

# CERTIFICATE

## **P3 communications GmbH**

Am Kraftversorgungsturm 3, D-52070 Aachen, Germany

hereby certifies that

## **Makedonski Telekom**

kej 13 Noemvri 6, 1000 Skopje, Macedonia



achieved „**Best in Test**“ with a

Total Score of **740 of 1000**

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

(Score 320 of 400 in Telephony, Score 420 of 600 in Data Services)



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## Measurement Setup

	Voice	Data
<b>Device</b>	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
<b>Test Cases</b>	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
<b>Mobility and Route Types</b>	100% Drivetest 58% in big cities and 42% in small cities and on transfer	
<b>Samples</b>	4Gpref to 3Gpref: ~1200 per Operator	4Gpref ~ 850 per Operator and Service
<b>Dates</b>	<b>7 days of measurement: May 12th - May 20th</b>	

## 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.	Makedonski Telekom	Operator 2	Operator 3
<b>Voice</b>	<b>Total</b>	<b>400</b>	<b>320</b>	<b>289</b>	<b>336</b>
	Big Cities	260	77%	70%	85%
	Small Cities and Connecting Roads	140	86%	76%	82%
<b>Data</b>	<b>Total</b>	<b>600</b>	<b>420</b>	<b>293</b>	<b>104</b>
	Big Cities	390	69%	54%	19%
	Small Cities	90	80%	50%	20%
	Connecting Roads	120	64%	30%	11%
<b>TOTAL</b>		<b>1.000</b>	<b>740</b>	<b>581</b>	<b>440</b>

Shown voice, data and total scores are rounded

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

Data	Service Group	Max.	Makedonski Telekom	Operator 2	Operator 3
<b>Big Cities</b>	Web Browsing	136,5	83%	62%	18%
	File Download	78,0	80%	54%	40%
	File Upload	78,0	73%	50%	1%
	YouTube	97,5	38%	48%	16%
<b>Small Cities</b>	Web Browsing	31,5	87%	57%	18%
	File Download	18,0	81%	57%	46%
	File Upload	18,0	71%	29%	1%
	YouTube	22,5	78%	54%	17%
<b>Connecting Roads</b>	Web Browsing	42,0	75%	35%	19%
	File Download	24,0	74%	29%	1%
	File Upload	24,0	65%	16%	1%
	YouTube	30,0	41%	34%	14%

## 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”, combined “Small Cities” and “Connecting Roads”.

Voice M2M	Kpi Name	Unit	Makedonski Telekom	Operator 2	Operator 3
<b>Big Cities</b>	Qualified	[%]	96,9%	96,5%	98,5%
	Call Setup Time	[s]	5,9	6,5	4,8
	AVG Speech Quality	[MOS-LQO]	3,0	2,5	2,7
<b>Small Cities and Connecting Roads</b>	Qualified	[%]	96,7%	94,9%	96,4%
	Call Setup Time	[s]	5,4	6,4	5,3
	AVG Speech Quality	[MOS-LQO]	3,3	2,6	2,7

## 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	Makedonski Telekom	Operator 2	Operator 3
http Live Page DL	Qualified	[%]	97,0%	91,7%	72,4%
	AVG Session Time	[s]	2,8	3,1	5,7
http Static Page DL	Qualified	[%]	96,9%	93,8%	61,3%
	AVG Session Time	[s]	1,5	2,2	4,4
http file DL 3MB	Qualified	[%]	98,6%	95,2%	93,4%
	AVG Session Time	[s]	2,6	7,8	14,8
	90% faster than	[kbit/s]	4921	1680	866
	10% faster than	[kbit/s]	38278	8127	3784
http file UL 1MB	Qualified	[%]	96,3%	92,7%	38,6%
	AVG Session Time	[s]	2,3	2,8	12,9
	90% faster than	[kbit/s]	1657	1365	450
	10% faster than	[kbit/s]	8630	6565	834
http DL FDTT 10s	Qualified	[%]	99,4%	97,1%	95,4%
	AVG throughput	[kbit/s]	31937,1	4622,8	2339,7
	90% faster than	[kbit/s]	4256	1025	822
	10% faster than	[kbit/s]	59534	8266	4343
http UL FDTT 10s	Qualified	[%]	99,0%	94,0%	65,1%
	AVG throughput	[kbit/s]	19760,0	8342,4	383,0
	90% faster than	[kbit/s]	1282	851	93
	10% faster than	[kbit/s]	36173	17829	793
Youtube SD	Qualified	[%]	98,3%	96,2%	92,3%
	Start Time	[s]	1,7	2,2	3,8
	Playouts w/o interruptions	[%]	98,9%	98,4%	94,0%
Youtube HD	Qualified	[%]	78,2%	85,5%	52,3%
	Start Time	[s]	2,1	2,0	6,0
	Playouts w/o interruptions	[%]	72,6%	97,7%	82,1%

Data Small Cities	Kpi Name	Unit	Makedonski Telekom	Operator 2	Operator 3
<b>http Live Page DL</b>	Qualified	[%]	98,0%	91,3%	73,8%
	AVG Session Time	[s]	2,9	3,8	5,7
<b>http Static Page DL</b>	Qualified	[%]	98,2%	94,6%	63,8%
	AVG Session Time	[s]	1,6	2,9	4,3
<b>http file DL 3MB</b>	Qualified	[%]	99,5%	95,6%	96,3%
	AVG Session Time	[s]	2,6	10,5	15,1
	90% faster than	[kbit/s]	6018	1086	941
	10% faster than	[kbit/s]	31373	8798	3868
<b>http file UL 1MB</b>	Qualified	[%]	96,8%	78,0%	42,7%
	AVG Session Time	[s]	2,3	3,5	12,5
	90% faster than	[kbit/s]	2003	861	457
	10% faster than	[kbit/s]	7360	6349	832
<b>http DL FDTT 10s</b>	Qualified	[%]	99,1%	99,5%	95,2%
	AVG throughput	[kbit/s]	25561,4	4292,8	2619,6
	90% faster than	[kbit/s]	5351	983	908
	10% faster than	[kbit/s]	49483	8146	4922
<b>http UL FDTT 10s</b>	Qualified	[%]	98,2%	92,9%	69,9%
	AVG throughput	[kbit/s]	12668,2	7193,7	410,6
	90% faster than	[kbit/s]	1281	235	101
	10% faster than	[kbit/s]	31197	15476	823
<b>Youtube SD</b>	Qualified	[%]	99,5%	98,4%	89,8%
	Start Time	[s]	1,4	2,6	3,9
	Playouts w/o interruptions	[%]	99,1%	100,0%	98,7%
<b>Youtube HD</b>	Qualified	[%]	95,9%	88,6%	58,6%
	Start Time	[s]	1,8	3,7	5,6
	Playouts w/o interruptions	[%]	96,2%	95,7%	87,4%

Data Connecting Roads	Kpi Name	Unit	Makedonski Telekom	Operator 2	Operator 3
<b>http Live Page DL</b>	Qualified	[%]	91,8%	78,4%	43,4%
	AVG Session Time	[s]	3,2	4,4	5,8
<b>http Static Page DL</b>	Qualified	[%]	92,4%	79,2%	43,0%
	AVG Session Time	[s]	2,1	3,6	4,2
<b>http file DL 3MB</b>	Qualified	[%]	94,0%	85,1%	48,1%
	AVG Session Time	[s]	5,6	14,8	17,9
	90% faster than	[kbit/s]	2475	633	471
	10% faster than	[kbit/s]	27429	7981	3545
<b>http file UL 1MB</b>	Qualified	[%]	90,2%	65,0%	35,4%
	AVG Session Time	[s]	3,7	6,2	13,5
	90% faster than	[kbit/s]	1184	707	407
	10% faster than	[kbit/s]	6888	5323	824
<b>http DL FDTT 10s</b>	Qualified	[%]	98,5%	85,4%	53,9%
	AVG throughput	[kbit/s]	13373,7	3312,3	2043,7
	90% faster than	[kbit/s]	1738	509	170
	10% faster than	[kbit/s]	35618	7577	4005
<b>http UL FDTT 10s</b>	Qualified	[%]	95,5%	77,2%	38,7%
	AVG throughput	[kbit/s]	6749,6	2940,9	338,4
	90% faster than	[kbit/s]	546	79	81
	10% faster than	[kbit/s]	19276	8398	757
<b>Youtube SD</b>	Qualified	[%]	92,5%	85,4%	56,9%
	Start Time	[s]	1,9	3,9	4,8
	Playouts w/o interruptions	[%]	99,2%	96,6%	97,6%
<b>Youtube HD</b>	Qualified	[%]	73,8%	63,4%	29,0%
	Start Time	[s]	2,5	3,8	6,8
	Playouts w/o interruptions	[%]	86,5%	95,3%	85,0%