Description and Manual

Verification Test Software
R&S® EVS-Z11

EVS-Z11 1329.8144.00

ROHDE & SCHWARZ

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History

Version	Date	Authors	State	Comment
01.00	2.7.2007	Breuer		First issue
01.10	6.8.2007	Breuer		Manual for Release 1.0 of the test software
02.00	01.02.2010	Breuer		Update for Test Software V1.27 Now also contains release notes for the software
02.10	20.1.2011	Breuer		Update for Test Software V1.30
03.00	26.11.2014	Breuer		Major rework for Test Software 2.00 System is renamed to EVS-Z11
03.01	23.11.2015	Breuer		Typos and corrections

1 Introduction

1.1 System Overview

The R&S EVS300 is a ILS, VOR and MB test receiver with a number of additional features. It is used to validate the installation of navigation aids installations from ground and air. The EVS300 offers an unreveiled sensitivity and accuracy even at extreme temperatures.

To maintain and prove the outstanding performance of the EVS300, verification on a regular basis is mandatory. This is common among high accuracy instruments and is a service which is offered by Rohde&Schwarz for all of its measurement devices.

The EVS-Z11 is a verification test system which enables the customer to do verification and correction of the EVS300 by himself.
The main task of the EVS-Z11 is to provide ILS/VOR/MB signals with an accuracy which is higher than the EVS300 itself. By reading the measurement results of the EVS300 and comparing the values with the generated signal the correct function of the EVS300 is proven.

The Vector Signal Generator SMW200A generates arbitrary signals with very high linearity and very low distortion. Avionic signals are calculated on the PC and can be generated with the required accuracy. While the predecessor of the EVS-Z11 needed a reference receiver (FMAV) to fine adjust the avionic signals, the SMW can go without.
The Power sensor is used to provide very accurate signal levels.
An additional step attenuator is used to provide the level accuracy for linearity tests below -30dBm, where the power sensor cannot follow.

1.2 Use of verification

For sophisticated measurement devices like the EVS300 a verification on a regular basis ensures that the measurement values are inside of the specifications.
The EVS-Z11 offers a fast and easy way to verify an EVS300. The generated report documents if the device under test achieves its specs or not.

1.3 Use of correction

Modulation parameters are usually inside limits, since the demodulation and signal processing is done digitally. If there is something wrong in the receiver hardware, this will affect all demodulation values. In the case of modulation parameters out of tolerance, R&S service for the EVS300 will be necessary.

The following corrections can be done:

1.) Level accuracy: This depends on correction tables stored in the EVS300 RF-Board. They contain the internal attenuations of the RF-Board and the levels of the comb generator. If the EVS300 level accuracy is out of limit, a new set of correction values will restore the accuracy.
2.) Frequency accuracy: The RF synthesizer on the RF-Board offers a possibility to fine-adjust the reference frequency.
3.) Overload Limit: The level which leads to an overload indication can also be adjusted from outside.
4.) MB modulation depth fine adjustment: Since Release 5.2 of the EVS firmware it is possible to store correction values for the MB measurements.

The EVS-Z11 can perform the process of generating new correction tables automatically. This enables the user to retight the above parameters if necessary.

2 System Setup

2.1 Security advice

The documentation of the measurement devices, e.g. SMW200, RSC and the PC, contain further security advices . They must be read carefully and must be taken in consideration while building and operating the system.

The EVS-Z11 is just a PC software. Its up to the user if the equipment is permanently mounted in a rack or just assembled on the desktop.

The components inside the EVS300 are sensitive to electrostatic discharge (ESD). The same applies to the measurement devices. There are no special ESD precautions necessary as long as all devices are closed, as the devices housing is build to resist any electrostatic effects. Still it's a good idea to operate the system in an ESD-compliant environment.

As soon as a device like the EVS300 is opened ESD precautions are absolutely mandatory.

2.2 Equipment

To build up the EVS-Z11 the following equipment is necessary:
(not part of the delivery with EVS-Z11)

| Equipment	Pcs.	R&S ident number
Signal Generator		
R&S SMW200A	1	1412.0000.02
– B10 Baseband + ARB	1	1413.1200.02
– B13 1 IQ RF Path	1	1413.2807.02
– B103 3GHz	1	1413.0004.02
Power Sensor	1	
NRP-Z98		1170.8508.02
Or		
NRP-Z81		1137.9009.02
R&S RVZ Splitter (only necessary for NRP-Z81)	1	0800.6612.52
Step Attenuator		
RSC	1	1313.8004.04
or		
RSP	1	831.3515.02
Cabling		
RF cable N-N	max. 2	
RF cable BNC-BNC	1	
N-N Adapter	1	0092.6581.00
LAN cable	max. 4	
LAN-switch min. 4 port	1	
NRP-Z4	1	1146.8001.02

Alternative Equipment:
The EVS-Z11 is designed and tested to work with the SMW200. Other generators like SMU, SMBV might work, but its not sure if they generate signals with the same accuracy. Therefore the use of other generators is mainly for demonstration purposes, and at the users risk.

A appropriate PC with Windows 7 operating system is required. Windows XP or Windows 8.1 are supposed to work, but are not tested and supported.
A National Instruments GPIB interface (PCI or USB) is only required when using an RSG or RSP with GPIB interface. However the NI Visa installation is required to start the software.

2.3 Cabling

RF cabling with NRP Z98:

LF Out 1 I   Baseband / Trigger in

NRP-Z98

RF cabling with NRP-Z81:

LF Out 1 I   Baseband / Trigger in
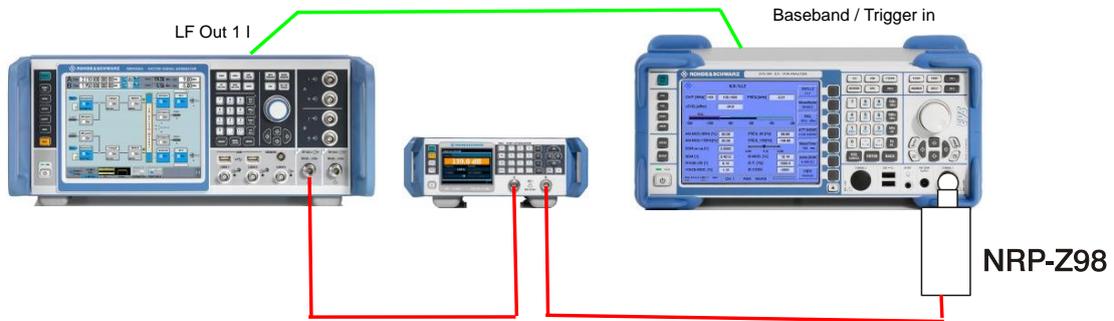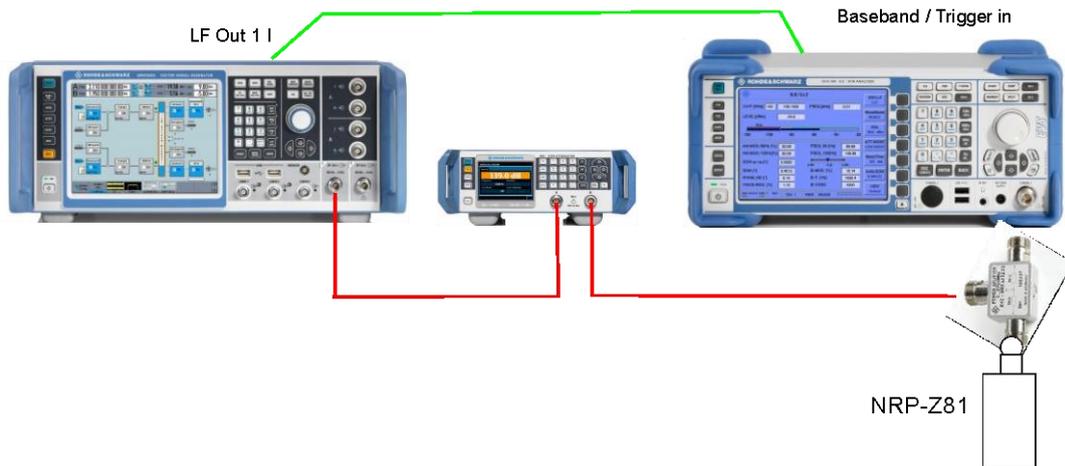
NRP-Z81

Note:
If no step attenuator is used, the NRP-Z98 or the RVZ is directly connected to the SMW.
If using the NRP-Z81 with splitter RVZ, there may be no cabling between RVZ-EVS and RVZ-NRP-Z81. Only the inevitable N-N adapter between RVZ and EVS may be present.

Data cabling:
PC, SMW200A, RSC and EVS300 need to be connected to the network switch.
The NRP Power Sensor is connected to the PCs USB interface using the adapter NRP-Z4.

2.4 Software installation

The EVS-Z11 CD contains the test software and the R&S NRP Toolkit. The National Instruments drivers are available on the internet at www.ni.com for free, but you may need to register before you are allowed to download. When you buy NI products like the USB-GPIB-adapter, they are usually on the CD.

On a new installed windows system the installation shall be done this way:

1. Install NI 488.2 driver.
   This is the driver for the GPIB interface. Installation includes the CVI runtime engine, which is needed by the EVS-Z11 as well.
2. Install NI-VISA
   This is a software layer for controlling measurement devices which is used by the EVS-Z11
3. Install the R&S NRP Toolkit. This is the USB-device driver which is required for the NRP-series of power sensors. It is absolutely necessary to install the NRP-Toolkit, even when using a different power sensor. The EVS-Z11 application will not start without.
4. The EVS-Z11 software comes as a ZIP archive without automatic installation. Unzip all files and folders in a directory. It is recommended that the directory does not contain spaces, for example c:\EVS_Z11. Create a shortcut to the desktop

To uninstall the software, just delete the folder.

Test reports and logfiles are generated in c:\EVS_Z11, that means a drive c: must be present on the PC. Only the 100 latest logfiles are kept, but the reports are not deleted automatically. It is the user responsibility to make backups of the test reports if necessary and to delete reports if the disk is running out of space.

3 Verification Software

3.1 Introduction: The EVS-Z11 Test Sequencer

The test instruction of the EVS300 describes a certain number of tests to calibrate the device. Measurements with a signal generator are performed, reference receiver and power sensor are made, and the measurement results of the EVS300 usually have to be inside the limits described in the test procedure.

The EVS-Z11 verification software automates this process:
- contains a database of all test steps and data
- executes one test step after another (Sequenzer)
- makes settings on measurement devices and on the EVS300
- reads, calculates and compares results
- generates a test report

The software is designed to be operated as easy as possible. The user just needs to take care that the EVS300 is properly connected and switched on, and that a TCP/IP-connection to the EVS300 is possible. He can run a full test or select only certain test steps. The sequence can be performed several times ("loop") to watch the EVS300 behaviour over time or temperature. The test itself is running without any user action required. The test report contains the devices inventory data and the result of all test steps.
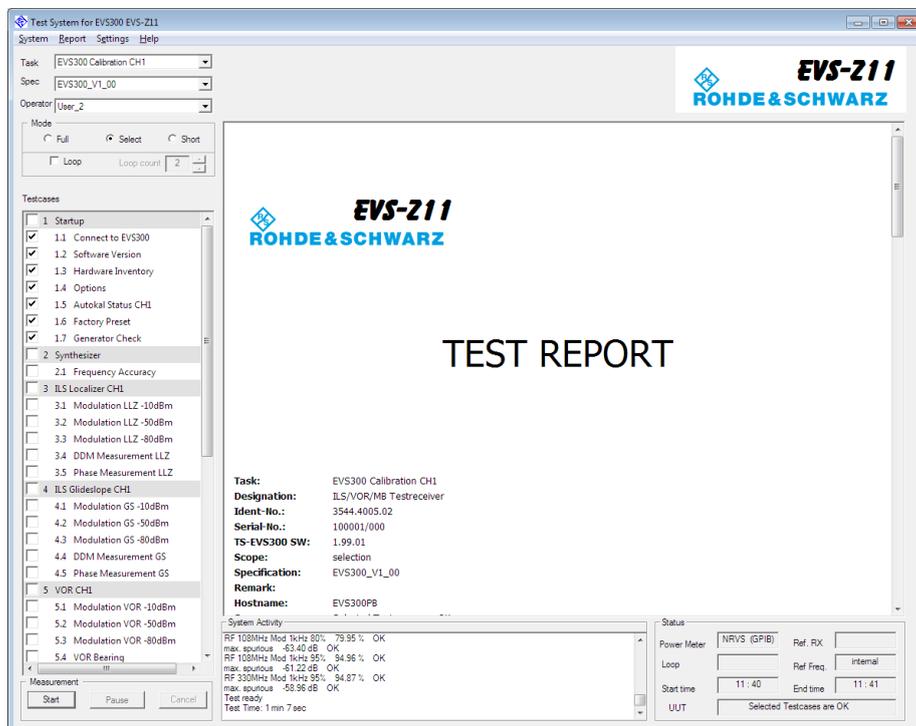

The user interface of the software consists of the standard windows control elements, like bottons, drop-down boxes checkmarks etc.

3.2 User Administration

Each report should contain the name of the operator who was doing the test. The EVS-Z11 software offers a tiny operator database which prevents the user from typing his name for each test.

Menu: Settings → User Administration
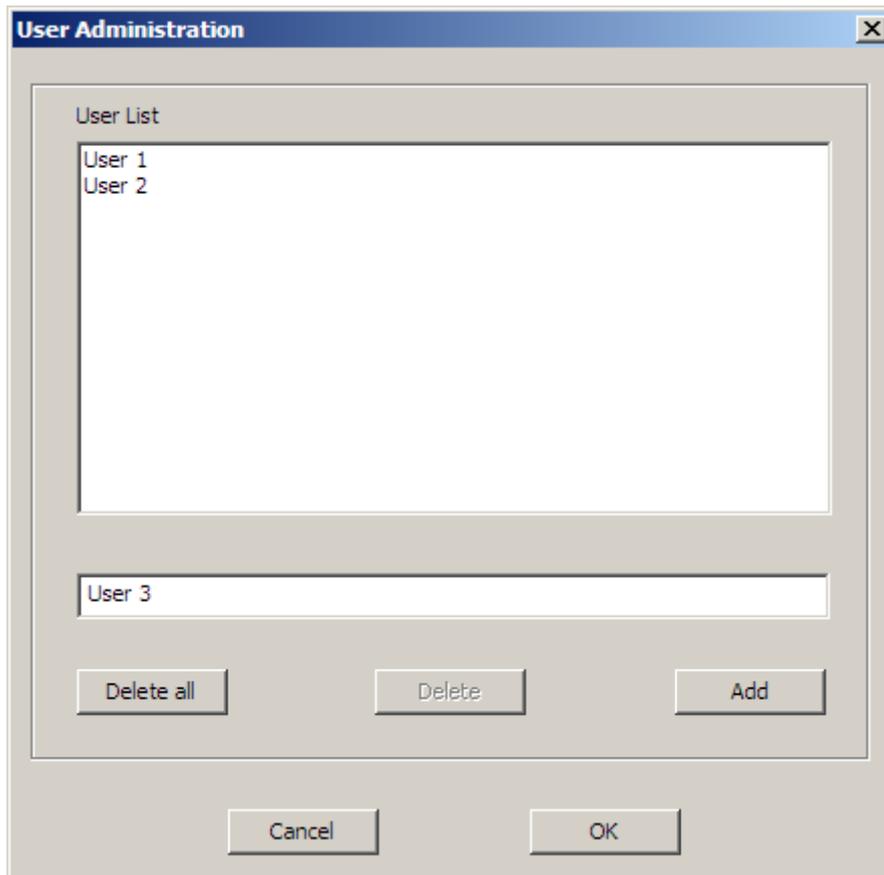
User List: list of all names stored in the database

Button "Add": Name in the edit box is copied to the database

Button "Delete all": Clear entire database, no entry is left

Button "Delete":remove the name in the database which is marked

Button "Cancel": leave this dialog without saving changes

Button "OK": leave this dialog and save changes

The list of names is offered in the drop down box "Operator" on the main window, where you shall select a name before running a test:
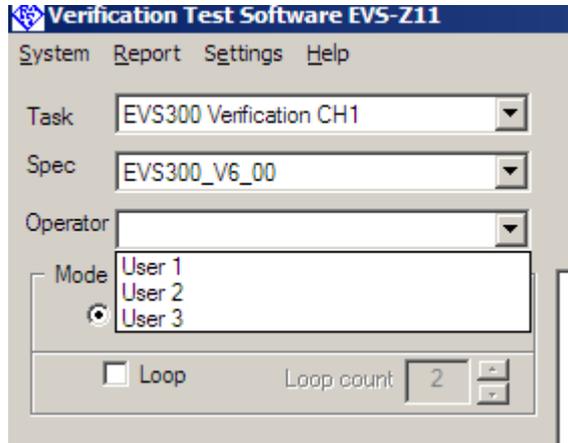

The name is quoted in the test report:
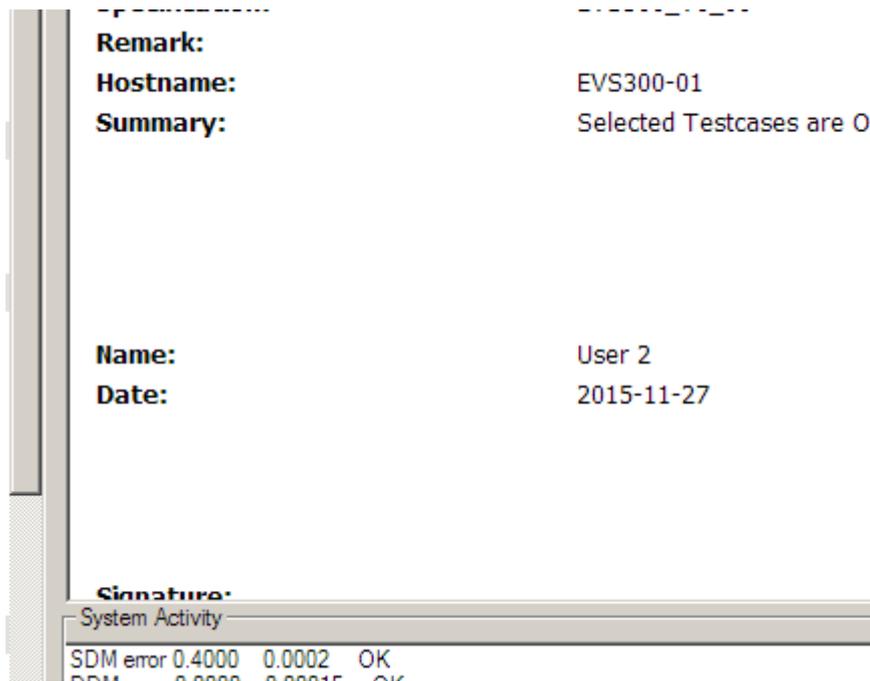
Beside of that, the operator name has no deeper meaning. There is no such thing as password protection or user privilege levels. Its just the name for the report.

3.3 Network Setup

Usually the correct network configuration is automatically configured by a DHCP server. If connected to a larger network, there should be a DHCP server present. Even small networks with some kind of router will propably have a DHCP server. In this case, all network equipment (SMW, RSC, EVS, PC) shall be set to DHCP. You may need to have a look in the instruments setup to find out which IP they actually have.

If DHCP is not available you need to use static IPs. See the instruments manual to find out how to set statical IPs. For TCP/IP connections it is necessary that the device and the PC share the same subnet; that usually means the first parts of the IP must be equal.

To change an IP address in MS Windows , go to "Network Connections"
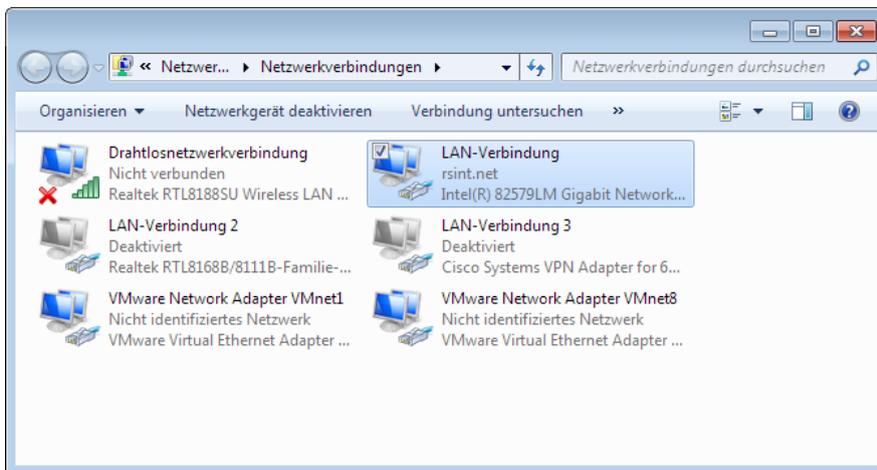
Select your network adapter, press right mouse button, properties:
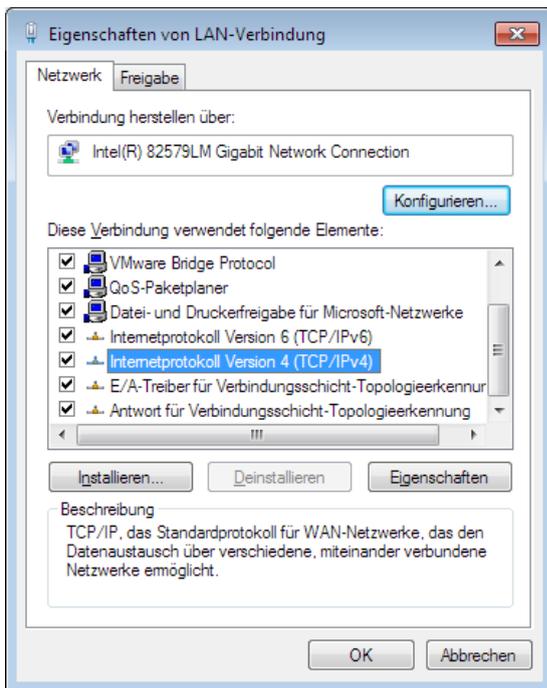
Double click on TCP/IP v4:
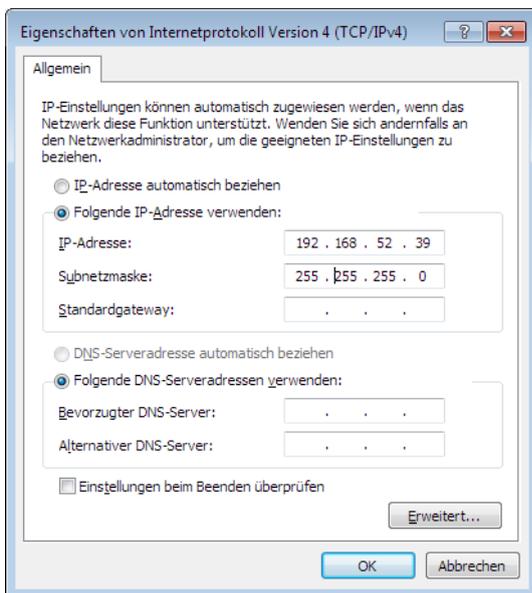
In this example, the PCs IP is 192.168.52.39, netmask is 255.255.255.0
So you may set the other network equipment to addresses like:
SMW200A: 192.168.52.40
RSC: 192.168.52.41
EVS: 192.168.52.50
Just make sure that only last number differs and no address exists twice in the network.

If unsure or if you are working on a corporate network, better ask your network administrator.

3.3.1   Menu: Settings → Devices
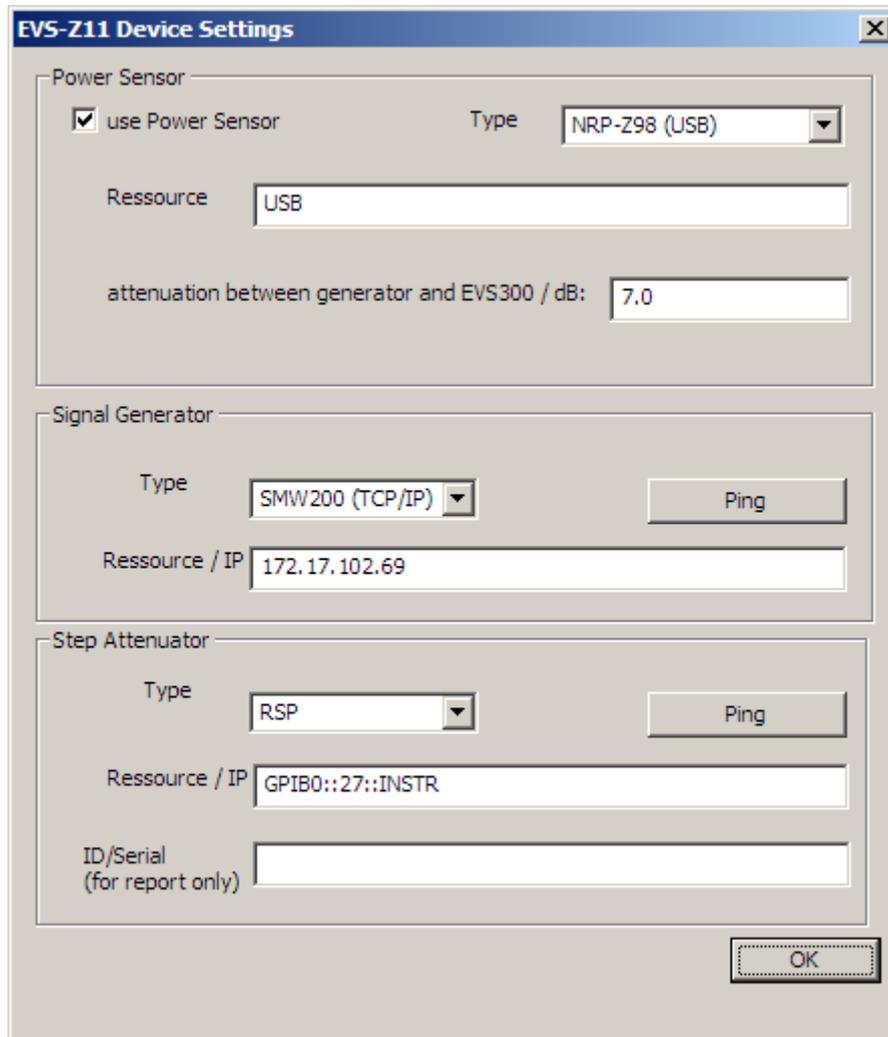
Power Sensor:
Checkmark "use power sensor":
The power sensor is necessary to provide RF signal levels with high accuracy. Without Power sensor, level verification does make only little sense. However, a rough check of the EVS300 levels may be done without power sensor.

Drop-Down-Box "Type":
Type of the power sensor. The NRP-Z98 is especially suited for this kind of utilization because of the integrated splitter.

The EVS-Z11 is only tested and qualified with a NRP-Z98 and NRP-Z81. Other sensors or power meters may appear in the selection, but they are only provided for research and testing purposes. There is no guarantee that other sensors are working with the EVS-Z11.

Ressource:

Ressource string for the power sensor: Only use the keyword "USB" for the NRP-type sensors.

Edit box "attenuation between generator and EVS300":

With the standard setup (see "cabling") you will have this signal path:

Generator → RSC@0db → NRP-Z98 (-6dB) → EVS300

This results in approx. 6..7dB attenuation. This value is used as start value when the level is fine adjusted using a power sensor. This value shall not differ more than approx. 3dB from reality. The more precise this value is, the less level adjustment is necessary, so this can also be used to speed up the test procedure.

A good estimation of this value can be done by connecting an EVS300 to the system, generate a signal of 0dBm with the generator, set the step attenuator to 0dB, receive the signal with the EVS300 and note down the received level. While the received level is negative, enter the positive value as attenuation.

When working without power meter this value and the signal generators setting are the only hints about the RF-level at the EVS300. In this case the attenuation is more important.

Signal Generator

The system is designed for an SMW200A.

The EVS-Z11 is only tested and qualified with a SMW200A. Other generators may appear in the selection, but they are only provided for research and testing purposes. There is no guarantee that other generators are working with the EVS-Z11,

Ressource:
TCP/IP address of the SMW200A. No other types of connections are supported, since the test needs to transfer large amounts of data to the generator.
The Button "Ping" may help to establish a connection to the generator. The button will change its label when pressed:

Ping   changes to   Ping - OK   or to   Ping - no reply   .

When there is no reply, check the network and TCP/IP settings.

Step Attenuator

Type:
Select RSP or RSC.
The selection "SMW200A" means that we use the internal step attenuator of the generator. An additional step attenuator is not necessary, but the accuracy for level linearity might be worse.

Ressource:
RSC : Just type in the TCP/IP adress. The ping-button can be used like described above.

RSP: This older step attenuator requires GPIB. The VISA-Ressource-String for this devive needs to be used :
GPIB<adapter>::<device address>
Typical example: GPIB0::27::INSTR

If no step attenuator is used the entry has no meaning.

ID/Serial:
The RSP step attenuator has no possibility to read out the ID or serial number.
The numbers shall be entered here, so they will be written to each test report.
For RSC step attenuators this setting has no meaning.

After doing the settings press the OK-button. The settings will be stored in the "user.dat" file, which is located in the programs directory.

3.4 Test Preparations

At first there are a few decisions to be made before the test can be started

Select the task:
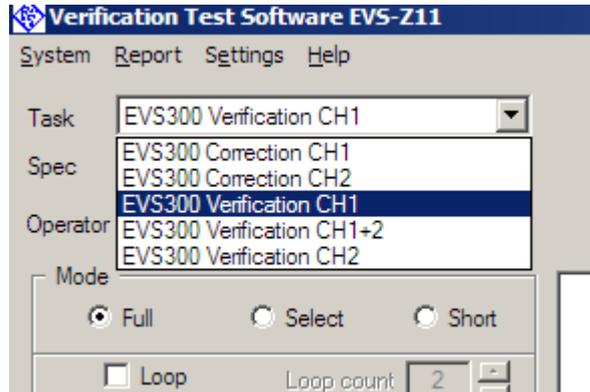
Choose if the system shall do verification or generate a new set of correction values. For EVS300 devices with no second channel, always choose CH1.
2-channel EVS300 can do a verification for the second channel or with both channels at once. This requires that the user changes the RF cable during the test procedure.
Correction always must be done seperatly for each channel.

Select the specification:
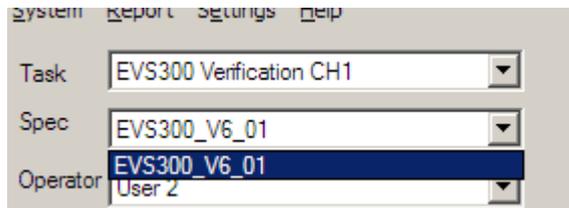
The Performance of the EVS300 may differ depending on the hardware or software version, which is published in different version of the datasheet. With the choice of the specification the user selects the datasheet which matches to the EVS300 under test.

In case the chosen specification does not match to the EVS300 under test, this will be indicated in the test report. The readout of the SW version indicates "fail".

Possibly there is only one version available.

Select the operator:
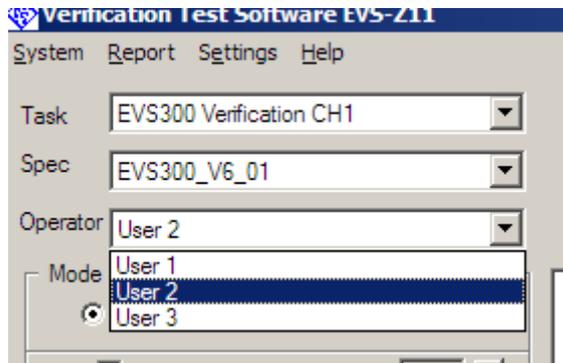
Selecting an operator name is optional, but recommended.

Select the test mode:
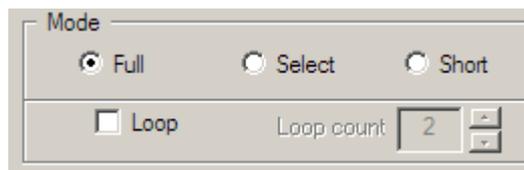
Choose between Full, Short, Select an automatic test.

- Full test: All test points are performed
- Short: A fixed selection of the most important tests are performed
- Select: The user may select which tests shall be done

If the user activates the "loop"-checkmark, the whole test will be repeated as often as the loop count indicates. The report will contain all results of all loops.

Select testcases:

If the user has chosen the "Select" test mode, it is possible to select and unselect the desired testcases:
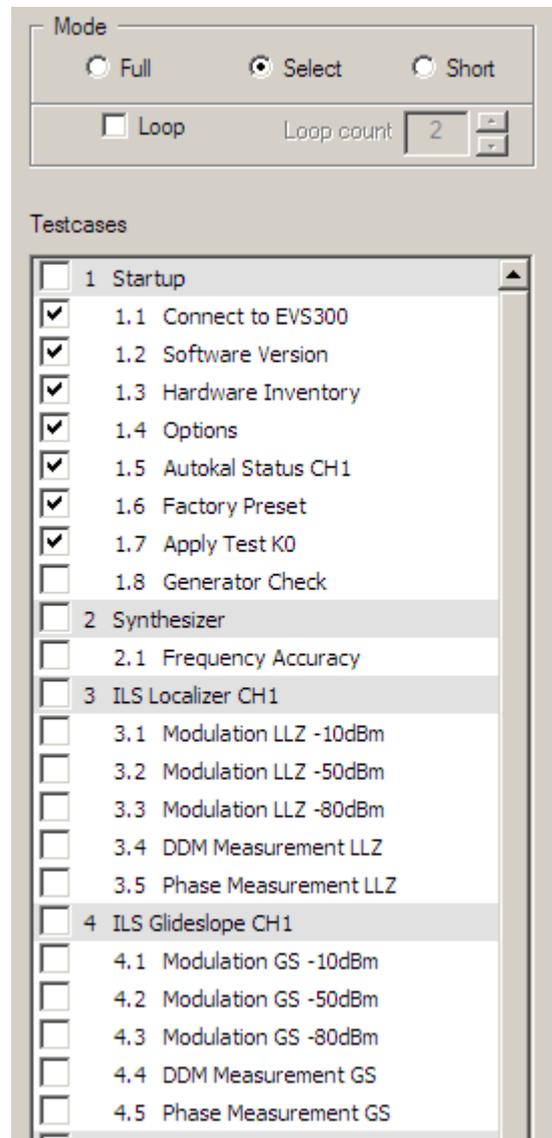
Most tests can be selected at the users demands. However, there are a few testcases at the beginning which can never be deselected. These are "mandatory" test cases, which are required to run the following tests – for example to establish the connection, or to set the device to factory preset.
There may be other testcases who are dependent from each other. For example the "Modulation LLZ" at -50dBm require that the measurement at -10dBm was also done.
In that case the necessary testcases are automatically marked and cannot be deselected.

3.5 Run a test

Press the start button!
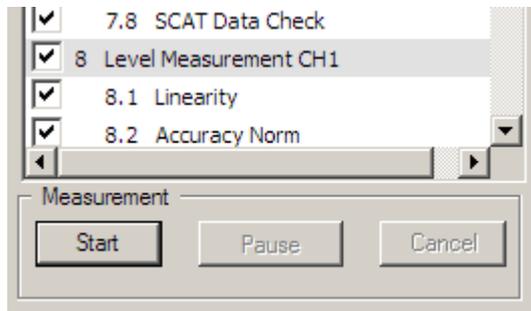
A message box appears and reminds you to properly connect, switch on and boot the EVS300:
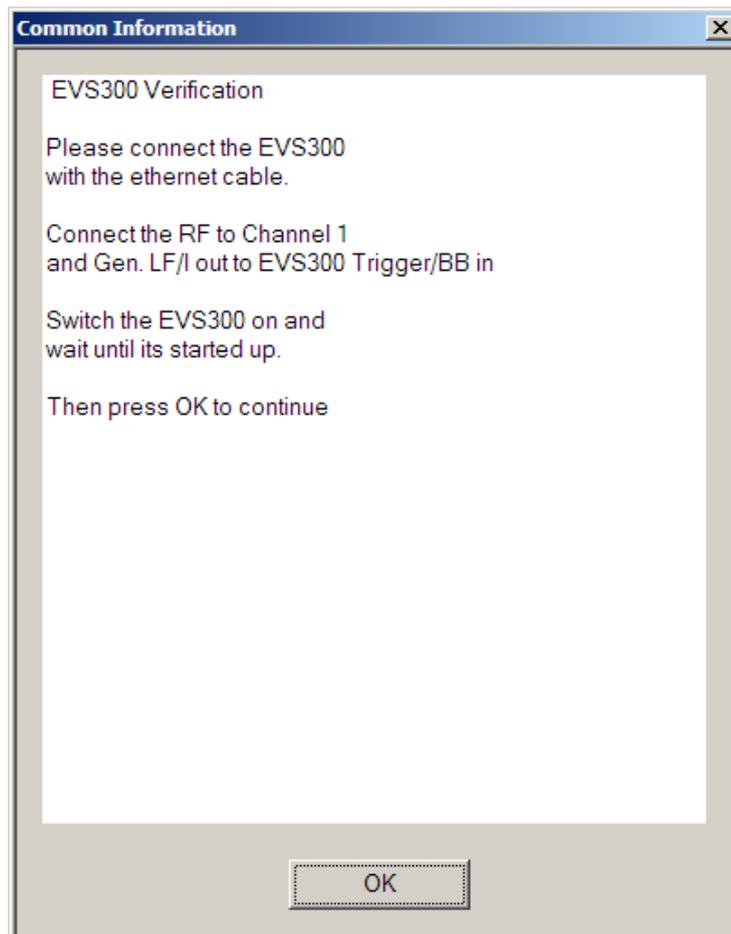
If you have not already done so, please do it now. Wait until the EVS software is running and the display is showing measurement values. Then press OK.

Another message box appears and asks you to enter the TCP/IP-adress of your EVS300 under test:
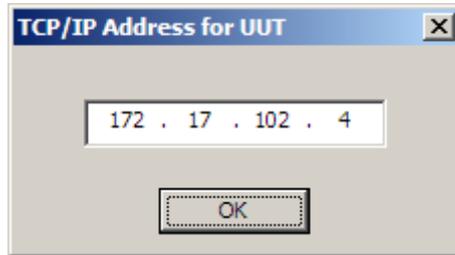
The message box is initialized with the TCP/IP address from the last test. If it fits, just press OK. Otherwise please enter the correct address of the EVS300. Then press OK!

Yet another message box offers the possibility to type in an arbitrary remark. It will be written on the title page of the report.
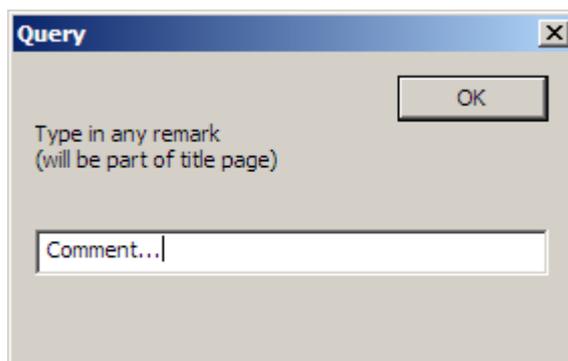
No matter if you entered some text or not, please press OK.

Now the test is running.

You can observe the systems action in the status window, where an stream of messages indicates that the system is working.
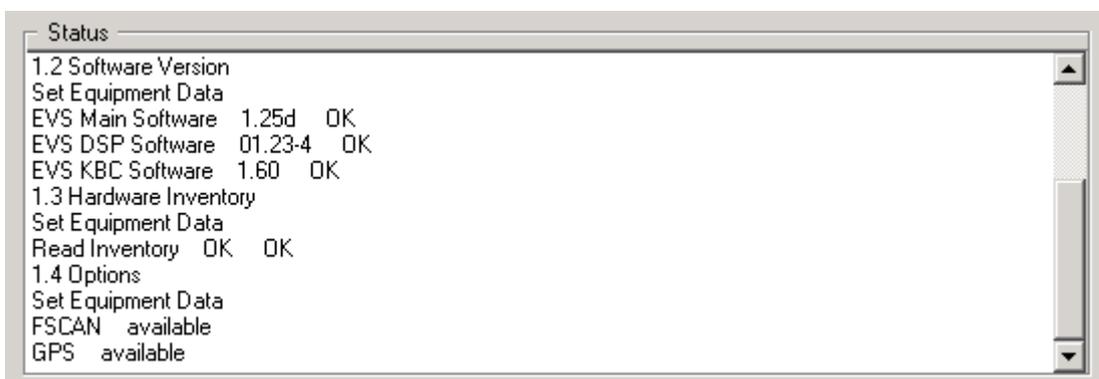
It is also possible to watch the report, which is always updated and automatically scrolled down.

The test will automatically run until its finished, or if some user interaction is required.
In case you decide to interrupt the test, press the cancel button. The system will stop as soon as possible, which might still require some time. The last test step will propably be invalid.
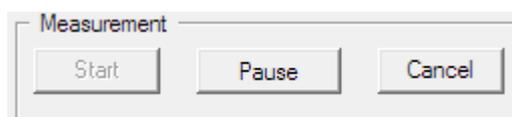
Pressing the "Pause" button will cause the system to stop before doing the next measurement. This is a frequently requested feature that can be helpful for troubleshooting. While the system is in "Pause", the EVS300 and the measurement equipment can be operated manually, or the measurement result can be observed for some time. The "Pause" button is labelled "Continue", and by pressing it again the test procedure will proceed.

Be carefull: if the settings of EVS300 or measurement equipment is changed, the measurement results are propably falsified. There is nothing implemented to avoid this, so it is highly recommended to use the "pause" button only for troubleshooting.

In case of errors the test sequence will be cancelled. In this case a message box appears and displays an error message.
This error message contains the device which is causing the problem and possibly some hint how to solve the problem.

3.6 Test Reports

Test Reports are generated during the test as html-file and stored in c:\EVS_Z11\reports.
On the title page they contain (example):

Task:	EVS300 Verification CH1
Designation:	ILS/VOR/MB Testreceiver
Ident-No.:	3544.4005.02
Serial-No.:	100001/000
EVS-Z11 SW:	1.99.01
Scope:	selection
Specification:	EVS300_V1_00
Remark:	
Hostname:	EVS300PB
Summary:	All Testcases OK

The task and scope are taken from the settings during test preparation. Designation and Ident-No. is always given as quoted above, since the EVS300 is the only unit under test for this test system. The serial-no. is read from the device itself and should match the one on the sticker at the back of the EVS300. If this does not match, please contact Rohde&Schwarz.

The version number of the EVS-Z11 testsoftware is also quoted for later reference.

Specification is the name of the specification or datasheet version that was selected for the test.

The Remark contains the text that was entered (or not) at the start of the test.
The hostname is the EVS300 hostname, as entered in EVS300 Setup->RemoteControl. The idea is to configure the hostname with something like the airport name, so the EVS300 and the report are easier to identify.

The Indication "All Testcases are OK" means that no value is out of limit and that the verification was completely successful. Otherwise there will be an indication about how many tests failed.

Name: User 2

Date: 06-23-2015

Signature: _____

Operator name, date and space for a signature shall help to track who was doing the test.

The second page starts with a summary of the equipment:

Equipment

Signal Generator: Rohde&Schwarz,SMW200A,1412.0000K02/101223

Last internal adjustment: "2015-03-05"

Power Sensor: ROHDE&SCHWARZ,NRP-Z81,101689,01.35

Step Attenuator: ROHDE & SCHWARZ, RSP,0,1.1 100105

The serial numbers of generator and Power Sensor are read from the devices. For the SMW200A there is also the date of the last full internal adjustment, which shall be done at least every 100 days.
The Step attenuators RSG and RSP cannot read out their serial number. Information is taken from the Settings-> Devices window, please take care that the correct number is entered.
If the SMW200A internal step attenuator is used, the report just quotes "generator internal"

After this the tests start. It is structured like this:

Test Group: One headline which belongs to several testcases which belong together but are different in the kind of measurement.

Test Case: Number of test points which are similar in their measurement butt differ in at least one parameter

Test Point: One single measurement, producing one output value.

For example: The Test Group is Level Measurement:

7 Level Measurement CH1

It contains 2 testcases:

7.1 Linearity
7.2 Accuracy

The „Linearity" contains several testpoints:

Text	Limit	Tolerance	Result
0dBm	-0.5 ... 0.5 dBM	-0.3 ... 0.3 dBm	-0.1 dBm OK
-10dBm	-10.5 ... -9.5 dBm	-10.4 ... -9.7 dBm	-10.0 dBm OK
-20dBm	-20.5 ... -19.5 dBm	-20.4 ... -19.6 dBm	-20.0 dBm OK
-30dBm	-30.0 ... -30.0 dBm	-30.0 ... -30.0 dBm	-30.0 dBm OK

-40dBm	-40.5 ... -39.5 dBm	-40.4 ... -39.6 dBm	-39.9 dBm OK
-50dBm	-50.5 ... -49.5 dBm	-50.4 ... -49.6 dBm	-50.0 dBm OK
-60dBm	-60.5 ... -59.5 dBm	-60.4 ... -59.6 dBm	-59.9 dBm OK
-70dBm	-70.5 ... -69.5 dBm	-70.3 ... -69.7 dBm	-70.0 dBm OK

Every testpoint contains its name, which may only make sense together with the testcases name and settings. The limit values are taken from the EVS300 test instruction. The system must prove that the values are inside of this limits; unfortunately the system itself has a certain accuracy. This is taken into account in the "Tolerance" column, which quotes the limits together with the systems accuracy (Tolerance = Limits – Meas.uncertainty). Only if the resulting value is inside the "Tolerance", the testpoint is rated OK.

3.7 Logfiles

In c:\EVS_Z11\logfiles a textfile for every test will be generated. It contains all kind of settings and remarks about the communication flow between the PC and the devices. These information is intended for R&S in case of problems. They do not contain any valuable information for the operator.

3.8 Directories

The standard directory for reports and logfiles is c:\EVS_Z11\, assuming that all PCs have a drive c: and have write access.
If there are reasons to use another directory, this can be changed in the configuration file setup.dat:

```
[Settings]
Logo = R&S.bmp
SYSTEM = EVS-Z11
; Absolute report path!
Report Path = c:\EVS-Z11\Report
Logfile Path = c:\EVS-Z11\Logfile
Max Logfiles = 100
Loop max = 100
```

4 Test Description

This chapter shall give a brief introduction what is tested with the EVS-Z11 and how the results can be interpreted.
Before any measurements starts, the system tries to initialize all the needed equipment. If any of these devices is not present or not properly configured, an error will be indicated and the test wont start.

The EVS300 shall be running for at least 10 minutes to ensure a evenly spread temperature.
A autocalibration shall be done at a similar temperature not too long ago. If unsure, run a new autocalibration before running the verification.

" 1.1 Connect to EVS300"
First of all, the system tries to establish a TCP/IP connection to the EVS300. Without this connection, the system cant do anything and the test will abort. If this step fails, check the network connection and make sure that the PCs and EVS300 network addresses are inside of the same subnet.

" 1.2 Software version"
It is mandatory that the EVS300 is equipped with the according software. Older software may not be supported by the EVS-Z11. However, the test will continue if the software does not match.

" 1.3 Hardware Inventory"
Inventory is the collection of serial and identnumbers to identify the EVS300 parts. The fact that it could be read is a test for itself. If successful, the inventory table is quoted.

" 1.4 Options"
Gives a list of options which are available in this EVS300. This is not a matter of pass or fail – the test will be OK for an EVS300 with no options at all. The list is just part of the report for later reference.

" 1.5 Autocal Status"
This indicates if a valid autocalibration is present in the EVS300. A comment shows how old this calibration is, the mainboard temperature during autocal and the current mainboard temperature. The system does not evaluate this, but if the calibration is old or if the current temperature has a big difference, this may lead to a less precise level measurement on the EVS300.

" 1.6 Factory Preset"
All settings are set back to default. This is usually done when a device is remote controlled to ensure a consistant behaviour of the device. If you have certain settings made which shall not be lost it is recommended to save the settings to a user preset and recall them after test.

" 1.7 Generator Check"
This is a test of the SMW200A generator. The EVS300 is operating in FFT mode and measures the modulation depth of an AM signal as well as the maximum spurious. This test will only pass if both generator and EVS300 are OK. This test will use the FFT even when the EVS300 does not have the FFT option. However this is only possible for EVS300 SW Release 5.3 and above. Older SW releases without FFT will skip this point.

4.1 Verification

"2.1 Frequency Accuracy"
Frequency Deviation of the internal reference oscillator.
If this value is slightly out of limits, a new set of correction values will help.

"3.1 Modulation LLZ -10dBm"
"3.2 Modulation LLZ -50dBm"
"3.3 Modulation LLZ -70dBm"

The generator produces a clean ILS LLZ signal with SDM=40% and DDM =0%. The EVS300 measures the DDM, SDM and the modulation depth of the 90Hz/150Hz signal. This must work at different input levels.

"3.4 DDM Measurement LLZ"
An ILS LLZ signal wit different DDM values is produced. The EVS300 must prove that he identifies the changes in DDM.

"3.5 Phase Measurement LLZ"
Phase between 90Hz and 150Hz is observed.

"4.1 Modulation GS -10dBm "
"4.2 Modulation GS -50dBm "
"4.3 Modulation GS -80dBm "
"4.4 DDM Measurement GS "
"4.5 Phase Measurement GS"
Similar measurements are done with a glideslope signal.

"5.1 Modulation VOR -10dBm"
"5.2 Modulation VOR -50dBm"
"5.3 Modulation VOR -80dBm "
The modulation parameters of the VOR signal are observed at different input levels.

"5.4 VOR Bearing "
Bearing ist the main VOR signal parameter. It is tested with several bearing angles.

"6.1 Modulation MB -10dBm "
"6.2 Modulation MB -50dBm "
"6.3 Modulation MB -80dBm "
The Marker Beacon Analysis is tested at different input levels.
In case the modulation depth at 95% is slightly out of tolerance it is possible to generate and store correction values (starting with release 5.2).

"7. GBAS"
The GBAS and SCAT option is enabled temporarily during the test (EVS SW release 5.3 and above). For older devices which do not have the GBAS option this tests are skipped.

"7.1 GBAS Level LD "
"7.2 GBAS Level NO"

The Level accuracy at 30dBm are measured for low distortion and norm. It is not measured in low noise, as low noise does not cover -30dBm.

"7.3 GBAS Level Linearity"
Level is measured from 0dBm to -90dBm in 10dB steps. -30dBm is the reference, so the result is always 0.00dB deviation. For all other levels the deviation from the expected value is shown.

"7.4 GBAS Sensitivity"
Level is decreased until the GBAS signal can no longer be properly decoded. The level value is taken as sensitivity.

"7.5 GBAS Freq"
GBAS Carrier frequency is varied by + / - 2kHz.

"7.6 GBAS noise floor"
Level measurement without a signal at frequencies 112 .. 118MHz . Please note that the limit (-110dBm) is a little bit higher than the specification value (-115dBm) as the specification is a typical value. Single level values may be higher.

"7.7 GBAS Data Check"
A check if station ID, transmission length, message block IDand the FECs can properly be decoded.

"7.8 SCAT Data Check"
The same test as 7.7 with a SCAT compliant signal.

"8.1 Level Linearity "
A level linearity as low is 0.5dB is given in the EVS300 specifications.
A reference level is measured at -30dBm. Now the level is varied in steps of 10dB to levels above and below -30dBm. The reading may never differ more that 0.5dB from the expected value.

"8.2 Level Accuracy "
A level accuracy as low is 0.8dB is given in the EVS300 specifications.
That means that the reading may never differ more than 0.8dB from the inserted level.

"9.1 Baseband "

This testcase needs a BNC-BNC connection from the signal generators LF OUT1 to the EVS300 trigger / baseband input.
The first testpoint uses the input as a trigger input and expects to receive approx. 400 trigger inputs during one second.
The second testpoint uses the input as baseband input and expects to receive a 40% signal.
For old units which do not offer the baseband input this testcase will always indicate a failure.
"10.1 Factory Preset"

At the end of the test procedure the EVS is set back to default values.

4.2 Correction

The modulation parameters are calculated by a DSP. If there is a value out of tolerance, this usually indicates a fault in the RF-board.
Level and Frequency measurements depend on the set of correction values. If these values are slightly out of tolerance, generating a new set of correction values will help. The level measurements also depend on the autocalibration; in case of errors, it might help to run another autocalibration.

Generating a new set of correction values permanently modifies the EVS300s frequency and level accuracy. It shall only be done if necessary.
Before starting the procedure the EVS300 must be running for at least 30 minutes to warm up. An average environmental temperature of 20°C is recommended. After the procedure a verification shall be carried out to verify if it was successful.

"1.6 Read EEPROM"
The content of the EEPROM is read from the EVS300. This is the basis for the modifications. If the reading fails, the test will cancel.
A copy of this file will remain in c:\EVS_Z11\report. The Filename ends with …CorIn.txt.

"2.1 Frequency Accuracy"
Generates a new correction value for the fine adjustment of the internal reference oscillator. Make sure that the generator itself is calibrated. If available, use a external frequency standard.

"3.1 Overload Level"
The overload indication depends on a limit value. During this measurement, the limit is aquired.

"4.1 Signal Path Norm "
"4.2 Signal Path Low Noise "
"4.3 Signal Path Low Distortion"
This is the first part of the level correction. These measurements aquire the internal attenuation of the signal path over frequency. This must be done 12 times, taking into consideration the 3 attenuator mode and the 4 preselectors (75Mhz, 108 .. 118Mhz, 320..340Mhz, Bypass).
The signal path values are used when the EVS300 is working without autocal values ("Clear Cal."), and they are also needed during the autocal procedure.
The values may differ up to 8dB from the expected value. If the difference is greater, this indicates a fault in the RF-board. In this case, this step will indicate an error.

"5.1 CombGen Norm "
"5.2 CombGen Low Noise "
"5.3 CombGen Low Distortion"
The comb generator is our ultimate source of level accuracy. For every set of signal path attenuations, there is a according set of Comb generator level. It is necessary that both set of values are made with little time inbetween. The environmental temperature during the whole procedure shall not change.
Just like the signal path, the comb generator levels have tolerances up to 10 dB. If the limits are exceeded, this indicates a hardware problem with the RF board.

"6.1 MB fine adjustment factor"
Since EVS300 SW release 5.2 it is possible to increase the MB modulation depth accuracy by adding a correction factor.

"6.2 save MB factor"
The factor is stored in the EVS300 controller.

"7.1 Write EEPROM"
At the end of the procedure the new set of correction values is stored as a file in c:\EVS_Z11\report. It is automatically converted into binary format and transmitted to the EVS300. The EVS300 shall now be restarted, and the new values are active.
The step 7.1 is not "mandatory" if working with a test selection. If the correction is not made completely, it is not advisable to use this set in an EVS300. However, it is possible to write this content back, but at the user own risk.
If this step is not selected, the whole procedure has no effect on level or frequency. In case of errors during the procedure, the new EEPROM content will not be written to the EVS300 to avoid working with invalid correction values. It is very likely that a device which is showing errors during correction will show errors during verification as well.

5 Software Release Notes

This chapter provides information about the different versions of the test software, their development and changes.

5.1 Testsoftware V 1.00

Release Date: 10.8.2007

General remarks:

This is the first official release which was used during the factory acceptance procedure.
Supports EVS300 SW Release 2.2, 3.0, 3.1, 3.2, 3.3

Functionality:

-   Verification for single channel EVS300:
    ILS, VOR, MB, Level accuracy, Level linearity
-   Correction for first channel of the EVS300:
    Frequency accuracy, Overload Limit, Signal Path, Combgenerator

5.2 Testsoftware V 1.11

Release Date: 23.04.2008

General remarks:

This release solved the most urgent customer demand for a possibility to enter the reference receivers special calibration.
Supports EVS300 SW Release 3.0, 3.1, 3.2, 3.3

Functionality:

-   Verification for dual channel EVS300
-   The "Special Calibration" values of the FMAV reference receiver can be stored with the software. The values are used during the measurement, so they increase the accuracy of the reference receivers measurements.
-   Measurements of DDM, SDM, Phase, Bearing and Modulation Grade no longer show the absolute value, but the deviation from the reference receivers result.
    This makes evaluation and comparison of results easier.
-   Measurement of baseband input
-   Possibility to add a remark at the beginning of the test, which appears on the reports title page.
-   Autocal Status at the beginning of the report
-   Possibility to select EVS300 as a reference receiver

5.3 Testsoftware V 1.22

Release Date: 10.07.2008

General remarks:

This version was released after a customer visit.
Supports EVS300 SW Release 3.0, 3.1, 3.2, 3.3

Functionality:

- Signal Generator settings offer a "preferred level" setting.
  It means that the generator is operated with this level, and the level variation on the unit under test is done with the step attenuator. The generators level is only used for fine adjustments by 1..2 dB. This increases signal quality on generators which do not have an internal step attenuator (SMA100L)
- Serial number of generator (SMA100) and power sensor (NRP-Z98) is read from the instrument and appears in the report.
- The reference receivers data (serial number, special calibration certificate, calibration date) appears in the report.

5.4 Testsoftware V 1.25

Release Date: 02.03.2009

General remarks:

This is a bugfix release to support the EVS300 Release 4.0
Supports EVS300 SW Release 3.0, 3.1, 3.2, 3.3, 4.0

Functionality:

- Bugfix: with Release 4.0 is was not possible to generate new correction values
- Bugfix: Measurement of VOR bearing at -50dBm

5.5 Testsoftware V 1.27

Release Date: 01.02.2010

General remarks:

This is a minor update to support the Release 4.1 of the EVS300 software
Supports EVS300 SW Release 3.0, 3.1, 3.2, 3.3, 4.0, 4.1

Functionality:

- New options (FFT,Scope, K5,K6,GBAS) are now listed in the report
- Fixed some typos in the Special Calibration input form

5.6 Testsoftware V 1.30.1

Release Date: 27.01.2011

General remarks:

This update implements some of the remaining issues.

Functionality:

- New option SNMP is now listed in the report
- Special calibration is now entered and stored with tolerances. Tolerances are taken into account in the report. This was necessary because special calibration reports may have different tolerance values.
- Serial number of step attenuator: it is not possible to read the serial number from a step attenuator RSP. To have this number in the report anyway it can be entered in Setup->Devices.
- Cabling instruction contains BNC-BNC cable for baseband measurement.
- The hostname is read from the EVS and quoted on the title page.

5.7 Testsoftware V 2.10

Release Date: 12.2015

General remarks:
While the "look and feel" of the test software did not change much, this is a major update with lots of changes.

Functionality:

- Renamed the software to "EVS-Z11 Verification Test Software"
- Replacement of SMA100 with SMW200A
- No more reference receiver FMBV
- GBAS tests
- Selection of a specification ("datasheet version").
- Pause / Continue button
- Support of R&S RSC step attenuator
- Runs without step attenuator
- Tolerances depend on equipment type
- Correction of CH2
- Runs with Windows 7

5.8 Missing features

Some features and change requests are still pending:

- More tests of FSCAN, FFT and scope mode
- More meaningfull error messages