



Streamlining Field Test with Task Planner

For use with Agilent N9344C/43C/42C handheld spectrum analyzers (HSAs)

Application Note



Introduction

Ensuring the peak performance of RF systems has grown increasingly complex. In the field, RF issues like faulty transmitters and antennas, amplifier overdrive, and signal interference, can impact the operation of an RF system and result in degraded system performance. In addition, the rapid development of various RF systems (such as cellular, satellite, broadcasting, or military-related), means today's field engineers and technicians also need to run routine tests and troubleshoot a larger array of systems.

This application note looks at the unique test equipment requirements of RF field engineers and illustrates how the new Task Planner feature of Agilent's N9344C, N9343C, and N9342C handheld spectrum analyzers (HSAs) helps streamline system test and maximize RF network performance.

Challenges of Field Spectrum Analysis

One of the test tools frequently used by RF field engineers is an HSA. A versatile tool, the spectrum analyzer can perform various measurements such as frequency and power, spur, distortion, and adjacent channel power ratio. It is also one of the more complex test and measurement tools for field engineers and technicians to use.

Historically, RF field engineers have had to set up the HSA to make correct measurements. While this may sound simple, in the field this set-up process can take a substantial amount of time. In fact, sometimes field engineers and technicians spend more time pushing instrument set-up buttons than they do actually making measurements; compromising their speed, productivity, and flexibility.



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The set-up process itself is also prone to problems. Using multiple buttons to set up tests means there is an inherently high probability of operator entry mistakes. The cost of such errors can be quite high—for example when the error results in the engineer having to drive hundreds of miles to redo the measurement.

A Smarter Spectrum Analyzer

Now, after in-depth market research, Agilent has introduced a new product line of HSAs designed specifically to address the unique needs of RF field test engineers. The Agilent N9344C, N9343C, and N9342C HSAs (collectively called the N934xC HSAs), provide frequency coverage up to 20, 13.6, and 7 GHz respectively to support testing on a variety of systems. Rich in features, these handhelds also include a built-in GPS receiver with integrated GPS antenna, providing precise geographic location information without the need of an external GPS antenna. Perhaps more importantly, these HSAs remove the error-prone areas associated with routine field measurements through a unique innovative feature—the industry’s first Task Planner.

Task Planner is an intuitive tool with a user-friendly interface that automatically sets up measurements, cutting test setup time by up to 95 percent and allowing users to greatly improve productivity. It also captures signals, saves the result, and generates a report.

Using The Task Planner Tool

Overview

To begin using Task Planner, users create a predefined task plan file consisting of up to 20 tasks using Agilent’s free HSA PC software. Once created, the task plan file can run on other HSAs of the same model number and can be distributed easily via email or USB flash drive. Next, the PC-created task plan file is transferred to the HSA. In the field, the press of a single keystroke executes the measurements sequentially and automatically. Measurement results are then logged which allows a corresponding measurement report, with screenshots, to be generated.

Detailed Example

Step 1: Create a Task Plan File (.TPF)

Creating a task plan file is a two part process:

- 1) Set the N9342C up according to the test requirement and save the instrument state files (.STA). One state file is required for one measurement task, e.g. if six tasks are required then six state files need to be saved. Currently up to 20 measurement tasks can be saved in one task plan.
- 2) Load the state files into the HSA PC software to compile the task plan file (.TPF).

To illustrate, in the following example three different measurement tasks (channel power, OBW, and ACPR), will be made so three different state files need to be saved. After that the free HSA PC software will be used to compile the task plan file (.TPF) based on the three N9342C state files.

Step 1.1: Save state files

Instructions for N9342C HSA	Keystrokes for N9342C HSA
Set center frequency and span	[Freq], {Center Freq}, [2], {GHz}, [Span], [10], {MHz}
Task 1: Channel power	[Meas], {Channel Power} {Integrated BW}, [5], {MHz}
Set integrated bandwidth	
Save the state file for channel power	[Shift], {File}, {Save As}, input file name [WCDMA_CHP], use the rotating knob to choose File Type: STA", [Enter]
Task 2: Occupied bandwidth (OBW)	[Meas], [Meas], {OBW}
Save the state file for OBW	[Shift], {File}, {Save As}, input file name [WCDMA_OBW], use the rotating knob to choose File Type: STA", [Enter]
Task 3: Adjacent channel power ratio (ACPR)	[Meas], [Meas], {ACPR}
Set main channel BW, adjacent channel BW and space	{Main Channel}, [3.84], {MHz}, {Adj Chn BW}, [3.84], {MHz}, {adj Chn Space}, [5], {MHz}
Save the state file for ACPR	[Shift], {File}, {Save As}, input the file name [WCDMA_ACPR], use the rotating knob to choose File Type: STA", [Enter]

Step 1.2: Compile task plan file (.TPF) with the free HSA PC software

Note: Make sure the Agilent I/O library and the HSA PC software are correctly installed. Connect HSA and PC via a USB cable.

Run the HSA PC software

Establish the connection between the PC and the HSA.

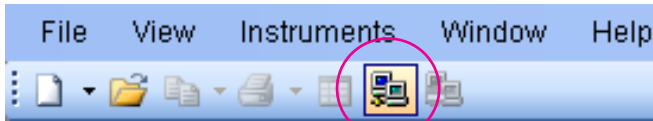


Figure 1. Connect to the HSA

- Click the connection shortcut in the toolbar as shown in Figure 1
- Select the N9342C HSA in the connect instrument dialog box
- Click "Ok" button

Note: If connection difficulties are experienced, please refer to the built-in help of the PC software: [Help] [Contents] [Getting Started] [Preparation].

Add state files into the task plan file

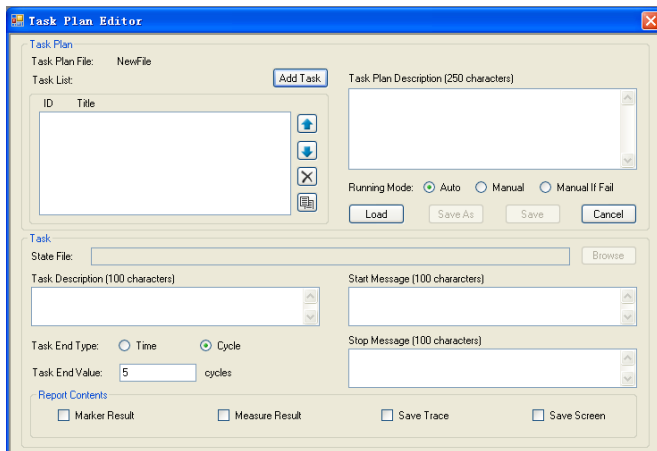


Figure 2. Task plan editor

- Click "Instruments" then "Task Plan Editor" to open the task plan editor as shown in Figure 2

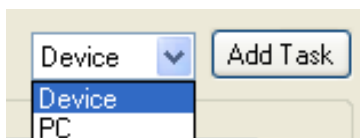


Figure 3. Add from the device

- Click "Add Task" button in the task plan editor

Note: State files are on the PC, you should choose media type "PC" before clicking "Add Task" button.

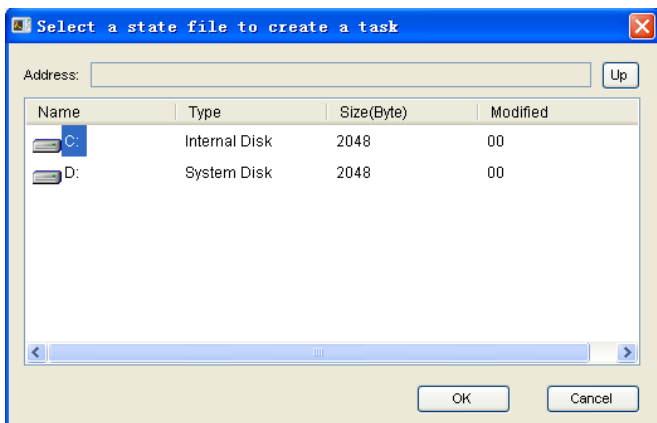


Figure 4. Select a state file

- Double click the "Driver C" in the "Select a state file to create a task" dialog box as shown in Figure 4
- Double click file WCDMA_CHP.STA
- Repeat the steps b to d to add WCDMA_OBW.STA and WCDMA_ACPR.STA to the task plan

Edit the task list

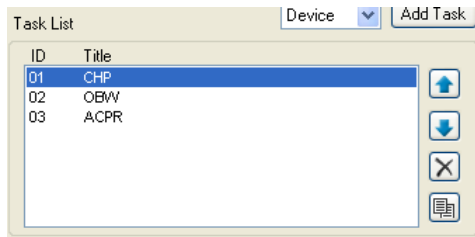


Figure 5. Task list

The task list can be easily edited:

- Click button and to move up or down the file
- Click button to delete task files
- Click button to copy files
- Double click the selected task file to rename the selected task

Edit the task description, start/stop message, report contents, and limits

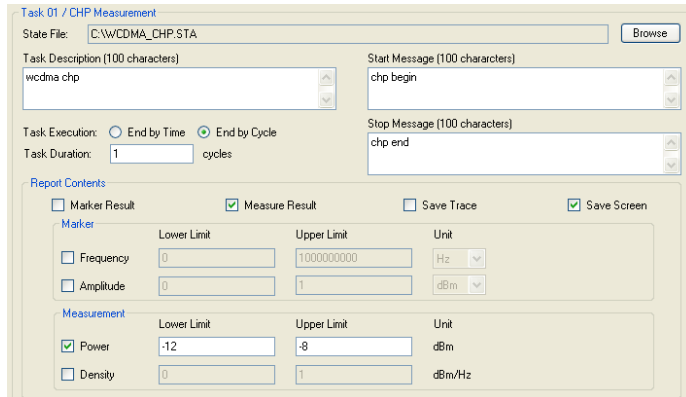


Figure 6. Edit a task

Note: Use the Task Description and Start/Stop message to give brief instructions to field engineer/technician on test setup.

Note: Task Execution can be ended by either Time or Cycle. If “End by Time” is selected, the unit of the unit of “Task Duration” is second.

Note: Four types of report content are provided:

1 Marker result

If this is selected, the N9342C will log the marker readout if the marker is enabled in the state file. The upper and lower limits can be set up for marker frequency and amplitude to indicate the PASS/FAIL of the marker readout.

2 Measure result

Measure result is only shown when the measurement is CHP, OBW, or ACPR. The upper and lower limits can be set up to indicate the PASS/FAIL of the measurement result.

3 Save trace

If this is selected, the N9342C HSA will save the trace (.TRC) at the end of the current task.

4 Save screen

If this is selected, the N9342C HSA will capture the screen (.JPG) at the end of the current task.

The following demonstration is on Test 1: Channel power (see Figure 6).

a) Task description:

- Select CHP in the task list
- Input “wcdma chp” in the Task Description box
- Input “chp begin” in the Start Message box
- Input “chp end” in the Stop Message box

b) Set Task Execution to “End by Cycle” and set Task Duration to 1

c) Set Report Contents as the following:

- CHP’s lower limit is -12 dBm and upper limit is -8 dBm

d) Select the task “OBW”

- Input “wcdma obw” in the Task Description box
- Input “obw begin” in the Start Message box
- Input “obw end” in the Stop Message box
- Set lower limit as 4 MHz and upper limit as 5 MHz

e) Select the task “ACPR”

- Input “wcdma acpr” in the Task Description box
- Input “acpr begin” in the Start Message box
- Input “acpr end” in the Stop Message box
- Set ± 5 MHz ACPR’s lower limit as -60 dBc and upper limit as -44.2 dBc
- Set ± 10 MHz ACPR’s lower limit as -60 dBc and upper limit as -49.2 dBc

Edit the Task Plan Description, Running Mode, and save the task plan

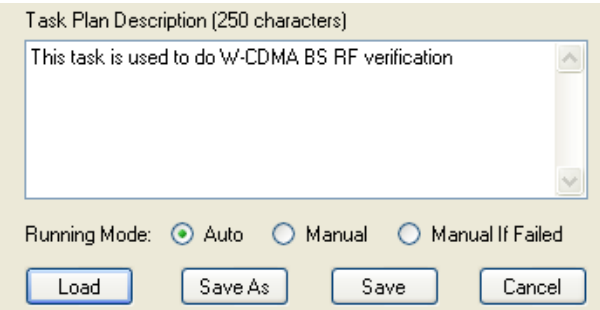


Figure7. Task plan running mode

Note: About running mode

There are three choices (see Figure 8):

1 Auto

Tasks are executed non-stop till all tasks are completed.

2 Manual

After one measurement task is finished, there is a measurement result report (Figure 8) and you can choose to:

- {Redo} Redo the current task
- {Next} Execute the next task
- {Skip} Skip the next task

3 Manual if failed

The measurement tasks are executed non-stop but if there is a failed result, e.g. passing the defined limit, it will enter "Manual" mode.

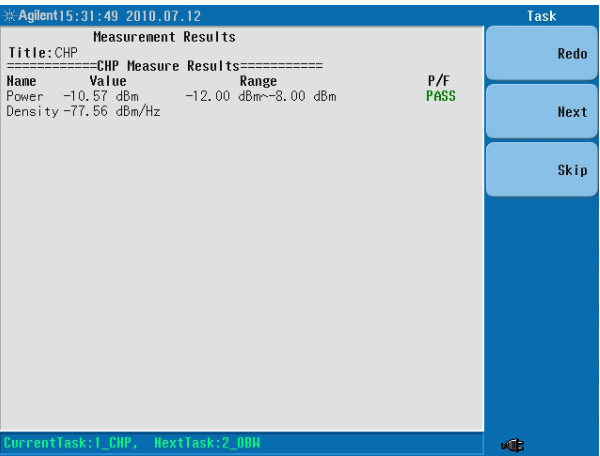


Figure 8. Task measurement result

A "Load" button is provided to load an existing *.TPF for future modification.

a) Input "This task is used to do W-CDMA BS RF verification" as the Task Plan Description

b) Select "Auto" as the Running Mode

c) Click the "Save as" button and save this file as: "W-CDMA.tpf". Close the "Task Plan Editor" dialog box

Step 2: Transfer the Task Plan File to the N9342C HSA

There are two ways to transfer the task plan file to the N9342C HSA: via a USB flash drive or using the N9342C HSA PC software. In this example we will use the USB flash drive to transfer the task plan file to the N9342C HSA. Note the task plan file needs to be placed in the “N934XDATA” directory in the USB flash drive. If “N934XDATA” does not exist, create one under the root directory of the USB flash drive. Insert the USB flash drive to the USB port on the N9342C and go to the next step.

Step 3: Run Task Planner

Instructions for N9342C HSA

Enter Task Planer

Load the task plan file

Run the task plan file (Figure 9)

Keystrokes for N9342C HSA

[Mode], Task Planner

[Directory], [Media Type], [USB], use the rotating knob to select file “W_CDMA.TPF”, [Enter]

{Run}

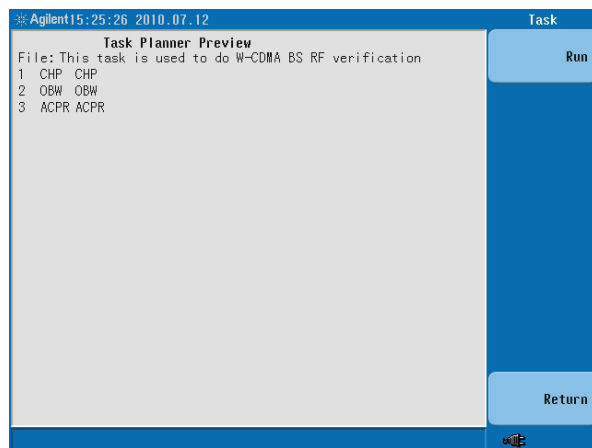


Figure 9. Task plan preview

Run task 1: Channel power

- Press [Enter] after the “chp begin Enter/Esc to Confirm” message appears
- Press [Enter] after the “chp end Enter/Esc to Confirm” message appears

Run task 2: OBW

- Press [Enter] after the “obw begin Enter/Esc to Confirm” message appears
- Press [Enter] after the “obw end Enter/Esc to Confirm” message appears

Run task 3: ACPR

- Press [Enter] after “acpr begin Enter/Esc to Confirm” message appears
- Press [Enter] after “acpr end Enter/Esc to Confirm” message appears

Read the report

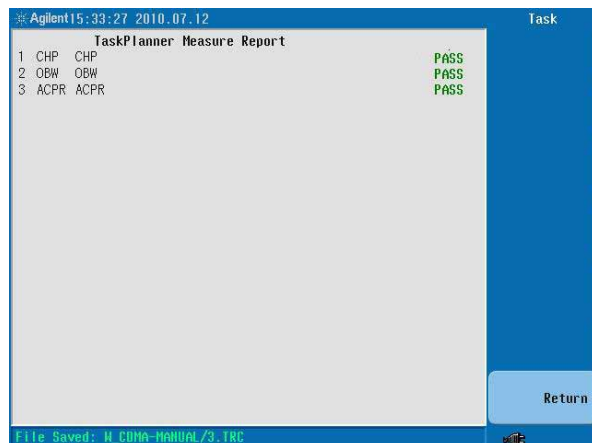


Figure 10. Task plan measurement result

The N9342C HSA automatically creates a folder whose name is the same as the task plan file name (for this demo, the directory is named as W_CDMA) to save all report contents, including a text report, screenshots, and trace files depending on the choices of report contents. The PASS/FAIL result is shown in the report

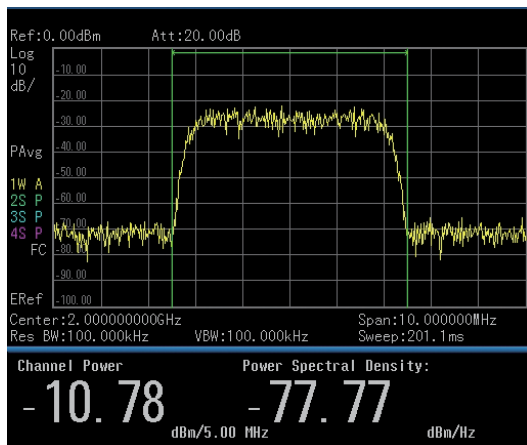


Figure 11. Channel power measurement result

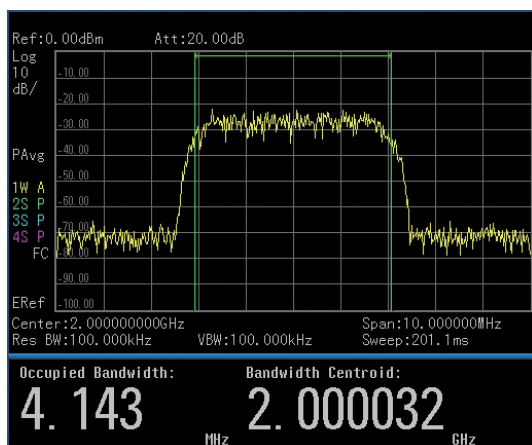


Figure 12. OBW measurement result

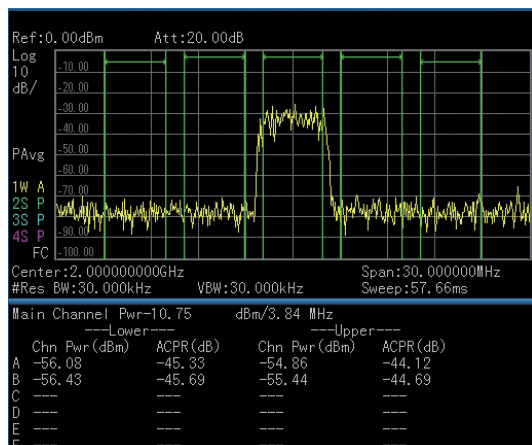


Figure 13. ACPR measurement result

Summary

The Agilent N934xC HSAs' Task Planner option is a great tool for making complex field measurements simpler to perform and faster to obtain. The Task Planner saves field engineers from tedious instrument setup and boosts work efficiency. It also offers a more effective operation model: an experienced field engineer creates the task plan file then distributes it to the less-experience field technicians. This allows technicians of any skill level to simply drive to the designated spot and run the Task Planner on the N934xC to make the measurements. With both the Task Planner and the built-in GPS receiver, the N934xC HSAs guarantee the RF measurements are made in the right way, at the right time, and at the right place.



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