

Barometer of mobile Internet connections in Romania

H2 2021 – H1 2022



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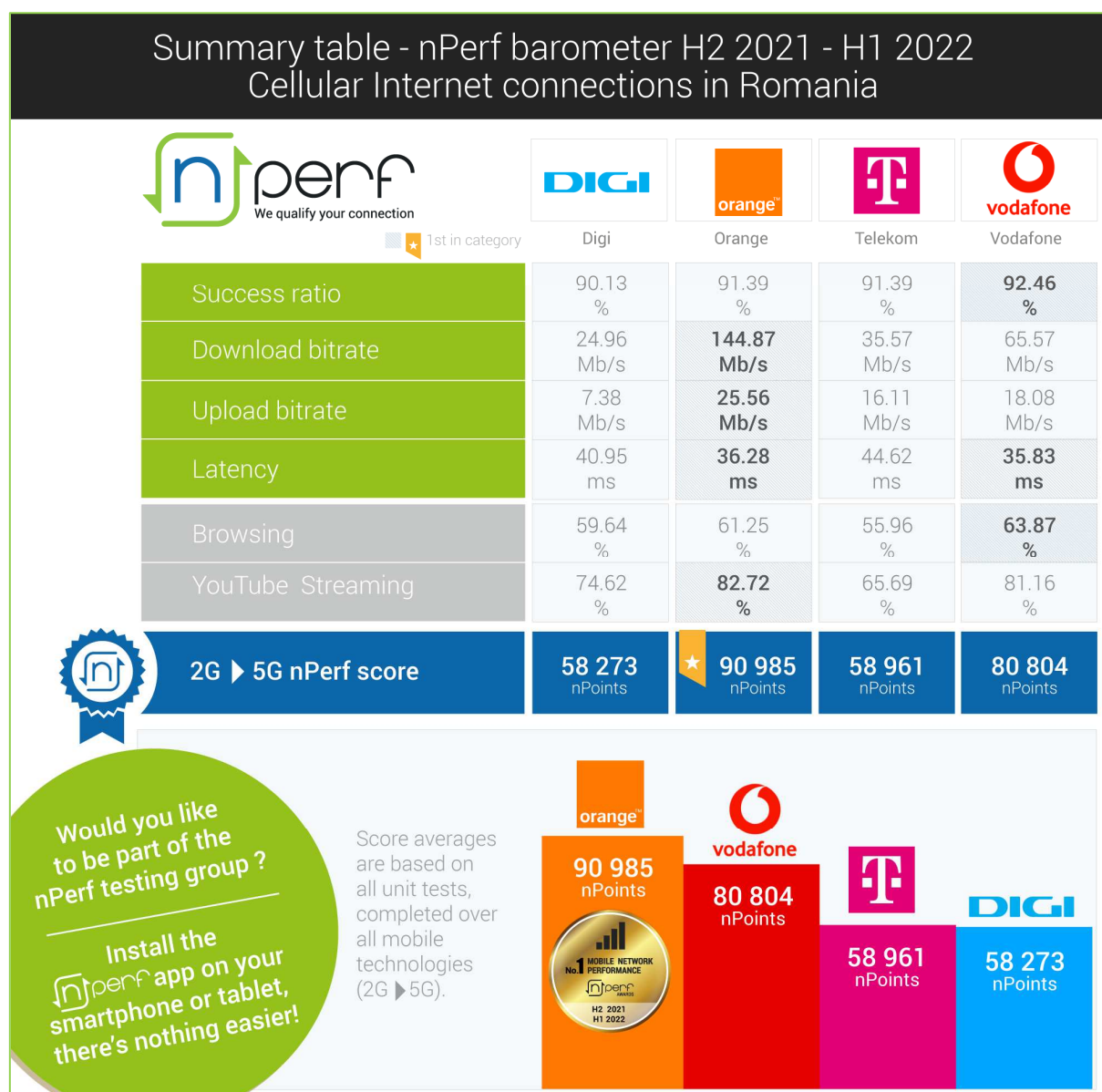


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1 Overall results - summary

1.1 Summary table and nPerf scores (2G → 5G)



2



Orange provided the best mobile Internet performances in Romania during the last two semesters.

1.2 Our analysis

This study is based on tests carried out by users of the nPerf mobile application, available for free on iOS and Android. During the last two semesters, users of the nPerf app completed, before filtering, **143.122 tests**.

Orange leads comfortably the Romanian mobile Internet. Thanks to its high 5G connection rate (on compatible devices), leading the bitrates KPIs becomes much easier. The difference is particularly outstanding when looking at the download speed (145 Mb/s, meaning 2,2 times faster than Vodafone, 4 times faster than Telekom, almost 6 times faster than DiGi). Moreover, this ISP has dominated the races of the upload speed, the YouTube streaming experience and recorded one of the two best latencies of the past twelve months.

Vodafone is the actual challenger of this year's study. Indeed, all the best performances are distributed between the latter and Orange. Vodafone is the winner when it comes to the success rate, the latency (shared with the global winner) and the web browsing experience. Regarding the other KPIs, this ISP finishes in second position every time, after Orange. It scores approximately 10.000 nPoints less than Orange, but gains slightly more points than its rivals from the H1 2020 (+16.497)

Telekom and DiGi shows smaller performances and end up in, respectively, the 3rd and 4th rank of our barometer. Both obtain a similar score, of approximately 58.000 points, i.e. over 32.000 nPoints behind the champion, and that's at very large gap to compete. Except their better 4G connection rate, which is not specially the best news, knowing that this is due to their smaller 5G connection rate, for the moment. Comparing to the first half of 2020, Telekom has almost stagnated (+1.5%, = +867 nPoints), whereas DiGi has made stronger efforts in the same time : +30.8% = +13.719 points.

Should we expect any surprises in the forthcoming months ? Of course, nPerf will keep an eye on this!

2 Overall results (2G → 5G)

Results, all cell generations included, of the tests carried out on 4G compatible terminals.

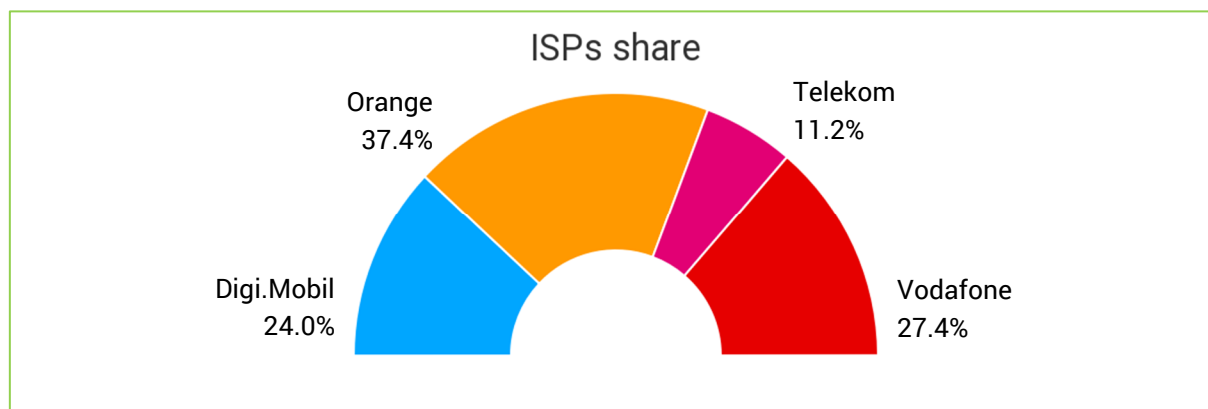
2.1 Data volume and distribution

The nPerf application allows the user to perform a full test (*), or each test separately. Between **July 1st, 2021** and **June 30th, 2022** we counted in Romania **143.122 unit tests**, distributed as follows, after filtering (see § 5.1.4) :

Technology	Speed	Browsing	Streaming	Total
2G → 5G	15.037	6.381	5.789	27.297

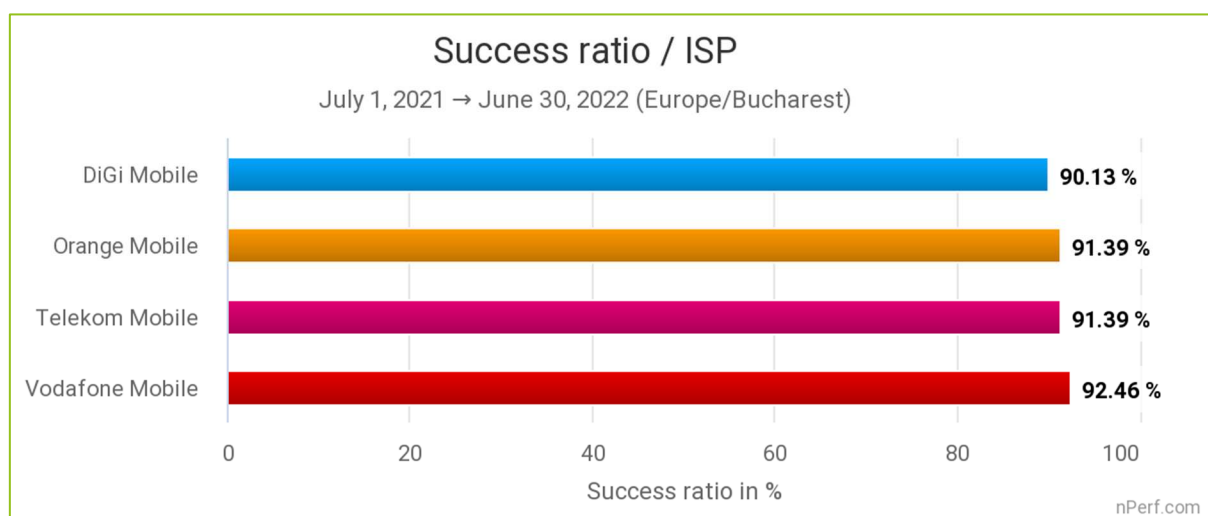
(*) one full test (speed, web browsing, streaming) = 3 unit tests

The overall distribution of the tests per provider is as follows:



Orange has known a significant growth (6+ points) at the expense of Telekom. DiGi grows more than 2 points too, lost by Vodafone.

2.2 Success rate

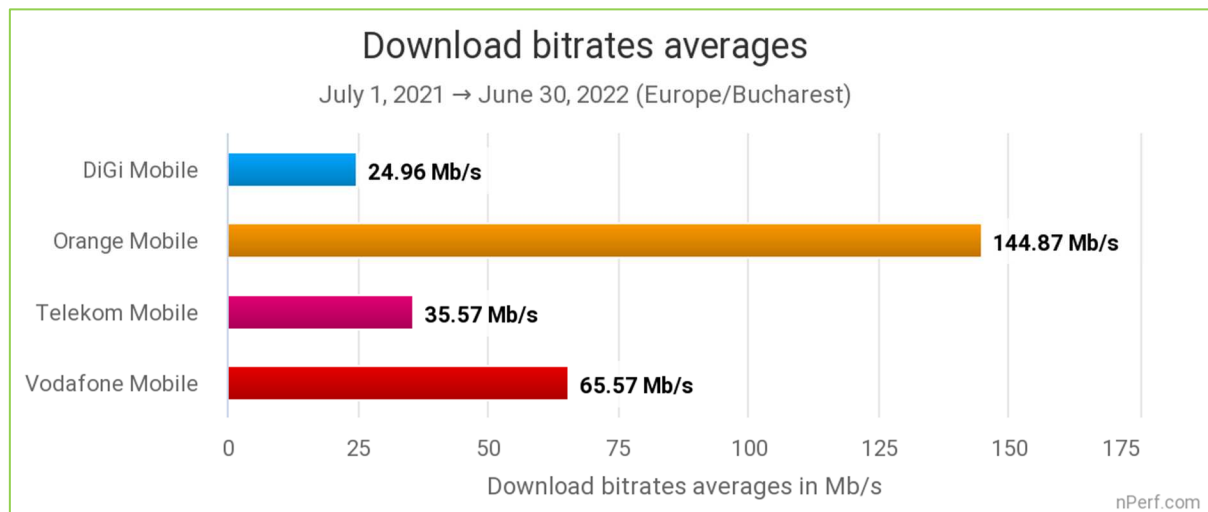


The highest value is the best.

Vodafone recorded the best success rate throughout the last two semesters.

However, all the ISP are above 90%, which means a global growth of 4 points on average since the first half of 2020.

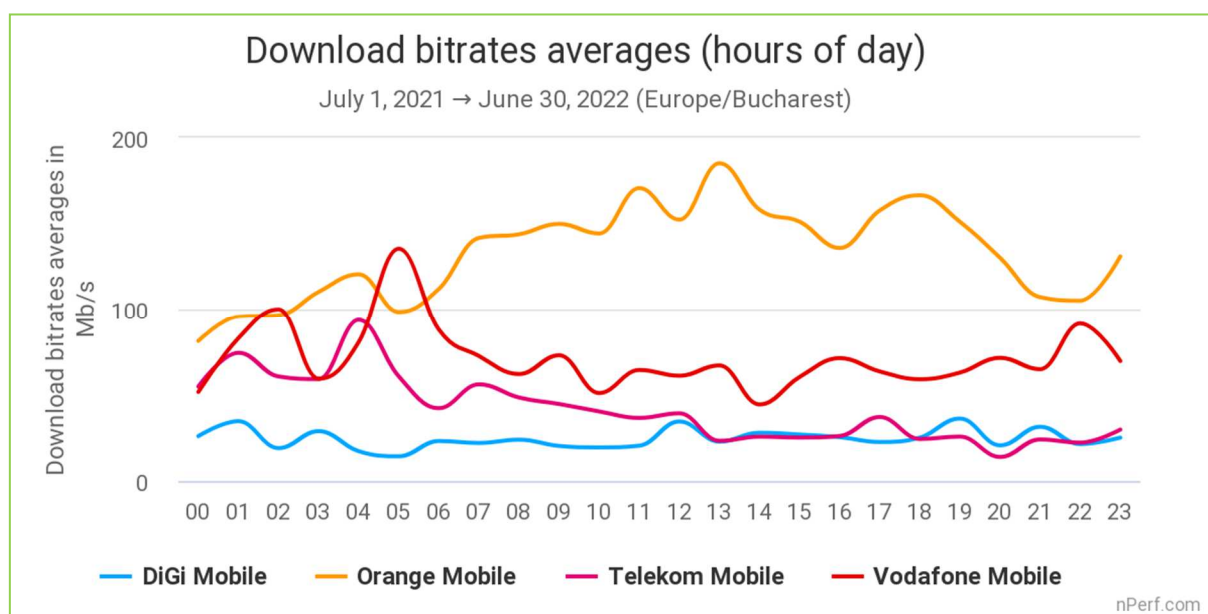
2.3 Download speed



The highest speed is the best.

Orange subscribers enjoyed the best average mobile download speed, during the last two semesters.

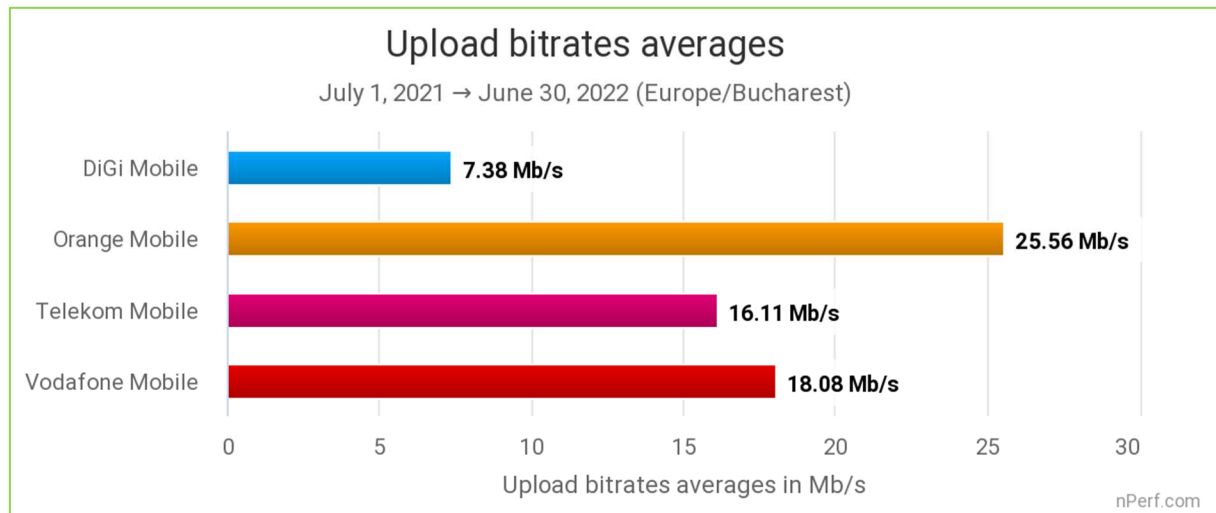
Orange benefits from a much more attractive speed, on average 145 Mb/s. Telekom is second with around 66 Mb/s, i.e. less than the half, while Vodafone and DiGi remain far below, under 36 Mb/s. This way, Orange has provided an almost six times higher speed than the last ranked ISP, during the last months.



The graph above shows the evolution of the average bitrate, by hour of the day.

Vodafone reaches a peak, over 100 Mb/s, at 5 a.m. Apart from that, Orange shows its domination from the early morning to the late night, often above 140 Mb/s, while its opponents figures hardly reach 40 Mb/s in the afternoon.

2.4 Upload speed

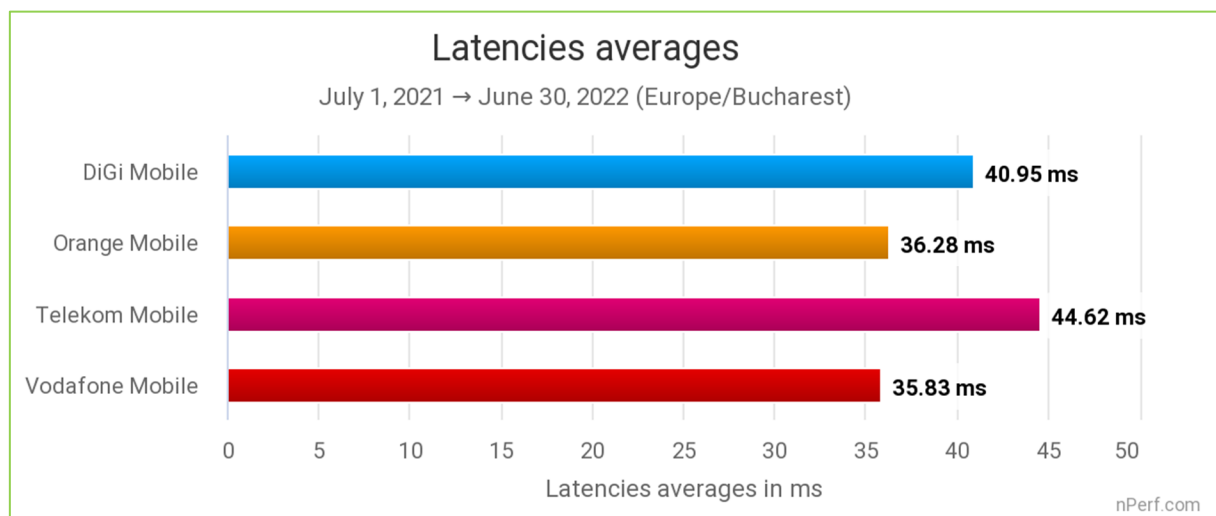


The highest speed is the best.

Orange subscribers enjoyed the best average mobile upload speed, during the last two semesters.

It offers 7,5 Mb/s more than Vodafone on average, but this speed ends up being three times higher than DiGi, which is the lowest of all four !

2.5 Latency



The shortest time is the best.

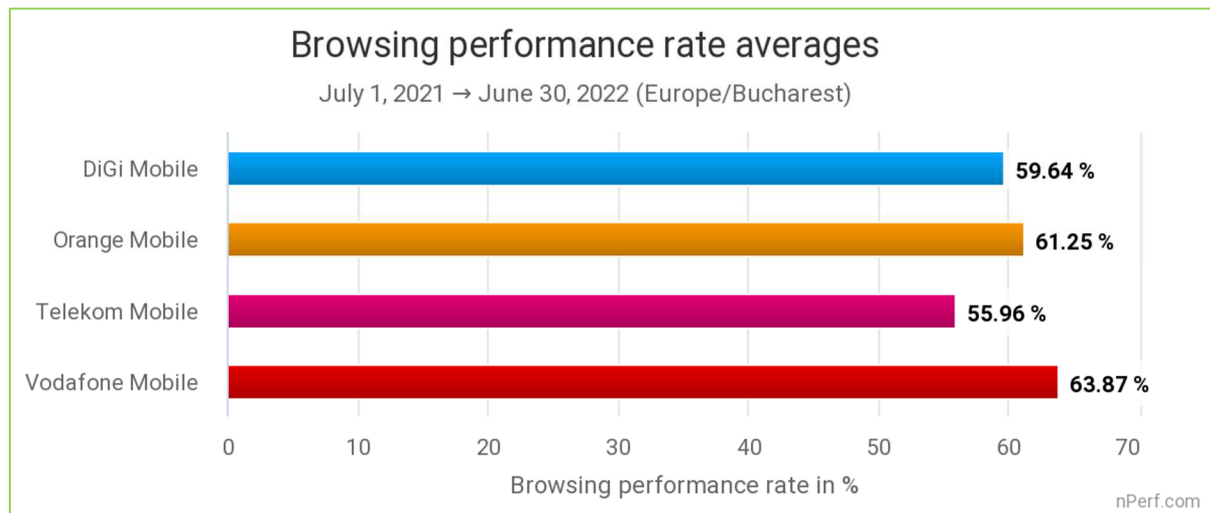
Vodafone and Orange subscribers enjoyed the best average mobile latencies, during the last two semesters.

By showing average figures of 36 ms, Vodafone and Orange record the fastest times of response of the country. Nonetheless, its opponents show a correct level too, all under 45 ms. DiGi has shown the best progression since early 2020 (18 ms quicker).

2.6 Quality of Experience (QoE)

The indicators used in this section are the nPerf performance rates (PR). More details in the appendices (§ 5.1.2).

2.6.1 Web browsing

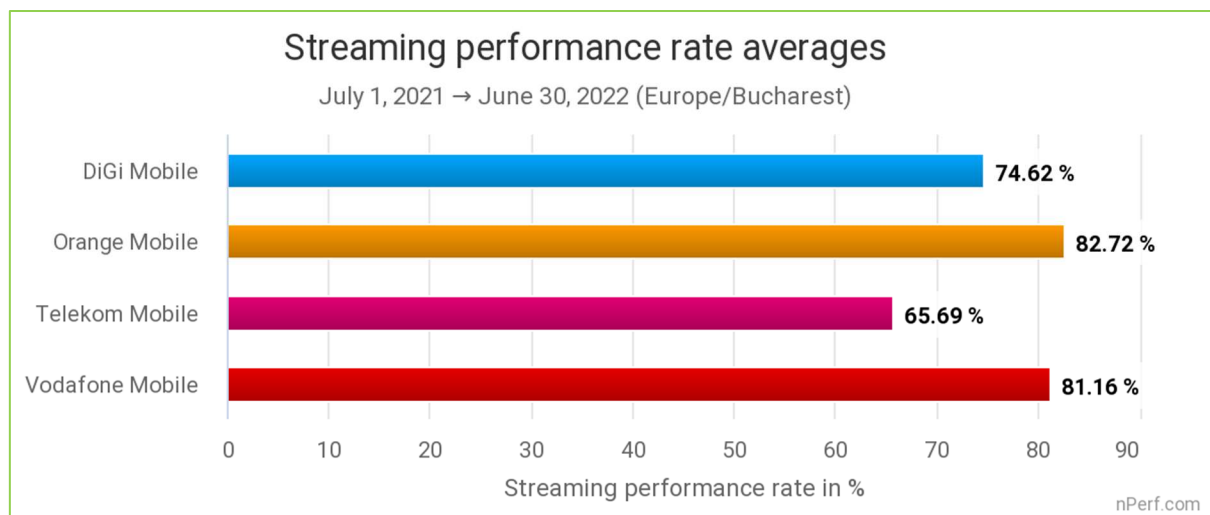


The highest rate is the best.

Vodafone provided the best performance rate in mobile Internet browsing, during the last two semesters.

The win is deserved, but the gap is not that comfortable for the leader : all the operators are within a range of 8 points of amplitude.

2.6.2 Video streaming



The highest rate is the best.

Orange provided the best performance rate in mobile video streaming, during the last two semesters.

Vodafone is not far behind, just a couple of points. The best evolution since early 2020 corresponds to DiGi. In contrast, Telekom has fallen sharply in the meantime : - 11 points !

2.7 4G and 5G connection rates

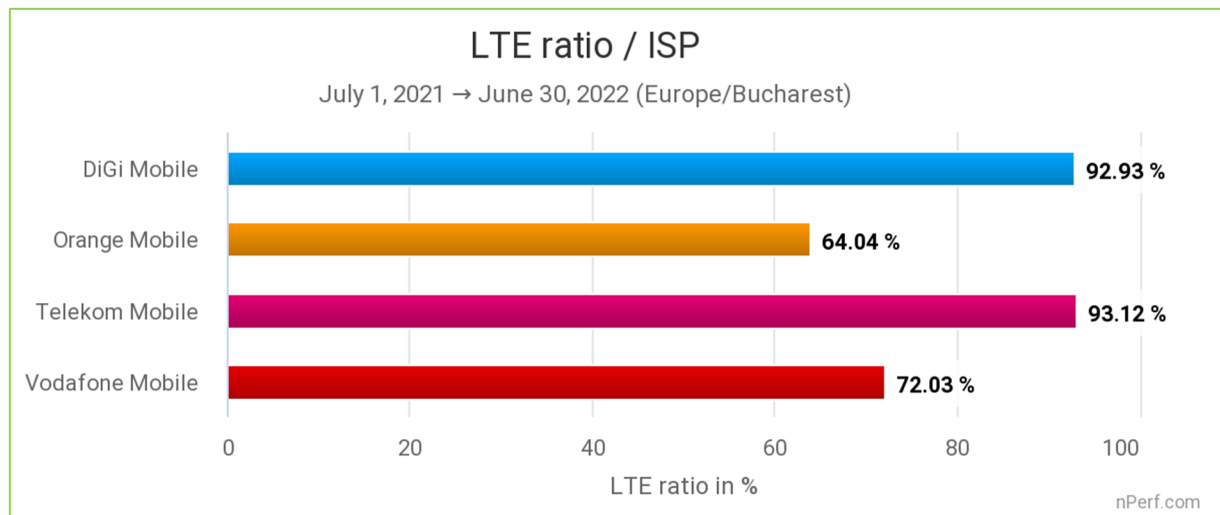
The principle is simple: for each operator, the number of tests performed in 4G/5G is divided by the total number of cellular tests. In other words, this rate corresponds to the probability of being connected in 4G/5G with a given ISP.

For the relevance of the result, we exclude beforehand all the tests carried out on the terminals which do not make it possible to benefit from the technology concerned.

Important note: we do not have the possibility to distinguish between commercial offers. Consequently, although few in number, users who do not have a 4G/5G offer, but have a 4G/5G device, are not excluded from the results.

2.7.1 4G connection rate

Statistics based on **22.489 tests** performed on 4G compatible terminals. See the complete list in appendix.



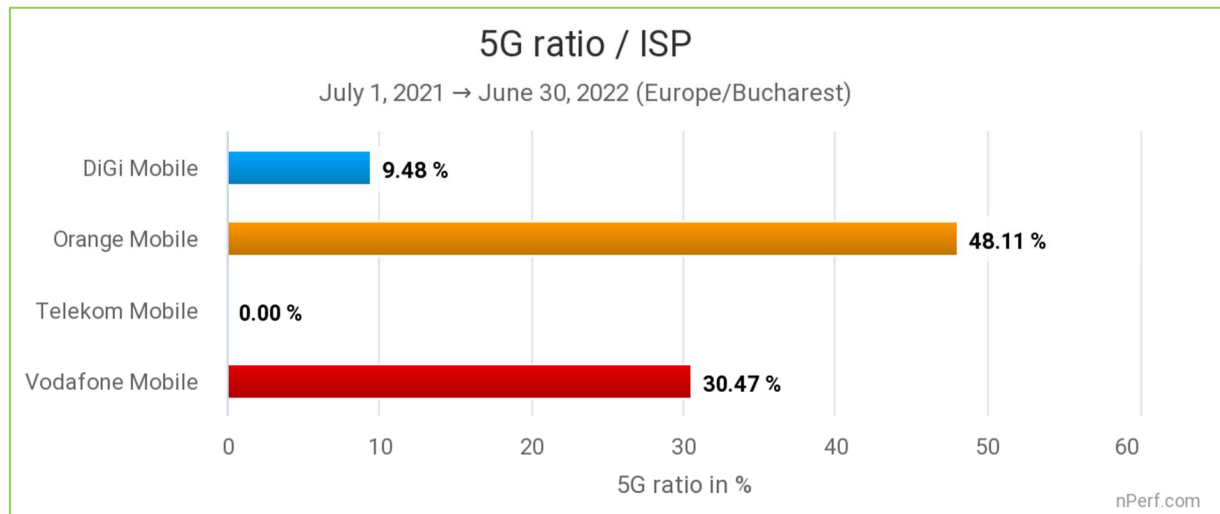
The highest value is the best.

Telekom and DiGi recorded the best 4G connection rates of the last two semesters.

That is surely due to their delay on the rollout of the 5G (see next).

2.7.2 5G connection rate

Statistics based on **10.021 tests** performed on 5G compatible terminals, allowing the identification of the 5G technology (**Android only**). See the complete list in appendix.



The highest value is the best.

Orange recorded the best 5G connection rate of the last two semesters.

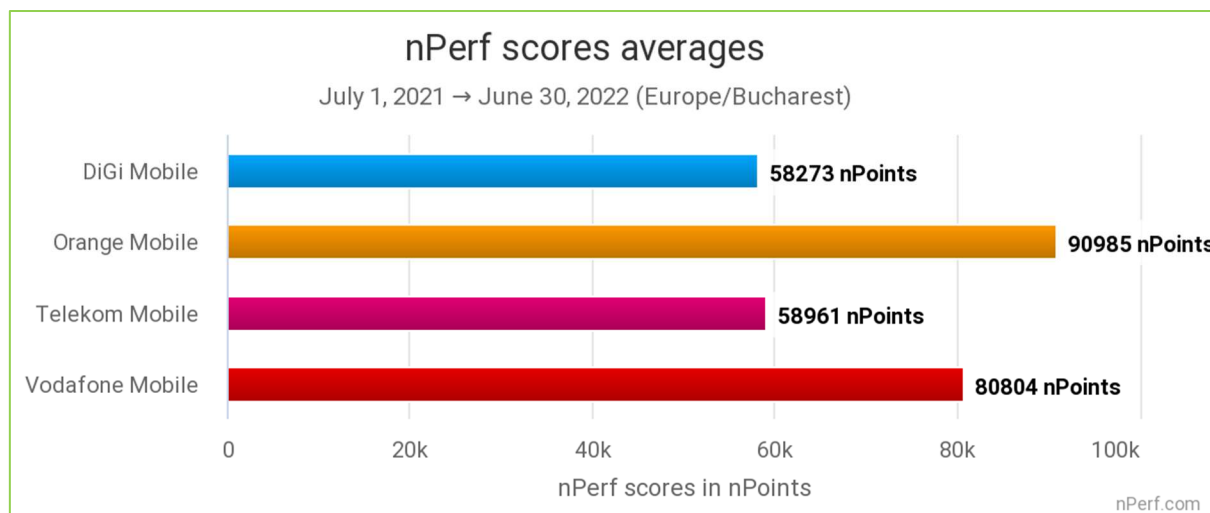
This means that, when a Romanian Internet user performs a test with a 5G compatible device on Orange's mobile network, there's 48.1% chances the 5G is used for it. Its subscribers may have benefited from a better (or earlier) 5G offer, before the rest of the ISP marketed theirs. Vodafone's done a great work on this field too (30.5%). DiGi has started its race too, and now situates at 9.5%.

2.8 nPerf scores

The nPerf score, expressed in nPoints, gives an overall picture of the quality of a connection. It takes into account the measured bitrates (2/3 on download + 1/3 on upload), the latency and is affected by QoE tests equally (browsing / streaming). The value of the points for the rates and the latency is calculated on a logarithmic scale, to better represent the perception of the user.

Thus, this score reflects the overall quality of the connection **felt by the user**.

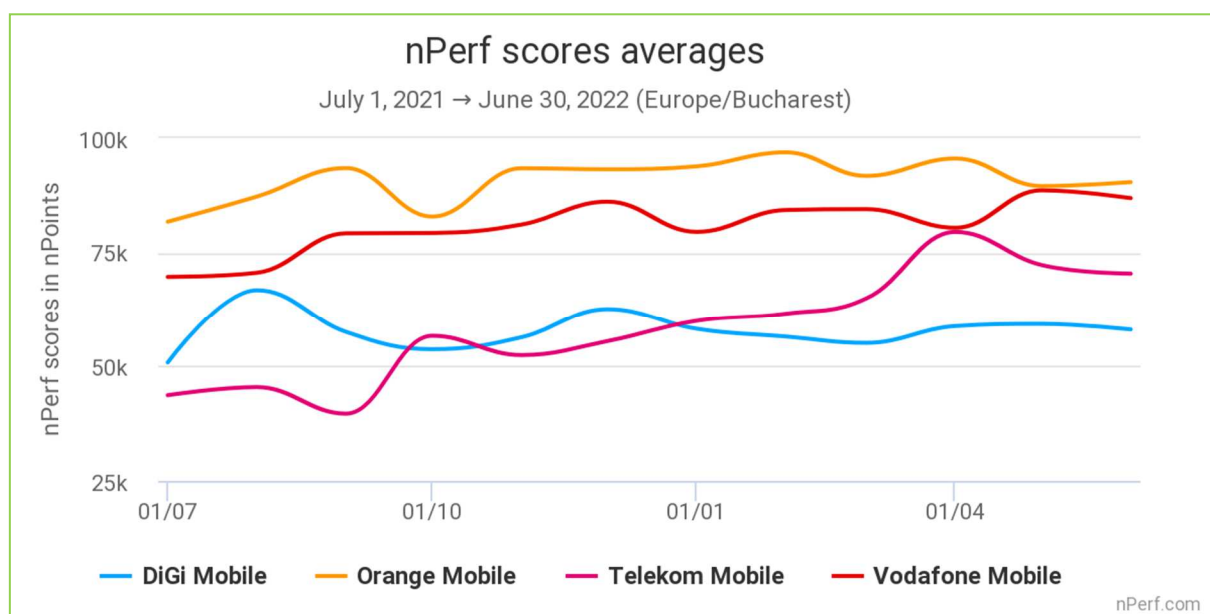
The results below consider all the previous indicators and therefore all the tests carried out. As technologies are grouped together, the proportion of tests in different technologies strongly impacts this global trend.



The highest value is the best.



Orange subscribers enjoyed the best mobile Internet performances, during the last two semesters.



The graph above illustrates the evolution of the score over the period.

The step ahead of Orange has been constant. Its closer challenger is Vodafone, and Telekom raises its results strongly within the studied period. In general, the evolution of the four Romanian ISP performances are rather positive within the period.



Thanks to the nPerf application, find this global indicator directly on your smartphone or tablet, via the « Compare » function at the end of the full test. It is updated in real time over 14 rolling days.

3 You too, participate in the nPerf panel!

To participate in the panel, simply use the nPerf application, available for free on the Apple AppStore for iPhone and iPad, and on Google Play for Android devices.

Download the nPerf App	
Android	http://android.nperf.com/
iOS	http://ios.nperf.com/

Also participate in the Fixed Connections Barometer panel by testing your DSL, cable or optical fiber connection at www.nPerf.com.

4 Custom analysis & contact

Do you need further studies, or want to get the raw data, punctually or automatically, to compile it yourself?

You can contact nPerf via www.nPerf.com through the "Contact Us" section, or directly from the mobile app.

Phone contact: +33 482 53 34 11

Address: nPerf SAS, 87 rue de Sèze, 69006 LYON, France

Stay in touch with us, follow us!



5 Appendices

5.1 Methodology

5.1.1 The panel

nPerf offers a free application for testing the quality of the Internet connection, downloadable for free on Android and iOS (Apple) mobile devices.

Everyone is free to use this app to measure the quality of their mobile connection. The panel of this study is formed by the users of the nPerf application in **Romania**. In addition, the results from the nPerf speed tests integrated on our partner websites are also included in the panel.

Thus, the nPerf study is based on the **tens of thousands of tests** carried out yearly, exclusively by the operators' end customers, which makes it the "crowdsourced" study based on **one of the largest panels of the country**.

These tests reflect the **actual experience of the general public** on the various Internet networks.

5.1.2 Definitions and goals

5.1.2.1 Success rate

The success rate is calculated by dividing the number of successful attempts by the total number of attempts made.

5.1.2.2 Speed and latency tests

The purpose of the nPerf Speed Test is to measure the maximum capacity of the connection in terms of bit rate and latency.

To achieve this, nPerf simultaneously establishes multiple connections to saturate the bandwidth to accurately measure it.

The speed measurements thus reflect **the maximum capacity** of the connection. This rate may not be representative of the user experience experienced during normal use of the Internet because it is measured only on nPerf servers.

The user experience is then measured by the Quality of Experience (QoE) tests.

5.1.2.3 The browsing test

The browsing test allows the user to accurately measure the loading time of the 5 websites most frequented by local Internet users (YouTube is excluded from this test as it is subject to the following test).

This indicator reflects the quality of navigation perceived by the user. It can however be negatively impacted by the performance of the terminal used, especially if it is old.

It is calculated considering the loading time of the page. A page loaded in 10 seconds or more gets a 0% performance rate and a page loaded instantly gets a performance rate of 100%. For example, a page loaded in 2 seconds will get a performance rate of 80%.

5.1.2.4 The YouTube streaming test

The goal of the streaming test is to measure the quality of video viewing on the most popular streaming platform around the world: YouTube.

It operates under conditions similar to the direct use of YouTube and therefore takes into account the quality of the network between the user and the YouTube servers.

It is calculated considering all the time required to load the video (before or during playback). If the ratio between the duration of the video and the overall reading time (reading + loading) tends to 1 then the performance index will tend towards 100%. And conversely, the more the ratio moves away from 1, the more the index will tend towards 0%.

5.1.3 nPerf servers

To ensure maximum user bandwidth at all times, nPerf relies on a network of servers dedicated to this task.

These servers are hosted in the country and abroad. nPerf has also installed dedicated servers directly at some operators, to maximize measurement reliability. **Local carriers are welcome to install nPerf servers, that's free!**

The total bandwidth available for **Romania** is **14 Gb/s**, and reaches more than **10 Tb/s** worldwide, with more than **2.300** active nPerf servers!

5.1.4 Filtering of test results

The results obtained are subject to automatic and manual checks to avoid duplication and to rule out possible abusive or fraudulent use (massive tests, robots ...). The exclusive nPerf algorithm retains only the relevant tests, thus eliminating biases related to the overrepresentation of certain terminals, users or test locations.

The results are classified by provider. The results for each provider include the tests performed on the partner networks (roaming, pooling).

5.1.4.1 Filtering of the devices

In order not to introduce any bias related to the capabilities of the terminals, only the tests carried out on 4G or higher compatible terminals are retained. The exhaustive lists are provided in the appendix.

For calculating the 5G connection rates, only 5G compatible terminals are selected. Their exhaustive list is provided in the appendix below. Moreover, given that iOS devices do not provide reliable information about the cellular generation used for the tests, nPerf has only taken into account Android results for this calculation.

5.1.5 Statistical accuracy

With regard to the total volume of unit tests, the statistical precision used in this publication is:

Category	Absolute values	Percentages
2G → 5G	3%	1 point

If, for a given indicator, one or more operators have results very close enough to the best, in the confidence interval defined above, these will **share the first place**.

5.2 Complete list of devices selected for 2021/2022

5.2.1 4G compatible devices

Samsung Galaxy S4 LTE, Samsung Galaxy S3 LTE, LG Nexus 5, Samsung Galaxy Note 3 LTE, Sony Xperia SP, Sony Xperia Z1, Samsung Galaxy Mega 6.3" LTE, HTC One M7, Sony Xperia Z, Samsung Galaxy Express, HTC One mini, Samsung Galaxy S4 LTE+, Samsung Galaxy S4 Mini LTE, LG G2, Samsung Galaxy Note LTE 10.1", Samsung Galaxy Tab 3 10.1" LTE, HTC One X+, Bouygues Telecom Ulytm 4, LG Optimus G, HTC One SV, Asus Nexus 7, Samsung Galaxy S4 LTE (Google), Sony Xperia Z Ultra, Samsung Galaxy S4 Active, LG Optimus True HD, HTC Desire 601, Samsung Galaxy Ace 3 LTE, Samsung Galaxy S4 LTE Advanced, Samsung Galaxy Note II LTE, Alcatel One Touch Idol S, Bouygues Telecom BS501, Sony Xperia V, LG Optimus F6, HTC One max, Apple iPhone 5, Apple iPhone 5S, Apple iPhone 5C, Apple iPad Air, Apple iPad mini 2, Apple iPad 4, Nokia Lumia 920, Nokia Lumia 925, Nokia Lumia 1020, Nokia Lumia 820, Nokia Lumia 625, Nokia Lumia 1520, Nokia Lumia 1320, Sony Xperia Z1 Compact, Huawei Ascend G740, Samsung Galaxy S5, Sony Xperia Z2, HTC One M8, HTC One VX, Motorola Moto X, RIM BlackBerry Z10, LG G3, Nokia Lumia 930, Motorola Moto G 4G, Nokia Lumia 635, Sony Xperia M2, HTC One mini 2, HTC Desire 610, Alcatel One Touch Idol 2 S, Samsung Galaxy S5 LTE-A (SM-G906S), HTC Desire 816, Samsung Galaxy S5 LTE-A (SM-G901F), ZTE Grand S Flex, Apple iPhone 6, Apple iPhone 6+, Sony Xperia Z3, Sony Xperia Z3 Compact, Samsung Galaxy Alpha LTE-A, Samsung Galaxy Alpha LTE, Samsung Galaxy Note 4 LTE, Samsung Galaxy Note 4 LTE-A, Motorola Moto X 2014, OnePlus One, Motorola Nexus 6, Apple iPad Air 2, Apple iPad mini 3, Wiko WAX LTE, Samsung Galaxy Core LTE, Samsung Galaxy S5 mini, Samsung Galaxy Note 3 Lite, Samsung Galaxy S4 VE, Wiko Rainbow 4G, Archos 50 Helium 4G, Archos 50b Helium 4G, Archos 45 Helium 4G, Archos 45b Helium 4G, Samsung Galaxy Grand II LTE, Nokia Lumia 735, Nokia Lumia 830, Nokia Lumia 822, Nokia Lumia 928, Nokia Lumia 636, Motorola Droid Turbo, Samsung Galaxy Note Edge, Samsung Galaxy S5 Active, Huawei Ascend Mate 7, Huawei Honor 6, Huawei Ascend G620s, Samsung Galaxy Ace Style LTE, Meizu MX4, Meizu MX4 Pro, Sony Xperia E3, Sony Xperia T3, Wiko Birdy, Wiko Highway 4G, Samsung Galaxy S6, Samsung Galaxy S6 Edge, HTC One M9, Asus Zenfone 2, Samsung Galaxy Grand Prime, Archos 50 Diamond, LG G3 S, Samsung Galaxy A3, Samsung Galaxy Tab 4 10.1" LTE, Samsung Galaxy Tab S 10.5" LTE, Samsung Galaxy Core Prime, Samsung Galaxy A5, Wiko Ridge Fab 4G, Wiko Ridge 4G, Motorola Moto G2, Microsoft Lumia 640 XL LTE Dual SIM, Huawei Ascend G7, OnePlus Two, Apple iPhone 6s, Apple iPhone 6s+, Samsung Galaxy Note 5, Samsung Galaxy J2, Samsung Galaxy J7, Samsung Galaxy J5, Samsung Galaxy J1 Ace, Samsung Galaxy A8, Motorola Moto X Style, Motorola Moto X Pure Edition, Motorola Moto G3, Samsung Galaxy S6 Edge+, Sony Xperia Z3+, LG G4, Huawei Honor 7, LG Nexus 5X, Huawei Nexus 6P, Hisense Andromax R, Hisense PureShot+, Hisense PureShot, Huawei P8lite, Huawei P8, Sony Xperia Z5 Cat6, Sony Xperia M4 Aqua Dual, Sony Xperia Z5 Compact Cat6, Sony Xperia M4 Aqua, Sony Xperia M2 Aqua, Sony Xperia C5, Sony Xperia E4g, Samsung Grand Prime VE, Samsung Galaxy S5 Neo, Samsung Galaxy A7, Samsung Galaxy Tab S 8.4" LTE, Alcatel One Touch Idol 3 5.5", Alcatel One Touch Idol 3 4.7", Alcatel One Touch Pop 2 Premium, Orange Nura, Alcatel One Touch Pop S7, Lenovo A7000, Lenovo A6000, Xiaomi Redmi Note 2, Xiaomi Redmi Note 3, Xiaomi Mi 4i, Xiaomi Mi 4, Microsoft Lumia 950, Microsoft Lumia 950 XL, Samsung Galaxy S7, Samsung Galaxy S7 Edge, Wiko Tommy 4G, LG G Flex 2, Apple iPad mini 4, Apple iPad Pro 10", Apple iPad Pro 13", Apple iPhone SE, Wiko Fever, Motorola Moto X Play, OnePlus X, Microsoft Lumia 640 LTE, Microsoft Lumia 640 LTE Dual SIM, Microsoft Lumia 550 LTE, Microsoft Lumia 1330, Microsoft Lumia 650, Microsoft Lumia 650 Dual SIM, Microsoft Lumia 640 XL LTE, Microsoft Lumia 638, Nokia Lumia 929, Smartfren Andromax E2, Samsung Galaxy A5 2016, Huawei Honor 4X, Samsung Galaxy A3 2016, Huawei Honor 5X, Huawei Ascend Mate 8, Sony Xperia Z5 Premium, Sony Xperia X, LG G5, LG V10, Samsung Galaxy A7 2016, Apple iPhone 7, Apple iPhone 7+, Sony Xperia X Performance, Samsung Galaxy Note 7, OnePlus 3, Huawei Y560, Samsung Galaxy Tab A 9.7" LTE, Motorola Moto G4, Asus Zenfone 5, Huawei P9, Huawei P9 Lite, Huawei Honor 5C, LeEco Le Max 2 X820, BlackBerry Priv, Motorola Moto E2, Motorola Moto E3, Motorola Moto Maxx, Samsung Galaxy J3, Asus Zenfone Max, Xiaomi Redmi 3, Xiaomi Mi 5, HTC 10, Huawei Honor 8, Lenovo Vibe K5, Smartfren Andromax Q, Smartfren Andromax R2, Xiaomi Redmi 3s, Lenovo Vibe K4 Note, LG K10, Meizu M2 Note, Samsung Galaxy A9 Pro, Xiaomi Mi Max, Sony Xperia XZ, Motorola Moto G4 Play, Huawei P9 Plus, Huawei Mate 9, Wiko Pulp 4G, Meizu M3 Note, Samsung Galaxy J7 Prime, Samsung Galaxy J2 Prime, Samsung Galaxy Tab A 10.1" LTE, Samsung Galaxy Tab S2 9.7" LTE, Samsung Galaxy Xcover 3, Oppo F1s, Oppo A37, Oppo F1, Oppo F1 Plus, Oppo A33, Xiaomi Redmi Note 4, Xiaomi Redmi Note 4X, Xiaomi Redmi 4, Xiaomi Redmi 4a, Xiaomi Redmi 4X, Asus Zenfone 3 Max, Asus Zenfone 3, Asus Zenfone Go LTE, Asus Zenfone 3 Deluxe, Motorola Moto Z Play, Motorola Moto Z, Motorola Moto X Force, Alcatel Flash Plus 2, Vivo V3Max, Vivo V3, Smartfren Andromax A, Smartfren Andromax E2 Plus, Smartfren Andromax L, Wiko U Feel, Huawei Y6 II, Huawei Mate S, Huawei Honor 6X, Huawei G8, Huawei P8 Lite 2017, Lenovo A2010, Lenovo Vibe P1m, Lenovo Vibe K5 Note, Lenovo P70, Sony Xperia E5, Sony Xperia XA, Sony Xperia X Compact, LG V20, LG X power, LG K8, LG Magna, Google Pixel, Google Pixel XL, OnePlus 3T, Samsung Galaxy S8, Samsung Galaxy S8+, Sony Xperia XZ Premium, Samsung Galaxy A7 2017, Samsung Galaxy A3 2017, Samsung Galaxy J5 Prime, Samsung Galaxy Grand Prime Plus, Samsung Galaxy Tab S2 9.7" VE, Samsung Galaxy Tab A 7" LTE, Samsung Galaxy Tab S2 8.0" LTE, Samsung Galaxy Tab S2 8.0" VE, Motorola Moto G5, Motorola Moto G5 Plus, Huawei P10, Huawei P10 Lite, Huawei P10 Plus, Huawei Mediapad M3 LTE, Huawei Nova, Huawei Mate 9 Pro, Huawei Y5II, ZTE Axon 7, Lenovo P2, Lenovo C2, Lenovo K6, Lenovo Vibe K6 Note, Xiaomi Mi 5s, Xiaomi Redmi 3X, Xiaomi Mi 5s Plus, Asus Zenfone Go ZB500KL,

Xiaomi Redmi 2, Xiaomi Redmi Pro, LG G4 Stylus, LG G5 SE, Meizu M3s, Apple iPhone 8, Apple iPhone 8+, Apple iPhone X, ZTE V9820, Samsung Galaxy S8 Active, OnePlus 5, LG G6, Oppo A57, Oppo A39, Samsung Galaxy Note 8, Samsung Galaxy J7 Pro, True SMART 4G Octa 5.5, Huawei Mate 10 Pro, OnePlus 5T, Samsung Galaxy J5 2017, HTC U11, HTC U11 Life, HTC U11+, Motorola Z2 Play, Sony Xperia XZ1, Sony Xperia XZ1 Compact, Google Pixel 2, Google Pixel 2 XL, Samsung Galaxy A5 2017, Xiaomi Mi A1, Motorola Moto G5S Plus, Motorola Moto G5S, Motorola Moto E4 Plus, Motorola Moto E4, Motorola Moto X4, Xiaomi Redmi Note 5A, Xiaomi Mi Max 2, Xiaomi Mi 6, Xiaomi Mi Mix 2, Xiaomi Redmi 5A, Xiaomi Redmi Note 5, Huawei Honor 9, Huawei Mate 10 Lite, Huawei Honor 8 Pro, Huawei Honor 7X, Huawei Honor View 10, Asus Zenfone 4 Max, Asus Zenfone Live, Asus Zenfone 2 Laser, Vivo 1606, Vivo V5s, Vivo V5 Lite, Vivo V7, Vivo Y55s, Vivo Y55L, Samsung Galaxy J7 Nxt, Samsung Galaxy A8 2018, Samsung Galaxy S9+, Samsung Galaxy S9, Samsung Galaxy Note FE, Samsung Galaxy C9 Pro, Samsung Galaxy J3 2017, Samsung Galaxy C7 2017, Samsung Galaxy Tab S3 9.7" LTE, ZTE Blade Q Lux, Oppo F5, Oppo F3, Oppo A71, Oppo R9s, LG X power2, LG Q6, LG X style, Vivo V5 Plus, Wiko U Feel Lite, Lenovo Vibe P1 Turbo, Vivo V7+, Lenovo Vibe C, Sony Xperia XA1 2CA, Sony Xperia XA1, Sony Xperia XA1 Ultra, Motorola Moto C Plus, OnePlus 6, Huawei P20 Pro, Huawei P20, Huawei P20 Lite, Huawei P Smart, Huawei Honor 10, Nokia 7 Plus, Nokia 8, Samsung Galaxy A8+ 2018, Wiko Wim Lite, Wiko Wim, Xiaomi Mi Mix 2S, Xiaomi Mi Note 2, Sony Xperia XZ2, Sony Xperia XA2 Ultra, Sony Xperia XA2, Sony Xperia XZ2 Compact, Oppo F7, Oppo A71 2018, Oppo A83, Oppo F3 Plus, Oppo F5 Youth, Oppo R9s Plus, Asus Zenfone Max Plus M1, Asus Zenfone 4 Selfie, Asus Zenfone Go, Asus Zenfone 4, Huawei Honor 7i, Huawei Honor 9 Lite, Huawei Y9 2018, Huawei Y7 Prime, Huawei Y7, Huawei Y5 2017, Nokia 6, Nokia 5, Nokia 3, Xiaomi Redmi Note 5 Pro, Xiaomi Redmi 5, Xiaomi Mi Note 3, Essential PH-1, LG V30, ZTE Blade A452, Vivo V9, Vivo Y51, Vivo V9 Youth, Vivo Y65, Sony Xperia L1, Samsung Galaxy J2 2016, Samsung Galaxy J2 Pro 2018, Samsung Galaxy Xcover 4, Samsung Galaxy J7 Max, True SMART 4G MAX 5.0, True SMART 4G MAX 5.5, True SMART 4G MAX 4.0, True SMART 4G M1 Plus, True SMART MAX 4.0 PLUS, Bittium Tough Mobile, Telma NAVTECH 4GEN, Vivo Y69, Advan S5E, Advan i5C, Infinix Hot S3, Motorola Moto C, Samsung Galaxy Note 9, Samsung Galaxy A6+ 2018, Samsung Galaxy A6 2018, Samsung Galaxy J6 2018, Samsung Galaxy J6+ 2018, Asus ZenFone Max Pro M1 (ZB601KL), Xiaomi Redmi S2, Xiaomi Mi 8, Xiaomi Pocophone F1, Huawei Nova 3i, Vivo Y71, Motorola Moto G6 Plus, Lenovo K8 Note, Oppo A3s, Apple iPhone Xs, Apple iPhone Xs Max, Apple iPhone XR, Apple iPad 9.7" 2017 WiFi+Cell, Apple iPad Pro 12.9" 2017 WiFi+Cell, Apple iPad Pro 10.5" 2017 WiFi+Cell, Apple iPad 9.7" 2018 WiFi, Apple iPad 9.7" 2018 WiFi+Cell, Apple iPad Pro 11" 2018 WiFi+Cell, Apple iPad Pro 12.9" 2018 WiFi+Cell, Oppo F9, Huawei Mate 20 Pro, Huawei Mate 20 X, Huawei Honor 8X, Huawei Mate 20 Lite, Huawei Honor Play, Huawei Y5 Prime 2018, Huawei Y9 2019, OnePlus 6T, Xiaomi Mi A2 Lite, Xiaomi Mi Max 3, Xiaomi Mi A2, Xiaomi Redmi Note 6 Pro, LG K4 2017, Motorola Moto G6 Play, Nokia 6.1, Samsung Galaxy J8 2018, Samsung Galaxy J4 2018, Asus Zenfone 5Z, Vivo V11, Xiaomi Mi 8 Lite, Xiaomi Redmi 6, Xiaomi Redmi 6A, Xiaomi Mi Mix 3, Samsung Galaxy S10, Samsung Galaxy S10+, Samsung Galaxy A7 2018, Samsung Galaxy J4+, Samsung Galaxy J6+, Samsung Galaxy A9, Huawei Mate 20, Motorola Moto G6, Huawei Nova 3, Google Pixel 3, Google Pixel 3 XL, Huawei Mate 20 X 5G, Xiaomi Mi Mix 3 5G, Samsung Galaxy S10 5G, OnePlus 7 Pro 5G, OnePlus 7, OnePlus 7 Pro, Xiaomi Redmi Note 7, Xiaomi Redmi Note 7 Pro, Xiaomi Mi 9, Samsung Galaxy A50, Samsung Galaxy A30, Samsung Galaxy S10e, Huawei P30 Pro, Huawei P Smart 2019, Huawei P30, Huawei Honor View 20, Huawei Y7 Pro 2019, Vivo V11i, Vivo Y91, Myria Grand 4G, Oppo A7, Oppo Realme C1, Oppo F11 Pro, Asus ZenFone Max Pro M2, Motorola Moto G7 Power, Motorola One, ZTE Axon 10 Pro 5G, Apple iPhone 11, Apple iPhone 11 Pro, Apple iPhone 11 Pro Max, Apple iPad Air 3, Apple iPad Mini 5, Samsung Galaxy Note 10+, Samsung Galaxy A40, Samsung Galaxy A70, Samsung Galaxy A10, Samsung Galaxy A20, Samsung Galaxy M20, Samsung Galaxy Note 10, Samsung Galaxy Note 10+ 5G, Samsung Galaxy A50s, Samsung Galaxy A80, Xiaomi Redmi Note 8 Pro, Xiaomi Mi 9T Pro, Xiaomi Redmi Note 8, Xiaomi Redmi Note 8T, Xiaomi Redmi 7, Xiaomi Redmi 7A, Xiaomi Mi 8 Pro, Xiaomi Redmi K20 Pro, Oppo A5s, Oppo Reno, Oppo A9, Oppo A5, Oppo F11, Oppo A1k, Sony Xperia XZ2 Premium, Sony Xperia 1, Huawei Honor 20, Huawei P30 Lite, Huawei Y9 Prime 2019, Huawei Nova 4, Huawei Honor 7A, Huawei Honor 10 Lite, Realme 3 Pro, Realme 3, Realme C2, Realme 5 Pro, Realme 5, Vivo V15, Vivo Y12, Vivo Y17, Vivo Y91i, Vivo V15 Pro, Vivo Y95, Vivo Y83 Pro, Vivo S1, Vivo Y93, Vivo Z1 Pro, Vivo Y81, OnePlus 7T Pro, Google Pixel 3a, Google Pixel 3a XL, Motorola One Vision, Motorola Moto G7 Play, Motorola Moto G7 Plus, Motorola Moto Z3 Play, LG G7 ThinQ, LG V50 ThinQ 5G, Nokia 6.1 Plus, Nokia 5.1 Plus, Huawei Mate 30 Pro 5G, Huawei Mate 30 Pro, Huawei P40 Pro, Huawei P40 Pro+, Huawei Y6 2019, Huawei Honor 8A, Huawei Y5 2019, Huawei Honor 7S, Huawei Mate 30 5G, Huawei Mate 30, Asus Rog Phone II, Asus Zenfone Max Shot, Asus Zenfone Max Pro M1 (ZB602KL), Asus Zenfone 6, Samsung Galaxy S20 Ultra 5G, Samsung Galaxy A71, Samsung Galaxy A10s, Samsung Galaxy A20s, Samsung Galaxy S20+ 5G, Samsung Galaxy A20e, Samsung Galaxy A30s, Samsung Galaxy Note 10 Lite, Samsung Galaxy A90, Samsung Galaxy S20+, Samsung Galaxy S20, Samsung Galaxy S20 5G, Samsung Galaxy M30s, Samsung Galaxy A2 Core, Samsung Galaxy S10 Lite, Samsung Galaxy Tab S6, Samsung Galaxy J2 Pure, Samsung Galaxy J4 Core, Samsung Galaxy Tab A 10.1" 2019 LTE, Samsung Galaxy J7 Prime 2, Samsung Galaxy A10e, Samsung Galaxy Tab S4, Samsung Galaxy M30, Samsung Galaxy Tab A 8.0" 2019 LTE, Samsung Galaxy M31, Samsung Galaxy M10, Samsung Galaxy Xcover 4s, ZTE Axon 10s Pro 5G, Xiaomi Redmi 8, Xiaomi Mi Note 10, Xiaomi Redmi 8A, Xiaomi Redmi Note 9S, Xiaomi Mi Note 10 Pro, Xiaomi Mi 10 Pro, Xiaomi Mi 10, Xiaomi Redmi 6 Pro, Xiaomi Redmi Go, OnePlus 8 Pro, OnePlus 7T, OnePlus 8, Oppo A9 2020, Oppo Reno2 F, Oppo A5 2020, Oppo Reno2, Oppo Realme 2 Pro (RMX1801), Oppo Reno2 Z, Oppo Reno 10x Zoom, Oppo A31, Oppo Find X2 Pro, Oppo Find X2, Oppo Realme 2 Pro (RMX1807), Oppo Realme 2, Oppo K3, Oppo Reno A, Oppo Realme 5i, Oppo Realme XT, Oppo Realme X2 Pro, Oppo Realme C3, Oppo Realme 6, Oppo Realme 6 Pro, Oppo Realme 5s, Oppo Realme X50 Pro 5G, Vivo Y15, Vivo Y11, Vivo Y19, Vivo IQOO, Vivo S1 Pro, Vivo V17, Vivo Y81i, Vivo V17 Pro, Vivo Y83, Apple iPhone SE2, Nokia 6.2, Nokia 7.2, Nokia 8.1, Nokia 3.1 Plus, Nokia 7.1, Google Pixel 4, Google Pixel 4a, Google Pixel 4 XL, Google Pixel 4a 5G, Infinix Hot 8, LG K11+, LG K40, LG V60 ThinQ 5G, LG Q60, LG Aristo 2, LG G8s ThinQ, LG Stylo 5, LG G8 ThinQ, Sony Xperia 5, Sony Xperia XZ3, Motorola One Action, Motorola Moto G7, Motorola Moto G8 Plus, Motorola Moto E6 Plus, Motorola Moto E5 Play, Motorola Moto G8 Play, Motorola One Zoom, Motorola One Macro, Motorola Moto E5, Crosscall Trekker X4, Allview X4 Soul Lite, Umidigi A5 Pro, Xiaomi Black Shark 2, Apple iPhone 12 Mini, Apple iPhone 12, Apple iPhone 12 Pro, Apple iPhone 12 Pro Max, Samsung Galaxy A51, Samsung Galaxy A51 5G, Samsung Galaxy Note 20 Ultra 5G, Samsung Galaxy Note 20 5G, Samsung Galaxy S20 FE 5G, Samsung Galaxy A21s, Samsung Galaxy A11, Samsung Galaxy A31, Samsung Galaxy A71 5G, Samsung Galaxy Z Fold 2, Samsung Galaxy Fold, Samsung Galaxy Fold 5G, Samsung Galaxy A01, Samsung Galaxy M21, Samsung Galaxy Xcover Pro, Samsung Galaxy Note 20 Ultra, Samsung Galaxy A41, Samsung Galaxy M11, Samsung Galaxy Note 20, Xiaomi Redmi Note 9 Pro, Xiaomi Redmi Note 9 Pro Max, Xiaomi 9A/9AT, Xiaomi Mi 10 Lite, Xiaomi Redmi Note 9, Xiaomi Mi 10T Pro, Xiaomi Poco F2 Pro, Xiaomi Redmi 9, Xiaomi Poco X3 NFC, Xiaomi Mi Note 10 Lite, Xiaomi Redmi 8A Pro, Xiaomi Redmi K30 5G, Xiaomi Mi Play, Xiaomi Mi 10T Lite, Xiaomi Redmi K30 Pro, Xiaomi Redmi K30 Pro Zoom Edition, Oppo A53, Oppo A12, Oppo A92, Oppo Reno4 Pro 5G, Oppo Reno4, Oppo A72, Oppo Find X2 Neo, Oppo Find X2 Lite, Oppo Reno4 Z 5G, Huawei P40, Huawei Honor V10, Huawei P40 Lite 5G, Huawei P40 Lite, Huawei P Smart 2020, Huawei Y6p, OnePlus Nord, OnePlus 8T, OnePlus Nord N10, Motorola Moto G 5G Plus, Motorola Moto G8 Power, Motorola Moto G8 Power Lite, Motorola One Hyper, Motorola Edge, Realme X50 5G, Realme C15, Realme C11, Realme 7 Pro, Google Pixel 5, Sony Xperia 1 II 5G, Sony Xperia 5 II 5G, Sony

Xperia XZs, LG K40s, LG V40 ThinQ, LG K50s, Vivo Y50, Vivo Y30, Vivo X50, Vivo V19, Vivo Y20i, Asus Zenfone Max M2, Asus Zenfone Live L1, Asus ROG Phone 3, Asus Zenfone Max M1, Apple iPad Pro 11" 2020 WiFi+Cell, Apple iPad Pro 12.9" 2020 WiFi+Cell, Apple iPad 10.2" 2019 WiFi+Cell, Apple iPad 10.2" 2020 WiFi+Cell, Apple iPad Air 4 WiFi+Cell, Samsung Galaxy S21 Ultra, Xiaomi Redmi Note 9T, Xiaomi Redmi Note 9 5G, Samsung Galaxy S21, Oppo A74 5G, Xiaomi Mi 11, Samsung Galaxy A42, Samsung Galaxy A32 5G, Xiaomi Redmi Note 10, Xiaomi Poco F3, Xiaomi Poco M3, Samsung Galaxy S21+, Realme 7 5G, Samsung Galaxy A52 5G, Samsung Galaxy A12, Samsung Galaxy S20 FE, Oppo Find X3 Lite, Xiaomi Redmi 9A, Lenovo Tab M8 (FHD), Motorola Moto G9 Play, ZTE Blade A5 2019, Huawei Nova 7, Xiaomi Redmi 9T, Huawei Mate 40 Pro, Motorola Moto G9 Plus, Samsung Galaxy M51, Xiaomi Redmi 9C, Motorola One Fusion, Xiaomi Redmi Note 10 5G, Vivo Y12s, Xiaomi Redmi Note 10 Pro, Xiaomi Poco X3 Pro, Oppo Find X3 Pro, OnePlus 9 Pro, Asus Zenfone 7, Realme X7 Pro 5G, Realme 7, Realme 6i, Realme 7i Asia, Oppo A15, Samsung Galaxy A02, Samsung Galaxy A02s, Infinix Note 8, LG K20, Realme C17, Motorola Moto E7 Plus, Vivo V20 Pro 5G, Nokia 8.3, LG K61, LG Q61, Realme C12, Lenovo Phab, Oppo Reno5, Infinix Note 7, Oppo A93, Samsung Galaxy Tab S7+, Realme X3 SuperZoom, Motorola Moto G9 Power, Itel P36 Pro, Xiaomi Poco X2, Motorola Moto G8, Vivo Y20 2021, LG Velvet 5G, Infinix Hot 9 Play, Huawei P Smart 2021, Xiaomi Black Shark 3, Oppo Reno5 Pro 5G, LG K41s, Samsung Galaxy A52, Realme C15 Qualcomm Edition, Realme 6 Pro, LG G8X ThinQ, Motorola One Fusion Plus, Sony Xperia 10 II, Crosscall Core X4, Umidigi Bison, Oppo Find X3 Neo, Apple iPad Pro 12.9" 2021 WiFi+Cell, Apple iPad Pro 11" 2021 WiFi+Cell, Apple iPad Pro 11" 2021 WiFi, Apple iPad Pro 12.9" 2021 WiFi, Apple iPhone 13, Apple iPhone 13 Pro, Apple iPhone 13 Mini, Apple iPhone 13 Pro Max, Xiaomi 11T, Xiaomi Mi 11 Lite, Oppo A54 5G, Samsung Galaxy A32, Vivo V21 5G, Xiaomi Poco M3 Pro 5G, Realme GT, Realme 8 5G, Samsung Galaxy Z Fold 3, Xiaomi Mi 11i, Oppo A54, Samsung Galaxy A52s, TECNO MOBILE LIMITED Spark Go 2020, Doogee X95, Infinix Hot 10, Oppo A15s, Samsung Galaxy Z Flip3, Asus ROG Phone 5, Xiaomi Redmi Note 10S, Xiaomi Mi 11 Lite 4G, Samsung Galaxy A72, Infinix Note 8i, Samsung Galaxy A22 5G, Motorola Moto G100, Itel A56, Vivo Y72 5G, Samsung Galaxy Tab S6 Lite, OnePlus Nord 2, Realme GT Master, Oppo Reno6 Pro 5G, Realme C21, Motorola Moto G30, Xiaomi Mi 11 Ultra, TECNO MOBILE LIMITED Spark 4, Oppo A73 5G, Xiaomi 11T Pro, Oppo A52, Oppo Realme 1, Oppo Reno4 5G, Infinix Hot 10 Play, Motorola Moto G 5G, Google Pixel 6 Pro, Google Pixel 6, ZTE Axon 30 Ultra, Xiaomi Redmi K20 Pro Premium, Oppo Reno6 5G, Oppo Reno6 Z 5G, Oppo Reno5 Z 5G, Samsung Galaxy A12s, OnePlus Nord CE, Xiaomi 11 Lite NE, Vivo Y52 5G, Realme 8 Pro, Realme 8, Xiaomi Poco X3 GT, Samsung Galaxy A22, Prestigio PC Driver PMT3201_4G, Realme C11 (2021), OnePlus 9, Sharp Aquos Sense, TECNO MOBILE LIMITED Spark 5 Pro, Motorola Moto G10, Realme X, Samsung Galaxy A03s, Oppo Reno5 Lite, Apple iPad mini 6, Samsung Galaxy S22 Ultra, Samsung Galaxy S21 FE, Realme GT Neo2, Motorola Moto G20, Motorola Moto G60, Xiaomi Poco M4 Pro 5G, Xiaomi Redmi 10, Oppo A16, Xiaomi Redmi K40, TECNO MOBILE LIMITED Pop 5, Xiaomi 12, Apple iPhone SE3, OnePlus Nord N100, Honor 50, Oppo F19(s), Infinix Hot 10 Lite, Infinix Smart 5, Vivo V20, LG Reflect, Samsung Galaxy S22+, Samsung Galaxy M12, Motorola Moto G 50 5G, Samsung Galaxy M62, Samsung Galaxy Tab S7, Huawei Y9a (Nova), Xiaomi Redmi Note 8 2021, Vivo Y21 2021, Motorola Edge 20 Pro, Oppo Find X5 Pro, Samsung Galaxy S22, Samsung Galaxy S21 4G, Xiaomi Mi 10T, Xiaomi Mi 9T, General Mobile GM 8, Blackview A80 Plus, Vestel Venus V4, Xiaomi Redmi Note 11 Pro 5G, Samsung Galaxy A53, Xiaomi Poco X4 Pro, Xiaomi Redmi Note 11, Realme 9 Pro+, Oukitel WP15, OnePlus 10 Pro, Vivo V23e, Samsung Galaxy M22, Motorola Moto E6s, Motorola Moto E7, Samsung Galaxy Tab S7 FE, Xiaomi 12 Pro, Samsung Galaxy Tab A7 Lite LTE, Oppo A94 LTE, Samsung Galaxy M32 LTE, Realme GT2 Pro, Infinix Note 11s

5.2.2 5G compatible devices

Huawei Mate 20 X 5G, Xiaomi Mi Mix 3 5G, Samsung Galaxy S10 5G, OnePlus 7 Pro 5G, ZTE Axon 10 Pro 5G, Samsung Galaxy Note 10+ 5G, LG V50 ThinQ 5G, Huawei Mate 30 Pro 5G, Huawei P40 Pro, Huawei P40 Pro+, Huawei Mate 30 5G, Samsung Galaxy S20 Ultra 5G, Samsung Galaxy S20+ 5G, Samsung Galaxy A90, Samsung Galaxy S20 5G, ZTE Axon 10s Pro 5G, Xiaomi Mi 10 Pro, Xiaomi Mi 10, OnePlus 8 Pro, OnePlus 8, Oppo Find X2 Pro, Oppo Find X2, Oppo Realme X50 Pro 5G, Google Pixel 4a 5G, LG V60 ThinQ 5G, Apple iPhone 12 Mini, Apple iPhone 12, Apple iPhone 12 Pro, Apple iPhone 12 Pro Max, Samsung Galaxy A51 5G, Samsung Galaxy Note 20 Ultra 5G, Samsung Galaxy Note 20 5G, Samsung Galaxy S20 FE 5G, Samsung Galaxy A71 5G, Samsung Galaxy Z Fold 2, Samsung Galaxy Fold 5G, Xiaomi Mi 10 Lite, Xiaomi Mi 10T Pro, Xiaomi Poco F2 Pro, Xiaomi Redmi K30 5G, Xiaomi Mi 10T Lite, Xiaomi Redmi K30 Pro, Xiaomi Redmi K30 Pro Zoom Edition, Oppo Reno4 Pro 5G, Oppo Find X2 Neo, Oppo Find X2 Lite, Oppo Reno4 Z 5G, Huawei P40, Huawei P40 Lite 5G, OnePlus Nord, OnePlus 8T, OnePlus Nord N10, Motorola Moto G 5G Plus, Motorola Edge, Realme X50 5G, Google Pixel 5, Sony Xperia 1 II 5G, Sony Xperia 5 II 5G, Vivo X50, Asus ROG Phone 3, Samsung Galaxy S21 Ultra, Xiaomi Redmi Note 9T, Xiaomi Redmi Note 9 5G, Samsung Galaxy S21, Oppo A74 5G, Xiaomi Mi 11, Samsung Galaxy A42, Samsung Galaxy A32 5G, Xiaomi Redmi Note 10, Xiaomi Poco F3, Samsung Galaxy S21+, Realme 7 5G, Samsung Galaxy A52 5G, Samsung Galaxy A12, Oppo Find X3 Lite, Huawei Nova 7, Huawei Mate 40 Pro, Xiaomi Redmi Note 10 5G, Oppo Find X3 Pro, OnePlus 9 Pro, Asus Zenfone 7, Realme X7 Pro 5G, Vivo V20 Pro 5G, Nokia 8.3, Samsung Galaxy Tab S7+, LG Velvet 5G, Xiaomi Black Shark 3, Oppo Reno5 Pro 5G, Oppo Find X3 Neo, Apple iPad Pro 12.9" 2021 WiFi+Cell, Apple iPad Pro 11" 2021 WiFi+Cell, Apple iPad Pro 11" 2021 WiFi, Apple iPad Pro 12.9" 2021 WiFi, Apple iPhone 13, Apple iPhone 13 Pro, Apple iPhone 13 Mini, Apple iPhone 13 Pro Max, Xiaomi 11T, Xiaomi Mi 11 Lite, Oppo A54 5G, Samsung Galaxy A32, Vivo V21 5G, Xiaomi Poco M3 Pro 5G, Realme GT, Realme 8 5G, Samsung Galaxy Z Fold 3, Xiaomi Mi 11i, Samsung Galaxy A52s, Samsung Galaxy Z Flip3, Asus ROG Phone 5, Samsung Galaxy A22 5G, Motorola Moto G100, Vivo Y72 5G, OnePlus Nord 2, Realme GT Master, Oppo Reno6 Pro 5G, Xiaomi Mi 11 Ultra, Oppo A73 5G, Xiaomi 11T Pro, Oppo Reno4 5G, Motorola Moto G 5G, Google Pixel 6 Pro, Google Pixel 6, ZTE Axon 30 Ultra, Oppo Reno6 5G, Oppo Reno6 Z 5G, Oppo Reno5 Z 5G, OnePlus Nord CE, Xiaomi 11 Lite NE, Vivo Y52 5G, Xiaomi Poco X3 GT, OnePlus 9, Apple iPad mini 6, Samsung Galaxy S22 Ultra, Samsung Galaxy S21 FE, Realme GT Neo2, Xiaomi Poco M4 Pro 5G, Xiaomi Redmi K40, Xiaomi 12, Apple iPhone SE3, Honor 50, Samsung Galaxy S22+, Motorola Moto G 50 5G, Motorola Edge 20 Pro, Oppo Find X5 Pro, Samsung Galaxy S22, Xiaomi Mi 10T, Xiaomi Redmi Note 11 Pro 5G, Samsung Galaxy A53, Xiaomi Poco X4 Pro, Realme 9 Pro+, Oukitel WP15, OnePlus 10 Pro, Vivo V23e, Samsung Galaxy Tab S7 FE, Xiaomi 12 Pro, Realme GT2 Pro