Testimony of Juliana DeVries

Cook County SCRAM Hearing

Wednesday, September 21, 2022

Good morning, and thank you for the opportunity to offer this testimony about the SCRAM Continuous Alcohol Monitor device. My name is Juliana DeVries. I am an attorney at the Akin Gump Strauss Hauer & Feld law firm in Washington, DC. I was previously a clinical teaching fellow at the Samuelson Law, Technology & Public Policy Clinic at UC Berkeley School of Law and an Assistant Federal Public Defender for the Northern District of California.

As part of my work at the Samuelson Clinic, I researched the reliability of the SCRAM Continuous Alcohol Monitor. Before I started researching the topic, I had heard from public defender contacts of mine that their clients were insisting that they did not drink when their SCRAM monitor says that they did. I started speaking to scientists who understood the technology behind the device, as well as conducting legal research and reading scientific papers myself. What I found is that it appears that water, atmospheric alcoholic compounds, and skin properties may all interfere with the SCRAM bracelet's ethanol reading. Proper calibration of the device for each wearer is also key. In other words, it is quite possible that those clients had not been drinking even though their SCRAM monitors said they did. These kind of reliability issues are particularly important to assess in the criminal context, where the evidence from this device may be relied upon to put people in jail.

By way of background, the SCRAM monitor is an ankle bracelet with an attached monitor that weighs about eight ounces. It fits around the wearer's ankle but with a gap between the skin and the monitor, and there is a fuel cell inside. Scientists I spoke to explained to me how the device works. Basically, the fuel cell is like an Oreo, with conductors on either side and a hydrated membrane in the middle. When the person wearing the monitor sweats on their ankle, it creates a vapor. Protons from that vapor are then drawn across the fuel cell membrane in the device, while electrons are drawn on a wire from one conductor to the other. This produces a signal that is used to extrapolate the presence of ethanol content. The SCRAM company refers to this ethanol content extrapolation as Transdermal Alcohol Concentration (TAC).

The SCRAM company produces a report with a graph showing TAC over time as measured by the device. The graph also includes temperature and infrared readings taken from additional

sensors inside the device. Unlike the fuel cell TAC reading, the temperature and infrared readings are meant to detect whether the wearer has tampered with the device.

Deciding that the TAC reading reflected in the graph shows that the wearer drank alcohol requires a series of assumptions. It assumes any ethanol in the sweat is there because the wearer drank alcohol rather than, for example, used a product that contains an alcoholic compound. It assumes any ethanol picked up by the device comes from the wearer's skin rather than from the air. It assumes there is nothing significant about the wearer's skin properties or body chemistry that might throw off the correlation between the reaction in the fuel cell and the concentration of alcohol in the person's body. It assumes, of course, that the device is working properly. And it assumes the correlations the SCRAM company uses between the device's signal and its TAC determination are correct and properly applied.

What I found in my research is that these assumptions are not necessarily correct. Take water damage, for example. The SCRAM company said in a patent application that "[c]ondensation of moisture into water droplets within an alcohol monitor can eventually damage internal components, thus reducing the service life of the alcohol monitor." In other words, at least in the version of the device created before this patent issued in 2009, water coming into the device from the atmosphere had the potential to damage the SCRAM device's internal components and impact the TAC reading. The patented invention attempted to solve this problem in part by taking "advantage of gravity, allowing any water droplets that form to flow out of [the device] while the subject is in an upright position (walking or standing)." The issue with this is clear: to avoid water damage, the wearer must be walking or standing, which individuals do not do 24 hours a day. In addition to SCRAM Systems' own patent acknowledgements, scientific papers have noted water problems with SCRAM, including a paper by the National Highway Traffic Safety Administration and another by independent researchers Dr. Joseph Anderson and Dr. Michael P. Hlastala.

Another important area for potential reliability problems is outside alcohol sources. Recall that there is a gap between the SCRAM alcohol monitor and the wearer's skin. This means the device may be picking up on alcohol in the air, rather than just from the wearer's sweat. These outside alcohol sources could include hand sanitizer, breath mints, menthol cigarettes, even decaying fruit. There are, again, scientific studies recognizing that outside alcohol sources may create false positive SCRAM TAC readings. As one study put it, "transdermal vapor-based alcohol

sensors [such as SCRAM] may yield false signals, rising from external alcohol-containing vapors (i.e., bar scenario, paint, etc.) as well as from alternate components found in insensible sweat due to the non-specific nature of the electrochemical detection method (i.e., nonspecific oxidation at the sensing electrode, particularly non-enzymatic platinum-based sensors)." The National Highway Traffic Safety Administration study similarly attributed the false positives it found to "an undetected external source of alcohol," such as shaving cream or perfume.

Yet another source of potential inaccuracy comes from differences in the properties of SCRAM device-wearers' skin. When a person drinks alcohol, the person's liver metabolizes most of the ethanol, but approximately one percent exits the body through the skin in perspiration. Variation in the person's body chemistry and skin affect how the person metabolizes that one percent. It is also possible that differences in skin tone impact the SCRAM device's operation because the device includes an infrared sensor, and infrared sensors can vary in their readings based on skin tone. There do not appear to have been any studies of this specific issue, at least not any that are publicly available.

In addition to these potential reliability issues, there are fairness concerns where individuals have to pay for their own SCRAM monitors. In *People v. Hakes*, for example, the New York Court of Appeals held that a sentencing court could require a defendant to wear and pay for a SCRAM bracelet, but only if it is feasible for that particular defendant to pay the cost.

All in all, my research has found that there are legitimate reliability and fairness concerns with the SCRAM Continuous Alcohol Monitor. Given that people may be incarcerated based on evidence coming from this technology, it is imperative that the technology be entirely sound. I appreciate you taking these points into consideration.

Thank you.