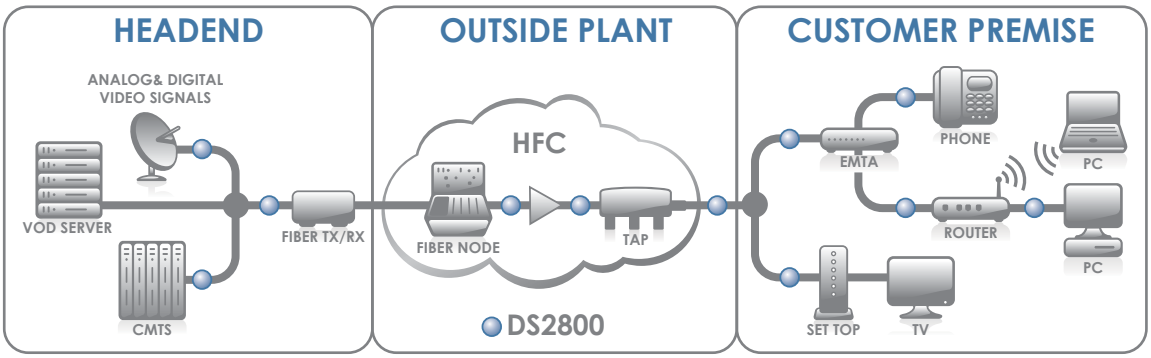
DS2800
Spectrum Analyzer

Key Benefits

- An all-in-one tool for installation, verification and maintenance of cable networks
- Ensure proper installation on the first visit reducing service calls
- Persistence testing finds hidden transient noise under the return path signal
- Detect interference from LTE with EVS masks
- View both the QAM and spectrum analysis simultaneously, eliminating the need to switch between screens to obtain the overall signal statistics
- Run in-service CTB, CSO and C/N tests with gated measurements
- Future-proof spectrum analyzer that covers up to 210 MHz for upstream
- Quickly identify linear distortion impairments with equalizer, frequency response and group delay measurements
- Automated FCC proof-of-performance test
- Long battery life of 8 hours enables all day testing

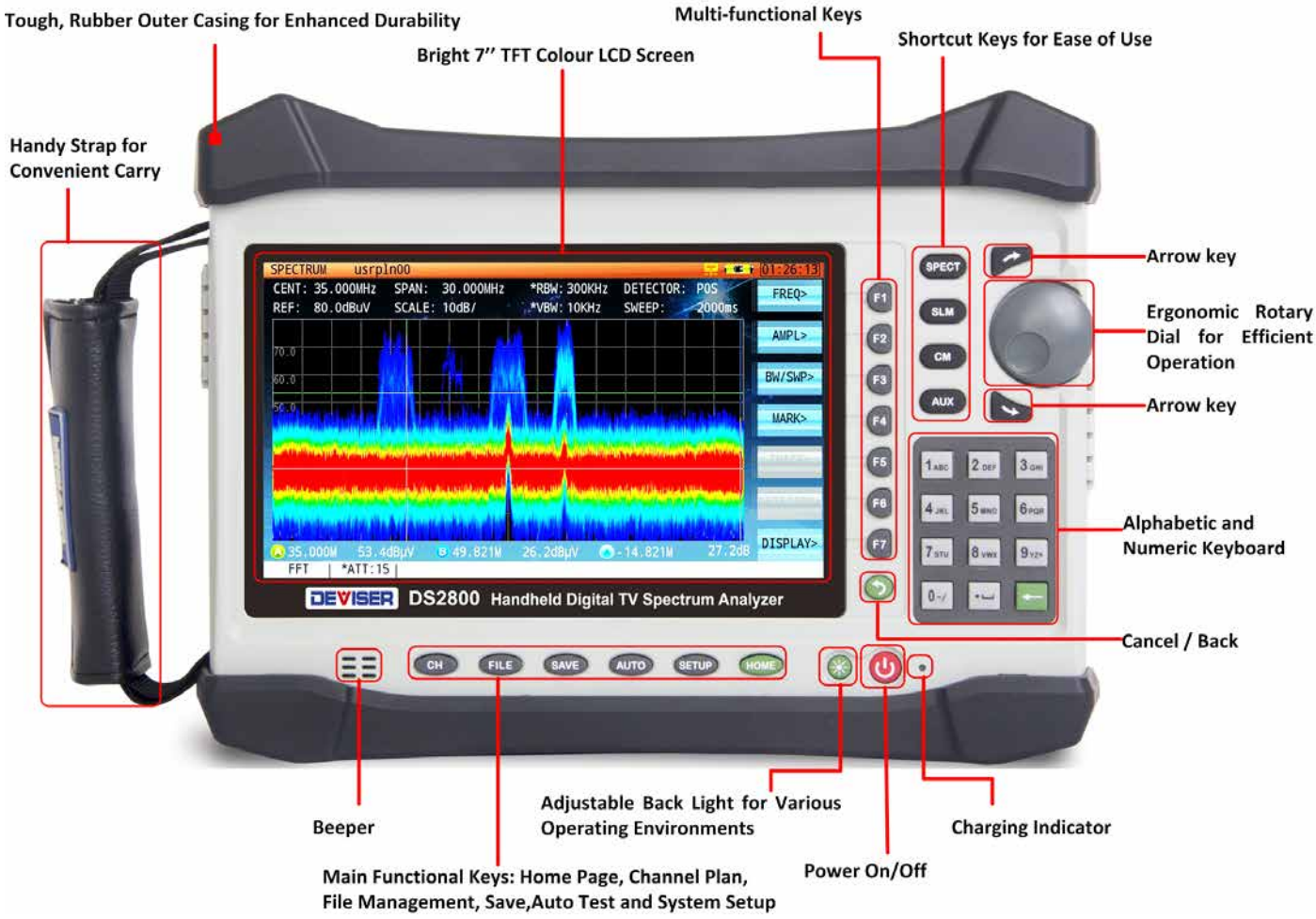
2014 DIAMOND TECHNOLOGY REVIEWS
BTR
BROADBAND TECHNOLOGY REPORT

The DS2800 is truly an "all-in-one" tool for performing installation, verification and maintenance of the cable network. Its unique features, such as persistence testing and EVS analysis, enable technicians to quickly detect and isolate impairments that were not visible in the past. The analyzer reduces operational expenses by ensuring a proper installation on the first visit and by shortening the time during service calls.



Key Features:

- Fast spectrum analysis with 80 dB dynamic range
- QAM/Digital TV analysis
- Integrated DOCSIS 3.0 cable modem
- Ultra-fast QAM signal lock
- Gated measurements
- Equalizer, frequency response and group delay
- FCC Analog/Digital Proof-of-Performance automated tests
- Transport stream (TS)/MPEG analysis in PID with TR-101 290 MPEG monitoring
- Persistence testing
- In-Service error vector spectrum (EVS) testing
- Simultaneous display of QAM and spectrum analysis
- Integrated return path sweep
- Upstream signal generator
- Wifi Analysis
- IP Test



Error Vector Spectrum (EVS) Analysis

The error vector spectrum analysis is new to handheld instruments. With EVS, the user can quickly detect and identify interference from the fast growing LTE network. This type of interference typically cannot be seen with frequency domain measurements as the interference signal is too weak.

Figure 1: EVS with interference

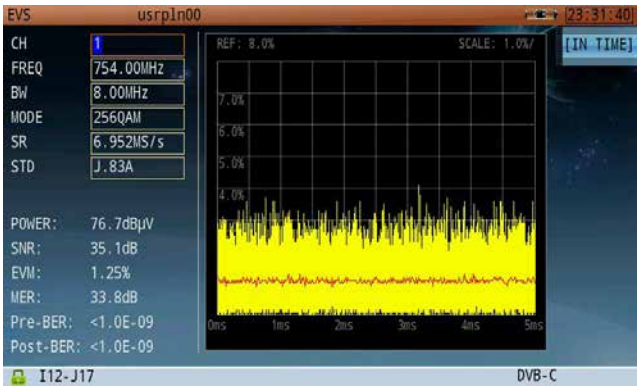


Figure 2: EVS without interference

Fast Spectrum Analysis Function

The spectrum analyzer on the DS2800 has a frequency range of up to 2150 MHz, with a dynamic range of 80 dB.

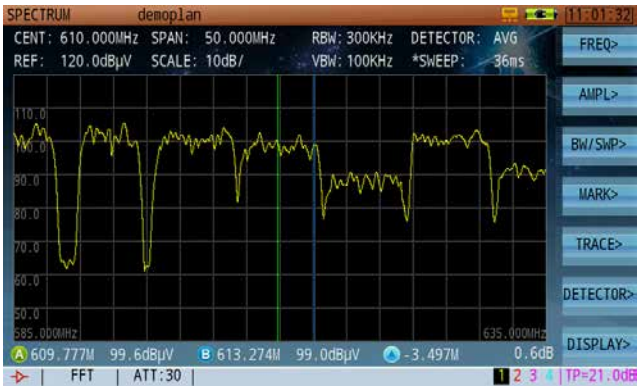


Figure 3: Spectrum Analysis

Gated Measurement

The Gated measurement enables the engineer run in-service C/N,CSO, CTB measurements.

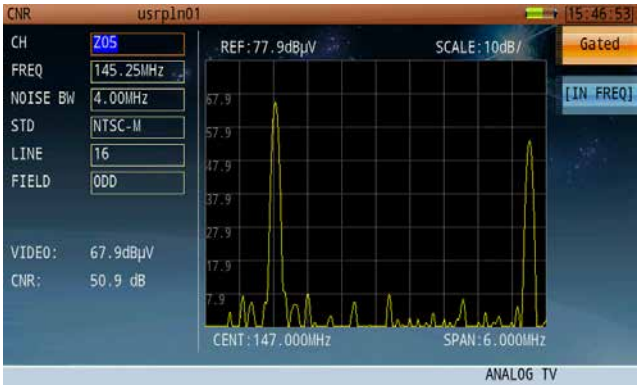


Figure 4: Analog TV Gated Measurement

Simultaneous display of Spectrum and QAM Analysis

The DS2800 displays QAM signal spectrum analysis andQAM measurement results on one screen. This new feature empowers the user to check the signal's different characters at the same time, and easily find the fault.

Figure 5: Simulaneous Display of Spectrum and QAM Analysis

Upstream Spectrum Persistence Technology

The new spectrum persistence analysis enables in-service detection of transient noise and impairments hiding beneath the upstream signal. Traditionally, troubleshooting the upstream channels is done by finding a free upstream spectrum. However, with the introduction of DOCSIS 3.0, the upstream channel is now extremely crowded, making it difficult to distinguish the upstream signal from the interference signal. The new persistence analysis facilitates finding impairments such as CPD and impulse noise with a color coded spectrum display.

Figure 6: Spectrum Analysis: Low Level Signal Covered by High Level Signal

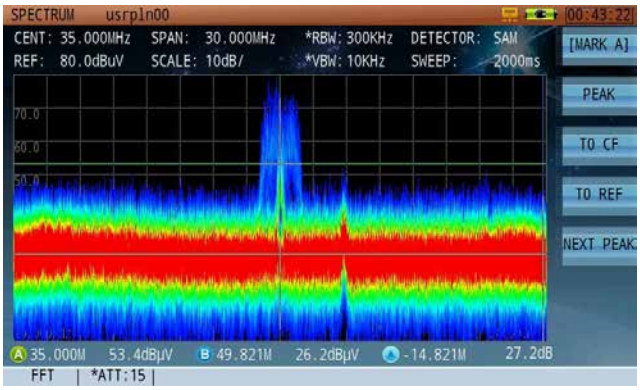


Figure 7: Persistence Shows Low Level Signal Covered by High Level Signal

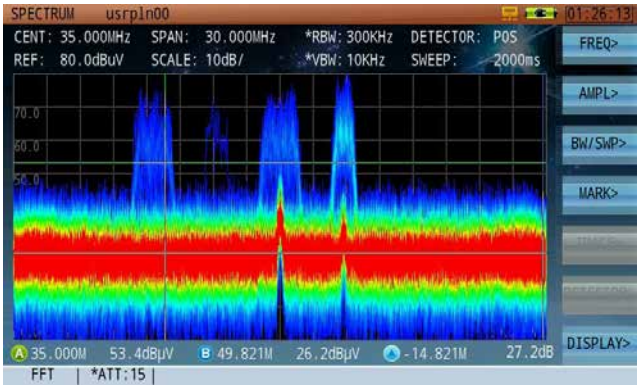


Figure 8: Persistence Shows Low Level Signal Covered by High Level Signal

DVB-C Signal Analysis

DS2800 supports ITU-T J.83 Annex A/B/C standards. The test automatically provides power level, MER, BER, constellation measurements.

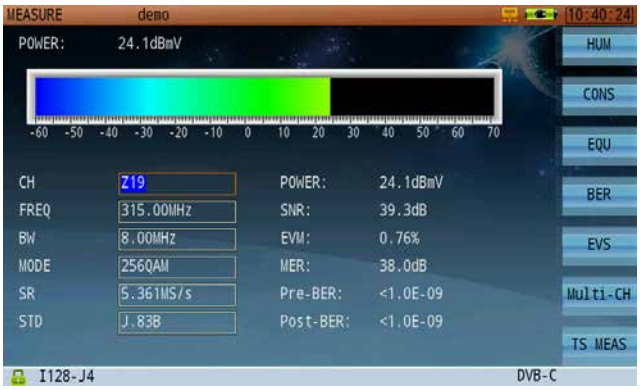


Figure 9: DVB-C Measurement

Figure 10: Constellation Display

Figure 11: BER and MER Statistical Analysis

Equalizer, Frequency Response and Group Delay Analysis

In a cable TV network, the most common signal impairments come from impendence mismatch and filters. Impendence mismatch can cause serious micro-reflection, which can overlay the transmission signal. This results in amplitude fluctuations or standing waves, which can affect signal quality. The equalizer, frequency response and group delay analysis are the best tools to troubleshoot these linear distortions.

Figure 12: Adaptive Equalizer

Figure 13: Group Delay

Figure 14: Frequency Response

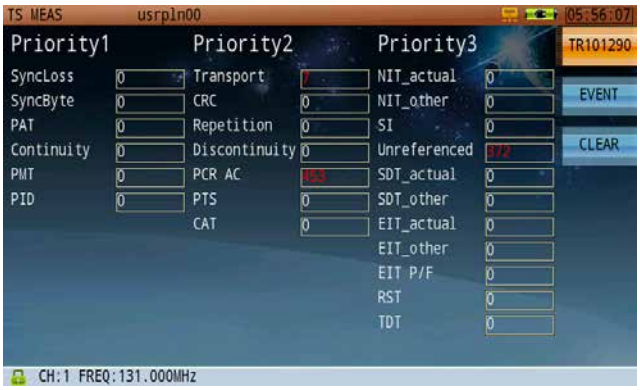


Figure 15: TR 101 290 Monitoring

Cable Modem Measurement

The DS2800 includes a DOCSIS 3.0 cable modem which supports 4 bonded upstream channels and 8 downstream channels. It is also compatible with DOCSIS 1.x and 2.0. The measurement displays statistics such as downstream signal level, modulation type, bandwidth, symbol rate, MER, BER and upstream signal level, modulation type, bandwidth, symbol rate, UCD (Upstream Channel Descriptor), standard. User can change MAC address, choose DOCSIS mode, downstream channel and UCD. Basic network test tools include: Ping, Traceroute, PPPoE, FTP and Browser.

Figure 16: DOCSIS 3.0 Statistical Information Display

Reverse Path Sweep and Upstream Spectrum Verification

With DS1610 broadband network monitor system DS2800 can run reverse path sweep. DS2800 can use these test results to draw the frequency response curve. This curve describes fromDS2800 position (Field) to DS1610 position (Headend) return path frequency response. DS2800 use FSK function connection to DS1610 can look at you test port upstream spectrum.

Figure 17: Return Path Sweep

Upstream Signal Generator

Upstream signal generator can generate both sine wave and QAM signals. The QAM signal has FEC coding, which supports both Annex A and B. The USG is useful for pre-qualifying new installations and new frequencies with an actual signal.

Figure 18: Upstream Signal Generator

Auto Test

The auto test on the DS2800 runs through a pre-configured test with the push of one button. The user can create test profiles that define a test procedure with pass/fail limits. This simplifies test result interpretation and ensures consistent testing. Even an inexperienced user can run the test and verify that the installation is up to the same specification as others. The results are then saved automatically.

Figure 19: Auto Test Project

Asset and Test-Data Management Software

Deviser's newly launched asset and data management system, SYNCOR enhances work efficiency by allowing the user to manage test profiles, sending work orders to the instrument and managing test results and reports.

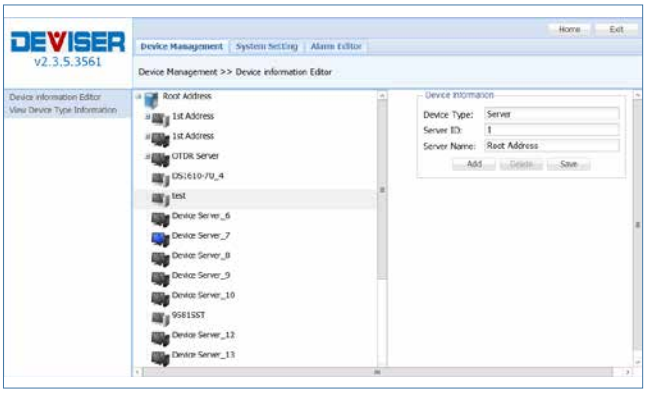


Figure 18: System Management

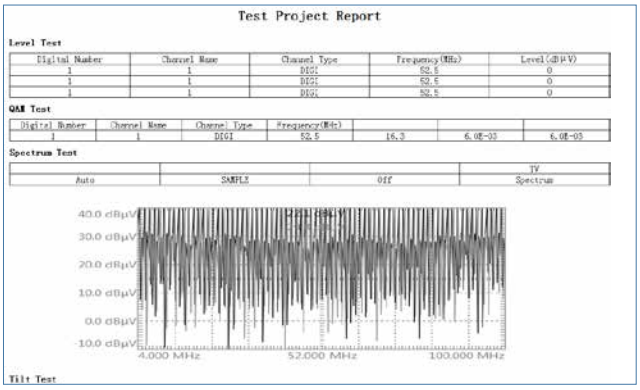


Figure 19: Exported Test Report

Specifications

Forward Spectrum Analysis		
Frequency Range	4MHz ~ 1220MHz; option 4MHz ~ 2150MHz	
Frequency Stability	±1x10-6 (0°C ~ 50°C)	
Frequency Span	0MHz ~ Full span	
Frequency Step	1 kHz	
Resolution Bandwidth (-3dB)	1kHz, 3kHz, 10kHz, 30kHz, 100kHz, 300kHz, 1MHz, 3MHz	
Video Bandwidth	30Hz, 100Hz, 300Hz, 1kHz, 3kHz, 10kHz, 30kHz, 100kHz, 300kHz, 1MHz, 3MHz	
Display Scale and Range	1, 2, 5, 10, 20 dB/Div; 8 vertical divisions	
Sweep Time	20ms ~ 25s	
Input Level Range	-60dBmV ~ +60dBmV	
Dynamic Range	80dB (30kHz RBW)	
Sensitivity	-60dBmV (300 kHz RBW, Pre-amplifier On)	
Attenuation	0~30dB in 1dB Steps	
Accuracy of Measurements	<±1.0dB@+25±5°C (typical value)	
Measurement Detector	Positive Peak, Negative Peak, Sample, Average, RMS	
Reference Level	-80dBmV ~ +70dBmV	
Markers	2 vertical markers	
Upstream Spectrum Analysis		
Frequency Range	4~46MHz (DOCSIS); 4~68MHz (Euro DOCSIS 2.0); 4~88MHz (Euro DOCSIS 3.0); 4~120MHz (DOCSIS 3.1); 4~210MHz (DOCSIS 3.1)	
Frequency Span	42/64/84/116/206MHz, zero span	
Resolution Bandwidth (-3dB)	100kHz, 300kHz	
Video Bandwidth	30Hz, 100Hz, 300Hz, 1kHz, 3kHz, 10kHz, 30kHz, 100kHz, 300kHz, 1MHz, 3MHz	
Display Scale and Range	1, 2, 5, 10, 20 dB/Div	
Sweep Time	20ms ~ 25s	
Input Level Range	-60dBmV ~ +60dBmV	
Attenuation	Automatic, 0~30dB	
Pre-amplifier	Manual, 18dB Gain	
Accuracy of Measurements	<±1.0dB@+25±5°C (typical value)	
Measurement Detector	Positive Peak, Negative Peak, Sample, Average	
Markers	2 vertical markers	
Persistence		
0-7MHz	100%POI minimum signal duration 2.5ms	
4-46MHz	100%POI minimum signal duration 3ms	
4-68MHz	100%POI minimum signal duration 4ms	
4-88MHz	100%POI minimum signal duration 5ms	
4-120MHz	100%POI minimum signal duration 6ms	
4-210MHz	100%POI minimum signal duration 10ms	
Analog TV Measurement		
Standards	B/G, I, D/K, L/L', M/N	
Colour Standards	NTSC, PAL, SECAM	
Frequency Steps	10kHz	
Level Measurement Range	-40dBm ~ +60dBmV	
Accuracy of Measurement	<±1.0dB @ +25±5°C (S/N>30dB)	
Level Resolution	0.1dB	
Resolution Bandwidth	300 kHz	
C/N	>53dB	
CTB/CSO	Optimum Input Range	82dBμV~87dBμV 0dB Attenuation - Amplifier Off
		62dBμV~67dBμV 0dB Attenuation - Amplifier On
	Maximum	63dB with ±1.5dB Accuracy and 78 Channels
		70dB with ±4.0dB Accuracy and 78 Channels
HUM Measurement	1% ~ 20%; ±0.5% (1~5%); ±1.0% (5%~20%)	
Depth of Modulation	Range 40 to 95%, ±1.5%(C/N>40dB)	
Tilt	Up to 16 channels	
Pre-amplifier	Automatic, 18dB Gain	
Attenuator	Automatic, 30dB	

WiFi	
Frequency	2.4G, 5G
Support Standard	802.11 a/b/g/n
Security Mode	WPA/WPA2/WPA-PSK/WPA2-PSK
Encryption	WEP/AES/TKIP
Test Parameters	SSID, Level, Channel
Digital TV Measurement	
Frequency Range	4 ~ 1220MHz
Power Level Range	-30dBmV ~ +50dBmV
Level Resolution	0.1dB
Power Level Accuracy	<±1.5dB (C/N>20dB) @+25±5°C
Pre-amplifier	Automatic, 18dB Gain
Attenuator	Automatic, 30dB
Modulation Type	16, 32, 64, 128, 256 QAM (J.83 Annex A and C); 64, 256 QAM (J.83 Annex B)
Interleave Depth	128×1~128×7(J.83 B); 12×17(J.83 A/C)
Symbol Rate	1.0MS/s ~ 7.0MS/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
Cable Modem Measurement	
Support Standard	DOCSIS 1.1, 2.0, 3.0; EuroDOCSIS 1.0, 1.1, 2.0, 3.0
DS Demodulation	64, 256QAM
DS Frequency Range	>91MHz (5~65MHz US); >100MHz (5~85MHz EU)
DS Maximum Speed	Up to 304Mbps (6MHz); And 400Mbps (8MHz)
DS Channel Bonding	Up to 8 channels
DS Bandwidth	6MHz / 8MHz
DS Input Signal Level	-15dBmV to +15dBmV
US Frequency Range	5 ~ 42MHz; 5 ~ 65MHz; 5 ~ 85MHz
US Signal Bandwidth	TDMA: 200/400/800/1600/3200/6400kHz; S-CDMA: 1600/3200/6400kHz
US Output Signal Level	QAM level range: +17 to +58dBmV;QPSK level range: +17 to +61dBmV
US Channel Bonding	Up to 4 channels
US Maximum Speed	120Mbps (4 channels bonding)
Upstream Signal Generator	
Signal Modulations	CW, QPSK, QAM16, 64, 256, Annex A/B
FEC	RS (204,188) J.83 A; RS (128,122) J83B
Symbol Rates	1~7 MS/s
MER	>40dB; Accuracy ±2.0dB
BER	<1E-9
Frequency Range	5~120MHz
Frequency Adjustable Steps	10kHz
Phase Noise	85dBc@10kHz; 105dBc@100kHz (CW@50MHz)
Frequency Accuracy	2ppm
Settling Time	2ms
Supported Level	0~60dBmV
Level Accuracy	±1.5dB(CW); ±2.0dB(QAM)
Level Adjustable Step	0.1dB

Reverse Path Sweep	
FSK Tx Frequency	5~65MHz
FSK Tx Amplitude	70 dBμV ~ 110 dBμV
FSK Rx Frequency	42~120MHz
FSK Rx Sensitivity	20dBμV
Pilot Frequency	5~65MHz
Pilot Frequency Amplitude	70 dBμV ~ 110 dBμV
Tx Test Signal Amplitude	60dBμV~120dBμV
Tx Test Signal Frequency	5~65MHz
Tx Test Frequency Point	1~16 Frequency Points
Headend Support DS2800 Number	DS1610 Max Support 4 DS2800 Units
DS1615	
Size	1U Standard Rack
FSK Tx Frequency	42MHz~120MHz
FSK Tx Level	85dBμV~110dBμV
Modulation type	FSK
Baud Rate	38.4kbps
Other	
RF Input	75Ω F-Type connector
USB	USB 1.1
Ethernet	RJ45, 10/100T Ethernet
Display	7 inches TFT LCD 800×480 pixels
AC/DC Adapter	AC 100 ~ 240 V/50 ~ 60Hz DC 12V / 5A
Battery	Li-ion, 7.4 V/10Ah
Charge Time	Around 4 hours
Working Time	8 Hours
Dimension (W×H×L)	245mm×155mm×60mm
Weight	Around 2.2kg
Work Temperature	-10 ~ +50°C
Storage Temperature	-20 ~ +70°C