

# DS2831 Digital TV Spectrum Analyzer

## Key Benefits

- Fast Spectrum Analysis: 4~1220MHz, 4~2150MHz
- Optical features such as OPM, VFL, and an optional Fibrescope
- ITU-T J 83 Annex A/B/C/D, QAM/8VSB; auto-detects channel parameters
- Spectrum Persistence Analysis: any frequency band, max span 206MHz
- Downstream & Upstream Spectrum Analysis covers DOCSIS 3.1 frequency bands
- DOCSIS 3.0 32\*8 cable modem
- Integrated Upstream Signal Generator (J.83A/B-FEC)
- Highly sensitive and effective capacitive touchscreen
- Forward/Reverse PASSIVE non intrusive sweep (doesn't require US sweep receivers for up to 51.2MHz of high resolution sweep response in the Upstream path)
- TS Analysis
- TR 101 290 Monitoring, auto-generated program lists, and program-channel mapping
- Error Vector Spectrum identifies interference under QAM carriers with no interruptions in service
- Gated Measurements: in-service CCN, CSO, CTB, CLDI, DG/DP, DOM, ICR tests
- Auto Test
- Asset and Test Data management software



## Overview

Integrating multiple functions in a very small portable instrument, the DS2831 is a new-generation Digital TV Spectrum Analyzer with a comprehensive measurement suite specifically designed for HFC network testing, troubleshooting, and maintenance.

The DS2831's main functions include Analog TV and Digital TV analysis, DOCSIS 3.0 analysis, Spectrum Analysis, Forward/Return Path Sweep, Upstream Signal Generation, simple Ethernet and Wi-Fi testing, and Auto Test.

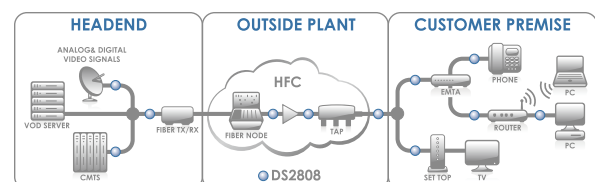
With the latest in miniaturized technology, the DS2831 affording outstanding performance to the CATV engineer. Its RF features are based on a handheld spectrum analyzer, with 80dB of dynamic range.

A host of new applications help HE/HUB and field engineers perform in-service measurements and locate interference. Upstream Spectrum Analysis mode offers a persistence mode (any frequency band, max span 206 MHz) that will show interference under bursty signaling.

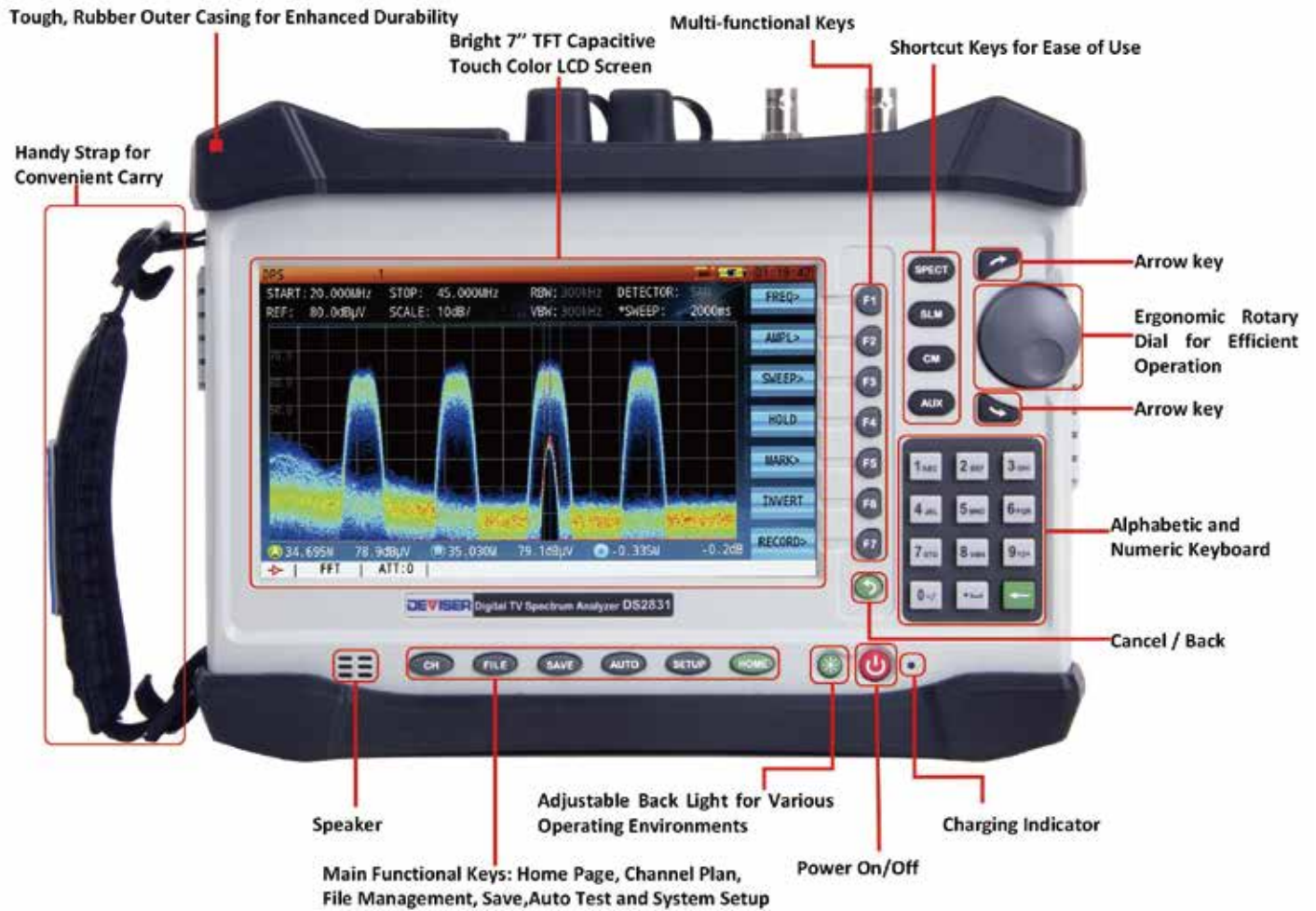
In the Analog TV mode, when VITS signals are inserted, gated CCN, CSO, CTB, CLDI, DG-DP, DoM, and ICR measurements allow in-service channel testing; the DS2831 can also perform non-intrusive measurements.

For DVB-C and CMTS downstream signals, the revolutionary Frequency & Time EVS function enables users to detect coherent distortions hiding under QAM carriers like LTE – without interrupting service. The DS2831 also supports Transport Stream Analysis, showing reactive bandwidth usage, basic TS structure, TR 101 290, PID view, PCR, PSIP, PAT, and PMT tables.

The DS2831 supports the Toolbox PC software for small-scale applications. The SYNCOR platform manages asset and test data for larger applications. As fiber-optic technology continues to expand into the CATV network space, the DS2831's optical measurement options – including an optical power meter and visual fault location – are now standard-issue (Fibrescope optional).



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**Fast Spectrum Analysis**

DS2831 offers enhanced spectrum analysis performance, with a frequency range of 4MHz ~ 1220MHz (optionally expandable to 2150MHz), 80dB of dynamic range, and -60dBmV sensitivity @ 300kHz.

**Spectrogram**

The spectrogram provides a scrolling three-dimensional display, allowing users to track frequency and level over time - excellent for analyzing intermittent signals. Users can analyze the stability of a signal, or identify bursty interference.



Figure 1: Spectrum Analysis

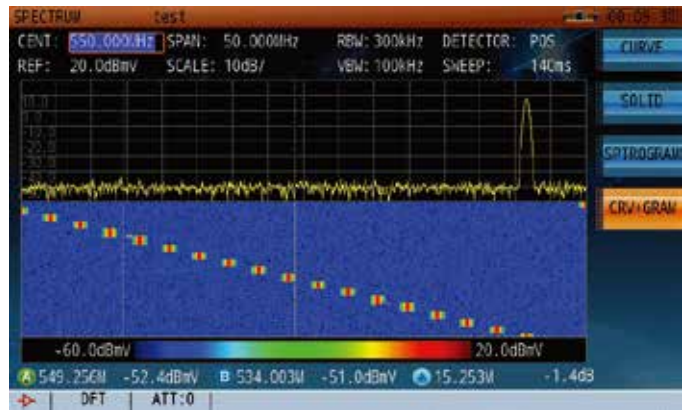


Figure 2: Spectrogram

**Upstream Persistence Analysis**

Traditionally, the task of troubleshooting upstream signal involves using free regions of the upstream spectrum to measure the noise floor and monitor for interference. But in DOCSIS 3.1 systems, the upstream spectrum becomes too crowded for this approach; ordinary analyzers cannot distinguish communication signals from interference. Persistence analysis mode is designed for this task.

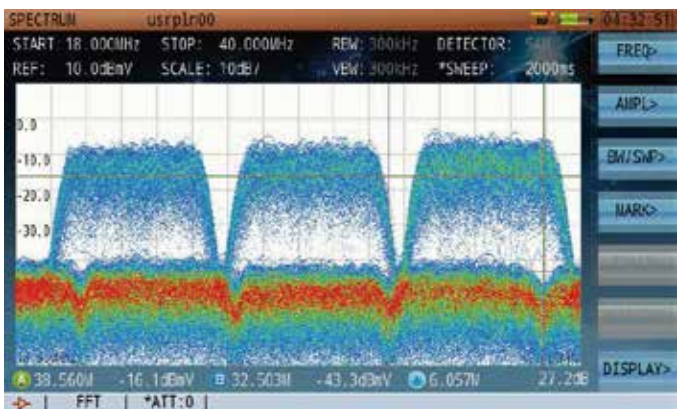


Figure 3: Persistence analysis shows low-level CPD under DOCSIS upstream signal. Color-coded for easy interpretation.

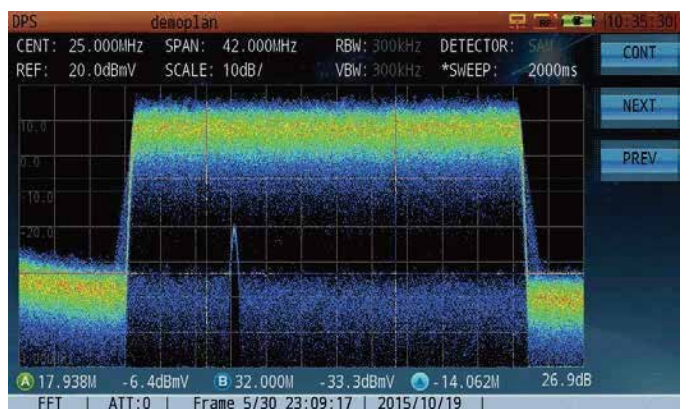


Figure 4: Replaying record of CW interference under upstream DOCSIS 3.1 signal.

**Analog TV Test**



Figure 5: Analog TV Gated Measurement supports in-service CCN, CSO, CTB, CLDI, DG/DP, DOM and ICR measurements.



Figure 6: Use VITS and Analog TV Gated Mode to measure analog TV video parameters without interrupting service.

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**QAM Test: Basics**



**Figure 7:** Use DVB-C channel measurements to characterize digital carrier metrics such as channel power, MER, and Pre/Post BER.



**Figure 8:** The Digital Hum measurement can detect changes in modulation amplitude - typically due to powerlines.



**Figure 9:** Constellation Display



**Figure 10:** BER and MER Statistical Analysis helps to find impairments, interference and distortions over time.

**QAM Test: Error Vector Spectrum (In-Service)**



**Figure 11:** The EVS time-domain function is used to locate signatures of LTE interference signals under a QAM carrier - without interrupting service.



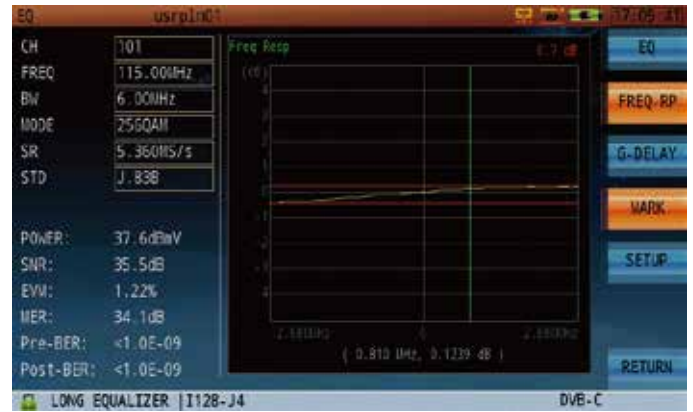
**Figure 12:** The EVS frequency-domain function measures interference signals under a QAM carrier.

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**QAM Test: Finding Linear Distortions**



**Figure 13:** The Adaptive Equalizer uniquely compensates for linear distortions such as phase noise, impedance mismatch & group delay, in the HFC network.

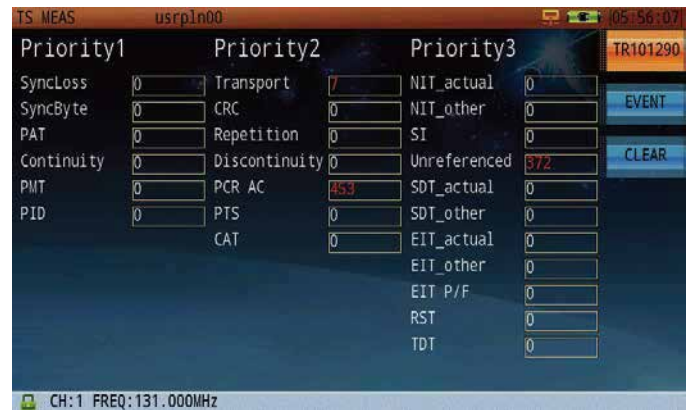


**Figure 14:** Frequency Response is derived from the adaptive EQ power coefficient. The in-band frequency response should not exceed +/- 1.5 dB peak to valley.

**MPEG Transport Stream Analysis**

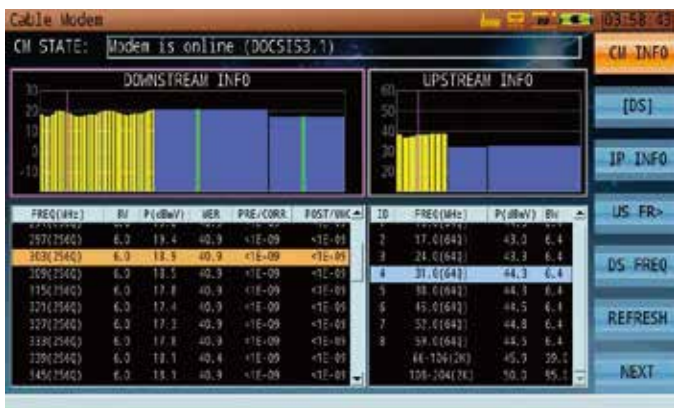


**Figure 15:** Group Delay is also derived from the adaptive EQ power coefficient. Group delay should not exceed 200 ns/MHz (upstream) or 75 ns/MHz (downstream).

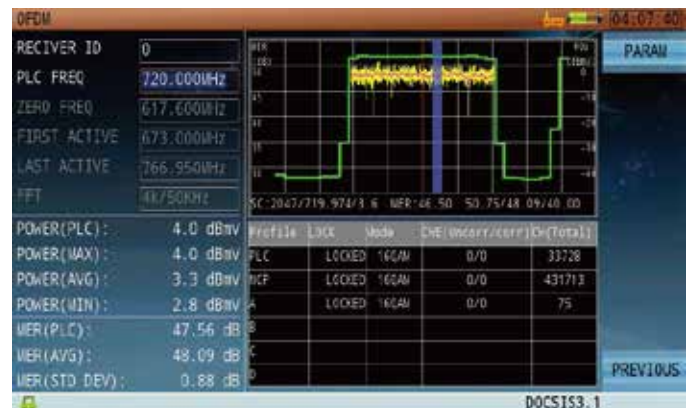


**Figure 16:** The DS2831 supports transport stream analysis, showing bandwidth usage, basic TS structure, TR 101 290, PiD view, PCR, PSIP, PAT, and PMT tables.

**Cable Modem Measurement**



**Figure 17:** DOCSIS 3.1 Downstream and upstream OFDM demodulation identifies and characterizes OFDM signals.



**Figure 18:** Error Vector Spectrum for OFDM captures interference under your OFDM carrier signals in service.

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### Cable Modem Measurement



Figure 19: DOCSIS 3.0 32x8 Cable Modem Analysis

### Channel Scan

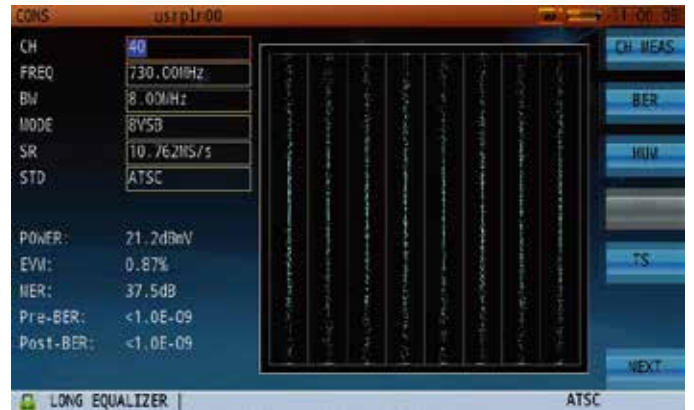


Figure 20: The Channel Scan function easily identifies OFM signals.

### Upstream Signal Generator

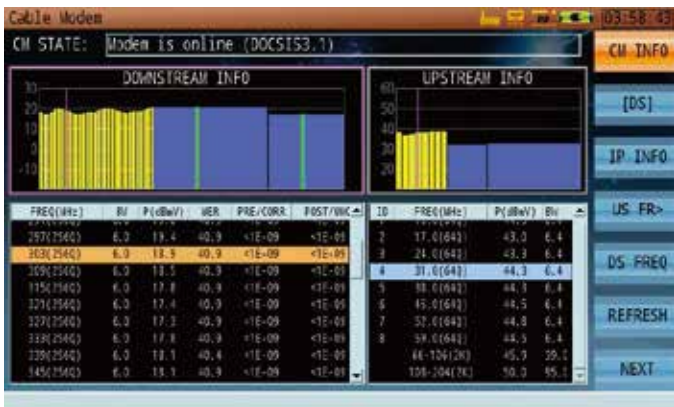


Figure 21: The Upstream Signal Generator can generate C/W carriers to QAM signals.

### Loopback

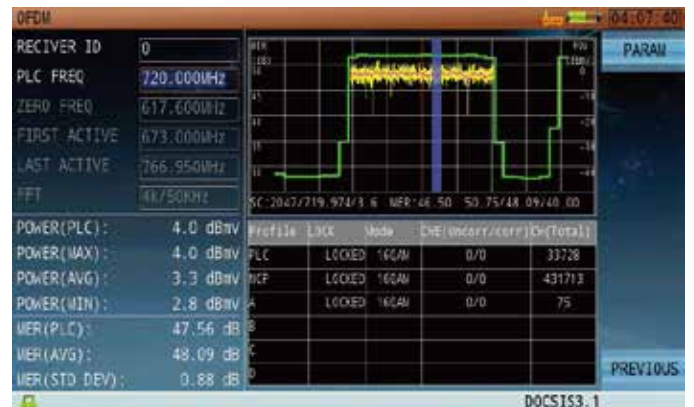


Figure 22: The Loopback function is effective for testing attenuation and gain from 5 - 210 MHz. It can measure both CW & QAM signal frequency and sweep frequency.

### Reverse Path Sweep

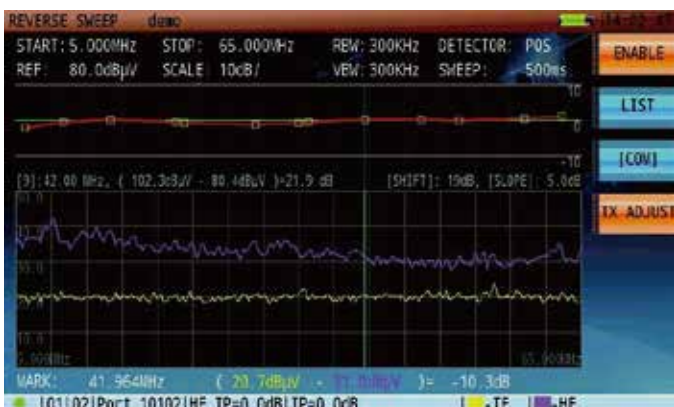


Figure 23: The DS2831 can perform reverse path sweep measurements when paired with the Deviser DS1610 Remote Monitoring System.

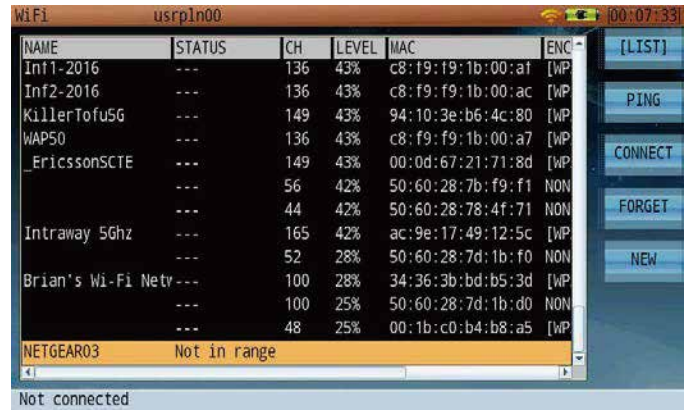
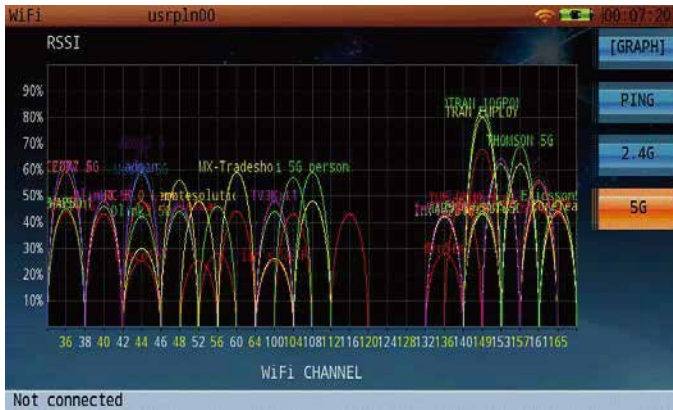
### IP Test



Figure 24: The IP test suite includes tests such as Ping, traceroute, and FTP download/upload.

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Wifi Analysis



**Figure 25:** Wifi Analysis can retrieve SSID, channel and signal strength information from surrounding WiFi hotspots.

**Figure 26:** Offering Graphical and List modes, 5G WiFi Analysis can capture MAC addresses and encryption information from surrounding WiFi hotspots.

Auto Test



**Figure 25:** Define limit profiles to perform auto tests. Results will show Pass or Fail according to channel plans & limit profiles, eliminating the need for interpretation.

## DS2831 Digital TV Spectrum Analyzer

### Specifications

Frequency	
Frequency Range	4~1220 MHz; 4~ 2150 MHz (by option)
Frequency Stability	±1 PPM (0 °C ~50 °C / 32-122°F)
Frequency Step	1 Hz
Resolution Bandwidth (-3dB)	1kHz, 3kHz, 10kHz, 30kHz, 100kHz, 300kHz, 1 MHz, 3 MHz
Video Bandwidth (-3dB)	30 Hz, 100 Hz, 300 Hz, 1kHz, 3kHz, 10kHz, 30kHz, 100kHz, 300 kHz, 1 MHz, 3 MHz
Display Scale / Range	1, 2, 5, 10, 20dB/div; 8 vertical divisions
Sweep Time	20ms ~ 25s
Input Level Range	-60 ~ +60dBmV
Dynamic Range	80dB (30kHz RBW)
Sensitivity	-60dBmV (300kHz RBW, preamp on)
Attenuation	0 ~ 30dB in 1dB steps
Accuracy of Measurements	< ±1.0dB @ +25 ±5°C (typical)
Detector Modes	Positive Peak; Negative Peak; Sample; Average; RMS
Reference Level	-80 ~ +70dBmV
Markers	2 vertical markers

Analog TV Measurement	
Standards	B/G, I, D/K, L/L', M/N
Color Standards	NTSC, PAL, SECAM
Frequency Steps	10kHz
Level Measurement Range	-40 ~ +60dBmV
Accuracy	<±1.0dB @ +25 ±5 °C (S/N > 30dB)
Level Resolution	0.1dB
Resolution Bandwidth	300kHz
CCN (>53dB, 0dB attenuation)	Optimum input range: 32 ~ 37dBmV (preamp off); 12 ~ 17dBmV (preamp on) Max input range: 60dB ±1.0dB; 65dB ±3.0dB
CTB/CSO (>53dB, 0dB attenuation)	Optimum input range: 22 ~ 67dBmV (preamp off); 2 ~ 7dBmV (preamp on) Max input range: 63dB w/ ±1.5dB acc. & 78 channels 70dB w/ ±4.0dB acc. & 78 channels
HUM Measurement	1~20%; ±0.5% (1~5%); ±1.0% (5~20%)
Depth of Modulation Range	40~95%, ±1.5% (CCN>dB)
Tilt Measurement	Up to 16 channels
Pre-Amplifier	Automatic, 18dB gain
Attenuator	Automatic, 30dB

Persistence	
0 ~ 7 MHz	100% POI; minimum signal duration 2.5ms
4 ~ 46 MHz	100% POI; minimum signal duration 4.5ms
4 ~ 68 MHz	100% POI; minimum signal duration 4.64ms
4 ~ 88 MHz	100% POI; minimum signal duration 5.3ms
4 ~ 120 MHz	100% POI; minimum signal duration 6.3ms
4 ~ 210 MHz	100% POI; minimum signal duration 10.6ms

Upstream Spectrum Analysis	
Frequency Range	4 ~ 46 MHz (DOCSIS) 4 ~ 68 MHz (Euro DOCSIS 2.0) 4 ~ 88 MHz (Euro DOCSIS 3.0) 4 ~ 120 MHz upstream, 4 ~ 210 MHz downstream (DOCSIS 3.1)
Frequency Span	42 / 64 / 84 / 116 / 206 MHz
Resolution Bandwidth (-3dB)	300kHz fixed
Video Bandwidth	300 kHz fixed
Display Scale / Range	1, 2, 5, 10, 20dB/div; 8 vertical divisions
Sweep Time	20ms ~ 25s
Input Level Range	-60 ~ +60dBmV
Attenuation	Automatic, 0 ~ 30dB
Pre-Amplifier	Manual, 18dB gain
Accuracy of Measurements	< ±1.0dB @ +25 ±5°C (typical)
Detector Modes	Positive Peak; Negative Peak; Sample; Average
Markers	2 vertical markers

Digital TV Measurement	
Frequency Range	7 ~ 1200 MHz
Power Level Range	-30 ~ +50dBmV
Accuracy	<±1.5dB @ +25 ±5°C (CCN > 20dB)
Level Resolution	0.1dB
Pre-Amplifier	Automatic, 18dB gain
Attenuator	Automatic, 30dB
Modulation Type	16, 32, 64, 128, 256 QAM (J.83 Annex A, C) 64, 256 QAM (J.83 Annex B)
Interleave Depth	128 x 1 ~ 128 x 4 (J.83B) 12 x 27 (J.83A,C)
Symbol Rate	1.0 ~ 7.0 MS/s
SNR	>45dB; Accuracy ±2.0dB
MER	>45dB; Accuracy ±2.0dB
EVM	>0.36%
BER	1E-3 ~ 1E-9
Constellation	16, 32, 64, 128, 256 QAM



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### Specifications (continued)

Cable Modem Measurements	
Supported Standards	DOCSIS/EuroDOCSIS 1.1/2.0/3.0
Downstream Demodulation	64, 256 QAM
Downstream Freq. Range	108 ~ 1002 MHz (EuroDOCSIS)
Downstream Bandwidth	6 MHz / 8 MHz
Downstream Max Speed	1.2 Gbps with 32 downstream channel bonding
Downstream Chan. Bonding	Up to 32 channels
DS Input Signal Level	-15 ~ 15dBmV (EuroDOCSIS)
Upstream Freq. Range	5 ~ 85 MHz (EuroDOCSIS)
Upstream Signal Bandwidth	TDMA: 200 / 400 / 800 / 1600 / 3200 / 6400kHz S-CDMA: 1600 / 3200 / 6400kHz
Upstream Max Speed	240 Mbps with 8 upstream channel bonding
Upstream Chan. Bonding	Up to 8 channels
US Output Signal Level	TDMA: +8 ~ +54 dBmV (32QAM, 64QAM) +8 ~ +55 dBmV (8QAM, 16QAM) +8 ~ +58 dBmV (QPSK) S-CDMA: +8 ~ +53 dBmV (all modulations)
Upstream Signal Generator	
Signal Modulation	CW, QPSK, 8QAM, 16QAM, 32QAM, 64QAM
Symbol Rate	160kS/s, 320kS/s, 640kS/s, 1.28MS/s, 2.56MS/s, 5.12MS/s
MER	>38dB; Accuracy ±2.0dB
Frequency Range	5 ~ 85 MHz
Frequency Adjustable Steps	1 MHz
Signal Level Range	8.0 ~ 60dBmV
Level Adjustable Step	1dB
Advanced Upstream Signal Generator (Option)	
Signal Modulation	CW, QPSK*, 16* / 64 / 256QAM
FEC	RS (204, 188) J.83A; RS (128, 122) J.83B
Symbol Rates	1 ~ 7 MS/s
MER	>40dB; Accuracy ±2.0dB
BER	<1E-9
Frequency Range	5 ~ 120 MHz
Frequency Adjustable Steps	10kHz
Phase Noise	100dBc @ 10kHz; 115dBc @ 100kHz (CW @ 50 MHz)
Frequency Accuracy	2ppm
Settling Time	2ms
Signal Level Range	0 ~ 60dBmV
Level Accuracy	±1.5dB (CW); ±2.0dB (QAM)
Level Adjustable Steps	0.1dB

\* QPSK and 16QAM supported for Annex A only. Other modulations available for both A and B.

Transport Stream Analysis	
Real-Time Analysis	Real-time transport stream info, including service name, ID, provider info, video/audio PIDs. Detailed audio/video data for unencrypted programs.
TR 101 290 Priority 1, 2, 3	TR 101 290 Priority 1, 2, 3 real-time testing & monitoring.
Basic Information	Various TS details, including data type % breakdown; transmission speed; packet length; network info.
PID List	Displays PIDs in current stream w/ type, symbol rate, and % of each.
PCR Monitor	Calculates PCR interval / accuracy; real-time dynamic graph of results; max/min interval / accuracy data.
PSI/SI List	Displays PSI/SI info (PAT, PMT, CAT, NIT, SDT, TDT, EIT) in tree view.
Program List (EPG Info)	Transport stream EPG, including program #, service name & ID, carrier frequency, provider info, modulation type & symbol rate.
Active Reverse Path Sweep	
FSK Tx Frequency	5 ~ 65 MHz
FSK Tx Amplitude	10 ~ 50dBmV
FSK Rx Frequency	42 ~ 210 MHz
FSK Rx Sensitivity	-40dBmV
Pilot Frequency	5 ~ 65 MHz
Pilot Frequency Amplitude	10 ~ 50dBmV
Tx Test Signal Amplitude	0 ~ 60dBmV
Tx Test Signal Frequency	5 ~ 65 MHz
Tx Test Frequency Point	1 ~ 16 frequency points
DS2831 Units Supported (HE)	DS1610 supports up to 4 units
FSK Tx Amplitude	5 ~ 65 MHz
FSK Rx Frequency	10 ~ 50dBmV
WiFi	
Frequency	2.4G, 5G
Supported Standards	802.11 a/b/g/n
Security Mode	WPA / WPA2 / WPA-PSK / WPA2-PSK
Encryption	WEP / AES / TKIP
Test Parameters	SSID, Level, Channel
Miscellaneous	
RF Input	75Ω F
USB	USB 1.1
Ethernet	RJ45, 10/100T Ethernet
Display	7" capacitive LCD touchscreen, 800x480 pixels
AC/DC Adapter	AC 100 ~ 240V / 50 ~ 60Hz DC 12V / 5A
Battery	Li-ion, 7.4V / 10Ah
Charge Time	~4 hrs.
Working Time	8 hrs.
Dimensions (WxHxL)	245mm x 155mm x 60mm (9.6" x 6.1" x 2.4")
Weight	~2.2kg (4.9 lbs)
Working Temperature	-10 ~ +50 °C
Storage Temperature	-20 ~ +60 °C



## DS2831 Digital TV Spectrum Analyzer

### Specifications (continued)

Model	Description
SFL10-KK	TOKO F-F Connector
DS2800-003	CD (Toolbox Software and User Guide)
DS2800-004	Quick Start Guide
FSP060-DBAE1	AC/DC Adapter
DS2800-008	Soft Carrying Case
DS2800-010	Carabiner Red Deviser Logo
DS2800-011	Carabiner Blue Deviser Logo
DS2800-012	Plated Key Ring
DS2800-013	DS2800 Inspection Certificate
DS2800-700	Extended Spectrum (1220 ~ 2150 MHz)
DS2800-702	ATSC (8VSB) Measurement
DS2800-800	DPS (Digital Persistence Spectrum)
DS2800-801	CCN, CSO, CTB, Gated Measurements
DS2800-802	Analog Video Parameters Measurement (DG/DP, CLDI, ICR, DOM)
DS2800-803	EVS (Error Vector Spectrum)
DS2800-804	TS (Transport Stream) Analysis
DS2800-805	Wifi Analysis
DS2800-806	Reverse Path Sweep
DS2800-212	DS2800 FSK Unit
DS2800-807	Upstream Signal Generator with FEC
DS2800-808	SYNCOR Certificate
DS2800-810	SYNCOR Asset Management
CDA-26380	Built-in DOCSIS 3.0 32x8 Cable Modem
DS2800-809	DOCSIS 3.0 32x8 Cable Modem
DS2800-811	Passive Sweep
DI-1000	DI-1000 LighTel Fiber Inspection Scope
DS2800-812	FIP (Fiber Inspection Probe)
DS2800-211	GPS
DS2800-005	DS2800 User Guide hard copy
AE4000-733	2-Prong Power Cord plus Ground (Europe except UK)
AE4000-734	3-Prong Power Cord plus Ground (US)
AE4000-735	3-Prong Power Cord plus Ground (UK)
AE4000-736	3-Prong Power Cord plus Ground (Australia)

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