useful part of the GMSK burst (EGPRS off) < 0.2 dB peak-to-peak

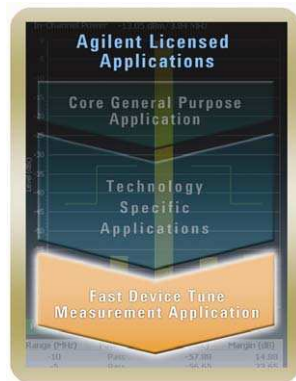
Noise floor (rms)

+10 dBm with narrow bandwidth *Typically > 76 dB*

Measurement bandwidths

Narrow 800 kHz over the useful part of a burst, 400 kHz on the rising and falling parts of a burst

Wide 1.6 MHz



Output RF Spectrum Suite

Includes ORFS due to modulation and ORFS due to switching measurements.

Input level range

Average power -10 to +33 dBm

Amplitude capture range

With 1 dB overshoot < ±3 dB of expected power

Frequency capture range

< ±200 Hz of expected frequency
GMSK bursts only (EGPRS off)
GMSK and 8PSK bursts (EGPRS on)

Output RF spectrum due to modulation

Dynamic range

≥ 600 kHz offsets *Typically < -70 dBc*

Measurement and filtering bandwidths

Five-pole, synchronously tuned 30 kHz RBW filter averaged over 40 bits with a video bandwidth of 30 kHz

Offsets measured

0 to 22 offsets ±1800 kHz

Output RF spectrum due to switching

Dynamic range

≥ 600 kHz offsets and 0 to +33 dBm *Typically < -70 dBc*

Measurement and filtering bandwidths

Five-pole, synchronously tuned 30 kHz RBW filter with peak hold during the whole frame, and a video bandwidth of 100 kHz

Offsets measured

0 to 8 offsets ±1800 kHz

Phase and amplitude versus time measurement

This measurement provides a means to characterize the magnitude and phase variations introduced by the nonlinearity of power amplifiers operating over a wide dynamic range. Phase, amplitude, and frequency results are returned for up to 512 measurement bursts.

Input level range	
CW signals	-40 to +33 dBm
Amplitude capture range	
Reference bursts	< ±3 dB of expected power
Frequency capture range	< ±100 kHz of expected frequency
Absolute accuracy²	
Reference burst transmit power from +10 to +33 dBm	< ±0.6 dB, <i>typically</i> < ±0.3 dB
Relative accuracy	
Transmit power relative to reference burst for measurement interval > 542.8 μs	
-30 to 0 dB below reference burst	< ±0.25 dB
-40 to < -30 dB below reference burst	< ±0.5 dB
-50 to < -40 dB below reference burst	< ±0.8 dB
Filter	300 kHz

Dynamic power measurement

Input level range	
Average power	-40 to +33 dBm
Amplitude capture range	
With 4 dB crest factor	< ±2 dB of expected power
Measurement accuracy¹	
+2 to -45 dB of expected power	< ±0.6 dB, <i>typically</i> < ±0.3 dB
+2 to -45 dB of expected power with < 48 hours warm-up before self alignment initiated	< ±0.7 dB, <i>typically</i> < ±0.3 dB
Measurement repeatability	
Returning to same level and frequency, no temperature change and insignificant time change	<i>Typically</i> < ±0.05 dB
Filters	1 kHz 30 kHz 100 kHz 300 kHz 640 kHz 1.23 MHz 3.84 MHz 5.0 MHz 8PSK estimated carrier power GSM Tx power W-CDMA mean power

² Additional accuracy error when using RF OUT ONLY port is < ±0.1 dB

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