

BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C.



In the Matter of)	
)	
Measurement of Mobile Broadband)	CG Docket No. 09-158,
Network Performance and Coverage)	CC Docket No. 98-170,
)	WC Docket No. 04-36
)	DA 10-988
)	

To: Office of the Secretary

COMMENTS OF THE NIELSEN COMPANY

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Federal Communications Commission
Office of the Secretary

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COMMENTS OF THE NIELSEN COMPANY

The Nielsen Company (“Nielsen”) is a leading global information and measurement company that provides clients with a comprehensive understanding of consumers and consumer behavior. Nielsen delivers critical media and marketing information, analytics and industry expertise about what consumers watch (consumer interaction with television, online and mobile) and what consumers buy on a global and local basis. Nielsen’s information, insights and solutions help its clients maintain and strengthen their market positions and identify opportunities for profitable growth. Nielsen has a presence in approximately 100 countries, including many developing and emerging markets, and holds leading market positions in many of its services and geographies. Based on the strength of the Nielsen brand, its scale and the breadth and depth of its solutions, Nielsen believes that it is the global leader in measuring and analyzing consumer behavior in the segments in which it operates.

The Nielsen Company provides mobile measurement – including information to track operator marketshare, consumer preferences, quality of service, and other data to help wireless operators and device manufacturers develop and market their products and services -- in

more than 60 countries. It is Nielsen's significant experience in measuring wireless broadband performance that forms the basis for the comments that Nielsen respectfully submits in this proceeding.

I. INTRODUCTION & SUMMARY

Nielsen understands, as does the Commission, that it is far more difficult to measure a mobile broadband service than its fixed service counterpart. In a fixed broadband environment, when a communication leaves the provider's network peering point, ultimate data control is lost. However, in a mobile environment, not only does the provider have the same peering point loss(es) of control, but it also experiences a second level of data unpredictability in the last-mile spectrum network.

Nielsen understands, and has been tackling, these issues since 2000 through its leading wireless network performance measurement business unit, Nielsen Telecom. Nielsen Telecom's annual testing program provides an independent view of wireless network performance and coverage across all major voice and data networks in more than 200 unique markets that are home to more than 220 million consumers.

Based on its broad and deep experience with wireless network measurement, Nielsen offers comments to Sections 1, 2, 3, 4 and 6 of the Commission's Public Notice. In its comments, Nielsen explains that, to ensure the greatest possible degree of accuracy, seven statistical metric categories should be collected by any provider measuring wireless broadband performance. Moreover, Nielsen explains why an end-to-end simulated "consumer experience" analysis is most appropriate for this measure; and why, in Nielsen's opinion, its existing, industry-leading consumer experience drive tests, in conjunction with consumer self-testing and

controlled crowdsourcing, would yield the most effective and scientifically-valid broadband performance measurement data. While Nielsen has no opinion on whether this information should be released to consumers, if this information is released, Nielsen is well-positioned to help facilitate public and industry consensus on the most effective way to clearly communicate this information.

II. MEASUREMENT METRICS FOR MOBILE BROADBAND SERVICES (PN § 1)

Before Nielsen describes its own proprietary product lines, it must define generally what, in Nielsen's view, should constitute the proper scope of mobile broadband network performance and coverage measurement.

A. Performance Measurement Indicators For Mobile Broadband Services

The FCC should work with industry to define adequate and realistic end-to-end performance indicators for today's modern packet networks. Those indicators should have a dual-purpose: (1) to provide consumers with an apples-to-apples, simple comparison of quality of service among wireless providers; and (2) to amass sufficient data for wireless providers to have confidence in the results.

Given this dual purpose goal, Nielsen suggests collection of the following measurement metrics: Availability, 1/ Accessibility, 2/ Retainability, 3/ Reliability, 4/

1/ Availability is a general measure of whether a network is up (*i.e.*, does the consumer have any coverage bars and may Ping echo requests be sent to components within the wireless network). This measure is comprised of the following data sets: signal strength, signal quality and available broadband network (*i.e.*, 2G, 2.5G, 3G or 4G).

2/ Accessibility is a measure of whether services may be accessed on a network. A network may be available and broadcasting, but one might not be able to use broadband services on that network.

Performance, 5/ Responsiveness 6/ and Coverage. 7/ Nielsen believes that this much data should be collected and analyzed to determine mobile network performance. On the other hand, there are serious concerns with releasing this data to the public, because it has the potential to cause significant consumer confusion. If the Commission considers any form of consumer release, it will need to do so in a careful manner. As discussed, Nielsen is well-positioned to work with the relevant stakeholders to develop effective and clear consumer disclosures.

B. Network Measurement Components

Mobile broadband measurement requires an end-to-end performance analysis that mimics actual consumer use. Ultimately, the consumer only cares about whether he or she can send and receive data and at what speed. Thus, any proposed broadband measurement process should measure from the consumer device to a third-party site or application on the Internet.

These endpoints are represented by A and B in the simplified diagram below:

3/ Retainability is a measure of wireless call failure classification (*i.e.*, how many drops or call blocks occur on the network during a given period of time).

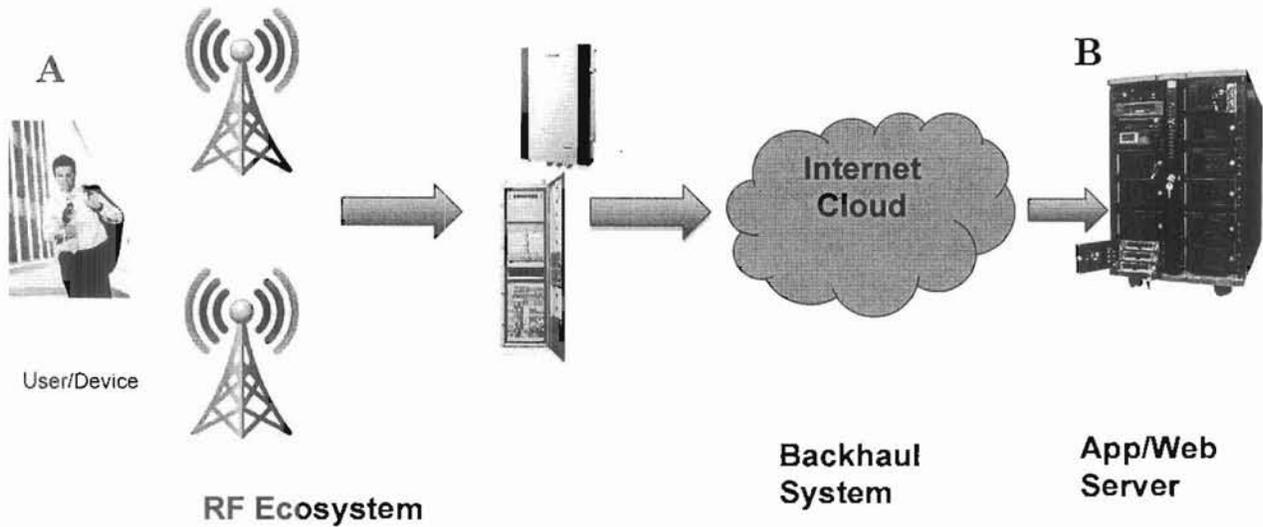
4/ Reliability is a measure of broadband session and task success. For example, one may be able to use broadband services, but reliability measures whether a consumer can successfully complete a broadband session or browsing task. This metric also assists with determining the percentage of time that an operator hits its specific broadband speed threshold.

5/ Performance is a measure of broadband speed and error rates, taking into account consumer mobility. This measure is comprised of the following metrics: network speed, user-perceived speed, packet error-rate, performance impact due to mobility, performance impact due to coverage, and performance impact due to signal quality.

6/ Responsiveness measures general network and session task delay. This measure is comprised of the following metrics: ping round trip time, task latencies (time to first byte), user-perceived download or upload time, and data session setup time.

7/ Coverage plots the geographic zones where a given wireless carrier will have both network availability and broadband accessibility.

Figure 1 – the “Consumer Experience” Measurement End-Points



However, Nielsen understands that modern networks are never as simple as the above diagram. For one mobile broadband packet to reach its ultimate destination application or web server, that packet must often transit several proprietary networks. Any proposed broadband measurement tool must both measure the communications end points and retain sufficient data to assist fixed broadband providers and mobile carriers in discerning where latency and packet errors occur in a given communication pathway. The seven detailed measurement indicators proposed by Nielsen, *supra*, serve this dual purpose.

C. Mobile vs. Fixed Broadband Measurement

Mobile broadband environments have some of the same basic problems with regard to broadband quality and service measurement as their fixed counterparts, including with respect to geographic scope and granularity, network segmentation and the impact of the applications layer on network speed. But, when attempting to measure wireless speeds, these

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problems are multiplied ten-fold due to the difficulties presented by mobility and spectrum environmental factors.

Wireless mobility adds tremendous challenges to any attempt at measurement. As consumers move around in a given market, they are: (1) varying their distance from the applicable wireless tower and (2) connecting to other wireless communications towers as they reach other mobile zones of coverage (a.k.a., wireless handoffs). Each of these variables plays an important role in broadband performance.

As to the first variable, when a mobile customer moves, his or her handset device gets closer to, or farther from, a given mobile communications tower. Network load, traffic and service all depend on one's distance from a tower. Generally, as a consumer (and his device) moves closer to a communication tower, signal strength improves, causing most network performance indicators also to improve. On the flip side, as consumers (and their devices) move away from a given communications tower, signal strength degrades (along with most network performance indicators).

Regarding the second variable, each time a consumer connects to a new communications tower (wireless hand-off), the broadband transmission path may significantly change. A new tower connection may result: (1) in connection to a new wireless carrier (varying network capacity); (2) in different geographic coverage; and (3) in a new back-end connection route to the fixed broadband infrastructure. Thus, frequent tower exchanges, especially in dense spectral areas, keep network performance in a constant state of flux.

Even if a consumer remains completely stationary for the entire duration of his or her broadband usage, wireless technologies present yet another challenge, as compared to their wireline counterparts, when it comes to measuring performance: transmission over open

spectrum. Fixed broadband communications, for the most part, are transmitted inside shielded environments or use light-based technologies that protect communications transmissions from outside forces. The last mile of mobile broadband systems, however, occurs over open spectrum, and a number of uncontrollable outside variables impact network performance. Those variables include: topography; plant foliage, rain and humidity; and for transmission indoors, the thickness of, and material used in, walls.

Thus, the processes for, and standards used in, the measurement of mobile broadband services must be different than those for fixed broadband connections. Wireless broadband measurement metrics that fail to take mobility and spectral environmental factors into account could present a highly distorted view of the mobile communications marketplace. Nielsen's "Consumer Experience" measurement metrics discussed *infra*. compensate for many of these mobility and environmentally-related challenges to derive industry-leading wireless network performance data. Ultimately, the most important goals in measuring and reporting network performance are consistency, repeatability and accuracy.

III. NIELSEN'S "CONSUMER EXPERIENCE" DATA GATHERING METHODS (PN § 2)

Nielsen's "Consumer Experience" program measures coverage and performance of the available wireless broadband networks in a controlled environment. Nielsen's current program tests all widely available mobile data standards – 2G, 2.5G, 3G, 3.5G and 4G – ensuring a like-for-like comparison of performance, while simulating actual consumer usage.

A. Nielsen's Methods for Measuring Broadband Performance

Nielsen has the most respected wireless benchmarking program on the market today. To conduct its network performance tests, Nielsen's team of experienced broadband

measurement professionals will drive through more than 200 markets and will travel over 800,000 miles in 2010.

1. How Nielsen Conducts its Simulated “Consumer Experience” Drive Tests

Nielsen’s professionals use a fleet of vans equipped with wireless communications network assessment devices. These testing vans employ a combination of engineering-level test equipment, coupled with consumer devices (handsets and data cards), to simulate the wireless consumer experience.

Before each test session, Nielsen professionals geographically plot a testing route through major thoroughfares and population centers in a given market. When testing is underway on the drive, Nielsen’s engineers systematically conduct multiple applications test processes (e.g., messaging, web browsing, voice calls) using different commercial-grade diagnostic wireless devices. Nielsen’s engineering-level test equipment is specifically-equipped to test simultaneously the network performance of all wireless carriers, on all available carrier network segments, in a given area.

During this drive test, Nielsen measures the end-to-end data customer experience in a true mobile environment and collects all measurement metrics listed in Section II.A. The data from these metrics enable Nielsen to answer crucial questions, such as: (1) what the geographic scope of the wireless networks in a given market is; (2) whether a wireless network is up and available in a particular area; (3) whether consumers can connect to the given network or networks; (4) whether consumers can finish their application tasks on a network; and (5) how fast a consumer may connect to the network and finish the intended task.

From time-to-time during their drive tests, Nielsen’s engineers encounter unusually slow networks or degradations in performance. If this occurs, Nielsen’s established

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methodology provides for the collection of further network data to facilitate carrier investigation after the applicable metrics are published. In such cases, Nielsen's engineers will collect technology-specific, key network performance indicators for in-depth engineering analysis. ^{8/} Carriers are free to challenge Nielsen's data and corrections are issued if sound engineering evidence is provided that contradicts Nielsen's findings. Or, carriers may use Nielsen's data to identify and address network problem areas so as to optimize their networks as they see fit.

The frequency with which Nielsen tests in a given market depends on what costs that market will bear. For each market, Nielsen attempts to capture one measurement with foliage and one measurement without foliage during the applicable year. Generally, best performing carriers tend to remain the same, unless a major network upgrade occurs. Nielsen also annually evaluates (and, if appropriate, updates) its methodology in order to account for the constant technological and market shifts in the fast-moving wireless industry.

2. Nielsen's "Consumer Experience" Drive Test Limitations

Although Nielsen is the industry-leading wireless network performance measurement company, no one is perfect in this space. Nielsen's drive test measures network reliability within given parameters with a high degree of accuracy, but Nielsen's drive test methodology: (1) does not measure the differences in all retail devices and (2) only measures at the street level and does not measure indoors. Even though Nielsen's current methodology has these limitations, Nielsen strongly believes that its test approach is the most accurate and consistent means of measuring wireless broadband network availability and performance in the market today. Moreover, the ability of carriers to raise measurement concerns with Nielsen after

^{8/} See Confidential Nielsen Key Performance Measurement Description for Abnormal Testing Results (attached hereto as Appendix A), **APPENDIX REDACTED**.

the metrics are published ensures that Nielsen maintains the highest level of methodological validity.

B. Nielsen's Historical Wireless Broadband Data

Nielsen has an archived database of syndicated research on measuring the performance of wireless networks, which includes over five years of wireless network performance data from previous drive tests. Indeed, Nielsen has the most comprehensive, geographically diverse and statistically valid historical data of any wireless measurement company.

IV. CONTROLLED CROWDSOURCING (PN § 3)

In addition to Nielsen's robust drive test approach, Nielsen is developing "on device" mobile tools that measure network performance and could enable consumers to conduct self (or Nielsen) initiated performance testing. "On Device" solutions hold tremendous promise and Nielsen is presently working through some of the key challenges associated with the approach, including a methodology to "crowdsource," or invite the public to participate in, periodic broadband test measurements to be used in conjunction with the "on device" software. While "crowdsourcing" and "open innovation" may be the methodologies du jour, Nielsen, as a company, has been soliciting, and incorporating, public participation in its measurement techniques for decades. As explained more fully below, Nielsen will soon use its existing sampling know-how to provide a crowdsourcing metric that will be able to yield more statistically valid and repeatable data than those technologies presently on the market today.

A. Current Crowdsourcing Testing Tools

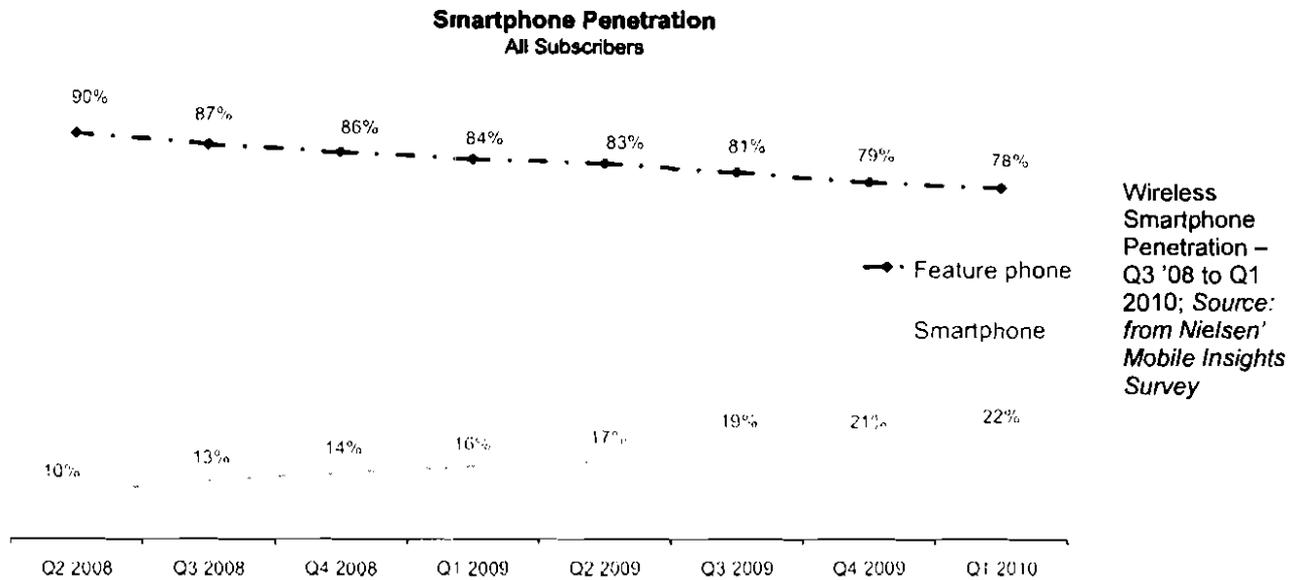
There are already a wide variety of on-device broadband and mobile broadband testing tools on the market. Existing applications that enable users to self-report problems,

applications like the FCC's broadband speed tests that allow independent, user-initiated broadband tests, and tools that silently monitor and report performance – all provide avenues for consumer-based measurement and hold considerable promise. But, taken together, these tools are not yet at a level where they are capable of providing consistent and repeatable data. The current tools on the market: (1) exhibit a smartphone bias; (2) lack uniform measurement across wireless devices and operating systems; and (3) fail to isolate and monitor mobile movement.

1. Smartphone Bias

Present mobile broadband tools are widely available for smartphones. While smartphones represent a growing segment of the industry, they are still only a discrete subset of the mobile broadband market. As of the first quarter of 2010, smartphones only represented approximately 22% of the total market for mobile broadband use, as depicted in Figure 2 below. This means that the existing measurement tools are missing the lion's share of mobile browsing activities on regular telephones or using wireless broadband cards.

Figure 2 – Smartphone Penetration



For example, Internet browsing on a traditional “clam shell” or “candy bar”-style feature phone uses a simplified browsing environment via the Wireless Application Protocol (“WAP”). WAP-based Internet browsing via feature phones typically displays text and the occasional low-resolution picture; there is no expectation that WAP-based Internet browsing will display the full functionality of a website. By contrast, the HTC Droid, the iPhone and other smartphones, use more-robust protocols and frequently display high-resolution pictures, video streams and streaming audio. The Internet browsing expectation with smart phones is that it will be more comparable to a broadband connection, which requires far more network bandwidth and device capabilities. Even the carriers separate the feature vs. smartphone Internet browsing activities into separate business lines – typically, feature phones will access the Internet based on a rate per kilobyte transferred and smartphones will have nationwide tiered broadband data plans.

The use differences between smart and feature phones do not lend themselves to an apples-to-apples comparison of the consumer experience, even if the devices are connecting

to the exact same carrier and carrier network variation. A consumer's experience may be richer on a smartphone, but her perception of performance may be worse, not due to any system delays, but rather, due to the amount of information being rendered by the device. By contrast, a traditional feature phone may be perceived as faster because the customer is accessing text and not high resolution graphics, streaming video and audio. In reality, the network, itself, is serving at the same rate, the variables happen to be the device, the Internet protocols and the type of content downloaded.

2. Varying Performance Metrics Among Devices and Operating Systems

Access to metrics, such as signal strength, application success rate and speed, are limited by the architecture established by a particular operating system platform and/or a particular device model. In several instances, operating system vendors have provided developers with the opportunity to create applications that pull varying metrics used by a phone to manage a wireless transaction. For example, some device and operating system combinations may offer developers the ability to measure some, all or none of the seven key metrics listed in Section II.A of these Comments. Nielsen would like to work with device manufacturers and operating system developers to facilitate consistent access to an appropriate level of network performance metrics.

3. Wireless Mobility Tracking

Current on-device measurement methodologies do not provide consistent tracking of location and movement. Many measurement platforms may be able to provide a GPS latitude and longitude position or a triangulated coordinate based on a consumer's position relative to surrounding wireless towers, but the existing services are not likely to be able to plot these

values in motion with the same degree of accuracy. Further, these tests do not examine whether there is difficult terrain in a given area, adverse weather patterns, or in-building operations that could account for network performance degradation.

B. Nielsen's Controlled Crowdsourcing Measurement Tool

Because of the deficiencies with existing on-device measurement software, this software alone cannot replace traditional methods of wireless broadband measurement, such as the Nielsen drive tests. But, Nielsen believes that a well-designed on-device software package, *used in conjunction with sound sampling methodology*, could yield promising results. Nielsen has been working on development of on-device measurement software and methodologies for more than three years and is excited about the possibilities they offer. Nielsen is currently evaluating its methodology and considering:

- how to interpret the data accurately (*i.e.*, whether the data could be validated);
- what permutations exist among network, device hardware, and device software,^{9/} and
- how representative the crowdsourcing population is of the general user population in terms of devices on the network, applications used and geographic dispersion..

1. Nielsen's Technical & Statistical Sampling Corrections

Implementing a crowdsourcing model with no controls for data validation, real-world device permutations and representativeness would negatively skew the results of the

^{9/} For example, there are several permutations of device hardware, device software and the applicable networks just for one model of a smart phone with the latest operating system and the many networks of its carrier (2G, 3G, 3.5G and 4G). It is readily apparent that many, many more permutations could be imagined if all national and regional wireless network generations and all models of smartphones (*i.e.*, Android, PalmPre, Blackberry, iPhone) were considered.

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model and the ability of consumers to interpret the resulting information. For Nielsen's crowdsourcing methodology, it is working to incorporate the following controls and ensure data consistency:

Data Validation: Nielsen favors established technical controls and quality assurance procedures for the crowdsourcing data. For example, the current on-device test platforms lack the capability to determine the cause of any abnormal network performance, and thus would provide little data to an investigating carrier. Most on-device metering technologies today are really applications developed as software sitting on top of operating systems; they lack the capability to perform anything but very high-level diagnostics on wireless networks. The methodology that Nielsen is currently developing has the capability to access packet routing information and trace network nodes in order to accurately determine the cause of many service problems.

“Real World” Permutations: Nielsen's crowdsourcing software will record, and its testing panel will take into account, the varying carrier network segments, devices and operating systems. By recording this data and considering it in the crowdsourcing design, it becomes far more likely that the data will produce like-for-like results across platforms and network technologies; at a minimum, platform and / or device bias can be accounted for when reporting the results as a representative panel of wireless users. Simple crowdsourcing cannot account for these factors without third party management of a dedicated, focused panel within the crowd.

Representativeness: Nielsen plans to use a controlled statistically valid volunteer consumer panel that is representative of the relevant market and accounts, at the very least, for smartphone market segmentation and penetration percentages. A true crowdsourc

collection model, without statistical sampling, lacks the rigor accurately to represent wireless broadband performance and coverage across large geographic areas with confidence. Nielsen believes that it can design a methodology that includes a managed representative testing panel adequate to ensure that the reported data is reflective of the wireless subscriber base within a given geographic area.

2. Nielsen's On-Device Measurements & Effect on Carrier Networks

Once available, Nielsen's on-device measurement tool will be deployed in select panels established by Nielsen and the on-device broadband tests will be scheduled by Nielsen only minimally to impact carrier networks (while maintaining statistical validity). Nielsen's software will be capable of testing consumer phones so long as the phone has battery power. Nielsen's test schedule will not be impacted by the fact that a given phone is turned off.

V. BENEFITS & COSTS OF MEASUREMENT (PN § 4)

A. Benefits of Nielsen's "Consumer Experience" Measurements

Nielsen already provides its clients with leading insight into wireless network performance. Nielsen has experience managing and delivering these measurement programs in multiple countries around the world, including in Canada, Brazil and India. In all countries, the primary objective in measuring performance is to improve network quality and the accuracy of consumer promotional information.

Nielsen's data is currently used in varying ways and to varying degrees by its clients. Primarily, carriers use this data to identify performance gaps within their entire network and take actions to correct these challenges. Corrections could include actions such as, prioritization of general maintenance, specific network node or tower fixes, or an evaluation of whether coverage expansion and build out is necessary. As network performance drives most

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subscriber churn in the industry, the benefits of continually knowing with precision about any network deficiencies and taking actions to improve performance can help carriers reduce churn and help improve subscriber satisfaction.

Carriers also currently use this information to support product marketing and advertising. Carriers often publicly communicate performance data regarding network reliability, coverage and speed to highlight the investments they have made in their service offering. Nielsen's wireless performance data offers an independent metric to validate the accuracy of consumer advertising.

B. Privacy: Consumer-Conducted Measurements Would be Expressly Opt-In

With regard to the majority of Nielsen testing, privacy is not a concern. Nielsen's drive testing is conducted by Nielsen on its own wireless accounts, using its own devices and no consumer personally identifiable data is collected. But, for any anticipated crowdsourcing on-device measurement, privacy issues must be considered. Consumer data are The Nielsen Company's currency. Nielsen's privacy practices have been developed knowing how critical it is to maintain the trust of its consumer panelists. Nielsen intends to apply this same level of care and concern for privacy matters for which it is known to its mobile broadband measurement panel. For each mobile panel, as it does with all of its other consumer panels company-wide, Nielsen takes the following privacy disclosure steps and would recommend that the Commission require any third-party considered for its mobile broadband measurement services to do the same:

- All panels are queried on a strict opt-in basis after having been provided meaningful notice and choice;
- Nielsen provides a clear Privacy Policy and Panel Membership Agreement before any data are collected;

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- Nielsen keeps its Privacy Policy in a clear conspicuous position on its website, and, depending on the type of measurement channel, accessible from the relevant device, to remind panelists, on a continuous basis, of their data privacy rights;
- Nielsen never uses panel participant information to advertise, promote or market third party goods to panel members;
- Nielsen always aggregates or de-identifies panelist data when they are reported to third parties. Nielsen never provides panelists' personally identifiable information ("PII") to third parties (other than in certain customary exceptions, such as vendors performing services on Nielsen's behalf);
- Nielsen has security measures in place (including encryption methods and access protocols) to help protect the security and confidentiality of stored PII at Nielsen;
- Nielsen permits panelists to correct their PII data at any time; and
- Nielsen permits panelists to resign from panels at any time and remove their PII from its databases.

Nielsen also works with public interest organizations to continually reassess its company-wide privacy compliance. Presently, Nielsen is working with the following privacy organizations: the Center for Democracy and Technology, the Future of Privacy Forum, the RIM (Responsible Information Management) Council, the Digital Policy Forum and the International Association of Privacy Professionals.

VI. CURRENT MOBILE BROADBAND NETWORK DISCLOSURES (PN § 5)

There are currently very few options when it comes to publicly available mobile coverage and performance information. The primary sources of such information are the coverage maps provided by carriers. Coverage maps are typically available to the consumer in two forms – static maps made available by carriers at retail outlets and online sites and dynamic maps made available via carrier websites. Static maps are typically one-dimensional and provide consumers a rudimentary ON/OFF view into coverage and service availability metrics with little to no window into network performance. The dynamic maps that carriers have begun to offer

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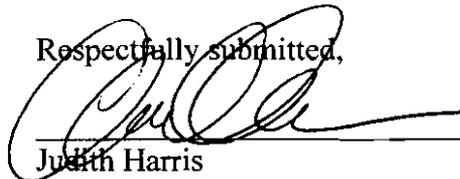
online are starting to add additional granularity via additional gradations/tiers, and Nielsen would like to work with the industry to further improve upon these disclosures.

Additionally, third party sources also provide coverage maps that are premised on carrier data. The third party sources do not usually perform any consumer experience measurements and most certainly not with the level of granularity that Nielsen's independent measurements can provide. Further, some third party sources may claim to have independent, complete and statistically valid data, but many of these sources use "crowdsource" methodologies that, as we have discussed, lack the statistical rigor to be stand-alone metrics.

VII. CONCLUSION

For the foregoing reasons, The Nielsen Company respectfully requests that the Commission consider the measurement of mobile consumer-experienced network quality via an independent third party in the manner outlined above.

Respectfully submitted,



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APPENDIX A

Nielsen Key Performance Measurement Description for Abnormal Testing Results

CONFIDENTIAL EXHIBIT REDACTED