

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 06/2016.**

(Score 319 of 400 in Telephony, Score 421 of 600 in Data Services)



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*Head of Network Testing
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Measurement Setup

	Voice	Data
Device	Sony Xperia Z5 (E6653) P3 attenuator	Samsung Galaxy Note4 LTE cat6 (SM-N910F) LTE/HSPA+ DC/HSUPA 5.76 Carrier Aggregation capable P3 attenuator
Test Cases	Mobile-to-Mobile (M2M) Side1 (4G preferred) to Side2 (3G preferred) Side1 (4G preferred) to Side2 (4G preferred) 115 sec call window 70 sec call duration 15 sec call setup timeout Email traffic injection on both sides (100KB) (1 email per call window)	Data 4G preferred HTTP DL data stream 10s HTTP UL data stream 10s HTTP 3MB DL fixed file transfer HTTP 1MB UL fixed file transfer Web browsing - Kepler ETSI ref. page (50% http, 50% https) 10 Live web pages (50% http, 50% https) YouTube HD/ SD video - 45s
Mobility and Route Types	100% Drivetest 64% in cities, 14% in towns and 22% on roads	
Samples	~ 3087 per Operator	~ 1180 per Operator/Service
Dates	7 measurement days May 28th – June 8th, 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”.

Module	Infrastructure	Max.	Telekom	Operator 2	Operator 3
Voice	Total	400	319	251	261
	Overall	400	80%	63%	65%
Data	Total	600	421	120	293
	Overall	600	70%	20%	49%
TOTAL		1.000	740	371	554

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 Service Group

Data	Service Group	Max.	Telekom	Operator 2	Operator 3
Overall	Web Browsing	210	58%	19%	38%
	File Download	120	77%	9%	58%
	File Upload	120	70%	11%	62%
	YouTube	150	82%	37%	46%

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).

Voice M2M	Kpi Name	Unit	Telekom	Operator 2	Operator 3
Overall	Qualifier	[%]	97,8	95,7	96,5
	Call Setup Time	[s]	6,2	6,7	7,4
	AVG Speech Quality	[MOS-LQO]	3,6	2,8	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).

Data Overall	Kpi Name	Unit	Telekom	Operator 2	Operator 3
HTTP live page DL	Qualifier	[%]	92,6	74,7	88,0
	AVG Session Time	[s]	4,3	5,6	4,8
HTTP static page DL	Qualifier	[%]	97,4	82,8	95,3
	AVG Session Time	[s]	2,3	5,0	2,6
HTTP file DL 3MB	Qualifier	[%]	99,5	86,7	96,7
	AVG Session Time	[s]	2,8	13,8	6,7
	10% faster than	[kbit/s]	32498	5175	19566
	90% faster than	[kbit/s]	4328	990	1875

Data Overall	Kpi Name	Unit	Telekom	Operator 2	Operator 3
HTTP file UL 1MB	Qualifier	[%]	96,3	69,2	96,1
	AVG Session Time	[s]	2,4	7,3	2,9
	10% faster than	[kbit/s]	5984	1846	6715
	90% faster than	[kbit/s]	2059	637	1484
HTTP DL FDTT 10s	Qualifier	[%]	99,2	75,1	97,4
	AVG throughput	[kbit/s]	29057	4995	9685
	10% faster than	[kbit/s]	61446	7941	15145
	90% faster than	[kbit/s]	4703	1740	4590
HTTP UL FDTT 10s	Qualifier	[%]	98,4	66,5	97,6
	AVG throughput	[kbit/s]	20444	1305	10315
	10% faster than	[kbit/s]	38463	1860	18782
	90% faster than	[kbit/s]	2125	217	1444
YouTube	Qualifier	[%]	97,8	91,5	89,7
	Start Time	[s]	2,6	3,7	3,4
	Playouts w/o interruptions	[%]	99,7	98,2	96,2
	AVG Resolution	[p]	661,8	360,0	662,2
	HD Share	[%]	83,8	0,0	83,9