

# CERTIFICATE

## **P3 communications GmbH**

Am Kraftversorgungsturm 3, D-52070 Aachen, Germany

hereby certifies that

## **Vodafone Romania**

Piața Charles de Gaulle nr.15, Sector 1, 011857 București, Romania

achieved „**Best in Test**“ with a

Total Score of **449 of 500**

in the **Mobile Benchmark Romania 12/2014**.

(Score 161 of 190 in Telephony, Score 288 of 310 in Data Services)



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## Measurement Setup

|                                 |                                                                                                                                                                                                                      |                                                                                                                                                                                                                     |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Device</b>                   | Samsung Galaxy S4 LTE (GT-I9506)<br>LTE / HSPA+ DC / HSUPA 5.76<br>12 dB attenuation                                                                                                                                 | Samsung Galaxy S4 LTE (GT-I9506)<br>LTE / HSPA+ DC / HSUPA 5.76<br>12 dB attenuation                                                                                                                                |
| <b>Test Cases</b>               | Mobile-to-Mobile 70 sec call duration.<br>Multi-RAB active on both parties<br>1:10 traffic injection on both parties<br>2 car setup - Car1: 3G pref, Car2: 4G pref                                                   | HTTP DL stress test 10s HTTP UL stress test 5s Web Browsing-ETSI Ref. Page, Top 6 national live websites<br>YouTube SD Video-60s clip<br>YouTube HD Video-30s clip<br>2 car setup – Car1: 3G pref and Car2: 4G pref |
| <b>Mobility and Route Types</b> | Drive Test in the cities of Arad, Bacau, Braila, Brasov, Bucuresti, Cluj-Napoca, Constanta, Craiova, Galati, Iasi, Oradea, Pitesti, Ploiesti, Sibiu and Timisoara and connecting roads. Distance travelled: > 8200km |                                                                                                                                                                                                                     |
| <b>Samples</b>                  | ~4650 per Operator<br>Total: ~14000                                                                                                                                                                                  | 4Gpref: ~400GB Data Traffic                                                                                                                                                                                         |
| <b>Dates</b>                    | <b>Dates</b> November 06th – December 2nd / 23 measurement days                                                                                                                                                      |                                                                                                                                                                                                                     |

## Testing Route



## Score Points and Breakdown

The following table indicates the score points achieved by the networks under test in the modules “Telephony” and “Data Services” as well as the breakdown of achieved points in the geographical categories “Big Cities” and “Connecting Roads”.

| Category             | Max.       | Vodafone   | Operator 2 | Operator 3 |
|----------------------|------------|------------|------------|------------|
| <b>Telephony</b>     | <b>190</b> | <b>161</b> | <b>152</b> | <b>152</b> |
| Big Cities           | 125        | 87%        | 78%        | 82%        |
| Connecting Roads     | 65         | 82%        | 84%        | 75%        |
|                      |            |            |            |            |
| <b>Data Services</b> | <b>310</b> | <b>288</b> | <b>276</b> | <b>213</b> |
| Big Cities           | 240        | 98%        | 92%        | 74%        |
| Connecting Roads     | 70         | 76%        | 78%        | 49%        |
|                      |            |            |            |            |
| <b>TOTAL</b>         | <b>500</b> | <b>449</b> | <b>428</b> | <b>365</b> |

The following table indicates the achieved percentage of the maximum score in each of the different data services.

| Category                  | Max.       | Vodafone   | Operator 2 | Operator 3 |
|---------------------------|------------|------------|------------|------------|
| <b>Data Services max.</b> | <b>310</b> | <b>288</b> | <b>276</b> | <b>213</b> |
| <b>Big Cities</b>         | 240        | 98%        | 92%        | 74%        |
| Web Browsing              | 84,0       | 98%        | 98%        | 97%        |
| File Download             | 48,0       | 95%        | 91%        | 69%        |
| File Upload               | 48,0       | 99%        | 93%        | 38%        |
| YouTube                   | 60,0       | 99%        | 84%        | 76%        |
|                           |            |            |            |            |
| <b>Connecting Roads</b>   | 70         | 76%        | 78%        | 49%        |
| Web Browsing              | 24,5       | 95%        | 94%        | 68%        |
| File Download             | 14,0       | 70%        | 69%        | 31%        |
| File Upload               | 14,0       | 73%        | 83%        | 37%        |
| YouTube                   | 17,5       | 57%        | 57%        | 46%        |

## **Voice KPI Overview**

The following table indicates the achieved values of all networks under test in each of the relevant Telephony Key Performance Indicators (KPIs) for the geographical categories “Big Cities” and “Connecting Roads”.

| <b>TELEPHONY (Big Cities)</b> | <b>Vodafone</b> | <b>Operator 2</b> | <b>Operator 3</b> |
|-------------------------------|-----------------|-------------------|-------------------|
| Call Success Ratio (%)        | 98,7            | 98,0              | 98,1              |
| Call Setup Time (s)           | 6,2             | 8,9               | 7,4               |
| Speech Quality (MOS-LQO)      | 3,4             | 3,3               | 3,5               |
| Call Sustainability (%)       | 99,7            | 99,8              | 99,8              |

| <b>TELEPHONY (Connecting Roads)</b> | <b>Vodafone</b> | <b>Operator 2</b> | <b>Operator 3</b> |
|-------------------------------------|-----------------|-------------------|-------------------|
| Call Success Ratio (%)              | 95,6            | 96,4              | 94,2              |
| Call Setup Time (s)                 | 5,7             | 6,9               | 8,0               |
| Speech Quality (MOS-LQO)            | 3,1             | 3,3               | 3,2               |
| Call Sustainability (%)             | 99,5            | 99,4              | 99,3              |

## **Data KPI Overview**

The following table indicates the achieved values of all networks under test in each of the relevant Data Key Performance Indicators (KPIs) for the geographical categories “Big Cities” and “Connecting Roads”.

| <b>DATA Services (Big Cities)</b>        | <b>Vodafone</b> | <b>Operator 2</b> | <b>Operator 3</b> |
|------------------------------------------|-----------------|-------------------|-------------------|
| <b>WEB-PAGE DOWNLOAD (Live/Static)</b>   |                 |                   |                   |
| Success Ratio (%/%)                      | 99,7 / 99,6     | 99,4 / 100        | 99,5 / 99,5       |
| Avg. Session Time (s/s)                  | 1,4 / 0,7       | 1,4 / 0,6         | 2,5 / 1,4         |
| <b>FILE-DOWNLOAD (10 seconds)</b>        |                 |                   |                   |
| Avg. Throughput (kbit/s)                 | 47198           | 40970             | 28203             |
| 90 % faster than (kbit/s)                | 26484           | 17850             | 6402              |
| <b>FILE-UPLOAD (10 seconds)</b>          |                 |                   |                   |
| Avg. Throughput (kbit/s)                 | 34042           | 27078             | 7835              |
| 90 % faster than (kbit/s)                | 13828           | 6340              | 1369              |
| <b>YOUTUBE SD</b>                        |                 |                   |                   |
| Success Ratio/Start Time (%/s)           | 99,8 / 0,8      | 99,1 / 0,8        | 98,7 / 1,6        |
| Video playouts without interruptions (%) | 99,9            | 99,9              | 99,5              |
| <b>YOUTUBE HD</b>                        |                 |                   |                   |
| Success Ratio/Start Time (%/s)           | 99,8 / 1        | 96,4 / 1,2        | 96,9 / 2,1        |
| Video playouts without interruptions (%) | 99,9            | 96,5              | 96,1              |

| <b>DATA Services (Connecting Roads)</b>  | <b>Vodafone</b> | <b>Operator 2</b> | <b>Operator 3</b> |
|------------------------------------------|-----------------|-------------------|-------------------|
| <b>WEB-PAGE DOWNLOAD (Live/Static)</b>   |                 |                   |                   |
| Success Ratio (%/%)                      | 97,8 / 98,1     | 97,7 / 97,8       | 87,3 / 92,4       |
| Avg. Session Time (s/s)                  | 2,2 / 1,8       | 2,2 / 1,7         | 3,4 / 3,4         |
| <b>FILE-DOWNLOAD (10 seconds)</b>        |                 |                   |                   |
| Avg. Throughput (kbit/s)                 | 14242           | 16788             | 8999              |
| 90 % faster than (kbit/s)                | 2225            | 1729              | 204               |
| <b>FILE-UPLOAD (10 seconds)</b>          |                 |                   |                   |
| Avg. Throughput (kbit/s)                 | 7115            | 8739              | 2048              |
| 90 % faster than (kbit/s)                | 251             | 535               | 79                |
| <b>YOUTUBE SD</b>                        |                 |                   |                   |
| Success Ratio/Start Time (%/s)           | 96 / 1,6        | 96,7 / 1,8        | 85,4 / 2,2        |
| Video playouts without interruptions (%) | 96,3            | 96,3              | 95                |