STATE OF MINNESOTA | DISTRICT COURT

Case Type: Consolidated Source Code Cases

In re Minnesota Intoxilyzer 5000EN Source Code Litigation in Criminal Cases,

and

In re Minnesota Intoxilyzer 5000EN Source Code Litigation in Civil Cases,

Court File Nos.: 70-CR-09-19749
70-CV-09-19459

WRITTEN CLOSING ARGUMENT IN SUPPORT OF MOTION TO EXCLUDE INTOXILYZER 5000EN RESULTS

TO: The Honorable Jerome B. Abrams and All Liaison Counsel:

EVIDENTIARY HEARING PROCEDURAL HISTORY

Petitioners/Defendants ("Drivers") moved the Court for an evidentiary hearing pursuant to Minn.R.Civ.P. 16.01 & 16.03(c), and Minn.R.Crim.P. 10.01, Subd. 2. The Court presided over the requested hearing on December 8th-10th, 13th-17th, 20th, 22nd, and 23rd. Liaison Counsel participated in the hearing on behalf of the Drivers and the State.[1] The Court heard testimony from eight witnesses and received numerous exhibits, all of which form the record and provide the support for the Drivers' Motion to Exclude. Simultaneous written closing arguments from all parties are due to the Court by 4:00 p.m. on January 31, 2011, when the Court will officially take the matter under advisement.

[1] Throughout this Memorandum, "the State" refers to all civil and criminal entities representing the State of Minnesota in their various capacities and their assigned Liaison Counsel.

MOTION TO EXCLUDE

The Drivers moved this Court to exclude all test results produced by the Intoxilyzer 5000EN in their individual cases. The Drivers presented evidence at the hearing to refute the State's *prima facie* showing for admissibility. The Drivers' evidence reveals errors and omissions in the source code of the machine that affect the foundational reliability of the results produced during a test sequence. The Drivers also provided evidence that the source code does not meet the minimum necessary safeguards, standards and controls for breath alcohol testing contained in the Request for Proposal ("RFP") written by the BCA in 1996 to implement a new breath alcohol testing machine.

The State has not met its burden to establish that the source code of the machine produces reliable test results and that the administration of these tests (as carried out by the source code of the machine) meets the minimum necessary breath alcohol testing safeguards, standards and controls set by the BCA in its RFP. The State did not refute the fact that the RFP standards are the appropriate standards to follow, nor did it offer any alternative safeguards, standards and controls for this Court to consider when deciding whether the results of the Intoxilyzer 5000EN have the necessary foundational reliability to be admissible in court as scientific evidence.

Now, the State can no longer rely on the talisman of a "*prima facie* showing" to meet its burden for admissibility. As always, the State is the proponent of scientific evidence produced by this machine, and as the proponent of scientific evidence, the State bears the ultimate burden of persuasion regarding its admissibility at trial. The State's

attempt to merely debunk or discredit the Drivers' evidence without presenting its own evidence supporting admissibility falls short.

The State did not present evidence to independently establish the minimum source code safeguards, standards and controls necessary to ensure reliability of these test results. It spent most of the hearing trying to label evidence as irrelevant "non-source code" issues and did little to refute the nature or import of the actual findings. Instead of taking it upon itself to prove the reliability of the source code and its results, the State expects this Court to *assume* reliability based solely on a statutory *prima facie* showing that the tests were performed by trained operators with no errors being reported on the face of the test records. The Drivers successfully negated the *prima facie* showing and the State did not rehabilitate its evidence to support its admission at trial. As a result, all Intoxilyzer 5000EN test results must be excluded from trial in the cases before this Court.

Because the State has not met its burden, all cases should be remanded to their original jurisdictions with an order excluding the test results. This Court's Order should prevent all test results, deficient samples, invalid tests and deficient tests from being used in all proceedings. If the Court does not exclude all Intoxilyzer 5000EN test results, the Drivers ask the Court to exclude particular types of tests, remove the statutory presumption of admissibility, require the State to prove test results to a standardized degree of precision, and order any further relief the Court deems appropriate.[2]

[2] The Court made clear it does not view its charge to include review of the issue alleged by the Drivers regarding varying EPROM content that may exist in the 264 Intoxilyzer 5000EN units in use across the state. It is possible that counsel and/or judges in individual counties may assume this issue was considered to be a "source code issue" that

ARGUMENT

I. LEGAL STANDARD OF REVIEW.

A. Procedural and Subject Matter Jurisdiction of the Court.

Before the Court can sift through the plethora of the evidence submitted and determine its import, a clear framework needs to be set. The Minnesota Supreme Court established these consolidated proceedings in the interests of judicial economy, but it also set limits on the procedural posture of the proceedings and the scope of its subject matter. The Drivers are mindful that the Court has been very deliberate and careful about carving out its charge. In the spirit of the predominant desire to provide judicial economy for similarly situated litigants, the Court should not seek to interpret all ambiguities in its charge in favor of the most strictly limited interpretation. This Court was assigned to:

> [A]dminister, hear, and decide all pretrial matters concerning challenges to the reliability of the Intoxilyzer 5000EN results based on the source code of the instrument, including scheduling, discovery, and an evidentiary hearing, if necessary, in all pending and future civil implied consent cases [and criminal DWI cases] in which a party challenges the reliability of Intoxilyzer 5000EN results based on the source code of the instrument . . .

January 11, 2010 Order of the Minnesota Supreme Court In re Minnesota Intoxilyzer 5000EN Source Code Litigation, pp. 3 & 4.

This Court is presiding over all pretrial matters concerning challenges to the reliability of the Intoxilyzer 5000EN test results, but that clearly defined general task is

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was addressed in these proceedings. Therefore, Drivers request that the Court include a specific holding in its order stating that this issue was not addressed by the Court and that the Drivers are not foreclosed from addressing this issue further in their individual cases.

modified by the key ambiguous phrase "based on the source code of the instrument." The Court has expressed its concern that it does not want to go far afield of any limitations inherent in that phrase. The State has latched onto this concern and repeatedly tried to characterize this phrase in the narrowest of terms, declaring that the Drivers may only challenge "material defects in the source code itself" in these proceedings. Notably, the State used similar language in its motion to the Supreme Court to have these matters consolidated. However, the Drivers believe the language used by the Supreme Court was designed to address all infirmities in the Intoxilyzer discovered through the analysis of the source code and should be construed accordingly.

This was not the first time the Supreme Court used such open-ended language to discuss the role of source code analysis in a challenge to the reliability of the testing method overall. In its holding that affirmed the source code discovery order regarding Timothy Brunner, the Supreme Court stated that "Brunner's submissions show that an analysis of the source code *may reveal deficiencies that could challenge the reliability of the Intoxilyzer* and, in turn, would relate to Brunner's guilt or innocence." *State v. Underdahl*, 767 N.W.2d 677, 686 (emphasis added). The "deficiencies" referred to in that passage are not explicitly limited to deficiencies in the source code itself, and they certainly are not limited to only "material" deficiencies in the source code itself.

A later section of this closing argument will address the interrelationship of the design, software, and hardware of an embedded system like the Intoxilyzer 5000EN, but a brief mention is in order here. Almost any issue discussed at the hearing for these proceedings could be characterized by a skilled litigator as a "software" issue or a

"hardware" issue or a "design" issue. An embedded system lends itself to such inexact boundaries, but the bottom line is that all of the issues presented at the hearing were discovered by way of source code analysis and debugging.

All of the problems to be discussed in this closing argument can be remedied by modifying the source code without modifying the hardware or design of the machine. Perhaps some of the problems could alternatively be remedied by changing the hardware or the design; even the EPROMs themselves could be characterized as "hardware" by the State since they are physical components installed in the machine that could (and should) be upgraded. Rather than succumbing to the State's obsession with labeling every finding as a "source code" or "non-source code" issue, this Court should be predominantly concerned with how these findings seriously undermine the reliability of this machine and the accuracy of its evaluations.

Additionally, the Court has remained mindful that in the consolidated implied consent proceedings, the ultimate issue being challenged by the Drivers is the validity and reliability of the testing method and whether the test results were accurately evaluated. *See* Minn.Stat. 169A.53, subd. 3(b)(10). At this pretrial stage of the litigation, the Drivers move this Court to find the test results inadmissible at trial pursuant to Rules 104 and 702 of the Minnesota Rules of Evidence. If the Court does not grant that pretrial relief, the alternative is to rule that the test results are admissible at trial, but the ultimate issue of validity, reliability, and accuracy of the testing method and its results would be left to the judge presiding over the remanded trial proceeding. *See* Minnesota Rules of Evidence 104(e) ("This rule does not limit the right of a party to introduce before the jury

evidence relevant to weight or credibility"). Any dispositive action taken against the Drivers would be beyond this Court's pretrial authority.

Likewise, in the consolidated criminal matters, the Drivers move this Court to exclude the test results from being used against them at their individual trials, also pursuant to Minnesota Rules of Evidence 104 and 702. If the Court deems the test results admissible in criminal matters, it is not permitted to take the place of the fact-finder or go any further in deciding that the testing method and its results are reliable beyond a reasonable doubt. *See* CRIMJIG 29.10 (providing in the elements for Driving While Impaired that the jury will evaluate the testing method and the test results).

B. Inapplicability of Minnesota Statute 634.16.

Since the ultimate issue to be determined by the Court is the admissibility of these test results at trial, the legal standard and burdens on the parties with regard to admissibility must be reviewed. The Court has been clear that it will not engage in a *Frye/Mack* analysis of the scientific principles of the Intoxilyzer 5000EN, and there was no evidence presented by either party attacking or supporting that science in general.[3] The Court's limitation in this regard is presumed to be based on the fact that the Minnesota Legislature has already summarily endorsed these scientific principles in Minnesota Statute 634.16.[4] As long as the State proves that a breath test was

[3] The Drivers did not waive the right to demand a *Frye/Mack* hearing at a later date, but declined to present evidence in that regard or otherwise argue for such hearing based on this Court's notice that such evidence was not appropriate in these proceedings.

[4] The Drivers also do not waive the argument that Minn.Stat. 634.16 is unconstitutional, but decline to address it since the statute is inapplicable in this "non-*Frye/Mack*" proceeding.

administered by a person trained by the BCA to do so, that evidentiary statute allows the State to seek admission of breath test results "without antecedent expert testimony that an infrared or other approved breath-testing instrument provides a trustworthy and reliable measure of the alcohol in the breath." Minn.Stat. 634.16. This statute was passed in the interest of judicial economy to relieve the State from the requirement of having an expert testify at every implied consent hearing and DWI criminal trial statewide to present the fact-finder with proof of the scientific principles of breath alcohol measurement through infrared spectrometry.

The Drivers are not disputing whether the science of infrared breath testing can sometimes provide a trustworthy and reliable measure of breath alcohol concentration; the Drivers do dispute the foundational reliability of the test results produced by the source code of the Intoxilyzer 5000EN because of source code errors and omissions and the machine's failure to meet the minimum necessary safeguards, standards and controls to ensure the reliability of any infrared breath alcohol testing machine.

The distinction was pointed out in similar fashion by the Minnesota Supreme Court in *State v. Jobe*, 486 N.W.2d 407, 419 (Minn. 1992). In that opinion, the Supreme Court stated that while it had already decided that the underlying forensic principles of DNA RFLP testing met the *Frye/Mack* standards, the results from any specific testing laboratory would still be subject to reliability challenges at a pretrial hearing. *Id*. The court's role in such hearings would be to determine whether the particular laboratory in question complied with appropriate standards and controls. *Id.* That is the foundational reliability being challenged in this litigation.

Each Intoxilyzer 5000EN is a self-contained "laboratory" that collects, analyzes, and then destroys biological specimens. Its source code measures and evaluates the quality and viability of these specimens. It further uses mathematical algorithms and other processes to determine and measure the physical contents of the specimens. In the midst of this procedure, it also must monitor the environment surrounding the "laboratory" for other factors that affect the machine's ability to properly measure the specimen (radio frequency interference, power supply, ambient alcohol, interferents, etc.). Further still, the machine purportedly performs self diagnostics in an attempt to ensure it is in proper working order. All of these embedded functions are controlled and evaluated by the source code. "Every aspect of operation, from displaying and printing of information to the basic electrical and mechanical functions, is micro-computer controlled." Ex. 44, p. 2.

The Drivers are challenging whether the machine's source code carries out all of these necessary processes in compliance with appropriate forensic standards and controls, thereby ensuring foundational reliability. This challenge is not foreclosed by Minnesota Statute 634.16; if it was, the entire proceeding created by the Supreme Court's Order would be moot.

C. Foundational Reliability and the Burden of the Parties.

The State is the proponent of scientific test results created by the Intoxilyzer 5000EN, which means it carries the ultimate burden to prove the foundational reliability of those results. *See* Minn.R.Evid. 702, ("The [expert] opinion must have foundational reliability"); Minn.R.Evid. 702, Advisory Committee Comment 2006 Amendments ("If

the opinion or evidence involves a scientific test, the case law requires that the judge assure that the proponent establish that 'the test itself is reliable and that its administration in the particular instance conformed to the procedure necessary to ensure reliability,'" *quoting Goeb v. Tharaldson*, 615 N.W.2d 800, 814 (Minn. 2000)); *State v. Dille*, 258 N.W.2d 565, 567 (Minn. 1977). The State can initially meet its burden by presenting a *prima facie* showing that the test was conducted by a person trained by the BCA to administer the test, that the machine passed its internal diagnostics, that the machine performed the necessary air blanks measuring .000, and that the control solution was measured to be within the acceptable range. *Kramer v. Comm'r Pub. Safety*, 706 N.W.2d 231, 236 (Minn. Ct. App. 2005); *Bond v. Comm'r Pub. Safety*, 570 N.W.2d 804, 807 (Minn. Ct. App. 1997).

Once a *prima facie* case is presented, the driver must suggest reasons beyond "mere speculation," as to why the test may still be untrustworthy. *Kramer*, 706 N.W.2d at 236 (holding that driver did not overcome *prima facie* showing by merely pointing out an incorrect date printed on test record to speculate that all other items on test record could be incorrect); *Bond*, 570 N.W.2d at 807 (finding failure to adequately refute *prima facie* showing in consolidated appeal of three drivers where all drivers argued that insufficient proof of timely replacement of simulator solution rendered test results inadmissible; no evidence presented to indicate why untimely changing of simulator solution made test results unreliable). The court must then decide the issue of test admissibility based on the entire evidence before it, bearing in mind that the State retains the ultimate burden to prove foundational reliability for admissibility. *Id*.

In these proceedings, the Drivers presented evidence beyond mere speculation to show errors and omissions in the source code and how the source code does not meet several of the safeguards, standards and controls required by the RFP. The State failed to adequately rebut this evidence or even establish the minimum safeguards, standards and controls necessary to ensure reliability of the test results. Therefore, it is the position of the Drivers that the State has not met their burden to prove that the Intoxilyzer 5000EN functions reliably. Even if the Court is satisfied that the machine has foundational reliability, it should provide alternative relief to the Drivers as outlined later in this memorandum.

II. ALL INTOXILYZER 5000EN TEST RESULTS MUST BE EXCLUDED BECAUSE THE TESTING METHOD IS NOT FOUNDATIONALLY RELIABLE.

The Drivers presented significant evidence that the testing method and the test results provided by the Intoxilyzer 5000EN are untrustworthy, which the State failed to adequately rebut. In fact, the State did not establish what forensic safeguards, standards and controls the machine and its source code must comply with, leaving the Court to determine what those standards and controls should be. The Drivers have identified several safeguards, standards and controls to provide the court guidance, including those set forth in the RFP written by the BCA,[5] informational material generated by CMI, as well as the scientific standards and controls testified to by the witnesses.

[5] The Court made clear that it will not consider the RFP as the basis for any claim of contractual breach because those claims are properly handled in a Qui Tam or other similar action. The Drivers never intended to use the RFP for that purpose in these specific consolidated proceedings, and they do not waive any possible such claim that

The evidence shows that the Intoxilyzer 5000EN and its source code are not in compliance with the safeguards, standards and controls necessary for reliable breath alcohol testing. While any one of these compliance failures could be grounds to render the test results inadmissible, the collective non-compliance is staggering and weighs heavily in favor of test exclusion. Before moving on to the individual failures, it is important to address the global arguments likely to be presented by the State.

A. The Evidence Presented by the Drivers Is Not Speculative.

The State will likely argue that the evidence presented by the Drivers is speculative because no proof was presented that any single test was actually incorrect. This argument is flawed and misdirected. The Drivers have been consolidated into these proceedings to make challenges to the overall testing method and the machine's ability to accurately evaluate ALL test samples. The deficiencies, errors, and omissions presented by the Drivers are not speculative; they are real problems with the source code present in

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may exist. For the purposes of these specific consolidated proceedings, the Drivers maintain that looking at the State's criteria in developing this machine is a relevant reference point for determining whether the machine is reliable for purposes of admissibility. The BCA relied upon the RFP and CMI's responses to it when approving this instrument without performing any source code analysis or debugging to verify CMI's claims. The Drivers assert that the failure of the Intoxilyzer to meet the RFP standards in and of itself is sufficient reason to exclude all test results. The State specifically established criteria that it felt were necessary to purchase reliable and accurate breath testing machines. The machine's failure to meet those minimum standards requires all tests to be excluded. If the Court decides that the RFP specifications are inapplicable to these particular proceedings, the Drivers request that this Court make a specific finding that the Drivers are able to assert this issue at the trial level and are also able to use the RFP at trial to challenge the weight to be given to the test results by the fact-finder.

every machine throughout the state. Every time a test is administered, the same source code is being executed with the same deficiencies, errors, and omissions.

The Drivers do not need to prove, for example, that RFI actually caused a particular test result to be reported incorrectly. The Drivers only need to present something more than mere speculation to suggest that RFI detection is a necessary safeguard for breath alcohol testing and that this machine is incapable of reliably detecting and accounting for RFI. The lack of reliability is the problem, regardless of whether RFI actually was present in any individual instance. While it would be speculative at this point to state that RFI actually affected a particular test result, it is not speculative to state that the machine has unreliable RFI detection in every single instance of testing. If the State had proven that the RFI detection is scientifically adequate, the fact question of whether RFI actually affected any particular test would be a trial issue in that individual case. To establish foundational reliability, it is the testing *method* that must be scrutinized, not the individual test results.

B. Relationship of Design, Hardware and Source Code in an Embedded System.

The State will also likely argue that the evidence presented by the Drivers is irrelevant to this proceeding because it relates to the design or hardware of the machine instead of the source code. This argument is also without merit. The "design" of an embedded system encompasses its software, hardware, firmware, and the interaction between all of these things. The source code is the direct implementation of the machine's design. Changes in "design" over the years have been accomplished by

modifying the source code without changing the hardware inside the machine. To say something is a "design" issue implicates the source code and certainly does not exclude the issue from being a source code issue. The scientific safeguards, standards and controls necessary to ensure reliability of the results drive the design choices and features of this forensic gadget. The State ignores this fact and instead asks this Court to dumb-down the scientific standards so they are achievable within the limitations of the machine. Doing so is tantamount to the tail wagging the dog.

The source code of a forensic scientific breath alcohol testing machine must be designed to properly collect, measure, and evaluate the test sample. Source Code design should not compromise any of these requirements simply to accommodate severely limited processor capability. If the machine is incapable of performing an accurate scientific measurement, it simply should not be used. The Intoxilyzer 5000EN lacks the computing capability to adequately perform reliable tests. It is not for this Court to find a way to congratulate CMI for squeezing some modicum of scientific aura from a Tinker Toy. Instead, the Court must decide whether a Tinker Toy is an appropriate tool to use to incarcerate Minnesota's drivers.

For example, the machine is incapable of detecting whether the heating elements and RFI antenna in the external breath tubes are connected and functional. The State will characterize this as a "design" issue. Claiming that the BCA trains its officers to feel the tube to make sure it feels warm to the touch and to turn off police radios, the State will argue that the source code is unrelated to this function. But the BCA's decision to train an officer to act in place of functions that could be easily controlled by source code does

not transform these issues into "design" issues. Source code errors can be errors of omission, and such errors are relevant to the reliability of the testing method and the accuracy of its evaluation.

"Hardware" issues also cannot be separated from the source code in an embedded system as they have a symbiotic relationship. Hardware selection and the resulting limitations of it need to be addressed in the source code. The perfect example is the pressure transducer used in the Intoxilyzer 5000EN. When CMI designed the machine, it decided to use a transducer with a certain defined range of linear operation. We do not know why this part was chosen, and there are many different considerations that could go into the part's selection: physical size and shape, cost, availability, scientific adequacy, personal preference, contractual obligations, etc. The Drivers are not arguing that CMI made an incorrect hardware choice or that the hardware fails; the argument is that CMI failed to account for breath pressure profiles outside the linear range of measurement when it wrote the source code. If there had been enough memory space, source code could have been written to account for non-linear operation, but that was not done here. This should be viewed as both a hardware issue and a software issue, which is the nature of an embedded system. The State's attempt to compartmentalize these issues should not mislead the Court.

C. The Source Code for the Intoxilyzer 5000EN Does Not Comply With the Safeguards, Standards and Controls Necessary to Ensure Reliability and Accuracy of Evaluation.

The Drivers submitted evidence to this Court that the testing method carried out by the source code does not meet the minimum safeguards, standards and controls

necessary to provide foundational reliability. A "normal" test record contains numerous results of the testing process, listed on numbered lines in the middle of the page from 1 to 15. These results include a Diagnostics Pass (line 1); four Air Blanks (lines 2, 6, 10, and 14); two Subject Samples with corresponding Replicates and Breath Volumes (lines 3-5 and 11-13); Simulator Temperature, Control Sample and corresponding Replicate (lines 7-9); and the final Reported Value (line 15). Together, these results represent the final product of the Intoxilyzer 5000EN testing method: a method that is directed, carried out, and evaluated by the source code.

The Drivers presented evidence based on source code analysis, review, and debugging that challenges the foundational reliability of nearly every result line of the test. The Drivers also presented evidence that the machine's source code does not adequately detect and report RFI during the test process, it rejects scientifically acceptable breath samples as deficient samples, and it fails to provide the level of precision necessary to ensure reliability and accuracy of evaluation. Many of the failures of this machine relate back directly to the BCA's own breath alcohol testing machine specification requirements set forth in its RFP. The State failed to rebut this evidence. Accordingly, this Court must exclude the results of the Intoxilyzer 5000EN.

As indicated above, the scientific standards that should be applied are found within the design specifications of the instrument (often referred to as the RFP), as well as the testimony of the witnesses regarding the necessity of each safeguard, standard and control. For ease of discussion, the analysis below will follow the standard "DABACABA" test sequence found in a typical test record.

In beginning this discussion it is important to review the fundamental scientific principals employed in breath testing. Scientific experts and knowledgeable lawyers agree that the proper administration of a chemical test for intoxication – in this case, a breath test – is necessary to ensure that the final breath result reflects the amount of alcohol in the blood. Proper administration of a breath test includes the need to screen out interferents that can cause false positive results. It also requires safeguards be put into place that will ensure that the tested sample actually reflects blood alcohol concentration – for example, methods for distinguishing mouth alcohol concentration from lung alcohol concentration. To ensure that mouth alcohol is not being measured, the Minnesota BCA established various criteria for an acceptable breath sample.[6]

As a person begins to provide a breath sample, the alcohol concentration rapidly increases, then begins to level off as a person nears the end of the breath. This "level slope" (which is not completely level) is believed to be deep lung air and is the desired sample. To accomplish this, the software will not accept a breath sample until a subject's breath profile begins to plateau, defined by an increase in alcohol concentration of less than seven percent. *See* Ex. 59 (Garriott's Medicolegal, p. 230), a typical breath alcohol profile.

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[6] BCA sample acceptance criteria includes:

1. Initial flow rate of .17 liters/second;
2. Maintain a flow rate of .15 liters/second;
3. Blow a minimum of two seconds;
4. Total calculated volume must be 1.1 liters or greater;
5. Have a subject-replicate agreement of less than .006; and,
6. The increase in alcohol concentration must increase at a rate of less than seven percent.

1. Line One: The Diagnostics Performed by the Source Code Do Not Contribute to the Reliability of the Testing Method.

The use of diagnostics is a necessary safeguard to ensure the reliability of the breath alcohol testing method and the accuracy of the evaluation of individual breath samples. A showing that the machine successfully passed diagnostics is one of the elements of the State's required *prima facie* showing to support admissibility. *See Kramer v. Comm'r Pub. Safety*, 706 N.W.2d at 236. The test operator and the BCA rely on the diagnostics line of a test record as an indicator that "all functions were working and responding properly." See Ex. 2, p. 65 (Bates p. 71).

It is vitally important for a forensic machine like the Intoxilyzer 5000EN to have a meaningful, comprehensive diagnostic routine during each test run. These machines are placed in the field, in non-laboratory settings, and they are usually operated by someone with no scientific or forensic training or education aside from three days of limited instruction from the BCA. Often, the test operator is the arresting officer. That officer is not preoccupied with the accuracy and reliability of the scientific process being conducted. Further, the BCA does not have a regular maintenance schedule for these machines, so repairs and maintenance are only performed when the machine is obviously in error (such as a complete failure of the machine) or when the source code reports a detected need for repair or maintenance to the operator or the BCA.

Timothy Black reviewed the self-test portions of the source code to determine what components and processes were actually being checked by the code during the diagnostics routine. Based on his extensive experience working with Z80 programming

language and C code on embedded systems, his expert opinion is that the self-test function is woefully inadequate and fails to ensure that the machine is operating reliably and producing accurate results. Further, numerous components and processes that are prone to failure, error or drift are not being tested or checked by the source code at all.

While some of these items would be indirectly checked by the normal operation of the test, many would not be checked and would still silently affect the accuracy of the results if they failed or drifted. It would not be apparent to the operator or the BCA that the results were being affected by these errors since the source code completely ignores them during diagnostics and they do not cause the machine to crash or fail – a "normal" test record is still produced. As Donald Rumsfeld would say, these material source code omissions are the "unknown unknowns," or things the machine "doesn't know that it doesn't know" about itself. We now review these items individually in more detail.

a. Heating Tubes & RFI Antenna

Black noted in his review of the source code that the heating elements lining the internal and external breath tubing are not checked for connectivity or functionality during diagnostics, nor during any other part of the test sequence. Black stated that it would be simple to include the source code that would conduct this check. The external heating element is connected to the machine with a simple RCA jack on the outside of the machine. When Black received the leased machine from the BCA that was prepared for use by the BCA from its fleet of machines, he noted that the RCA connection was loose and subject to stress as the breath tube was handled. When he unplugged the jack altogether to simulate failure, the machine completed entire test sequences, including

diagnostics, without any change in operation. This simple but effective hands-on debugging confirmed his initial finding that the source code fails to detect whether the breath heating tubes are connected or functional, and it further confirmed that the source code has no way of detecting this through indirect means during testing.

Paragraph 3 of the RFP Performance Specifications for Evidentiary Breath Test Instruments requires in part that the machine must collect breath "in such a manner that condensation of alcohol and moisture are prevented." *See* Ex. 1. BCA forensic scientist Karin Kierzek testified that the heating of the breath tubes is necessary to ensure scientifically valid, reliable, and accurate test results. She explained that the breath tubes are required to be heated because lack of proper heating would allow breath vapors to condense inside the tubes. Because "alcohol loves water," the condensation in the tubes would attract and absorb alcohol vapors as they passed through the tubes. This phenomenon could decrease the alcohol concentration of a subject test if alcohol was absorbed from the breath into the condensed moisture, or it could increase the alcohol concentration if absorbed alcohol was released from the evaporation of the condensation when a subsequent breath sample was blown through the tubes. Additionally, there is a desire to keep water out of the machine since water and electronics are a "bad mix." There was also testimony from BCA employees referencing "sticky valves" that could have presumably been caused by moisture in the machine.

Kierzek testified that the BCA's operator training instructs operators to feel the external breath tubes to see if they are "warm to the touch" , then make written note of that step on the printed test record at the end of the testing process. Her claim is that

training was sufficient to remedy the source code's failure to check the operation of the heating elements in the external heating tube (the internal heating element is a completely different connection, which is also untested by the source code and cannot be felt by an operator since it is inside the machine). Kierzek could not quantify how warm the tube should feel to the operator.

The BCA's Operator Manual contains nothing about the requirement or suggestion of feeling the breath tube during the testing process, except for the phrase "[check] tubes" appearing on one sample test record out of ten sample records. See Ex. 2, pp. 77-86 (Bates 83-92). And, the Operator Manual's "Setup" sequence instructs operators how to connect all the various external plugs *except* for the breath tube jack. *See* Ex. 2, p. 55-56 (Bates 61-62). Since operators are not strictly required to feel the tubes for warmth, and even if they did, such a check would be completely subjective, the only way to ensure that the tubes are heated is to rely on the source code to perform a reliable, consistent diagnostic check on this function. The source code could easily perform such a check, but CMI did not include this programming in the code and the BCA has not asked for it, even though the RFP requires heated breath tubing and it is a necessary part of a valid, accurate, and reliable breath testing protocol. Since the testing method is unreliable, none of the *prima facie* tests presented by the State in these proceedings can even imply that the breath tube heaters were in working order during that test.

Notably, the external heating element doubles as the machine's only mechanism for detecting radio frequency interference (RFI) during the testing process. Kierzek stated that RFI detection is a necessary function in breath alcohol testing to ensure valid,

accurate, and reliable results because RFI can affect the alcohol values and other results that are reported by the machine. The RFP also requires the machine to have RFI detection in paragraph 15 of that document. *See* Ex. 1. The source code performs status checks on RFI presence at various stages throughout the testing process, yet there is no way for the code to detect that the RCA jack is failing or unplugged, meaning the entire antenna could be disconnected from the machine and render it unable to detect the presence of RFI. The machine never gave any error or other message alerting Black to this fact when the jack was unplugged. The machine is able to produce test records that appear valid on their face even during a complete lack of RFI detection capability. There will be more discussion about RFI in another section, but for now it is important to note that the diagnostic routine does nothing to ensure that the RFI antenna is connected and functional. Again, none of the *prima facie* tests presented by the State can reliably ensure that RFI detection was even taking place during each test.

b. Power Supplies

Black testified and reported that the electronic components in an embedded system cannot be powered using electricity directly from a wall outlet. To regulate the current, the circuit boards inside the machine have multiple power supply capacitors that act as gateways to provide particular levels of voltage as needed. The capacitors tend to have a life expectancy of five or six years before they begin to drift and cause unstable readings. The most common failure for these capacitors is the development of an internal hum, which is line interference that causes these instabilities. The line noise will create an

increasingly non-linear error band of readings that can be monitored by the source code to detect when the error band inevitably gets too wide.

The source code should be written to perform diagnostic checks on the stability and performance of these components, but this code does not do that. This critical diagnostic function is completely absent from the source code, leaving the BCA and the test operator with no means of knowing that non-linear behavior and erroneous readings could be generated during the test process. Since the BCA does not employ the proper expert personnel to even know about the need for this diagnostic function, it presumably relied on the expertise of CMI to account for any items like this that should be subject to self-test. Any machines being used today with capacitors that are at least five or six years old would be prone to these non-linear errors unbeknownst to anyone in the BCA. The testimony and report about this problem from Black was uncontroverted. The State's source code expert admitted that he did not review the self-test portion of the source code before or after receiving Black's report.

c. Internal Reference Voltage (.100/.200/.300 "Calibration")

The Intoxilyzer 5000EN has converters that change voltage values to digital values and vice versa. The analog to digital converter (ADC) converts voltage to digital values, while the digital to analog converter (DAC) does the opposite. These conversions are necessary for this embedded system to measure, analyze, and report all of its data. The source code also relies on these components to accurately and reliably convert values back and forth. Unlike the last few items discussed, the source code actually performs a reference check on these components during the diagnostic routine. Black explained that

the source code tests the components' ability to convert voltage into digital values that correspond to .100, .200, and .300. The operator actually sees these numbers appear on the display as it performs this check.

The BCA seems to misunderstand the purpose of this diagnostic function. Kierzek incorrectly testified about this process being a further check on the "calibration of the measuring system" of the machine at those three levels, and the BCA's Operator Manual also erroneously refers to this "Internal Standard" as a check on the calibration of the measuring system at those levels. *See* Ex. 2, p. 120 (Bates 126). In contrast, Mary McMurray correctly testified about the Internal Standard having nothing to do with calibration of the machine. She was aware of this because she personally participated in comparison testing of external standards versus internal standards of a previous model of the Intoxilyzer 5000 during two weeks in Sheboygan, Wisconsin. She further testified that the internal standard almost never failed in her experience with all models of the Intoxilyzer 5000 and the 5000EN.

Aside from the BCA's misunderstanding of the diagnostic check's purpose, Black discovered that this diagnostic check is completely meaningless and does nothing to truly test the conversion reliability of the ADC and DAC. The diagnostic is faulty because it only checks the conversion using one voltage reference value for both converters. The diagnostic will always pass this test because the voltage value is only being compared to itself instead of to an independent value. This makes the test self-referential. This diagnostic is intended to check the reliability of the ADC and the DAC, not the calibration of the measurement system. The source code only uses one reference to

check these components against each other. This is one example of how even the limited diagnostics performed by the source code are still not helpful to establish the reliability of the machine's performance during each test.

Another example of a faulty diagnostic check is the "Simulator Check" function. *See* Ex. 2, pp. 120 (Bates 126). According to the BCA manual, this diagnostic is supposed to check the simulator temperature and error status of the simulator. Black recorded a video demonstration showing the machine completing and passing all of its diagnostics, including the "Simulator Check," while the simulator was disconnected from the Intoxilyzer 5000EN. The diagnostic check on the simulator is also meaningless and does nothing to establish the reliability of the machine's performance during each test.

d. IR Detector Cooling & the Control Sample's Irrelevancy

The Intoxilyzer 5000EN is equipped with a thermoelectric cooling system that cools the detector that measures the infrared light coming through the sample chamber. The detector is critical for measuring ethyl alcohol and interferents. In addition, the source code uses data from the detector for slope detection, sample acceptance, and interferent handling. The detector's sensitivity to infrared light is increased when it is cooled. Kierzek testified that this cooling function is a necessary function to ensure the accuracy, validity, and reliability of the results.

Despite the vital importance of this function to the testing method, the source code does not self-test the cooling system. It is not subject to any diagnostic procedure anywhere in the source code. Black testified that faults in the thermal cooler could result in non-linear behavior or drifting values. This would go unnoticed due to the number of

internal compensations and the forcing of zero and maximum values integrated into the source code. The specifications from CMI state that the life expectancy of the detector is "more than seven years" without specifying how much longer than seven years it will perform reliably. *See* Ex. 44. After seven years, it is reasonable to presume that the detector would become non-linear and be subject to drift. Unless the detector is routinely replaced, there is no way to ensure that old detectors are working in a reliable, linear fashion. There is no evidence that these detectors have ever been replaced.

The State may argue the control sample test is a reliable check on the detector's performance, but that is not sufficient. The simulator solution provides a vapor sample with a very even slope that is free from everything except ethyl alcohol. The detector and other components of the machine are supposed to be precise and reliable enough to detect the variables of human breath, which will have an uneven slope and the possibility of numerous interferents.

When asked whether a control test is a necessary function to ensure reliability of the testing method, Kierzek admitted that she was unsure because many other states do not perform a control test every time a test is run. If the State only proves that the machine is capable of reliably measuring the ethyl alcohol content of a pure fixed simulator solution, then it should only use the machine to test the alcohol content of the simulator solution. Relying on the testing of an ideal control sample as an indicator of reliability for testing of less-than-ideal human breath is like relying on an airplane's ability to fly in perfect conditions as an indicator of its ability to fly in adverse variable conditions. Black, Dr. Karl Schubert, and several BCA witnesses all referred to this

distinction as comparing routine cases to "marginal" ones. Passengers on a nose-diving airplane in a crosswind would not be comforted by proof of the plane's reliable operation in typical conditions. This Court should also find no comfort in the Intoxilyzer 5000EN's ability to detect alcohol in a laboratory-quality sample presented to the machine in a closed loop.

Even when testing a laboratory-quality sample, the machine is still imprecise. When Kierzek was questioned about the specification in paragraph 13 of the RFP requiring the systematic error of the machine to be within 3% or 0.003, she said that specification was referring to the machine's ability to test the control sample, not human breath. However, she further testified that the acceptable range of tolerance for testing the control during a test sequence was plus or minus 0.01, or more than 12% of the usual 0.080 simulator alcohol concentration. When asked why the tolerance was so high, Kierzek explained that a larger tolerance was necessary because of "different influences" such as "solution variation," "temperature variation," and "simulator variation." Not only is the control test incomparable to human breath, but the tolerance for error greatly exceeds the systematic error limitations set by the BCA in the RFP. This Court should not be impressed with the machine's ability to test control samples as any indicator of the machine's ability to test human breath. The control sample is a red herring with no scientific relevance to the machine's ability to reliably test *human* breath and its natural variables.

e. Automatic Gain Control

CMI knew that the components used in the Intoxilyzer 5000EN would be subject to decay and drift over time so it included an automatic gain control (AGC) circuit to attempt to compensate for drift in the embedded system. This circuit purports to adjust various signals and readings to keep them within acceptable levels. While this can be a useful function, the AGC needs to be part of the diagnostics routine of the source code because the AGC circuit itself can become unstable. The source code fails to check the AGC's stability or reliability. If the AGC circuit is unstable, it increases the error band of the entire system because it could mask faults in the IR detector cooling system, infrared light source, filter operation, and power supplies. Black's opinion is that the AGC circuit needs to be subject to self-test before any of those other functions can be deemed reliable and stable. The State did not contest this opinion.

f. Sample and Hold

There is a "sample and hold" circuit in the machine that collects and stores data from the filter readings for use by the source code. This circuit takes a "snapshot" of each filter at precise times when the filter is directly in front of the detector during its rapid rotation. After taking this sample, the circuit holds the data value while it collects more samples. Then the data is retrieved and used by the source code. Black noted that this critical circuit is not subject to any means of self-test during the diagnostics or any other part of the testing process. These circuits are subject to drift and other errors that are undetectable by the source code. The timing of the sample snapshots and the ability to hold the data without modification are both affected by the age of the circuit, line noise

and circuit interference. Black's opinion was that the sample and hold circuit needs to be subject to self-test to ensure the reliability and accuracy of the measurements being used by the source code. The State did not contest this opinion.

2. Lines 2, 6, 10 & 14: The Source Code Does Not Perform Air Blanks in a Reliable Manner.

The ability to perform proper air blanks during the test process is necessary to ensure the reliability and accuracy of the test results. Kierzek agreed with this proposition and the RFP, in paragraph 7, requires the same. *See* Ex. 1. The State must show that the machine successfully completed all four air blanks with readings of .000 to meet its *prima facie* burden. *See Kramer v. Comm'r Pub. Safety*, 706 N.W.2d at 236. The test operator and the BCA rely on the air blank function "to clear the sampling system of any sample, to check the ambient air quality and verify the sample chamber has returned to *the initial* zero reference point."[7] *See* Ex. 2, p. 15 (Bates p. 21) (emphasis added). The diagram on that same page of the BCA Operator Manual shows the flow path for an air blank and indicates that air is drawn through the breath inlet and the pressure transducer, just like the flow path for a breath sample.

The purpose of the air blank is to purge the air from the sample chamber and the breath tubes. Doing so will hopefully avoid cross contamination of alcohol and other interferents from one breath sample to the next while also checking for alcohol in the ambient air. To accomplish these goals, the source code should determine when enough air has been drawn through the machine to purge the air already inside the machine while

[7] As discussed in other areas, the source code actually performs a "silent adjustment" which precludes the return to the initial zero reference point.

it takes measurements of the newly drawn air for the presence of alcohol. Review and debugging of the air blank source code revealed that the source code fails to ensure that this necessary scientific safeguard is performed.

First, the source code does not verify whether any air is actually moving through the system during the air blank function; it simply directs a pump to run for a fixed number of seconds while it takes alcohol readings from the sample chamber. It does not verify whether air is actually moving through the chamber. In fact, Black performed and videotaped a simple debugging test in which he capped the breath inlet tube with a rubber cap to demonstrate that the air blank function passed with no indication of error when no fresh ambient air was drawn into the machine—even when it was impossible for ambient air to be pulled through the machine while the pump ran. There is no guarantee that the machine is actually checking ambient air during air blanks.

Second, the source code does not take measurements from the pressure transducer during the air blank function, so no volume measurement is taken to ensure that fresh air is being drawn into the machine by the pump. The ambient air could be rich with alcohol vapors affecting any individual breath sample or even the control sample and the source code has no way of determining this reliably since the "ambient fail" error can only occur during the air blank process. Since the pump is also not checked during the diagnostics or at any other time for proper operation, the pump could be failing or barely pulling air through and there would be no way of knowing this. The source code could have been written to take breath volume or flow rate measurements from the pressure transducer during the air blank function, but this is omitted from the source code.

Third, the source code silently adjusts the zero baseline for alcohol after each individual air blank without reporting this action in any way. If the alcohol present in the ambient air (or the air still present in the sample chamber) is tested at 0.017 or below, the source code will silently adjust the zero point for alcohol during the next immediate subject sample or control sample to account for that perceived ambient alcohol condition. If the alcohol present in the ambient air tests above 0.017, then the source code reports the error "Ambient Fail" and the test is terminated due to excessive alcohol vapors being present in the room. The test operator is only made aware of ambient alcohol if it exceeds 0.017 as determined by the source code. While 0.017 may seem like a small amount, it is nearly equal to the required 0.02 statutory agreement between the two subject samples. An adjustment of as much as 0.017 can materially affect the determination of the 0.02 agreement that is necessary for a complete valid test and the laws of this State punish the driver with a test refusal if breath samples are more than 0.02 apart.

In addition to consequences suffered by drivers for providing samples more than 0.02 apart, the 0.02 agreement is a necessary scientific safeguard used to determine the presence of mouth alcohol. For example, if mouth alcohol is present in a subject's second sample, the silent adjustment of the air blank preceding that sample could negate this critical scientific safeguard for detecting mouth alcohol. If a silent adjustment is made by the source code up to 0.017, this adjustment needs to be reported so that it can be accounted for, because the alcohol present in the sample chamber may not even be from the ambient air.

The source code is too simplistic to ensure that the air blank process is reliably performing its scientific purpose in the overall testing method. By running the air blank on a simple timer without measuring air volume or flow rate, there is no guarantee that the sample chamber is being purged of the air inside, nor is there any guarantee that ambient air is being drawn into the machine to be tested for alcohol. Because the source code is not ensuring that this necessary safeguard is being reliably performed, any *prima facie* test record showing all four air blank readings at .000 cannot reliably indicate that the sample chamber was purged or that the ambient air was tested for alcohol.

3. Lines 3, 4, 11 & 12: The Source Code Does Not Reliably or Accurately Measure, Evaluate and Report the Alcohol Concentration of Breath Samples.

The Intoxilyzer 5000EN source code does not reliably measure and report only the alcohol concentration of deep lung (alveolar) breath samples when mouth alcohol and/or interferents are present. Additionally, the alcohol readings are subject to erroneous readings due to RFI, internal hum, faulty volume measurement, lack of reliable heating in the breath tubes, and other component failure or drift discussed in previous and subsequent sections of this Memorandum. To avoid repetition, this section will only deal specifically with the source code's inability to reliably measure, evaluate, and account for slope and interferents.

Accurate and reliable measurements of alcohol concentration could be considered the paramount function of this machine. The final Reported Value on line 15 of a test record will almost always be derived from one of the Subject Sample lines (Replicate test results are always equal to or higher than the corresponding Subject Sample). The State

may have provided enough evidence to show that the machine is accurate and reliable when measuring a pure alcohol control sample, but presented no evidence (not even validation studies) to prove the machine's accuracy and reliability with alcohol testing in human breath with its numerous biological variables.

A breath testing method (versus a method for measuring the alcohol content of a control sample) must be able to reliably measure the slope of a breath alcohol profile as well as detect other interferents for the alcohol readings to be reliable and accurate. Simply being capable of accurately measuring a control sample is insufficient to demonstrate accuracy with live subjects.

Kierzek agreed that slope detection and interferent detection are necessary safeguards to ensure the validity, accuracy, and reliability of the test results. The source code handles slope detection through commands and algorithms. Slope detection is designed to ensure that the machine tests deep lung air free from mouth alcohol. In the same fashion, the source code is responsible for the detection and handling of interferents. Depending on the levels present in the sample, the source code will either reject the breath sample entirely or subtract the interferent from the reported alcohol reading. Further still, the source code will only report this subtraction above certain levels.

Most of Black's experience, knowledge, and training is in debugging embedded systems. Black reviewed the source code and observed that the slope detection and interferent detection sections were problem areas for the programmers. These sections are very unorganized and contain wholesale "hacked-in" changes that appear to be

untested. Recognizing the importance of these sections to the overall results, Black performed custom debugging of these functions and found them to be wildly unreliable and inaccurate. Usually his debugging process would include the writing of a "test bench" software program that would be designed to provide controlled inputs directly to portions of the source code. Then the outputs from the source code would be observed to see if they are consistent and in line with what was expected.

This process would normally need to be conducted in his tech lab, where he has access to the various instruments and tools needed to perform the process. However, the restrictions in this particular case prevented Black from copying the electronic source code or having access to it anywhere outside the source code room at CMI's headquarters in Owensboro, Kentucky. Counsel specifically requested access for Black outside Owensboro from CMI, but it denied that request.

As a result of these restrictions, Black built a custom testing rig that simulated repeatable inputs directly into the machine. This way, Black could observe the source code's output and begin to pinpoint what source code errors, if any, would be present. Black has performed similar custom debugging for other source code analysis projects, specifically when access to the source code has been limited or cost prohibitive.

The State's source code expert, Dr. Steven Nuspl, characterized this process as "black box testing" instead of debugging. However, black box testing is done without regard to the source code at all. In this case, Black was using his experience, knowledge, and training to exercise portions of the source code, make deductions and draw inferences about the source code's behavior.

Black's testing rig used an industry-standard 4-channel air valve body employed in medical applications. This component was responsible for producing variable controlled pressure levels and repeatable mixtures of four substances. He could also regulate the introduction of these substances at different moments during the sample, simulating slope. He attached each channel to bottles containing liquid solutions of four individual substances: clean distilled water (to simulate clean air), ethyl alcohol (to simulate breath alcohol), methyl-ethyl-ketone (MEK) (a common interferent found in human breath), and vinegar (chosen because the source code made mention of a test to isolate vinegar).

Paragraph 14 of the RFP requires the machine's response to various interferents to be determinable by testing various concentrations of known interferents on the machine to observe its handling of these substances. Accordingly, Black expected the machine to behave consistently when he introduced repeated inputs from his testing rig. To the contrary, his testing revealed that the source code behaves unpredictably when interferents are introduced into the machine. He also noticed that the source code was unable to accurately measure breath volume no matter what pressure profile or amount of volume he introduced to the machine. Because so many errors were occurring at once, Black realized that his testing rig was not specific enough to isolate individual errors. However, the testing rig confirmed his initial suspicion that the slope detection and interferent detection portions of the code were error-prone. Nuspl did not perform any debugging on the source code, and he only performed a cursory static review of the code, yet proclaimed the source code to be free of errors and dismissed Black's findings as

either hardware/design issues or unsubstantiated assumptions. Nuspl's limited code review and complete lack of debugging is unconvincing compared to the hundreds of hours that Black spent debugging the source code.

Paragraph 10 of the RFP requires the machine to indicate an alcohol concentration of 0.000 when analyzing alcohol-free samples. However, Black observed that the machine reports values above 0.000 even when no alcohol is introduced into the machine. He produced printed test records indicating examples of some of those instances. *See* Exs. 21 (clean air), 23 (clean air), 25 (clean air, "INV" -- invalid reading, indicating an early peak of alcohol detected), 29 (clean air), 38 (only glue present), 39 ("INV" reading, only glue present), and 40 (clean air, "INV" reading). One of his video demonstrations regarding volume measurement also captured this phenomenon on film. *See* Ex. 20. The State's witnesses did nothing to determine how this phenomenon was occurring and provided no explanation or theory about it. The testing method carried out by the source code does not satisfy the RFP specifications and the State has not proven otherwise.

4. The Source Code Does Not Use the Replicate Reading Function for Its Intended Diagnostic Purpose; Rather It Is Used to Reject Otherwise Acceptable Samples.

The source code takes a replicate reading of the alcohol concentration in the sample chamber within milliseconds of measuring the alcohol concentration of the subject sample tests and the control sample. The replicate readings are always equal to or higher than the subject sample readings; Kierzek testified that she could not recall ever seeing a replicate reading that was lower than a subject sample. This made sense to Kierzek because a human breath slope will always be rising slightly.

Minnesota is the only state that uses this replicate function as part of its breath testing method. The State presented no evidence to indicate that replicate testing is a necessary part of the breath testing method to ensure valid, accurate, and reliable test results. However, the source code causes otherwise acceptable subject samples to be rejected if the replicate alcohol reading is 0.006 or higher than the subject sample. In Kierzek's opinion, the subject sample is rejected in these cases because a high replicate reading indicates that the driver did not provide a deep-lung air sample, despite the sample having already passed the sample acceptance criteria. Once the otherwise acceptable subject sample is rejected due to the lack of subject-replicate agreement, the subject's alcohol reading is erased and gone forever.

For example, if a driver provided a breath sample that met all other sample acceptance criteria and was measured to have an alcohol concentration of 0.079, and the replicate reading was measured at 0.086, the machine would reject the subject sample, erase the alcohol reading from that sample, and display a "please blow" command. The operator is trained to assume the driver did not provide an adequate sample, even though the driver has no control over the replicate reading. The command "please blow" fails to provide information with sufficient granularity for an operator to draw this conclusion.

If this process happens near the end of the four-minute window to provide a subject sample and the driver runs out of time to provide another acceptable sample, the entire subject sample will be labeled as deficient. That deficient sample can be used to accuse the driver of test refusal. The only real function that replicate testing provides is a means to reject otherwise acceptable subject samples.

The 0.006 threshold is an arbitrary number chosen by the BCA, and the State provided no scientific basis to support the use of replicate testing or the use of a sample rejection threshold. However, McMurray testified that when she worked in the breath testing section of the Wisconsin State Patrol's Office, its breath testing program was the first in the country to use replicate testing with the Intoxilyzer 5000 (a previous model of the Intoxilyzer 5000EN). This was done at the suggestion of CMI. At that time, she was told by representatives from CMI that replicate testing would be a diagnostic tool to monitor the reliability of the electronic measurement system in the machine. There was no recommended threshold for sample rejection from CMI; the source code would simply print out the accepted subject sample and the subsequent replicate reading without regard to how far apart the readings were. CMI instructed her department to monitor the gap between these readings to determine when they started drifting further and further apart. Its instruction to her department was that an individual machine would need maintenance or repair when those readings drifted to a certain level. The sole purpose of the replicate reading was to provide diagnostics for the reliability of the internal measurement system.

McMurray stated that the Wisconsin breath test program initially used this feature, but eventually removed it from their program because it allowed the machine to produce test records with significant differences from the subject and replicate readings on the same subject sample. This provided drivers with ammunition against the accuracy of the Intoxilyzer 5000, and since they did not deem this extra calibration feature to be necessary, it was removed to prevent further challenges.

The Minnesota BCA's use of the replicate reading as a means to reject otherwise acceptable samples is completely unrelated to the intended diagnostic purpose of replicate testing. In fact, the BCA's introduction of the sample-replicate agreement threshold stymies the source code's ability to determine when the measurement system is in need of maintenance or repair.[8] Any gap in readings that exceeds 0.006 will be ignored since replicate tolerance rejection is not recorded by the source code or otherwise reported as such; the source code simply reverts the process back to the "please blow" instruction.

It should also be noted that when the replicate tolerance threshold requires a subject to blow again, the source code does not run an additional air blank to purge any existing air from the sample chamber. Starting with a clean sample chamber should be just as important then as it is when the subject is first asked to provide the sample. This is another flaw in the air blanking system that is created by the unnecessary replicate tolerance threshold. The entire replicate testing routine and its tolerance threshold can only be characterized as bad science. The routine rejects acceptable samples, causes samples to be provided into a sample chamber that has not been tested for ambient alcohol, and eradicates an important diagnostic function recommended by CMI.

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[8] It appears that the Minnesota version of the Intoxilyzer 5000 did not always use this .006 subject replicate threshold, but simply reported the replicate regardless of the gap in readings, consistent with McMurray's understanding of the purpose of replicate testing from CMI. *See Bond*, 570 N.W.2d at 805 (describing how appellant Nelson's first subject test reading was .129 with a replicate reading of .136, which would not be possible with a .006 rejection threshold); *Jasper v. Comm'r Pub. Safety*, 642 N.W.2d 435, 438 n.3 (Minn. 2002) (discussing testimony of BCA witness explaining introduction of replicate threshold in series 68-01 Intoxilyzer models).

5. Lines 5 & 13: The Source Code Does Not Accurately Evaluate Breath Volume and Number of Attempts.

Accurate measurements of volume are necessary to ensure the reliability and accuracy of breath test results, as indicated in paragraph 4 of the RFP and CMI's specifications, and due to the role of volume measurement in sample acceptance (a minimum volume of 1.1 liters must be measured). *See* Exs. 1 and 44. The volume measurements themselves are test results, which the State uses to characterize the breath sample as a "strong" or "weak" sample. *See* Ex. 2, p. 11 (Bates 17) (instructing operators that the measured volume can be compared with tables for predicted forced vital capacity (FVC) "to determine if a subject has provided a full and complete exhalation"). This is also consistent with paragraph 3 of the RFP requiring the machine to test "end expired breath essentially alveolar in character." *See* Ex. 1.

The Intoxilyzer 5000EN does not directly measure volume. Instead, the source code calculates the volume based on pressure and time. Any interruption in breath flow – however slight – resets the cycle to the beginning of a breath sequence. Thus, the source code interprets a driver's inadvertent, mid-exhalation, flick-of-the-tongue over the mouth piece as a basis to discard the entire breath sample and reset the sequence - and it does so without providing any notice to the operator or the driver. This software flaw is likely to lead an operator to conclude the driver is not cooperating.

The Drivers presented uncontested evidence that the Intoxilyzer 5000EN source code is not capable of accurately measuring and evaluating breath volume. Black conducted physical tests on the machine using his own breath and his 4-channel testing

rig, and he observed that the volume measurements were inconsistent and unreliable. He then devised a very simple plan to test the pressure transducer and the source code's handling of its data. He constructed a simple plunger testing rig using PVC pipe with marked volumetric measurements and an analog pressure gauge to introduce repeatable inputs of air volume into the machine at different levels of pressure. A video demonstration of this simple testing rig and its operation was submitted to the Court. *See* Ex. 20. Also, a chart of data resulting from combinations of three pressure levels and three air volumes was included in Black's last report. *See* Ex. 16, p. 4; *see also* Exs. 24, 26-32 (printed test records corresponding to chart data).

The chart revealed that the source code was unable to accurately measure volume at all and the degree of error was not linear. The source code was least accurate when measuring all three levels of breath volume at a pressure of approximately 1 psi (volume measurements calculated by the source code were 61%, 54.5%, and 64% higher than actual volume on the samples done at 1 psi). The source code was also grossly inaccurate at pressure levels of 2 psi and minimal psi (simply allowing the plunger to fall using gravity).

The source code's inability to calculate volume negates a critical scientific safeguard which should protect against the measurement of mouth alcohol. For this reason alone, all test results should be excluded. The source code prematurely accepts the sample before the volume threshold is actually met. Black's testing reveals that if a driver blows with approximately 1 psi, the source code will measure 1.1 liters of air when only about 60% of that amount, or about 0.6 liters, is actually collected. The source code

could accept a sample with only 0.6 liters of air, which may include mouth alcohol. Because the State cannot guarantee the sample reading is free from mouth alcohol, the test results are not scientifically valid or reliable and therefore must be excluded.

The State tried to downplay the role of volume measurements in the overall reliability and accuracy of the results. It made little to no attempt to explain Black's data and it did not perform its own volume experiments. The State was given an opportunity to continue the hearing to have more time to conduct further study of the source code or conduct its own experiments, but elected not to.

The State will also attack Black's simple testing rig to undermine the credibility of his data. The only possible inaccuracy from the testing rig would be from leaks; leaks would result in *lower* volume readings than expected, not higher ones. The State cannot escape the laws of physics. It did not prove that the Intoxilyzer 5000EN source code is able to ever accurately calculate breath volume. As a result of the lack of this necessary scientific safeguard there is no guarantee that any of the tests submitted in this proceeding contain accurate breath volume measurements. Those results are in error. This Court cannot ignore those faulty measurements and assume that the rest of the measurements on the test records are reliable and accurate.

The State may argue that the volume issue is a "hardware" issue instead of a "source code" problem. The Drivers are not arguing that the hardware is faulty or needs to be replaced. Black testified that the source code should have been written to account for non-linear values from the transducer, but obviously it is not. In fact, Black's testing showed that the source code does not properly calculate linear values from the transducer.

The pressure transducer operates within a specified linear range, from 0-1.45 psi and the data from Black within that range was the least accurate. This demonstrates that the source code is the problem, not the hardware.

The "puff count" feature added to the source code at the BCA's request is not a necessary function, but the BCA uses this feature to accuse drivers of refusing to provide a proper breath sample. According to its standards and operator training, a high puff count is indicative of a driver "messing with" the test. When used for that purpose, the reliability and accuracy of the puff counter is critical. Even the BCA witnesses testified that this function is prone to counting one puff as two puffs, that it is sensitive enough to count a flick of the tongue as a separate attempt, and that the amount of pressure used by the driver can change the behavior of the puff counter. *See* Ex. 7, p. 28. Even this unnecessary function included in the source code at the request of the BCA does not work properly.

6. The Source Code Does Not Adequately Detect or Report the Presence of RFI Within the Required Range of Frequency.

Every aspect of operation and measurement performed by the Intoxilyzer 5000EN is prone to error when radio frequency interference (RFI) is introduced. This interference creates line noise in the system during the testing process, causing it to behave in unpredictable ways and create readings that are randomly skewed. For this reason, a reliable RFI detection system is necessary to ensure the reliability, validity, and accuracy of an infrared breath alcohol testing machine. Kierzek agreed with this. Paragraph 15 of the RFP requires the machine to prevent false positive or negative measurements of

alcohol caused by the presence of RFI of 10 voltmeters or less in the frequency range of 0.5 to 1000 MHZ. *See* Ex. 1.

As discussed earlier, the source code does not monitor the RFI antenna to verify that it is connected or in proper working order. A typical test record does not indicate that the results were not affected by RFI.

Even when the antenna is properly connected to the machine and in working order, the antenna is not capable of detecting or reporting any RFI outside the narrow bandwidth of 148 to 156 MHZ, which is the typical bandwidth of RFI created by 1980's police radios. Black performed RFI testing with an industry standard signal generator using values from 1 to 1000 MHZ at an output of one voltmeter. The source code only flagged RFI inside the narrow band of 148 to 156 MHZ. It ignored everything else. The source code is unable to report the presence of RFI in any band below or above that limited range, even when the hardware is connected.

McMurray testified about her experience with all models of the Intoxilyzer 5000 and 5000EN regarding RFI detection. She has participated in experiments where cell phone RFI produced erroneous readings on all models of Intoxilyzers. Kierzek agreed that RFI can affect all readings provided by the Intoxilyzer, including the alcohol readings themselves, which is why RFI detection is a necessary safeguard.

The source code is written to perform RFI checks throughout the testing process. When it performs these checks, it only communicates with the antenna circuit to see if RFI is being detected at that moment. The source code does not measure the strength of the RFI or its bandwidth; it only reports a binary answer of presence or absence of RFI.

Because CMI represented to the BCA that its machine met the RFP specification of detecting RFI from 0.5 to 1000 MHZ, apparently the BCA has never seen fit to test this representation itself. This is a failure to comply with the testing method as defined by the BCA in the RFP. Notably, CMI's Specification brochure makes no mention whatsoever regarding the machine's ability to detect, prevent, or report RFI. *See* Ex. 44.

Even after being presented with Black's findings, the BCA still did no RFI testing for the Court's consideration. No evidence was presented by the State to show that the machine's RFI detection and the source code's reporting of RFI meets its own specifications. Nuspl hypothesized about an explanation for Black's findings, but he did not do any testing of his own. Instead, the State only present one old study that had been found online, performed in Europe at CMI's request, that verified the machine's sensitivity to RFI. *See* Ex. 52, p. 8. This is a failure to comply with the testing method as defined by the BCA in the RFP. Notably, CMI's Specification brochure makes no mention whatsoever regarding the machine's ability to detect, prevent, or report RFI. *See* Ex. 44. The State has not met its burden to prove that the Intoxilyzer 5000EN source code reliably and accurately detects and reports RFI in the range of 0.5 to 1000 MHZ.

7. Errors in the Intoxilyzer 5000EN's Source Code Produce False Reports of "Deficient Samples" and Artificially Raise Reported Alcohol Concentrations, Rendering the Results of the Current Version of Software Invalid and Unreliable.

a. The Drivers demonstrated that the current slave software causes the machine to falsely report "deficient samples," even when a subject provides a valid sample.

The problems with deficient samples are directly related to the inadequacies in the

software to properly perform all functions required for a scientifically valid and reliable test. In September 2006, the BCA first noticed a problem with the current version of software. BCA staff reviewed video of a peace officer administering a breath test to a woman. Despite the woman's sincere attempts to provide an acceptable sample, the machine deemed her breath samples "deficient."

Internal testing revealed that the current version of software had different acceptance criteria than the previous version of software. *See* FN 6, *supra*. The BCA summarized its findings of the problems with the new software in an email to CMI, which stated:

> The acceptance of samples blown into the instrument is dependent on which version of software the instrument is running. Acceptance is also dependent on how the subject provides the sample, i.e. soft through very hard . . .
> *See* Exhibit 7, page 28.

In sum, the new software always required the test subject to provide more than 1.1 liters of air; in some cases, the BCA reported that it was necessary for the driver to provide 4.1 liters of air for acceptance, "if it will accept it at all." *Id*. As a result of this error drivers who agreed to submit to a breath test and attempted to complete the test were charged with the crime of test refusal after the machine rejected their otherwise-valid samples. Ironically, the police practice of telling subjects to "blow harder" would exacerbate this problem, as this software error becomes more pronounced at higher breath pressures.

After this problem with the software became public knowledge, the BCA claims to have altered its training of Minnesota peace officers to instruct drivers to blow softer in

cases where the machine was rejecting subject samples. When pressed, the BCA could not identify any change to the training and acknowledged that it never informed operators of the problem.

While in search of a better solution, BCA employees corresponded further with CMI sales staff. The BCA now admits, however, that CMI claimed to be working with a different version of software. This added another layer of complexity to both entities' ability to identify and solve the problem of falsely reported deficient samples. Eventually, based upon testing its unique version of the slave software, CMI employees speculated that the deficient sample errors were likely a result of changes made to the "interferent detection" modules of the slave software. The redesign of this portion of the software increased the time needed to perform calculations on the breath sample. This meant that the source code required larger breath volumes to accept the sample.

Although Minnesota law requires a minimum of 1.1 liters of total breath volume, the new slave software always requires the subject to provide a greater volume than previous versions of software. This software defect is an unintended consequence of CMI tinkering with the software and changing the acceptance criteria without BCA consent.

BCA witnesses admitted that this software error is still present in the current slave software implemented statewide. BCA records reveal this error has resulted in a 337% increase in "deficient sample" test records where the subject provided a sample greater than 1.1 liters of air. Exhibit 7, p. 34. There was also nearly 10% increase in "test refusals" where the reported breath volume was less than 1.1 liters. *Id.* This, coupled

with the machine's failure to properly measure volume in the first place, further prevents a cooperative subject from meeting the 1.1 liter requirement.

Despite known errors, stopgap solutions to bypass the errors, and efforts to fix the errors, the BCA has refused to test or install a software patch that addresses this error. The BCA admitted that political concerns, not scientific method, drove the decision to leave this current software error in place. The uninstalled "fix" to this error has remained untested due to direction from the Office of the Attorney General.

b. The Drivers demonstrated that the current slave software reports higher alcohol concentrations than previous versions.

Besides falsely reporting breath samples as deficient and secretly increasing the total volume necessary to complete a test, another byproduct of this error is a software-induced increase in reported alcohol concentrations. Tests performed on previous versions of the slave software not only avoided false reports of deficient samples, those tests also reported lower alcohol concentrations.

This is due to the nature of this software error. Because the current version of slave software requires a higher volume than the old version, test subjects are required to provide more breath. It was established that breath profiles on the Intoxilyzer always increase in value – the alcohol concentration in the breath rapidly rises before eventually "leveling off" (which in reality is not level, but is merely a continued increase of no more than 7%). *See* Exhibit 59, p. 230 (Harding, Patrick, B.S., "Methods for Breath Analysis," Garriott's Medicolegal Aspects of Alcohol, 5th ed. (2008). Under older versions of the slave software, a valid test could be concluded at 1.1 liters of air. Under this new

version, tests cannot be concluded at that level of breath volume. In fact, some tests can require 4.1 liters of air or more. *See* Exhibit 7, p. 28.

Because of this error, every test subject is now required to provide more air, erroneously and arbitrarily increasing the time that it takes to provide a sample, which in turn increases the final reported alcohol concentration.[9] A softly blowing subject will test slightly higher than they would have under previous software; a subject who blows hard could test substantially higher than they would have under the previous software, up to 15% higher (this figure is based upon the BCA's own 2006 study which confirmed that this error exists).

In this case, one error in the slave software causes three distinct problems for test subjects. The first problem is that otherwise valid samples will be rejected as deficient, resulting in the subject being deemed to have refused testing. This situation did not exist on the previous versions of slave software. Likewise, the current software is overly sensitive to slight disruptions in the breath profile being provided, and silently discards the current sample and starts anew. The final problem is that the current version of the source code reports a higher alcohol concentration than earlier versions of the software. Without a new validation study using simultaneous blood and breath testing there is no guarantee that this higher alcohol concentration is accurate.

All of these problems underscore the fact that the test results produced by the

[9] The BCA admits it did not perform simultaneous blood and breath comparisons as part of its validation study to check the accuracy of the Intoxilyzer 5000 with the current version of software. BCA witnesses were unable to confirm whether it had performed such a comparison since the Intoxilyzer 5000 EN was introduced in the mid 1990's.

current slave software are scientifically invalid and unreliable, and should not be used to either deem a sample as "deficient" or to identify a specific breath alcohol concentration. The Drivers have demonstrated that the Intoxilyzer 5000EN source code does not produce test results that are valid or reliable.

8. The Testing Method Employed by the Source Code Is Less Precise Than What Is Forensically Acceptable.

Among the multitude of problems seen when analyzing the source code is the lack of precision inherent within the machine itself. To quote Donald Rumsfeld, "a lack of precision is dangerous when the margin of error is small." After the testimony in this case, this court not only knows that the machine is imprecise, but why and just how inaccurate it is. Such evidence goes far beyond an "*alleged* margin for *potential* error," considered and ruled upon by past appellate courts. (*see Hrncir*, 370 at 444) (emphasis added).

Under current Minnesota law, a driver is not permitted to introduce evidence that an Intoxilyzer machine, like all other machines that perform scientific measurements, produces results within a margin of precision. *Grund v. Comm'r of Pub. Safety*, 359 N.W.2d 652 (Minn. Ct. App. 1984); *Schildgen v. Comm'r of Pub. Safety*, 363 N.W.2d 800 (Minn. Ct. App. 1985); *Hrncir v. Comm'r of Pub. Safety*, 370 N.W.2d 444 (Minn. Ct. App. 1985). Although none of these decisions were the product of any in-depth legal or constitutional analysis, they are, nonetheless, the law.

Courts have, for decades, relied only on factors visibly obvious to the operator (such as air blank and simulator solution concentrations) as evidence of sufficient

trustworthiness of the machine. "If the two tests give the expected results, 'this would seem to be almost incontrovertible proof not only that the chemicals are proper but the instrument is in working order." *Bielejeski v. Com. of Pub. Safety*, 351 N.W.2d 664, 666 (Minn. Ct. App. 1984). This reliance fails to take into consideration the multitude of calculations, safeguards, diagnostic checks, and conversions that the source code performs outside of the visible observations of the officers. All of these operations are performed by this integrated system.

As this Court pointed out during the hearing, none of these courts (or their litigants) had the benefit of access to the source code to either explain or quantify the machine's lack of precision. After the testimony in this case, this Court is the first to be made aware that this is not an "*alleged* margin for *potential* error." *Hrncir* at 444.

All science is subject to some error in measurement from any number of sources. Some measurement errors may be from variations in the subject sample, some from bias and some from the limitations of the technology. Normally, this is taken into consideration and in fact the BCA claims to take such potential error into consideration in calculating BrAC. Witnesses from the BCA repeatedly reminded the court that although they personally have not done any studies to determine the actual error associated with such testing, they just "give the benefit to the driver" and take the lowest number reported. This proclamation seems to suggest altruism on their part instead of the reality that doing so is cheap, expeditious, and might be good enough most of the time. But good enough most of the time is not scientifically sound and still casts a net wide enough to leave drivers charged with DWI who should not be.

Dr. Karl Schubert's uncontroverted testimony is that the Intoxilyzer's results are imprecise based on mathematical shortcuts and processor limitations. He further testified, based on his review of the source code, that the study done by Rod Gullberg properly quantifies the imprecision of the machine. Finally, he testified that if a driver was precluded from introducing the degree of imprecision before the fact-finder, certain results would not be scientifically valid or reliable. The State's truncation and mathematical shortcuts in reporting BrAC does not accurately account for the actual lack of precision build into the design and implementation of the source code of this machine.

An additional contributing factor to consider when looking at the Intoxilyzer 5000EN's lack of precision is the extensive testimony regarding the difficulties and challenges in dealing with human breath. This machine, as well as officer training, is in theory designed to assist in eliminating the variables in biological sampling inherent in attempting to measure the amount of alcohol found in a person's breath. Those include, among other things, an individual's physical ability to provide a sample (lung capacity, size, gender, illness), the breath temperature (as evidenced by the heating and checking of the warming of the breath tube), breath volume and flow rate. The source code of this machine is designed to monitor sample acceptance based on many of these factors. All criteria are necessary to eliminate the variables that lead to an inaccurate breath alcohol result. Yet, there has been lengthy testimony regarding the challenges of the Intoxilyzer in completing these tasks in a scientifically accurate, reliable and repeatable fashion.

Allowing test results in cases where the driver has provided a test result at the thresholds of criminal sanctions, .04, .08, and .20, fails to acknowledge what we now

know to be true: this machine is not capable of meeting CMI's claimed ±3% precision standard[10] and in fact, the machine is not even capable of getting any closer precision than a ±10% accuracy.

In the end, the only thing more outdated than the Intoxilyzer 5000EN used to convict drivers is the case law used to justify its continued admissibility. Regardless of the lack of wisdom in prior case law, this is the state of the law. Assuming the Court follows existing law, it only has one real remedy to ensure that the science being used in the courtroom is accurate and reliable. That remedy is exclusion of all test results.

III. IF THIS COURT DOES NOT EXCLUDE ALL TESTS, IT MUST CONSIDER OTHER APPROPRIATE RELIEF.

If this Court does not exclude all tests there are at least four other remedies which it can fashion. First, this Court can exclude all test results that involve a deficient test or deficient sample. Secondly, it can exclude test results near the levels of .04, .08 and .20. Third, the Court can require that juries be provided with information about the lack of precision in the test results. Fourth, it can order that the State lose the presumption of reliability allowing introduction of the test results, require an expert to validate the results, and mandate a curative jury instruction.

A. THE COURT SHOULD EXCLUDE ALL TEST RESULTS THAT INVOLVE EITHER A DEFICIENT TEST OR DEFICIENT SAMPLE.

The Court is well-aware of the testimony of Dr. Karl Schubert regarding slope detection and sample acceptance criteria. *See e.g.* Ex. 46. As argued above in sections IIC4 and IIC7, the Intoxilyzer rejects otherwise sufficient samples and the Court must

[10]Exhibit 1, para. 13.

exclude those tests from all proceedings.

B. THE COURT SHOULD EXCLUDE TEST RESULTS AT OR NEAR .04, .08 AND .20.

The Defense will not reargue the points established in section IIC8 above regarding the imprecision of the machine. If this Court does not exclude all tests based upon the lack of precision, it should at a minimum exclude test results near the critical thresholds of .04, .08 and .20.

C. THE COURT SHOULD ORDER THAT DRIVERS BE ALLOWED TO PRESENT EVIDENCE TO A FACTFINDER THAT THE RESULT OF THE DRIVER'S INTOXILYZER TEST IS IMPRECISE.

If the court determines that test results should not be excluded from a driver's jury trial or implied consent hearing, the court must, at a minimum, allow the driver to present evidence to challenge the precision of the result. To deny the driver the ability to challenge the state's evidence violates the driver's rights to due process and a fair trial.

Due process, as guaranteed by Article I, § 7 of the Minnesota Constitution and the Fifth and Fourteenth Amendments to the United States Constitution, includes the right to a fair trial. *State v. Reardon*, 245 Minn. 509, 513-14, 73 N.W.2d 192, 195 (1955) (citations omitted). This right to a fair trial in turn includes the right to present a complete defense. *California v. Trombetta*, 467 U.S. 479, 485 (1984); *State v. Richards*, 495 N.W.2d 187, 191 (Minn. 1992) (citation omitted); W*ashington v. Texas*, 388 U.S. 14, 19 (1967).

In light of Dr. Karl Schubert's uncontroverted testimony, this court must, at a minimum, rule that drivers must be permitted to introduce expert testimony that

Intoxilyzer results are only accurate within a margin of precision. A jury should be advised that mathematical shortcuts, such as truncation, and processor limitations affect the result. They should be advised as to the percentage error associated with the Intoxilyzer's BrAC result. This is the only way the jury can fully understand the weight that should be given to this evidence.

To hold otherwise would be to hold not only that the results are admissible, but unassailable. Such a holding would deny drivers their right to a fair trial as guaranteed by the Due Process Clauses of both the state and federal constitutions.

D. THE STATE SHOULD LOSE THE PRESUMPTION THAT THE TESTS ARE ADMISSIBLE WITHOUT ANTECEDENT TESTIMONY AND THE COURT SHOULD REQUIRE A CURATIVE JURY INSTRUCTION

Should the Court rule that exclusion is not warranted, at a minimum the Court should clarify to the individual district courts what those results actually mean.

As the Court is well-aware, the legal status quo allows the State to present breath test results as "black and white," quantitatively accurate, "end-all-be-all" evidence of a person's alcohol content. When the legislature enacted Minnesota Statute 634.16 in 1984 it blessed prosecutors and attorneys general with the ability to present these results without requiring the interpretation or testimony from a breath-testing expert. Essentially, the legislature usurped the finder-of-fact's role of determining the validity and credibility of the machine's specific scientific reported value, i.e. the test result before the finder-of-fact is valid and reliable; no expert opinion is necessary to say why that is so.

In deciding that expert testimony is either irrelevant or unnecessary, the legislature relied upon promises and assertions from the BCA that the machine is sufficiently accurate and reliable. The BCA made these assertions, however, without having a sufficiently legitimate basis to claim such accuracy and reliability. As previously noted, the validation studies were not comprehensive. The BCA relied heavily on assertions from CMI regarding the accuracy and reliability of the machine. As noted in CMI's brochure, CMI severely inflated the machine's ability to measure test results with precision. The Defense's experts were able to note numerous problems with the machine in the little time they spent with it. Certainly, if the legislature was aware of the deficiencies of the machine and the lack of diligence performed by the BCA in ensuring reliable results the legislature would not have blessed the datum this machine produces as unassailable.

Of course, as the Court heard, nearly all of these deficiencies are tied to the source code of the machine: something no BCA expert has ever taken the time to review. It is not only the code itself that makes the results untrustworthy, it is the failures and omissions in the code in failing to account for sufficient checks and safeguards that truly make the results suspect.

The BCA is not and never has been a completely independent agent in carrying out the legislative requirements for assuring the reliability of this contraption. Its interest lies in making decisions that are cost effective, such as choosing to shelve a fix for the slope detection because in part it would require more work, more money and more time. It also benefits from proclaiming the Intoxilyzer's accuracy because it is then not

required to testify and be subject to the scrutiny of a jury. These motivations should be given careful consideration when assessing the weight of their testimony in this proceeding.

Since the Court now has evidence regarding the Driver's valid concerns about the machine, it is appropriate, then, that the Court require the State to lay foundational basis for entry of the test results above the automatic presumption. Any test results that return to the individual district courts must be subject to the appropriate evidentiary safeguards that usually accompany scientific data: an expert should be required to testify about the results validity and the State should lose its presumption of reliability that presently guards the allegedly-perfect test results.

Drivers must be allowed to present evidence to judges and juries that their respective test results are not necessarily the final word on one's blood alcohol content. The Minnesota Jury Instruction Guidelines should reflect this fact. This Court should mandate that a curative jury instruction, which states that a specific test result is not in and of itself proof beyond a reasonable doubt of a petitioner's or defendant's specific blood alcohol concentration, is required.

CONCLUSION

The National Academy of Sciences, in its report on the state of forensic science in this country, pointed out,

> Over the last two decades, advances in forensic science disciplines, especially the use of DNA technology, have demonstrated that some areas of forensic science have great additional potential to help law enforcement identify criminals… [t]hose advances, however, also have revealed that, in some cases, substantive information and testimony based on faulty forensic science analyses may have

> contributed to wrongful convictions of innocent people. This fact has demonstrated the potential danger in giving undue weight to evidence and testimony derived from imperfect testing and analysis.

Strengthening Forensic Science in the United States: A Path Forward, National Academy of Sciences Committee 2009, p. S-3.

In many areas of forensic science, what would have been considered good forensic science fifty years ago may not be good forensic science today.

Analogously, our laws also continue to change. We continually strive to have a current version of the law that provides for fairness and justice. Unfortunately, by today's standards, our Government has not sought to provide for such fairness and justice through the use of reliable and accurate technology for the enforcement of its DWI laws.

Up until approximately 1984, DWI/.10 cases were prosecuted with the "Breathalyzer" machine, referred to colloquially as the "Dial-A-Drunk" machine because an officer would literally turn a mechanical knob to balance color changes in an ampoule based upon a chemical reaction with alcohol. The officer would physically ink a needle that he / she would manually push down onto a slip of paper that would give an approximate alcohol reading.

In the early 1980s we ushered in the use of computer technology for breath testing. The State introduced the first CMI Intoxilyzer- a computer that employed infrared technology. Subsequently, the Intoxilyzer was upgraded with the use of the 5000EN and a new Slave EPROM was added. Although not used in Minnesota, CMI started offering the Intoxilyzer 8000 in 2005 which touts even greater advances in accurate breath testing.

Just as prosecutors and courts were in awe of the validity of the Breathalyzer machine used in the early 1980's, prosecutors and courts today still employ that same mindset in supporting the validity of the Intoxilyzer 5000EN. This confidence in such an antiquated device like the Intoxilyzer 5000EN is misplaced.

By today's standards, many of those convictions imposed upon Minnesota citizens with the antiquated Breathalyzer technology of the 1970's and 1980's would not survive current scientific scrutiny. It is almost laughable when one looks at this primitive Breathalyzer technology used to prove guilt if the consequences of DWI were not so serious.

Just as we stopped using the Breathalyzer in the 1980's, this Court now has an opportunity to stop a similar travesty from occurring with ongoing use of the Intoxilyzer 5000EN. This Court should prevent Minnesota residents from being charged with criminal violations and/or license revocations based upon test results that do not pass today's standard of scientific reliability.

It will be unfortunate if twenty years from now lawyers, the courts, and scientists, alike scoff at people having been convicted through the use of the Intoxilyzer 5000EN that employs thirty-year-old Z80 processor technology.

While the Drivers recognize there is a lag time between the development of new technology reaching the marketplace and the financial constraints on government in implementing that new technology, one reaches a point where the time for action has passed. The State has been aware of serious flaws in the Intoxilyzer since at least the mid-1990's when it started to cobble together additions and changes to the machine with

the addition of an improved slave EPROM and numerous source code revisions. These efforts to extend the life and use of this old device allowed CMI to maximize the life cycle of the unit to bolster CMI profits and allowed the State to delay capital expenditures in purchasing new breath machines.

While the State's and CMI's motives may be lauded as financially shrewd decisions, they come at the expense of providing Minnesota residents with appropriate scientific protections for .08 criminal charges and license revocations. At some point, basic justice and fundamental fairness require this court to reject the Government's mentality of "good enough for government work."

We should aim for the highest standards and require more from our criminal and civil processes. Who, besides the Government, uses a 1980's computer to perform work that requires the utmost precision, reliability and confidence?

While the new Datamaster breath testing machine will be implemented within the next few months, the question remains as to what should happen with the cases pending before this court and those Intoxilyzer 5000EN cases yet to occur between now and the date of implementation of the new machine. The court should not reward the State for finally moving to new technology at such a late date. The technology of the Datamaster and the Intoxilyzer 8000 and similar machines has been available for at least five years.

The remaining group of pending alcohol breath tests should be eliminated from consideration by the courts and juries in the consolidated and future implied consent and criminal cases. Such a ruling will not prevent the implementation of public safety standards to deter drunk driving. Such a ruling would simply hold the State to using

reliable and accurate evidence. Defendants can still be prosecuted for driving under the influence and driver's licenses can still be revoked and cancelled based upon other evidence of driving while under the influence regardless of one's alcohol level.

In summary, all Intoxilyzer 5000EN test results must be excluded from trial in the cases before this Court. Alternatively, it can:

a) exclude all deficient tests and deficient samples;

b) exclude test results near the levels of .04, .08 and .20;

c) require that juries be provided with information about the lack of precision in the test results; and/or

d) order that the State lose the presumption of reliability allowing introduction of the test results, require an expert to validate the results, and mandate a curative jury instruction.

January 31, 2011

Respectfully submitted,

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On behalf of the Coalition, the Minnesota Public Defenders Office and the clients of Mr. Patrin.