

# Technical Comments Cell Phone Reception Quality in the USVI

Gregory Guannel, Ph.D., UVI CGTC

Good morning Senator Blyden, members of the Committee, and those in attendance.

My name is Greg Guannel, and I'm the Director of the Caribbean Green Technology Center at the University of the Virgin Islands. We develop and share knowledge on how infrastructure, ecosystems, and institutions interact in the U.S. Virgin Islands, with the goal of supporting more resilient and sustainable development of the islands.

Thank you for the opportunity to provide an update on the cell phone reception quality work that we have been working on over the past few years.

How do cell phones work? Very simply, your phone connects to the nearest cell tower. That tower connects your call or data to the network, which then routes it to another tower near the person you're trying to reach.

To determine whether a call is good or bad, we need to look at two things. First, signal strength, or how strong the connection is. This depends on distance to towers and obstacles like buildings or hills. Second, there is interference, or how noisy the signal is. This happens when too many users share the network, when towers overlap, or when signals bounce off terrain like water and hills.

To quantify the quality of cell reception, we collected data in Fall 2023 and throughout 2024 using a mobile app as part of the SpectrumX research program. This is program led by the University of Notre Dame, in collaboration with other universities, including UVI. We measure two key indicators:

- RSRP: signal strength: 'Do I hear the tower?'
- RSRQ: signal quality: 'Is the signal clear, or is there interference?'

In this study, we focus on RSRQ, because it reflects what people actually experience, that is dropped calls, slow speeds, and instability. Good service requires both a strong signal and a clean signal.

Looking across the islands, we see that performance varies significantly by carrier.

- 30 • Viya generally performs best, though there are weaker areas, particularly in parts of  
31 St. Croix.
- 32 • T-Mobile tends to be in the middle, with generally fair to good quality.
- 33 • AT&T/Liberty performs the worst overall, with more areas of poor quality.

34 We also see that signal quality varies across time and across space. Some areas are  
35 consistently good, while others experience larger variation. Some areas, including parts of  
36 St. Thomas and St. John, show significant variation. That means users may experience  
37 good service in one location and poor service just a short distance away. This suggests that  
38 the issue is not just coverage, but how the network is configured and how signals interact  
39 with the environment. In some areas, the signal quality remains relatively stable. But in  
40 others, it fluctuates more significantly. That variability is important because even if the  
41 average signal looks acceptable, inconsistent performance leads to poor user experience.

42 The box plot summarizes the data collected over many months. Each box represents the  
43 typical range of signal quality, and the lines show the extremes. What we see is that all  
44 networks show variability, but some networks, particularly Viya, have consistently better  
45 quality than others. This confirms the spatial patterns we saw earlier.

46 We also looked at the quality of the signal at one fixed location. We see that even without  
47 moving, the signal fluctuates. These oscillations are caused by interference and changing  
48 network conditions, such as users joining and leaving the network or signals interacting  
49 with the environment. This is why calls may drop or quality may degrade even when you're  
50 standing still.

51 So overall, what we find is that Viya performs best, T-Mobile is intermediate, and  
52 AT&T/Liberty performs worst. This suggests that improving service in the Virgin Islands is  
53 not just a matter of adding more towers. It also requires better network coordination,  
54 managing interference, and understanding how terrain and demand affect performance. I  
55 would like to remind you though that these data were taken more than 1 year and a half  
56 ago.

57 We are currently doing another campaign, and we expect to have results to present next  
58 Spring. Specifically, we are collecting more repeated measurements across locations;  
59 analyzing temporal patterns in more detail; and examining the impact of weather and  
60 environment. We are also investigating why calls placed on St. Thomas, especially 911, get  
61 routed to Puerto-Rico. To do this we are looking at which antennas get pinged when calls are  
62 placed at different location on the Northside and in Bordeaux.

63 Thank you for inviting me to present this information. We are happy to come again and give  
64 an update in a year or so.