

**5G in the UK:**

Improving the end-user  
experience and growing our  
connected communities



All four major UK operators have launched 5G, and it's fast—much faster than 4G LTE. While 5G will eventually empower applications that hold the potential to transform everyday life, from remote surgery to driverless cars and more, those changes won't happen overnight. The good news, however, is that we're seeing great progress in major UK cities as seamless connectivity becomes a fundamental part of the end-user's daily experience, with impressive results on 5G that should only improve as 5G continues to expand and mature across the UK.

The fast speeds, improved latency, and greater capacity of 5G will serve as the backbone of our connected communities and spur exciting new use cases that will have a transformative effect on the end-user mobile experience. Read on to see how the operators' 5G networks performed across the 16 most populated metropolitan markets in the UK in the first half of 2020.

Note that with all four major UK operators now having deployed 5G, 1H 2020 marks the first test period in which we've used 5G-enabled devices to measure performance on both 4G LTE and 5G.



# 5G and spectrum

In a word, 5G can be complicated. There is no one-size-fits-all 5G solution, and the end-user 5G experience can vary a great deal depending on what type of spectrum operators use for deployments. In the context of 5G, higher band spectrum above 6 GHz is considered millimeter wave (mmWave), while spectrum at 6 GHz or below can be separated into “low-band” or “mid-band” spectrum. It’s worth noting that low-and mid-band spectrum is also used for 4G LTE networks and isn’t intended solely for 5G, whereas mmWave was developed specifically for 5G.

While differences in spectrum can have a significant impact on a user’s real-world 5G experience, all four operators in the UK utilise mid-band spectrum for 5G, which is often considered a spectrum “sweet spot,” offering both fast speeds and broad geographic coverage.

There are two key considerations when it comes to spectrum:



**Speed performance**



**Geographical coverage**



## **Low-band spectrum 5G (under 1 GHz):**

Low-band spectrum can cover long distances and penetrate deep within buildings and other structures, but it doesn’t have the capability to provide high-end speeds as fast as those of mid-band or, especially, mmWave spectrum. In short, low-band 5G could help reach rural areas, but its speeds will likely be closer to what you’re used to with 4G LTE rather than the blistering speeds 5G can deliver on other types of spectrum.

## **Mid-band spectrum 5G (1 GHz – 6 GHz): Spectrum used by EE, O2, Three, and Vodafone**

Mid-band spectrum, which is also used for 4G LTE networks, is often considered the most desirable type of spectrum for 5G. It carries the advantages of both low-band and mmWave spectrum, with not only fast speeds but also broad geographic coverage. Mid-band spectrum also provides additional capacity in areas with heavy congestion such as event venues, busy city centres, and other areas where finding strong mobile service can be a problem. All four UK operators are currently using mid-band spectrum (3.3 to 3.8 GHz) for 5G.

## **High-band/mmWave spectrum 5G (6 GHz+)**

The primary benefit of mmWave spectrum is that it’s fast. It offers the potential to deliver speeds theoretically as high as 5.0 Gbps or better and can provide broadband connectivity to busy office buildings and other densely populated areas of cities much more easily (and cost effectively) than wired broadband. However, the downside to mmWave is that signals don’t travel more than about one city block and can be obstructed by architecture and other physical objects—including a user’s hand—relatively easily.

# Benchmarking what matters most

To provide a holistic view of each network's real-world 5G performance, we've included visuals showing 5G availability and speed results along with key insights for the end-user 5G experience. We've also taken a look at how consistently the operators delivered download speeds across all network technologies to show the speeds end users are likely to experience on each operator's network. Taken together, this complementary information provides a full picture of the current end-user experience on 5G.



## 5G median and maximum download speeds

End-users won't always access a 5G network as they move through a city, so we've removed all non-5G (4G LTE) test results to show what to expect when 5G is available. 5G median download speeds offer a look at "everyday" 5G performance, while 5G maximum download speeds show what topline performance might be and highlight the potential of an operator's 5G network.



## Speed consistency across all network technologies

At the end of the day, consistency of speed performance has the most impact on the end-user experience. Our speed intervals bring together test results across all network technologies (4G LTE, any sub-4G technologies, and 5G where available) to show how many cities in which each operator reached or surpassed various median download speed thresholds across the 16 most populated cities in the UK.



## Latency

Latency refers to the response time (or delay) between a user request and an action being taken by a simple function, application, or machine. The latency metrics in this report are from our web and app latency testing, which characterise use cases that require continuous data usage such as gaming, streaming videos, and AR/VR applications, among others. The lower the latency, the better the end-user experience.



## 5G at a high level in the UK:

EE leads the way with consistently fast speeds and the highest 5G availability.

**All four operators register outstanding reliability:** During our web and app testing, we consider success rates of 97% or better for getting connected to the network and/or staying connected to the network as “Excellent” reliability, and all four operators met that mark in nearly every city we tested on both 5G and non-5G. Even better news is that reliability should only get better as 5G continues to expand.

**EE offers the best combination of fast 5G speeds and broad 5G availability:** The only operator with 5G in all 16 cities tested, EE’s 5G median download speeds were consistently fast—and much faster than those recorded on 4G LTE. EE’s 5G availability was also broad relative to other operators. Indeed, EE had the highest 5G availability in each of the 16 markets we tested. EE’s 5G latency was also generally low across the board, though it’s worth noting that EE’s latency on 5G was relatively similar to its latency on 4G LTE.

**O2 provides strong 5G maximum download speeds but low 5G availability:** O2’s 5G availability was the lowest among all networks, and we were only able to collect enough test samples to accurately characterise O2’s 5G median download speed in one city (Belfast, at 121.3 Mbps). That said, O2 registered strong maximum download speeds on 5G in two cities (Belfast and Edinburgh), suggesting that O2’s 5G has good potential. O2 also recorded generally low latency on 4G LTE, and the good news is that we expect O2’s 5G service to expand across the UK in the near future.

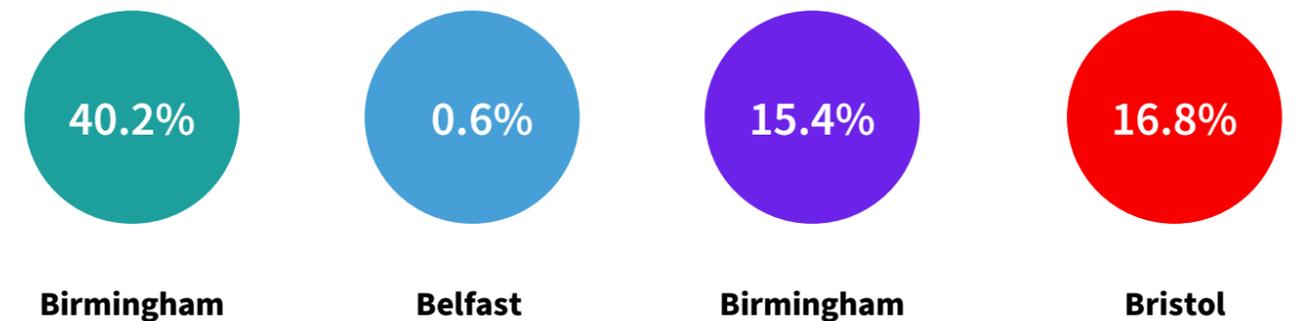
**Three shows impressive 5G speeds but limited availability:** Three earned distinction for clocking the single fastest 5G median and maximum download speeds among all operators during testing. However, Three’s 5G availability was generally low in most of the operator’s 11 cities with 5G, so there is room for improvement. Three’s latency on both 5G and 4G LTE was relatively low.

**Vodafone’s 5G was consistently fast, but availability has room to grow:** Vodafone’s 5G speeds were excellent—and consistent—in most markets, but the operator’s 5G availability has room to improve across the 10 cities in which it offered 5G. Vodafone’s latency on both 5G and 4G LTE was low in most markets, though similar to what we observed with EE, Vodafone’s latency was relatively consistent with that on 4G LTE.

## Top-end 5G results for each operator

To provide a look at each operator’s top 5G performance metrics, the following visuals show each network’s highest 5G availability, fastest 5G median download speed, and fastest 5G maximum download speed across the 16 cities we tested. For more detailed results and insights, see the operator-by-operator breakdown of 5G performance in the section below.

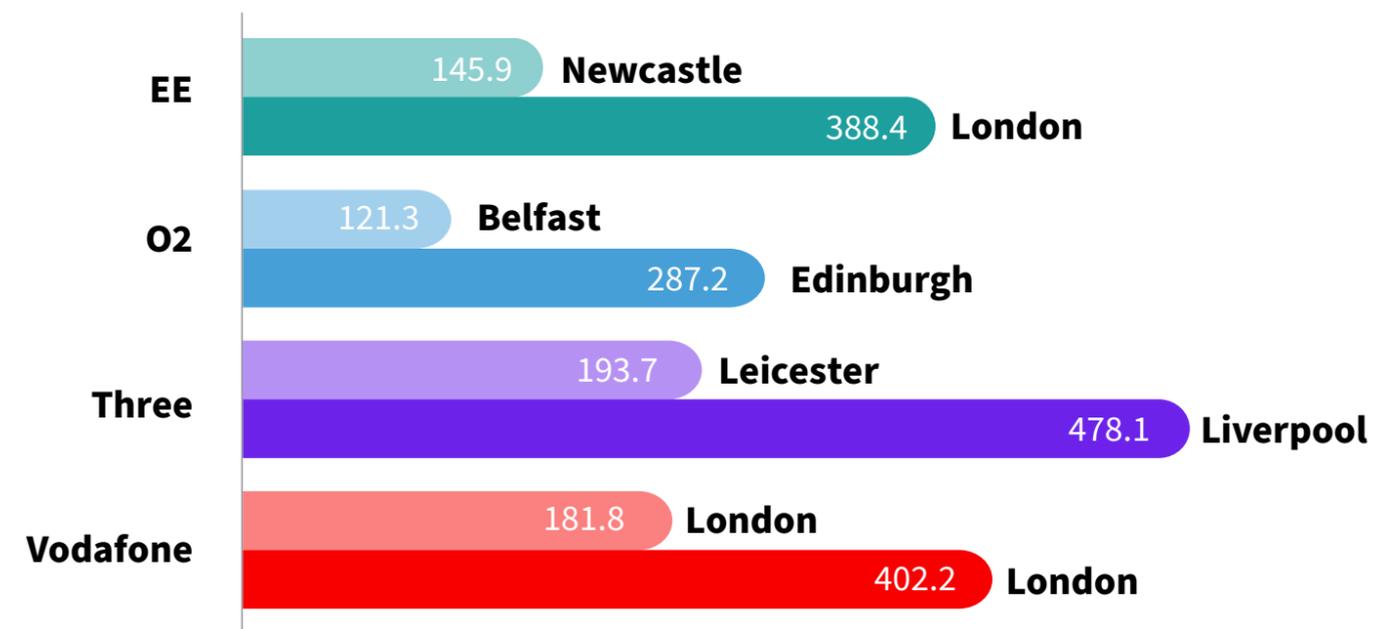
### City with each operator's highest 5G availability (%)



Note: 5G availability is based on the percentage of tests recorded on 5G across all data tests (download, upload, and web and app tests).

● EE ● O2 ● Three ● Vodafone

### Fastest 5G median & maximum download speeds (Mbps) by operator



● 5G median download speeds ● 5G maximum download speeds

## Operator performance highlights

5G offers incredibly fast speeds,  
but 5G availability is still growing in the UK



# EE delivers fast 5G speeds, generally broad 5G availability, and consistently low latency.

## 5G speed and availability performance

EE's 5G was fast in all 16 cities, and the operator registered the best 5G availability in our testing. EE's "slowest" 5G median download speed of 103.9 Mbps was recorded in Nottingham and its fastest 5G speed of 145.9 Mbps was found in Newcastle. EE's 5G median download speeds were markedly faster than its speeds on 4G LTE, with EE's fastest 4G LTE median download speed coming in at 50.5 Mbps in Manchester. EE also recorded the highest 5G availability among all operators in each of the 16 markets we tested. What's more, EE's highest 5G availability of 40.1% in Birmingham was over twice as high as the highest 5G availability of any other operator (Vodafone's 16.8% in Bristol).

## The big picture: speeds across all network technologies

Since end users won't access 5G all the time, looking at EE's median download speeds across all network technologies at the speed interval table on the right shows the most accurate picture of the end-user's real-world speed experience. The consistency with which EE delivered fast speeds was unmatched: EE was the only operator that registered median download speeds above 30 Mbps in all 16 markets, and EE clocked speeds above 50 Mbps in half of those cities. In short, even if users can't consistently access 5G in a given location, their speeds should still be fast, and in 14 of the 16 cities we tested, EE's speeds were faster than those of the other operators.

## A look at latency and the bottom line

EE recorded generally low 5G (and 4G LTE) latency in all 16 cities. EE's median web and app latency on 5G ranged from 37.0ms in Birmingham to 55.8ms in Edinburgh. However, it's worth noting that, with some exceptions, EE's 5G latency was relatively similar to that on 4G LTE. The bottom line is that EE's combination of fast 5G speeds, broad 5G availability, and low latency was second to none. Looking ahead, the operator's impressive 5G maximum download speeds point to a promising future for the operator's 5G experience as we move further into 2020 and beyond.



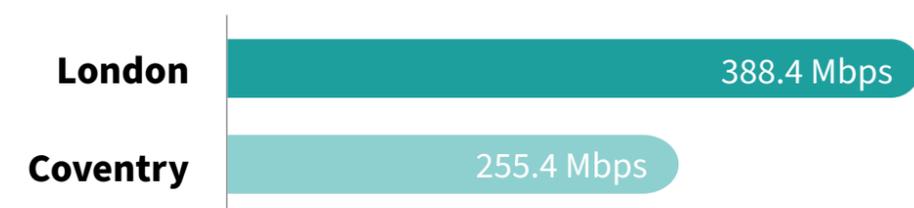
### EE's median download speed intervals (all network technologies)

Median download speed intervals	0-10 Mbps	10-20 Mbps	20-30 Mbps	30-40 Mbps	40-50 Mbps	50+ Mbps
2H 2019	0	0	0	5	9	2
1H 2020	0	0	0	3	5	8

- Number of markets out of 16 in which EE delivered median download speeds at various intervals.  
 - Median download speeds from 1H 2020 represent speeds on all network technologies, including 5G, where available.  
 - Speeds from 2H 2019 did not include 5G results.



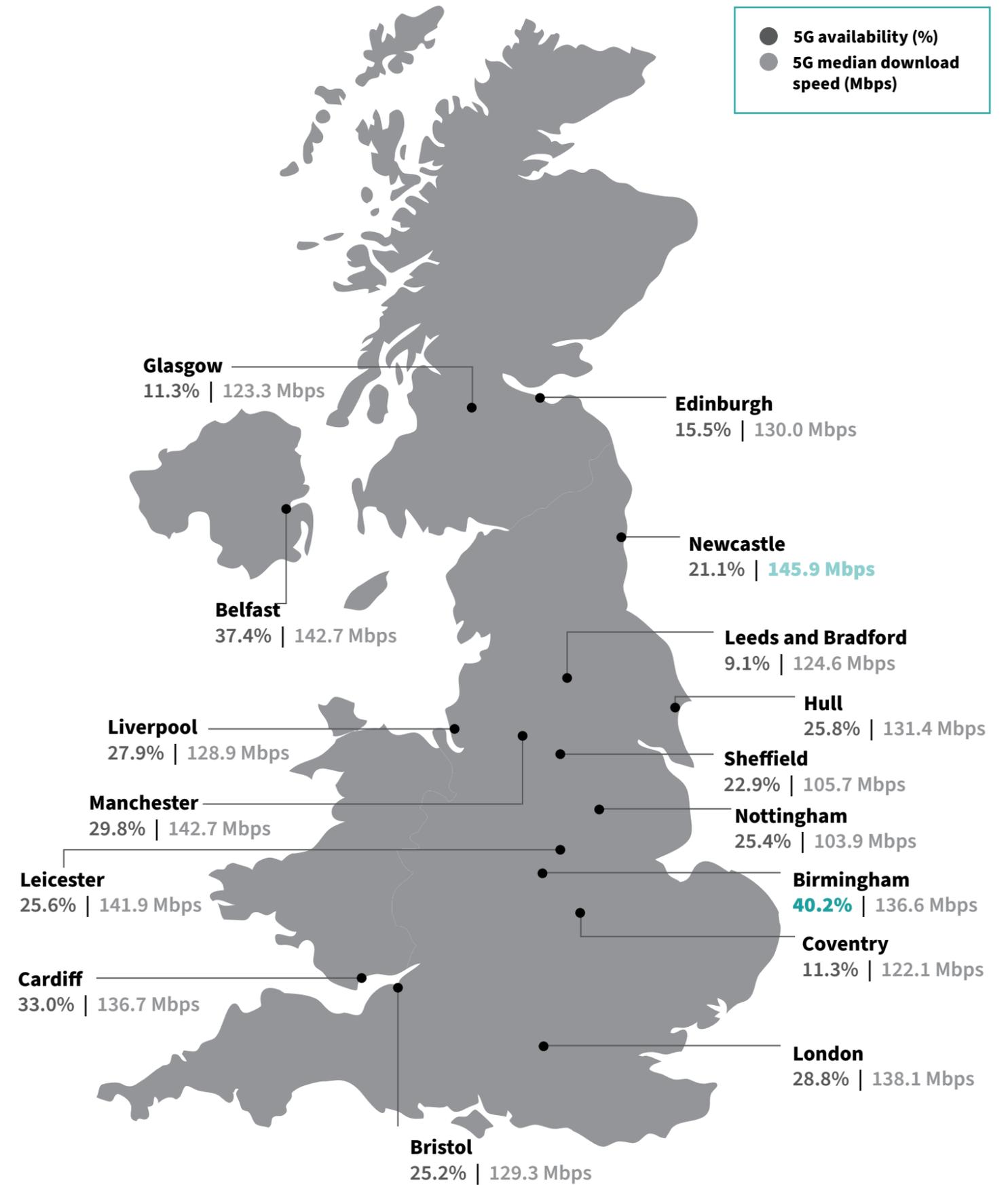
### EE's fastest and slowest 5G maximum download speeds



● Fastest ● Slowest



# EE's map of 5G median download speeds and 5G availability (16 cities)



Note:  
- 5G availability is based on the percentage of tests recorded on 5G across all data tests (download, upload, and web and app tests).  
- Highlighted figures represent the fastest 5G median download speed and highest 5G availability.

# O2's 5G availability was limited, but the operator's 5G maximum speeds show strong potential.

## 5G speed and availability performance

We were able to connect to O2's 5G network in four cities, the fewest number of cities among all operators, and O2's highest 5G availability was just 0.6% in Belfast. While we could only collect enough test samples to accurately characterise the operator's 5G median download speed in one city, (121.3 Mbps in Belfast), O2's 5G speed in that city was impressive: it was nearly six times faster than its 4G LTE median download speed of 21.5 Mbps in the same city.

While O2's 5G availability was certainly limited, we saw positive signs for the operator's 5G. O2's 5G maximum download speeds in Belfast and Edinburgh of 249.1 Mbps and 287.2 Mbps, respectively, were much faster than its maximum download speeds on 4G LTE and demonstrate strong potential for O2's 5G going forward.

## The big picture: speeds across all network technologies

O2's median download speeds across all network technologies were primarily in the 10-20 and 20-30 Mbps ranges. Keep in mind that speeds on the table on the right are across all network technologies, so as O2's 5G availability grows, the operator's speeds in general should also increase. We're eager to test O2's 5G as it continues to expand.

## A look at latency and the bottom line

O2's strong 5G maximum download speeds and fast 5G median download speed in Belfast suggest good things are in store for O2's 5G service in the future. O2 also registered generally low latency on 4G LTE in most cities, with median web and app latency ranging from 44.0ms in London to 57.0ms in Belfast. The bottom line is that until O2's 5G service expands, end users will find decent but not spectacular speeds, and we expect to see much broader 5G availability and fast 5G speeds from O2 going forward.



## O2's median download speed intervals (all network technologies)

Median download speed intervals	0-10 Mbps	10-20 Mbps	20-30 Mbps	30-40 Mbps	40-50 Mbps	50+ Mbps
2H 2019	2	9	4	1	0	0
1H 2020	1	10	5	0	0	0

- Number of markets out of 16 in which O2 delivered median download speeds at various intervals.  
 - Median download speeds from 1H 2020 represent speeds on all network technologies, including 5G, where available.  
 - Speeds from 2H 2019 did not include 5G results.



## O2's fastest and slowest 5G maximum download speeds

**Edinburgh** 287.2 Mbps

**Newcastle** 40.7 Mbps

● Fastest ● Slowest



# O2's map of 5G median download speeds and 5G availability (one city)

We were only able to collect enough 5G test samples to accurately characterise O2's 5G median download speed in one city.



Note:  
- 5G availability is based on the percentage of tests recorded on 5G across all data tests (download, upload, and web and app tests).  
- Highlighted figures represent the fastest 5G median download speed and highest 5G availability.

# Three shows impressive 5G speeds, but availability was generally limited.

## 5G speed and availability performance

Three's 5G speeds were fast across the board, with 5G median download speeds above 100 Mbps in 8 of the 11 cities in which the operator offered 5G at the time of our testing. In fact, Three clocked the single fastest 5G median download speed among all operators at 193.7 Mbps in Leicester, while also registering the fastest 5G maximum download speed at 478.1 Mbps in Liverpool. Three's 5G speeds were also much faster than its speeds on 4G LTE: Three's "slowest" 5G median download speed of 62.5 Mbps in Edinburgh was about three times faster than its fastest 4G LTE median download speed across all 16 UK cities (21.0 Mbps in Manchester). That said, the operator's 5G availability was lower than what we saw from EE, with Three's highest 5G availability coming in at 15.4% in Birmingham.

## The big picture: speeds across all network technologies

Three's median download speeds across all network technologies were similar to what we found in the second half of 2019, with the vast majority of its speeds in the 10-20 Mbps range. Three did show modest improvement in 1H 2020, registering speeds above 20 Mbps in two more cities than it did in our previous test period. Three also improved at the lower end of the spectrum in the first half of 2020, with the operator not registering any speeds below 10 Mbps in our most recent testing. As Three's 5G continues to expand and its availability grows, the operator's speeds in general should improve.

## A look at latency and the bottom line

Three's latency metrics were strong, with generally low latency on both 5G and 4G LTE. Three's lowest median 5G latency was 23.0ms in London, while its highest 5G latency was 79.8ms in Edinburgh. Similar to what we've observed with other operators, however, Three's 5G latency was relatively similar to that on 4G LTE. The bottom line is that while accessing Three's 5G could prove challenging, the good news is that the Three holds impressive spectrum assets, the operator's 5G is already fast, and we should see broader 5G availability in the near future.



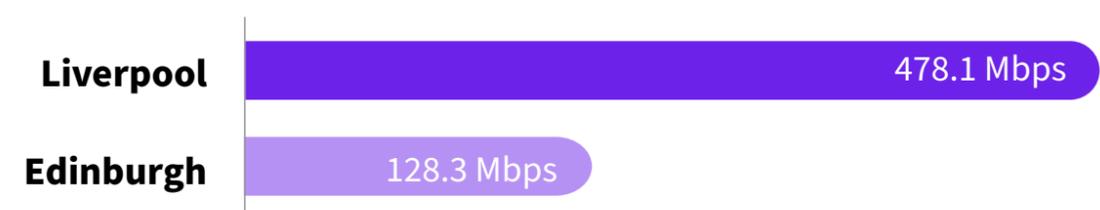
## Three's median download speed intervals (all network technologies)

Median download speed intervals	0-10 Mbps	10-20 Mbps	20-30 Mbps	30-40 Mbps	40-50 Mbps	50+ Mbps
2H 2019	1	15	0	0	0	0
1H 2020	0	14	2	0	0	0

- Number of markets out of 16 in which Three delivered median download speeds at various intervals.  
 - Median download speeds from 1H 2020 represent speeds on all network technologies, including 5G, where available.  
 - Speeds from 2H 2019 did not include 5G results.



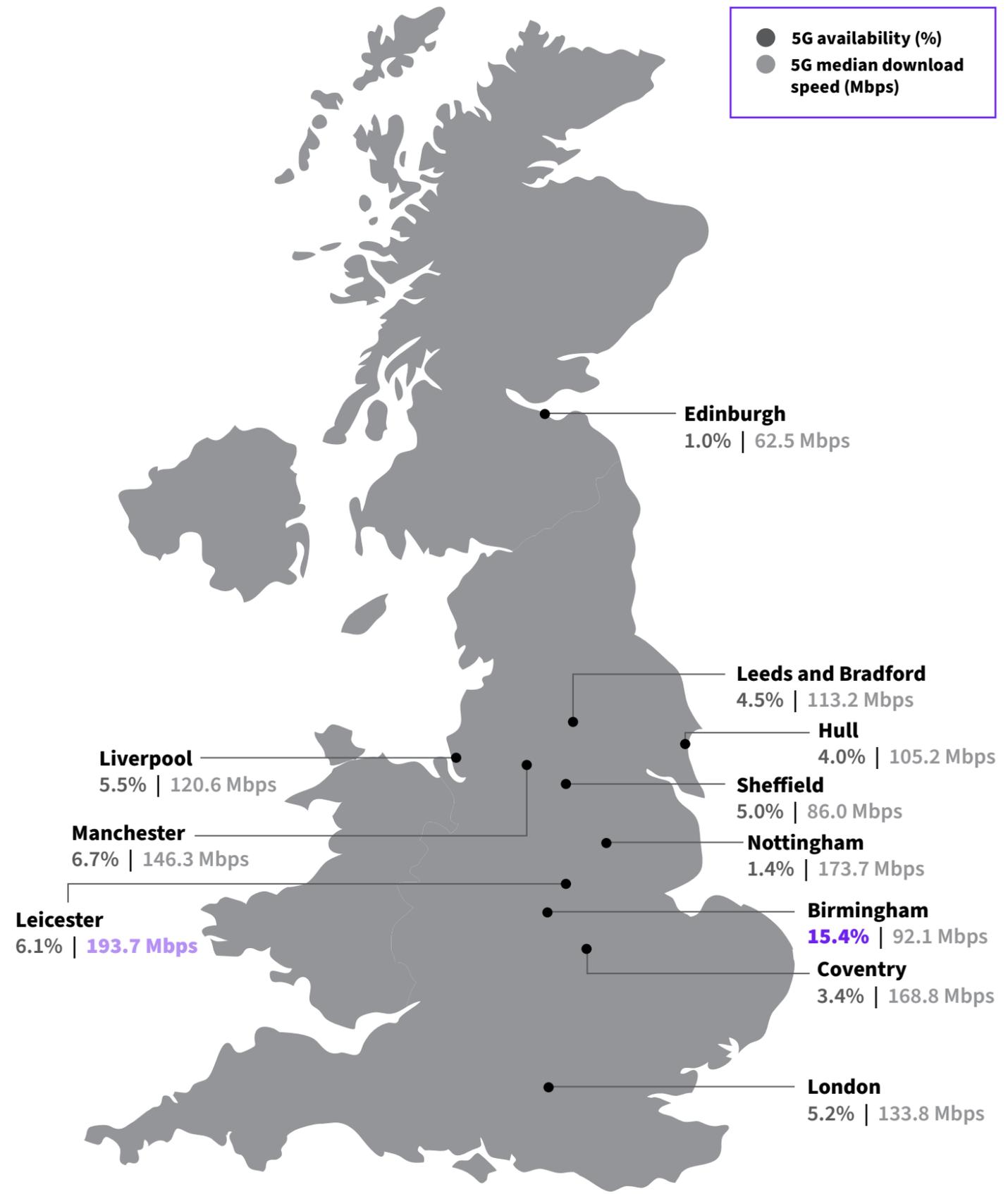
## Three's fastest and slowest 5G maximum download speeds



● Fastest ● Slowest



# Three's map of 5G median download speeds and 5G availability (11 cities)



Note:  
- 5G availability is based on the percentage of tests recorded on 5G across all data tests (download, upload, and web and app tests).  
- Highlighted figures represent the fastest 5G median download speed and highest 5G availability.

# Vodafone provides consistently fast 5G speeds, but availability shows room for improvement.

## 5G speed and availability performance

Vodafone offered 5G in 10 of the 16 cities we tested, and its 5G median download speeds were outstanding and significantly faster than its speeds on 4G LTE in most markets. Vodafone clocked 5G median download speeds of at least 112.4 Mbps in 9 of its 10 5G cities, and Vodafone's 5G was particularly fast in London: the operator's 5G median download speed of 181.8 Mbps was the fastest among all operators in the UK's capital city, and Vodafone's 5G maximum download speed of 402.2 trailed only that of Three in London. While Vodafone's 5G is certainly fast—and much faster than its non-5G network—availability is still growing and trails what we recorded for EE. Vodafone recorded 5G availability over 10% in three cities, with its highest 5G availability of 16.8% in Bristol.

## The big picture: speeds across all network technologies

When looking at speeds on all network technologies, Vodafone was one of two operators that delivered median download speeds faster than 50 Mbps in at least one city. In other good news, since the second half of 2019, Vodafone increased the number of cities in which it recorded speeds between 40-50 Mbps. On the other hand, we recorded median download speeds below 20 Mbps on Vodafone's network in eight cities. Overall, the operator's speeds should become faster and more consistent as Vodafone's 5G rollout continues.

## A look at latency and the bottom line

One of the first operators in the UK to launch 5G, Vodafone's latency was generally good on both 5G and 4G LTE. Vodafone's 5G median latency ranged from a low of 19.0ms in Bristol to a high of 104.5ms in Manchester. Vodafone's 5G latency in Bristol was the lowest of any operator in any city. Conversely, the operator's 5G latency in Manchester was the highest among all networks. That said, Vodafone delivered strong latency results in general, and its latency metrics should only improve as its 5G continues to mature. The bottom line is that with generally low latency and impressive 5G median and maximum download speeds, Vodafone's 5G is poised for good things ahead.



## Vodafone's median download speed intervals (all network technologies)

Median download speed intervals	0-10 Mbps	10-20 Mbps	20-30 Mbps	30-40 Mbps	40-50 Mbps	50+ Mbps
2H 2019	0	7	3	4	2	0
1H 2020	0	8	2	1	4	1

- Number of markets out of 16 in which Vodafone delivered median download speeds at various intervals.  
 - Median download speeds from 1H 2020 represent speeds on all network technologies, including 5G, where available.  
 - Speeds from 2H 2019 did not include 5G results.



## Vodafone's fastest and slowest 5G maximum download speeds

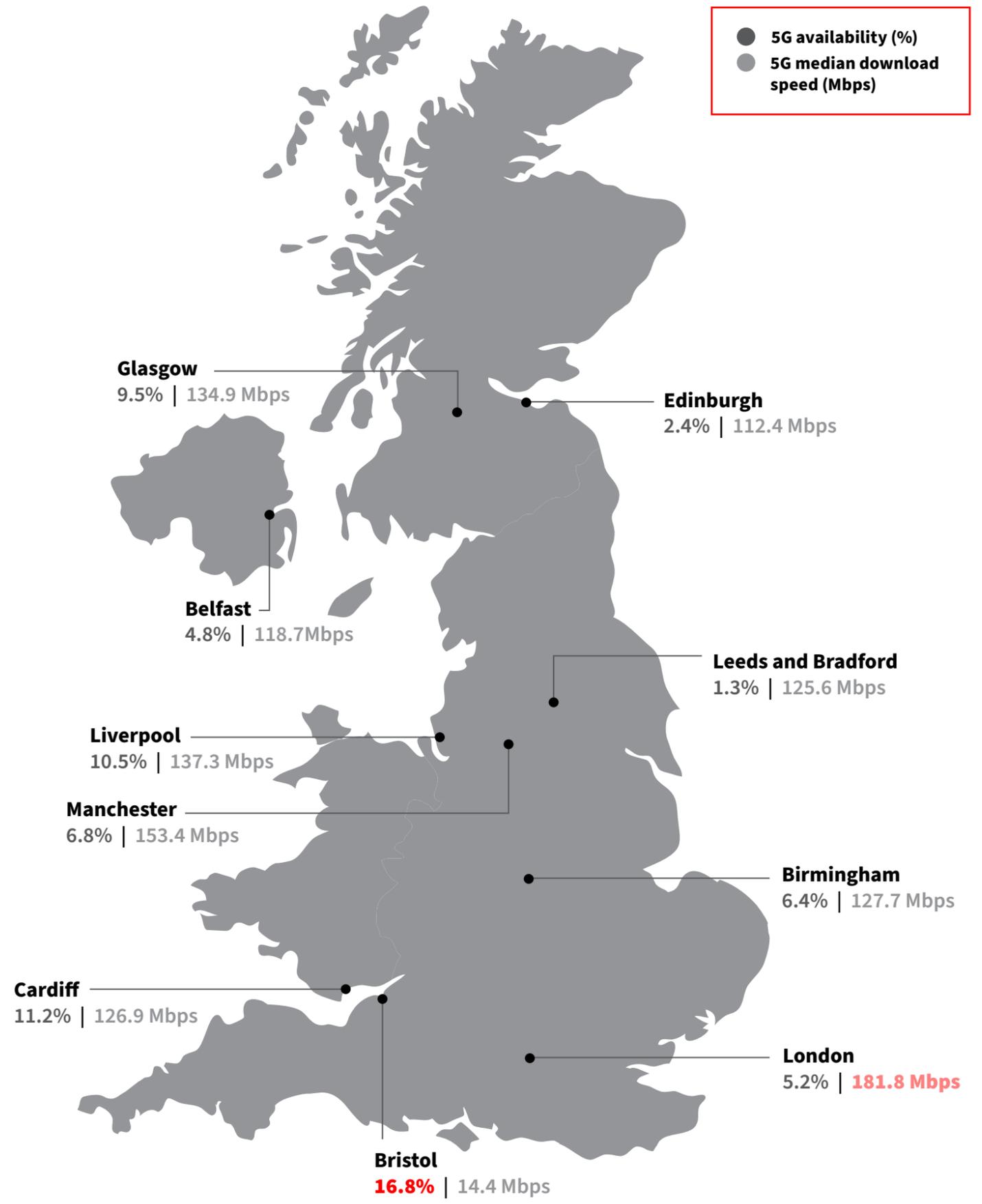
**London** 402.2 Mbps

**Belfast** 163.7 Mbps

● Fastest ● Slowest



Vodafone's map of 5G median download speeds and 5G availability (10 cities)



Note:  
- 5G availability is based on the percentage of tests recorded on 5G across all data tests (download, upload, and web and app tests).  
- Highlighted figures represent the fastest 5G median download speed and highest 5G availability.

## 5G in London:

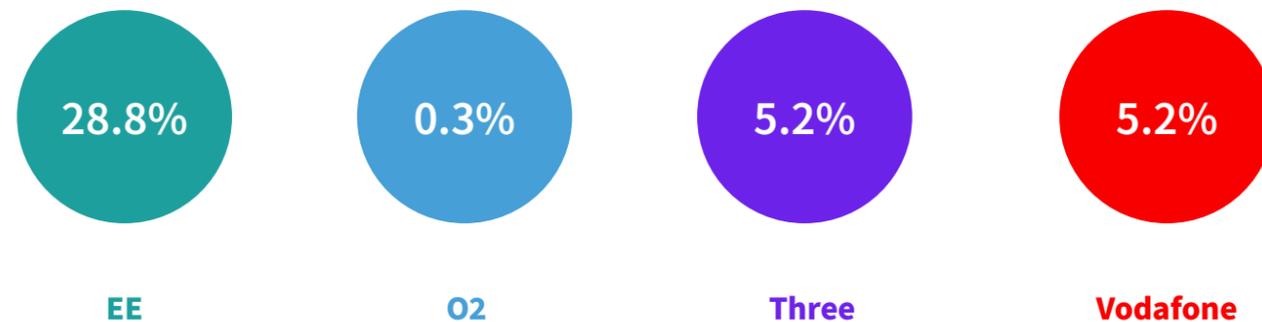
# a look at 5G results in the UK's biggest city

London is one of the world's largest and busiest cities, and seamless connectivity is paramount for residents and visitors alike. The good news is that 5G has arrived and we've seen impressive speeds in the UK's most populated city.

Take a look at the charts to see each operator's 5G availability in London, as well as each operator's median and maximum download speeds on both 5G and 4G LTE. Median download speeds represent typical, everyday speeds, while maximum speeds show the potential of an operator's 5G network.

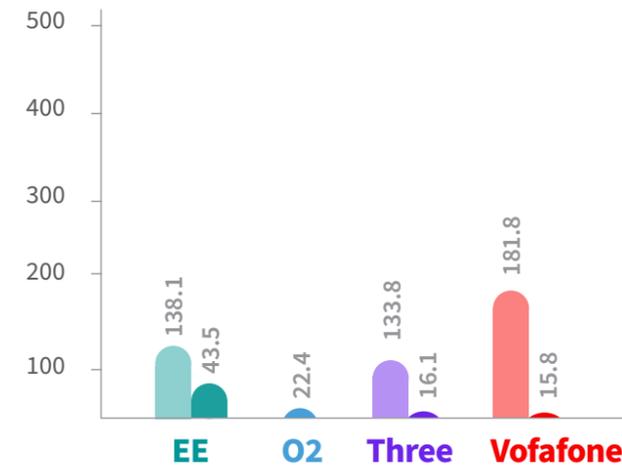
To put the speeds of 5G in perspective, we've compared 5G median and maximum download speeds to those purely on 4G LTE, rather than speeds recorded across all network technologies.

### London 5G availability (%)



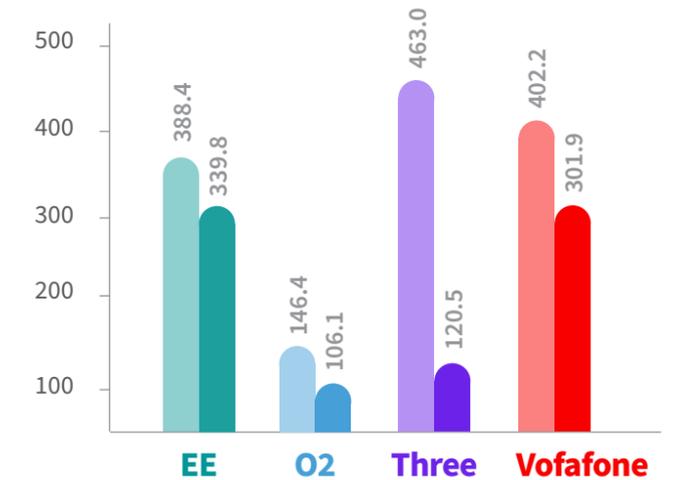
Note: 5G availability is based on the percentage of 5G recorded across all data tests (download, upload, and web and app tests).

### London 5G & 4G LTE median download speeds (Mbps)



Note: We didn't collect enough test samples to accurately characterise O2's 5G median download speed in London.

### London 5G & 4G LTE maximum download speeds (Mbps)



### London 5G, in short

**5G much faster than 4G LTE in London:** EE, Three, and Vodafone all registered incredibly fast 5G median download speeds in excess of 133 Mbps, and each operator's 5G median download speed was at least three times faster than its speed on 4G LTE. Vodafone's 5G median download speed was over 11 times faster than that on 4G LTE.

**Limited 5G availability in London, but EE stands out:** EE offered generally broad 5G availability in London at 28.8%, but EE was the exception. In fact, EE's 5G availability was over five times greater than that of either Three or Vodafone, with both operators registering relatively low 5G availability of 5.2%. That said, the good news is that the operators' speeds on 4G LTE were generally good, so even if users can't access 5G in London, they should still experience decent speeds, especially on EE's network. We also expect 5G availability to expand as the networks continue to mature.

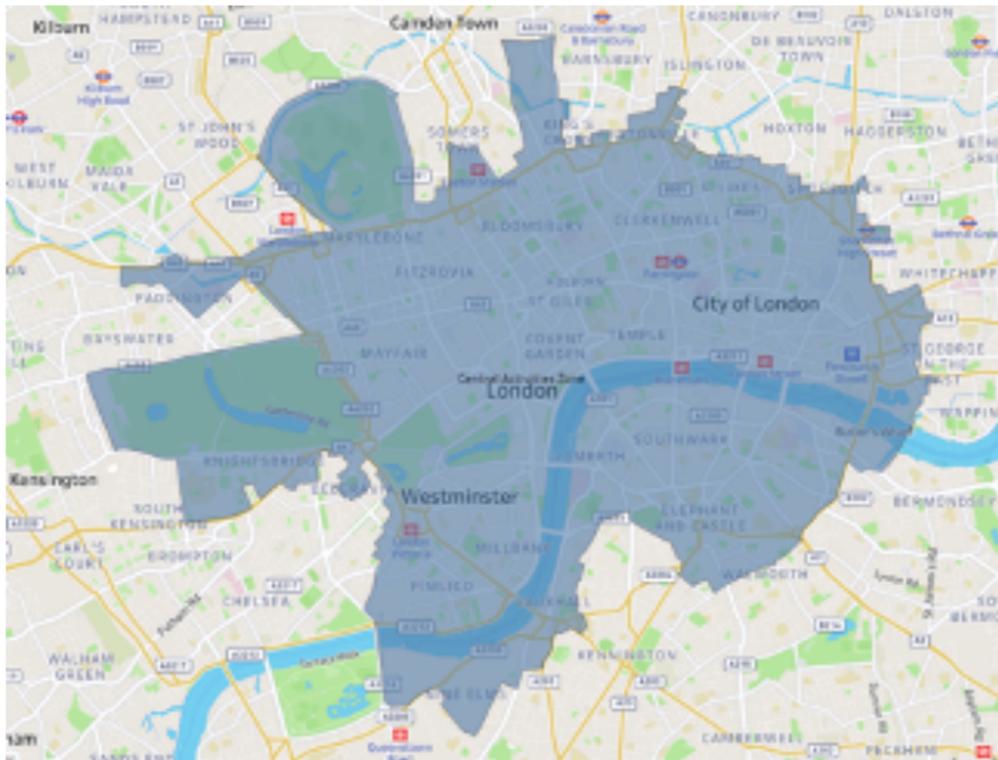
**5G maximum download speeds suggest a promising future for 5G in London:** The 5G maximum download speeds we recorded in London were extremely impressive. Three was the standout, clocking the fastest 5G maximum download speed among all operators in London at 463.0 Mbps. EE and Vodafone also impressed, with 5G maximum download speeds much faster than those on 4G LTE. While Three clearly led the way with the fastest 5G maximum download speed in London, it's worth noting that with Three's generally low 5G availability in London (and elsewhere), Three users will likely spend most of their time on 4G LTE, and Three's 4G LTE speeds were much slower than those on 5G.

## 5G performance in the heart of London:

# Central London: The London Central Activities Zone (CAZ)

While London is the UK's most populated city and one of the largest cities on the planet, there is one particular area within the UK's capital that is arguably the heart of the city: central London, as defined by the London Central Activities Zone (CAZ). Central London is one of the world's most attractive and competitive business centres. In it lies the seat of national government, and it's world renowned for its culture, shopping, and heritage. In short, central London is a major centre of activity for consumers, businesses, and government agencies alike, and the need for seamless and fast connectivity in the area is of critical importance. Throughout this report, we refer to central London and the London Central Activities Zone (CAZ) interchangeably.

In addition to 5G providing stronger connectivity in general for users in central London, 5G will also become an important driver of economic growth in the area. With 5G ultimately poised to enable a host of revolutionary use cases that will open up new business opportunities and foster partnerships across multiple connected industries, the importance of 5G in this influential business area cannot be understated. The good news is that 5G is going strong in central London, with EE providing the best combination of broad 5G availability and fast speeds in the area.



### Key figures for central London (the London CAZ)



3.5 million daily trips on public transit, cycling, and walking



£139 billion output in 2012 (10% of entire UK)



1.7 million jobs



125,000+ businesses



113,000 households



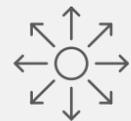
230,000 residents



4,000 listed buildings



400 London squares



11 opportunity areas



4 royal parks



2 intensification areas



2 world heritage sites

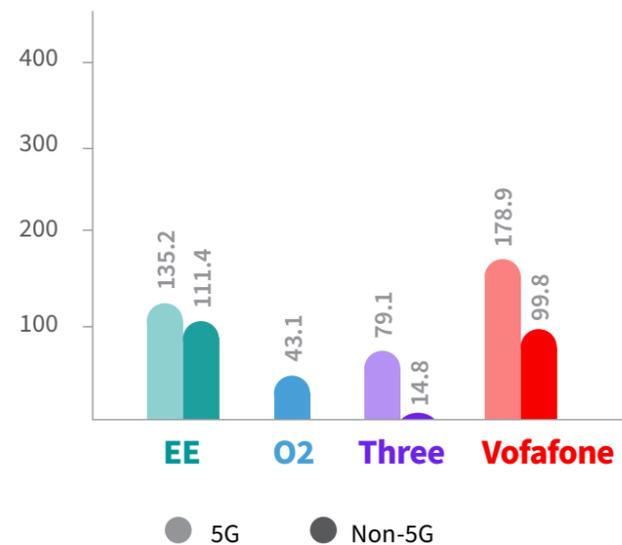
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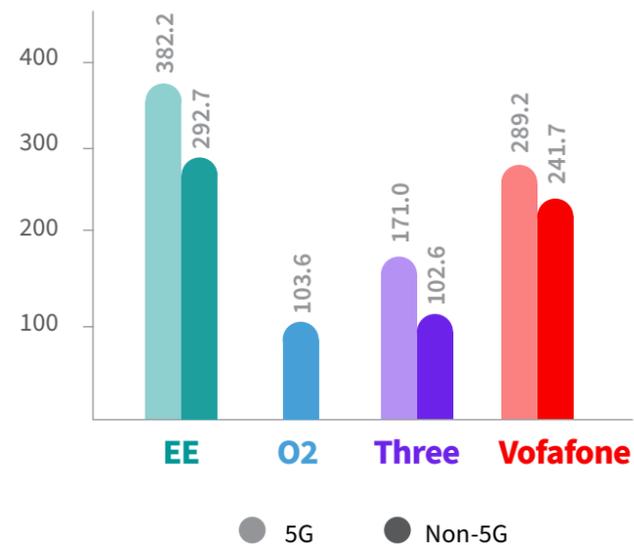
## 5G availability for each operator in central London



## 5G and non-5G median download speeds in central London (Mbps)



## 5G and non-5G maximum download speeds in central London (Mbps)



## Key takeaways from testing in central London:

**EE's 5G availability approached ubiquity in central London, and its speeds were fast:** EE registered remarkable 5G availability of 77.5% in central London, along with a very impressive 5G median download speed of 135.2 Mbps. EE's 5G speed trailed that of only Vodafone (178.9 Mbps) but was much faster than that of Three (79.1 Mbps).

**O2 was the only operator without 5G, but its non-5G speeds were strong:** O2's non-5G median download speed of 43.1 Mbps in central London was solid and much faster than its non-5G speeds in any of the UK's 16 most populated metro areas. We'll be interested in testing O2's 5G network as it expands.

**Three's 5G speeds impressed, but its availability was limited:** Similar to what we observed during testing across major metropolitan markets in the UK, Three delivered a strong 5G median download speed of 79.1 Mbps in central London, but the operator's 5G availability of 20.0% was the lowest among the three operators with 5G. It's worth noting that Three's non-5G median download speed of 14.8 Mbps in central London was markedly slower than its 5G speed.

**Vodafone shines in central London, clocking the fastest 5G median download speed:** Vodafone's 5G median download speed of 178.9 Mbps was incredibly fast and easily the fastest in central London. Vodafone's 5G availability was also relatively widespread at 39.6%. And even if users can't access Vodafone's 5G in central London, its non-5G median download speed of 99.8 Mbps was incredibly fast—even faster than Three's median download speed on 5G.

### The bottom line

5G speeds and availability in central London were excellent in general, and all three operators' 5G availability was much higher than what we found across the UK's largest 16 metropolitan cities. Given the importance of central London for all of London and the UK in general, it's clear (and not surprising) that the networks have prioritised their 5G networks in the area, and the results we recorded in central London were very impressive indeed.

Note: we didn't collect enough test samples to accurately characterize O2's 5G median or maximum download speed in central London.



# Conclusion

As the 5G era in the UK continues to expand, we'll keep testing 5G performance to provide the most accurate possible picture of the end-user 5G experience across the UK. While some UK operators currently have greater 5G footprints than others, it's clear that all operators are providing extremely impressive speeds on 5G—speeds that in most cases far surpass those on 4G LTE. EE stood out during testing with the broadest 5G availability and consistently fast 5G speeds, but we also saw encouraging 5G median and maximum download speeds from the other operators in major UK cities.

The results we found in central London (the London Central Activities Zone) were particularly impressive and encouraging for the rest of the UK. If and when the generally broad 5G availability and fast speeds we found in central London start to manifest in entire cities across the UK, the end-user connected experience could fundamentally and significantly change for the better.

With the exception of EE, the operators' 5G availability across major UK cities was generally low, but the good news is that we expect to see 5G availability expand going forward, and each operator showed impressive 5G results during testing. In fact, 5G could get a big boost in the UK (and elsewhere) after the release of the iPhone 5G, which could mark a watershed moment for 5G and the mobile industry in general. Stay tuned to RootMetrics to learn more about real-world 5G performance and the mobile performance landscape at large.



# How we test

We believe that real-world results come from real-world testing. All RootMetrics testing is conducted from the consumer's point of view. For UK-wide, nation, and metro testing in 1H 2020, we used Samsung Note 10+ 5G smartphones purchased off the shelf from operator stores to test both 4G LTE and 5G performance, and tests were conducted during the day and night while walking and driving. We utilise random sampling techniques to ensure our results offer a robust characterisation of performance in the places consumers most often use their mobiles, and all testing is focused on the activities for which consumers typically use their mobiles, including data, call, and text usage. To learn more about our testing, visit the [methodology](#) page of our website.

## A note about our 5G results

With all four operators having launched 5G in the UK, 1H 2020 marks the first test period in which we've used 5G-enabled smartphones to test operator performance on both 5G and other network technologies, such as 4G LTE or sub-4G LTE technologies. Because 5G users will likely switch from 5G to 4G LTE (or vice versa) during a typical mobile activity, the metrics in this report, unless explicitly stated as 5G or 4G LTE, reflect performance across all network technologies, including 5G where available.

The 5G metrics in this report were collected during our scientific Metro Area RootScore testing across the UK's 16 largest metropolitan cities, as defined by the Eurostat's Larger Urban Zone (LUZ). Our scientific metro area testing is designed to characterise network performance as a whole across an entire metropolitan market.

In contrast, during our 5G First Look testing in 2019, we tested 5G performance shortly after EE and Vodafone had launched 5G in Birmingham, Cardiff, and London. During that study, tests were largely conducted in known areas of 5G deployment, and a large portion of our tests were done while walking and were concentrated on densely populated city centres in each market, rather than across the entirety of each city. As a result of the differences in testing methodologies, comparisons between 5G results in this report cannot be made to those in our 5G First Look Reports for Birmingham, Cardiff, or London.



For more information, visit