Beyond Coverage

Mobile Connectivity in Greater Manchester

A study into the wireless network performance across selected key venues, transport links and outdoor areas across Greater Manchester

PREPARED FOR Ofcom GMCA GREATER MANCHESTER COMBINED AUTHORITY

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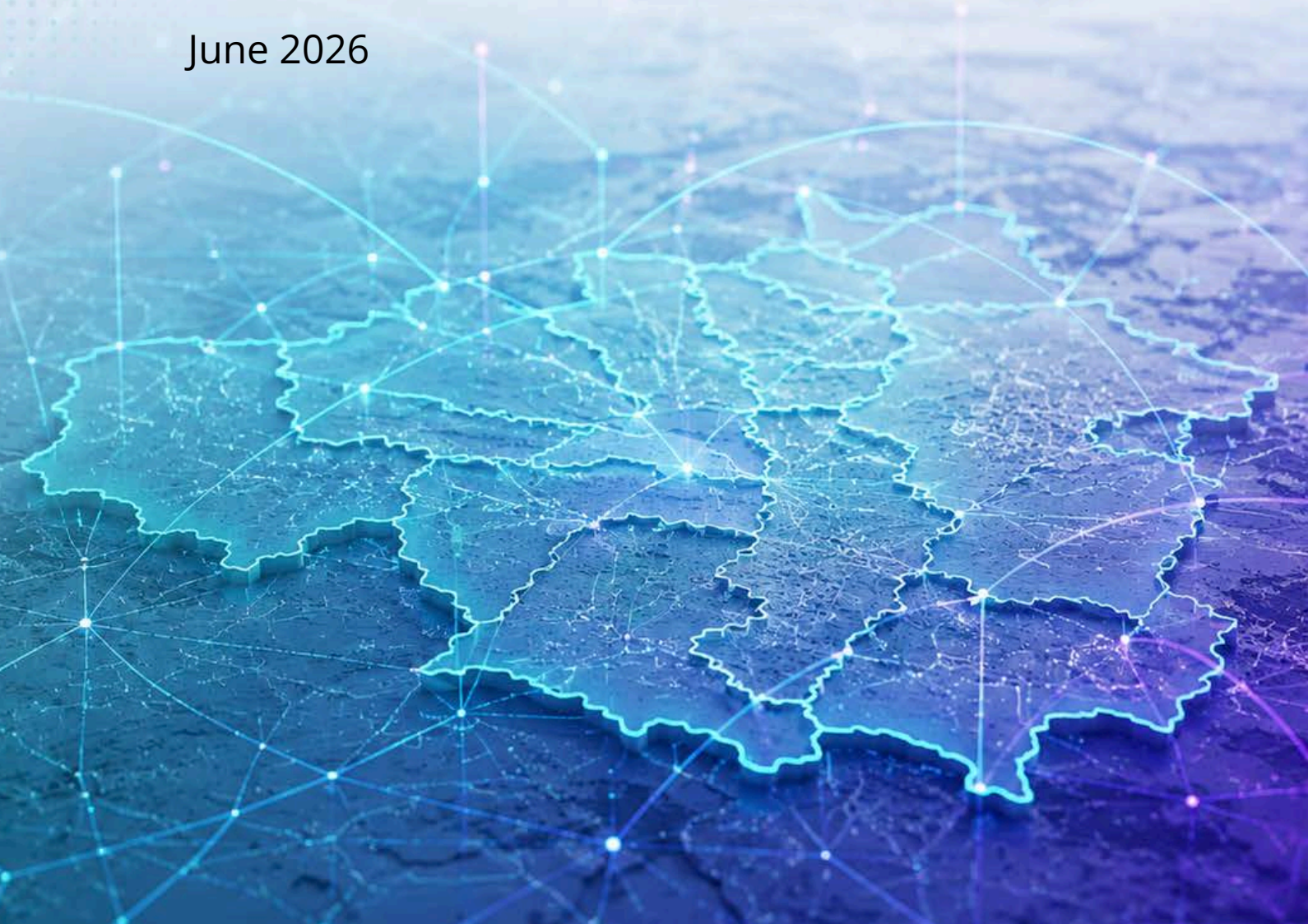

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Executive Summary

This report measured "How often does connectivity just work?"

This study assesses how often networks deliver a "good enough" connection for everyday mobile use, focusing on real-world user experience rather than peak performance, coverage or engineering metrics. Ofcom's "Good Performance" metric was used for this purpose.

Coverage was very high. Consistent quality was the limiting factor

Mobile performance was driven by how consistently networks met minimum performance thresholds, rather than isolated instances of high performance. Significant variation was observed across locations and operators.

Access to 5G coverage increases the chances of a good performance - but does not guarantee it

While 5G (both Standalone and Non-Standalone) was widely available and often associated with better outcomes, it did not consistently translate into reliable mobile performance. Outcomes depended on spectrum, capacity, signal quality and congestion levels.

Poor performance within venues was primarily driven by lack of capacity, not lack of coverage

Performance dropped materially during peak periods in most indoor venues, with some networks degrading by up to 50 percentage points. This indicates that capacity, rather than coverage alone, is the primary constraint.

Indoor environments were among the weakest points in the connectivity performance

Indoor performance was frequently constrained by signal attenuation and limited in-building network infrastructure. The building with a comprehensive indoor system delivered significantly stronger connectivity performance.

Download speeds were the primary limiting factor to good connectivity within indoor venues

In 80% of cases when the Good Performance test failed, it was due to download speeds being below our 5Mbps threshold. The remaining 20% of failures were due to upload being below our 1.5Mbps threshold. Latency was rarely an issue.

Only 40% of bus and tram routes had fair in-bus signal coverage from all four operators (7% for 5G SA)

Transport routes showed frequent variability and gaps in network connectivity between providers. Only 7% of the routes were covered by a fair 5G (NSA or SA) signal strength (greater than -105 dBm) by all four operators.

59% of weak coverage spots had at least one operator with fair signal

The proportion of locations along transport routes where weak signal from one operator coincided with fair signal coverage from other operators suggests that planning issues alone were not responsible for all coverage gaps

High 5G coverage but frequent fallback to 4G

While all four operators covered 97% or more of outdoor tested locations in Bury town centre with 5G, up to 30% of samples were taken on 4G.

Crowdsourced and field data provided complementary insights

Side-by-side analysis of crowdsourced and field test data revealed strong correlations, showing crowdsource data ability to identify patterns and weaknesses, while field collected data provided targeted, granular insights.

Policy And Investment Implications

The results of this study point to a shift in how connectivity challenges should be addressed.

While coverage is broadly established, user experience is increasingly determined by consistency, indoor performance and localised capacity constraints. The following implications highlight where policy and investment could most effectively improve outcomes.

1. Coverage policies alone are not enough. Improving user experience requires a shift to consistent quality

While geographic coverage is broadly strong outdoors, user experience is primarily constrained by the consistency of performance. Policy and investment should therefore focus on improving reliability and maintaining minimum performance thresholds, rather than extending basic coverage.

2. Indoor connectivity is now the critical gap in urban network performance

Indoor environments – particularly complex, high-density or older buildings – consistently represent the weakest part of the user experience. Improving connectivity in these locations will require greater deployment of in-building solutions such as Distributed Antenna System (DAS) and small cells, as outdoor networks alone are often insufficient.

3. Capacity and resilience under peak demand are key to connectivity - but can fall short

Performance differences between operators are most pronounced during busy periods, indicating that capacity – not just coverage – is a limiting factor. Addressing peak-time degradation in high-footfall locations should be a priority for both operators and policymakers.

4. 5G deployment should be evaluated in terms of user experience, not availability

The presence of 5G, including 5G standalone, does not consistently guarantee a good user experience. Policy frameworks and reporting should therefore prioritise outcome-based metrics – such as reliability and service quality – over simple availability or coverage measures.

5. Connectivity challenges are highly localised and require targeted intervention

Performance issues are concentrated in specific venues, buildings and route segments rather than being uniform across areas. This suggests that targeted, location-specific interventions – rather than broad, area-wide solutions – will be more effective in improving user experience.

6. Planning constraints alone do not fully explain outdoor coverage gaps

Across the four transport routes analysed, in 59% of locations where one operator had weak or unusable signal, at least one other operator still recorded Fair signal. This indicates that weaker coverage is often operator-specific rather than uniformly constrained across the corridor.

This highlights the potential for more coordinated approaches to network deployment, including infrastructure sharing and improved access to existing sites, to reduce duplication and close localised coverage gaps more efficiently.

7. Combining crowdsourced and field tested data enable efficient and confident evidence-based decisions

High-quality decision making requires multiple data sources, each offering different perspectives on network performance. Combining field tested measurements with crowdsourced data gives decision-makers both a national view together with a granular view of real-world network performance, enabling an efficient approach to monitoring, prioritisation and actionable decision making.

Contents

Introduction

About this Study

Consumers and businesses rely on good connectivity – whether at home, at work or on the move. Ensuring a consistent quality of connectivity is the essential foundation to entertainment, accessing websites, connecting with friends and family and running businesses.

Ofcom and the Greater Manchester Combined Authority (GMCA) commissioned this study to better understand why and where connectivity falls short and inform policies to support delivery of better connectivity. This study can support stakeholders including local authorities, transport agencies, landlords, and mobile network operators to address barriers to better mobile connectivity and make decisions about mobile infrastructure and services. The findings are being shared to stimulate public debate and guide solutions for improved connectivity across Greater Manchester and the UK.

About Ofcom

Ofcom is the independent national regulatory authority for the UK's communications industries, with responsibilities in the broadcasting sector (television and radio), telecommunications, online services, video-on-demand, spectrum and postal services. Ofcom's principal duty, set out in the Communications Act 2003, is to further the interests of citizens in relation to communications matters and to further the interests of consumers in relevant markets, where appropriate by promoting competition.

About Greater Manchester Combined Authority

GMCA is a strategic authority made up of the ten local councils in Greater Manchester. It works collectively to improve the region's economy, infrastructure, environment, and public services. GMCA has devolved powers in areas such as transport, housing, and digital infrastructure, and plays a key role in driving inclusive growth and innovation across Greater Manchester.

Other key stakeholders for this project in the Greater Manchester area include Manchester City Council, Bury Council, Transport for Greater Manchester.

Scope

This study sought to establish the connectivity performance within a cross-section of key locations across Bury and Manchester and included:

1. **Notable Manchester and Bury Venues (primarily indoors)**
    - 1.1. Arndale Shopping Centre
    - 1.2. Aviva Studios
    - 1.3. Co-Op Live
    - 1.4. Manchester Central Library
    - 1.5. Piccadilly Station
    - 1.6. Shudehill Interchange (mix of indoor / outdoor)
    - 1.7. Bury Interchange (mix of indoor / outdoor)
    - 1.8. Bury Town Hall
    - 1.9. Millgate Shopping Centre

2. **Transport Routes**
   - 2.1. Green Line Tram: Bury to Altrincham
   - 2.2. Bus 192: Hazel Grove to Manchester City Centre
   - 2.3. Bus V1: Leigh to Manchester Royal Infirmary
   - 2.4. Bus 100: Warrington Interchange to Shudehill Interchange

3. **Bury Town Centre (outdoor)**
   - 3.1. Bury Outdoor Market
   - 3.2. Bury Interchange (Outdoor)
   - 3.3. The Rock
   - 3.4. Bury Town Centre

Methodology

“How often does connectivity just work?”

This study was commissioned to measure the mobile experiences that users are likely to receive across the key locations included in this survey and explore some of the underlying causes affecting the results. The testing methodology was therefore designed to reflect the typical, real-world experience – not to capture top speeds, peak potential performance or run engineering grade tests. Instead, this analysis focuses on a single practical question: how often do mobile networks provide a service that works for everyday users, and where they do not, when, where and why does performance fall short?

To reflect this, the methodology was aligned with the performance approach used in Ofcom’s Map Your Mobile reporting, referred to in this report as “**Good Performance**”. This primary metric, co-developed by Ofcom and Opensignal in 2025, measures the proportion of tests that pass a set of minimum thresholds required to deliver a seamless experience on everyday mobile apps. These thresholds are based on the service levels typically required for tasks such as messaging, social media, gaming and video calling. The metric therefore captures both the availability of a mobile signal and whether service quality is sufficient for everyday use.

The Good Performance thresholds are shown below. To illustrate, if 100 tests were taken for a given network in a given location, and 80 of these tests passed all thresholds, the Good Performance score would be 80%. A higher score is therefore better, with 100% being the highest possible.

The table below also includes examples of mobile use-cases that could have a degraded experience if a metric is below the threshold.

Performance Metric	Threshold	Example Affected Mobile Use-Cases
Download speed	At least 5 Mbps	• Streaming HD video from YouTube • Video calling • Browsing social media • Downloading an app or attachment
Upload speed	At least 1.5 Mbps	• Video calling • Posting to social media or live streaming • Sharing photos or videos
Latency	Less than 50 ms	• WhatsApp voice calls • Mobile gaming • Payment or ticket apps

Good Performance thresholds

Note on disambiguation
Please note that Opensignal uses and reports using similar metric called “Consistent Quality” which is also based on a threshold formula using the same metrics and threshold values, but also includes additional performance sub-metrics including Packet Loss, Time-To-First-Byte and Jitter to encompass the experience of applications that are sensitive to these metrics such as webpage loading. Results in this report are only based on the Good Performance methodology - and comparisons to other results published by Opensignal may vary. To learn more about Consistent Quality please visit opensignal.com/consistent-quality

Measuring the Consumer Experience

This study was designed to infer the connectivity experience of typical mobile users. Testing was conducted using standard, commercially available smartphones (Samsung Galaxy S24), rather than specialised engineering equipment. Devices were equipped with retail SIMs on unrestricted, top-tier tariffs, providing access to the highest level of service available to consumers, including 5G SA where supported. This approach ensures that results reflect real-world user experience rather than theoretical network capability.

To survey the locations, five mobile devices were each configured with an Opensignal network testing application, running continuous network testing including downloading a 2MB file, uploading a 1MB file and sending 100 packets to measure download and upload speed and latency with traffic to popular application and content hosting end-points, intended to simulate typical mobile application traffic. Four devices were used to test the mobile network operators, while a fifth device was used to assess public Wi-Fi where available. During walk tests, the devices were carried around inside a polymer box by the Streetwave team on a pre-determined route. In addition, a subset of devices was deployed in selected fixed (static) locations to collect continuous 24-hour data over multiple days. This combination of walk and static testing provided insight into both spatial variation and changes in performance over time, including peak and off-peak periods.

Testing Methodology

To evaluate the venue's connectivity experience, two testing approaches were taken - static continuous testing and walk testing.

Walk Testing

On separate occasions, at a peak and off-peak period for expected network congestion, each typically lasting between 30 minutes and two hours, our tester walked around the selected building, location or travelled on a transport route carrying five mobile handsets in a box – one for each mobile network and one to test public Wi-Fi performance where available. The devices ran continuous network performance tests including measurements of signal quality and application layer performance including download throughput, upload throughput and latency. This allowed us to measure the actual connectivity experience that users would expect in different locations in the test locations - at both quiet and busy times - to best represent the true overall experience. The peak and off-peak time periods for each location were determined by local representatives based on the expected demand patterns for each location.

Occasionally, peak-time results outperformed off-peak results. This may reflect measurement noise, demand variability, or uneven sample volumes rather than a genuine network effect. These instances were isolated and do not affect the overall directional findings of this study.

Static Continuous Testing

To enable controlled testing on a 24/7 basis, a fixed installation of four or five devices were installed in a number of locations and left for a period of one week. This enabled us to observe the performance at all times of day and night, enabling analysis into time of day changes, as well as to validate the walk testing results.

Summarising Connectivity Performance

When summarising the connectivity performance in each location or route in this report, the following definitions were used:

Name	Definition
Well Connected	Four mobile networks each scoring **over** 90%
Mostly Connected	Three or more mobile networks each scoring **over** 75%
Partially Connected	Two or more mobile networks each scoring **under** 75%
Poorly Connected	Three or more mobile networks each scoring **under** 75%

Based on Good Performance from cellular networks during peak hours, except where otherwise specified.

Venue Analysis

Introduction

This section presents the findings from mobile performance testing conducted across nine Manchester and Bury venues. These venues were selected as they represent important places where significant numbers of the public can gather and demand connectivity.

Performance Summary

Venue	Venue Type	Connectivity Performance (Peak)
Manchester Venues		
Arndale Shopping Centre	Shopping centre / Retail	**Partially Connected**
Aviva Studios	Arts / Cultural venue	**Poorly Connected**
Co-op Live	Arena / Entertainment venue	**Mostly Connected**
Manchester Central Library	Library / Public institution	**Poorly Connected**
Manchester Piccadilly Station	Railway station	**Mostly Connected**
Shudehill Interchange	Transport interchange	**Mostly Connected**
Bury Venues		
Bury Interchange	Transport interchange	**Well Connected**
Bury Town Hall	Civic / Government building	**Mostly Connected**
Millgate Shopping Centre	Shopping centre / Retail	**Mostly Connected**

Venue Analysis - Key Findings

Indoor performance varied significantly by venue and operator

Some venues enjoyed consistently strong performance across most networks – particularly Bury Interchange and Shudehill Interchange – while Co-op Live also performed well, supported by in-building systems. Testing at Manchester Central Library, Aviva Studios and the Arndale shopping centres showed limited connectivity from at least two networks.

Peak-time pressure affected performance – but was not the only factor

Several venues showed material (over 30%) performance drops at peak times, consistent with increased strain under load. However, some locations remained weak even outside peak periods – such as Aviva Studios, EE at Bury Town Hall, and Three at Co-op Live and Manchester Piccadilly Station. This indicates that while congestion played a role, persistent coverage and access limitations were also key drivers.

Download speed was most often the weakest link in the Good Performance metric

Across the indoor venues analysed, when a connection was established, failures to meet the Good Performance thresholds were most frequently driven by download speed, accounting for approximately 80% of cases, with upload speed contributing to a lesser extent (around 20%). Latency was never the limiting factor when the device was connected to a network.

This pattern is illustrated at Manchester Piccadilly Station, where Three consistently met the latency threshold and achieved the required upload performance in at least 75% of tests, but met the download threshold in fewer than 20% of cases.

The most challenging areas were enclosed or lower-level spaces

Weaker performance was consistently concentrated in basements, sub-surface areas and deeper indoor zones rather than evenly distributed. This was evident at Aviva Studios, Bury Town Hall, Manchester Central Library and Manchester Piccadilly Station, highlighting the impact of indoor signal attenuation.

Indoor infrastructure strongly influenced outcomes

The one venue with comprehensive in-building infrastructure – Co-op Live – enjoyed consistently strong performance for operators integrated into its DAS, while those without access underperformed. Aviva Studios indoor repeater solution covering the ground floor delivered observable coverage benefits enabling very light use-cases such as messaging. Across remaining venues, older buildings or high-demand locations without dedicated indoor solutions performed more poorly, reinforcing the importance of indoor infrastructure investment.

Public Wi-Fi was rarely a reliable alternative to mobile networks

Wi-Fi improved resilience in some venues, notably at Co-op Live and Aviva Studios, but performance was inconsistent and often degraded under heavy demand. In many locations, it was either weaker than mobile or limited in coverage. Overall, user experience remained primarily dependent on the strength and consistency of indoor mobile networks.

Arndale Shopping Centre

Manchester · City Centre (Northern Quarter edge)

Partially Connected

Mixed connectivity, with two operators delivering excellent and two delivering weak performance during congested peak hours.

Highlights

- Mobile signal was available throughout the building on all networks, however, performance at the busy peak times degraded on O2 and Three materially, highlighting capacity constraints on these networks which did not appear on EE and Vodafone.
- Performance variability across zones at peak indicated uneven infrastructure load, with certain areas (e.g. Food Hall and South-West sections) driving overall degradation.
- Wi-Fi performance was consistently poor across all periods and locations, with no active test data in the Food Hall, indicating very weak or unavailable service.

Performance Overview

Network	Off-peak	Peak	Change
EE	100%	97%	-3 pp
O2	97%	47%	-50 pp
Three	95%	54%	-41 pp
Vodafone	100%	85%	-15 pp
Wi-Fi	39%	7%	-32 pp

Good Performance during Peak and Off-Peak walk testing.

Overview analysis

Good coverage for all networks but peak congestion issues were a major issue for O2 and Three
Mobile performance at Arndale Shopping Centre showed a clear divergence between operators under peak conditions. EE and Vodafone remained consistently strong, with only minor reductions in performance at peak. In contrast, Three and O2 experienced substantial declines, falling to 54% and 47% Good Performance respectively, despite strong off-peak results. This pattern indicated differing levels of network resilience as demand increased.

Capacity constraints are the likely driver of weaker peak performance
The contrast between strong off-peak and weaker peak results for Three and O2 was consistent with capacity limitations under higher user demand. Both operators delivered good performance when lightly loaded but showed reduced reliability as usage increased. Signal strength remained broadly stable between peak and off-peak periods, indicating that coverage was not the primary constraint, but rather the ability to handle increased traffic.

Technology mix affected performance
EE and Vodafone maintained higher shares of newer 5G SA modes across testing and delivered the most stable outcomes. Three remained predominantly on LTE, while O2's peak profile became more mixed. This was consistent with less resilient performance under load compared to operators maintaining stronger 5G presence.

Congested Wi-Fi results in poor download performance
Wi-Fi fell from 39% Good Performance off-peak to just 7% at peak time. Download was the dominant failure point, with average speeds dropping to 2.8 Mbps at peak, while upload averaged 7.6 Mbps, indicating downstream congestion rather than a coverage failure. The venue has confirmed awareness of this limitation and noted that a capacity upgrade programme is underway.

Performance by Location

Good Performance - Peak Time

Area	EE	O2	Three	VF	Wi-Fi
Ground Flr. NE	100%	61%	94%	96%	6%
Ground Flr. SW	96%	39%	33%	66%	19%
First Flr. NE	100%	13%	69%	77%	4%
First Flr. SW	100%	63%	37%	89%	6%
Food Hall	89%	71%	31%	100%	0%

Good Performance - Off-Peak Time

Area	EE	O2	Three	VF	Wi-Fi
Ground Flr. NE	100%	100%	94%	100%	35%
Ground Flr. SW	100%	100%	89%	100%	61%
First Flr. NE	100%	96%	89%	100%	37%
First Flr. SW	100%	92%	100%	100%	46%
Food Hall	100%	100%	100%	100%	0%

Context Snapshot

Indoor systems	Public Wi-Fi available & tested
Staff reported issues	Unknown
Peak test	Date: Sat. 7th Feb. 2026 Time: 14:00 to 15:30
Off-Peak test	Date: Mon. 9th Feb. 2026 Time: 8:00 - 9:26
Static test	Location: Ground Floor SW Start: 3rd Feb. 2026, 14:00 End: 10th Feb. 2026, 14:00

Aviva Studios

Manchester · City Centre

Poorly Connected

Signal and connectivity performance are constrained for all operators in most areas due to building fabric.

Highlights

- Mobile connectivity is constrained across most of the venue, due to coverage issues on all operators, likely caused by the building's concrete & metal fabric.
- The ground floor has a signal provided by an inbuilding repeater solution, which was sufficient for light mobile uses such as messaging and browsing.
- Wi-Fi coverage and performance is good throughout, however degraded to low performance levels in the Warehouse during a busy concert.

Performance Overview

Network	Off-peak	Peak	Change
EE	2%	2%	–
O2	0%	0%	–
Three	6%	2%	-4 pp
Vodafone	9%	13%	+4 pp
Wi-Fi	100%	68%	-32 pp

Good Performance during Peak and Off-Peak walk testing.

Overview analysis

Peak testing during high-demand live event
Peak testing was conducted during a live performance by American singer-songwriter Halsey in the Warehouse, with an audience of approximately 5,000 filling the venue. This provided representative conditions for assessing network performance under maximum demand.

Widespread indoor signal limitations
Walk testing showed signal strength falling below -120 dBm across all operators in both the Hall and Warehouse – two of the largest areas of the venue – indicating limited to no mobile service, requiring devices to switch to the WiFi service to stay connected in these areas.

Ground Floor provided usable signal mobile
The 5,000-capacity Warehouse exhibited weak or no signal conditions in much of the space, with signal frequently dropping below -125 dBm) and intermittently reaching no-signal states. This was consistent with a very limited usable mobile service across all operators, likely influenced by the building's concrete and metal structure.

Warehouse showed limited signal availability
The 5,000-capacity Warehouse exhibited weak or no signal conditions in much of the space, with signal frequently dropping below -125 dBm) and intermittently reaching no-signal states. This was consistent with limited to no mobile service across all operators, likely influenced by the building's concrete and metal structure.

Wi-Fi strong off-peak but degraded under heavy load
Venue Wi-Fi delivered strong performance in Peak and Off-Peak conditions - except in the Warehouse where it degraded during Peak periods. This pattern was consistent with high user demand, where a large proportion of attendees relied on Wi-Fi due to limited mobile availability.

Performance by Location

Good Performance - Peak Time

Area	EE	O2	Three	VF	Wi-Fi
Ground Floor	6%	0%	6%	40%	100%
Hall	0%	0%	0%	0%	100%
Warehouse	0%	0%	0%	0%	11%

Percentage of tests with fair signal strength

Area	EE	O2	Three	VF
Ground Floor	90%	81%	95%	89%
Hall	6%	0%	2%	0%
Warehouse	0%	0%	0%	0%

Where 4G or 5G >= -105 dBbm

Context Snapshot

Indoor systems	Public Wi-Fi available & tested Small cells in Ground Floor
Staff reported issues	Yes, throughout venue except for entrance
Peak test	Date: Thu. 29th Jan. 2026 Time: 19:00 to 20:12 Event: Halsey concert
Off-Peak test	Date: Thu. 29th Jan. 2026 Time: 16:58 - 18:12
Static test	Location: Ground Floor Start: 23rd Jan. 2026, 10:00 End: 30th Jan. 2026, 10:00

Co-Op Live

Manchester · Etihad Campus

Mostly Connected
Strong performance for all except Three – thanks to ***in-building antenna solutions.***

Highlights

- Cellular performance at Co-op Live was consistently strong, with minimal performance impact at peak, supported by the DAS deployed across three of the four operators.
- 5G presence was minimal, with performance delivered almost entirely over LTE, yet still achieving high reliability across supported operators.
- Three was a clear outlier, with very low Good Performance across the venue, consistent with lack of integration into the in-building system and resulting weak indoor coverage.
- Wi-Fi delivered outstanding performance at peak and off-peak times, and across the venue.

Performance Overview

Network	Off-peak	Peak	Change
EE	100%	100%	–
O2	98%	79%	-19 pp
Three	9%	19%	+10 pp
Vodafone	100%	100%	–
Wi-Fi	100%	97%	-3 pp

Good Performance during Peak and Off-Peak walk testing.

Overview analysis

Strong overall performance
Co-op Live, a ~23,000-capacity arena, delivered a strong overall connectivity during a high-attendance event (~20,000 users), with reliable performance across most areas. EE and Vodafone remained flawless at both peak and off-peak, while Wi-Fi provided a stable fallback layer supporting user experience throughout the venue.

Indoor infrastructure drives outcomes
The data showed that the venue's concrete and steel construction made indoor coverage highly dependent on the in-building system. Operators integrated into the 4G DAS performed strongly, while Three – without DAS integration – struggled due to reliance on weaker outdoor signal penetration.

Peak vs off-Peak resilience
Network performance remained stable for EE and Vodafone under peak demand during the RAYE concert, indicating strong capacity and effective in-building support. O2 showed a noticeable drop at peak, most pronounced on the Fourth Floor. Three remained weak across both periods; although its Good Performance score increased slightly at peak time, this was likely due to testing variability rather than a meaningful improvement in underlying performance.

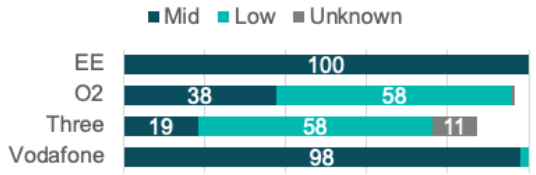
All networks relied on 4G LTE
Devices remained almost entirely connected to LTE, indicating the in-building system was operating on 4G rather than 5G. EE and Vodafone had the vast majority of tests on mid-band spectrum (1–3 GHz), supporting consistent peak performance, whereas O2 relied more heavily on low-band spectrum (58.2% vs 37.8% mid-band). Low-band spectrum, while effective for coverage and range, has lower capacity than mid-band and is less well suited to handling large volumes of simultaneous data demand. This characteristic is consistent with O2's observed drop in peak-time performance, where higher user loads were likely to place greater strain on available capacity.

Performance by Location

Good Performance - Peak Time

Zone	EE	O2	Three	VF	Wi-Fi
Ground Floor	100%	75%	42%	100%	100%
First Floor	100%	100%	25%	100%	100%
Second Floor	100%	100%	0%	100%	100%
Third Floor	100%	92%	0%	100%	100%
Fourth Floor	100%	20%	33%	100%	86%

Percentage of tests on 4G bands - Peak Time



Mid: 1-3 GHz; Low: < 1 GHz.

Context Snapshot

Indoor systems	Public Wi-Fi available & tested. DAS installed, excludes Three
Staff reported issues	None
Peak test	Date: Tue. 17th Feb. 2026 Time: 18:26 - 19:45 Event: RAYE concert
Off-Peak test	Date: Tue. 17th Feb. 2026 Time: 15:59 - 17:14
Static test	Location: First Floor Start: 17th Feb. 2026, 15:00 End: 24th Feb. 2026, 15:00

Manchester Central Library

Manchester · City Centre

Poorly Connected

3 out of 4 networks struggled to sustain peak-time capacity due to weak signal conditions.

Highlights

- Overall mobile performance was relatively weak across most operators, primarily driven by low indoor signal quality, particularly in harder-to-reach areas such as the Lower Ground Floor.
- Three of four mobile operators experienced significant peak-time performance degradation, consistent with capacity constraints rather than uniform coverage loss.
- Wi-Fi performance was moderate but stable, with similar outcomes at peak and off-peak times, providing a consistent but not high-performing connectivity layer.

Performance Overview

Network	Off-peak	Peak	Change
EE	83%	85%	**+2 pp**
O2	84%	56%	**-28 pp**
Three	57%	14%	**-43 pp**
Vodafone	72%	47%	**-25 pp**
Wi-Fi	64%	68%	**+4 pp**

Good Performance during Peak and Off-Peak walk testing.

Overview analysis

Overall connectivity performance is unsatisfactory
During peak time, all networks struggled to deliver consistent connectivity, with three of the four operators achieving below 60% Good Performance. Wi-Fi performance was moderate but inconsistent in some areas.

Significant performance drops during busy hours
Vodafone, Three and O2 experienced substantial performance degradation at peak time, with declines ranging from 25pp to over 40pp. This pattern was consistent with insufficient capacity to sustain performance under higher user demand.

EE and Wi-Fi show greater resilience at peak
EE and the venue Wi-Fi maintained more stable performance during peak periods, indicating relatively stronger capacity and resilience compared to other mobile operators.

Performance varies across the building
Performance varied significantly by location within the venue. The Lower Ground Floor was consistently the weakest area across operators, while the First Floor performed best overall. The Ground, Second, Third and Fourth Floors showed weaker and less consistent performance during peak periods.

24/7 testing supports peak and off-peak findings
The static hourly results reinforced these conclusions. EE remained strong throughout the day; O2 and Vodafone showed some daytime dips – particularly on upload – but still maintained generally usable service. Three was materially less robust, with performance dropping to borderline or below-threshold levels for extended periods for both download and upload.

Technology mix varies between networks
Time spent across cellular technologies differed by operator. Three was almost entirely LTE, O2 predominantly used 5G NSA, Vodafone had a smaller share of 5G SA (22%), and EE recorded the highest proportion of 5G SA connections (52%). This distribution aligned with the relative performance observed across networks.

Performance by Location

Good Performance - Peak Time

Zone	EE	O2	Three	VF	Wi-Fi
Lr Gnd Floor	58%	17%	0%	17%	67%
Ground Floor	100%	100%	0%	41%	75%
First Floor	92%	74%	40%	77%	78%
Second Floor	92%	42%	8%	58%	67%
Third Floor	61%	25%	17%	17%	50%
Fourth Floor	90%	43%	10%	50%	67%

Good Performance - Off-Peak Time

Zone	EE	O2	Three	VF	Wi-Fi
Lr Gnd Floor	58%	33%	0%	25%	60%
Ground Floor	100%	100%	23%	73%	64%
First Floor	75%	75%	67%	85%	67%
Second Floor	100%	100%	92%	90%	83%
Third Floor	67%	100%	92%	86%	67%
Fourth Floor	100%	100%	88%	54%	25%

Context Snapshot

Indoor systems	Public Wi-Fi available & tested.
Staff reported issues	None
Peak test	Date: Tue. 3rd Feb. 2026 Time: 11:59 to 13:26
Off-Peak test	Date: Tue. 3rd Feb. 2026 Time: 18:28 - 19:47
Static test	Location: First Floor Start: 3rd Feb. 2026, 10:00 End: 10th Feb. 2026, 10:00

Piccadilly Station

Manchester · City Centre

Mostly Connected

Strong performance for all networks except for Three. Quality correlated with 5G signal strength.

Highlights

- EE and O2 delivered a strong and consistent mobile performance across the station, while Three struggled due to a congested 4G network and no 5G.
- Overall performance closely tracked time spent on fair-quality 5G, with the most consistent operators maintaining a stronger 5G SA presence, particularly in the main station areas.
- Lower-level areas, particularly the Tram Station and Taxi Bay, showed materially weaker performance and signal conditions, particularly at peak-time, for several operators.

Performance Overview

Network	Off-peak	Peak	Change
EE	99%	95%	-4 pp
O2	98%	91%	-7 pp
Three	0%	12%	**+12 pp**
Vodafone	100%	85%	-15 pp
Wi-Fi	78%	86%	**+8 pp**

Good Performance during Peak and Off-Peak walk testing.

Overview analysis

Strong overall performance – driven by two operators
Piccadilly Station delivered a strong overall connectivity, with EE and O2 maintaining high Good Performance across most areas and time periods. This indicated generally robust indoor coverage and capacity for these networks. Vodafone also performed well overall, though it showed some peak-time weakening in specific areas.

Three underperforms due to limited 5G access and LTE reliance
Three recorded consistently low performance across the station in both peak and off-peak conditions. This was primarily driven by weak download performance and limited access to 5G NSA, with greater reliance on LTE reducing resilience in this indoor environment.

Good 5G signal – not just 5G presence – drives performance
A clear relationship was observed between strong 5G signal conditions and mobile performance. Operators with higher shares of fair-quality 5G signal delivered consistently better outcomes, while weaker or inconsistent 5G coverage aligned with reduced performance.

Performance variability is driven by a small number of areas
Most of the station delivered strong results, with overall performance reduced by a limited number of challenging zones. This showed that localised signal conditions, rather than venue-wide limitations, were the primary drivers of inconsistent performance in the station.

Lower-level areas are the weakest points
The Tram Station and Taxi Bay – both located underground – consistently showed poorer performance across operators. These areas recorded weaker signal and lower Good Performance, indicating that sub-surface environments remained a key challenge for indoor connectivity.

Performance by Location

Good Performance - Peak Time

Zone	EE	O2	Three	VF	Wi-Fi
Food Terrace	100%	100%	0%	100%	100%
Main Terminal	100%	100%	30%	95%	75%
Taxi Bay	92%	100%	13%	38%	100%
Platforms	100%	100%	10%	100%	100%
Tram Station	80%	55%	10%	80%	60%

Percentage of tests on 5G (SA or NSA) with fair signal strength - Peak Time

	EE	O2	Three	VF
Food Terrace	100%	100%	0%	98%
Main Terminal	100%	100%	0%	93%
Taxi Bay	70%	97%	0%	12%
Platforms	100%	100%	0%	100%
Tram Station	64%	23%	0%	0%

Where 5G >= -105 dBbm

Context Snapshot

Indoor systems	Public Wi-Fi available & tested.
Staff reported issues	Unknown
Peak test	Date: Fri. 6th Mar. 2026 Time: 18:52 to 19:38
Off-Peak test	Date: Mon. 9th Mar. 2026 Time: 10:24 - 11:00
Static test	Not installed

Venue Analysis

Shudehill Interchange

Manchester · Shudehill Transport Hub

Mostly Connected

Strong performance for all networks. Three's performance waned at peak hours where the signal was weak.

Highlights

- Exceptional performance for EE, Vodafone and O2 in all locations across all areas tested.
- Strong performance was sustained even at peak times, with only limited degradation – indicating sufficient capacity across most operators in this environment.
- Three was the only operator to show a material decline at peak, with performance issues concentrated on the bus platforms, consistent with weaker signal in those areas.

Performance Overview

Network	Off-peak	Peak	Change
EE	100%	100%	–
O2	100%	100%	–
Three	96%	78%	-18 pp
Vodafone	100%	98%	-2 pp
Wi-Fi	N/A	N/A	

Good Performance during Peak and Off-Peak walk testing.

Overview analysis

Three's performance is constrained on the bus platforms
Three was the only operator with a material performance gap, declining from 96% Off-Peak to 78% at Peak. This deterioration was concentrated on the bus platforms, where Good Performance fell to around 50%, while performance remained near-perfect within the enclosed terminal areas, aligning with stronger signal conditions.

Weak signal combined with congestion drives poorer outcomes
Three's signal was consistently weaker on the bus platforms in both Peak and Off-Peak periods. Performance degraded materially at Peak without a corresponding decline in signal strength, indicating that congestion was compounding an underlying coverage limitation rather than acting as the sole cause.

Download performance became the primary constraint
Performance failures for Three in weaker signal areas were driven by reduced download throughput, with pass rates falling to around 50% at Peak on the platforms. Upload and latency remained stable, indicating that the issue was primarily downlink capacity.

5G availability supports stronger and more resilient performance
EE and Vodafone maintained consistent 5G SA connections across the venue, with O2 also showing strong 5G usage. In contrast, Three relied more heavily on LTE with limited 5G access, which aligned with lower throughput and reduced resilience under Peak demand.

Performance differences are highly localised within the interchange
Overall performance across the interchange was strong, with issues concentrated in specific platform areas rather than across the wider site. This showed that localised signal conditions, particularly in more exposed areas, were the primary drivers of mobile performance variation.

Performance by Location

Good Performance - Peak Time

Zone	EE	O2	Three	VF
Bus Terminal N	100%	100%	100%	100%
Bus Terminal S	100%	100%	100%	100%
Inner Bus Platform	100%	100%	50%	89%
Outer Bus Platform	100%	100%	56%	100%

Bus Terminals are located indoors, while Bus Platforms are located outdoors.

Percentage of tests with fair 4G or 5G signal strength - Peak Time

Zone	EE	O2	Three	VF
Bus Terminal N	100%	61%	92%	99%
Bus Terminal S	100%	81%	97%	100%
Inner Bus Platform	100%	100%	33%	100%
Outer Bus Platform	100%	99%	40%	100%

Showing 4G or 5G >= -105 dBbm

Context Snapshot

Indoor systems	Unknown
Staff reported issues	Unknown
Peak test	Date: Fri. 23rd Jan. 2026 Time: 17:04 to 17:30
Off-Peak test	Date: Fri. 23rd Jan. 2026 Time: 11:02 - 11:28
Static test	Location: Bus Terminal S Start: 20th Jan. 2026, 15:00 End: 27th Jan. 2026, 15:00

Bury Interchange

Bury, Greater Manchester · Bus & Tram Interchange

Well Connected

Near flawless connectivity for all networks. Strong 5G coverage for all operators.

Highlights

- Flawless, or near-perfect Good Performance for all mobile operators: EE, O2 and Vodafone hit 100% Good Performance both at Peak and Off-Peak times – while Three scored 94% Off-peak and 100% at Peak.
- O2's 700 MHz Band n28 provided strong performance during walk-testing, despite its lower capacity compared to higher frequency bands.

Performance Overview

Network	Off-peak	Peak	Change
EE	100%	**100%**	–
O2	100%	**100%**	–
Three	94%	**100%**	**+6 pp**
Vodafone	100%	**100%**	–
Wi-Fi	N/A	**N/A**	

Good Performance during Peak and Off-Peak walk testing.

Overview analysis

Near-perfect mobile performance
All four mobile operators delivered consistently high performance, with EE, O2 and Vodafone achieving 100% Good Performance in both Peak and Off-peak testing.

Only limited and localised variation observed
Performance was uniformly strong across the venue, with only minor and localised variation observed. Three showed a small reduction Off-Peak, driven by weaker results in the Tram Station, though this did not materially affect overall usability.

O2's 700 MHz 5G-SA performance suggests low traffic during testing
Throughout the walk testing, the O2 device spent the entire time on the 700 MHz Band n28 – a low frequency band. This band delivered strong performance, even at peak times, with download speeds averaging 46.5 Mbps, uploads averaging 16.4 Mbps and latency below 15 ms. This strong performance on a low frequency band suggested relatively light loading of O2's 5G-SA network in this location – perhaps limited by compatible devices or plans in the local area.

Strong performance despite varying signal conditions
Operators maintained high Good Performance scores even where signal strength differed significantly. EE, for example, showed weaker signal readings than the other operators but still achieved a 100% score, indicating sufficient network resilience to maintain mobile performance despite less favourable radio conditions. However, EE recorded lower average upload speeds at 12 Mbps, compared to 16.4-17.3 Mbps for the other networks.

Technology differences show little impact at Bury Interchange
EE, O2 and Vodafone operated consistently on 5G SA, while Three relied on 5G NSA with some LTE presence, particularly during Peak time (18%). This difference did not materially impact overall usability at Bury Interchange.

Performance by Location

Good Performance - Peak Time

Zone	EE	O2	Three	VF
Bus Platforms	100%	100%	100%	100%
Main Terminal	100%	100%	100%	100%
Tram Station	100%	100%	100%	100%

Percentage of tests with fair 4G or 5G signal strength - Peak Time

Zone	EE	O2	Three	VF
Bus Platforms	80%	100%	99%	100%
Main Terminal	66%	100%	100%	100%
Tram Station	58%	100%	97%	100%

Showing 4G or 5G >=-105 dBbm

Context Snapshot

Indoor systems	Unknown
Staff reported issues	Unknown
Peak test	Date: Sat. 7th Mar. 2026 Time: 10:00 to 10:24
Off-Peak test	Date: Mon. 9th Mar. 2026 Time: 12:01 - 12:26
Static test	Location: Main Terminal Start: 3rd Mar. 2026, 12:00 End: 10th Mar. 2026, 12:00

Bury Town Hall

Bury, Greater Manchester · Civic building

Mostly Connected

All networks delivered excellent performance - except EE, which was poor - due to ***poor signal coverage****.*

Highlights

- Mobile signal strength levels were generally weak inside the building and performance was generally relying on low-band usage, likely due to its dense stone construction.
- O2, Vodafone and Three networks delivered Good Performance most of the times, likely thanks to their extensive use of lower bands and a lower demand in terms of users.
- EE delivered a very poor mobile performance, recording the lowest use of sub-1 GHz bands and poorer signal levels. This aligns with reports from staff using EE-issued phones, who experienced connectivity issues throughout the building.

Performance Overview

Network	Off-peak	Peak	Change
EE	26%	19%	-7 pp
O2	97%	94%	-3 pp
Three	90%	96%	**+6 pp**
Vodafone	94%	98%	**+4 pp**
Wi-Fi	10%	19%	**+9 pp**

Good Performance during Peak and Off-Peak walk testing.

Overview analysis

Different networks had different performances
O2, Three and Vodafone delivered consistently high Good Performance across both Peak and Off-Peak testing. EE was the clear outlier, performing poorly throughout, which points to a coverage limitation within the venue.

Low-band coverage with weak signal
Mobile operators served the building using low and mid-band spectrum. O2, Three and Vodafone relied on 700-900 MHz, while EE used 1800 MHz. Signal strength was generally weak across all operators, except O2, which recorded 76% or more of tests with fair signal throughout the building via its 5G SA service on 700 MHz band n28.

EE's signal limitations were compounded by high network load
EE recorded the weakest signal in the building, with a fair signal observed less than 5% of the time on the lower three floors. With staff reporting they used EE-issued devices, the shared load on limited LTE coverage likely increased congestion. Performance failures were evenly split between download and upload, indicating a broad capacity constraint driven by weak signal and high network demand.

Technology mix influences consistency
O2's consistent use of low-band 5G SA was associated with stable performance across all floors, supporting high Good Performance even in more challenging indoor areas. In contrast, Three and Vodafone relied on a mix of 5G NSA and LTE, with LTE more prevalent in weaker coverage zones such as the basement and lower floors.

Wi-Fi constrained, not absent
Despite low Good Performance driven by poor upload speeds, Wi-Fi showed usable download speeds at around 8-9 Mbps and generally acceptable latency. The persistent upload failure suggests a constrained or managed service profile, rather than a fundamental coverage issue across the venue.

Performance by Location

Good Performance - Peak Time

Zone	EE	O2	Three	VF	Wi-Fi
Basement	0%	78%	100%	100%	17%
Ground Floor	8%	100%	100%	100%	8%
First Floor	25%	100%	83%	92%	25%
Second Floor	42%	100%	100%	100%	25%

Percentage of tests on 4G/5G Lower bands (sub-1 GHz) - Peak Time

Zone	EE	O2	Three	VF
Basement	20%	100%	100%	99%
Ground Floor	13%	100%	100%	100%
First Floor	19%	100%	100%	100%
Second Floor	9%	100%	100%	100%

Context Snapshot

Indoor systems	Public Wi-Fi available & tested
Staff reported issues	Yes, throughout the building
Peak test	Date: Wed. 28th Jan. 2026 Time: 9:59 to 10:44
Off-Peak test	Date: Wed. 21st Jan. 2026 Time: 18:07 - 18:50
Static test	Location: Ground Floor Start: 21st Jan. 2026, 15:00 End: 28th Jan. 2026, 15:00

Millgate Shopping Centre

Bury, Greater Manchester · City Centre

Mostly Connected

Strong performances on all networks. Three had challenges outdoors. Wi-Fi performance issues at both peak and off-peak.

Highlights

- EE and Vodafone demonstrated exceptional resilience, with both networks achieving a 100% Good Performance during peak times.
- Three experienced the largest performance degradation due to congestion, dropping 24 percentage points from a 100% off-peak Good Performance to 76% at peak.
- Three's weaker peak-time performance appears linked to band steering, as the device shifted off 2600 MHz 5G NSA during Off-Peak testing onto 1800 MHz LTE at Peak.

Performance Overview

Network	Off-peak	Peak	Change
EE	100%	**100%**	–
O2	95%	**92%**	-3 pp
Three	100%	**76%**	-24 pp
Vodafone	93%	**100%**	**+7 pp**
Wi-Fi	77%	**78%***	**+1 pp**

*Good Performance during Peak and Off-Peak walk testing. *Wi-Fi was only available indoors, so the score reflects indoor areas only.*

Overview analysis

EE showed flawless performance
EE delivered 100% Good Performance during both Peak and Off-Peak testing. Performance remained stable across all zones, supported by high throughput and consistent 5G usage throughout the venue.

Three's performance dropped sharply at peak, likely linked to band steering
Three saw a clear peak-time decline, with Good Performance falling from 100% to 75% in The Mall and Outdoor Market, and to 29% in Outdoor Street. This appears linked to technology steering: Off-Peak, the device remained on 5G NSA using 2600 MHz (Band 7), whereas at Peak it did not access Band 7 and instead relied mainly on LTE 1800 MHz (Band 3), with only limited use of 2100 MHz (Band 1). Supporting static data from Millgate, where the device rotated between 1800, 2100 and 2600 MHz over time, indicates the area is served by multiple bands, with mobile performance varying depending on which layer the device is connected to.

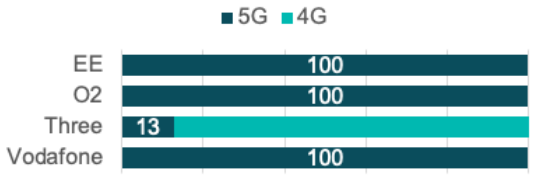
O2 and Vodafone are strong overall with localised dips
O2 delivered broadly consistent performance across both Peak and Off-Peak periods, with only minor softening in the Outdoor Market, The Mall and Union St./Arcade, where Good Performance was around 88% in all three cases. This is consistent with its reliance on 700 MHz (band n28), which supports coverage but may offer more limited capacity in certain locations. Vodafone, by contrast, achieved near-perfect performance, maintaining 100% Good Performance across all zones and test periods, with the only exception being a slight Off-Peak dip in the Outdoor Market.

Performance by Location

Good Performance - Peak Time

Zone	EE	O2	Three	VF	Wi-Fi
The Haymarket	100%	100%	100%	100%	78%
Union St./ Arcade	100%	88%	100%	100%	92%
The Mall	100%	88%	75%	100%	67%
Outdoor Market	100%	89%	75%	100%	
Outdoor Street	100%	100%	29%	100%	

Percentage of tests per technology - Peak Time



Context Snapshot

Indoor systems	Public Wi-Fi available indoor (capped) & tested
Staff reported issues	Yes, in indoor areas, worsening at peak times
Peak test	Date: Sat. 24th Jan. 2026 Time: 11:00 to 12:03
Off-Peak test	Date: Thu. 22nd Jan. 2026 Time: 10:13 - 11:23
Static test	Location: The Mall Start: 20th Jan. 2026, 16:00 End: 27th Jan. 2026, 16:00

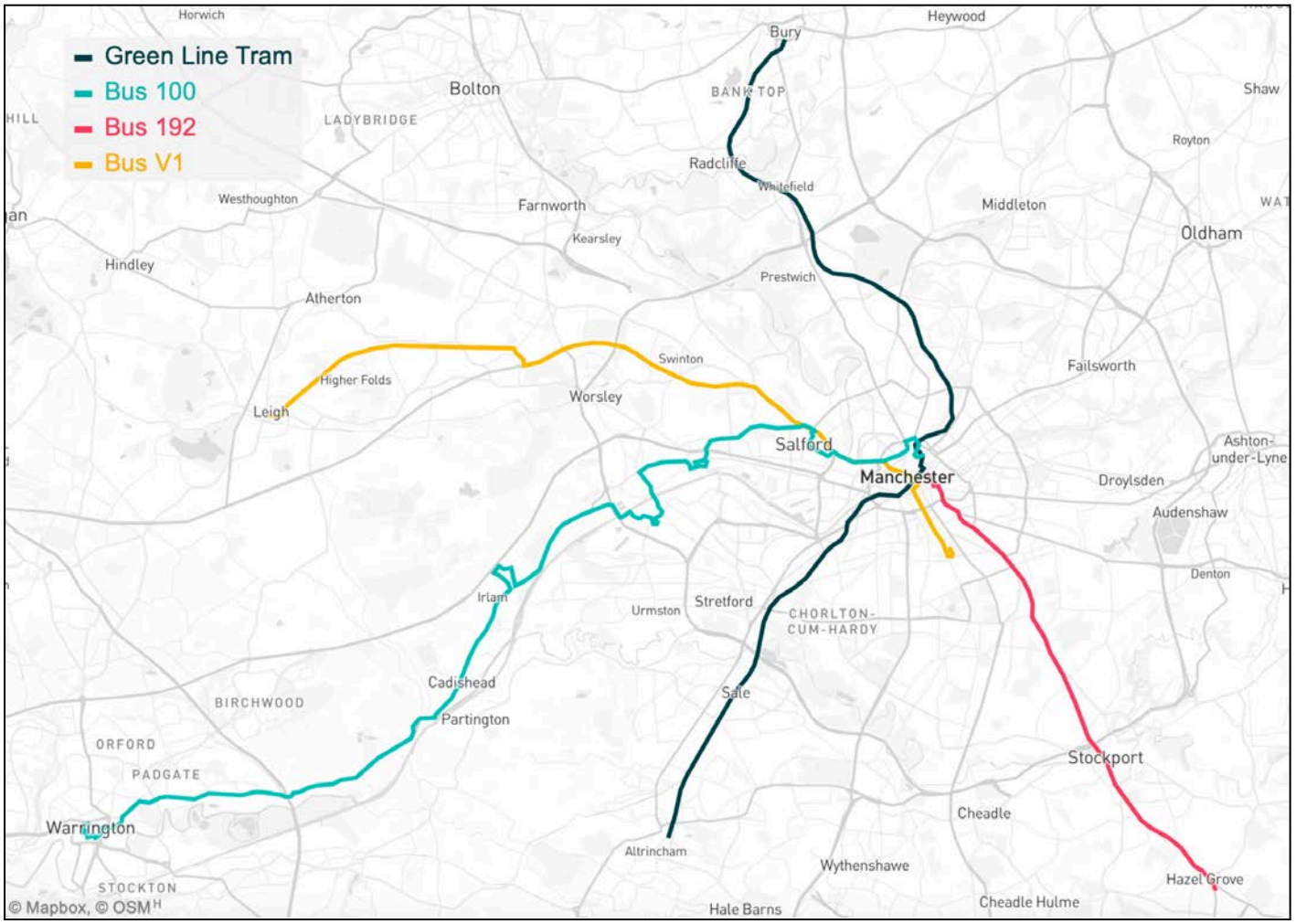
Transport Routes

Introduction

This section presents the findings from mobile testing conducted across four Greater Manchester transport corridors, all transiting through central Manchester:

- Green Line tram (Bury to Altrincham);
- Bus 192 (Hazel Grove to Manchester City Centre);
- Bus V1 (Leigh to Manchester Royal Infirmary);
- Bus 100 (Warrington Interchange to Shudehill Interchange).

Each corridor was assessed through four journey-based tests, covering both outbound and inbound directions at peak and off-peak transport commuting periods.



Performance Summary

Transport Service	Route	Connectivity Performance (Peak)
Green Line Tram	Bury to Altrincham	**Mostly Connected**
Bus 192	Hazel Grove to Manchester City Centre	**Mostly Connected**
Bus V1	Leigh to Manchester Royal Infirmary	**Partially Connected**
Bus 100	Warrington Interchange to Shudehill Interchange	**Partially Connected**

Transport Routes - Key Findings

On-the-move connectivity was shaped by short weak sections, not just average route scores.

Transport connectivity was sometimes uneven due to brief weak-signal areas or occasional dips during device handovers. This pattern showed up on Bus 192 and parts of the Green Line, where weaker sections pulled some operators materially below the stronger performers. It also explains why some areas performed worse than expected, even when signal strength or 5G coverage wasn't especially bad.

Peak-time congestion was visible, but it was not the only explanation.

Some routes showed a clear peak-time penalty, while others did not. On Bus 100, Three's performance fell by 21 percentage points (73% to 52%). On the V1, peak-time stress was also visible with both Three and Vodafone's Good Performance dropping by 14% and 11%, respectively. By contrast, the Bus 192 showed limited to no variation between Peak and Off-Peak testing. Moreover, the evidence also showed that some weaker sections persisted even outside peak, especially for O2, indicating that congestion alone did not explain the full pattern.

Localised coverage weaknesses reduced performance, especially in outer sections.

A common pattern across the routes was that underperformance was concentrated in specific stretches rather than being evenly distributed. This was particularly evident for O2 and Three on the Bus V1, where performance in the weakest sections dropped to 27% and 41%, respectively. On Bus 100, O2 fell as low as 7% in Hollins Green & Cadishead, while Three hit 30% in Dumplington. In these areas, the weaker results were often accompanied by poorer signal conditions or, in some cases, no active test data being recorded, which is consistent with weak or unstable performance rather than a short-lived one-off issue.

Technology mix and deployments influenced the results.

EE was the most consistent operator across all four routes, staying within a narrow 94-98% range across peak and off-peak testing, aligning with the route-level evidence of a heavier 5G SA profile. Vodafone's pattern was more mixed but still generally solid at 76-96%, with evidence on routes such as Bus 100 that a combination of 4G coverage on outer sections and added 5G capacity in denser urban areas helped support a usable service for much of the journey. By contrast, Three's results were more variable with the data showing heavier reliance on LTE and 5G NSA, while O2's weaker sections suggest that the presence of 5G alone was not enough where signal continuity and local radio conditions were less reliable.

Fair signal coverage was generally broad, but not consistent across all operators and newer 5G layers.

At least one operator provided a fair 4G/5G signal in 92% of route locations, but all four did so in only 40%. Moreover, when one operator was weak, another still provided a fair 4G/5G signal in 59% of weaker locations, falling to 29% for 5G SA.

Percentage of transport routes covered with Fair signal

This metric shows how much of the tested routes had a fair-quality usable 4G or 5G signal, based on location bins where at least half of measurements met the Fair threshold of -105 dBm or better. In practice, this represents a measure of coverage continuity along the journey: how often passengers are in parts of the route where the radio signal is strong enough to support a stable connection, rather than dropping into marginal coverage.

Key Insights:

40% of the transport network tested had at least a “fair” 4G or 5G signal for all four network operators when measured from inside the vehicle. This means that 60% of the transport network had weak signal coverage for at least one operator inside the vehicle.

Only 7% of the transport network was covered by a “fair” 5G signal from all four operators when measured from inside the vehicle.

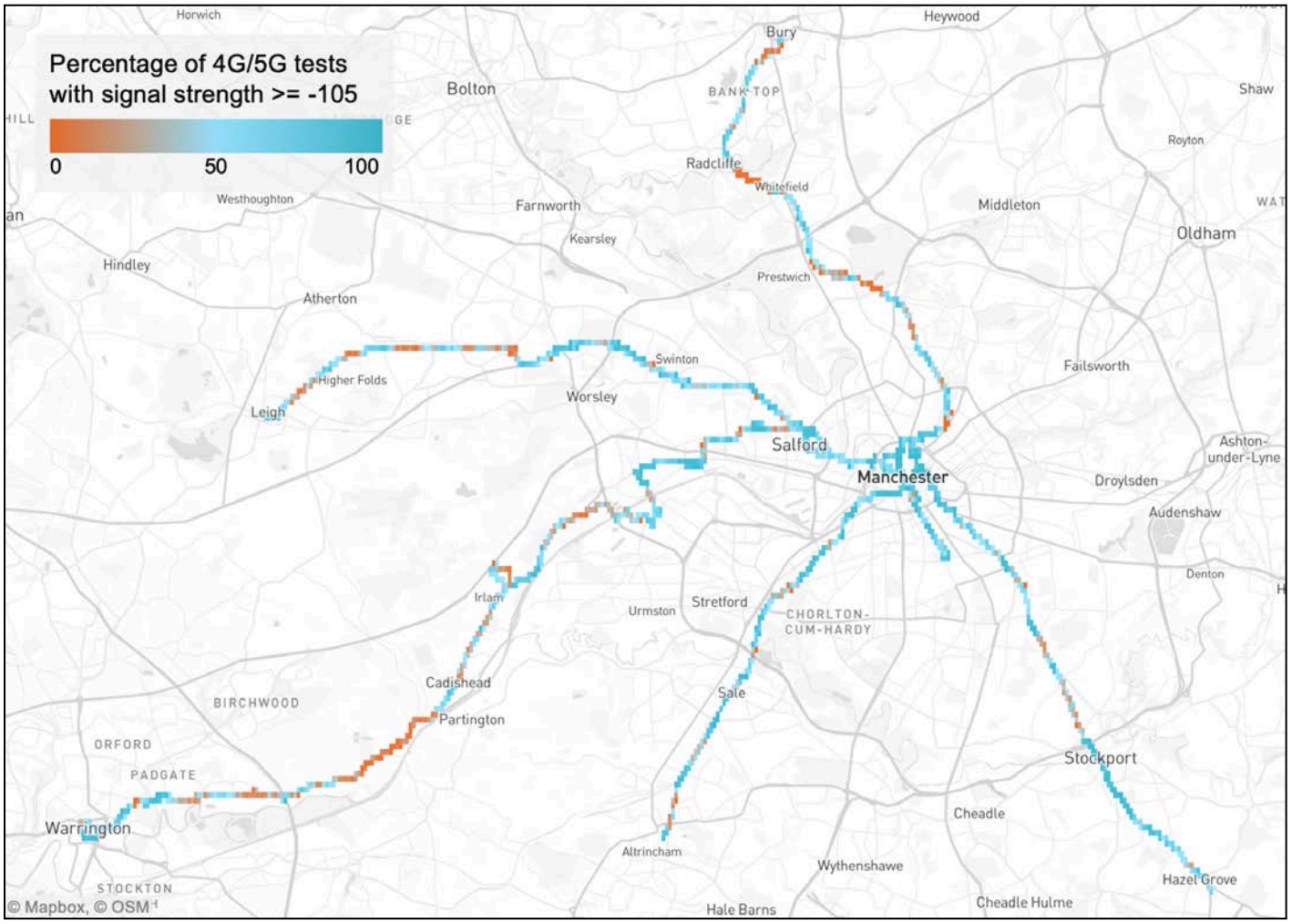
Percentage of location bins (geohash7), where at least 50% of measurements had a 4G or 5G Fair signal strength (>= -105 dBm) when measured from inside the vehicle. A minimum threshold of 10 samples per operator/bin is applied.

	4G + 5G	5G (NSA + SA)	5G SA
EE	76%	74%	73%
O2	69%	52%	20%
Three	63%	20%	0%
Vodafone	68%	40%	30%

	4G + 5G	5G (NSA + SA)	5G SA
1+ operators	92%	85%	80%
2+ operators	81%	60%	36%
3+ operators	64%	34%	7%
4 operators	40%	7%	0%

This is important on transport corridors because users are moving continuously between cells and through changing local environments, so even relatively short weak-signal sections can affect messaging, browsing, streaming, journey planning and app-based ticketing. The above results show that Fair 4G/5G signal was available from at least one operator across most route bins, but that level of consistency dropped materially when considering all operators together, and fell further for 5G SA. That indicates a network environment where a fair-quality signal was present across most of the route, but not always evenly shared across operators or technologies.

The map below shows the percentage of measurements on 4G or 5G with Fair signal strength (>= -105 dBm) when measured from inside the vehicle across all four mobile operators.



Availability of alternative usable signal when primary signal is weak

This section examines what happens when an operator's signal becomes weak. It measures the share of route bins where that operator did not meet the Fair signal threshold, but at least one other operator did. A higher rate indicates that weak coverage is more often operator-specific, because another network remains usable in the same location. A lower rate suggests a broader corridor-level weakness, where alternative usable signal is also limited.

Key Insight:

On average across the four transport network lines, in 59% of cases when an operator had weak or no signal, at least one other operator had at least fair signal.

Percentage of location bins (geohash7), where the primary operator had fewer than 50% of samples with a 4G or 5G Fair signal strength (>= -105 dBm) and where at least another operator had more than 50% of samples with a 4G or 5G Fair signal strength (>= -105 dBm). A minimum threshold of 10 samples per operator/bin is applied.

	4G + 5G	5G (NSA + SA)	5G SA
EE	65%	43%	27%
O2	55%	29%	26%
Three	62%	57%	41%
Vodafone	56%	43%	15%
Total	59%	45%	29%

The results show that alternative-operator availability is more common when assessing 4G and 5G combined, where 59% of weaker bins still had at least one other operator with Fair signal. This fell to 45% for 5G and to 29% for 5G SA, indicating that while weak coverage on one network was often offset by another operator at the broader 4G/5G layer, that resilience became more limited when the assessment was narrowed to newer 5G layers, particularly 5G SA.

Green Line Tram: Bury to Altrincham

Mostly Connected

Strong performance on EE and generally Vodafone; O2 and Three dipped at peak times and in particular sectors

Highlights

- EE remained above 94% in both periods, with only limited local softening in a small number of tram sections.
- Three showed high variability: it scored 77% off-peak but decreased 14 percentage points at peak and displayed notable local issues around Manchester city centre, between Shudehill and Trafford Bar.
- O2 performed well in the central section of the Green Tram Line but experienced performance deterioration at both ends of the line, where scores dropped to 63-71%.

Performance Overview

Network	Off-peak	Peak	Change
EE	98%	**94%**	-4 pp
O2	81%	**77%**	-4 pp
Three	77%	**63%**	-14 pp
Vodafone	87%	**84%**	-3 pp

Good Performance during Peak and Off-Peak walk testing.

Overview analysis

EE shows consistent high performance
Across the Bury to Altrincham Green Line, EE delivered a strong and consistent mobile performance in all four segments, with Good Performance staying above 94% throughout. The route showed only limited local softening, and its strong 5G SA profile was consistent with a performance that remained stable while the tram was moving.

Limited peak degradation, except for Three
Performance remained broadly stable across operators between Off-Peak and Peak periods, indicating limited overall congestion pressure alongside this transport route. EE, O2 and Vodafone all experienced 3-4 percentage point drops at peak compared to off-peak, suggesting some limited sensitivity to increased demand. Three experienced the most notable drop (77% to 63%), indicating that its network was more affected by peak-time load, consistent with capacity constraints under higher usage conditions.

Few tram sections drive most underperformance
Performance issues were concentrated in specific sections rather than across the whole line. For Three, the main weak points were Shudehill – St Peter's Square, Heaton Park – Crumpsall and Deansgate-Castlefield – Trafford Bar, with some evidence of underlying coverage weakness in the northern part of the route. O2's weaker results were concentrated more on outbound sections including the Southern end of the Green Line from Deansgate-Castlefield to Altrincham. Vodafone's weaker areas were narrower but still visible in sections such as Besses o'th'Barn – Prestwich and Deansgate-Castlefield – Trafford Bar. Supporting technology data shows EE making much heavier use of 5G SA, while Three relied more on LTE and 5G NSA, which is consistent with the overall ranking.

Performance by Locality

Good Performance

	EE	O2	Three	VF
Bury - Radcliffe	94%	71%	89%	100%
Besses o'th'Barn - Prestwich	95%	80%	79%	70%
Heaton Park - Crumpsall	89%	88%	76%	86%
Abraham Moss - Victoria	94%	95%	78%	87%
Shudehill - St Peter's Square	100%	100%	18%	95%
Deansgate-Castlefield - Trafford Bar	94%	77%	54%	74%
Old Trafford - Dane Road	100%	69%	84%	88%
Sale - Altrincham	98%	63%	80%	89%

Average across all Peak and Off-Peak Surveys.

Context Snapshot

Date tested	Tue. 3rd March
Outbound journeys	Peak: 7:55 - 8:57 Off-Peak: 11:43 - 12:45
Inbound journeys	Peak: 17:06 - 18:10 Off-Peak: 10:06 - 11:10

Bus 192: Hazel Grove to Manchester City Centre

Mostly Connected

EE is near-perfect along the full route; Vodafone and Three perform well except for specific times/segments, while O2 weakens in half of the sectors.

Highlights

- EE delivered a near-perfect route mobile performance with scores stable around 97-98% across peak and off-peak times.
- Vodafone and Three scored all periods above 90% but also showed time-specific and localised dips in performance.
- O2 showed high variability across sectors, with performance dips between Hazel Grove and Shaw Heath, as well as Heaton Norris – Heaton Chapel.

Performance Overview

Network	Off-peak	Peak	Change
EE	97%	**98%**	**+1 pp**
O2	76%	**77%**	**+1 pp**
Three	91%	**90%**	**-1 pp**
Vodafone	96%	**92%**	**-4 pp**

Good Performance during Peak and Off-Peak walk testing.

Overview analysis

EE delivers a strong performance throughout the route

EE delivered strong and consistent mobile performance in both Peak and Off-Peak conditions, with a strong reliance on 5G SA – which is consistent with the higher level of stability seen in the results.

Three performs well with localised softening

Three provided a generally good performance and remained broadly stable across the route, with localised weaker performance in sections including Heaton Norris – Heaton Chapel, Levenshulme, Stockport and Ardwick.

O2 shows persistent weakness

O2 showed performance weaknesses across both Peak and Off-Peak periods rather than being confined to busy times. This indicates that the main issue was likely to be route-side coverage and radio-quality limitations rather than congestion alone. The weakest O2 results were concentrated in Hazel Grove, Heaviley & Shaw Heath, and Heaton Norris – Heaton Chapel, where signal conditions were materially poorer and some zone-level performance results fell as low as 12% on outbound runs.

Vodafone is strong overall with limited peak softening

Vodafone performed well on off-peak testing, but it experienced a small drop at peak, mainly because of localised deterioration in Hazel Grove and Heaton Norris – Heaton Chapel. In those sections, Vodafone displayed materially weaker signal conditions, consistent with a more fragile connection along that part of the route.

Performance by Locality

Good Performance

	EE	O2	Three	VF
Hazel Grove - Great Moor	99%	40%	95%	82%
Heaviley & Shaw Heath	100%	65%	100%	89%
Stockport	100%	86%	87%	100%
Heaton Norris - Heaton Chapel	100%	63%	89%	84%
Levenshulme & Crowcroft Park	91%	94%	88%	100%
Longsight	100%	88%	100%	97%
Ardwick - Manchester City Centre	92%	97%	79%	100%

Average across all Peak and Off-Peak Surveys.

Context Snapshot

Date tested	Fri. 6th March
Outbound journeys	Peak: 7:56 - 9:07 Off-Peak: 11:14 - 12:16
Inbound journeys	Peak: 16:58 - 18:04 Off-Peak: 10:03 - 10:58

Bus V1: Leigh to Manchester Royal Infirmary

Partially Connected

EE is strong and consistent; Vodafone shows localised peak weakness; O2 and Three suffered recurring coverage gaps.

Highlights

- EE' average performance scores ranged between 94% and 97% across peak and off-peak times, with very small peak-time deterioration.
- Three and O2 both faced connection challenges, but for different reasons:Three showed a clear peak/off-peak penalty, while O2 remained inconsistent even off-peak.
- Three out of four operators showed performance issues between Manchester City Centre and the Royal Infirmary.

Performance Overview

Network	Off-peak	Peak	Change
EE	97%	**94%**	-3 pp
O2	59%	**61%**	+2 pp
Three	69%	**55%**	-14 pp
Vodafone	87%	**76%**	-11 pp

Good Performance during Peak and Off-Peak walk testing.

Overview analysis

Clear operator differences on the V1 bus route

During the testing, EE showed a strong performance throughout, delivering performance scores of 94% and above and remaining comparatively stable between peak and off-peak periods. Vodafone performed well on most of the journeys, although its peak performance fell materially. Three and O2 both faced a degraded performance, particularly towards the two ends of the route – where they relied more heavily on lower spectrum bands while also experiencing worse signal conditions.

Two different patterns for underperformance

For Three, and to a lesser extent Vodafone, the evidence showed a clear peak-time penalty, particularly on the inbound journey, which was consistent with higher network load under busier conditions. Instead, O2's pattern was less clearly linked to time of day. Its results remained inconsistent in both peak and off-peak periods, indicating that the issue was not simply congestion. Rather, O2 appeared to be affected by persistent weak sections along the route, with Leigh, Tyldesley, and Mosley Common & Ellenbrook standing out as the main problem areas. By contrast, EE remained broadly consistent across nearly all route sections, with only limited softening in Tyldesley at peak.

Local performance drops are driven by signal & band usage

The zoned analysis shows that weaker overall results are being driven by a small number of recurring route sections rather than by uniform weakness across the corridor. For Three, the main issues were from Wallness to the Royal Infirmary, where weaker signal conditions and heavier reliance on LTE and 5G NSA, with little evidence of 5G SA, align with poorer performance. O2 was weakest from Leigh to Ellenbrook, where poor signal levels were consistent with more persistent coverage limitations. Vodafone's dips were more concentrated in Manchester City Centre and Chorlton-on-Medlock during inbound peak, where an LTE-heavier mix appeared less resilient than EE's broader 5G-led profile. Overall, the signal and band data indicate that EE benefited from stronger route continuity, while Three and O2 were more exposed to weak-signal sections and Vodafone to more localised peak-time instability.

Performance by Locality

Good Performance

	EE	O2	Three	VF
Leigh	100%	27%	70%	90%
Tyldesley	87%	37%	67%	94%
Mosley Common & Ellenbrook	92%	28%	77%	76%
Roe Green - Deans	100%	96%	65%	96%
Swinton Park & Pendleton	100%	100%	89%	93%
Wallness - Spinningfields	94%	70%	46%	86%
Manchester City Centre	94%	62%	47%	70%
Chorlton-on-Medlock	95%	52%	41%	45%

Average across all Peak and Off-Peak Surveys

Context Snapshot

Date tested	Thu. 5th March
Outbound journeys	Peak: 7:36 - 8:58 Off-Peak: 11:35 - 12:43
Inbound journeys	Peak: 16:45 - 18:05 Off-Peak: 10:05 - 11:04

Bus 100: Warrington Interchange to Shudehill Interchange

Partially Connected

EE and Vodafone are strong and consistent; O2 is uneven, while Three struggles on weaker outer sections.

Highlights

- Three and O2 experienced very weak results in the Woolston to Cadishead & Dumplington sections, mostly driven by coverage limitations.
- EE and Vodafone displayed strong overall performance along this route on all four journeys, with little sign of peak congestion and only some performance softening between Hollins Green and Cadishead.

Performance Overview

Network	Off-peak	Peak	Change
EE	95%	**95%**	**–**
O2	69%	**74%**	**+5 pp**
Three	73%	**52%**	**-21 pp**
Vodafone	90%	**89%**	**-1 pp**

Good Performance during Peak and Off-Peak walk testing.

Overview analysis

EE and Vodafone – Strong and reliable

EE and Vodafone delivered the best mobile performance on Bus 100. EE had a Good Performance of 95% in both peak and off-peak periods, while Vodafone followed at around 89-90%. Both were strong across most of the route, with only limited localised weakness. This stronger performance was consistent with better coverage and technology mix, particularly EE's higher share of 5G SA and n78 (3500 MHz), which supported a more stable data connection. Vodafone also performed well because its mixed 4G/5G footprint was generally sufficient across the corridor, combining broad LTE coverage on the outer sections with added 5G capacity in stronger areas such as Irlam, Salford and Manchester City Centre.

O2 – Uneven performance

O2 recorded variable results, from 74% at peak, to 69% off-peak. Performance was pulled down by several outer-route sections, especially the Woolston to Cadishead section, and Dumplington. The clearest weakness was Hollins Green & Cadishead, where O2 passed the quality thresholds just 7% across all journeys. This suggests O2 was more exposed to weaker coverage and less able to sustain download performance through the most difficult parts of the route.

Three – Weak at peak, better off-peak

Three was particularly weak at peak times, with performance scores down to 52% on the peak journey, but improved to 73% off-peak. Its peak result was heavily affected by the opening sections with very weak or unavailable signal between Woolston and Cadishead. Three's band mix was concentrated mainly on 2100 MHz (Band 1) and 1800+ MHz (Band 3), with only small shares on lower bands such as 700 MHz, 800 MHz and 900 MHz. Together with Three's improved score during off-peak journeys, this suggests that Three could deliver a better performance where 5G NSA and stronger signal were available, such as Irlam and Manchester City Centre, but on the outer route it was more exposed to weaker coverage and less stable performance, especially in busier peak conditions.

Performance by Locality

Good Performance

	EE	O2	Three	VF
Warrington - Paddington	97%	76%	50%	97%
Woolston - Rixton	91%	49%	21%	74%
Hollins Green & Cadishead	81%	7%	50%	76%
Irlam	100%	87%	73%	97%
Dumplington	98%	43%	30%	97%
Burton upon Irwell - Eccles	100%	88%	63%	80%
Salford Royal Hospital & Pendleton	98%	95%	85%	99%
Salford	93%	78%	69%	84%
Manchester City Centre	100%	100%	70%	93%

Average across all Peak and Off-Peak Surveys.

Context Snapshot

Date tested	Wed. 4th[1], Tue. 10th[2] March
Outbound journeys	Peak[1]: 7:48 - 9:44 Off-Peak[2]: 12:52 - 14:45
Inbound journeys	Off-Peak[1]: 10:30 - 12:17

Outdoor Surveys

Introduction

This section presents the findings from outdoor mobile testing conducted across Bury Town Centre, along with further testing conducted at three specific locations:

- Bury Outdoor Market;
- Bury Interchange;
- The Rock shopping centre.

Bury Town Centre was assessed through repeated outdoor walk testing during Peak and Off-Peak times, covering three market days and three non-market days.

Bury Outdoor Market, Bury Interchange and The Rock were assessed through 7-day static testing at fixed outdoor points, allowing comparison between busier and quieter operating periods such as Market Open versus Market Closed and Peak versus Off-Peak.

Performance Summary

Outdoor Testing	Connectivity Performance (Peak)
Bury Town Centre	**Mostly Connected**
Bury Outdoor Market	**Mostly Connected**
Bury Interchange (Outdoor)	**Well Connected**
The Rock	**Well Connected**

Outdoor Surveys - Key Findings

EE demonstrated the strongest outdoor performance and greatest use of 5G SA across the survey set

Across the town-centre walk route and all three static outdoor sites, EE delivered 98-100% Good Performance with little variation between busy and quiet periods. This aligned with a strongly 5G SA-led profile and sustained use of higher-capacity spectrum. In Bury Town Centre, 5G SA accounted for 95% of off-peak records and 93.7% at peak, split across both >3 GHz spectrum (48.9%; 47.5%) and 1-3 GHz spectrum (45.2%; 45.1%). At the Outdoor Market, EE was effectively 100% 5G SA and almost entirely on >3 GHz spectrum (99.8% off-peak; 99.0% peak), indicating the strongest outdoor capacity headroom overall.

Technology mix and band use influenced how well operators converted outdoor coverage into usable performance

Vodafone's strongest results were typically supported by heavy use of 5G SA on >3 GHz spectrum – which offers greater bandwidth capacity and reduced congestion compared to lower frequency bands – including 100% of off-peak records and 99.8% at peak at the Outdoor Market, 100% in both periods at Bury Interchange, and 99.6% in both periods at The Rock. O2, by contrast, was much more concentrated on low-band 700 MHz within its 5G SA profile: 78.1% of all off-peak town-centre records and 53.7% at peak, plus 100% of its 5G SA records at both the Outdoor Market and The Rock. Three followed a different pattern, relying mainly on 5G NSA and LTE rather than 5G SA, including 82.1%/85.3% 5G NSA in the town centre and 75.6%/75.3% LTE at the Outdoor Market.

Busy-period pressure was visible, but it was not evenly distributed across operators

The clearest recurring weakness was on O2. In Bury Town Centre, O2's Good Performance fell from 79% off-peak to 69% at peak, while LTE use rose from 5.5% of records to 32.4%. At the Outdoor Market, O2 also weakened from 93% to 85%, with an hourly low of 63% at 1pm. By contrast, EE remained stable on a broader 5G SA mix, Vodafone stayed very strong where higher-band 5G SA was prevalent, and Three generally remained strong despite a more LTE/5G NSA-led profile. This points to a pattern where busy-period pressure mattered most for O2, rather than a general outdoor capacity problem affecting all networks equally.

Localised weaker-signal areas reduced performance in parts of the town centre, but signal strength alone did not explain the overall pattern

The main weak area in the town-centre analysis was the north-west section around the Transport Museum and Bolton Street, with some added variability toward the north-east near The Rock and Derby Way. However, weaker radio conditions did not affect all operators equally. Operators making better use of higher-capacity 5G layers generally maintained stronger outcomes, while those spending more time on low-band 5G or LTE fallback were more likely to see performance drop. This indicates that outdoor performance in Bury was shaped by both signal conditions and how effectively each network used its available radio layers.

Bury Town Centre (Page 1 / 3)

Bury, Greater Manchester

Peak: 3x market days
Off-Peak: 3x non-market days

Mostly Connected

EE is near-perfect; Three and Vodafone are very strong; O2's performance dips at busy times.

Highlights

- Strong overall connectivity performance in most cases.
- Operators with 5G SA showed near-universal coverage of Bury Town Centre, but that did not always guarantee good performance, nor that devices would always connect to 5G SA.
- The North West area around the Transport Museum and Bolton St. was a common weak performance area for all operators.
- EE, Three and Vodafone maintained a strong performance both at off-peak and peak testing. O2 showed a weaker off-peak score of 79% and experienced a 10 percentage points dip to 69% at peak, consistent with network congestion patterns.

Performance Overview

Network	Off-Peak	Peak	Change
EE	99%	**98%**	-1 pp
O2	79%	**69%**	-10 pp
Three	93%	**94%**	+1 pp
Vodafone	94%	**91%**	-3 pp

Good Performance during Peak and Off-Peak walk testing.

Overview analysis

EE shows a strong performance, driven by 5G SA

EE achieved near-perfect scores both at off-peak and peak times relying mainly on a 5G SA footprint, with 5G SA accounting for 95% of records off-peak and 94% at peak.

O2 shows a clear performance dip, especially during peak hours, driven by reduced download speeds

O2's peak time performance dip was largely driven by a drop in the download KPI pass rate. The underlying issue appeared to be less about simple coverage and more about peak-time network behaviour: O2 shifted from a more 5G-led mix off-peak, where 5G SA and 5G NSA together accounted for 93% of records, to a peak profile where LTE jumped to 30% and 5G SA fell by 23 percentage points. This pattern suggests a busy-hour capacity or fallback issue rather than a pure signal availability issue.

Vodafone and Three perform well but with different strategies

Three delivered solid and slightly improving Good Performance, rising from 93% off-peak to 94% at peak, despite relying mainly on 5G NSA and some LTE rather than 5G SA. Vodafone also recorded high performance scores, from 94% off-peak to 91% at peak, but using a more balanced split between 5G SA,5G NSA, and LTE.

Great 5G coverage but frequent 4G fallback

The outdoor testing highlighted a 100% 5G SA coverage for EE and O2, 90% for Vodafone, and 99% 5G NSA coverage for Three. However, the testing devices experienced frequent fallback to LTE, particularly during peak times, up to 29-30% of samples on Vodafone and O2.

North West and North East Bury showed broader multi-operator weakness

Several operators recorded weaker connectivity in North West Bury and in the North East beyond The Rock, where radio conditions were poorer and mobile connectivity was more likely to fall below the minimum performance threshold.

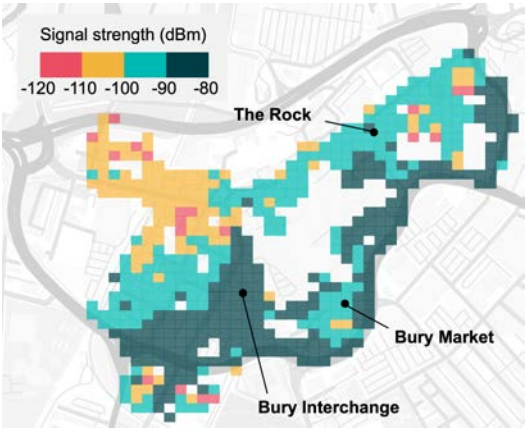
Performance by Survey

Survey	EE	O2	Three	VF
Peak 1	97%	74%	93%	94%
Peak 2	99%	68%	94%	88%
Peak 3	99%	63%	96%	89%
Off-Peak 1	100%	82%	97%	92%
Off-Peak 2	98%	80%	81%	94%
Off-Peak 3	100%	76%	99%	97%

Peak 1	Wed. 21st Jan. 2026, 11:05 - 15:46
Peak 2	Wed. 28th Jan. 2026, 10:56 - 14:05
Peak 3	Wed. 18th Feb. 2026, 10:41 - 13:16
Off-Peak 1	Thu. 22nd Jan. 2026, 11:39 - 13:57
Off-Peak 2	Tue. 27th Jan. 2026, 10:36 - 13:09
Off-Peak 3	Thu. 19th Feb. 2026, 10:52 - 13:27

Locations Surveyed

Average signal strength & static testing placement



Bury Town Centre (Page 2 / 3)

Bury, Greater Manchester

Peak: 3x market days
Off-Peak: 3x non-market days

Technology and spectrum mix drive capacity, shaping both throughput quality and overall mobile performance.

Deep Dive 1: Technology Mix drives Throughput

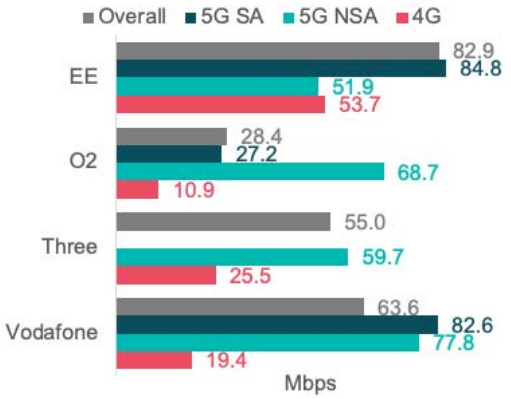
Technology and spectrum mix determine throughput rates
Connection technology and band usage determined how much capacity was available, while the mix of those layers influenced the overall performance scores seen during testing.

EE's results were driven by a heavy concentration on 5G Standalone, supported by strong use of the 3.5 GHz n78 layer, which showed faster download rates.

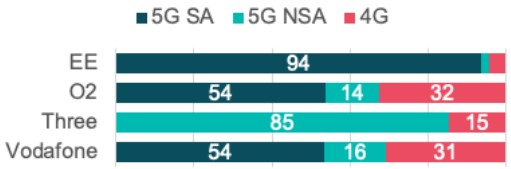
Three relied much more on 5G Non-Standalone, with a larger role for LTE-based mid-band layers such as 2600 MHz and 2100 MHz, which supported acceptable performances but did not deliver the same level of throughput as a strong SA n78 profile.

The same principle explains the wider operator spread: Vodafone performed strongly in download throughput when on 5G SA and n78, but its overall average was pulled down by a larger share of LTE fallback, while O2 shows that a nominally 5G-led mix does not automatically produce high speeds if that mix is weighted more towards lower-capacity layers such as 700 MHz and other lower-band spectrum.

Download Throughput - Peak Time



Percentage of tests by technology - Peak Time



Includes both active and passive tests.

Deep Dive 2: Vodafone saw 5G SA boost in mid-February

Materially improved speeds following 5G SA 3.5 GHz activation
Across the three Bury Town Centre walk-test rounds, Vodafone shows the clearest time-based improvement by Survey 3 in mid-February. Average download and upload speeds increased materially in both Peak and Off-Peak testing, with Peak download rising to 88.0 Mbps and Off-Peak download to 84.6 Mbps, well above the levels recorded in Surveys 1 and 2. This uplift is partly explained by Vodafone spending more time on 5G Standalone, particularly on the higher-capacity 3.5 GHz layer, rather than the more mixed LTE and lower-band profile seen in the earlier surveys.

A faster 5G SA layer drove Vodafone's mid-February speed boost
Vodafone's Survey 3 improvement was not just due to spending more time on 5G SA: the 5G SA layer itself performed much better. Average 5G SA download speeds more than doubled versus the earlier Off-Peak rounds and also rose sharply at Peak, with the same pattern still evident on n78 alone. This suggests Survey 3 benefited both from greater use of Vodafone's best-performing layer and from that layer operating more effectively, consistent with better cell selection and/or higher available capacity at the time of testing. However, Good Performance at Peak remained below Survey 1, indicating that some weaker tests still persisted. Overall, the data points to a much stronger 5G performance by mid-February, while showing that fallback onto slower layers had not been fully removed.

Vodafone download throughput, by Survey

Bury Town Centre (Page 3 / 3)

Bury, Greater Manchester

Peak: 3x market days
Off-Peak: 3x non-market days

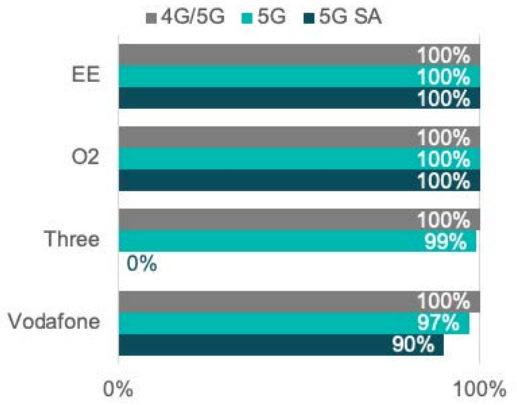
Coverage alone does not guarantee good outcomes. Technology, frequency band, signal quality and congestion affect mobile performance.

Deep Dive 3: Coverage does not guarantee good outcomes

All operators serve 5G in at least 97% of tested locations
Bury Town Centre outdoor testing shows that all operators provided near-universal coverage with 97% or more of tested locations having 5G coverage – and even 100% 5G Standalone coverage for EE and O2. However, this did not mean that the testing devices always stayed on 5G or 5G SA, or that performance was always strong. In fact, the data shows that fallbacks to 5G NSA or LTE were frequent – particularly at Peak times – and 5G connections did not guarantee 100% pass rates.

Multiple conditions beyond coverage determine performance
In practice, a location may be covered by 5G or 5G SA, but performance can still vary materially depending on the band in use, whether the device is connected to the strongest or a less favourable cell, the level of congestion at that moment, and whether traffic is pushed onto other technologies during busier periods. Coverage therefore indicates network presence, but it does not guarantee strong download speeds, low latency, or high pass rates under Peak demand.

Coverage by Technology



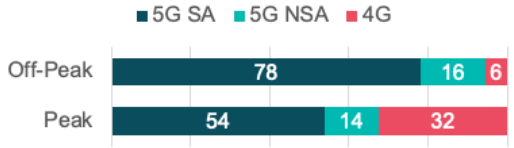
Percentage of location bins (geohash 8) covered by technology; a minimum threshold of 10 samples per operator/bin is applied.

Deep Dive 4: O2's LTE fallback drags its performance

Greater LTE fallback at Peak increases O2's exposure to its weakest network layer
O2's weaker overall results are partly explained by a clear shift in technology mix between Off-Peak and Peak testing. Off-Peak, O2 remained predominantly on 5G SA, which accounted for around 78% of active tests, with only a small proportion on LTE. At Peak, that position changed materially: 5G SA fell to around 56%, while LTE rose to roughly 30% of tests. This means that when the network was under greater load, O2 was spending much more time on its fallback layer rather than remaining on its higher-performing 5G layer. In practice, that shift matters because O2's LTE layer was materially weaker than its 5G layers, so a heavier reliance on LTE at Peak had a disproportionate negative effect on the overall mobile performance and helps explain why O2's pass rates remained below those of the other operators.

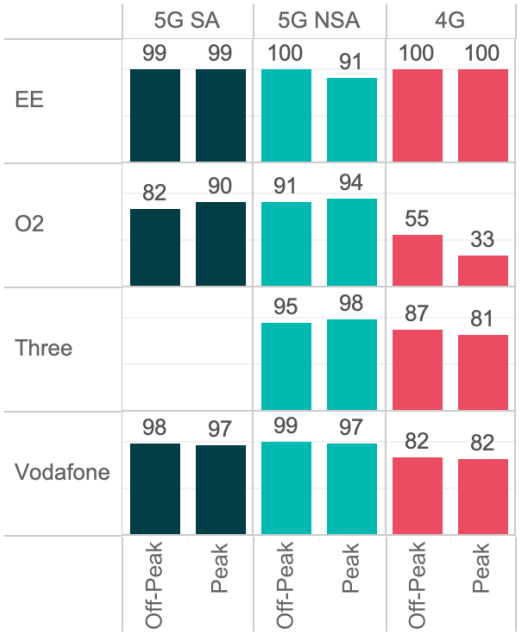
O2's LTE network underperforms compared to peers
The pass-rate by technology chart shows that O2's LTE performance was a clear outlier. Off-Peak, O2's LTE pass rate was only 55%, falling further to just 33% at Peak. LTE pass rates for Three and Vodafone ranged around 81–87%, and 100% for EE. This indicates that, for O2, LTE was not simply a slower fallback option but a materially weaker mobile layer that frequently failed to meet the reporting threshold. In fact, O2's Peak LTE average download speed was only 10.9 Mbps, well below other operators' 4G-led profiles. As Peak conditions pushed more O2 tests onto LTE, the combination of lower download throughput and weaker LTE pass performance pulled down the overall score much more sharply than on the other networks.

O2 percentage of tests, by technology



Includes both active and passive tests.

Performance by Technology



Bury Outdoor Market

Outdoor Market
Bury, Greater Manchester

Start: 17th Feb. 2026, 13:00
End: 24th Feb. 2026, 13:00

Mostly Connected

EE and Vodafone score 100%, Three suffers a blip, while O2 is constrained at peak times when the market is open.

Highlights

- Great performance on EE & Vodafone with 100% scores both during market days and off-peak days.
- O2 suffered a significant performance dip at around 1pm on days the outdoor market was open due to network congestion affecting throughput speeds.
- Despite being on 5G SA, O2 recorded lower download and upload throughput scores largely due to its use of low-band 700 MHz spectrum, which offered limited capacity.

Performance Overview

	Market Closed	Market Open	Change
EE	100%	**100%**	–
O2	93%	**85%**	-8 pp
Three	99%	**98%**	-1 pp
Vodafone	100%	**100%**	–

Good Performance based on Static testing.
***Market Open**: Wed. & Fri. 9:00 - 16:30, Sat. 9:00 - 17:00*
***Market Closed**: Mon., Tue., Thu., Sun. 9:00 - 17:00*

Overview analysis

Perfect scores for EE and Vodafone
EE and Vodafone delivered 100% Good Performance scores both during closed and opening times of the Bury outdoor market. Their performance remained stable regardless of market activity, indicating sufficient capacity and resilience under load.

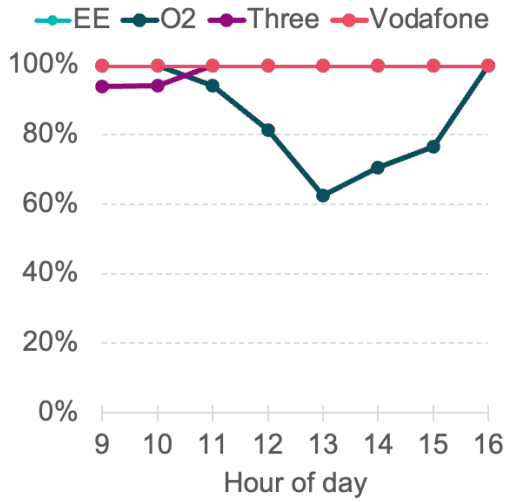
Near-perfect score for Three
Three performed reliably with Good Performance remaining high, and only a marginal decline during market hours, showing that throughput levels were sufficient for a solid mobile performance. However, Three's performance headroom was lower than Vodafone and EE mostly due to the large share of tests over its LTE network, reflecting a more constrained network setup rather than a fundamental service issue.

Performance dip for O2 when the market is busy
O2 showed a clear drop in average Good Performance when the market was open from 93% to 85%, with a down peak of 63% at 1pm. This decline was driven by reduced download performance, while upload and latency remained stable.

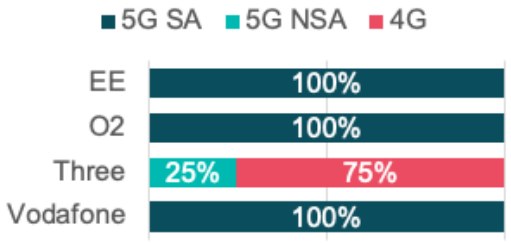
O2's capacity constraint appears to be band-related
The primary issue at this location appeared to be capacity pressure during market hours, where performance tightened across all operators – although with uneven impact. O2 degraded significantly, Three showed only a minor decline, and EE and Vodafone remained stable. This pattern appeared directly linked to differences in radio strategy: EE and Vodafone benefited from high-capacity 5G SA on mid-band n78, Three relied more on LTE with some 5G NSA support, and O2 – despite using 5G SA – was constrained by low-band 700 MHz spectrum, which limited capacity under load.

Deep dive

Hourly Good Performance - Market Open



Percentage of tests by technology - Market Open



Includes both active and passive tests.

Bury Interchange (Outdoor)

Bus & tram station
Bury, Greater Manchester

Start: 17th Feb. 2026, 11:00
End: 24th Feb. 2026, 11:00

Well Connected

EE and Vodafone score 100%, Three suffers a blip, while O2 experiences a dip due to 2G fallback.

Highlights

- EE and Vodafone displayed flawless performance, maintaining 100% Good Performance at all times.
- Three delivered stable, near-perfect performance, with only minor peak-time impact, though at lower throughput levels due to LTE-heavy reliance.
- O2 appeared to show peak-time degradation, but that was rather caused by an 8-hour network fallback to 2G at the end of the 7-day testing that affected its results.

Performance Overview

	Off-Peak	Peak	Change
EE	100%	**100%**	–
O2	99%	**93%**	-6 pp
Three	100%	**99%**	-1 pp
Vodafone	100%	**100%**	–

Good Performance based on Static testing.
***Peak**: weekdays 7:00 - 9:30 & 16:00 - 18:30*
***Off-Peak**: weekdays 9:30 - 16:00, weekends 7:00 - 18:30*

Overview analysis

Flawless performance score for EE and Vodafone
EE and Vodafone delivered strong and consistent performance, maintaining 100% Good Performance in both Peak and Off-Peak periods. Their results remained stable under load, with high throughput and low latency throughout, indicating strong capacity and resilience at this location.

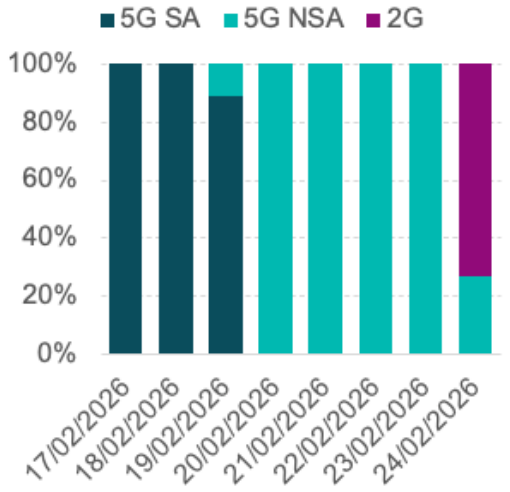
Near-perfect score for Three
Three performed reliably with near-perfect Good Performance and only marginal degradation during Peak periods. However, throughput remained notably lower than EE and Vodafone, reflecting a more constrained performance ceiling rather than a stability issue – likely tied to its LTE reliance.

O2 switched from 5G SA to 5G NSA mid-testing
The 7-day testing highlighted a clear network switch on the O2 network. Initially, all measurements were on a 5G SA network, but on Feb. 19 they moved to a 5G NSA network. Both network technologies delivered 99% and above performance during peak and off-peak hours.

Network and Technology Mix explain differences
Performance differences appeared to be tied to network configurations. EE and Vodafone operated fully on 5G SA, supporting stable, high-capacity performance. Three relied more on LTE with some 5G NSA, limiting peak throughput but maintaining reliability. O2's mixed 5G NSA/SA profile performed strongly, but its fallback to 2G at the end of the testing period with its temporary 0% score clouded its Peak result.

Deep dive

O2 share of active readings by Connection Technology over time



O2 Good Performance, by Connection Technology

The Rock

The Rock street
Bury, Greater Manchester

Start: 17th Feb. 2026, 10:00
End: 24th Feb. 2026, 10:00

Well Connected
All operators score 99-100% during trading hours at the shopping centre.

Highlights

- Three, EE and Vodafone all achieved 100% Good Performance across both weekdays and weekends, indicating consistently strong performance during trading times.
- Three was the strongest overall performer on this external static test, combining the highest average download throughput (228.6 Mbps overall) with the lowest latency (8.4 ms overall).
- O2 was the only operator below 100% – at 99% – with materially lower average download speeds than peers as it relied on the 700 MHz low frequency band.

Performance Overview

	Weekday Open	Weekend Open	Change
EE	100%	**100%**	–
O2	99%	**99%**	–
Three	100%	**100%**	–
Vodafone	100%	**100%**	–

Good Performance based on Static testing.
***Weekday Open**: weekdays 9:00 - 19:00*
***Weekend Open**: Sat. 9:00 - 18:00, Sun. 10:30 - 16:30*

Overview analysis

Outstanding performance for all network operators
Three, EE and Vodafone each achieved 100% Good Performance during both weekdays and weekends trading hours at The Rock shopping centre, while O2 was the only operator to fall marginally below that level, at 99% during both periods.

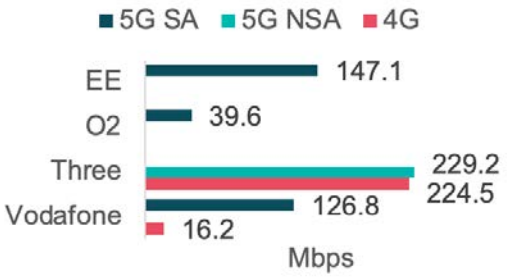
Three – Strong Performance due to very strong signal
Three achieved 100% performance during both weekday and weekends open times, delivering the highest download speeds and lowest latency overall. Although it used a 5G NSA/LTE mix rather than full 5G SA, the signal conditions outside the venue were clearly very favourable – with signal stronger than -85dbm for the most part – which help explain its strong performance.

O2 – Reliable but with lower download throughput
O2 recorded a strong performance with 99% Good Performance during trading hours of both weekdays and weekends. However, O2's average download throughput was markedly lower than the other operators. As signal levels remained broadly stable and O2 stayed on 5G SA throughout, the weaker result is consistent with a local capacity constraint – likely due to the use of low-frequency 700 MHz band.

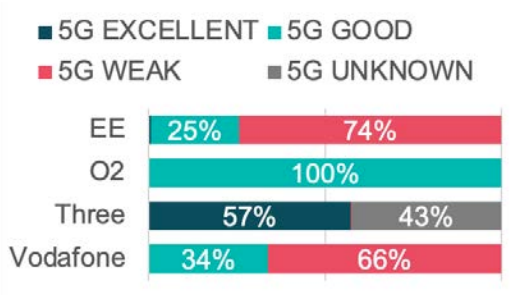
EE and Vodafone – Strong and Consistent
EE combined high throughput with a broader 5G SA band mix, while Vodafone also maintained strong speeds and reliability, largely supported by the 3500 MHz band. Neither matched Three on headline speed, but both delivered stable and consistently strong performance at this outdoor location.

Deep dive

Average download throughput, by technology



Percentage of 5G (SA or NSA) active tests, by 5G signal category



Comparison to Crowd-Sourced Data

The field test findings within this report relied on dedicated field testing conducted by Streetwave using handsets running Opensignal network testing software - the same software installed on over one hundred million handsets globally and gathering data across the UK every second.

Key Findings

Crowdsourced data correlated with the field test data

In Bury Town Centre, both datasets placed EE and Three as the leading operators and O2 as the weakest in terms of performance. This directional alignment held indoors: at Co-op Live and Piccadilly Station, both datasets independently identified Three as a, consistent underperformer relative to the other three operators at the tested venues during the testing period, while EE, O2 and Vodafone performed strongly across both methods. At Aviva Studios, both sources consistently identified a building-wide signal limitation affecting all four operators.

Absolute results differ for expected methodological reasons

While the broad competitive pattern is consistent, the two datasets do not produce identical values. This is expected: crowdsourced data reflects an average view aggregated over 180 days across a wide mix of devices and usage conditions, whereas field measurements capture a specific point in time under controlled conditions using premium handsets with 5G SA access. In Bury Town Centre, field testing generally recorded higher Performance Scores, faster download speeds and lower latency while crowdsource recorded higher upload speeds across all four operators. These differences reflect the two methods capturing different conditions rather than contradictory findings.

Shared identification of weaker coverage areas and buildings

Both approaches aligned spatially. In Bury Town Centre, crowdsource and field testing both identified a persistent weaker-signal area in the north-west of the town centre, particularly around the Transport Museum and Bolton Street, while stronger conditions were more consistently observed to the east and north-east. Indoors, this spatial alignment was equally evident: at Aviva Studios, both datasets identified the building as dominated by weak signal conditions across all operators, consistent with its dense concrete and metal structure.

Crowdsourced data is effective for screening; field testing adds precision

Crowdsourced data proved effective at identifying broad patterns of performance and highlighting likely at-risk locations – whether a weak outdoor corridor in a town centre or a poorly covered building – over extended time periods. Field testing then provided the more precise evidence needed to validate those patterns, quantify their severity under controlled conditions, and define their spatial extent with greater accuracy. The two approaches are most effective when used together: crowdsource for broad and continuous monitoring, field testing for detailed, location-specific analysis.

Methodology Differences

Although both approaches are based on consumer handsets running the same core testing software, there are key differences between field testing and crowdsourcing that present distinct advantages to each. For this comparison, the field-testing dataset comprises peak and off-peak sessions, all undertaken using a Samsung Galaxy S24 with a retail SIM and 5G SA enabled. The crowdsourced dataset, by contrast, is an aggregated 24/7 sample over 180 days and reflects a much wider mix of user conditions, device types and time periods.

Key differences affecting results include:

1. **Consistent high-end devices in field testing vs mixed in crowd**
   For the field testing modern premium handsets were used - Samsung Galaxy S24 with SIMs that have access to 5G SA. Crowdsourcing uses a mixture of devices in the market, not all with access to 5G or 5G SA networks. For this reason, field devices are generally expected to report higher performances than the average experience by users.

2. **Point in time vs continuous sampling**
   Field testing takes place on a specific date and time, enabling a direct comparison between providers. During the field testing, network conditions may be good or bad, such as if a location is busy or quiet. Crowdsourcing on the other hand samples data over time therefore aggregating a diverse range of experiences over time. For this reason, results may vary.

3. **Like-for-like versus diverse sampled**
   Crowdsourcing relies on a wide range of device makes, models, software versions, ages and capabilities. On the other hand, field testing uses consistent, modern high-end handsets with the latest technology and generally able to enjoy the best available experiences. For these reasons, results may vary, with crowdsourced performance results generally expected to be slightly lower than field test results.

4. **Local granularity versus broad scale**
   Field testing produces a large amount of test data, in a selected location, over a short space of time, enabling a highly granular view. Crowdsourcing produces a little data everywhere, all of the time. These provide distinct advantages - the ability to monitor and observe changes across a city or whole country 24/7 with crowdsourced data to identify potential problem areas - then deep dive into a specific location in high granular detail with field testing.

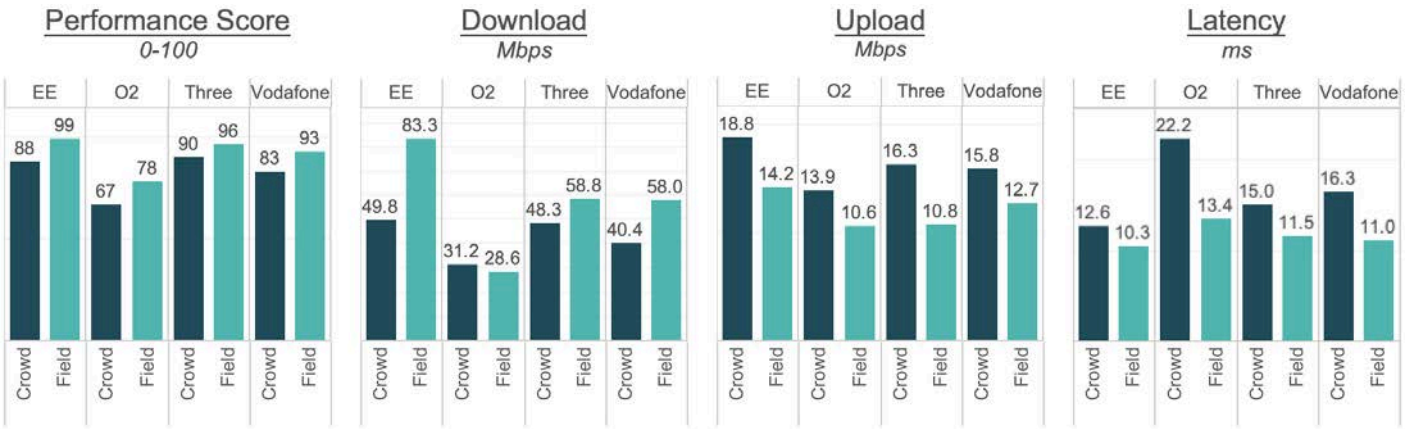
5. **Indoor accuracy**
   Determining indoor location from cellular devices in crowdsourcing is often unreliable, as GPS signals are generally weak or blocked inside buildings. Field testing is fully controlled, with the testing engineer recording their location throughout, enabling accurate indoor measurement. Crowdsourced data can therefore identify buildings with poor coverage or quality, while field testing can accurately analyse different parts and floors of those buildings.

Outdoor Comparison

This section compares network signal and performance data collected through outdoor field testing in Bury Town Centre with Opensignal crowdsourced data covering the 180-day period ending 13 March 2026. The purpose is not to treat the two datasets as directly interchangeable, but to assess whether they point to the same broad conclusions on operator performance and the location of weaker coverage, despite the methodological differences.

Performance Analysis

The performance comparison shows broad alignment in overall operator outcomes, although the exact ranking is not identical. EE and Three were the top two operators in both datasets, Vodafone remained behind them, and O2 was clearly weakest. In crowdsource, Three recorded the highest Performance Score (90) ahead of EE (88), whereas in field testing EE led (99) ahead of Three (96).

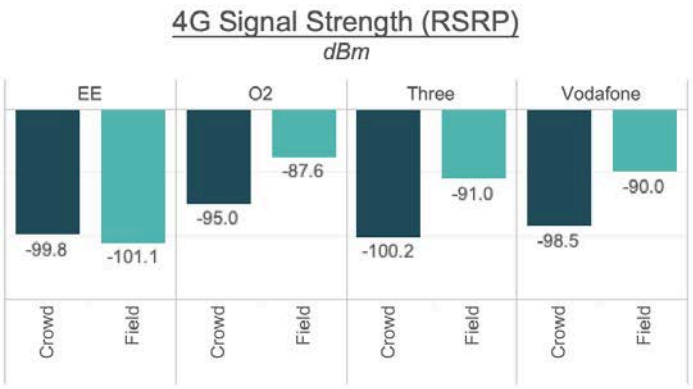


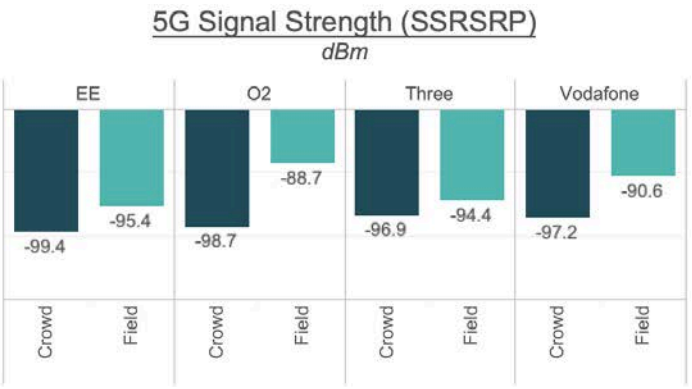
The Performance Score represents the percentage of tests meeting Download (5 Mbps), Upload (1.5 Mbps) and latency (50 ms) minimum thresholds. For the sake of comparability both Crowd and Field results used a direct aggregation of individual measurements, instead of a time-based aggregation.

Across download, upload and latency, the two datasets are broadly directionally consistent, though they do not produce identical values. EE recorded the strongest download speeds in both sources, rising from 49.8 Mbps in crowdsource to 83.3 Mbps in field testing, while O2 was the weakest on both at 28.6-31.2 Mbps. Upload is the least closely aligned metric – crowdsource recorded higher upload speeds than field testing for all four operators – yet the operator ranking remained broadly similar, with EE strongest and O2 weakest. Latency shows the clearest relationship: field testing recorded lower figures for every operator, with EE best at 10.3 ms and O2 weakest at 13.4 ms, compared to consistently higher crowdsourced values, particularly for O2 at 22.2 ms. These differences are consistent with field testing capturing a controlled outdoor environment, while crowdsource reflects a broader mix of user conditions over time.

Signal Strength Analysis

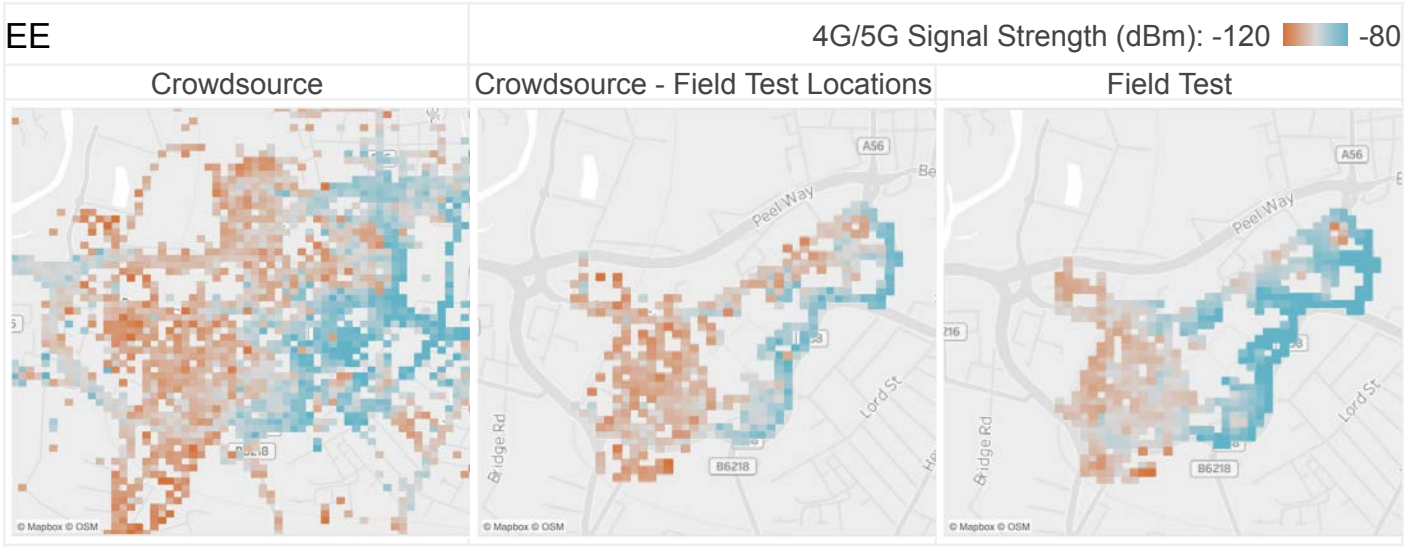
Signal strength should not be treated as a direct measure of user experience on its own, but it remains a useful indicator of underlying coverage conditions and is particularly helpful when comparing broad patterns between datasets – particularly when plotted on a map.

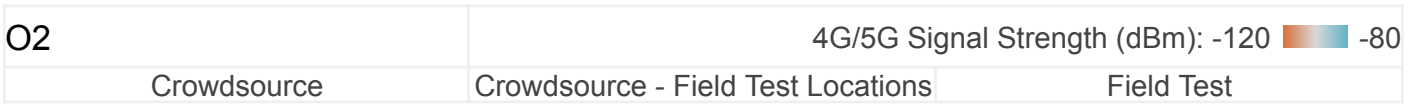


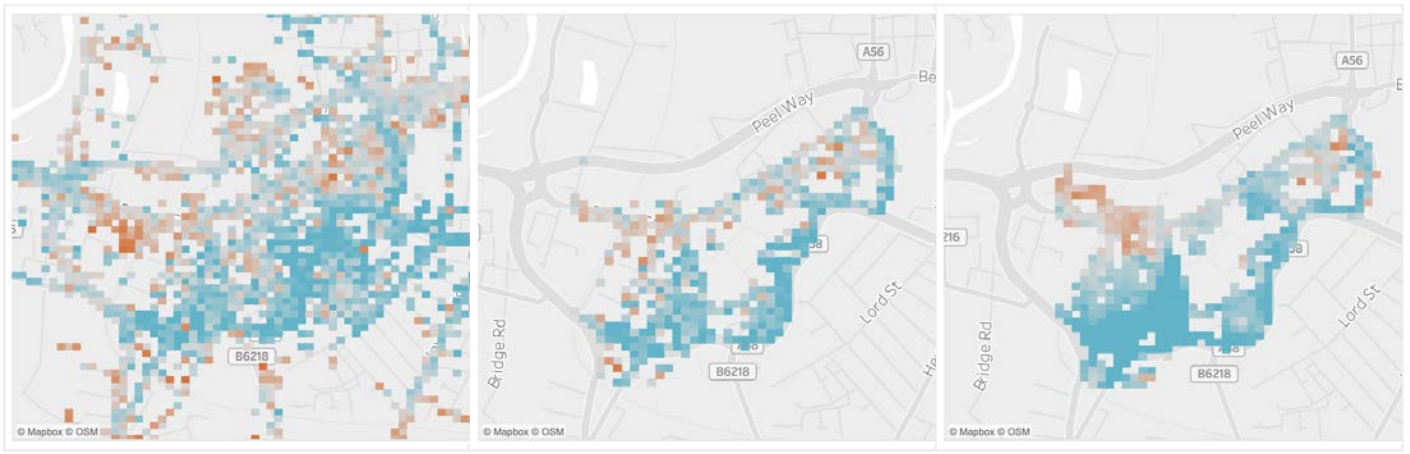


The overall 4G RSRP and 5G SSRSRP charts do not show a closely aligned operator ranking between crowdsource and field testing. While outdoor field testing often recorded stronger signal than crowdsource in absolute terms, the relative ordering between operators shifts materially between datasets. This is consistent with the two datasets capturing very different conditions: crowdsource reflects a broad mix of indoor and outdoor usage, devices and everyday user behaviour over an extended period, whereas field testing is a controlled outdoor sample. As a result, operator-level average signal values are useful as broad contextual indicators, but not as a reliable comparative measure of network performance in their own right. O2 illustrates this clearly: despite appearing comparatively strong on the signal charts, it was the weakest operator on the combined Performance Score, showing that stronger signal alone did not necessarily translate into the strongest overall mobile performance.

Plotting the 4G/5G signal strength data on maps appears to be the more informative part of the signal strength comparison, as they show whether both datasets identified the same localised weak spots and whether the stronger and weaker areas were distributed in a similar way across the survey area.

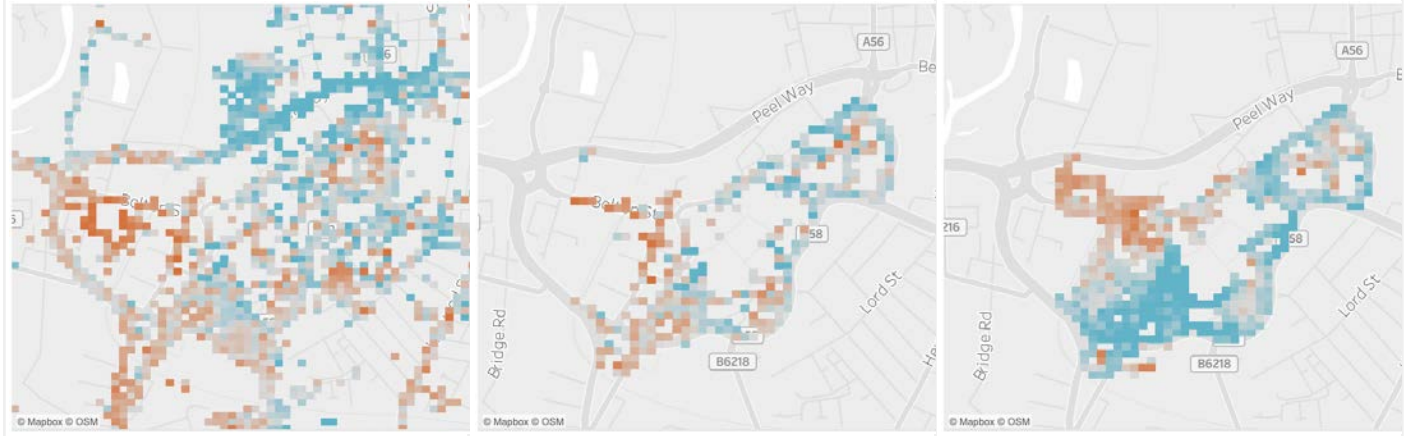






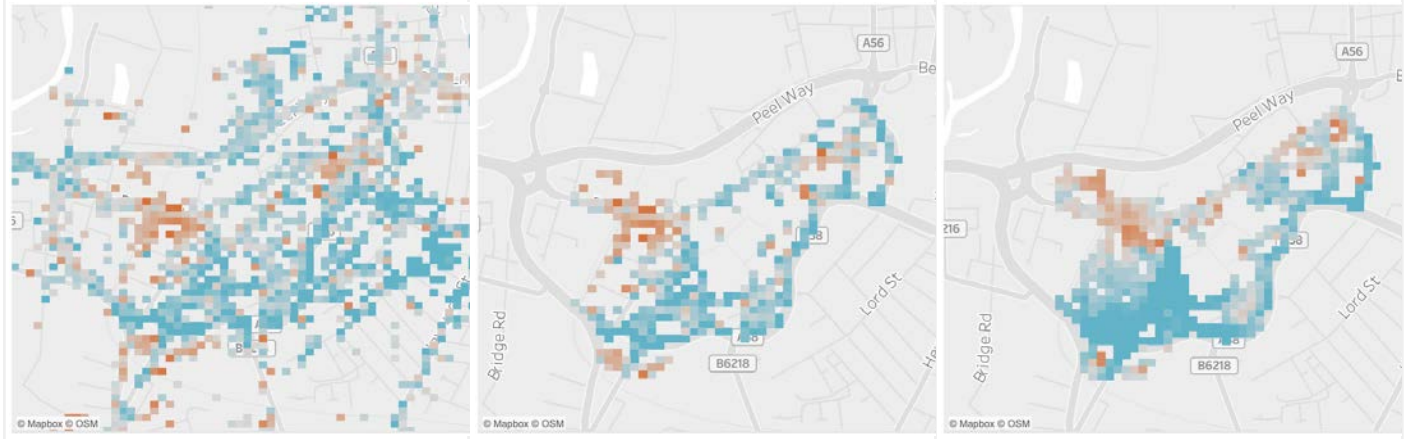
Three — 4G/ 5G Signal Strength (dBm): -120 -80

Crowdsource | Crowdsource - Field Test Locations | Field Test



Vodafone — 4G/5G Signal Strength (dBm): -120 -80

Crowdsource | Crowdsource - Field Test Locations | Field Test



Note: crowdsourced data collected over a 180 day period ending 13 March 2026.

The signal map comparisons show broad spatial alignment across all four operators. Field testing generally recorded stronger signal than crowdsource – expected given that the field sample was outdoor-only while crowdsourced data included indoor use, where buildings attenuate signal. The main coverage pattern remained consistent across both datasets, with the north-western part of the study area – particularly around the Transport Museum and Bolton Street – appearing as a weaker signal zone for all four operators in both sources. This gives a relatively high level of confidence that this was a genuine area of weaker outdoor coverage rather than a one-off effect of sample timing. By contrast, the eastern and north-eastern

parts of the mapped area are more often shown in green, indicating comparatively stronger signal conditions.

Interpretation

The outdoor comparison shows strong directional alignment between crowdsourced and field-testing data for Bury Town Centre. Both datasets placed EE and Three as the leading operators, with O2 consistently weakest on the combined Performance Score, and both identified the same persistent weak-signal area in the north-west of the town centre around the Transport Museum and Bolton Street. The differences in absolute values – field testing recording stronger Performance Scores, faster downloads and lower latency, crowdsource recording higher upload speeds – are consistent with the two methods reflecting different user conditions rather than contradictory findings.

In-Building Comparison

This section analyses network performance data collected through indoor field testing against Opensignal crowdsourced data at three venues – Aviva Studios, Co-op Live and Piccadilly Station. The crowdsourced data covered the 180-day period ending 13 March 2026. As with the outdoor comparison, the purpose is not to treat the two datasets as directly interchangeable, but to assess whether they point to the same broad conclusions on operator performance within these buildings, despite the methodological differences. Field testing used controlled walk routes with precise location logging, whereas crowdsourced data was aggregated from everyday users whose indoor GPS positioning may have been less reliable.

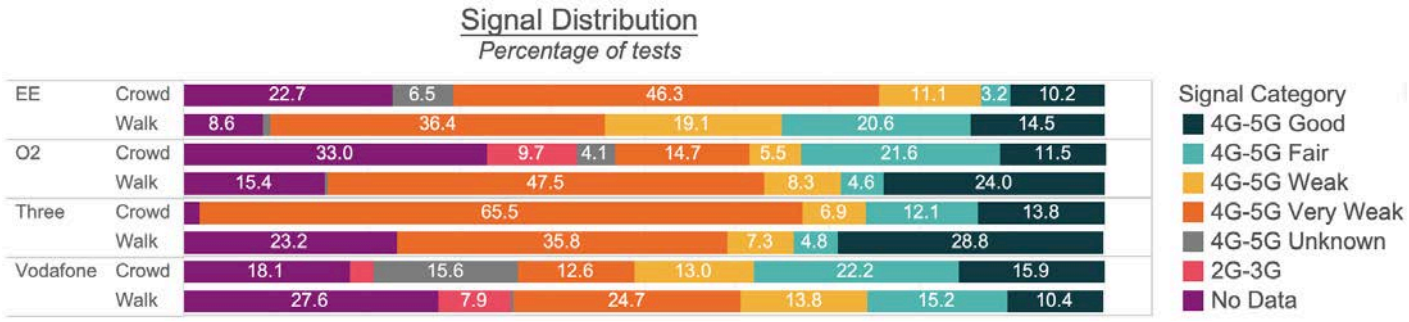
Whilst it is possible to be certain that the field tested data was collected inside buildings, the collection environment of crowdsourced data cannot be determined with the same level of certainty. For this reason, a probabilistic approach was taken to classify the likely collection environment of crowdsourced data points.

This included:

- Applying a proprietary Opensignal indoor classification algorithm that determines the likelihood of the device being within a building, considering a combination of characteristics such as device velocity, the reported location accuracy of the device, whether the device is being charged, together with other metrics which, when combined, provide a strong indication of indoor/outdoor status.
- Determining which point results fell within building polygon boundaries for specific buildings of interest.

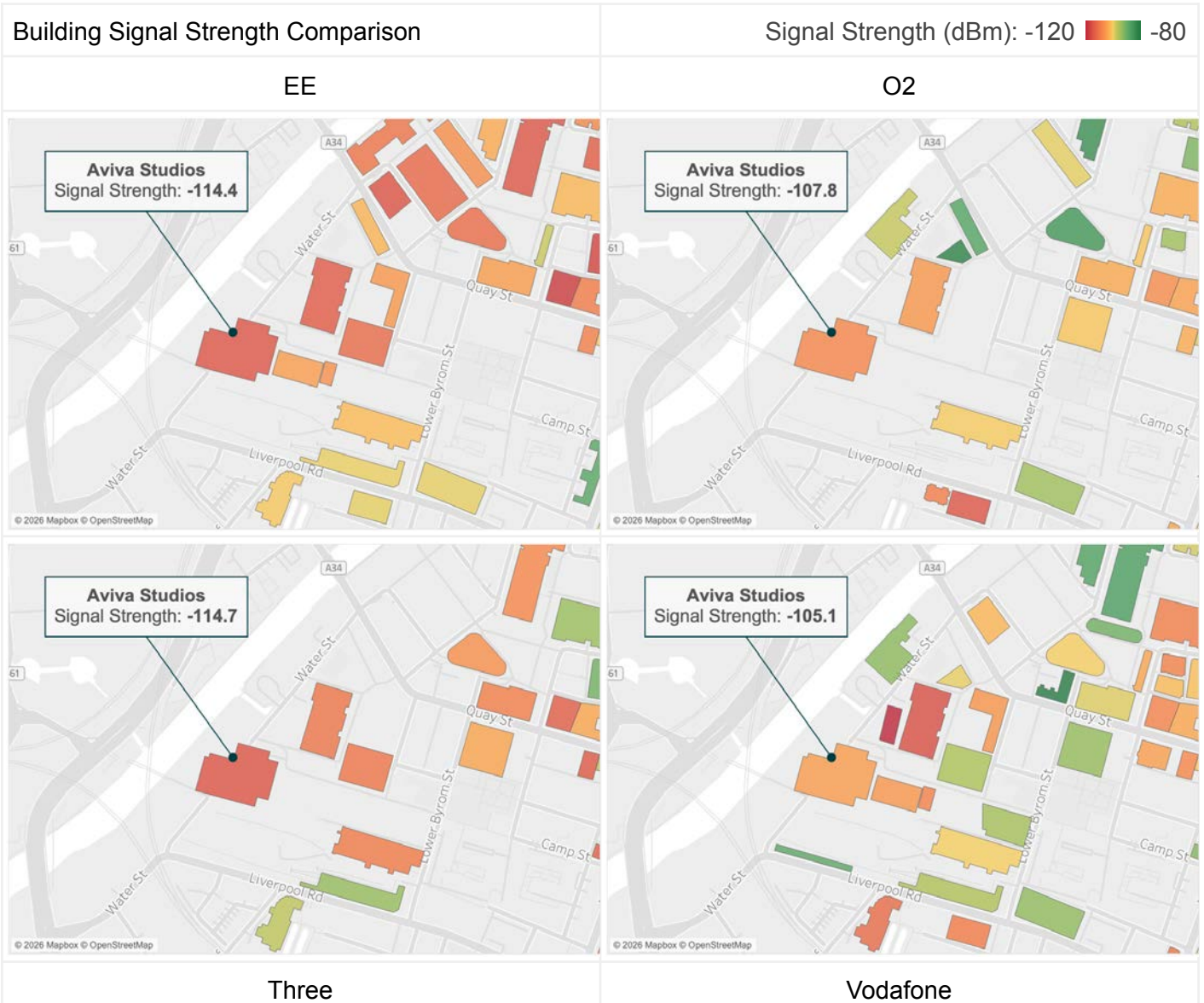
Aviva Studios

At Aviva Studios the signal distribution data shows that all four operators had weak indoor conditions in both datasets. While there are light distributional differences between crowdsource and field testing in the relative share of signal categories, both datasets share a consistent and material finding: a large proportion of measurements fell into the Weak, Very Weak or No Data categories for every operator. This directional alignment – present even where absolute values differ – is consistent with both methods identifying persistent challenges with indoor signal penetration.



Note: signal levels (dBm) – Good: -95 <= X; Fair: -105 <= X < -95 dBm; Weak: -115 <= X < -105; Very Weak: X < -115 dBm.

The divergence in absolute values between the two datasets is consistent with the methodological differences. Crowdsourced data aggregates measurements from everyday users in and sometimes around the building, due to the indoor GPS positioning being less reliable. The controlled field walk test, by contrast, was conducted throughout the interior – including the Warehouse and Hall – where signal was recorded as falling consistently below usable thresholds. The field data therefore provides a more precise and spatially accurate representation of the coverage environment experienced by visitors inside the venue but the crowdsourced data still detected the very same poor signal conditions due to the building's dense concrete and metal structure.

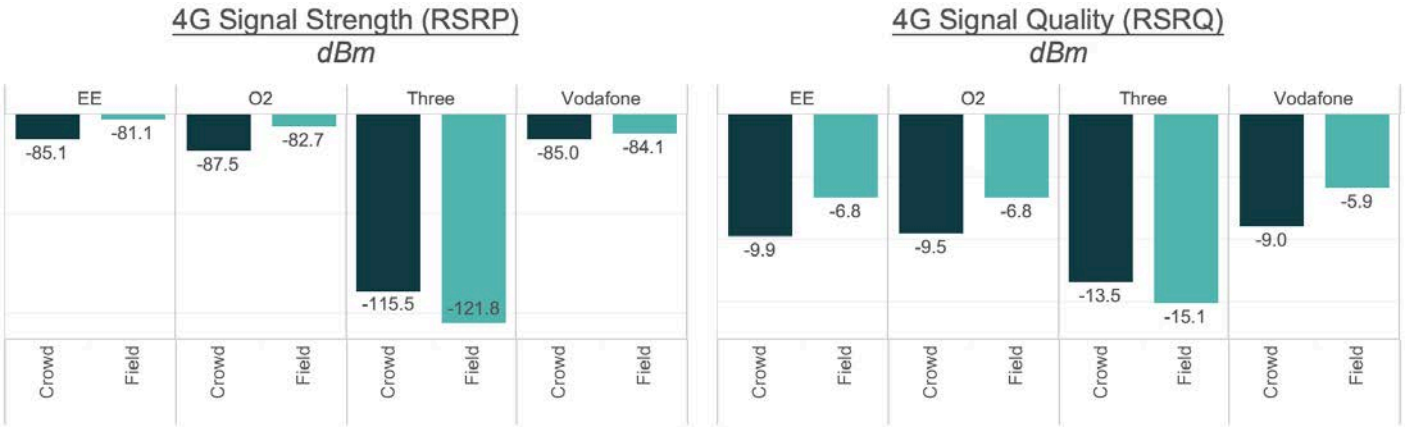


Note: crowdsourced data collected over a 180 day period ending 13 March 2026. A minimum building reportability threshold of 10 samples applied.

The crowdsourced signal strength maps reinforce this conclusion spatially. Across all four operators, the mapped data identified the Aviva Studios building as being dominated by weaker signal conditions. While the signal strength for the buildings in the area surrounding Aviva Studios was sometimes reported as strong, Aviva Studios was consistently weaker than the rest across all operators, highlighting a building-level limitation rather than an operator-level one.

Co-Op Live

At Co-op Live, both the crowdsourced and field-testing datasets tell a consistent story: three operators benefited from strong and broadly comparable indoor signal conditions – thanks to the in-building antenna system – while Three stands apart as a clear outlier.

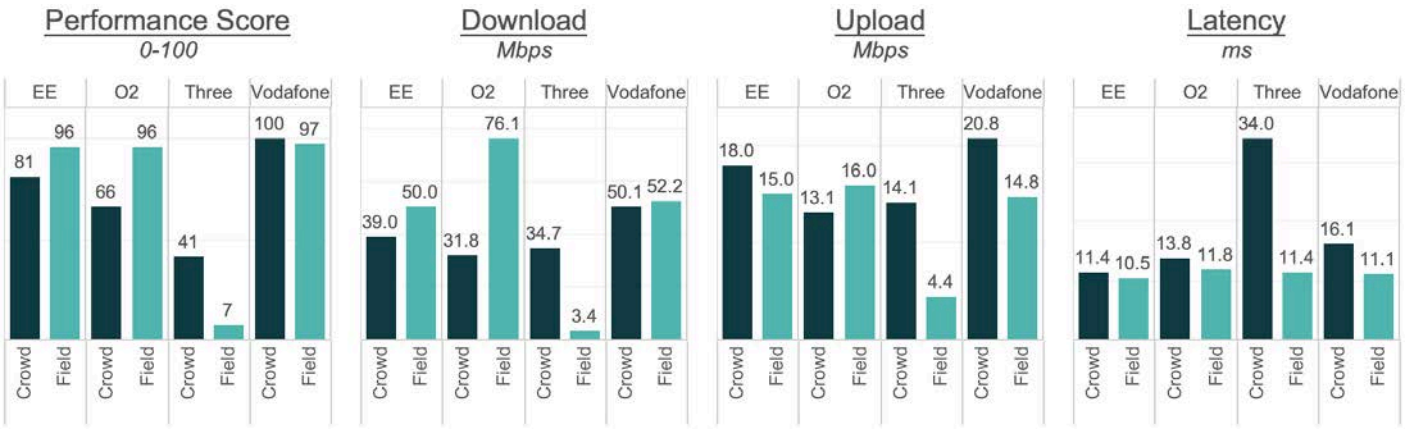


For EE, O2 and Vodafone, 4G RSRP values are broadly comparable between the two methods – field testing recorded values in the range of -81.1 to -84.1 dBm, while crowdsource figures sat within a few dBm of those levels – indicating that the in-building antenna system produced a strong signal environment visible and consistent across both datasets. Three, by contrast, recorded substantially weaker 4G signal in both sources: -115.5 dBm in crowdsource and -121.8 dBm in field testing – values that are more than 25 dBm below the other operators and directly consistent with the absence of DAS integration identified during field testing.

The 4G signal quality (RSRQ) charts reinforce this picture. Three once again diverges markedly from EE, O2 and Vodafone: its RSRQ of -15.1 dBm in field testing and -13.5 dBm in crowdsource were the weakest of any operator on both datasets, consistent with a signal that was not only weak in absolute terms but also subject to greater interference or congestion – indicative of reliance on distant outdoor cells rather than a dedicated in-building system.

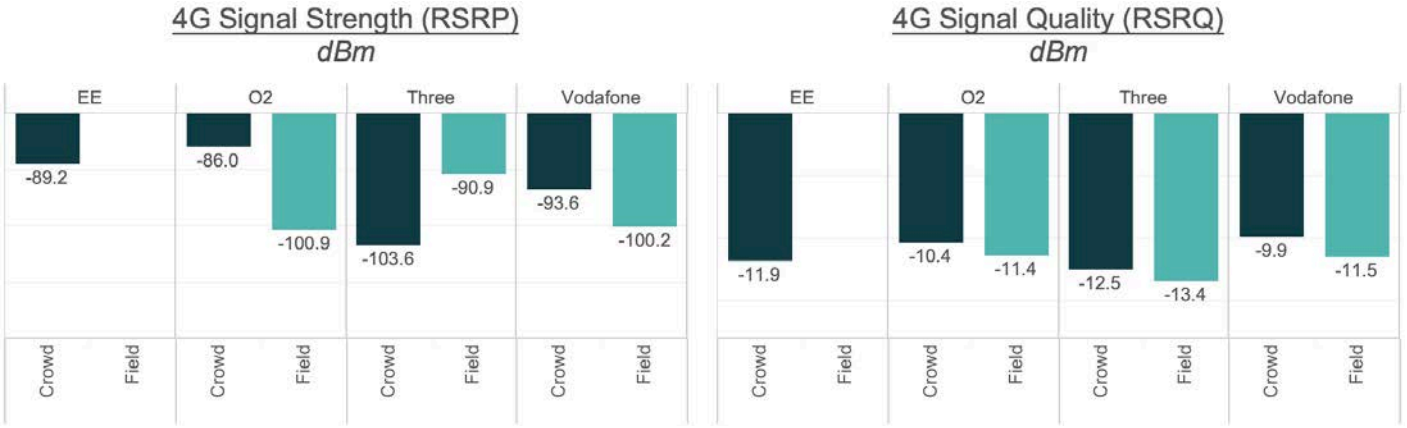
Piccadilly Station

At Piccadilly Station, once again both datasets point to the same broad competitive picture: EE, O2 and Vodafone deliver stronger indoor performance than Three – which performed consistently below the other three operators across the tested venues during the testing period



The Performance Score represents the percentage of tests meeting Download (5 Mbps), Upload (1.5 Mbps) and latency (50 ms) minimum thresholds. For the sake of comparability both Crowd and Field results used a direct aggregation of individual measurements, instead of a time-based aggregation.

The Performance Score chart shows a broadly consistent directional pattern for the four operators. EE, O2 and Vodafone recorded field testing scores of 96, 96 and 97 respectively, with crowdsource scores of 81, 66 and 100. This pattern is broadly in line with the general methodological expectation that controlled premium-device testing produces stronger absolute results, though the gap is more pronounced for O2. Three presents a notable anomaly: while both field and crowdsource results highlight its weak performance, in field testing throughput was the primary limiting factor – with download recording just 3.4 Mbps and upload 4.4 Mbps – whereas in crowdsource, latency (34 ms) appeared to be the greater constraint, with download (31.8 Mbps) and upload (14.1 Mbps) recording comparatively higher scores.



While the crowdsourced and field-testing 4G signal strength and quality values do not show a closely aligned operator ranking at Piccadilly Station, they collectively point to Three experiencing the most challenging radio conditions at the venue – consistent with its weaker performance observed across both datasets.

The signal quality (RSRQ) chart is the more telling of the two. Three recorded the weakest scores in both datasets – -12.5 dBm in crowdsource and -13.4 dBm in field testing – while EE, O2 and Vodafone clustered between -10.4 and -11.9 dBm between the two datasets, indicating a comparatively cleaner radio environment for those operators. Three's combination of the weakest signal quality and the lowest Performance Score across both methods is consistent with reliance on more congested or distant cells, where radio quality rather than raw signal level appeared to be the primary constraint on mobile performance.

Interpretation

Across all three indoor venues analysed, crowdsourced and field-testing data converged on the same broad connectivity conclusions, despite their methodological differences. At Aviva Studios, both datasets identified a building-wide signal limitation affecting all four operators. At Co-op Live and Piccadilly Station, Three performed consistently below the other three operators in both crowdsource and field testing across the tested venues and testing period. At Co-op Live, Three's substantially weaker 4G signal aligned with its absence from the venue's in-building DAS infrastructure, which benefited EE, O2 and Vodafone. At Piccadilly Station, Three's combination of the weakest signal quality and the lowest Performance Score across both methods suggested a greater reliance on more distant or congested cells, where radio quality rather than raw signal level appeared to be the primary constraint.

Overall Conclusions: Crowdsource vs Field Testing

Taken together, the outdoor and in-building comparisons demonstrate that crowdsourced and field-testing data are broadly complementary. Across Bury Town Centre and at the three Manchester venues analyzed, the two methods identify the same operators as stronger or weaker performers and highlight the same persistent outdoor areas or building of weaker coverage. The differences in absolute values – field testing generally recording stronger Performance Scores, faster downloads and lower latency, while crowdsource records higher upload speeds – are consistent with the methodological distinctions set out earlier in this report and do not undermine the overall directional alignment.

The evidence confirms that crowdsourced data is most effective as a broad screening tool: identifying persistent patterns of network performance and highlighting likely weak spots across large areas or poorly covered buildings over extended time periods. Field testing then provides the more precise evidence needed to validate those patterns, define the local extent of weaker areas with greater spatial accuracy, and quantify the scale of any issues under controlled conditions. Used together, the two approaches provide a more complete view of connectivity – across both outdoor and indoor environments – than either source alone.

About us

To produce this analysis, Streetwave and Opensignal partnered to combine complementary expertise. Streetwave led the field testing programme, delivering large-scale, cost-efficient on-the-ground measurements, while Opensignal provided network testing software, data processing and analytical expertise.

About Opensignal

Opensignal is an independent provider of data and analytics on real-world mobile and broadband network experience. We analyse billions of measurements collected daily through a global panel of consent-based users, complemented by targeted field testing, to assess actual user experience across networks worldwide.

Our data and methodologies are used by regulators and policymakers internationally to support competition analysis, coverage and quality monitoring, spectrum policy, and consumer transparency.

Opensignal supports Ofcom's *Map Your Mobile* platform with real-world network performance data, helping consumers make more informed choices about their mobile services.

For more information, visit opensignal.com

About Streetwave

Streetwave is a UK-based mobile network field testing company specialising in the measurement and analysis of real-world mobile network performance. The company conducts large-scale, on-the-ground testing across road networks, transport routes and venues to assess coverage and service quality.

Streetwave has mapped over 50% of the UK's road network and worked with more than 100 local authorities, providing detailed, evidence-based insights to support connectivity planning, procurement and network investment decisions.

To produce this analysis, Streetwave and Opensignal partnered to bring together Streetwave's expertise in network experience field testing with Opensignals strengths in network testing software platforms and analytics.

For more information, visit streetwave.co