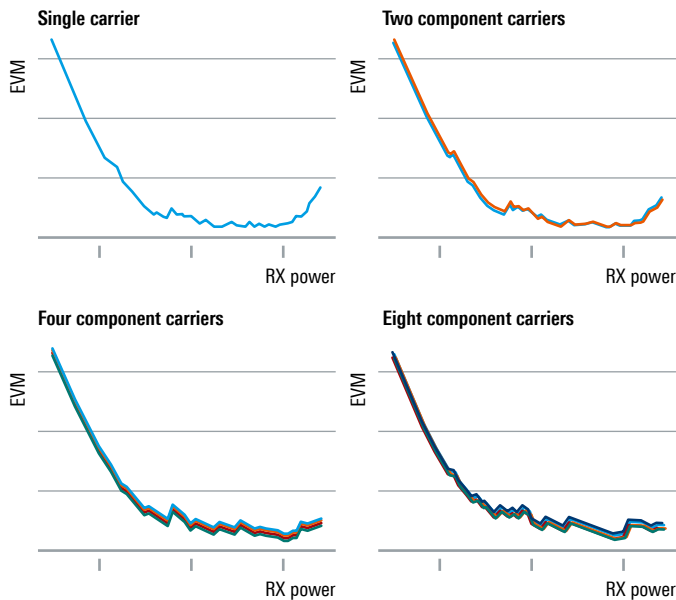


REDUCE 5G NEW RADIO MULTICARRIER TEST TIMES WITH R&S® SERVER-BASED TESTING

R&S® Server-Based Testing helps reduce test times for workloads that can be parallelized. 5G New Radio (5G NR) multicarrier signals are an ideal workload because each component carrier can be analyzed independently and in parallel. In an example EVM measurement, scenario test times are reduced significantly even when receiving I/Q data from just a single instrument.

5G NR multicarrier DUT



Your task

The performance of a 5G NR multicarrier DUT needs to be benchmarked and the error vector magnitude (EVM) is the measurement criterion.

Due to the complexity and larger bandwidths, test times for 5G NR signals have increased compared to equivalent measurements in previous generations of wireless communications technologies. To mitigate long test times, one option is to evaluate only part of the 5G frame. However, this is not possible if measurements need to comply with the 3GPP standard and the full frame has to be analyzed.

Let us consider the measurement of full frame 5G NR multicarrier signals in frequency range 2 (FR2) with each component carrier having a bandwidth of 100 MHz.

With the R&S®FSx-K144 5G NR option on Rohde&Schwarz midrange or high-end spectrum analyzers, you can setup a measurement scenario to evaluate EVM performance over power as shown in the figure on the left. However, carriers will be measured sequentially and test times are proportional to the number of carriers to be measured.

Rohde & Schwarz solution

R&S® Server-Based Testing helps reduce 5G NR multicarrier test times both by outsourcing signal analysis and by means of parallel processing. The user decides on the degree of parallelization and can configure the signal analysis microservices (SAMS), which do the work.

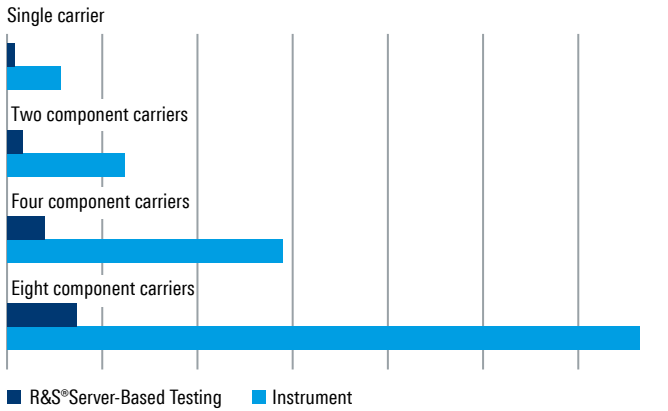
Note: The microservices make use of the same algorithms as the options on the instrument (e.g. R&S®FSV3-K144 for 5G NR analysis). Therefore, the measurement results from R&S® Server-Based Testing are identical to those on the instruments.

R&S® Server-Based Testing shows its full potential when installed on powerful server hardware and when receiving I/Q data from several sources. This application card shows that improvements in test times are significant even in cases where only one single instrument is used as the I/Q data source. To show this, the power sweep multicarrier EVM performance measurements are executed twice (see the figure on the left):

- ▶ Solely on the R&S®FSVA3000
- ▶ With the signal analysis performed using R&S® Server-Based Testing



Total test times for 59 measurements

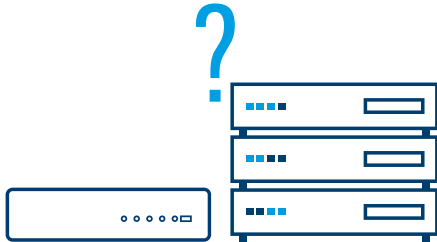


In both cases, the instrument executed both the auto amplitude leveling and the I/Q capturing. The signal analysis time increases proportionally to the number of component carriers. Each carrier analysis is independent and can be analyzed in parallel with other carriers on R&S®Server-Based Testing. The figure above shows that test times for measurements with eight component carriers are reduced by 89% when using R&S®Server-Based Testing compared to the instrument only scenario.

Finding the optimal number of signal analysis microservices (SAMS)

The optimal number of SAMS can be estimated with the multiserver queueing model. Two parameters are important: the mean rate of I/Q data arrival and the average time it takes one SAMS to run the signal analysis.¹⁾

What hardware is necessary?



Once the required number of SAMS is known, the hardware can be chosen accordingly. To achieve the desired reduction in time required for the multicarrier measurements, four SAMS are sufficient. Rohde & Schwarz recommends two processor cores for each SAMS.

The measurement scenario was executed on two different hardware configurations: a small form factor PC with eight processor cores and a powerful server with 40 processor cores.

¹⁾ For more information on how to estimate the optimal number of SAMS, please contact the Rohde & Schwarz Spectrum Analyzer Product Management.

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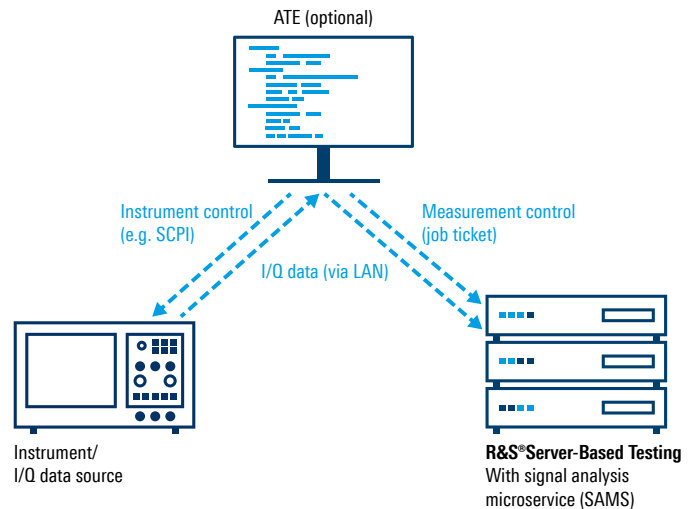
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The CPU of the small PC has a higher base frequency and is slightly better when configuring up to four SAMS. Hardware resources on this machine are insufficient to support eight SAMS working in parallel. If the measurement scenario is executed with two instruments configured as I/Q data sources and eight SAMS using R&S®Server-Based Testing, the test time with the small PC is approx. 52% longer compared to the server configuration.

Summary

R&S®Server-Based Testing shows its full potential when receiving I/Q data from several sources. 5G NR multicarrier measurements can be well parallelized and provide the ideal workload to speed up measurements on data captured with just a single instrument. The hardware requirement for this scenario is not high and a small form factor PC is capable of reducing test times by up to 89% for measurements with eight component carriers. In more demanding measurement scenarios where several I/Q sources are configured, adequate server hardware is required for R&S®Server-Based Testing.

Example test environment with R&S®Server-Based Testing



Key features and benefits

- ▶ Helps speed up accurate characterizations of 5G NR multicarrier DUTs
- ▶ 3GPP-compliant 5G DL and UL as well as 4G DL EVM calculation currently supported
- ▶ Additionally supported: industry-standard spectral measurements such as SEM and ACLR
- ▶ The degree of parallelization with R&S®Server-Based Testing is determined by the specific requirements and/or the engineer/user
- ▶ Compatible with any Rohde & Schwarz instrument capable of capturing and exporting I/Q data (I/Q data needs to be in a compatible format)
- ▶ Strongly localized operation (internet connectivity is not required)

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Reduce 5G new radio multicarrier test times with R&S®Server-Based Testing
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