

CERTIFICATE

P3 communications GmbH

Am Kraftversorgungsturm 3, D-52070 Aachen, Germany

hereby certifies that



vodafone

Vodafone Portugal

Av. D. João II, Lote 1.04.01, Parque das Nações,
1998 – 017 Lisboa, Portugal

achieved „**Best in Test**“ with a

Total Score of **915 of 1000**

in the **Mobile Benchmark Portugal 06/2016.**

(Score 376 of 400 in Telephony, Score 540 of 600 in Data Services)



Maziar Kianzad
*Head of Network Testing
& Benchmarking*
October 2016

Measurement Setup

	Voice	Data
Device	Samsung Galaxy S5 LTE cat4 (SM-G900F) LTE/HSPA+ DC/HSUPA 5.76 P3 attenuator	Samsung Galaxy Note4 LTE cat6 (SM-N910F) LTE/HSPA+ DC/HSUPA 5.76 P3 attenuator
Test Cases	Mobile-to-Mobile Side1 (4G preferred) to Side2 (3Gpref) 115 sec call window 70 sec call duration 15 sec call setup timeout Email traffic injection on both sides (1 email per call window)	4G preferred CA 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 5 live web pages YouTube HD video YouTube SD video
Mobility and Route Types	100% Drivetest 56% in Cities, 21% in Towns and 23% on Roads Cities, towns and roads	
Samples	~ 2850 per Operator	~ 1100 per Operator and Service
Dates	14 measurement days June 15th - July 1st, 2016	

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”, “small cities” and “connecting roads”.

Module	Infrastructure	Max.	Vodafone	Operator 2	Operator 3
Voice	Total	400	376	338	302
	big cities	260	93%	84%	74%
	small cities and connecting roads	140	95%	85%	78%
Data	Total	600	540	447	425
	big cities	390	92%	84%	83%
	small cities	90	87%	56%	60%
	connecting roads	120	85%	58%	41%
TOTAL		1.000	915	786	727

Shown voice, data and total scores are rounded

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

Data	Service Group	Max.	Vodafone	Operator 2	Operator 3
big cities	Web Browsing	136,5	93%	89%	88%
	File Download	78,0	91%	84%	80%
	File Upload	78,0	90%	72%	81%
	YouTube	97,5	95%	85%	78%
small cities	Web Browsing	31,5	86%	60%	73%
	File Download	18,0	86%	70%	70%
	File Upload	18,0	87%	37%	61%
	YouTube	22,5	90%	57%	34%
connecting roads	Web Browsing	42,0	82%	58%	41%
	File Download	24,0	89%	73%	59%
	File Upload	24,0	84%	50%	40%
	YouTube	30,0	84%	55%	27%

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”.

Voice M2M	Kpi Name	Unit	Vodafone	Operator 2	Operator 3
big cities	Qualified	[%]	99,2%	97,8%	96,6%
	Call Setup Time	[s]	4,9	5,4	6,2
	AVG Speech Quality	[MOS-LQO]	3,8	3,5	3,0
small cities and connecting roads	Qualified	[%]	98,8%	96,0 %	94,8%
	Call Setup Time	[s]	4,9	5,2	6,0
	AVG Speech Quality	[MOS-LQO]	3,8	3,5	2,9

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”, “small cities” and “connecting roads”.

Data big cities	Kpi Name	Unit	Vodafone	Operator 2	Operator 3
http Live Page DL	Qualified	[%]	99,1%	98,0%	98,1%
	AVG Session Time	[s]	2,6	2,8	2,8
http Static Page DL	Qualified	[%]	99,8%	99,5%	99,0%
	AVG Session Time	[s]	1,8	1,8	1,8
http file DL 3MB	Qualified	[%]	100,0%	100,0%	99,7%
	AVG Session Time	[s]	1,5	2,3	3,2
	90% faster than	[kbit/s]	11811	5492	4393
	10% faster than	[kbit/s]	41667	36199	30769
http file UL 1MB	Qualified	[%]	99,7%	98,2%	99,0%
	AVG Session Time	[s]	1,4	2,9	2,0
	90% faster than	[kbit/s]	4603	1165	2506
	10% faster than	[kbit/s]	11348	9501	9804
http DL FDTT 10s	Qualified	[%]	100,0%	100,0%	100,0%
	AVG throughput	[kbit/s]	41327	27284	18945
	90% faster than	[kbit/s]	13054	6655	4158
	10% faster than	[kbit/s]	75534	54058	34578
http UL FDTT 10s	Qualified	[%]	99,8%	99,0%	99,7%
	AVG throughput	[kbit/s]	20591	10181	13758
	90% faster than	[kbit/s]	8188	913	3211
	10% faster than	[kbit/s]	35176	22774	23125
Youtube SD	Qualified	[%]	99,7%	99,2%	99,7%
	Start Time	[s]	1,2	1,3	1,4
	Playouts w/o interruptions	[%]	100,0%	100,0%	98,5%
Youtube HD	Qualified	[%]	99,4%	97,6%	95,7%
	Start Time	[s]	1,6	1,7	1,7
	Playouts w/o interruptions	[%]	99,8%	97,7%	96,7%

Data small cities	Kpi Name	Unit	Vodafone	Operator 2	Operator 3
http Live Page DL	Qualified	[%]	97,1%	91,4%	94,3%
	AVG Session Time	[s]	2,7	3,4	3,2
http Static Page DL	Qualified	[%]	99,4%	94,2%	97,6%
	AVG Session Time	[s]	1,8	2,4	2,2
http file DL 3MB	Qualified	[%]	99,6%	98,3%	99,1%
	AVG Session Time	[s]	2,1	4,9	5,8
	90% faster than	[kbit/s]	8253	2616	1846
	10% faster than	[kbit/s]	36923	23346	21661
http file UL 1MB	Qualified	[%]	100,0%	86,7%	95,3%
	AVG Session Time	[s]	1,7	4,4	2,8
	90% faster than	[kbit/s]	3751	890	1390
	10% faster than	[kbit/s]	10554	7214	8307
http DL FDTT 10s	Qualified	[%]	100,0%	99,1%	99,6%
	AVG throughput	[kbit/s]	33567	15146	11012
	90% faster than	[kbit/s]	7726	1836	1736
	10% faster than	[kbit/s]	69994	31185	26123
http UL FDTT 10s	Qualified	[%]	100,0%	95,6%	97,4%
	AVG throughput	[kbit/s]	16492	5974	7927
	90% faster than	[kbit/s]	4818	364	802
	10% faster than	[kbit/s]	26644	15506	15449
Youtube SD	Qualified	[%]	99,2%	96,9%	97,0%
	Start Time	[s]	1,3	1,9	1,7
	Playouts w/o interruptions	[%]	100,0%	98,6%	96,9%
Youtube HD	Qualified	[%]	99,2%	88,8%	80,9%
	Start Time	[s]	1,8	2,4	2,2
	Playouts w/o interruptions	[%]	98,3%	97,5%	88,7%

Data connecting roads	Kpi Name	Unit	Vodafone	Operator 2	Operator 3
http Live Page DL	Qualified	[%]	94,4%	86,1%	79,5%
	AVG Session Time	[s]	3,2	3,8	3,9
http Static Page DL	Qualified	[%]	97,0%	87,8%	81,4%
	AVG Session Time	[s]	2,2	3,0	3,1
http file DL 3MB	Qualified	[%]	99,2%	96,6%	92,3%
	AVG Session Time	[s]	3,2	6,3	9,6
	90% faster than	[kbit/s]	4162	1880	1005
	10% faster than	[kbit/s]	31414	20654	16701
http file UL 1MB	Qualified	[%]	97,3%	83,2%	79,4%
	AVG Session Time	[s]	2,1	5,2	4,9
	90% faster than	[kbit/s]	2050	902	669
	10% faster than	[kbit/s]	10101	5797	7533
http DL FDTT 10s	Qualified	[%]	100,0%	97,5%	95,8%
	AVG throughput	[kbit/s]	23216	10196	6573
	90% faster than	[kbit/s]	4292	1278	555
	10% faster than	[kbit/s]	47166	25028	18096
http UL FDTT 10s	Qualified	[%]	98,1%	93,3%	89,0%
	AVG throughput	[kbit/s]	12641	3860	4600
	90% faster than	[kbit/s]	1344	417	264
	10% faster than	[kbit/s]	21691	13137	12690
Youtube SD	Qualified	[%]	98,5%	90,9%	87,3%
	Start Time	[s]	1,7	2,0	2,7
	Playouts w/o interruptions	[%]	98,9%	97,7%	96,1%
Youtube HD	Qualified	[%]	94,8%	81,8%	63,3%
	Start Time	[s]	2,0	2,9	3,0
	Playouts w/o interruptions	[%]	96,5%	95,5%	80,7%