INDEPENDENT DRIVE TEST REPORT

For

Delhi to Amritsar Highway
July 2018

NORTH ZONE

Key Performance Indicators: All TSPs have met the Drop Call Rate (DCR) benchmark of 2% except BSNL 2G and BSNL 3G. All TSPs have met the Call Setup Success Rate (CSSR) of 95% except BSNL 3G.

The Independent Drive Test has been carried out by M/s PhiMetrics Technologies Pvt. Ltd. on behalf of TRAI in Delhi to Amritsar Highway Route from 9th July to 10th July 2018. The drive test covered an drive route of 465 KMs over a period of two day. Approximately 400 calls were made for each of the 11 networks: five 2G networks, five 3G networks and one LTE network covering 6 unique TSPs.
Overview:

Telecom Regulatory Authority of India has been entrusted with the task of laying down the standards of quality of service to be provided by the service providers and ensuring its enforcement; and also TRAI is responsible for conducting the periodical audit of such services provided by the service providers so as to protect the interest of the consumers of telecommunications service.

TRAI is regularly monitoring the performance of Telecom Service Providers (TSP) against the benchmarks for the various Quality of Service (QoS) parameters laid down by the Authority. TSPs submit Performance Monitoring Reports to TRAI every quarter. TRAI also undertakes audit and assessment of Quality of Service through independent agencies to verify the Quality of Service claimed. The Audit agencies conduct sample ‘Drive tests’ across various cities in the country as part of audit and assessment of the TSPs’ performance.

In view of complaints on call drops and other network quality issues, on behalf of TRAI, an Independent Drive Test (IDT) was conducted by PhilMetrics Technologies Pvt. Ltd. From 9th July to 10th July 2018 covering various locations in Delhi to Amritsar Highway Route. The performance of Airtel, BSNL, Idea, Tata, Vodafone and Jio were monitored across various technologies (2G, 3G, and 4G). The test results obtained from these drive tests were utilized to assess the network quality for Voice services in terms of

**Voice:** Coverage, Quality, Handover Success Rate, Call Setup Success Rate, Drop Call Rate and Block Call Rate.

**Drive Test Details For Delhi to Amritsar Highway:**

Independent Drive test was conducted for a period of two days from 9th July to 10th July 2018 in Delhi to Amritsar Railway Route from 9:00 AM to 9:00 PM. Calls were made for 90 sec duration with wait time of 10 sec between calls in all technologies.

**Voice Tests:** The drive test covered a drive route of approximately 465 KMs over a period of two days on 9th July to 10th July 2018. Approximately 400 calls were made for each of the 11 networks: five 2G (Lock Mode) networks, five 3G (Dual mode) networks and one VoLTE network covering 6 unique TSPs.

* In case of multiple call failure in similar geo location in given period of 60sec has been counted as one call failure.
* For Voice and Data KPI’s, 2G measurement is done with UE locked on 2G, 3G measurement is done with UE in Dual mode (2G & 3G) and 4G measurement is done with UE in Free Mode.
* 3G KPI’s which are calculated from UE in Dual Mode (2G & 3G) includes samples and events of 2G.
* 4G KPI’s which are calculated from the UE in Free Mode included samples and events of 2G & 3G.
Voice Calls

Key Observations

QoS compliance of the TSPs From Delhi to Amritsar Highway for Voice across technologies 2G/3G/4G-VoLTE is given below:

**Voice Summary**

- **KPI**
  - **2G Networks**
    - **SDCCH Congestion% (≤1%)**
      - Airtel: 0.00%
      - BSNL: 1.00%
      - Idea: 0.00%
      - Tata: 0.26%
      - Vodafone: 0.00%
    - **TCH Congestion % (≤2%)**
      - Airtel: 0.00%
      - BSNL: 2.76%
      - Idea: 0.00%
      - Tata: 0.00%
      - Vodafone: 0.25%

- **KPI**
  - **3G Networks**
    - **SDCCH Congestion%**
      - Airtel: 0.00%
      - BSNL: 0.00%
      - Idea: 0.00%
      - Tata: 0.00%
      - Vodafone: 0.00%
    - **RRC Congestion%**
      - Airtel: 0.50%
      - BSNL: 0.97%
      - Idea: 0.97%
      - Tata: 0.25%
      - Vodafone: 0.26%
    - **SDCCH & RRC Congestion (≤1%)**
      - Airtel: 0.50%
      - BSNL: 0.97%
      - Idea: 0.25%
      - Tata: 1.04%
      - Vodafone: 1.04%
    - **TCH Congestion %**
      - Airtel: 0.00%
      - BSNL: 0.97%
      - Idea: 0.00%
      - Tata: 0.26%
      - Vodafone: 2.67%
    - **RAB Congestion %**
      - Airtel: 0.49%
      - BSNL: 3.14%
      - Idea: 0.26%
      - Tata: 0.52%
      - Vodafone: 0.00%
    - **TCH & RAB Congestion (≤2%)**
      - Airtel: 0.49%
      - BSNL: 4.11%
      - Idea: 0.26%
      - Tata: 0.78%
      - Vodafone: 0.00%

- **2G Network**
  - **Drop Call Rate (%)**
    - Jio: 0.00%
    - Airtel: 0.25%
    - BSNL: 6.89%
    - Idea: 0.51%
    - Tata: 0.80%
    - Vodafone: 1.29%
  - **3G Network**
    - Jio: 0.51%
    - Airtel: 0.99%
    - BSNL: 5.08%
    - Idea: 0.51%
    - Tata: 1.82%
    - Vodafone: 0.77%

- **3G Network**
  - **TCH Congestion %**
    - Airtel: 0.50%
    - BSNL: 2.60%
    - Idea: 0.76%
    - Tata: 0.77%
    - Vodafone: 0.00%

- **Voice Summary**
  - a) All TSPs have met the 2% QoS benchmark of Drop Call Rate (DCR%) except BSNL 2G and BSNL 3G.
  - b) All TSPs have met the 3% benchmark of Call Block Rate (CBR%) except BSNL 2G and BSNL 3G.
# Voice Calls

## Key Observations

### Coverage

**Coverage**

a) Percentage of coverage samples for $2G \geq -85$ dBm.

<table>
<thead>
<tr>
<th>TSPs</th>
<th>2G</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Airtel</td>
</tr>
<tr>
<td>Coverage%</td>
<td>98.10%</td>
</tr>
</tbody>
</table>

b) Percentage of coverage samples for $2G \geq -85$ dBm, $3G \geq -90$ dBm & $LTE \geq -110$ dBm.

<table>
<thead>
<tr>
<th>TSPs</th>
<th>3G</th>
<th>VoLTE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Airtel</td>
<td>BSNL</td>
</tr>
<tr>
<td>Coverage %</td>
<td>99.54%</td>
<td>86.14%</td>
</tr>
</tbody>
</table>

c) Percentage of time spent on $3G$ network:

<table>
<thead>
<tr>
<th>TSPs</th>
<th>3G</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Airtel</td>
</tr>
<tr>
<td>Time Spent on 3G%</td>
<td>84.61%</td>
</tr>
</tbody>
</table>

d) Percentage of RLT spent on $\geq 48$:

<table>
<thead>
<tr>
<th>TSPs</th>
<th>2G</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Airtel</td>
</tr>
<tr>
<td>%RLT $\geq 48$</td>
<td>0.31%</td>
</tr>
</tbody>
</table>
## City Level Summary

### Voice Call

<table>
<thead>
<tr>
<th></th>
<th>Airtel</th>
<th>BSNL</th>
<th>Idea</th>
<th>Tata</th>
<th>Vodafone</th>
<th>Jio</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2G</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Call Attempt</td>
<td>401</td>
<td>399</td>
<td>396</td>
<td>389</td>
<td>406</td>
<td></td>
</tr>
<tr>
<td>Blocked Call Rate (%)</td>
<td>0.00%</td>
<td>3.76%</td>
<td>0.00%</td>
<td>0.26%</td>
<td>0.25%</td>
<td></td>
</tr>
<tr>
<td>CSSR% (Accessibility)</td>
<td>100.00%</td>
<td>96.24%</td>
<td>100.00%</td>
<td>99.74%</td>
<td>99.75%</td>
<td></td>
</tr>
<tr>
<td>Drop Call Rate (%)</td>
<td>0.50%</td>
<td>2.60%</td>
<td>0.76%</td>
<td>0.77%</td>
<td>0.00%</td>
<td></td>
</tr>
<tr>
<td>Mobility HOSR (%)</td>
<td>99.01%</td>
<td>96.17%</td>
<td>98.27%</td>
<td>98.57%</td>
<td>98.18%</td>
<td></td>
</tr>
<tr>
<td>Rx Quality (%)</td>
<td>97.51%</td>
<td>98.44%</td>
<td>97.87%</td>
<td>96.80%</td>
<td>96.45%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Airtel</th>
<th>BSNL</th>
<th>Idea</th>
<th>Tata</th>
<th>Vodafone</th>
<th>Jio</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3G</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Call Attempt</td>
<td>404</td>
<td>413</td>
<td>394</td>
<td>384</td>
<td>392</td>
<td>393</td>
</tr>
<tr>
<td>Blocked Call Rate (%)</td>
<td>0.99%</td>
<td>5.08%</td>
<td>0.51%</td>
<td>1.82%</td>
<td>0.77%</td>
<td>0.51%</td>
</tr>
<tr>
<td>CSSR% (Accessibility)</td>
<td>99.01%</td>
<td>94.92%</td>
<td>99.49%</td>
<td>98.18%</td>
<td>99.23%</td>
<td>99.49%</td>
</tr>
<tr>
<td>Drop Call Rate (%)</td>
<td>0.25%</td>
<td>6.89%</td>
<td>0.51%</td>
<td>0.80%</td>
<td>1.29%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Mobility HOSR (%)</td>
<td>99.89%</td>
<td>98.53%</td>
<td>99.71%</td>
<td>99.87%</td>
<td>99.31%</td>
<td>99.60%</td>
</tr>
<tr>
<td>Rx Quality (%)</td>
<td>95.62%</td>
<td>97.68%</td>
<td>93.56%</td>
<td>94.16%</td>
<td>92.90%</td>
<td>77.21%</td>
</tr>
</tbody>
</table>
RF Coverage relates to the geographical footprint within the system that has sufficient RF signal strength to provide for a call/data session. The Coverage rate of an TSP is calculated on the basis of % of samples in which the Rx level ≥ -85 dBm, RSCP is ≥ -90 dBm & RSRP ≥ -110dBm. The details are as follows.

<table>
<thead>
<tr>
<th>TSP</th>
<th>Coverage Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airtel 2G</td>
<td>98.10%</td>
</tr>
<tr>
<td>BSNL 2G</td>
<td>91.34%</td>
</tr>
<tr>
<td>Idea 2G</td>
<td>95.81%</td>
</tr>
<tr>
<td>Tata 2G</td>
<td>97.71%</td>
</tr>
<tr>
<td>Vodafone 2G</td>
<td>97.87%</td>
</tr>
<tr>
<td>Airtel Dual(2G/3G)</td>
<td>99.54%</td>
</tr>
<tr>
<td>BSNL Dual(2G/3G)</td>
<td>86.14%</td>
</tr>
<tr>
<td>Idea Dual(2G/3G)</td>
<td>94.49%</td>
</tr>
<tr>
<td>Tata Dual(2G/3G)</td>
<td>94.85%</td>
</tr>
<tr>
<td>Vodafone Dual(2G/3G)</td>
<td>80.08%</td>
</tr>
<tr>
<td>Jio VoLTE</td>
<td>98.90%</td>
</tr>
</tbody>
</table>
I. Coverage Details (contd.)

[Map showing coverage details for BSNL 2G and Idea 2G networks, with various RxLev Sub In Service dBm levels indicated.]
1. Coverage Details (contd.)
I. Coverage Details (contd.)
I. Coverage Details (contd.)
II. Quality Details

For measuring voice quality, as per the QoS norms, RxQual <=5 for GSM TSPs, EcNo >= -14 dBm for 3G TSPs, FER <=4% for CDMA TSPs and SINR >0 in case of VoLTE is considered to be good, where as quality beyond this benchmark is considered to be bad. The benchmark should usually be ≥ 95%.

<table>
<thead>
<tr>
<th>TSP</th>
<th>Rx Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airtel 2G</td>
<td>97.51%</td>
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<td>Idea 2G</td>
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</tr>
<tr>
<td>Vodafone Dual(2G/3G)</td>
<td>92.90%</td>
</tr>
<tr>
<td>Jio VolTE</td>
<td>77.21%</td>
</tr>
</tbody>
</table>

![Rx Quality Distribution](image)

- **RxQual >5, EcNo < -14 dBm, FER > 4%, SINR ≤ 0**
- **RxQual ≤5, EcNo ≥ -14 dBm, FER ≤ 4%, SINR > 0**

![Map of Quality Details](image)
II. Quality Details (contd.)

![Map of BSNL 2G network coverage](image1)

- **RxQual Sub**
  - Min,2: 16,187 (88.55%)
  - 2,4: 1568 (8.58%)
  - 4,5: 240 (1.31%)
  - 5,Max: 286 (1.56%)

![Map of Idea 2G network coverage](image2)

- **RxQual Sub**
  - Min,2: 15055 (80.51%)
  - 2,4: 2746 (14.69%)
  - 4,5: 499 (2.67%)
  - 5,Max: 399 (2.13%)
II. Quality Details (contd.)
II. Quality Details (contd.)

**Airtel DUAL (2G/3G)**

- **RxQual Sub**: Min,2 (1984) (68.44%), 2,4 (590) (20.35%), 4,5 (164) (5.66%), 5,Max (161) (5.55%)

- **Agg. Active Ec/Io (dB)**
  - [Min, -14] (751) (-4.19%)
  - [-14, -11] (3785) (21.14%)
  - [-11, -9] (5574) (31.13%)
  - [-9, Max] (7794) (43.53%)

**BSNL DUAL (2G/3G)**

- **RxQual Sub**: Min,2 (6158) (88.6%), 2,4 (618) (3.86%), 4,5 (87) (1.25%), 5,Max (89) (1.28%)

- **Agg. Active Ec/Io (dB)**
  - [Min, -14] (382) (2.86%)
  - [-14, -11] (746) (5.58%)
  - [-11, -9] (1105) (8.27%)
  - [-9, Max] (11134) (83.29%)
II. Quality Details (contd.)

![Map showing network coverage](image1)

**RxQual Sub**
- Min,2: (2622) (80.9%)
- 2,4: (1369) (13.4%)
- 4,5: (285) (2.79%)
- 5,Max: (297) (2.91%)

**Agg. Active Ec/Io (dB)**
- [Min, -14]: (993) (10.69%)
- [-14, -11]: (3348) (33.85%)
- [-11, -9]: (1904) (19.24%)
- [-9, Max]: (3643) (36.62%)

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![Map showing network coverage](image2)

**RxQual Sub**
- Min,2: (2442) (71.57%)
- 2,4: (547) (16.03%)
- 4,5: (115) (3.37%)
- 5,Max: (308) (9.03%)

**Agg. Active Ec/Io (dB)**
- [Min, -14]: (896) (5.21%)
- [-14, -11]: (4098) (23.78%)
- [-11, -9]: (4963) (28.8%)
- [-9, Max]: (7274) (42.21%)
II. Quality Details (contd.)
### Technology Details

<table>
<thead>
<tr>
<th>TSP</th>
<th>% Time on 3G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airtel 3G</td>
<td>84.61%</td>
</tr>
<tr>
<td>BSNL3G</td>
<td>63.57%</td>
</tr>
<tr>
<td>Idea 3G</td>
<td>47.10%</td>
</tr>
<tr>
<td>Tata 3G</td>
<td>81.45%</td>
</tr>
<tr>
<td>Vodafone 3G</td>
<td>57.01%</td>
</tr>
</tbody>
</table>

#### Technology Distribution

![Technology Distribution Chart]

- **% Time on 3G**
- **% Time on 2G**
III. Technology Details (contd.)
II. Quality Details (contd.)

- **System**:  
  - **GSM**: (8030) (18.55%)  
  - **WCDMA**: (35257) (81.45%)

- **System**:  
  - **GSM**: (17106) (42.06%)  
  - **WCDMA**: (22681) (57.31%)