

CERTIFICATE

P3 communications GmbH

Am Kraftversorgungsturm 3, D-52070 Aachen, Germany

hereby certifies that



vodafone

Vodafone Ireland

Mountainview, Leopardstown, Dublin 18, Ireland

achieved „**Best in Test**“ with a

Total Score of **823 of 1000**

in the **Mobile Benchmark Ireland 11/2017**.

(Score 314 of 400 in Telephony, Score 509 of 600 in Data Services)



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Measurement Setup

	Voice	Data
Device	Sony XZ cat9	Samsung Galaxy S7 cat9 Sony Xperia XZ cat9
Test Cases	Mobile-to-Mobile (M2M) Side1 (4G preferred) to Side2 (4G preferred) 115 sec call window 70 sec call duration 15 sec call setup timeout Multi-RAB traffic injection on both sides	Data 4G preferred CA HTTP DL datastream 7s HTTP UL datastream 7s 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) 4 YouTube HD video ~ 45s
Mobility and Route Types	100% Drivetest 52% in Cities, 18% in Towns and 30% on Roads	
Samples	~ 4000 per Operator	~ 1400 per Operator
Dates	11 measurement days 31.10.2017 – 16.11.2017	

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	314	251	244
	Cities	240	83%	68%	68%
	Towns	80	76%	65%	65%
	Roads	80	67%	46%	36%
Data	Total	600	509	476	349
	Cities	360	89%	86%	63%
	Towns	120	85%	75%	58%
	Roads	120	72%	63%	43%
TOTAL		1.000	823	727	593

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	108	90%	86%	72%
	File Download	90	89%	82%	61%
	File Upload	90	90%	87%	51%
	YouTube	72	88%	91%	67%
Towns	Web Browsing	36	87%	80%	65%
	File Download	30	84%	75%	60%
	File Upload	30	81%	69%	45%
	YouTube	24	88%	78%	64%
Roads	Web Browsing	36	73%	60%	48%
	File Download	30	75%	68%	55%
	File Upload	30	64%	59%	29%
	YouTube	24	74%	64%	38%

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	[%]	98,7	97,1	96,4
	Call Setup Time	[s]	5,4	9,3	6,4
	AVG Speech Quality	[MOS-LQO]	3,6	3,7	3,6
Towns	Qualifier	[%]	97,3	96,5	95,7
	Call Setup Time	[s]	5,4	8,8	5,9
	AVG Speech Quality	[MOS-LQO]	3,6	3,7	3,6
Roads	Qualifier	[%]	93,5	89,5	85,6
	Call Setup Time	[s]	5,4	8,7	6,4
	AVG Speech Quality	[MOS-LQO]	3,6	3,5	3,5

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	[%]	99,4	98,4	96,7
	Time to first Byte	[ms]	708	687	758
	KBytes first second	[KB]	532	520	463
HTTP Static Page DL	Qualifier	[%]	100	99,9	96,0
	Overall Session Time	[s]	1,1	1,2	1,5
HTTP file DL 3MB	Qualifier	[%]	100	100	94,8
	AVG Session Time	[s]	1,3	2,1	2,8
	90% faster than	[kbit/s]	12186	6255	4395
	10% faster than	[kbit/s]	60075	43557	39024
HTTP file UL 1MB	Qualifier	[%]	100,0	99,7	92,3
	AVG Session Time	[s]	1,1	1,3	1,6
	90% faster than	[kbit/s]	4316	4506	3499
	10% faster than	[kbit/s]	24096	19111	18141
HTTP DL FDTT 7s	Qualifier	[%]	99,9	99,7	98,2
	AVG throughput	[kbit/s]	50915	30944	24569
	90% faster than	[kbit/s]	14126	9307	3948
	10% faster than	[kbit/s]	101064	54146	56520
HTTP UL FDTT 7s	Qualifier	[%]	99,5	99,6	93,4
	AVG throughput	[kbit/s]	23358	16718	15488
	90% faster than	[kbit/s]	6177	4850	1782
	10% faster than	[kbit/s]	41849	27086	34348
YouTube	Qualifier	[%]	98,6	99,1	94,4
	Start Time	[s]	2,1	2,3	2,6
	Playouts w/o interruptions	[%]	98,3	98,8	97,7
	AVG Resolution	[p]	1075,9	1067,9	1065,2

Data Towns	KPI Name	Unit	Vodafone	Operator 2	Operator 3
HTTP Live Page DL	Qualifier	[%]	99,0	98,7	95,2
	Time to first Byte	[ms]	743	885	825
	KBytes first second	[KB]	521	465	467
HTTP Static Page DL	Qualifier	[%]	99,5	99,7	95,8
	Overall Session Time	[s]	1,2	1,7	1,7
HTTP file DL 3MB	Qualifier	[%]	99,7	99,3	93,5
	AVG Session Time	[s]	1,7	3,0	2,8
	90% faster than	[kbit/s]	8167	4714	4880
	10% faster than	[kbit/s]	59347	36265	42690
HTTP file UL 1MB	Qualifier	[%]	100,0	98,3	91,5
	AVG Session Time	[s]	1,4	2,6	2,3
	90% faster than	[kbit/s]	3051	1047	1537
	10% faster than	[kbit/s]	22009	15349	19474
HTTP DL FDTT 7s	Qualifier	[%]	99,7	99,0	98,8
	AVG throughput	[kbit/s]	44896	20186	32902
	90% faster than	[kbit/s]	8026	5171	2896
	10% faster than	[kbit/s]	90437	38767	70214
HTTP UL FDTT 7s	Qualifier	[%]	97,0	98,0	93,1
	AVG throughput	[kbit/s]	17305	11559	18174
	90% faster than	[kbit/s]	3592	1225	981
	10% faster than	[kbit/s]	33563	19850	40973
YouTube	Qualifier	[%]	98,0	96,6	92,9
	Start Time	[s]	2,2	2,7	2,4
	Playouts w/o interruptions	[%]	99,3	98,3	98,7
	AVG Resolution	[p]	1071,9	1053,7	1069,0

Data Roads	KPI Name	Unit	Vodafone	Operator 2	Operator 3
HTTP Live Page DL	Qualifier	[%]	94,4	92,6	86,4
	Time to first Byte	[ms]	883	1.195	876
	KBytes first second	[KB]	443	388	422
HTTP Static Page DL	Qualifier	[%]	95,5	93,7	88,1
	Overall Session Time	[s]	1,6	2,3	2,0
HTTP file DL 3MB	Qualifier	[%]	97,7	95,8	89,6
	AVG Session Time	[s]	3,9	5,4	5,5
	90% faster than	[kbit/s]	2963	2261	1866
	10% faster than	[kbit/s]	47876	32009	43090
HTTP file UL 1MB	Qualifier	[%]	93,5	93,5	80,5
	AVG Session Time	[s]	2,6	3,9	3,7
	90% faster than	[kbit/s]	1410	886	836
	10% faster than	[kbit/s]	16191	14435	18476
HTTP DL FDTT 7s	Qualifier	[%]	95,2	96,1	93,7
	AVG throughput	[kbit/s]	24110	16447	28088
	90% faster than	[kbit/s]	3936	3172	1742
	10% faster than	[kbit/s]	56544	37322	69160
HTTP UL FDTT 7s	Qualifier	[%]	93,7	93,2	83,8
	AVG throughput	[kbit/s]	10180	7213	12370
	90% faster than	[kbit/s]	1332	770	739
	10% faster than	[kbit/s]	21670	18424	36140
YouTube	Qualifier	[%]	92,9	89,8	81,0
	Start Time	[s]	2,8	3,3	2,8
	Playouts w/o interruptions	[%]	97,3	96,7	93,9
	AVG Resolution	[p]	1045,9	1033,8	1026,3