

CERTIFICATE

P3 communications GmbH

Am Kraftversorgungsturm 3, D-52070 Aachen, Germany

hereby certifies that



vodafone

Vodafone Ireland Limited

Mountainview, Leopardstown, Dublin 18, Ireland

achieved „**Best in Test**“ with a

Total Score of **810 of 1000**

in the **Mobile Benchmark Ireland 08/2016**.

(Score 334 of 400 in Telephony, Score 476 of 600 in Data Services)



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*Head of Network Testing
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September 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	<p>Mobile-to-Mobile</p> Side1 (4G preferred) to Side2 (4Gpref) 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)	<p>4G CA preferred</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 HD/SD video - 45s
Mobility and Route Types	100% Drivetest 54% in Cities, 21% in Towns and 25% on Roads	
Samples	~ 2200 per Operator	~ 1700 per Service and Operator
Dates	12 measurement days August 18th - August 31st, 2016	

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	334	172	260
	Cities	240	88%	47%	72%
	Towns	80	85%	25%	63%
	Roads	80	69%	48%	46%
Data	Total	600	476	381	272
	Cities	360	85%	76%	52%
	Towns	120	78%	55%	38%
	Roads	120	62%	36%	34%
TOTAL		1.000	810	554	532

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
Cities	Web Browsing	126	79%	72%	29%
	File Download	72	86%	75%	72%
	File Upload	72	89%	71%	58%
	YouTube	90	91%	84%	62%
Towns	Web Browsing	42	74%	44%	25%
	File Download	24	82%	65%	58%
	File Upload	24	74%	55%	35%
	YouTube	30	86%	61%	42%
Roads	Web Browsing	42	55%	29%	23%
	File Download	24	72%	46%	46%
	File Upload	24	56%	28%	29%
	YouTube	30	69%	46%	43%

Voice KPI Overview

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

Voice M2M	KPI Name	Unit	Vodafone	Operator 2	Operator 3
Cities	Qualifier	[%]	99,4	92,6	97,2
	Call Setup Time	[s]	6,6	7,9	6,5
	AVG Speech Quality	[MOS-LQO]	3,7	3,5	3,0
Towns	Qualifier	[%]	98,9	87,2	95,4
	Call Setup Time	[s]	6,5	7,4	6,4
	AVG Speech Quality	[MOS-LQO]	3,6	3,5	3,0
Roads	Qualifier	[%]	93,6	88,8	88,4
	Call Setup Time	[s]	6,6	7,7	6,9
	AVG Speech Quality	[MOS-LQO]	3,6	3,3	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 “Cities”, “Towns” and “Roads”.

Data Cities	KPI Name	Unit	Vodafone	Operator 2	Operator 3
HTTP Live Page DL	Qualifier	[%]	97,0	95,9	79,5
	AVG Session Time	[s]	4,4	4,6	5,0
HTTP Static Page DL	Qualifier	[%]	99,8	98,8	48,0
	AVG Session Time	[s]	1,2	1,6	2,1
HTTP file DL 3MB	Qualifier	[%]	99,9	99,0	98,8
	AVG Session Time	[s]	1,6	2,3	5,1
	90% faster than	[kbit/s]	8532	5979	1720
	10% faster than	[kbit/s]	53393	37843	35864
HTTP file UL 1MB	Qualifier	[%]	99,7	97,0	95,5
	AVG Session Time	[s]	1,3	2,2	3,9
	90% faster than	[kbit/s]	4196	1551	980
	10% faster than	[kbit/s]	13289	11734	4361
HTTP DL Datastream 10s	Qualifier	[%]	99,8	98,2	99,4
	AVG throughput	[kbit/s]	44323	26404	23716
	90% faster than	[kbit/s]	9409	8156	1953
	10% faster than	[kbit/s]	86545	49034	51319
HTTP UL Datastream 10s	Qualifier	[%]	99,9	99,2	98,3
	AVG throughput	[kbit/s]	22779	14026	7095
	90% faster than	[kbit/s]	5409	1469	865
	10% faster than	[kbit/s]	43511	27589	11414
YouTube	Qualifier	[%]	98,9	98,7	94,2
	Start Time	[s]	2,2	2,4	3,1
	Playouts w/o interruptions	[%]	98,8	99,1	97,9
	AVG Resolution	[p]	710,9	662,7	626,4
	HD Share	[%]	97,5	84,1	74,0

Data Towns	KPI Name	Unit	Vodafone	Operator 2	Operator 3
HTTP Live Page DL	Qualifier	[%]	96,4	89,7	70,8
	AVG Session Time	[s]	4,6	5,0	5,3
HTTP Static Page DL	Qualifier	[%]	98,9	95,7	46,4
	AVG Session Time	[s]	1,4	2,4	3,0
HTTP file DL 3MB	Qualifier	[%]	100,0	98,3	96,8
	AVG Session Time	[s]	2,7	4,9	7,4
	90% faster than	[kbit/s]	4679	2426	1224
	10% faster than	[kbit/s]	43103	29189	32113
HTTP file UL 1MB	Qualifier	[%]	97,5	95,0	87,9
	AVG Session Time	[s]	2,1	5,0	4,8
	90% faster than	[kbit/s]	1801	668	827
	10% faster than	[kbit/s]	11824	9823	4211
HTTP DL Datastream 10s	Qualifier	[%]	100,0	97,4	96,8
	AVG throughput	[kbit/s]	32616	16284	17982
	90% faster than	[kbit/s]	5077	3285	1127
	10% faster than	[kbit/s]	71876	36270	46560
HTTP UL Datastream 10s	Qualifier	[%]	99,0	98,0	96,6
	AVG throughput	[kbit/s]	15792	6585	4890
	90% faster than	[kbit/s]	2223	531	470
	10% faster than	[kbit/s]	34054	18381	10839
YouTube	Qualifier	[%]	98,7	94,8	90,0
	Start Time	[s]	2,5	2,8	3,3
	Playouts w/o interruptions	[%]	98,7	98,3	98,1
	AVG Resolution	[p]	679,8	546,7	542,3
	HD Share	[%]	88,8	51,9	50,6

Data Roads	KPI Name	Unit	Vodafone	Operator 2	Operator 3
HTTP Live Page DL	Qualifier	[%]	88,0	76,8	61,5
	AVG Session Time	[s]	4,9	5,4	5,6
HTTP Static Page DL	Qualifier	[%]	94,2	84,7	39,3
	AVG Session Time	[s]	2,1	3,2	3,5
HTTP file DL 3MB	Qualifier	[%]	96,5	89,8	89,2
	AVG Session Time	[s]	4,9	7,8	10,3
	90% faster than	[kbit/s]	1998	1542	891
	10% faster than	[kbit/s]	33195	19917	27532
HTTP file UL 1MB	Qualifier	[%]	90,7	73,4	82,5
	AVG Session Time	[s]	4,0	6,5	7,1
	90% faster than	[kbit/s]	748	597	553
	10% faster than	[kbit/s]	10828	8580	3829
HTTP DL Datastream 10s	Qualifier	[%]	96,8	90,2	91,4
	AVG throughput	[kbit/s]	19458	9490	12776
	90% faster than	[kbit/s]	2514	1730	1049
	10% faster than	[kbit/s]	43909	19116	38061
HTTP UL Datastream 10s	Qualifier	[%]	93,8	87,7	88,8
	AVG throughput	[kbit/s]	9782	3258	3237
	90% faster than	[kbit/s]	542	263	428
	10% faster than	[kbit/s]	21803	10905	10300
YouTube	Qualifier	[%]	93,4	87,1	85,6
	Start Time	[s]	2,9	3,4	3,8
	Playouts w/o interruptions	[%]	97,8	97,6	96,6
	AVG Resolution	[p]	580,3	436,5	456,1
	HD Share	[%]	61,2	21,2	26,7