# Automated spectrum clearance in LTE and 5G mobile networks

Spectrum clearance in mobile networks is becoming ever more important as operators use new bands that previously contained other services. This is particularly important for the rollout of 5G NR.

5G NR will initiate a worldwide deployment of TDD networks in an unknown radio environment where unwanted transmitters will create uplink interference that is masked by the network's own downlink signals. In such a scenario, interference hunting becomes a particularly demanding task. It uses traditional manual techniques and can be greatly assisted by the automated detection of interference signals before the network is switched on.

Automated recording of interference signals using the R&S®ROMES4NPA network problem analyzer
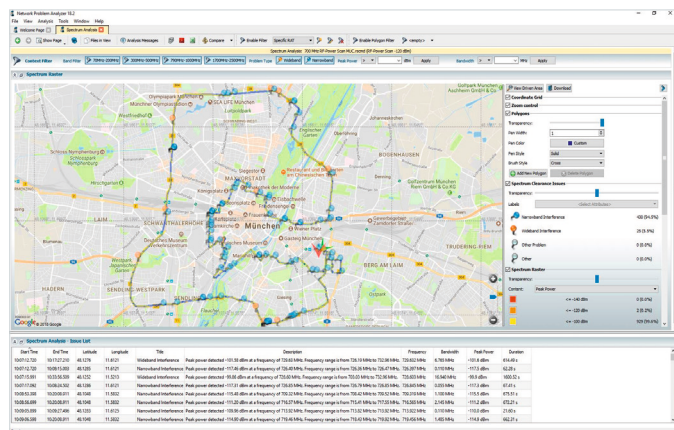
Your task

The task is to prepare new frequency bands for the deployment and switch-on of LTE or 5G NR networks by characterizing the radio environment and conducting spectrum clearance. The principal task ahead is to identify and eliminate external interference sources, which are most troublesome in the uplink. This process becomes more critical for the rollout of a new TDD network, where the downlink and uplink signals share the same frequency band and are separated only in time. In TDD deployments, the network's own high-power downlink signals will mask the uplink interference when spectrum measurements are performed within the interference hunting procedure. Therefore, the process of finding and eliminating interference sources is more complex than with FDD systems. and we highly recommend that you identify interference before the TDD system goes live. If this task can be automated, it will vastly reduce the time and difficulty of the process.

The following tasks need to be done before the network is switched on:
▪ Identify and map interference sources
▪ Hand over the location, frequency and spectral shape to interference hunting teams
▪ Find the source of interference and eliminate it

Automated solution from Rohde & Schwarz

The sequence of tasks listed above starts by conducting a drive test in the area concerned using a fast and sensitive scanning RF receiver to detect and record the location, frequency and spectral shape of interference sources. The results are then handed over to a postprocessing tool for further analysis and identification of signals fulfilling certain criteria such as minimum receive signal level.

Compared with the "traditional way" of directly deploying interference hunting teams equipped with spectrum analyzers or handheld receivers to the relevant area and manually searching for interference, the above method has three main benefits. First, the identification of potential interference signals and their characteristics is far faster than when using manual techniques. Second, since the collection of data and analysis of data are done separately,

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data collection, which is the most time-consuming part, can be achieved far more quickly using less skilled personnel. Third, the experts in the interference hunting teams are more effective because they concentrate only on the predefined interference spots.

The elimination of interference, the second step in the spectrum clearance process, can be automated using an appropriate direction-finding system such the R&S®MNT100 receiver in combination with the R&S®MobileLocator software.

The spectrum clearance solution consists of:
▪ A network scanner (such as the R&S®TSMW, R&S®TSMA or R&S®TSME)
▪ The R&S®ROMES4 universal software platform for network optimization and troubleshooting
▪ The R&S®ROMES4NPA network problem analysis software for postprocessing

The picture below shows the R&S®TSMA autonomous network scanner, which is battery powered and fits neatly into a shoulder bag for comfortable drive or walk tests. The R&S®ROMES4 drive/walk test software runs on the "Next Unit of Computing" PC integrated into the R&S®TSMA. The software is supported by a GPS receiver and a mapping capability. The measurements are controlled by a tablet that displays the results to the user in realtime.

Benefits and key features
The unique test solution from Rohde & Schwarz is the only one with a network scanner connected to the analysis and postprocessing software in an integrated package.
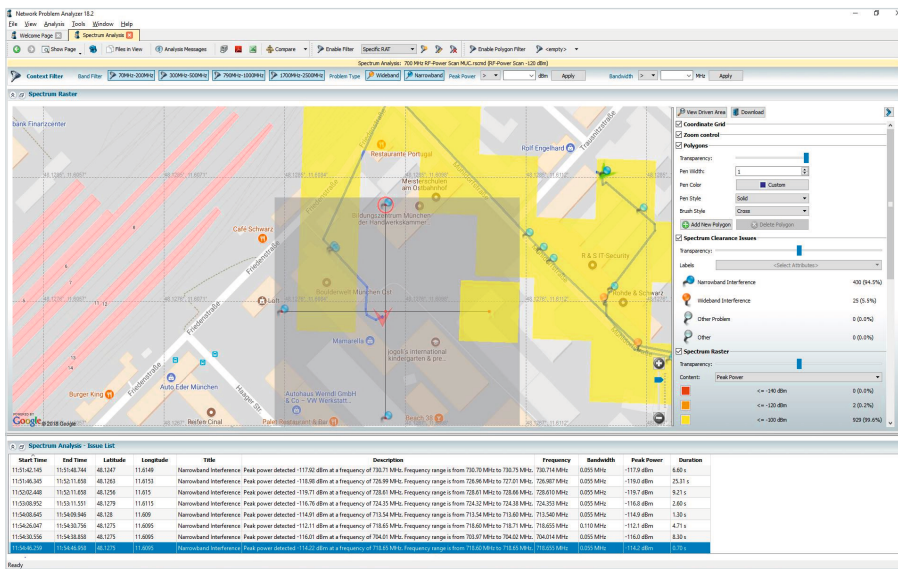
The key benefits for users:
▪ Acceleration of the spectrum clearance process by using automated interference identification
▪ More efficient utilization of expert resources by separating the data collection and analysis processes
▪ Increased reliability of data collection: the risk of redrives is reduced, since predefined measurement setups can be distributed, ensuring the quality of measurement results
▪ A complete overview of the interference situation due to the extremely sensitive scanner, enabling quick and clear separation between clear spectrum and interference sources
▪ Highly efficient data collection, thanks to very stable operation and the ability of the drive test software to handle a large amount of data
▪ Easy analysis, setup and modification using the integrated postprocessing tool
▪ Time saving due to fast analysis: two hours of drive test data is typically analyzed in two to three minutes

From further analysis of the interference signals, we can clearly see a cluster in the range of 725 MHz to 735 MHz (see lower screenshot on page 3).

The key features of this solution are:
▪ Central measurement control: predefined measurement setups can be distributed, ensuring good quality of measurement results
▪ Extremely sensitive scanner (able to scan the complete uplink 30 MHz bandwidth with –130 dBm DANL) enables quick and precise separation between clear spectrum and interference sources
▪ Very fast scanner allows more data to be collected per test time (or shorter measurement time for the same amount of data)
▪ Proven drive test platform able to handle large volume of data
▪ Fast automated and integrated postprocessing tool

The portable spectrum cearance solution: the R&S®TSMA autonomous mobile network scanner and the R&S®ROMES4 drive/walk test software

Result example from R&S®ROMES4NPA: spectrum measurements in the 700 MHz band. The red circle in the image identifies one potential problem spot, which is highlighted in the Issue List.
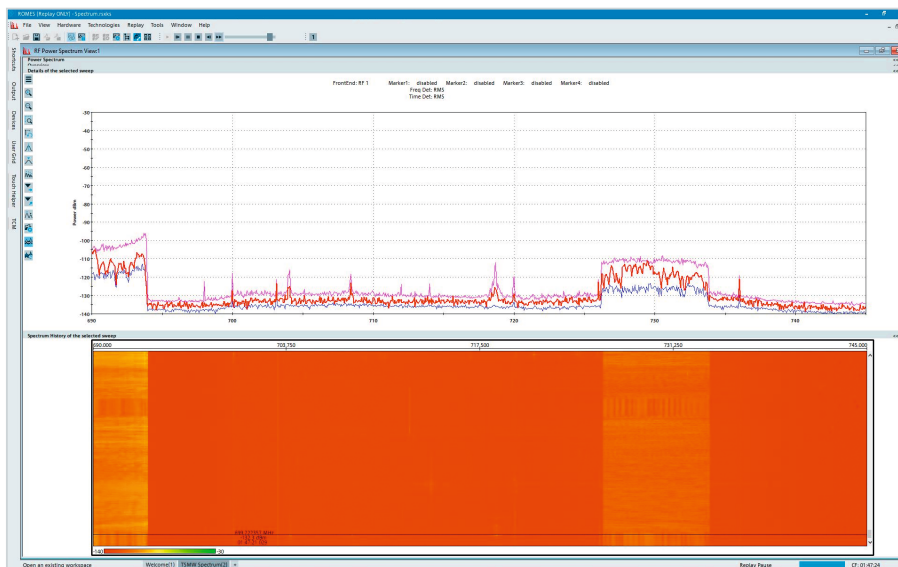
Spectral characteristics of the interference spot identified in the screenshot above using R&S®ROMES4 drive test software

Ordering information

Designation	Type	Order No.
Ultracompact drive test scanner	R&S®TSME6	4900.0004.02
Drive test software	R&S®ROMES4	1117.6885.04
R&S®TSME6 driver for R&S®ROMES4 drive test software	R&S®ROMES4T1E	1117.6885.82
Network problem analyzer	R&S®ROMES4NPA	1510.9276.02
RF power scan	R&S®TSME6-K27	4900.2120.02
Simultaneous measurement in all bands	R&S®TSME6-KAB	4900.2107.02
Autonomous mobile network scanner, includes R&S®TSMA6-BST (standard hardware configuration)	R&S®TSMA6	4900.8005.02
RF power scan	R&S®TSMA6-K27	4901.0720.02
Simultaneous measurement in all bands	R&S®TSMA6-KAB	4901.0708.02

Additional information

For more information on the test and measurement products and applications, please contact
your local Rohde & Schwarz sales representative or visit www.rohde-schwarz.com/mnt.

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

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

Certified Quality Management
ISO 9001

Certified Environmental Management
ISO 14001

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