

CERTIFICATE

P3 communications GmbH

Am Kraftversorgungsturm 3, D-52070 Aachen, Germany

hereby certifies that



Vodafone Portugal

Av. D. João II, Número 36, Parque das Nações,
1998 – 017 Lisboa, Portugal

achieved „**Best in Test**“ with a
Total Score of **922 of 1000**

in the **Mobile Benchmark Portugal 03/2017**.

(Score 363 of 400 in Voice, Score 559 of 600 in Data Services)



Maziar Kianzad
*Head of Measurement
and Testing Solutions*

May 2017

Measurement Setup

	Voice	Data
Device	Samsung Galaxy S5 Cat4 P3 attenuator	Samsung Galaxy S7 Cat9 P3 attenuator
Test Cases	<p>Mobile-to-Mobile</p> <p>Mobile-to-Mobile (M2M) Side1 (4G preferred) to Side2 (3G preferred) Side1 (4G preferred) to Side2 (4G preferred) 115 sec call window 70 sec call duration 15 sec call setup timeout Data traffic injection on both sides (100KB) (1 download per call window)</p>	<p>4G preferred CA</p> <p>HTTP DL datastream 10s HTTP UL datastream 10s HTTP 3MB DL fixed file transfer HTTP 1MB UL fixed file transfer Web Browsing - Kepler ETSI Ref. Page 10 Live web pages (50% http, 50% https) YouTube video streaming - 45s</p>
Mobility and Route Types	<p>100% Drivetest 51% in Cities, 19% in Towns and 30% on Roads</p>	
Samples	~ 4200 per Operator	~ 1400 per Operator
Dates	<p>12 measurement days March 18th – April 1st, 2017</p>	

Testing Route



Score Points and Breakdown

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

Module	Infrastructure	Max.	Vodafone	Operator 2	Operator 3
Voice	Total	400	363	320	309
	Cities	240	91%	80%	80%
	Towns	80	93%	87%	77%
	Roads	80	88%	72%	69%
Data	Total	600	559	474	488
	Cities	360	95%	84%	88%
	Towns	120	92%	82%	82%
	Roads	120	87%	60%	61%
TOTAL		1.000	922	794	797

Shown voice, data and total scores are rounded

The following table indicates the achieved percentage of the maximum score in each of the different infrastructural breakdown.

Data	Service Group	Max.	Vodafone	Operator 2	Operator 3
Cities	Web Browsing	126	92%	86%	86%
	File Download	72	95%	80%	83%
	File Upload	72	96%	74%	86%
	YouTube	90	99%	94%	97%
Towns	Web Browsing	42	89%	84%	80%
	File Download	24	91%	79%	77%
	File Upload	24	92%	68%	79%
	YouTube	30	98%	91%	89%
Roads	Web Browsing	42	84%	55%	56%
	File Download	24	91%	68%	64%
	File Upload	24	81%	42%	50%
	YouTube	30	95%	75%	74%

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 “Cities” and “Towns” and “Roads”.

Voice M2M	Kpi Name	Unit	Vodafone	Operator 2	Operator 3
Cities	Qualifier	[%]	99,3	97,8	98,5
	Call Setup Time	[s]	5,2	5,9	6,4
	AVG Speech Quality	[MOS-LQO]	3,8	3,5	3,0
Towns	Qualifier	[%]	99,7	99,2	97,7
	Call Setup Time	[s]	5,3	5,9	6,3
	AVG Speech Quality	[MOS-LQO]	3,8	3,5	3,1
Roads	Qualifier	[%]	97,9	94,3	94,5
	Call Setup Time	[s]	5,2	5,6	6,3
	AVG Speech Quality	[MOS-LQO]	3,8	3,5	3,0

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 “Cities”, “Towns” and “Roads”.

Data Cities	Kpi Name	Unit	Vodafone	Operator 2	Operator 3
HTTP live page DL	Qualified	[%]	99,6	98,4	97,8
	AVG Session Time	[s]	2,9	3,2	3,0
HTTP static page DL	Qualified	[%]	99,9	99,3	99,9
	AVG Session Time	[s]	1,1	1,2	1,2
HTTP file DL 3MB	Qualified	[%]	100,0	99,6	100,0
	AVG Session Time	[s]	0,9	2,3	1,8
	90% faster than	[kbit/s]	19643	4947	7702
	10% faster than	[kbit/s]	59406	48174	43796
HTTP file UL 1MB	Qualified	[%]	100,0	97,7	99,2
	AVG Session Time	[s]	0,8	2,7	1,3
	90% faster than	[kbit/s]	6653	1060	3742
	10% faster than	[kbit/s]	22309	19048	19185
HTTP DL FDTT 10s	Qualified	[%]	100,0	99,7	99,9
	AVG throughput	[kbit/s]	65511	29861	30523
	90% faster than	[kbit/s]	24748	5331	7977
	10% faster than	[kbit/s]	114196	62740	59723
HTTP UL FDTT 10s	Qualified	[%]	100,0	99,3	99,7
	AVG throughput	[kbit/s]	24899	13101	18049
	90% faster than	[kbit/s]	8253	1029	4227
	10% faster than	[kbit/s]	44067	33698	27396
YouTube	Qualified	[%]	100,0	99,4	99,6
	Start Time	[s]	1,5	1,6	1,6
	Playouts w/o interruptions	[%]	100,0	99,7	99,7
	AVG Resolution	[%]	702,4	653,4	687,3

Data Towns	Kpi Name	Unit	Vodafone	Operator 2	Operator 3
HTTP live page DL	Qualified	[%]	98,9	98,2	97,0
	AVG Session Time	[s]	3,1	3,4	3,4
HTTP static page DL	Qualified	[%]	100,0	99,6	99,6
	AVG Session Time	[s]	1,2	1,5	1,5
HTTP file DL 3MB	Qualified	[%]	100,0	100,0	100,0
	AVG Session Time	[s]	1,2	2,8	3,8
	90% faster than	[kbit/s]	14180	4474	2390
	10% faster than	[kbit/s]	54670	38964	39248
HTTP file UL 1MB	Qualified	[%]	99,6	96,6	99,2
	AVG Session Time	[s]	1,0	3,0	1,8
	90% faster than	[kbit/s]	5825	1247	2134
	10% faster than	[kbit/s]	20040	14363	16417
HTTP DL FDTT 10s	Qualified	[%]	100,0	100,0	99,6
	AVG throughput	[kbit/s]	52522	21922	23541
	90% faster than	[kbit/s]	17935	4200	2592
	10% faster than	[kbit/s]	93552	47420	57341
HTTP UL FDTT 10s	Qualified	[%]	100,0	99,6	99,6
	AVG throughput	[kbit/s]	21402	8651	11602
	90% faster than	[kbit/s]	6463	675	1719
	10% faster than	[kbit/s]	41999	20140	25688
YouTube	Qualified	[%]	99,6	99,2	98,4
	Start Time	[s]	1,7	1,7	1,7
	Playouts w/o interruptions	[%]	100,0	99,6	99,6
	AVG Resolution	[%]	699,4	628,5	641,6

Data Roads	Kpi Name	Unit	Vodafone	Operator 2	Operator 3
HTTP live page DL	Qualified	[%]	96,8	88,2	88,6
	AVG Session Time	[s]	3,3	4,1	3,9
HTTP static page DL	Qualified	[%]	98,3	91,9	90,6
	AVG Session Time	[s]	1,5	2,5	2,3
HTTP file DL 3MB	Qualified	[%]	99,6	98,3	95,4
	AVG Session Time	[s]	1,8	7,1	7,1
	90% faster than	[kbit/s]	7629	1556	1392
	10% faster than	[kbit/s]	45541	24418	33443
HTTP file UL 1MB	Qualified	[%]	97,3	86,7	87,8
	AVG Session Time	[s]	1,9	5,6	4,7
	90% faster than	[kbit/s]	1562	626	640
	10% faster than	[kbit/s]	16563	10019	13981
HTTP DL FDTT 10s	Qualified	[%]	98,7	95,7	94,7
	AVG throughput	[kbit/s]	34012	10719	13955
	90% faster than	[kbit/s]	6608	1914	1618
	10% faster than	[kbit/s]	64019	25351	34467
HTTP UL FDTT 10s	Qualified	[%]	99,1	91,9	93,9
	AVG throughput	[kbit/s]	14540	3653	6961
	90% faster than	[kbit/s]	1560	293	411
	10% faster than	[kbit/s]	23102	9942	17752
YouTube	Qualified	[%]	98,8	95,0	94,3
	Start Time	[s]	1,9	2,3	2,3
	Playouts w/o interruptions	[%]	100,0	99,5	99,5
	AVG Resolution	[%]	662,7	527,2	538,5