Broadband Data Collection

**Data Specifications for
Provider Infrastructure Data in the
Mobile Challenge and Mobile Verification Processes**

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1 Mobile Provider Infrastructure Data

Mobile broadband service providers whose coverage data have been challenged must submit either the results of on-the-ground mobile speed tests or infrastructure information to rebut the challenge or else concede the challenge. Mobile broadband service providers that are the subject of an inquiry as part of the Commission's verification process must submit either the results of on-the-ground mobile speed tests or infrastructure information. Regardless of which type of data is submitted in response to a challenge or verification inquiry, the Commission may subsequently require the provider to submit additional information if needed to ensure an adequate review, including but not limited to either infrastructure or mobile speed test data (to the extent not the option initially chosen by the provider) or data collected from network transmitter monitoring systems or software (to the extent available in the provider's network).

The specifications for the infrastructure data files listed below are provided in Sections 1.1 through 1.4. These data must be submitted in the specified file format in the BDC system via file upload or API. The Commission will separately release Instructions on how to use the API for data submissions will be provided. Mobile broadband service providers submitting these data must provide certifications to the accuracy of the data.

Section	Data Name	Parties	Description / Notes
1.1	Mobile Provider Base Station Location and Height	Service Providers	Infrastructure information on the base stations included in the propagation modeling used to generate the coverage maps for a mobile broadband service provider in the area subject to challenge or verification inquiry, in tabular format.

Section	Data Name	Parties	Description / Notes
1.2	Mobile Provider Base Station Carriers	Service Providers	Infrastructure information on the carriers (i.e., antennas) deployed on each base station included in the propagation modeling used to generate the coverage maps for a mobile broadband service provider in the area subject to challenge or verification inquiry, in tabular format.
1.3	Mobile Provider Base Station Loading	Service Providers	Infrastructure information on the cell loading measured for the carriers for each base station included in the propagation modeling used to generate the coverage maps for a mobile broadband service provider in the area subject to challenge or verification inquiry, in tabular format.

Section	Data Name	Parties	Description / Notes
1.4	Mobile Provider Band-specific Coverage Map	Service Providers	Coverage map with polygon GIS (geographic information system) data indicating the extent of a mobile service provider's service using a given technology for a particular spectrum band. *- Note: Providers may submit these data in addition to speed test data or infrastructure data, but these data are insufficient by themselves for a response to a challenge or verification inquiry.*

The requirements in this document do not constitute binding FCC rules; rather, this document provides guidance on the requirements governing the binding FCC data collection rules and explains how to make the required filings in the system. The rules governing the BDC (formerly known as the Digital Opportunity Data Collection) can be found in 47 CFR § 1.7004 *et seq.*

The FCC's Office of Economics and Analytics may publish updates to this document prior to the initial BDC filing window and in advance of subsequent BDC filing windows. In addition, instructions for biannual BDC submissions, a User Guide to the BDC system, and other materials will be made available prior to the initial BDC filing window on the FCC's Broadband Data Collection website at https://www.fcc.gov/BroadbandData/filers.

> *A Word about Header Rows*:
>
> When uploading files in the BDC System, users must include the header specified below for each upload file, and its characters must match what is specified in this document. File templates that include the specified header rows will be made available for download from the FCC's website at a later date.
>
> *A Word about Required Fields:*
>
> In the file specifications below, all of the fields are required. In certain specified cases, the value for a field can be left null. However, the field (or column) must still be included in the file; if it is not, the user will receive an error message from the BDC System.

1.1   Mobile Provider Base Station Location and Height

This file must contain the records for each base station used to model mobile broadband coverage. The file must be in Comma Separated Value (CSV) format and match the specifications in the table below. All values are required unless otherwise indicated.

Field Name	Header	Data Type	Example	Description / Notes
Site ID	site_id	String	VA0128	Unique site ID, assigned by the filer, for the base station to which this data record applies. *- Value length must be less than 256 characters.*
Latitude	latitude	Decimal (10,7)	38.903692	Geographic coordinate latitude of the base station in decimal degrees using WGS-84 coordinate reference system. *- Must be a minimum of 6 and a maximum of 7 decimal digits.*
Longitude	longitude	Decimal (10,7)	-77.009676	Geographic coordinate longitude of the infrastructure in decimal degrees using WGS-84 coordinate reference system. *- Must be a minimum of 6 and a maximum of 7 decimal digits.*
Height of Base Station	site_height	Decimal (5,1)	150.0	Height of the base station site above-mean-sea-level (AMSL) in meters *- Value must be greater than or equal to -100 and less than or equal to 6500.*
Model ID	model_id	String	ITM-1A	Unique identifier for the propagation model used to generate the coverage data for the base station. *- Value must correspond to a model_id value in the Mobile Propagation Model Details file submitted as supporting data in the biannual BDC collection.*
Morphology	morphology	Enumerated Integer	2	Code, taken from the list below, indicating the morphology of the area for which coverage is modeled from the base station. *- Value must be one of the following codes:* *1 – Urban* *2 – Suburban* *3 – Rural* *0 – Other*
Number of Sectors	number_of_ sectors	Integer	3	Number of base station sectors *- Value must be greater than 0 and less than or equal to 12.*

Field Name	Header	Data Type	Example	Description / Notes
Backhaul Medium	backhaul_medium	Enumerated	50	Code, taken from the list below, indicating the type of technology used for backhaul at the base station. *- Value must be one of the following codes:* *10 – Copper Wire* *40 – Coaxial Cable / HFC* *50 – Optical Carrier / Fiber to the Premises* *60 – Geostationary Satellite* *61 – Non-geostationary Satellite* *70 – Unlicensed Terrestrial Fixed Wireless* *71 – Licensed Terrestrial Fixed Wireless* *0 – Other*
Backhaul Capacity – Incoming	backhaul_capacity_incoming	Decimal (8,3)	10.0	One-way provisioned capacity of backhaul link incoming to the base station, in Gbps, given the capabilities of the existing hardware. *- Value must be greater than 0.*
Backhaul Capacity – Outgoing	backhaul_capacity_outgoing	Decimal (8,3)	10.0	One-way provisioned capacity of backhaul link outgoing from the base station, in Gbps, given the capabilities of the existing hardware. *- Value must be greater than 0.*
Backhaul Latency	backhaul_latency	Integer	10	Backhaul Service Level Agreement latency in milliseconds (round-trip). *- Value must be greater than 0.*

1.2 Mobile Provider Base Station Carriers

This file must contain the records of each carrier (i.e., antenna) used in each sector of the mobile provider's base stations, as identified in the corresponding Mobile Provider Base Station Location and Height data file. The file must be in Comma Separated Value (CSV) format and match the specifications in the table below. All values are required unless otherwise indicated.

Field	Header	Data Type	Example	Description / Notes
Site ID	site_id	String	VA0128	Unique site ID for the base station with which the carrier/antenna is associated. - *Value must correspond to a site_id value in the Mobile Provider Base Station Location and Height file.* - *Value length must be less than 256 characters.*
Sector ID	sector_id	String	A	Unique sector ID for the sector of the site / base station to which this data record applies. This is sometimes recorded as a suffix to a Site ID, such as VA0128-A, but filers should enter only the suffix here.
Cell ID	cell_id	String	32193025	Mobile broadcast cell identifier matching the cell_id value that devices on the network record.
Height of the Sector	sector_height	Decimal (5,1)	60.0	Height of the antenna sector above-ground-level (AGL), in meters. - *Value must be greater than or equal to 0 and less than or equal to 1000.*
Azimuth	sector_azimuth	Decimal (4,1)	120.0	Azimuth of the antenna sector orientation, in decimal degrees. - *Value must be greater than or equal to 0 and less than or equal to 360.*
Sector Down Tilt - Electrical	sector_down_tilt_ electrical	Decimal (3,1)	2.0	Electrical down-tilt angle of the sector antenna, in decimal degrees. - *This field may be null.* - *Value must be greater than or equal to -90 and less than or equal to 90 if not null.*
Sector Down Tilt - Mechanical	sector_down_tilt_ mechanical	Decimal (3,1)	6.0	Mechanical down-tilt angle of the sector antenna, in decimal degrees. - *Value must be greater than or equal to -90 and less than or equal to 90.*
Downlink EIRP	effective_ isotropic_ radiated_power	Decimal (4,1)	27.5	The downlink effective isotropic radiated power level (EIRP) of the transmitter, in decibel-milliwatts (dBm). - *Value must be greater than or equal to 0.*

Field	Header	Data Type	Example	Description / Notes
Downlink MIMO Configuration	mimo_ configuration	String	4x2	The deployed downlink MIMO (multiple-in multiple-out) antenna technology (e.g., 2x2, 4x4, 8x4, etc.). *- Value may be null if not applicable.* *- Value must be in valid matrix format: "<numeric>x<numeric>", if not null, and each numeric value must be an integer greater than 0.*
Antenna Make and Model	antenna_model	String	PCS-06515-0DH	The make and model of the antenna deployed. If multiple antennas are used at a particular Site ID, then each should be entered as a separate record.
Technology Code	technology	Enumerated Integer	501	Integer code, taken from the list below, indicating the technology standard used by the channel/carrier described in this record. *- Value must be one of the following codes:* *310 – 3G (CDMA-based)* *320 – 3G (GSM-based)* *401 – 4G LTE (3GPP release 8)* *402 – 4G LTE (3GPP release 9)* *403 – 4G LTE (3GPP release 10)* *404 – 4G LTE (3GPP release 11)* *405 – 4G LTE (3GPP release 12)* *406 – 4G LTE (3GPP release 13)* *407 – 4G LTE (3GPP release 14)* *501 – 5G-NR (3GPP release 15)* *502 – 5G-NR (3GPP release 16)* *503 – 5G-NR (3GPP release 17)* *0 – Other*
Link Budget ID - Downlink	downlink_ link_budget_id	String	VA1238DL	Unique identifier for the downlink link budget assumed in generating the coverage data for the base station carrier. *- Value must correspond to a corresponding downlink_link_budget_id value in the Mobile Link Budget Parameters file.*

Field	Header	Data Type	Example	Description / Notes
Link Budget ID - Uplink	uplink_ link_budget_id	String	VA1238UL	Unique identifier for the uplink link budget assumed in generating the coverage data for the base station carrier. *- Value must correspond to a corresponding uplink_link_budget_id value in the Mobile Link Budget Parameters file.*
Downlink Frequencies with Carrier Aggregation	downlink_carrier_ aggregation_ frequencies	String	737.5, 2172.625	List all downlink RF carrier center frequencies, separated by a comma, that are deployed in carrier aggregation with this RF carrier. *- Value may be null if downlink carrier aggregation is not used for this RF carrier.*
Uplink Frequencies with Carrier Aggregation	uplink_carrier_ aggregation_ frequencies	String	707.5, 1772.625	List all uplink RF carrier center frequencies, separated by a comma, that are deployed in carrier aggregation with this RF carrier. *- Value may be null if uplink carrier aggregation is not used for this RF carrier.*

1.3   Mobile Provider Base Station Loading

This file must contain records of cell loading measurements for cell sites used to offer mobile services, as identified in the corresponding Mobile Provider Base Station Carriers file. The file must be in Comma Separated Value (CSV) format and match the specifications provided in the table below. All values are required unless otherwise indicated.

Field	Header	Data Type	Example	Description / Notes
Site ID	site_id	String	VA0128	Unique site ID for the base station to which this data record applies. *- Value must correspond to a site_id value in the Mobile Provider Base Station Carriers file.* *- Value length must be less than or equal to 256 characters.*
Sector ID	sector_id	String	A	Unique sector ID for the sector to which this data record applies, created by adding a suffix to the site ID. *- Value must correspond to a sector_id value in the Mobile Provider Base Station Carriers file.*

Field	Header	Data Type	Example	Description / Notes
Cell ID	cell_id	String	32193025	Mobile broadcast cell identifier matching the cell_id value that devices on the network record. *- Value must correspond to a cell_id value in the Mobile Provider Base Station Carriers file.*
Timestamp	timestamp	Datetime	2021-12-15T09:15:00-05:00	Timestamp of the time at which the cell loading data measurement began. *- Value must match valid ISO-8601 format including seconds and timezone offset, e.g.: YYYY-MM-DD[T]hh:mm:ss±hh:mm*
Duration	duration	Integer	900	Duration of the measurement interval, in seconds. *- Value must be greater than or equal to 60 and less than or equal to 900.*
Technology Code	technology	Enumerated Integer	501	Integer code, taken from the list below, indicating the technology standard used by the channel/carrier described in this record. *- Value must be one of the following codes:* *310 – 3G (CDMA-based)* *320 – 3G (GSM-based)* *401 – 4G LTE (3GPP release 8)* *402 – 4G LTE (3GPP release 9)* *403 – 4G LTE (3GPP release 10)* *404 – 4G LTE (3GPP release 11)* *405 – 4G LTE (3GPP release 12)* *406 – 4G LTE (3GPP release 13)* *407 – 4G LTE (3GPP release 14)* *501 – 5G-NR (3GPP release 15)* *502 – 5G-NR (3GPP release 16)* *503 – 5G-NR (3GPP release 17)* *0 – Other*

Field	Header	Data Type	Example	Description / Notes
Downlink Bandwidth	downlink_ bandwidth	Decimal (6,2)	10.0	Total bandwidth of the downlink RF carrier used for the deployed service, in MHz. If using TDD, enter the entire bandwidth of the TDD carrier. *- Value must match the channel_bandwidth value for the corresponding downlink link budget in the Mobile Link Budget Parameters file of the link budget identified in the Mobile Provider Base Station Carriers file for this site and sector.*
Downlink Bandwidth Use	downlink_ bandwidth_use	Decimal (6,2)	5.2	Average amount of bandwidth of the downlink carrier that is carrying user traffic during the measurement interval, in MHz. *- Value must be less than or equal to value for downlink_bandwidth.*
Downlink Throughput	downlink_ throughput	Decimal (8,2)	30.90	Average downlink throughput of network traffic for the cell during the measurement interval, in megabits per second (Mbps). *- Value must be greater than or equal to 0.*
Downlink Cell Loading	downlink_ cell_load	Decimal (3,2)	0.52	Total calculated downlink cell loading percentage during the measurement interval. *- Value must be equal to (<downlink_bandwidth_use> / <downlink_bandwidth>).*
Uplink Bandwidth	uplink_ bandwidth	Decimal (6,2)	10.0	Total bandwidth of the uplink RF carrier used for the deployed service, in MHz. If using TDD, enter the entire bandwidth of the TDD carrier. *- Value must match the channel_bandwidth value for the corresponding uplink link budget in the Mobile Link Budget Parameters file of the link budget identified in the Mobile Provider Base Station Carriers file for this site and sector.*

Field	Header	Data Type	Example	Description / Notes
Uplink Bandwidth Use	uplink_ bandwidth_use	Decimal (6,2)	10.0	Average amount of bandwidth of the uplink carrier that is carrying user traffic during the measurement interval, in MHz. *- Value must be less than or equal to value for uplink_bandwidth.*
Uplink Throughput	uplink_ throughput	Decimal (8,2)	6.70	Average uplink throughput of network traffic for the cell during the measurement interval, in megabits per second (Mbps). *- Value must be greater than or equal to 0.*
Uplink Cell Loading	uplink_ cell_load	Decimal (3,2)	1.0	Total calculated downlink cell loading percentage during the measurement interval. *- Value must be equal to (<uplink_bandwidth_use> / <uplink_bandwidth>).*
Average Cell Users	cell_users	Decimal (8,3)	43.2	Average number of active radio resource control channel users connected to the cell during the measurement interval. *- Value must be greater than or equal to 0.*

1.4   Mobile Provider Band-specific Coverage Maps

Mobile service providers may choose to include separate maps for each spectrum band in response to a challenge or verification inquiry. These data can be submitted in addition to speed test or infrastructure response data but are insufficient to constitute a response on their own. The maps should represent broadband availability for a particular technology in accordance with the same parameters required for the biannual collection of mobile broadband availability coverage maps.

These coverage maps must contain GIS data with polygon geometries and associated data attributes in a supported GIS data format (e.g., ESRI Shapefile, ESRI FileGDB, GeoJSON, Geopackage). They must be in one of the GIS file formats supported by the BDC System: ESRI Shapefile, ESRI FileGDB, GeoJSON, or Geopackage. The required fields and specifications for the data attributes for these GIS data files are provided in the table. All values are required.

Specifications for the data attributes for these GIS data files is described in the table below:

Field	Data Type	Example	Description / Notes
brandname	String	T-Mobile	Name of the entity or service advertised or offered to consumers.
technology	Integer	500	Code for the technology used for the deployed service. *- Value must be one of the following codes:* *300 – 3G* *400 – 4G LTE* *500 – 5G-NR*
downfreq	Decimal	707.0	Unrounded center frequency, in MHz, of the downlink carrier used for the deployed service. If using TDD, enter the center frequency of the TDD carrier.
downbwidth	Decimal	10.0	Bandwidth, in MHz, of the downlink RF carrier used for the deployed service. If using TDD, enter the entire bandwidth of the TDD carrier.
upfreq	Decimal	737.0	Unrounded center frequency, in MHz, of the uplink carrier used for the deployed service. If using TDD, enter the center frequency of the TDD carrier.
upbwidth	Decimal	10.0	Bandwidth, in MHz, of the uplink RF carrier used for the deployed service. If using TDD, enter the entire bandwidth of the TDD carrier.
mindown	Float	7.0	Minimum download speed for modeled coverage, in Mbps.
minup	Float	1.0	Minimum upload speed for modeled coverage, in Mbps.
minsignal	Integer	-110	Minimum signal strength for modeled coverage from 50 to 130 dBm in 10 dB increments. *- Value represents predicted RSSI signal strength when technology value is 300 (i.e., 3G) or predicted RSRP signal strength when technology value is 400 or 500 (i.e., 4G LTE or 5G-NR).*
environmnt	Enumerated Integer	1	Integer code indicating whether the area is modeled to have coverage when the user equipment is in an outdoor stationary environment only or in both in-vehicle mobile and outdoor stationary environments. *- Value must be one of the following codes:* *0 – Outdoor stationary only* *1 – In-vehicle mobile and outdoor stationary*