UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

UNITED STATES OF AMERICA **Plaintiff,** **v.** **CHARLES MORGAN** **Defendant.**	**Crim. No. 16-0196 (ESH)**

MEMORANDUM OPINION

Before the Court is defendant's motion in limine to exclude the government's proposed cellular analysis testimony.[1] For the reasons explained below, the Court denies defendants' motion with the qualification that Special Agent Kevin Horan may not testify or imply that he can pinpoint a person's exact location using drive testing.

BACKGROUND

On March 23, 2017, the government filed an expert disclosure letter indicating that it intended to call FBI Special Agent Kevin Horan as an expert in the analysis of cellular telephone records. (ECF No. 39.) The type of cellphone-data analysis used in this case involves a method called drive testing. The government seeks to admit the expert testimony of Special Agent Kevin Horan of the FBI's Cellular Analysis Survey Team ("CAST") concerning (1) counts dealing with

[1] Two prior opinions of this Court describe the background and procedural history of this case in detail. *United States v. Morgan*, 255 F. Supp. 3d 221 (D.D.C. 2017); *United States v. Morgan*, 248 F. Supp. 3d 208 (D.D.C. 2017).

defendant's alleged kidnapping, transportation of a minor with intent to engage in criminal sexual activity, and attempted production of child pornography and (2) counts dealing with defendant's failure to register as a sex offender. (Government's Opp. to Def.'s Mot. in Limine, ECF No. 48, ("Gov. Opp.") at 1–2.) As to the substantive counts, Agent Horan's testimony will analyze the cell-site information and data obtained from defendant's cellphone and the alleged victim's cellphone as it relates to the time frame of the offenses alleged to have occurred on May 22–23, 2016. (*Id.* at 2.) As to the registration counts, Agent Horan's testimony will analyze the cell-site information and data obtained from defendant's cellphone records during a time period between 2015 and 2016. (*Id.*)

On April 3, 2017, defendant moved to exclude the government's proposed cellular analysis testimony on the grounds that Agent Horan's opinions (1) depend on unreliable methodologies, Fed. R. Evid. 702, and (2) otherwise pose a danger of unfair prejudice that substantially outweighs the proposed testimony's probative value, Fed. R. Evid. 403. (Def.'s Mot. in Limine, ECF No.44, ("Def.'s Mot.") at 1.) After initial briefing and a *Daubert* hearing that took place over three days, the Court allowed the parties to submit post-hearing briefing. Defendant filed his post-hearing brief on January 13, 2018, and the government filed their response on February 26, 2018. The Court is now in a position to rule on defendant's motion in limine.

ANALYSIS

I. LEGAL STANDARD

Federal Rule of Evidence 702 governs the admissibility of expert testimony in federal courts and provides that a witness may offer expert opinion testimony if:

> (a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue; (b) the testimony is based upon sufficient facts or data; (c) the testimony is the product of reliable principles and methods; and (d) the expert has reliably applied the principles and methods to the facts of the case.

Fed. R. Evid. 702. The Supreme Court has explained that trial judges must "ensure that any and all scientific testimony or evidence admitted is not only relevant, but reliable." *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 589 (1993); *see also Kumho Tire Co. v. Carmichael*, 526 U.S. 137, 147, 150 (1999).

An opinion exhibits *reliability* if the expert is qualified to offer the opinion and the opinion has an acceptable basis in the knowledge and experience of the expert's discipline. *See Daubert*, 509 U.S. at 592–93, 597; *United States v. Williams*, 827 F.3d 1134, 1156 (D.C. Cir. 2016), *cert. denied sub nom. Edwards v. United States*, 137 S. Ct. 706 (2017). The Supreme Court has detailed several non-exhaustive factors to assess a theory or technique's reliability—(1) whether the theory or technique at issue can be tested or has been tested, (2) whether the theory or technique has been subject to peer review and publication, (3) whether the theory or technique has a known or potential error rate, and (4) whether the relevant expert community generally accepts the theory or technique. *See Daubert*, 509 U.S. at 594; *Kumho Tire Co.*, 526 U.S. at 150. Still, the Rule 702 inquiry is a "flexible one," and this list is not exhaustive or determinative. *See Daubert*, 509 U.S. at 594; *see also Kumho Tire Co.*, 526 U.S. at 150.

A *relevant* opinion will help the trier of fact understand evidence or determine disputed facts. *See Daubert*, 509 U.S. at 592–93, 597; *Williams*, 827 F.3d at 1156. "If a court determines that expert testimony might be helpful to the jury, it should allow the testimony unless it finds that under Rule 403 the unfair prejudice caused by the testimony outweighs its probative value."

United States v. Gatling, 96 F.3d 1511, 1523 (D.C. Cir. 1996); *see also Daubert*, 509 U.S. at 595.

II. AGENT HORAN'S QUALIFICATIONS

At the first day of the *Daubert* hearing, the Court qualified Agent Horan as an expert in historical cell-site analysis and drive test analysis without objection from defendant. (Tr. of *Daubert* Hr'g (Day 1), Aug. 22, 2017, ECF No. 74 ("8/22/2017 Tr.") at 10–11.) However, it is necessary to briefly review Agent Horan's qualifications given the lack of independent scientific analysis on the use of cell-site data for law enforcement purposes.

Kevin Horan is a FBI special agent who has been a member of the FBI's CAST unit since its inception in 2007. (*Id.* at 4.) Agent Horan was using cellphone records in criminal investigations prior to joining CAST, but when CAST was formed in 2007, there were few, if any, subject matter experts in the field of cellular analysis for criminal investigations. (*See id.* at 4.)

Agent Horan underwent specialized training upon joining CAST, which includes: (1) education on radiofrequency theory and analysis; (2) instruction from major cell service providers and their radiofrequency engineers on network maintenance and operation; (3) education and applied training on the use of drive test gear and scanning gear; and (4) a concluding series of practical exercises on use of historical cell records. (*Id.* at 5–7.) Initial CAST training ends with a drive test evaluation, moot court session, and final exam. (*Id.* at 7.) In addition, CAST members have a yearly retraining course that includes instruction on any relevant updates and a recertification in an agent's current drive test equipment or a certification in new drive test equipment. (*Id.*; Tr. of *Daubert* Hr'g (Day 2), August 29, 2017, ECF No. 73 ("8/29/2017 Tr.") at 34–35.)

Agent Horan performs between 20–30 drive tests a year, and also teaches classes on drive testing and historical cell records analysis. (8/22/2017 Tr. at 9.) He has a valid certification to use his current drive test equipment. (*Id.* at 22.) Agent Horan has been certified as an expert in court on cellphone analysis at least 76 times, and "in the last several years, almost every one of [his] cases involved [a] drive test." (*Id.* at 10.)

III. RELIABILITY

At issue here is the reliability of drive testing, which "is a method used by wireless telephone companies and radio frequency engineers to determine the coverage range of a cell tower for the purpose of determining the health of the telephone company's wireless network." Larry Daniel, *Cell Phone Location Evidence for Legal Professionals: Understanding Cell Phone Location Evidence from the Warrant to the Courtroom* 69 (2017). Providers did not design drive testing methods for establishing a permanent footprint of a tower's coverage area, nor did they design drive testing to establish a cellphone's exact location when it communicates with a tower. *Id.* In its current form, drive testing cannot determine the exact "location of a cell phone or set[] exact boundaries for where a cell phone must be to connect to a particular cell tower." *Id.* at 70. As with all tests involving human inputs, "drive testing results can be skewed by the method used by the person doing the testing. It can also be skewed by whether or not the person doing the testing has the drive testing equipment calibrated by a qualified calibration engineer. Generally, calibration happens once a year." *Id.*

Drive testing cannot perfectly replicate how a cellphone would interact with a network on a past date. *See id.* at 77. Drive testing "is a test to determine if at the time of the drive test and in the location of the drive testing equipment, a phone can make an outgoing call and the phone can 'hear' a signal from a cell tower." *Id.* at 71. As evidence, results from a drive test can show

> that a cell phone could be at a particular place and would prefer the cell site and sector that was recorded in the historical call detail records. Or the drive test results are used to create a map showing the limits of where a cell phone could be and connect to a cell tower or sector.

Id. at 76; (*see also* 8/22/2017 Tr. at 11–12 (describing how cellphones communicate with towers).) In other words, drive test results cannot "provide an exact location." (8/22/2017 Tr. at 14; *see also id.* at 61–62.)

As a point of comparison, generating data from drive testing operates on many of the same principles as historical cell-site analysis. *Compare* Daniel, *supra*, at 29–40, 49–68, *with id.* at 69–78. "Historical cell-site analysis can show with sufficient reliability that a phone was in a general area, especially in a well-populated one. It shows the cell sites with which the person's cell phone connected, and the science is well understood." *United States v. Hill*, 818 F.3d 289, 298 (7th Cir. 2016); *United States v. Jones*, 918 F. Supp. 2d 1, 5 (D.D.C. 2013).

However, this Court does not accept drive testing as reliable simply because of its similarities to historical cell-site analysis. To analyze drive testing's reliability, the Court must examine whether the government has adequately addressed potential sources of error in drive testing methodology generally, and any sources of error in the application of the drive test to the data analyzed in this case. *See, e.g.*, *United States v. Cervantes*, No. 12-cr-00792, 2015 WL 5569276, at *4 (N.D. Cal. Sept. 22, 2015) ("Preliminarily, the Court finds that the delay between the time of the events in question and the field experiments conducted by the FBI CAST agents is significant, and the government has not explained adequately whether there were any differences in . . . its field test conditions as compared to those relevant to the facts here."); *United States v. Cervantes*, No. 12-cr-792, 2015 WL 7734281, at *11 (N.D. Cal. Dec. 1, 2015) ("After considering Special Agent Nguyen's supplemental declaration . . . the Court finds sufficient foundation for the government to use the results of its December 2012 'field

experiment.'"). After examining the methodology of drive testing generally, and as applied in this case, the Court finds that Agent Horan's testimony exhibits sufficient reliability.

A. Drive Testing Methodology

1. Cell Site Locations

Before conducting a drive test, an agent must know the cell-site locations he is targeting. CAST inputs cell sites in existence during the time an analyzed incident occurred into mapping software using latitudinal and longitudinal coordinates of cell sites provided by service providers, also known as the provider's tower lists. (Gov. Hr'g Ex. 4 at 2; 8/22/2017 Tr. at 24.) Before performing a drive test, an agent will cross-check a provider's tower list closest to the time the incident occurred with the provider's most current tower list at the time of the drive test to see if any changes have occurred to the tower or the cellular network. (8/22/2017 Tr. at 24.)

Agent Horan testified that he contacted the providers themselves to ask if any significant changes had occurred to the network. (*Id.* at 26, 36; *see also id.* at 24–25 (explaining factors that affect a tower's cellular footprint).) Agent Horan found that there were no changes to the towers that would have affected the drive test data's comparative value. (*Id.* at 36–37, 70–71; 8/29/2017 Tr. at 54–57, 60, 63.)

2. Call Detail Records

Prior to drive testing a CAST agent also performs an analysis on the target cellphones' call detail records ("CDRs"). (Gov. Hr'g Ex. 4 at 2.) CDRs document a cellphone's interaction with the cell provider's network. (*Id.*; *see also* 8/22/2017 Tr. at 11–12 (describing how cellphones communicate with towers).) CDRs "record basically everything that occurs on the phone over a period of time. So that is all the voice call activity, the text messages, as well as the . . . data sessions." (8/22/2017 Tr. at 13.) CDRs also document a cellphone's interaction with a

cell tower and its corresponding cell site, also known as a cell sector, which provides evidence on what cell sites could have serviced a cellphone at a particular time. (Gov. Hr'g Ex. 4 at 2; 8/22/2017 Tr. at 13; *see also* 8/29/2017 Tr. at 23–26 (explaining CDRS in this case); 8/22/2017 Tr. at 34–35, 58 (explaining differences between T-Mobile's and Sprint's CDRs).) CAST analyzes CDRs in conjunction with a list of cell-site locations to generate an estimated location of a cellphone when it initiated contact with a cellular network. (Gov. Hr'g Ex. 4 at 2.) When a CAST agent performs a drive test, he will put the CDRs into the software used for drive testing so as to better locate the area where he should perform the drive test. (8/22/2017 Tr. at 23.)

CAST analyzed records for the alleged victim's T-Mobile cellphone and the defendant's Sprint cellphone, (collectively "target cellphones"). (Gov. Hr'g Ex. 4 at 2.) During the alleged incident, calls incoming and outgoing to the target cellphones had durations ranging from one to 97 seconds. (8/29/2017 Tr. at 26.)

3. The Drive Test

The CAST team employs a piece of survey equipment known as a Gladiator Autonomous Receiver ("GAR") to survey networks in investigated areas. (Gov. Hr'g Ex. 4 at 2; 8/22/2017 Tr. at 18.) The GAR is a mobile computing system that scans the area driven by an agent, collecting the possible coverage area of towers that an agent specifically noted in the system beforehand as well as surrounding towers' coverage areas. (Gov. Hr'g Ex. 4 at 2; 8/22/2017 Tr. at 18, 21–22.) The GAR measures each tower's signal strength as the agent performs the drive test. (Gov. Hr'g Ex. 4 at 2; 8/22/2017 Tr. at 18–19, 23–24.)

To measure signal strength, the GAR collects information on radiofrequency signals. Radiofrequency signals are measured on a range going from 0 to negative numbers, with a signal of negative one representing a stronger signal than -100. (8/22/2017 Tr. at 41–42.) CAST's

software ("ESPA") cutoffs measurement of a tower's possible coverage area at a signal strength of -17, although no specific literature that Agent Horan was aware of supported the use of a -17 cutoff. (8/29/2017 Tr. at 30–31.) In Agent Horan's experience, however, a phone would normally connect to another tower once a particular tower's signal strength dropped below -17, (8/22/2017 Tr. at 47, 49–50; 8/29/2017 Tr. at 31), and the -17 cutoff represents an industry standard used by radiofrequency engineers working for providers. (8/29/2017 Tr. at 32–35.)

To collect this information about towers' radiofrequencies, an agent drives an expanded area surrounding the investigated area, trying to capture as many towers as possible that might have a coverage area overlapping with the investigated area. (*Id.* at 31–32, 39–40.) In rural environments an agent may drive as much as seven square miles to capture towers that have coverage areas in an investigated area, but in urban areas an agent may only drive within one or two square miles because towers are closer together and have smaller coverage areas. (*Id.* at 49–50.) The data from the GAR goes into a software program in CAST's server for later analysis. (*Id.* at 64); *see also* Daniel, *supra*, at 70 (describing how radiofrequency engineers perform a drive test).

On November 28, 2016 and December 1, 2016, Agent Horan used the GAR to conduct a drive test of the T-Mobile and Sprint networks in the areas of the alleged sexual assault, and other pertinent locations, analyzing the towers which appeared in the CDRs during the relevant time frame. (Gov. Hr'g Ex. 4 at 2; 8/22/2017 Tr. at 35–36.) On both days Agent Horan began his drive during the day and drove into the evening hours. (8/29/2017 Tr. at 50.)[2] The weather was "clear" on both days. (*Id.*)

[2] The alleged incident in this case occurred around midnight in May 2016. (8/29/2017 Tr. at 50.)

4. Data Processing After the Drive Test

After the drive test, the agent who performed the drive test runs data collected by his GAR through a post-processing program, the ESPA, which depicts the breadth of each sector and illustrates towers of interest ("the draft analysis"). (8/22/2017 Tr. at 28; 8/29/2017 Tr. at 16, 65; Gov. Hr'g Ex. 4 at 2.)[3] However, (1) the distance driven, (2) changes in environmental factors between the time of the incident and the drive test,[4] and (3) changes to a tower can affect the comparative value of the draft analysis to coverage areas at the time of incident. (8/29/2017 Tr. at 32, 52–54); *see also* Daniel, *supra*, at 77–78; *infra* Part III.A.6. CAST cannot quantify the margin of error produced by these factors, but Agent Horan testified that currently, drive test technology provides the best available verification of a tower's estimated coverage area. (8/22/2017 Tr. at 17, 32; 8/29/2017 Tr. at 32, 36–37.)

A second agent who did not perform the drive test analyzes the draft analysis and checks for any errors made on the part of the initial inputting agent or possible errors in the software's generated data ("the peer review process"). (8/22/2017 Tr. at 29, 32; 8/29/2017 Tr. at 14–16); *see also* Daniel, *supra*, at 74–76 (outlining how cell providers analyze drive test results). The agent conducting the peer review process has all the drive test data and any other information the initial agent had, including CDRs. (8/29/2017 Tr. at 15.) This agent also cross-checks the data by referencing different software programs and other collections of data. (*Id.* at 16, 33–34.) The

[3] ESPA's algorithm is proprietary so CAST cannot evaluate the algorithm's accuracy outside of the quality checks that Gladiator performs on CAST's equipment. (8/29/2017 Tr. at 65–66.) Agent Horan was not aware of any studies evaluating the accuracy of Gladiator's equipment and software. (*Id.* at 67.)

[4] Environmental factors include bodies of water, mountains, large hills, large trees, and substantial artificial structures such as skyscrapers, whereas weather, time of day, traffic, or smaller structures generally will not affect a drive test's accuracy. (8/22/2017 Tr. at 26–27, 36–37, 52–54, 69–71.)

peer review process does not include another drive test or a physical check of the area where the first agent performed the drive test unless the peer review process uncovers irreconcilable problems with the generated data and the review. (*Id.* at 16–17.)[5]

During Agent Horan's draft analysis he input a wrong code, but the peer review process corrected the error. (*Id.* at 14–17, 38.) No other errors were uncovered in the peer review process that could have generated irreconcilable problems.

5. Final Data Output

The drive test combined with the CDRs will generate a map of all towers' (1) total coverage areas or their "possible signal" and also (2) dominant coverage areas or "dominant signal." (8/22/2017 Tr. at 19, 28, 41, 51–52, 57, 92, 96–97; 8/29/2017 Tr. at 18; *see also* 8/22/2017 Tr. at 11–12 (describing how cellphones communicate with towers)); Daniel, *supra*, at 73–74 (describing data that a drive test collects). The dominant signal comes from the tower that provides the strongest signal to the cellphone when that phone initially tries to connect to a network. (8/22/2017 Tr. at 92–93, 95); *see also* Daniel, *supra*, at 74. Manufacturers design cellphones to constantly measure signal strength for the duration of a call or data session, and a cellphone selects the dominant, or strongest signal, as a user moves. (8/29/2017 Tr. at 27–29.) Radiofrequency engineers refer to this phenomenon as the "neighbor list"—an internal list of surrounding towers' signal strength that a cellphone constantly measures. (*Id.* at 28–29); *see also* Daniel, *supra*, at 74. A neighbor list ensures that a cellphone connects to the dominant signal instead of connecting to a tower that is farther away, but may still have a total coverage area reaching a user's location. (8/29/2017 Tr. at 29.) Only a drive test can measure the

[5] During Agent Horan's tenure with CAST, he has never seen a second drive test occur for the same case. (8/29/2017 Tr. at 17.)

dominant signal; without a drive test the most CAST members can do is measure a tower's possible signal area represented by a wedge that shows the direction that a tower's signal pushes out towards. (*Id.* at 35–36.)

By comparing CDRs to the output from a drive test, CAST agents aim to approximate a cellphone user's possible, not exact, location when he initiated a call. (8/22/2017 Tr. at 55, 65, 79; 8/29/2017 Tr. at 42.) As Agent Horan explained, "[t]he way I would testify, Your Honor, is that based upon what we have in the records and what the drive tests revealed to us, that [the cellphone] could be anywhere within what's illustrated here in the [mapped] footprint." (8/22/2017 Tr. at 79.) Based on the drive test data, Agent Horan cannot speculate where the target cellphones were exactly located at any particular time, but he can say that the target cellphones were most likely in certain coverage areas during the time the calls were initiated and testify that the target cellphones appeared to move between calls. (8/29/2017 Tr. at 44–45, 47.)

6. Other Factors Affecting the Accuracy of the Drive Test

i. Distance Driven

The distance covered in a drive test can affect the accuracy of the results it produces. Agent Horan testified that a tower signal can reach at least four miles. (8/29/2017 Tr. at 48.) Gerald Grant, the expert proffered by the defense, testified that it was his opinion that "a drive test should be at least four miles out and cover as many roads as possible." (Tr. of *Daubert* Hr'g, Oct. 11, 2017 (Day 3), ECF No. 79 ("10/11/2017 Tr.") at 30–35.) Based on this opinion, Mr. Grant testified that Agent Horan did not drive far enough to produce an accurate drive test. (*Id.* at 30–31.) Agent Horan explained that he has never seen a signal go beyond four miles in an urban environment such as the one surveyed here. (8/29/2017 Tr. at 49–50; *see also id.* at 39.)

ii. Changes in Cellular Towers and Other Environmental Factors

To generate accurate data, an agent should check to ensure that no relevant tower has changed physically. For example, cell towers tilt downward toward the earth to target cellphone users so an adjustment in tilt can change a tower's coverage area. (8/22/2017 Tr. at 25; 8/29/2017 Tr. at 41; *see also* 8/22/2017 Tr. at 24–25 (explaining factors that affect a tower's cellular footprint).)

A tower's possible and dominant signal can also be affected by what those in the industry refer to as "noise." (8/22/2017 Tr. at 100–01; 8/29/2017 Tr. at 19, 22.) Noise primarily represents the number of cellphone users on a tower. (8/29/2017 Tr. at 19.) Noise increases as the number of users connecting with a tower increase. (*Id.* at 19–20.) Agent Horan analogized the effect noise has on a tower to the effect noise has in a crowded room. (*Id.*) When a room is empty a person on the far side of the room might be able to have a conversation easily with the next entrant, but as more people enter the room and begin talking, the first two people will have to move closer together to maintain their conversation. (*Id.* at 20.) The same thing happens with a tower's dominant signal, as the noise level goes up a cellphone will have to move closer to the tower to connect. (8/22/2017 Tr. at 101–02; 8/29/2017 Tr. at 20, 22.)

However, providers do a relatively decent job of predicting the amount of noise a tower will have to handle, so barring an event which causes hundreds and hundreds of additional users to attempt a connection within a condensed area, a tower's dominant signal rarely contracts (a process also known as "cell breathing"). (8/22/2017 Tr. at 102–03; 8/29/2017 Tr. at 20–21.) If a cell breathing event did occur, radiofrequency engineers estimate that the shrinkage in coverage area would be around 1–5% of the coverage area's original footprint, which equates to a couple of blocks in a city environment. (8/29/2017 Tr. at 21–22.) Someone connecting in this

decreased area may connect to an adjacent tower, which now provides the dominant signal. (8/22/2017 Tr. at 66–69; 8/29/2017 Tr. at 22.)

Geography and large artificial structures may also affect a tower's coverage area. (8/22/2017 Tr. at 26–27, 36–37, 52–54, 69–71.) For example, radiofrequency signals can bounce off water and produce a coverage area farther away from where the tower's signal would normally reach. (*Id.* at 52–54; 8/29/2017 Tr. at 29.) This can affect both a tower's possible signal area and dominant signal area. (8/29/2017 Tr. at 29–30; 8/22/2017 Tr. at 52–54.) If a neighbor list operates correctly it should prevent a phone from connecting to coverage-area anomalies caused by geographical factors. (8/29/2017 Tr. at 30.)

Agent Horan did not uncover any changes to the towers or the environment that would have affected the drive test data's comparative value. (8/22/2017 Tr. at 36–37, 70–71; 8/29/2017 Tr. at 54–57, 60, 63.) Nor has defendant brought any to the Court's attention.

B. Reliability of the Drive Test at Issue

Defendant's main objections to the reliability of Agent Horan's proposed testimony relate to the lack of independent scientific testing and publications on the use of drive testing as evidence. (*See* Def.'s Mot. at 6.) It is true that the use of drive testing in criminal trials is a relatively new development, and as such, has not been subject to extensive peer review and its error rate has not been fully tested. *See Phillips v. State*, 163 A.3d 230, 233–34 (Md. App. 2017).

However, the *Daubert* inquiry is flexible, and a Court should not automatically exclude evidence because it is too new, or of too limited outside interest, to generate extensive independent research or peer-reviewed publications. *See Daubert*, 509 U.S. at 594; *Ambrosini v. Labarraque*, 101 F.3d 129, 134 (D.C. Cir. 1996). "*Daubert* makes clear that the factors it

mentions do *not* constitute a 'definitive checklist or test.'" *Kumho Tire Co.*, 526 U.S. at 150. Not all expert testimony will involve methods extensively studied by multiplicities of independent scientists. *See Daubert*, 509 U.S. at 594 (noting that a "reliability assessment does not require . . . explicit identification of a relevant scientific community and an express determination of a particular degree of acceptance within that community") (citation omitted); *see also Jenkins v. United States*, 307 F.2d 637, 645 n.19 (D.C. Cir. 1962) ("Particular inquiries which may be appropriate in some cases may be inappropriate in others.").[6]

Law enforcement officials employ drive testing because they believe it to be a more accurate method than historical cell-site analysis at approximating a tower's coverage area. Courts routinely accept historical cell-site analysis as reliable, *see, e.g.*, *Hill*, 818 F.3d at 298; *Jones*, 918 F. Supp. 2d at 5, and the principles and methods underlying drive testing are based on the same principles that underlie historical cell-site analysis. Moreover, drive testing's ability to map towers' coverage areas *in the present* has been extensively tested and proven to be reliable, and radiofrequency engineers accept drive testing as a reliable testing method. *See State v. Steele*, 176 Conn. App. 1, 23–24 (2017) (noting that "the precision of drive testing makes it the preferred method for determining the shape and size of a cell sector"); *United States v. Frazier*, No. 2:15-cr-044, 2016 WL 4994956, at *2 (D. Nev. Sept. 16, 2016); *United States v. Davis*, No. 11-cr-60285, 2013 WL 2156659, at *6 (S.D. Fla. May 17, 2013).[7]

[6] The Court also notes that no evidence in the record shows that Agent Horan performed his drive test differently from how radiofrequency engineers conduct drive tests—the professionals whom cellular companies depend on to reliably determine the coverage area of their own towers. *Compare* Part III.A, *with* Daniel, *supra*, at 70 (describing how radiofrequency engineers perform a drive test), *and Am. Cellular Network Co., LLC v. Upper Dublin Twp.*, 203 F. Supp. 2d 383, 390 (E.D. Pa. 2002).

[7] The government also suggests that the lack of peer-reviewed articles on the subject of drive testing is due to the fact that drive testing technology has been relied upon, "tested and reviewed for decades in the multibillion dollar wireless communications industry." (Post-Hr'g Br. in Opp.

Defendant also objects that because Agent Horan "*cannot* explain how the data collected during a drive test is translated into the shaded areas on the drive test maps, SA Horan is not qualified as an expert to speak about the accuracy of those maps." (Post-Hr'g Br. in Supp. of Def.'s Mot. in Limine, ECF No. 80, ("Def.'s Post-Hr'g Br.") at 2.) However, this Court does not require an expert to have an in-depth knowledge of all the algorithms underlying their technological tools—such as hardware and software—to reliably testify about the outputs of those tools.

> Forensic investigation increasingly requires the use of computer software or other technological devices for the extraction of data. While an investigator must have specialized knowledge in the use of the particular software or device, it is not required—nor is it practical—for an investigator to have expertise in or knowledge about the underlying programming, mathematical formulas, or other innerworkings of the software.

State v. Pratt, 128 A.3d 883, 891–92 (Vt. 2015) (surveying multiple cases involving the use of computer software and other technological devices for the extraction of data); *In re Toyota Motor Corp. Unintended Acceleration Mktg., Sales Practices, & Prod. Liab. Litig.*, 978 F. Supp. 2d 1053, 1080 (C.D. Cal. 2013); *see also Gardner v. Gen. Motors Corp.*, 507 F.2d 525, 528 (10th Cir. 1974) (noting that an expert "should not be required to satisfy an overly narrow test of his own qualifications").

This Court concludes that drive testing can form the foundation for expert testimony if the expert acknowledges that drive testing only produces an approximation of a cellphone's location and the expert adequately accounts for elements that could affect the test's accuracy. *See Frazier*, 2016 WL 4994956, at *2–3. Agent Horan has adequately limited his opinion and

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to Def.'s Mot. in Limine, ECF No. 84, ("Gov.'s Post-Hr'g Br.") at 12.) Regardless of the reason for the lack of independent scientific review of drive testing, this Court finds that drive testing exhibits sufficient reliability to form the foundation of expert testimony.

addressed potential sources of errors. Therefore, as found by other courts that have addressed this issue, drive testing testimony is sufficiently reliable. *See Frazier*, 2016 WL 4994956, at *2–3; *United States v. Cervantes*, No. 12-cr-792, 2015 WL 7734281, at *11 (N.D. Cal. Dec. 1, 2015); *United States v. Mack*, No. 3:13-cr-00054, 2014 WL 6474329, at *4 (D. Conn. Nov. 19, 2014); *Davis*, 2013 WL 2156659, at *6.

IV. RELEVANCE AND RULE 403 CONSIDERATIONS

The Court also finds that Agent's Horan's testimony is relevant. Agent Horan's "testimony is based on a reliable methodology that has been reliably applied to the facts of this case." *Jones*, 918 F. Supp. 2d at 6. Agent Horan's opinion will assist the jury because "[a]n explanation of how cell towers work and what general location a cell phone user must have been in at the time his cell phone connected to a particular cell tower would be helpful to the jury in understanding the government's claims about the movements and whereabouts" of defendant and the alleged victim. *Id.*

While defendant casts some of his objections as going to the issue of reliability, they more approximately go the issues of relevance and Rule 403 considerations. *See United States v. Eady*, No. 2:12-cr-00415-3, 2013 WL 4680527, at *5 (D.S.C. Aug. 30, 2013), *aff'd*, 599 F. App'x 116 (4th Cir. 2015). Defendant objects to Agent Horan's testimony on the grounds that (1) predicted coverage-area maps are not perfect, but are at best estimates (Def.'s Mot. at 7), (2) the government's evidence cannot demonstrate defendant's exact location at any time (*id.* at 8), (3) the jury will "speculate on whether a cell phone always connects with the closest cell tower, or whether a cell phone may connect for a myriad of technical reason[s] with another cell tower" (*id.* at 9), (4) Agent Horan did not "drive far enough away from the target towers to accurately illustrate coverage for those towers" (Def.'s Post-Hr'g Br. at 7), and (5) "any

testimony regarding the drive test results is based on the incorrect premise that a drive test conducted six months after an alleged event, at a different time of year and at a different time of day, can *accurately* depict the coverage area of a cell sector." (*Id.* at 2.)

The Court acknowledges, as the government has conceded, (1) that the generated coverage-area maps are not perfect, and (2) those maps cannot pinpoint defendant's exact location at any time. But relevancy and Rule 403 considerations do not require perfect expert opinions; "the judge is supposed to screen the jury from unreliable nonsense opinions, but not exclude opinions merely because they are impeachable." *Alaska Rent-A-Car, Inc. v. Avis Budget Grp., Inc.*, 738 F.3d 960, 969 (9th Cir. 2013).

The Court finds that Agent Horan's testimony will not mislead the jury so long as he testifies only to defendant's and the alleged victim's possible location within a general area of coverage, as opposed to an exact location. *See State v. Adams*, 161 A.3d 1182, 1197 (R.I. 2017) ("Agent Horan's inability to pinpoint the exact location of the cell phones on the morning in question to a reasonable degree of certainty does not render his testimony inadmissible. Instead, the jury was tasked with determining the weight of Agent Horan's testimony in light of that fact."); *see also Jones*, 918 F. Supp. 2d at 6. As to jury speculation and disagreements about the premises on which Agent Horan rests his testimony, the Court finds that cross-examination of Agent Horan and presentation of conflicting expert testimony on factors affecting the validity of Agent Horan's data will sufficiently cure any possible prejudice. *See Daubert*, 509 U.S. at 596; *see also Robinson v. D.C.*, 75 F. Supp. 3d 190, 200 (D.D.C. 2014); *Eady*, 2013 WL 4680527, at *5; *Primiano v. Cook*, 598 F.3d 558, 564 (9th Cir. 2010) ("Shaky but admissible evidence is to

be attacked by cross examination, contrary evidence, and attention to the burden of proof, not exclusion.").[8]

CONCLUSION

For the reasons stated above, defendant's motion is denied. A separate Order, ECF No. 86, accompanies this Memorandum Opinion.

/s/ *Ellen Segal Huvelle*
ELLEN SEGAL HUVELLE
United States District Judge

Date: March 5, 2018

[8] Defendant's proposed experts agrees that the concept of drive testing can be used to represent a tower's coverage area or footprint, but "disagree[s] that it's an accurate representation of how big the dominant area is." (10/11/2017 Tr. at 48.)