best in test

For adding something on top in Greece and reaching an overall score of 905 dots in mobile network benchmarking survey we proudly award this certificate to

Cosmote Greece

Score 905 out of 1000 in Total

Score 299 out of 320 in Voice Services

Score 429 out of 480 in Data Services

Score 177 out of 200 in Crowdsourced Quality

Hakan Ekmen
Chief Executive Officer Telecommunication

Best 04 in Test 21

umlaut

Measurement Overview

Measurement setup

umlaut tested and measured the performance of its voice and data services on smartphones in comparison to other 5G/LTE/UMTS mobile radio networks in metropolitan and rural areas of Greece.

The audit was done as a performance benchmark performed by umlaut between 10.04.2021 and 23.04.2021 in cities and towns as well as on connection roads.

Dedicated measurements have been executed as drive tests outdoors using a Samsung Galaxy S10 and Samsung Galaxy S21+ Smartphone. All data measurements have been performed in 5G and 4G preferred mode. Voice measurements have been done in 4G preferred mode on both sides, while call origin has been alternated.

In addition crowdsourced performance data has been collected and evaluated between CW45 2020 and CW15 2021.

The following pages provide a comparative overview about the performance results observed for the different tested service types.
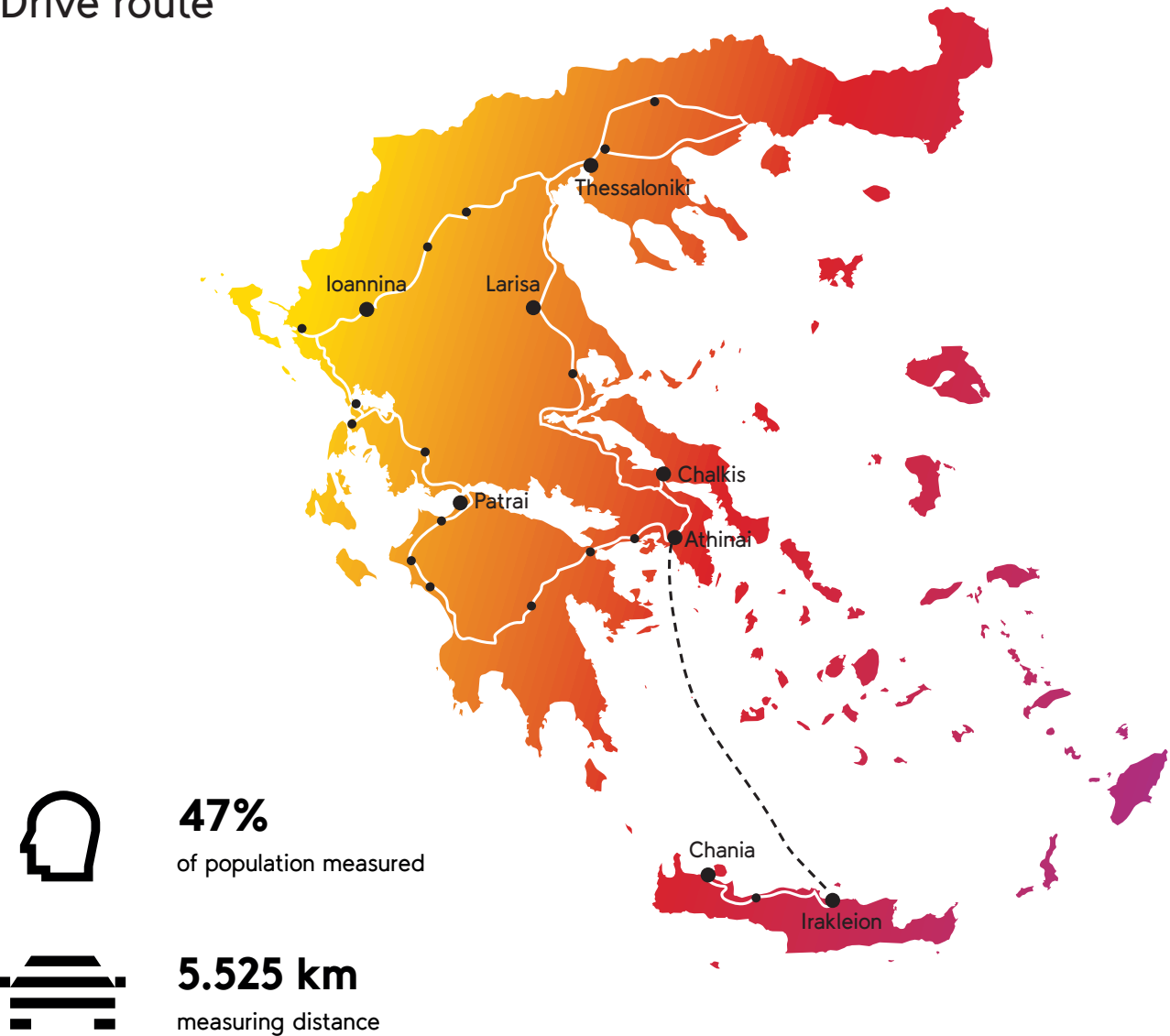
Drivetest	Voice	Data
Device	Samsung Galaxy S10	Samsung Galaxy S21+ 5G
Test Cases	Mobile–to–Mobile (M2M) Side1 (4G preferred: Volte) to Side2 (4G preferred: Volte) 115 sec call window 70 sec call duration 15 sec call setup timeout Multi–RAB traffic injection on both sides	System 1: Data 4G preferred CA System 2: Data 5G preferred HTTP DL datastream 7s HTTP UL datastream 7s HTTP 5MB DL fixed file transfer HTTP 2.5MB UL fixed file transfer Web Browsing – Kepler ETSI Ref. Page 10 Live web pages (5 http / 5 https) 2 YouTube HD video ~ 45s 1 YouTube live stream ~ 45s
Mobility and Route Types	100% Drivetest 54% in Cities, 14% in Towns and 32% on Roads	
Samples	~ 2,310 per Operator	~ 22,804 per Operator
Dates	11 measurement days 10.04.2021 – 23.04.2021	
Crowd Data Assessment	24 weeks 2020–W–45 to 2021–W–15	

Testing areas

Drive route

Thessaloniki

Ioannina

Larisa

Chalkis

Patrai

Athinai

Chania

Irakleion

47%
of population measured

5.525 km
measuring distance

Crowdsourcing

based test area

71.803 km^2
size of tested area

91.5%
of the 'build–up area' covered

97.4%
of the 'Population area' covered
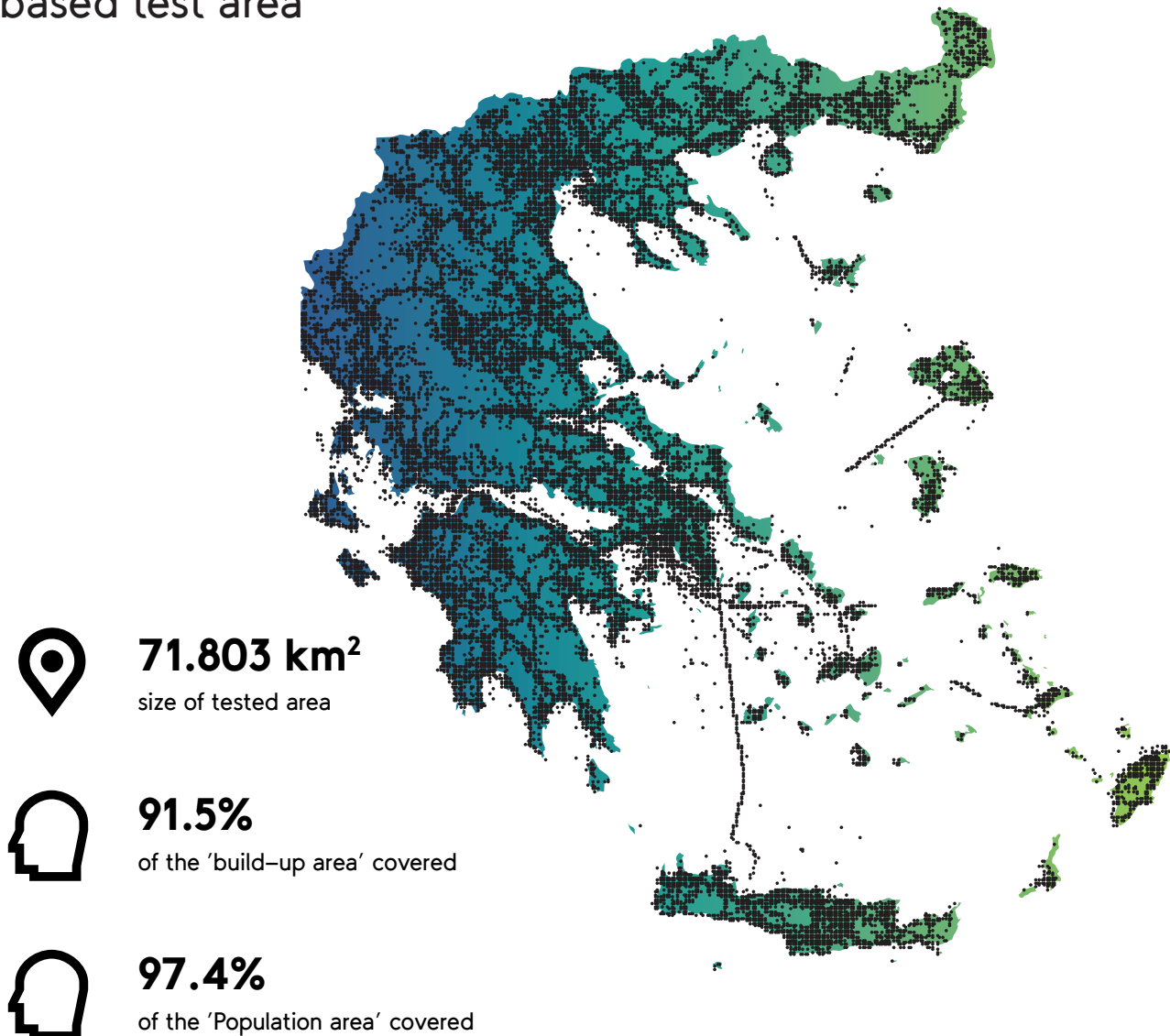
Claıms

Best in test
Cosmote

Best in data
Cosmote

Best in voice
Cosmote

Best in crowd–sourced quality
Cosmote

Methodology

The leader in mobile benchmarking, umlaut, has analyzed the mobile networks of Greece with regards to mobile network performance. We measure smartphone voice and data performance based on extensive drivetests – from major metropolitan areas to smaller cities and connection roads.

We objectively define the routes and test methodology and publish the results through certificates or public benchmark reports.

As the de–facto industry standard, our benchmarking methodology focuses on customer–perceived network quality and covers a wide range of mobile services. Today, more than 200 mobile networks in more than 120 countries are being evaluated by our unique scoring methodology. It allows a technical analysis that is unpre–

cedented in its level of detail and enables comparisons between the network performance and capability of each mobile network. Our public benchmarks as well as the certificate benchmarks help network operators to demon–strate how well they are delivering wireless connections to consumers, business users and enterprises and reveals the areas of improvement.

Score and breakdown

Cosmote achieved the highest overall score among competitors with 905 dots out of 1000.

**Total Score
1000 Dots**

→ Shown total scores are rounded.
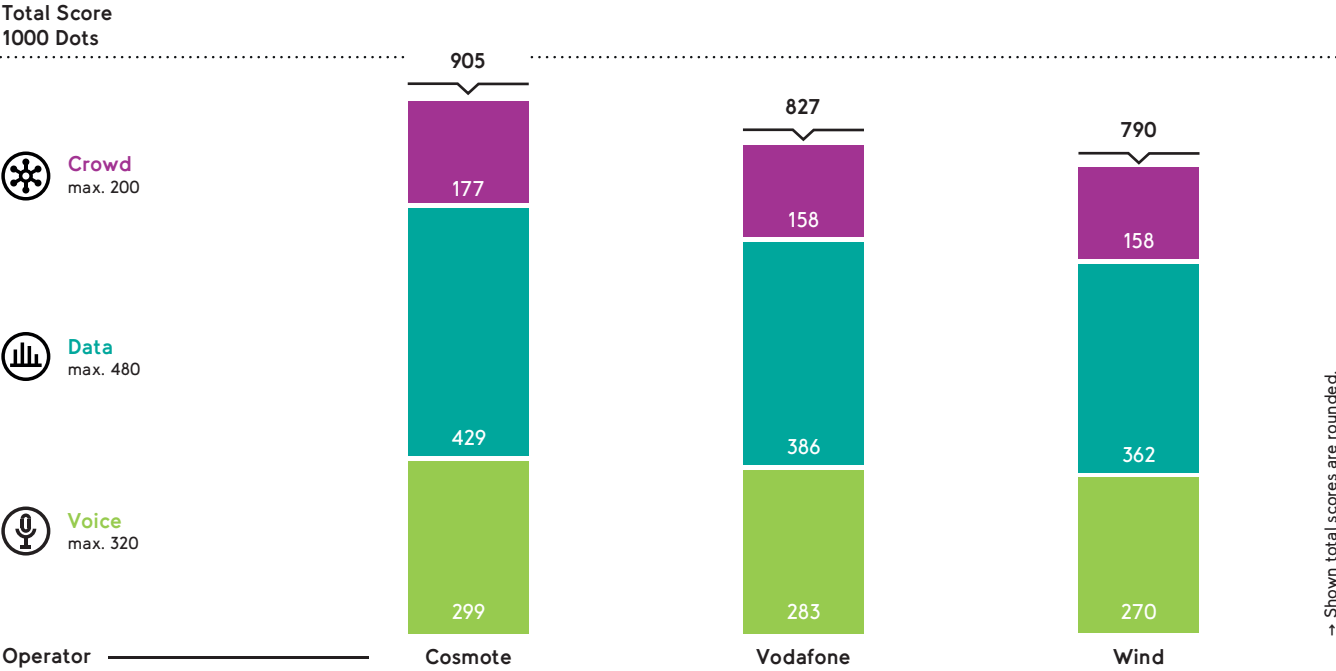
Overall score considering Voice, Data and Crowdsourcing.

Total score

		Cosmote	Vodafone	Wind
Voice	max. 320	299	283	270
Cities Drivetest	192	96%	89%	85%
Towns Drivetest	64	98%	96%	93%
Roads Drivetest	64	81%	79%	73%
Data	max. 480	429	386	362
Cities Drivetest	288	89%	81%	74%
Towns Drivetest	96	90%	84%	82%
Roads Drivetest	96	88%	75%	74%
Crowdsourced Quality	max. 200	177	158	158
Broadband Coverage	100	93%	89%	82%
Download Speed	60	177%	57%	69%
Latency	40	90%	88%	87%
Total	1000	905	827	790

Shown scores are rounded.

Achieved percentage of the maximum score in each of the different data services.

Data	Service Group	max	Cosmote	Vodafone	Wind
Cities	Web Browsing	72,0	96%	93%	86%
	File Download	72,0	90%	77%	69%
	File Upload	72,0	79%	72%	60%
	YouTube	72,0	93%	84%	79%
Towns	Web Browsing	24,0	97%	95%	93%
	File Download	24,0	89%	77%	79%
	File Upload	24,0	78%	75%	62%
	YouTube	24,0	95%	88%	94%
Roads	Web Browsing	24,0	93%	90%	84%
	File Download	24,0	90%	70%	72%
	File Upload	24,0	83%	72%	68%
	YouTube	24,0	87%	68%	71%

Achieved percentage of the maximum score in each of the different crowdsourcing services.

Crowd	Service Group	max	Cosmote	Vodafone	Wind
Crowdsourced Quality	Broadband Coverage	100	93%	89%	82%
	DL Speed	60	79%	57%	69%
	Latency	40	90%	88%	87%

Voice KPI overview

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	Service Group	Unit	Cosmote	Vodafone	Wind
Cities	Qualifier	[%]	99,7	98,6	98,4
	Call Setup Time	[s]	1,4	1,5	2,1
	Call Setup Time (P90)	[s]	1,8	1,9	2,5
	Speech Quality (AVG)	[MOS–LQO]	4,5	4,4	3,8
	Speech Quality (P10)	[MOS–LQO]	3,9	3,6	3,4
	Multirab connectivity	[%]	99,4	98,9	97,0
Towns	Qualifier	[%]	100,0	99,7	100,0
	Call Setup Time	[s]	1,6	1,6	2,2
	Call Setup Time (P90)	[s]	2,3	2,0	2,5
	Speech Quality (AVG)	[MOS–LQO]	4,5	4,4	3,8
	Speech Quality (P10)	[MOS–LQO]	3,9	3,9	3,4
	Multirab connectivity	[%]	100,0	99,4	95,5
Roads	Qualifier	[%]	95,0	94,6	94,4
	Call Setup Time	[s]	1,9	1,7	2,3
	Call Setup Time (P90)	[s]	2,5	2,3	3,4
	Speech Quality (AVG)	[MOS–LQO]	4,4	4,3	3,8
	Speech Quality (P10)	[MOS–LQO]	3,6	3,5	3,2
	Multirab connectivity	[%]	99,0	96,4	94,0

At the start of the benchmark, the measurement setup did not support enhanced voice services (EVS) with VoLTE for Wind. It is to be expected that the speech quality experienced by Wind users is higher than that measured.

Data Services KPI overview

Achieved values of all networks under test in each of the relevant Data Key Performance Indicators (KPIs) for the geographical category "Cities".

Data Cities	KPI Name	Unit	Cosmote	Vodafone	Wind
HTTP Live Page DL Smartphone	Qualifier	[%]	99,9	99,3	98,0
	Overall Session Time	[s]	1,1	1,1	1,1
HTTP Static Page DL Smartphone	Qualifier	[%]	99,8	99,2	98,2
	Overall Session Time	[s]	1,1	1,1	1,2
HTTP 5MB DL Smartphone	Qualifier	[%]	99,6	99,4	97,9
	Average Session Time	[s]	1,8	2,8	3,3
	90% faster than	[Mbit/s]	15,6	8,7	7,9
	10% faster than	[Mbit/s]	113,4	62,5	71,6
HTTP 2500KB UL Smartphone	Qualifier	[%]	99,3	98,5	98,1
	Average Session Time	[s]	2,5	2,8	3,8
	90% faster than	[Mbit/s]	4,6	3,3	2,5
	10% faster than	[Mbit/s]	32,2	36,9	26,0
HTTP DL FDTT	Qualifier	[%]	99,5	99,5	98,3
	Average Data Rate	[Mbit/s]	138,5	47,6	47,9
	90% faster than	[Mbit/s]	24,1	7,7	7,0
	10% faster than	[Mbit/s]	272,3	91,6	102,9
HTTP UL FDTT	Qualifier	[%]	98,7	98,1	96,0
	Average Data Rate	[Mbit/s]	30,5	26,9	17,3
	90% faster than	[Mbit/s]	5,5	3,0	2,0
	10% faster than	[Mbit/s]	58,6	53,8	41,8
YouTube	Qualifier	[%]	99,7	98,1	97,6
	Start Time	[s]	1,1	1,3	1,5
	AVG Resolution	[p]	920	907	911
YouTube Live Smartphone	Qualifier	[%]	99,2	98,2	96,8
	Start Time	[s]	1,4	1,7	1,8
	AVG Resolution	[p]	1036	1017	1023

Data Services KPI Overview

Achieved values of all networks under test in each of the relevant Data Key Performance Indicators (KPIs) for the geo–graphical category "Towns".

Data Towns	KPI Name	Unit	Cosmote	Vodafone	Wind
HTTP Live Page DL Smartphone	Qualifier	[%]	100,0	99,8	99,1
	Overall Session Time	[s]	1,1	1,1	1,1
HTTP Static Page DL Smartphone	Qualifier	[%]	100,0	99,6	99,8
	Overall Session Time	[s]	1,1	1,2	1,1
HTTP 5MB DL Smartphone	Qualifier	[%]	99,6	99,6	99,6
	Average Session Time	[s]	1,9	3,1	3,0
	90% faster than	[Mbit/s]	15,9	6,9	8,2
	10% faster than	[Mbit/s]	83,9	58,2	72,3
HTTP 2500KB UL Smartphone	Qualifier	[%]	100,0	99,6	98,5
	Average Session Time	[s]	2,7	3,2	4,1
	90% faster than	[Mbit/s]	4,2	2,9	2,1
	10% faster than	[Mbit/s]	28,7	31,2	21,7
HTTP DL FDTT	Qualifier	[%]	100,0	100,0	100,0
	Average Data Rate	[Mbit/s]	82,6	39,0	47,8
	90% faster than	[Mbit/s]	23,4	6,5	9,1
	10% faster than	[Mbit/s]	162,9	83,5	97,6
HTTP UL FDTT	Qualifier	[%]	98,9	99,3	97,4
	Average Data Rate	[Mbit/s]	22,6	18,7	13,4
	90% faster than	[Mbit/s]	5,2	2,4	2,2
	10% faster than	[Mbit/s]	43,2	43,9	27,5
YouTube	Qualifier	[%]	100,0	98,9	100,0
	Start Time	[s]	1,2	1,4	1,3
	AVG Resolution	[p]	923	896	913
YouTube Live Smartphone	Qualifier	[%]	100,0	99,3	100,0
	Start Time	[s]	1,5	1,7	1,8
	AVG Resolution	[p]	1037	1012	1034

Achieved values of all networks under test in each of the relevant Data Key Performance Indicators (KPIs) for the geo–graphical category "Roads".

Data Roads	KPI Name	Unit	Cosmote	Vodafone	Wind
HTTP Live Page DL Smartphone	Qualifier	[%]	98,8	98,1	96,2
	Overall Session Time	[s]	1,2	1,3	1,4
HTTP Static Page DL Smartphone	Qualifier	[%]	99,0	97,7	96,5
	Overall Session Time	[s]	1,2	1,4	1,3
HTTP 5MB DL Smartphone	Qualifier	[%]	98,4	96,7	98,6
	Average Session Time	[s]	2,1	4,4	4,6
	90% faster than	[Mbit/s]	12,0	4,5	5,7
	10% faster than	[Mbit/s]	85,5	52,8	57,5
HTTP 2500KB UL Smartphone	Qualifier	[%]	98,5	96,5	96,6
	Average Session Time	[s]	2,9	3,5	4,2
	90% faster than	[Mbit/s]	4,1	2,5	2,1
	10% faster than	[Mbit/s]	30,2	25,0	22,3
HTTP DL FDTT	Qualifier	[%]	99,1	97,6	96,1
	Average Data Rate	[Mbit/s]	88,3	28,6	30,4
	90% faster than	[Mbit/s]	14,1	3,5	4,4
	10% faster than	[Mbit/s]	175,1	67,6	70,1
HTTP UL FDTT	Qualifier	[%]	98,0	97,3	96,1
	Average Data Rate	[Mbit/s]	23,2	15,6	13,9
	90% faster than	[Mbit/s]	4,5	2,8	2,0
	10% faster than	[Mbit/s]	44,3	28,4	28,5
YouTube	Qualifier	[%]	96,9	92,5	93,6
	Start Time	[s]	1,3	1,7	1,7
	AVG Resolution	[p]	917	879	905
YouTube Live Smartphone	Qualifier	[%]	98,9	92,2	92,0
	Start Time	[s]	1,7	2,0	2,0
	AVG Resolution	[p]	1035	990	1022

Crowd KPI overview

Achieved values of all networks under test in each of the relevant Crowd Key Performance Indicators (KPIs) for the categories "Broadband Coverage", "Download Speed" and "Latency".

Category	KPI name	Unit	Cosmote	Vodafone	Wind
Broadband Coverage	Coverage Excellence	[%]	73,6	53,3	42,8
	Time on broadband	[%]	95,4	95,3	92,4
Download Speed	Basic internet class	[%]	89,8	86,1	87,1
	HD video class	[%]	67,9	51,8	59,8
	UHD video class	[%]	13,7	7,9	9,8
Latency	Gaming class	[%]	86,9	88,2	79,6
	OTT voice class	[%]	96,5	95,2	95,6

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