

CERTIFICATE

ROHDE & SCHWARZ

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Rohde & Schwarz SwissQual AG, as the issuer of this document, certifies that



Telia Norge AS

Lørenfarefaret 1A
0580 Oslo
Norway

attained the

Best Network Performance Score

for Norway, assessed during Telia Norway's nationwide benchmarking campaign from October 9 to November 2, 2024.

We congratulate **Telia Norway** for ranking first with a score of **829 out of 1000 points** on the Rohde & Schwarz Network Performance Score in line with ETSI TR 103 559.

- ▶ Network Performance Score for voice service: 376 out of 400
- ▶ Network Performance Score for data service: 453 out of 600

Axel Hansmann

CEO Rohde & Schwarz SwissQual AG



Link to benchmarking
campaign details



Scoring methodology in
line with ETSI TR 103 559

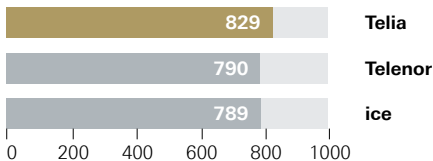


NETWORK PERFORMANCE SCORE

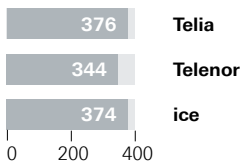
Rohde & Schwarz SwissQual AG performed a mobile network benchmarking campaign assessing the quality and performance of Norway's leading mobile operators. The drive-test based data collection campaign was implemented from October 9 to November 2, 2024 and covered Norway's major cities, towns and roads.

During this mobile network benchmarking campaign, over 11,900 voice calls and over 124,700 individual data service tests were performed to calculate a Network Performance Score in line with ETSI TR 103 559.

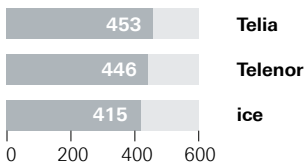
Network Performance Score



Voice Service Score



Data Service Score





Measurement campaign overview

- ▶ **Driven kilometers:** approx. 5,500 km
- ▶ **Time period:** October 9 to November 2, 2024
independently selected by Rohde & Schwarz SwissQual AG
- ▶ **Test routes:** Covering >50% of Norwegian population,
routes selected independently by Rohde & Schwarz SwissQual AG
based on population and population density
- ▶ **Network operators:** Telia, Telenor, ice

MEASUREMENT CAMPAIGN METHODOLOGY

Rohde & Schwarz SwissQual AG applied a fully transparent, harmonized and end-user centric scoring methodology as described in ETSI TR 103 559 and calculates a single overall Network Performance Score in line with this integrative methodology.

The scoring methodology includes essential aspects of popular mobile services and the resulting Network Performance Score reflects user's perceived performance of a mobile network in daily use regardless of the available technologies. The overall Network Performance Score is an aggregation of rated service performance over different regions covered by mobile networks with a state-of-art mobile phone.

- ▶ Data collection and analysis follows established standards and rules as defined in ETSI and ITU-T.
- ▶ The performance assessment uses tests of popular services in mobile networks, such as voice telephony, data transfer, video and app-specific services.
- ▶ The applied methodology provides insights into dedicated service classes and individual KPIs as well as for individual pre-defined geographical or morphologic categories.
- ▶ The entire measurement campaign used state-of-the art smartphones supported by all operators in Norway.
- ▶ Data collection and analysis used Rohde & Schwarz SwissQual AG de-facto industry standard benchmarking equipment that supports the Network Performance Score methodology.
- ▶ All measurements were performed in 5G preferred mode.

MEASUREMENT CAMPAIGN CONFIGURATION AND SETUP

VOICE SERVICE TESTING

Measurement device used for voice telephony testing: Samsung S24 Ultra (SM-S928B)



- ▶ Mobile-to-mobile voice calls between two smartphones, VoLTE enabled
- ▶ Call length 90s in line with ETSI TS 102 250-2 and TR 102 506
- ▶ Alternating speech transmission in both directions using a speech sample in line with ETSI TR 103 138 and defined in ITU-T P.501 Annex D
- ▶ Speech Quality measurement in line with ITU-T P.863 POLQA v3
- ▶ Success, setup time and speech quality evaluated in line with ITU-T E.804.1

DATA SERVICE TESTING

Measurement device used for data service testing: Samsung S24 Ultra (SM-S928B)



Data transfer

- ▶ Successful upload and download of data files to a local cloud server (2MB upload and 5MB download)
- ▶ Maximal bitrate measurements in upload and download



Video streaming

- ▶ YouTube streaming test in line with ETSI TR 101 578 and ITU-T E.804.1
- ▶ Receiving video on demand and live streams for 45s
- ▶ Video Quality measurement in line with ITU-T J.343.1
- ▶ Success, access time and video quality evaluated



Web Browsing

- ▶ Accessing and retrieving web-content from different websites
- ▶ Testing of locally popular dynamic sites in different sizes
- ▶ In line with ITU-T E.804.1 and ETSI TR 103 733, success and download time evaluated



Post to Social Media

- ▶ Uploading data content (images) to WhatsApp
- ▶ In line with ITU-T E.804.1, success and transfer time evaluated

About Rohde & Schwarz SwissQual AG

Together with teams from the global Rohde & Schwarz group of companies, our employees in the Swiss Rohde & Schwarz SwissQual AG subsidiary develop and market integrated solutions and managed services to test and improve the quality and performance of mobile networks.

Our experts for global benchmarking campaigns plan and run large-scale optimization and benchmarking campaigns and empower customers to make QoE centric business decisions with confidence, to deliver better services with higher quality for their end users, to reduce time to market for new technologies and services and to safeguard and increase the value of their business.

For more information about Rohde&Schwarz products visit:

www.rohde-schwarz.com/mnt

For more information about mobile network testing managed services visit:

www.rohde-schwarz.com/mnt/network-analytics-services

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Telia Norway sponsored an independent evaluation of its mobile network performance that was conducted by Rohde&Schwarz SwissQual AG. Telia Norway was ranked with the leading performance score in Norway based on an ETSI approved methodology.