2800-GSM

GSM Transmitter Modulation Quality Measurement Option

The 2800-GSM GSM Transmitter Modulation Quality Measurement Option measures whether a mobile phone transmitter or RFIC transmitter module conforms to the GSM standards for a modulated transmission. Verification that the transmitter modulates its input data properly ensures that a base station receiver can accurately demodulate the transmission and re-capture the original data. Thus, in addition to calibrating transmitter power output levels and ensuring that the transmissions are at the correct frequency, the Model 2800 with the 2800-GSM option can assess complete performance of a GSM mobile transmitter.

- **Performs all required measurements for GSM transmitters**
- **Outputs multiple time mask parameters for process control analysis**
- **Obtains frequency error, rms phase error, and peak phase error with one command**
- **Simplifies Output RF Spectrum analysis with Pass/Fail determination based on GSM standard maximum allowable spurious power levels**
- **Field-upgradable option**

Modulation Quality Measurements

The 2800-GSM option adds the following measurements to the 2800 RF Power Analyzer:

- Frequency error
- RMS phase error
- Peak phase error
- Time mask conformance
- Output RF Spectrum (ORFS) conformance

Frequency error determines the differential between the measured center frequency of a Gaussian Minimum Shift Keying (GMSK) transmitted signal and the frequency of the channel for which the device is programmed. This ensures that the transmission will be at the frequency that the base station has assigned to the device. The center frequency must be within 0.1ppm of the channel frequency.

The peak and RMS phase error measurements compare the measured phase of the transmitted data stream to the theoretical phase that the data stream should have based on the GMSK modulation scheme. RMS and Peak phase errors must be less than 5° and 20° respectively for accurate demodulation.

Time mask conformance tests that the power burst is properly limited to minimize spurious energy and to prevent interference with adjacent time slots. The power burst is compared with upper and lower limits defined by test standards for GSM mobile phones.

The output RF Spectrum test measures spurious power generated by the transmitter at a number of offsets from the center frequency of the transmission. Measurements are made at offsets out to 1800kHz from the center frequency of the transmission. Data is provided under two distinct conditions: spurious power due to the transitions of the power burst envelope and spurious power due to the modulation during the power burst.

All measurements are in compliance with the GSM test standards, standard 3GPP TS 05.05, V8.15.0.

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Ordering Information

2800-GSM
GSM Transmitter Modulation Quality Measurement Option

Accessories Supplied

2800-GSM Users Manual

Substantially Reduce Test Time of GSM Mobile Phones Using the Model 2800 RF Power Analyzer with the 2800-GSM Option

Increase device throughput in production by testing two devices at one time using the speed of a Model 2800 to perform all transmitter tests on a GSM mobile phone. A communication test set or a modulated source can perform the receiver tests. A transfer switch controlled by the 2800 can provide the RF switching to connect each device to either the 2800 or the receiver tester. A dual channel mobile phone power source, such as a 2306 Dual Channel Battery Simulator/Charger, and a Model 2015 Audio Analyzing DMM are the only additional instrumentation needed for a complete DC, audio, and RF test station. This configuration can be used to save 30% to 50% on production test times. A test system such as this can be used either at board level testing or at assembled phone testing. In addition to reducing test time, capital costs are substantially reduced. Furthermore the increased throughput could eliminate the need for a new test line which saves millions in capital expenditures for surface mount assembly machinery.

Let Keithley applications experts help cut test time and test costs in your facility.

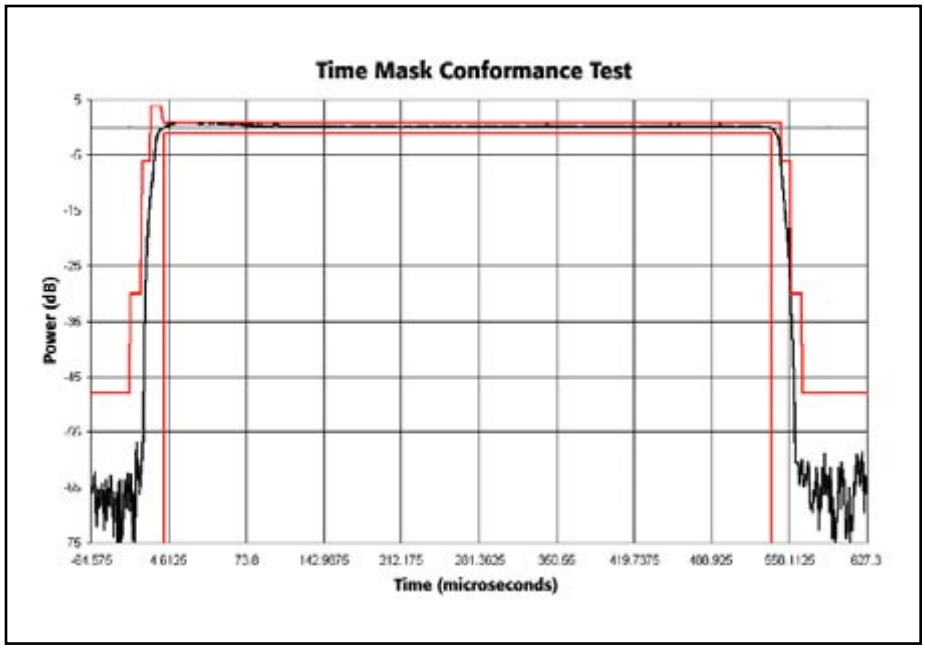

Figure 1. The 2800-GSM option can output the transmitter power burst and the time mask to a PC for analysis and troubleshooting.

APPLICATIONS

Production testing and automated environmental testing of:

- **Wireless phones**
- **Wireless-enabled PDAs**
- **RFIC power amplifiers**

Order the 2800-GSM with the 2800 or upgrade a 2800 with the 2800-GSM at any time.

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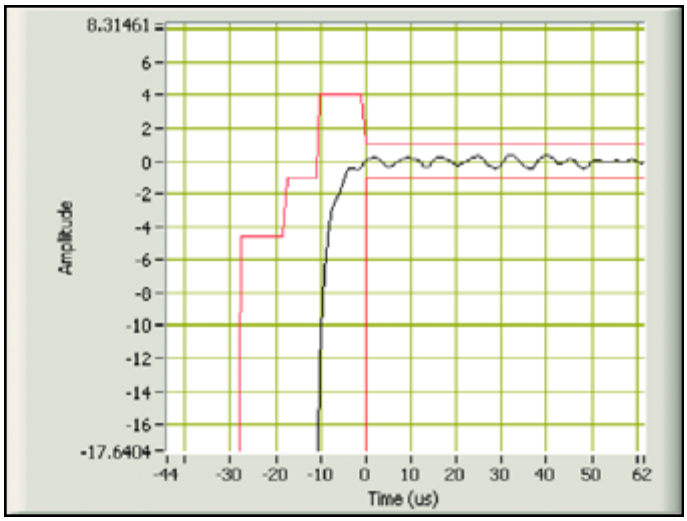
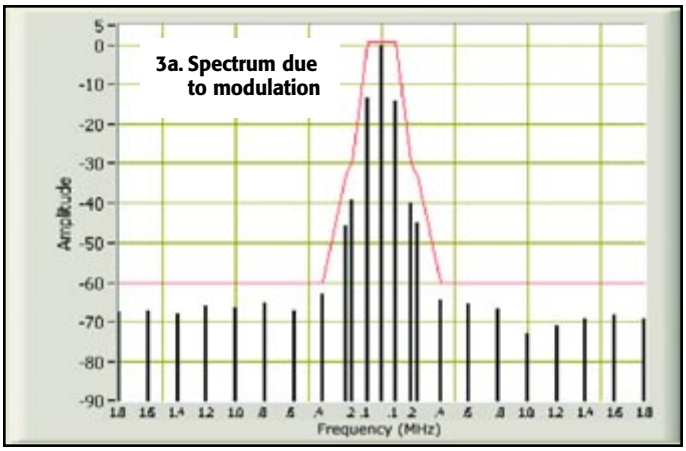


Figure 2. With all data points available, characteristics of the power burst relative to the mask can be studied.



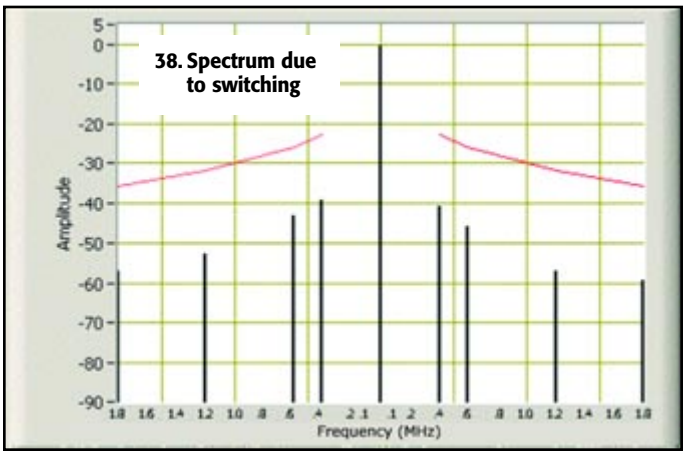


Figure 3: The 2800-GSM option computes and outputs the spurious power levels at all required frequency offsets of the spectrum due to modulation (Figure 3a) and the spectrum due to switching (Figure 3b).

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Figure 4. Use the Model 2800 with the 2800-GSM option as part of a high throughput/low cost GSM transmitter module, functional test system. The system shown characterizes the module's DC parameters, its power output, and its modulation quality.

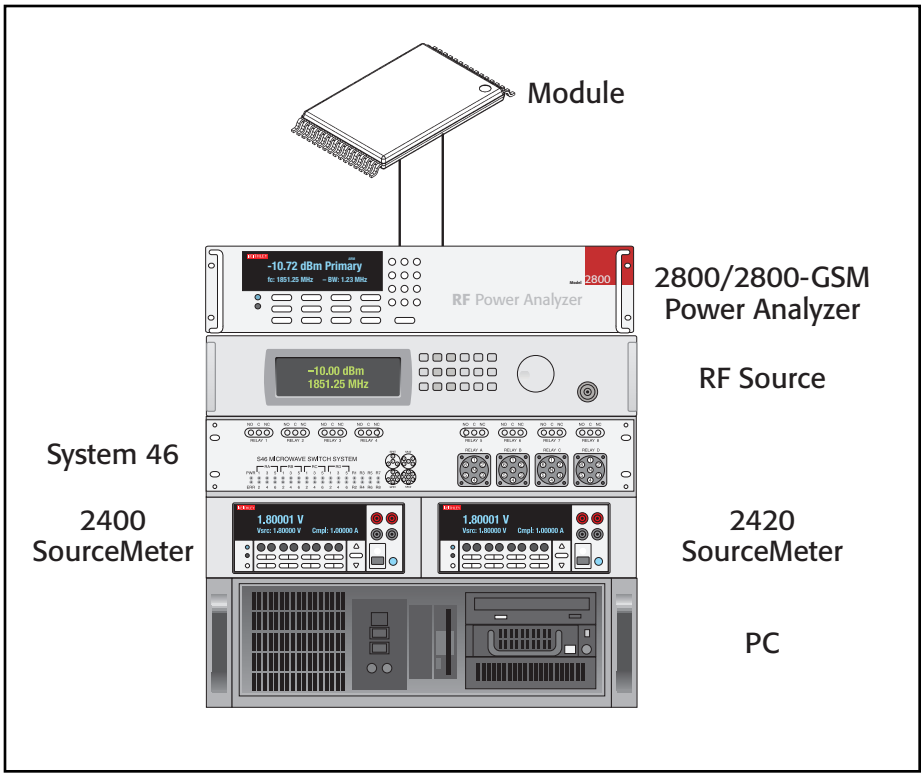
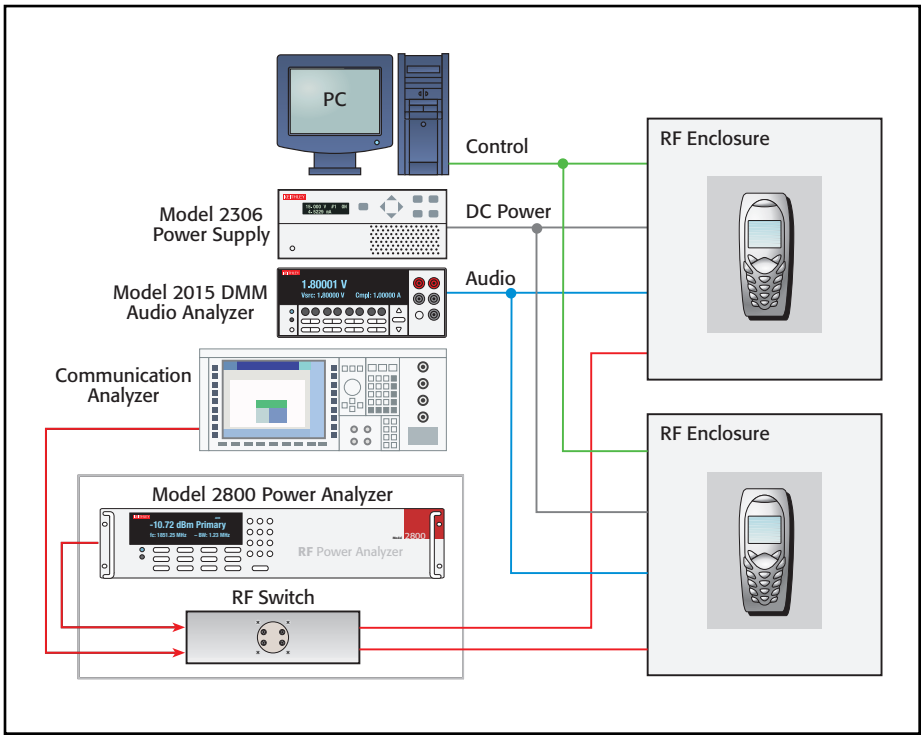


Figure 5. The 2800 combined with a communication analyzer can double throughput over a single phone station when the 2800 is used to test the phone transmitters while the communication analyzer is used to test the phone receivers. The system cost savings is also substantial.



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PHASE AND FREQUENCY ERROR (GMSK Demodulation)

MEASUREMENT RANGE: +20dBm to –20dBm.

PHASE ERROR:

RMS:
- **Display Resolution:** 0.1°.
- **Measurement Accuracy[1,4]:** ±0.5°.
- **Phase Error Floor (<1.5°):** 4.

PEAK:
- **Display Resolution:** 0.1°.
- **Measurement Accuracy[1,4]:** ±3°.
- **Phase Error Floor (<4°):** 4.

FREQUENCY ERROR:
- **Range:** ±10kHz.
- **Resolution:** 1Hz.
- **Accuracy:** ±15Hz.

OUTPUT RF SPECTRUM

Measurement of spurious energy under the following conditions

MEASUREMENT RANGE: +20dBm to –10dBm.

SPECTRUM DUE TO MODULATION:

Measured during the 50%–90% interval of the burst, excluding the midamble, and averaged over 200 power bursts.

Measurement Bandwidth: 30kHz.

Measurement Filter: 5-pole, synchronously tuned.

Frequency Offsets: ±100kHz, ±200kHz, ±250kHz, ±400kHz, ±600kHz, ±800kHz, ±1.0MHz, ±1.2MHz, ±1.4MHz, ±1.6MHz , ±1.8MHz.

Accuracy[2,5,6]: ±1.0dB.

SPECTRUM DUE TO SWITCHING: PEAK HOLD MEASUREMENT:

Measurement Bandwidth: Primary 400kHz, Offsets 30kHz.

Frequency Offsets: ±400kHz, ±600kHz, ±1.2MHz, ±1.8MHz.

Accuracy[3,5,6]: ±1.0dB.

TIME MASK CONFORMANCE:

Comparison of power burst power vs time waveform to GSM time mask[7] with power burst synchronized to transmitted training bit sequence.

Outputs: **Pass:** Waveform is entirely within the mask
Fail: Any part of the waveform falls outside the mask
First failure point (power, time).

Sampled waveform
- **Time Resolution:** 1/2 bit.
- **Time Uncertainty:** 1/16 bit (<0.3ms).

NOTES:

1 Provided attenuator has been optimized per the manual.
2 Based on average of 200 power bursts.
3 Based on average of 10 frames.
4 Specified to 95% confidence level.
5 Offset power measurements at <60dBc.
6 Based on NIST traceable CW signals and locked to the source reference.
7 Reference: Standard 3GPP TS 05.05.V8.15.0 Section 4.5.2.

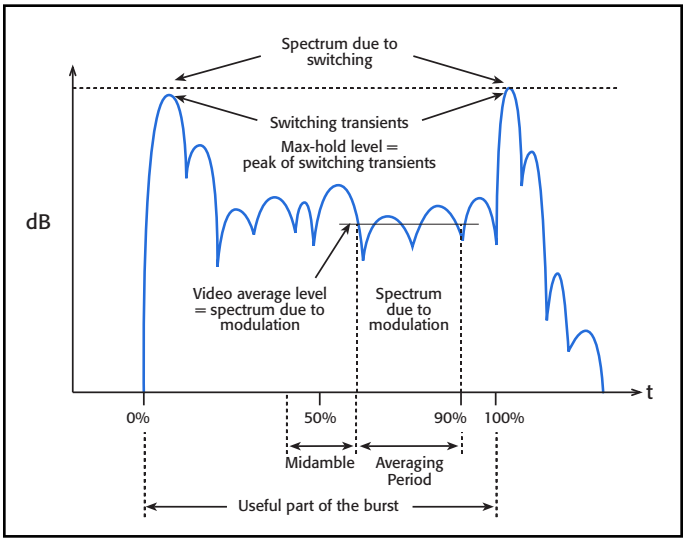

Figure 6. Example of a time domain GSM power burst when measured in a 30kHz bandwidth. The spectrum due to modulation is measured over the 50%–90% segment of the useful part of the burst. The major contributor to the spectrum due to switching is the rising and falling switching transients. However, the spectrum due to switching is measured over the whole burst.