BT Smart Hub: Marketing claims substantiation

July 2016

Contents

1.1 Introduction

The BT Smart Hub provides the UK's most powerful wi-fi signal. The following report presents extensive in-home and lab wi-fi testing of the BT Smart Hub compared to all major UK broadband providers. At any distance from the router, the BT Smart Hub will always provide the most powerful wi-fi signal.

The tests were based on the IEEE802.11T method, to provide robust and repeatable data, taking into account previous Advertising Standards Authority (ASA) rulings and guidance on wi-fi performance claims:

- The tests were carried out on 2.4 GHz and 5 GHz to demonstrate that the BT Smart Hub provides the most powerful wi-fi signal across both frequencies.
- The devices tested were representative of devices used by the public, incorporating the full range of performance possible, with the same devices used for each competitor router.
- The tests capture speeds for normal user tasks.
- Turntables were used to ensure the routers did not exhibit directionality and to ensure a fair test.
- Hundreds of data-points were captured to ensure results were repeatable and reliable.

Once we demonstrated superiority over competitors within the lab, we carried out further testing in 10 real homes that were fully furnished and of different construction types, to show the results we'd found in the lab were representative of normal homes.

1.2 How is the most powerful wi-fi tested?

Routers tested:

Testing was completed comparing all major UK broadband provider routers.

The table below summarises the routers and their wi-fi specification.

The majority of routers are Dual Band, meaning they provide wi-fi at both 2.4 GHz and 5 GHz.

- 5G Hz - provides faster data rates at a shorter distance (typically through just 1 wall)
- 2.4 GHz – provides better range but at slower speeds (typically through 2-3 walls)

The BT Smart Hub has superior specifications than the routers of all major broadband providers.

These descriptions describe the details in the table below:

290 Mb/s – the maximum theoretical throughput, this is based on the technology in the device.

3x3 – this defines the MIMO (multiple-input and multiple-output). It represents how many antennas are used per band for sending and receiving simultaneously. The BT Smart Hub has an additional antenna at each band to the competitor router, proving wider coverage at all angles.

b/g/n/ac – these are the supported 802.11 IEEE standards that govern wireless networking transmission methods.

256 QAM - Quadrature amplitude modulation defines the number of bits of data that can be coded per waveform ie 256 bits per wave form.

Name	2.4 GHz Wi-fi Band	5 GHz Wi-fi Band
BT Smart Hub	**290Mb/s, 256 QAM** 3x3 11b/g/n/ac	**1733Mb/s** 4x4 11a/n/ac (80MHz)
Virgin Media Super Hub 2 (ac)	**144Mb/s, 64 QAM** 2x2 11b/g/n	**600Mb/s** 3x3 11a/n/ac (40MHz)
Virgin Media Hub 3.0	**144Mb/s, 64 QAM** 2x2 11b/g/n	**1299Mb/s** 3x3 11a/n/ac (80MHz)
Talk Talk Super Router	**144Mb/s, 64 QAM** 2x2 11b/g/n	**1299Mb/s** 3x3 11a/n/ac (80MHz)
EE Bright Box 2	**144Mb/s, 64 QAM** 2x2 11b/g/n	**866Mb/s** 2x2 11a/n/ac (80MHz)
Sky Fibre Hub (SR102)	**144Mb/s, 64 QAM** 2x2 11b/g/n	None
Sky Q Hub	**144Mb/s, 64 QAM** 2x2 11b/g/n	**1299Mb/s** 3x3 11a/n/ac (80MHz)
Plusnet Hub One Fibre	**144Mb/s, 64 QAM** 2x2 11b/g/n	**1299Mb/s** 3x3 11a/n/ac (80MHz)

What do we measure?

The most important aspect of wi-fi for customers is their Transmission Control Protocol (TCP) throughput. This is the real world customer experience of wi-fi. This protocol determines experience when using applications like browsing the web, downloading files and transferring data around the home. The most representative measure for wi-fi performance is the download and upload TCP throughputs. We explain how this data is collected every second in the next section.

The tables below give an overview of the impact of having good wi-fi performance. The better the wi-fi performance, the more customers are able to do things on the internet. For example, an HD video steam needs a minimum of 8Mb/s to steam successfully, so in the BT test house results below, the BT Smart Hub would be the only router that supported this in room 3.

Everything about using wi-fi comes down to the download and upload speeds.

How do we test?

We use "Over-the-Air" testing. This is the best method for testing wi-fi performance:

- It is a 'real world' test method.
- It takes the wi-fi antennas into account (patterns, polarization, isolation and position).
- Real consumer devices are used in the test.
- It allows a consistent approach to compare different hardware.
- It reflects how the customer will experience wi-fi.

Bitrate (Mb/s)	Streaming
0.5	Music streaming
1	Web video (such as YouTube)
2	Standard TV stream
4	2x Standard TV stream
8	HD video stream
30	UHD video
38	HD + UHD
60	2x UHD video
90	3x UHD video

Devices used in the test

The testing is representative of the range of devices used in customers' homes. The number of antennas and wireless specification is typical of the range of devices used by customers. For example, 1 antenna is the minimum number of antennas needed for wi-fi reception, we used a device with 1 antenna to give us a clear and representative view of how products with the minimum specification required to receive wi-fi signals will perform. We also used a device with 3 antennas, which is the maximum specification of any laptop currently in market. We therefore have an overview of the relative performance of the full range of laptops.

- Typical 3x3 laptop - Macbook Pro with 3 antennas, running OSX Yosemite 10.10.4
- Typical 1x1 Smartphone - Samsung Galaxy S4, running Android 5.0.1.

These devices are representative of the range of devices within customers' homes.

Where were the tests completed?

Wi-fi test facilities:

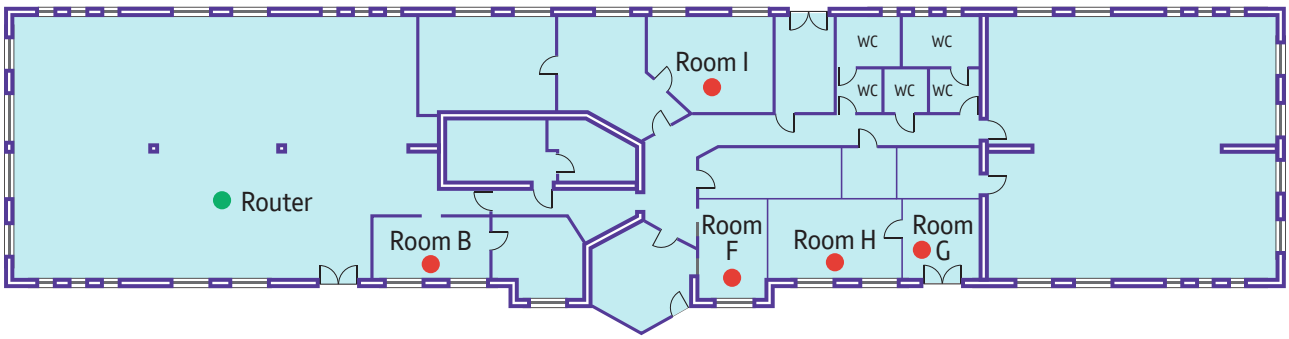
Testing was completed in two test facilities:

- Sagemcom Brocholt Germany
- BT Adastral Park research facility

These locations were free of wi-fi interference. The buildings have rooms that are equivalent in size and attenuation to a standard brick house.

The wi-fi range is the key variables. The test facilities have many test points in the buildings allowing testing on wi-fi performance at different distances as in a typical home.

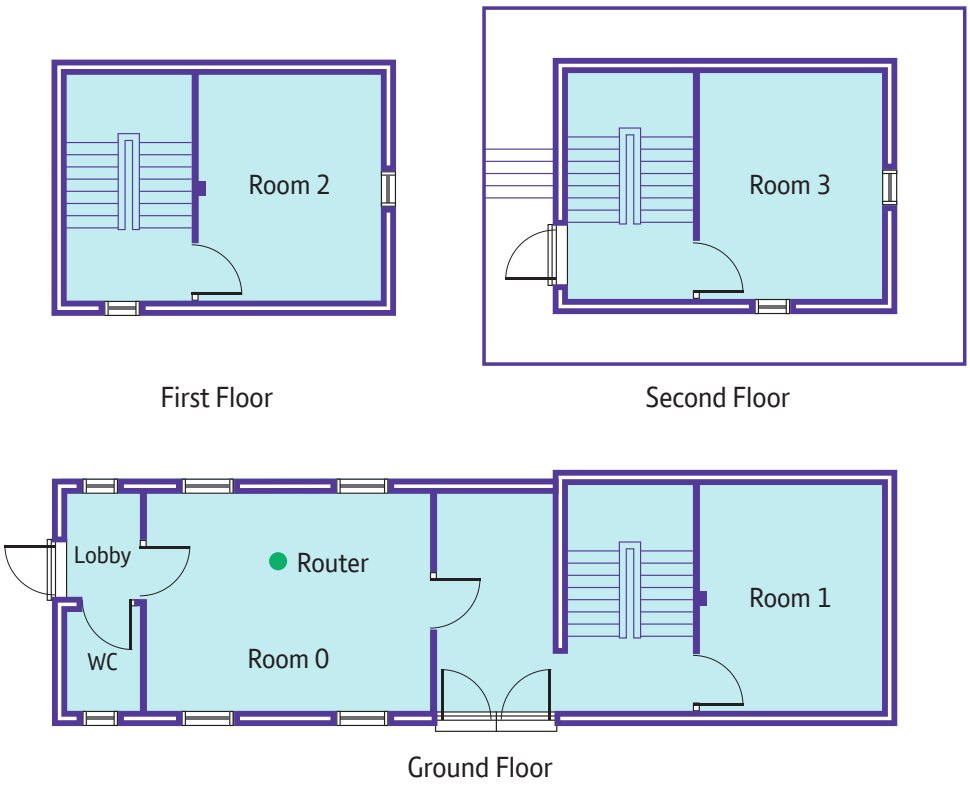
Sagemcom Brocholt Germany floor plan



Sagemcom Brocholt Germany

Test Point	Wi-fi Notes	Sagemcom Walls distance from link
Room B	Short distance, best range for 5 GHz	Same room
Room I	Middle coverage range for 5 GHz	1 brick wall and 1 internal plasterboard wall
Room F	Edge of coverage range of 5 GHz Middle coverage range for 2.4 GHz	1 brick wall and 1 internal plasterboard wall
Room H	Edge of coverage range for 2.4 GHz	1 brick wall and 1 internal plasterboard wall
Room G	Edge of coverage range for 2.4 GHz	1 brick wall and 2 internal plasterboard walls

BT floor plan



BT Adastral Park research facility

Test Point	Wi-fi Notes	BT Walls distance from link
Room 0	Short distance, best range for 5 GHz	Same room
Room 1	Edge of coverage range of 5 GHz	1 brick and 2 internal walls
Room 2	Edge of coverage range of 5 GHz Middle coverage range for 2.4 GHz	2 bricks and 1 internal wall
Room 3	Edge of coverage range for 2.4 GHz	3 brick and 1 internal wall

Both test facilities allowed for detailed and repeatable testing to be completed.

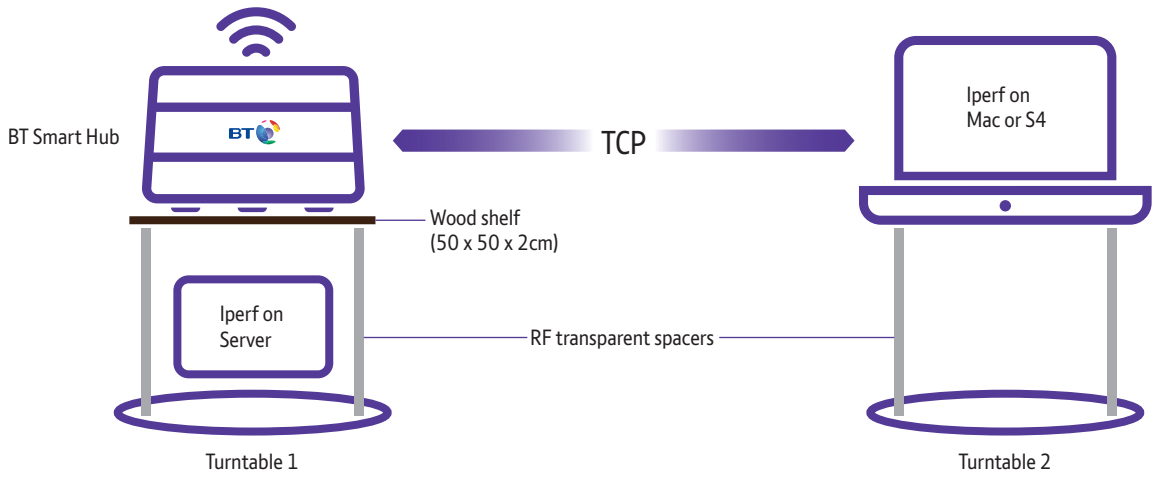
Live customer homes:

The lab based testing was deigned to be representative of a real customer environment. To provide further confidence that the test facilities truly represent the experience of customers in the UK, a further 10 tests were completed in 10 real customer homes.

These houses were of varying size and construction, fully furnished, and as they are normal homes there may be sources of noise, interference and contention.

These tests are used to validate the results obtained at the test facilities and show that the results and trends are representative of customer homes.

1.3 Test set-up



The router was connected to a server to generate the data needed for the throughput tests and placed on a turntable.

The client devices were placed on turntables in each test room and connected to the test router over wi-fi.

The wi-fi traffic was generated by an application called iperf.V3. This was used across the server and the client devices. It was used to control the test and capture the performance data.

During the test the TCP throughput for both the upload and download was recorded every second, for 480 seconds (while the turn tables were rotating). With 480 readings taken, repeated 3 times and results reported. This method results in a highly repeatable data set.

The turntables are set at suitable rotation speeds to ensure each second represents a unique combination of angles for the 2 turntables.

1.4 Results

BT test house

2.4 GHz

TCP Download Mbps

	Macbook Pro				Samsung Galaxy S4			
Room	**0**	**1**	**2**	**3**	**0**	**1**	**2**	**3**
BT Smart Hub	**119.75**	**116.50**	**94.20**	**8.55**	**63.98**	**63.13**	**38.33**	**8.78**
Virgin Media Super Hub 2 (ac)	108.30	81.31	68.21	1.82	55.30	55.70	23.00	0.00
Virgin Media Hub 3.0	94.40	94.30	58.80	0.13	54.23	52.20	17.30	0.00
EE Bright Box 2	93.52	61.95	57.07	0.74	49.00	45.13	13.98	1.71
Talk Talk Super Router	101.00	95.77	75.07	2.83	49.20	47.10	21.53	3.17
Sky Fibre Hub (SR102)	93.53	68.50	34.78	0.00	47.60	45.87	14.30	0.00
Sky Q Hub	94.50	61.40	49.66	0.62	45.90	40.36	11.76	0.00
Plusnet Hub One Fibre	101.00	98.80	58.47	0.91	47.75	45.80	21.20	0.00

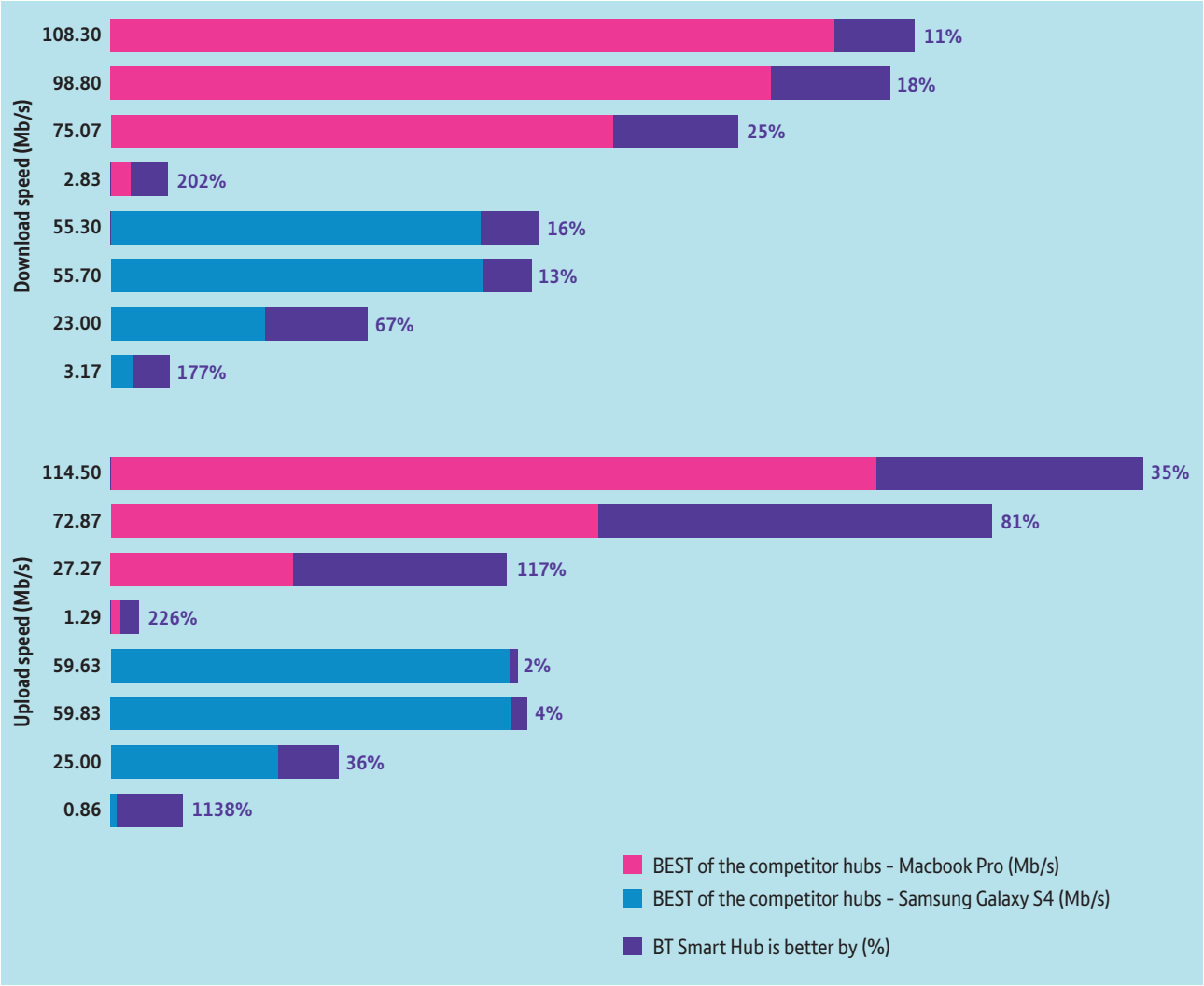
TCP Upload Mbps

	Macbook Pro				Samsung Galaxy S4			
Room	**0**	**1**	**2**	**3**	**0**	**1**	**2**	**3**
BT Smart Hub	**154.75**	**132.00**	**59.25**	**4.20**	**60.55**	**62.20**	**34.10**	**10.65**
Virgin Media Super Hub 2 (ac)	94.33	71.66	26.51	0.39	59.63	59.83	25.00	0.86
Virgin Media Hub 3.0	114.50	48.50	13.53	0.00	58.80	49.30	0.00	0.00
EE Bright Box 2	92.30	44.01	19.30	0.27	54.50	53.85	10.00	0.00
Talk Talk Super Router	99.50	72.87	27.27	1.29	53.70	55.03	23.10	0.00
Sky Fibre Hub (SR102)	69.63	57.67	19.83	0.00	56.77	55.87	11.50	0.00
Sky Q Hub	93.50	52.66	25.16	0.43	54.80	54.00	18.50	0.00
Plusnet Hub One Fibre	91.95	64.50	23.50	0.25	58.68	55.60	21.00	0.00

The results show that in every test the BT Smart Hub provides the most powerful wi-fi.

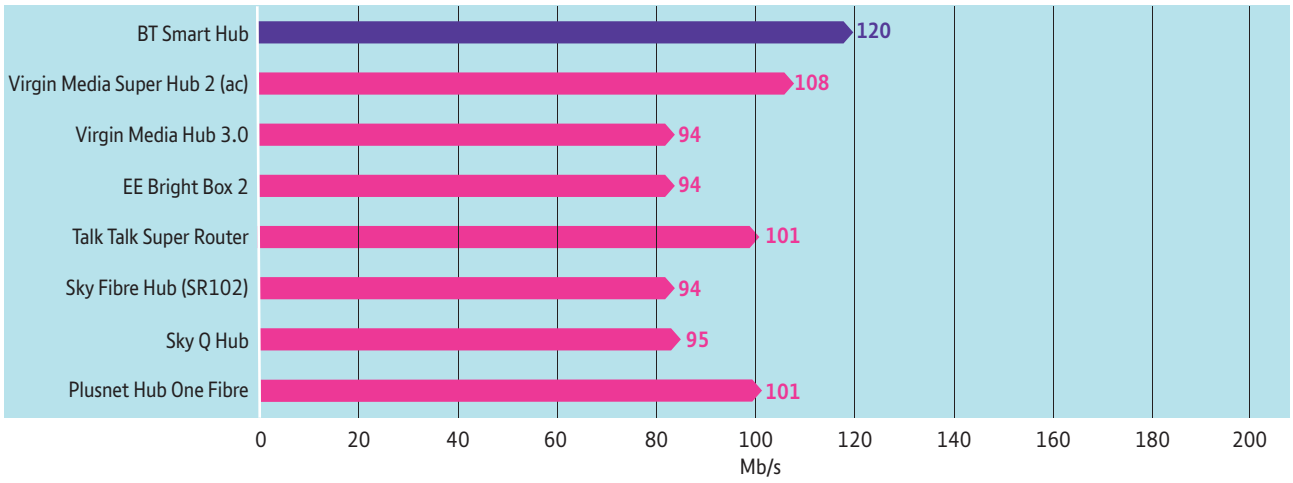
The summary table below shows a comparison between the BT Smart Hub and the next best result across all routers tested - the BT Smart Hub provided a significantly better performance at every location tested.

2.4 GHz BT vs. BEST competitor

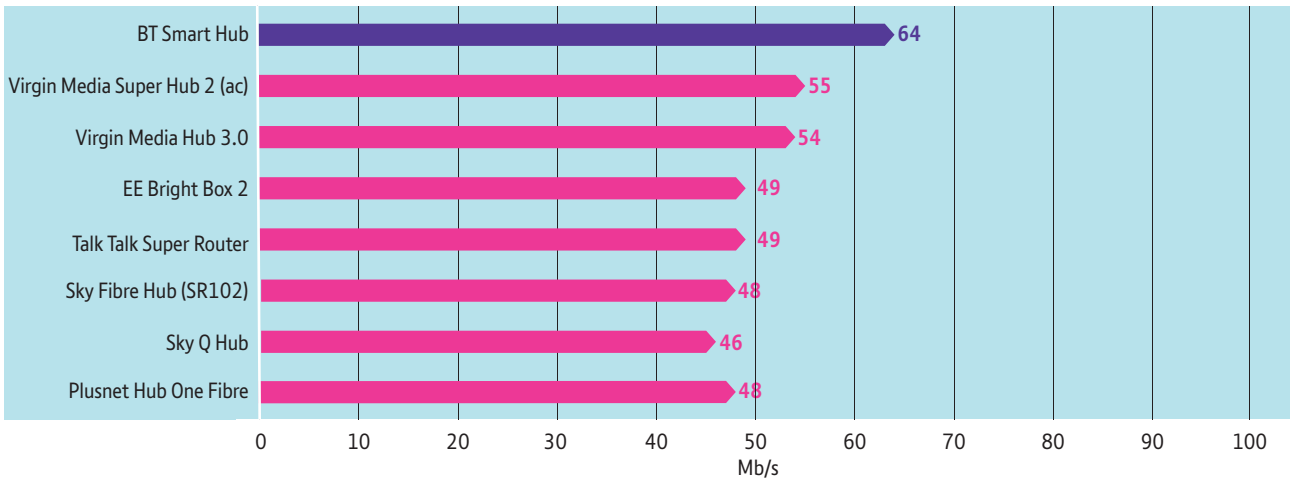


This data can be viewed graphically as shown on the following pages.

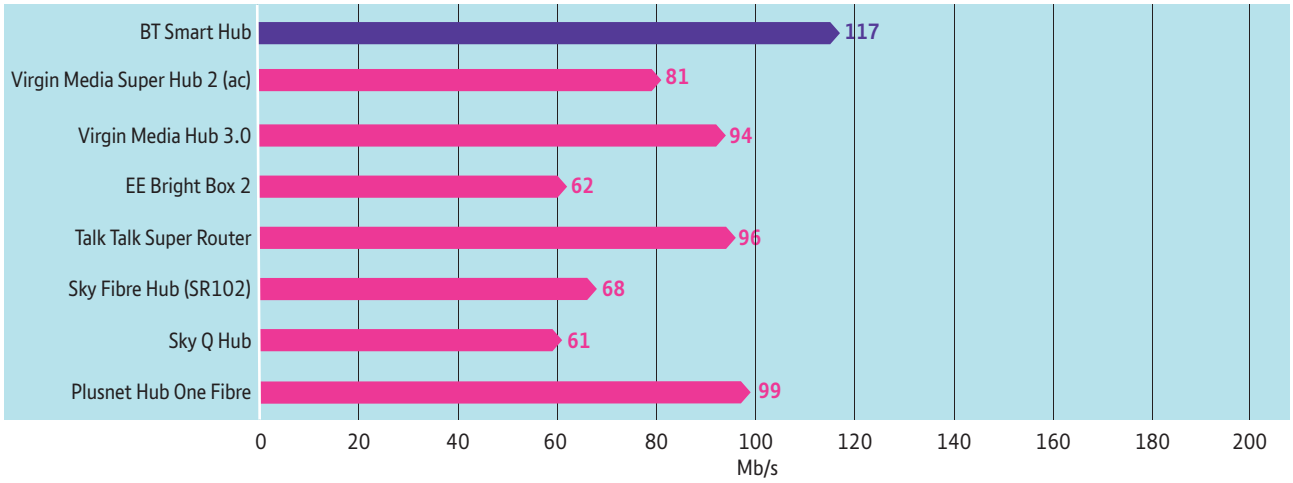
Room 0 – Download – Macbook Pro



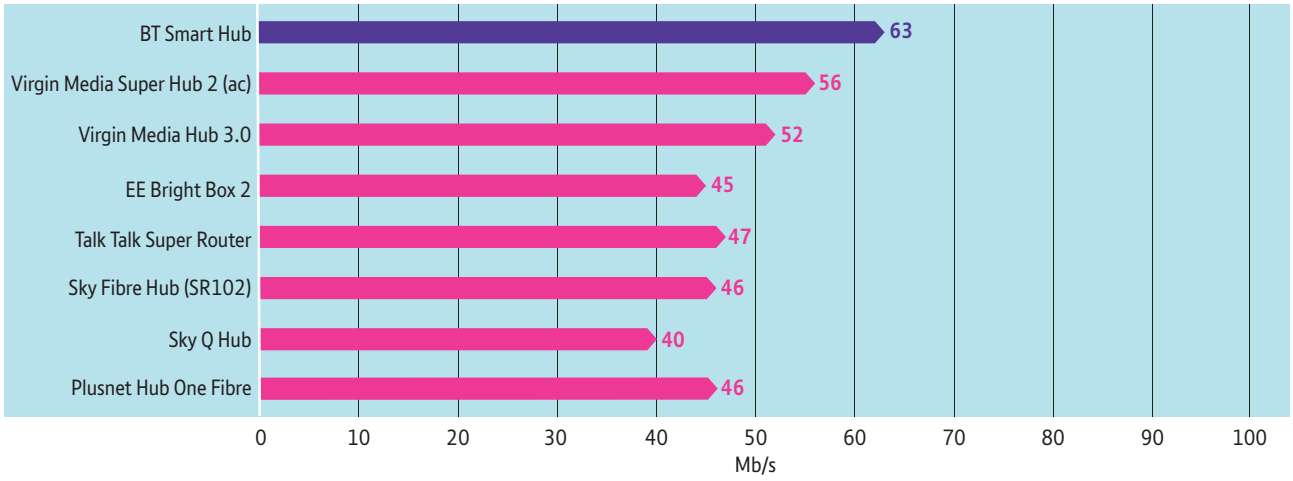
Room 0 – Download – S4



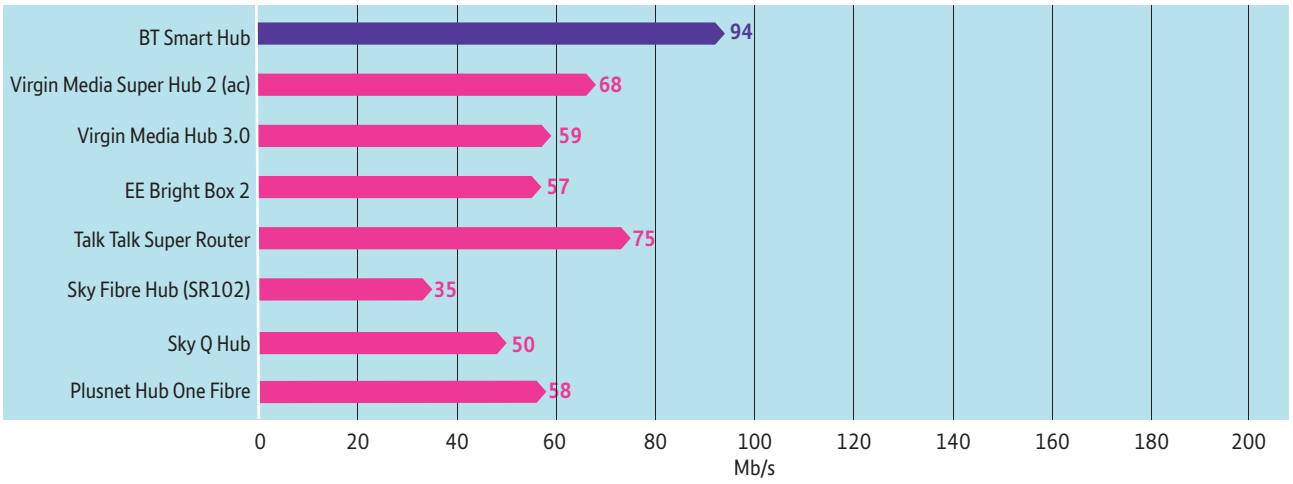
Room 1 – Download – Macbook Pro



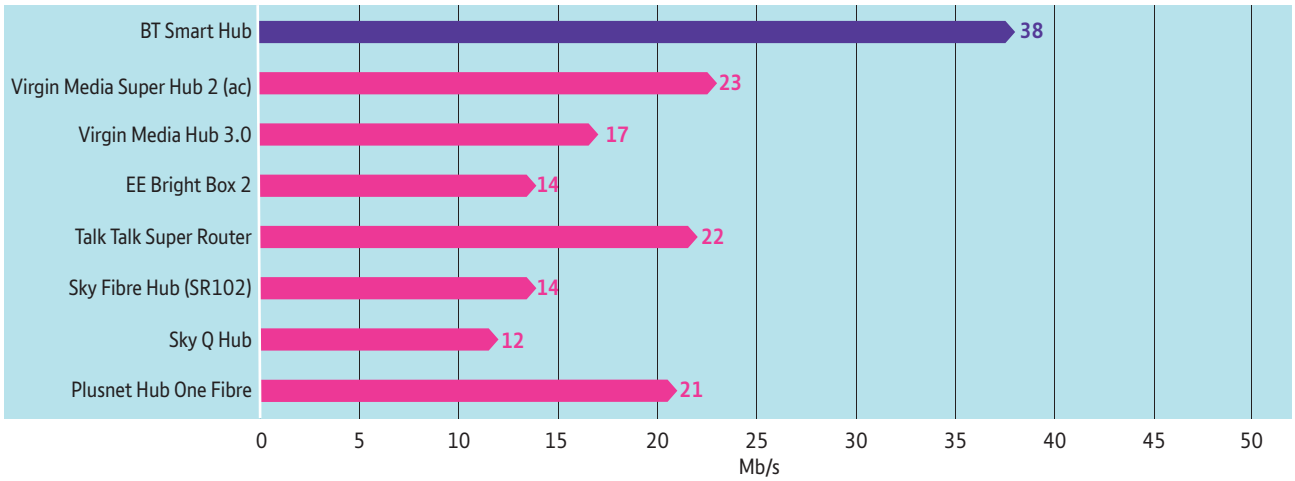
Room 1 – Download – S4



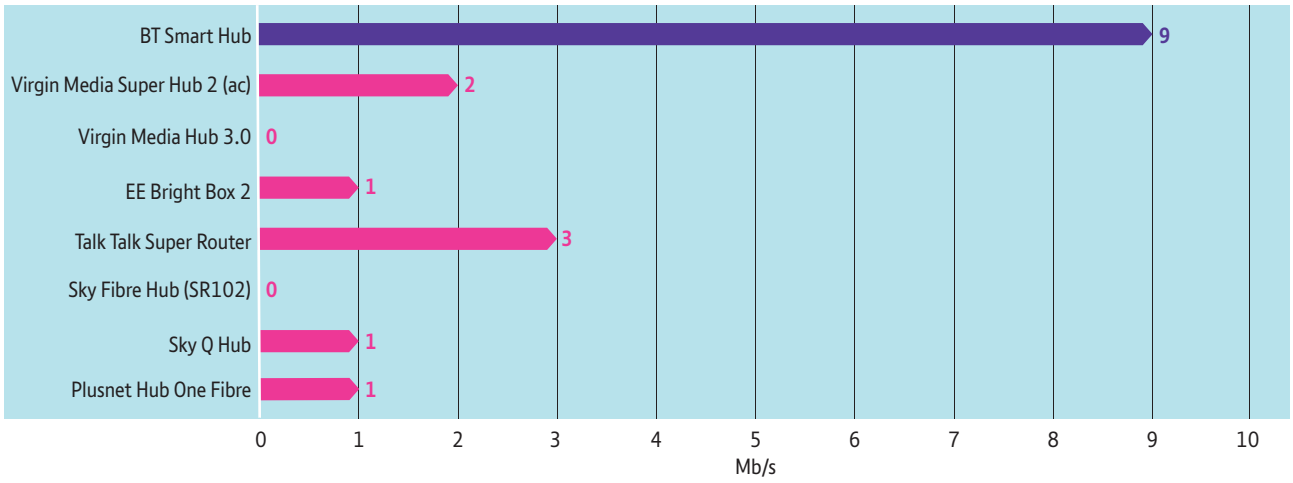
Room 2 – Download – Macbook Pro



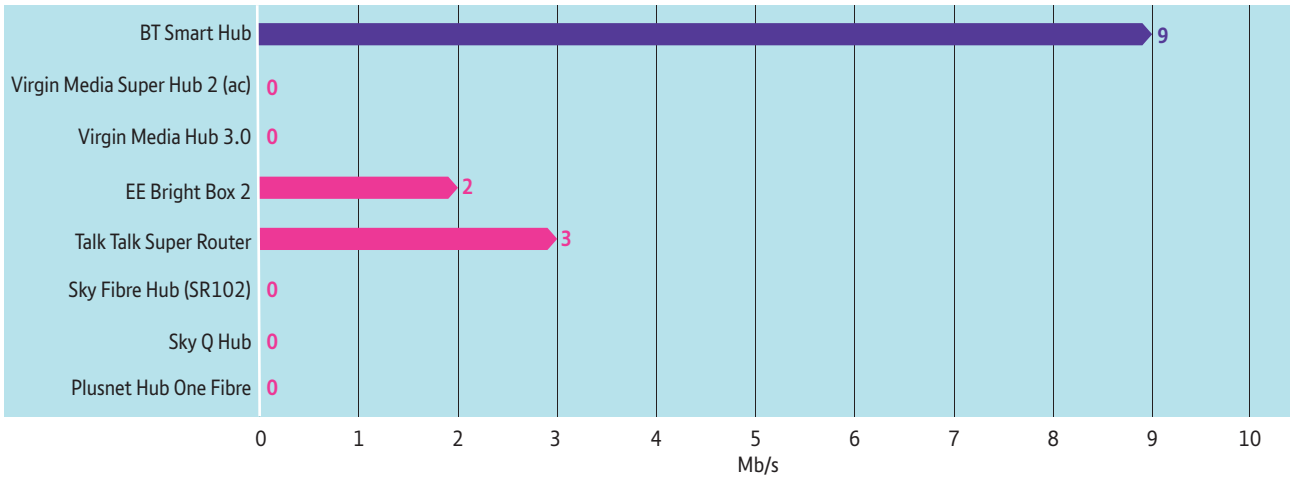
Room 2 – Download – S4



Room 3 – Download – Macbook Pro



Room 3 – Download – S4



BT test house

5 GHz

TCP Download Mbps

	Macbook Pro		Samsung Galaxy S4	
Room	**0**	**1**	**0**	**1**
BT Smart Hub	**655.7**	**358.7**	**293.3**	**189.8**
Virgin Media Super Hub 2 (ac)	367.3	171.0	141.7	84.1
Virgin Media Hub 3.0	374.0	174.1	142.0	87.4
EE Bright Box 2	93.52	93.63	93.45	92.63
Talk Talk Super Router	302.8	265.5	250.1	160.8
Sky Fibre Hub (SR102)	0.00	0.00	0.00	0.00
Sky Q Hub	496.3	192.0	230.7	92.5
Plusnet Hub One Fibre	376.8	202.4	255.6	114.1

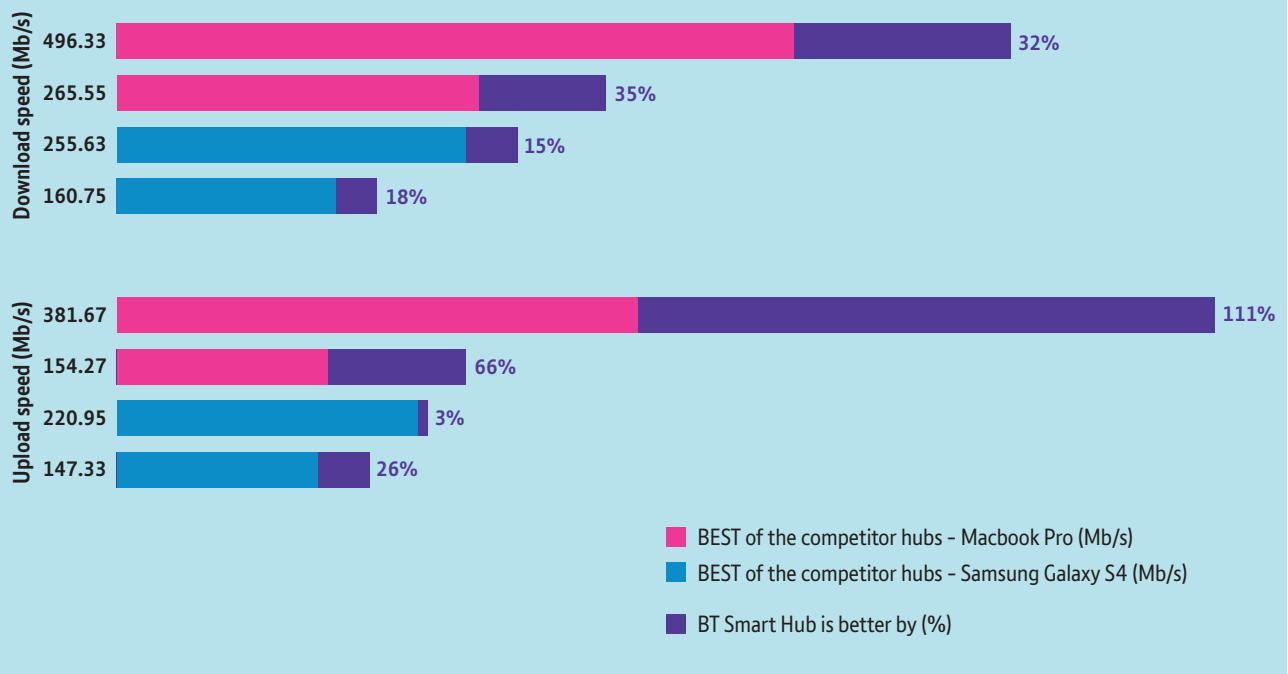
TCP Upload Mbps

	Macbook Pro		Samsung Galaxy S4	
Room	**0**	**1**	**0**	**1**
BT Smart Hub	**803.8**	**255.6**	**227.3**	**185.8**
Virgin Media Super Hub 2 (ac)	365.7	72.7	158.0	82.7
Virgin Media Hub 3.0	340.9	93.9	161.9	91.8
EE Bright Box 2	93.82	93.20	93.88	91.80
Talk Talk Super Router	315.4	154.3	221.0	125.3
Sky Fibre Hub (SR102)	0.00	0.00	0.00	0.00
Sky Q Hub	381.7	145.0	220.0	147.3
Plusnet Hub One Fibre	326.5	118.9	182.4	112.3

The results show that in every test the BT Smart Hub provides the most powerful wi-fi.

The summary table below shows a comparison between the BT Smart Hub and the next best result across all routers tested - the BT Smart Hub provided a significantly better performance at every location tested.

5 GHz BT vs. BEST competitor

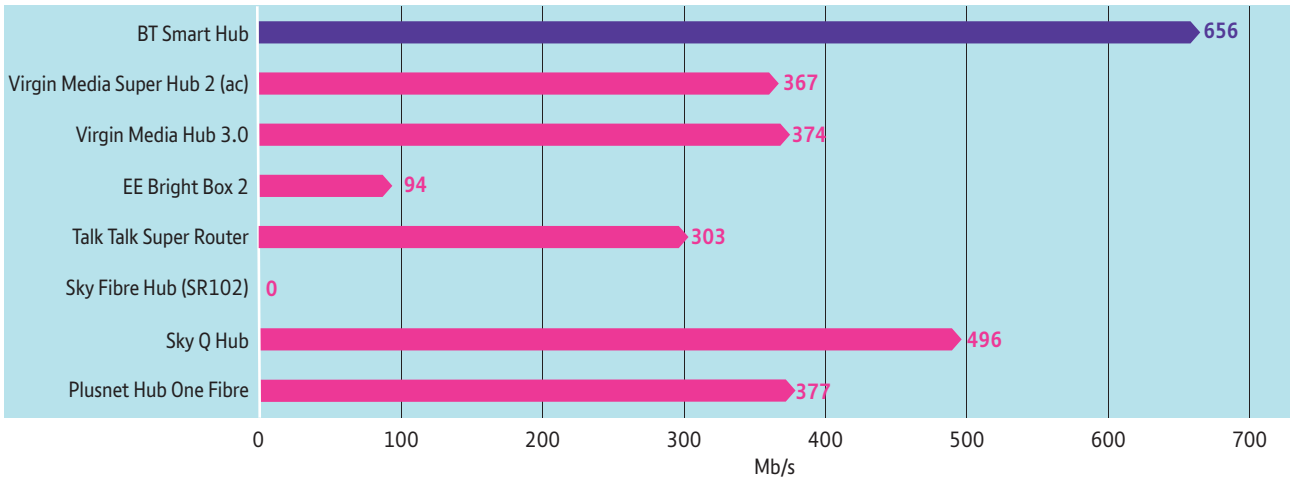


This data can be viewed graphically as shown on the following pages.

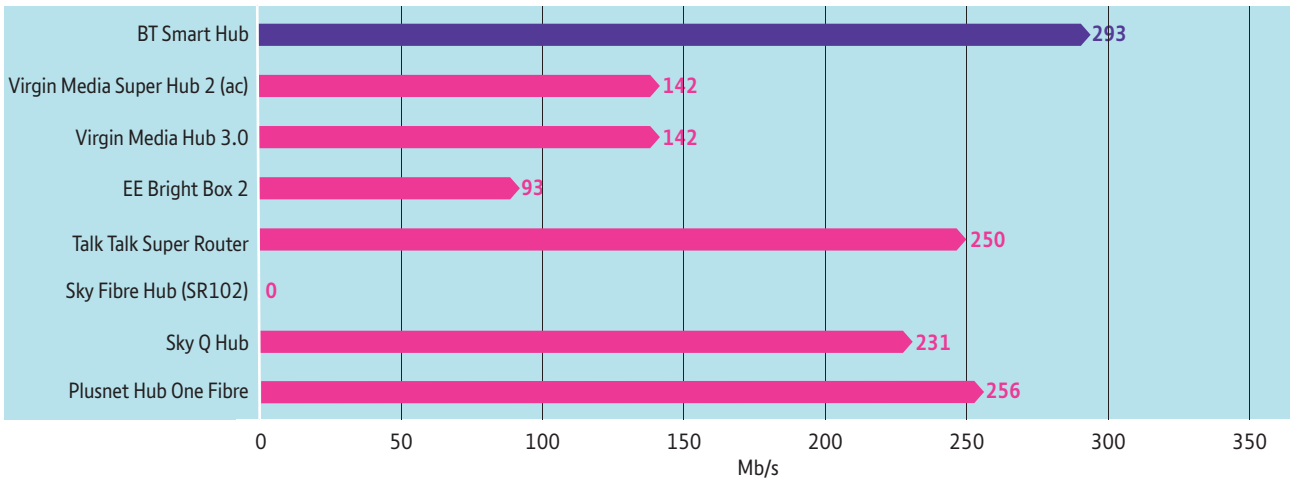
5 GHz

The results show that in every test the BT Smart Hub provides the most powerful wi-fi.

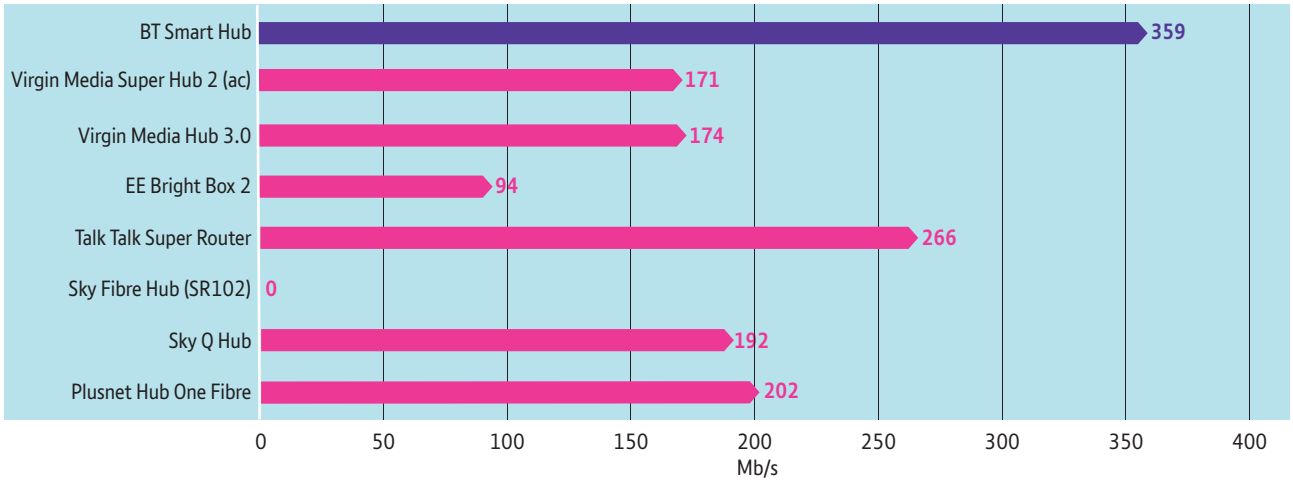
Room 0 – Download – Macbook Pro



Room 0 – Download – S4



Room 1 – Download – Macbook Pro



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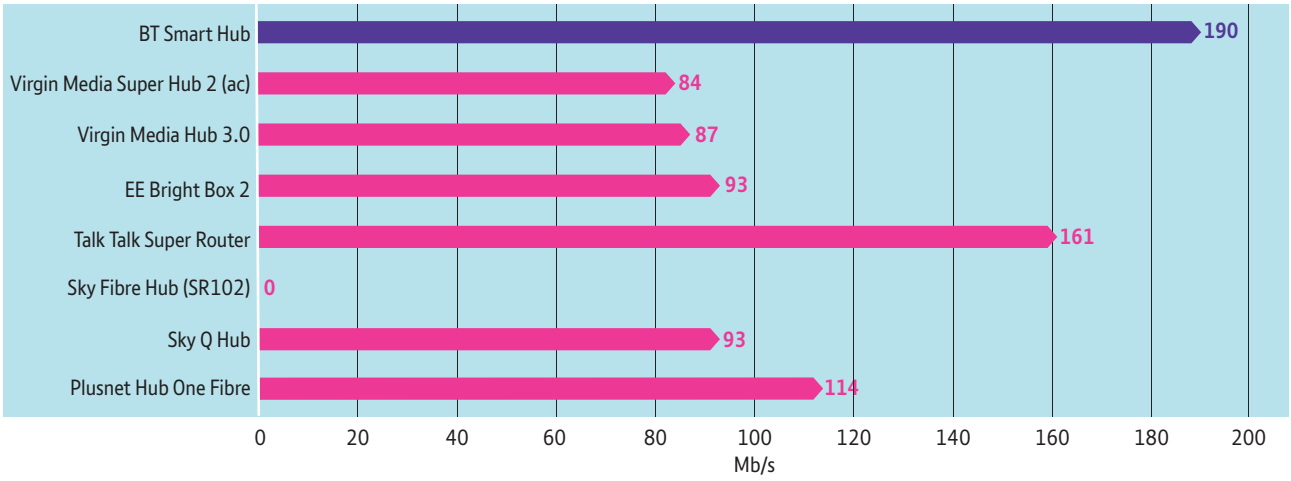

Sagem test house

The Sagem testing was the first to be completed. At the time the testing was commissioned the Virgin Media 3.0 and Sky Q routers were not available. The results from this test facility fully align to those from BT's Adastral Park test house.

2.4 GHz

TCP Download Mbps

	Macbook Pro					Samsung Galaxy S4				
Room	**B**	**I**	**F**	**H**	**G**	**B**	**I**	**F**	**H**	**G**
BT Smart Hub	**135.82**	**103.00**	**48.32**	**47.92**	**25.21**	**62.35**	**46.77**	**32.43**	**29.45**	**12.10**
Virgin Media Super Hub 2 (ac)	103.70	90.74	25.10	3.36	0.00	52.79	42.93	19.26	3.91	0.00
EE Bright Box 2	83.40	57.62	14.89	12.72	0.00	47.02	25.80	15.20	11.82	0.00
Talk Talk Super Router	94.49	76.73	31.69	23.03	9.20	49.26	36.94	20.22	14.99	5.03
Sky Fibre Hub (SR102)	91.03	66.20	17.10	21.74	2.21	48.40	27.22	11.21	8.96	1.50
Plusnet Hub One Fibre	94.14	71.29	16.49	22.06	0.00	49.30	27.36	14.16	9.57	0.00

TCP Upload Mbps

	Macbook Pro					Samsung Galaxy S4				
Room	**B**	**I**	**F**	**H**	**G**	**B**	**I**	**F**	**H**	**G**
BT Smart Hub	**129.45**	**63.92**	**32.78**	**19.60**	**10.33**	**60.45**	**40.11**	**24.58**	**24.05**	**10.98**
Virgin Media Super Hub 2 (ac)	78.08	34.84	13.29	3.36	0.00	53.54	31.56	12.65	19.79	0.00
EE Bright Box 2	66.97	25.03	9.76	4.09	0.00	42.47	24.13	14.04	10.71	0.00
Talk Talk Super Router	80.74	32.54	13.04	6.57	1.83	43.71	32.05	15.55	14.99	3.68
Sky Fibre Hub (SR102)	83.10	35.93	13.23	6.02	0.77	45.66	35.48	15.26	12.78	1.73
Plusnet Hub One Fibre	72.52	34.92	13.54	10.63	0.00	55.73	28.01	14.05	12.07	0.00

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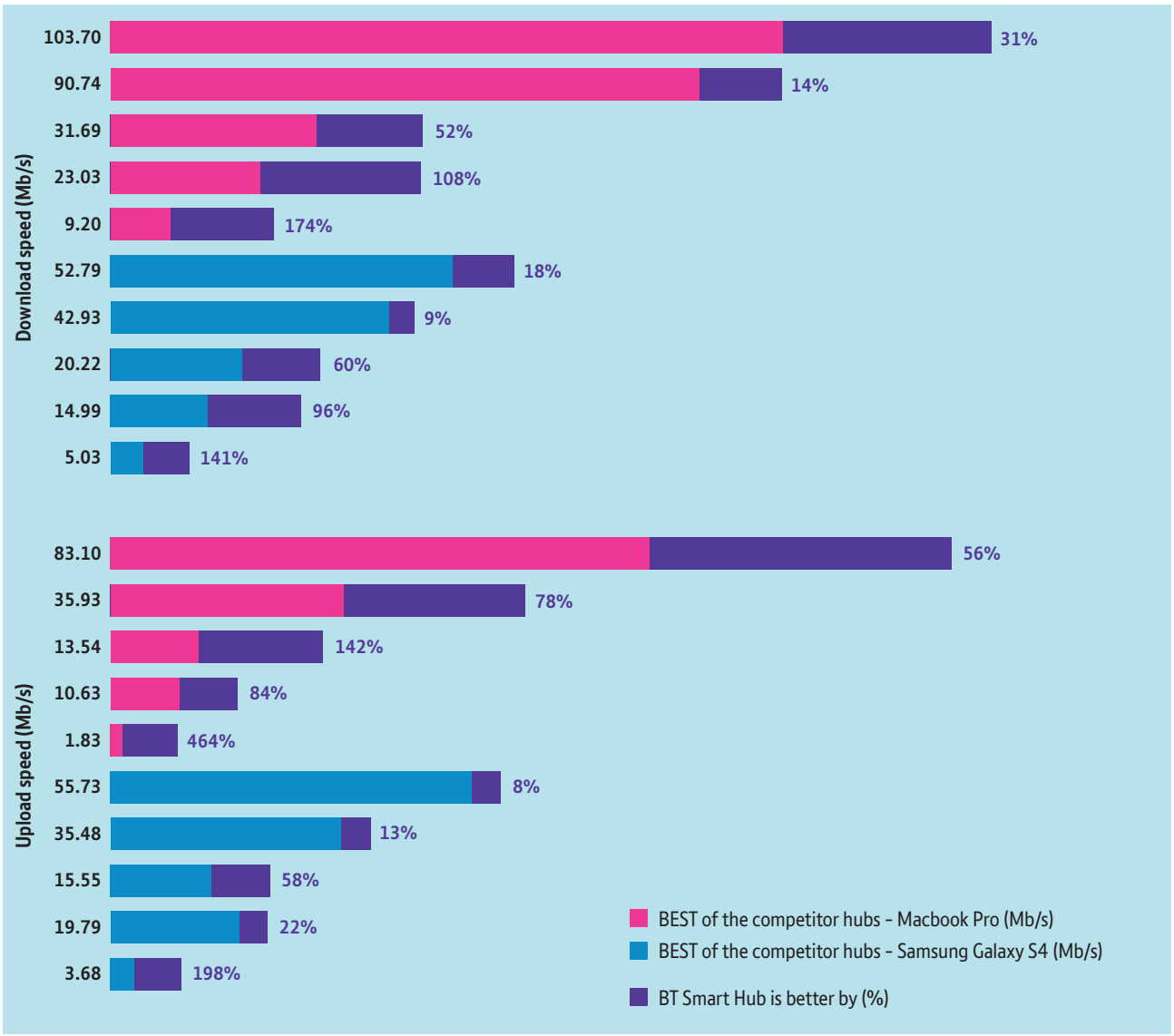
2.4 GHz BT vs. BEST competitor



5 GHz

TCP Download Mbps

	Macbook Pro					Samsung Galaxy S4				
Room	**B**	**I**	**F**	**H**	**G**	**B**	**I**	**F**	**H**	**G**
BT Smart Hub	**345.33**	**172.90**	**0.00**	**0.00**	**0.00**	**215.63**	**60.30**	**0.00**	**22.49**	**0.00**
Virgin Media Super Hub 2 (ac)	201.48	95.81	0.00	0.00	0.00	59.54	23.03	0.00	0.00	0.00
EE Bright Box 2	94.09	83.80	0.00	0.00	0.00	85.68	46.94	0.00	0.00	0.00
Talk Talk Super Router	295.20	141.50	0.00	0.00	0.00	166.88	44.48	0.00	12.75	0.00
Sky Fibre Hub (SR102)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plusnet Hub One Fibre	310.13	94.74	0.00	0.00	0.00	169.44	38.49	0.00	13.23	0.00

TCP Upload Mbps

	Macbook Pro					Samsung Galaxy S4				
Room	**B**	**I**	**F**	**H**	**G**	**B**	**I**	**F**	**H**	**G**
BT Smart Hub	**297.78**	**102.00**	**0.00**	**0.00**	**0.00**	**182.71**	**62.43**	**0.00**	**21.19**	**0.00**
Virgin Media Super Hub 2 (ac)	141.15	70.94	0.00	0.00	0.00	35.05	23.96	0.00	0.00	0.00
EE Bright Box 2	94.10	49.16	0.00	0.00	0.00	92.73	29.01	0.00	0.00	0.00
Talk Talk Super Router	260.10	62.94	0.00	0.00	0.00	179.71	49.05	0.00	10.98	0.00
Sky Fibre Hub (SR102)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plusnet Hub One Fibre	242.67	65.32	0.00	0.00	0.00	169.38	47.01	0.00	14.62	0.00

The results show that in every test the BT Smart Hub provides the most powerful wi-fi.

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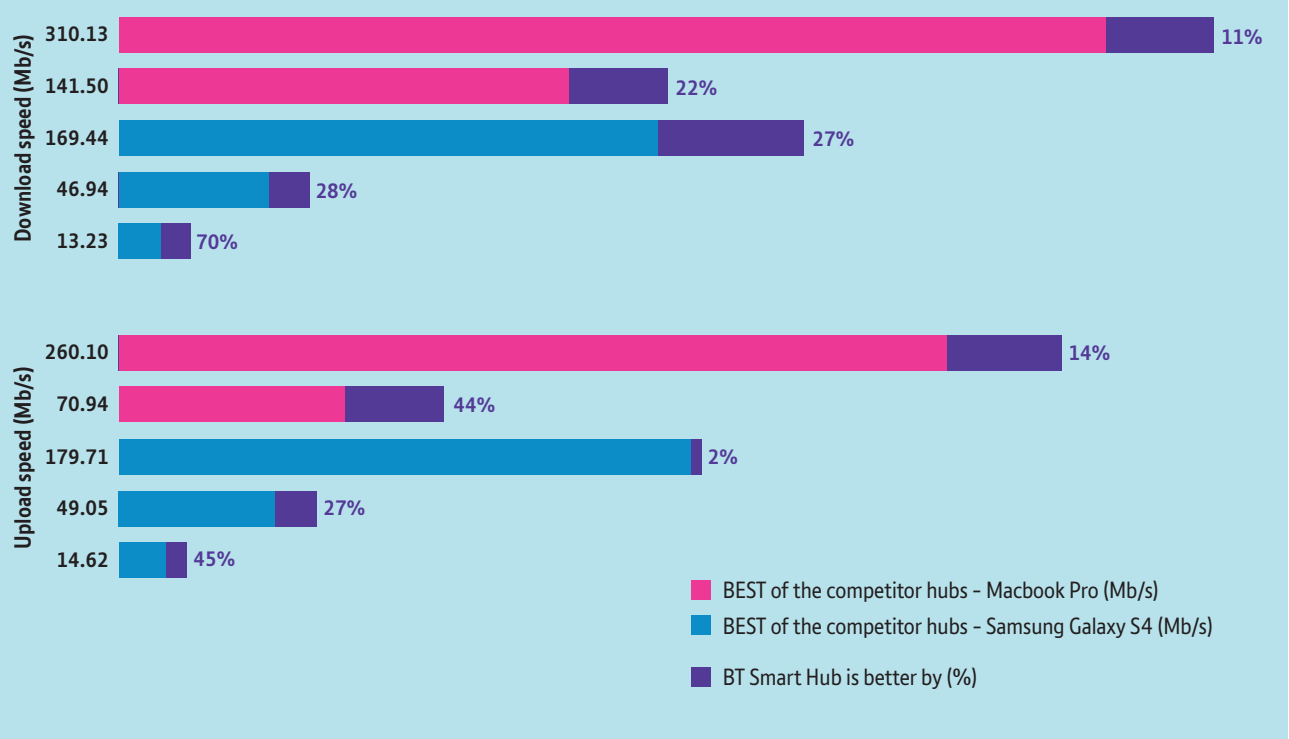
5 GHz BT vs. BEST competitor



10 real homes

The results from the 10 real homes are consistent with the results from the two test facilities. In every test the BT Smart Hub provided the most powerful wi-fi.

Real home test houses – results

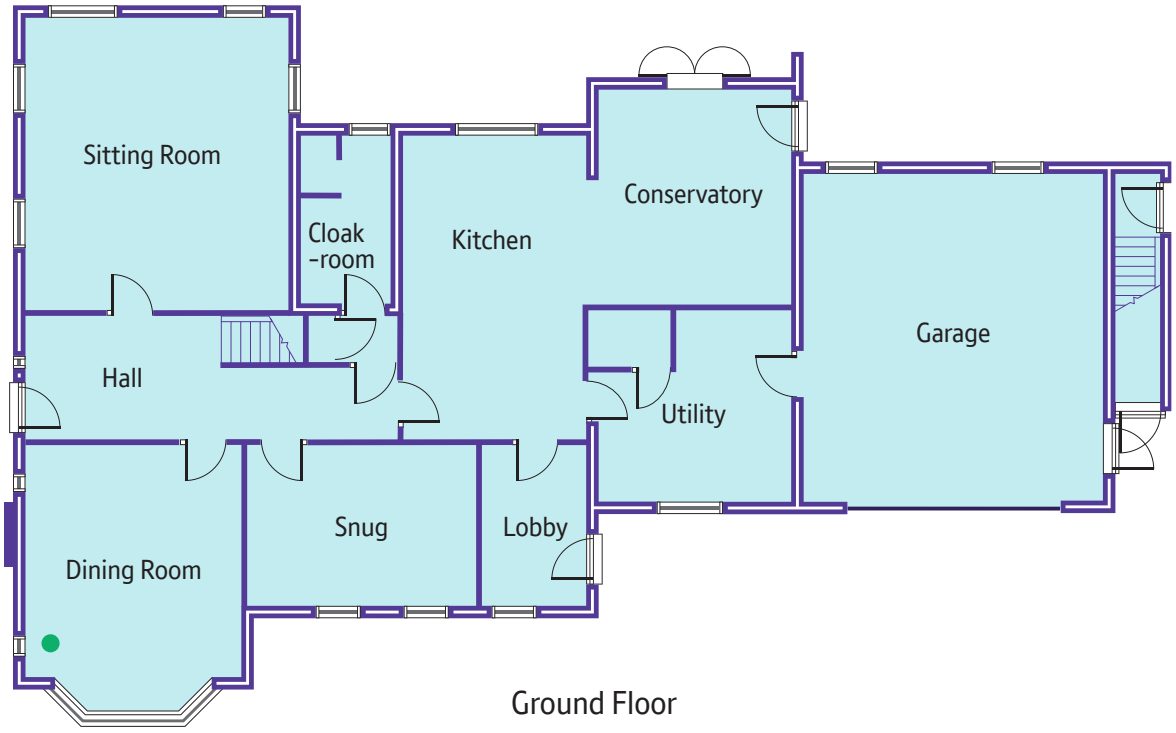
		2.4 GHz			5 GHz		
House 1		Smart Hub	VM	TT	Smart Hub	VM	TT
	Test Point 1	147.33	57.9	64.8	636	385	378
	Test Point 2	12.43	0	1.42	0	0	0
	Test Point 3	15.87	0.01	2.82	0	0	0
House 2		Smart Hub	VM	TT	Smart Hub	VM	TT
	Test Point 1	122	88.5	75.4	179	115	170
	Test Point 2	77.5	47.9	62.1	222	166	165
	Test Point 3	68.1	41.2	51.3	49.2	46	32.9
House 3		Smart Hub	VM	TT	Smart Hub	VM	TT
	Test Point 1	164.7	112.67	81.4	423	247	326
	Test Point 2	36.62	7.11	9.04	0	0	0
	Test Point 3	0.38	0	0	0	0	0
House 4		Smart Hub	VM	TT	Smart Hub	VM	TT
	Test Point 1	141	103	79.4	626	378	385
	Test Point 2	145	102	70.8	467	302	367
	Test Point 3	101	82.7	55.8	352	208	320
House 5		Smart Hub	VM	TT	Smart Hub	VM	TT
	Test Point 1	158	111	94.4	673	373	377
	Test Point 2	127	82.4	49.4	594	334	380
	Test Point 3	100	73.4	52.5	441	293	349
House 6		Smart Hub	VM	TT	Smart Hub	VM	TT
	Test Point 1	154	108	80.6	639	354	375
	Test Point 2	139	104	74.5	423	281	340
	Test Point 3	118	84.8	59.7	225	158	196
House 7		Smart Hub	VM	TT	Smart Hub	VM	TT
	Test Point 1	149	108	73.3	589	373	374
	Test Point 2	47.5	44.2	43.3	127	54.6	82.8
	Test Point 3	109	87.7	60.8	213	127	180
House 8		Smart Hub	VM	TT	Smart Hub	VM	TT
	Test Point 1	126	72.5	45.7	428	316	345
	Test Point 2	106	72	44.4	338	200	282
	Test Point 3	74.9	48.2	44.3	245	160	222
House 9		Smart Hub	VM	TT	Smart Hub	VM	TT
	Test Point 1	141.3	55.7	64.4	578	354	367
	Test Point 2	139.3	96.5	42.4	500	307	366
	Test Point 3	155.7	101.3	70.7	591	322	372
House 10		Smart Hub	VM	TT	Smart Hub	VM	TT
	Test Point 1	120	85.6	58.6	402	249	303
	Test Point 2	134	107	70.7	570	324	392
	Test Point 3	87.5	61.2	42.4	62.9	55.1	30.1

1.5 Conclusion

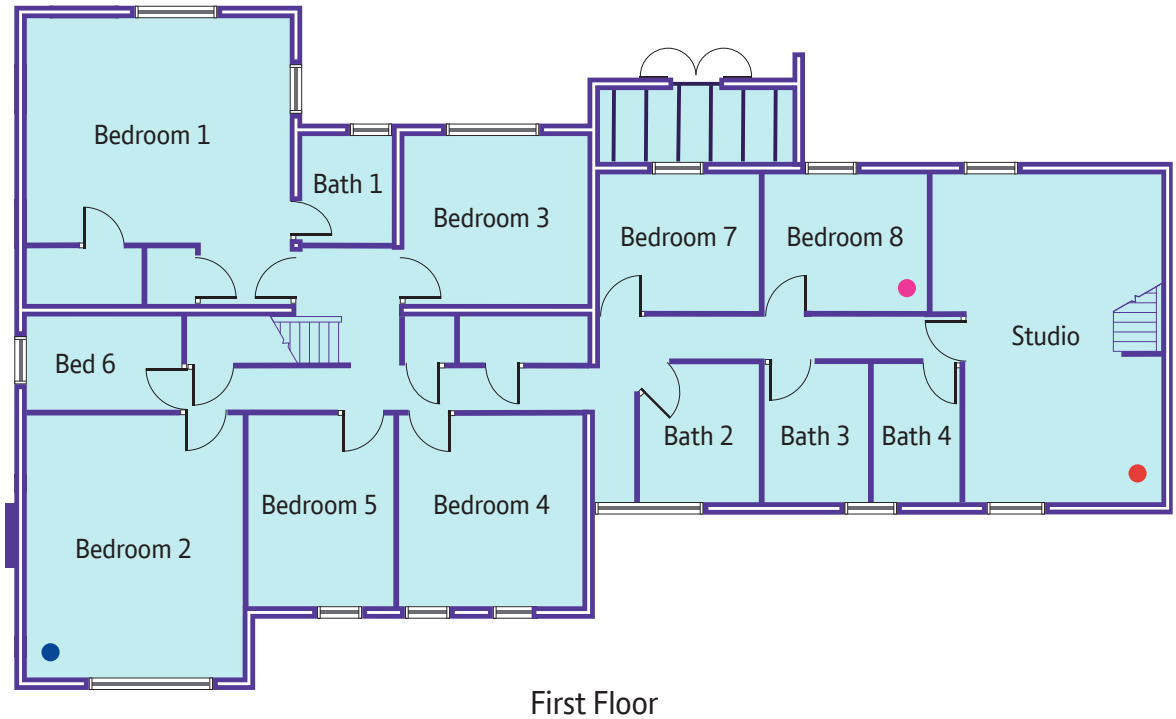
In a range of robust repeatable tests carried out at 2 test houses and in 10 real homes, we have shown that the BT Smart Hub consistently delivers the UK's most powerful wi-fi signal, outperforming routers from all major UK broadband providers.

Appendix

Home 1



Ground Floor



First Floor

Type of house: Detached large family house
Location: **suburban**
No. of Bedrooms: **8**
Approx. year built: **1950's**
Construction: **brick house with brick and plasterboard internal walls**
Length of longest link: **30m**

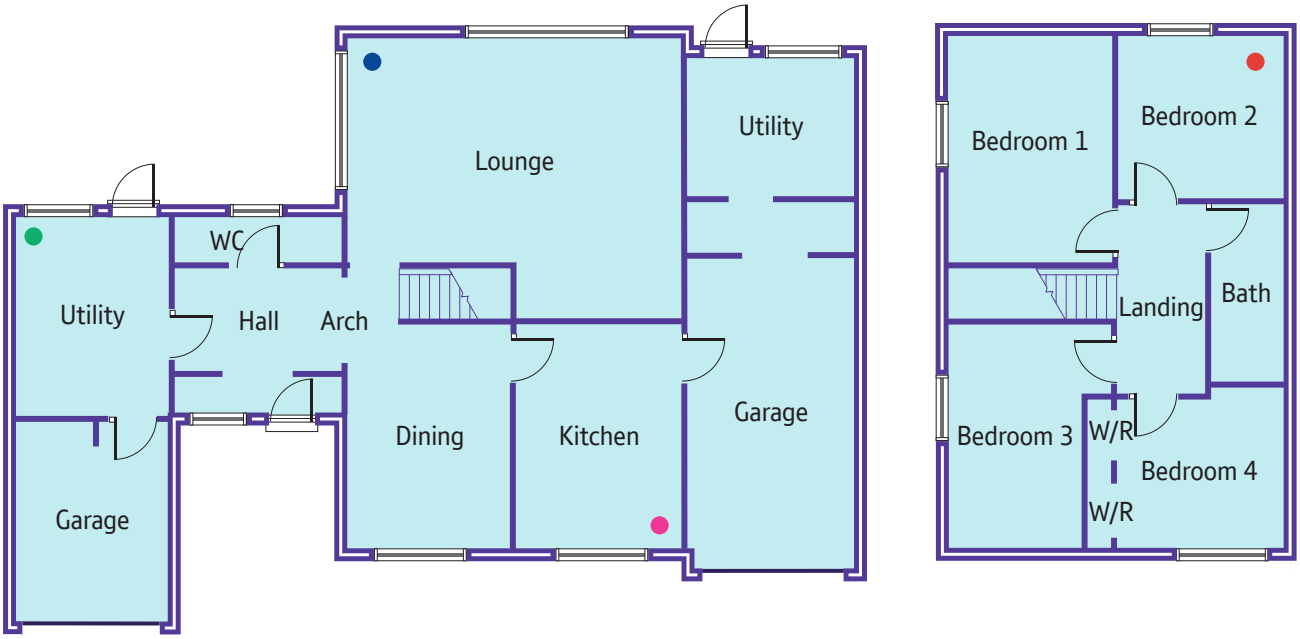
Test Point Details:

- TP1- 3m, 1 floor up
- TP2- 16m, 1 floor up, 3 walls
- TP3- 30m, 1 floor up and 6 walls

- Router

Appendix

Home 2



Ground Floor

First Floor

Type of house: **detached house, 2 floors but small additional steps into lower level living room**
Location: **suburban, one mile from city centre**
No. of Bedrooms: **4**
Approx. year built: **1960's**
Construction: **solid brick with mix of plaster and brick internal walls**
Length of longest link: **20m**
Other Details: **HH5 used to struggle. Hub 6 noticeably better.**

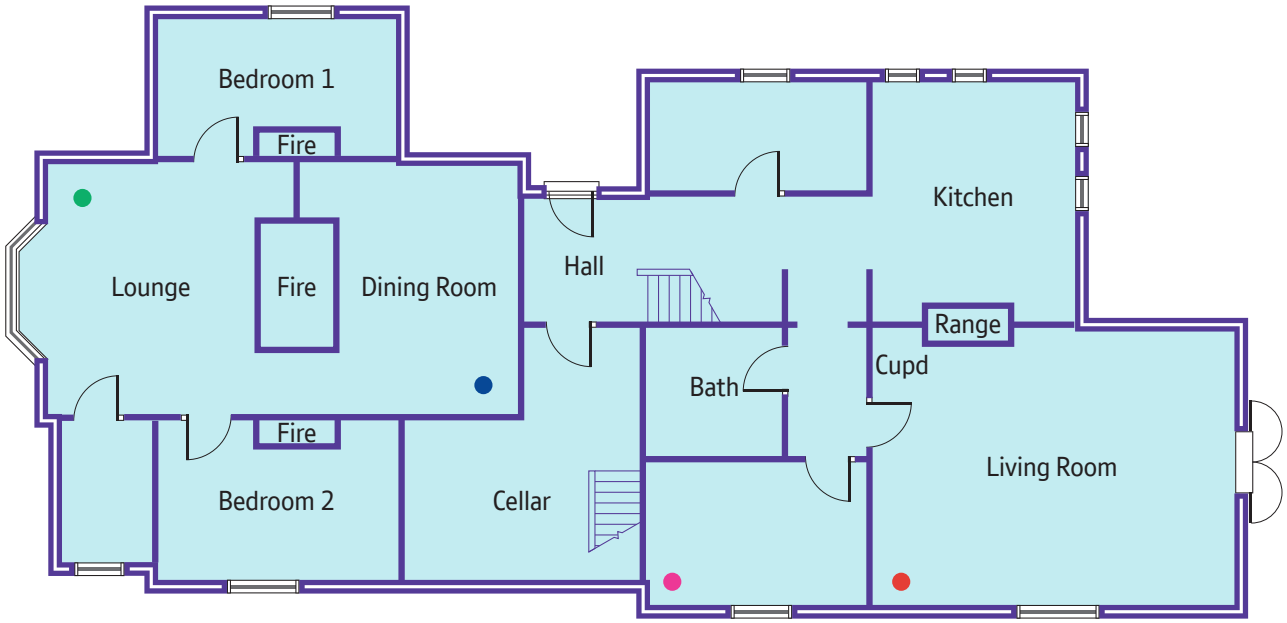
Test Point Details:

- TP1- 7m, round corner of solid wall
- TP2- 12m, 1 solid wall
- TP3- 20m, 1 solid wall, 1 floor

- Router

Appendix

Home 3



Ground Floor

Type of house: **detached thatched cottage with extensions**
Location: **very rural**
No. of Bedrooms: **4**
Approx. year built: **1850**
Construction: **timber frame with 5 solid brick internal fireplaces extended 3 times (lots of solid internal walls)**
Length of longest link: **15m**
Other details: **800m from nearest other building/house**

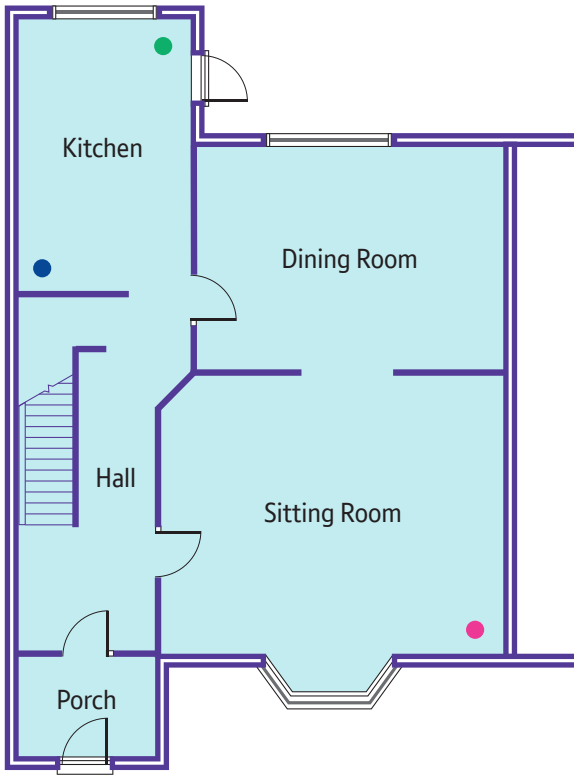
Test Point Details:

- TP1- 6m, 1 solid wall with fireplace
- TP2- 10m, 3 brick walls, 1 fireplace
- TP3- 15m, 4 brick walls, 2 fireplaces

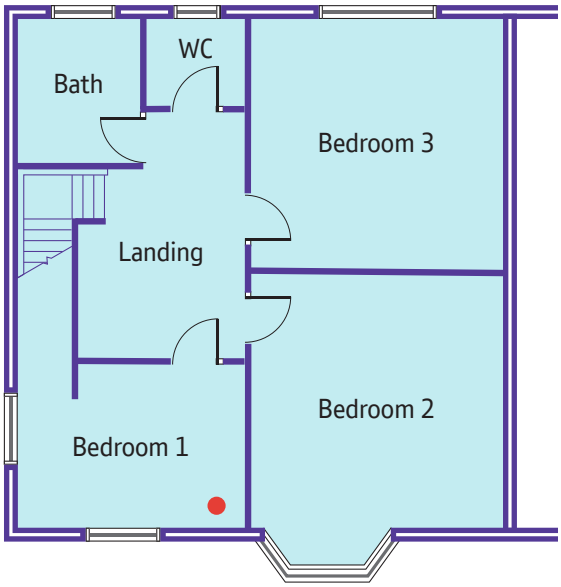
- Router

Appendix

Home 4



Ground Floor



First Floor

Type of house: **semi-detached house, 2 floors**
Location: **suburban – circa 1 mile from town centre**
No. of Bedrooms: **3**
Approx. year built: **1920's**
Construction: **solid brick with solid internal walls**
Length of longest link: **7m**

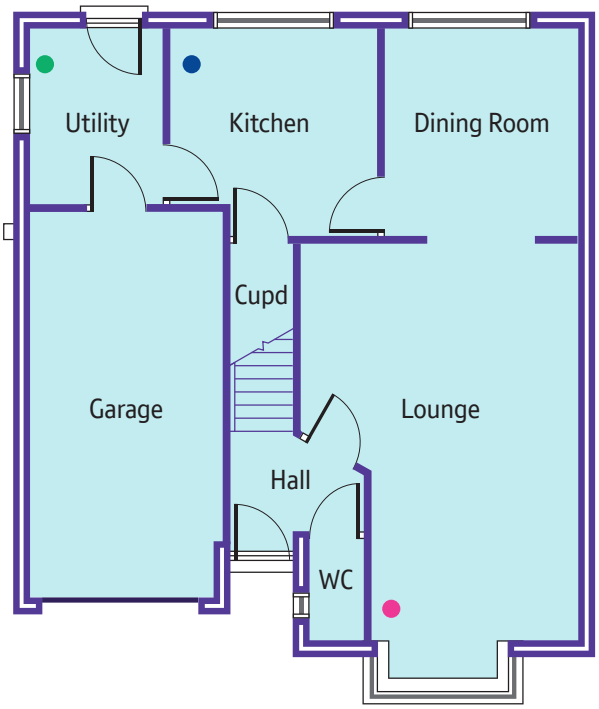
Test Point Details:

- TP1- 2m, no walls
- TP2- 7m, 1 solid wall, one doored wall
- TP3- 7m, 2 solid walls, 1 floor

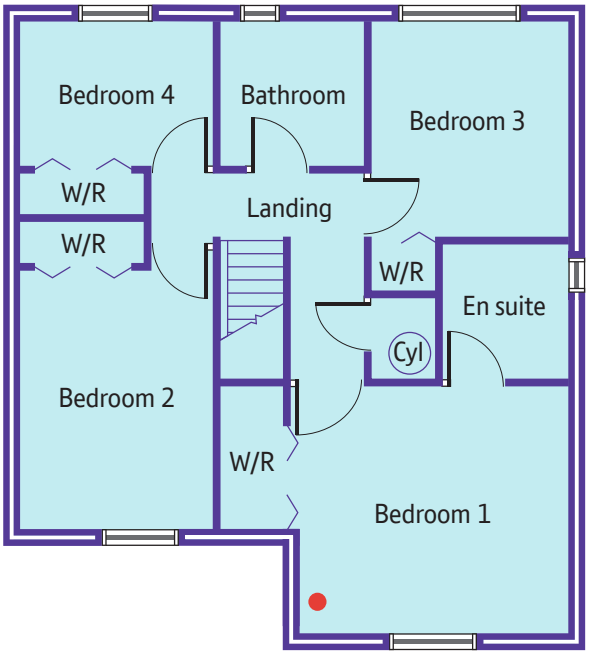
- Router

Appendix

Home 5



Ground Floor



First Floor

Type of house: **detached house, 2 floors**
Location: **housing estate**
No. of Bedrooms: **4**
Approx. year built: **1990's**
Construction: **solid brick with solid internal walls**
Length of longest link: **15m**

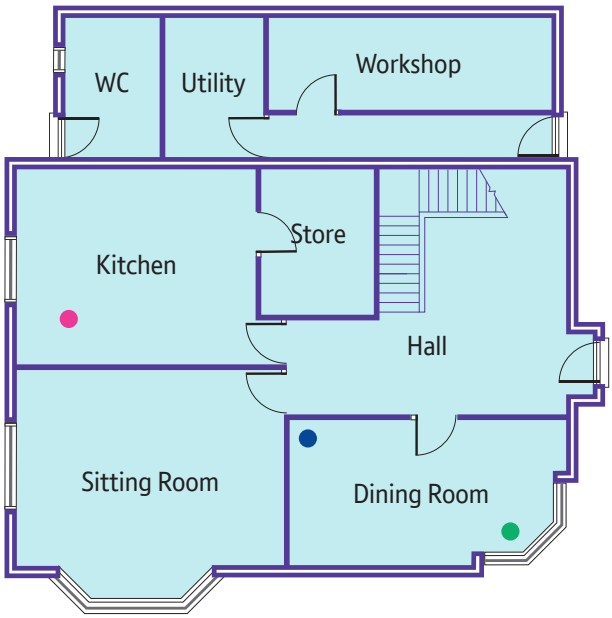
Test Point Details:

- TP1- 2m, 1 solid wall
- TP2- 10m, 1 solid wall, one arched wall
- TP3- 15m, 2 solid walls, 1 floor

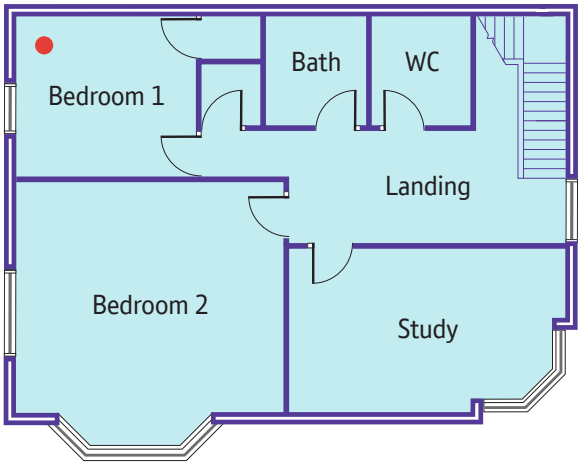
- Router

Appendix

Home 6



Ground Floor



First Floor

Type of house: **detached house, 2 floors**
Location: **urban/town**
No. of Bedrooms: **3**
Approx. year built: **1930's**
Construction: **solid brick with solid internal walls**
Length of longest link: **15m**

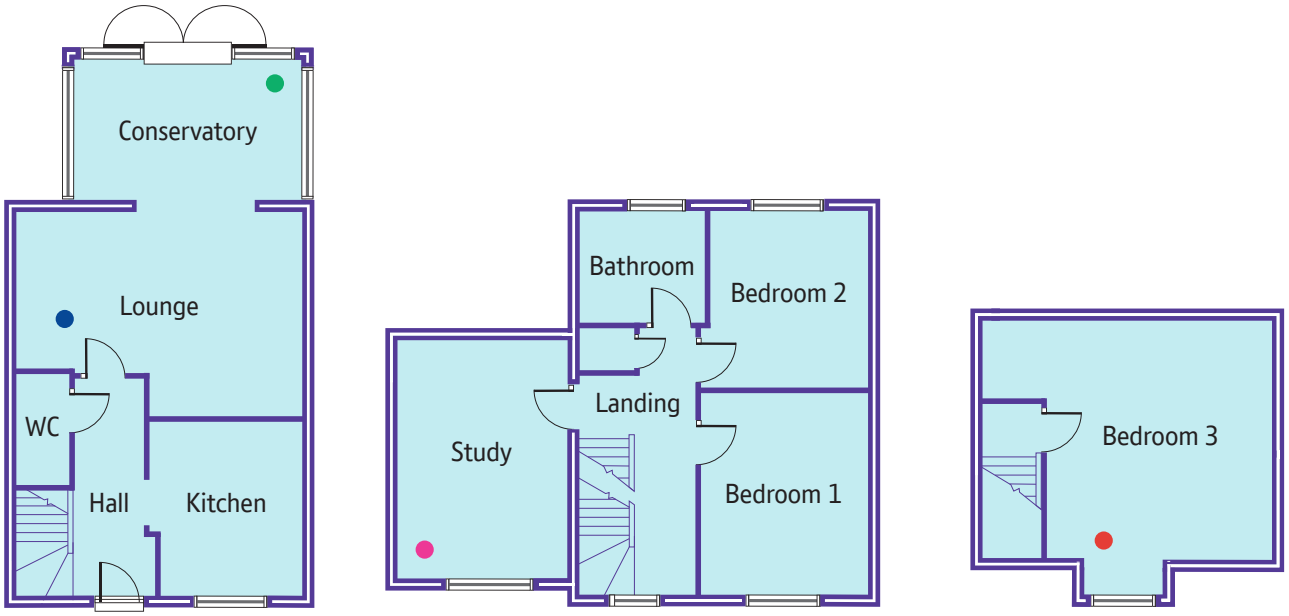
Test Point Details:

- TP1- 3m
- TP2- 8m, 1 solid brick, solid internal (brick/block)
- TP3- 15m, 1 solid wall, 2 doors, 1 floor

- Router

Appendix

Home 7



Type of house: **link detached house, 3 floors**
Location: **suburban housing estate**
No. of Bedrooms: **4**
Approx. year built: **2002**
Construction: **solid brick with a solid internal wall due to conservatory extension, mostly internal plasterboard internal walls, 2nd floor bedroom above carport is brick wall between it and the rest of the house**
Length of longest link: **13m**

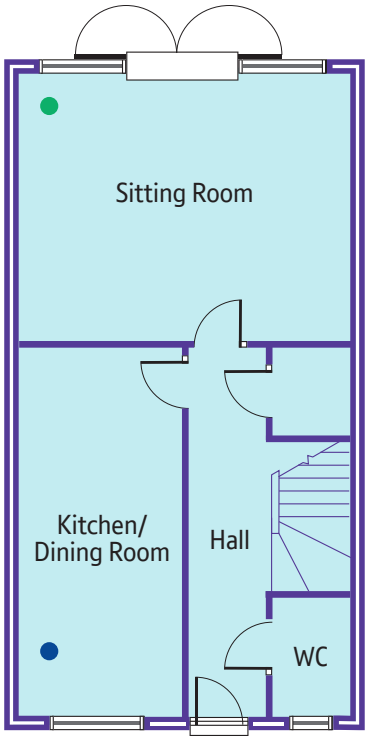
Test Point Details:

- TP1- 4m
- TP2- 8m, 1 solid internal wall, 1 floor. 1.5 external walls with openings
- TP3- 13m, 2 solid internal walls, 2 floors

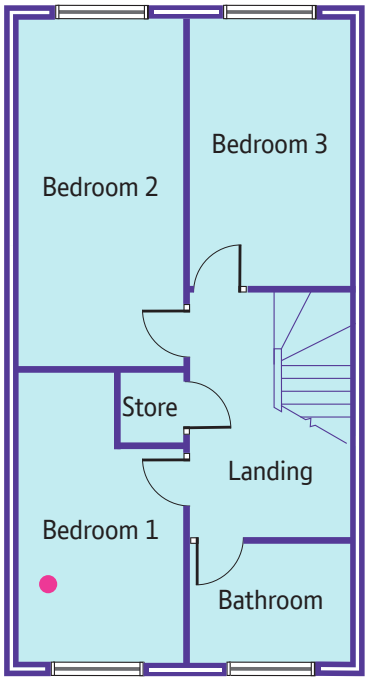
- Router

Appendix

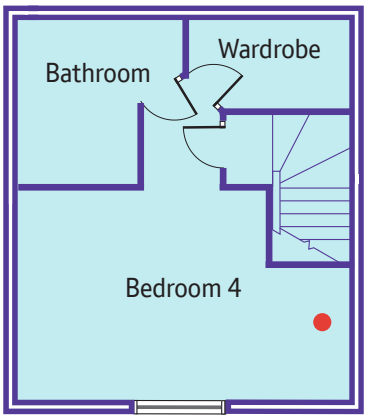
Home 8



Ground Floor



First Floor



Second Floor

Type of house: **semi-detached 3 storey town house**
Location: **estate**
No. of Bedrooms: **4**
Approx. year built: **2013**
Construction: **solid external brick with stud and plasterboard internal walls**
Length of longest link: **16m and 2 floors**

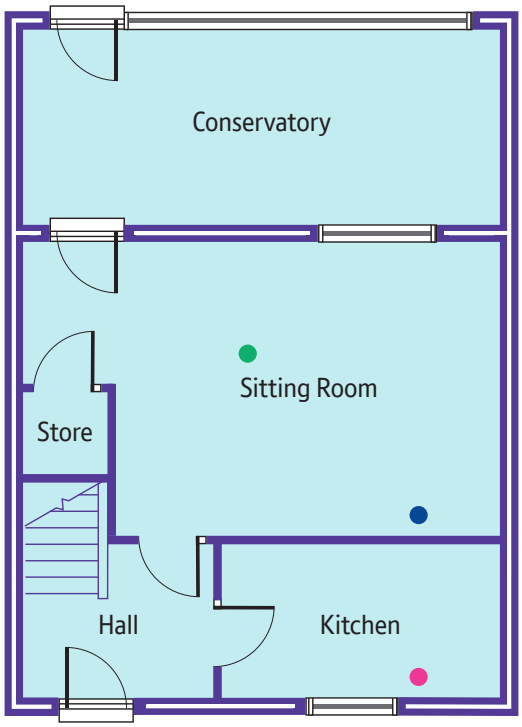
Test Point Details:

- TP1- 8m, 1 internal wall
- TP2- 11m, 2 internal walls, 1 floor
- TP3- 16m, 2 internal walls, 2 floors

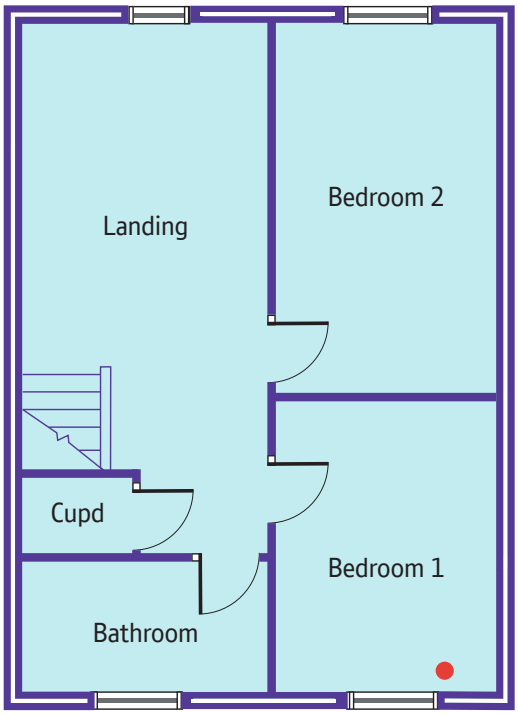
- Router

Appendix

Home 9



Ground Floor



First Floor

Type of house: **end of terrace**
Location: **suburban**
No. of Bedrooms: **2**
Approx. year built: **1980**
Construction: **brick external walls with plasterboard internal walls**
Length of longest link: **8m (up 1 floor, 2 internal walls)**
Any other details: **17 other wi-fi networks**

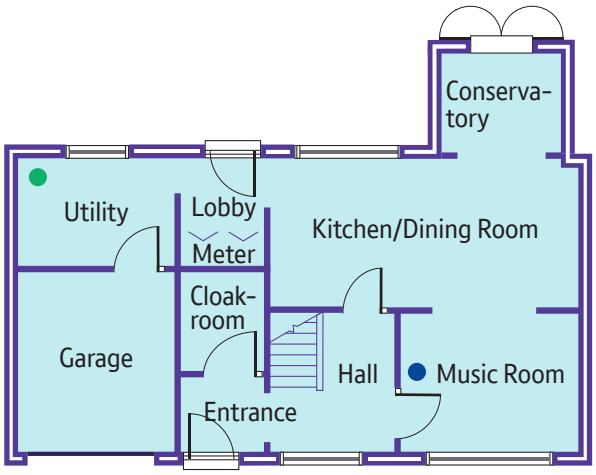
Test Point Details:

- TP1- 2m (same room)
- TP2- 5m, 1 internal wall
- TP3- 8m, 2 internal walls, 1 floor

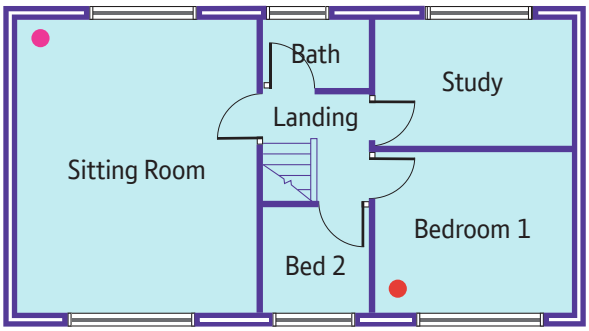
- Router

Appendix

Home 10



Ground Floor



First Floor

Type of house: **detached house, 2 floors**
Location: **housing estate**
No. of Bedrooms: **4**
Approx. year built: **1965**
Construction: **solid external brick with a mix of solid and plasterboard internal walls**
Length of longest link: **10m**
Any other details: **extension and re-purpose for back of garage (router location)**

Test Point Details:

- TP1- 8m, external wall, 2 internal walls
- TP2- 3m, 1 floor
- TP3- 10m, 1 external wall, 3 internal walls, 1 floor

- Router

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