

R&S® NESTOR-FOR Alibi Verification



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This application brochure describes the procedure for surveying telecommunications traces on the air interface in order to obtain information for alibi verification.

An R&S®NESTOR measuring system can be used to substantively determine whether or not a mobile device could have connected at a certain time and at a certain location with mobile radio cells that are known in advance.

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1 Use case

Alibi verification (ALI) is a forensics use case that is supported by the R&S®NESTOR software. It is performed for GSM, UMTS, LTE and CDMA2000®/EV-DO in a simultaneous measurement.

Alibi verification helps in determining whether a suspect could or could not have been at a certain location at a certain time. As a prerequisite, the suspect must have a mobile phone, and connection data for the time in question must be available from the network operator.

In combination with measurements on the air interface at the location in question, it is possible to demonstrate whether (and with what certainty) a suspect was there, or where the suspect might have been at the specified time.

If a suspect had a mobile device switched on at the time of the incident, then it is highly probable that it left activity traces at the claimed location (i.e. the “alibi location”) via the mobile radio network. This information can be requested from the network operator with a judicial order.

The request to the network operator shows in which GSM, UMTS and LTE mobile radio cells the suspect’s mobile phone was registered at the time in question. If these mobile radio cells can be received at the location where the suspect allegedly was, this corroborates the suspect’s alibi. However, if they can not or only inadequately be received, the suspect’s testimony is negatively contradicted, since the mobile phone must have been at a different location at the stated time.

The R&S®NESTOR software allows fast and accurate searches in the mobile radio network at the alibi location(s) and possibly the crime scene(s) for the cells that were relevant based on a traffic data request for the suspect’s IMSI during the time period of the crime.

The cells of interest (COI) (from the network operator request) are stored and one or more areas of interest (AOI) are analyzed in terms of their reception.

The following is a description of an exemplary work procedure, starting from the measurement preparation stage and ending with the printout of a report containing the data needed for the request.

2 Preparing for measurement

The R&S®NESTOR software uses templates and workspaces for configuring measurements.

Workspaces use templates with the settings that were active when the workspace was created. In other words, if configurations stored in the templates need to be permanently modified, it is advisable to make the relevant changes prior to creating the workspaces. Subsequent updates to the templates have no effect on existing workspaces. These workspaces must be manually updated. The advantage is that once workspaces have been created, they contain exactly the settings specified by the user at the time of storage, regardless of the measuring system that is used.

2.1 Configuring templates

Template configuration is performed for supplied standard templates or for user-specific versions based on the standard templates.

2.1.1 Modifying existing templates

Use “Settings/Templates” to select the template to be modified (Fig. 1): user-specific templates can be recognized by the delete icon next to them. Standard templates can only be modified; they cannot be deleted.

In the opened template, the tabs on the right can be used to modify the individual parameters for the analysis (Fig. 2): here, the coverage thresholds can be specified or the cells of interest stored.

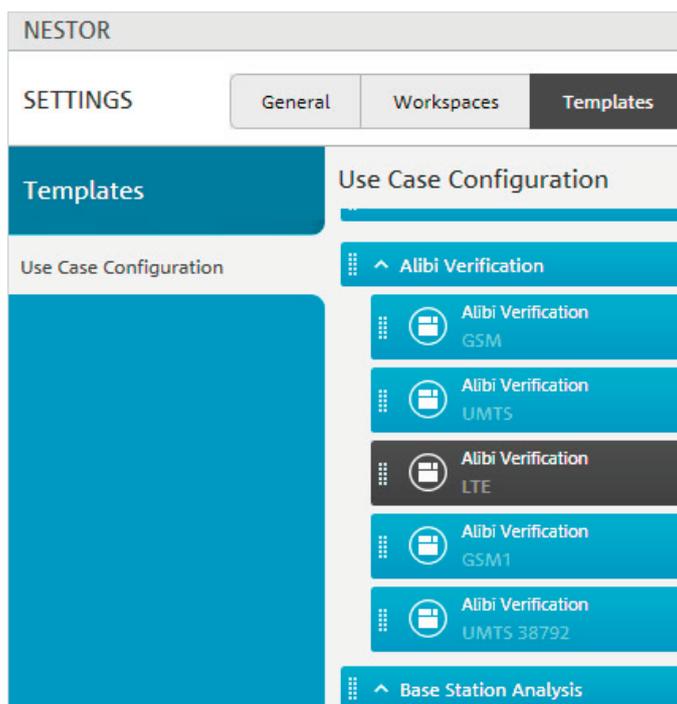


Fig. 1

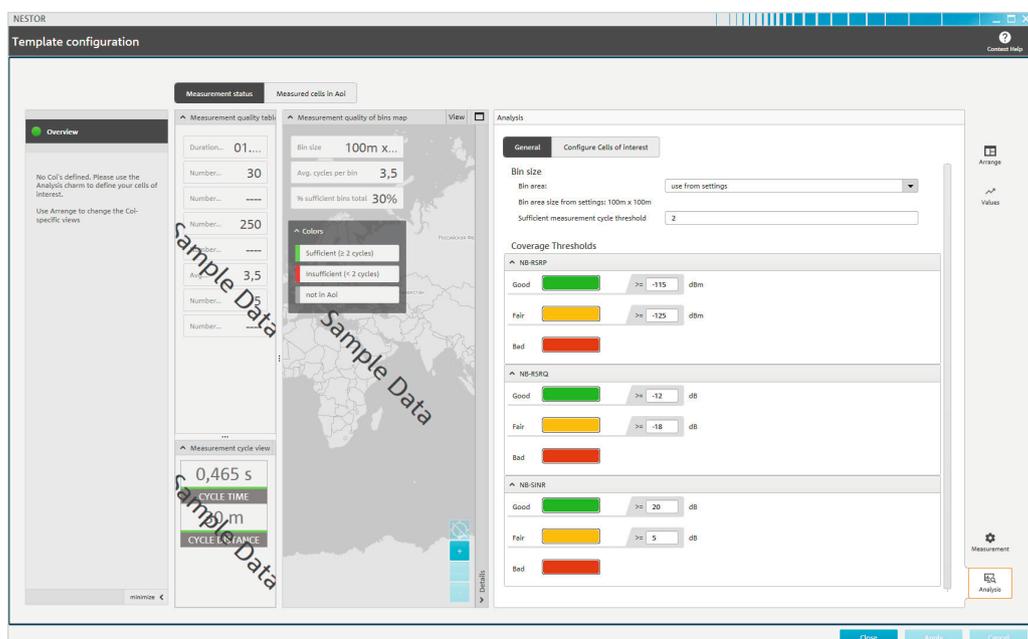


Fig. 2

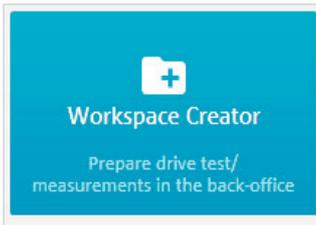


Fig. 3

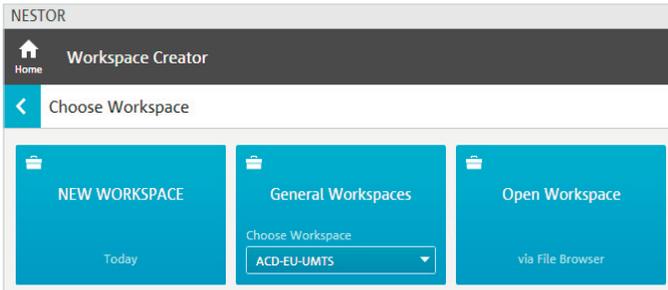


Fig. 4

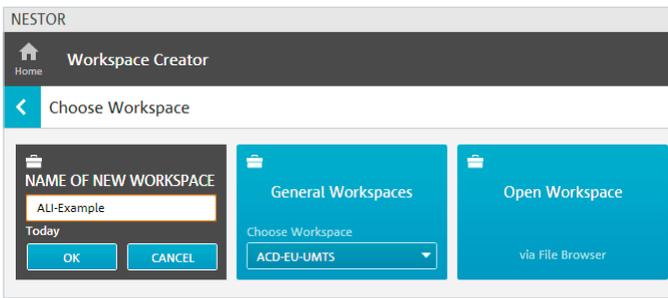


Fig. 5

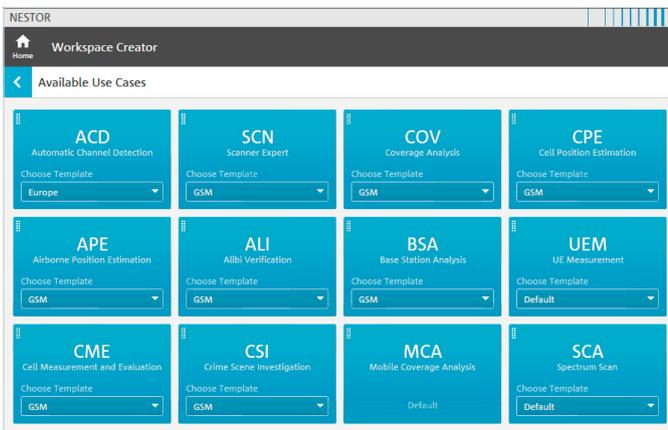


Fig. 6

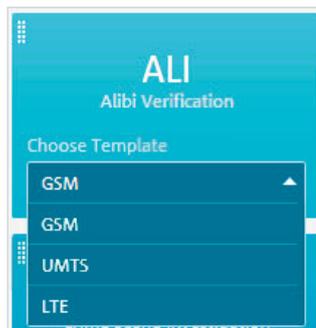


Fig. 7: The selected templates appear on the right side of the screen in the list of active use cases. Use the arrow to the right of "Active Use Cases" to continue, or directly click the desired use case (Fig. 8).

Recommendation: Special cells of interest should be defined only in user-specific templates because otherwise they will appear by default within the ALI use case.

In some cases, the specifications must be adapted for each specific mobile radio technology (GSM, UMTS, LTE).

2.1.2 Creating templates

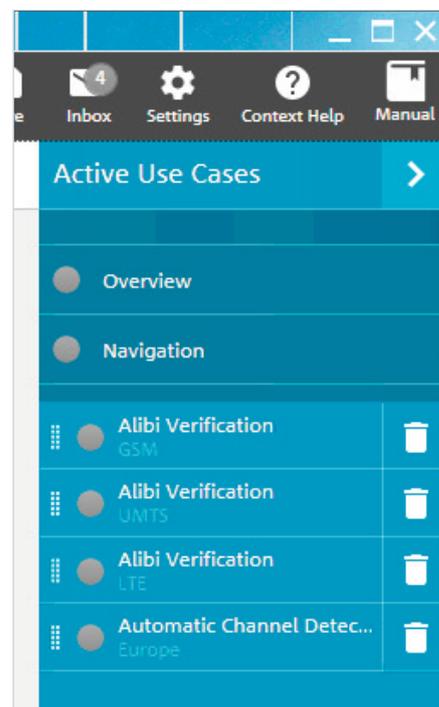
Templates are created when the workspace is created; the procedure is described in that section (2.1.1 Modifying existing templates).

2.2 Creating a workspace

The workspace editor is used to create workspaces (Fig. 3). Here, new workspaces can be created or existing workspaces modified (Fig. 4).

Clicking the name of a new workspace opens another menu (Fig. 5) where the name can be entered.

Depending on the options that were purchased, the available use cases can then be selected (Fig. 6): here, ALI is the correct choice for alibi verification. Depending on the available mobile radio technologies to be analyzed at the alibi locations, the ALI use case can have different choices with the corresponding templates (Fig. 7).



In the alibi verification area, the measurement parameters can be configured for the appropriate frequency range (Fig. 9): this is where the parameters from the templates are displayed. They can be modified if necessary.

Unsaved changes are shown on the tab and can be confirmed by clicking the "Apply" button (Fig. 10).

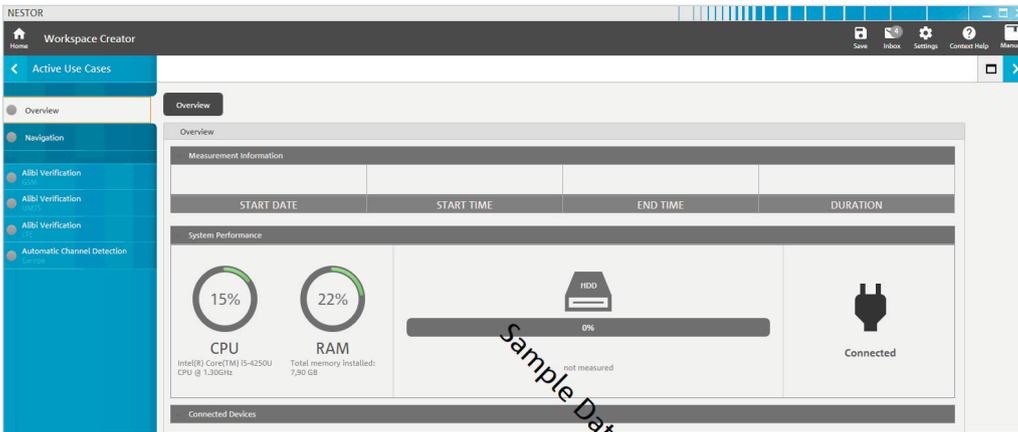


Fig. 8

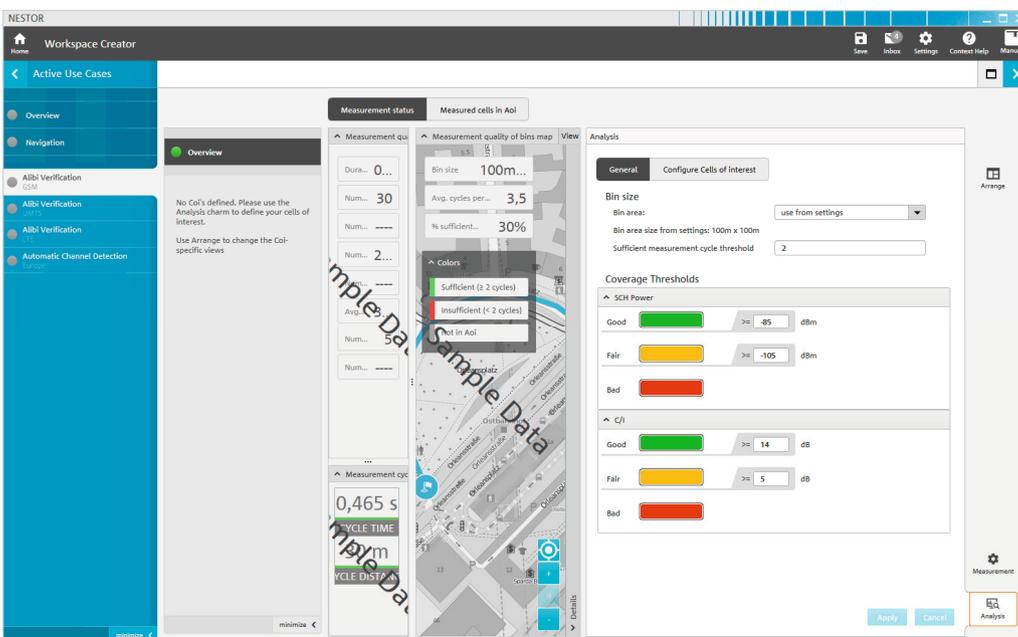


Fig. 9

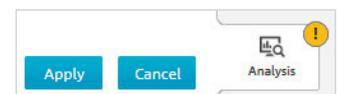


Fig. 10

If the parameters are not already in the standard templates, they can now be saved for the scanner (Fig. 11): here, the channels to be measured can be specified for each technology to be monitored (RAT). Alternatively, the R&S®NESTOR ACD option can be used for automatic configuration of the channels.

Recommendation: When lacking information about the level of development of on-site mobile radio networks, it is advisable to configure the scanner using automatic channel detection (ACD). This is preset in the standard templates. In this case, ACD must also be included in the workspace as a use case. The scanner specifications are maintained individually for each technology (RAT). ACD should be used with a template that includes all relevant technologies for usage with ACD.

Afterwards, it makes sense to configure the cells of interest and save them in a separate template (Fig. 12).

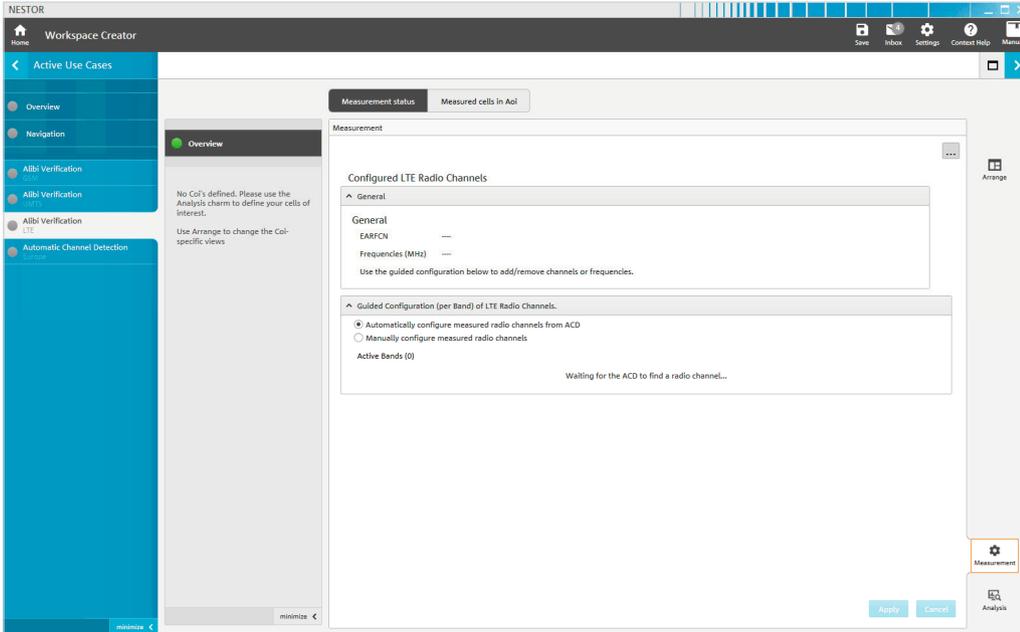


Fig. 11

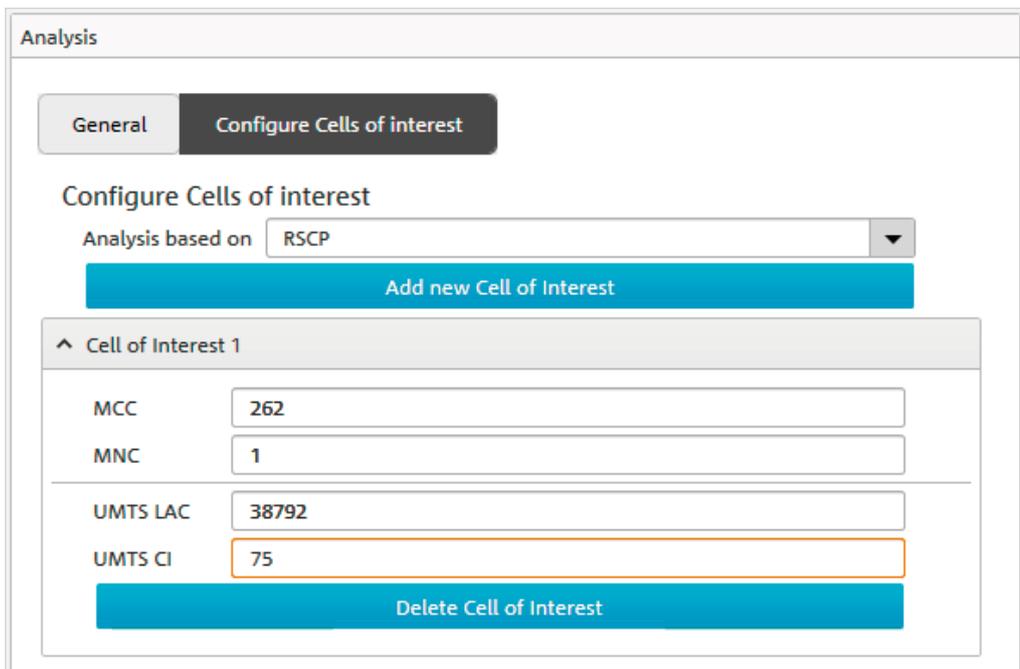


Fig. 12

2.2.1 Saving new templates

Use “Save/Save Template” to store the modified settings on the local R&S®NESTOR system for subsequent access. The only way to transfer the settings to other measuring systems is via the workspace. This is true especially if the cell(s) of interest are contained in the template, since logically they should be monitored starting during the measurement (Fig. 13).



Fig. 13



2.3 Saving workspaces

Use “Save/Save Workspace” to store modified workspaces on the local R&S®NESTOR system.

Use the arrow (Fig. 14, top) to access the save/export area (Fig. 15): here, the created workspace can be saved either locally or to external data carriers. The workspace can be added to the user’s favorite workspaces (Fig. 15).

The current workspace can also be deleted from the local R&S®NESTOR system so that it is only saved to a USB stick, network drive or desktop. Then, however, using the workspace on the local R&S®NESTOR system will require access to the selected storage location and it will no longer appear in the R&S®NESTOR workspace tiles.

Click the arrow to return to the dashboard. Further steps can now be carried out on the local R&S®NESTOR system or a remote measuring system.

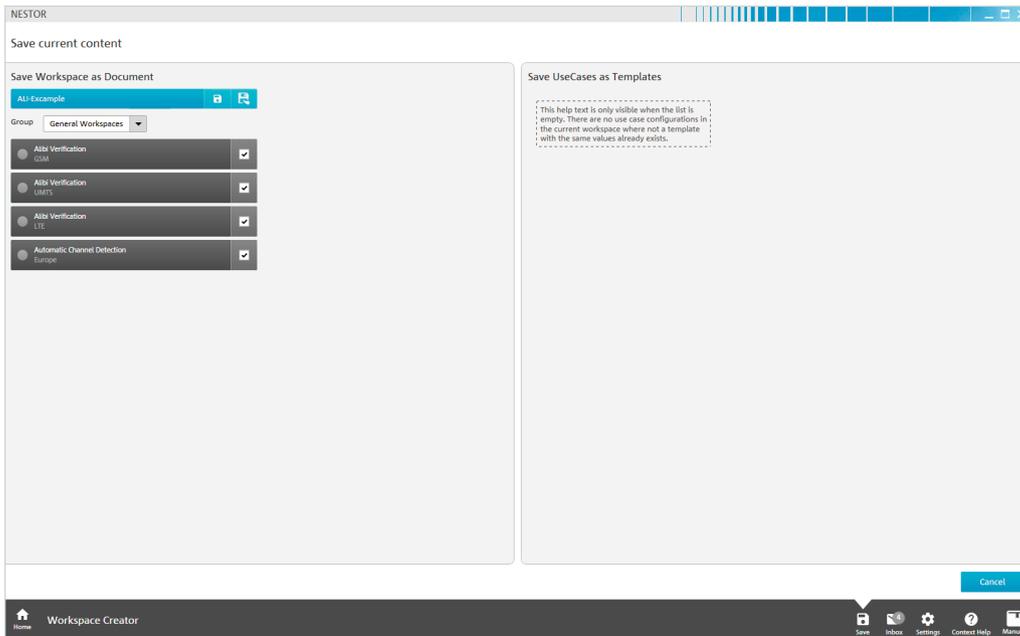


Fig. 14

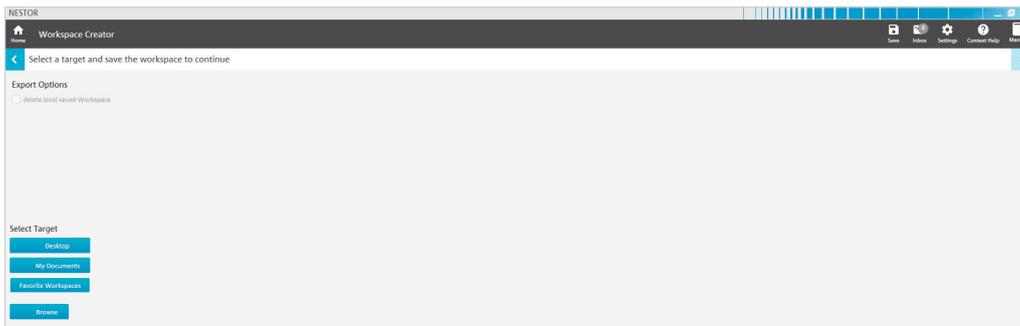


Fig. 15

3 Performing measurements

To perform a measurement, select the “Cellular Network Analysis” scenario after launching the R&S®NESTOR software (Fig. 16). Check that a connected instrument is displayed (typically an R&S®TSME or R&S®TSMA scanner) (Fig. 17).

Now, select the workspace that was created as described under 2.2 Creating a workspace (Fig. 18).

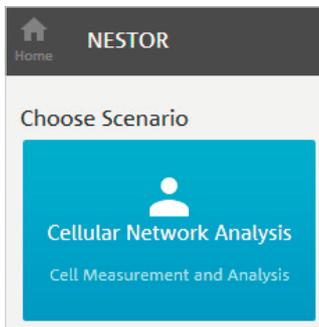


Fig. 16

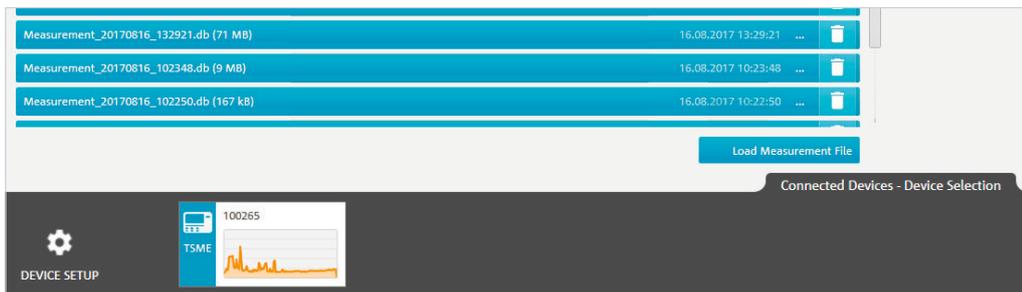


Fig. 17

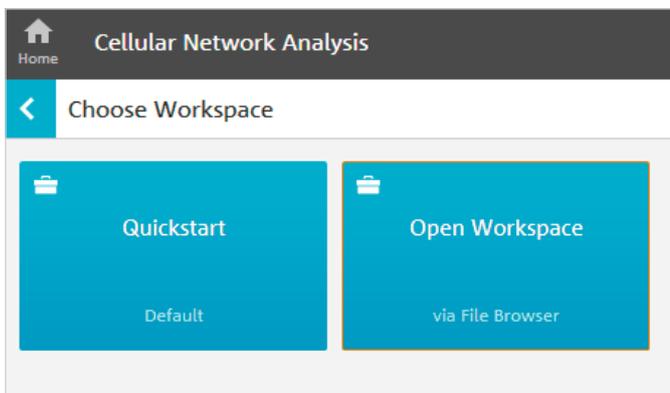


Fig. 18

This loads the defined use cases and all settings relevant to the measurement. If the workspace or its templates are also to be permanently stored on the remote measuring system, follow the steps as described above (2.3 Saving workspaces) (Fig. 19).

In the display for the current measurement, the frequency of measurement at a corresponding position (bin) can be recognized from the color code (Fig. 20).

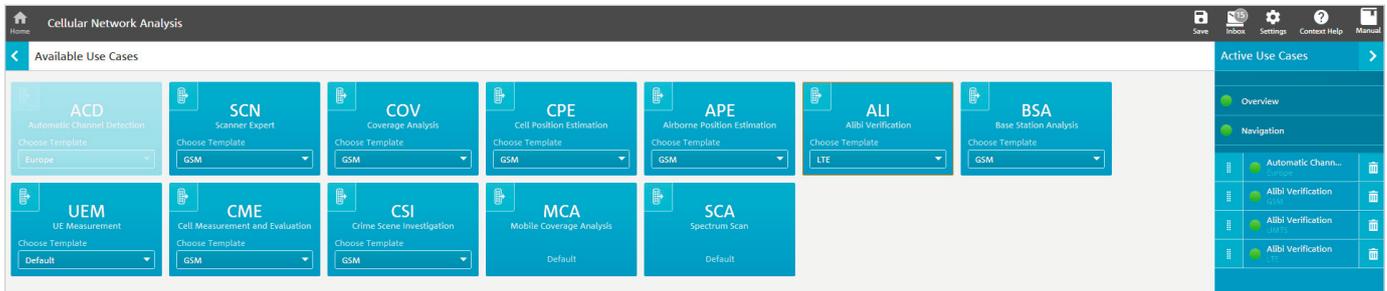


Fig. 19

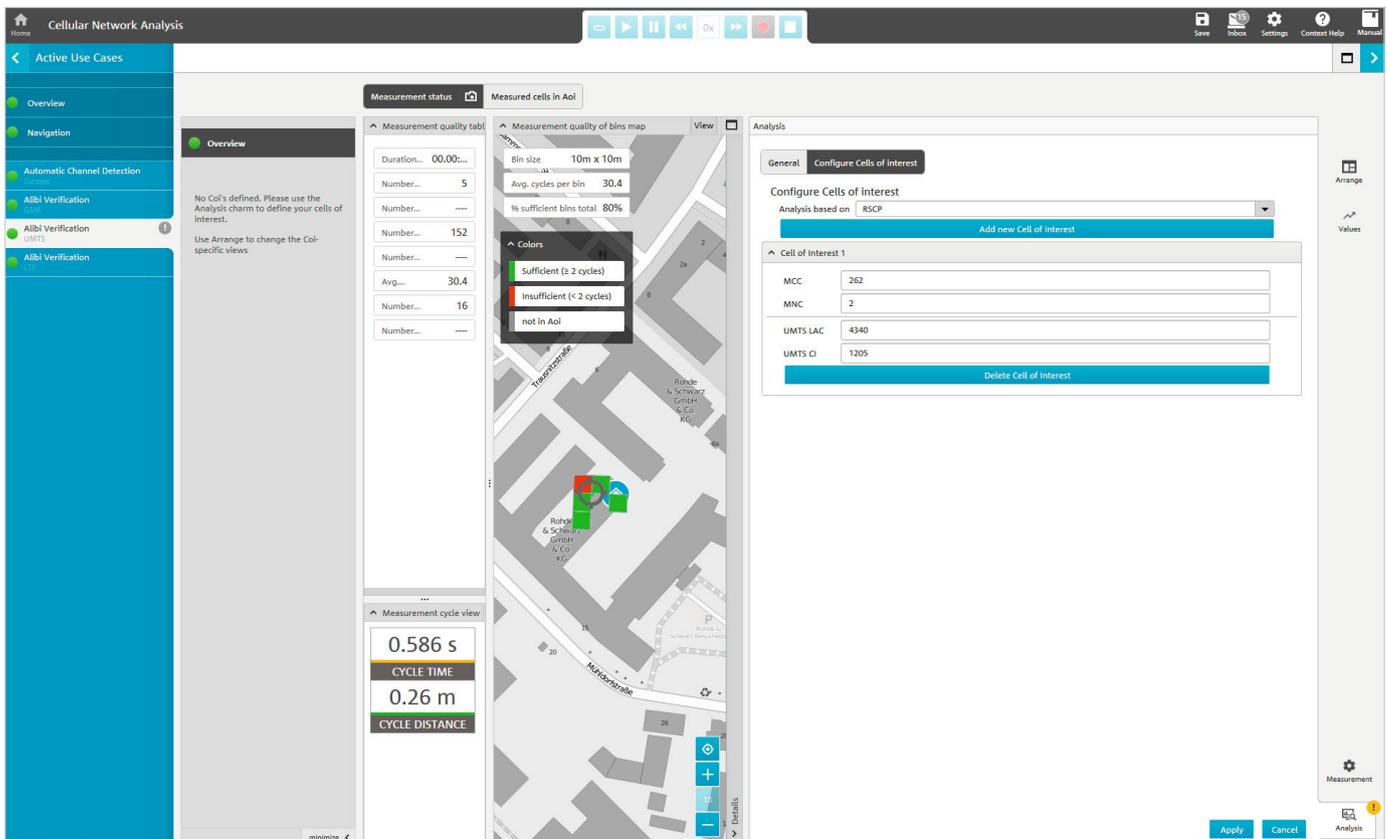


Fig. 20

To obtain a meaningful evaluation, at least two complete measurement cycles (green: standard display) should be performed in each geographic tile (bin, square). The actual number of measurement cycles can be checked by clicking each tile. Around the locations to be verified, a very high percentage of tiles should be shown in green. For configured cells of interest, the overview already shows whether they were surveyed during the measurement procedure. Select a measured cell to view its classification (Figs. 21 and 22).

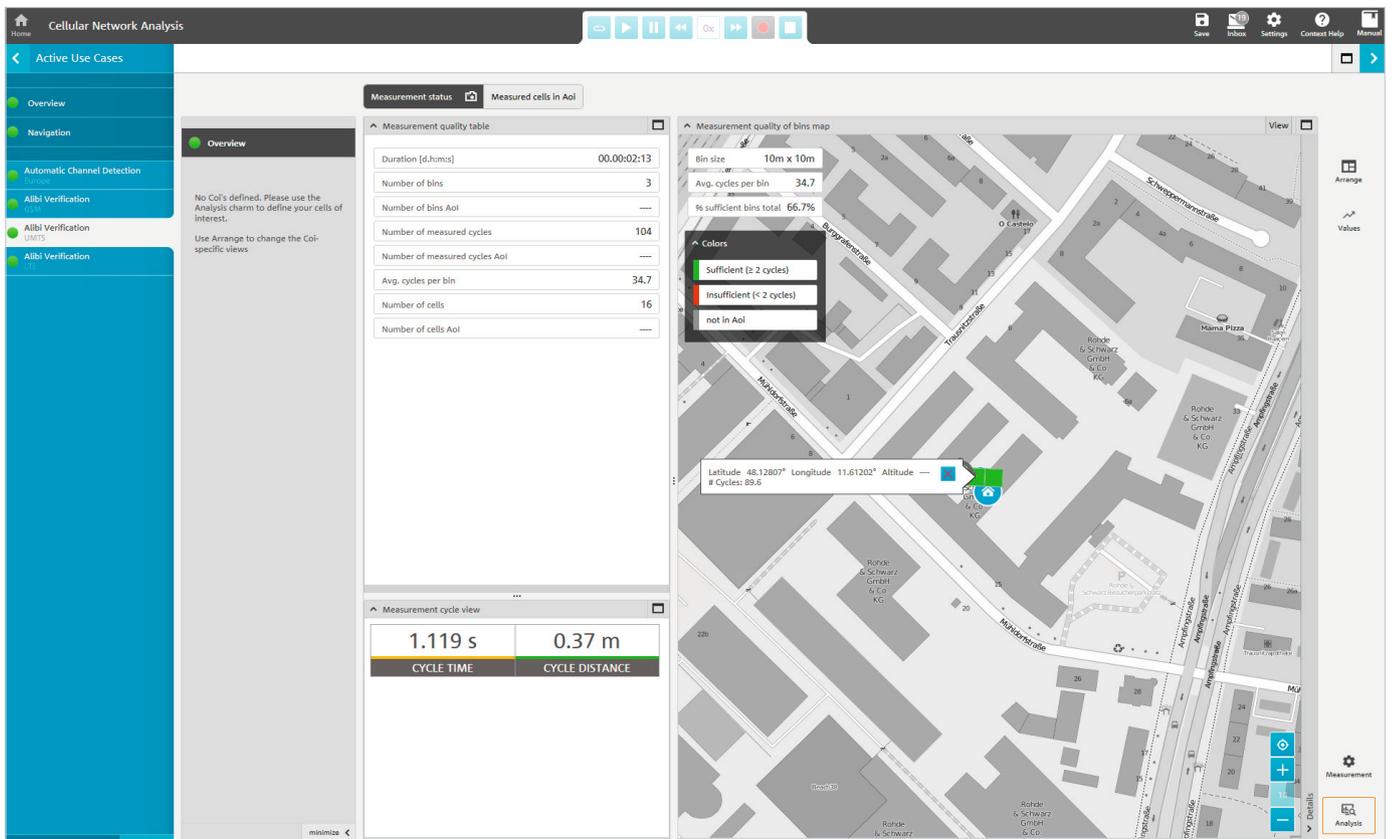


Fig. 21

Click HOME twice to end the measurement.

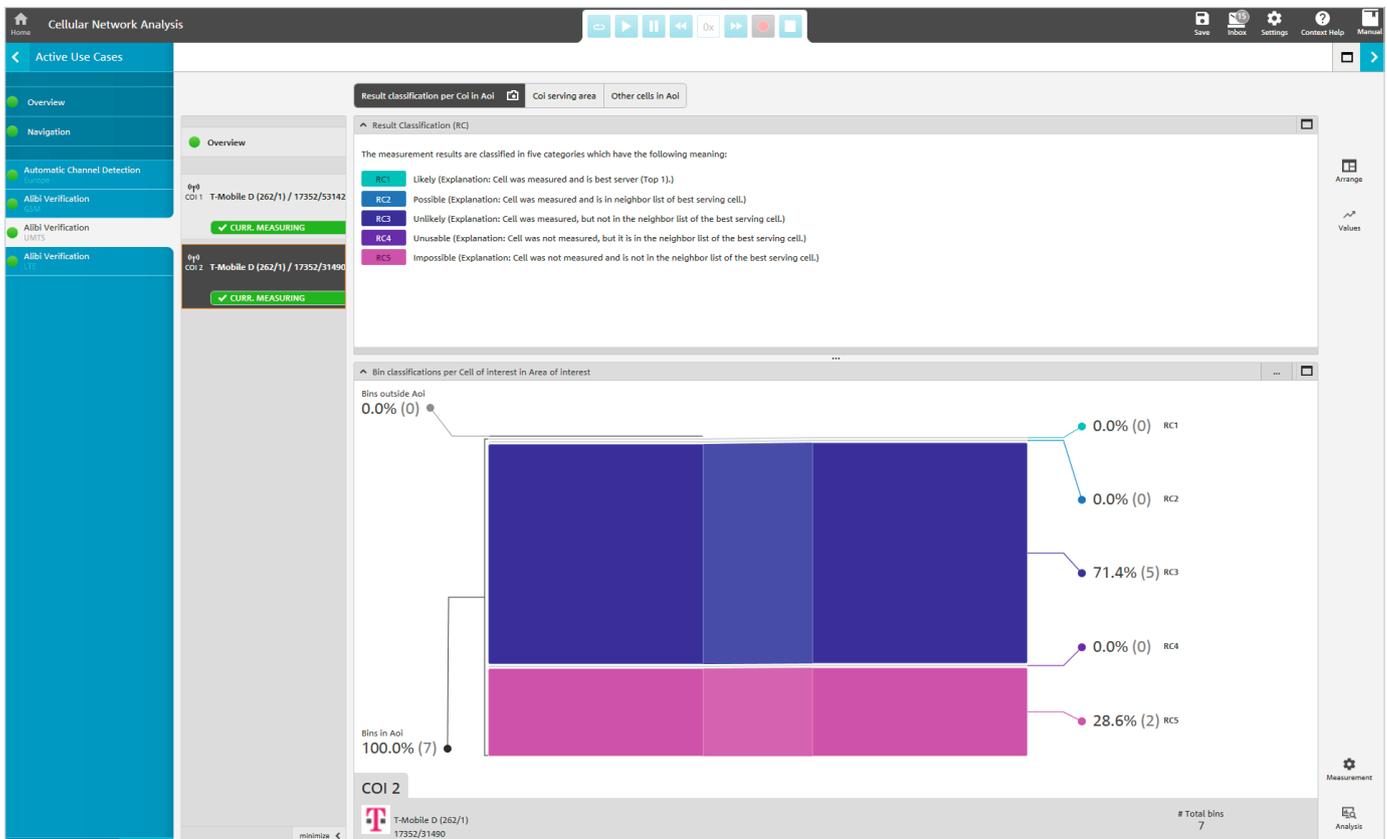


Fig. 22

4 Measurement evaluation/reports

Click “Data Investigation” under the scenarios to evaluate the measurement results (Fig. 23).

Note: The measurement file must be present on the analysis system.

4.1 Loading measurement files

During the subsequent file selection, the appropriate measurement file(s) are marked (Fig. 24).

If no file(s) are displayed, configure the paths used for file storage under “Add new data source...”.

All use cases contained in the selected measurement files are shown on the right under “Matched Use Cases” (Fig. 25).

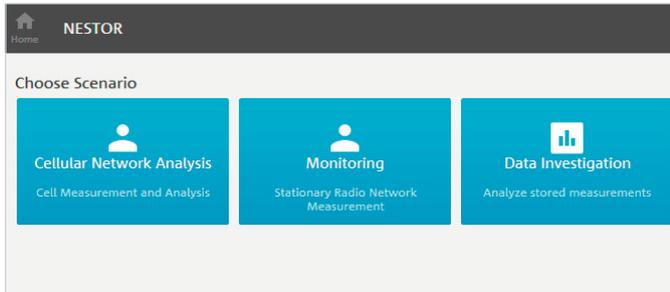


Fig. 23

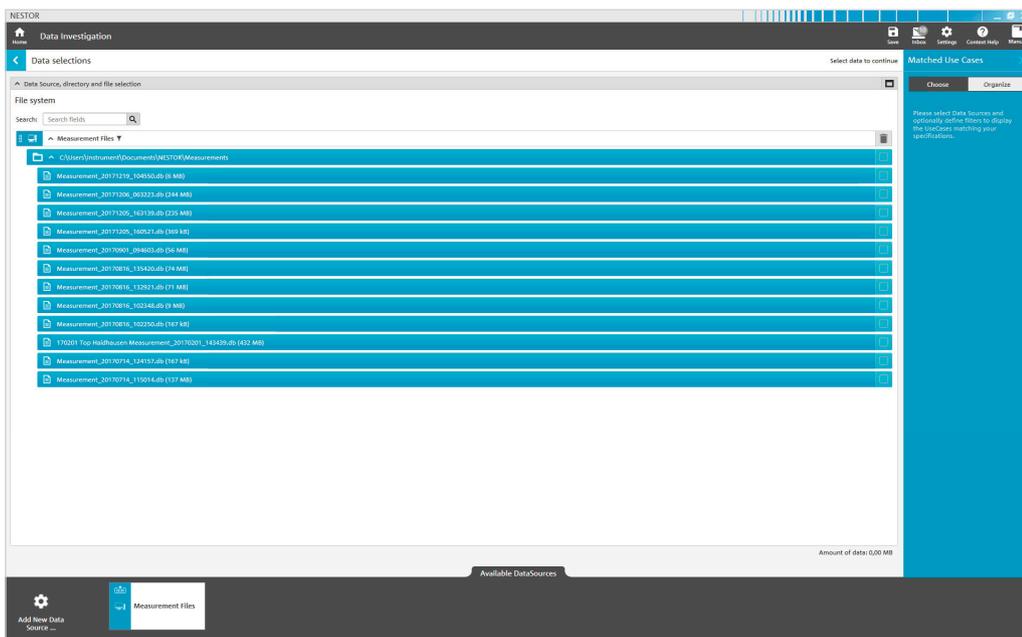


Fig. 24

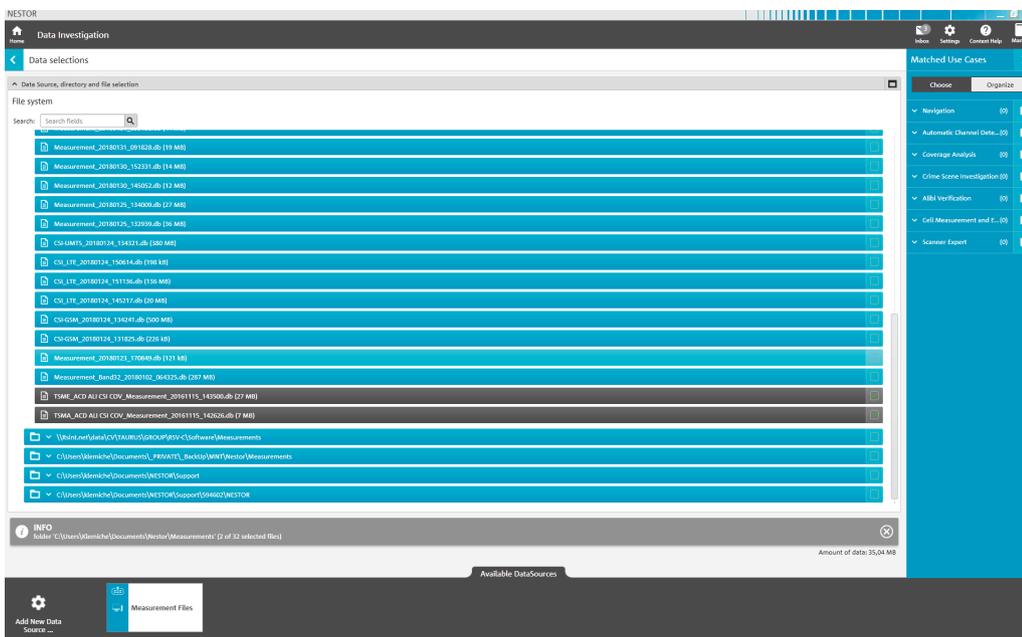


Fig. 25

There, the desired use cases can be clicked (Fig. 26).

Note: If the analysis is to be performed in a closed manner for multiple files with different templates, group these use cases using the “Organize” button. In case of templates with the same name, R&S®NESTOR automatically performs this merge operation. To separately perform the analysis simultaneously by locations, the templates should be given different names (e.g. according to the scene of the crime).

If the data from other use cases can be used for the use case currently under consideration, this data is displayed in the current use case and can be arranged with the “Organize” button. Here, the original use case that was used is shown in brackets before the technology (Fig. 27).

For example, this procedure can be useful for analyzing multiple files with different measured use cases. In case of a single file with multiple measured use cases, the data foundation for the different use cases is identical so that selection or grouping of multiple use cases only increases the analysis time without providing any additional information.

Click the arrow at the top right (Fig. 27, right side) to access the analysis interface (Fig. 28).

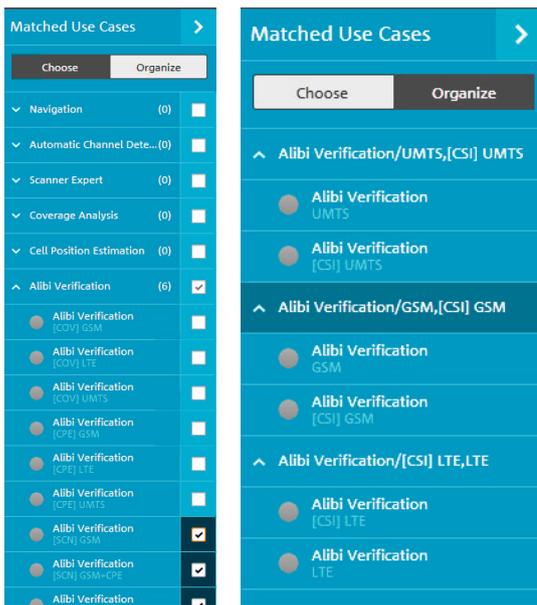


Fig. 26

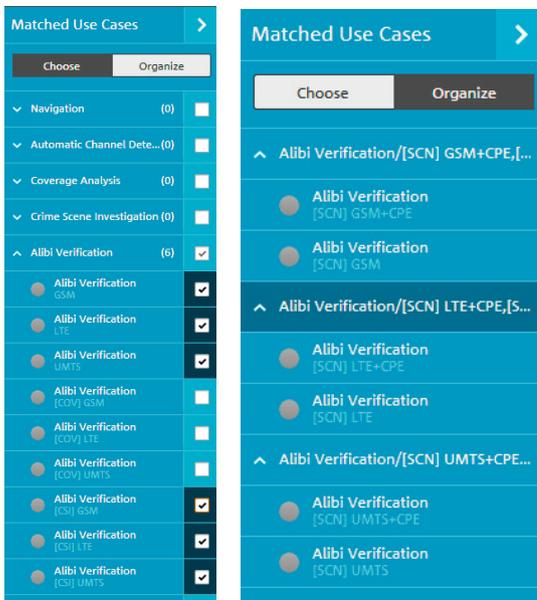


Fig. 27

4.2 Data analysis

This view provides an overview of the measurement. If one or more cells of interest are already configured, their survey status will appear under “Overview”. There is a list view of the measured cells under “Measured Cells in Aoi”.

By default, R&S®NESTOR uses the surveyed route as the area of interest (AOI).

If the user wishes to survey one or more specific locations, this can be configured via “Details/Polygons” in the map display (R&S®MapView) (Fig. 29).

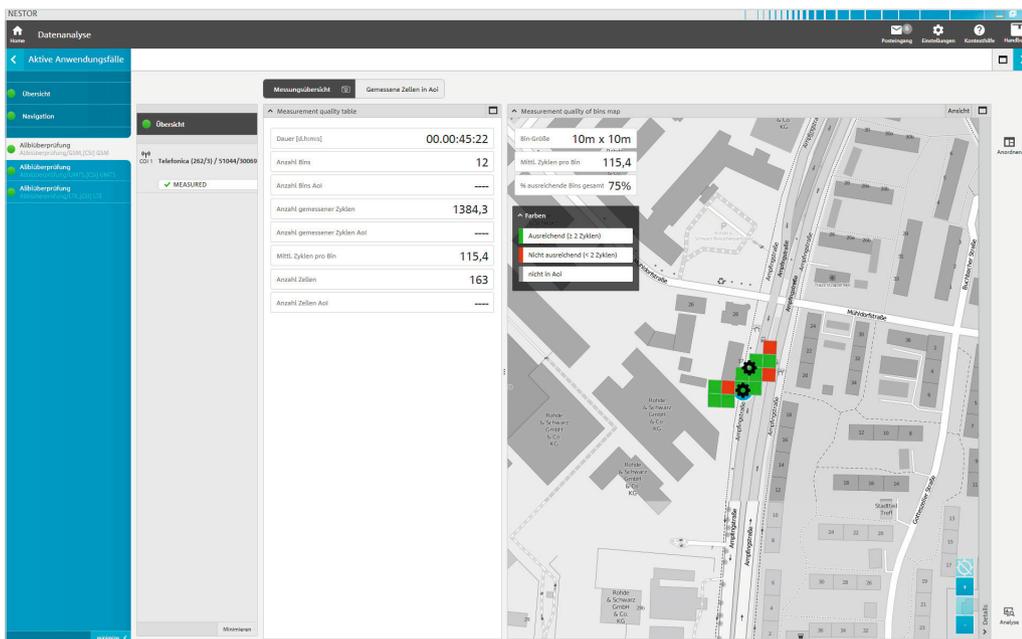


Fig. 28

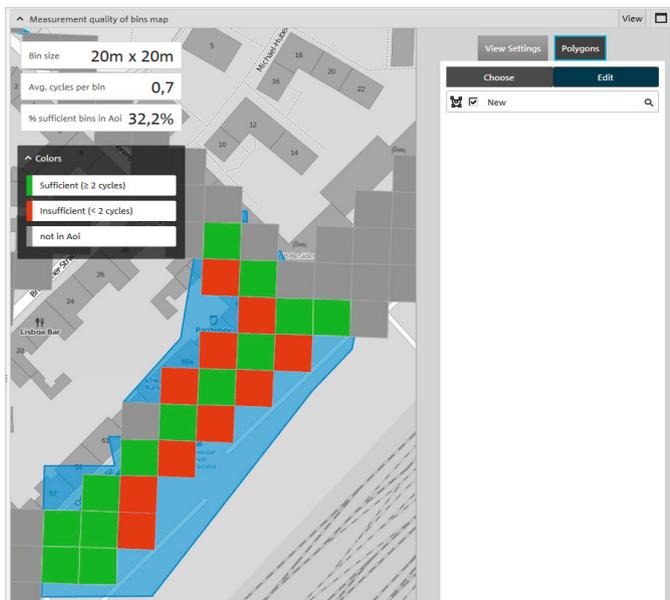


Fig. 29

The cell list then changes based on the currently selected AOI(s) (Fig. 30).

Click the  button to define measured cells as cells of interest (COI).

Use the “Analysis” button at the bottom right to modify the thresholds for the analysis and configure the cells of interest (Figs. 31 and 32).

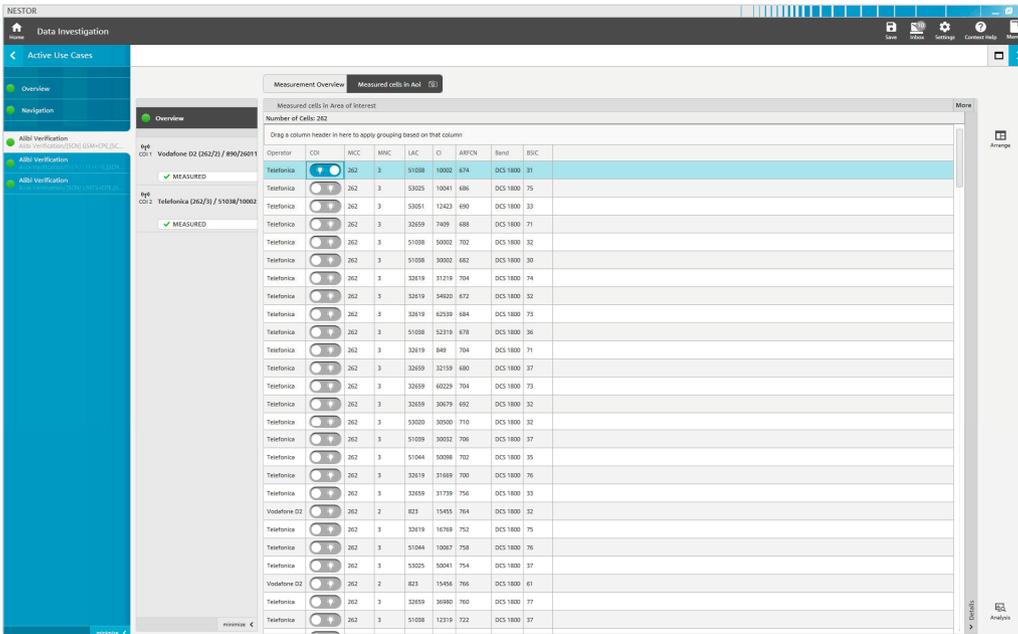


Fig. 30

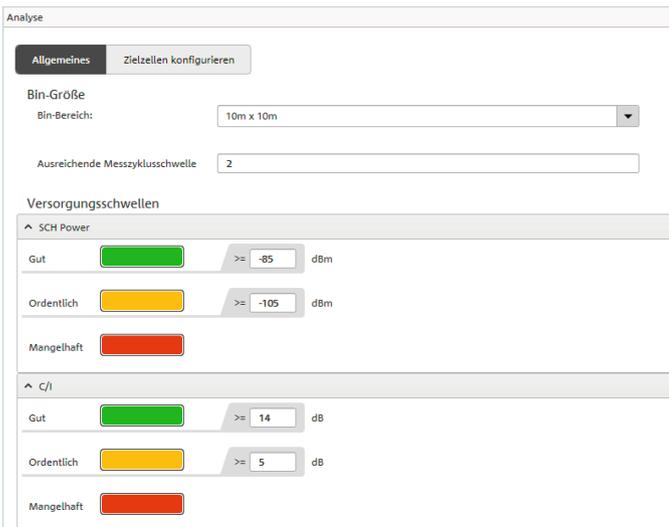


Fig. 31

Attention: These settings can be individually selected for each technology (GSM, UMTS, LTE). In GSM and UMTS, LAC and CI also define the cell in addition to MCC and MNC. In LTE, the ECI can also be used as an alternative to the eNB-ID-CI combination. R&S®NESTOR automatically converts these entries in the appropriate manner (Fig. 33).

Without any modification, the analysis is performed in accordance with the specifications in the standard template (2.1.1 Modifying existing templates). Ideally, the user should make any necessary modifications at the beginning.

When a COI is selected, the “Result classification per Coi in Aoi” is displayed. There, the cell is evaluated by usage probability (Fig. 34).

In the example, usage of the COI is unlikely because, even though the cell could be measured, it was not in the neighborhood list and not the best server.

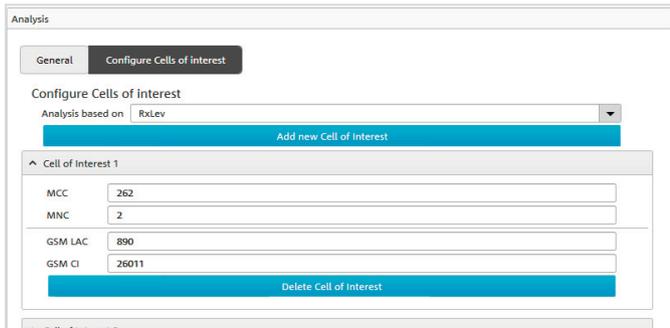


Fig. 32

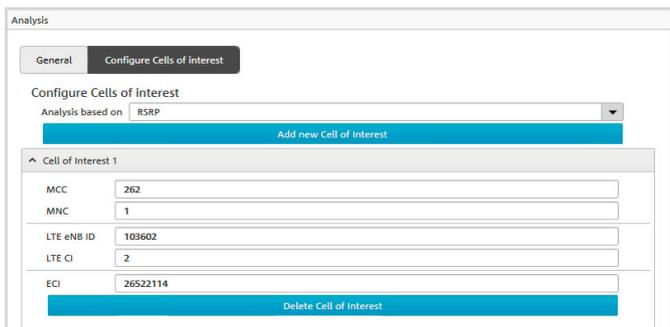


Fig. 33

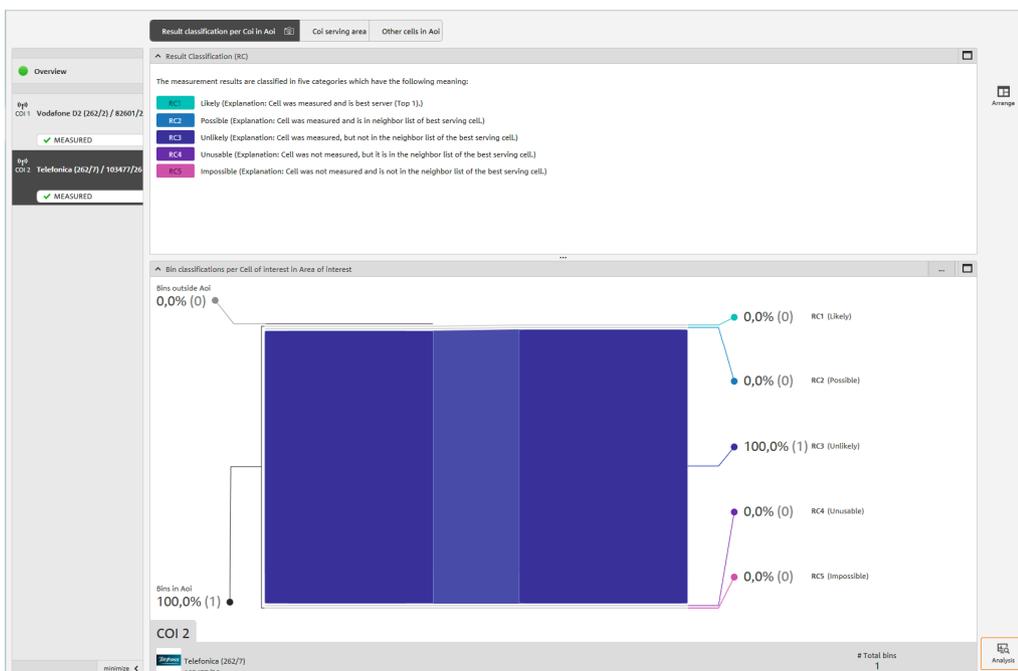


Fig. 34

In the “Coi serving area”, the usage probability within the AOI can be analyzed with greater geographical precision (Fig. 35).

Under “Other cells in Aoi”, the remaining cells surveyed in the AOI and belonging to the COI’s operator are listed.

Click



to include all of the analysis views in a subsequent evaluation.

Once the analysis has been completed fully in accordance with the desired settings to provide meaningful results, click the arrow in the top right corner (Fig. 35) to access the report.

4.3 Reports

In the ALI application, it is advisable to use the “Screenshots” view for reporting purposes, where the gathered screenshots are listed. They can be deleted if necessary. The selection is then exported as a PDF file or an editable RTF document.

The report is saved in the R&S®NESTOR export directory.

The export directory is indicated in the save message. It can be modified in the settings.

The default directory is “C:\Users\%USERNAME%\Documents\R&S®NESTOR\Exports”.

The ALI use case is now complete; the data is available for further processing.

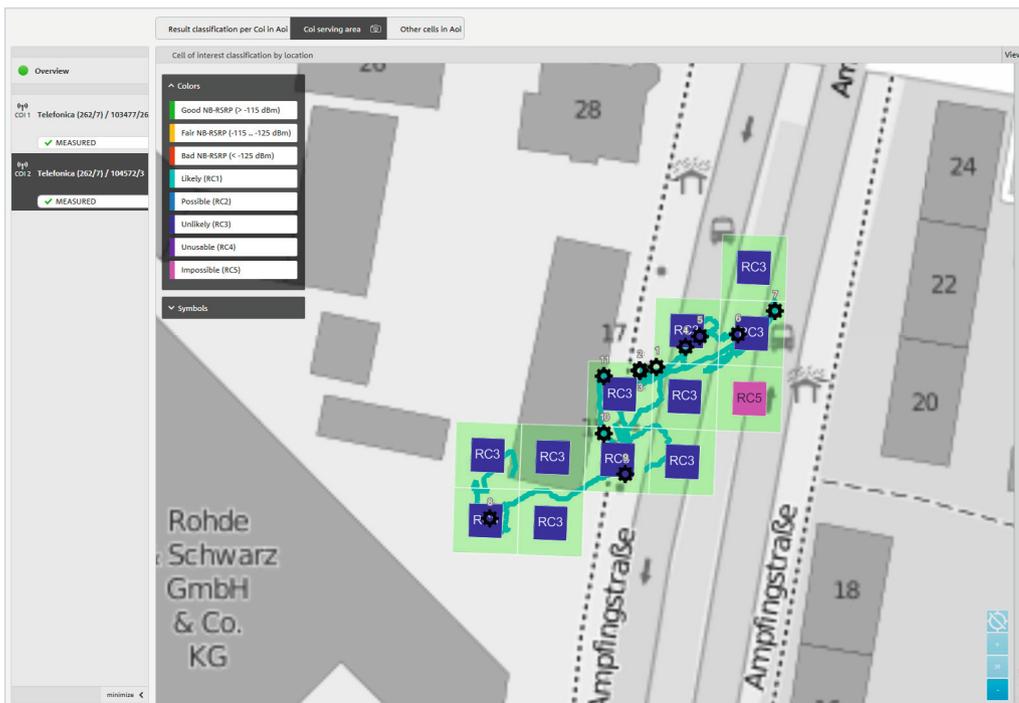


Fig. 35

5 Ordering information

| Designation | Type | Order number |
|---|----------------|--------------|
| Network Survey Software (SL) | R&S®NESTOR | 1522.8870K02 |
| CNA Software (SL) | R&S®NESTOR | 1522.8870.02 |
| Software Updates for One Year (four updates) | R&S®NESTOR-1Y | 1522.8870.82 |
| R&S®NESTOR option: Scanner Driver from Rohde&Schwarz (SL) | R&S®NESTOR-SCN | 1521.5031.02 |
| R&S®NESTOR option: Automatic Channel Detection (SL) | R&S®NESTOR-ACD | 1521.5048.02 |
| R&S®NESTOR option: Forensic Analysis (SL) | R&S®NESTOR-FOR | 1521.5060.02 |
| R&S®NESTOR option: R&S®NESTOR Language Package: German (SL) | R&S®NESTOR-L2 | 4900.3226.02 |
| Mobile Network Testing (MNT) Backpack System | R&S®MNT-CORE2 | 1531.1200.02 |
| Ultracompact Drive Test Scanner | R&S®TSME | 1514.6520.02 |
| Autonomous Mobile Network Scanner | R&S®TSMA | 1514.6520.20 |
| Universal Radio Network Analyzer | R&S®TSMW | 1503.3001.03 |
| Controller | | |
| Surface Pro Windows 10 | R&S®TSPC-SF4P | 3623.3981.02 |

6 Glossary

- ACD Automatic channel detection; automatically detects band and channel usage for GSM, UMTS, LTE and CDMA2000/EV-DO
- ALI Alibi verification; application for verifying alibis by surveying the involved radio cells
- AOI Area of interest; location where radio measurements are to be performed
- COI Cell of interest; cell to be measured in the radio survey
- RAT Radio access technology (e.g. GSM, UMTS, LTE)

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Rohde & Schwarz GmbH & Co. KG

www.rohde-schwarz.com

Rohde & Schwarz training

www.training.rohde-schwarz.com

Regional contact

- | Europe, Africa, Middle East | +49 89 4129 12345
customersupport@rohde-schwarz.com
- | North America | 1 888 TEST RSA (1 888 837 87 72)
customer.support@rsa.rohde-schwarz.com
- | Latin America | +1 410 910 79 88
customersupport.la@rohde-schwarz.com
- | Asia Pacific | +65 65 13 04 88
customersupport.asia@rohde-schwarz.com
- | China | +86 800 810 82 28 | +86 400 650 58 96
customersupport.china@rohde-schwarz.com

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