iTA A-SERIES OPERATING MANUAL

The Battery Operated Multiband Intermodulation Test System

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Rev A		Creation of document by Eng	24/05/2016	LW	TT
Rev B	11141 11319 11200	Add charging detail Implementation of new Kaelus format Remove warranty panel	22/11/2017	LW	TL
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Precautions

⚠ WARNING: I N T E R F E R E N C E

The ITA family of Test equipment is exempt from the technical requirements of CFR47 part 15 (FCC part 15) as stated in Section §15.103 Exempted devices" for Test equipment per sub part §15.103(c). The following Notice is mandated by Law.

§15.5 "(a) Persons operating intentional or unintentional radiators shall not be deemed to have any vested or recognizable right to continued use of any given frequency by virtue of prior registration or certification of equipment, or, for power line carrier systems, on the basis of prior notification of use pursuant to §90.35(g) of this chapter.

§15.5 "(b) Operation of an intentional, unintentional, or incidental radiator is subject to the conditions that no harmful interference is caused and that interference must be accepted that may be caused by the operation of an authorized radio station, by another intentional or unintentional radiator, by industrial, scientific and medical (ISM) equipment, or by an incidental radiator."

§15.5 "(c) The operator of a radio frequency device shall be required to cease operating the device upon notification by a Commission representative that the device is causing harmful interference. Operation shall not resume until the condition causing the harmful interference has been corrected."

Connection of Wi-Fi antenna to this device is only to be performed by a suitably qualified person.

This unit contains a WiFi Module FCC ID RYK-WUBR507N

All ITA units and external parts are solely intended as test equipment and not intended for any other use by the operator.

If this instrument does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna

- Increase the separation between the instrument and receiver

- Connect the instrument into an outlet on a circuit different from that to which the receiver is connected

- Consult the dealer or an experienced radio/TV technician for help

⚠ WARNING: R F   H A Z A R D

This series of instrument is capable of producing up to 50 Watts of radio frequency (RF) power in the 700 MHz to 2600 MHz frequency band. Users are reminded that proper precautions must be taken to minimize exposure to these RF fields to the recommended limits. Please pay particular care to the following areas:

- Switch off the RF power from the test equipment before removing or connecting the cables to the test port. Burns to fingers and permanent damage to eyes can result from exposure to connectors carrying high levels of RF power.

- Ensure that any antennas being tested are placed so that no personnel are exposed to RF field levels in excess of the maximum exposure limits [Ref ARPANSA RPS No. 3 for Australia]

- The iTA has two RF output ports, ensure that both ports are terminated to prevent exposure.

Also, the unit should be operated by a suitably qualified operator in order to ensure interference is not caused to other spectrum users. Radiation through an antenna requires authorization by the frequency license holder to do so.

⚠ WARNING: B A T T E R Y

The iTA Series Portable Passive Intermodulation Analyzer is fitted with a removable Lithium-Ion battery. Rechargeable lithium ion batteries contain organic solvents and reactive materials. Do not recharge batteries while inside an accessory or transport case. Do not charge in a moving vehicle. Do not operate or charge the equipment while inside an accessory or transport case.Erroneous handling of lithium ion batteries may result in heat generation, explosion or fire, possibly leading to injury.

Observe correct handling and disposal of Li-Ion batteries.

⚠ WARNING: H E A V Y   I N S T R U M E N T

The packed weight of the instrument exceeds the 18kg (40lb) guideline for manual handling by a single person (it weighs < 22.7kg/50lbs). To avoid risk of injury, an assessment should be carried out prior to handling to check individual capability, the equipment weight and the required workplace conditions, accordance with **OSHA Technical Manual (OTM) Section VII: Chapter 1** or equivalent National Regulations for manual handling.

DISCLAIMER: I N T E R F E R E N C E

The instrument uses similar frequencies and power levels to several cellular telephone systems. Kaelus and its agents or distributors accept no responsibility for interference to existing communications services as a result of improper operation or misuse. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

⚠ WARNING: E L E C T R I C A L   H A Z A R D

This unit is powered by a 25.9V Li-ion battery pack.The unit is routinely charged with a supplied smart charger.This charger is supplied with a protective ground lead for AC supply safety reasons. To maintain this level of protection, the supply lead must always be connected to the supply via a socket with an earth contact.

This product must only be used with the supplied charger.

Do not remove covers as there are no user serviceable parts inside.

GENERAL CONDITIONS OF USE

This equipment should be protected from the ingress of liquids and precipitation such as rain and snow. The equipment must be operated within the environmental conditions specified in **Chapter 1.4.** This equipment is not approved for use in hazardous atmospheres, locations or medical applications.

UNPACKING

Ensure that the total number of boxes of equipment is checked off against the delivery documentation. At the same time inspect for any obvious transit damage. Should any damage be noted, notify the carrier immediately to file a transit damage claim. Do not discard any packing material until notified by the carrier or Kaelus. Carefully unpack all containers and check that all items listed on the delivery documentation. Please notify Kaelus of any damaged or missing items from the shipment.

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1. Operating Instructions

1.1 Introduction

This manual describes the operation of the iTA (Interconnect Portable Analyzers) A series type of portable intermodulation test instruments developed by Kaelus.

The iTA Series Portable Passive Intermodulation (PIM) Analyzer enables measurements of the PIM quality of RF components. The iTA is a fully portable battery powered test instrument, that can be locally controlled using a touch screen interface or remotely controlled via wireless connection to a computer or smart device.

The iTA Series Portable Passive Intermodulation Analyzer is predominantly used to find IM3 sources such as badly terminated or loose connectors and faulty components.

The ITA series portable passive intermodulation analyzer measures the PIM quality of a component by monitoring reverse PIM fluctuations whilst a component is moved, knocked or stressed in some way.

1.2 Functional Description

The iTA is designed to carry out reverse Passive Intermodulation (PIM) measurements in accordance with IEC62037. PIM occurs in passive devices whenever two or more RF signals encounter non-linear electrical junctions or materials. The interference generated is mathematically related to the localized downlink frequencies and can result in a noise rise in the uplink band of one or more systems sharing the RF infrastructure. The impact of PIM on the network performance can be severe, especially for wideband systems such as CDMA, UMTS or LTE. PIM interference can lead to desensitization of the receiver causing increased dropped calls, increased access failures, pre-mature hand-offs, decreased data transmission rates and decreased system coverage and capacity. Any component in the RF path can be the source of the PIM interference including antennas, TMAs, diplexers, duplexers, surge arrestors, cables and connectors. In addition, loose mechanical connections or rusty surfaces external to the antenna system can generate PIM when subjected to high radiated RF power.

Two synthesized carriers can be set to specific frequencies in the transmit band. With the RF output switched on, these tones will be present at the test port and stabilized to the predefined output level. The resulting 3rd and 5th order intermodulation product is automatically calculated

and the receiver is tuned to the required product. The detected voltage is processed by a microcontroller and the relevant reading shown on the display unit.

1.3 Features

- Rugged and reliable; designed with tower climbers in mind

- Capable of connecting to any Wi-Fi device

- 4.3" LCD touch screen for local control

- Automatic detection and shut down when high Return Loss is detected

- Spectrum monitor, frequency sweep and time trace modes

- Measures reverse PIM of greater than -153dBc when using two 20W carriers

- Internal detector circuits with narrow IF bandwidth provide low noise floor

- Internal carrier power monitors

- Complete frequency agility in steps of 100 kHz to any frequency in the specified transmit bands

- Automatic internal calculation of IM product frequencies for receiver tuning

- Onboard report generation and exportation in PDF format

- All electronic systems are monitored and alarmed. This ensures that each measurement made is faultless

- An optional (RTF) Range To Fault Unit can assist to locate the point where either Return Loss or PIM may be occurring.

- Geotag function can provide geographical tagging on reports (Geotag service device such as mobile smart phone or Tablet PC required)

- Advance report generating features that can include smartphone or tablet Photo's Plots or screen shots

- Files, reports, status files and photos can be uploaded and downloaded from the device. SEE Note 1

- Eco Mode to conserve battery life when the instrument is not in use

- Two Bands in one instrument.

Note 1 : File upload size limit 300Mb, SD card formatted to fat32 filesize limit 2GB.

1.4 Specifications

Transmitter

Transmit band	Per product data sheet
Channel steps	100kHz
Frequency accuracy	± 5ppm (max), aging ± 1ppm (max) after first year
Power per tone (adjustable)	100mW - 20W (+20 to +43dBm)
Power Accuracy/ALC Leveling (per tone)±	0.5dB (max) across the full temperature range

Receiver

Receive band (100kHz steps)	Per product data sheet
Receiver noise floor	< -128dBm typical
Measurement range	-50dBm to -128dBm

System

Measurement method	Reflected PIM, 3rd and 5th order Also 7th order for iTA-0901
Residual PIM	< -117dBm max (< -125dBm typ)
Operating System	Based on Android 4.2.2
Ports	1x USB 2.0 Host, 1x USB 2.0 Slave, 1x SD, 1x monitor port (SMB female), 1x SMA-RP (Wi-Fi external antenna), RF Output Port (7-16/F)
User Interface	Local – touch screen display 4.3 in (109mm) Remote – Tablet PC, Wi-Fi (included), any user device Wi-Fi and Web browser
Return Loss Alarm	Automatic detection and shut down when high RL is detected

Electritcal

Battery Power	25.9 VDC, 2.6Ah, 67 Wh LI-ion battery pack (removable)
Battery Operating Time	Depends on usage, 2 hr min. per battery pack
Battery Charger	Output: 29.4 VDC, 1.2 Amp
Mechanical Dimensions 369 x 240 x 160mm	
Weight	< 12kg
Cooling	Natural Convection

Environmental

Max. Operating Temperature	-10°C to +45°C (Operating) -10°C to +60°C (Storage)
Ingress Protection (IP)	IP54. IP67 when enclosed in optional hard case
Relative Humidity	5% to 95% RH non-condensing
Mechanical Shock	40G shock/vibrating rating

1.5   Construction and Layout

The external details of the iTA test set are shown below in Figure 1

Figure 1   iTA and Tablet PC Front View

1   Red LED (RF on indicator)

The high intensity, red LED flashes when RF power is present on the RF output Port.

2   RF Output Port 1

The 7/16 RF output port is used for all measurements.

3   RF Output Port 2

The 7/16 RF output port is used for all measurements.

4   LCD Touch Screen

Care should be taken at all times to prevent accidental damage to the touch screen. At no time should any item be stored on top of the Touch Screen

5   Monitor Port, External Wi-Fi Antenna Port, DC input socket

Monitor port is used for Range TO Fault (RTF), Spectrum Analyzer mode and as a Receiver monitor port. An external Wi-Fi antenna may be connected to the Reverse SMA Wi-Fi socket.
The Charger may be connected to the DC input socket for recharging the replaceable battery (See Figure 2 for details).

6   Power ON/OFF Switch

Pressing the Power button (until a beep is heard) will initiate the instrument's start-up procedure. (Three beeps indicates a battery low condition) During operation the instrument can be switched off by pressing this button.

7   Removable Battery Pack

A removable 26 volt Li-ion battery pack. The iTA has an in-built charging function and is supplied with a 29 volt charger.The iTA should not be run with the battery removed.

8   2x USB Ports, SD card port

Used for loading state files and upgrades, and downloading reports and states. USB Host port is typically used for COMMS with the RTF plug-on module. (See figure 3 for details)

9   Handles

Rugged handles allow easy handling of the iTA during installation.

10   Lifting Lugs

Lifting lugs allow easy lifting of the iTA during installation and lowering.

Figure 2   Monitor Port, External Wi-Fi Port and DC input socket

11   Monitor Ports 1 & 2

The Monitor Port performs the following functions:

Receiver Monitor Port: Outputs Receiver RF signal spectrum for external Spectrum Analyzer.

RTF Mode: Output +12 volts and RF signal spectrum for RTF operation. Both USB and monitor cables need to be changed over when changing bands.

12   External Wi-Fi Port

Reverse SMA socket available for connecting an external Wi-Fi 5GHz Antenna.

13   External DC/Charging Socket

DC Charging socket for charging Li-ion battery. Charger may be connected to the iTA during operation with Li-ion battery inserted. It is not recommended that the charger be connected without the Li-ion battery being installed.

Figure 3   SD Card, USB and Mini USB Port

14   SD Card Port

Allows the connection of external memory device (SD Card) for the recording of Reports, State files and Screen Shots.

15   Mini USB Port

Accesses the internal memory of the iTA and allows the User to use the iTA as a mass storage device.

16   USB Port

Allows connection to the External RTF module.

1.6 Minimum Browser Requirements

Supported Browsers are Chrome for Windows and Android environments and Safari under IOS. Early Internet Explorer versions are not supported.

1.7 Equipment Operation – Fixed Frequency Mode

The fixed frequency mode is the default measurement mode of the iTA. In this mode the two test frequencies remain fixed during the duration of the test. When the RF is switched on, the instantaneous PIM value will be displayed by the test equipment.

1.7.1 Starting the equipment - iTA

Press and hold the Power button until a beep is heard and the instrument will begin its start-up procedure. The iTA Start up Window will appear. The user can expect the boot and start-up process to take 70 seconds.

Figure 4   iTA Start up Window

1.7.2 The Main Application Window - iTA

When the instrument is ready to use it will show the Fixed Frequency Window as per Figure 5 below

Figure 5   iPA TFixed Frequency Window (Default Measurement Mode)

iTA Initial Fixed Frequency Window features:

1. RF "On/Off" button

2. Wi-Fi Control/Status Icon

3. Change to time trace mode button

4. Settings menu selections button.

5. Changed between Fixed Mode, Swept Mode, Monitor Mode, RTF Mode (If Fitted)t

6. Reports menu, for saving, viewing, recalling reports. (Reports display recorded points)

7. Record button. Records a point during a test for a report.

8. Insert graphics menu button

9. Geo Cache function enabled indicator.

The iTA screen features mirror those of the Tablet PC display and are explained in Figure 13

1.7.3 Screen zoom functions (Local Control)

Zoom control is available on the local console for all modes including the RTF option.

Zoom control is supported in remote consoles in RTF mode, see the RTF Operating manual for more details.

Figure 6   Zoom Select Region Local Control

Touch the shaded region to enable the zoom function.

1.7.3.1 Adjusting Horizontal Zoom
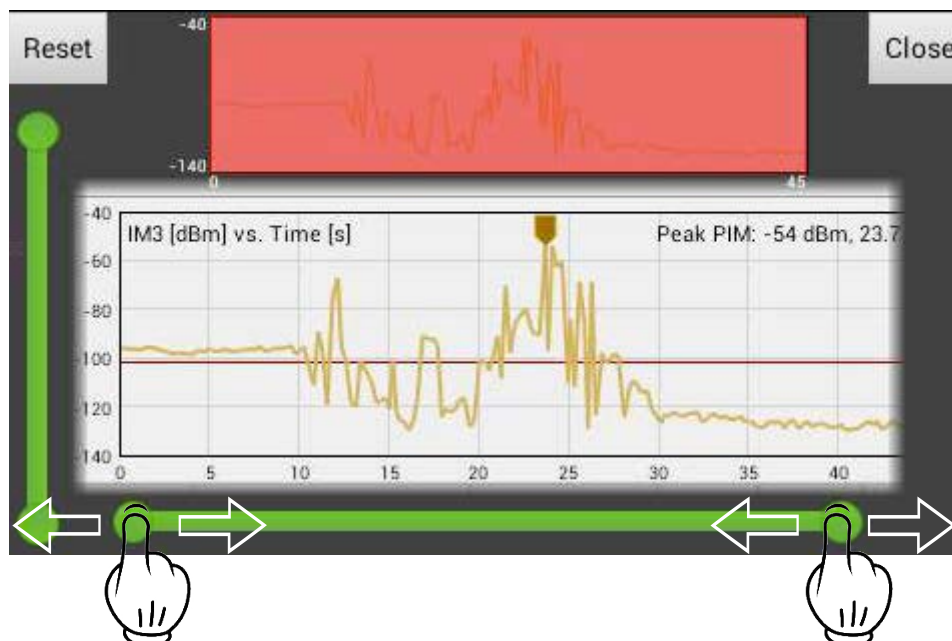
Figure 7   Zoom Adjustment Horizontal (Local control)

1.7.3.2   Adjusting Vertical Zoom
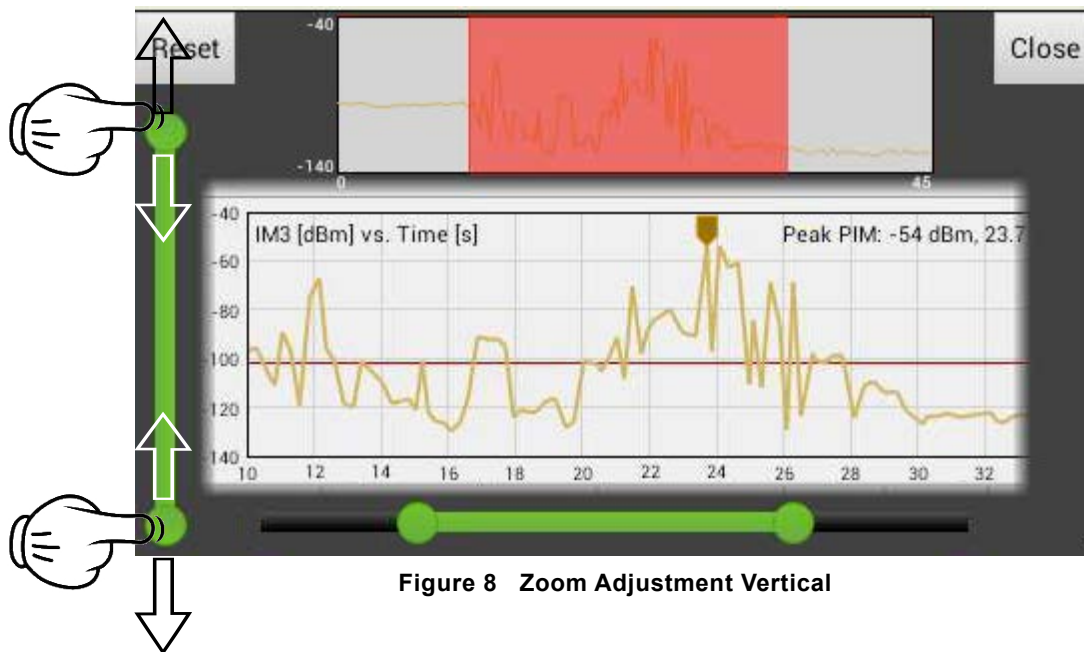
Figure 8   Zoom Adjustment Vertical

1.7.3.3   Adjusting Pan window position

Figure 9   Pan Window Adjustment (Local Control)

1.7.4 Starting the Equipment – Samsung Galaxy Tab

Turn on "on" the Tablet PC.

Install the Chrome Web Browser or update it to a recent version. This is the preferred browser for use with the iTA. This can be done via the internet on your local Wi-Fi network or mobile phone hotspot. First attend to your internet connection via the settings menu

Figure 10   Settings Window Table PC

1   Select the Settings menu

1.7.5 Starting the Equipment - iPAD

Turn iPAD "on" the iPAD Start Up Window will appear as below:

Figure 11 iPAD Start Up Window

- Go to iPAD "Settings" menu,

- Select Wi-Fi

- Set Wi-Fi to "On"

- Choose a network TX2131100XXX (Serial No of iTA)

- Key in password "kaelusap"

- Exit Settings

- Open Web browser: Chrome,Safari, etc

- Type in IP address: "192.168.0.1" into Address bar and hit "Go"

- iTA Front Panel display should appear on the iPAD (see Figure 12).

Figure 12   iPAD Initial Front Panel Display (Fixed Frequency Window)

iPAD Initial PIM Window features:

1. RF "On/Off" button (initially disabled on start-up)

2. Wi-Fi Request Control/Connect button (Ready to connect to iTA on start up), see Section 1.7.6 below.

3. iTA IP Address (preset to 192.168.0.1)

Other screen features are the same as for the iTA (see Figure 5).
Fixed Frequency Window features are explained in Figure 6.

1.7.6   Controlling the iTA via Wi-Fi

To control the iTA with the Tablet PC via the Wi-Fi link, follow the connection procedure below:

State/Action	iTA Wi-Fi Icon	Tablet PC Wi-Fi Icon	Description
1	🔓 Local	⬇ Control	iTA unlocked in local moe. Tablet PC ready for connection
Action Button Press		⬇ Control	Press Control on Tablet PC to transfer control of iTA to the Tablet PC via Wi-Fi
2	((ᵢ)) Remote	🔓 Control	iTA in Remote mode multiple remote access available
Action Button Press		🔓 Control	Press Control on Tablet PC to lock remote access to Tablet PC only. (Note: The iTA can always take back control – see table 2, State 3)
3	((ᵢ)) Remote	🔒 Control	ITA in remote mode, remote access locked to Tablet PC

Table 1   Procedure to Control iTA with Tablet PC remotely via Wi-Fi

- iTA is now locked in Remote mode and Remote access is locked and exclusive to the Tablet PC. (The iTA is always able to be returned to Local mode by pressing "Remote" (see Table 2, state 3))

- The iTA is now able to be controlled and monitored remotely from the Tablet PC.

- To return the iTA to Local mode, see Table 2 below.

1.7.7 Return ITA to Local Mode

To return iTA to Local mode and disengage Tablet PC Wi-Fi link, follow the procedure below

State/Action	iTA Wi-Fi Icon	Tablet PC Wi-Fi Icon	Description
Action Button Press	((ᵢ)) Remote		Press Remote on iTA to return iTA to local operation
4	🔒 Local	⊗ Control	iTA locked in local mode no remote access available
Action Button Press	🔒 Local		Press Local on iTA to unlock iTA Local Mode and allow remote access
1	🔓 Local	⊗ Control	ITA unlocked in Local mode, Tablet PC ready for remote connection (initial start-up state of iTA as per state 1 above).

Table 2   Procedure to Return iTA to Local Mode and Disable Wi-Fi

Further detail on Wi-Fi connection and operation is shown in Section 2.

1.7.8 Turning RF "On" Via the remote Browser

- Before turning RF "On" ensure an RF load is attached to the iTA Test Port.

- (Note: If RF Test Port is not properly terminated, a Return Loss Error will occur and PIM measurement will not be allowed.)

- To turn RF "On" on iTA remotely via remote Browser:

  - Ensure RF "On" icon is enabled on the Tablet PC (see table 1 above for Wi-Fi connect procedure)

  - Press "RF On" Icon on the Tablet PC (below):

🔒 Control	⏻ RF On

- The "RF On" icon will turn Red and the RF Indicator LED will flash on the iTA unit.

1.7.9 Fixed Frequency Window

The Fixed Frequency Window is operation is shown below in Figure 13

Figure 13 Browser/iTA Fixed Frequency Window (RF "on")

The Fixed Frequency Window features are explained below:

1 RF ON/OFF Button

The RF ON/OFF button is used for switching the RF either on or off. As a visual aid, this button will turn red when the RF has been switched on. In the default state (RF off) this button will be green. Additional text appears on this button to show what will happen when the button is pressed (RF On or RF Off).

2 iTA/Browser Wi-Fi Remote Interface Control

Local/Remote Control and State indicator of the Wi-Fi link to the iTA (see table 1 for Connection details).

3 Settings Menu

Settings menu for iTA (see section 1.8.7 for details).

4 Reports Menu

Reports menu for iTA (see sections 1.10, for details).

5   IP Address for iTA

IP Address of iTA (set to 192.168.0.1) Set in Tablet PC Browser window, see section 1.6.3

6   Record Button

Records instrument settings and Maximum PIM readings during a RF "on" time period. Information may be retrieved and stored by pressing the Reports button.

7   Measurement Tags Button

Add Measurement Tag Title to IM display and Reports (see section 1.10.5 for details).

8   IM Level Indicator

The IM Level Indicator shows the instantaneous IM level in numerical form. The large font size allows for easy reading of the IM level. In addition to the instantaneous IM level, the "peak" level is also displayed to the top-right of the instantaneous level.

9   Peak PIM Reading

Displays the peak PIM measurement as taken in a measurement interval (Yellow Bar).

10   PIM Fail Limit

Displays the peak PIM Fail limit as a Red line (see section 1.8.5 for details).

11   PIM Level Bar Indicator

Displays the Instantaneous PIM level as a Green Bar while below the PIM Fail limit, and Red when above the PIM Fail limit.

12,13   Mode Selector Scroll Bar

Is used to Scroll between Numeric or line graph mode.

Default Mode (Fixed Frequency PIM Window)
This mode is used for measuring the instantaneous IM level of a device under test. The IM level is shown in numerical form and with a corresponding IM sliding bar

Time Trace Window
This mode shows a trace of the instantaneous IM level as it changes with time

Frequency Sweep
This mode incorporates swept TX tones, for a resulting swept IM trace

Spectrum Analyzer
This mode allows monitoring of the full RX band with TX powers on or off

RTF
This mode allows Range To Fault operation of the iTA with an external RTF module.
Scroll bars are to be used to change between mode screens on the iTA. To change screens on the Tablet PC, the screen may be dragged across with the operator's finger.

14 **RF Power Timer/Settings menu**

Shows the remaining time before the output power is turned off.

15 **Tone Output Power/ Settings Menu**

The default TX tone output power is 43dBm (20W) per tone, but the power is adjustable to as low as 20dBm (100mW) per tone in 1 dB steps.The 3rd or 5th order IM product can also be chosen.The IM frequency automatically calculated and takes into account the TX tone frequencies, the desired order of the IM product and the instrument's RX band.

16 **IM Pass/Fail Indicator/Settings Menu**

The IM Pass/Fail level may be set.

17 **Notifications Menu**

Notifications Menu shows alarms and system notifications.

18 **Geo Tag Status**

Show the Operation of the Geo tag function.Grey "Turned off", Flashing "Acquiring location", Solid on "Fix of sufficient accuracy acquired"

19 **Battery Level/Charging Indicator**

Shows the charge level of Battery pack and shows when iTA is in Charge mode.The average Monitor Port gain is included, and System Temperature data is recorded.

1.7.10   Recalling State Files

For quick and easy instrument configuration, a state file can be pre-loaded on an SD card. The SD card can be inserted into the SD card slot and the file recalled for setting up the instrument.The setup information is stored in a *.sta file and contains:

• Frequency information for the two test tones

• IM order selection (3rd or 5th) ie., the frequency that the instrument's receiver will be tuned to

• Test tone RF power

• Pass/Fail thresholds

• Pre-configured test tags

• Test timer setting

1. Insert the SD Card into the SD card slot.

2. Press the Open State button. A window will be displayed with a list of the states stored on the SD card.
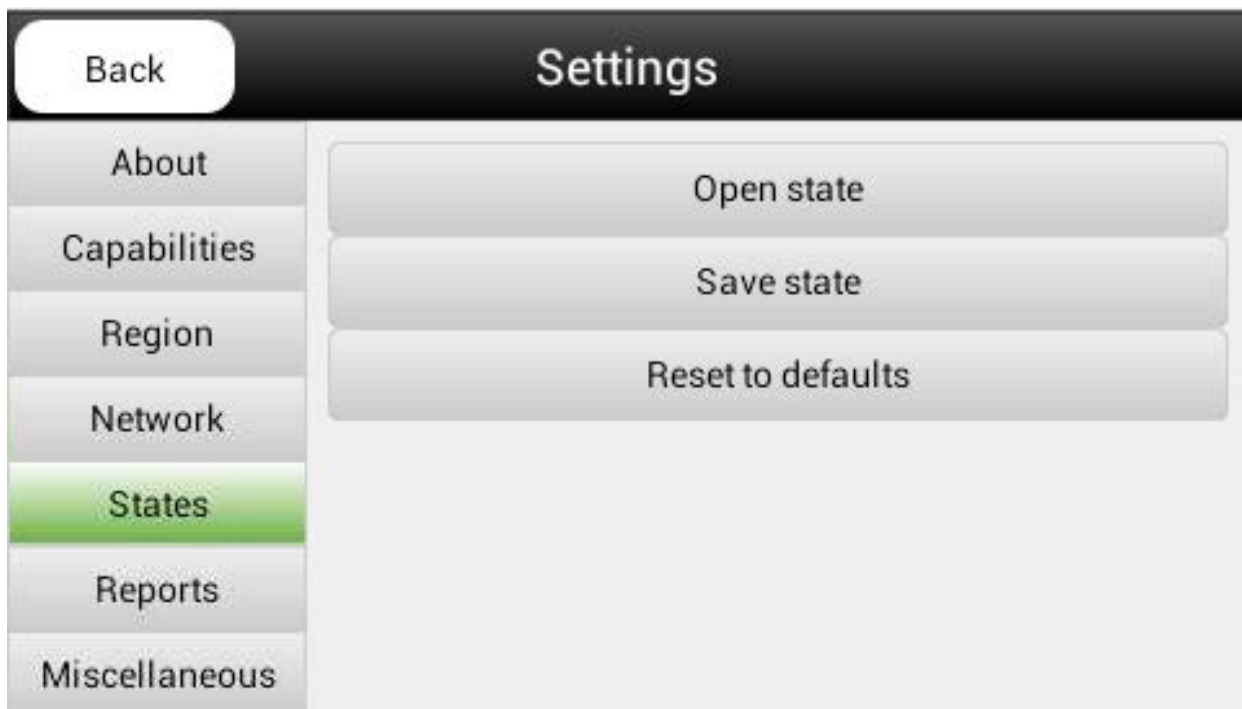
Figure 14   Test State Settings Window

3.Select the state information required, and press OK.The instrument setup will be updated accordingly

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1.7.11   Shutting down the Instrument

1.To shut down the instrument, press and hold the Power button. A shut-down window will be displayed.

Figure 15   Shutdown Window

2. Press OK to initiate the shutdown procedure. The on-board computer will shut down all the internal modules automatically.

1.8   Equipment Operation – Settings Mode

1.8.1   Changing Instrument Settings

The setup of the instrument can be modified via the instrument icons at the bottom of the Main Display Window. Instrument parameters such as RF "on" Timer, TX tone Power and Frequency and IM Threshold level may be adjusted by pressing the relevant icon at the bottom of the Main Display Window.

1.8.2   Modifying RF "on" Timer Setting

As a general parameter, the Power Timer limit is used to control the length of time the test tones are transmitted.The timer operates in seconds, and counts down until it reaches zero, at which point the RF is turned off.The RF may be switched off at any time by pressing the RF On/Off button..

• When the Timer icon is pressed, a Timer menu is displayed. (The current setting is highlighted with a green dot.)
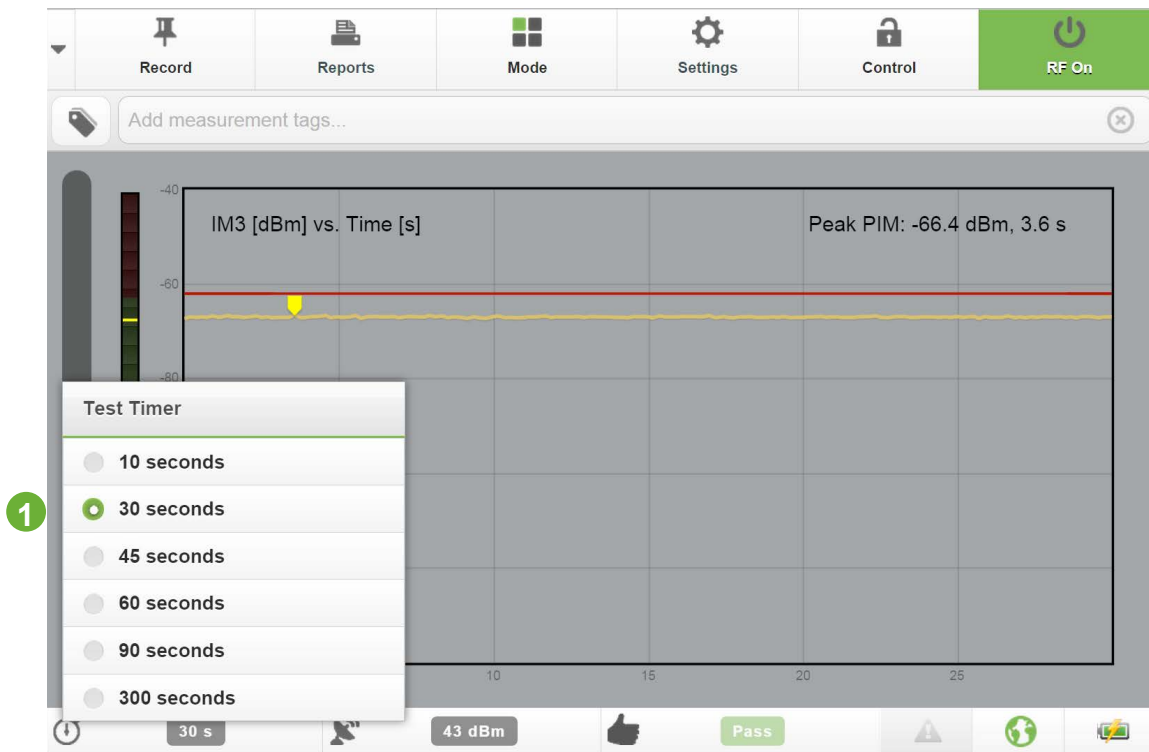
Figure 16   iTA RF "on" Timer Window

1   RF "On" Timer setting (Maximum "On" time is 300 seconds).

The RF "on" Timer may be set to a predefined period between 10 and 300 seconds.

1.8.3   Modifying Test Tone Frequency and Power Level

- Press the TX Power icon on the Main Display Window and the TX Tone Powers and frequencies will be displayed.

- Press a test tone power field (P1 or P2). A numeric keypad is displayed.

- Input the new test tone power in dBm, and press Return.

- The TX Tone frequencies and powers may also be modified using the slide bars shown below the numeric displays.

- Tone 2 power may be locked or unlocked to Tone 1 power by the Power Lock button shown as "3" in figure below:
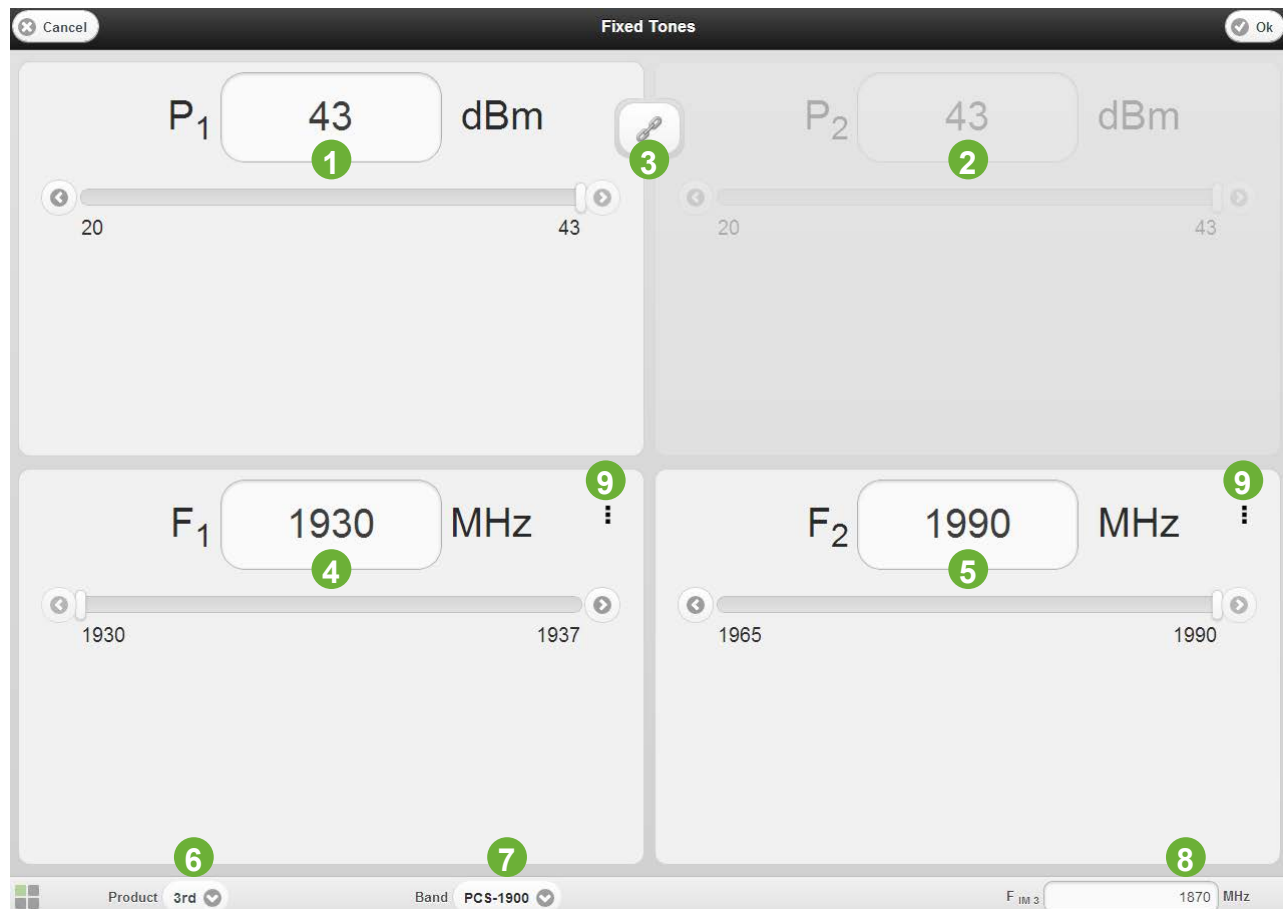
1 TX1 Power Level

2. TX2 Power Level

3. TX1, TX2 Power Locking Toggle (P2 shown locked to P1 power level)

4. TX1 Frequency

5. TX2 Frequency

6. IM Product (3rd, 5th, 7th) and 9th order, IM2 is available on some versions with external filter.

7. TX, RX Cellular Band

8. IM Receiver Frequency

9. Brings up the Tone enable/disable menu (Allows a test tone to be turned off individually Tone 1 or 2)

1.8.4 Modify the IM Product

• Press the IM Product field.The instrument will calculate the various order IM frequencies and a window will be displayed with relevant options.
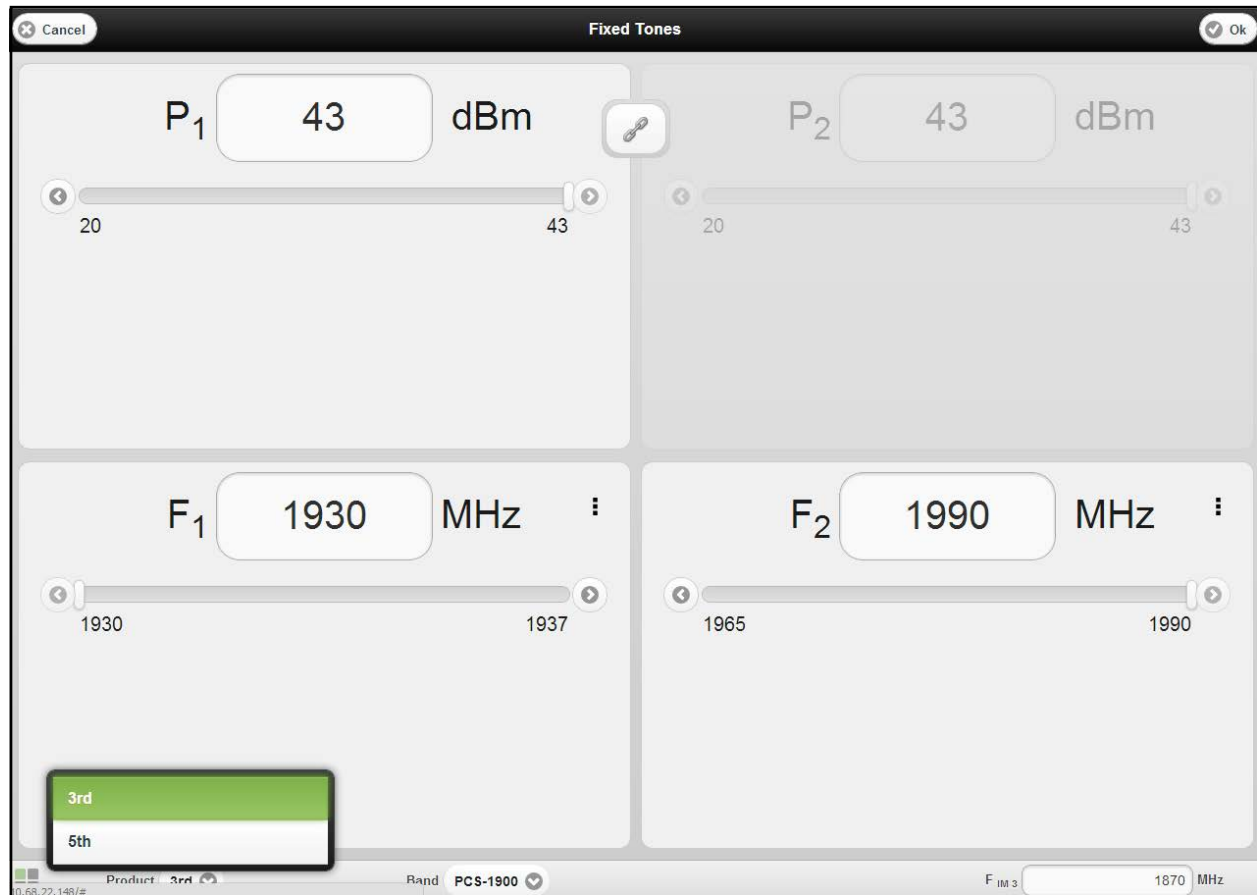
Figure 18   Calculated IM Products

• Select the IM product to be measured and press OK. The IM receiver will be switched to the appropriate frequency.

1.8.5   Modifying the IM Pass/Fail Threshold

• Press the IM icon at the bottom of the Main Display Window. A Limits Window will be displayed.
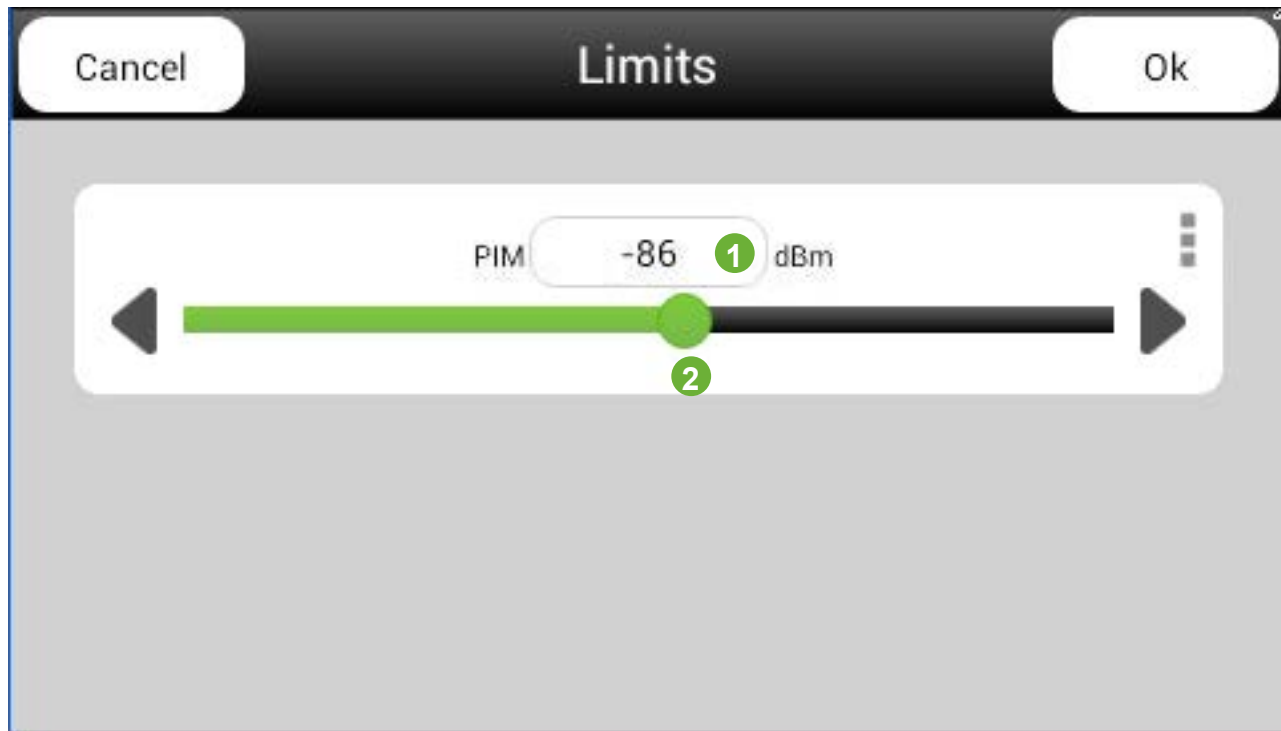
Figure 19   iTA IM Threshold Level Window

1 IM limit dBm or dBc as selected in Miscellaneous Menu

2 IM limit adjust bar

• Press the IM field IM. A keypad is displayed.

  • Input the IM threshold level (in dBm).

  • Press Return. The red line on the Main Display Window will move to the new threshold level. It also will show a corresponding red numeric tag on the Fixed Frequency Window.

• The IM threshold may also be modified using the slide bar shown below the numeric display.

1.8.6 Battery Charge Level Monitor, Monitor Port Gain and System Temperatures

- Press the Battery icon at the bottom of the Main Display Window. A Window detailing Battery voltage and monitoring limits will be displayed.

- Details on average Monitor Port Gain and System Temperatures will also be displayed.

- Unit Battery charging is managed by the Microcontroller, the iTA MUST BE SWITCHED ON. In order for the battery to charge

Back	Details	
Battery		
Voltage		28.6 V
Level		85%
Warning level		30%
RF disabled level		10%
Shutdown level		5%
Battery Usage		
Serial number		TX2132000148
Manufacture Date		22-Oct-2013
Unit On Time		6d 14:03:49 **1**
RF On Time		0d 01:04:13 **2**
Monitor port		
Gain		0.00 dB
Temperatures		
Isolator 1		29 ℃ **3**
Isolator 2		28 ℃
Battery		25 ℃ **4**

Figure 20   iTA Battery Window

1. The battery records how long the battery has been connected to an iTA and switched on for. "d" signifies days followed by hrs minutes and seconds.

2. Shows how long the connected iTA/s have been in the RF on state when connected to this battery.

3. Operating temperature of the in line Tx isolators for F1 and F2 signal generators.

4. Battery temperature sensor temperature.

1.8.7 Instrument Settings Menus

To access the iTA Instrument Settings menu, press the Settings icon at the top of the Main Display Window.

1.8.7.1 Instrument Settings - About Window

The Settings About Window details the iTA Model and Build details, Serial No.Software version and calibration dates.It also contains important information of Safety with the unit and Regulatory and Legal stipulations covering the use of the iTA. See figure below.
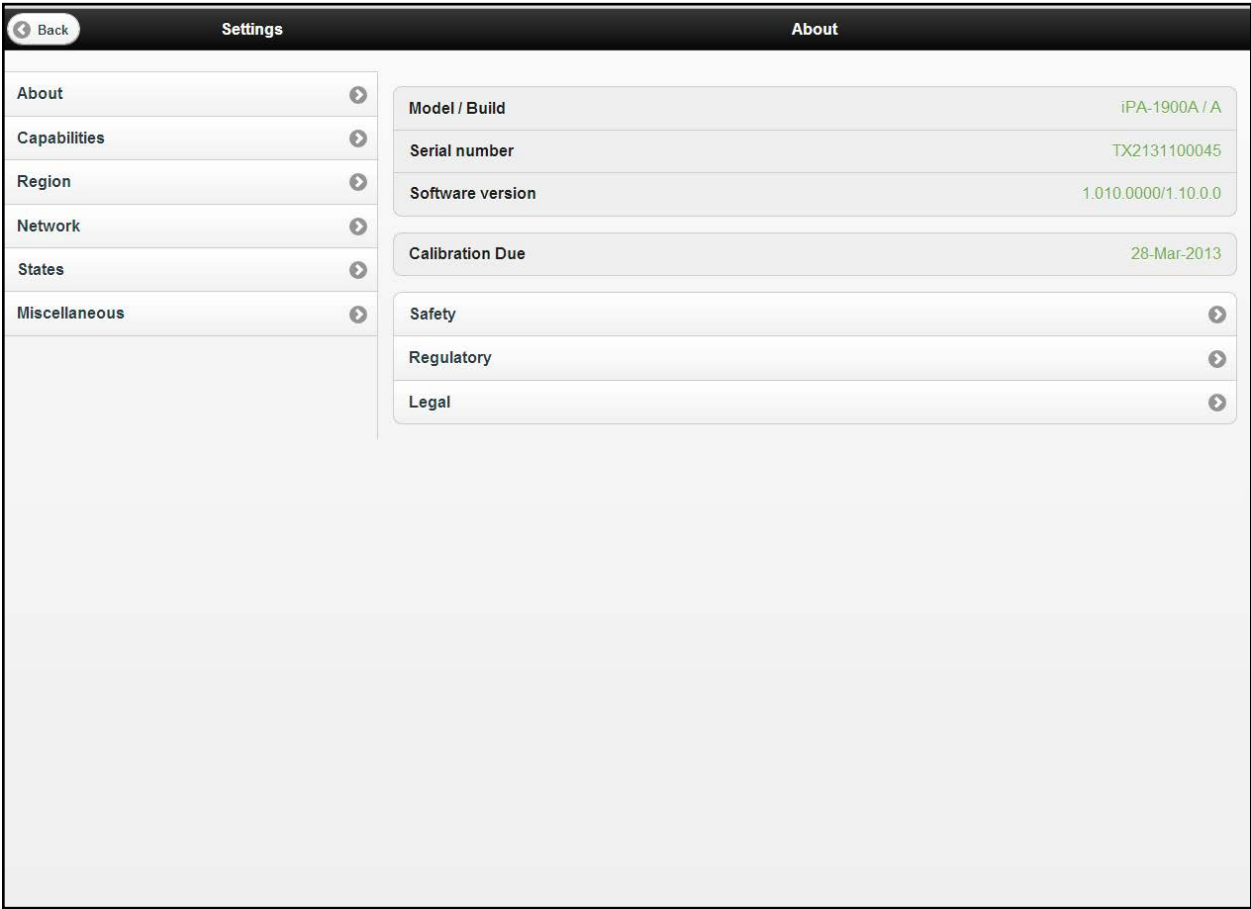
Figure 21   iTA Settings About Window

1.8.7.2   Instrument Settings - Capabilities Window

The Settings Capabilities Window details the Transmitter and Receiver Frequency ranges as well as Battery details including charge level, terminal voltage and shutdown levels. See Figure below.
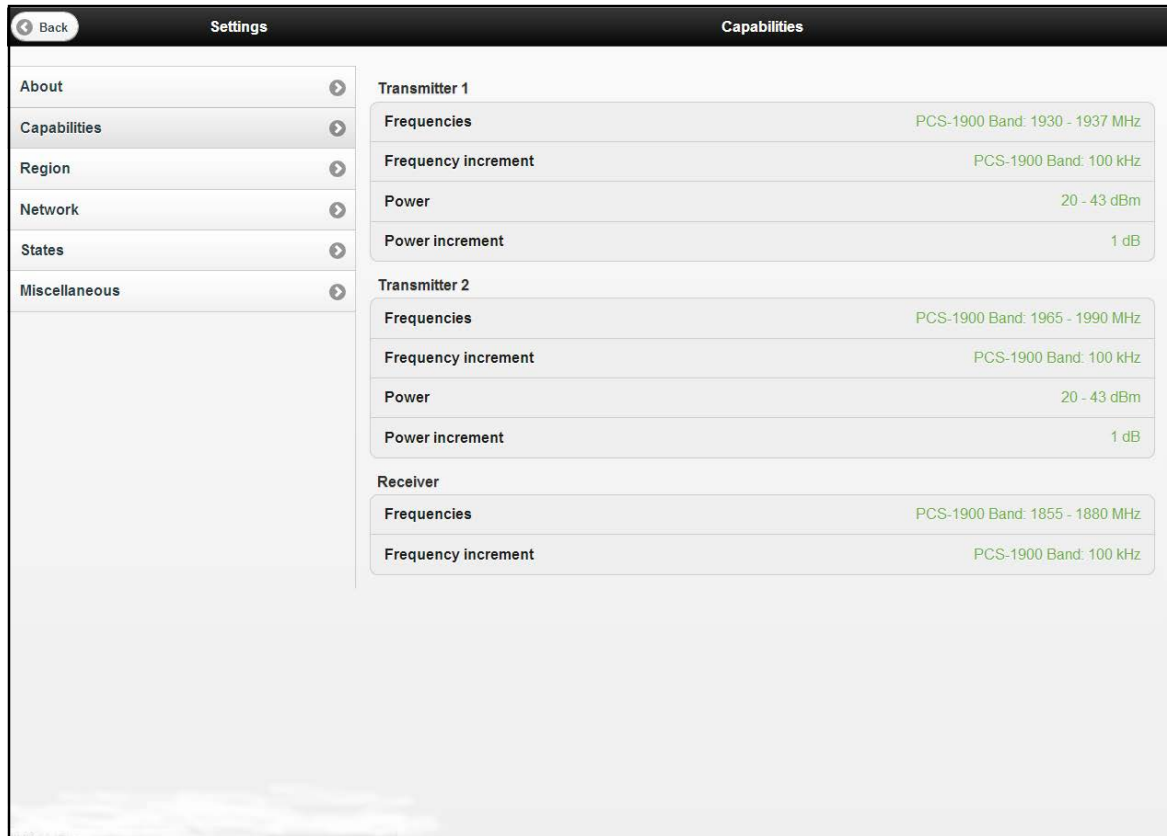
Figure 22   iTA Settings Capabilities Window

1.8.7.3 Instrument Settings - Region Window

The Settings Region Window includes the GUI user language, and date, time and time zone details.
 See Figure below
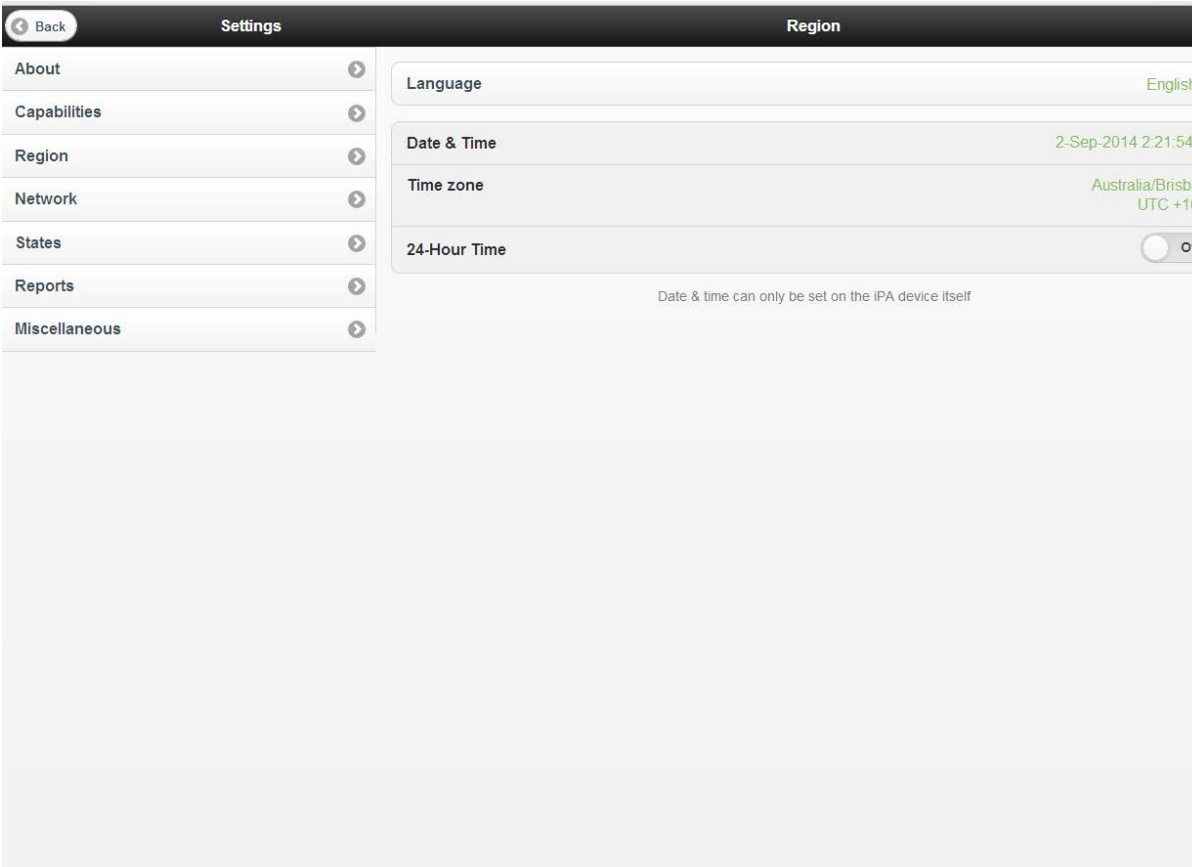
Figure 23   iTA Settings Region Window

1.8.7.4   Instrument Settings - Network Window (iTA and Tablet PC)

The Network Settings Window on the iTA and the Tablet PC displays Wi-Fi and Ethernet connectivity and allows the user to set the Wi-Fi Access point password, see figures below: Note: Configuring/ restarting the Wi-Fi and Network settings is available on the instrument
local display only. Settings can be viewed by remote clients.

Scroll down to find Ethernet addresses, client mode and hotspot settings.
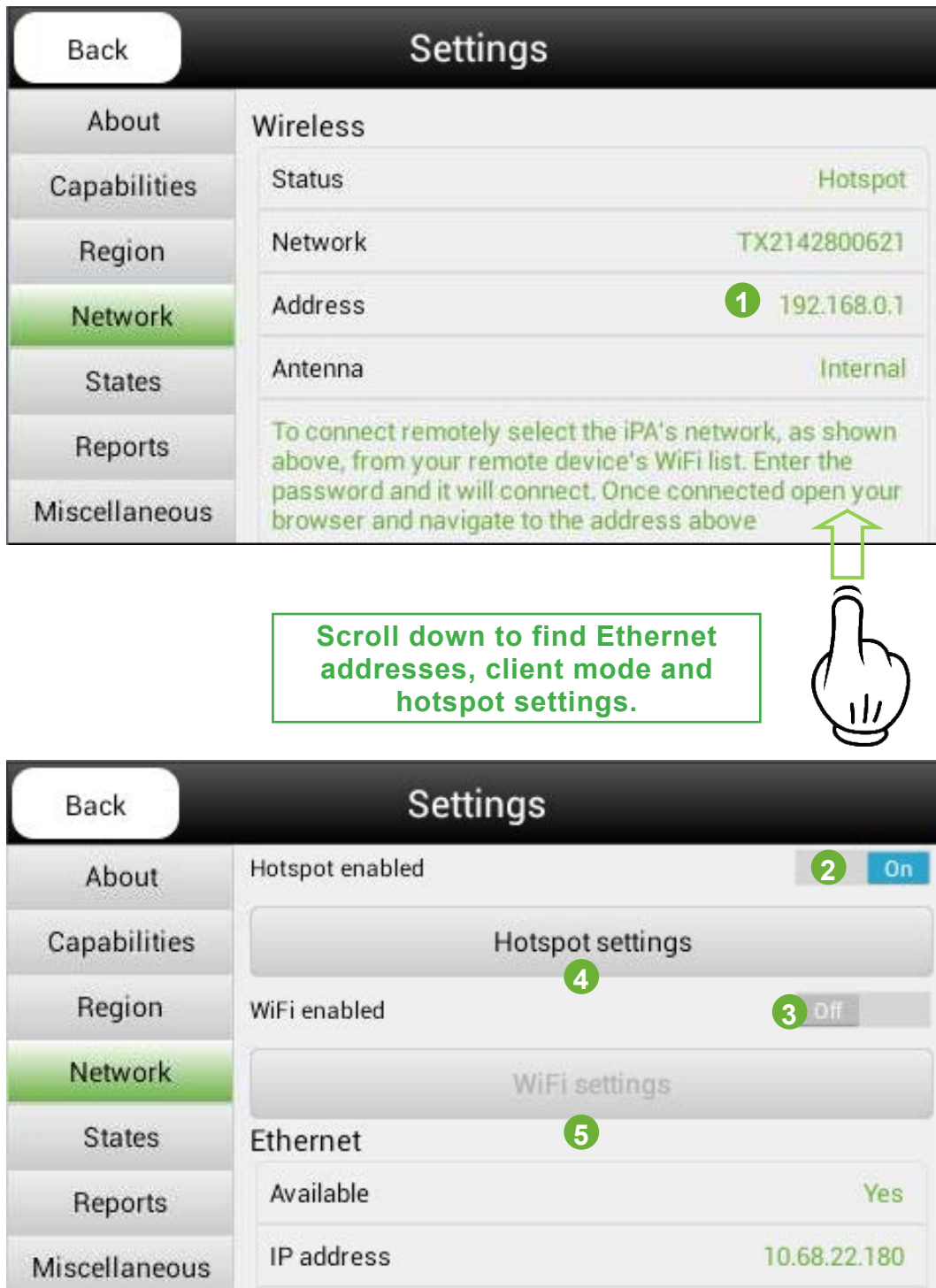
Figure 24   iTA Network Settings Window

1. Current Wi-Fi Hotspot IP address

2. Switch Hotspot mod on or off (Note : the unit can be in either hotspot or client mode or Wi-Fi Off)

3. Switch Wi-Fi enabled (Client mode) on or off.

4. Enter the hotspot settings menu.

5. Enter Wi-Fi Client settings menu.
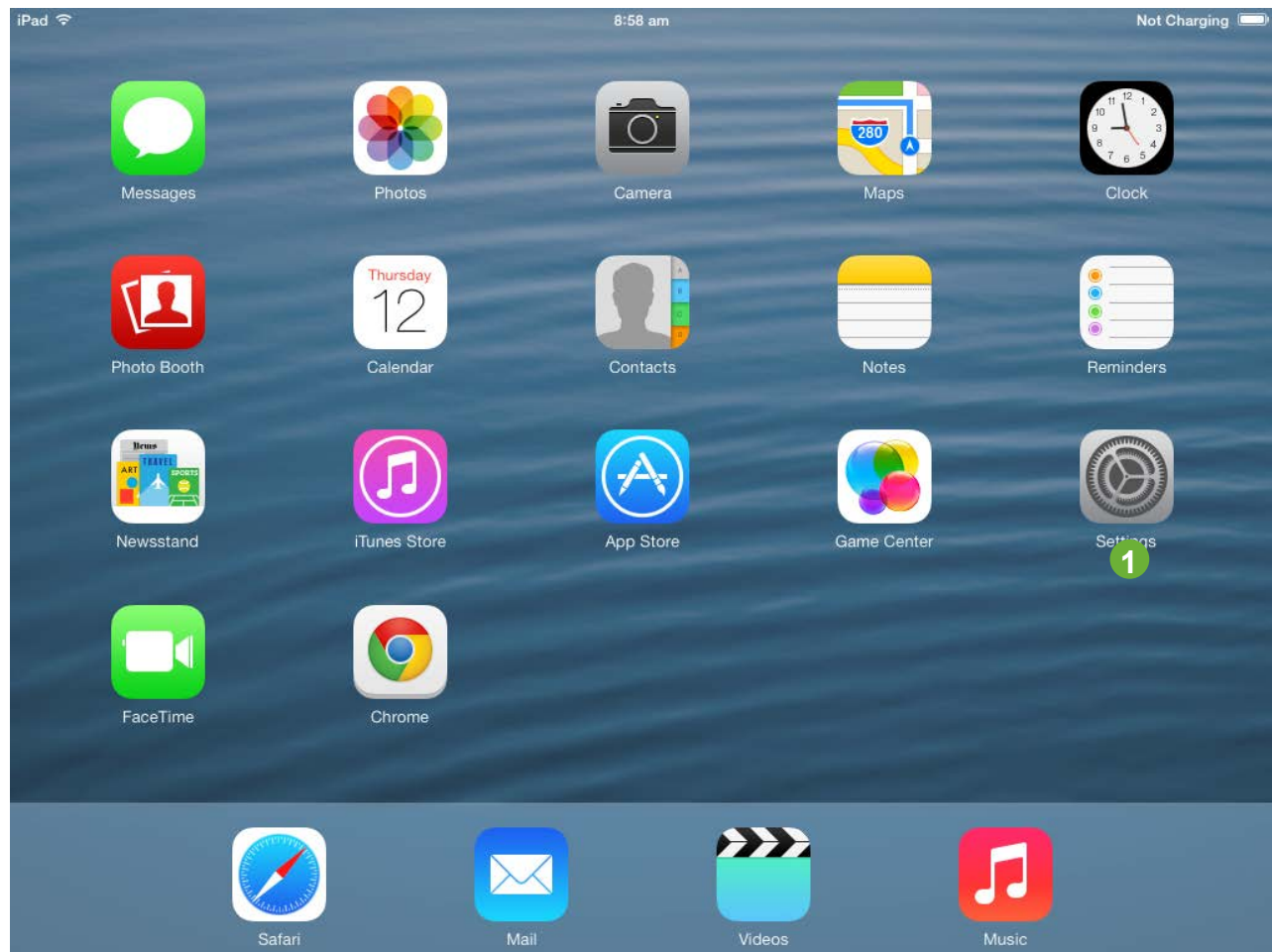
Figure 25   iPAD settings menu selection.

1. The iPAD Wi-Fi settings are accessed via the settings menu shown.
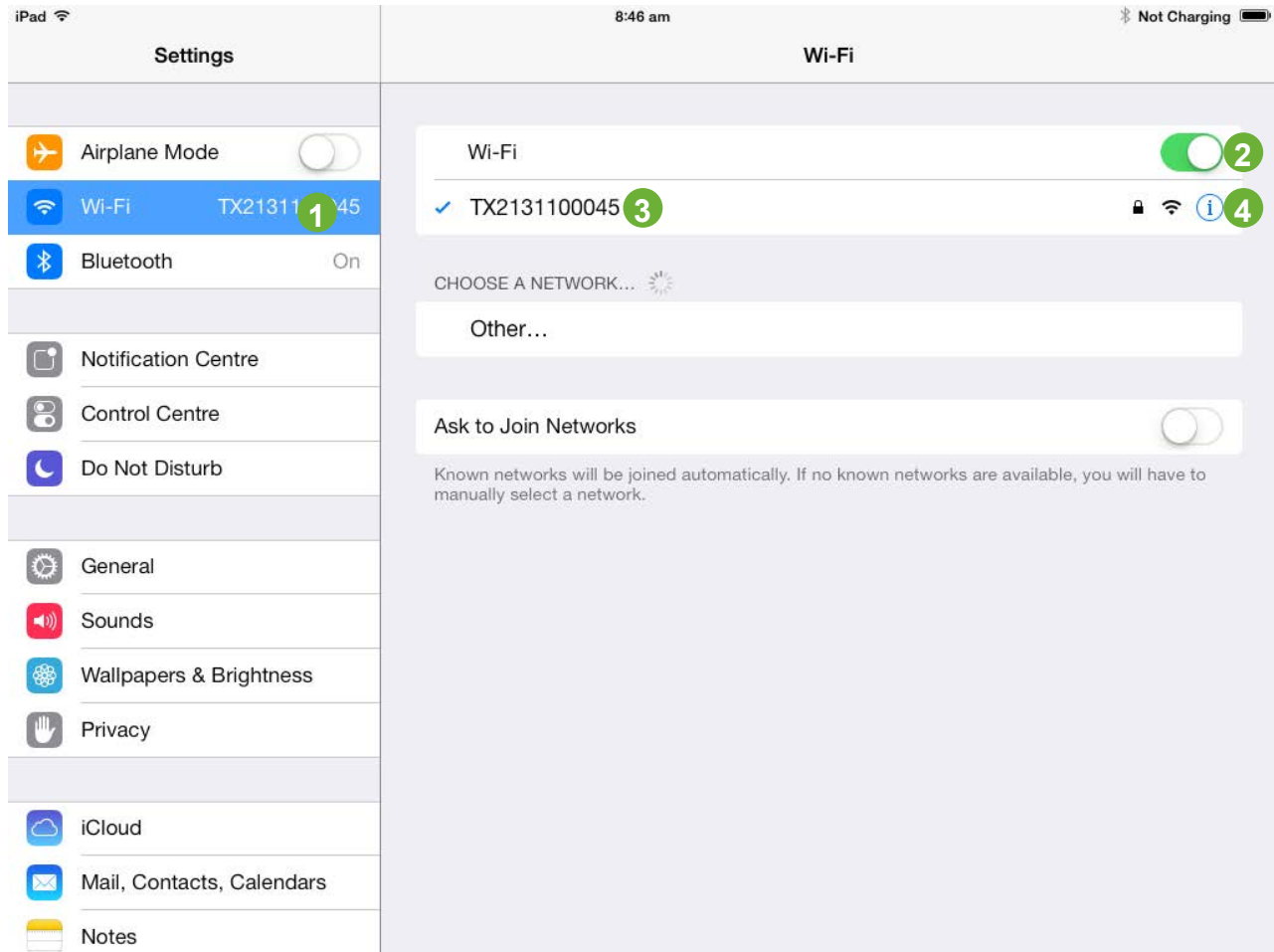
Figure 26   iPAD Selecting your Wi-Fi Hotspot (Serial Number).

1. Select the Wi-Fi menu.

2. Ensure Wi-Fi is switched on.

3. Select your iTA's Serial number as the network from the list. (Note : Factory default only this can be changed in the hotspot setting on the local display)

4. More information on you iPAD's network address can be obtained via the information menu. See Figure 27
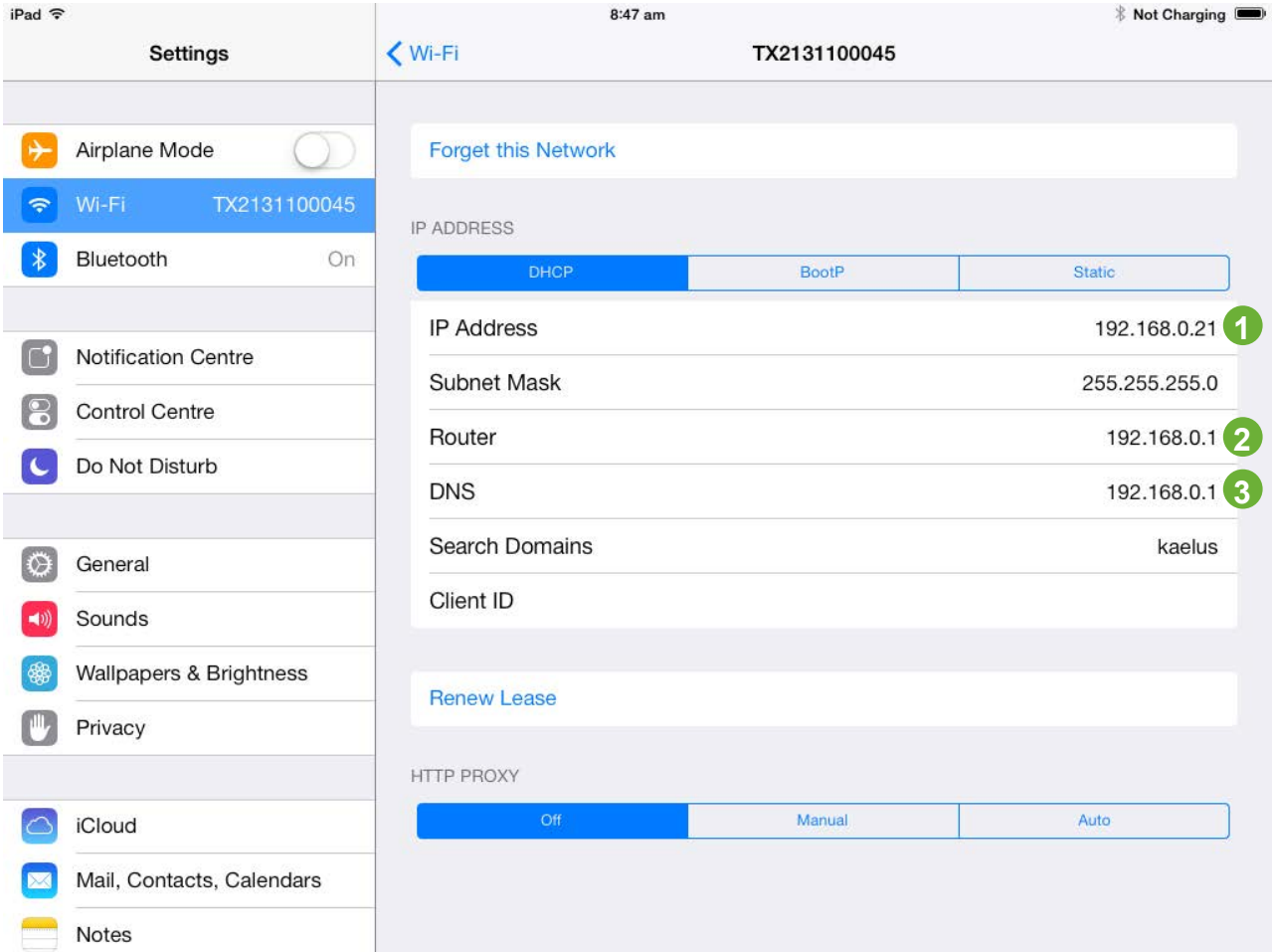
Figure 27   iPAD Network information Windows

1. Network address allocated to your iPAD from the iTA hotspot.

2. This shows the network address of the router, if the iTA is used as a hotspot this will be 192.168.0.1.

3. This shows the network address of the networks DNS, if the iTA is used as a hotspot this will be 192.168.0.1.

1.8.8 Instrument Settings – Instrument States

The Instrument State window shows the Test State of the iTA. The Test State may be created, edited and saved by the user to replicate and store instruments states for testing at similar sites.

1.8.8.1 Edit Test State

In Configuration mode, the user is able to create new states and recall, rename or delete states.

- Press the **Open State** button and the Open State screen will be displayed.
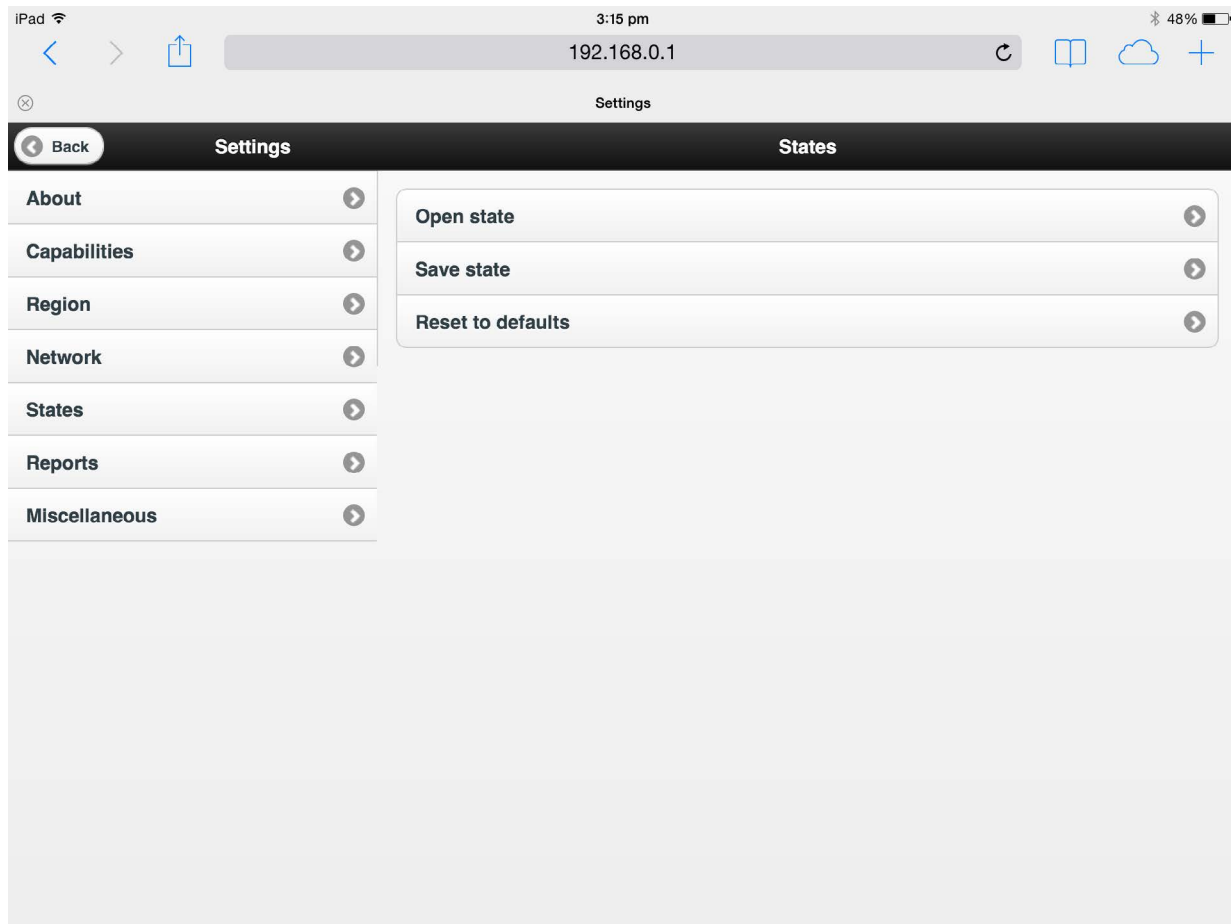
Figure 28 Instrument State Window

- Press the Back button to go back to the configuration screen.

1.8.8.2   Recall a State

The instrument setup can be changed by uploading a new state file from the Internal drive of the iTA,from an SD card. For Android and Windows based controllers the state file can also be uploaded from the controlling devices local drive to the iTA using the Upload key.

• For files on the iTA select the file you wish to recall, and press the Open button.

1.8.8.3   Change Drive/SD card

• To toggle though the different drives, select the drive you wish to access.

1.8.8.4   Rename a State File

• Select the file to be renamed, then press the Actions button and select rename.

• A rename file panel will appear.

• Type in or edit the new file name, and press OK,

1.8.8.5   Create a New State File

The user can create a new state file from the current instrument configuration

• To create a new state file from the instrument, press the Save State button, select which drive you would like the state file saved in.

• Press and hold the filename field, a keyboard will appear.

• Type in the name of the new state file and press Save or Download.

• Press the Save button to save the Instrument State on the selected iTA drive. Download for Android and Windows devices will allow state files to be saved on the controlling devices local drive.

• The instrument setup will be saved in a *.sta state file.

1.8.8.6   Delete a State File

• To delete a state file, select the file to be deleted, and press the Actions button, then press Delete and OK to confirm.

1.8.8.7   Tags and state files.

• Use your state file to manage how you edit and use tags, if you are editing tags on an existing report, you may want to load in an existing state file so you don't have to re-create your old tags. Remember your instrument settings will be loaded with the state file also. If your instrument settings are important to you, you may wish to save them in a state file so they can be recovered.

1.8.9   Instrument settings miscellaneous Window (remote control).
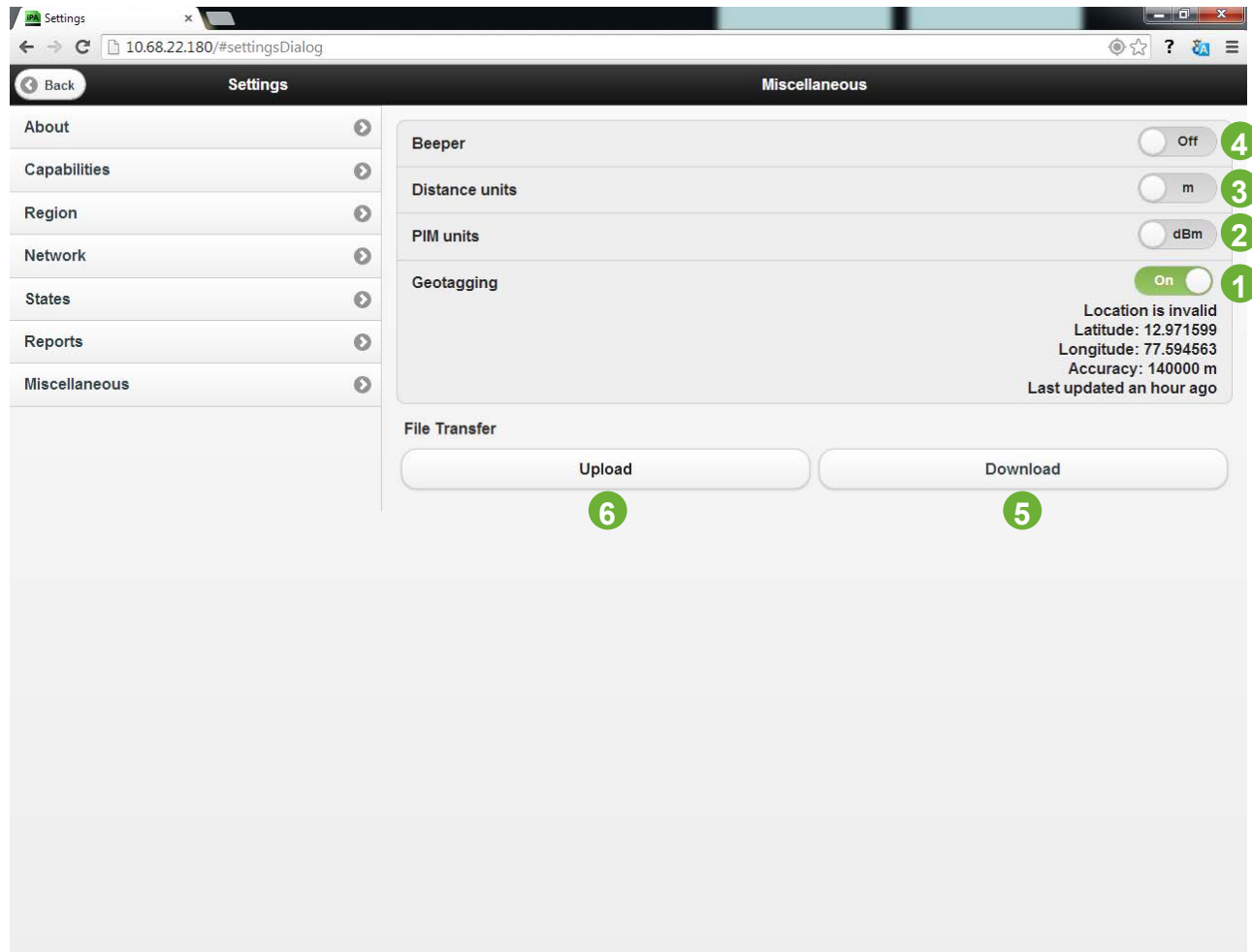
Figure 29   Miscellaneous settings window

1   Geotagging ON/OFF (Remote control)

Note: Location services will need to be enabled on your Tablet PC or SmartPhone and the device will need to have accessed location services sufficient to resolve your location.

If the Geotag Globe is flashing then your SmartPhone/Tablet PC's Geotag service does not have adequate data for a sufficient fix. Look in the trouble shooting section for suggestions on improving your Geo fix.

2   PIM Units dBm/dBc

Sets the measurement units of the PIM product produced. dBm (Decibels with respect to 1 milliwatt). dBc (Decibels with respect to Carrier Power set).

3   Distance units ft/m

Sets the measurement distance units, ft (feet), m (meters).

4   Beeper off/on

Switch a tone beeper on to warn when iTA's carrier/s are transmitting. The beeper repetition rate is also an indicator of the IM level being measured. Higher levels have a higher repetition rate.

5   Download

Allows files to be downloaded from the iTA's Internal storage or SD card. Note: IOS devices such as the iPAD will need an application associated with the file type downloaded. So to use zip report files, a zip file handling app will need to be installed from the app store. State files *.sta, cannot be downloaded or used on IOS devices..

6   Upload

Allows files to be uploaded from the controlling devices storage. Note: IOS devices such as the iPAD will be limited to uploading Camera Roll photo's. Android and Windows based controllers can upload any file that is within the upload limitations.
See Section 1.3.

1.8.10   Instrument settings miscellaneous window (Local control).
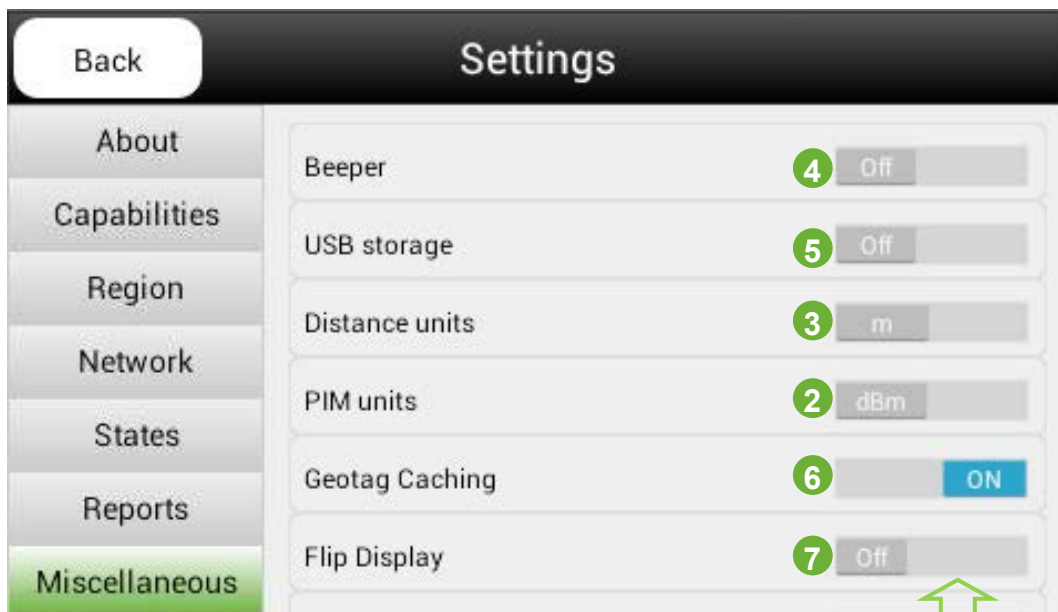
Scroll down to find Auto Save Screen shot and Power management settings
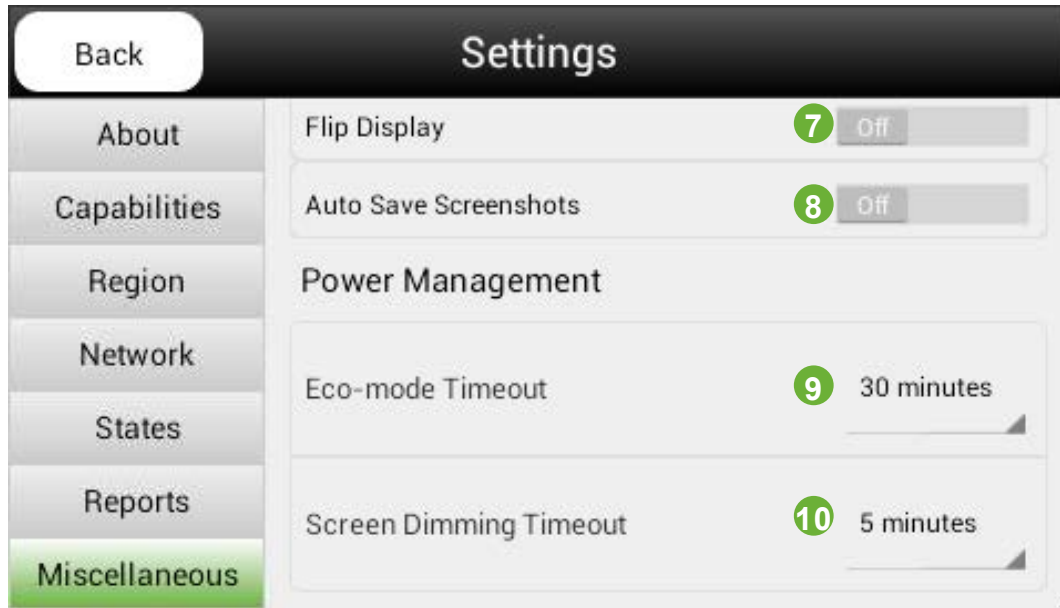
Figure 30   Miscellaneous settings window (Local control)

The functions of 2,3,4 are the same as described in Section 1.8.9.

5   USB storage

This enables the iTA to be used as a USB storage device, connect a cable form the mini USB port to your PC and see the files stored on both the SD card or the iTA's internal memory.

6   Geotag Caching

Geotag data provided by a remote control device can be cached on the iTA. With the Geotag caching on, a remote control device that has a Geotag fix will have the location saved to the cache when a measurement point is recorded or plot saved. This is particularly useful when you moving around with your remote control tablet,PC or phone and the geotag fix gets lost. When moving in and out of a RF screened room for example. The Cached location can be used for subsequent report items if the geotag fix on the remote device is lost for a while. On the local display, See Figure 5 Item 9, when Geotag caching is on, a Globe symbol will appear, when a cached location has been saved the symbol will display green as shown, if an acceptable geotag has not been sent to the iTA, then the Globe symbol will display in a grey color.

7   Flip display

When using the iTA in local mode it isn't always possible to orient the instrument for most convenient viewing of the local display, this switch allows the local display to be flipped upside down so you can view the display from the other direction.

8   Auto Save Screenshots

This enables the iTA to automatically select a storage name and location for your screenshots as outlined in Section 1.10.9

9   Eco-mode timeout

Sets the time of inactivity before the iTA enters Eco-mode, where parts of the iTA are powered down to extend battery life. The timer can also be disabled via this control. Note: Remote control functions still operate when in eco-mode.

10   Screen Dimming Timeout

Sets the time since the last local display screen press before the local display is dimmed, this further extends battery life. Remote control display screens are not affected by this setting.

1.8.11   Editing Measurement Tag Points

Measurement Tag labels identify the physical point(s) in the system that the measurement is taking place. The user can add, delete or modify Measurement Tag Labels.

1.8.11.1   Add a Measurement Tag Label

- Press the Measurement Tag button. A keyboard will be displayed

- Enter the new title and press Return.

Pressing the Return button will return user to the main screen

Figure 31   Add Measurement Tag Label

1.8.11.2   Modify a Measurement Tag Label

• Select the label to be modified.

• Select the label title at the top of the screen. A key board will be displayed.

• Enter the new title and press **Return**.

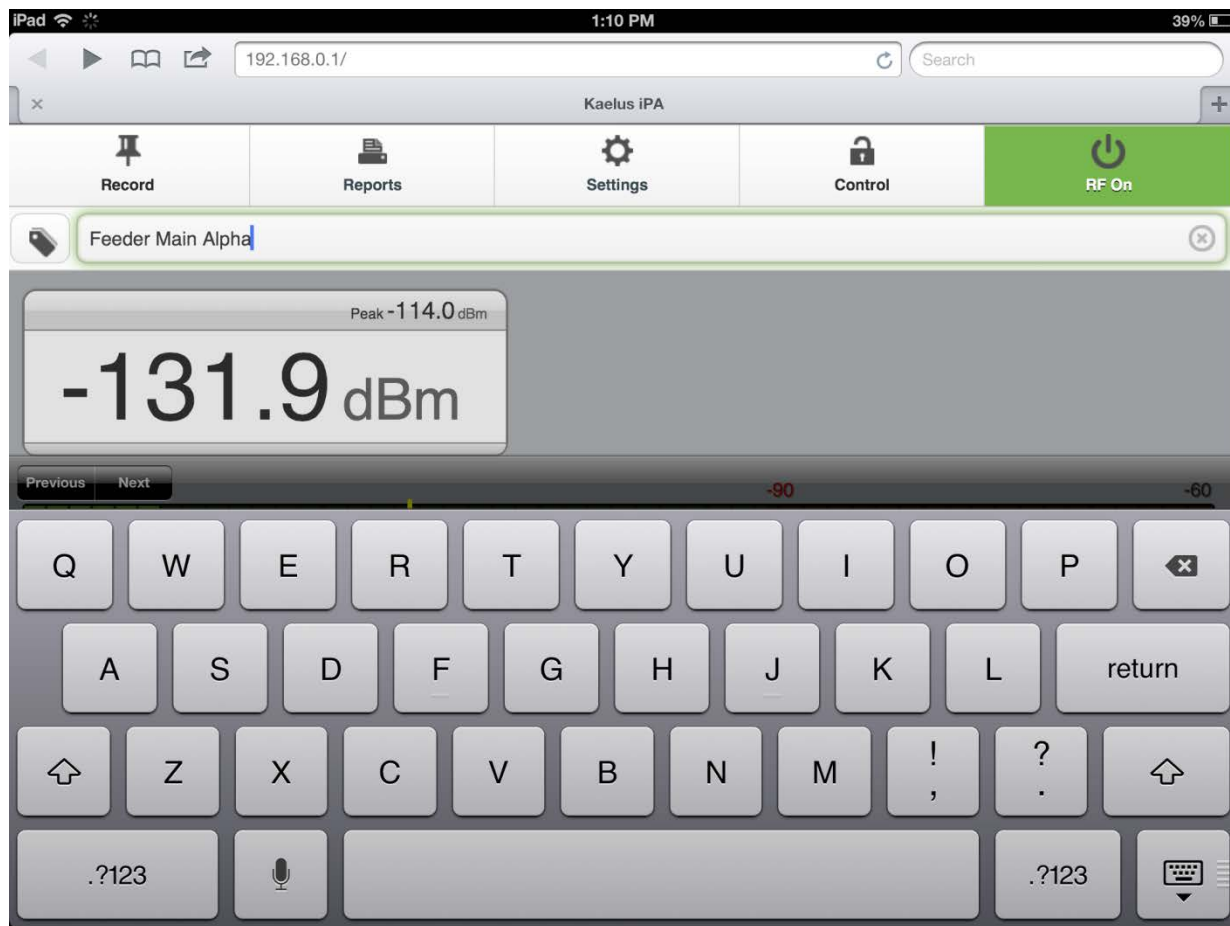• Pressing the **Return** button to return to the main screen

1.8.11.3   Delete Measurement Tag Labels

• Press the Delete (X) button on the right side of the Measurement Tag field.

1.9   Equipment Operation – Measurement Modes

The measurement modes offer added IM measurement and diagnostics capability. The measurement modes presently offered are Fixed Tones. Swept Tones, Spectrum Monitor and Range to Fault (RTF) mode.

Note: The user needs to take due care in ensuring that no unlicensed broadcasting of the TX carriers occurs. In this regard it is best practice to ensure that the device under test is alwtays terminated in a low PIM cable load.
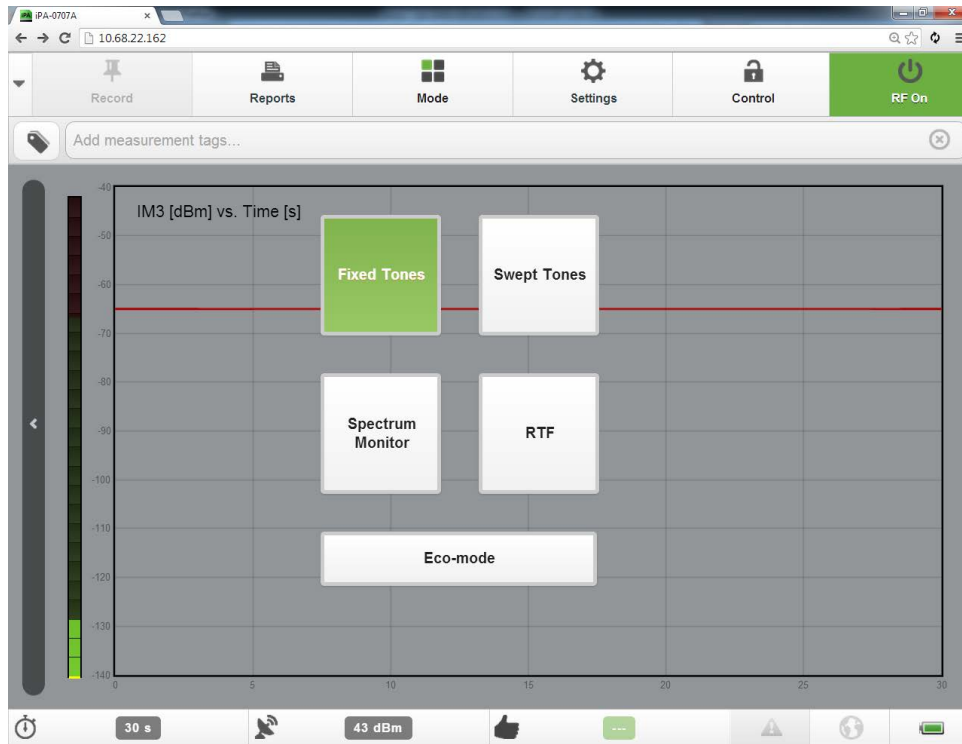
Figure 32   Mode selection menu

1.9.1   Fixed Tone

Fixed Tones mode can be displayed in two different forms. The iTA will always on first load display the Fixed Tones measurement mode in the Numerical PIM display our default measurement mode.The alternate display the PIM vs Time (sometimes called the Time Trace mode) is particularly useful for illustrating IM performance during a set time interval and under percussive testing. The measurement trace gives a "timeline view" on how the IM level changed within the set time interval. As with the default measurement mode, the TX tones remain fixed whilst the IM measurement is taken at the corresponding IM frequency. Before the IM measurement is shown, time is allowed to stabilize the output tone powers to within +/-0.5dB of the preset level.

The features offered by this mode are as follows:

• A peak level marker (Yellow line) highlights the peak IM level

• The time axis is automatically scaled as per the Power Timer setting mentioned earlier

• User adjustable Pass/Fail limit line (Red Line)

• Manual Measurement recording

Figure 33   Tablet PC PIM vs Time Window Mode (RF "on")

Figure 30 shows a screen shot of the PIM vs Time measurement window. The shown trace is typical of a loose connector under dynamic testing (percussive tapping).

1. RF "On/Off" button – (Red: RF "On", Green: RF "Off")

2. iTA/Tablet PC Wi-Fi Remote Interface control (see table 1 for operation)

3. Settings Menu

4. Reports Menu

5. IP Address for iTA – (factory set to 192.168.0.1 in hotspot mode)*

6. Record Data Point Button

7. Measurement Tag Title

8. Instantaneous PIM measurement

9. Maximum recorded Peak PIM level - (Yellow Marker)

10. PIM fail limit - (Red line)

11. PIM Time Trace (Orange Trace)

12. PIM Measurement Axis (dBm)

13. Instantaneous PIM measurement (Bar level)

14. Scroll Bar Left (to change to Display Mode)

15. Time Measurement Axis (Seconds)

16. Timer Monitor and Settings Menu

17. TX tones Power Monitor and Settings Menu

18. IM Pass/Fail indicator and Settings Menu

19. Notifications icon

20. Battery Level Indicator

21. Geo Tag Indicator (Light grey, off), (Flashing, requires better location fix),(Dark Grey, Geo tag fix obtained)

22. Record drop down menu

*In Client Mode the IP address is allocated by the Host network.

1.9.2　　Frequency Sweep.

The Swept Tones mode is particularly useful for highlighting anomalies in IM performance within a specific receive band. The instrument measures the vector sum of all PIM sources present on an RF path. If two PIM sources of approximately equal magnitude are present on the RF path and are physically separated in such a way that the two signals arrive at the PIM test equipment exactly 180º out of phase, the two PIM signals will cancel and the PIM problem may not be evident. Changing the test frequencies will change the generated PIM frequency and the phase relationship between multiple PIM signals on the line, if they exist. "Sweeping" across multiple test frequency combinations provides a range of data points to accurately characterize the PIM performance of the system.

With this measurement mode, the high power tones are swept across the transmit band in such a way that their IM products fall within the receive band.To optimize speed and efficiency only those pairs of transmit frequencies which create IM products in the receive band are swept. A unique feature is the use of dual-tone sweeps: the high-frequency tone is first swept towards the stationary low-frequency tone (Sweep:1/2) and then the low-frequency tone is swept upwards toward the stationary high-frequency tone (Sweep:2/2). The progress on any dual-tone sweep is shown by the sweep number as tagged in the figure below.
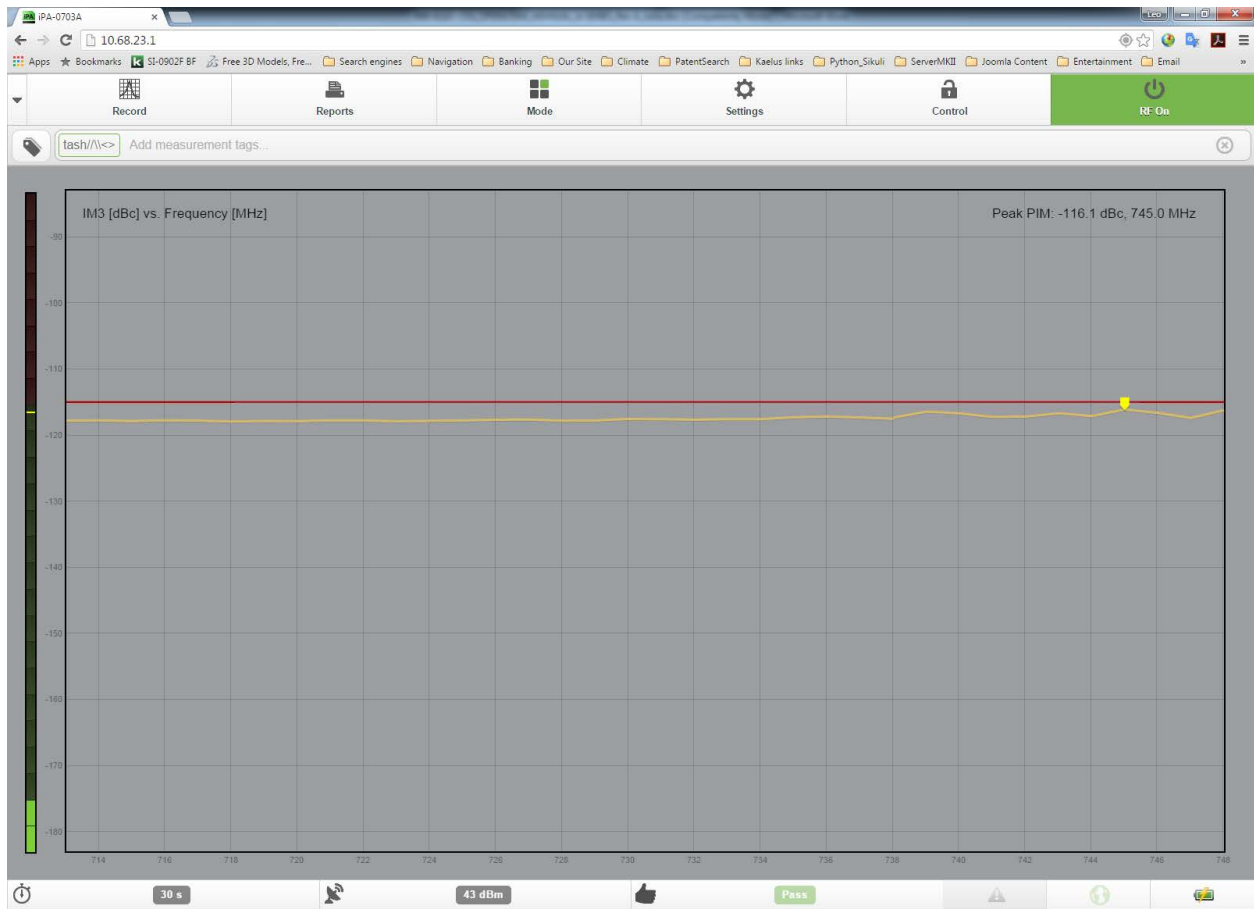
Figure 34   Swept Measurement Window

Note: The instrument will complete as many dual-tone sweeps as possible within the preset time frame. After the timer expired the RF is switched off.

Note: The test equipment automatically changes the two test frequencies and displays the resulting IM frequency, when doing the frequency sweep.

The frequency step size is adjustable and directly impacts on the time it takes for a sweep to complete. Clicking on the frequency step label, will open a selection window with different frequency steps. The user can make a suitable selection based on the IM bandwidth in question.

The frequency step size is adjustable and directly impacts on the time it takes for a sweep to complete. Clicking on the frequency step label, will open a selection window with different frequency steps. The user can make a suitable selection based on the IM bandwidth in question.
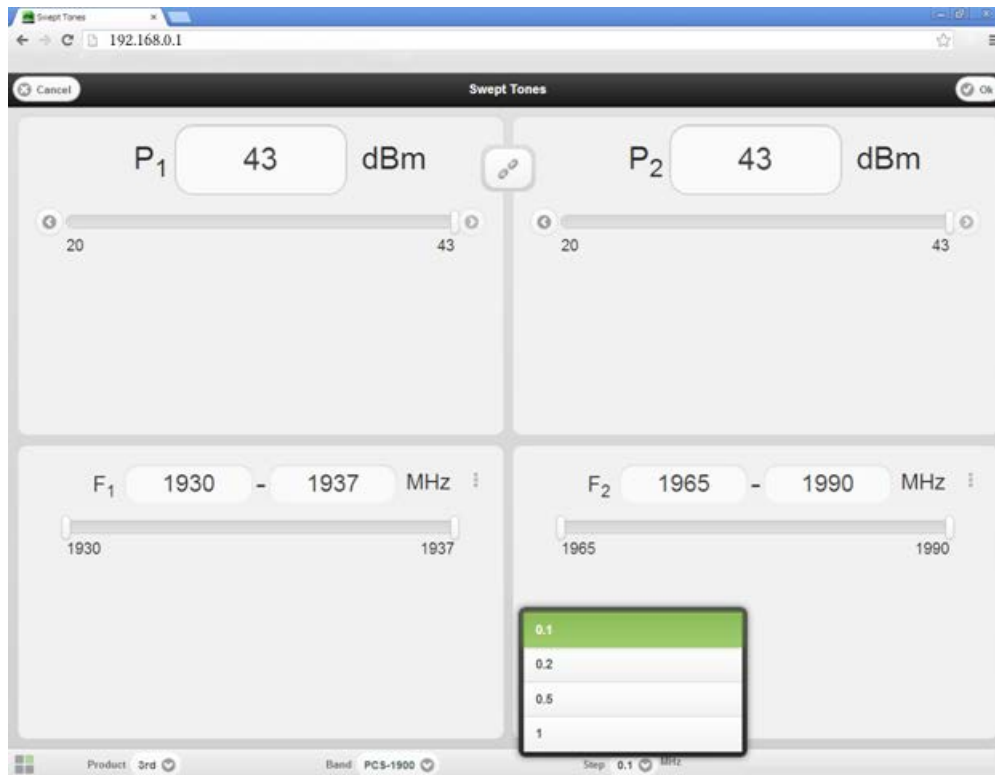
Figure 35   Frequency Step Selection Window

The figure below shows the IM order selection window. If a particular order IM band is present within the instruments receive band, it will be displayed.
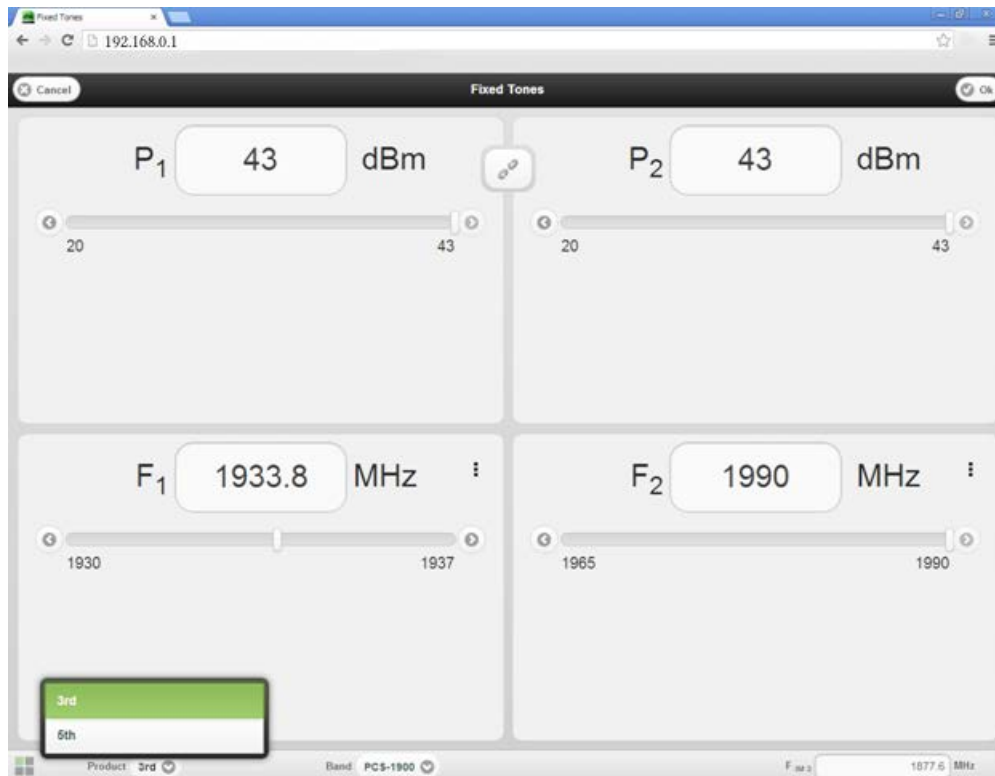
Figure 36   IM Order Selection Window

The user is at liberty to record the peak IM level of a test point at any time during the active frequency sweep. Alternatively, if the set measurement interval is allowed to expire, the usertwill have the option to save the peak result to the test report.

1.9.3   Spectrum Monitor Mode

The Spectrum Analyzer mode offers an added analysis tool and is especially useful in detecting external interference introduced in the instrument's RX band. When the application starts up, a sweep is automatically initiated to detect interferers in the RX band of the instrument. In the default state, the two TX test tones will remain off, but the user also has the option for turning them "on". When "on" the operator will see all intermodulation products that fall within the receive band as well as wide band interference of whichever nature. A peak hold feature identifies the worst case value measured during each sweep.

The features offered by this mode are as follows:

• Adjustable sweep step size

• A peak level marker highlights the peak IM level and at what frequency this measurement was taken

• The option to have the RF on or off in this mode

Figure 37   Spectrum Analyzer Measurement Window (Local Display)

An added feature in the spectrum monitor mode is the option to switch the RF on. In practical terms, this feature allows the user to see interference in the proximity of an IM signal. (Note: This feature is due to be released for the iTA at a future date).

1. RF "On/Off" button – (Red: RF "On", Green: RF "Off")

2. iTA/Tablet PC Wi-Fi Remote Interface control (see table 1 for operation)

3. Settings Menu

4. Reports Menu (Spectrum monitor mode is fault analysis tool, not intended for compliance testing)

5. Record Data Point Button (Not used in Spectrum Monitor mode)

6. Measurement Tag Title

7. Current trace Frequency (Vertical Orange line)

8. Maximum recorded Peak PIM level - (Yellow Marker)

9. PIM fail limit - (Red line)

10. PIM Time Trace

11. Network Settings (Local Display only)

1.9.4 Range To Fault Mode (Optional Module)

The Range to Fault mode offers an added analysis tool and is designed to determine the physical distance to the PIM fault from the iTA test set. Details on the operation of the RTF test set is given in the RTF operating manual:

R99-0068-RTF_A-SERIES_OPERATING_MANUAL_Rev*.doc
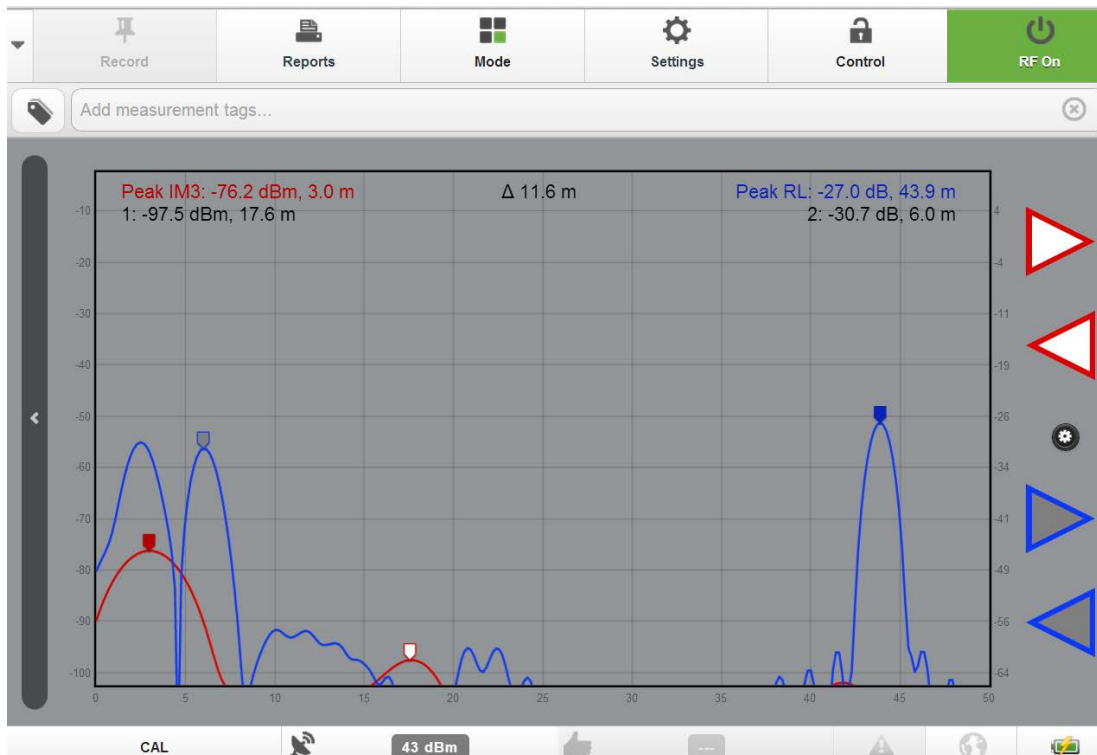
Figure 38   Range to Fault (RTF) Measurement Window

1.9.5 Eco Mode

Eco Mode offers a battery saving feature. Eco mode will power down the iTA's instrument RF stages when not in use, helping to extend the battery life. Remote control and hotspot functions are still active, so the user can still access all the report functions and data while the iTA is in Eco Mode. This also allows remote users to return the instrument to the measurement mode of their choice whenever it is required. In addition to Eco Mode the local instrument display has a display dimming function that can be set to operate independently saving even more battery current. Eco Mode and the display dimming functions have their own timers that can be set in the Settings/ Miscellaneous menu on the LOCAL console.

The iTA can be set into Eco mode immediately via the mode menu both on the LOCAL console and remotely. Eco mode also frees up processor capacity. When generating large reports and uploading and downloading files, being in Eco mode can make these jobs finish quicker.
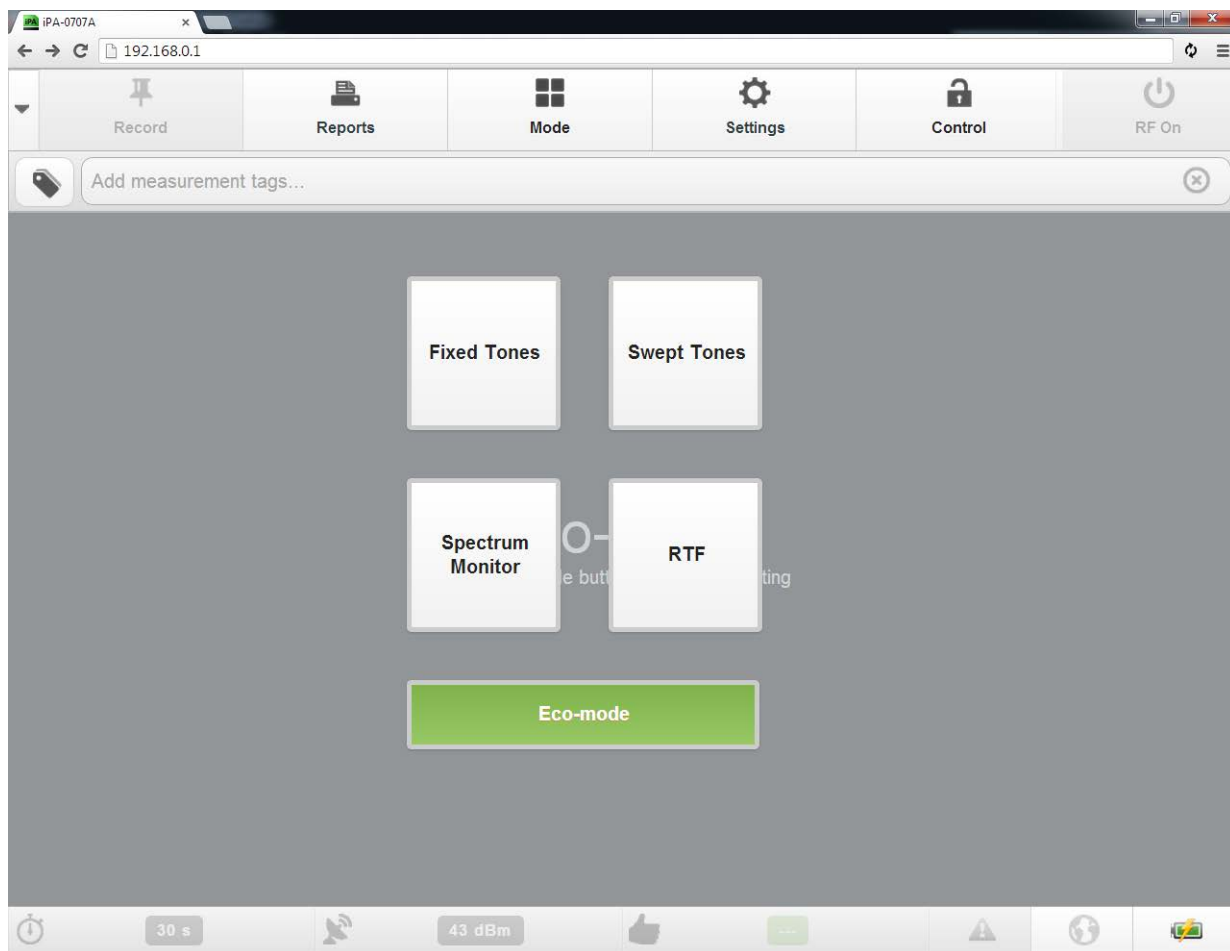
Figure 39   Immediate switch to Eco mode (via mode menu)
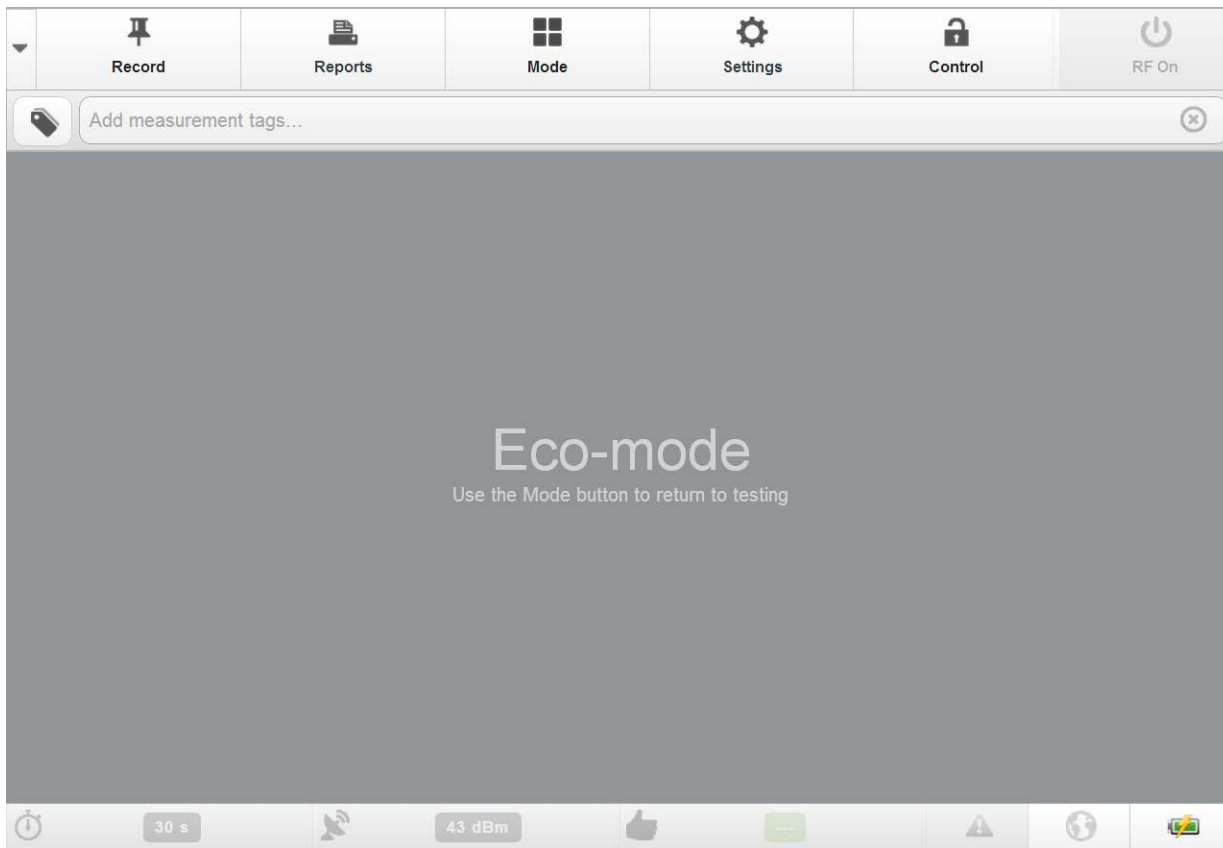
Figure 40   Eco Mode Display

To return to your measurement use the mode button and select the desired measurement mode again.

1.9.6   Eco mode and Dimmer timer setting
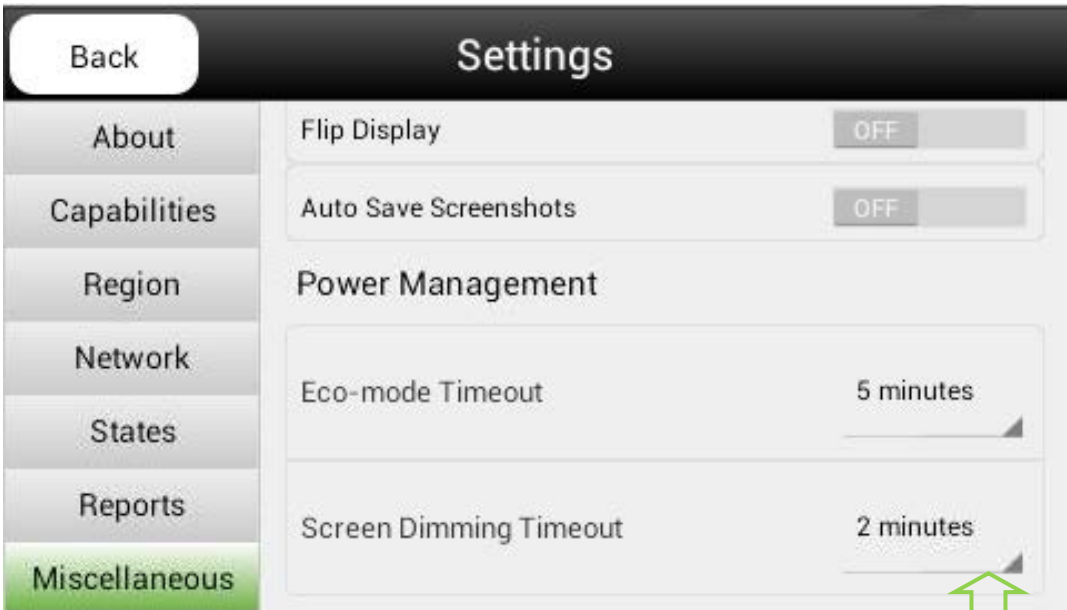
Figure 41   Eco Mode and Screen Dimming timer menu

Scroll down to find Screen and Eco-mode timeout settings

Note : The local dimmer timer is reset once the screen has been touched. The Eco-mode timer is reset if thereis a mode change or measurement made. If control is transferred to another tablet, local control is seized or RF settings changed the Eco-mode timer is reset

1.10　Generating Reports

The iTA includes industry leading report generation functions to assist system installers designers and maintainers provide a clear picture of the state of the equipment under test. Saving time for everyone involved in the process.

1.10.1　Overview

Reports can include tags or a combination of tags to identify results against equipment and cable sections that can be saved and re-used.

Site, cable or equipment images can be uploaded directly into the report from the controlling smartphone, tablet or laptop and comments added.

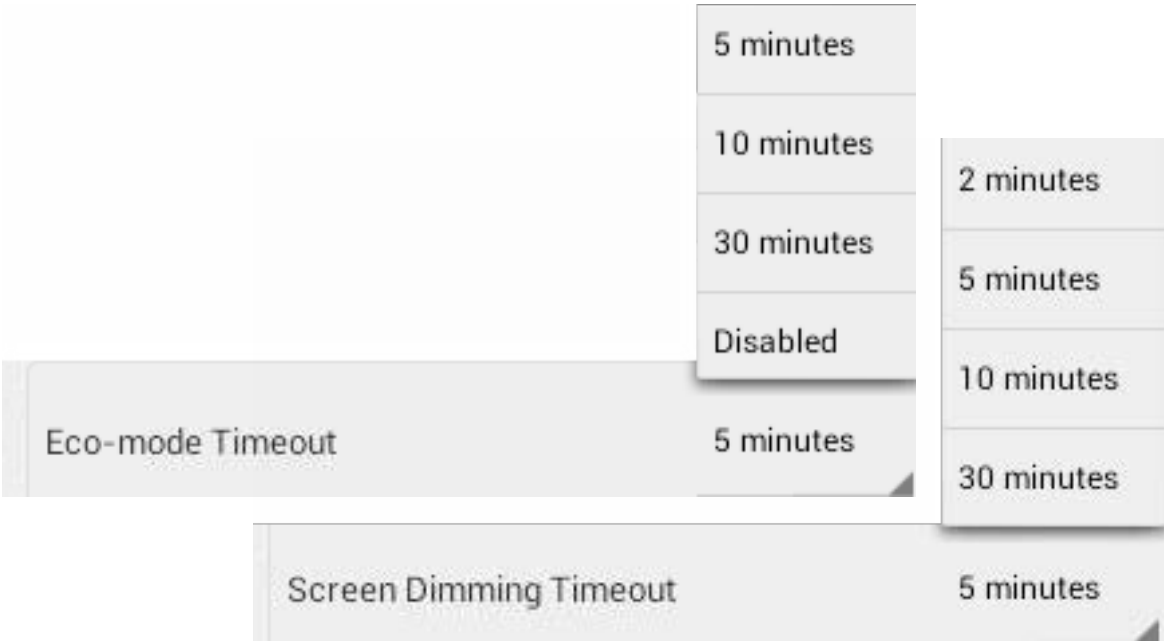The ability to add both contractor name and logo on the instrument and generate a PDF report directly helps to provide not just a professional looking report but helps to identify where the reports have come from and saves time, chasing a reports origin.

Measurement Plots and screens can be added to the PDF reports and commented, helping to convey the user's view of what they are seeing in the report.

Results can be recoded at various points showing IM product, power levels frequencies and spec applied.

Reports can be retrieved from the instrument by either saving them on and removing the SD card or downloaded directly to a remote control device such as smartphone, tablet or laptop. Allowing the job to be finished and reported right there and then.

1.10.2　　　Customizing your report Contractor Name, Details and logo

Enter the Settings/Report Menu to see the following screen.

Note : Custom logo files can be added to the extrernal SD card or uploaded to the iTA from a remote control tablet or PC Browser. This will be scaled down to fit in the corner of the report by the iTA. PNG, JPG filetypes are supported. Filesize limitations as per "1.3 Features" Note 1. The custom logo is used in the PDF report header as shown.The iTA's PDF report generation allows for the Testers business details or custom heading and logo to be added.

1.10.3 Report file formats.

iTA Report files use the popular *.zip file format, if you are using earlier version, the previous *.rpt format iPA report files can still be opened but will be saved in the *.zip file format in future. The new *.zip file includes all the convenient new report features in one file in an easily accessible zip file format, this zip file also includes csv (Comma Separated Values) of plots for importing to a spreadsheet program or database. All screenshots, photos and thumbnail images and comments are also included. Into one easily transportable file that also saves on disk space. To check your software version look in the Settings/About Menu.

1.10.4 Setting up the Site Test Report

The site test report should be set up before any measurements are made.

1. Press the Reports button. The Report window will be displayed.
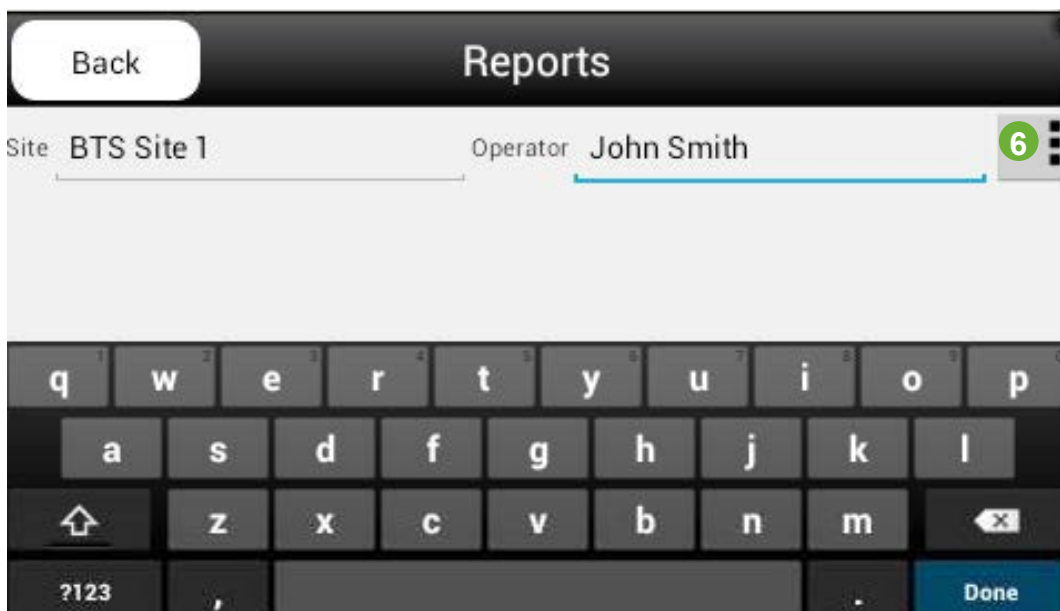
Figure 42   Report Window

2. Press the Site Field. A keypad will be displayed.

3. Input the Site name to be listed on the report, and press Return/Done.

4. Repeat the process for adding: Operator Name information

5. Press the Back button when the report setup is complete.

6. Pressing save from the pull down menu to save your Site entries in the current report..

1.10.5 Taking an RF Measurement and Adding Measurement Tags

1. Before connecting the Device Under Test (DUT) to the Output Port, ensure that all mating surfaces are clean and free of physical defects. Ensure that the connection is adequately tightened.

2. Press the Add Measurements Tag field on the Main Display Window of the Tablet PC. The Test Point Label window will be displayed.

Figure 43   Add Measurement Tag Input Screen

1. Direct tag entry

2. Tag list menu
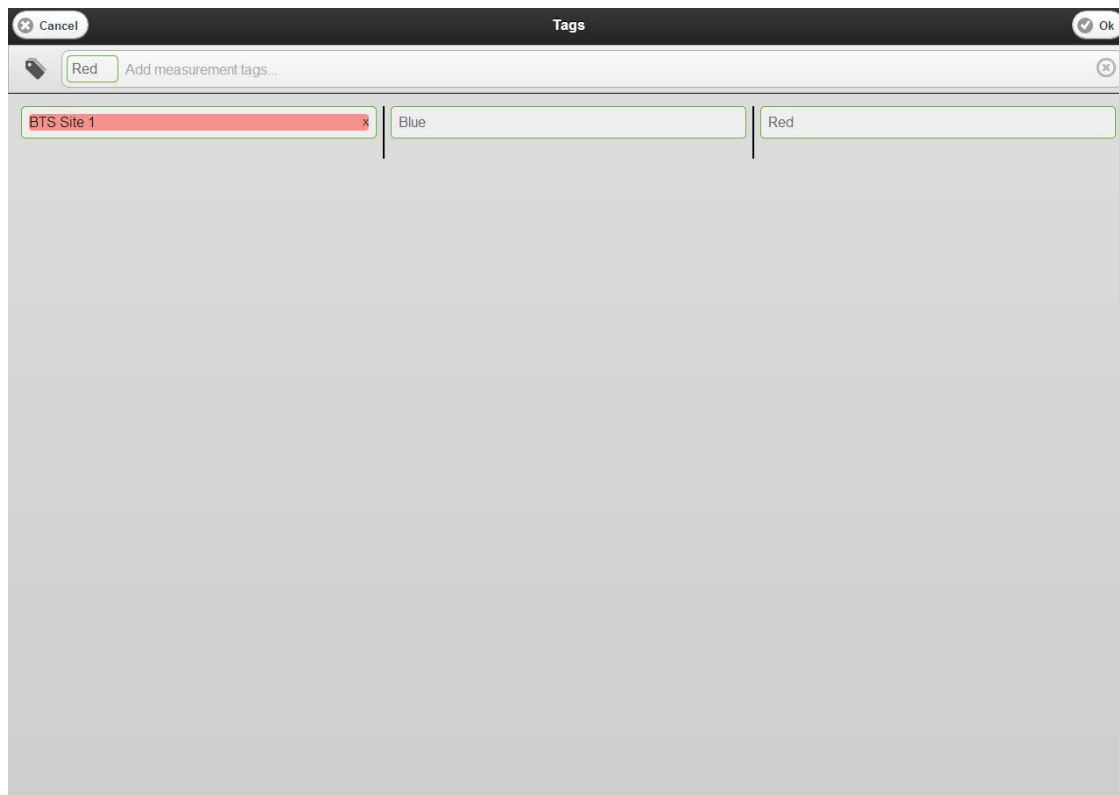
Figure 44   Removing Measurement Tags

3. Choose the label for the point in the system at which you are doing the testing and press **Return**. The chosen Test Point label will be displayed at the top of the test screen, and in the report next to the associated measurements.

4. Press the green **RF ON/OFF** button. The button will turn RED, indicating that the RF is active. The level of the intermodulation product will be displayed on the IM level indicator and IM level bar indicator. The red RF ON LED Indicator situated immediately above the RF Output connector will flash showing RF is present. While the measurement is taking place, the instrument will take a peak measurement and indicate if the device under test has a Pass or Fail status. The 'Peak' result will, however, not be displayed until the output tone powers have been stabilized to within +/-0.5dB of the preset level.

The 'Record' Test Point button will be visible (and active) during and after the RF "on" period. The 'Record" Test Button may be pressed at any time to record the previous Peak IM value. The peak indication is held until the next RF power on event.

Figure 45   Default Measurement Window

The RF power can be switched off by pressing the red **RF ON** button and it will return to green. If you want to record the peak measurement on the report before switching off the RF, press the **Record** Test Point button. The RF power will also turn off when the RF Timer reaches zero.

Note: All test reports are marked with a Pass or Fail Certification stamp. A Pass will only occur when the Peak PIM reading is equal to or below the test state setting for the Pass/Fail threshold.

1.10.6   Viewing a Test Report

Reports are can be saved to the iTA in a compressed *.zip format.

1. From the user screen, press the Report button.

2. The report screen will be displayed.
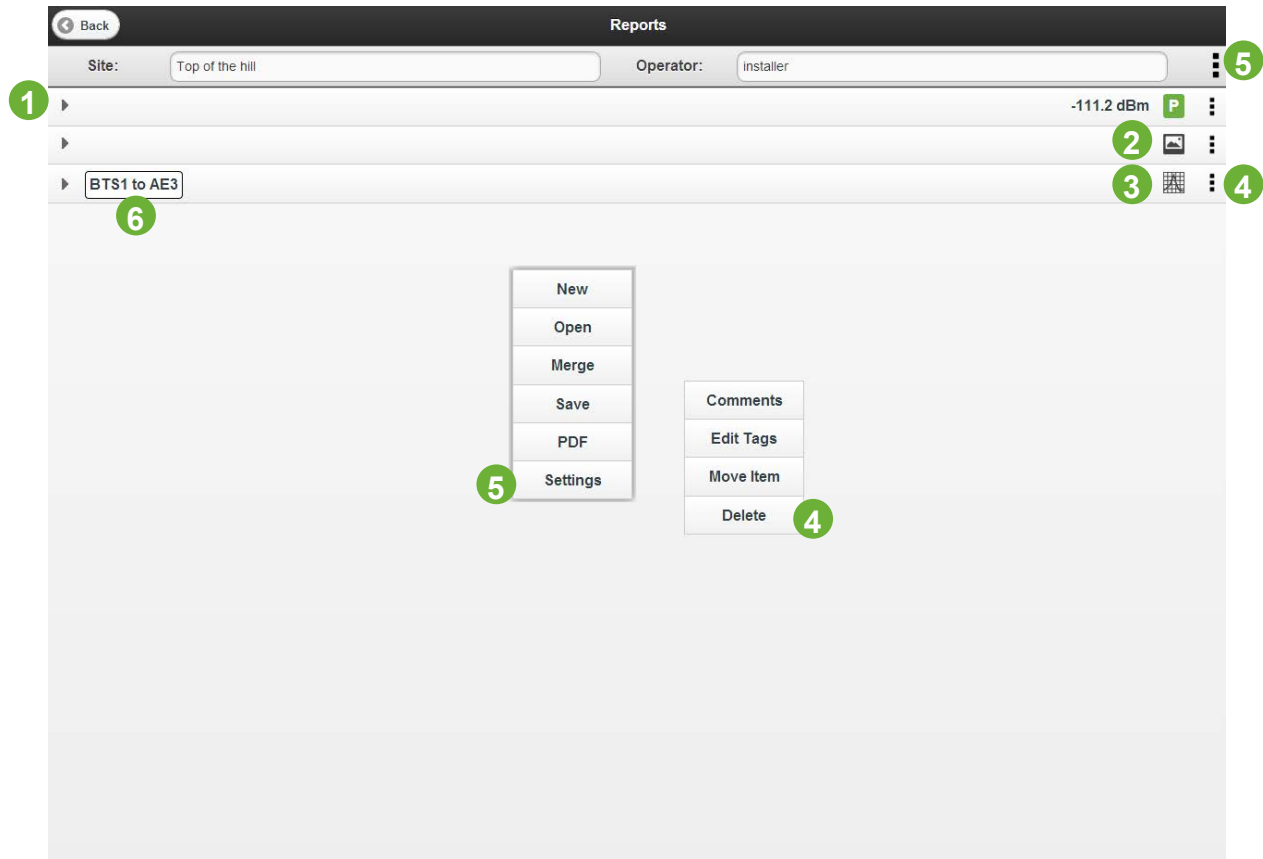
Figure 46   Report Browsing Window

Navigation in the report directory screen is done as follows:

1. To Expand a Report result in a Measurement tag, click on '▶'

2. Indicates an included Photo.

3. Indicates an included Plot.

4. Each Item can edit or add comments and tags and move items via a pull down menu.

5. The report may be saved into the iTA or SD card in an *.zip format or saved as a PDF. See Figure 46. Note : (Settings) This allows access to Report Settings from remote browser as per Section 1.10.2. (New) This will clear the current report data and start from a new screen, ensure any wanted results are saved before commencing a new report or data will be lost. (Merge) Allows the report zip file to be merged with the report in memory. Note : the report in memory must be saved before it can be merged with another report file. *.rpt files from early iPA's and iVA reports can also be merged with iTA reports.

6. Measurement tag
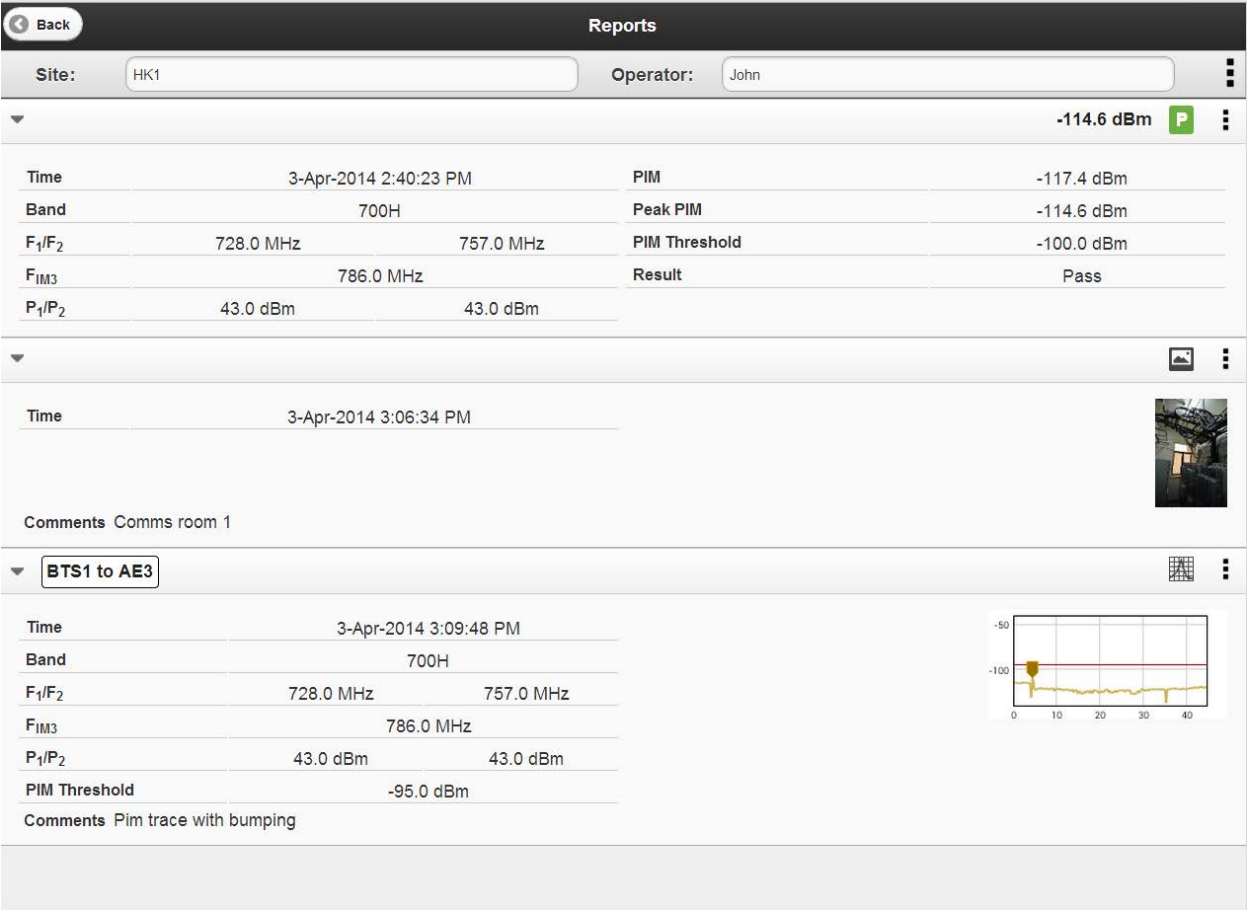
Figure 47   Report window items expanded

1.10.7   Saving Reports

Test reports can be saved internally in the iTA, to an SD card or Downloaded in a compressed.zip or PDF format.

1. Insert the SD card if required.

2. Type in a File Name of the test report, or accept the Auto generated filename.

3. Press the Save button to save the report in *.zip or *.pdf format internally on the iTA or on an SD card.

4. Press the Download button to download the report to a remote control device such a Tablet PC, Note: IOS devices will need a zip file opening application.
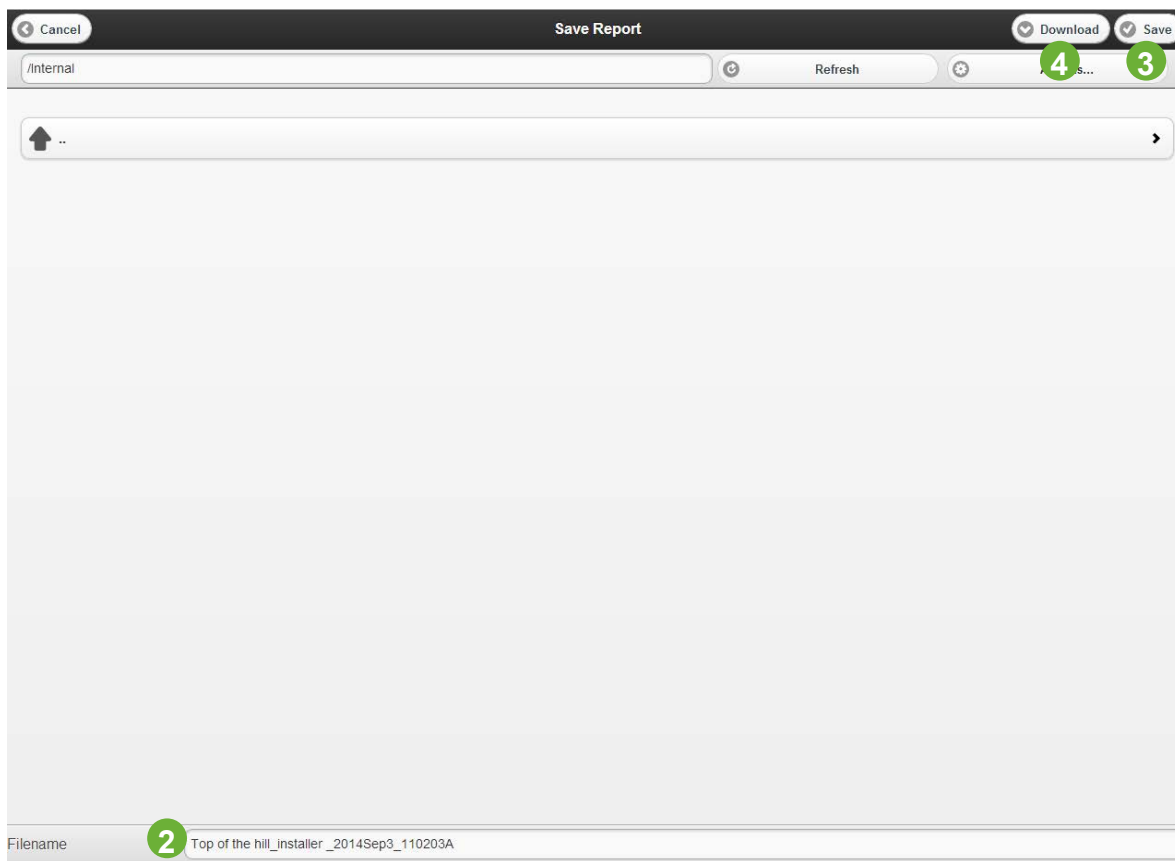
Figure 48   Report Save Window

1.10.8   Saving iTA screen shots for inclusion in reports
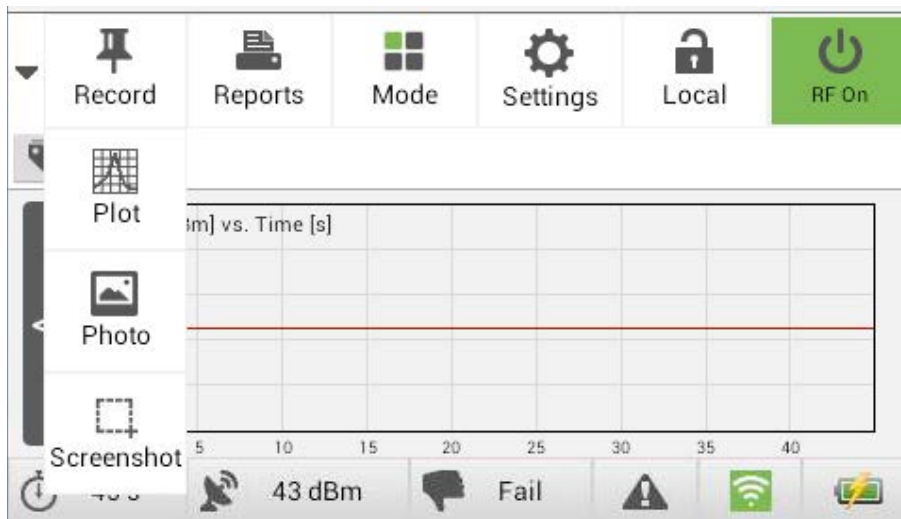
Figure 49   Screen shots local display to be added to reports.

1.10.9   Saving iTA screen shots (Not included directly in reports)

If you are already using your iTA via remote control, each of your remote control devices will have a different way to do a local screen capture, Print Screen for PC based devices, Android tables often use a combination of home, and Power buttons to do a screen shot as do iPADs, some use power and Volume up, refer to you control devices user manual. The iTA's local control console can also create and save screenshots of your local display in 2 different modes (Standard mode, or Autosave mode).

Touch and hold the Settings control for around 1 sec and release. The save screenshot menu will appear where you can select to save your screenshot on the SD card or internal memory. Once you have typed a filename the save control is then made available. The image will be save in *.png image format for you, saving on the SD card will allow you to remove the card and share your image with other devices equipped with an SD card reader or download via a remote control device.
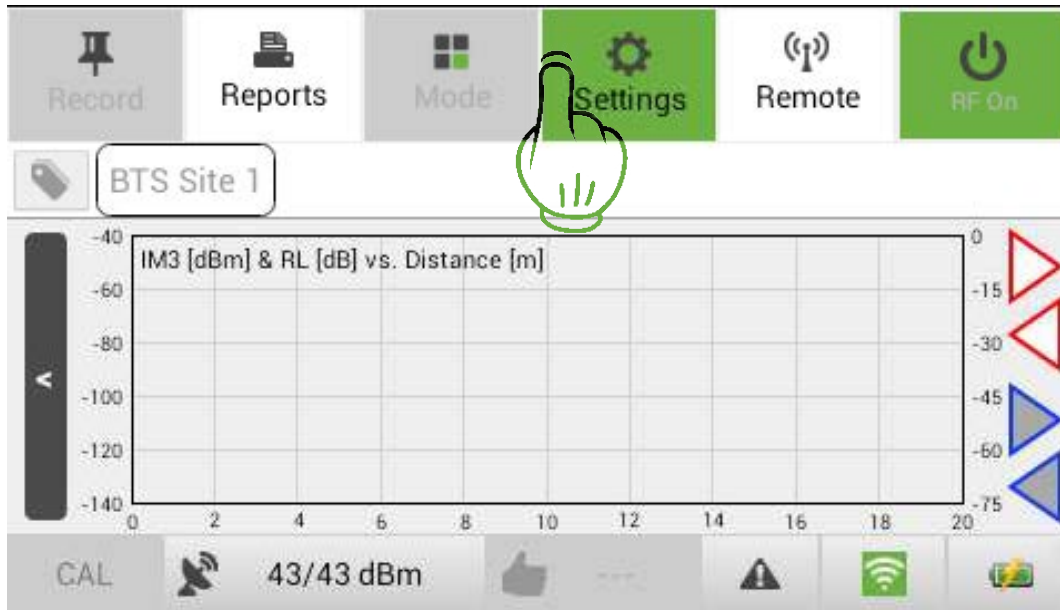
Figure 50   Local Screenshot touch point (Not for inclusion in report)

Touch and hold the settings button for 1 sec and release to enter the screenshot menu.. For standard mode (Autosave off) the following menu will appear.
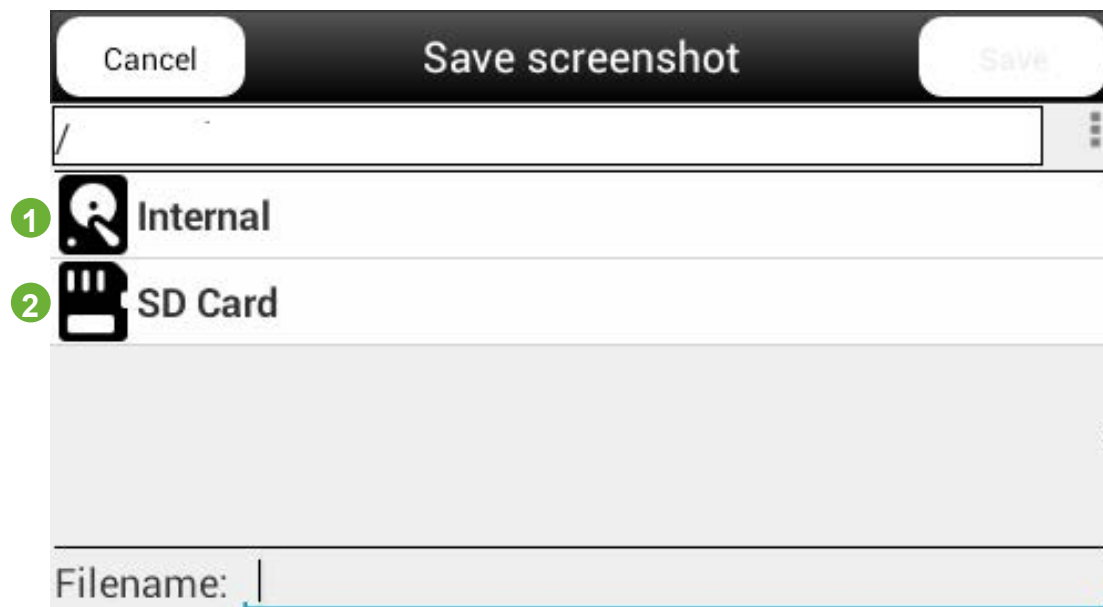
1. Touch on to select internal Storage

2. Touch on to select external SD card.

If Autosave mode is selected the iTA will create a filename starting with screenshot followed by a date stamp. If an SD card is fitted the screenshots will be saved in the screenshots directory on the SD card. If the SD card is not fitted the screenshot will autosave to the screenshot directory on the internal storage. To recover files from internal storage you will need to switch the iTA into USB mode and recover them with your PC connected via the mini USB port as shown in Figure 3 item 15. Or use the download function.

1.10.10   Moving items around in a report

See "Figure 46 Report Browsing Window". To locate the move control beside the item you want to shift. Select Move, once highlighted press in the new location for the item.

1.11   Uploading and downloading reports, files and Photos
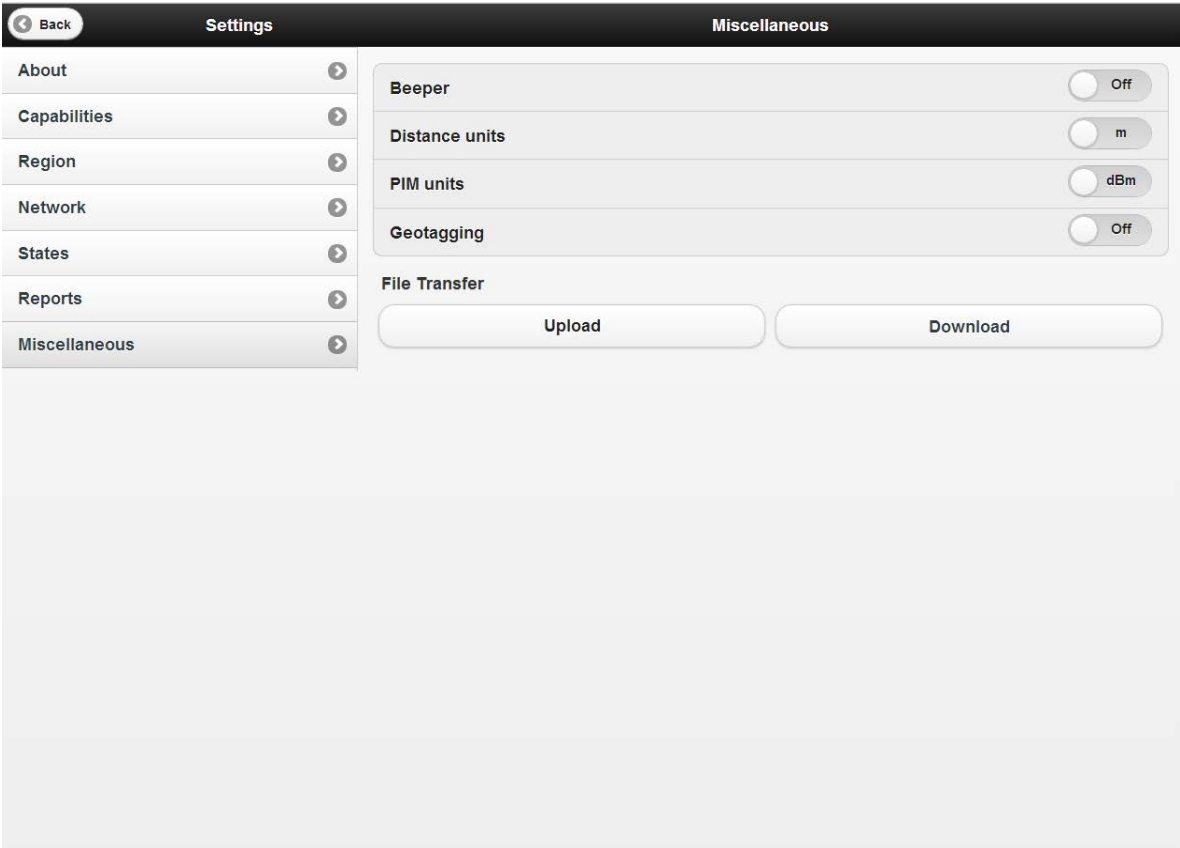
Figure 51   Upload and Download menu

1.11.1 Uploading files to the iTA

First your remote device needs to be in control, see 1.7.6. There are several ways to upload files to the iTA, via the settings/miscellaneous menu See Figure 51 Select the upload key, a file dialogue will appear on the remote control device, a filename can then be selected, this will be as per the local operating system, Apple, Windows, Android. Then a file dialogue will open for where the file will be saved on the iTA. In the reports menu, if you select open report you have the option to upload the report also.
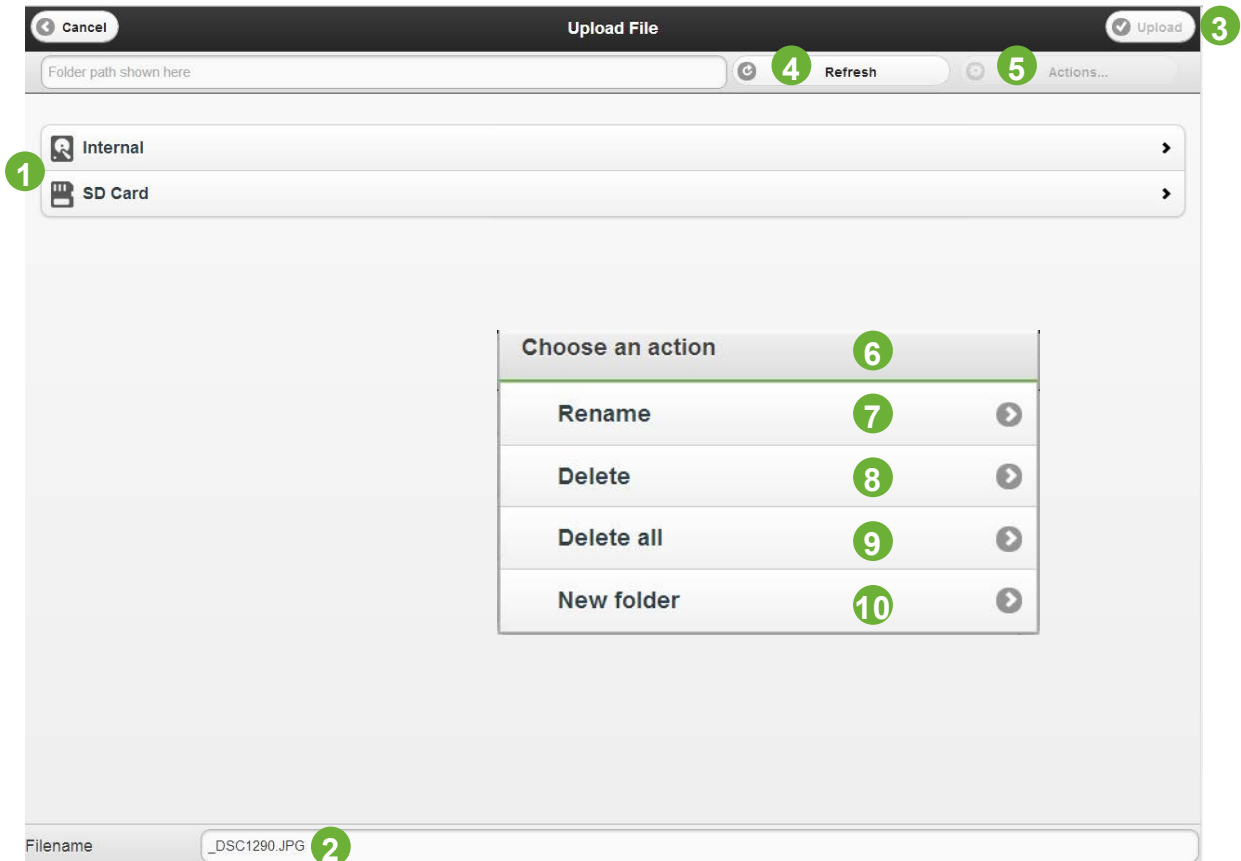
Figure 52   Upload file dialogue

1. Storage location selection

2. Filename (Can be changed at this point if required)

3. Upload Key (Currently Grey as storage device not selected yet)

4. Refresh (Refreshes the view of the current directory for any recently changed or uploaded files)

5. Actions menu selection (Causes a pulldown menu to be shown) Items 7-10

6. Actions Pulldown menu.

7. Rename, the currently highlighted file can be renamed.

8. Delete, the currently highlighted file can be deleted.

9. Delete all, All files in the current selected directory are deleted. (Take care you really want to delete them all, this might include *.sta state files)

10. New Folder. Create a new folder under the currently selected directory
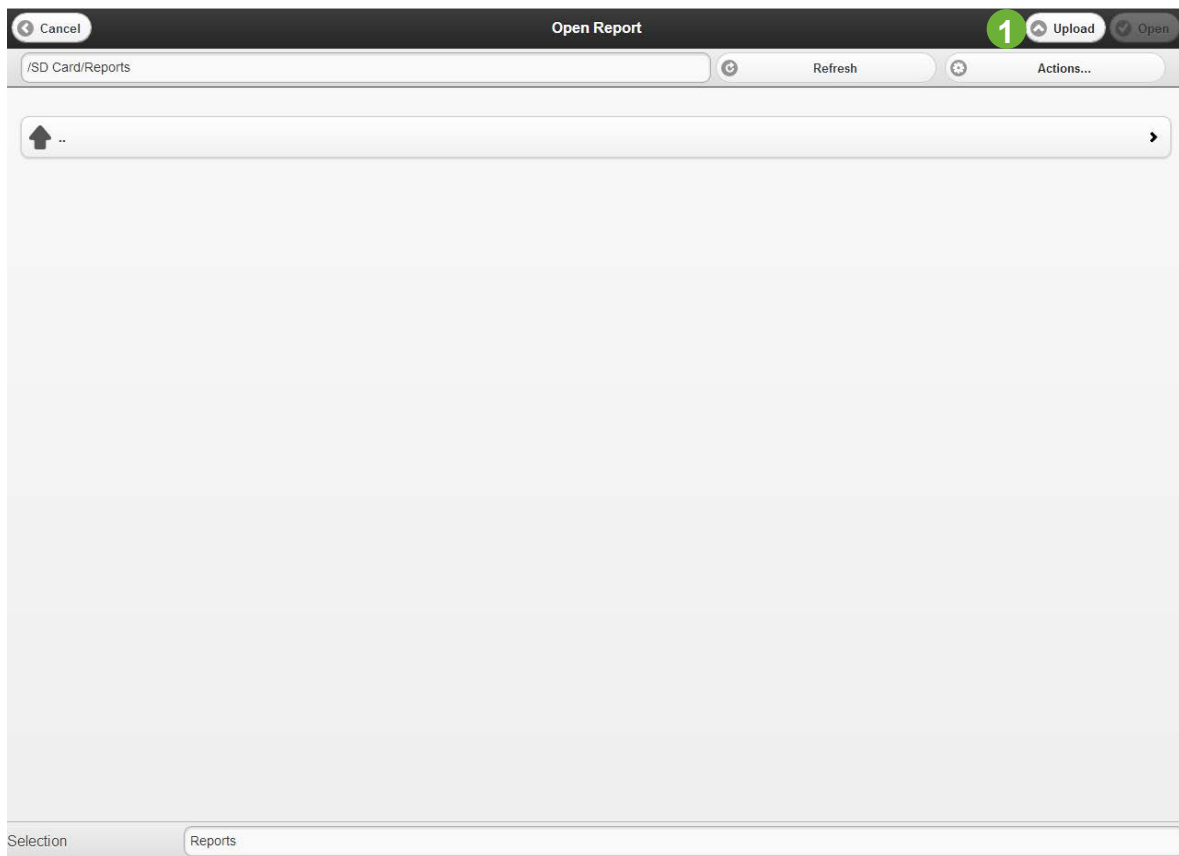
Figure 53   Uploading files from the open report menu

1. After the desired directory is selected press Upload, if you are using a Windows or Android controller you will get a local file dialogue and you can select the report *.zip file to upload and open. IOS devices will not permit *.zip file uploads.

1.11.2　Uploading photos into reports
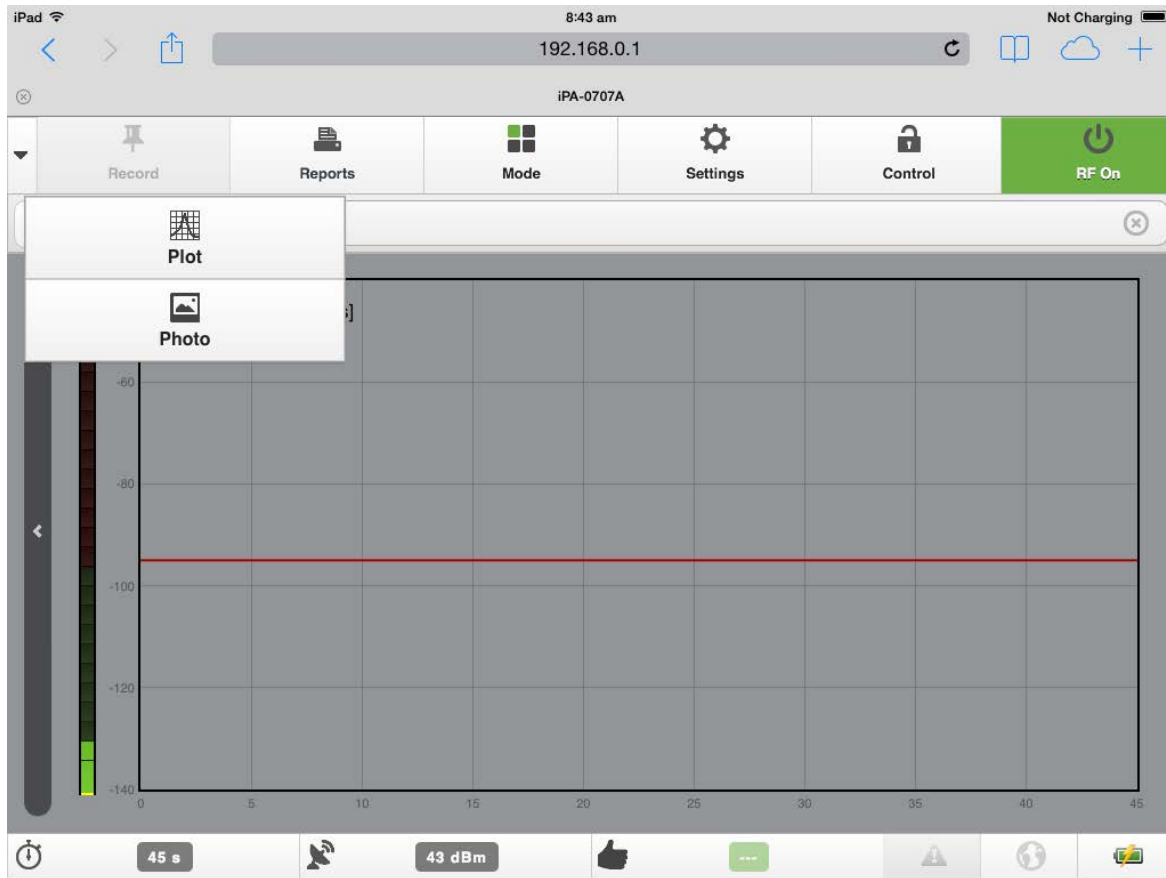
Figure 54　Uploading photos into reports

Depending on your tablet or smartphone operating system the screens will looks slightly different when the photo option is selected, the operating system will give you the option to upload an existing photo file from the device or to take the photo directly from the tablet or smartphone. This allows you to take photos of the state of the equipment under test for your reports. As per 1.10.6

1.11.3　Downloading files

Files can be downloaded to the controlling device. Select download as shown in Figure 51. The available files can be browsed either on the SD card or internal storage and downloaded. Filetypes of interest include.

*.sta files (Instrument State files) for instrument settings.

*.zip files include images, results plots and the display thumbnails.

*.PDF reports generated in PDF format and saved on the iTA.

*.png files, graphics such as screenshots generated by the iTA

1.11.4 How Language functions and settings effect report generation

PDF Reports are generated based on the language, units and settings of the controlling device. Reports can still be browsed by other connected devices even when not in control. If controlling device A is set to Mandarin Chinese and dBc units, then if a PDF report is saved, the Report will be saved in that language and those units, if another device B takes control with English settings in ft and dBm then the PDF report will be generated in that form. However the *.zip file generation is common, opening a saved *.zip file will allow report units and language to be changed to what is desired by the user.

1.12 PDF report layout
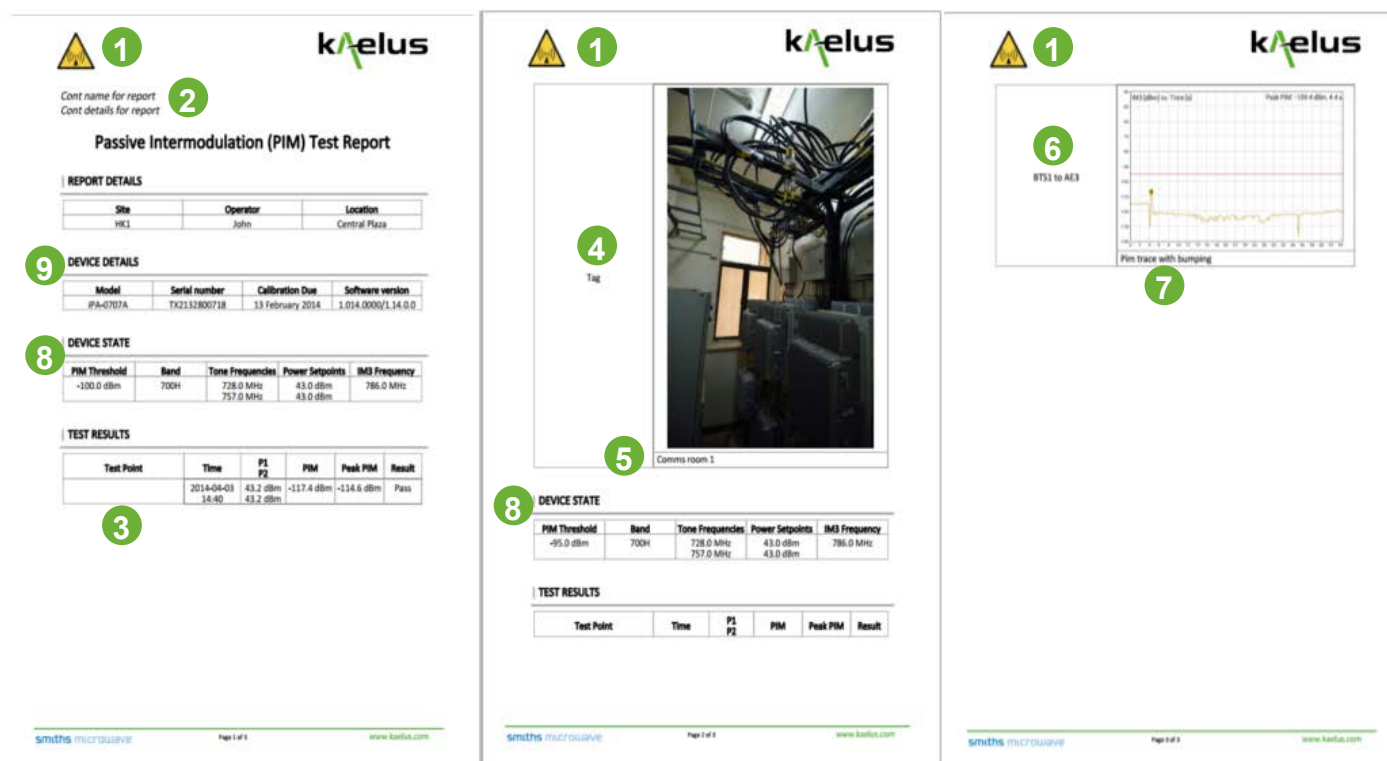
Figure 55   PDF Report layout

1. Contractor Logo

2. Contractor name and details

3. Recorded test result

4. Photo tag/s

5. Photo comment

6. Plot tag/s

7. Plot comment

8. Device state report header

9. Testing device details

2. Connection Options

Figure 56   Wi-Fi Connection Options (iTA hotspot)

1. This is a nice and easy configuration with the iTA in hotspot mode connecting to the Serial number as a network 192.168.0.1 in your browser and kaelusap as a default Wi-Fi password.

2. Easy to remember the same IP address and password every time just the serial number required to connect to the correct iTA.
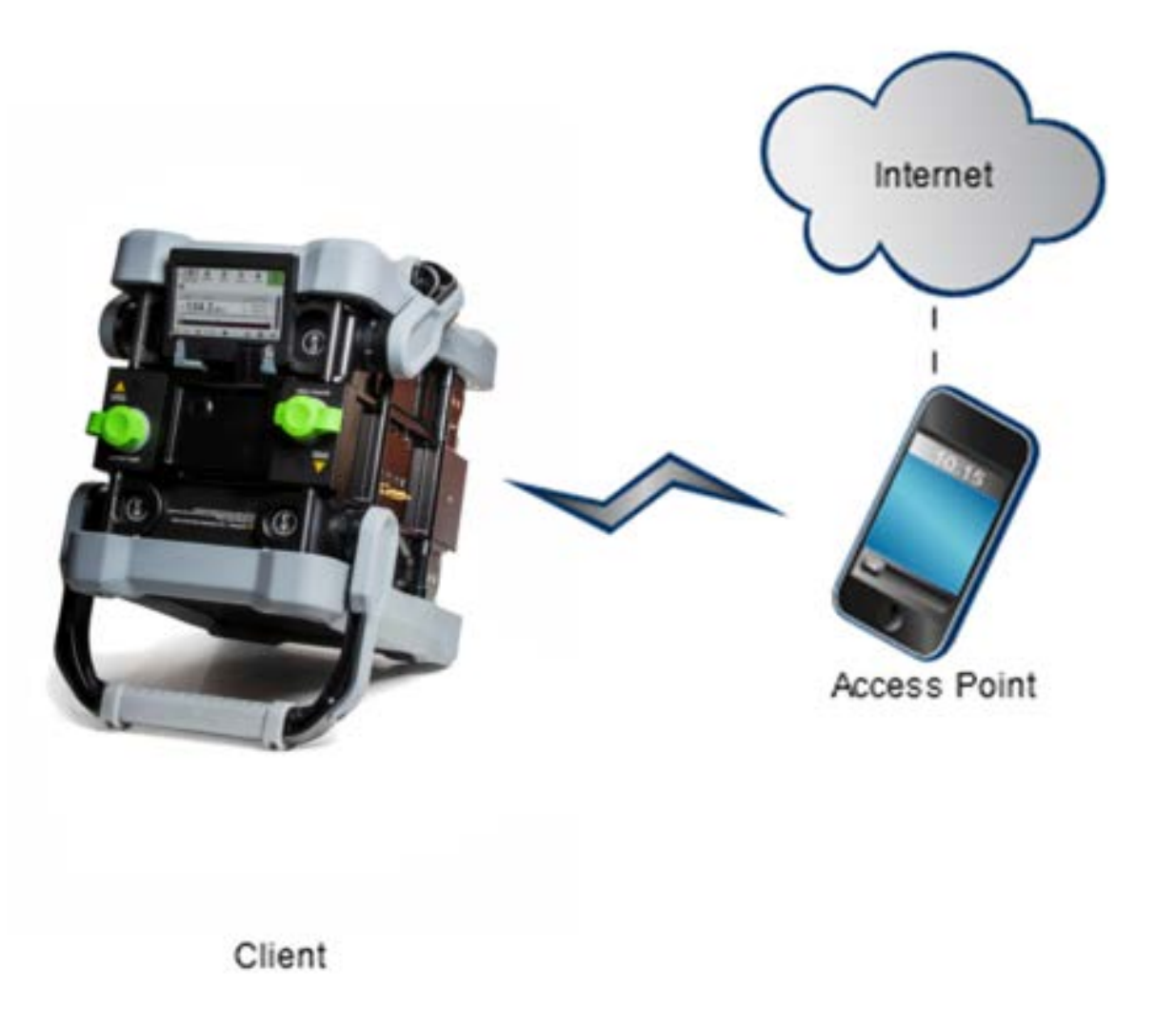
Figure 57   Wi-Fi Connection Options (Smartphone hotspot)

1. This is a nice way to use geolocation services, particularly if your phone also has a GPS (Global Positioning System) receiver built in. Remember to setup your phone to share it's location.

2. You should check that your smartphone is able to establish it's own location first, the iTA will then be able to share that location in it's reports if geolocation is enabled.

3. Note : the geotag switch is only visible on devices that browse the iTA.

Figure 58   Wi-Fi Connection Options (external access point)

When using this configuration the IP address of the iTA will be the one allocated to it from the access point. This can be checked by scrolling down in the network menu of the local machines screen

1. This configuration has a number of advantages when connecting many devices, the access point can now take some of the Wi-Fi traffic load improving response times.

2. The access point features can be used for additional functionality such as allocating fixed addresses. Allowing shortcuts or bookmarks to connect to each iTA.

3. Sharing internet connectivity can assist with Geolocation services.

4. When using this configuration the IP address of the iTA will be the one allocated to it from the access point. This can be checked by scrolling down in the network menu of the local machines screen.

5. The other browsing clients will need to use those allocated IP addresses to connect to the required iTA.

6. If you want to browse the iTA from either the internet or intranet the access point will need to offer an appropriate network address or port translation to connect to the desired iTA.

7. Bluetooth connection to our iVA via a tablet and app allows for cross platform report integration.

2.1   iTA Client Connection Mode

2.1.1   Overview

The iTA can connect as a client to an existing wireless access point. The following aspects of it's operation need to be considered.

1. Only WEP, WPA network security is supported, enterprise security is NOT supported.

2. Your Wireless access point needs to be set to visible with the password security protocol that is acceptable to the iTA client as mentioned in point 1. Some access points such as phones have a timer, only allowing the access point to be visible for a short period, it is sometimes necessary to re-check the visibility check box if you have not connected the iTA to the Access point in time. (You will need to refer to the documentation from your access point supplier to see if it's features are suitable and how it is configured)

3. Your network password is not stored on the iTA. Every time you connect to the access point the user password will need to be re-entered.

4. An understanding of how your wireless access point delivers DHCP (Dynamic Host Control Protocal) is needed. It may allocate IP addresses from a pool of addresses, can be configured to allocate a fixed address, or deliver DHCP services from it's connected network. Connecting to your iTA can be impacted by how this service is delivered.

5. If the iTA is to be accessed via an intranet or internet you will need to consult the documentation of you access point supplier to see if NAT (Network Address Translation), Port forwarding or network tunneling is available. Your network administrator may also need to be consulted.

6. Security. All measures should be taken to make a secure network prior to the wireless access point, particularly if the access point is connected to a wider network, likewise regular password changes of the last wireless leg of the network to the iTA is also good security practice. Not having wireless access active for extended periods can reduce wireless vulnerabilities.

7. Familiarity with your wireless access points functions is needed. Having your access point's product documentation available and/or support from the supplier will assist. Some examples are given, though this will vary depending your hardware. Check with your supplier to check your access point works before going on site.

8. The iTA is not available for use as a hotspot when in client/wifi mode. Access for for the iTA and any controlling device/s will need to be arranged on the access point and their DHCP requirements met. Likewise any additional iTA client units need to be added to the external access point.

2.1.2   Enabling WiFi Client Mode

Under the settings menu select Network. Scroll down and turn on the Wifi enabled switch, see item 1 below, this will also turn off the Hotspot enabled switch.
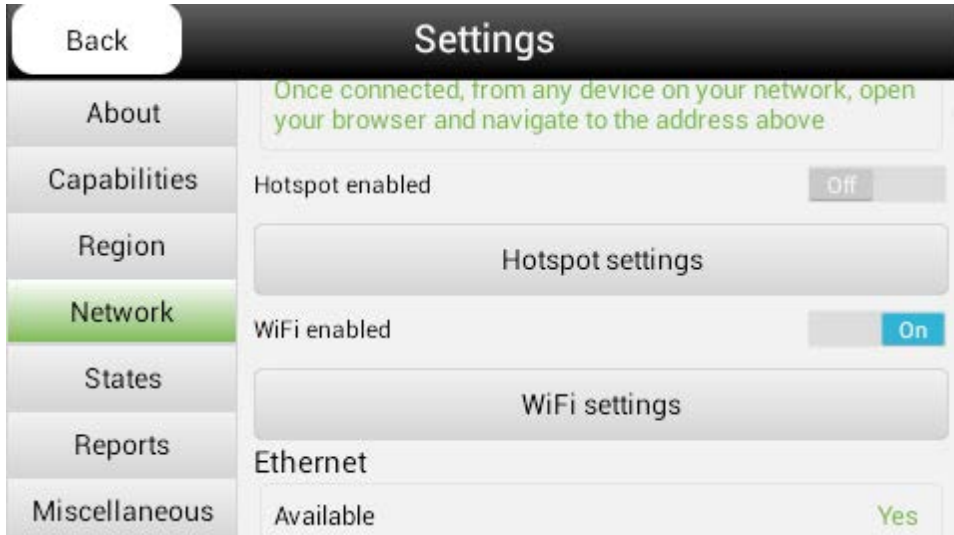
Figure 59   Select WiFI enabled (Client mode)

2.1.3   Connecting the iTA to the external wireless access point.

Ensure your wireless access point/router has been set to visible and select WiFi settings.

A list of available wireless access points will appear, select the name of the desired access point and enter the password you have configured. Press connect

Figure 60   Wi-Fi Settings, Network Selection and Password Menu

If everything is correct you should get a WiFi Connected message on the display.

Note : If connecting to 2GHz wireless LAN the internal panel antennae will be used . An external antenna will need to be fitted if you are attempting to use 5 GHz wireless LANs.

2.1.4 Establishing the IP address of your iTA

Scroll to the top of the Network menu. If you have successfully connected to the external network he name of the external network will appear and the IP address allocated to your iTA by the Access Points DHCP service.You will need this address to allow you to connect to your iTA with a remote control device.

Figure 61   IP address allocated by the access point.

2.1.5 Connect your other devices.

Connect any other iTA's via the same method, note that each iTA will have it's own IP address. Connect laptops, tablets or other control devices to the same wireless network and using the same network password. If for example I had a laptop connected to the TARDIS wireless network shown in Figure 61 above. Open Chrome Browser and type the following URL in the Browser http://192.168.0.20. You should now be able to connect and remotely control that iTA, if there are additional iTA'ts connected on the TARDIS wireless network you would simply change the IP address number to that shown on that iTA. Refer to **Figure 58**.

2.2 External Wireless access point examples

2.2.1 Enable WEP/WPA security on an external wireless access point

Note : All devices will need to support the selected Encryption Protocol.

Figure 62   Select WEP Security on external access point

2.2.2 Enable a DHCP Server function
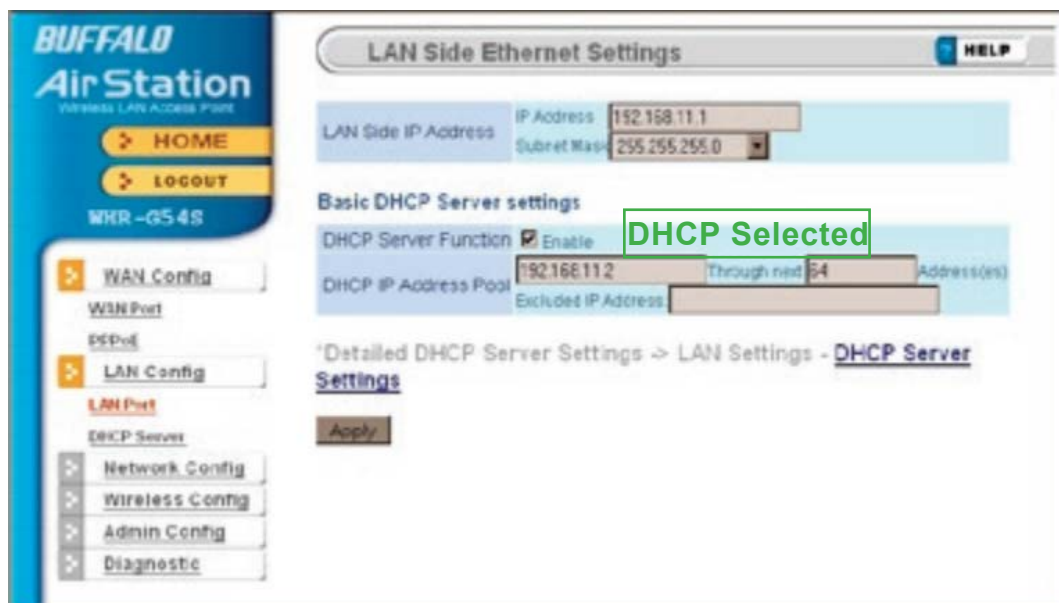
Figure 63   Enabling DHCP on External Access Point

Note : If you don't mind having to check what IP (internet protocol) address is allocated to the iPA, you could stop configuring DHCP here . This configuration will allocate an address from a pool, this shows a pool of 64 addresses with 192.168.11.1 and 192.168.11.2 already used by the access point and the DHCP server. Some Access points may give you the option to allocate a fixed IP address . As shown in Figure 64

Figure 64   Manual IP Assignment External wireless acess point example

Find the MAC address of the iPA from the hostname shown on the wireless router usually the iPA's serial number by default and enter the IP address that you want to set in the router . You will have to connect as a DHCP pool first and add the manual entry you want afterward.

1   **MAC Address List**

2   **Hostname**

3   **Manual IP Assignment**

2.2.3   Outside connection via wireless router

Depending on your external wireless access points capabilities there may be several ways to connect to your iTA. To connect to a single iTA most routers provide either a virtual server function or NAT (Network Address Translation) table. Consult with your Network administrator for the preferred method to use
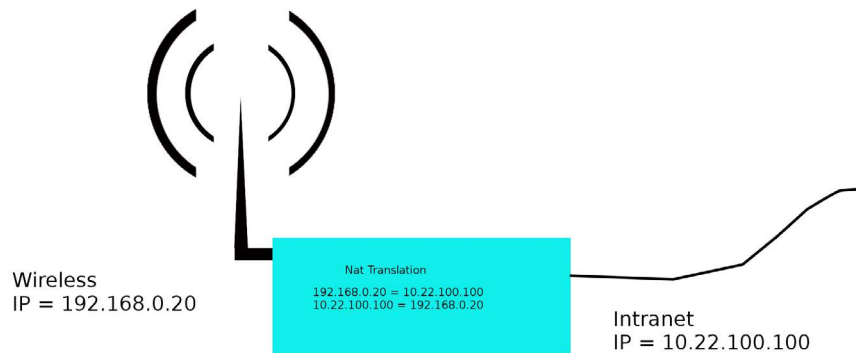
Figure 65   Typical NAT configuration from an intranet

Most wireless routers are configured to share a Pool of wireless side addresses with a single Intranet side address. Some routers provide functions that allow incomming requests on the intranet side to be redirected to single IP address on the wireless side. This would then allow you to point your Chrome browser on the intranet side to http://10.22.100.100 and control the iTA on the wireless side at 192.168.0.20. Consult your wireless router provider information to establish what functions are available. Port forwarding functions may also be an option in this situation.

Some routers have provision for a VPN (Virtual Private Network) this can provide a network tunnel across the internet
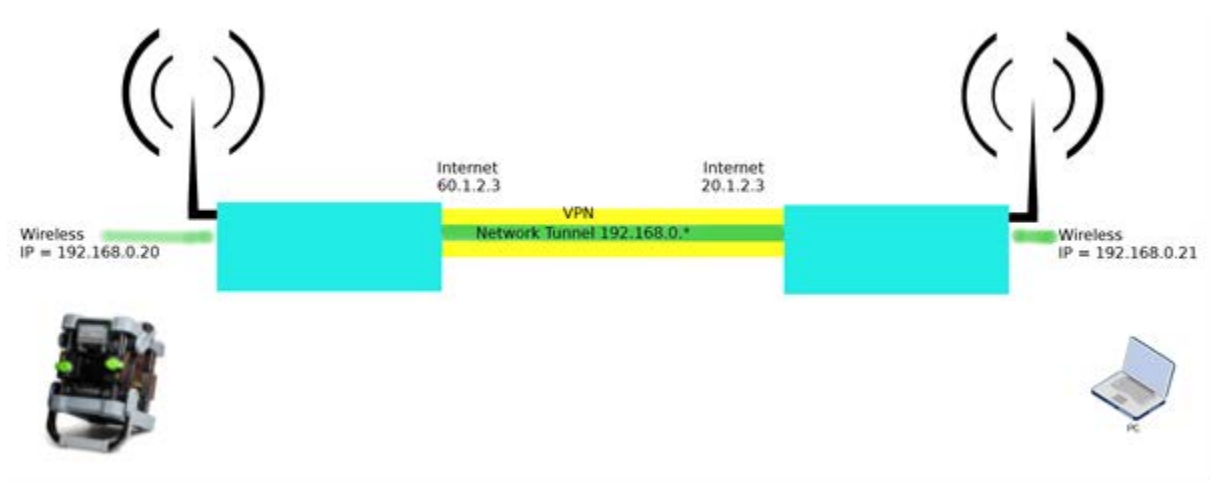
Figure 66   Internet connection via VPN

2.2.4 Mobile Phone as an external hotspot.

Some mobile have the provision to be able to be used as a mobile WiFi Hotspot see Figure 57.
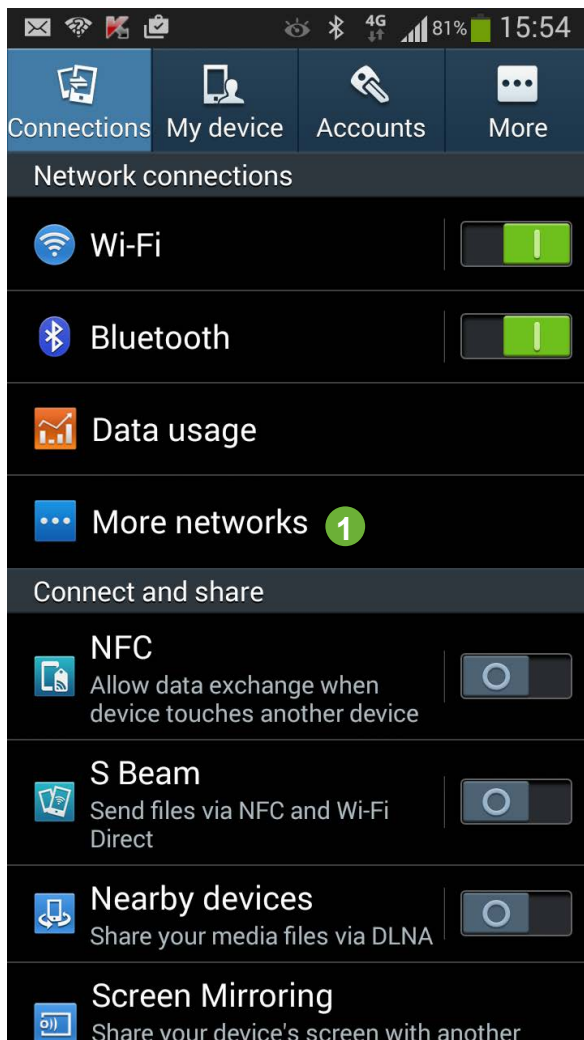
Figure 67   Phone connection settings
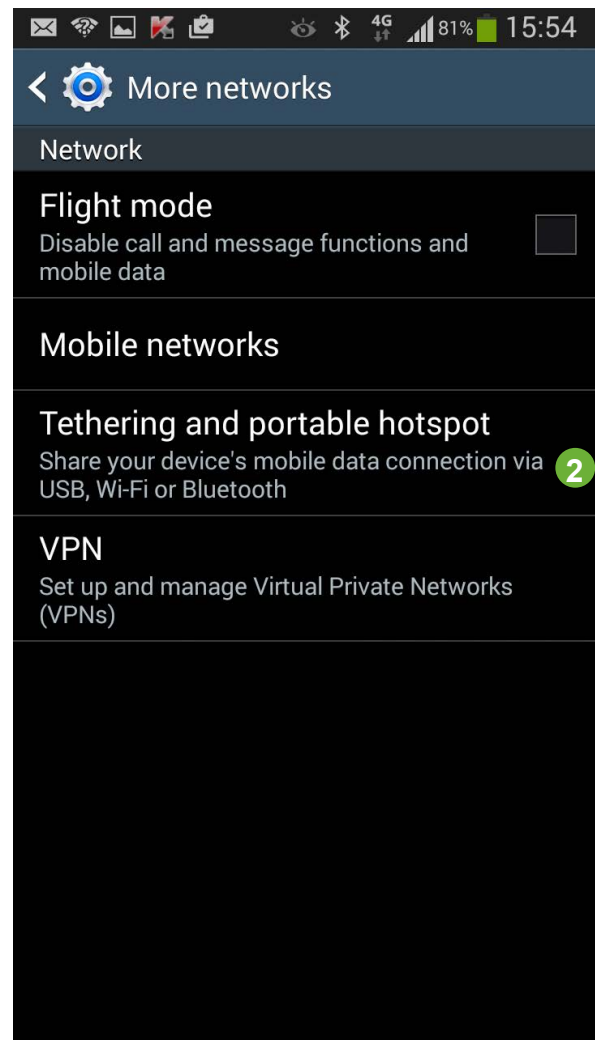
Figure 68   Phone tethering/Portable hotspot

1   **Select more Networks**

2   **Tethering and Portable hotspot**
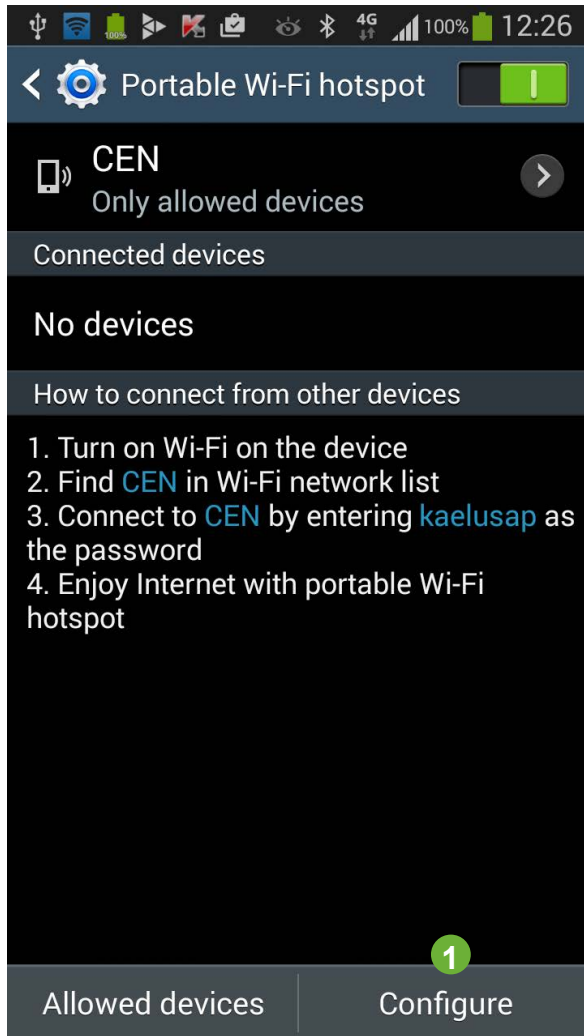
Figure 69   Select Hotspot configuration menu
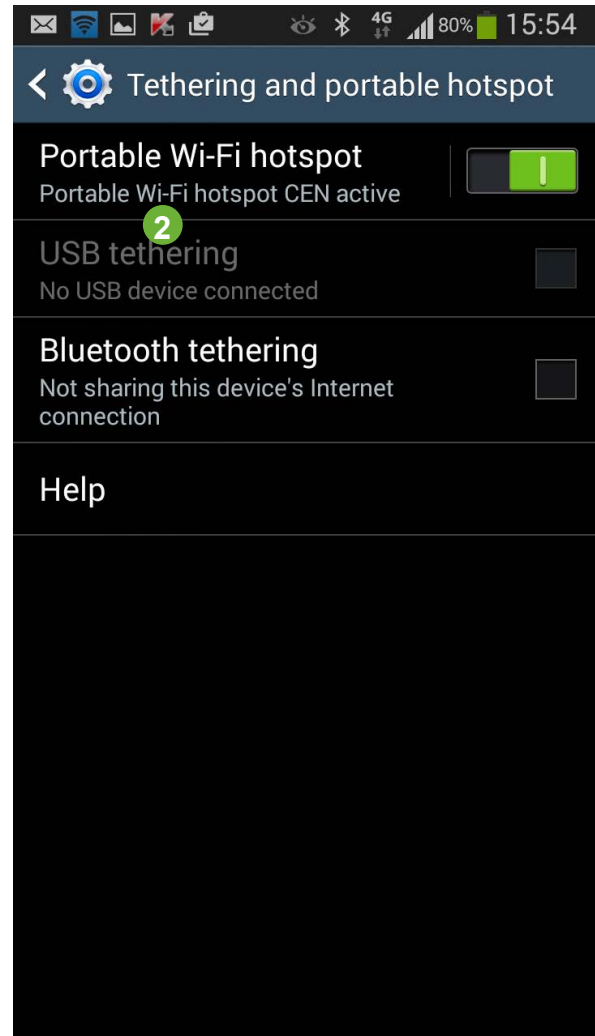
Figure 70   Select Phone Hotspot menu

1   **Configure the Hotspot**

2   **Enter the configuration menu**
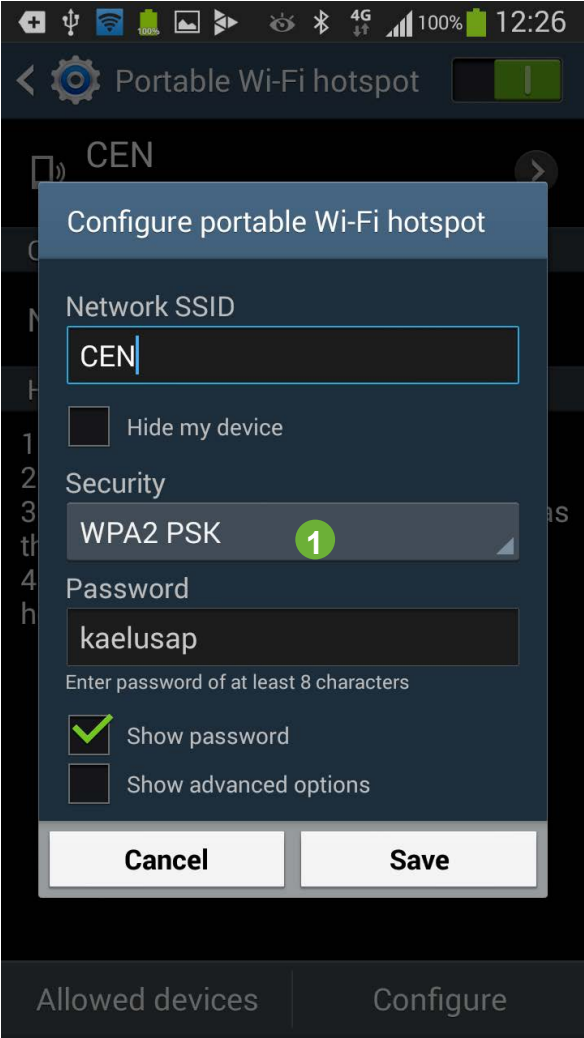
Figure 71   Configure Name. Password and security

1   Configure the Hotspot

3. General Detail

3.1 Getting The Best From The Test Equipment

There are a number of practices that will allow the best to be gained from the IM test system, especially for taking PIM measurements.

Connector & Cable Care

- Good quality connectors and test cables are essential for making PIM and return loss measurements

- Take good care of the RF connectors on the test port and the test cable. Do avoid damaging the connectors in transit

- Remove O-rings from all test equipment adapters and test leads. This will reduce the torque required to achieve a tight, low PIM connection during test and extend the life of the connectors. (Do not remove O-rings from the site jumper cables)

- Care should be taken when mating a cable to the test port on the test set. Ensure the mating surfaces line-up correctly, and the coupling nut does not cross thread. Tighten the locking nut by hand initially, and then only do a final torque using a spanner. If a torque spanner is used, torque the 7-16 connector to a maximum of 25 Nm; otherwise ensure that the connector is firmly fastened. DO NOT allow the body of the connector to rotate. DO NOT over-torque these as this can cause permanent damage to the connector.

- Ensure that the relevant connectors are cleaned regularly as lack of cleanliness can cause PIM problems

- A cleaning kit is supplied within the accessories kit for this purpose. Clean connector mating surfaces using a cotton bud and an isopropyl wipe to remove dirt, dust & small metal filings

- The connection of the cable screen to the connector is a major cause of PIM problems, so observe connector assembly instructions closely if constructing your own

- Do not allow the body of the connector to rotate while tightening

- Keep protective caps installed on RF connectors whenever they are not in use

- RF connectors have a finite life and are typically rated for 500 mate / de-mate cycles by connector manufacturers. Longer life is achievable with proper Care

Making PIM Measurements

- PIM measurements made by the test set are affected by all items attached to the test port. This includes the test cable, the device under test and any terminations.

- Be aware that high power resistive loads are known to have poor PIM in the region of -60 to -80 dBm for two +43 dBm tones. Choice of RF load type is important and cable loads are preferred for good PIM performance.

- Not all test cables are suitable for taking good quality PIM measurements.

- All isolators and circulators are known to be a source of poor PIM performance in the region of -50 dBm for two +43 dBm tones.

- If constructing your own cables, the major sources of PIM are in the connectors, the connection of the Outer Conductor of the coax to the connector and the Outer conductor itself. Observe connector assembly instructions closely.

- PIM measurement must be taken under conditions that simulate the physical stresses that apply in the installation

environment, and the recorded results can only be regarded as relevant if this stress is applied during the test sequence. International standard IEC37065 provides guidance on this matter.

General Tips and Caution

- Correctly terminate components to measure best return loss

- When not carrying out measurements, switch the RF Output Power OFF, for safety reasons

- When connecting or disconnecting from the measurement port, switch the RF Output Power OFF

3.2   Safety Features

There are several features to enhance the tester's safety and prevent damage to the instrument. It is important that the operator is aware of these built-in features.

1   Auto-Power Off

The RF power is on a 'Power Timer' which is set up in the Timer menu. The maximum time the power can be on at any time is 90 Seconds. This is an added feature to prevent power being left on for an indefinite time.

2   Fuses

The iTA has a 4 Amp fuse on the internal DC bus to protect the internal circuitry. This fuse is not User Accessible.

3   Battery Over-temperature shutdown

The battery has inbuilt hardware over temperature protection. When the battery reports more than 50 Deg C, the iTA software suspends charging until the temperature drops.

4   Local Exclusive Control

On the local control panel the instrument can be set to Local exclusive control. This prevents any connected remote control from operating the RF On Control, while changing cables and configurations.

3.3   Accessories Kits

Accessory kits are provided with iTAs and include the basic tools, cables, connectors, and adapters etc. to do PIM testing in the field. Users are encouraged to contact iTA service centers to discuss the specific requirements and configurations of these accessory kits.

3.4   Handling And Transport

- The equipment is designed for rugged handling, but it remains a precision test instrument and should be handled with care

- Do ship the equipment in a padded external box where possible

- Use a lock or external straps to secure both IM tester and accessories kit

- Airfreight is allowed as there are no dangerous items contained within the iTA (but battery packs should be transported in accordance with Airline Company regulations).

- Transport via road freight is preferred to air freight due to care of handling

3.5   Cleaning The Equipment

Before commencing any cleaning, switch off the equipment. We recommend that the exterior surface of the equipment case is cleaned using a soft cloth moistened in water. Do not use aerosol or liquid solvent cleaners.

To prevent damage to the internal panel, care should be taken not to scratch the surface during use and also when cleaning. To prevent the access of moisture and lint into the device, we recommend that the internal panels and instruction sheets should be cleaned by wiping with a slightly damp, lint-free cloth gently over the surface.

3.6   External Charger

External Charger is sold separately with Various accessory kits and has specific details for it's use in user manual R99-0092-BATTERY_CRADLE_OPERATING_MANUAL

Figure 72   External Battery charger (Optional)

3.7 RTF (Range To Fault) Unit

RTF unit is sold separately with Various accessory kits and has specific details for it's use in user manual R99-0068-RTF_A-SERIES_OPERATING_MANUAL

Figure 73   RTF Range to Fault Unit (Optional)

3.8 iVA Cable And Network Analyzer System

The iVA is sold separately with Various accessory kits and has specific details for it's use in user manual R99-0105 -ANDROID_ iVA_OPERATING_MANUAL

Figure 74   iVA Cable Network Analyser (optional)

3.9   Troubleshooting Guide

If the remedies indicated in the chart below do not solve the problem, consult the manufacturer for further instructions.

Power

No Power upon pressing power switch

- Insert a fully charged battery.
- If the above action does not fix the problem the test set should be returned to a Kaelus/Summitek approved service facility.
- **Note** : Battery charging occurs when connected to the charger and the iPA is switched ON.

Operation

PIM measurements are worse than expected.

- Tester may be defective. Perform RF verification using PIM standard from accessories kit. Check PIM of an external cable load
- Confirm all test rig components are in good condition by separately testing the device or system under test
- Device under test may have poor PIM. Test a device with known PIM performance.
- RF cable may be defective. Try another RF cable or attach an external cable load directly to test port to confirm
- Benchmark against another IM tester

Carrier frequencies are not suitable for antenna feeders using Tower Mounted Amplifiers (TMAs).

- Bypass TMA using cable tail with known PIM. Retest PIM
- Consult manufacturer. Other frequencies can be supplied

Carrier frequencies cause interference or regulatory problems.

- Consult manufacturer. Other frequencies can be supplied

Buttons Greyed out and not working with remote Tablet PC

- Another remote client may have control. Check the control icon to see you have control. Note : Network settings cannot be changed remotely.
- Some buttons are inhibited during certain functions, changing settings while a test is underway for example.

Unable to take control with remote Tablet PC

- Another Client or the local control screen may have exclusive control. Releasing remote control on the local control screen will take priority over any remote control sessions. This should allow you to take control again.

Geotag

- Geotag data may not be available inside a screened room or where high RF fields are present. Secure your location on your smartphone or Tablet PC before connecting wirelessly to the iPA or entering the screened environment.
- Geotag data is only as good as the information provided by the location service on your Smartphone or Tablet PC. You must allow the web browser application to access your location when prompted.

- Geotag service providers can gather geo data from several sources. Having more data sources turned on, on your smartphone/Tablet PC being shared with your geotag service provider can improve your chances of an adequate fix. These include GPS (Global Positioning System) switched on and set to share your location (if fitted), Wi-Fi access points that can be received nearby, Cellular Phone tower signals being received nearby for smartphones or phone enabled tablets, and an internet data connection can all assist to get a geotag fix.
- If your smartphone/Tablet PC Wi-Fi is your only Geotag data collection source, get your geotag fix first then use the Wi-Fi to connect to the iPA Hotspot after your location is resolved.
- You can use your map application on your Tablet PC or phone to confirm you have a Geotag fix for your location this can help isolate problems with your Geotag fix. If your Geotag location information is not accurate enough, or you are not yet able to get a fix on your location (Green globe icon flashing), then the Geotag fix will not be included in the report or be saved in the Geotag Cache if enabled.
- If reports are showing longitude and latitude from a previously visited site this could indicate the old location is still saved in the Geotag Cache. This can be cleared by switching the Geotag cache off then on again, or recording a new point with a correct Geotag location, or waiting for the Geotag Cache to clear automatically after an hour.

3.10 CE Declaration of Conformity

Hereby, Kaelus Pty Ltd
34 Corporate Drive
Cannon Hill, QLD, 4170

AUSTRALIA

declares that the following products are in compliance with the essential requirements of Directive 2004/108/EC (EMC Directive), Directive 1999/5/EC (RTT&E) and Directive 2006/95/EC (LVD Directive) if installed and operated in accordance with manufacturer's instructions.

Part Number:	Model Number	Description
IT0818V01B-01N	iTA0818A	Passive Intermodulation Test Set
IT0819V01B-01N	iTA0819A	Passive Intermodulation Test Set
IT7719V01B-01N	iTA7719A	Passive Intermodulation Test Set
IT7991V01B-01N	iTA7991A	Passive Intermodulation Test Set
IT9118V01B-01N	iTA9118A	Passive Intermodulation Test Set
IT9126V01B-01N	iTA9126A	Passive Intermodulation Test Set

These products are in conformity with the following European, harmonised and published standards at the date of this declaration

Referenced EMC Standard:	
EN 61326-1	EN 61000-4-4
EN 61326-2-1	EN 61000-4-5
EN 55022:2010 "Class A"	EN 61000-4-6
EN 61000-4-2	EN 61000-4-11
EN 61000-4-3	
Referenced Safety Standard:	
EN 61010-1	EN 61010-030
Referenced RTT&E Standard:	
ETSI EN 301-489-1	

3.11 Contacts

Kaelus has service center locations globally. Please visit http://www.kaelus.com/Contact-Us/Locations/ to find the service center nearest you.

When ringing, ask for IM tester support (technical or otherwise) & quote the relevant part numbers.

Send feedback to: info@Kaelus.com