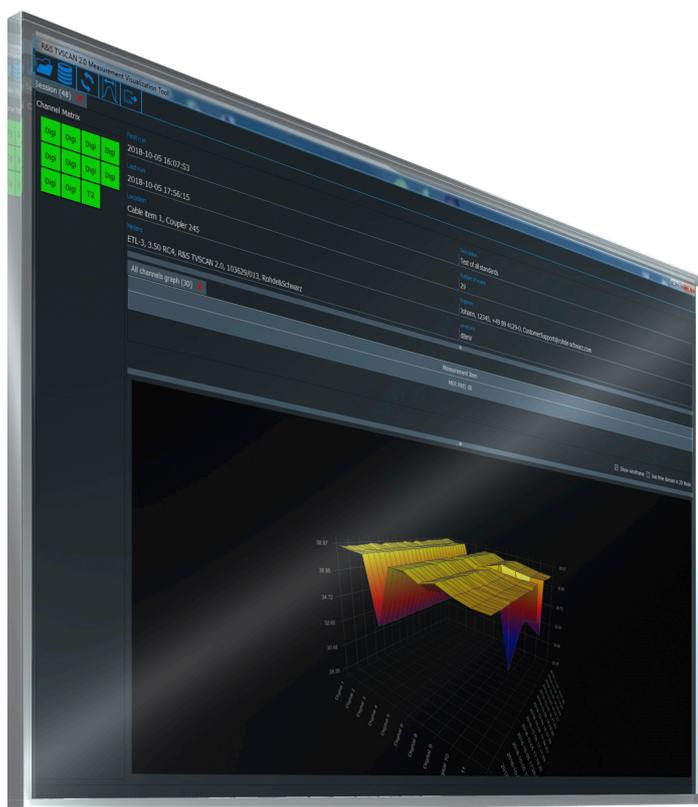


R&S® ETL-K950 / R&S® DSA-K950

TVSCAN2.0

User Manual



1178933202

This document describes the following Rohde & Schwarz products:

- R&S®ETL-K950 TVSCAN2.0 (order no. 2112.0479.02)
- R&S®DSA-K950 TVSCAN2.0 (order no. 2118.8236.02)

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1178.9332.02 | Version 01 | R&S®ETL-K950 / R&S®DSA-K950

Throughout this manual, products from Rohde & Schwarz are indicated without the ® symbol, e.g. R&S®ETL is indicated as R&S ETL.

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1 Installation

R&S TVSCAN2.0 is a software package that runs on a computer with the MS Windows operating system.

The software consists of three applications.

- The configuration tool to prepare and configure measurements.
- The measurement tool to capture data with a TV analyzer (R&S ETL).
- The visualization tool to analyze the captured data.

The configuration tool and visualization tool are free for use. Capturing data with the measurement tool requires an option key.

System requirements

Installation on a 64 bit system (incl. the visualization tool)

- 64 bit operating system
 - Microsoft Windows 7, Windows 8, Windows 8.1 or Windows 10
 - 64 bit Linux distribution - we recommend using Ubuntu 16.0.4
- OpenGL ES 2.0 driver
- Quad core processor with at least 2.5 GHz clock rate (for example Intel i5)
- At least 8 GB RAM
- Database requirements:
 - SQLite: at least 2 GB of free memory on the hard disk
 - Postgres data base version 9.00 or higher

Installation on a 32 bit system (excl. the visualization tool) for installation on a R&S ETL

- 32 bit operating system
 - Microsoft Windows 7, Windows 8, Windows 8.1 or Windows 10
- Dual core processor with at least 1 GHz clock rate
- At least 2 GB RAM
- Database requirements:
 - SQLite: at least 2 GB of free memory on the hard disk
 - Postgres data base version 9.00 or higher

Installing R&S TVSCAN2.0

R&S TVSCAN2.0 is available in a 64-bit version and 32-bit version. Use the version appropriate for your system.

1. Download the R&S TVSCAN2.0 installer from the product homepage.

To find the installer,

- search for the term "TVScan"
- visit the product homepage of the R&S ETL or R&S DSA directly:

<https://www.rohde-schwarz.com/product/etl>

<https://www.rohde-schwarz.com/product/dsa>

You can install R&S TVSCAN2.0 on a PC or on a R&S ETL.

- Optional: To install the measurement tool on one of the instruments, copy the installer to a memory stick and plug it into the USB interface of the instrument. For both instruments, always use the 32-bit version.

Note: Do not install the configuration tool and the visualization tool on an instrument. Especially the visualization tool will not run with the instrument hardware.

- Run the installer (`tvscan_2.0_setup.exe`).

The installation wizard guides you through the installation.

Wait until the installation is done. The installer indicates a finished installation by turning green. Do not select "Exit" before the installer user interface turns green. When installation is done, three shortcuts become available on the desktop.

- One for the configuration tool.
- One for the measurement tool.
- One for the visualization tool.

Installing the option key

Before you can use the measurement tool to capture data, you have to install the option key on the instrument you are using to capture data.

- For a comprehensive description about installing option keys, refer to the instructions delivered with the option.

Uninstalling R&S TVSCAN2.0

To uninstall the software, use the "Apps & Features" or "Programs" tool (Windows, the name of the tool depends on the Windows version) or the "Software Manager" tool (Linux).

2 Introduction

R&S TVSCAN2.0 is a software package that provides functionality to configure, control and analyze measurements on TV signals. While measurement configuration and result analysis are independent tools that do not need additional equipment, the measurement itself is only possible with a connected TV analyzer.

The container for all measurement information is a database, by default in a SQLite database. You can also use other database formats, however.

This database collects the following data.

- **Measurement configuration** files.
- Data for each individual channel scan (measurements on certain frequencies). Each channel scan evaluates various measurement results, for example the signal power, the signal EVM, the signal BER.
- Data for each scan, which consists of one or more channel scans.
- Data for each measurement session, which consists of one or more scans. You can analyze the measurement data in the database with the visualization tool. For more information, see [Chapter 5, "Visualization"](#), on page 26.



Figure 2-1: Database structure

By default, R&S TVSCAN2.0 stores all database and configuration files in the following directory:

```
C:\ProgramData\Rohde-Schwarz\TVScan2.0
```

Regardless of where you store the database, make sure there is enough free space on the harddisk. Databases can get big, depending on the amount of data you store in it.

For more information about the structure of the database, see [Chapter 6, "Database Structure"](#), on page 38.

3 Configuration

The "Configuration Tool" provides functionality to configure various aspects of the measurement.

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3.1 Overview

The measurement configuration consists of several categories. Each category has its own dedicated file type.

- Device configuration
For the configuration of the measurement equipment.
The file type for the device configuration is `*.device`.
- Channel configuration
For the configuration of the channels you want to measure.
The file type for the device configuration is `*.channel`.
- Limit configuration
For the configuration of limits to check against during the measurement.
The file type for the device configuration is `*.limit`.
- Measurement configuration
For the configuration of the measurement based on the device, channel and limit configuration.
The file type for the device configuration is `*.measurement`.

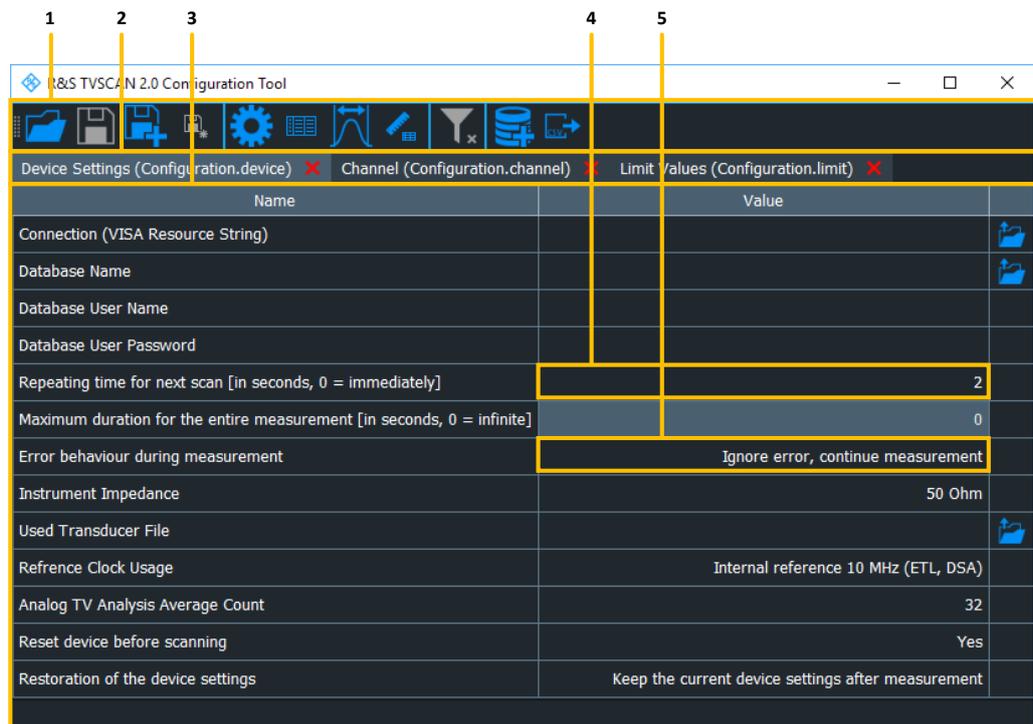


Figure 3-1: Overview of the user interface

- 1 = Toolbar
- 2 = Tab bar, one tab for each configuration file
- 3 = Parameter list
- 4 = Input field for numeric values
- 5 = Dropdown menu

3.2 General Operation

The following functionality applies to all configuration features.

Entering numeric values

Input fields allow you to enter a numeric value.

1. Select the input field.
2. Press the F2 key or double-click on the input field.
R&S TVSCAN2.0 activates the corresponding input field.
3. Enter any value you want.
Some input fields for numeric values have up and down arrows on their left and right.



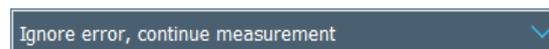
Instead of entering a value directly, you can increase or decrease a value by 1 with these arrows.

Selecting values from a dropdown menu

Dropdown menus allow you to enter a value from a list.

1. Select the input field.
2. Press the F2 key or double-click on the input field.

A down arrow indicates that you can open a dropdown menu.



3. Select a value from the dropdown menu.

3.3 Device Configuration

The "Device Configuration" dialog box contains settings to configure the connected measurement equipment (R&S ETL or R&S DSA).

Name	Value	
Connection (VISA Resource String)		
Database Name		
Database User Name		
Database User Password		
Repeating time for next scan [in seconds, 0 = immediately]	0	
Maximum duration for the entire measurement [in seconds, 0 = infinite]	0	
Error behavior during measurement	Ignore error, continue measurement	
Instrument Impedance	50 Ohm	
Used Transducer File		
Reference Clock Usage	Internal reference 10 MHz (ETL, DSA)	
Analog TV Analysis Average Count	32	
Reset instrument before scanning	Yes	
Restoration of the instrument settings	Keep the current device settings after measurement	

Creating or editing a device configuration



1. Select the cog wheel icon from the toolbar to create a device configuration.



2. Select the folder icon from the toolbar to edit an existing device configuration.
Files that contain the device configuration have the file extension *.device.

3. When you are done configuring the channel properties, save the file with one of the disk icons in the toolbar.

-  Save with a new file name.
-  Save with the same file name (only if the device configuration already has a file name).
- 

Save all open configurations at the same time.

If one of the configurations does not have a file name yet, the R&S TVSCAN2.0 opens a dialog box to define a name.

Configuring the LAN connection

You can define the LAN connection with the "Connection (VISA Resource String)" property.



1. Select the folder icon in the last column to open the "VISA Connection Configuration" dialog box.
2. Select the "LAN Connection" type.
Select "Local" if R&S TVSCAN2.0 is installed on the instrument itself.
3. Enter the "IP Address" of the instrument (not available for a local connection).
4. Adjust the "VISA Connection String", if necessary.
R&S TVSCAN2.0 automatically creates the VISA connection string based on the connection type and IP address. So usually, it is not necessary to change it.
5. Test the connection ("Test Connection").
The R&S TVSCAN2.0 shows a message if the connection was successful or not.
6. Confirm your entries with "OK".

Defining database properties

You can select database properties with the "Database Name" property.



1. Select the folder icon in the last column to select a SQLite database and its contents (including the device configuration associated with that database).
R&S TVSCAN2.0 will write measurement data associated with the device configuration to the selected database.



2. If you want to write the data into a database that does not exist yet, you have to create one with the database icon in the toolbar.
3. Define a "Database User Name" and "Database Password" to protect it from unauthorized access.

Defining measurement characteristics

1. Define the scan intervals "Repeating Time For Next Scan".
The scan intervals define the time after a subsequent scan starts, regardless of how long the scan itself takes.
For example, if you define a time interval of 100 seconds, a scan is initiated every 100 seconds. If the scan itself lasts 10 seconds, R&S TVSCAN2.0 waits for 90 seconds until the next scan starts.
This setting only has an effect in [continuous scan](#) mode.
2. Define the maximum measurement time ("Maximum Duration for the Entire Measurement").
This setting applies to the overall measurement session, not a single channel scan. Several channel scans can occur during the overall measurement. The measurement stops when it reaches the maximum time.
A value of 0 defines an infinite measurement time that you have to stop deliberately.
3. Select the "Error Behavior During Measurement".
This setting selects what happens in case an error occurs during the measurement. You can either stop the measurement, repeat it or ignore the error.
4. Select the "Instrument Impedance".
This setting selects the impedance for the RF connector of the connected instrument. For a comprehensive description, refer to the user manual of the connected instrument.
For measurements with an R&S DSA, you must select 75 Ω , because it only supports that impedance. The R&S ETL only supports the 75 Ω impedance if you equip it with option R&S ETL-B203.
-  5. Select the folder icon in the last column of the "Used Transducer File" property to select a transducer.
For a comprehensive description of transducers, refer to the user manual of the connected instrument.
6. Define the average count applied to the measurement ("Analog TV Analysis Average Count").
This setting defines the number of scans used to average measurement results.
7. Select the instrument behavior before the measurement begins ("Reset Device Before Scanning").
 - "Yes": Restores the default instrument configuration before initiating a scan. During the scan, only the settings defined with R&S TVSCAN2.0 are changed, if necessary.
 - "No": Uses the current instrument configuration for a scan. Settings defined with R&S TVSCAN2.0 are still changed during the scan, if necessary.
8. Select the instrument behavior after the measurement is done ("Restoration of the Device Settings").

R&S TVSCAN2.0 backs up the instrument configuration before it starts a measurement.

- "Keep the Current Device Settings After Measurement": All changes that are made during the R&S TVSCAN2.0 measurement remain when the measurement is done.
- "Restore Saved Device Settings After Measurement": Restores the initial instrument configuration after the measurement is done.

3.4 Channel Configuration

The "Channel Configuration" dialog box contains functionality to configure the channels you are measuring.



Context menu

The dialog box provides several useful features to manage the channel table in a context menu that you can access with a right-click.

	1	2	3	4
Channel Name	Channel 1	Channel 2	Channel 3	Channel 4
Description				
TV Standard	B/G Pal (anal...	B/G Pal (anal...	B/G Pal (anal...	B/G Pal (anal...
Center / Vision Carrier Frequency	0.00 Hz	0.00 Hz	0.00 Hz	0.00 Hz
Frequency Offset	0.00 Hz	0.00 Hz	0.00 Hz	0.00 Hz
Reference Level Mode	Automatic	Automatic	Automatic	Automatic
Reference Level	0 dBmV	0 dBmV	0 dBmV	0 dBmV
Pre Selector	On	On	On	On
Pre Amplifier	On	On	On	On
Attenuation	0 dB	0 dB	0 dB	0 dB
Sideband Position	Automatic	Automatic	Automatic	Automatic
Group Delay	General	General	General	General
Audio Standard	FM 5.5 MHz /...			

Creating or editing a channel configuration



1. Select the list icon from the toolbar to create a channel configuration.



2. Select the folder icon from the toolbar to edit an existing channel configuration.

Files that contain the channel configuration have the file extension `*.channel`.

3. When you are done configuring the channel properties, save the file with one of the disk icons in the toolbar.



Save with a new file name.



- Save with the same file name (only if the device configuration already has a file name).



Save all open configurations at the same time.

If one of the configurations does not have a file name yet, the R&S TVSCAN2.0 opens a dialog box to define a name.

Configuring channels

By default, the channel table is empty.

1. To add a channel, right-click anywhere in the empty area of the dialog box.
2. Select "Add New Channel" from the context menu.

R&S TVSCAN2.0 adds a column to the channel table. Add as many channels as you need.

3. Define the channel properties.

For each channel, you can configure various parameters like the channel name, the center frequency, reference level and others.

The channel name is also displayed in the [channel matrix](#) of the visualization tool. Because the channel matrix only shows the first 4 characters of the channel name, we recommend to define a channel name whose first 4 characters allow you to identify the channel.

For a comprehensive description of all parameters, refer to the user manual of the connected instrument.

If you cannot edit the value of a parameter, it is not available for the TV standard you have selected.

Note: Reference level.

For the reference level, you can select the following settings:

- "Manual": Define a reference level that you like. For this mode, you have to define the attenuation manually in the corresponding input field.
- "Auto": Determines the reference level depending on the currently measured signal. This includes an automatic selection of the signal attenuation.
- "Time Optimized": Uses the reference level as the last measured channel of the same TV standard.

4. Optional: Copy a channel configuration.

- a) Click on the header cell of one or more channels to select a channel.
- b) Copy the channel to the clipboard with Ctrl-C.
You can also copy channels via the context menu.

- c) Paste the copied channel with Ctrl-V.
 - To add the channel at the end of the table, do not select a channel.
 - To add the channel at a certain position, select one of the channel. If you want to paste the channel to column 2, select column 2. Existing channels are shifted to the right.

You can also select a paste action from the context menu.

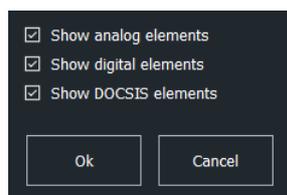
5. Optional: Copy individual cells.
 - a) Select any cell.
 - b) Copy the contents to the clipboard with Ctrl-C.
You can also copy cell contents via the context menu.
 - c) Select the cells (one or more) whose values you want to replace.
Note that these cells must have the same type of value as the copied values.
 - d) Paste the copied value with Ctrl-V.
You can also paste the values via the context menu.
6. Optional: Remove a channel.
 - a) Click on the header cell of one or more channels to select a channel.
 - b) Remove the column with the "Del" key.
You can also remove channels via the context menu.

Filtering parameters

Some parameters in the channel table are only relevant for a specific TV standard and are therefore probably not relevant for you. You can filter the list by a TV standard category (analog, digital and DocSis) and thus reduce the number of table entries.



1. Select the filter icon from the toolbar to open the "Select Filter Conditions" dialog box.

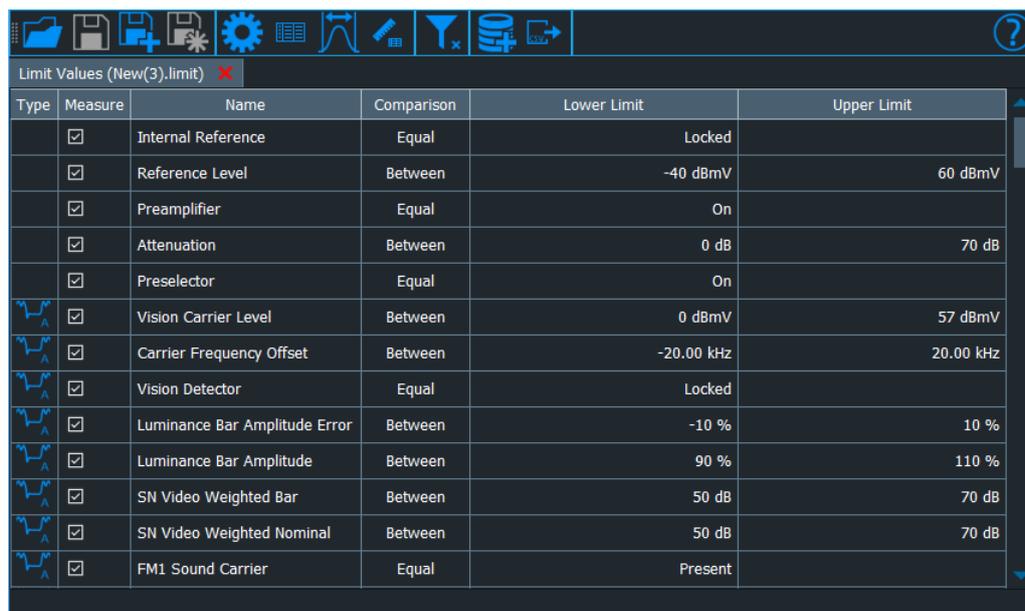


2. Select the TV standard category you are interested in.
After you confirm your selection with "OK", the table only shows the parameters for the selected category. If you filter by analog elements, for example, the channel table only contains parameters necessary for measurements on analog TV standards.
The small "x" at the filter icon indicates if a filter is in use or not. If it disappears, a filter is in effect.

3.5 Limit Configuration

The "Limit Configuration" dialog box contains functionality to define limit values for various network performance measures and results. If you define limits, the R&S TVSCAN2.0 checks each result against the corresponding limit. During evaluation, the R&S TVSCAN2.0 indicates if the limit check has passed or not.

For a comprehensive description of all results for which you can define limits, refer to the user manual of the connected instrument.



Type	Measure	Name	Comparison	Lower Limit	Upper Limit
	<input checked="" type="checkbox"/>	Internal Reference	Equal	Locked	
	<input checked="" type="checkbox"/>	Reference Level	Between	-40 dBmV	60 dBmV
	<input checked="" type="checkbox"/>	Preamplifier	Equal	On	
	<input checked="" type="checkbox"/>	Attenuation	Between	0 dB	70 dB
	<input checked="" type="checkbox"/>	Preselector	Equal	On	
	<input checked="" type="checkbox"/>	Vision Carrier Level	Between	0 dBmV	57 dBmV
	<input checked="" type="checkbox"/>	Carrier Frequency Offset	Between	-20.00 kHz	20.00 kHz
	<input checked="" type="checkbox"/>	Vision Detector	Equal	Locked	
	<input checked="" type="checkbox"/>	Luminance Bar Amplitude Error	Between	-10 %	10 %
	<input checked="" type="checkbox"/>	Luminance Bar Amplitude	Between	90 %	110 %
	<input checked="" type="checkbox"/>	SN Video Weighted Bar	Between	50 dB	70 dB
	<input checked="" type="checkbox"/>	SN Video Weighted Nominal	Between	50 dB	70 dB
	<input checked="" type="checkbox"/>	FM1 Sound Carrier	Equal	Present	

Creating or editing limits



1. Select the graph icon from the toolbar to create a set of limits.



2. Select the folder icon from the toolbar to edit an existing set of limits.

Files that contain a set of limits have the file extension *.limit.

3. When you are done configuring the channel properties, save the file with one of the disk icons in the toolbar.



Save with a new file name.



- Save with the same file name (only if the device configuration already has a file name).



Save all open configurations at the same time.

If one of the configurations does not have a file name yet, the R&S TVSCAN2.0 opens a dialog box to define a name.

Filtering result types

The list of values that support limits is long. However, most results are only relevant for a specific TV standard and are therefore probably not relevant for you. You can filter the list by a certain TV standard and thus reduce the number of table entries.



1. Select the filter icon from the toolbar to open the "Select Filter Conditions" dialog box.



2. Select the TV standard you are interested in. After you confirm your selection with "OK", the table only shows the results that are useful for the selected standards. The small "x" at the filter symbol indicates if a filter is in use or not. If it disappears, a filter is in effect.

Working with the limit table

Each line in the table corresponds to one specific measurement result. For each result, you have the following options:

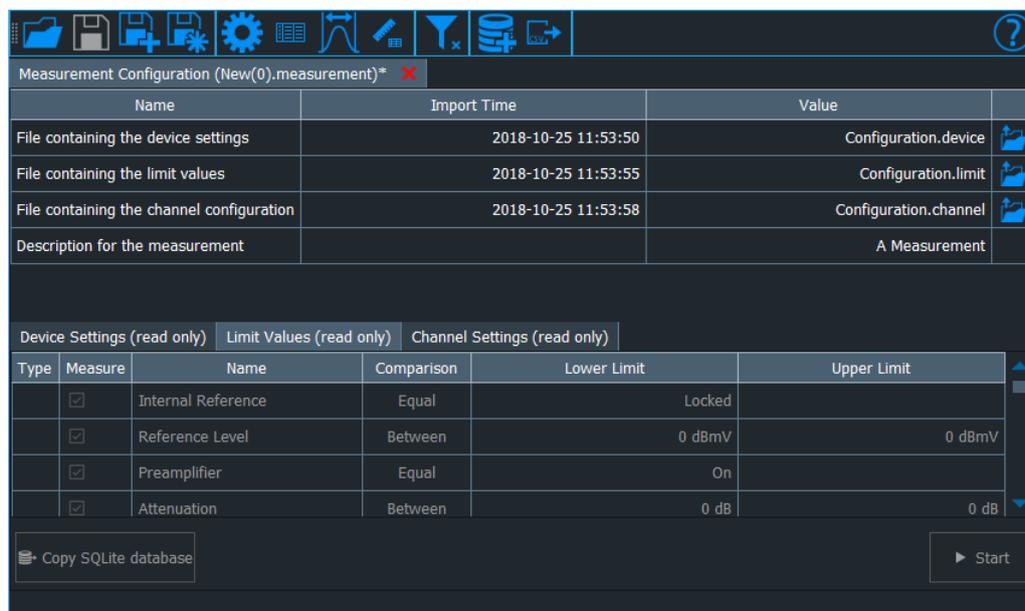
1. The "Type" column shows the type of TV standard the result belongs to (analog, digital or DocSis).
2. Select if the corresponding result is evaluated during the measurement in the "Measure" column.
3. The "Name" column shows the name of the measurement result. Some results are specific to a certain TV standard, others are global. You can filter the results by a certain TV standard with the filter icon. See ["Filtering result types"](#) on page 17 for details.
4. Select the limit check logic in the "Comparison" column.
 - "Not Used": Does not check against a limit.
 - "Equal": Result must have the exact same value for a pass. All other values result in a failed limit check.



- "Not Equal": Result must be different to the defined value.
 - "Between": Result must be between two values. If outside the value range, the limit check fails.
 - "Lower": Result must be below a certain value. If higher, the limit check fails.
 - "Higher": Result must be above a certain value: If lower, the limit check fails.
5. Define the limit values in the "Lower Limit" and "Upper Limit" columns.
- The lower limit is available if "Comparison" = "Equal", "Not Equal", "Between" or "Higher".
 - The upper limit is available if "Comparison" = "Between" or "Lower".

3.6 Measurement Set Configuration

The "Measurement Configuration" dialog box allows you to compose a measurement set out of the different configuration files.



Creating or editing a measurement set



1. Select the measurement icon from the toolbar to create a measurement set.



2. Select the folder icon from the toolbar to edit an existing measurement set.

Files that contain the measurement set have the file extension *.measurement.

3. When you are done configuring the channel properties, save the file with one of the disk icons in the toolbar.



Save with a new file name.

- 
- Save with the same file name (only if the device configuration already has a file name).
- 

Save all open configurations at the same time.

If one of the configurations does not have a file name yet, the R&S TVSCAN2.0 opens a dialog box to define a name.

Compiling a measurement set

A measurement set consists of a device configuration, a channel configuration and / or a limit configuration file.



1. Add a device configuration file to the measurement set with the folder icon in the "File Containing the Device Settings" row. You can only select *.device files.



2. Add a limit configuration file to the measurement set with the folder icon in the "File Containing the Limit Values" row. You can only select *.limit files.



3. Add a limit configuration file to the measurement set with the folder icon in the "File Containing the Channel Configuration" row. You can only select *.channel files.

4. Add a "Description of the Measurement".
The description also appears in the overviews of the measurement tool and the visualization tool.
5. To start the [measurement tool](#), select "Start".
Note that "Start" only becomes available after you save the measurement set.

The "Import Time" column shows when you have added the configuration file to the measurement configuration. The "Value" column shows the file name.

The lower pane shows the configuration stored in each file. Select one of the tabs to review the configuration, changing the configuration is not possible.

Changing the configuration in a measurement set

If you want to update a configuration file that is already used in a measurement set, you have to replace the configuration file measurement set manually. Configuration files in a measurement set are not updated automatically after their contents have changed.



1. Open the file you want to edit with the folder icon.
R&S TVSCAN2.0 opens the configuration in a new tab.
2. Make the required changes.



3. Save the changes and close the tab.



4. Replace the file in the measurement set with the folder icon.



5. Save the changes in the measurement set.

4 Measurement

The "Measurement Tool" provides the functionality to capture the actual signal data.

Using the measurement tool requires a connection to an R&S ETL or R&S DSA that are equipped with option K950. See [Chapter 1, "Installation"](#), on page 5 for a comprehensive description on how to install the option on an instrument.

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4.1 Overview

The measurement tool is made up out of two areas.

- The upper area shows general information about the measurement. A double-click on one of the settings opens a dialog box to change the corresponding setting.

For more information about the settings, see:

- "Description of the Used Measurement File": Inherited from the [measurement set](#) you load.
- "Database Settings": Location of the database (read-only).
- "Location": ["Specifying the measurement environment"](#) on page 23.
- "VISA Connection String": ["Configuring the LAN connection"](#) on page 23.
- "Engineer": ["Specifying the measurement environment"](#) on page 23.
- "Selected Channels": ["Selecting the channels to scan"](#) on page 24.

- The lower area contains a measurement log.

This log is distributed across three tabs.

- The "Logging" tab contains information about the state of the instrument connection.
- The "Measurement" tab contains information about the measurement progress.
- The "SCPI" tab contains a list of the SCPI commands that have been sent during the measurement.

A border between areas indicates that you can increase the size of the areas or hide and unhide them by dragging the border bar upwards or downwards.



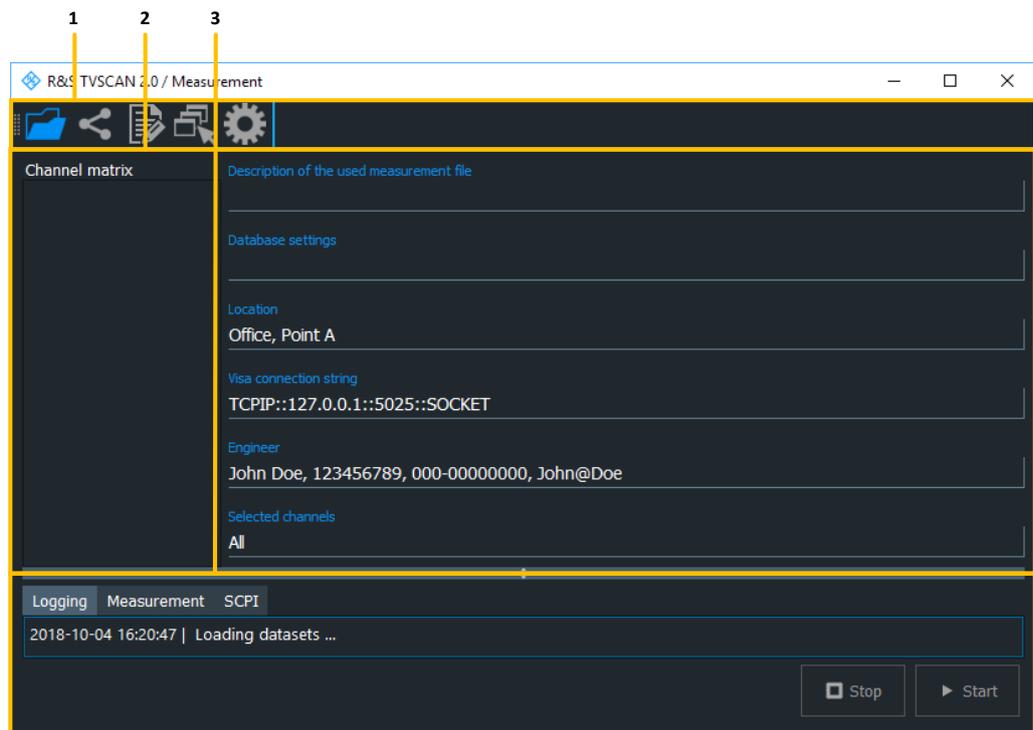


Figure 4-1: Overview of the user interface

- 1 = Toolbar
- 2 = Measurement information
- 3 = Measurement log

4.2 Operation

The measurement tool provides the following functionality.

Restoring a measurement set



1. Select the folder icon from the toolbar to select a [measurement set](#). A measurement set is a file with the `*.measurement` extension.
2. Alternatively, you can load a database with the file extension `*.sqlite`. The database also contains a measurement set.



Using a different configuration for a measurement

If you want to use an updated version of one of the configuration files used in a measurement set, you have to replace those files deliberately. The configuration files in a measurement set are not updated automatically after they have been changed.

For a comprehensive description on how to do that, see "[Changing the configuration in a measurement set](#)" on page 19.

Configuring the LAN connection

By default, the measurement set already contains details about the LAN connection [LAN connection](#). Only change the connection properties if the LAN configuration is different to those defined in the measurement set.

The LAN properties you define here are not transferred to the measurement set and will be lost when you close the measurement tool.



1. Select the connection icon from the toolbar to open the "VISA Connection Configuration" dialog box.
2. Select the "LAN Connection" type.
3. Enter the "IP Address" of the instrument (not available for a local connection).
4. Adjust the "VISA Connection String", if necessary.
R&S TVSCAN2.0 automatically creates the VISA connection string based on the connection type and IP address. So usually, it is not necessary to change it.
5. Test the connection ("Test Connection").
The R&S TVSCAN2.0 shows a message if the connection was successful or not.
6. Confirm your entries with "OK".

Specifying the measurement environment



1. Select the credentials icon from the toolbar to open the "Engineer Data Configuration" dialog box.

Site	Office
Test Point	Point A
Engineer Name	John Doe
Engineer Number	123456789
Engineer Telephone	000-0000000
Engineer Email	John@Doe

Ok Cancel

2. Enter the location of the measurement ("Site" and "Test Point").
3. Enter the credentials of the person who conducts the measurement (like name, phone number and email address).
4. Confirm your entries with "OK".

Selecting the channels to scan



1. Select the channels icon from the toolbar to open the "Measurement Sessions" dialog box.
The dialog box contains a list of all channels defined in the measurement set. For more information about configuring channels, see [Chapter 3.4, "Channel Configuration"](#), on page 13.
2. Select the channels you want to scan.
3. Select if you want to conduct a [single or continuous scan](#).
4. Confirm your selection with "OK".

Defining additional measurement properties



1. Select the cog wheel icon from the toolbar to open the "Measurement Sessions" dialog box.
2. Select the scan mode ("Only Single Scan").
 - Single scan: R&S TVSCAN2.0 captures the data once, and then stops.
 - Continuous scan: R&S TVSCAN2.0 captures the data indefinitely, until either the [maximum measurement time](#) you have defined is up, or you deliberately [stop the measurement](#).
3. Select if the measurement should be a new session, or an addition to another session ("Append To Session").
If you decide to add the new measurement data to an existing session, R&S TVSCAN2.0 opens a dialog box.
 - a) Double-click the session you want to add new data to.
The selected session is indicated in the "Append To Session" label.
 - b) To delete a session, right-click on a session and select "Delete".
4. Turn the log display on or off ("Show Processing Activities").
If you turn off the log display, R&S TVSCAN2.0 no longer shows the measurement process and SCPI log in the lower pane of the user interface.
5. Turn database backup on or off ("Backup Database").
When you turn on this feature, R&S TVSCAN2.0 backups the database before a new scan starts.
The backup is stored in a separate directory:
`C:\ProgramData\Rohde-Schwarz\TVScan2.0\Database\Backup\.`

Capturing data

When you are done configuring the measurement, start the actual data capture.

1. Select "Start".
R&S TVSCAN2.0 starts to scan the channels. You can view the measurement progress in the "Measurement" tab in the log.

The measurement lasts until the conditions you have defined have been met, or until you stop the measurement deliberately.

2. To stop the measurement, select "Stop".

5 Visualization

The "Visualization Tool" provides functionality to analyze and evaluate measurement results in different result displays.

• Overview	26
• General Operation	27
• Limit Violations Overview	30
• Scan Result Summary	31
• 2D Diagram	32
• 3D Diagram	35

5.1 Overview

The visualization has three areas.

- The channel matrix shows all channels for which data has been recorded. Right-clicking on a channel opens a context menu.
- The measurement information shows general measurement information. The description is inherited from the [measurement set](#) configuration. The [user credentials and location](#) are inherited from the measurement configuration.
- The result display shows the measurement result, either in a table or in a diagram. A border between areas indicates that you can increase the size of the areas or hide and unhide them by dragging the border bar upwards or downwards.



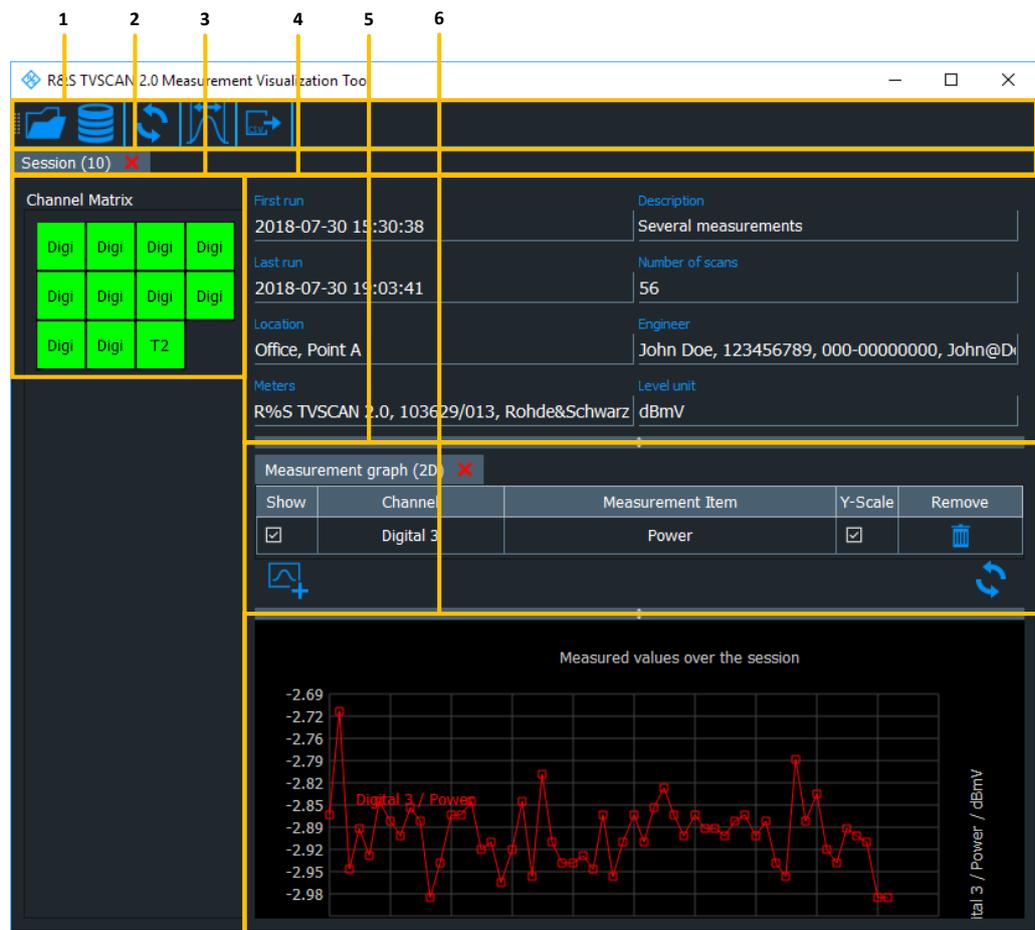


Figure 5-1: Overview of the user interface

- 1 = Toolbar
- 2 = Tab bar, one tab for each measurement session
- 3 = Channel matrix
- 4 = Measurement information
- 5 = Result display
- 6 = Diagram area (graphical results only)

5.2 General Operation

The following functionality applies to all result displays.

Loading measurement data

Using the visualization tool requires measurement data that you have recorded previously.

For more information about recording measurement data, see [Chapter 4, "Measurement"](#), on page 21.



1. Select the folder icon from the toolbar to load measurement data.
You can load either a measurement set linked to a SQLite database or a SQLite database directly.

2. Select the measurement or database you want to evaluate.

R&S TVSCAN2.0 opens a list of measurement sessions that are included in the database.

The list contains information about each session. This information includes number of scans performed during that session, the date of the last recording, the instrument it was recorded with, the measurement site and the description of the measurement.

Note: The evaluated limits depend on whether you load a measurement set or a SQLite database.

- If you load a SQLite database, the visualization tool always evaluates the limits originally linked to the measurement session. Different sessions may have different limits.
- If you load a measurement set, the visualization tool evaluates the limits that were active during the last measurement session. All sessions will have the same limits.

3. Select the measurement session you want to evaluate with a double-click.

R&S TVSCAN2.0 opens a tab in the user interface with the data of the measurement session.

In its initial state, the user interface shows the channel matrix that was recorded during the measurement and various information about the measurement sessions. This information includes date and time of the measurements, number of scans, location, instrument type and unit of level values.



4. Select the database icon from the toolbar to load another measurement session in an additional tab.

5. Select a channel in the channel matrix with a double-click.

R&S TVSCAN2.0 adds a table to the user interface that contains the results of the individual scans.



6. Refresh the result evaluation by selecting the refresh icon from the toolbar.
Refreshing the results can be useful if you have updated the database with new measurement data.

Colors in the channel matrix

The number of channels in the channel matrix depends on the number of channels defined in the [channel configuration](#) tool. The name of each channel in the channel matrix depends on the [channel name](#) of the corresponding channel.

The colors of the individual channels in the channel matrix carry the following information.

- Green: All results over all scans have passed their limit checks.
- Yellow: At least one parameter in one scan failed the limit check.
- Orange (different shades): At least one parameter in more than one scan failed the limit check.
- Red: At least one parameter in all scans failed the limit check.

Selecting result displays

In addition to the result summary, the visualization tool provides various other result displays.

1. Right-click on one of the channels in the channel matrix.
2. Select one of the available result displays from the context menu.
 - "View All Session Limit Violations": [Chapter 5.3, "Limit Violations Overview"](#), on page 30.
 - "View Time Domain Graph (2D)": [Chapter 5.5, "2D Diagram"](#), on page 32.
 - "View Time / Frequency Domain Graph (3D)": [Chapter 5.6, "3D Diagram"](#), on page 35.
 - "View Channel <x> Scan Results": [Chapter 5.4, "Scan Result Summary"](#), on page 31.
 - "View Channel <x> Limit Violations": [Chapter 5.3, "Limit Violations Overview"](#), on page 30.

Applying different limits

During result evaluation, you can apply a different set of limit values instead of those included in the database. Limits only have an effect on the numerical results.



1. Select the graph icon from the toolbar to select a new set of limits.
2. Select "Load New Limits" from the dialog box.
3. Select the [limit configuration](#) file (*.limit) you want to apply.

R&S TVSCAN2.0 reevaluates the results based on the new limits.

Tip: You can restore the original limits by selecting the graph icon from the toolbar and selecting "Restore Original Limits" from the dialog box.

Exporting the results

You can export the results to an *.csv file for later evaluation or further analysis in an external spreadsheet, for example.



1. Select the export icon from the toolbar.
2. Define a file name.
3. Save the file with "Save".

5.3 Limit Violations Overview

The limit violations overview is a numerical result summary that contains a list of all limit violations.

You can select two overviews:

- The measurement session overview contains all failed limit checks of the measurement session.
- The channel overview contains all failed limit checks of a channel.

Both overviews have the same table layout.

Each row in the table corresponds to a failed limit check. The columns show the following information.

- "Channel Name"
Channel in which the limit violation was measured.
- "Scan ID"
Number of the channel scan in which the limit violation was measured.
- "Date / Time Stamp"
Date and time when the limit violation was measured.
- "Result"
Measurement result that did not pass the limit check.
- "Show"
Opens the result summary for the corresponding scan. For details about this result display, see [Chapter 5.4, "Scan Result Summary"](#), on page 31.

The screenshot displays the 'Session (10)' overview. On the left is a 'Channel Matrix' with colored cells (yellow, green, red) representing different channels. The main area shows session details:

- First run:** 2018-07-18 11:57:32
- Last run:** 2018-07-18 15:29:39
- Description:** Munich cable network 586 + 10 channels
- Number of scans:** 55
- Location:** Office, Point A
- Engineer:** John Doe, 123456789, 000-00000000, John@Doe
- Meters:** R%S TVSCAN 2.0, 103629/013, Rohde&Schwarz
- Level unit:** dBm

Below the session details is a table titled 'All limit violations' with the following data:

Channel Name	Scan ID	Date / Time Stamp	Result	Show
Digital 11	14	2018-07-18 12:58:38	Power is not between -15 <= valu...	🔍
Digital 11	14	2018-07-18 12:58:38	Demod Lock is not Locked	🔍
T2	14	2018-07-18 12:58:38	Power is not between -15 <= valu...	🔍
T2	14	2018-07-18 12:58:38	Demod Lock is not Locked	🔍
Digital 1	15	2018-07-18 13:03:32	Power is not between -15 <= valu...	🔍

Using the measurement session overview

1. Right-click on any channel in the channel matrix.
2. Select the "View All Session Limit Violations" item from the context menu.

R&S TVSCAN2.0 adds the measurement session overview to the user interface. If another result display is already open, the measurement session overview gets a new tab.



3. Select the magnifier icon in the last column.

R&S TVSCAN2.0 opens the channel and scan specific [result summary](#) for the selected result.

Instead of viewing the limit violations over all channels and scans, you can also view the limits that have been violated in a certain channel.

Using the channel overview

Instead of an overview of the limit violations over all scans in the measurement session, you can also display only the limit violations in a certain channel.

1. Right-click on a certain channel in the channel matrix.
2. Select "View Channel <x> Limit Violations" from the context menu.

R&S TVSCAN2.0 opens the channel overview. The table contains the same information as the measurement session overview, only for the selected channel.

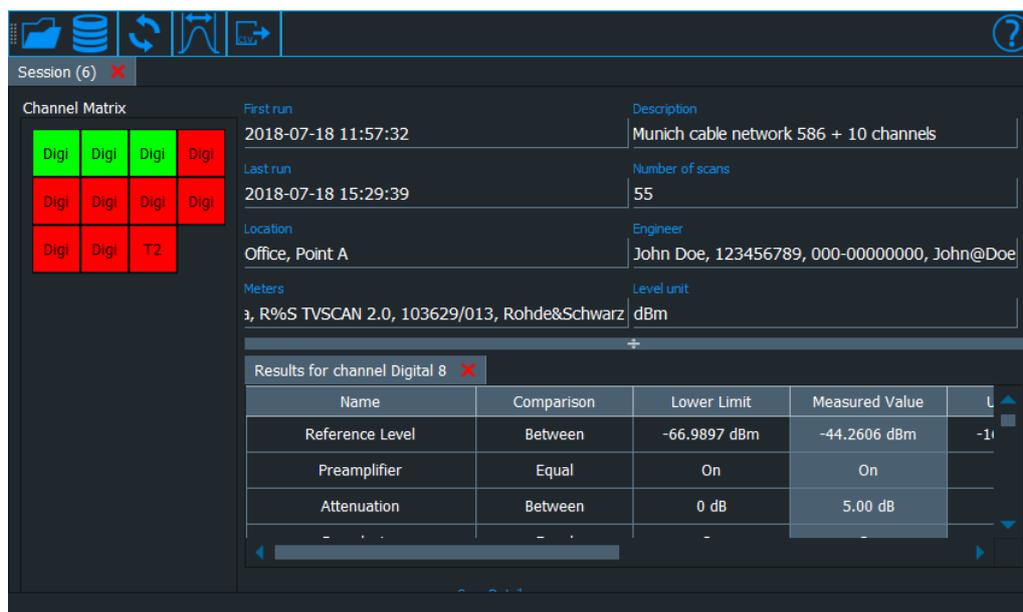
5.4 Scan Result Summary

The scan result summary is a numerical result summary that contains the properties and results of a certain channel scan. A measurement property is, for example, the attenuation during the channel scan.

The contents of the table are variable and depend on the channel scan you have selected from the channel matrix.

Each row in the table corresponds to a measurement property or result that was evaluated for the selected channel. The columns show the following information.

- "Name": Type of the measurement property or result.
- "Comparison": Shows the [logic](#) of the limit check.
- "Lower Limit": Shows the lower limit if one has been defined.
- "Measured Value": Shows the actual measurement result.
If the measurement result violates the defined limits or if the actual setting is not the expected one (on instead of off, for example), the cell is highlighted red.
If the measurement result is not valid (for example if a communication error occurs), the result is written in yellow font.
- "Upper Limit": Shows the upper limit if one has been defined.
- "Description": Shows the reason of a limit check failure.



Using the scan result table

1. Right-click on any channel in the channel matrix.
2. Select the "View Channel <x> Scan Results" item from the context menu.
Alternatively, double click on any channel in the channel matrix.
R&S TVSCAN2.0 adds the scan result summary to the user interface.
If another result display is already open, the measurement session overview gets a new tab.



3. Select a channel scan whose characteristics you want to see with the interface below the table.
 - Select the first or the last scan in the session.
 - Select the previous or the next scan in the session.
 - Select a scan by date or number.

R&S TVSCAN2.0 shows the results for the selected channel scan.

5.5 2D Diagram

The 2D diagram is a diagram that shows a measurement session's results for a certain channel over time. You can view one or more different results and channels in the diagram. If you select more than one graph, each graph has a different color. The graph itself shows discrete measurement points, each of which corresponds to a single channel scan. The number of measurement points therefore depends on the number of channel scans performed for a certain channel in the measurement session.

The x-axis is a time axis, whose origin corresponds to the first channel scan. Channel scans appear in ascending order.

The scale of the y-axis depends on the result currently displayed.



Using the 2D diagram

1. Right-click on any channel in the channel matrix.
2. Select the "View Time Domain Graph (2D)" item from the context menu.

R&S TVSCAN2.0 adds the 2D diagram to the user interface. In its initial state, the diagram displays one graph that indicates the power characteristics for the channel.

Tip: Drag the border separating the areas upwards to hide the tables and display the diagram in full screen mode.



To unhide the tables, drag the borders in the opposite direction.

Using the diagram configuration table

A table above the diagram contains functionality to configure the diagram and graphs.

- "Show"
Turns the display of the graph on and off.
- "Channel"
Selects the channel to analyze.
- "Measurement Item"
Selects the result to display.
- "Y-Scale"
Selects the unit of the y-axis.
- "Remove"

Removes the graph from the diagram.

Selecting the graph properties

You can assign a graph to any channel in the channel matrix or to specific measurement results.

Thus, you can, for example, compare different results of the same channel, or compare a certain result over several channels.

1. Double-click on a cell in the "Channel" column of the configuration table.
R&S TVSCAN2.0 activates a drop-down menu.
2. Click on the cell again.
R&S TVSCAN2.0 opens a drop-down menu.
3. Select a channel from the drop-down menu.
4. Double-click on a cell in the "Measurement Item" column of the configuration table.
R&S TVSCAN2.0 activates a drop-down menu.
5. Click on the cell again.
R&S TVSCAN2.0 opens a drop-down menu.
6. Select a result from the drop-down menu.

The graph displays the selected result for the selected channel.

If the selected result has not been analyzed for the selected channel, no graph is displayed in the diagram.

Adding additional graphs



1. Select the add result icon to add another graph to the diagram.
R&S TVSCAN2.0 adds an additional graph to the diagram in a different color.
2. [Configure the graph.](#)
3. If the graphs have different units, select the unit displayed on the y-axis from the "Y-Scale" column in the configuration table.
4. Hide a graph by deselecting the checkbox in the "Show" column of the configuration table.



5. Remove a graph with the trash can icon in the last column of the configuration table.

Zooming into the diagram

Zooming can be useful to see the results in more detail.

1. Select a (rectangular) area in the diagram.
R&S TVSCAN2.0 shows an enlarged view of the selected diagram area.

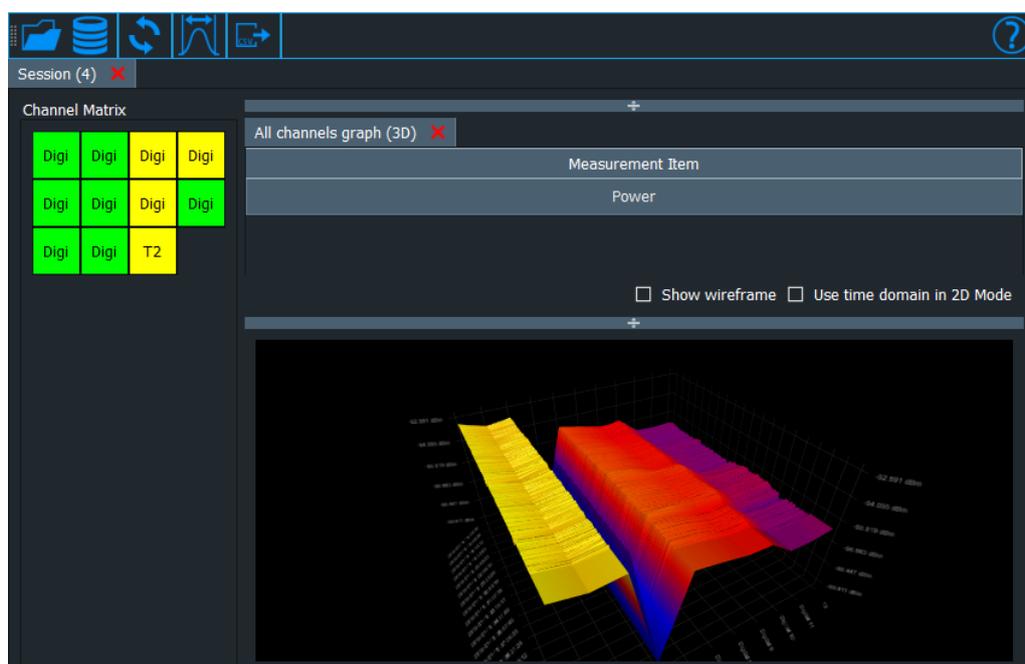


2. Restore the default zoom with the refresh icon.

5.6 3D Diagram

The 3D diagram is similar to the 2D diagram. It also shows the results of a channel scan over time, but does so for all channels at the same time. One axis of the diagram plots the measured channels, one axis plots the channels scans, and the third axis plots the measurement results. Different colors indicate the magnitude of the measurement results.

The 3D diagram can display a single result at a time.



Using the 3D diagram

1. Right-click on any channel in the channel matrix.
2. Select the "View Time / Frequency Domain Graph (3D)" item from the context menu.

R&S TVSCAN2.0 adds the 3D diagram to the user interface. In its initial state, the diagram contains no graph.

Selecting the result

Before the 3D graph is displayed, you have to select the result to be evaluated.

1. In the table above the diagram area, double-click on the "Please Select Item" menu.

R&S TVSCAN2.0 activates a drop-down menu.

2. Click on the menu again.
R&S TVSCAN2.0 opens a drop-down menu.
3. Select a result from the drop-down menu.
R&S TVSCAN2.0 adds a 3D diagram to the user interface.
The 3D diagram has 3 axes: The first axis plots the channel scans over time. The second axis plots the channels that were scanned. The third axis indicates the measurement results.
The colors indicate the measured values of the measurement results. Cold colors indicate low values, with deep blue corresponding to the lowest values. Warm colors indicate high values, with yellow corresponding to the highest values.
A marker, in the form of a small white circle, shows the coordinates of a point on the graph: the first number is the time of the recording, the second number the value of the measured result, the third number the channel the result was measured in.
4. Click on a point in the graph to move the marker to a different coordinate.
Note: In addition to moving the marker to another coordinate, clicking on the graph has [other effects](#).

Navigating in the diagram

R&S TVSCAN2.0 provides several tools to navigate in the 3D diagram.

1. Hold the right mouse button and move the 3D graph in any direction to view the graph from different angles.
2. Display a diagram grid by selecting the "Show Wireframe" setting.
The grid indicates channels and channel scans and can be useful for better orientation in the diagram.
3. Zoom into the diagram with the mouse wheel while the mouse pointer is on the diagram.

Tip: Drag the border separating the areas upwards to hide the tables and display the diagram in full screen mode.



To unhide the tables, drag the borders in the opposite direction.

Switching between a 2D and a 3D display

You can easily switch between a 2D view and a 3D view.

1. Select any point on the 3D graph with the left mouse button.
By default, R&S TVSCAN2.0 shows the values measured at the selected point in time over all channels. The x-axis in this 2D diagram represents the measured channels. The y-axis in this diagram shows the measurement result. The unit depends on the selected result.
2. Select the "Use Time Domain in 2D Mode" setting.

R&S TVSCAN2.0 displays a 2D diagram that shows the results for the selected channel over time.

This diagram is basically the same as the 2D diagram described in [Chapter 5.5, "2D Diagram"](#), on page 32.

3. Click on the 3D thumbnail to return to the 3D view.

6 Database Structure

The default location of the database is:

C:\ProgramData\Rohde-Schwarz\TVScan2.0\Database. For every database you create, R&S TVSCAN2.0 creates a *.sqlite file with the corresponding database name.

In addition, R&S TVSCAN2.0 stores temporary data in the following directory (incl. subdirectories): C:\Users\\AppData\Local\Temp\.

Refer to [Figure 6-1](#) for a graphical overview of the database structure.

Table: session

The "Session" table contains the following columns:

id, uniqueid, description, firstrun, lastrun, site, testpoint, name, enumber, tnumber, email, hwmodel, firmwarev, softwarev, serialnr, owner

Table 6-1: SQL command

```
CREATE TABLE Session (id INTEGER PRIMARY KEY AUTOINCREMENT, uniqueid character varying(32), description character varying(255), firstrun varying(32) NOT NULL, lastrun varying(32), "
"site character varying(64), testpoint character varying(64), name character varying(64), enumber character varying(32), tnumber character varying(32), email character varying(64), "
"hwmodel character varying(64), firmwarev character varying(64), softwarev character varying(64), serialnr character varying(64), owner character varying(64), channelfileid INTEGER NOT NULL REFERENCES
exportedchannelsettings(id) ON UPDATE NO ACTION ON DELETE CASCADE DEFAULT 0, limitfileid
INTEGER NOT NULL REFERENCES exportedlimitvalues(id) ON UPDATE NO ACTION ON DELETE
CASCADE DEFAULT 0)
```

Table: scan

The "Scan" table contains the following columns:

id, sessionid, state, datetime

Table 6-2: SQL command

```
CREATE TABLE Scan (id integer, sessionid integer NOT NULL REFERENCES session(id) ON UPDATE
NO ACTION ON DELETE CASCADE, state integer, datetime character varying(21) NOT NULL) CREATE
INDEX index_scan_sessionid ON Scan(id,sessionid)
```

Table: measurements

The "Measurements" table contains the following columns:

id, sessionid, scanid, channelid, measurementid, state, value, errordescription

Table 6-3: SQL command

```
CREATE TABLE Measurements (id integer PRIMARY KEY NOT NULL, sessionid integer NOT NULL REF-
ERENCES Session(id) ON UPDATE NO ACTION ON DELETE CASCADE, "
"scanid integer NOT NULL REFERENCES Scan(id) ON UPDATE NO ACTION ON DELETE CASCADE,
channelid integer, measurementid integer, state integer, "
"value character varying(32), errordescription character varying(128)) CREATE INDEX index_measure-
ments_sessionid ON Measurements(sessionid) CREATE INDEX index_measurements_scanid ON Mea-
surements(scanid)
```

Table: exportfiles

The "Exportfiles" table contains the following columns:

id, file, description

Table 6-4: SQL command

```
CREATE TABLE exportfiles (id character varying(32) PRIMARY KEY NOT NULL, file text NOT NULL, "description character varying(255))
```

Table: exportedchannelsettings

The "Exportedchannelsettings" table contains the following columns:

id, hash, file, added

Table 6-5: SQL command

```
CREATE TABLE exportedchannelsettings (id INTEGER PRIMARY KEY NOT NULL, hash INTEGER NOT NULL UNIQUE, file text NOT NULL, added varying(32) NOT NULL)
```

Table: exportedlimitvalues

The "Exportedlimitvalues" table contains the following columns:

id, hash, file, added

Table 6-6: SQL command

```
CREATE TABLE exportedlimitvalues (id INTEGER PRIMARY KEY NOT NULL, hash INTEGER NOT NULL UNIQUE, file text NOT NULL, added varying(32) NOT NULL)
```

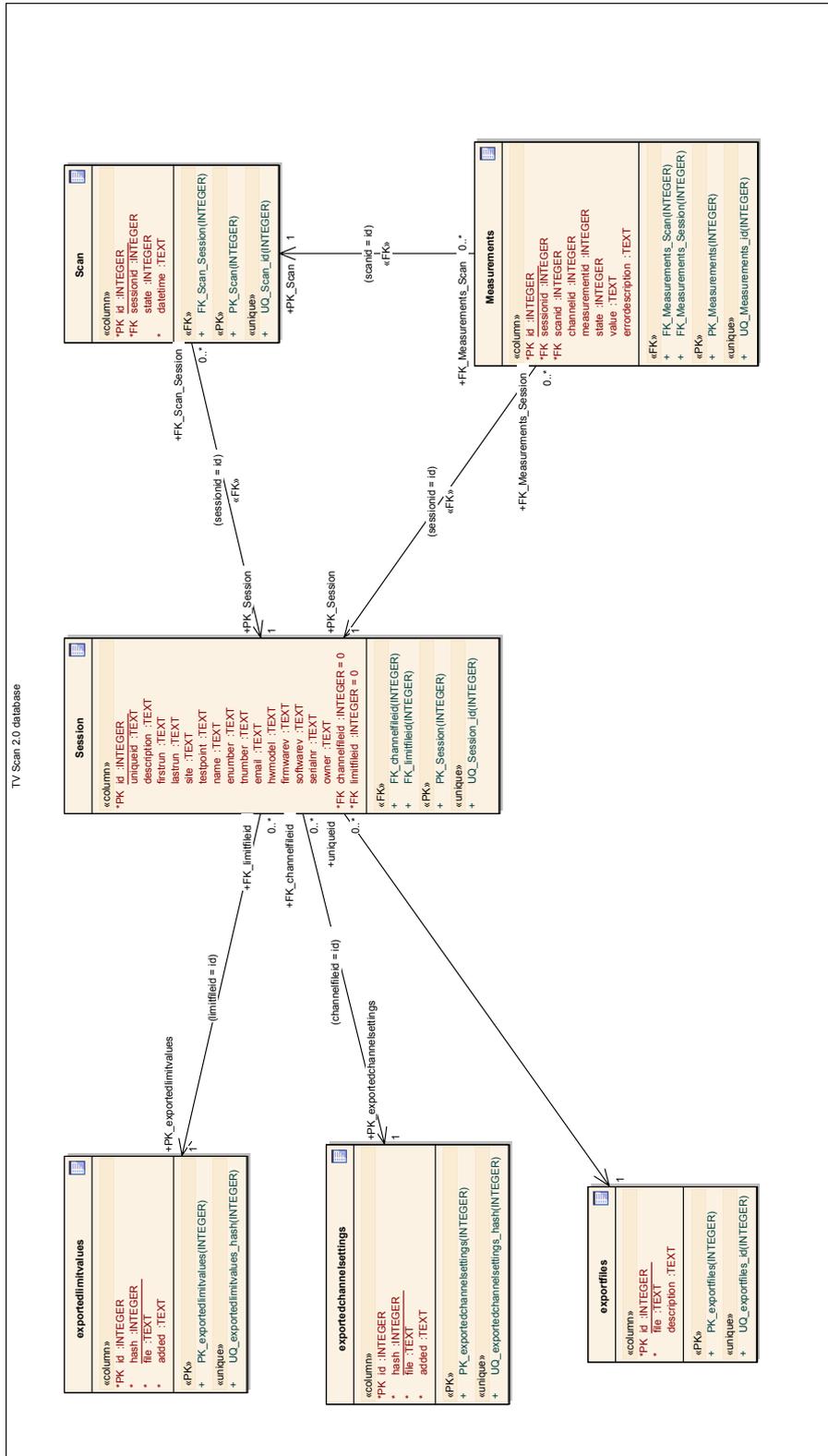


Figure 6-1: Database structure of the R&S TVSCAN2.0 database