

CERTIFICATE

P3 communications GmbH

Am Kraftversorgungsturm 3, D-52070 Aachen, Germany

hereby certifies that



Cosmote Mobile Telecommunications S.A.

Kifissias Av 99, Maroussi, PO 15124
Athens, Greece

achieved „**Best in Test**“ with a

Total Score of **843 of 1000**

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

(Score 336 of 400 in Telephony, Score 507 of 600 in Data Services)



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*Head of Network Testing
& Benchmarking*
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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 53% in Cities, 17% in Towns and 30% on Roads Cities, towns and roads	
Samples	~ 4300 per Operator	~ 1560 per Operator
Dates	15 measurement days 21.09.2017 – 7.10.2017	

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.	Cosmote	Operator 2	Operator 3
Voice	Total	400	336	292	257
	Cities	240	87%	76%	67%
	Towns	80	89%	82%	71%
	Roads	80	71%	55%	49%
Data	Total	600	507	429	324
	Cities	360	89%	74%	69%
	Towns	120	75%	73%	26%
	Roads	120	82%	63%	36%
TOTAL		1.000	843	721	580

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.	Cosmote	Operator 2	Operator 3
Cities	Web Browsing	108	85%	74%	73%
	File Download	90	90%	76%	66%
	File Upload	90	86%	71%	65%
	YouTube	72	97%	76%	73%
Towns	Web Browsing	36	72%	68%	25%
	File Download	30	76%	76%	21%
	File Upload	30	71%	62%	25%
	YouTube	24	82%	89%	37%
Roads	Web Browsing	36	75%	59%	32%
	File Download	30	91%	70%	38%
	File Upload	30	74%	61%	31%
	YouTube	24	88%	64%	45%

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	Cosmote	Operator 2	Operator 3
Cities	Qualifier	[%]	98,9	98,1	96,7
	Call Setup Time	[s]	4,2	5,2	6,0
	AVG Speech Quality	[MOS-LQO]	3,5	3,0	3,1
Towns	Qualifier	[%]	99,4	98,9	97,2
	Call Setup Time	[s]	4,4	5,0	5,5
	AVG Speech Quality	[MOS-LQO]	3,5	3,1	3,1
Roads	Qualifier	[%]	94,1	90,8	89,4
	Call Setup Time	[s]	4,4	5,3	5,7
	AVG Speech Quality	[MOS-LQO]	3,5	3,1	3,2

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	Cosmote	Operator 2	Operator 3
HTTP Live Page DL	Qualifier	[%]	99,1	97,3	97,8
	Time to first Byte	[ms]	650	786	739
	KBytes first second	[KB]	357	361	290
HTTP Static Page DL	Qualifier	[%]	99,9	98,1	98,3
	Overall Session Time	[s]	1,2	1,4	1,7
HTTP file DL 3MB	Qualifier	[%]	99,9	99,0	98,5
	AVG Session Time	[s]	1,2	2,3	4,0
	90% faster than	[kbit/s]	13449	7255	2906
	10% faster than	[kbit/s]	63644	47244	34382
HTTP file UL 1MB	Qualifier	[%]	99,6	98,2	97,3
	AVG Session Time	[s]	1,4	1,9	2,3
	90% faster than	[kbit/s]	3121	1868	1566
	10% faster than	[kbit/s]	25974	20844	15829
HTTP DL FDTT 7s	Qualifier	[%]	99,6	97,3	97,1
	AVG throughput	[kbit/s]	59288	34669	17684
	90% faster than	[kbit/s]	19468	7381	3414
	10% faster than	[kbit/s]	107270	65848	38741
HTTP UL FDTT 7s	Qualifier	[%]	99,3	96,5	96,4
	AVG throughput	[kbit/s]	21899	15319	10074
	90% faster than	[kbit/s]	3568	2022	1679
	10% faster than	[kbit/s]	40258	30375	20353
YouTube	Qualifier	[%]	99,5	95,9	95,8
	Start Time	[s]	2,3	2,6	3,1
	Playouts w/o interruptions	[%]	100,0	98,3	98,0
	AVG Resolution	[p]	1078,8	1068,3	1050,0

Data Towns	KPI Name	Unit	Cosmote	Operator 2	Operator 3
HTTP Live Page DL	Qualifier	[%]	96,2	96,5	81,8
	Time to first Byte	[ms]	707	839	821
	KBytes first second	[KB]	356	347	278
HTTP Static Page DL	Qualifier	[%]	97,7	97,9	79,7
	Overall Session Time	[s]	1,2	1,6	2,0
HTTP file DL 3MB	Qualifier	[%]	97,3	99,6	90,2
	AVG Session Time	[s]	1,3	2,7	7,5
	90% faster than	[kbit/s]	12071	5315	980
	10% faster than	[kbit/s]	63092	36047	30380
HTTP file UL 1MB	Qualifier	[%]	97,0	95,4	71,2
	AVG Session Time	[s]	1,7	2,2	2,2
	90% faster than	[kbit/s]	2505	1829	1827
	10% faster than	[kbit/s]	24413	15601	14625
HTTP DL FDTT 7s	Qualifier	[%]	96,1	98,9	87,5
	AVG throughput	[kbit/s]	58615	24662	15318
	90% faster than	[kbit/s]	20696	5141	1102
	10% faster than	[kbit/s]	94080	48274	31138
HTTP UL FDTT 7s	Qualifier	[%]	96,6	97,3	71,6
	AVG throughput	[kbit/s]	19688	11010	10996
	90% faster than	[kbit/s]	2691	1690	2893
	10% faster than	[kbit/s]	39737	21122	18894
YouTube	Qualifier	[%]	96,1	99,2	84,1
	Start Time	[s]	2,3	2,8	3,6
	Playouts w/o interruptions	[%]	100,0	98,5	97,4
	AVG Resolution	[p]	1078,8	1047,4	975,8

Data Roads	KPI Name	Unit	Cosmote	Operator 2	Operator 3
HTTP Live Page DL	Qualifier	[%]	96,0	92,7	83,1
	Time to first Byte	[ms]	840	1098	861
	KBytes first second	[KB]	328	319	281
HTTP Static Page DL	Qualifier	[%]	96,8	92,4	82,2
	Overall Session Time	[s]	1,5	2,0	1,9
HTTP file DL 3MB	Qualifier	[%]	98,3	96,7	85,4
	AVG Session Time	[s]	2,1	4,6	5,1
	90% faster than	[kbit/s]	9220	2798	2238
	10% faster than	[kbit/s]	63660	33832	29949
HTTP file UL 1MB	Qualifier	[%]	95,4	93,6	81,1
	AVG Session Time	[s]	2,3	3,3	2,2
	90% faster than	[kbit/s]	1591	1140	1765
	10% faster than	[kbit/s]	23739	15595	15582
HTTP DL FDTT 7s	Qualifier	[%]	97,3	93,8	86,7
	AVG throughput	[kbit/s]	54363	19516	17390
	90% faster than	[kbit/s]	10519	3978	2577
	10% faster than	[kbit/s]	108774	43088	32762
HTTP UL FDTT 7s	Qualifier	[%]	96,2	92,4	82,2
	AVG throughput	[kbit/s]	17669	9562	10849
	90% faster than	[kbit/s]	1872	1602	1856
	10% faster than	[kbit/s]	37389	20532	19767
YouTube	Qualifier	[%]	96,6	88,7	80,2
	Start Time	[s]	2,7	3,1	3,2
	Playouts w/o interruptions	[%]	99,3	98,8	98,2
	AVG Resolution	[p]	1073,0	1047,6	1046,8