

OPEN SIGNAL

5G Global Mobile Network Experience Awards 2022

September 2022

Sam Fenwick, Senior Analyst



OPEN SIGNAL

Key Findings

T-Mobile U.S. is the 5G Global Winner for both 5G Availability and 5G Reach

This means that our 5G users on T-Mobile U.S. spent the largest proportion of time with an active 5G connection, and they also found a 5G signal in the highest proportion of locations. T-Mobile U.S. wins 5G Availability with a score of 40.4% and 5G Reach with 7.8 points on a 10 point scale. The operator also saw the second greatest improvement in 5G Download Speed between the first half of 2021 and 2022 – an increase of 98.9%, 5.2 percentage points behind the front-runner, Croatia's HT.

SK telecom users clock up the fastest 5G Download Speed in the world

Our users observed the fastest average 5G download speeds using SK telecom with an incredibly fast 469.6 Mbps. Both South Korea's other operators, LG U+ and KT, are 5G Global Leaders for 5G Download Speed, with scores of 429.6 Mbps and 381.9 Mbps, respectively.

The best 5G Games Experience was on SK telecom and KT

KT and SK telecom are 5G Global Winners for 5G Games Experience with statistically tied scores of 90.5–90.9 points on a 100 point scale. Fellow South Korean operator LG U+ is a 5G Global Leader for multiplayer gaming using 5G and is in joint third place, alongside Switzerland's Salt, T-Mobile Czech Republic and Hong Kong's csl.

Two out of three 5G Global Winners for 5G Video Experience are Swedish

Due to a three-way statistical tie, our users had the best 5G video streaming experience using Tele2, Telia – both from Sweden – and on Slovenia's Telemach. Therefore, the three operators are 5G Global Winners for 5G Video Experience with statistically tied scores of 82.8–84.1 points on a 100 point scale.

Telia Sweden users had the fastest 5G upload speeds in the world

Telia is the sole 5G Global winner for 5G Upload Speed with a blisteringly fast score of 50.9 Mbps. The operator wins by an impressive margin of at least 7.5 Mbps ahead of five operators sharing second place – Czech Republic's T-Mobile, Norway's Telia and Telenor, Swedish Tele2, and the Netherlands' KPN – with statistically tied scores of 41.1–43.3 Mbps.

Only four operators' users saw 5G Download Speeds over 1000% faster than 4G

5G has had an incredibly positive impact on users' average download speeds. Our users on Israeli operator Hot Mobile reported the most impressive improvement – 1183.3% – in their average download speeds with 5G compared to 4G, followed by those on Chile's Movistar (1084.5%), the UAE's du (1051.9%) and Israel's Partner (1014.7%).

Five operators place in the top 30 for all four measures of 5G Global Impact

5G Global Impact is the percentage improvement users experienced with 5G compared with 4G. Five operators have managed the impressive feat of being recognized in all four 5G Global Impact categories: Israel's Hot Mobile and Partner, Globe and Smart in the Philippines, along with the UAE's du. All ranked in 5G Global Impact for Download Speed, Upload Speed, Video Experience and Games Experience.

Globe Philippines users had the largest improvement in Video Experience with 5G

Our Globe users saw the largest uplift in their experience when streaming video on 5G compared with 4G (Video Experience – 5G Global Impact). Their video experience score improved by 89%. In addition, Globe had the second highest Games Experience 5G Global Impact score, with users experiencing an improvement of 39.6% with 5G.


Japan's NTT docomo and SoftBank are 5G Global Rising Stars in four categories

NTT docomo and SoftBank are the only operators to have placed as 5G Global Rising Stars across four categories. This means our users saw a tremendous improvement in 5G experience between the first half of 2021 and 2022. They are both rising stars for 5G Availability, 5G Reach and 5G Games Experience. In addition, NTT docomo is a 5G Global Rising Star for 5G Download Speed, while SoftBank is one for 5G Upload Speed.

Opensignal 5G Global Awards 2022

The Global Winners and Leaders







 5G Availability	T-Mobile USA	FarEasTone Taiwan stc Kuwait Zain Kuwait	WOM Chile KT South Korea SK telecom South Korea	stc Saudi Arabia Vivacom Bulgaria LG U+ South Korea	Ooredoo Kuwait Telemach Croatia
 5G Reach	T-Mobile USA	SK telecom South Korea FarEasTone Taiwan CMHK Hong Kong	LG U+ South Korea KT South Korea cs1 Hong Kong	Taiwan Mobile Taiwan Swisscom Switzerland Sunrise Switzerland	
 5G Download Speed	SK telecom South Korea	LG U+ South Korea Vivacom Bulgaria Tele2 Sweden	KT South Korea Telenor Sweden A1 Bulgaria	Telemach Slovenia Chunghwa Taiwan Ooredoo Qatar	
 5G Upload Speed	Telia Sweden	T-Mobile Czech Republic Telia Norway Tele2 Sweden	KPN Netherlands Telenor Norway SK telecom South Korea	Swisscom Switzerland FarEasTone Taiwan T-Mobile Netherlands	Chunghwa Taiwan Telekom Hungary
 5G Games Experience	SK telecom South Korea KT South Korea	LG U+ South Korea Salt Switzerland T-Mobile Czech Republic	cs1 Hong Kong KPN Netherlands SoftBank Japan	O2 Czech Republic Singtel Singapore Telekom Slovakia	A1 Croatia Telemach Slovenia Telekom Slovenia Slovenia
 5G Video Experience	Tele2 Sweden Telia Sweden Telemach Slovenia	Taiwan Mobile Taiwan DNA Finland Telia Norway Magenta Austria	Chunghwa Taiwan Swisscom Switzerland FarEasTone Taiwan Telekom Germany	A1 Austria Elisa Finland A1 Croatia CMHK Hong Kong	Telenor Norway Telia Finland Telenor Sweden 3 Sweden



Opensignal 5G Global Awards 2022

5G Global Impact

(improvement over 4G)

 <p>Download Speed</p>	Hot Mobile Israel Movistar Chile du UAE Partner Israel Zain Saudi Arabia Ooredoo Kuwait	TIM Italy Tele2 Sweden Entel Chile Telenor Sweden Globe Philippines AIS Thailand	Telemach Slovenia WOM Chile 3 UK Zain Kuwait Vivacom Bulgaria FarEasTone Taiwan	LG U+ South Korea stc Saudi Arabia China Mobile China Smart Philippines Orange Romania Taiwan Mobile Taiwan	Vodafone Qatar Mobily Saudi Arabia TrueMove H Thailand Etisalat UAE Chunghwa Taiwan MEO Portugal
 <p>Upload Speed</p>	Chunghwa Taiwan FarEasTone Taiwan DTAC Thailand Tele2 Sweden Telia Sweden Hot Mobile Israel	Globe Philippines SmarTone Hong Kong Wind Greece Magenta Austria CMHK Hong Kong AIS Thailand	Partner Israel Telekom Slovakia csl Hong Kong Etisalat UAE Vodafone Greece Smart Philippines	Telenor Sweden KPN Netherlands du UAE T-Mobile Czech Republic Vivacom Bulgaria Yettel Hungary	Telemach Slovenia SK telecom South Korea Telia Norway T Star Taiwan TIM Brazil Telekom Germany
 <p>Games Experience</p>	Entel Peru Globe Philippines Etisalat UAE Entel Chile AT&T Mexico stc Saudi Arabia	Mobily Saudi Arabia Indosat Indonesia Telkomsel Indonesia TrueMove H Thailand Vivo Brazil csl Hong Kong	Telemach Slovenia Hot Mobile Israel CMHK Hong Kong Claro Peru Wind Greece Orange Romania	TIM Brazil DTAC Thailand du UAE Partner Israel Verizon USA Vodafone Greece	Sunrise Switzerland Rogers Canada Telekom Germany Omantel Oman Smart Philippines WOM Chile
 <p>Video Experience</p>	Globe Philippines AIS Thailand Movistar Chile Zain Saudi Arabia Indosat Indonesia Entel Peru	Entel Chile WOM Chile Smart Philippines Hot Mobile Israel Telkomsel Indonesia Partner Israel	TrueMove H Thailand Plus Poland CMHK Hong Kong O2 UK 3 Hong Kong du UAE	SmarTone Hong Kong T Star Taiwan TIM Italy DTAC Thailand 3 UK MTN South Africa	csl Hong Kong TIM Brazil Claro Peru Mobily Saudi Arabia Tele2 Sweden Pelephone Israel



Opensignal 5G Global Awards 2022

5G Global Rising Stars

(most improved year-on-year)

 5G Availability	DTAC Thailand Vodafone Australia StarHub Singapore SoftBank Japan Telia Sweden	au Japan Telia Norway Yoigo Spain Telenor Sweden Vodafone Germany	eir Ireland NTT docomo Japan O2 Germany Play Poland O2 UK	FarEasTone Taiwan Cosmote Greece Orange Spain SFR France Sunrise Switzerland
 5G Reach	Yoigo Spain SoftBank Japan Vodafone Australia Orange Spain au Japan	Vodafone Germany O2 Germany Iliad Italy Movistar Spain NTT docomo Japan	Salt Switzerland O2 UK Free Mobile France Bell Canada Telus Canada	Vodafone Spain Sunrise Switzerland StarHub Singapore Vodafone Ireland Vodafone Italy
 5G Download Speed	HT Croatia T-Mobile USA 3 UK Singtel Singapore Free Mobile France	TrueMove H Thailand Bouygues France Telekom Germany Globe Philippines Verizon USA	cs1 Hong Kong Zain Kuwait Vodafone Italy SmarTone Hong Kong Mobily Saudi Arabia	Orange France SFR France NTT docomo Japan LG U+ South Korea KT South Korea
 5G Upload Speed	cs1 Hong Kong Globe Philippines Salt Switzerland Vodafone Italy Cosmote Greece	SoftBank Japan Zain Kuwait Bouygues France LG U+ South Korea Claro Brazil	Etisalat UAE Vodafone Germany SK telecom South Korea SmarTone Hong Kong Orange France	Telekom Germany Mobily Saudi Arabia Ooredoo Kuwait Rogers Canada HT Croatia
 5G Games Experience	stc Kuwait NTT docomo Japan Zain Kuwait T-Mobile USA StarHub Singapore	T Star Taiwan cs1 Hong Kong SmarTone Hong Kong Ooredoo Kuwait Salt Switzerland	du UAE Taiwan Mobile Taiwan Claro Brazil Swisscom Switzerland stc Saudi Arabia	Zain Saudi Arabia Etisalat UAE HT Croatia SoftBank Japan Bouygues France

5G: The end of the beginning

It has now been nearly three and a half years since the first 5G networks launched. Since April 2019, operators in some markets have been investing heavily to increase the geographical extent of their 5G networks, as well as to obtain and deploy more 5G spectrum. Conversely, in other markets 5G is just getting started, or even just about to start.

5G adoption is accelerating. Most new mid-tier smartphones now support 5G as standard – as do an increasing number of low-tier models – so as consumers upgrade their phones they routinely become 5G users too. 5G technology is also improving as work is well underway on new 5G standards – 3GPP Releases 17 and 18 – that aim to further improve the 5G experience that users have had for the last few years. In addition, the global economic situation is causing many consumers to carefully consider their spending priorities and whether to prioritize wireless contracts and mobile purchases over other areas.

Given how 5G technology and the world is rapidly changing it's even more important to understand the real-world 5G experience. Everyone wishes to quantify what 5G really means for mobile users and how it differs from the existing 4G experience.

To aid this understanding – and to celebrate the mobile industry's collective efforts – Opensignal has again compared users' 5G mobile network experience by operator to see how operators stack up globally. We have examined six key measures of the 5G experience. We have determined the 5G Global Winners using confidence intervals as we do with all of our reports. If the confidence intervals overlap then the result is a statistical tie and we declare two or more operators to be joint winners. Also, we have used confidence intervals to determine the 5G Global Leaders and the 5G Global High Performers, which are composed of the top 10 and top 30 scoring operators respectively (excluding 5G Global Winners). The exact number of operators in these categories vary because of statistical ties between operators' scores.

Additionally, we've included four 5G Global Impact categories – for Download Speed, Upload Speed, Games Experience and Video Experience. These categories assess the uplift, or improvement, in mobile experience seen by our users while connected to 5G compared to 4G, the previous generation of network technology.

Finally, for the first time, we have compared how the 5G Experience has changed year-on-year. We've analyzed the difference between the first half of 2021 and the first half of 2022 and recognised the operators with the 20 highest percentage improvements in our users' experience across five categories: 5G Availability, 5G Reach, 5G Download Speed, 5G Upload Speed and 5G Games Experience.



5G Availability – Global



T-Mobile – USA 40.4



FarEasTone – TWN 38.5

stc – KWT 36.0

Zain – KWT 34.9

WOM – CHL 33.7

KT – KOR 33.1

SK telecom – KOR 32.5

stc – SAU 31.7

Vivacom – BGR 29.4

LG U+ – KOR 28.2

Ooredoo – KWT 27.3

Telemach – HRV 25.6



Zain – SAU 24.6

AIS – THA 24.3

csl – HKG 23.9

3 – HKG 23.7

Mobily – SAU 23.7

CMHK – HKG 23.6

WindTre – ITA 23.3

T Star – TWN 23.1

Chunghwa – TWN 23.0

du – ARE 22.4

TrueMove H – THA 22.3

Taiwan Mobile – TWN 22.2

HT – HRV 21.8

T-Mobile – NLD 21.5

Singtel – SGP 20.9

A1 – BGR 20.7

NOS – PRT 20.1

Ooredoo – QAT 19.7

Average – Global 13.5
(Only highest ranked 5G operators listed on chart)



OPEN SIGNAL

0 10 20 30 40 50
(% time)

Data collection period 1 January – 29 June 2022 | © Opensignal Limited

Opensignal's 5G Availability assesses the amount of time 5G users spent on 5G – the higher the percentage, the more time users on a network had an active 5G connection. It is an important measure of the 5G experience as users can only benefit from the superior performance that 5G can provide when they have a 5G connection.

This time around, we have a sole 5G Global Winner for 5G Availability. T-Mobile U.S. wins with a truly impressive score of 40.4%. The next highest ranked set of operators, the 5G Global Leaders, had scores that ranged from 25.6 to 38.5%. T-Mobile's winning score is three times higher than the average 5G Availability of 13.5% measured across all 5G operators analyzed globally. Smaller geographies such as Taiwan and Kuwait have an advantage over large markets like the U.S. when trying to provide users with high levels of 5G Availability which makes T-Mobile U.S.'s score even more impressive.

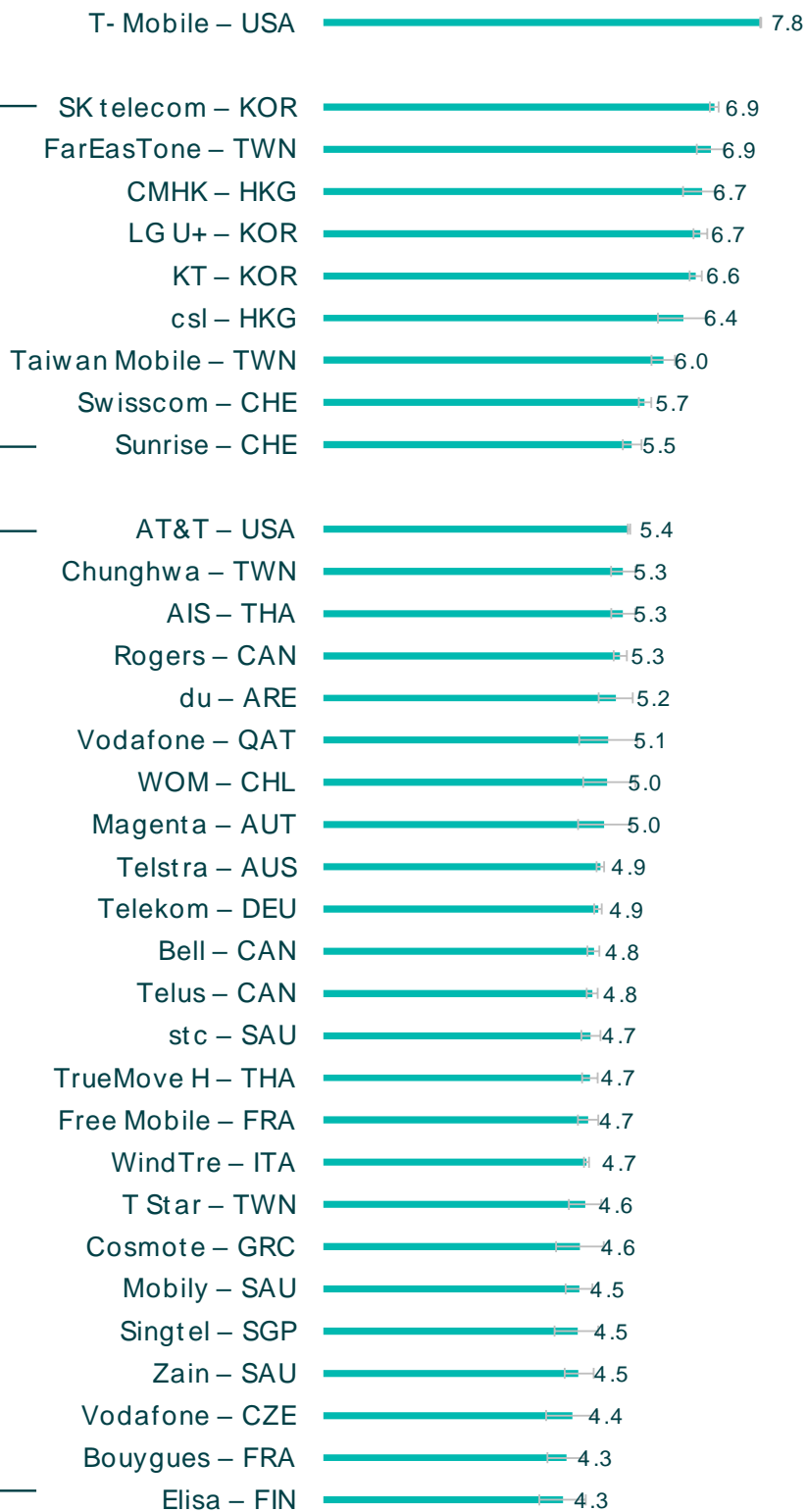
The list of 5G Global Leaders for 5G Availability mainly includes East Asian and Middle Eastern markets, with four operators from each region. The former includes all three of South Korea's national operators SK telecom, KT and LG U+, together with FarEasTone in Taiwan. Meanwhile 5G Global Leaders from the Middle East for 5G Availability consist of all three of Kuwait's operators, Ooredoo, stc and Zain, along with stc in Saudi Arabia. Only two European operators are 5G Global Leaders – Bulgaria's Vivacom and Croatia's Telemach. Chile's WOM is the only operator from Latin America to be recognized as a 5G Global Leader for 5G Availability.

While it has been nearly three and a half years since 5G first launched, many 5G networks are still at an early stage in their commercial rollouts. This explains why 41.4% of all operators analyzed had a 5G Availability score of under 10%.

Half of all the 5G Global High Performers for 5G Availability come from East Asia, including Taiwan's Chunghwa, T Star and Taiwan Mobile. Five are European such as Italy's WindTre, Croatia's HT, and the Netherlands' T-Mobile. Turning to the Middle East, both of stc Saudi Arabia's domestic rivals, Zain and Mobily are 5G Global High Performers. The 5G Global High Performers had scores that were at least 6.1 percentage points higher than the global average of 13.5%.



5G Reach – Global



Average – Global

(Only highest ranked 5G operators listed on chart)



OPEN SIGNAL

0 2 4 6 8 10

Data collection period 1 January – 29 June 2022 | © Opensignal Limited

(0-10 score)

5G Reach measures how users experience the geographical extent of an operator's 5G network. It analyzes the average proportion of locations where users were connected to a 5G network out of all the locations those users have visited.

T-Mobile U.S. is the 5G Global Winner for 5G Reach – it wins with a score of 7.8 points on a 10 point scale – indicating that our users on its network found a 5G signal in nearly eight out of 10 locations they visited. In addition, no other operator scored more than 6.9 points and T-Mobile's score was more than double the global average of 3.7 points.

As with the 5G Availability category – which T-Mobile U.S. also wins outright – its victory here is all the more impressive given the sheer scale of the task of rolling out 5G across a geography as vast as the U.S. compared to some other markets.

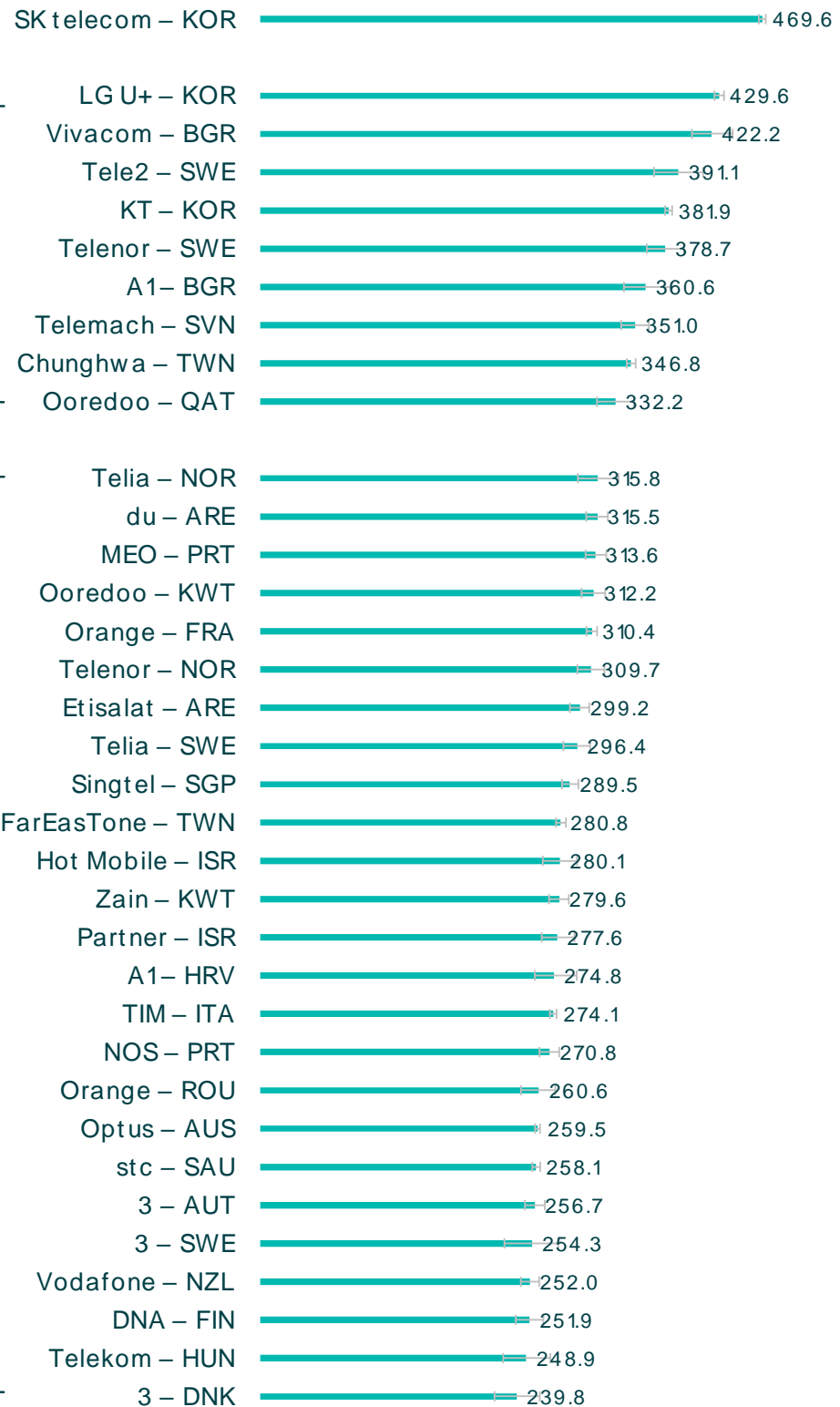
Turning to the 5G Global Leaders, seven out of nine hail from East Asia – with the exceptions being Switzerland's Swisscom and Sunrise. All three of South Korea's operators are 5G Global Leaders for 5G Reach along with Taiwan's FarEasTone, Taiwan Mobile and Hong Kong's CMHK and csl. The 5G Global Leaders' scores of 5.5–6.9 points were at least 46.1% higher than the global average.

European operators make up a third of the 5G Global High Performers for 5G Reach. In addition all of Canada's national operators – Bell, Rogers and Telus – are 5G Global High Performers for 5G Reach. The same is true for Saudi Arabia, with Mobily, stc and Zain all earning this accolade.

Like 5G Availability, when we analyze the scores across all operators globally, 5G Reach scores were generally relatively low, with a global average of 3.7 points. Only eight operators had a score of six points or more. All the 5G Global High Performers had scores that were at least 0.5 points or 13.5% higher than the global average.



5G Download Speed – Global



OPEN SIGNAL

0 100 200 300 400 500 (Mbps)

Data collection period 1 January – 29 June 2022 | © Opensignal Limited

5G continues to deliver blisteringly fast download speeds – with a global average of 184.2 Mbps observed across all operators analyzed. However, on all of the 5G Global Leaders' 5G networks our users observed average speeds above 300 Mbps and three operators – including the 5G Global Winner SK telecom – racked up scores above 400 Mbps. SK telecom's winning score was more than 2.5 times the global average.

Switching to the 5G Global Leaders, fellow South Korean operator LG U+ and Bulgaria's Vivacom were statistically tied in joint second place with scores of 422.2–429.6 Mbps. KT, another mobile operator from South Korea, is also a 5G Global Leader. European operators narrowly make up the majority of 5G Global Leaders for 5G Download Speed, including two out of three Swedish operators – Tele2 and Telenor. The only 5G Global Leader to come from the Middle East is Qatar's Ooredoo.

While European operators also dominate the list of 5G Global High Performers, making up almost half of them, operators from the Middle East are better represented – with the UAE's du and Etisalat, stc Saudi Arabia, Hot Mobile and Partner from Israel, and Kuwait's Zain all making an appearance. European 5G Global High Performers include Telenor and Telia in Norway along with MEO and NOS in Portugal. All the 5G Global High Performers had 5G Download Speed scores that were at least 55.6 Mbps (30.2%) higher than the global average of 184.2 Mbps.



5G Upload Speed – Global



Telia – SWE 50.9



T-Mobile – CZE 43.3

Telia – NOR 43.2

Tele2 – SWE 43.1

KPN – NLD 42.2

Telenor – NOR 41.1

SK telecom – KOR 40.6

Swisscom – CHE 40.3

FarEasTone – TWN 40.2

T-Mobile – NLD 39.4

Chunghwa – TWN 39.3

Telekom – HUN 38.6



Salt – CHE 37.4

Vivacom – BGR 37.3

Telenor – SWE 37.2

LG U+ – KOR 36.8

Yettel – HUN 36.4

Telemach – HRV 36.3

Telekom – DEU 34.8

Telekom – SVK 34.3

DNA – FIN 34.0

HT – HRV 33.9

Vodafone – CZE 33.7

Sunrise – CHE 33.7

3 – SWE 33.3

Etisalat – ARE 33.1

Telemach – SVN 32.5

A1 – BGR 32.1

Ooredoo – QAT 32.0

Orange – ROU 31.1

A1 – HRV 30.4

Yettel – BGR 30.0

Average – Global 24.6

(Only highest ranked 5G operators listed on chart)



OPENSIGNAL

0 10 20 30 40 50 60

(Mbps)

Data collection period 1 January – 29 June 2022 | © Opensignal Limited

For most of the mobile industry's existence, the mobile user experience has mainly been defined by download speeds. But with changing usage patterns and consumption habits, driven in part by the rise of social media, upload speeds are becoming increasingly important. Upload speeds affect how quickly and conveniently mobile users can share large files, such as photos or videos, via social media services or as email attachments on the go. However, global 5G Upload Speed scores continue to lag behind those seen for 5G Download Speed, a consequence of operators and network vendors focusing on the downlink side of network deployments.

For example, while Sweden's Telia is the sole 5G Global Winner for 5G Upload Speed with a score of 50.9 Mbps – 2.1 times the global average of 24.6 Mbps – its 5G Download Speed score was 5.8 times higher than its 5G Upload Speed.

The bulk of the 5G Global Leaders for 5G Upload Speed are European, with three exceptions: South Korea's SK telecom, together with Taiwan's FarEasTone and Chunghwa. Norway and the Netherlands are the only European countries that are represented by more than one 5G Global Leader: Telia and Telenor (Norway), along with KPN and T-Mobile (Netherlands). However, both the 5G Global Winner (Telia) and one 5G Global Leader (Tele2) come from Sweden.

17 out of 20 5G Global High Performers are European, including all of Bulgaria and Croatia's national operators – A1, Vivacom and Yettel (Bulgaria); and A1, HT and Telemach (Croatia). The three operators from other regions are South Korea's LG U+, the UAE's Etisalat and Qatar's Ooredoo. The 5G Global High Performers' 5G Upload Speeds are all at least 5.5 Mbps (22.3%) faster than the global average of 24.6 Mbps.



5G Games Experience – Global



SK telecom – KOR 90.9
KT – KOR 90.5



LG U+ – KOR 89.4
Salt – CHE 88.4
T-Mobile – CZE 87.8
csl – HKG 87.3
KPN – NLD 87.3
SoftBank – JPN 85.6
O2 – CZE 85.4
Singtel – SGP 85.3
Telekom – SVK 85.2
A1 – HRV 85.0
Telemach – SVN 85.0
Telekom Slovenije – SVN 84.7



StarHub – SGP 84.9
Telia – SWE 84.6
T-Mobile – NLD 84.3
Swisscom – CHE 84.1
Telekom – HUN 84.0
Taiwan Mobile – TWN 83.9
Vodafone – IRL 83.7
Telekom – DEU 83.5
Telkomsel – IDN 83.4
FarEasTone – TWN 83.2
Tele2 – SWE 83.0
Sunrise – CHE 82.8
A1 – AUT 82.2
Vodafone – NLD 82.2
CMHK – HKG 82.1
Telia – NOR 82.1
Vodafone – CZE 81.5
Telenor – SWE 81.3
Rakuten – JPN 81.1
HT – HRV 81.0
Yettel – HUN 80.9
SmarTone – HKG 80.8
A1 – SVN 80.7
Chunghwa – TWN 80.7
eir – IRL 80.0
Magenta – AUT 79.9
3 – SWE 79.3
Vivacom – BGR 79.2
3 – HKG 79.0

Average – Global 74.5
(Only highest ranked 5G operators listed on chart)



OPENSIGNAL

0 20 40 60 80 100

5G Games Experience score

Data collection period 1 January – 29 June 2022 | © Opensignal Limited

Opensignal's 5G Games Experience measures how mobile users experience real-time multiplayer mobile gaming on an operator's 5G network. Measured on a scale of 0-100, it analyzes how our users' multiplayer mobile gaming experience is affected by mobile network conditions including latency, packet loss and jitter.

The 5G Global Winners for 5G Games Experience are South Korea's SK telecom and KT due to their statistically tied scores of 90.5-90.9 points on a 100 point scale. None of the other operators analyzed globally had a score above the 90 point mark.

Fellow South Korean operator LG U+ is a 5G Global Leader and in joint third place, alongside Switzerland's Salt, T-Mobile Czech Republic and Hong Kong's csl. Eight out of 12 5G Global Leaders are European, while four hail from East Asia – including Japan's SoftBank and Singapore's Singtel.

Two out of three Czech operators (O2 and T-Mobile) are 5G Global Leaders, while the third, Vodafone, is a 5G Global High Performer for this metric.

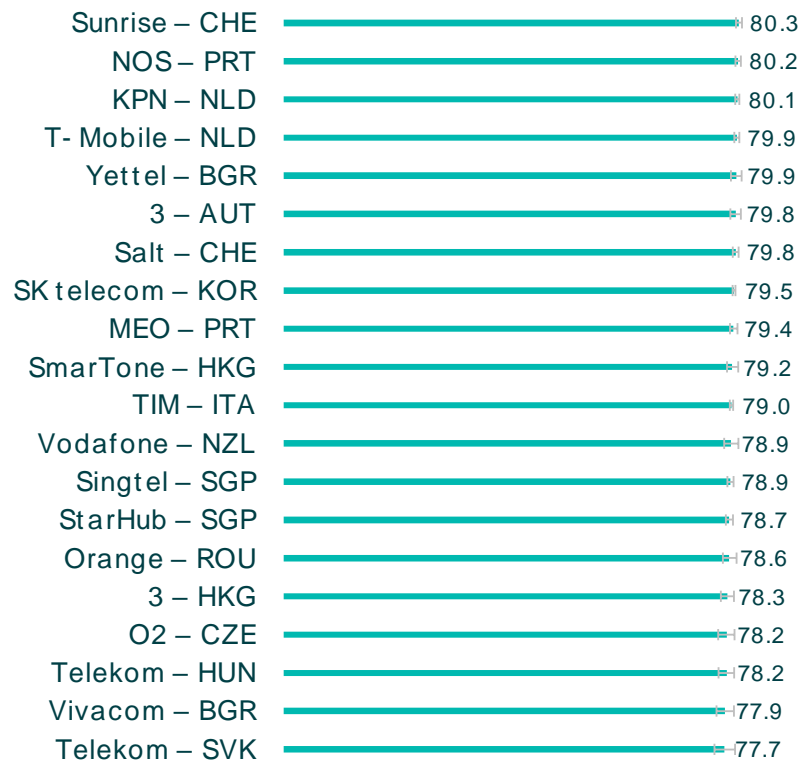
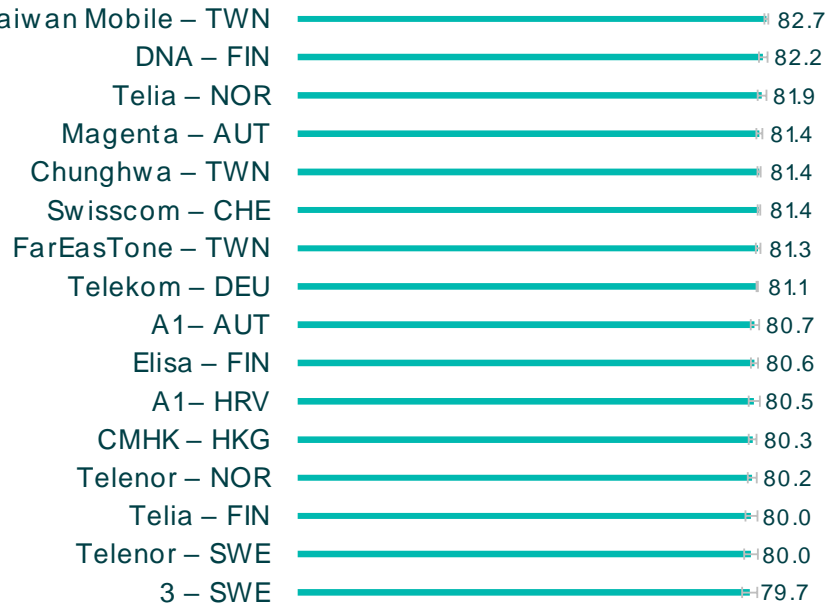
The 5G Games Experience scores of the 5G Global Winners and nearly all the 5G Global Leaders place in the Excellent (85 or above) category. Excellent is the highest achievable rating for 5G Games Experience and means that the vast majority of users deemed this network experience acceptable. Nearly all respondents felt like they had control over the game and they received immediate feedback on their actions. There was no noticeable delay in almost all cases.

Turning to the 5G Global High Performers for 5G Games Experience, 20 out of 29 come from Europe, with the remainder hailing from East Asia – including Singapore's StarHub, Japan's Rakuten and Telkomsel in Indonesia. All three Swiss operators are either 5G Global Leaders (Salt) or 5G Global High Performers (Swisscom and Sunrise). Similarly, all of Sweden's operators are 5G Global High Performers. Over in Hong Kong, while csl is a 5G Global Leader, its domestic rivals (3, CMHK and SmarTone) are all 5G Global High Performers.

The 5G Global High Performers had 5G Games Experience scores that were at least 4.5 points (6.1%) higher than the global average of 74.5.



5G Video Experience – Global



Average – Global 75.2
(Only highest ranked 5G operators listed on chart)



OPEN SIGNAL

0 20 40 60 80 100

5G Video Experience score

Data collection period 1 January – 29 June 2022 | © Opensignal Limited

Opensignal's 5G Video Experience quantifies the quality of video streamed to mobile devices by measuring real-world video streams over an operator's 5G network. It is based on an International Telecommunication Union (ITU) approach, built upon detailed studies which have derived a relationship between technical parameters, including picture quality, video loading time and stall rate, with the perceived video experience as reported by real people. The videos tested include a mixture of resolutions – including Full HD (FHD) and 4K / Ultra HD (UHD) – and are streamed directly from the world's largest video content providers.

Three operators share the winners' podium for 5G Video Experience – Tele2 and Telia from Sweden, and Slovenia's Telemach, with statistically tied scores of 82.8-84.1 points on a 100 point scale.

Similarly, the majority of the 5G Global Leaders are European. This category includes the other Swedish operators 3 and Telenor, along with Switzerland's Swisscom, Germany's Telekom and all three of Finland's operators – DNA, Elisa and Telia.

Of the four East Asian 5G Global Leaders, three hail from Taiwan – Chunghwa, FarEasTone and Taiwan Mobile, with Hong Kong's CMHK making up the balance.

All the 5G Global Winners, 5G Global Leaders and 5G Global High Performers for 5G Video Experience placed in the Excellent (75 or above) category. This indicates a very consistent experience across all users, video streaming providers and resolutions tested, with fast loading times and almost non-existent stalling, when connected to 5G.

Switching to the 20 5G Global High Performers, 14 come from Europe with the remainder coming from the Asia Pacific. The former include two operators from the Netherlands (KPN and T-Mobile) along with Portugal's MEO and NOS and Switzerland's Salt and Sunrise. East Asian 5G Global High Performers include Singapore's Singtel and StarHub, South Korea's SK telecom and Vodafone New Zealand.

5G Global Impact

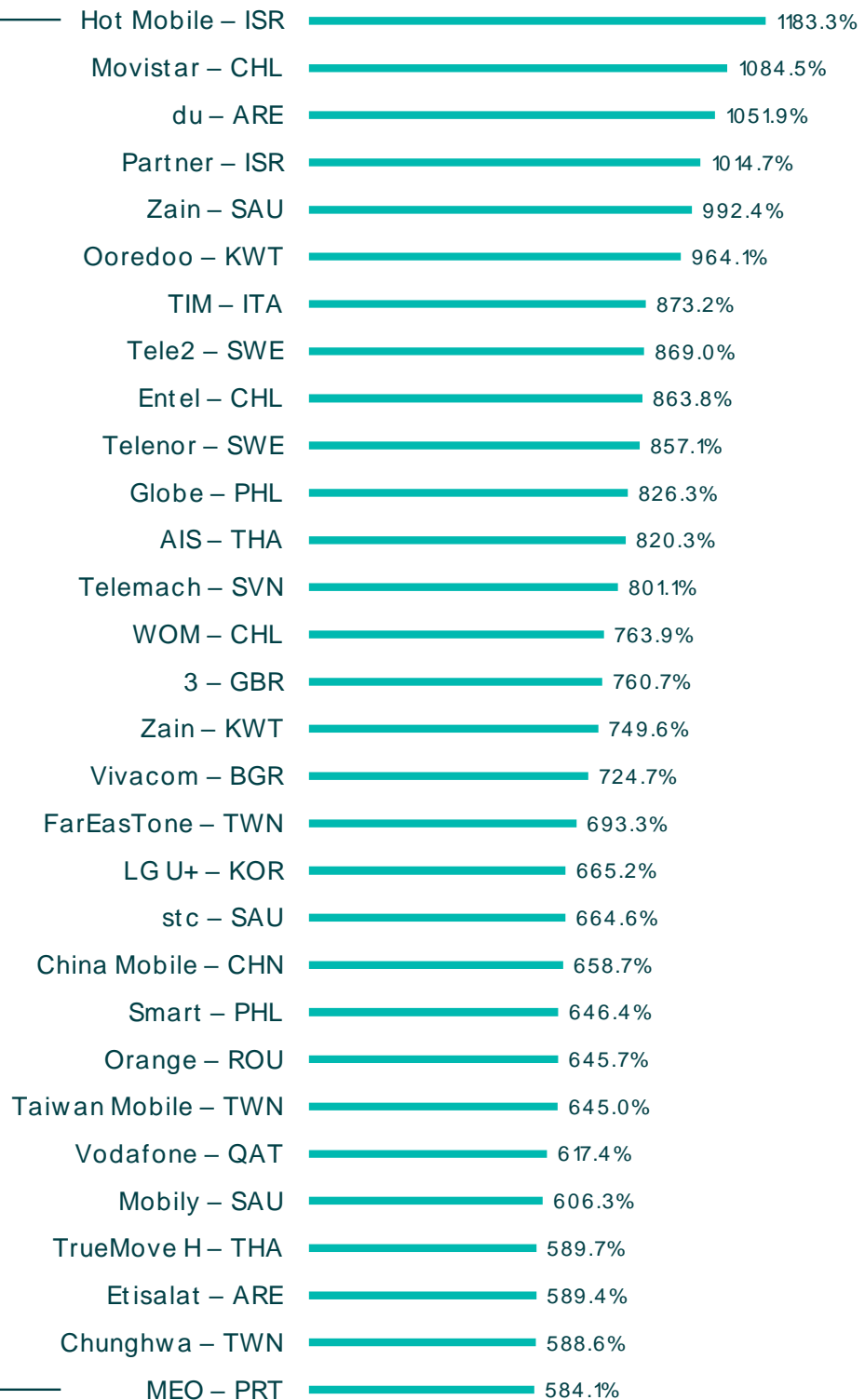
In this section, we have assessed the improvement, or uplift, that users experience when they connect to 5G compared to older 4G technology. For 5G Global Impact, we recognize the top 30 operators for the greatest uplift on four measures of mobile network experience: Download Speed, Upload Speed, Games Experience and Video Experience. This section highlights the impressive improvements in users' experience that can be achieved through effective investment in 5G. These results also highlight the degree to which 5G can sidestep the congestion often found on 4G networks.

Five operators have managed the impressive feat of being recognised for 5G Global Impact in all four categories – Israel's Hot Mobile and Partner, Globe and Smart in the Philippines, along with the UAE's du. Globe had the greatest uplift for Video Experience and also had the second largest improvement for Games Experience.

12 operators are among the top 30 for three categories. They are: all three of Thailand's national operators (AIS, DTAC and TrueMove H), the UAE's Etisalat, Tele2 Sweden, Telemach Slovenia, Saudi Arabia's Mobily, Entel and WOM in Chile, TIM Brazil, along with CMHK and csl in Hong Kong.



Download Speed – 5G Improvement Over 4G



Average – Global 408.9%
(Only highest ranked 5G operators listed on chart)



OPEN SIGNAL

0% 200% 400% 600% 800% 1000% 1200% 1400%
Change in Download Speed with 5G over 4G

Data collection period 1 January – 29 June 2022 | © Opensignal Limited

5G is delivering a massive increase in our users' average download speeds. The average global uplift between 5G and 4G download speed was a spectacular 408.9% across all the operators we analyzed.

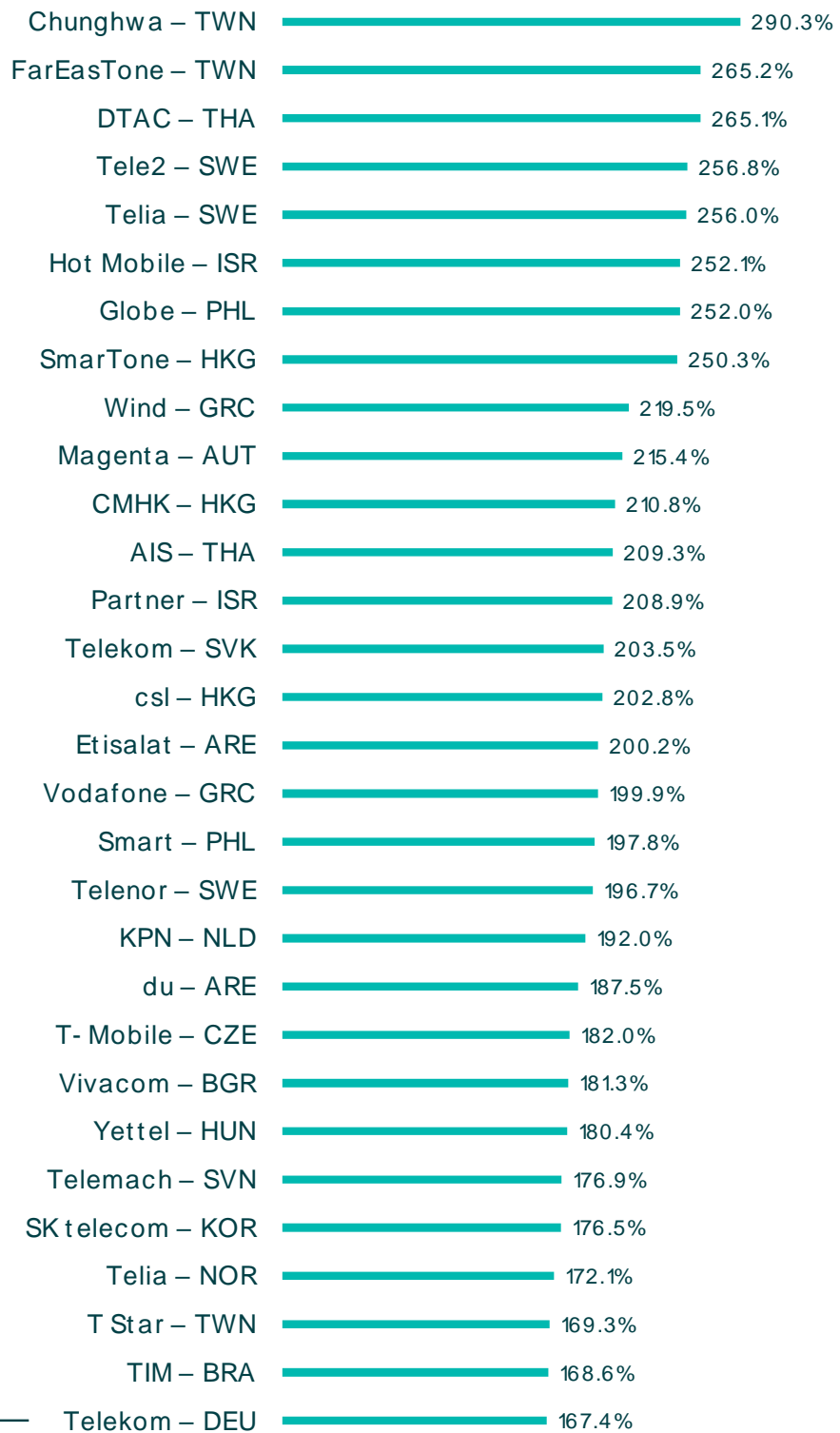
At the top end of the Download Speed – 5G Global Impact chart, four operators saw improvements in excess of 1000% – i.e. their 5G Download Speed scores were more than 11 times faster than their 4G Download Speed scores. The four are Israel's Hot Mobile – which saw the greatest uplift of 1183.3% – and Partner, Movistar's Chile and the UAE's du.

10 out of the top 30 operators for Download Speed – 5G Global Impact come from the Middle East, including all three of Saudi Arabia's national operators (Mobily, stc and Zain).

Two of the Philippines' operators – Globe and Smart – are present with uplifts of 826.3% and 646.4%, respectively. Similarly, all three of the Chilean operators that [activated their 5G networks in December 2021](#) have also made it to the top 30, namely Entel, Movistar and WOM.



Upload Speed – 5G Improvement Over 4G



Average – Global 125.4%
(Only highest ranked 5G operators listed on chart)



OPEN SIGNAL

0% 100% 200% 300%

Change in Upload Speed with 5G over 4G

Data collection period 1 January – 29 June 2022 | © Opensignal Limited

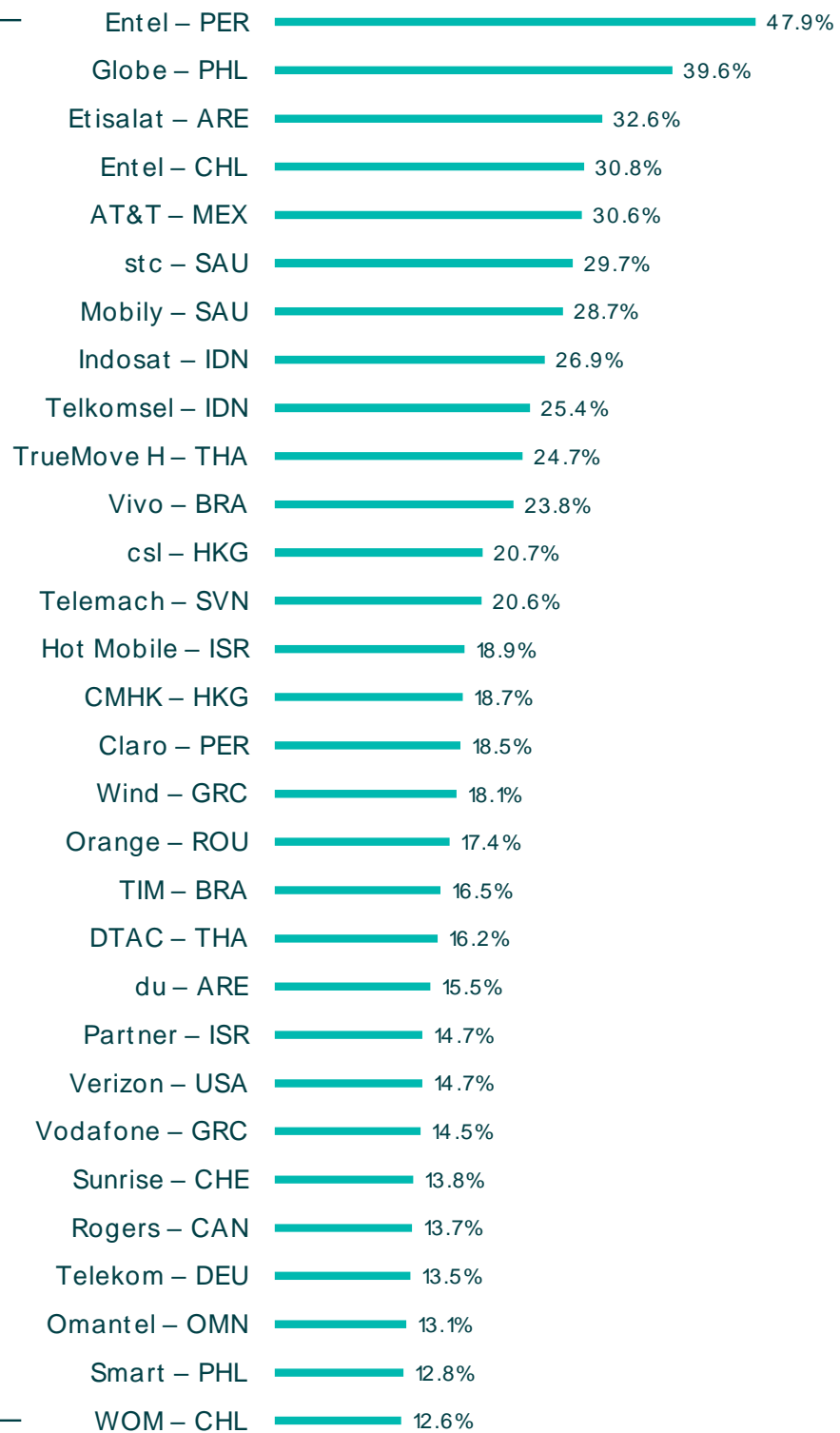
Operators from Taiwan take the first two spots for Upload Speed – 5G Global Impact: Chunghwa and FarEasTone, with uplifts of 290.3% and 265.2%, respectively. The top 30 operators for the increase in average upload speeds on 5G networks compared to 4G networks include Greece's Vodafone and Wind, along with three operators from Hong Kong – CMHK, csl and SmarTone.

As is also the case with Download Speed – 5G Global Impact, the Philippines' Globe and Smart, Israel's Hot Mobile and Partner, along with the UAE's du and Etisalat and Taiwan's Chunghwa and FarEasTone have made into the top 30.

While the uplift that our users observed when connected to 5G instead of 4G was more modest for average upload speeds than download speeds, it was still impressive. The average for Upload Speed – 5G Global Impact across all operators analyzed was 125.4%. In addition, users on 16 operators' networks observed improvements of more than 200%.



Games Experience – 5G Improvement Over 4G



Average – Global 7.0%
(Only highest ranked 5G operators listed on chart)



OPEN SIGNAL

0% 10% 20% 30% 40% 50%

Change in Games Experience with 5G over 4G

Data collection period 1 January – 29 June 2022 | © Opensignal Limited

Our users on Entel Peru's network observed the greatest 4G vs 5G uplift for Games Experience, reporting an improvement of 47.9%. Globe in the Philippines had the second highest improvement – while its domestic rival, Smart, had a lower increase of 12.8% but still made it through to the top 30.

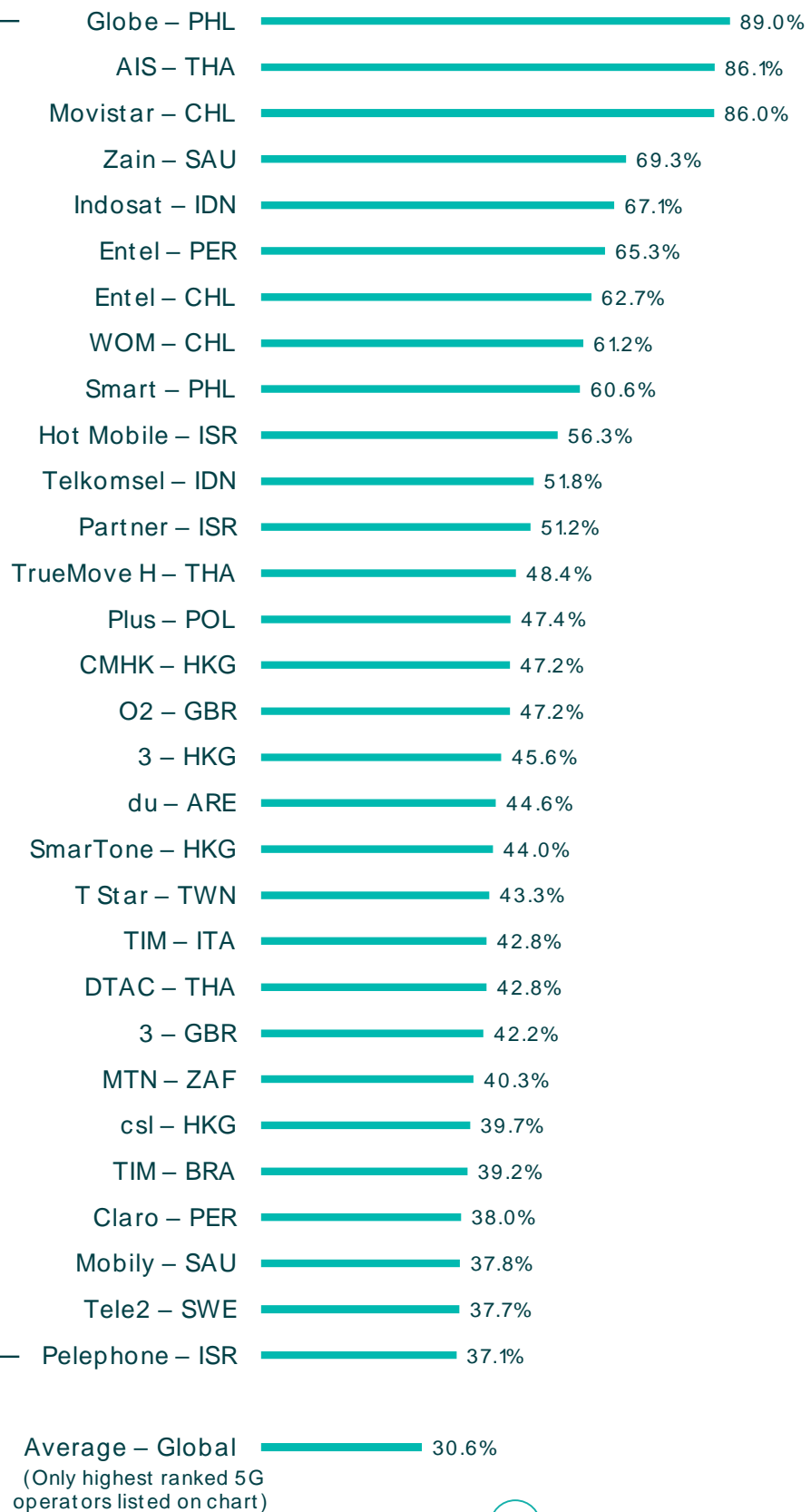
Five operators had uplifts of more than 30%, including Etisalat in the UAE, Chile's Entel and AT&T Mexico. An additional eight operators had uplifts of 20–30%, such as stc and Mobily in Saudi Arabia along with Indosat and Telekomsel in Indonesia.

In addition to AT&T Mexico, the only other North American operators to make it into the top 30 for Games Experience – 5G Global Impact are Verizon and Canada's Rogers, with uplifts of 14.7% and 13.7%, respectively.

Impressively, our users' 5G Games Experience on five operators' networks was two categories higher than their 4G Games Experience. Telemach Slovenia and Hong Kong's csl's networks placed in the highest category, Excellent (85 or above), for 5G Games Experience while their 4G Games Experience was Fair (65–75). Thailand's TrueMove H, Indonesia's Indosat and the UAE's Etisalat went from Poor (40–65) to Good (75–85).



Video Experience – 5G Improvement Over 4G



OPEN SIGNAL

0% 20% 40% 60% 80% 100%
Change in Video Experience with 5G over 4G

Data collection period 1 January – 29 June 2022 | © Opensignal Limited

Our users on Globe's network in the Philippines saw the greatest uplift in their experience while streaming mobile video when they shifted from 4G to 5G connections. Globe's score rose by an impressive 89%. In addition, Globe along with the operators with the next two highest uplifts – Thailand's AIS and Movistar Chile – moved up three categories, from from Poor (under 40) to Very Good (65-75). These three operators were the only on which we observed uplifts in excess of 80%, with the next highest scoring operator – Saudi Arabia's Zain – some way behind with 69.3%.

In addition to the three front-runners, seven other operators from the top 30 also shifted up by three categories, but went from Fair (40-55) to the highest category – Excellent (75 or above): Israel's Hot Mobile and Partner, Poland's Plus, and Taiwan's T Star, along with 3, CMHK and csl in Hong Kong.

The top 30 for Video Experience – 5G Global Impact includes all three of Thailand's operators (AIS, DTAC and TrueMove H), along with Smart in the Philippines, all four of Hong Kong's operators and three Chilean operators (Entel, Movistar and WOM). Two out of four operators from the United Kingdom are also present – O2 and 3, with uplifts of 47.2% and 42.2%, respectively.

Opensignal's 2022 5G Global Rising Stars

We now take a look at the 5G Global Rising Stars: the top 20 operators around the world on which our users have seen the greatest improvement in their 5G experience in the last year. We compare their experience between the first half of 2022 and the same period in 2021. We have 5G Global Rising Stars awards for five key measures of the real-world mobile network experience: 5G Availability, 5G Reach, 5G Download Speed, 5G Upload Speed and 5G Games Experience.

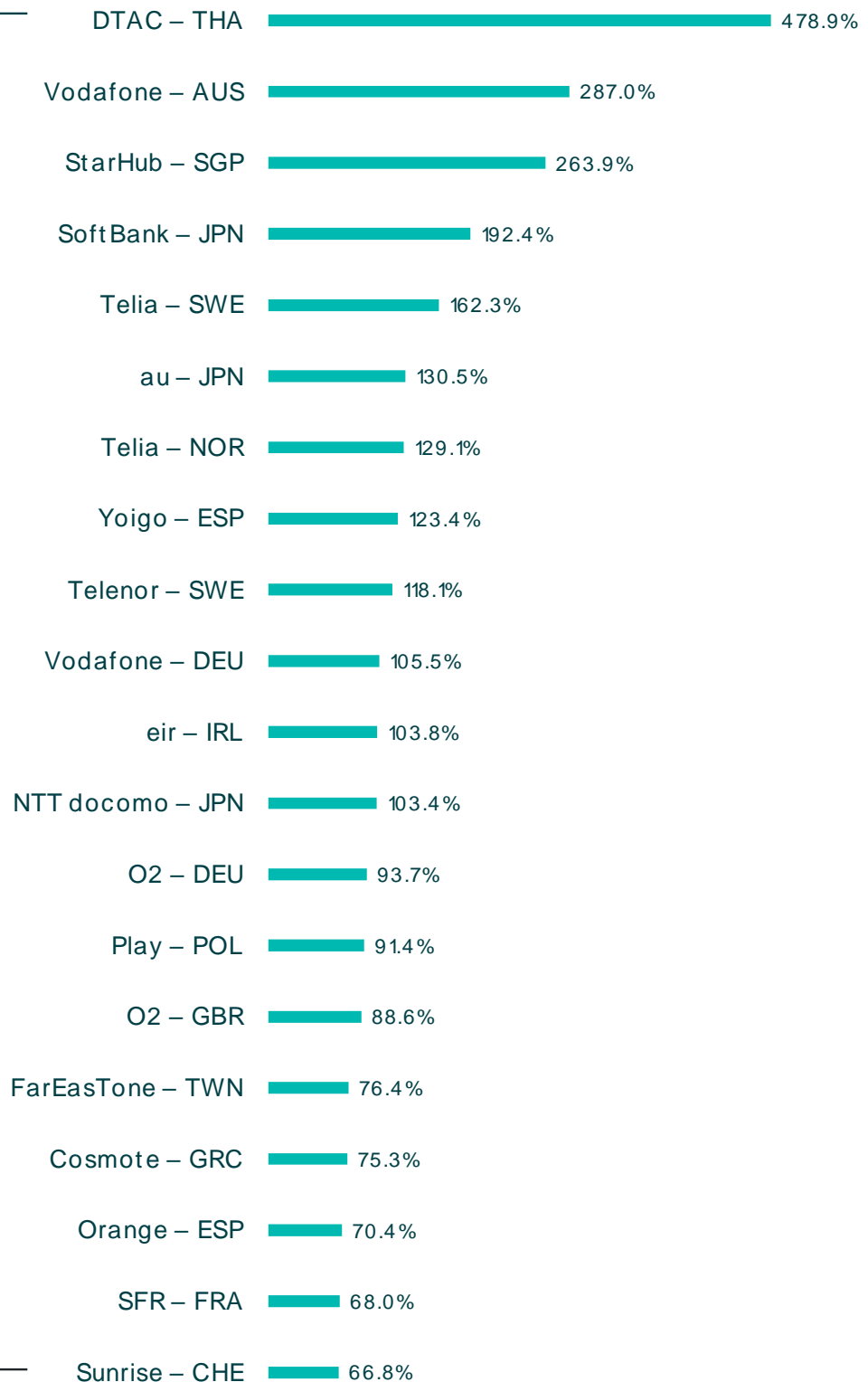
5G Global Rising Stars celebrate the recent achievements of those operators that have made rapid progress in improving the 5G experience of their users in a short period of time. By contrast, Opensignal's 5G Global Winner awards highlight the fruits of years of cumulative effort and investment by comparing the current state of users' 5G experience across different operators.

Two operators, Japan's NTT docomo and SoftBank, have achieved a remarkable feat – they are both 5G Global Rising Stars in four out of five categories. They have secured this accolade for 5G Availability, 5G Reach and 5G Games Experience. In addition NTT docomo is a 5G Global Rising Star for 5G Download Speed, while SoftBank is one for 5G Upload Speed. Both operators launched their 5G networks in March 2020 and are clearly making excellent progress in improving users' 5G Experience.

A further nine operators are 5G Global Rising Stars in three categories: Croatia's HT, France's Bouygues, Vodafone Germany, csl and SmarTone in Hong Kong, Vodafone Italy, Zain Kuwait, Singapore's StarHub and Switzerland's Salt.



5G Availability – Most Improved Year on Year



(Only highest ranked 5G operators listed on chart)



OPEN SIGNAL

0% 100% 200% 300% 400% 500%
Change in 5G Availability

Data collection period 1 January – 29 June 2021 & 2022 | © Opensignal Limited

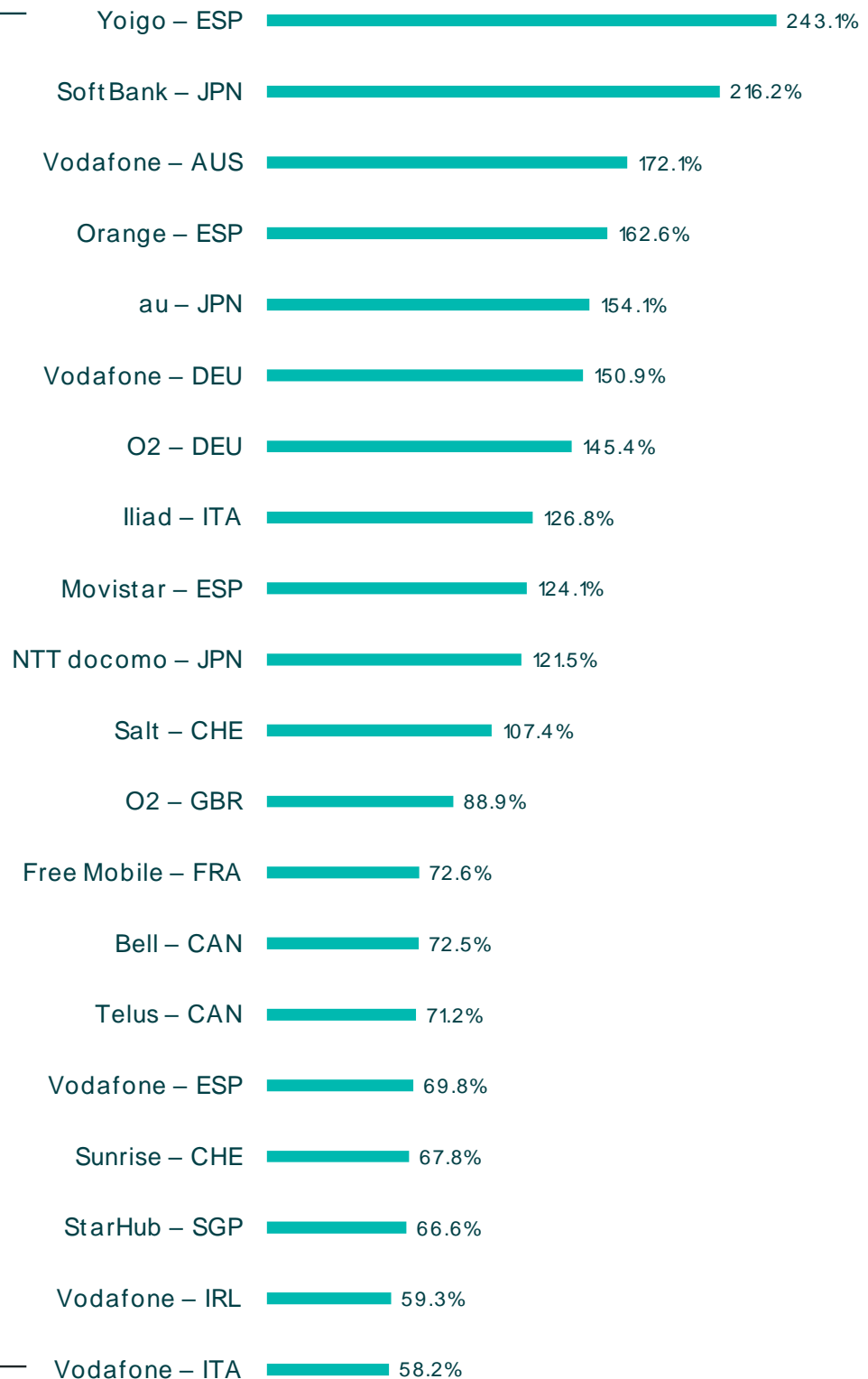
Our 5G users on Thailand's DTAC saw by far the largest percentage improvement in 5G Availability – the proportion of time that they had an active 5G connection – with an improvement of 478.9% between H1 2021 and H1 2022. 5G Availability is an important measure of the 5G experience as users cannot enjoy the superior experience that 5G can deliver over older generations of mobile technology if they are not connected to it.

Two other operators saw improvements in excess of 200% – Vodafone Australia and Singapore's StarHub, with increases of 287% and 263.9%, respectively. Of the top 20 operators for 5G Availability – 5G Global Rising Stars, 13 come from Europe, with the remainder hailing from the Asia Pacific. Three out of four Japanese operators are 5G Global Rising Stars for 5G Availability: au, NTT DoComomo and SoftBank. Both O2 and Vodafone in Germany have also made it through to the top 20, with increases of 93.7% and 105.5%, respectively.

The only operators to be 5G Global Rising Stars for 5G Availability from France and the UK are SFR (68%) and O2 (88.6%), respectively. Similarly, Sunrise is the only Swiss operator to receive this accolade this time around.



5G Reach – Most Improved Year on Year



(Only highest ranked 5G operators listed on chart)



OPEN SIGNAL

0% 100% 200%
Change in 5G Reach

Data collection period 1 January – 29 June 2021 & 2022 | © Opensignal Limited

Out of all the operators analyzed, our users saw their largest improvement in terms of 5G Reach with Spain's Yoigo – with a remarkable 243.1% increase in its score between H1 2021 and H1 2022. The higher 5G Reach is, the more locations our users were able to connect to 5G relative to those they visited. 11 operators saw improvements in excess of 100% – highlighting the pace at which they are rolling out their 5G networks.

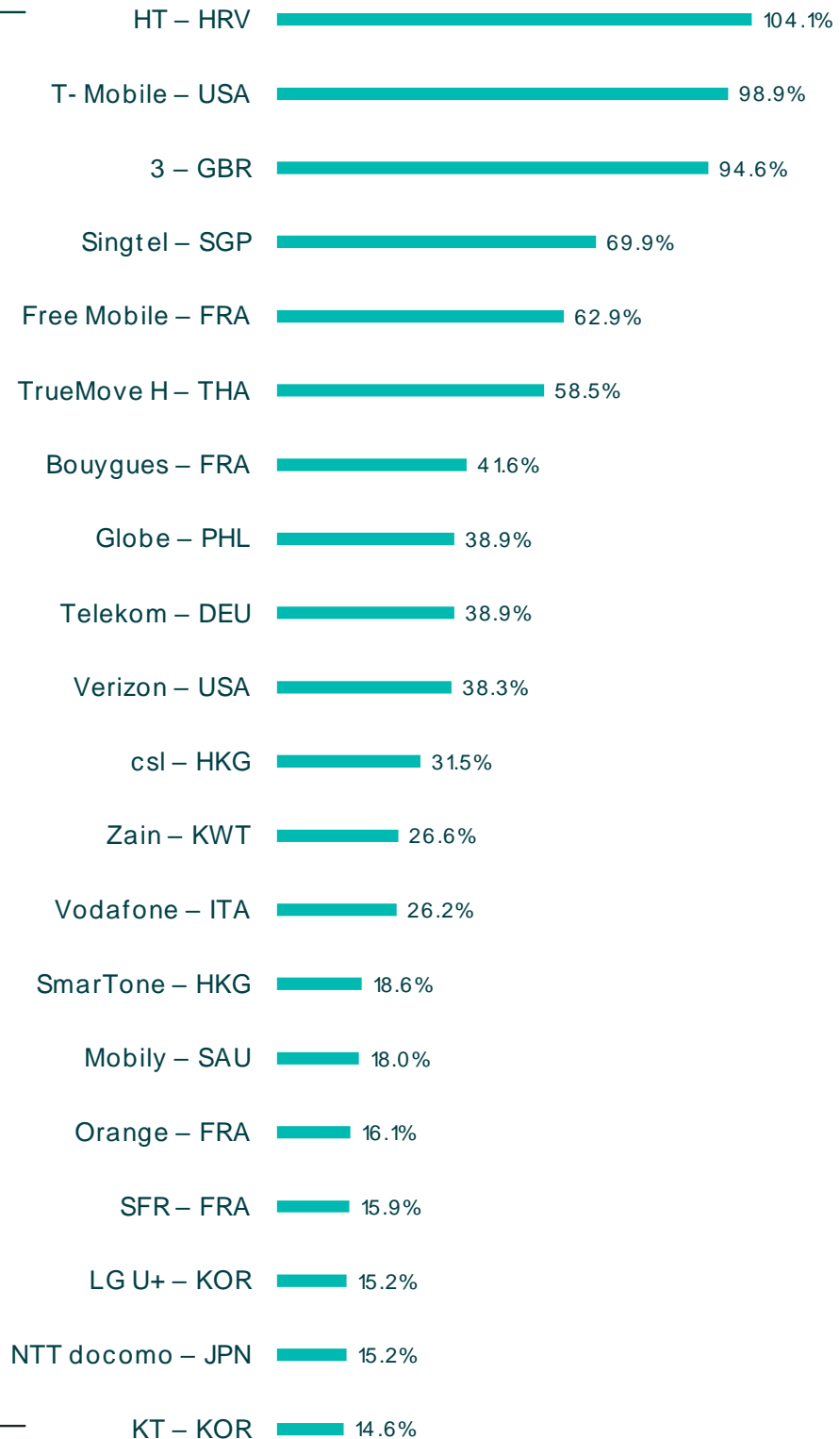
As is the case with 5G Availability, three Japanese operators are 5G Global Rising Stars for 5G Reach: SoftBank – the operator with the second highest improvement – along with au and NTT docomo. Similarly, Vodafone Australia and the U.K.'s O2 are 5G Global Rising Stars for both 5G Reach and 5G Availability.

All three of Yoigo's domestic rivals – Orange, Movistar and Vodafone have also made it through to the top 20.

Like 5G Availability, 13 out of 20 5G Global Rising Stars are European, but the ranks of operators hailing from the Asia Pacific have been thinned out slightly as two Canadian operators, Bell and Telus have made the grade with increases of 72.5% and 71.2%, respectively.



5G Download Speed – Most Improved Year on Year



(Only highest ranked 5G operators listed on chart)



OPEN SIGNAL

0% 20% 40% 60% 80% 100% 120%
Change in 5G Download Speed

Data collection period 1 January – 29 June 2021 & 2022 | © Opensignal Limited

Our users on Croatia's HT observed the largest percentage improvement in their average 5G download speeds between H1 2021 and H1 2022 – an impressive 104.1%. The operator with the next highest increase is T-Mobile U.S. with 98.9%. T-Mobile is not the only U.S. operator to make it into the top 20 as Verizon is also a 5G Global Rising Star for 5G Download Speed with an improvement of 38.3%.

The boost in these two U.S. operators' scores is no doubt driven by their ongoing rollouts of [2.5 GHz](#) and [C-Band](#) spectrum, by T-Mobile and Verizon respectively. AT&T is conspicuous by its absence, but it may well make it through to the top 20 in our next 5G Global Awards given its [one-climb tower strategy](#) for C-band and 3.45 GHz deployment which has led to a [slightly later](#) C-Band rollout.

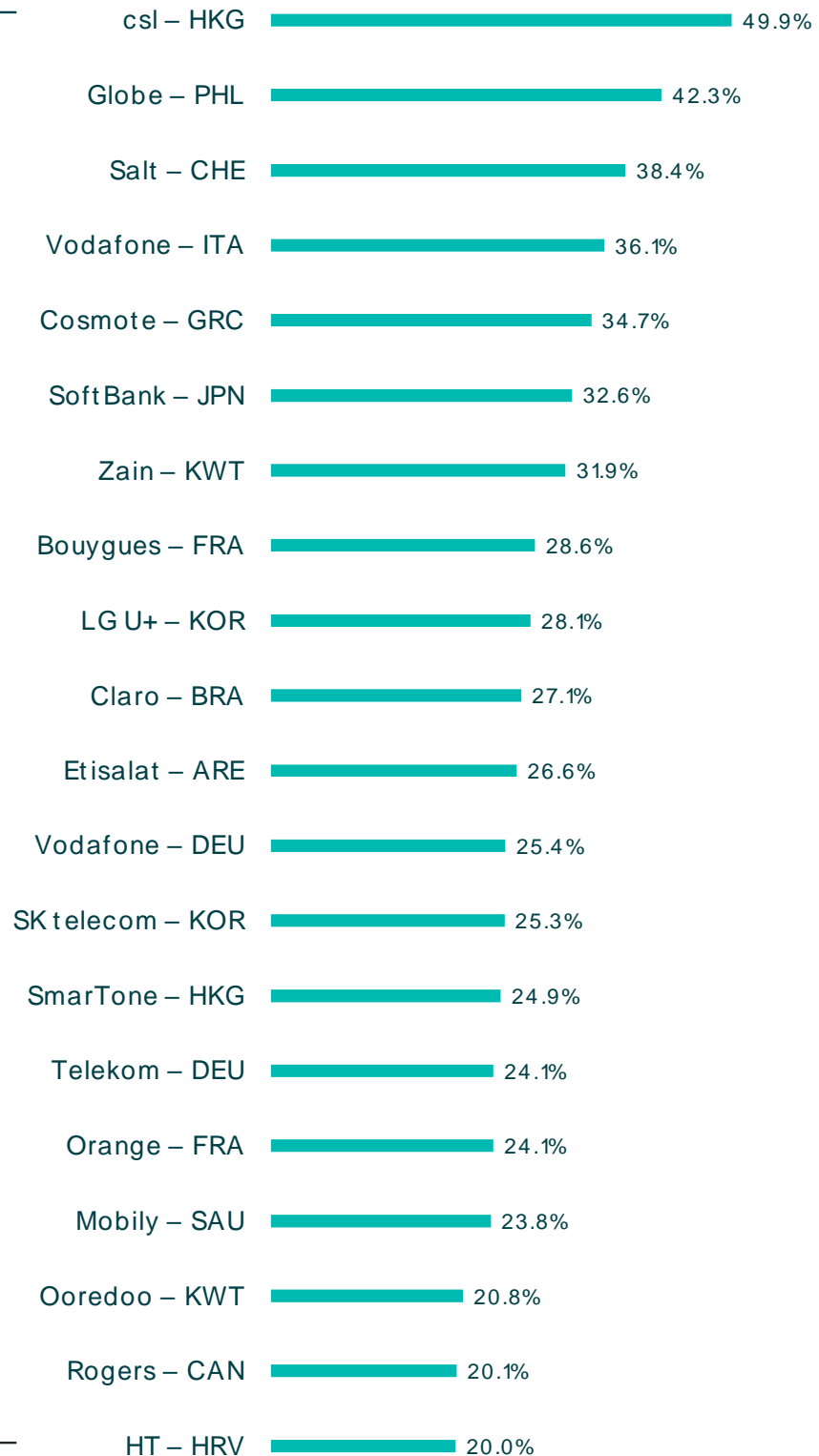
The UK's 3 is in third place with 94.6%, followed by Singapore's Singtel and France's Free Mobile, given their improvements of 69.9% and 62.9%, respectively. In fact, all four of France's national operators are 5G Global Rising Stars for this metric. Singtel's improvement was the largest increase seen in East Asia.

Two of three South Korean operators have also made it through to the top 20 – LG U+ and KT with increases of 15.2% and 14.6%, respectively. This is an impressive achievement, given the maturity of their 5G networks compared to those in many other markets.

Only two operators from the Middle East are 5G Global Rising Stars for 5G Download Speed – Kuwait's Zain and Saudi Arabia's Mobily, with improvements of 26.6% and 18%, respectively. Operators from Asia Pacific and Europe dominate the chart, with eight operators from both regions making it through to the top 20.



5G Upload Speed – Most Improved Year on Year



(Only highest ranked 5G operators listed on chart)



OPEN SIGNAL

0% 10% 20% 30% 40% 50% 60%
Change in 5G Upload Speed

Data collection period 1 January – 29 June 2021 & 2022 | © Opensignal Limited

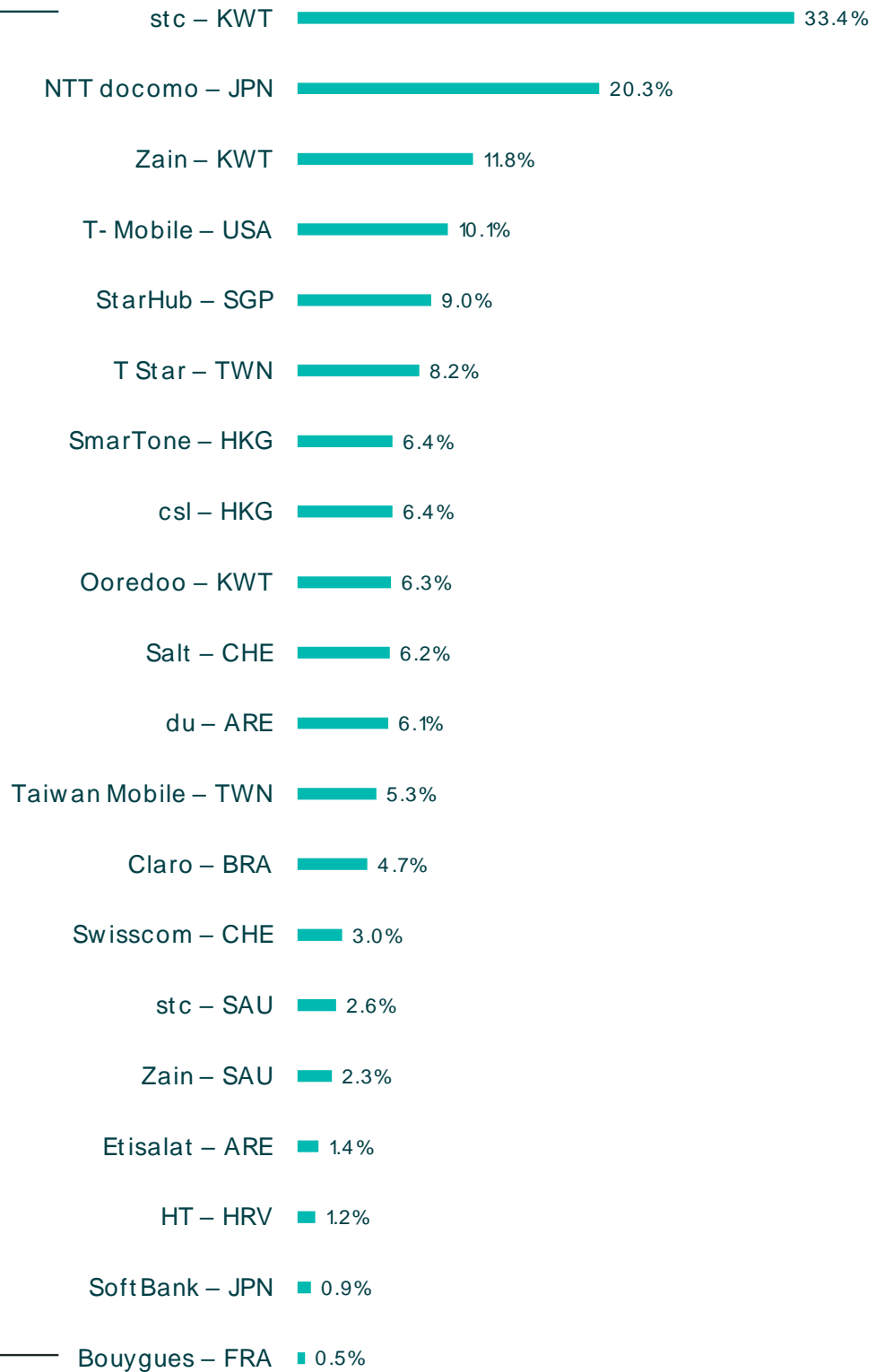
Our users on csl's network in Hong Kong observed nearly a 50% increase in their average 5G upload speeds between H1 2021 and H1 2022. The next largest improvement was seen by our Filipino users on Globe's network, given its increase of 42.3%, while our users on Salt's network in Switzerland observed the largest increase in Europe – 38.4%.

As is the case with 5G Download Speed, two of three South Korean operators have also made it through to the top 20 – LG U+ (28.1%) and SK telecom (25.3%). While KT is a 5G Global Rising Star for 5G Download Speed, it did not make the top 20 for 5G Upload Speed. The 5G Global Rising Stars for this metric also include two out of four of France's national operators – Bouygues (28.6%) and Orange (24.1%). Germany's Vodafone and Telekom are also present with increases of 25.4% and 24.1%, respectively.

Out of the top 20, only two operators come from North and Latin America – Canada's Rogers with 20.1% and Brazil's Claro with 27.1%.



5G Games Experience– Most Improved Year on Year



(Only highest ranked 5G operators listed on chart)



OPEN SIGNAL

0% 10% 20% 30%
Change in 5G Games Experience

Data collection period 1 January – 29 June 2021 & 2022 | © Opensignal Limited

Kuwait's stc leads the chart for 5G Games Experience – 5G Global Rising Stars by an impressive margin. The improvement our users saw on its network in their 5G Games Experience between H1 2021 and H1 2022 – a remarkable 33.4% – is 13.1 percentage points higher than the next highest increase – NTT docomo's 20.3%. Fellow Kuwaiti operator Zain is in third place with an improvement of 11.8% and the country's Ooredoo is also a 5G Global Rising Star for 5G Games Experience with an increase of 6.3%. T-Mobile U.S. and Singapore's StarHub are also 5G Global Rising Stars for 5G Games Experience, with improvements of 10.1% and 9%, respectively.

Of the top 20, seven hail from the Middle East – the greatest showing from the region across the five 5G Global Rising Stars categories. A further seven come from East Asia, with four operators from Europe and one from both North America (T-Mobile U.S) and Latin America (Claro Brazil) making up the balance.

Our users on three operators' networks went from having a Good (75–85) 5G Games Experience in H1 2021 to an Excellent (85 or above) in H1 2022: Hong Kong's csl, Switzerland's Salt and Japan's SoftBank.

Operators analyzed

3 – Austria	Movistar – Chile	Telekom – Germany
3 – Denmark	Movistar – Spain	Telekom – Hungary
3 – Hong Kong	MTN – South Africa	Telekom – Slovakia
3 – Ireland	NOS – Portugal	Telekom Slovenia – Slovenia
3 – Sweden	NTT docomo – Japan	Telemach – Croatia
3 – UK	O2 – Czech Republic	Telemach – Slovenia
A1 – Austria	O2 – Germany	Telenor – Denmark
A1 – Bulgaria	O2 – Slovakia	Telenor – Norway
A1 – Croatia	O2 – UK	Telenor – Sweden
A1 – Slovenia	Omantel – Oman	Telia – Denmark
AIS – Thailand	Ooredoo – Kuwait	Telia – Finland
AT&T – Mexico	Ooredoo – Oman	Telia – Norway
AT&T – USA	Ooredoo – Qatar	Telia – Sweden
au – Japan	Optus – Australia	Telkomsel – Indonesia
Bell – Canada	Orange – France	Telstra – Australia
Bouygues – France	Orange – Poland	Telus – Canada
China Mobile – China	Orange – Romania	TIM – Brazil
China Telecom – China	Orange – Spain	TIM – Italy
China Unicom – China	Partner – Israel	TrueMove H – Thailand
Chunghwa – Taiwan	Pelephone – Israel	Verizon – USA
Claro – Brazil	Personal – Argentina	Vivacom – Bulgaria
Claro – Peru	Play – Poland	Vivo – Brazil
CMHK – Hong Kong	Plus – Poland	Vodacom – South Africa
Cosmote – Greece	Proximus – Belgium	Vodafone – Australia
csl – Hong Kong	Rakuten – Japan	Vodafone – Czech Republic
DNA – Finland	Rogers – Canada	Vodafone – Germany
DTAC – Thailand	Salt – Switzerland	Vodafone – Greece
du – UAE	SFR – France	Vodafone – Hungary
EE – UK	Singtel – Singapore	Vodafone – Ireland
eir – Ireland	SK telecom – South Korea	Vodafone – Italy
Elisa – Finland	Smart – Philippines	Vodafone – Netherlands
Entel – Chile	SmarTone – Hong Kong	Vodafone – New Zealand
Entel – Peru	SoftBank – Japan	Vodafone – Portugal
Etisalat – UAE	Spark – New Zealand	Vodafone – Qatar
FarEasTone – Taiwan	StarHub – Singapore	Vodafone – Romania
Free Mobile – France	stc – Kuwait	Vodafone – Spain
Globe – Philippines	stc – Saudi Arabia	Vodafone – UK
Hot Mobile – Israel	Sunrise – Switzerland	Wind – Greece
HT – Croatia	Swisscom – Switzerland	WindTre – Italy
Iliad – Italy	T Star – Taiwan	WOM – Chile
Indosat – Indonesia	T-Mobile – Czech Republic	Yettel – Bulgaria
KPN – Netherlands	T-Mobile – Netherlands	Yettel – Hungary
KT – South Korea	T-Mobile – Poland	Yoigo – Spain
LG U+ – South Korea	T-Mobile – USA	Zain – Kuwait
M1 – Singapore	Taiwan Mobile – Taiwan	Zain – Saudi Arabia
Magenta – Austria	Tele2 – Sweden	
MEO – Portugal		
Mobily – Saudi Arabia		

How Opensignal measures mobile network experience

We report as accurately as possible the real-world mobile experience as recorded by mobile network users. To make decisions based on our market insights, network operators, regulators, analysts and consumers need to know the facts we present are accurate and that the comparisons we make are valid.

Please visit: <https://www.opensignal.com/methodology-overview>

About this report

Opensignal Limited retains ownership of this report including all intellectual property rights, data, content, graphs & analysis. Reports produced by Opensignal Limited may not be quoted, reproduced, distributed, published for any commercial purpose (including use in advertisements or other promotional content) without prior written consent. Journalists are encouraged to quote information included in Opensignal reports provided they include clear source attribution. For more information, contact press@opensignal.com