

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 901 of 1000

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

(Score 342 of 400 in Telephony, Score 559 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 (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 56% in Cities, 13% in Towns and 31% on Roads Small country approach	
Samples	~ 3000 per Operator	~ 1100 per Operator
Dates	7 measurement days 16.11.2017 – 23.11.2017	

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.

Module	Infrastructure	Max.	Telekom	Operator 2
Voice	Total	400	342	313
	Overall	400	86%	78%
Data	Total	600	559	535
	Overall	600	93%	89%
TOTAL		1.000	901	849

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
Overall	Web Browsing	180	87%	83%
	File Download	150	91%	88%
	File Upload	150	98%	95%
	YouTube	120	99%	94%

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).

Voice M2M	KPI Name	Unit	Telekom	Operator 2
Overall	Qualifier	[%]	99,0	98,0
	Call Setup Time	[s]	4,8	5,6
	AVG Speech Quality	[MOS-LQO]	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).

Data Overall	KPI Name	Unit	Telekom	Operator 2
HTTP Live Page DL	Qualifier	[%]	99,6	98,9
	Time to first Byte	[ms]	687	681
	KBytes first second	[KB]	375	389
HTTP Static Page DL	Qualifier	[%]	100,0	99,9
	AVG Session Time	[s]	1,2	1,7
HTTP file DL 3MB	Qualifier	[%]	100,0	99,8
	AVG Session Time	[s]	1,1	1,4
	90% faster than	[kbit/s]	16620	12558
	10% faster than	[kbit/s]	53691	41422
HTTP file UL 1MB	Qualifier	[%]	100,0	99,9
	AVG Session Time	[s]	0,6	1,0
	90% faster than	[kbit/s]	11852	8896
	10% faster than	[kbit/s]	23881	15094
HTTP DL FDTT 10s	Qualifier	[%]	99,8	100,0
	AVG throughput	[kbit/s]	59117	48315
	90% faster than	[kbit/s]	21887	18000
	10% faster than	[kbit/s]	112456	86628
HTTP UL FDTT 10s	Qualifier	[%]	99,8	99,3
	AVG throughput	[kbit/s]	34965	29046
	90% faster than	[kbit/s]	16636	11603
	10% faster than	[kbit/s]	46269	42533
YouTube	Qualifier	[%]	100,0	99,2
	Start Time	[s]	2,1	2,3
	Playouts w/o interruptions	[%]	100,0	99,6
	AVG Resolution	[p]	1078,7	1075,7