R&S®NESTOR-FOR Alibi Verification





Application Brochure | Version 02.00

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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.

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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.

NESTOR			
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		Good 72 70 d8 Tair 72 5 d8	¢ Measurement
minimize ("Ario	Bed .	Eq Analysis
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Fig. 3



Fig. 4

NESTOR Home Workspace Creator Choose Workspace MAME OF NEW WORKSPACE ALI-Example Today OK CANCEL General Workspace ACD-EU-UMTS Via File Browser

Fig. 5

NESTOR			
Home Workspace Creator			
Available Use Cases			
Europe	Scanner Expert Choose Template	COV Coverage Analysis Choose Template	ECPE Cell Position Estimation Choose Template
E APE Airborne Position Estimation Choose Template GSM	ALLI Alibi Verification Choose Template GSM	BSA Base Station Analysis Choose Template GSM	UE Messurement UE Messurement Choose Template
ECME Cell Measurement and Evaluation Choose Template GSM	ECSI Crime Scene Investigation Choose Template GSM	E MCA Mobile Coverage Analysis Default	SCA Spectrum Scan Choose Template

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).

	ALI Alibi Verification	
	Choose Template	
	GSM 🖌	•
	G5M	
1	UMTS	
	LTE	

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. 10



6

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).

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minimize <	minimize K			

nalysis	
General	Configure Cells of interest
Configure Cel	ls of interest
Analysis based	on RSCP 🗨
	Add new Cell of Interest
↑ Cell of Interest	t1
мсс	262
MNC	1
UMTS LAC	38792
UMTS CI	75
	Delete Cell of Interest

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).

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.

NESTOR Save current content Save Workspace as Document Save UseCases as Templates General Workspaces 💌 ~ ~ Home Workspace Creator ê 😢 💠

Fig. 14









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Settings Active Use Cases 2

Context Help

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Save

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

Measurement_20170816_132921.db (7	'1 MB)	16.08.2017 13:29:21
Measurement_20170816_102348.db (9	MB)	16.08.2017 10:23:48
Measurement_20170816_102250.db (1	67 kB)	16.08.2017 10:22:50 🔐 📋
	100265	Load Measurement File Connected Devices - Device Selection

Fig. 17



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

Cellular Network Analys	is		Context Help Manual
< Active Use Cases			
Overview	Measurement status	Measured cells in Aoi	
Navigation Automatic Channel Detection Ability Verification ABility Verification MMS ABility Verification MMS	Overview No Col's defined. Please use the Analysis charm to define your cells of interest. Use Arrange to change the Col- specific views Number. Second Sec	y tab Messurement quality of bins map Wew Bin size 10m x 10m Arg. cycles per bin 30.4 We sufficient bins total 80% Coors Sufficient (z 2 cycles) Sufficient (z 2 cycles) Configure Cells of Interest Analysis based on ISCP Add new Cell of Interest Add new Cell of Interest Configure Cells of Interest Analysis based on ISCP Add new Cell of Interest Configure Cells of Interest C	Arrange Values
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	0.26 m CYCLE DISTANCE		Measurement Ed Analysis

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).



Click HOME twice to end the measurement.



4 Measurement evaluation/reports



Fig. 23

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).



STOR			- 2
Data Investigation		🔝 🏟 Index Settings Cor	etent Help Ma
Data selections		Matched Use Cas	
Data Source, directory and file selection		Choose	Organize
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earch fields Q		 Navigation 	
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B Measurement_J0180125_134009.db (27 M8)		 Allbi Verification 	
Macauroment_20180125_132939.db (56 MB)		✓ Cell Measurement	
COLUMITS_20180134_134331.db (300 MB)		✓ Scanner Expert	
CSI_LTE_20180124_150014.db (198.ks)			
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Messurement_Band32_20180182_064325.db (287 M8)			
TSME_ACD AU CSI COV_Measurement_20161115_143500.db (27 M8)			
TSMA_ACD ALI (SLCOV_Messurement_20161115_142626.dk (7 M8)			
C v //Rointweil/Josa/CV/TAURUS/GROUP/RSV-C/Software/Measurements			
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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).



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Fig. 26





Matched Use Cases 5 Choose Organize Alibi Verification/[SCN] GSM+CPE,[... ▲ Alibi Verification/[SCN] LTE+CPE,[S... Alibi Verification Alibi Verification Alibi Verification Alibi Verification

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).





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

Click the **O** 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).

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Data Investigation											tin the second	Contra	At Help Mercal
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	010 CO12 Telefonica (262/3) / 51038/10002	Telefonica		262	3	53051	12423	690	DCS 1800	33			
	✓ MEASURED	Telefonica		262	3	32659	7409	688	DCS 1800	71			
		Telefonica		262	3	51038	50002	702	DCS 1800	32			
		Telefonica		262	3	51038	30002	682	DCS 1800	30			
		Telefonica		262	3	32619	31219	704	DCS 1800	74			
		Telefonica		262	3	32619	34920	672	DCS 1800	32			
		Telefonica		262	3	32619	62539	684	DCS 1800	73			
		Telefonica		262	3	51038	52319	678	DCS 1800	36			
		Telefonica		262	3	32619	849	704	DCS 1800	71			
		Telefonica		262	3	32659	32159	680	DCS 1800	37			
		Telefonica		262	3	32659	60229	704	DCS 1800	73			
		Telefonica		262	3	32659	30579	692	DCS 1800	32			
		Telefonica		262	3	53020	30500	710	DCS 1800	32			
		Telefonica		262	3	51039	30032	706	DCS 1800	37			
		Telefonica		262	3	51044	50098	702	DCS 1800	35			
		Telefonica		262	3	32619	31669	700	DCS 1800	76			
		Telefonica		262	3	32659	31739	756	DCS 1800	33			
		Vodatone D2		262	2	823	15455	764	DCS 1800	32			
		Telefonica		262	3	32619	16769	752	DCS 1800	75			
		Telefonica		262	3	51044	10067	758	DCS 1800	76			
		Telefonica		262	2	53025	50041	754	DCS 1800	37			
		Vodatone D2		262	2	823	15456	766	DCS 1800	61			
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Bin-Bereich:	10m x 10m 👻
Ausreichende Messzyklusschwelle	2
Versorgungsschwellen	
 SCH Power 	
Gut	>= -85 dBm
Ordentlich	>= -105 dBm
Mangelhaft	
∧ c/I	
Gut	>= 14 dB
Ordentlich	>= <u>5</u> d8
Mangelhaft .	

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.

Analysis

 General
 Configure Cells of Interest

 Configure Cells of Interest

 Analysis based on Rxtev

 Add new Cell of Interest

 Add new Cell of Interest

 MCC
 262

 MNC
 2

 GSM LAC
 890

 GSM CI
 26011

 Delete Cell of Interest

General C	onfigure Cells of interest	
Configure Cell	s of interest	
Analysis based	RSRP	•
	Add new Cell of Interest	
Cell of Interest	1	
MCC	262	
MNC	1	
LTE eNB ID	103602	
LTE CI	2	







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.



5 Ordering information

Designation	Туре	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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- Local and personalized
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- Uncompromising qualityLong-term dependability

About Rohde & Schwarz

The Rohde&Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, monitoring and network testing. Founded more than 80 years ago, the independent company which is headquartered in Munich, Germany, has an extensive sales and service network with locations in more than 70 countries.

Sustainable product design

- I Environmental compatibility and eco-footprint
- I Energy efficiency and low emissions
- Longevity and optimized total cost of ownership



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