

CERTIFICATE

P3 communications GmbH

Am Kraftversorgungsturm 3, D-52070 Aachen, Germany

hereby certifies that



Hrvatski Telekom

Kupska 2, 10000 Zagreb

achieved „**Best in Test**“ with a

Total Score of **776 of 1000**

in the **Mobile Benchmark Croatia 06/2015**.

(Score 330 of 400 in Telephony, Score 446 of 600 in Data Services)



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*Head of Network Testing
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Measurement Setup

	Voice	Data
Device	Samsung Galaxy S5 Cat4 (SM-G900F) LTE / HSPA+ DC / HSUPA 5.76 P3 attenuation solution	Samsung Galaxy S5 Cat6 (SM-G901F) LTE / HSPA+ DC / HSUPA 5.76 P3 attenuation solution
Test Cases	Mobile-to-Mobile 4Gpref (MRAB) to 3G pref (MRAB) 90 sec call duration 140 sec call window multiRAB 1:1 traffic injection	HTTP DL stress test 10s HTTP DL user experience 3MB HTTP UL stress test 10s HTTP UL user experience 1MB Web Browsing-ETSI Ref. Page, 3 live websites YouTube SD Video-30s clip YouTube HD Video-30s clip
Mobility and Route Types	100% Drivetest 53% in big cities and 47% in small cities and on transfer	
Samples	4Gpref to 3Gpref: ~1970 per operator	4Gpref ~ 1170 per operator and service
Dates	10 days of measurement: June 9th - June 18th	

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” and “Connecting Roads”.

Module	Infrastructure	Max.	Telekom	Operator 2	Operator 3
Voice	Total	400	330	307	259
	Big Cities	260	83%	73%	69%
	Small Cities and Connecting Roads	140	82%	83%	57%
Data	Total	600	446	389	212
	Big Cities	390	79%	65%	43%
	Small Cities	90	66%	66%	33%
	Connecting Roads	120	66%	63%	14%
TOTAL		1.000	776	695	471

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.	Telekom	Operator 2	Operator 3
Big Cities	Web Browsing	136,5	74,5%	68,9%	48,7%
	File Download	78,0	84,3%	66,7%	55,0%
	File Upload	78,0	73,0%	57,3%	35,2%
	YouTube	97,5	84,3%	65,2%	29,9%
Small Cities	Web Browsing	31,5	59,8%	72,4%	30,9%
	File Download	18,0	76,2%	67,7%	48,2%
	File Upload	18,0	61,4%	54,6%	32,9%
	YouTube	22,5	69,9%	63,7%	21,9%
Connecting Roads	Web Browsing	42,0	65,5%	67,1%	21,1%
	File Download	24,0	75,1%	64,8%	4,7%
	File Upload	24,0	63,6%	52,2%	6,0%
	YouTube	30,0	63,1%	62,7%	16,5%

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	Telekom	Operator 2	Operator 3
Big cities	Qualified	[%]	97,6%	96,0%	95,4%
	Call Setup Time	[s]	5,4	6,5	5,8
	AVG Speech Quality	[MOS-LQO]	3,5	3,6	2,9
Small Cities and Connecting Roads	Qualified	[%]	95,1%	95,4%	87,8%
	Call Setup Time	[s]	5,3	5,6	6,1
	AVG Speech Quality	[MOS-LQO]	3,4	3,5	2,8

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” and “Connecting Roads”.

Data Big Cities	Kpi Name	Unit	Telekom	Operator 2	Operator 3
http Live Page DL	Qualified	[%]	94,8%	93,8%	91,0%
	AVG Session Time	[s]	3,7	3,6	5,0
http Static Page DL	Qualified	[%]	98,1%	95,0%	94,3%
	AVG Session Time	[s]	1,5	1,6	3,9
http file DL 3MB	Qualified	[%]	98,1%	94,7%	97,3%
	AVG Session Time	[s]	1,9	3,0	13,6
	90% faster than	[kbit/s]	10059	6289	1489
	10% faster than	[kbit/s]	49281	26258	4151
http file UL 1MB	Qualified	[%]	97,7%	92,7%	90,7%
	AVG Session Time	[s]	2,8	3,0	9,6
	90% faster than	[kbit/s]	1545	1390	637
	10% faster than	[kbit/s]	10000	8686	1478
http DL FDTT 10s	Qualified	[%]	98,9%	97,7%	98,3%
	AVG throughput	[kbit/s]	41828,0	20009,3	2270,5
	90% faster than	[kbit/s]	9474	6843	1097
	10% faster than	[kbit/s]	88663	38295	3824
http UL FDTT 10s	Qualified	[%]	98,4%	97,0%	94,4%
	AVG throughput	[kbit/s]	12539,2	9497,7	1039,5
	90% faster than	[kbit/s]	1489	1268	472
	10% faster than	[kbit/s]	32754	20177	1799
Youtube SD	Qualified	[%]	98,9%	95,4%	95,6%
	Start Time	[s]	1,4	1,4	3,2
	Playouts w/o interruptions	[%]	99,7%	99,8%	99,2%
Youtube HD	Qualified	[%]	96,9%	91,0%	84,8%
	Start Time	[s]	1,4	1,6	4,2
	Playouts w/o interruptions	[%]	98,2%	98,9%	90,9%

Data Small Cities	Kpi Name	Unit	Telekom	Operator 2	Operator 3
http Live Page DL	Qualified	[%]	91,3%	94,4%	85,1%
	AVG Session Time	[s]	3,9	3,8	4,9
http Static Page DL	Qualified	[%]	95,4%	98,0%	95,8%
	AVG Session Time	[s]	1,7	1,6	4,5
http file DL 3MB	Qualified	[%]	97,1%	97,6%	93,8%
	AVG Session Time	[s]	3,2	3,9	13,3
	90% faster than	[kbit/s]	4806	5162	1558
	10% faster than	[kbit/s]	43636	22493	3952
http file UL 1MB	Qualified	[%]	94,3%	94,4%	89,6%
	AVG Session Time	[s]	3,7	4,4	10,4
	90% faster than	[kbit/s]	1091	1245	566
	10% faster than	[kbit/s]	9462	7663	1440
http DL FDTT 10s	Qualified	[%]	98,8%	96,8%	98,5%
	AVG throughput	[kbit/s]	31078,3	16733,3	2179,8
	90% faster than	[kbit/s]	4621	3510	1015
	10% faster than	[kbit/s]	74713	39277	3746
http UL FDTT 10s	Qualified	[%]	97,5%	96,0%	95,3%
	AVG throughput	[kbit/s]	10184,5	5521,2	914,6
	90% faster than	[kbit/s]	922	654	445
	10% faster than	[kbit/s]	28636	16664	1631
Youtube SD	Qualified	[%]	97,5%	97,6%	91,6%
	Start Time	[s]	1,5	1,5	3,5
	Playouts w/o interruptions	[%]	98,7%	99,6%	99,4%
Youtube HD	Qualified	[%]	92,2%	90,3%	80,6%
	Start Time	[s]	1,6	1,8	4,6
	Playouts w/o interruptions	[%]	98,7%	97,3%	88,3%

Data Connecting Roads	Kpi Name	Unit	Telekom	Operator 2	Operator 3
http Live Page DL	Qualified	[%]	88,4%	89,4%	66,2%
	AVG Session Time	[s]	4,3	4,1	5,2
http Static Page DL	Qualified	[%]	95,0%	91,7%	63,4%
	AVG Session Time	[s]	2,3	2,0	4,4
http file DL 3MB	Qualified	[%]	95,0%	93,7%	69,4%
	AVG Session Time	[s]	6,1	6,9	16,8
	90% faster than	[kbit/s]	2149	2275	983
	10% faster than	[kbit/s]	33566	14688	3697
http file UL 1MB	Qualified	[%]	92,1%	87,0%	58,6%
	AVG Session Time	[s]	5,4	5,6	10,7
	90% faster than	[kbit/s]	946	921	482
	10% faster than	[kbit/s]	8048	3391	1547
http DL FDTT 10s	Qualified	[%]	96,6%	95,0%	75,8%
	AVG throughput	[kbit/s]	16858,3	9476,7	1865,7
	90% faster than	[kbit/s]	2452	2078	454
	10% faster than	[kbit/s]	45300	18184	3404
http UL FDTT 10s	Qualified	[%]	94,1%	94,0%	74,2%
	AVG throughput	[kbit/s]	4657,6	2937,8	860,3
	90% faster than	[kbit/s]	707	459	176
	10% faster than	[kbit/s]	12247	3922	1486
Youtube SD	Qualified	[%]	94,1%	92,2%	71,9%
	Start Time	[s]	2,2	1,8	3,5
	Playouts w/o interruptions	[%]	99,3%	98,9%	98,1%
Youtube HD	Qualified	[%]	84,8%	84,5%	53,5%
	Start Time	[s]	2,6	2,5	5,2
	Playouts w/o interruptions	[%]	95,2%	96,9%	86,0%