



**Fox Delta**

Amateur Radio  
Projects & Kits

# SWR ANALYZER

Measuring with an ANDROID device



August 2013

## INDEX

1. Project description	3
2. Getting started	4
2.1 SWR Analyzer Board.....	4
2.2 Bluetooth Adapter.....	6
2.3 Testing the BT Adapter.....	8
2.4 Installing SWRA Android application.....	10
3. SWRA for Android	12
3.1 Run an antenna analysis.....	14
3.2 Save the analysis.....	17
3.2.1 Export CSV file.....	18
3.2.2 Save to PIC memory.....	19
3.3 The Generator utility.....	20
3.4 Parameters setting.....	21
4. Analyze the scan results on PC	22
4.1 Import from SWRA board.....	22
4.2 Import a csv file.....	23

## 1. Project description

This document describes how the **SWR Analyzer (SWRA)** can work with an ANDROID device, **Smartphone or Tablet**, enabling antenna performances measurement to be made **connecting the analyzer via a Bluetooth link to a portable Android terminal without the PC usage.**

This way to use the SWRA without the PC is very useful during Ham Radio mobile operations from the car, portable field day, at the top of the tower or every time a pc/laptop is not easily usable.

### H/W Requirements

- Modified SWRA unit as per paragraph 2, with f/w v5.00.
- A Bluetooth adapter.
- A cable to connect SWRA to the Bluetooth adapter and 9-12V 250mA power supply.
- A portable terminal (smartphone or tablet) running Android (v. Froyo or later).

### S/W Requirement

- SWRA firmware for the SWRA 18F2550 pic v 5.00 or later
- SWRA Analyzer.exe Windows software v 5.00 or later
- SWRA.apk application for Android devices v1.00.

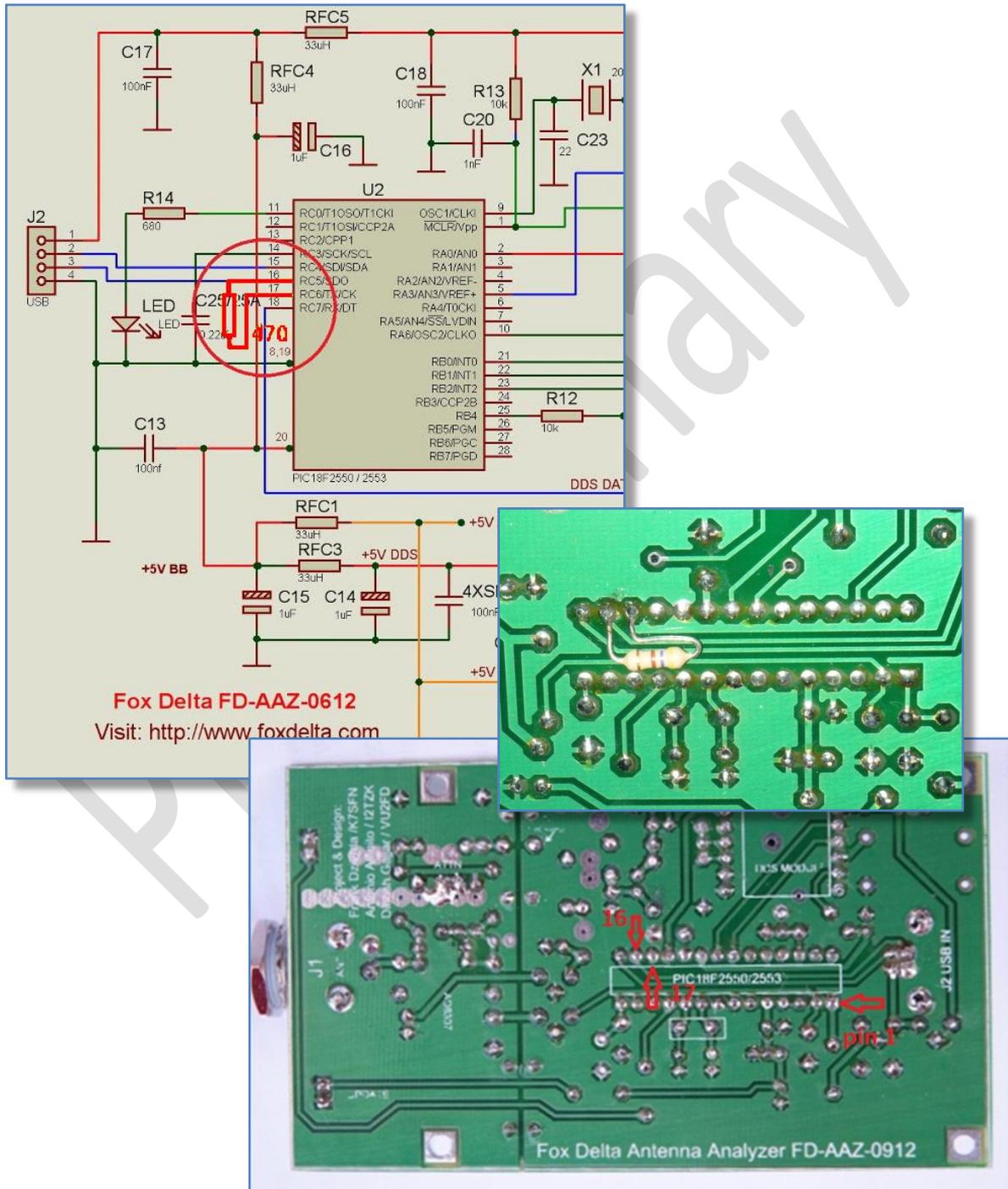
### *NOTA BENE*

A Windows PC is required to calibrate the SWRA board and optionally to make more detailed analysis on data collected by the portable device.

## 2. Getting started

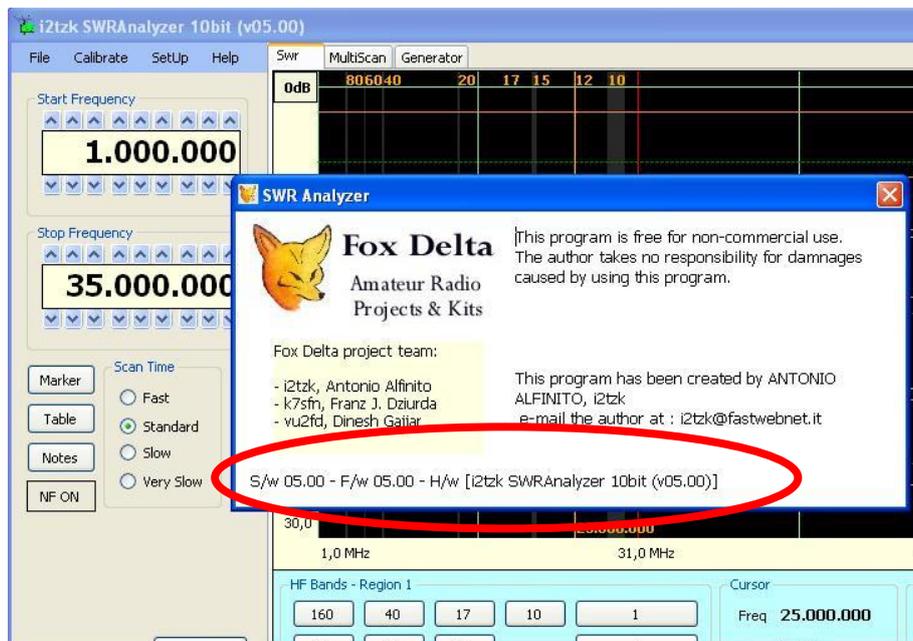
### 2.1 SWR Analyzer Board

- Modify the SWRA board by adding a 470 ohm 0.25W resistor between pin 16 and pin 17 of the pic 18F2550



- Update the 18F2550 pic f/w to v5.00
- Update also the Windows program to v5.00

Please refer to **“SWRA USB Update”** documentation for detailed instructions.

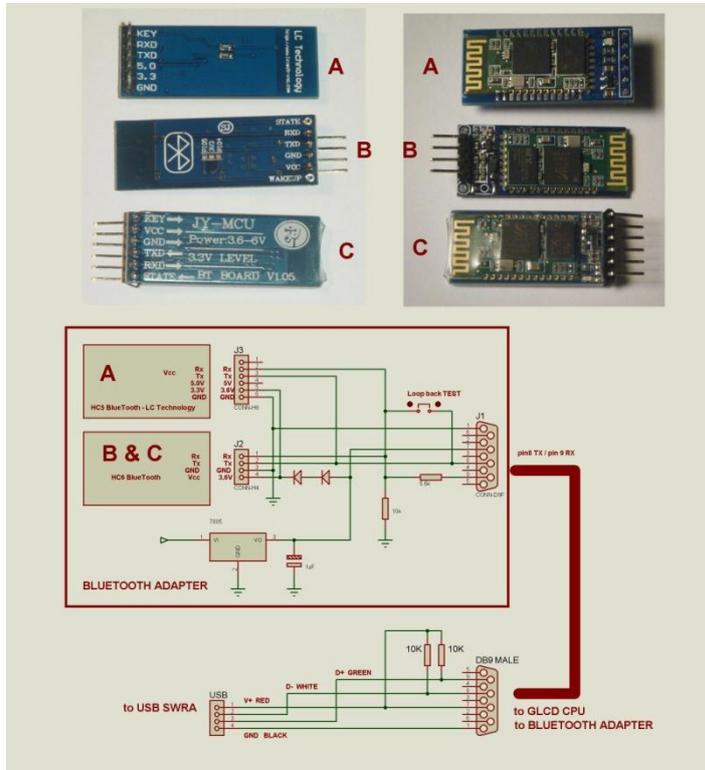


When f/w has been updated, connect using a standard USB cable, the SWRA board to your pc and:

- Verify that the right f/w version is installed
- **calibrate** the SWRA board by following the on screen prompts.  
To make the measurements SWRA Android version applies a simple average offset while PC uses the linear regression methodology, that is the offset applied to the measurement is computed by interpolating the values stored by a table “Frequency / OdB”.  
Both, table **values** (used by PC) and average OdB offset (used by SWRA Android) **are calculated during the calibration process, for this reason the calibration must be done at least once before to start the first measuring session with a portable device.**

## 2.2 Bluetooth Adapter

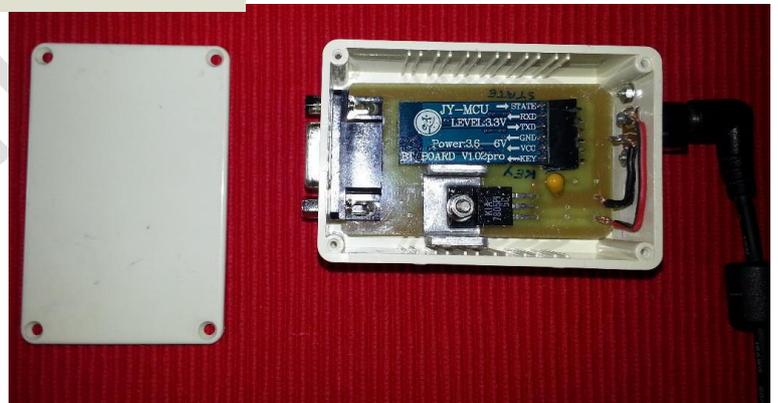
The Adapter uses an already assembled Bluetooth module, following pictures show three of the several models available from the market:



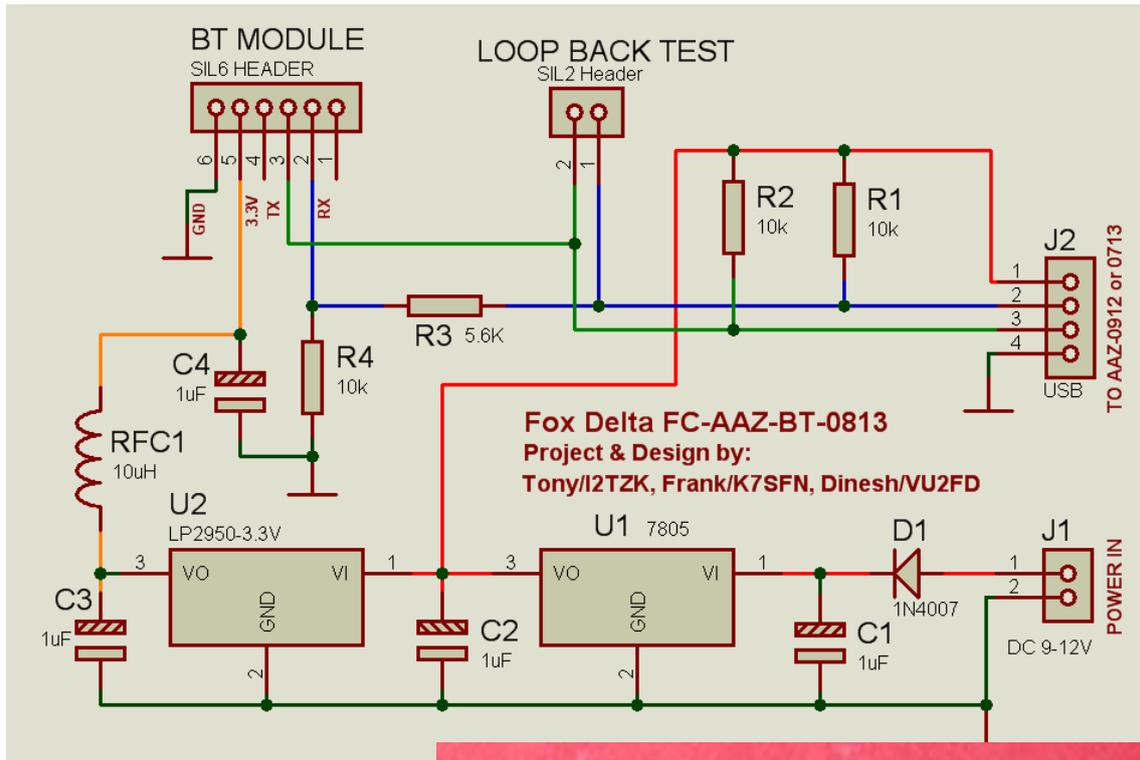
The left schematic allows to install BT modules from different manufactures.

The same special cable USB-DB9 designed to connect the Graphic CPU (see FoxDelta web site) is used.

Mario's, G8ODE, prototype used for testing



The electric schema from Dinesh, VU2FD is using a standard USB cable (please refer to [www.foxdelta.com](http://www.foxdelta.com)) :



FoxDelta Kit AAZ-BT-0813



## 2.3 Testing the BT Adapter

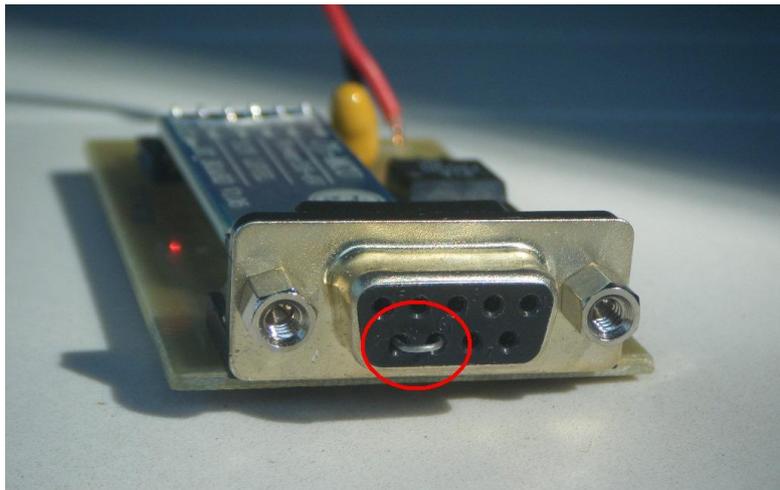
The loop-back test is used to verify that the Bluetooth module is properly working.

This test requires that the device's **transmit** pin is connected to its **receive** pin, this will result in the device receiving exactly what it transmits.

Test can be done using a laptop or a pc having a Bluetooth port, as well as a portable terminal (smartphone or tablet), implementing the following steps:

- Shortcut Rx and Tx lines of the adapter.

BT RX signal is at DB9 connector pin 9, TX at pin 8, use a small paperclip as shown by the picture or put a jumper on the “loop back test” header of the FoxDelta implementation.



- Connect and **pair** the BT Adapter to your PC/Smartphone. Code to be entered and module ID depend on the specific BT module used, the most common are **1234** for pairing code and “HC-05” as module ID. Please refer to datasheet of your module for code and ID.

### PC / Laptop

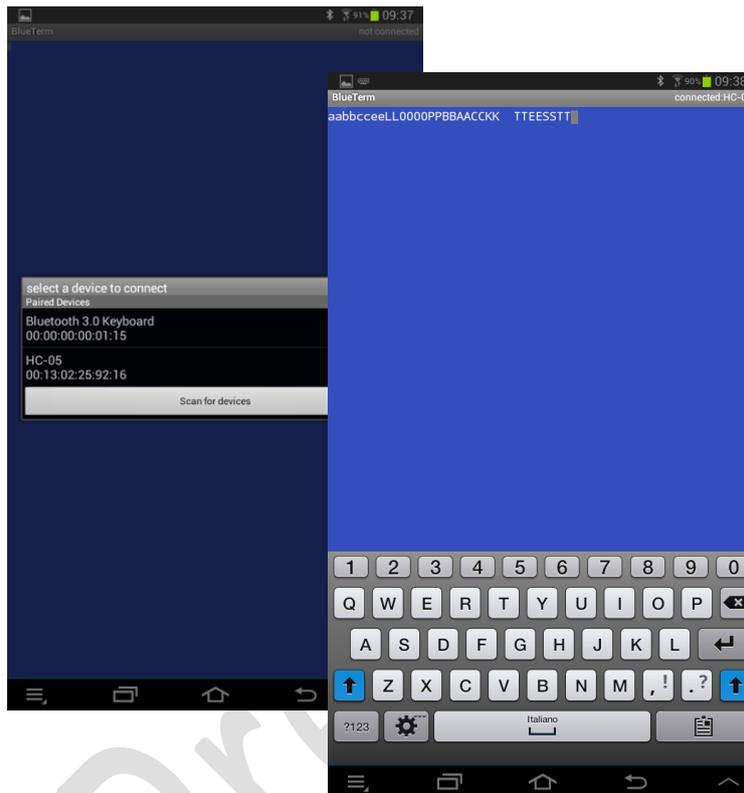
- Run a terminal program and connect the “virtual port” created by the BT pairing process. WinXP users can run Hyperterminal, Win7 users can choose any one of the many dumb terminal programs available from the web.
- Parameters to initialize the COM port are: 9.600 Baud, 8 bits, no parity, 1 stop (9600-8N1)
- When the BT Device is connected, **verify that all the characters you enter in the terminal program and transmit are echoed back by the BT Adapter.**

## Smartphone / Tablet

- Run any “Bluetooth terminal” application. Google Play, Amazon Store and similar websites offer many free “Terminal Emulator for Bluetooth”, choose the one of your preference.

My favorite is called just “Bluetooth Terminal” it’s simple and essential.

- Connect the BT Adapter and verify that all the characters you enter from the terminal keyboard are transmitted and echoed back.



Notice that all characters are shown twice, this is correct: first character is the keyboard echo, second is sent back by the BT Adapter.

## 2.4 Installing SWRA Android application

Copy the file “SWRA.apk” to the sd card of your portable terminal.



We suggest to create a folder named:  
....\Download\i2tzk.SWRA  
and copy there the application

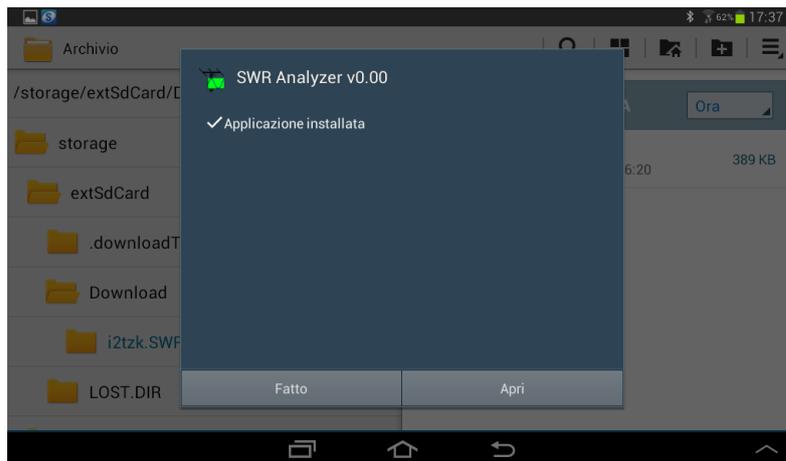
Navigate to the folder where the application as been copied and install it by clicking/touching on his icon.

Android forces applications to declare the permissions they require when they install them. You can protect your privacy, security, and cell phone bill by paying attention to Android application permissions when installing.

“SWRA.apk” asks for following permissions:



Installation successfully executed.

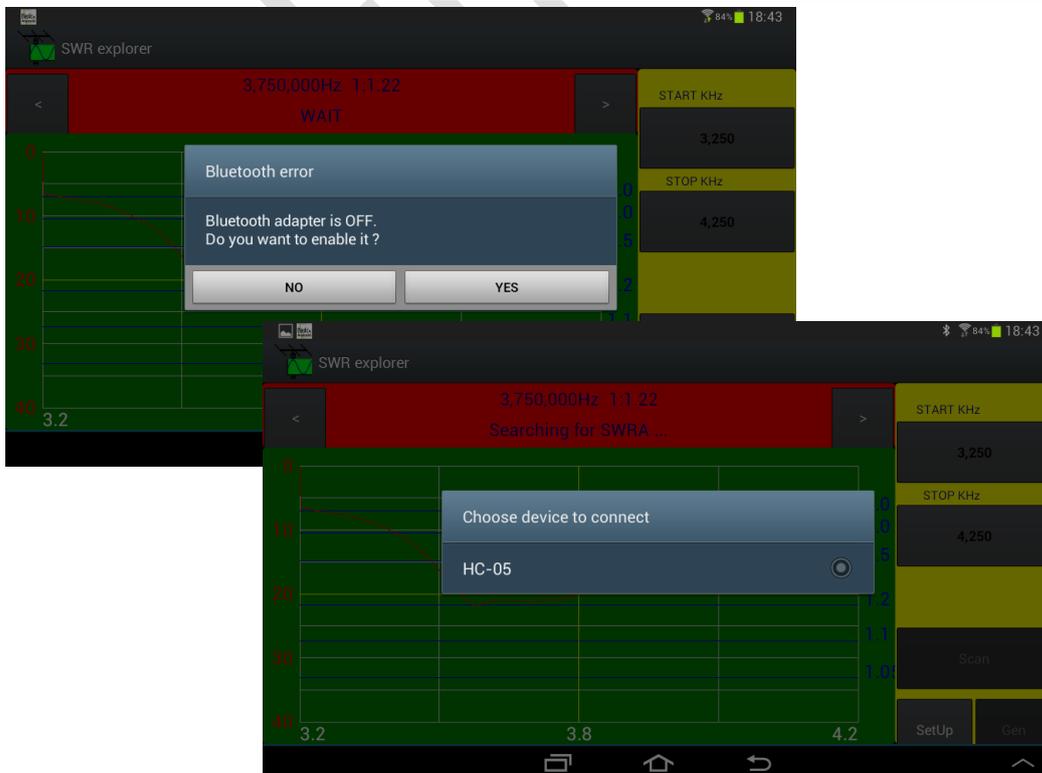


### 3. SWRA for Android

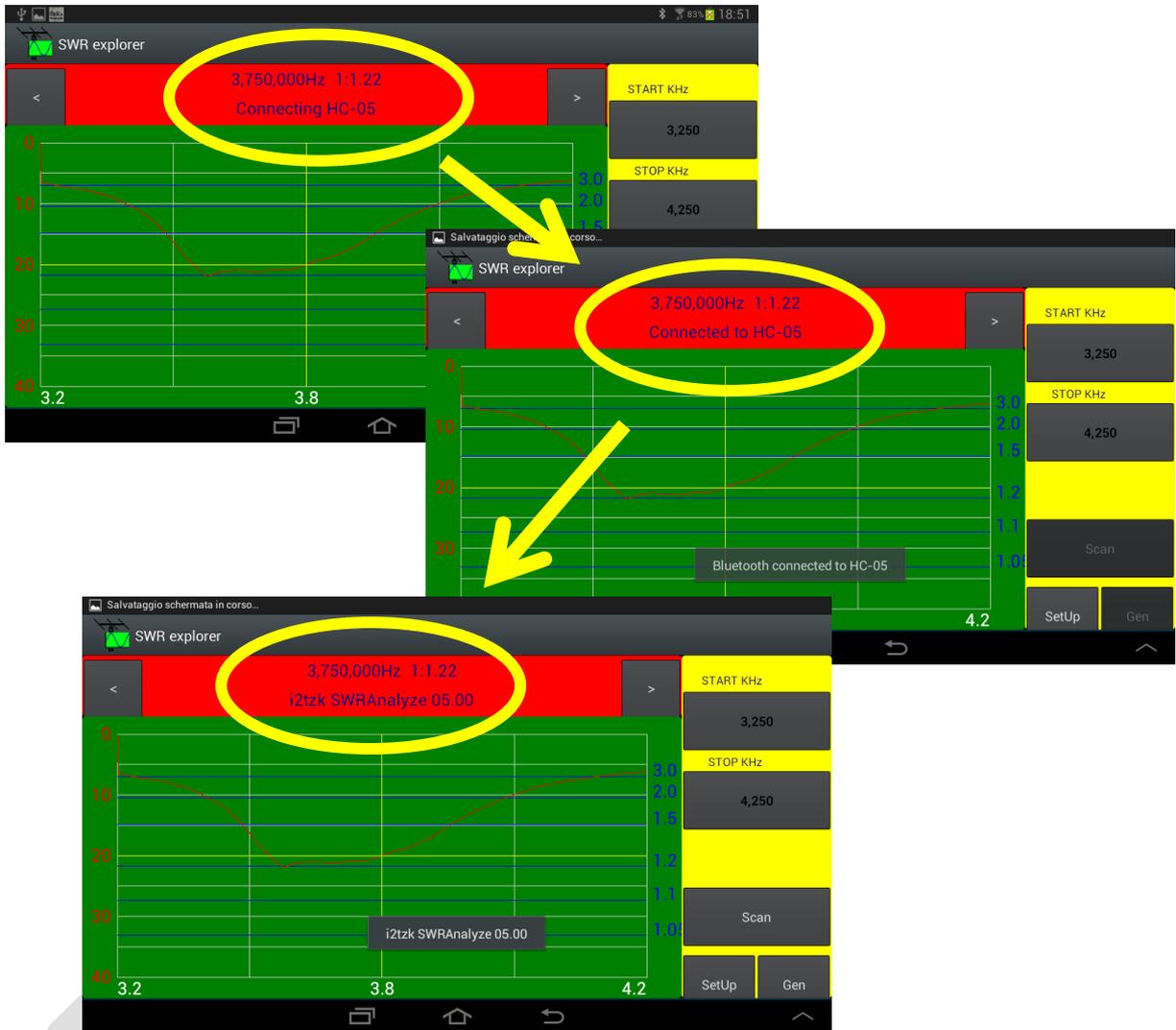
Before to run “SWRA.apk”, be aware that the BT Adapter has been enabled and paired with your portable terminal.

If this is the first time you’re using SWRA, or it has been previously unpaired/removed, run the Bluetooth discovery service from the Setting menu of your terminal, identify your BT Adapter and enter the pairing code (PIN).

Code to be entered and module ID depend on the specific BT module used, the most common are **1234** for pairing code and **“HC-05”** as module ID.



Following figures are showing the connecting sequence:

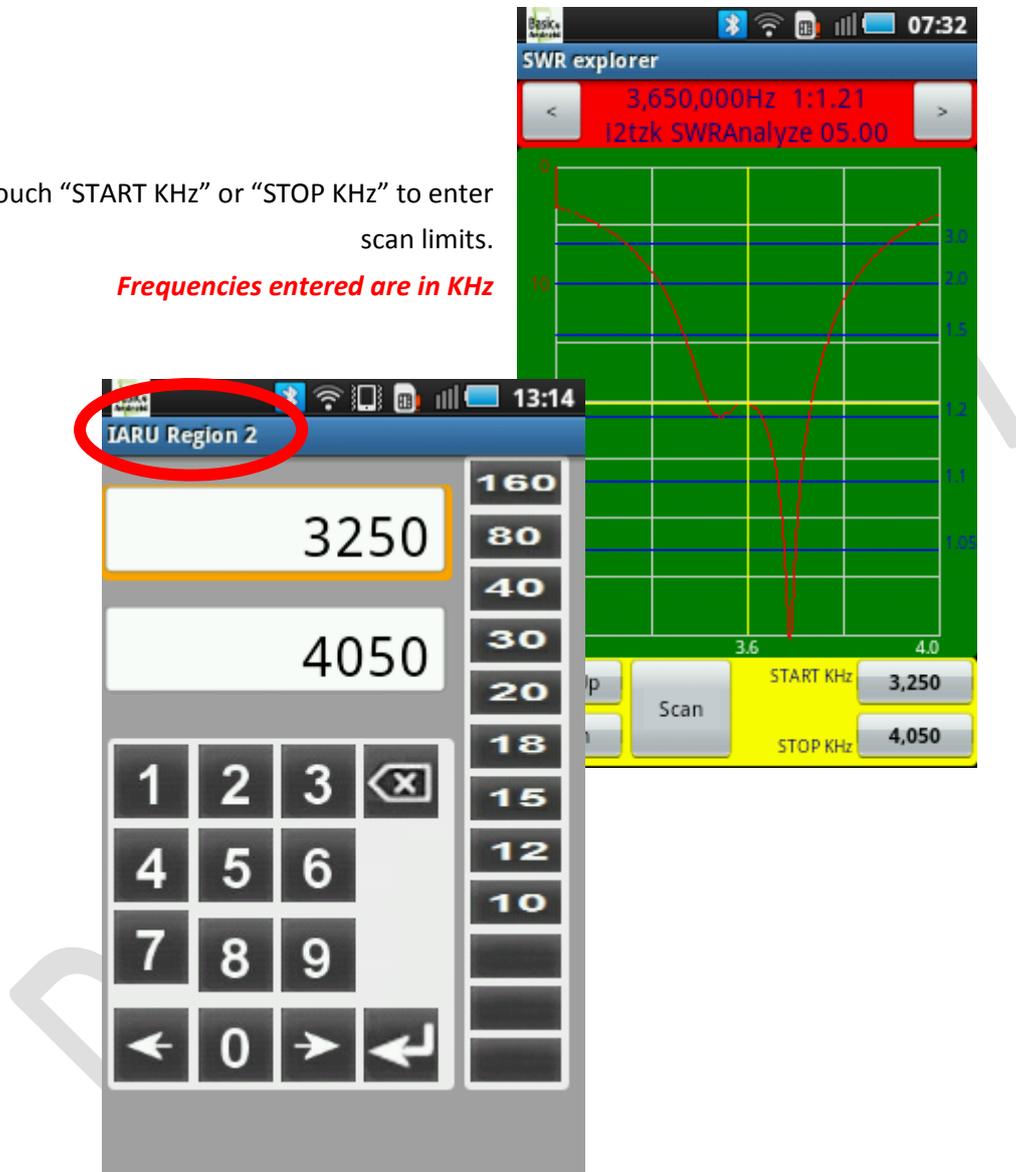


### 3.1 Run an antenna analysis

Launching “SWRA.apk” the last saved analysis is shown, if this is the first time you run the application or you never saved an analysis, the default graph is presented:

Touch “START KHz” or “STOP KHz” to enter scan limits.

*Frequencies entered are in KHz*

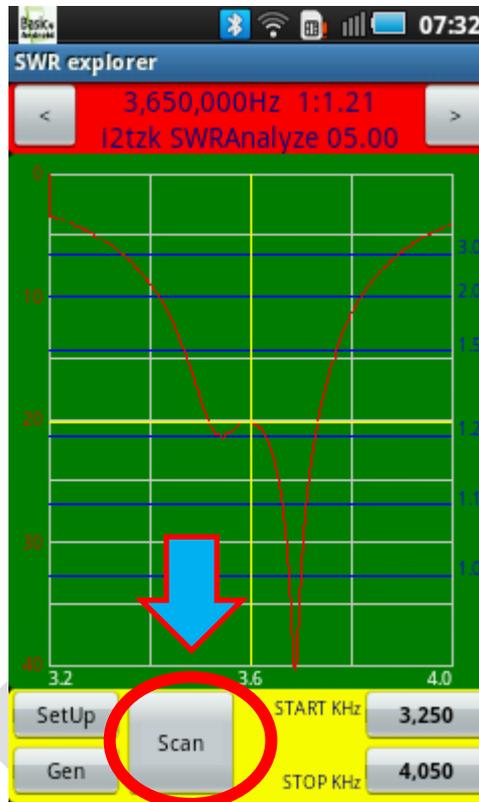


Enter “START” and “STOP” frequencies touching the keyboard or selecting the band limit with the correspondent button.

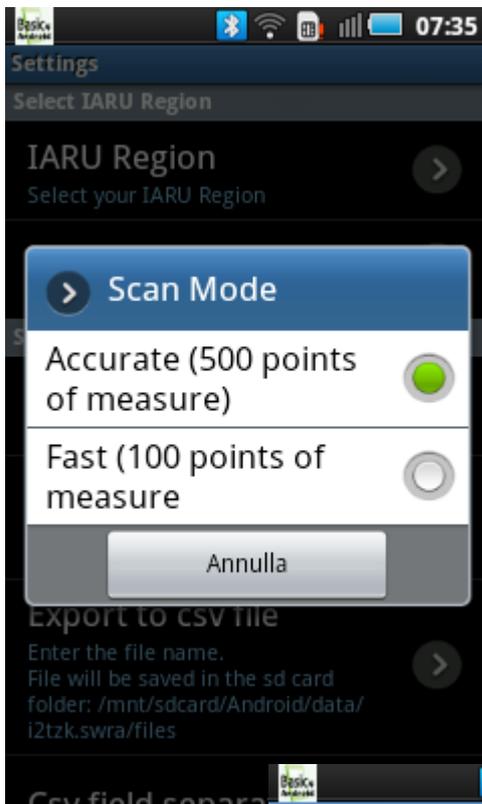
“SetUp” function allows to select the band limits based on the regional IARU Band Plan.

While the *scan limits are entered and shown in KHz, the application works with 1 Hz resolution*, frequency values associated to the cursor position are presented in Hz, see the row at the graphic top showing frequency at cursor position 3.650.000 Hz and SWR 1:1.21.

- Execute the analysis touching the button "Scan".
- "Stop" label is shown during the scan operation.
- Touch this button to stop it.
- Current step and frequency are updated while scan cycle is running.

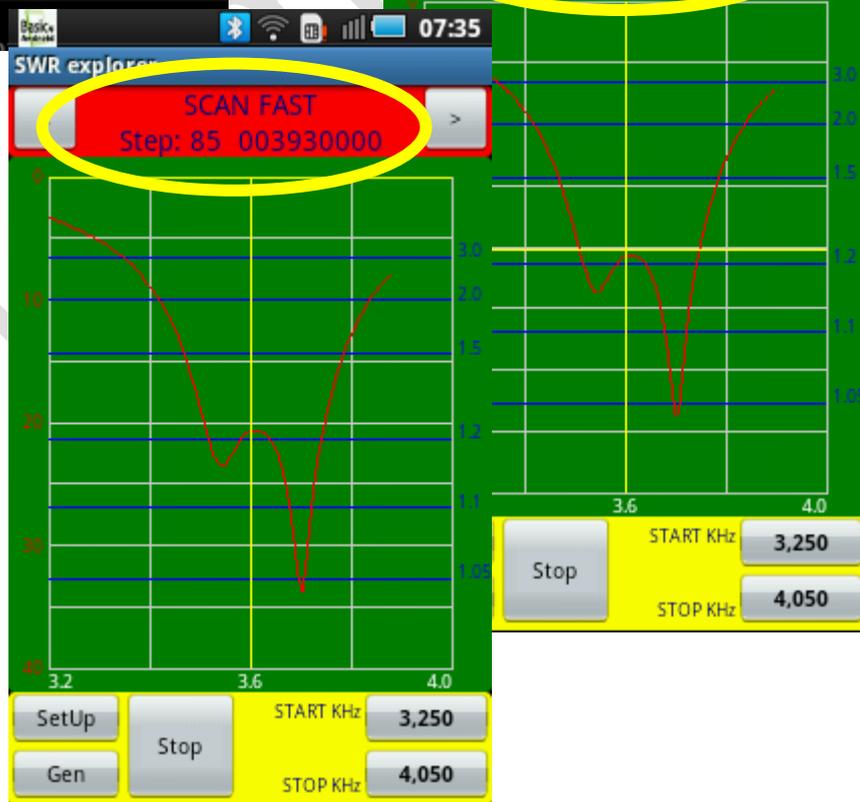


Two scanning modes can be selected from the “SetUp” screen:



- **ACCURATE** scanning : the scan cycle measures the SWR of 500 points
- **FAST**: the scanning cycle is limited to 100 points of measure.

*NOTA BENE: after changing "Scan Mode" application must restart to take effect.*

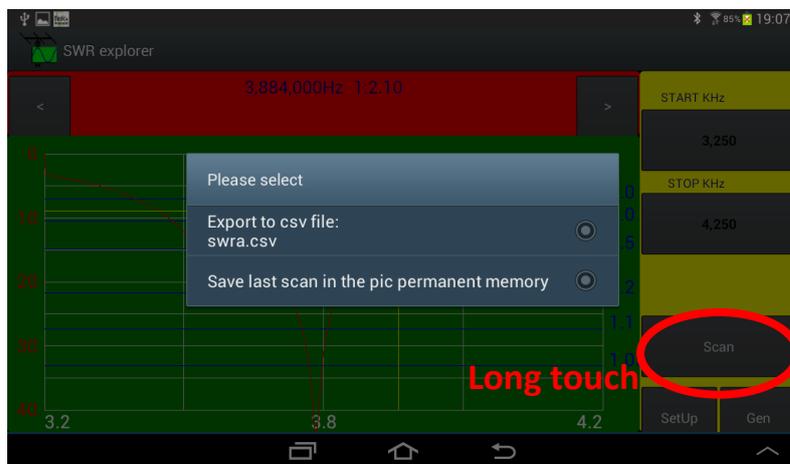


## 3.2 Save the analysis

Long touch “Scan” button to select mode and save data.

Two available modes:

- Save last analysis into the SWRA board (permanent pic memory)
- Export the analysis data as csv (comma separated values) file into the memory card of your portable terminal



The PC program **SWR Analyzer.exe v5.00** provides two new functions that enable the scan data to be imported in the PC memory for a further analysis:

- Import from the SWRA Board permanent PIC memory
- Import a csv file

The Android application at start, if the option “ACCURATE” scan is selected, automatically imports the last saved csv file.

“SetUp” has a flag to disable this function and allows to change the default filename and csv separator.

### 3.2.1 Export CSV file

First execute an “ACCURATE” scan cycle, then long touching the “Scan” button activates the save/export function, select: “Export to csv file”.

Filename and the character used as fields separator can be edited from the “SetUp” function.

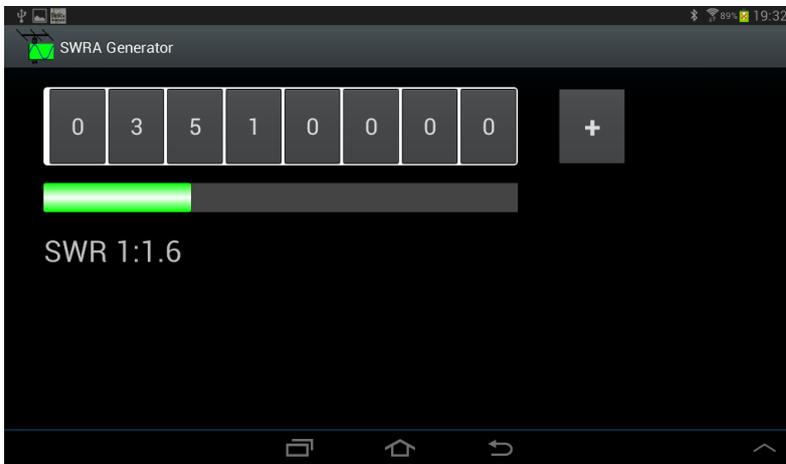


### 3.2.2 Save to PIC memory

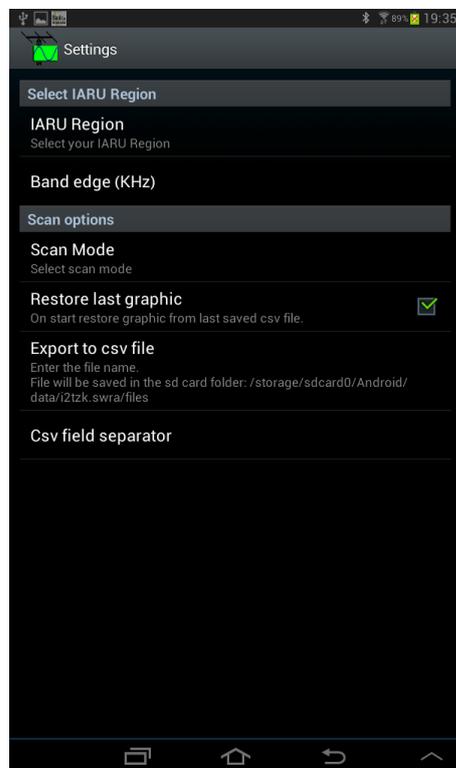
UNDER DEVELOPMENT

Preliminary

### 3.3 The Generator utility



### 3.4 Parameters setting



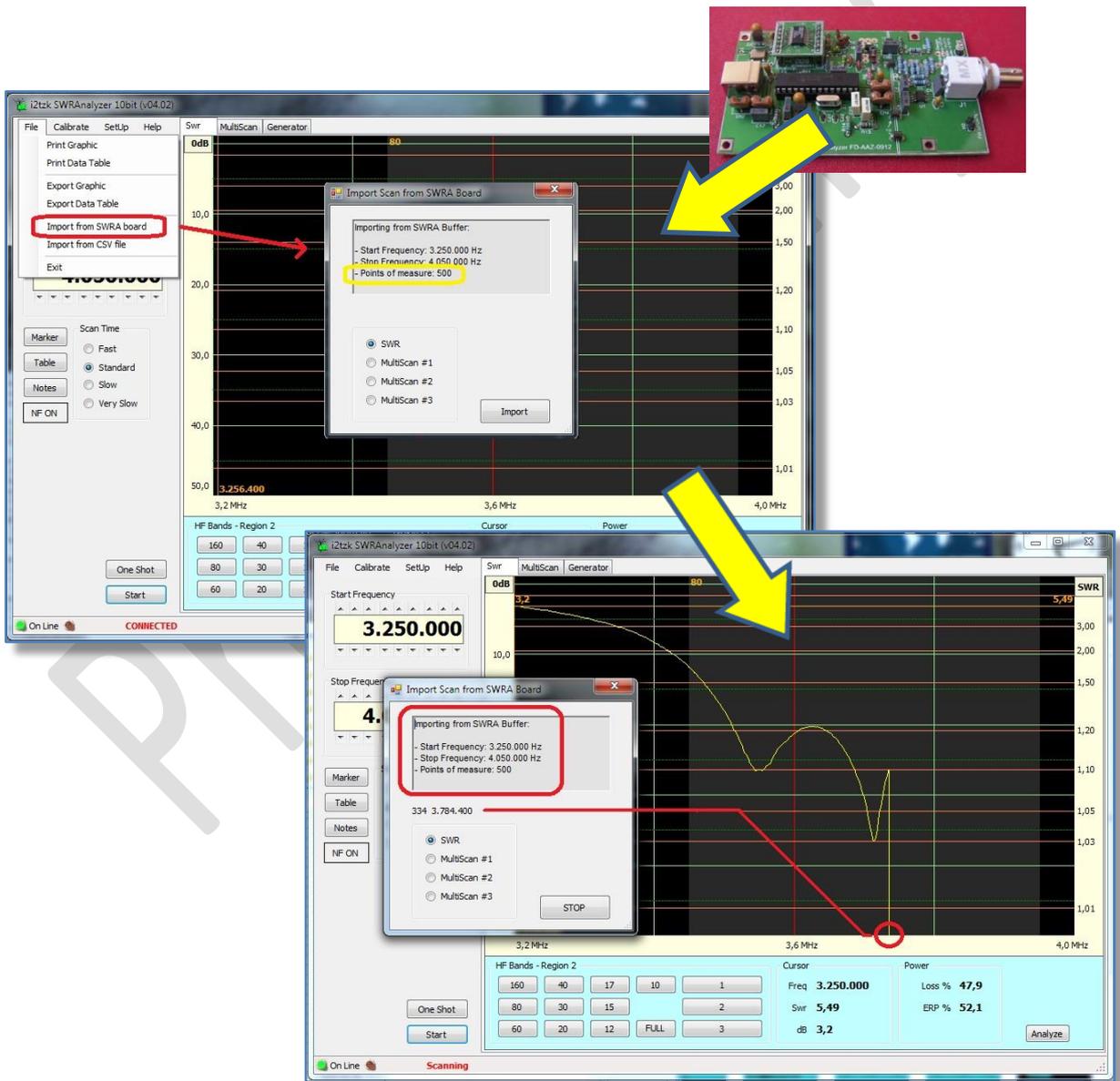
*If "Scan Mode" is changed the selected mode will take effect at next application run.*

## 4. Analyze the scan results on PC

The PC program **SWR Analyzer.exe v5.00** provides two new functions that enable the scan data to be imported in the PC for a detailed analysis:

- Import from the SWRA Board
- Import a csv file

### 4.1 Import from SWRA board



## 4.2 Import a csv file

The image illustrates the process of importing a CSV file into the i2tzk SWRAnalyzer 10bit (v04.04) software. It consists of three sequential screenshots:

- First Screenshot:** The software interface is shown with the 'File' menu open. The 'Import from CSV file' option is highlighted with a red box. A red arrow points from this option to the next screenshot.
- Second Screenshot:** The 'Import CSV file' dialog box is displayed. The 'Import file' field contains the path 'C:\Documents and Settings\All Users\Dati applicazioni\FoxDelta\SwrTable.csv'. The 'Destination Table' section has 'SWR' selected. A red box highlights the import details, and a red arrow points to the third screenshot.
- Third Screenshot:** The main software interface is shown with the imported data. The 'Start Frequency' is set to 3.250.000 Hz and the 'Stop Frequency' is 4.250.000 Hz. The graph displays the SWR curve. The bottom panel shows the following data:

HF Bands - Region 1	Cursor	Power
160	Freq 3.488.000	Loss % 3,1
80	Swr 1,43	ERP % 96,9
60	db -15,1	

Preliminary