DASMaster™

The RF Gear for Every Phase of your DAS Project

User Manual

Ver. 2 February 2019

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Introduction

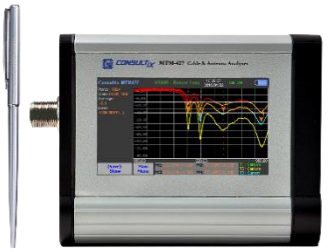
DASMaster Overview

A large number of abnormal cell site problems are typically caused by the antenna system, cable runs or connectors. It's important to have the right instrument available when either servicing or certifying cell sites for operation. The Miniature cable and antenna analyzer DASMaster is a lightweight portable diagnostic tool needed to accurately detect operational problems. DASMaster has all of the measurement functions necessary to accurately verify antenna systems from VSWR to fault location. A 4.3-inch TFT touch screen allows measurements to be easily configured and displayed on the device. Its specific PC software allows users to easily document, compare, analyze measurements and generate reports. A rechargeable battery secures 3-hour continuous field operation and up to 8 hours in power saving mode. One second fast calibration technique implies saving time and efforts in field missions.

DASMaster Highlights

Key Measurements

- VSWR (Voltage Standing Wave Ratio)
- Return Loss
- DTF (Distance to Fault)
- Cable Loss
- Spectrum Analyzer
- CW Receiver



Key Features

- CW Test Receiver Option
- Spectrum Analyzer Option
- Channel Power Measurement Option
- Built-in worldwide signal standards and frequency channels database
- Superior immunity to RF interference
- Rechargeable battery
- Internal storage (1000 trace)
- External USB storage
- User friendly menu structure
- A compact lightweight instrument < 700 gm
- 4.3-inch TFT touch screen color display viewable in daylight
- Fast one-touch selection of menu items & positioning marker
- Alphanumeric labeling of saved data
- Built-in cable database
- Up to 4 markers & delta markers, peak & minimum search
- Two Limit Lines.
- Up to 1024 data points per measurement

Safety Compliances & Precautions

In order to use the DASMaster in a correct, efficient, safe way, and to avoid damage caused by improper operations, we mandate the following:

1. Use only the original accessories to prevent any damage to the device.
2. Don't let water or other liquids flow into the device.
3. Prohibit approaching the device to flammable or explosive items.
4. Don't open the device outside company maintenance branches.
5. For the first time usage of the device, the battery should be charged continuously 7 hours before usage.
6. Don’t disassemble the parts of the instrument; it may cause instrument damage. Consultix doesn’t take any repair responsibility for the damage or malfunction of the instrument caused by an unauthorized disassembly even during the warranty period.
7. Do not apply RF power more than 33 dBm (1-Watt continuous wave, 2-Watt peak) to the RF port of the instrument; that will damage the instrument.
8. Do not use solvents or abrasive cleaners to avoid damage to the display or the case.
9. Use the touch pin included in the package to avoid scratching the display screen.

Unpacking DASMaster

Unpack and inspect the shipping package to ensure that nothing was damaged during shipment.

If the contents are damaged or defective, contact your nearest Consultix service office or agent. Verify that all the parts were included in the shipping container as shown in ***table 1***.

DASMaster MTM-427			
Touch Pin		**Shoulder strap with shock absorbers**	
Site Auditor Software		**AC Adapter**	
Carrying Case		**USB Mini B Cable**	
2G/3G Duck Antenna		**N Type-SMA Adapter**	
Calibration Kit (Optional)		**Launch Cable (Optional)**	

Table 1*: MTM-427 Packing list*

DASMaster User Interface

Figure 1, depicts the DASMaster user interface

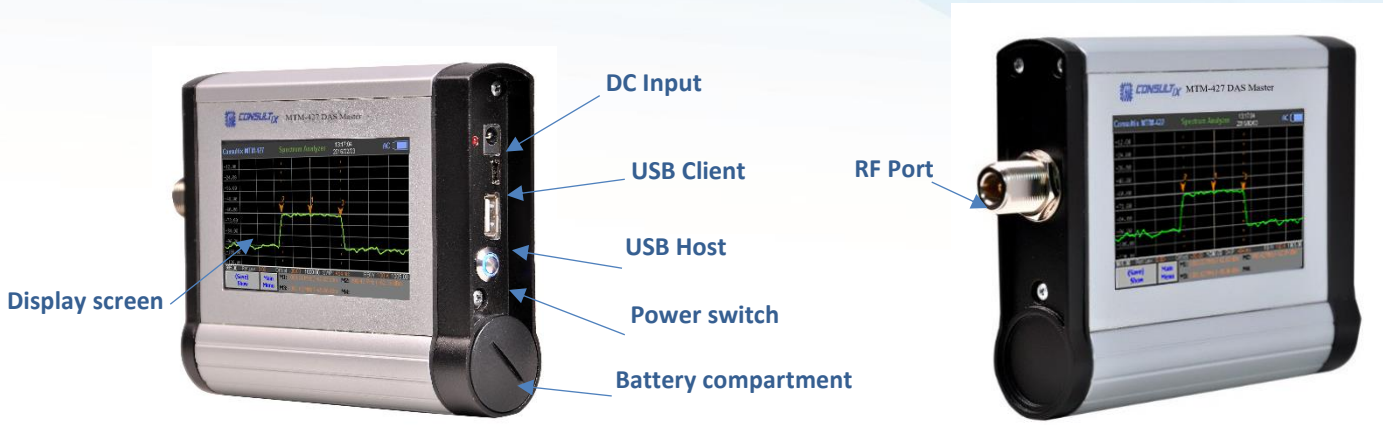


***Figure 1**: DASMaster User interface*

- **RF Port:** N-Type female 50Ω connector that transmits/receives RF signal to/from DUT (Device Under Test) with 33 dBm maximum input power
- **DC Input:** DC input port 12 V, 2 A
- **USB Client:** USB port for interfacing with an application SW on a PC and upgrading the instrument's firmware, if needed
- **USB Host:** USB port to export/import measurement data to/from an external memory
- **Power switch:** Push button to power on/off the DASMaster with one click
- **Display screen:** TFT touchscreen for configuration of displaying measurements
- **Battery compartment:** Battery cover for replacing the battery, if needed, just rotate it counterclockwise and plug the battery into its socket as shown in figure 2

***Figure 2**: Battery replacement*

DASMaster Display Screen

Figure 3, depicts the DASMaster display screen.

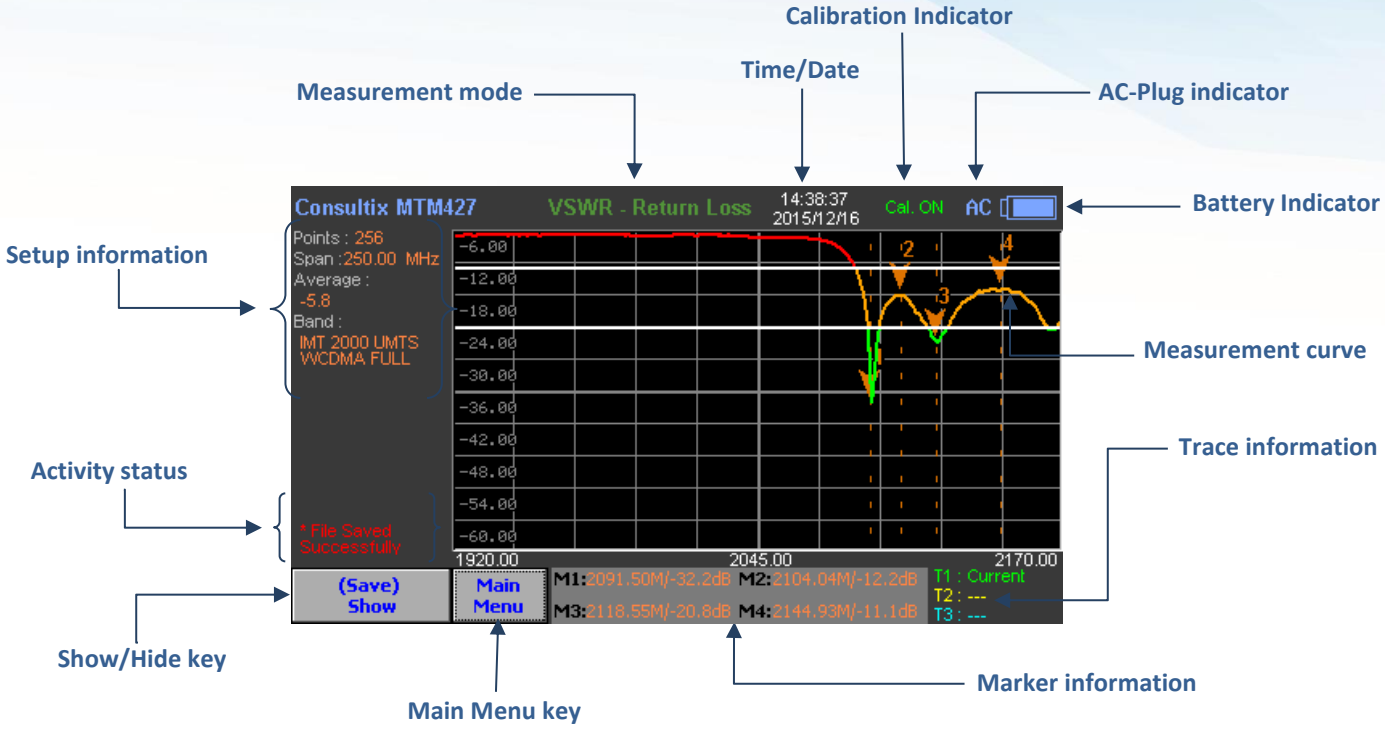


Figure 3*:* DASMaster *Display screen*

- Setup information: displays setup parameters like "Trace Points", "Span", "Average", …. etc. and that depends on the measurement mode
- Measurement mode: displays the selected measurement mode
- Time/Date: indicates the system clock/date information
- Calibration Indicator: indicates the calibration status (Cal. ON/Cal. OFF) of the DASMaster
- AC-Plug indicator: indicates if the instrument is connected to its AC/DC adapter
- Battery Indicator: indicates the battery status
- Measurement curve: displays the current measurement curve, users can add markers & limit lines, adjust scale and so on
- Trace information: displays the current active traces and captured traces as well
- Marker information: displays the marker values; frequency (in MHz), amplitude (in dB), and distance (in m or ft)
- Main Menu key: a shortcut button to jump to the main menu when touched
- Show/Hide key: shows/hides the current pop-up menu
- Activity status: displays running operations like file saving, error messages...etc

Figure 4, depicts the DASMaster display screen in the spectrum analyzer mode

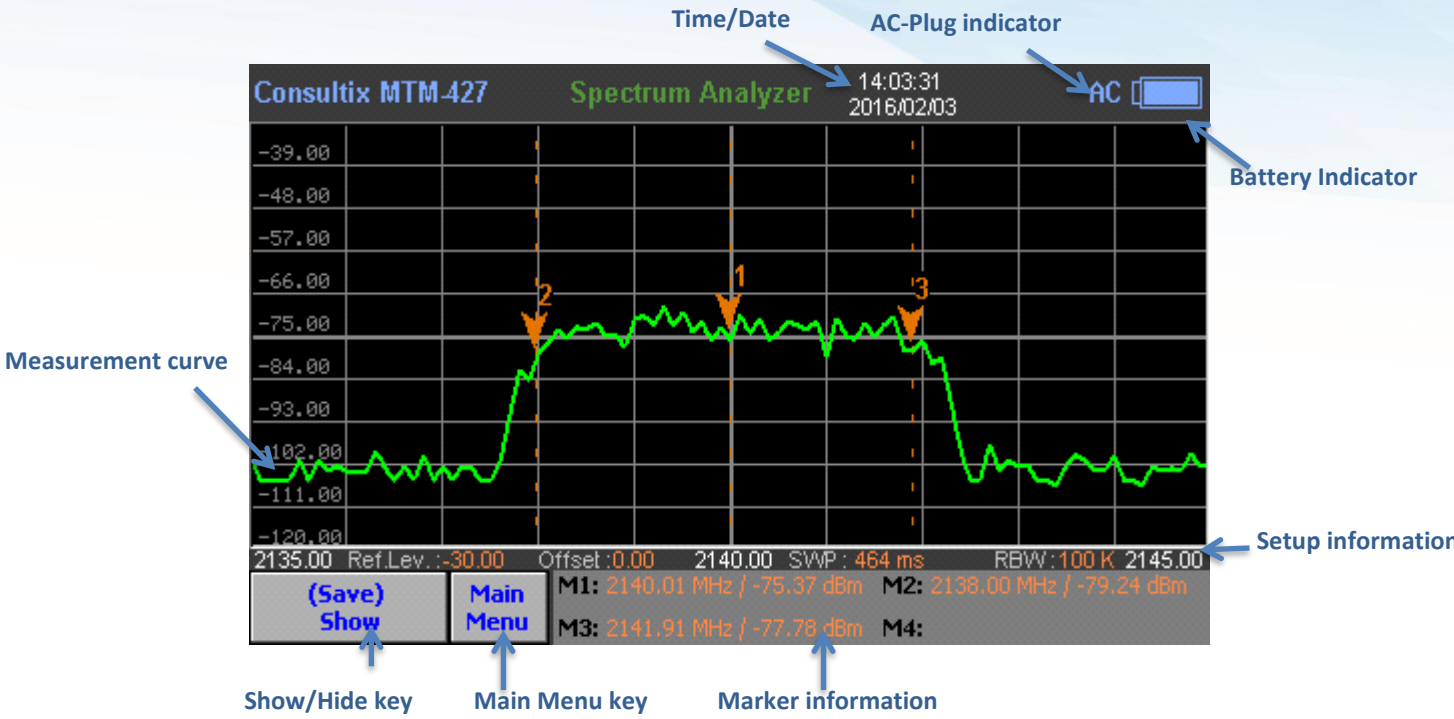


Figure 4: DASMaster Display screen (Spectrum Analyzer Option)

- Measurement curve: displays the current measurement curve, users can add markers & limit lines, adjust scale and so on.
- Show/Hide key: shows/hides the menu to enable viewing full-screen measurements.
- Main Menu key: a shortcut button to jump to the main menu when touched.
- Marker information: displays the marker values; frequency (in MHz), and amplitude (in dBm).
- Setup information: displays current configuration parameters like reference amplitude level “Ref. Lev.”, reference attenuation offset "Offset", sweep time "SWP”, and resolution bandwidth “RBW”.
- Battery Indicator: indicates the battery status.
- AC-Plug indicator: indicates if the instrument is connected to its AC/DC adapter.
- Time/Date: indicates the system clock/date information.

DASMaster Menus

Cable and Antenna Analyzer

Always, user can jump to the “Main Menu” by clicking “Main Menu” button at any time. DASMaster Main Menu is depicted in ***figure 5***

Figure 5: DASMaster *Main Menu*

Mode: switches between 5 measurement modes provided by the DASMaster as depicted in *figure 6*

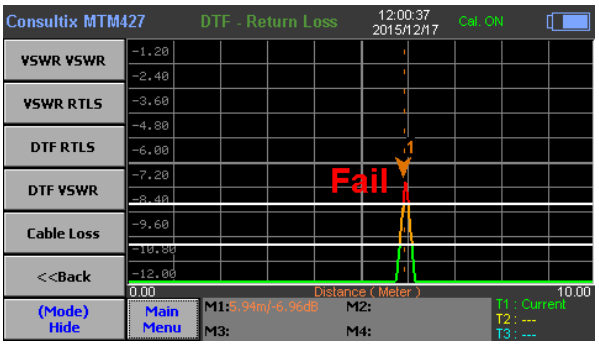


Figure 6: DASMaster *Mode Menu*

Measurements: configures the measurement parameters; like Frequency, Amplitude, and Distance, and in addition to setting and customizing markers. ***Figure 7,*** depicts the “Measurements” menu in the two main modes (VSWR & DTF).

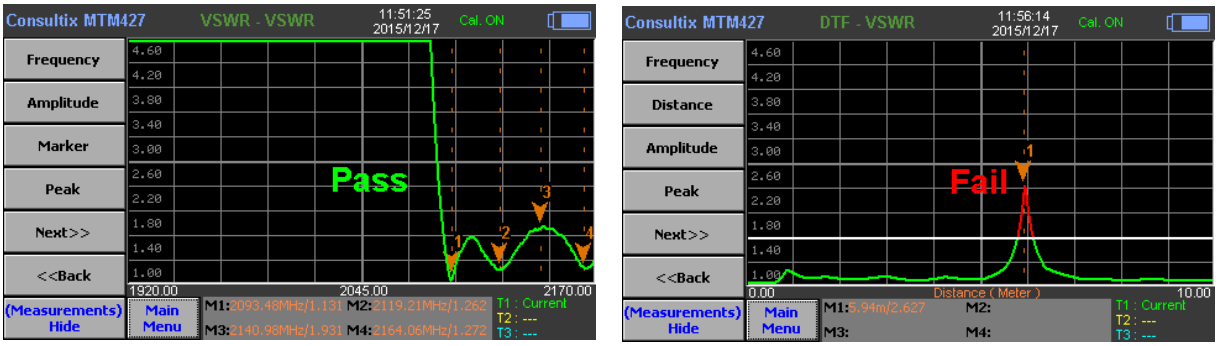


Figure 7: DASMaster *Measurements Menu*

Frequency: configures customized frequency band either setting “Start Frequency” & “Stop Frequency” or setting “Center Frequency” & “Span” and other parameters depending on the selected mode (VSWR or DTF) As shown in ***figure 8 & 9*** respectively.

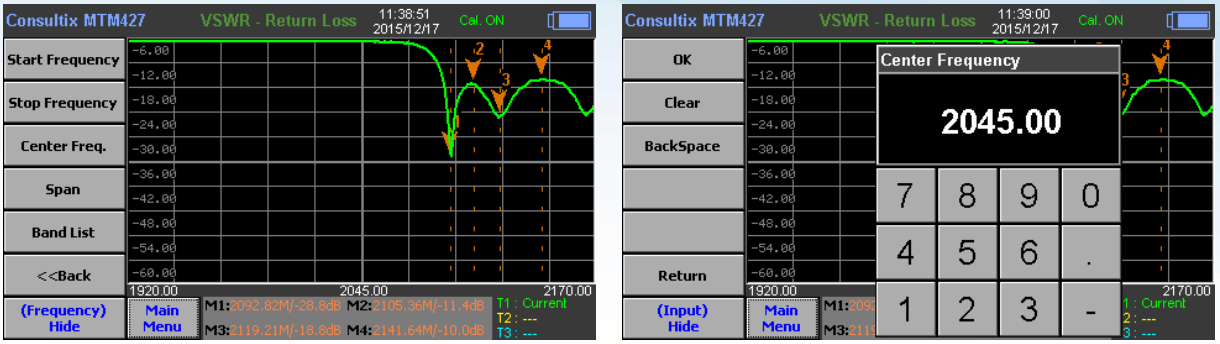


***Figure 8**: DASMaster Frequency Menu in "VSWR" mode*

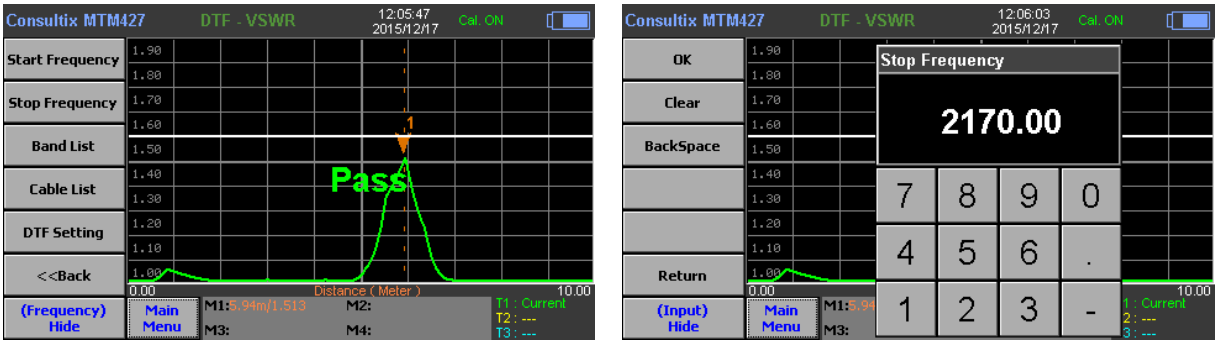
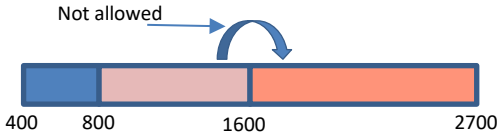


***Figure 9**: DASMaster Frequency Menu in "DTF" mode*

In "DTF" mode, there are relevant sub-bands; users can sweep through each sub-band, but they can't sweep from sub-band to another as depicted below,



Users can choose from ready-configured standard bands by clicking "Band List" and selecting the required band as depicted in ***figure 10*** below,

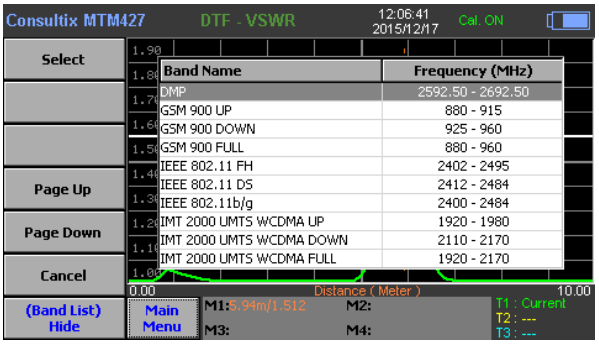


***Figure 10**: DASMaster Band List*

In "DTF" mode, users can choose from ready-configured cable types by clicking "Cable List" and configure the DTF required settings (i.e. Velocity, Cable Loss, distance Unit, and windowing) as depicted in ***figure 11 & 12*** below,

***Figure 11**: DASMaster Cable List*

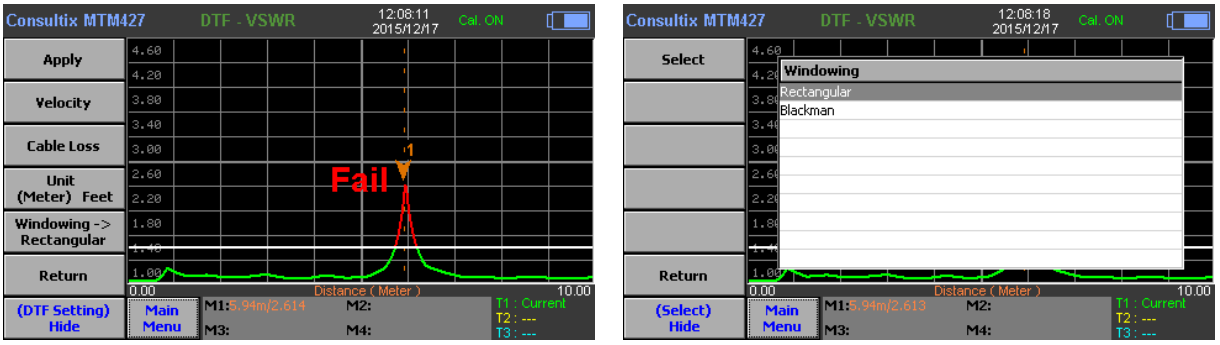


***Figure 12**: DASMaster DTF Setting Menu*

In "DTF Setting" Menu, user must click "Apply" key after any configuration or a value entered for Velocity, Cable Loss, etc.

Amplitude: customizes curve profile by setting "Max (TOP)", "Min (BOTTOM)", "Auto Scale" ...extra. and adds limit lines as shown in ***figure 13***.

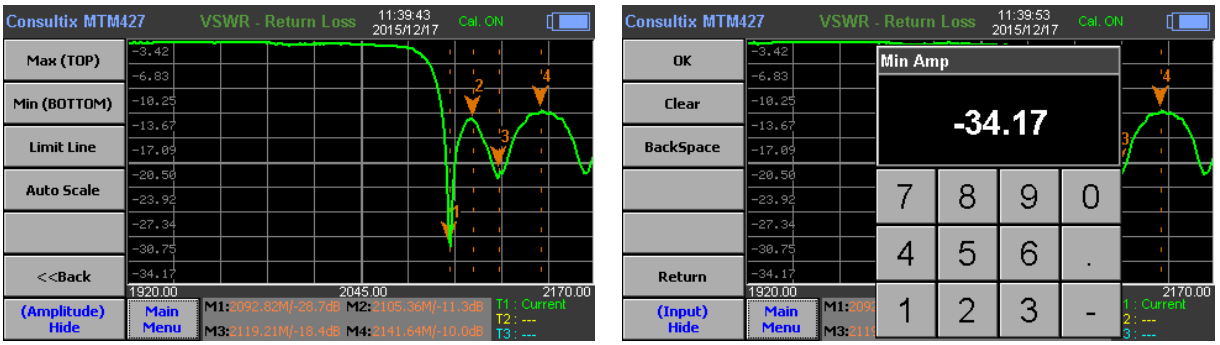


***Figure 13**: DASMaster Amplitude Menu*

Distance: enters the cable length estimated to measure its DTF as shown in ***figure 14.***

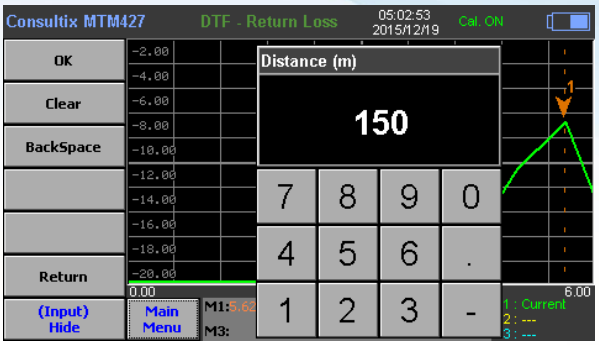


***Figure 14**: Setting distance*

Marker: adds and edits markers (up to 4 markers) and changes the marker type between "Normal" and "Delta" markers as shown in ***figure 15***.

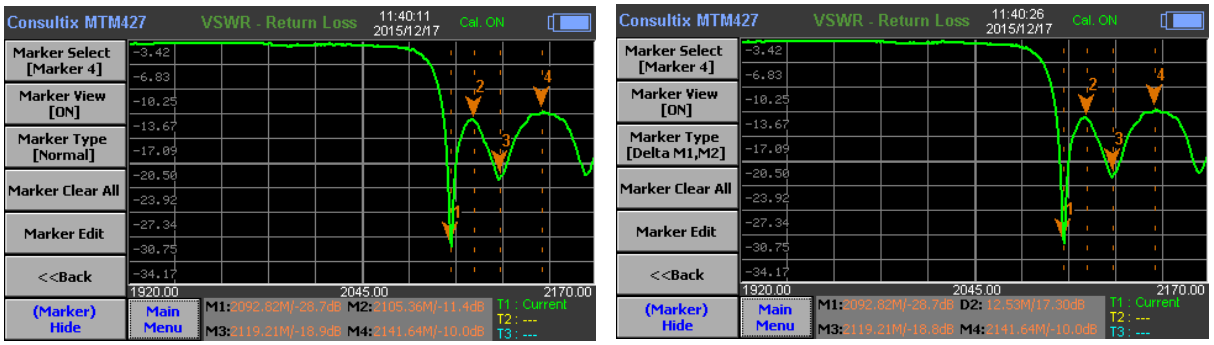


***Figure 15**: DASMaster Marker Menu*

Peak: moves through the measurement curve smoothly through using "Peak" soft key as shown in ***figure 16***.

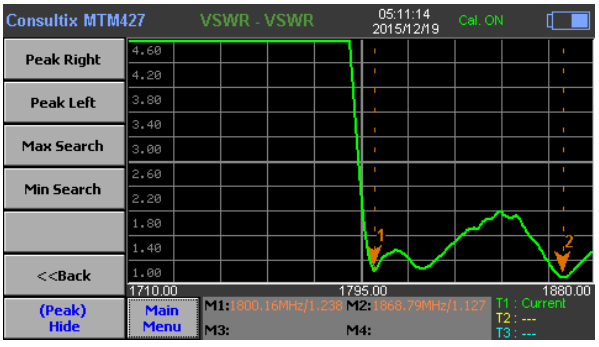


***Figure 16**: DASMaster Peak Menu*

Trace: adds traces by clicking “Next” from the “Measurements” and customizes up to 3 traces by clicking “Trace” key as shown in ***figure 17.***

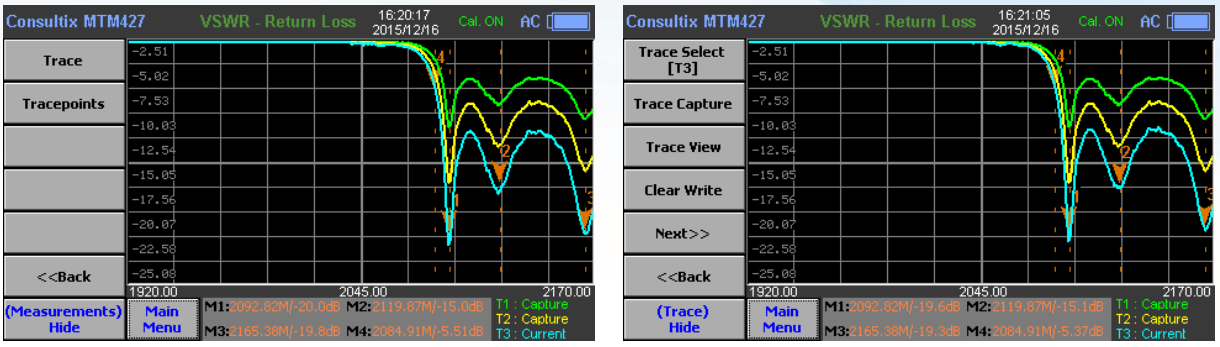


Figure 17: DASMaster Trace Menu

Trace Points: chooses the curve adequate number of “Trace Points” by clicking “Next” from the “Trace” menu as shown in ***figure 18.***

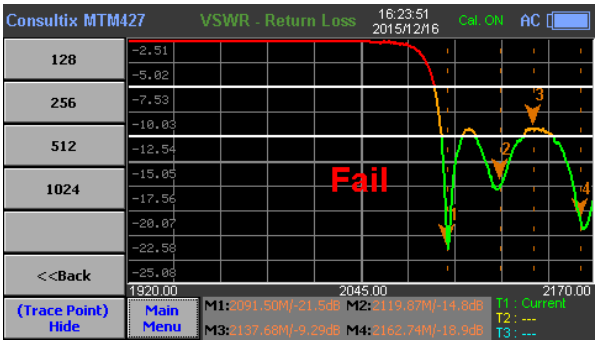


Figure 18*: DASMaster Trace Points*

System: configures DASMaster settings; like “Date/Time”, “Beep”,” Pass Ind.”, and “Factory Reset”, also user can view device information. As shown in **figure 19**.

Figure 19*: DASMaster System Menu*

Calibration: calibrates the DASMaster before starting your measurements by clicking “Calibration” key from the “Main Menu”. as shown in ***figure 20.***

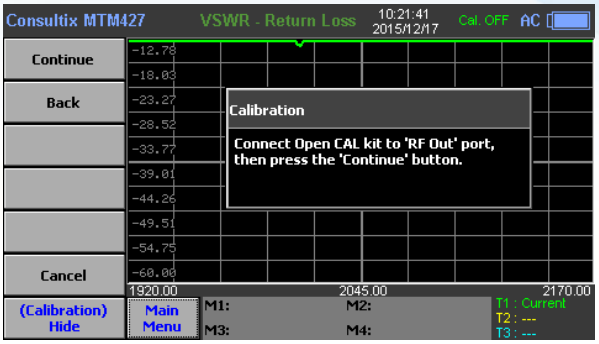


Figure 20*: DASMaster Calibration Menu*

File: saves/loads screenshots or traces to/from internal/external memory.

Save: saves measurements either as .bmp images or .csv traces as shown in ***figure 21***

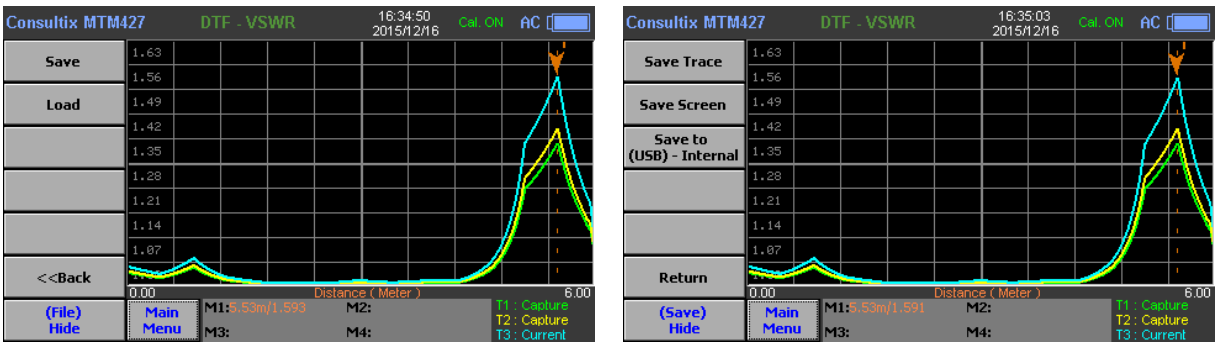


Figure 21: *DASMaster Save Menu*

Load: Loads measurements from the internal memory or from external flash memory as shown in ***figure 22***

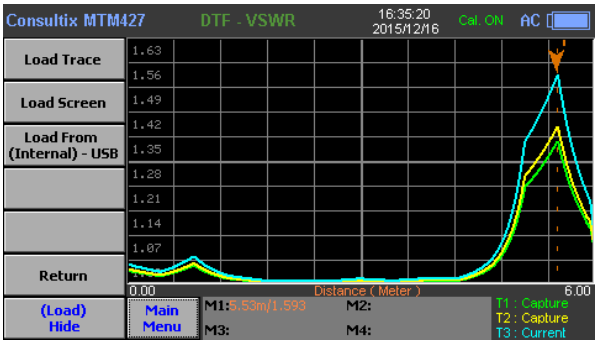


Figure 22*: DASMaster Save Menu*

Users can copy their measurements (traces or images) from the internal memory to an external flash memory after loading it by using “File Management”

Shortcuts: allows user to execute all common functions fast by using “Shortcuts” menu as shown in ***figure 23***.

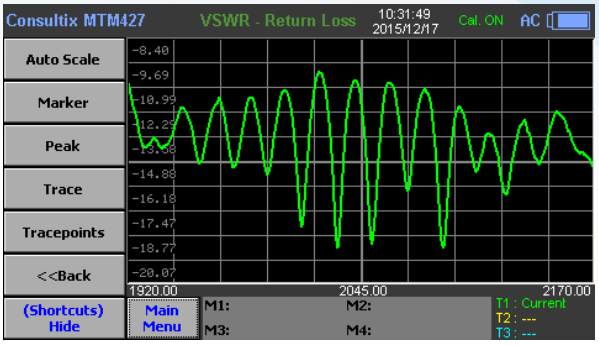


Figure 23*: DASMaster Shortcuts Menu*

WalkView Mode

appears when the user taps the “Set Frequency” icon on WalkView SW which is running on an android tablet and when the DAS Master is connected to that tablet via USB Mini-B cable & OTG Adapter as shown in ***figure 24.***

In order to activate the CW Test Receiver option, please do the following steps,

1. Connect the suitable antenna to the RF Port of the DAS Master.
2. On DAS Master, go to “Main Menu” > Mode > “Spectrum Analyzer” mode, select the frequency band of interest and adjust the maximum top (reference level) and the minimum bottom (sensitivity) of your spectrum analyzer.
3. On the Android tablet, run WalkView SW, configure the frequencies needed to be measured and tap “Set Frequency” icon
4. The WalkView Mode will be activated on the DAS Master and it will appear on its screen.
5. After finalizing your measurements on WalkView SW, save & export your data.

Figure 24*: DAS Master CW Test Receiver Option*

For more details about the configurations of WalkView SW, please refer to WalkView User Manual

Spectrum Analyzer Mode

go to “Main Menu” > Mode > “Spectrum Analyzer”, below are the menus of the spectrum analyzer mode

Presetting the spectrum analyzer

On **Main Menu > Shortcuts**, press “**Reset**” button to restore current configurations to a default state as shown in figure 24.

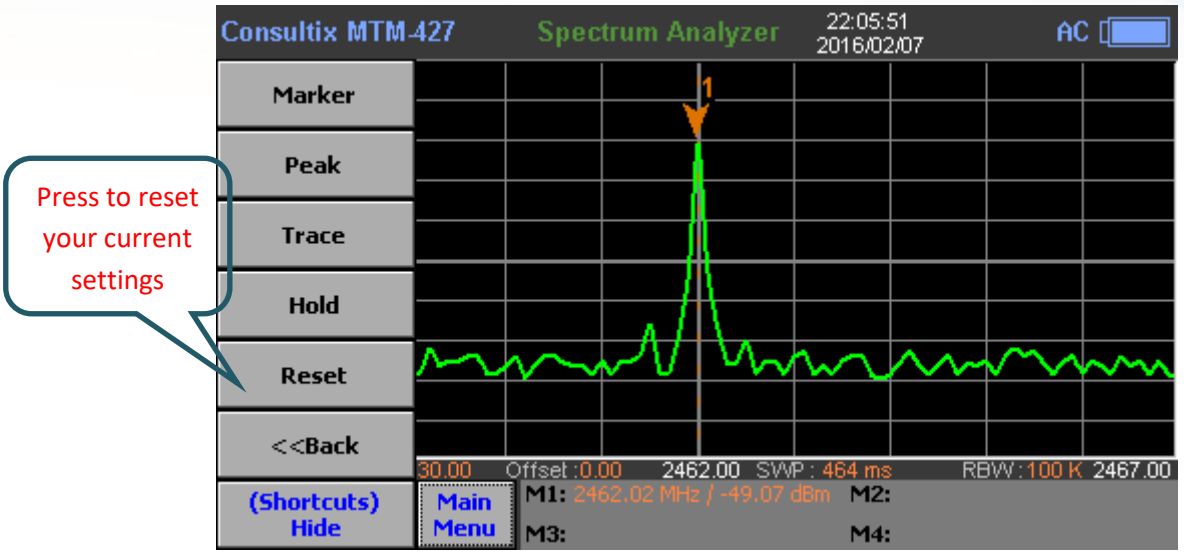


Figure 24: Spectrum Analyzer Configuration Resetting

Frequency Settings

On **Main Menu > Measurements > Frequency**, the user can configure measurement frequencies in two ways; either using "**Start Frequency**" & "**Stop Frequency**" or using "**Center Freq**." & "**Span**" as shown in figure 25.

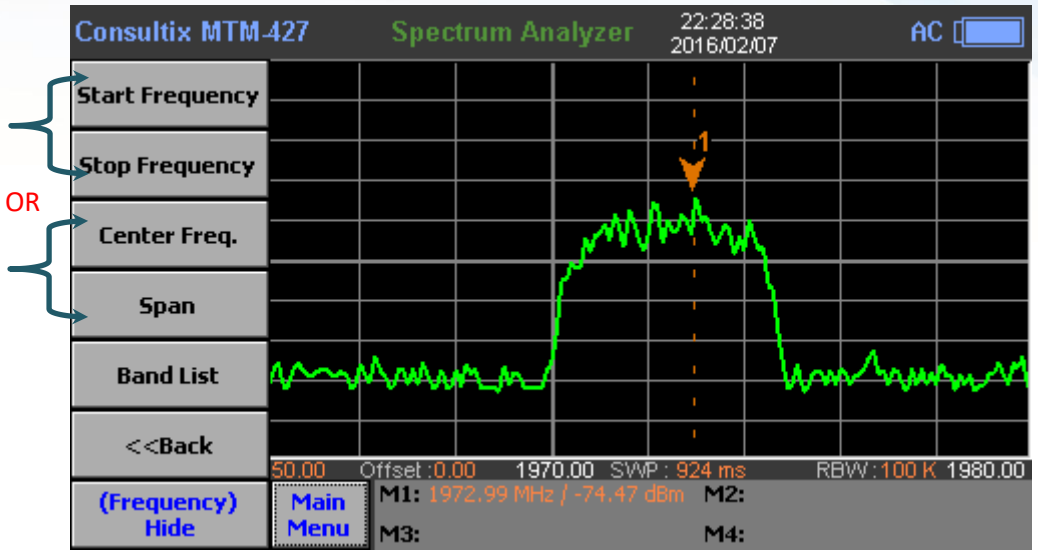


Figure 25: DASMasters Frequency Menu

For quick frequency configuration, the user can select a frequency band from the ready-made band list made according to the frequency band standard as shown in figure 26.

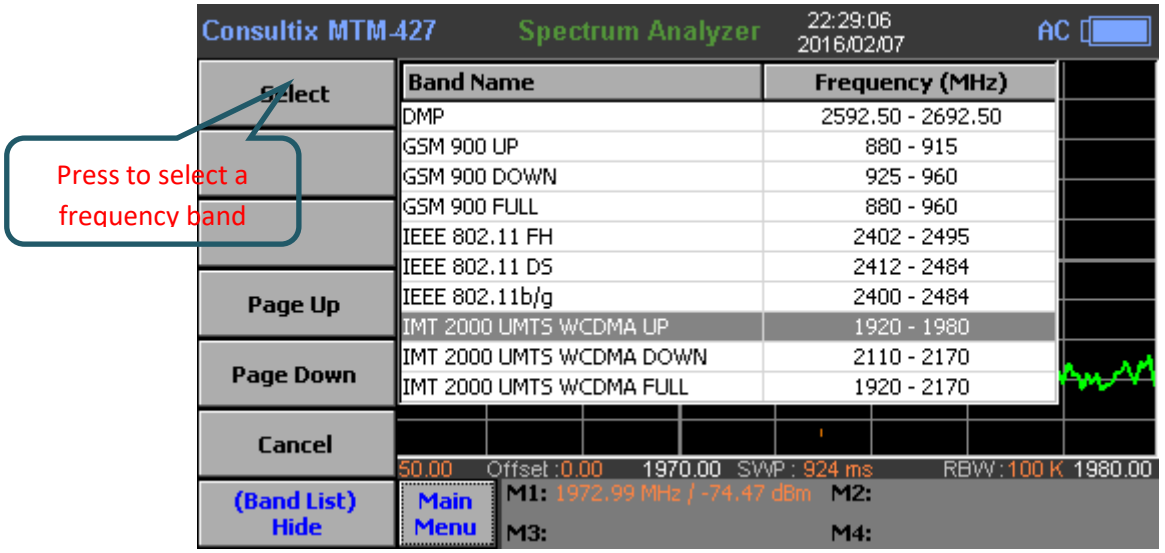


Figure 26: DASMaster Frequency Band List

Amplitude Settings

On **Main Menu > Measurements > Amplitude**, you can adjust scale settings according to the received signal level through using "**Max (TOP)**", "**Min (BOTTOM)**", and setting a "**Ref. Offset**" as shown in figure 27.

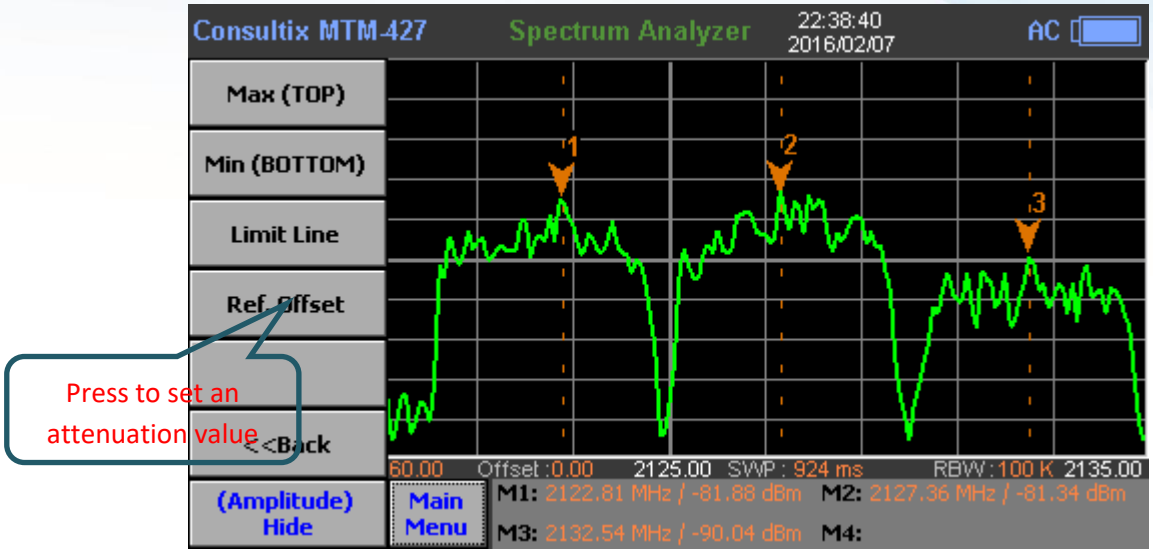


Figure 27: Spectrum Analyzer Amplitude Menu

Resolution Bandwidth Selections

On **Main Menu > Measurements > RBW,** select the suitable resolution bandwidth (RBW) for your displayed graph (I.e. select a wide RBW for modulated signals regarding its sidebands) as shown in figure 28.

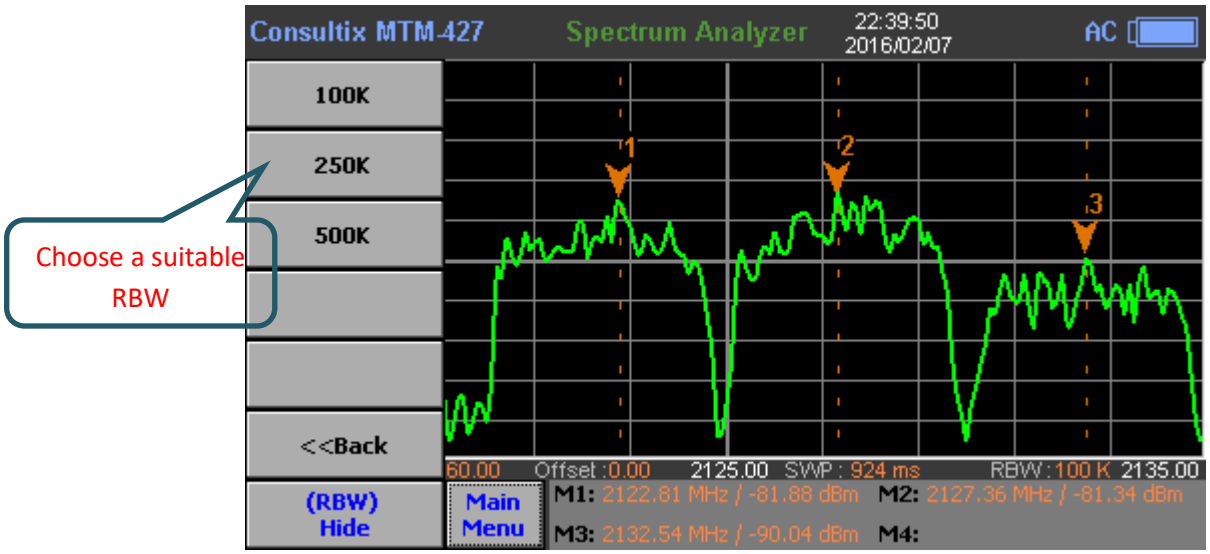


Figure 28: Spectrum Analyzer RBW selection Menu

Capturing Traces

On **Main Menu > Measurements > Trace**, you can control three traces; select, capture, Max. Hold, Min.

Hold, and delete traces as shown in figure 29 & 30

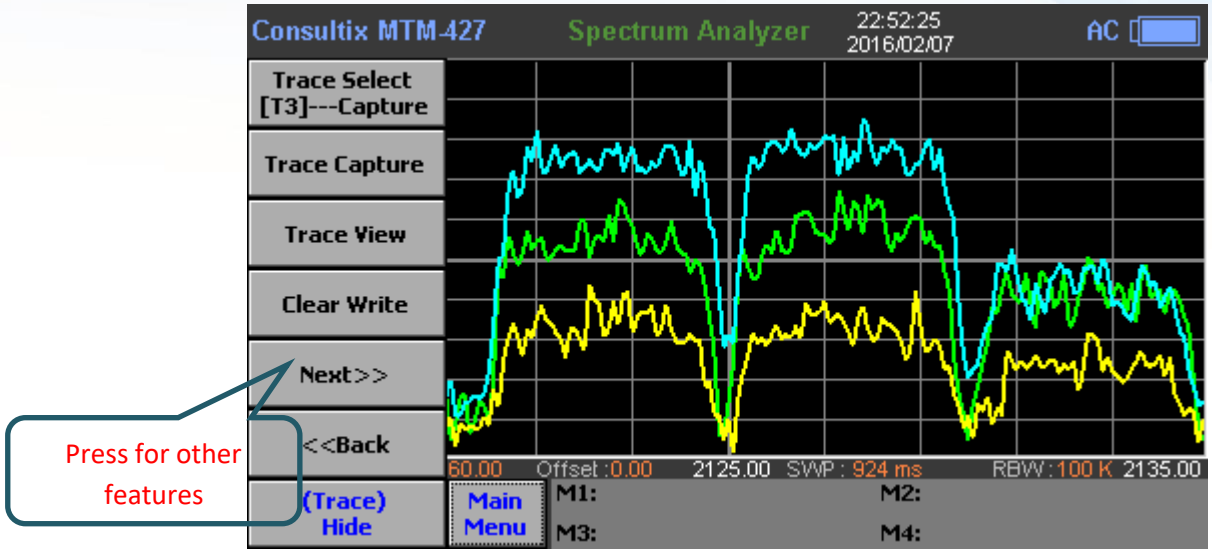


Figure 29: Spectrum Analyzer Trace Menu

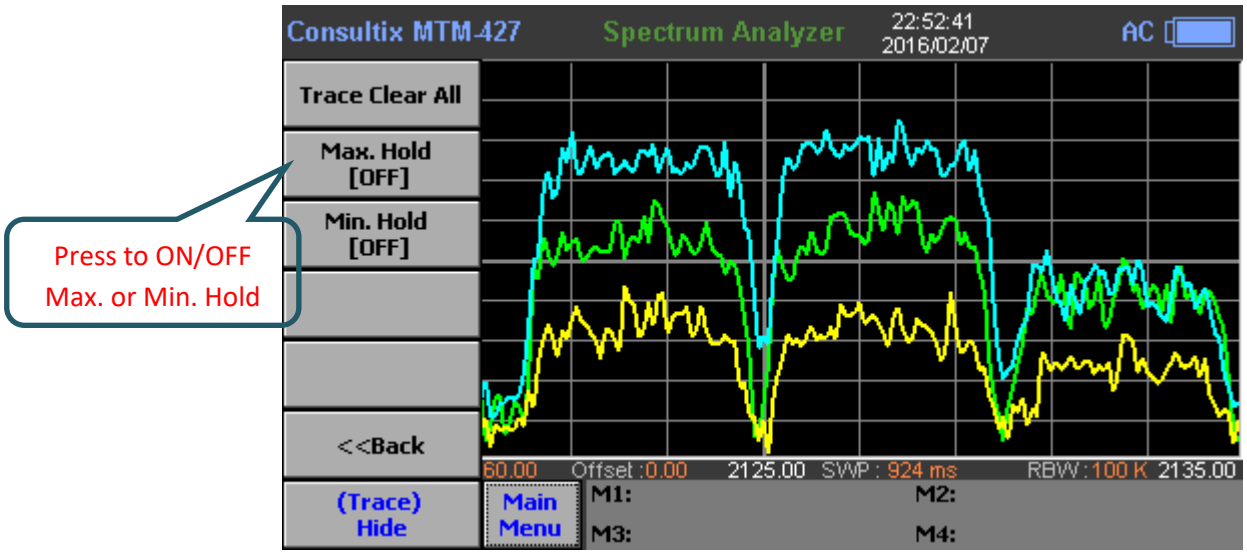


Figure 30: Spectrum Analyzer Trace Menu – Maximum & Minimum hold

Setting Limit Lines

On Main **Menu > Measurements > Amplitude > Limit Line**, set two limit lines to monitor if the signal exceeds certain limits as shown in figure 31.

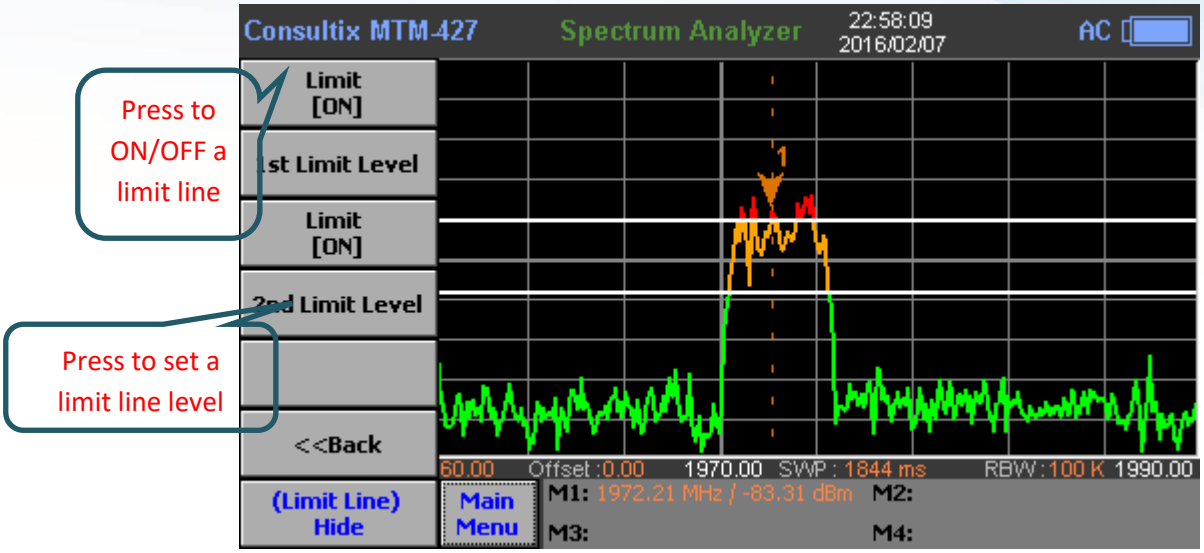


Figure 31: DASMaster Limit Lines

With limit line capability, on **Main Menu > System > Next**, the user can enable the Pass/Fail indication of the current signal level by switching on "**Pass Ind**." Button at the system menu.

Markers

On **Main Menu > Measurements > Next > Marker**, you can set, edit, and clear up to 4 markers (& Delta Marker) as shown in figure 32 & 33.

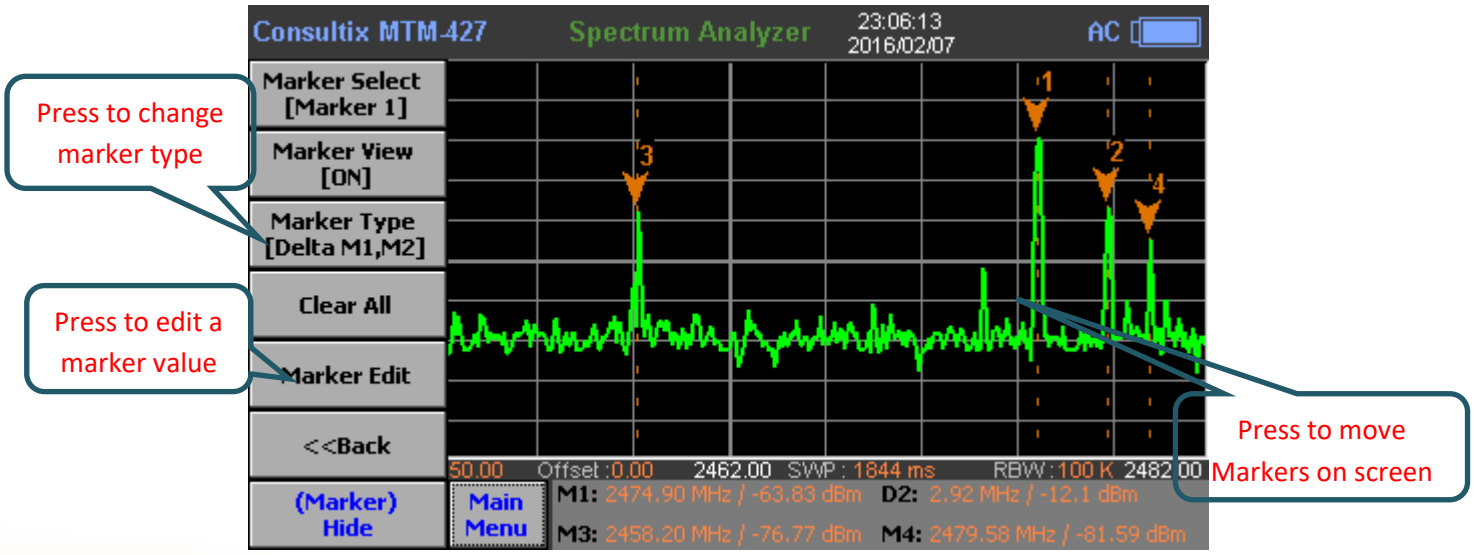


Figure 32: DASMaster Marker Menu

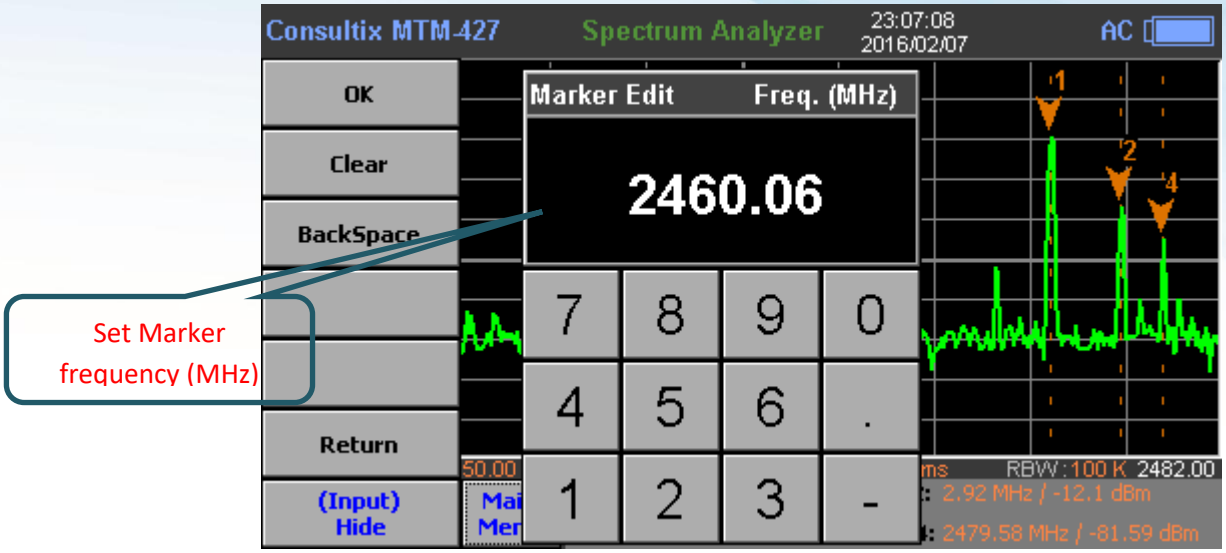


Figure 33: DASMaster - Marker editing

On **Main Menu > Measurements > Next > Peak**, you can set a marker to the peak value, to the maximum search point or to the minimum search point on your current trace as shown in figure 34.

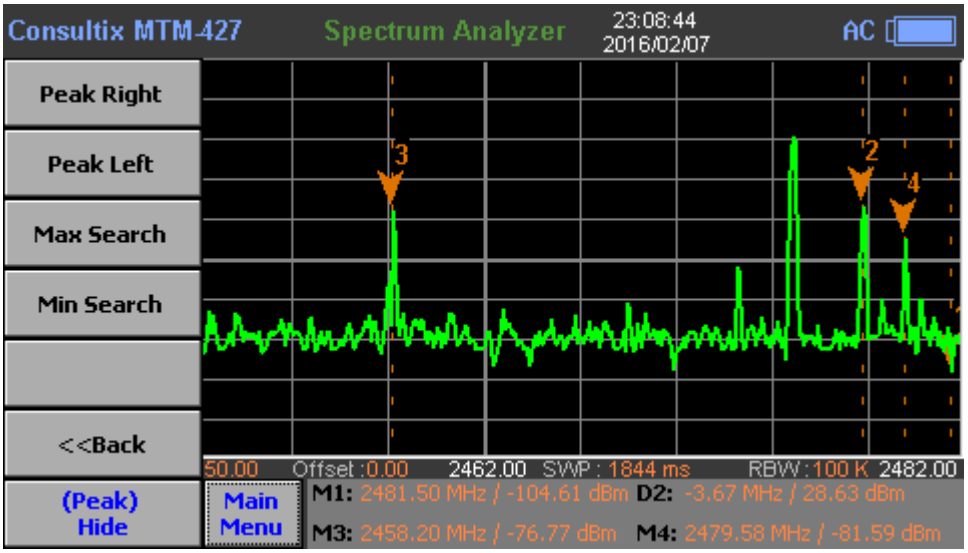


Figure 34: DASMaster Peak Menu

Shortcuts

On **Main Menu > Shortcuts**, users can do the common functions; like setting markers & traces, holding measurement, and resetting the current configuration as shown in figure 35.

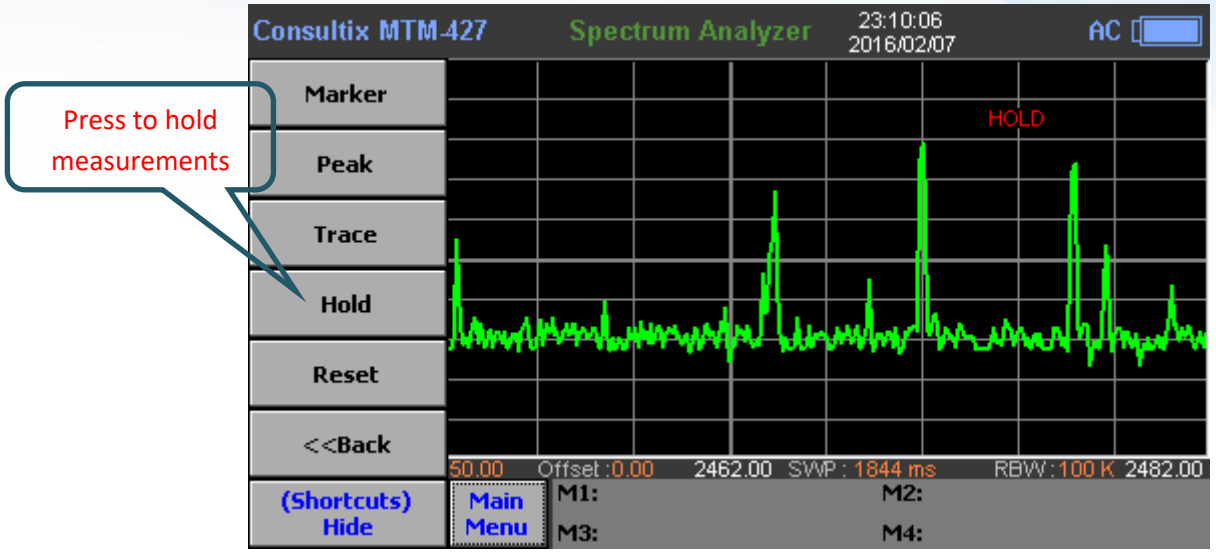


Figure 35: Spectrum Analyzer Shortcuts Menu

Prepare for your test

DASMaster Calibration

Before starting your measurements, user has to calibrate the unit as per the following steps,

1. Attach the launch cable to the DASMaster RF port.
   (Alternatively, user can mount the DASMaster directly to test port using an appropriate adapter)
2. **Main Menu > Mode**, select your measurement mode (VSWR, Return Loss...etc.)
3. **Main Menu > Measurements > Frequency > Band List**, select the required band, and click "**Select**" key
4. **Main Menu**, click "**Calibration**" key to start the calibration process, then pop-up menus will appear to confirm each step.
5. Connect the **OPEN** port of the N-Type cal. Kit to the other end terminal of the launch cable and click "**Continue**" key.
   "**Open Calibration in progress**" message appears
6. Connect the **SHORT** port of the N-Type cal. Kit and click "**Continue**".
   "**Short Calibration in progress**" message appears
7. Connect the **LOAD** port of the N-Type cal. Kit and click "**Continue**".
   "**Load Calibration in progress**" message appears
8. Upon accomplishing calibration, the "**Calibration Indicator**" status will be changed from Cal. OFF to Cal. ON

Figure 36, depicts the calibration process

Figure 36: DASMaster Calibration Process

Test Scenarios

VSWR Measurements

After calibrating the DASMaster, now the unit is ready for real-time VSWR or DTF measurements. The user has to take the following points into consideration,

- After calibration, do not change or modify the connection of the launch cable or the frequency settings; that will result in measurement errors, otherwise, you have to recalibrate the unit
- Do not connect the unit to the DUT (Antenna, cable...etc.) when there is a risk of lightning. It may cause a malfunction or damage the unit

Measurement

1. After calibration, connect the other terminal of the launch cable to the DUT (Device Under Test) port such as an antenna, RF cables...etc. As shown in ***figure 37.***

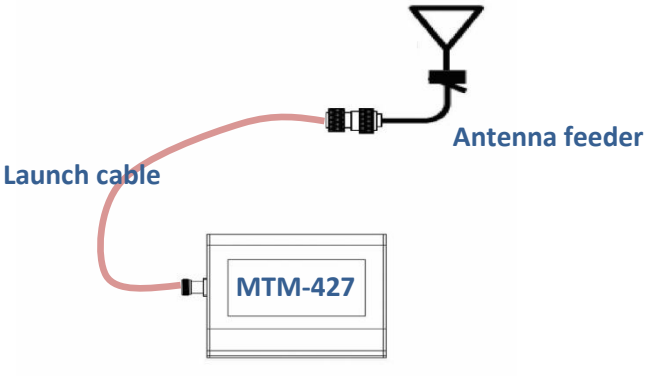


***Figure 37**: DASMaster VSWR Measurements*

2. **Main Menu > Mode**, select your measurement mode either “VSWR” or “RL”
3. **VSWR** curve appears on the display screen as shown in ***figure 38***

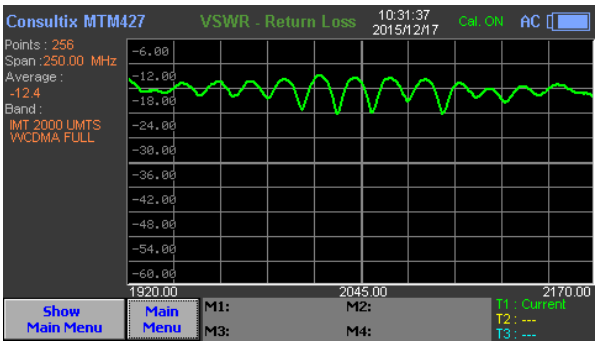


***Figure 38**: DASMaster VSWR Curve*

4. **Main Menu > Shortcuts**, click "**Auto Scale**" for adjusting curve appearance as shown in ***figure 39***

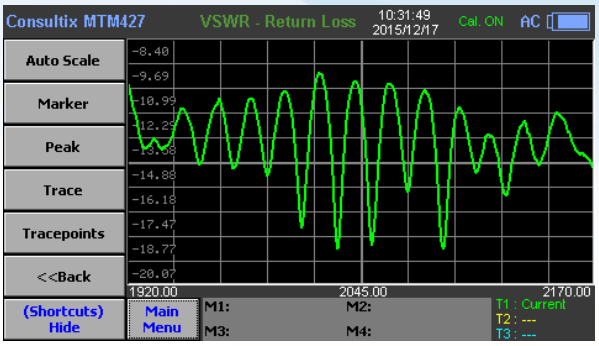


Figure 39 *DASMaster VSWR Curve*

5. **Main Menu > Measurements > Amplitude**, click "**Limit Line**" key to open "Limit Line" menu, add up to two limit lines, and define their levels - out of these limits, measurements are not accepted and marked in red as shown in ***figure 40.***

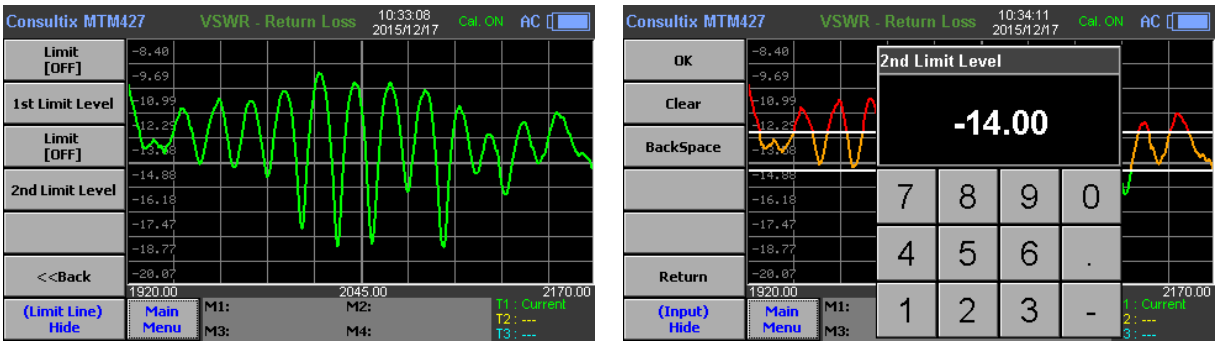


Figure 40*: DASMaster Limit Line*

On "Main Menu" click "System" key and click "Pass Ind." On or Off to show either the measurements are "Pass" or "Fail" according to the limit lines levels as shown in ***Figure 41***.

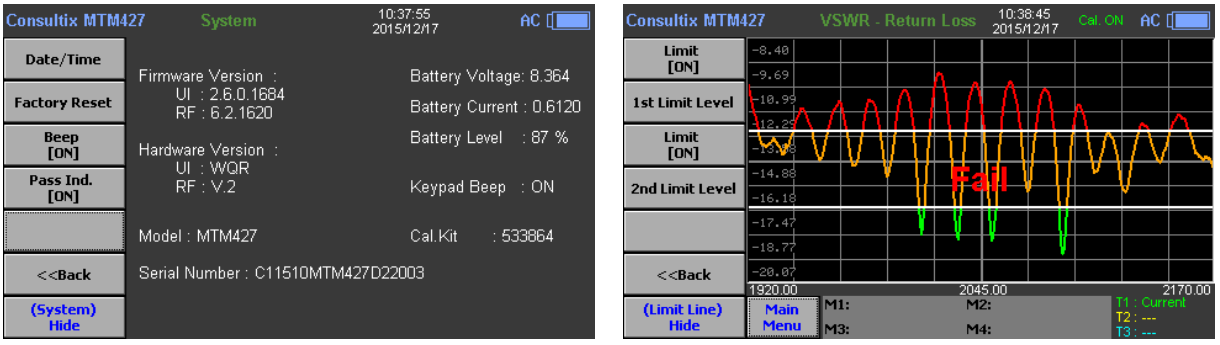


Figure 41*: DASMaster Limit Line in two VSWR modes*

During site acceptance process, the DASMaster field engineer may accept or decline the DUT performance according to the defined limit levels, these levels defer from vendor to others.

DTF Measurements

1. After calibration, connect the other terminal of the launch cable to the DUT (Device Under Test) port such as an antenna, RF cables...etc. As shown in ***figure 36*** above**.**
2. **Main Menu > Mode**, select your measurement mode either “DTF RTLS” or “DTF VSWR”
3. **Main Menu > Measurements > Distance**, enter the length of the line system (DUT) as shown in ***figure 42***

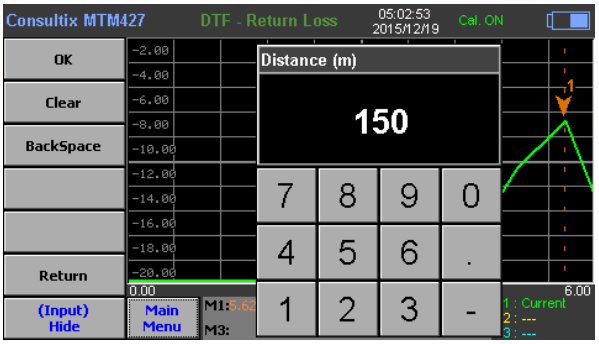


Figure 42: *Distance setting*

4. Main Menu > Measurements > Frequency, click “Cable List” and choose your cable type as shown in ***figure 43***

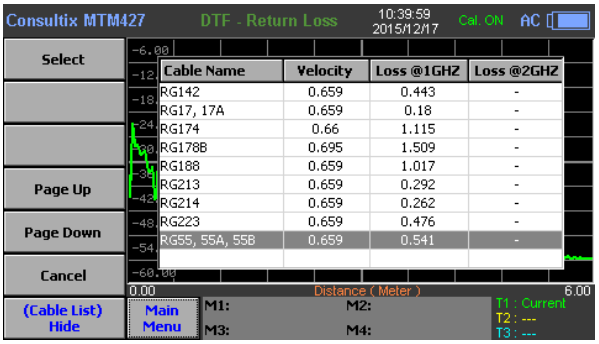


Figure 43*: Selecting Cable type*

5. **Main Menu > Measurements > Frequency > DTF Setting**, adjust the DTF parameters; like cable loss, windowing (Blackman/Rectangular), distance unit (m/feet) as shown in ***figure 44***

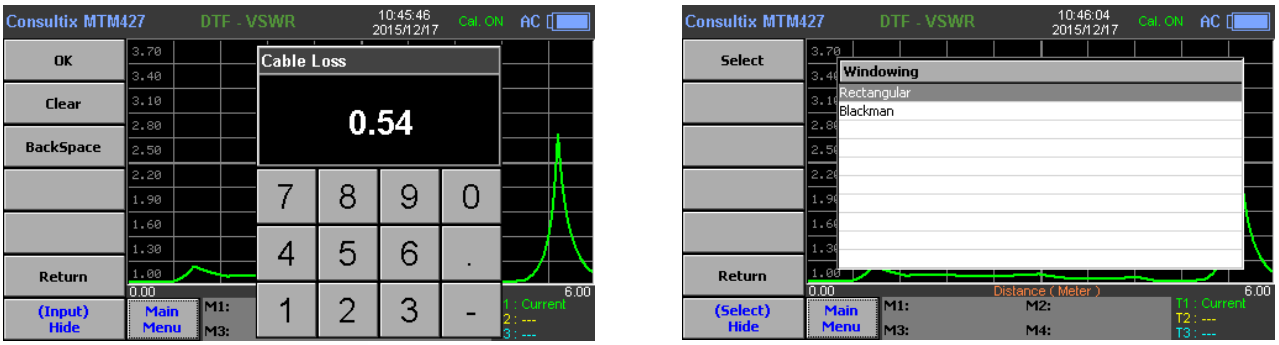


Figure 44*: DTF settings*

6. The curve shows peaks at the faulty location; on **Main Menu > Measurements**, click "**Peak**" to set a marker at the maximum peak point you can add markers from **Main Menu > Measurements > Marker** as shown in ***figure 45***

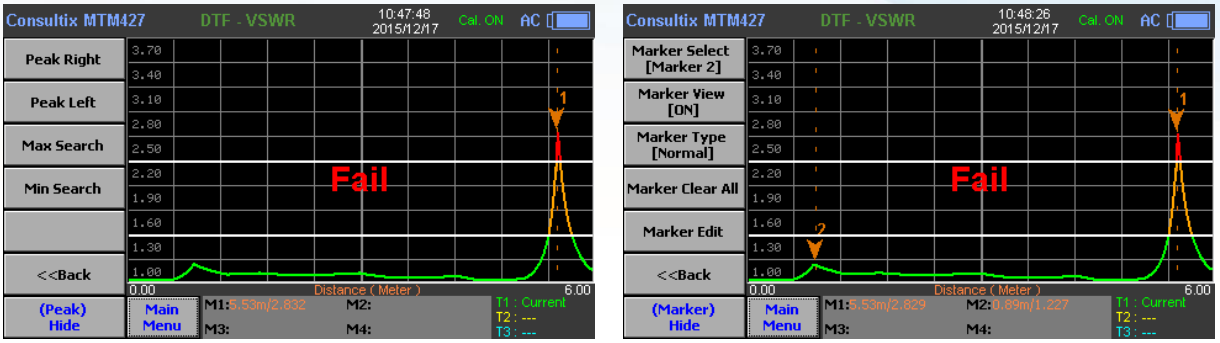


***Figure 45**: Fault detection*

Users can capture up to 3 traces of many cable measurements and save it to internal or external memory as shown in ***figure 46***

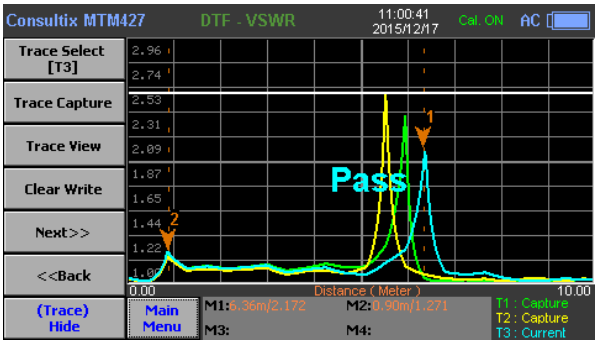


***Figure 46**: Capturing Measurement Traces*

The user can define limit lines, save, load, and capture traces & screenshots to arrange the site measurements for acceptance packaging

Cable Loss Measurements

1. After calibration, connect the other terminal of the launch cable to the measurement cable.
2. **Main Menu > Mode**, select "Cable Loss" mode as shown in ***figure 47***

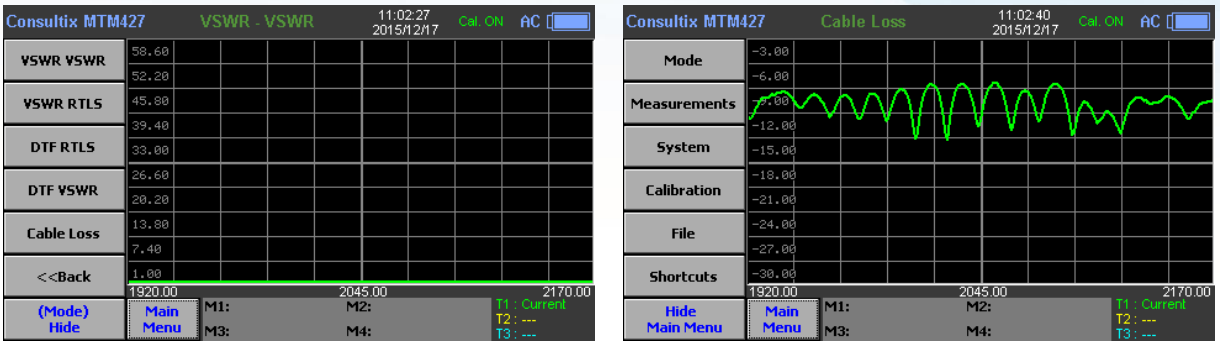
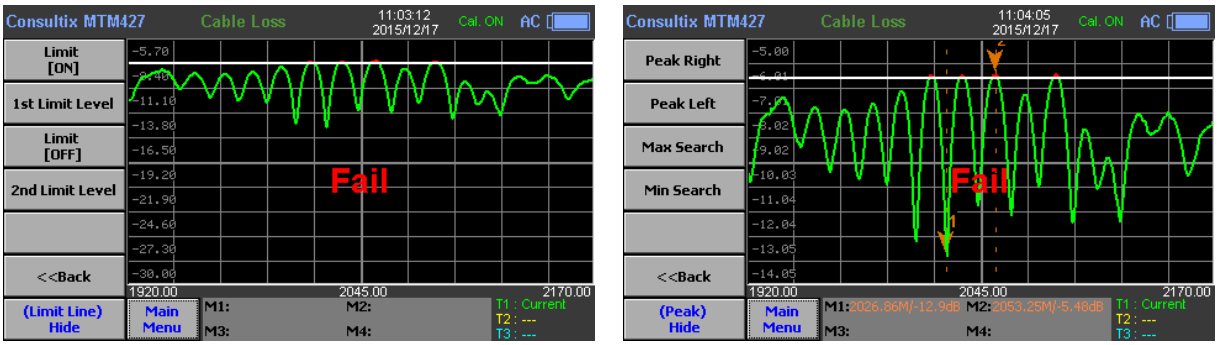


***Figure 47**: Cable Loss Measurement*

3. Add markers, define limit lines, and capture many traces of your measurements to accept or decline your site as shown in ***figure 48***



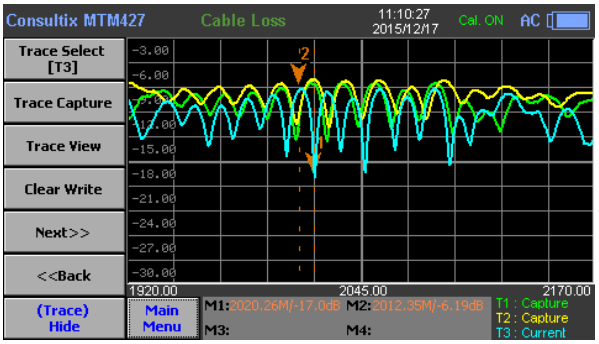


***Figure 48**: Cable Loss measurement acceptance*

Appendix A: Technical Background

Overview

RF energy transmission requires an impedance match which is the most important condition to achieve a maximum power transfer from the BTS radio to the antenna. On the other hand, a mismatch before the antenna will produce a reflective wave in the opposite direction of the incident wave and that implies an interference pattern called “standing wave”.

VSWR is the ratio between the power transmitted through the cable or antenna and the amount of the power that is reflected back to the transmitter. In cellular communication, having high VSWR results in dropped calls, poor reception, and unacceptable performance.

DTF (Distance-To-Fault) is a measurement to identify the fault locations by displaying the distance of the reflections from various points in the antenna line system where there are various types of cables, connectors, and functional devices, and that guarantees the whole system performance.

SWR (STANDING WAVE RATIO)

The SWR is usually defined as a voltage ratio called the VSWR, for voltage standing wave ratio. For example, the VSWR value 1.2:1 denotes a maximum standing wave amplitude that is 1.2 times greater than the minimum standing wave value. It is also possible to define the SWR in terms of current, resulting in the ISWR, which has the same numerical relationship. The power standing wave ratio (PSWR) is defined as the square of the VSWR.

RETURN LOSS

Return loss is the ratio between the power reflected in a communication link to the incident power.

For example, if a device has 15 dB of return loss, the reflected energy from that device is always 15 dB lower than the transmitted energy. When expressed in dB, larger negative numbers represent larger return losses and thus smaller reflected power. In electrical systems, return losses often occur at junctions between transmission lines and terminating impedances.

Return Loss is a function in VSWR, as outlined in the following equation,

$$\boldsymbol{Return\ Loss = 20\ .\log_{10}\frac{VSWR+1}{VSWR-1}\ \ (dB)}$$

DTF (Distance-to-fault)

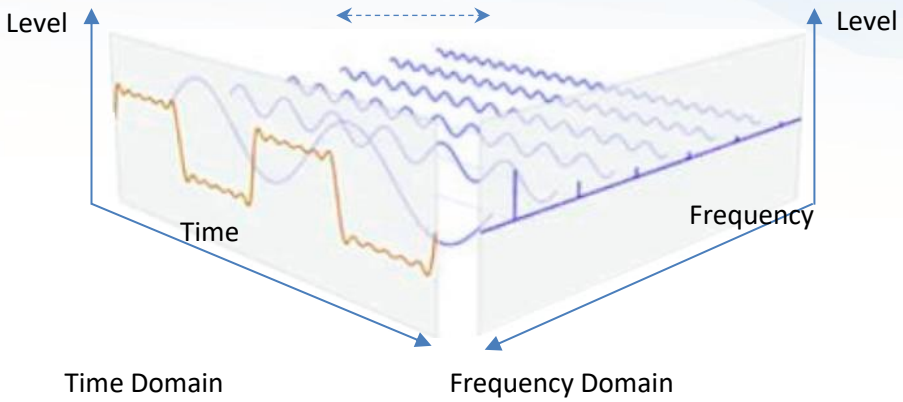
Due to impedance mismatching, some of the incident signal power is reflected back to the source, if a matched terminal is connected to the other terminal of the cable or the line system, the signal will be absorbed and no reflection occurs

The resulting reflected signal that is measured and plotted as a function of time and, because of the constant signal speed for a given transmission medium, it can be read as a function of cable length or distance location.

DTF measurement depends on **FDR technology** (Frequency Domain Reflectometer) for testing long cables over several kilometers

Appendix B: Spectrum Analysis

Spectrum Analyzer is a measurement instrument that measures the amplitude (strength) of an input signal varied by frequency over the full frequency range of the instrument to reveal the frequency and power contents of the input signal based on Fourier transform theory as shown below,



$$f(x) \qquad F(X)$$

$$F(X) = \int_{-\infty}^{\infty} f(x)e^{-j\omega x}dx$$

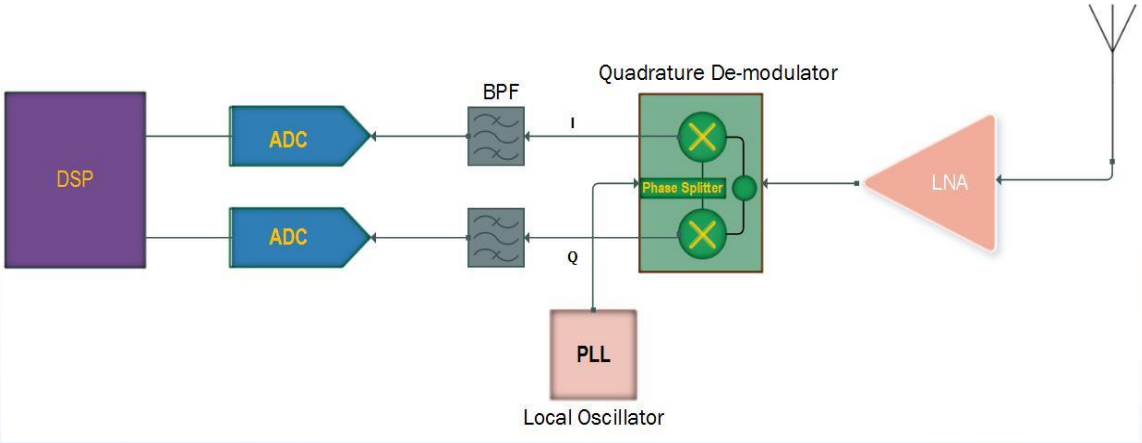
In the frequency domain, a spectrum analyzer can detect complex RF signals, separate its frequency components into a fundamental frequency and other harmonics and the signal amplitude at each frequency is displayed.

There are two main types of spectrum analyzers a fast Fourier transform (FFT) analyzer or a swept-tuned analyzer. The FFT analyzer detects the signal with period T in the time domain, samples it with a frequency f_s equal to or more than twice the signal bandwidth (based on Nyquist Limit), and applies the Fourier transform mathematics to convert to the frequency domain where all frequency components are displayed from zero to $\frac{f_s}{2}$, this requires analog to digital converters and high processing power making the FFT analyzers limited in frequency range.

The swept-tuned analyzer is the most common type of spectrum analyzer; it down-converts a portion of the input signal spectrum to the center frequency of a band-pass filter by sweeping the voltage-controlled oscillator through a range of frequencies across the displayed frequency range and detects all the frequency components. This enables to perform measurements over a large dynamic range.

Both types of spectrum analyzers can be used for a wide range of measurements in most of the field applications spectrum monitoring, spurious emissions, and interference hunting.

The below block diagram simply illustrates the employed technique in the spectrum analyzer mode of DASMaster.



Appendix C: Band list

Band Name	Start Freq. (MHz)	Stop Freq. (MHz)	Band Name	Start Freq. (MHz)	Stop Freq. (MHz)
Bluetooth USA & Europe	2,400	2,484	NMT 411 FULL	411	430
Bluetooth JAPAN	2,472	2,497	NMT 451 UP	450	460
C450 P UP	453	464	NMT 451 DOWN	460	470
C450 P DOWN	463	474	NMT 451 FULL	450	470
C450 P FULL	453	474	NMT 451 20kHz CDMA2k UP	451	484
C450 SA UP	465	470	NMT 451 20kHz CDMA2k DOWN	461	494
C450 SA DOWN	455	460	NMT 451 20kHz CDMA2k FULL	451	494
C450 SA FULL	455	470	NMT 450 20kHz CDMA2k UP	411	458
CDMA CHINA UP	872	915	NMT 450 20kHz CDMA2k DOWN	421	468
CDMA CHINA DOWN	917	960	NMT 450 20kHz CDMA2k FULL	411	468
CDMA CHINA FULL	872	960	NMT 900 UP	890	915
CELLULAR UP	824	849	NMT 900 DOWN	935	960
CELLULAR DOWN	869	894	NMT 900 FULL	890	960
CELLULAR FULL	824	894	PCS GSM 1900 UP	1,850	1,910
CELLULAR 700 UP	776	794	PCS GSM 1900 DOWN	1,930	1,990
CELLULAR 700 DOWN	746	764	PCS GSM 1900 FULL	1,850	1,990
CELLULAR 700 FULL	746	794	PCS KOREA UP	1,750	1,780
DCS GSM 1800 UP	1,710	1,785	PCS KOREA DOWN	1,840	1,870
DCS GSM 1800 DOWN	1,805	1,880	PCS KOREA FULL	1,750	1,870
DCS GSM 1800 FULL	1,710	1,880	PDC 800 UP	898	940
DMB	2,593	2,693	PDC 800 DOWN	843	885
GSM 900 UP	880	915	PDC 800 FULL	843	940
GSM 900 DOWN	925	960	PDC 1500 UP	1,525	1,549
GSM 900 FULL	880	960	PDC 1500 DOWN	1,477	1,501
IEEE 802.11 FH	2,402	2,495	PDC 1500 FULL	1,477	1,549
IEEE 802.11 DS	2,412	2,484	PHS	1,895	1,918
IEEE 802.11b/g	2,400	2,484	SMR 800 UP	806	821
IMT2000 UMTS WCDMA UP	1,920	1,980	SMR 800 DOWN	851	866
IMT2000 UMTS WCDMA DOWN	2,110	2,170	SMR 800 FULL	806	866
IMT2000 UMTS WCDMA FULL	1,920	2,170	SMR 1500 UP	1,453	1,465
ISM 2.4GHz	2,400	2,484	SMR 1500 DOWN	1,501	1,513
JTACS/NTAC JPN ARIB UP	887	925	SMR 1500 FULL	1,453	1,513
JTACS/NTAC JPN ARIB DOWN	832	870	TACS/ETACS UP	872	915
JTACS/NTAC JPN ARIB FULL	832	925	TACS/ETACS DOWN	917	960
NMT 411 UP	411	420	TACS/ETACS FULL	872	960
NMT 411 DOWN	421	430	Tetra	380	430

***Table 2**: Standard band list*

Appendix D: Cable list

Cable Type	Relative Propagation Velocity (V_r)	Nominal Attenuation dB/m @ 1000MHz	Cable Type	Relative Propagation Velocity (V_r)	Nominal Attenuation dB/m @ 1000MHz
FSJ1-50A	0.84	0.197	LMR600	0.87	0.087
FSJ250	0.83	0.134	LMR900	0.87	0.056
FSJ4-50B	0.81	0.119	RG142	0.69	0.443
HCC 12-50J	0.915	0.092	RG17, 17A	0.659	0.18
HCC 158-50J	0.95	0.023	RG174	0.66	0.984
HCC 300-50J	0.96	0.014	RG178B	0.69	1.509
HCC 312-50J	0.96	0.013	RG187, 188	0.69	1.017
HCC 78-50J	0.915	0.042	RG213/U	0.66	0.292
HF 4-1/8" Cu2Y	0.97	0.01	RG214	0.659	0.292
HF 5" Cu2Y	0.96	0.007	RG223	0.659	0.165
HF 6-1/8"Cu2Y	0.97	0.006	RG55, 55A, 55B	0.659	0.541
HJ4.5-50	0.92	0.054	RG58, 58B	0.659	1.574
HJ4-50	0.914	0.087	RG58A, 58C	0.659	0.787
HJ5-50	0.916	0.042	RG8, 8A, 10, 10A	0.659	0.262
HJ7-50A	0.921	0.023	RG9, 9A	0.659	0.289
LDF12-50	0.88	0.022	HFSC-12D(1/2")	0.81	0.112
LDF4-50A	0.88	0.077	HFC-12D(1/2")	0.88	0.072
LDF5-50A	0.89	0.043	HFC-22D(7/8")	0.88	0.041
LDF6-50	0.89	0.032	HFC-33D(1_1/4")	0.88	0.0294
LDFF7-50A	0.88	0.027	HFC-42D(1_5/8")	0.87	0.0243
LMR100	0.8	0.792	RFCX-12D(1/2")	0.88	0.088
LMR1200	0.88	0.044	RFCX-22D(7/8")	0.88	0.049
LMR1700	0.89	0.033	RFCX-33D(1_1/4")	0.88	0.038
LMR200	0.830	0.344	RFCX-42D(1_5/8")	0.87	0.028
LMR240	0.84	0.262	RFCL-22D(7/8")	0.88	0.044
LMR400	0.85	0.135	RFCL-33D(1_1/4")	0.88	0.034
LMR500	0.86	0.109	RFCL-42D(1_5/8")	0.87	0.0315

***Table 3**: Standard cable list*

Appendix E: VSWR-Return Loss Conversation

VSWR	Return Loss (dB)	Trans. Loss (dB)	Volt. Refl Coeff	Power Trans (%)	Power Refl (%)	VSWR	Return Loss (dB	Trans. Loss (dB)	Volt. Refl Coeff	Power Trans (%)	Power Refl (%)
1.00	--	0.000	0.00	100.0	0.0	1.64	12.3	0.263	0.24	94.1	5.9
1.01	46.1	0.000	0.00	100.0	0.0	1.66	12.1	0.276	0.25	93.8	6.2
1.02	40.1	0.000	0.01	100.0	0.0	1.68	11.9	0.289	0.25	93.6	6.4
1.03	36.6	0.001	0.01	100.0	0.0	1.70	11.7	0.302	0.26	93.3	6.7
1.04	34.2	0.002	0.02	100.0	0.0	1.72	11.5	0.315	0.26	93.0	7.0
1.05	32.3	0.003	0.02	99.9	0.1	1.74	11.4	0.329	0.27	92.7	7.3
1.06	30.7	0.004	0.03	99.9	0.1	1.76	11.2	0.342	0.28	92.4	7.6
1.07	29.4	0.005	0.03	99.9	0.1	1.78	11.0	0.356	0.28	92.1	7.9
1.08	28.3	0.006	0.04	99.9	0.1	1.80	10.9	0.370	0.29	91.8	8.2
1.09	27.3	0.008	0.04	99.8	0.2	1.82	10.7	0.384	0.29	91.5	8.5
1.10	26.4	0.010	0.05	99.8	0.2	1.84	10.6	0.398	0.30	91.3	8.7
1.11	25.7	0.012	0.05	99.7	0.3	1.86	10.4	0.412	0.30	91.0	9.0
1.12	24.9	0.014	0.06	99.7	0.3	1.88	10.3	0.426	0.31	90.7	9.3
1.13	24.3	0.016	0.06	99.6	0.4	1.90	10.2	0.440	0.31	90.4	9.6
1.14	23.7	0.019	0.07	99.6	0.4	1.92	10.0	0.454	0.32	90.1	9.9
1.15	23.1	0.021	0.07	99.5	0.5	1.94	9.9	0.468	0.32	89.8	10.2
1.16	22.6	0.024	0.07	99.5	0.5	1.96	9.8	0.483	0.32	89.5	10.5
1.17	22.1	0.027	0.08	99.4	0.6	1.98	9.7	0.497	0.33	89.2	10.8
1.18	21.7	0.030	0.08	99.3	0.7	2.00	9.5	0.512	0.33	88.9	11.1
1.19	21.2	0.033	0.09	99.2	0.8	2.50	7.4	0.881	0.43	81.6	18.4
1.20	20.8	0.036	0.09	99.2	0.8	3.00	6.0	1.249	0.50	75.0	25.0
1.21	20.4	0.039	0.10	99.1	0.9	3.50	5.1	1.603	0.56	69.1	30.9
1.22	20.1	0.043	0.10	99.0	1.0	4.00	4.4	1.938	0.60	64.0	36.0
1.23	19.7	0.046	0.10	98.9	1.1	4.50	3.9	2.255	0.64	59.5	40.5
1.24	19.4	0.050	0.11	98.9	1.1	5.00	3.5	2.553	0.67	55.6	44.4
1.25	19.1	0.054	0.11	98.8	1.2	5.50	3.2	2.834	0.69	52.1	47.9
1.26	18.8	0.058	0.12	98.7	1.3	6.00	2.9	3.100	0.71	49.0	51.0
1.27	18.5	0.062	0.12	98.6	1.4	6.50	2.7	3.351	0.73	46.2	53.8
1.28	18.2	0.066	0.12	98.5	1.5	7.00	2.5	3.590	0.75	43.7	56.3
1.29	17.9	0.070	0.13	98.4	1.6	7.50	2.3	3.817	0.76	41.5	58.5
1.30	17.7	0.075	0.13	98.3	1.7	8.00	2.2	4.033	0.78	39.5	60.5
1.32	17.2	0.083	0.14	98.1	1.9	8.50	2.1	4.240	0.79	37.7	62.3
1.34	16.8	0.093	0.15	97.9	2.1	9.00	1.9	4.437	0.80	36.0	64.0
1.36	16.3	0.102	0.15	97.7	2.3	9.50	1.8	4.626	0.81	34.5	65.5
1.38	15.9	0.112	0.16	97.5	2.5	10.00	1.7	4.807	0.82	33.1	66.9
1.40	15.8	0.122	0.17	97.2	2.8	11.00	1.6	5.149	0.83	30.6	69.4
1.42	15.2	0.133	0.17	97.0	3.0	12.00	1.5	5.466	0.85	28.4	71.6
1.44	14.9	0.144	0.18	96.7	3.3	13.00	1.3	5.762	0.86	26.5	73.5
1.46	14.6	0.155	0.19	96.5	3.5	14.00	1.2	6.040	0.87	24.9	75.1
1.48	14.3	0.166	0.19	96.3	3.7	15.00	1.2	6.301	0.88	23.4	76.6
1.50	14.0	0.177	0.20	96.0	4.0	16.00	1.1	6.547	0.88	22.1	77.9
1.52	13.7	0.189	0.21	95.7	4.3	17.00	1.0	6.780	0.89	21.0	79.0
1.54	13.4	0.201	0.21	95.5	4.5	18.00	1.0	7.002	0.89	19.9	80.1
1.56	13.2	0.213	0.22	95.2	4.8	19.00	0.9	7.212	0.90	19.0	81.0
1.58	13.0	0.225	0.22	94.9	5.1	20.00	0.9	7.413	0.90	18.1	81.9
1.60	12.7	0.238	0.23	94.7	5.3	25.00	0.7	8.299	0.92	14.8	85.2
1.62	12.5	0.250	0.24	94.4	5.6	30.00	0.6	9.035	0.94	12.5	87.5

***Table 4**: VSWR-Return Loss table*

Appendix F: DASMaster Specifications

Specifications:	
Measurement Modes	VSWR, Return Loss, DTF, Cable Loss and Optional Spectrum Analyzer
Frequency Range	400 MHz to 2700 MHz (optional 100 MHz to 3200 MHz)
VHF / Public Safety Bands	**Option: MTM-427-K-V**
Frequency Extension Down to 100 MHz and up to 3200 MHz	
General RF Characteristics	
Internal Frequency Accuracy	2.5 ppm
Frequency Resolution	1 KHz
Max. Input Power (Protection)	33 dBm (1 Watt Continuous Wave , 2 Watt Peak)
Interference Immunity	10 dBm on Channel, -5 dBm on Frequency
Reflection Measurements	
VSWR Range	1-65
Output Power	0 to -5 dBm
Return Loss Range	0-60 dB
Return Loss Resolution	0.01 dB
Measurement Speed	≤ 1 msec/data point @ 1024 Points ≤ 2 msec/data point @ 512, 256 and 128 Points
Accuracy	42 dB (Calibration Kit Return Loss)
DTF	
Range	0-1500 Meters (According to Cable Type)
Vertical Range (VSWR)	1-65
Vertical Range (Return Loss)	0-60
Vertical Resolution	0.01
Spectrum Analyzer Mode	**Option: MTM-427-K-SA**
Frequency Range	400 MHz to 2700 (100 MHz to 3200 MHz with MTM-427-K-V Option)
RBW	16 KHz, 100 KHz, 250 KHz and 500 KHz
Power Range / Sensitivity	0 dBm to - 112 dBm (DANL @ 2 GHz. 100KHz RBW)
CW Test Receiver Mode	**Option: MTM-427-K-RX**
RF Measurement Range	-112dBm to -40dBm
Sampling Speed	>100 sample/sec
Floor Mapping	Consultix WalkView Android Application
Setup	
Simultaneous Traces	Up to 3
Markers and Limit Lines	4 Markers, Delta Markers, 2 Limit Lines and Peak and Minimum Search
Windowing	Rectangular and Blackman
Cable	Cable Type, Propagation Velocity, Cable Loss and m/ft
Data Points	128, 256, 512 or 1024 Points
Memory	
Type	Internal (1000 trace) and External USB Storage
Save/Recall	Measurements and Screenshots
Battery and Power Supply	Battery: Li-ion 3400 mAh
Battery Operation Time	>8 Hours: Normal Mode (with Continuous Sweep Operation) >4 Hours: High Immunity Mode (with Continuous Sweep Operation)
AC Charger	Input: 100-240 VAC, 50-60 Hz / Output: 12 VDC, 2A
Physical and Environmental	
Display	4.3" TFT, LCD Touch Screen
Ports and Interfaces	N-type Female, 2 x USB, and DC Input
External Dimensions	L163 x W118 x H36 mm
Weight	< 700 gm (1.5 lbs.) incl. Battery
Operating Temp	-10 to +50 C
Standard Package	Tester, AC Charger, Hard Carrying Case, Shoulder Strap, Stylus Pen, USB Mini B Cable, Calibration Certificate, User Manual and Site Auditor Reporting Software for PC
Optional Accessories	Choose from our Variety of High Precision Calibration Kits, Adapters and Launch Cables

***Table 5**: DASMaster Specifications*

Further Help

- For any support inquiry, kindly contact:

  Support: support@consultixwireless.com

  Or contact our distributor covering your region (check www.consultixwireless.com)

- For any information about prices, specifications, future developments, recommendations, customizations, or general question, kindly contact:

  Sales: sales@consultixwireless.com