WELLZION®

-Focus On Test Intruments-

# E8000A Presentation

Wellzion Electronics Co., Ltd

www.wellzion.com

# E8000A series Handheld Spectrum Analyzer

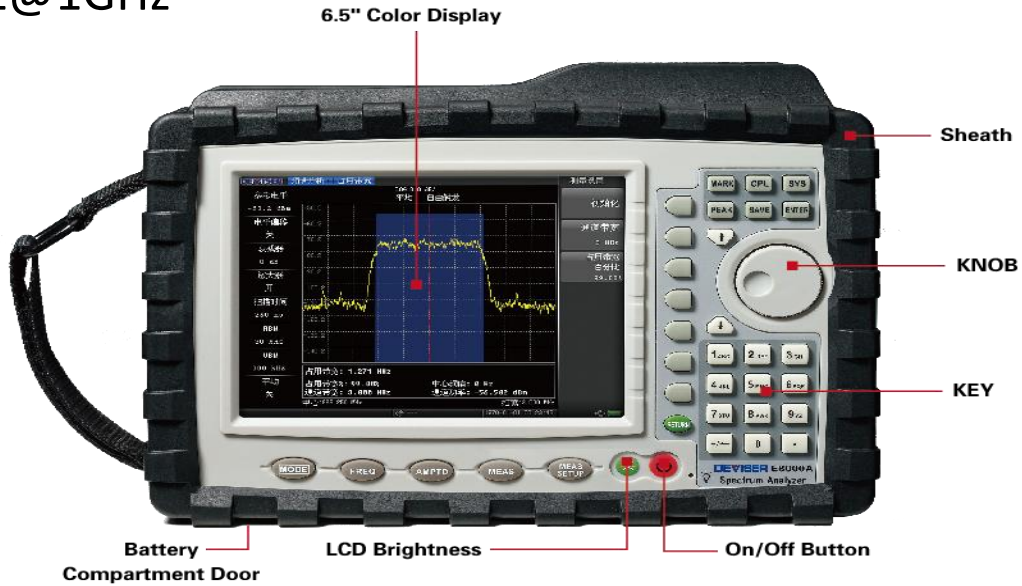
E8000A 9kHz～3.0GHz Released

E8100A 9kHz～6.0GHz 2014-Q1

# Table of Contents

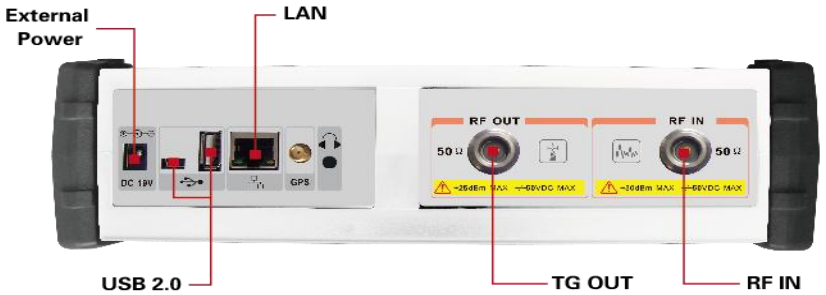
# Introduction

- 6.5inch TFT LCD, visible under strong light
- 9kHz～3/6GHz frequency span
- Lower DNAL -145dBm@RBW=100Hz@1GHz
- Fast sweep 1ms～250S@span>1kHz
- Large DR ＞90dB@RBW=100Hz
- IP3≥15dBm @ATT=0
- Phase Noise< -95dBc/Hz@10kHz



# Introduction

- One button test , CHP, ACP, OBW
- LAN/USB data port with SCPI
- 3/6GHz TG OPTION
- GPS option
- LTE Analysis Option
- Interference Analysis Option
- ＞3.5 hours battery working time



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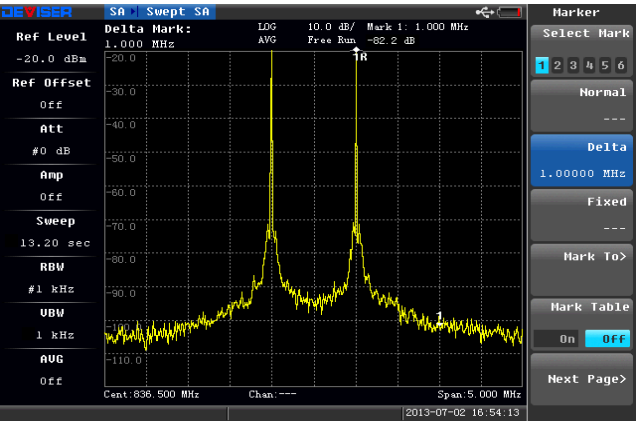
# Key Features:

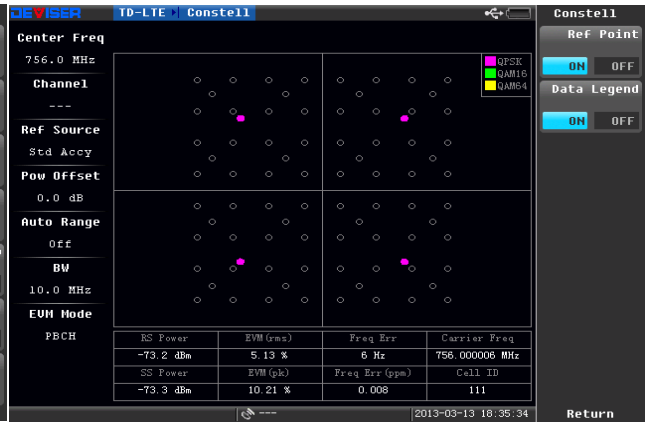
- 3/6GHz Spectrum Analysis (SA)
- Interference Analysis (IA)
- 3GPP 2G/3G/4G Base Station Analysis  LTE Analysis will be released in




Spectrum Analysis


Interference Analysis

E8000 Handheld Spectrum Analyzer

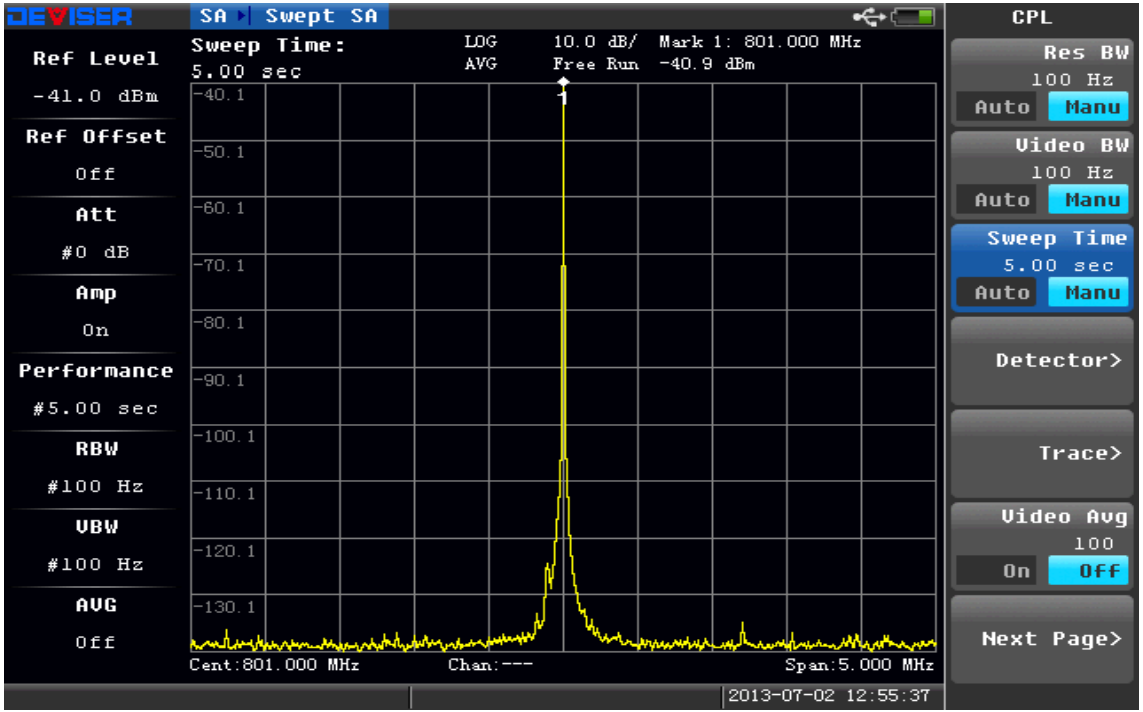



LTE Analysis

# Dynamic Range

**What is Dynamic Range?**
**Max Input level – DANL**

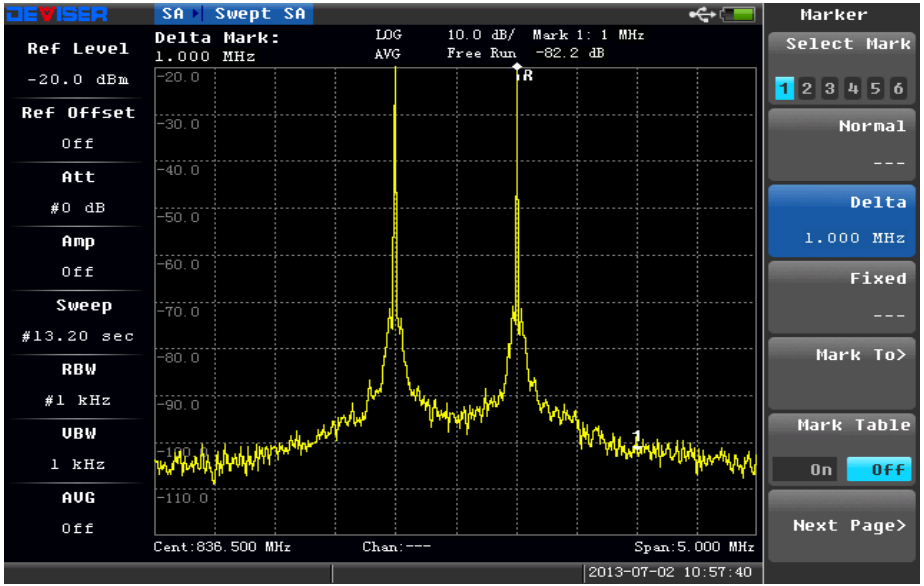
- Input related Spurious
- Spurious
- TOI
- DANL
- Phase Noise




Large Dynamic Range
＞ 90 dB @ 100Hz RBW

# Dynamic Range

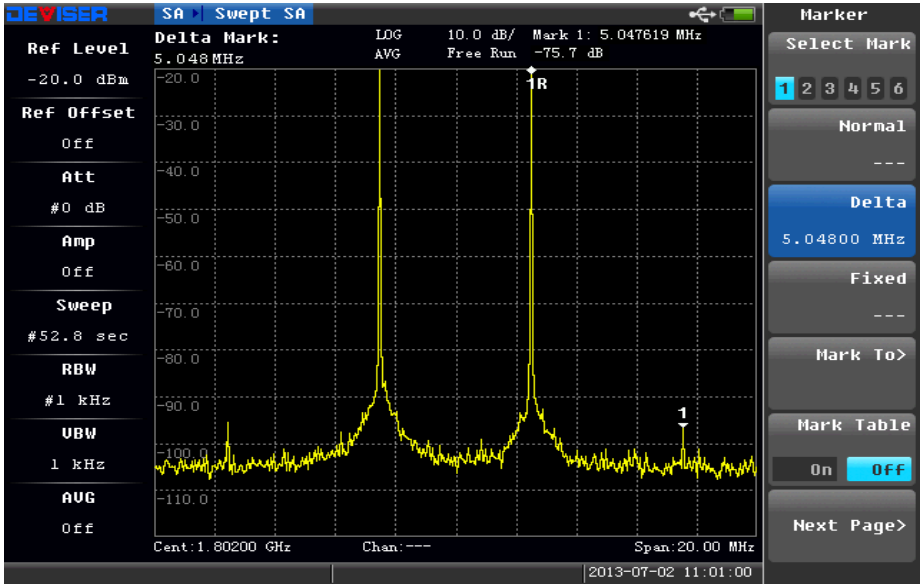
## High TOI - IP3 > +15dBm @ ATT=0, -20dBm two tone input




836&837MHz , -20dBm

ATT=0dB

IM3 >80dB



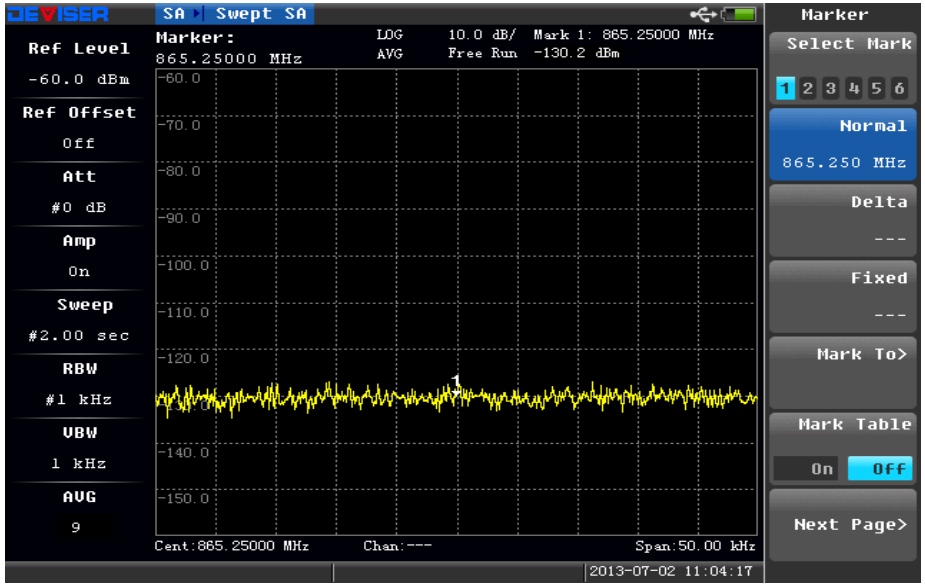

1800&1805MHz , -20dBm

ATT=0dB

IM3 >75dB

# Dynamic Range

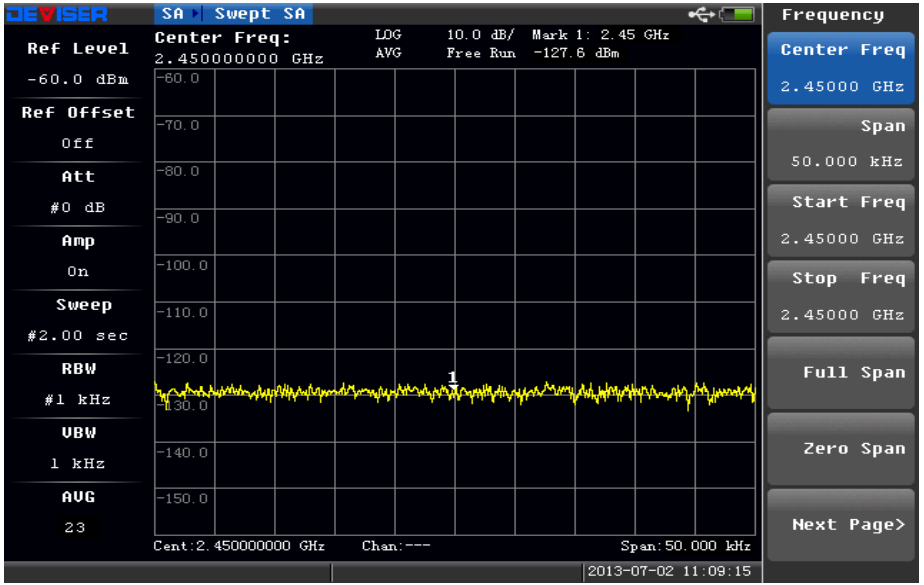
## Low DANL




800MHz, amplifier=on, ATT = 0dB

DANL -135dBm@1kHz RBW

DANL -165dBm@1Hz RBW




2400MHz, amplifier=on, ATT = 0dB

DANL -131dBm@1kHz RBW

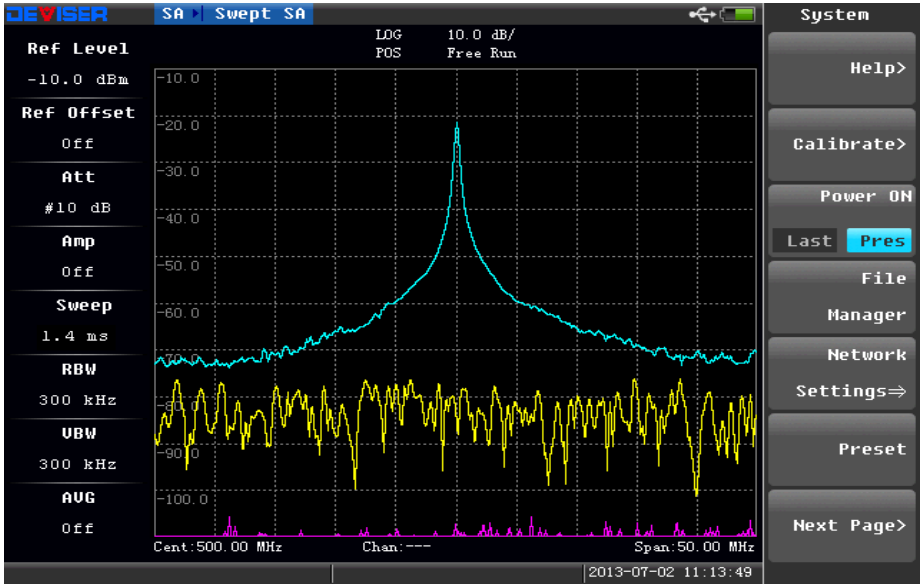
DANL -161dBm@1Hz RBW

Spectrum Analysis - Fast sweep and helpful for catch impulse signal

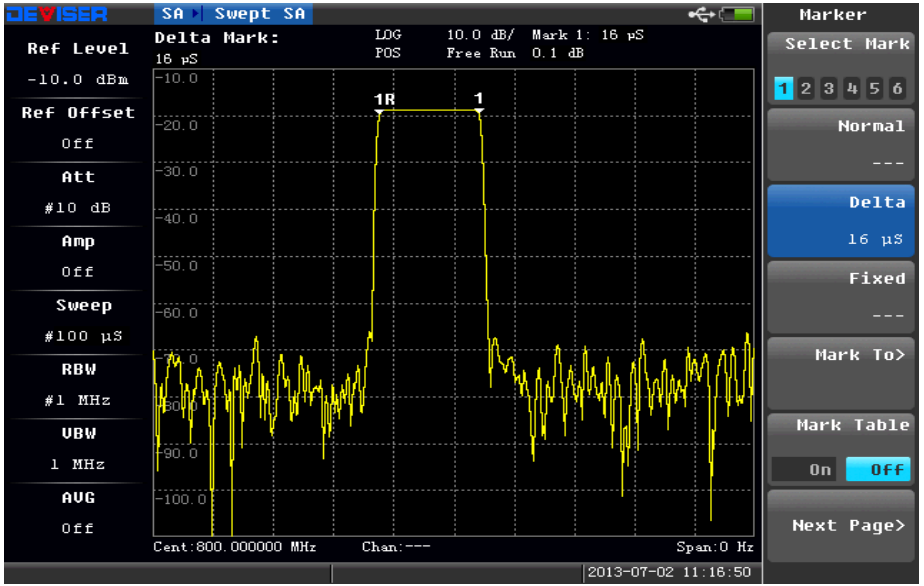
Full span: 60mS

Span > 1kHz: 1mS – 250S

Zero span: 20μS – 250S



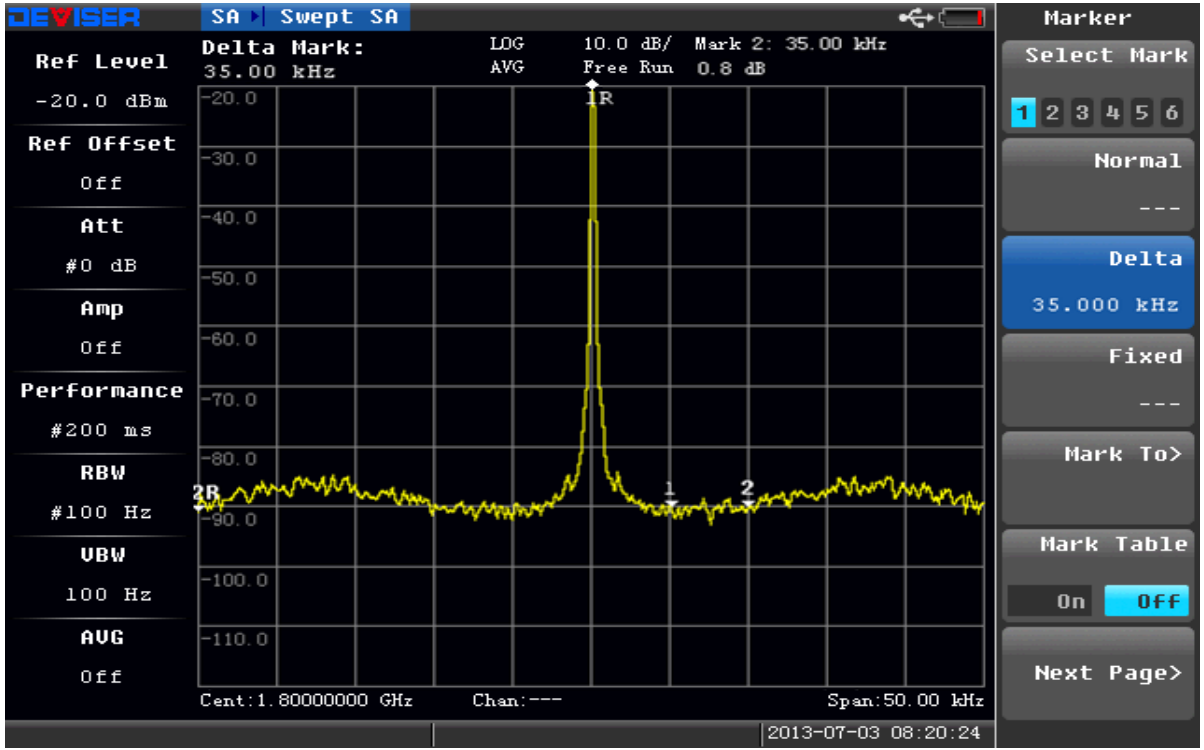

SPAN≠0 1mS-250S




SPAN=0 20μS -250S

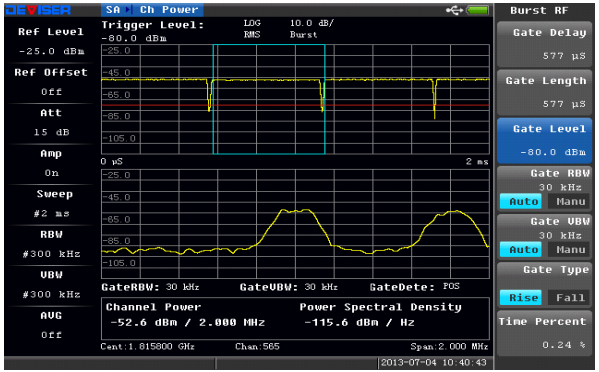
# Spectrum Analysis - Lower phase noise

<-85dBc/Hz@1kHz
<-95dBc/Hz@10kHz
<-105dBc/Hz@100kHz

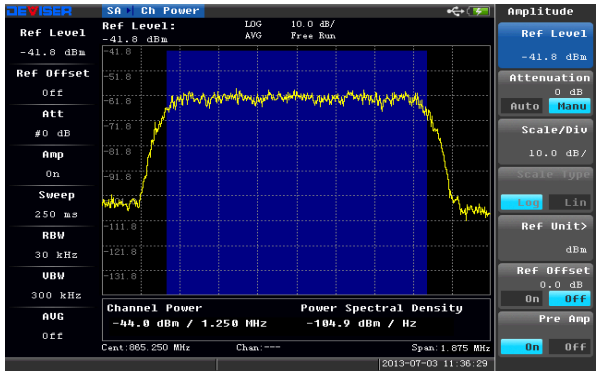


# Spectrum Analysis - One Button Testing

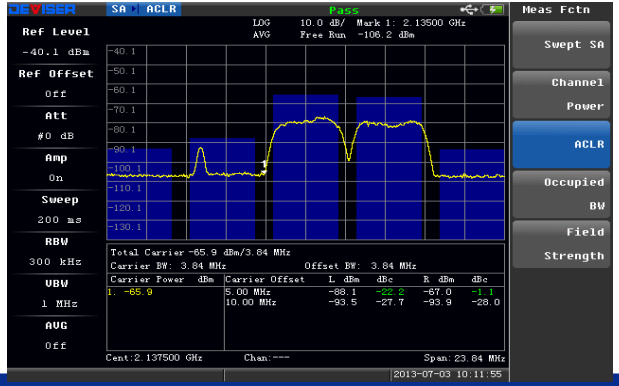
- CHANNEL POWER
- ACP
- OBW
- SEM



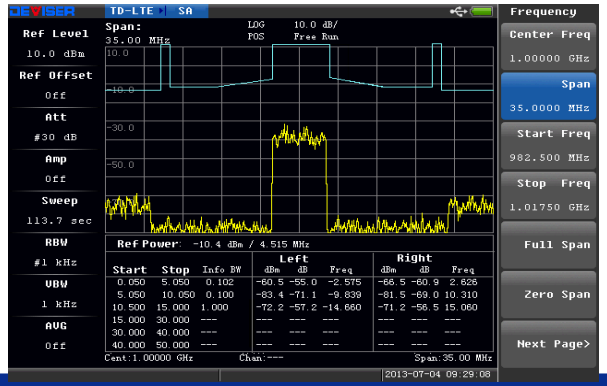

TD Power



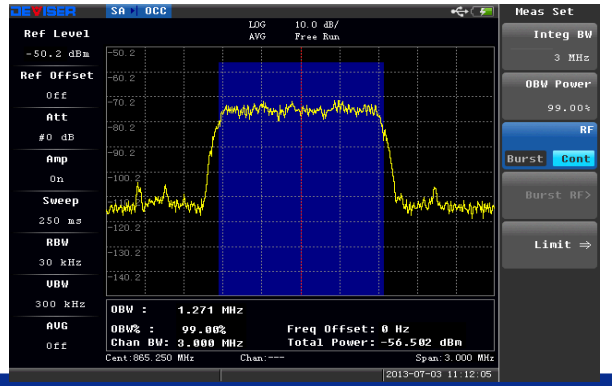

Channel Power




ACLR



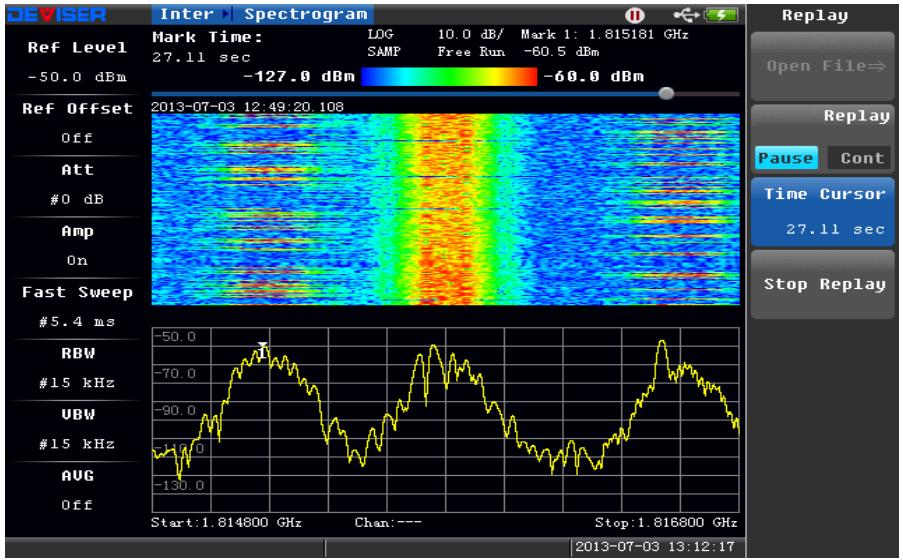

SEM



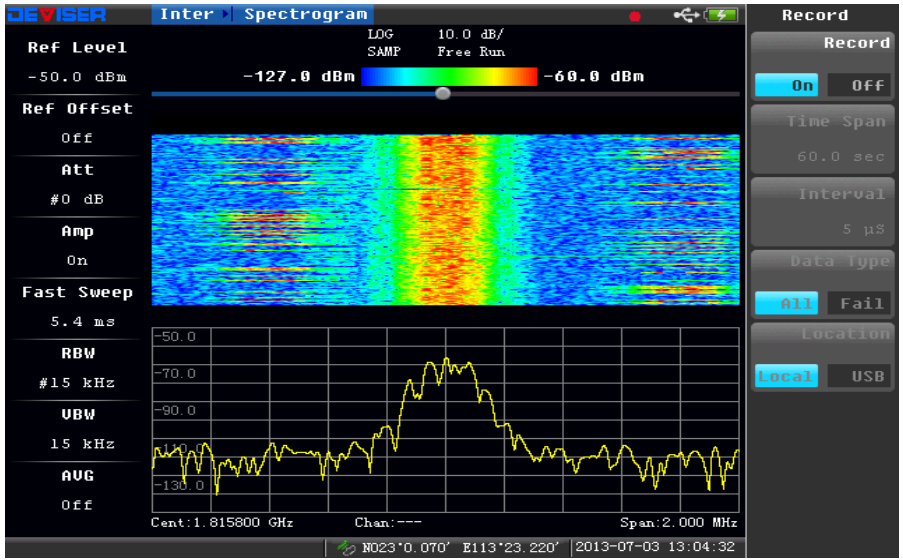

OBW

# Interference Analysis — Spectrogram

- Monitoring Spectrum over time
- Save/recall a history of data  up to 3 days
- Save/recall a history of warning data up to 3 days



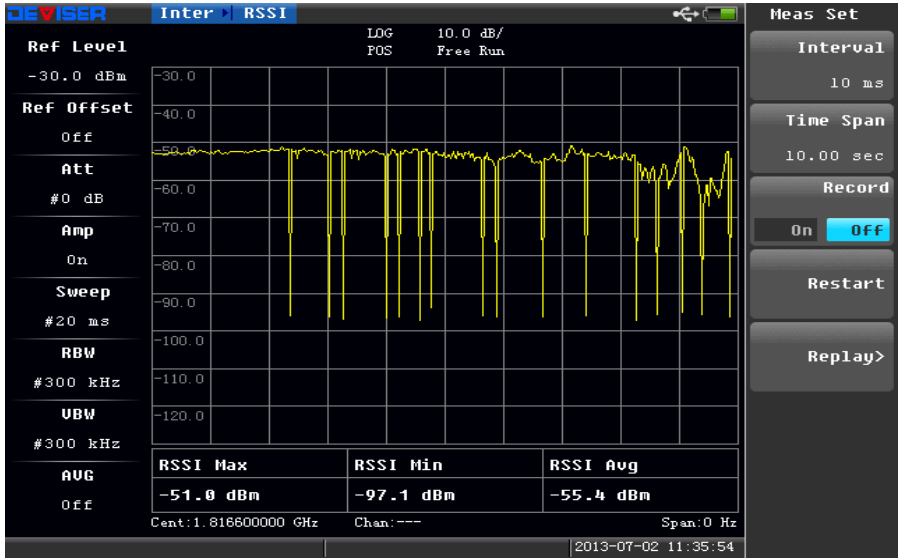

Spectrogram replay



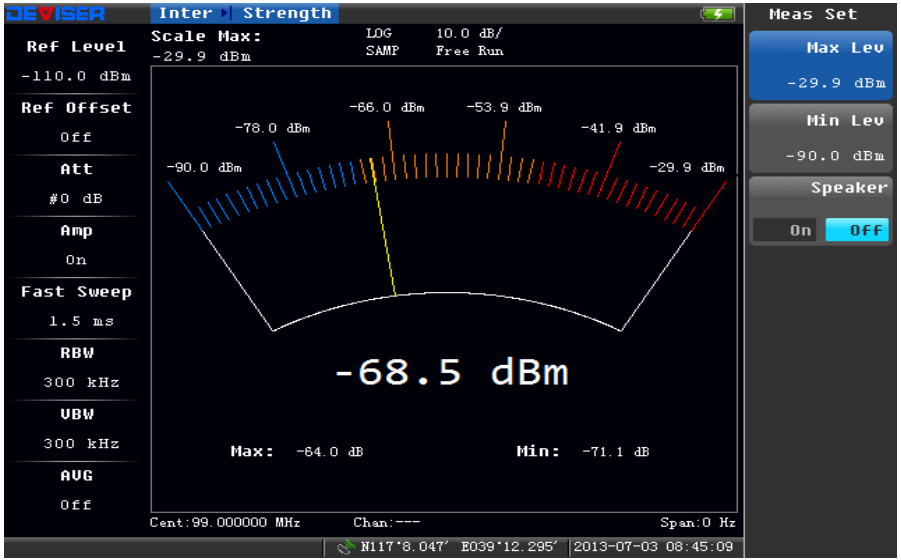

Spectrogram and Auto save

# Interference Analysis — Signal Strength

- Monitoring Signal Strength
- An Audible beep proportional to the Signal Strength
- RSSI monitor/save Signal Strength data up to 10 days




RSSI



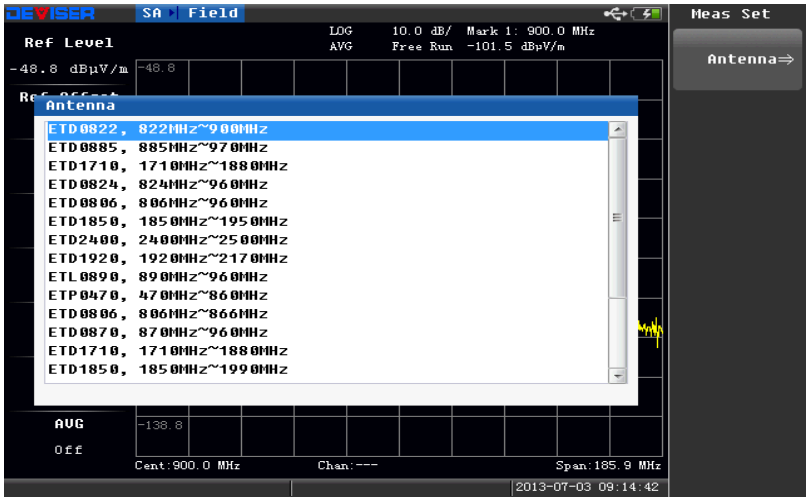

Signal Strength

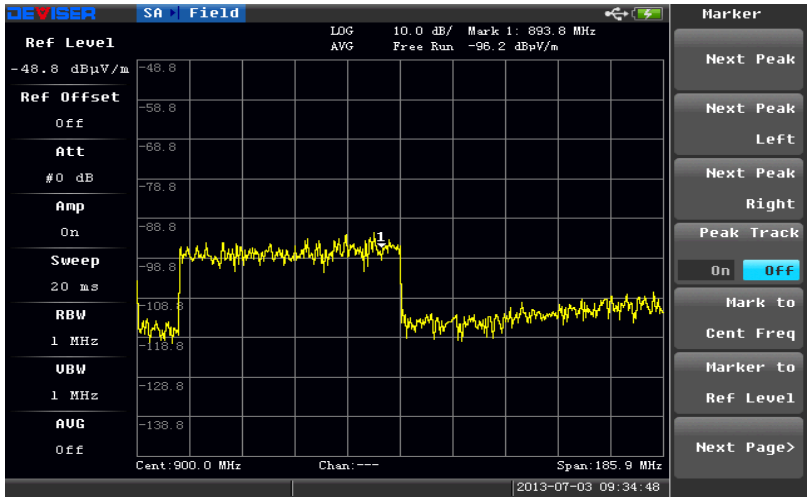
# Interference Analysis — Interference mapping

- With GPS and compass to triangulate interfering signal
- GPS indentifies the location on the map
- Compass indentifies direction of the antenna
- The additional map can be imported from USB disk
- GPS and Compass are designed inside of the directional antenna

# Interference Analysis — Field Strength

- The Antenna factor can be imported from USB disk

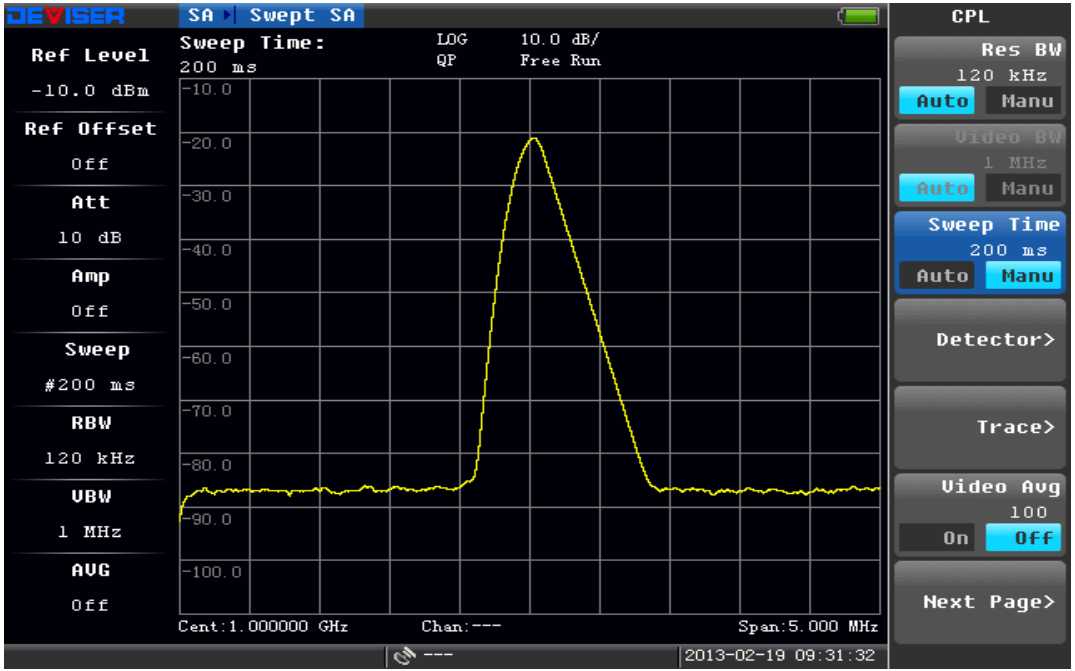


# Interference Analysis —EMI Test

- 6dB RBW
  200Hz/9kHz/120kHz

- Detector mode
  Quasi-peak
  Peak
  Avg.

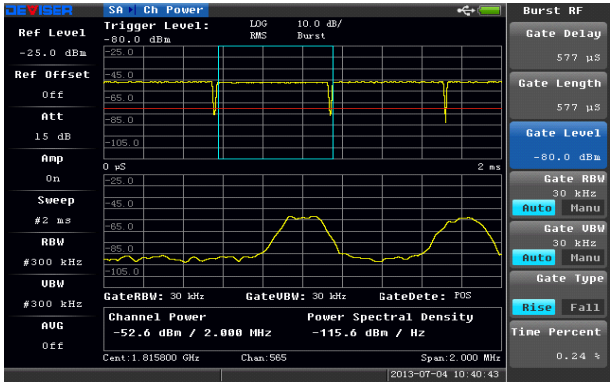


# Interference Analysis — AM/FM/SSB demodulation and monitoring

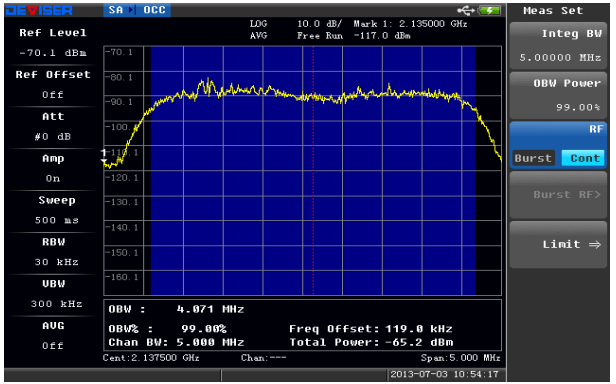
- Demodulate AM/FM/SSB signal
- Listen the signal and figure out what it is

# Base Station Analysis — RF measurements

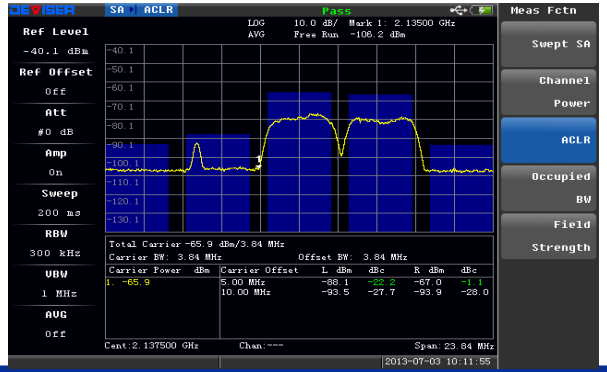
- CHANNEL POWER
- ACLR
- OBW
- SEM



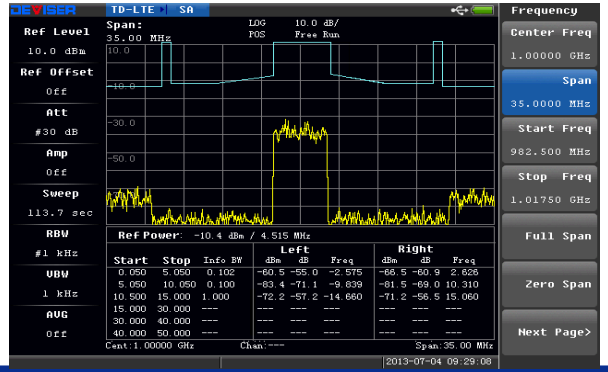

Power vs. Time




Channel Power




ACLR

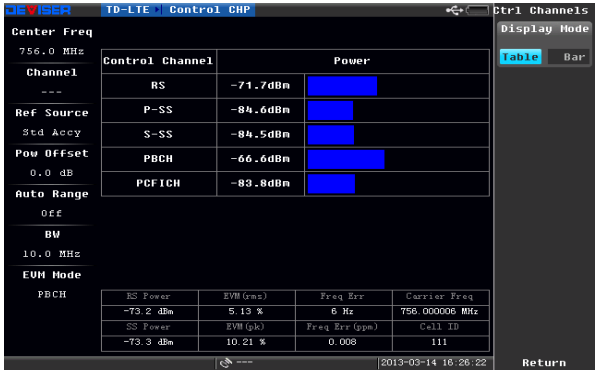



SEM

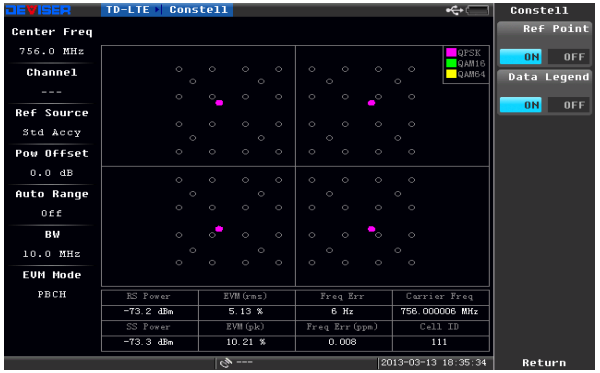

OBW&Channel Power

# Base Station Analysis — Demodulation Measurements

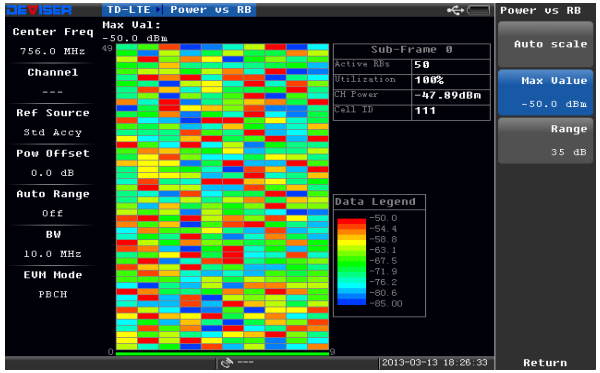
- Power vs. Resource Block (RB)
- Constellation (EVM/frequency error)
- Control Channel (CCH) Power




CCH Power



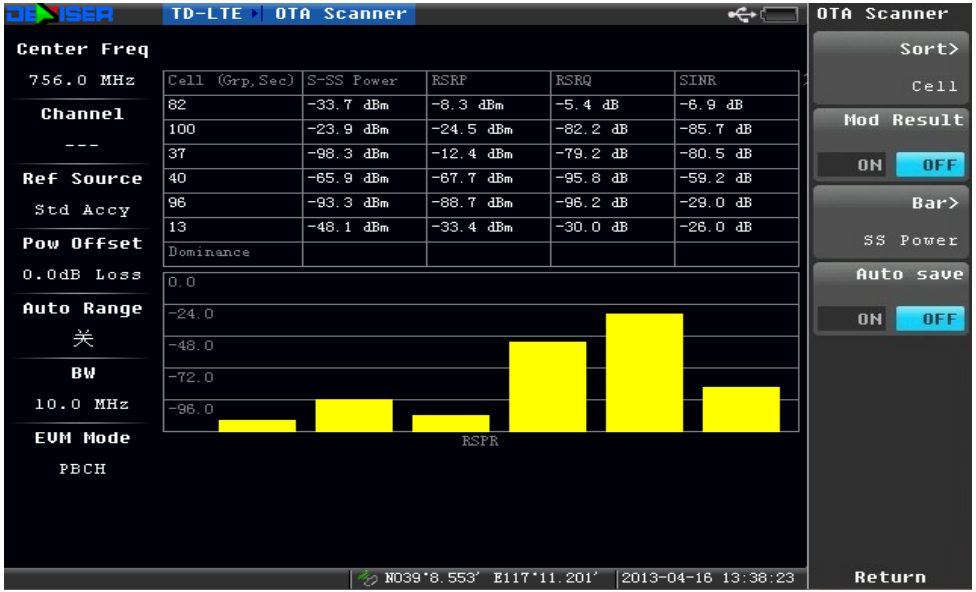

Constellation/EVM




Power vs. RB

# Base Station Analysis — OTA Measurements

- SS-P
- RSRP/RSRQ/SINR
- Cell/Sector/Group ID
- Auto save with GPS
- Tagging information

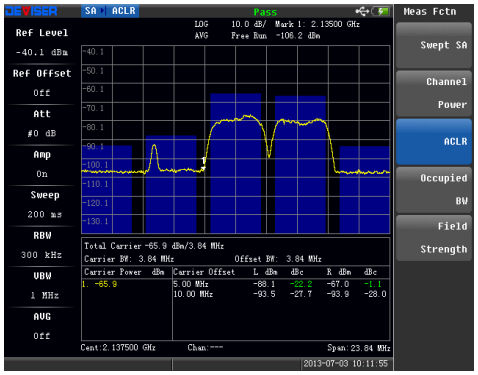


# LTE Analysis

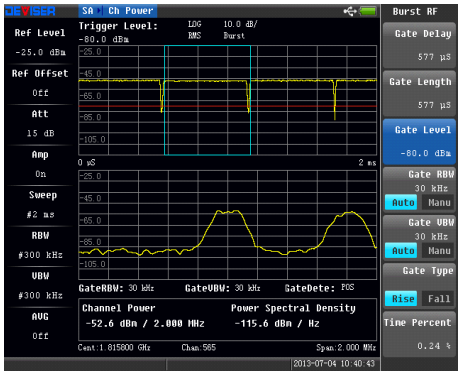
E8000A series spectrum analyzer includes LTE-TDD/FDD signal analysis option for downlink signal quality measurement to ensure the quality of signal coverage of base station and identify the possible interference. There are three portions of test: RF testing, signal modulation quality testing and over-the-air testing.

# LTE Analysis

RF test includes Channel Power, Occupied Bandwidth (OBW), Adjacent Channel Leakage Ratio (ACLR), Spectrum Emission Mask (SEM) and Power vs. Time (PVT) measurement. All test results can be exported and printed. PVT measurement applies to LTE-TDD specifically.






Channel Power and OBW ACLR SEM PVT

# LTE Analysis

Signal modulation quality test is used to measure Error Vector Magnitude (EVM), Channel Power and Resource Block (RB) power of control channels, EVM analysis on sub-carrier, co-channel interference (CCI) …etc. All measurement results can be formatted in a report to export.

RB power measurement provides RB quantity, RB utilization, channel power, Cell ID … etc. metrics.

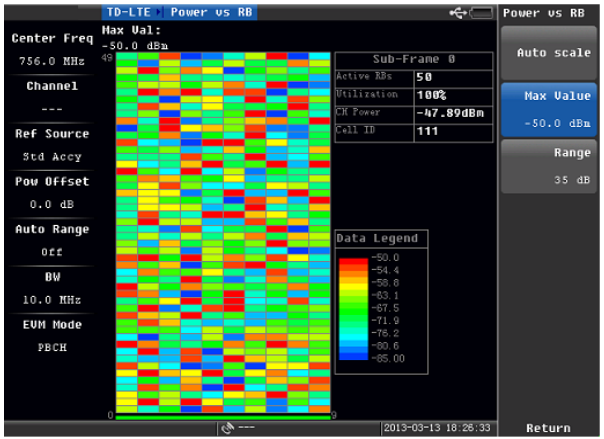
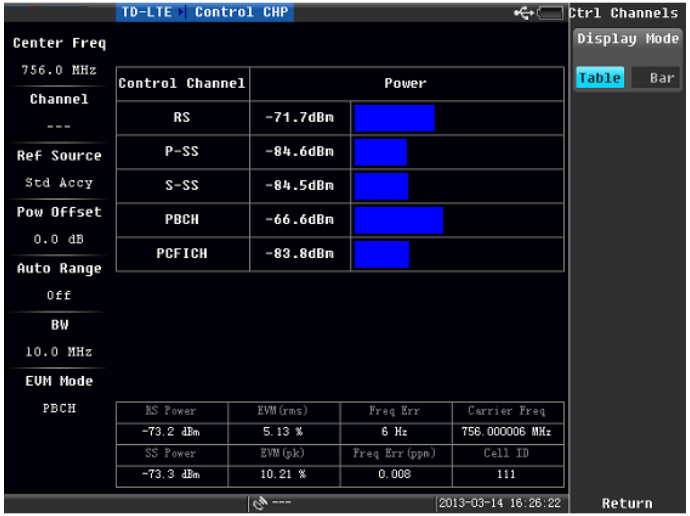


Table of Control Channel Power

Control channel power of Reference Signal (RS), Synchronization Signals (PSS and SSS), Physical Broadcast Channel (PBCH), Physical Control Format Indicator Channel (PCFICH), Physical Hybrid ARQ Indicator Channel (PHICH) and Physical Control Channel (PDCCH) are displayed in table and bar graph formats.

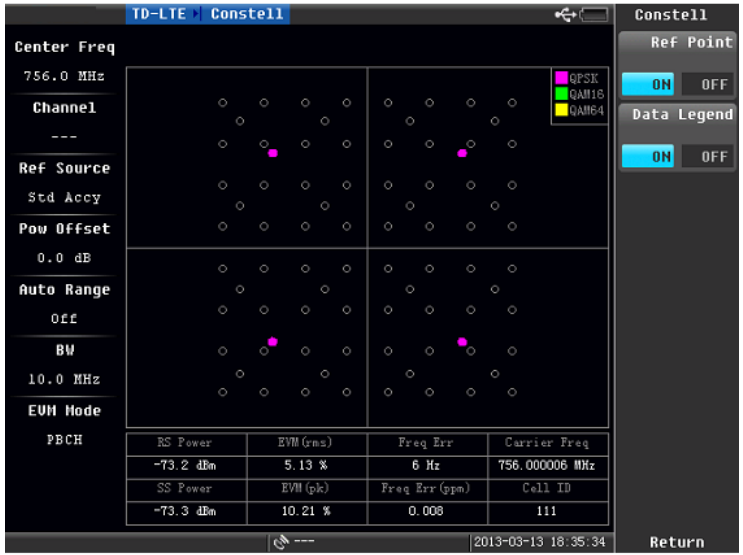



RS/SS/PBCH/PCFICH/PHICH/PDCCH Power Measurement

# LTE Analysis

Constellation analysis is used to test LTE-TDD/FDD signal quality to ensure the signal coverage can be received by network terminals and any potential problems.
Test measurement metrics are:

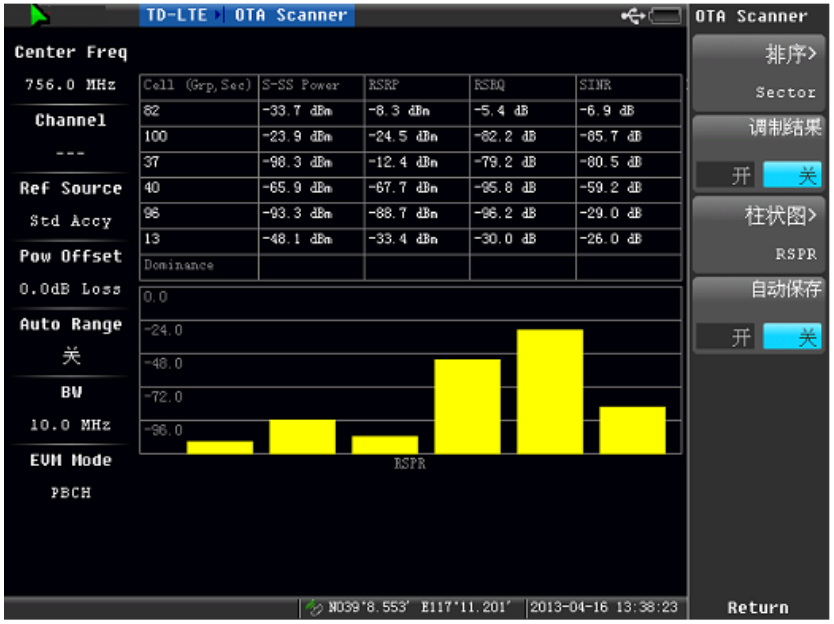
- Reference Signal Channel Power / Synchronization Signal Channel Power
- EVM – Peak & Root Mean Square (RMS)
- Sub-Carrier EVM for in-band interference
- Frequency Deviation / Cell ID



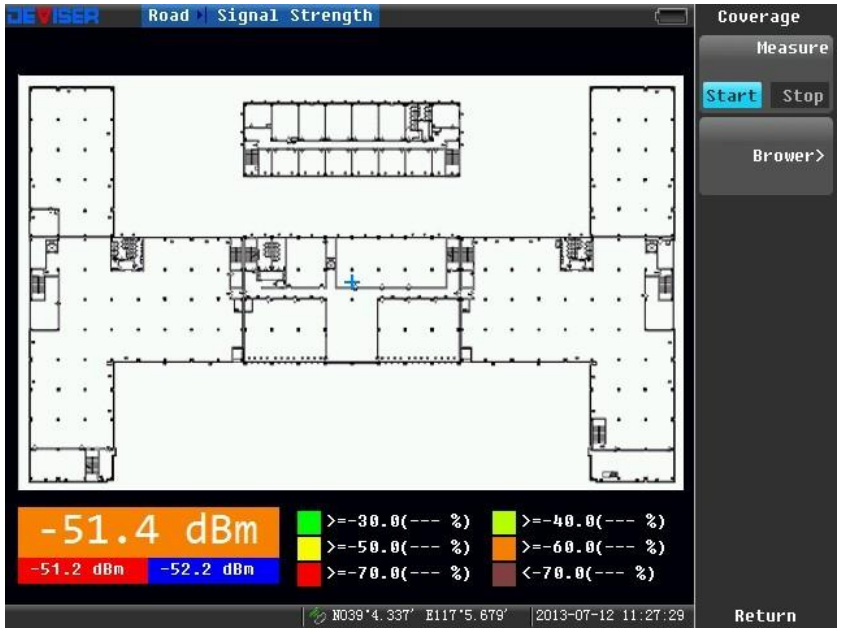
# LTE Analysis

Over-the-Air test measures the quality of covered signal with signal sweep, GPS, electronic compass, output signal coverage and outdoor geographical mapping.

- Signal sweep provides fast measurement of SS power, Reference Signal Receive Power (RSRP), Reference Signal Receive Quality (RSRQ), Signal to Interference plus Noise Ratio (SINR) and Cell ID. GPS information can be recorded and exported to the geographical mapping tool.



- Signal Coverage Map reflects the signal coverage of the area. Coverage measurement indicators can be CW signal strength or LTE mobile signal quality (synchronization channel power, reference signal power, Cell ID) etc.




Outdoor Signal Coverage


Indoor Signal Coverage

# Tracking Generator Option

- Frequency Range 10MHz – 3000/25M – 6000MHz
- Level Range -50dBm – 0dBm
- Level Resolution 1dB
- Level Accuracy ±2dB
- Output Port N-F

# Interface

- 10M/100M LAN port

  SCPI program command

- 2 USB port

  USB1.1 and USB2.0

  for import and export file

  support  USB printer

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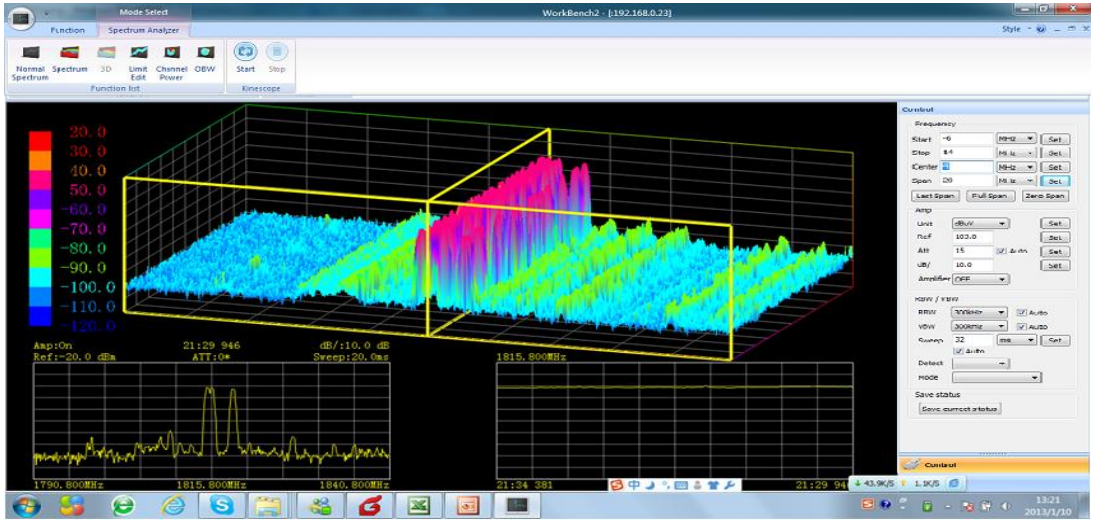
# PC software

- It supports Max. 64 E8000A series or E8001M module connection
- Remote control via LAN port
- File import and export
- SCPI compatible programming interface




Monitoring multi-SA

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# Accessories and Options

Accessories

- Analyzer
- AC adaptor
- Car Cigarette Lighter 12 VDC Adapter
- Soft Carrying Case
- Li-on Battery
- User Manual
- CD with PC tool software

Options

- Tracking Generator
- Power Meter
- LTE Analysis
- Interference Analysis

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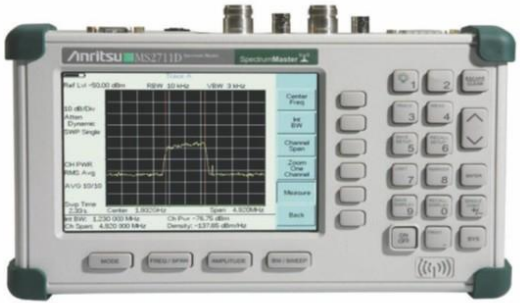
# Competitive Analysis

E8000A
N9340B

VS

MS2711E
MS2711D



# Competitive Analysis

| Items | | Anritsu (MS2711D) | Anritsu(MS2711E) | Agilent(N9340B) | Deviser(E8000A) |
|---|---|---|---|---|---|
| Frequency | Range | 100k-3000MHz | 100k-3000MHz | 100kHz-3000MHz | 9kHz-3000MHz |
| | resolution | 1Hz | 1Hz | 1Hz | 10Hz |
| | accuracy | ±1ppm | ±1ppm | ±1ppm | ±1ppm |
| | span | 0, 10Hz-2.99GHz | 0, 10Hz-3GHz | 0, 1kHz-3GHz | 0, 1kHz-3GHz |
| | Sweep time | ≤1.1s full span<br>50μs-600s span=0 | min 100ms span≠0<br>10μs-600s span=0 | 10ms-1000s span≠0<br>6μs-200s span=0 | 1ms-250s span≠0<br>20μs-250s span=0 |
| | RBW | 100Hz-3MHz, 1/3 per Step | 100Hz-3MHz, 1/3 per Step | 30Hz-1MHz, 1/3 per Step | 100Hz-3MHz, 1/3 per Step |
| | VBW | 3Hz-3MHz, 1/3 per Step | 10Hz-3MHz, 1/3 per Step | 3Hz-1MHz, 1/3 per Step | 10Hz-3MHz, 1/3 per Step |
| | Phase nois @1GHz | –75dBc/Hz@30kHz offset | –100dBc/Hz@10kHz offset<br>–102dBc/Hz@100kHz offset<br>–111dBc/Hz@1MHz offset | –87dBc/Hz@30kHz offset<br>–100dBc/Hz@100kHz offset<br>–120dBc/Hz@1MHz offset | –85dBc/Hz @1kHz offset<br>–95dBc/Hz @10kHz offset<br>–105dBc/Hz @100kHz offset |

# Competitive Analysis

| Items | | Anritsu(MS2711D) | Anritsu(MS2711E) | Agilent(N9340B) | Deviser(E8000A) |
|---|---|---|---|---|---|
| Amplitude | Range | DANL - +20dBm | DANL - +26dBm | DANL - +20dBm | DANL - +20dBm |
| | Max. Input | +43dBm | +35dBm | +33dBm，50VDC | +30dBm，100VDC |
| | ATT | 0 to 51 dB, 1.0 dBstep | 0 to 55 dB, 5.0 dBstep | 0 to 51 dB, 1.0 dBstep | 0 to 50 dB, 5.0 dBstep |
| | Reference | -120dBm - +30dBm | -120dBm - +30dBm | -100dBm - +20dBm | -130dBm - +30dBm |
| | Accuracy | ±1.0 dB | ± 1.25 dB, ± 0.5 dB typical | ± 1.5 dB, ± 0.5 dB typical | ± 1.0 dB |
| | DANL | -135dBm@100Hz | -142dBm 10MHz~2.4GHz @100Hz | -144dBm 10MHz~1.5GHz@30Hz | < -155dBm 1MHz~1GHz@10Hz |
| | | | -139dBm 2.4GHz~3GHz@100Hz | -136dBm 1.5GHz~3GHz@30Hz | < -151dBm 1GHz~3GHz@10Hz |
| | Input related Spurs | ≤45dBc | ≤52dBc | -70dBc | -70dBc |
| | Residual Spurious | ≤–90 dBm, ≥10 MHz | ≤–90 dBm, ≥10 MHz | -88dBm | -85dBm @1MHz-3000MHz |
| | | ≤–80 dBm, ＜10 MHz | | | |
| | TOI | ? | 800 MHz:-4 dBm，400 MHz: 0 dBm | +10 dBm | ＞+15 dBm |
| | AMP=off,ATT=0 | | 200-2200 MHz： +5 dBm, typical | | |
| | 2×-20dBm ) | | >2.2GHz； +8 dBm, typical | | |
| | 2nd Harmonic Distortion | ? | Mixer input -30dBm， | -70dBc @mixer input=-40dBm | -68dBc @mixer input= -20dBm |
| | | | -56 dBc@≤50 MHz | | |
| | | | -60 dBc, typical@>50MHz~200MHz | | |
| | | | -70 dBc, typical@200MHz~3GHz | | |
| | Dynamic Range | ＞65dB | ＞ 85 dB (2.4 GHz), in 100 Hz RBW | ? | ＞ 75 dB 1kHz RBW |
| | Input VSWR | 1.5:1 @ATT=20dB | 2:1, typical | 1.5:1 @ATT=10dB | 1.8:1 @ATT=10dB |
| | | | | 1.4:1 @ATT=20dB | |

| Items | | Anritsu(MS2711D) | Anritsu(MS2711E) | Agilent(N9340B) | Deviser(E8000A) |
|---|---|---|---|---|---|
| display | LCD | 6.5" TFT LCD | 8.4" highlight TFT LCD | 6.5" highlight TFT LCD | 6.5" highlight TFT LCD |
| | Touch screen | no | yes | no | no |
| | Language | cn、en、fr、ge、Jp、sp | | cn、en、fr、ge、it、jp kr、ru、sp、pr | cn、en |
| Miscellaneous | Save Traces | 300 traces | 2000 traces | 200 traces | 2000traces |
| | Save screen | No | Yes | No | Yes |
| | Trace | 2 | 3 | 4 | 3 |
| | Detector | AVG,PEAK,SAMPLE | AVG,PEAK,SAMPLE, RMS、QUASI-PEAK | NORMAL,AVG,PEAK,SAMP,LOG-AVG,RMS-AVG,VOLT-AVG | NORMAL,AVG,PEAK,SAMP,LOG-AVG,RMS-AVG,VOLT-AVG |
| | MARKER | 4 | 6 | 6 | 6 |
| | BATTERY | Ni-M | Li-Ion | Li-Ion | Li-Ion |
| | Working time | ? | 3hours | 4hours | 3.5hours |

| Items | | Anritsu (MS2711D) | Anritsu(MS2711E) | Agilent(N9340B) | Deviser(E8000A) |
|---|---|---|---|---|---|
| Interface | RS-232 | Yes | No | No | No |
| | USB | No | Yes | USB1.1 | USB1.1， USB2.0 |
| | LAN | No | 10 Base-T | Yes | 10/100 Base-T |
| | Rotate knob | No | Yes | Yes | Yes |
| | Size | 254mm×178mm×61mm | 273mm×199mm×91mm | 318mm×207mm×69mm | 258 mm x 173 mm x 74 mm |
| | Weight | ＜2.28kg | ＜3.45kg | 3kg | ＜2.2kg |
| Evironment | Op temp | -10℃～55℃ | | -10℃～+50℃ | -10℃～+55℃ |
| | Store temp | -51℃~+71℃ | -40℃~+71℃ | -40℃~+70℃ | -30℃~+80℃ |
| | Max. humidity | 85% | 90% | 95% | 95% |
| SW | PC tool | Yes | Yes | Yes | yes |

# Table of Contents

# Specifications

- **Frequency Specifications**
- **Frequency Range** 100 kHz to 3000 MHz
- **Frequency Reference**
  - **Aging** ± 1 ppm per year
  - **Stability** ± 1 ppm
  - **Temperature Stability** ± 2 ppm (0 to +50ºC)
- **Marker Count Accuracy (S/N 25 dB, RBW/span 0.01)**
  - **Accuracy** ±2 ppm, ±1 count
  - **Counter Resolution** 1 Hz
- **Frequency Span** 0 Hz (zero span), 1kHz to 3000 MHz

# Specification

- **Sweep** 1mSec to 250 sec (span > 200 Hz)
  20µSec to 250 sec (span = 0 Hz)
- **Trigger Type** free run, single, video, TV
- **Resolution Bandwidths**
  - **Range** 10Hz to 3 MHz in 1-3-10 sequence
  - **Bandwidth Accuracy** < ± 10%
  - **Selectivity (60 dB/3 dB Bandwidth Ratio)** < 5:1
- **Video Bandwidths** 3 Hz to 1 MHz in 1-3-10 sequence
- **Phase Noise** < -105dBc/Hz @ 100 kHz offset from CW signal
  < -95 dBc/Hz @ 10 kHz offset from CW signal
  < -85 dBc/Hz @ 1 kHz offset from CW signal

# Specifications

- **Amplitude Specifications**
- **Measurement Range** — displayed average noise level to maximum safe input level
- **Input Attenuator**
  - **Range** — 0 dB to 50 dB
  - **Step** — 5dB
- **Internal Preamplifier**
  - **Frequency Range** — 1 MHz to 3000 MHz
  - **Gain** — 15 dB
- **Max Safe Input** — +30dBm (peak power/input attenuation >15 dB), 100 VDC

# Specifications

- **DANL (Input Terminated, 0 dB Attenuator, RBW=10Hz, VBW=3Hz, Sample Detector)**

  Pre-amplifier OFF (typical)

  < -142 dBm 1MHz ~ 1GHz  < -138 dBm 1GHz ~ 3GHz

  Pre-amplifier ON (typical)

  < -155 dBm 1MHz ~ 1GHz  < -151 dBm 1GHz ~ 3GHz

- **Spurious Responses**

  **Second Harmonic** < -68dBc for -20 dBm signal at input mixer

- **TOI** >+15dBm (two -20 dBm signals at input mixer with > 1 MHz separation and att=0)

- **Residual Responses (Input Terminated and 0 dB Attenuator)**

  < -85 dBm 1 MHz to 3000 MHz

# Specifications

**Display Range**

| | |
|---|---|
| • **Log Scale** | 0.1 to 1 dB/div in 0.1 dB step 1 to 40 dB/div in 1 dB step |
| • **Linear Scale** | 10 divisions |
| • **Scale Units** | dBm, dBmV, dBµV, mV |
| • **Marker Readout Resolution** | 0.03 dB for log scale<br>0.03% of ref level for linear scale |

# Specifications

- **Traces** 3 traces
- **Trace Detector** sample, posi-peak, neg-peak, normal, average
- **Marker Functions** peak, next peak, marker to center, marker to ref, etc.
- **Marker Display** normal, delta, fix marker & frequency counter
- **Reference Level** -130 dBm to +30 dBm
- **Level Accuracy** < ± 1 dB @ +25ºC (typical)

Specifications

| | |
|---|---|
| • **Inputs/Outputs** | |
| • **RF INPUT** | |
| **Input** | N-F |
| **Input Impedance** | 50Ω |
| • **USB PORT** | USB 2.0 port and USB 1.1 port |
| • **LAN port** | 10M/100M RJ45 |
| • **CHARGER** | Battery charger connection |
| • **Power Specifications** | |
| **Battery Type** | 11.1V @ 5.2Ah Lithium-Ion |
| **Charge Time** | < 5 hours |
| **Operating Time** | > 3.5 hours |
| | > 2.5 hours with TG |
| **AC Adapter** | 19 VDC @ 3.42A |

# Specifications

- **TG (tracking generator) OUT**

| | |
|---|---|
| **Output** | N-F |
| **Frequency Range** | 10 MHz to 3000 MHz |
| **Phase Noise** | < -70 dBc/Hz @ 10 kHz |
| **Level Range** | -40 to 0 dBm |
| **Level Accuracy** | ± 2 dB |
| **Harmonic Distortion** | < -20 dBc |
| **Non-Harmonic Distortion** | < -30 dBc |
| **Output Impedance** | 50Ω |

## Other Specifications

| | |
|---|---|
| • **Temperature, Operating** | -10ºC to +55ºC |
| • **Temperature, Storage** | -30ºC to +80ºC |
| • **Dimensions (W x H x D)** | 258 mm x 173 mm x 74 mm |
| • **Weight (With Battery)** | <2.2 kg |
| • **Display Type** | 6.5 inch TFT color LCD |
| • **Display Resolution** | 640 X 480 pixels |
| • **Language** | Chinese, English |

# Thank you