

CERTIFICATE

P3 communications GmbH

Am Kraftversorgungsturm 3, D-52070 Aachen, Germany

hereby certifies that



T-Mobile Polska S. A.

Marynarska 12, 02-674 Warszawa, Poland

achieved „**Best in Test**“ with a

Total Score of **876 of 1000**

in the **Mobile Benchmark Poland 10/2017.**

(Score 346 of 400 in Telephony, Score 529 of 600 in Data Services)



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*Head of Network Testing
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Measurement Setup

	Voice	Data
Device	Samsung Galaxy S7 cat9	Samsung Galaxy S7 cat9 Sony Xperia XZ cat9
Test Cases	Mobile-to-Mobile (M2M) Side1 (4G preferred) to Side2 (4G preferred) Side1 (VoLTE) to Side2 (VoLTE) 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 55% in Cities, 13% in Towns and 32% on Roads	
Samples	~ 9000 per Operator	~ 2600 per Operator
Dates	21 measurement days 04.10.2017 – 27.10.2017	

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.	T-Mobile	Operator 2	Operator 3	Operator 4
Voice	Total	400	346	336	297	307
	Cities	240	87%	86%	79%	77%
	Towns	80	89%	87%	73%	78%
	Roads	80	82%	75%	59%	74%
Data	Total	600	529	505	460	323
	Cities	360	90%	85%	83%	57%
	Towns	120	86%	83%	77%	46%
	Roads	120	85%	81%	57%	54%
TOTAL		1.000	876	841	757	630

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.	T-Mobile	Operator 2	Operator 3	Operator 4
Cities	Web Browsing	108	92%	89%	80%	34%
	File Download	90	85%	81%	81%	63%
	File Upload	90	88%	85%	87%	76%
	YouTube	72	96%	86%	85%	58%
Towns	Web Browsing	36	90%	84%	74%	29%
	File Download	30	81%	80%	77%	56%
	File Upload	30	84%	83%	73%	63%
	YouTube	24	91%	86%	87%	41%
Roads	Web Browsing	36	87%	81%	57%	33%
	File Download	30	85%	84%	64%	68%
	File Upload	30	83%	79%	49%	71%
	YouTube	24	85%	80%	60%	46%

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	T-Mobile	Operator 2	Operator 3	Operator 4
Cities	Qualifier	[%]	98,8%	98,9%	99,3%	99,0%
	Call Setup Time	[s]	3,8	4,2	6,5	7,6
	AVG Speech Quality	[MOS-LQO]	3,5	3,5	3,0	3,4
Towns	Qualifier	[%]	99,3%	99,0%	98,2%	99%
	Call Setup Time	[s]	4,0	4,4	6,5	7,5
	AVG Speech Quality	[MOS-LQO]	3,4	3,5	3,0	3,4
Roads	Qualifier	[%]	97,0%	95,3%	93,5%	97,6%
	Call Setup Time	[s]	4,1	4,6	6,8	7,7
	AVG Speech Quality	[MOS-LQO]	3,4	3,4	3,0	3,4

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	T-Mobile	Operator 2	Operator 3	Operator 4
HTTP Live Page DL	Qualifier	[%]	99,7	99,5	97,8	86,7
	Time to first Byte	[ms]	553	573	659	1775
	KBytes first second	[KB]	448	417	393	339
HTTP Static Page DL	Qualifier	[%]	99,8	99,7	99,3	96,3
	Overall Session Time	[s]	1,2	1,3	1,6	2,4
HTTP file DL 3MB	Qualifier	[%]	100,0	99,7	99,7	95,3
	AVG Session Time	[s]	1,7	2,1	2,9	3,2
	90% faster than	[kbit/s]	7850	6689	4062	6383
	10% faster than	[kbit/s]	51836	45889	55944	47263
HTTP file UL 1MB	Qualifier	[%]	99,8	99,3	99,7	95,5
	AVG Session Time	[s]	1,1	1,2	1,2	1,9
	90% faster than	[kbit/s]	4971	4335	4247	7390
	10% faster than	[kbit/s]	20888	20997	21181	21390
HTTP DL FDTT 7s	Qualifier	[%]	99,8	99,2	99,6	96,7
	AVG throughput	[kbit/s]	43697	39188	40508	33715
	90% faster than	[kbit/s]	9161	7561	6706	6412
	10% faster than	[kbit/s]	89616	82582	94330	69678
HTTP UL FDTT 7s	Qualifier	[%]	99,4	99,2	99,0	97,1
	AVG throughput	[kbit/s]	19688	18362	20402	25160
	90% faster than	[kbit/s]	5556	4759	5653	8134
	10% faster than	[kbit/s]	30271	28882	40660	36400
YouTube	Qualifier	[%]	99,5	97,9	97,5	91,6
	Start Time	[s]	2,1	2,3	2,5	4,3
	Playouts w/o interruptions	[%]	99,6	98,9	99,3	99,4
	AVG Resolution	[p]	1072,7	1069,9	1068,3	1068,5

Data Towns	KPI Name	Unit	T-Mobile	Operator 2	Operator 3	Operator 4
HTTP Live Page DL	Qualifier	[%]	99,6	98,7	97,0	83,9
	Time to first Byte	[ms]	549	609	691	1738
	KBytes first second	[KB]	420	390	365	322
HTTP Static Page DL	Qualifier	[%]	99,9	99,8	98,6	93,9
	Overall Session Time	[s]	1,3	1,5	1,7	2,6
HTTP file DL 3MB	Qualifier	[%]	100,0	99,8	99,3	94,7
	AVG Session Time	[s]	2,6	2,7	3,8	3,6
	90% faster than	[kbit/s]	5334	5141	2942	4535
	10% faster than	[kbit/s]	45767	44280	52770	46128
HTTP file UL 1MB	Qualifier	[%]	99,5	99,7	97,9	94,0
	AVG Session Time	[s]	1,3	1,5	1,9	2,3
	90% faster than	[kbit/s]	3813	3150	2457	4163
	10% faster than	[kbit/s]	17778	18476	15754	19324
HTTP DL FDTT 7s	Qualifier	[%]	99,8	100,0	99,3	94,7
	AVG throughput	[kbit/s]	34431	29948	37561	30824
	90% faster than	[kbit/s]	6714	5362	5702	5012
	10% faster than	[kbit/s]	68769	63580	80704	64092
HTTP UL FDTT 7s	Qualifier	[%]	99,2	99,2	97,7	95,5
	AVG throughput	[kbit/s]	15969	15022	14064	19552
	90% faster than	[kbit/s]	3942	3467	3215	3955
	10% faster than	[kbit/s]	26709	25535	29042	33895
YouTube	Qualifier	[%]	99,3	98,0	97,9	86,7
	Start Time	[s]	2,3	2,6	2,5	4,5
	Playouts w/o interruptions	[%]	98,5	99,0	99,3	98,7
	AVG Resolution	[p]	1061,7	1060,0	1063,0	1054,9

Data Roads	KPI Name	Unit	T-Mobile	Operator 2	Operator 3	Operator 4
HTTP Live Page DL	Qualifier	[%]	98,4	96,5	89,5	83,1
	Time to first Byte	[ms]	584	638	698	1727
	KBytes first second	[KB]	427	389	364	317
HTTP Static Page DL	Qualifier	[%]	97,6	97,6	90,2	92,7
	Overall Session Time	[s]	1,4	1,5	1,8	2,7
HTTP file DL 3MB	Qualifier	[%]	98,9	98,9	93,1	94,2
	AVG Session Time	[s]	2,6	3,4	4,1	5,0
	90% faster than	[kbit/s]	4816	3395	3139	3025
	10% faster than	[kbit/s]	47629	46190	49710	46449
HTTP file UL 1MB	Qualifier	[%]	97,9	97,2	89,4	94,6
	AVG Session Time	[s]	1,4	1,8	2,7	2,8
	90% faster than	[kbit/s]	3223	2241	1280	2272
	10% faster than	[kbit/s]	18227	19194	15474	19990
HTTP DL FDTT 7s	Qualifier	[%]	98,2	99,3	91,9	94,3
	AVG throughput	[kbit/s]	34183	31438	33741	31332
	90% faster than	[kbit/s]	4908	4953	2693	4039
	10% faster than	[kbit/s]	72694	67413	78976	70338
HTTP UL FDTT 7s	Qualifier	[%]	96,8	96,5	87,4	93,7
	AVG throughput	[kbit/s]	15671	14253	11674	16082
	90% faster than	[kbit/s]	3310	2752	1469	2017
	10% faster than	[kbit/s]	27593	26456	20636	34705
YouTube	Qualifier	[%]	96,4	95,0	87,3	82,8
	Start Time	[s]	2,4	2,6	2,7	4,8
	Playouts w/o interruptions	[%]	97,3	97,1	97,9	98,7
	AVG Resolution	[p]	1058,8	1056,9	1057,8	1055,8