No. 18-1303

UNITED STATES COURT OF APPEALS
FOR THE FIRST CIRCUIT

JUDITH GRAY,

Plaintiff – Appellant,

v.

THOMAS A. CUMMINGS; TOWN OF ATHOL, MASSACHUSETTS,

Defendants – Appellees.

On Appeal from the United States District Court
for the District of Massachusetts (No. 4:15-cv-10276-TSH)

BRIEF FOR AMICUS CURIAE AXON ENTERPRISE, INC. IN SUPPORT OF DEFENDANTS-APPELLEES AND AFFIRMANCE

Pamela B. Petersen
AXON ENTERPRISE, INC.
17800 N. 85th Street
Scottsdale, AZ 85255
(623) 326-6016
Counsel for Amicus Curiae
Axon Enterprise, Inc.

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CORPORATE DISCLOSURE STATEMENT

Pursuant to Rules 29(a)(4)(A) and 26.1(a) of the Federal Rules of Appellate Procedure, counsel for Amicus Curiae Axon Enterprise, Inc. ("Axon") provides the following corporate disclosure: Axon is a Delaware corporation with its principal place of business in Scottsdale, Arizona. Axon does not have a parent company. As of the date of this filing, BlackRock Institutional Trust Co., N.A. and The Vanguard Group, Inc. each owned 10% or more of Axon's stock.

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STATEMENT OF INTEREST

Pursuant to FRAP 29(a)(2) and (4)(D)-(E), Axon Enterprise, Inc. ("Axon"), formerly TASER International, Inc. ("TASER"), files this Amicus Brief with the written consent of counsel of record for all parties. Axon certifies that no counsel for a party authored this brief in whole or in part, and no party or party's counsel made a monetary contribution intended to fund its preparation or submission. No person other than amici and its counsel made a contribution intended to fund the preparation or submission of this brief. This brief is filed in support of Defendant-Appellees and affirmance of the district court's grant of summary judgment on the 42 U.S.C § 1983 excessive force claim.

Axon is the manufacturer of the TASER® X26E™ Conducted Energy Weapon ("CEW")[1] used on Plaintiff-Appellant Judith Gray ("Gray") in this case. Axon is the world's leading manufacturer of CEW products. As of July 2018, Axon has sold approximately 1,000,000 CEWs to more than 18,000 law enforcement, private security and military agencies in 107 countries. Axon has a keen interest in ensuring published appellate decisions accurately describe its CEW products,

[1] TASER changed its name to Axon effective April 5, 2017. TASER® is a registered trademark of Axon and remains the brand name for its CEW products. As an acronym, TASER is always written in all capital letters. The weapons Axon manufacturers are CEWs, not "tasers." CEW is synonymous with ECD (Electronic Control Device) and CED (Conducted Energy Device), each found in court cases and in the medical, scientific, electrical, and engineering literature.

including their electrical characteristics, risks, benefits, capabilities, and limitations, which are often misrepresented by the media and misunderstood by the general public and courts alike.

Axon is also a major CEW trainer. To aid its law enforcement customers in understanding CEW technology, risks, and safe use practices, Axon developed its CEW Instructor Training Program in 1999. Axon trains and certifies Master Instructors, who then train and certify agency trainers as CEW instructors to train CEW end users within their departments. Since 2004, Axon has sponsored 6,477 CEW instructor courses and has certified 125,000 CEW instructors, including 938 master instructors, worldwide. Axon's extensive instructor network keeps the company current with the best available CEW field-use information, including CEW-associated injuries.

Axon is dedicated to the establishment of clear and practical force guidance that can be effectively incorporated into CEW training to aid officers in their force decisions. It is critical that appellate CEW force decisions not unduly handcuff law enforcement by preventing use of the very tool demonstrated to significantly reduce injuries to both subjects and officers compared to other force alternatives, including hands-on physical force. The relative risks associated with CEW use, therefore, must be viewed in relationship to the comparative risks of other force alternatives, and not in a vacuum.

STATEMENT OF FACTS

A. CEW-Related Incident Facts.

Regarding Officer Cummings' CEW use in this case, the facts are undisputed. After Gray was verbally abusive and displayed physical aggression in approaching the officer, Officer Cummings took her to the ground. Gray actively resisted seizure by refusing officer commands to release her arms from underneath her body for handcuffing. Officer Cummings warned Gray she would be "Tazed" if she did not immediately place her hands behind her back. Gray again refused to comply, telling the officer to "Fucking do it!" Officer Cummings then removed the probe cartridge from his TASER X26E CEW, placed the CEW in the middle of Gray's back, and pulled the trigger. The parties agree this single CEW application in drive-stun (touch/contact) mode for about five seconds was successful in gaining the desired compliance (RA30, 40). Gray released her arms, put them behind her back, and was handcuffed, bringing her resistance to an end. (RA30; *see also* RA202, Cummings depo. at 38:2-4 (describing Gray as "actively resisting arrest"); RA37, Gray depo. at 8:17-19 (admitting "I was in a full-blown manic phase. I really don't know what happened."); RA11, Complaint ¶ 12 (stating "Gray was in the midst of a bipolar manic episode and was highly agitated.")).

It is further undisputed that Gray suffered no injury from the CEW application. Hospital records reflect that "pt. denies any injuries." (RA280).

Photographs of the CEW contact location on Gray's back show only a "slight red area" and no other observable injuries. (RA41; *see also* RA43, use-of-force report noting "Very minor reddening was observed on her back in the area where the [CEW] was used."). Plaintiff's expert testified he did not consider the red marks on Gray's back "an injury." (RA233, Lyman depo. at 41:6-8; *see also* RA244, Lyman depo. at 117:1-19, agreeing drive stun signature marks are not injuries).

Plaintiff's Brief ("PB") claims that "by tasing Gray, Cummings caused her to suffer significant pain and lose consciousness." (PB15, citing RA189). But the record does not support this. Gray testified her memory of the events are sketchy "[b]ecause I was totally out of my mind." (RA190, Gray depo. at 42:6-12). When asked about her pain, she said "I had pain all over" but from what "I don't know." (*Id.* at 42:16-20; *see also* 43:2-24, describing "Back pain, leg, hip pain. I was in pain from being in restraints."). And although Gray also testified, "something bad happening and I passed out," she then backtracked:

> Q. What makes you think you passed out?
>
> A. **I don't know whether I passed out or not**. It was just that one minute, I was one place, and the next minute, I was at the hospital.

(RA190, Gray depo. at 43:14-24, emphasis added). There is no medical or other expert evidence in this record that Gray ever lost consciousness from the CEW drive stun or otherwise, or that a CEW touch-stun back application is even capable of causing such an effect.

B. TASER X26E CEW Electrical and Operational Basics.[2]

An X26E CEW is used primarily in two ways: (1) a probe deployment in which two small metal darts are expelled from a cartridge via compressed nitrogen, with electrical impulses transmitted into the target through very thin insulated trailing wires; and (2) in drive-stun (touch/contact) mode,[3] wherein the CEW is physically pressed against the subject without a cartridge or with an expended (empty) cartridge attached (Ex. 1 ¶ 8). In probe mode, the CEW is designed to transmit stimuli through very short duration low charge electrical pulses that interfere with the command and control systems of the body to temporarily incapacitate the target (*Id.* ¶ 9). In probe deployment mode, Axon's patented Neuro-Muscular Incapacitation ("NMI") technology affects both the sensory and motor nervous systems to cause incapacitation (*Id.* ¶ 5). To achieve NMI an adequate probe

[2] The following facts, together with photographs and illustrations, are contained in the declaration of Magne Nerheim, an electrical engineer and inventor of the Shaped Pulse™ waveform technology (Pat. 6.999.295) utilized by the TASER X26E CEW (Ex. 1, Nerheim Dec. ¶¶ 3-6). This declaration is also posted on Axon's website at www.axon.com/legal under Reference Materials.

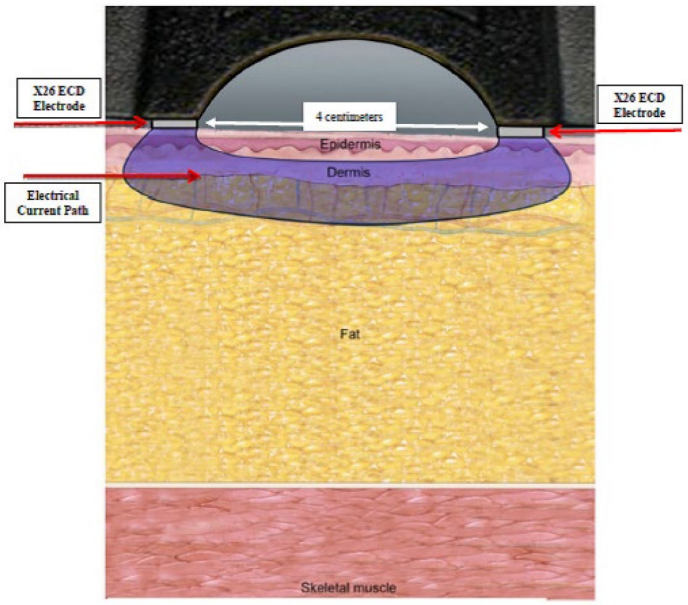
[3] The term "drive stun" originally described forcefully pushing the front of the CEW into specific points on the body where nerve bundles were close to the surface of the skin to optimize the intended effect and increase the probability of achieving compliance (Ex. 2, Ho Dec. ¶ 16). However, not all CEW contact exposures are technically "drive" stuns; they simply involve the CEW being touched or placed into direct contact with a subject (*Id.*), as happened here.

spread is required to ensure major muscle groups between the darts are affected by the delivered electrical charge (*Id.* ¶ 10).

In drive-stun mode without a cartridge as used here, electrical impulses are transmitted superficially through two fixed electrodes on the front of the CEW, which are only 1.6 inches apart (*Id.* ¶ 12, depicted below). Because the electrical current in a drive-stun application is confined to such a small localized electrical stimulation area between the two electrodes on the surface of the skin, it does not create any significant motor-nerve mediated muscle mass involvement and does not result in incapacitation (*Id.* ¶ 13). The illustration below depicts the path and depth of delivered electrical charge from a CEW drive-stun based upon finite-element modelling:[4]

[4] This illustration was discussed in *Glowczenski v. TASER Int'l, Inc.*, 2012 WL 976050, *7 (E.D.N.Y. March 22, 2012) (noting electrical charge does not penetrate the dermal fat layer into skeletal muscle of recipient). *See also* Legal Aspects of Conducted Electrical Weapon Injuries, Wounds, and Effects, Ch. 8 at 149, J.D. Ho et al. (eds.), Atlas of Conducted Electrical Weapon Wounds and Forensic Analysis, Springer (2012).

Electricity arcing between fixed electrodes on CEW without a cartridge attached



Thus, a CEW drive-stun is primarily used as a pain compliance tool.[5] (*Id.*; *see also* Ex. 2 ¶ 18).

In any given electric circuit, the total power is limited by and cannot exceed the output of its power supply (Ex. 1 ¶ 16). An X26E CEW's power source consists of a battery of two 3-volt cells (Duracell® CR123), such as those commonly used in some digital cameras (*Id.*). In a probe deployment, delivered electrical charge is also limited by the very small diameter (36 gauge, 127 microns) cartridge wires between

[5] An officer may use CEW drive stuns for purposes other than pain compliance, *e.g.*, as a distraction tactic or countermeasure to gain separation from the subject; to cause a subject to release his grip on something for safety reasons; and, with an expended cartridge attached, to complete or expand the electrical circuit after a single probe strike or narrow probe-spread application.

the CEW and the target, which are not capable of delivering large electrical currents like automobile jumper cables or home electrical extension cords (*Id.* ¶ 17).

Claims that the X26E CEW delivers a 50,000-volt jolt to a person are simply not true.[6] While the X26E CEW produces an open-circuit peak arcing voltage of 50,000 volts, the output voltage (what actually enters or is delivered to the body) is less than 2,520 volts (*Id.* ¶ 19). Moreover, voltage is not a key measure of electrical safety (*Id.*). As examples, Van de Graff generators found in many science museums and grade schools discharge up to 20 million volts without injury:

[6] Such claims are often repeated by ill-informed courts when construing qualified immunity facts in the light most favorable to plaintiffs on summary judgment. *See, e.g., Meyers v. Baltimore Cty., Md.*, 713 F.3d 723, 728 (4th Cir. 2013) (misstating that TASER CEW probe deployments delivered three separate 60,000 volt shocks to subject). *Compare Bryan v. MacPherson*, 630 F.3d 805, 824 (9th Cir. 2010) ("Upon striking a person, the X26[E] delivers a 1200 volt, low ampere electrical charge through the wires and probes").

Instead, electrical safety depends on the amount of electrons flowing per second measured in amperes (*Id.* ¶¶ 19-20). The X26E CEW output is only ≈0.0019 amperes (*Id.*), less than a single Christmas tree light bulb. *See Mitchell v. TASER Int'l, Inc.,* 803 F.3d 223, 227 (6th Cir. 2015) (comparing X26E CEW's minimal delivered current to a 1 ampere Christmas-tree light bulb instead of a 16 ampere wall outlet). The TASER X26E CEW meets all relevant international electrical safety standards (Ex. 1 ¶ 22).[7]

SUMMARY OF ARGUMENT

"A single, familiar standard is essential to guide police officers, who have only limited time and expertise to reflect on and balance the social and individual interests involved in the specific circumstances they confront." *New York v. Belton,* 453 U.S. 454, 458 (1981) (quoting *Dunaway v. New York*, 442 U.S. 200, 213-14 (1979)). When it comes to CEWs and lawful seizures of unrestrained, noncompliant, actively resisting subjects like Gray—regardless of mental health status—it is objectively reasonable for law enforcement to choose *the* force option demonstrated *least likely* to result in significant injury to officers and subjects alike, including

[7] Panescu, D., "Electrical Safety of Conducted Electrical Weapons Relative to Requirements of Relevant Electrical Standards," *Conf Proc IEEE Eng Med Biol Soc*, vol. 35, pp. 5342-47 (2013) (Ref. O). For the Court's convenience, this and other references ("Ref.") cited herein may be viewed at the following link: https://axonenterprise.sharepoint.com/:f:/g/joinforces/Eo27AvJo0hZGo7hQzotsSRMBqlCgD3TDrZclkNIlyZ9mhQ?e=LULwwE

hands-on physical force. Under these circumstances, irrespective of deployment mode (probe or drive stun), a 5-second CEW application to a subject's back that is reasonably likely to achieve compliance or bring the subject's resistance to an end with minimal injury is constitutionally permissible.

ARGUMENT

I. TASER CEW USE IS A SAFE OBJECTIVELY REASONABLE ALTERNATIVE WHEN PHYSICAL FORCE IS JUSTIFIED.

A. CEW Drive-Stun Injuries Are Limited to Local Skin Effects.[8]

A CEW drive-stun application is much less intrusive than a typical probe deployment and produces substantially less significant physiological effects (Ex. 2 ¶ 17). *See also Hoyt v. Cooks*, 672 F.3d 972, 976 n.5 (11th Cir. 2012) (noting "stark contrast" between probe mode and "much less serious" CEW drive stun, which "results merely in pain, a burning sensation"). CEW drive-stun injuries are typically limited to superficial localized application burns that do not extend below the

[8] The following CEW drive-stun injury profile is contained in the declaration of Jeffrey D. Ho, M.D., an emergency medicine physician at a Level 1 Trauma Center in Minneapolis, Minnesota with substantial mental health, law enforcement, and CEW research experience (Ex. 2, Ho Dec. ¶¶ 2-6). Dr. Ho is co-editor of two academic textbooks on CEWs and authored the chapters on CEW skin effects and drive-stun wounds (*Id.* ¶ 5). Dr. Ho is also a leading researcher and study author of peer-reviewed CEW literature (*Id.* ¶¶ 7-14), including "Impact of conducted electrical weapons in a mentally ill population: a brief report," *Am J Emerg Med.* Sep 2007;25(7):780-785, which analyzes 2,452 CEW field uses on mentally ill and suicidal subjects over a six-year period (*Id.* ¶ 6, Ref. A).

epidermis and dermis layers of the skin (Ex. 2 ¶ 18). Indeed, no published peer-reviewed article or study has ever suggested that a CEW drive stun directly causes any injury beyond minor contact burns (*Id.* ¶ 21).

After conducting a literature review of thousands of volunteers and individuals in law enforcement custody who received CEW drive stuns "with no untoward effects beyond local skin effects," the American Academy of Emergency Medicine ("AAEM") released a Clinical Practice Statement recommending that medical screening of patients post CEW drive stun "should focus on local skin effects at the exposure site, which may include local skin irritation or minor contact burns."[9] (*Id.*). There is simply no generally accepted or prevailing view in the medical or scientific community that CEW drive stuns pose any significant health risk (*Id.* ¶ 22). *See also Caetano v. Massachusetts*, 136 S. Ct. 1027, 1029 (2016) (Alito, J. concurring) (noting stun gun use "posed little, if any, danger of permanent[] harm[]"). Indeed, Plaintiff's expert testified he was unaware of any case where a CEW drive-stun application "caused injuries or death." (RA236, Lyman depo. at 53:14-16).

[9] Later published as Vilke, G.M., "Emergency Department Evaluation after Conducted Energy Weapon Use: Review of the Literature for the Clinician," *J Emerg Med* 2011;40(5):598-604 (Ref. K).

Moreover, a CEW drive stun causes only momentary localized pain and discomfort (Ex. 2 ¶ 18). *See De Boise v. TASER Int'l, Inc.*, 760 F.3d 892, 895 n.5 (8th Cir. 2014) (CEW in drive-stun mode "only causes discomfort and does not incapacitate the subject."). Pain, in and of itself, is not injurious. It is also clear that individuals in the midst of a psychotic episode often experience a mind-body disconnect and do not perceive pain in the same manner as a person in a non-psychotic state (Ex. 2 ¶ 19).[10] Psychotic subjects are often described as being impervious to pain or having a high pain tolerance (*Id.*). But even if a CEW drive stun caused some pain, no published research suggests that CEW-induced stress or pain from drive stuns causes secondary adverse changes in blood chemistry or any clinically significant adverse physiological effect (*Id.* ¶¶ 19-20).[11] The relevant literature is to the contrary (*Id.*).

B. TASER CEW Exposures Are Associated With "Significantly Lower Risk of Injury" Than Other Force Options, Including Physical Force.

[10] Due to this potential mind-body disconnect, Axon's warnings and training expressly advise officers to "[a]void using repeated drive-stuns on such individuals if compliance is not achieved." *See* TASER Law Enforcement Warnings at 6, available at www.axon.com/legal under Product Warnings. However, pain compliance is reasonably likely, as was the case here despite Gray's full-blown manic episode.

[11] Also absent from the CEW literature is any reported incident of a drive stun inducing unconsciousness in a subject (Ex. 2 ¶ 23). Nor is there any established or reported mechanism that would cause a person to lose consciousness from a CEW drive-stun exposure in preferred target zones, which include the back (*Id.*).

TASER's X26E CEW has been studied more than any other law enforcement force option, and its safety and efficacy have been confirmed by hundreds of published, peer-reviewed studies, as well as the vast number of CEW applications without injury (Ex. 2 ¶ 24). *See* Laub, J.H., Director, National Institute of Justice ("NIJ"), *Study of Deaths Following Electro Muscular Disruption* at 30 (2011) ("Field experience with CED use indicates that exposure is safe in the vast majority of cases.").[12] Indeed, a study by six university departments of emergency medicine found "99.7% of those Tased by police suffer no injuries or, at most, mild ones." *See Mattos v. Agarano,* 661 F.3d 433, 454 (9th Cir. 2011) (en banc) (Kozinski, J., concurring in part and dissenting in part) (citing Bozeman study);[13] *see also Hagans v. Franklin Cty. Sheriff's Office*, 695 F.3d 505, 510 (6th Cir. 2012) (TASER CEWs

[12] The NIJ is the research division of the U.S. Department of Justice. It empaneled an impressive group of independent medical and scientific experts to conduct a 5-year study concerning CEW outcomes. The panel's comprehensive 74-page report (Ref. N) (later published in the American Journal of Public Health) is also available at www.ncjrs.gov/pdffiles1/nij/233432.pdf. A comprehensive CEW Research Index with 800 entries is available at www.axon.com/legal under Reference Materials.

[13] Bozeman, WP, "Safety and Injury Profile of Conducted Electrical Weapons Used by Law Enforcement Against Criminal Suspects," 53 *Annals Emerg Med* 480, 484 (2009) (Ref. H). This study examined actual CEW use in the field on 1,201 subjects in six U.S. law enforcement agencies over a 36-month period (*Id.* at 480; Ex. 2 ¶ 25). These subjects had a wide variety of medical and psychiatric conditions, and nearly half (49.5%) involved documented alcohol or drug intoxication. More than 200 subjects were transported to a hospital for medical or psychiatric evaluation, yet, the study found no CEW injuries in nearly all cases (*Id.*).

carry "a significantly lower risk of injury than physical force" and "the vast majority of individuals subjected to a taser—99.7%—suffer no injury or only a mild injury."). These findings are significant since, to date, an estimated 6.2 million people have received TASER CEW exposures, including 3.75 million field-use applications and 2.46 million training/volunteer applications.

Moreover, studies consistently find that CEW use over other force alternatives dramatically reduces both subject and officer injuries. For example, the Police Executive Research Forum ("PERF") found subject injuries decreased 40% and officer injuries decreased 70% in police agencies using CEWs.[14] Another study examined more than 24,000 use-of-force cases across 12 agencies and found the "odds of suspect injury *decreased* by almost 60 percent when a CED was used." In stark contrast, using hands-on physical force "*increased* the odds of injury to officers by more than 300 percent and to suspects by more than 50 percent."[15] Thus, when a force option reduces or avoids hand-to-hand physical struggles, "greater safety

[14] Harris, D.A., *Taser Use by Law Enforcement: Report of the Use of Force Working Group of Allegheny County, Pennsylvania*, 71 U. Pitt. L. Rev. 719, 740-42 (2010) (Ref. P).

[15] Smith M.R., "A Multi-Method Evaluation of Police Use of Force Outcomes: Final Report to the National Institute of Justice," Department of Criminology and Criminal Justice, University of South Carolina (2010) (Ref. L at 8-3, emphasis added). *See also* Ref. N, NIJ at 30 ("Multiple departmental reviews have suggested that injury rates, death rates and complaints against police drop significantly following the deployment of CEDs").

follows for all involved." (Ref. P at 742). *See also Bryan v. MacPherson,* 630 F.3d at 826 ("We recognize the important role controlled electric devices like the Taser X26 can play in law enforcement. The ability to defuse a dangerous situation from a distance can obviate the need for more severe, or even deadly, force and thus can help protect police officers, bystanders, and suspects alike.").

The American Medical Association ("AMA") has likewise determined that, when used appropriately, "Taser use by law enforcement officers appears to be a safe and effective tool to place uncooperative or combative subjects into custody."[16] Significantly, the AMA paper further states:

> Most studies undertaken by law enforcement agencies (and others) indicate that deploying CEDs relative to other use-of-force options, such as pepper spray, *physical force*, police dogs, and batons, reduces injuries to officers and suspects and reduces the use of lethal force.

Ref. Q, AMA at 1 (emphasis added). This comports with the NIJ's 5-year study conclusions that TASER CEW use "has a margin of safety as great or greater than most alternatives," and carries a "significantly lower risk of injury than physical force." Ref. N at 30-31. Thus, as stated by the NIJ:

> **[I]f a goal is minimization of harm, it is appropriate to use the force application that is associated with the least likelihood of injury. CED use is associated with a significantly lower risk of injury than physical force, so it should be considered as an alternative in**

[16] White Paper by Carolyn B. Robinowitz, M.D., Chair, *Report 6 of the Council on Science and Public Health (A-09), Use of Tasers® by Law Enforcement Agencies* (Reference Committee D), 06/09 ("AMA") (Ref. Q).

> **situations that would otherwise result in the application of physical force**.

Id. at 31. Even more recently, in analyzing different force modalities, including 504 CEW field uses, a 2017 NIJ funded study found that CEW use was the force modality *least likely* to result in significant injury, including hands-on physical force.[17] (Ex. 2 ¶ 26).

And while this is a drive-stun case without physical incapacitation effects, any finding of impropriety of the lesser CEW touch-stun application in this context would lead to the argument that a CEW probe deployment is also impermissible. However, it is well-documented that CEW probe-mode incapacitation is often the most effective method to end harmful exertional activity and get the person quickly to medical attention. As stated by one such authority:

> In the pre-hospital setting, the basic principles used by law enforcement to control a patient in [excited delirium] revolve around rapid physical restraint, minimalization of the patient's exertional activity, and safety for all. *The use of a [TASER CEW in probe mode] is felt by many experts to be preferable to the more traditional physical wrestling for control*, because fighting or heavy physical exertion has a more deleterious effect on a patient's acid-base status. [18]

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[17] Bozeman WP, "Injuries Associated with Police Use of Force," *Journal of Trauma and Acute Care Surgery* (2017) (Ref. M).

[18] Wilson, MP, "The patient with excited delirium in the emergency department," Behavioral Emergencies for the Emergency Physician, ch. 17 at 127 (2013) (Ref. R, emphasis added).

Another authority concludes that when dealing with subjects with an altered mental status, who are often paranoid and "essentially impossible to effectively communicate with, making verbal de-escalation of little value":[19]

> *use of an ECD such as TASER to rapidly gain physical control and restrain a* subject *is preferable to the approach of going hands-on*, as heavy physical exertion may exacerbate acidosis in the subject and contribute to a greater risk of sudden death. *Data have shown that exertion and struggle increase acidosis more than use of a TASER* (Ho et al. 2010). [20]

See also Draper v. Reynolds, 369 F.3d 1270, 1278 (11th Cir. 2004) ("Although being struck by a [CEW] is an unpleasant experience, the amount of force used—a single use of the [CEW] causing a one-time shocking—was reasonably proportionate to the need for force and did not inflict any serious injury. . . [and] may well have prevented a physical struggle and serious harm.").

The Ho study referenced above simulated common law enforcement arrest-related situations. Test subjects were assigned to one of five task groups: (1) a 150-meter sprint and wall hurdle (simulated flight from arrest); (2) 45 seconds of striking

[19] Notably, Plaintiff's expert could not state how frequently de-escalation techniques work when a person is in a full-blown manic episode (RA227, Lyman depo. at 19:20-23; RA228 at 22:9-21).

[20] Nakajima, Y., Chapter 12: Use of Force in the Prehospital Environment, *The Diagnosis and Management of Agitation* at 179 (2017) (Ref. S, emphasis added); also available at: https://www.cambridge.org/core/books/the-diagnosis-and-management-of-agitation / F579A66F96776E2DC8B807613B8E6A23

a heavy bag (simulated physical resistance); (3) a 10-second continuous TASER X26E CEW exposure in deployed probe mode; (4) a fleeing and resistance exercise involving a law enforcement canine; or (5) an oleoresin capsicum ("OC" or pepper spray) exposure to the face and neck.[21] Vital signs, serum pH, lactate, potassium, troponin I, catecholamines (epinephrine, norepinephrine, and dopamine), and creatine kinase ("CK") were evaluated pre and post task (Ex. 2 ¶ 12(a)). Significantly, the simulations of physical resistance and fleeing on foot led to the *greatest* changes in markers of acidosis and catecholamines. The CEW produced the *lowest* total catecholamine increase of all groups, including the pepper spray group (*Id.*).

Accordingly, CEW exposure is typically a safer approach to restraint than other force alternatives and is reasonably likely to achieve an officer's objectives without injury. Where hands on physical force is justified to gain compliance or effectuate a lawful seizure, use of an X26E CEW is objectively reasonable.

II. OFFICER CUMMINGS'S CEW USE TO GAIN COMPLIANCE WAS CONSTITUTIONALLY PERMISSIBLE.

"[T]he Fourth Amendment addresses 'misuse of power,' not the accidental effects of otherwise lawful government conduct." *Brower v. County of Inyo*, 489

[21] Ho J.D., "Acidosis and Catecholamine Evaluation Following Simulated Law Enforcement ''Use of Force'' Encounters," *Acad Emerg Med*, 2010;17:E60-E68 (Ref. D). This study was awarded the 2010 IACP/Sprint Excellence in Law Enforcement Research Award (Ex. 2 ¶ 12(a)).

U.S. 593, 596 (1989). It is well established that the right to make an arrest "necessarily carries with it the right to use some degree of physical coercion or threat thereof to effect it." *Graham v. Connor*, 490 U.S. 386, 396 (1989). "Whether officers hypothetically could have used less painful, less injurious, or more effective force in executing an arrest is simply not the issue." *Forrester v. City of San Diego*, 25 F.3d 804, 808 (9th Cir. 1994) (deeming wrist locks applied by nunchakus on peaceful abortion protestors to be reasonable force despite injuries). *See also Atwater v. City of Lago Vista*, 532 U.S. 318, 350-51 (2001); *Skinner v. Ry. Labor Executives' Ass'n*, 489 U.S. 602, 629 n.9 (1989) (rejecting least-restrictive-alternative limitations in Fourth Amendment context "because judges engaged in *post hoc* evaluations of government conduct 'can almost always imagine some alternative means by which the objectives of the [government] might have been accomplished.'"). The proper inquiry is whether the force used to effect a particular seizure was objectively reasonable, viewing the facts "from the perspective of a reasonable officer on the scene, rather than with the 20/20 vision of hindsight." *Graham*, 490 U.S. at 396.

Applying these standards and the undisputed incident facts, it is clear Officer Cummings' use of force, including the CEW drive stun, was objectively reasonable. Plaintiff does not argue it was improper or excessive for Officer Cummings to go hands-on with Gray, grabbing her shirt and taking her to the ground. Yet, it is clear from the NIJ and numerous other independent studies that CEW use "has a margin

of safety as great or greater than most alternatives," and carries a "significantly lower risk of injury than physical force." Ref. N, NIJ at 30-31. Accordingly, "if a goal is minimization of harm, it is appropriate to use the force application that is associated with the least likelihood of injury." *Id*. Because CEW use has a lower risk profile than physical force, "it should be considered as an [objectively reasonable] alternative in situations that would otherwise result in the application of physical force." *Id*. Officer Cummings' minimal application of the CEW touch stun was reasonably likely to achieve compliance without injury and therefore was objectively reasonable under the totality of the circumstances.

CONCLUSION

This Court should affirm summary judgment in favor of the law enforcement defendants on the § 1983 excessive force claim. Officer Cummings' use of a 5-second CEW drive-stun application to the back of an unrestrained, noncompliant, actively resisting subject during a lawful seizure, after giving her a warning and opportunity to comply, was not only objectively reasonable, it was the force option least likely to injure Gray, including hands-on physical force.

Dated: November 20, 2018

Respectfully submitted,

/s/ Pam Petersen

Pamela B. Petersen
AXON ENTERPRISE, INC.
17800 N. 85th Street
Scottsdale, AZ 85255
(623) 326-6016
Counsel for Amicus Curiae Axon Enterprise, Inc.

CERTIFICATE OF COMPLIANCE WITH RULE 32

Pursuant to FRAP 32(g), the undersigned certifies that this brief complies with the applicable type-volume limitation. This brief was prepared in 14-point Times New Roman and complies with the typeface requirements of FRAP 32(a)(5), as well as the typestyle requirements of Rule 32(a)(6).

Exclusive of the portions exempted by FRAP 32(f), this brief contains 4,780 words. This document was prepared in reliance on the word-count function of the word processing system (Microsoft Office Word 2016) used to prepare is brief.

/s/ Pam Petersen
Pam Petersen
Counsel for Amicus Curiae
Axon Enterprise, Inc.

CERTIFICATE OF SERVICE

I certify that counsel for the parties have been served with a true and correct copy of the foregoing Amicus Curiae Brief via this Court's CM/ECF system on November 20, 2018. I certify that the following parties or their counsel of record are registered as ECF Filers and that they will be served by the CM/ECF system:

Thomas R. Donohue, Esq.
Email: tdonohue@bhpklaw.com

Leonard H. Kesten, Esq.
Email: lkesten@bhpklaw.com

Richard L. Neumeier, Esq.
Email: rneumeier@morrisonmahoney.com

Diedre Brennan Regan, Esq.
Email: dregan@bhpklaw.com

Matthew R. Seagal, sq.
Email: MSeagal@aclum.org

/s/ Pam Petersen
Pamela B. Petersen
Counsel for Amicus Curiae
Axon Enterprise, Inc.

Exhibit 1

DECLARATION OF MAGNE "MAX" NERHEIM

REGARDING TASER® X26E™ CONDUCTED ENERGY WEAPON ("CEW") OPERATIONAL BASICS, CAPABILITIES AND LIMITATIONS

I, Magne "Max" Nerheim, declare and state as follows:

1. I am a competent adult over the age of 18 and have personal knowledge of the following facts.

2. I am Vice President of Research and Technical Fellow for Axon Enterprise, Inc. ("Axon"), formerly (name changed April 5, 2017) TASER International, Inc. ("TASER"), stationed at its corporate headquarters in Scottsdale, Arizona. I have held this position since August 2009.

3. I received my Bachelor (1988) and Master (1991) of Science Degrees in Electrical Engineering from Arizona State University in Tempe, Arizona.

4. I began working as a consultant for TASER in 1998 and was hired as the company's first full-time electrical engineer in 2002. I served as TASER's Electrical Engineering Manager from April 2002 to December 2004, and as its Vice President of Research and Development from December 2004 to August 2009, when I was promoted to my present position.

5. I designed the TASER® M26™ CEW (Conducted Energy Weapon, synonymous with Electronic Control Device or "ECD") released in 1999, the first electrical weapon to incorporate TASER's patented Neuromuscular Disruption or Neuro-Muscular Incapacitation ("NMI") technology that affects both the sensory and motor nervous systems to cause incapacitation.

6. I am an inventor on 40 U.S. Patents, including the Shaped Pulse™ waveform technology (Pat. 6.999.295) utilized by the TASER X26E™ CEW released in 2003, which allowed

a substantial reduction in CEW size and power consumption. I am therefore intimately familiar with the design, specifications, capabilities and limitations of the TASER X26E CEW.

7. I also directed the development and launched the TASER CAM™ incident audio/video recording system in 2007.

I. X26E CEW APPLICATION MODES.

8. In the field, the TASER X26E CEW may be applied to a person in three ways:

(1) **Probe-Deployment Mode**, where two small metal darts are expelled from a cartridge via compressed nitrogen, with electrical impulses transmitted into the target through very thin insulated trailing wires;

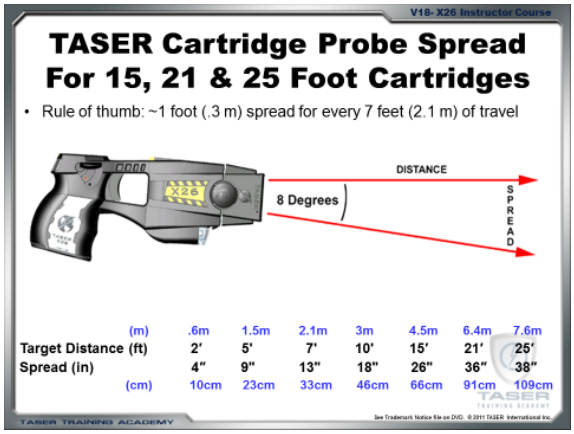
CEW probes deploying through green blast doors

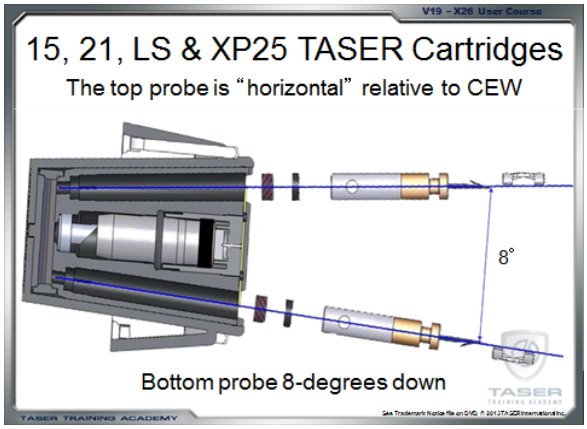
(2) **Drive-Stun Mode** (also referred to as "contact" or "touch" mode), in which the front of the CEW is physically pressed against the target utilizing the fixed electrodes on the front of the X26E CEW without a cartridge or the fixed rounded recessed electrodes on the sides of an expended cartridge; and

(3) **Three- or Four-Point Activation** that combines a probe deployment with a follow up drive stun to potentially combine CEW effects

9. In a successful probe deployment, the CEW is designed to primarily work by motor-nerve mediated stimulation of skeletal muscles. The TASER X26E CEW is designed to transmit stimuli through very short duration (≈125 microseconds ("μs")), low charge (≈100 microcoulombs ("μC")), low energy (≈ 0.1 joules), and low power (≈ 1.9 watts) electrical pulses to interfere with the command and control systems of the body to temporarily induce NMI of the target.

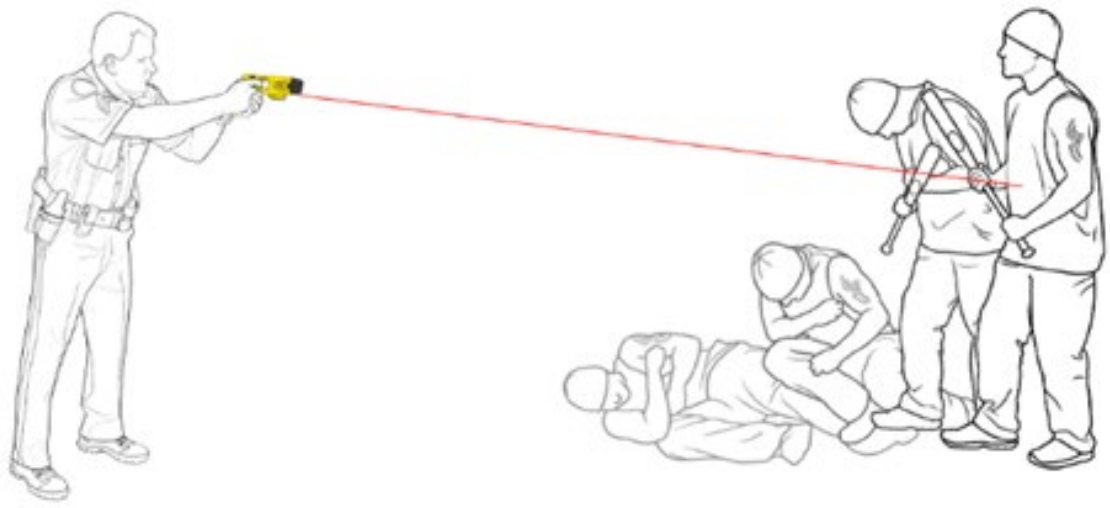
10. To achieve NMI an adequate probe spread is required to ensure major muscle groups between the darts are affected by the delivered electrical charge. As reflected in the following TASER training slide, the bottom probe is deployed at an 8-degree downward angle (for cartridges with a range of ≤ 25 feet) resulting in a probe spread of approximately 1 foot for every 7 feet of distance from the front of the CEW cartridge to the target:





The optimum CEW deployment range is 7 to 15 feet. When deployed at close range, the probe spread may be insufficient to cause NMI.

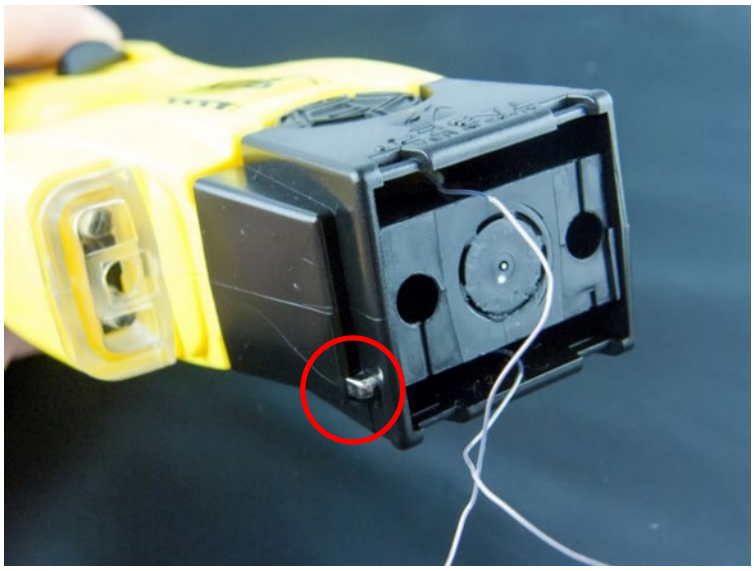
11. To aid officers in deployment accuracy, the X26E CEW is equipped with a LASER sight that emits a red dot on the intended target (when selected and activated). The top probe generally impacts the target near the LASER dot. Impact points may vary based on wind, subject and officer movements, or other variables.



12. In drive-stun (touch/contact) mode without a cartridge attached, electrical impulses are transmitted superficially through two fixed electrodes on the front of the CEW, as pictured below. The electrodes are 1.6 inches (4 centimeters ("cm")) apart.

Electricity arcing between fixed electrodes on CEW without a cartridge attached

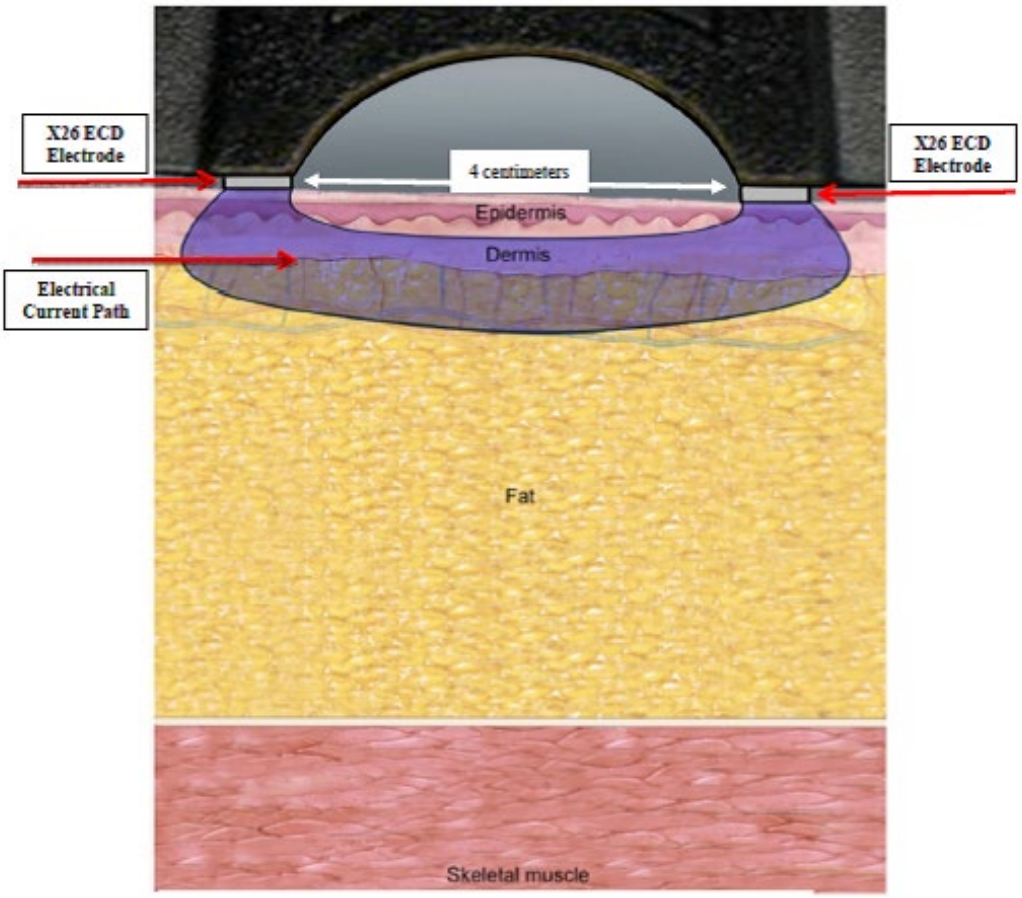
A drive stun may also be applied with an expended (empty) cartridge still attached to the CEW. In this instance, electrical impulses are transmitted through two fixed electrodes on the sides of the cartridge, which are 1.77 inches (4.5 cm) apart.



Fixed electrode (circled in red) on side of expended CEW cartridge

13. Because the electrical current in a drive-stun application is confined to such a small electrical stimulation area between or very close to the two electrodes on the surface of the skin, it does not create any significant muscle mass involvement and does not result in NMI. Thus, a CEW drive stun is strictly a pain compliance tool. The illustration below depicts the path and depth of delivered electrical charge from a CEW drive-stun based upon finite-element modelling:[1]

[1] Illustration discussed in *Glowczenski v. TASER Int'l, Inc.*, 2012 WL 976050, *7 (E.D.N.Y. March 22, 2012) (noting electrical charge does not penetrate the dermal fat layer into skeletal muscle of recipient). *See also* Legal Aspects of Conducted Electrical Weapon Injuries, Wounds, and Effects, Ch. 8 at 149, J.D. Ho et al. (eds.), Atlas of Conducted Electrical Weapon Wounds and Forensic Analysis, Springer (2012).

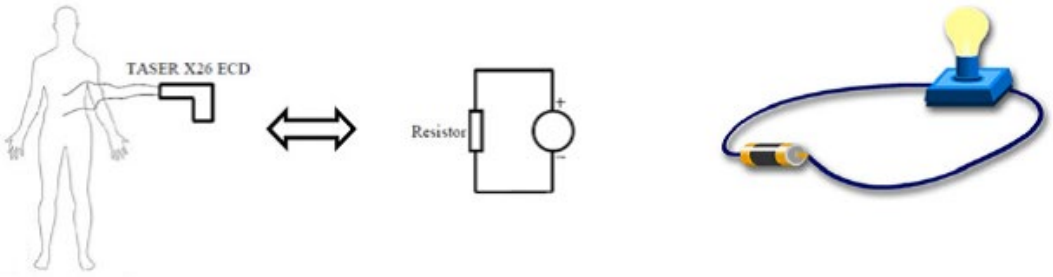


14. It is possible, however, to use a drive stun following and in connection with a probe deployment to attempt to achieve NMI in what is known as a "3-point" or "4-point" stun. If only one probe contacts the target, the user may drive stun the subject with the expended probe cartridge still attached to the CEW to an area of the body away from the probe contact point to complete the circuit and increase the probability of inducing NMI. In this circumstance, the electricity flows between the two fixed electrodes on the sides of the expended cartridge affixed to the CEW and the single probe embedded in the subject or the subject's clothing in a 3-point contact. Similarly, if both probes contact the target but the probe spread is insufficient to cause NMI, as may happen with a close-range deployment, a follow up drive stun away from the probes in a 4-point contact

can effectively widen the muscle groups between the probes and the fixed electrodes to cause the intended NMI.

II. X26E CEW ELECTRICAL PRINCIPALS AND LIMITATIONS.

15. In order for a CEW to be effective in delivering an electrical charge to a person, the electricity must flow in a complete circuit. In a CEW, an electric current starts at a small battery power source, flows through an intact circuit, and must return to the power source. If there is no completed circuit, then no electric charge is delivered to the person. There are numerous reasons why a CEW may not have a completed or maintained circuit, including a miss with one or both probes, a dislodged probe, a clothing disconnect, or a broken wire.



16. In any given electric circuit, the total power is limited by and cannot exceed the output of its power supply. A TASER X26E CEW's power source consists of a battery of two 3-volt cells (Duracell® CR123), such as those commonly used in some digital cameras.

X26E CEW battery of 2 3-volt cells and U.S. quarter

17. Delivered electrical charge from a TASER CEW also is limited by the wire conductors between the TASER CEW and the target. The TASER CEW cartridge wires are very small (36 gauge, 127 microns (millionths of a meter)) in diameter, and are not capable of delivering large electrical currents that would require much larger wires such as automobile jumper cables or home electrical extension cords.

CEW cartridge wire and U.S. dime

18. CEW cartridges identified by their silver blast doors contain 21 feet of wire per probe and standard probes with 9 millimeter (mm) dart tips.

9 mm Dart and U.S. Dime

21 ft.
Silver Blast Doors
Live Cartridge
Regular Probe

Cartridges containing 15 feet of wire have yellow blast doors, and 25-foot cartridges have green blast doors with XP 13 mm dart tips.

13 mm Dart and U.S. Dime

25 ft.
Green Blast Doors
Live Cartridge
XP Probe

19. While the TASER X26E CEW produces an open-circuit peak voltage of 50,000 volts, the output voltage (what actually enters or is delivered to the body) is approximately 1,400 to 2,520 volts. Claims that a person is shocked with 50,000 volts are simply not true. Moreover, voltage is not a key measure of electrical safety. As examples, Van de Graff generators found in many science museums and grade schools discharge up to 20,000,000 volts without injury.

Examples of Experiencing up to 20 Million V from a Van de Graff Generator

20. It is the total number of electrons delivered that matters, and the X26E CEW delivers ≈100 µC of charge at ≈19 pulses per second which yields an aggregate output of 0.0019 amperes ("A") (or 1.9 milliamperes ("mA")).

21. The TASER X26E CEW produces a complex shaped pulse. It delivers 19 +1/-2.5 pulses per second. Each pulse delivered from a TASER X26E CEW is 105 to 155 microseconds (millionths of a second) in duration. In a single second of time, a TASER X26E CEW is not delivering any electrical charge to the subject for ≈ 99.81% of the second.

22. The TASER X26E CEW meets all relevant sections of the American National Standards Institute ("ANSI")[2], International Electrotechnical Commission ("IEC"), Underwriter's Laboratories ("UL"), European Norm ("EN"), British Standard ("BSI"), and Australian/New Zealand ("AUS/NZ") electrical safety standards as they pertain to cardiac safety.[3]

III. X26E CEW Accountability Features.

23. Pulling and releasing the X26E CEW trigger automatically activates a 5-second discharge cycle. The CEW operator may cut the cycle short at any time by placing the safety lever in the down (SAFE) position. As a safety factor, the operator also may extend the CEW discharge beyond 5 seconds by holding the trigger down. Releasing the trigger any time after 5 seconds will immediately stop the CEW discharge.

24. As an objective accountability measure, the X26E CEW has data download capabilities that record the date, time and duration of each CEW discharge. The data download shows discharges (trigger pulls) only, not whether the electrical charge was delivered to the subject. For example, if an officer only pulls and releases the trigger in probe mode, the download report will show a 5-second duration even if one probe misses the target such that there is no

[2] ANSI/CPLSO-17-2017, Electrical Characteristics of ECDs and CEWs.

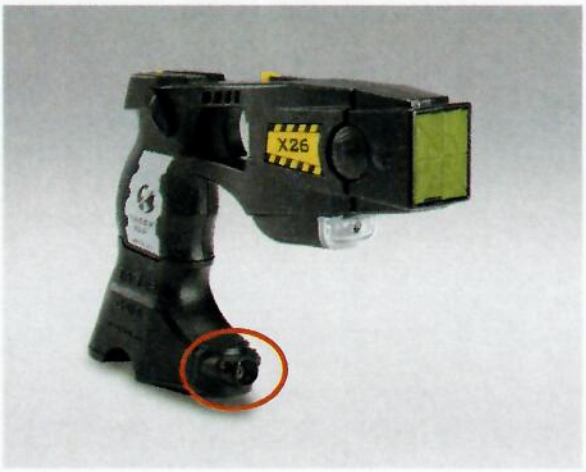
[3] *See* D. Panescu et al. "Electrical Safety of Conducted Electrical Weapons Relative to Requirements of Relevant Electrical Standards," *Conf Proc IEEE Eng Med Biol Soc*, vol. 35, pp. 5342-47 (2013).

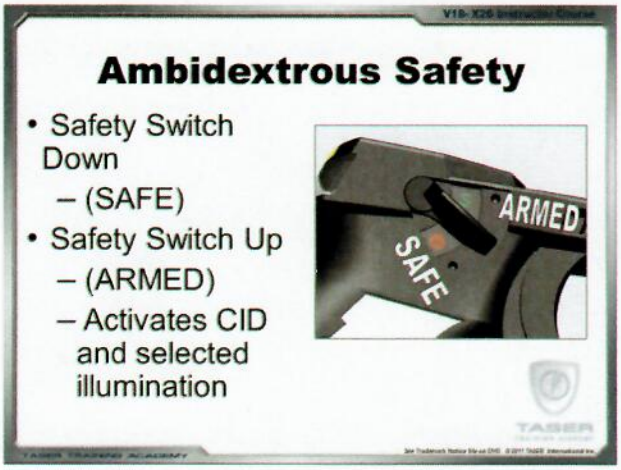
completed circuit and no delivered charge to the person. Similarly, in drive-stun mode, if an officer pulls and releases the trigger and presses the CEW against a subject for two seconds before the subject pulls away or the officer disengages and breaks the contact, the download report will still reflect a 5-second duration.

25. An X26E CEW data download reports the time when the firing sequence ends, not the time the trigger pull activates the discharge. Also, time is rounded up to the nearest second. Therefore, if the discharge is 4.01 to 5.00 seconds, the data download time will show a 5-second discharge duration.

26. The X26E CEW's internal clock is run by the central microprocessor. It is initially set to Greenwich Mean Time ("GMT") at the factory. Like most other clocks and watches, the CEW clock is subject to time drift, which ranges up to ± 4 minutes per month. When the X26E CEW is downloaded, the download software automatically adjusts the GMT time in the CEW to the local time zone set on the PC (when in Offline Mode), or to the user's time zone setting in Evidence.com (when in Online Mode).

27. An X26E CEW may be equipped with a TASER-Cam™ recording device—a digital camera with audio mounted in the handle grip (circled in red below), replacing the standard digital power magazine ("DPM"). The camera and audio recording features are automatically activated when the CEW safety lever is moved to the ARMED position, and deactivated when the safety lever is returned to the down (SAFE) position.





The TASER-Cam has a boot-up time of approximately 1.6 seconds after the safety is removed.

28. All photographs and illustrations contained in this declaration are true and accurate representations.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed this 15th day of November, 2018 at Scottsdale, Arizona.

Magne Nerheim

Magne "Max" Nerheim

Exhibit 2

DECLARATION OF JEFFREY D. HO, M.D.

I, Jeffrey Ho, declare and state as follows:

1. I am a competent adult and have personal knowledge of the following facts.

Medical Background

2. I am a board-certified attending emergency medicine physician at the Hennepin County Medical Center ("HCMC") in Minneapolis, Minnesota. I completed my residency in emergency medicine at HCMC from 1992–1995, as well as a fellowship in emergency medical services ("EMS") and pre-hospital care from 1995–1996. I am a Fellow of the American College of Emergency Physicians ("ACEP") ("FACEP") and the American Academy of Emergency Medicine ("AAEM") ("FAAEM"). I have held an academic appointment as an assistant or associate professor of emergency medicine at the University of Minnesota School of Medicine since 1996 and as a full professor since 2015.

3. HCMC is an urban Level 1 Trauma Center with an emergency department census of approximately 103,000 patients per year. HCMC is a teaching and research facility, and regularly teams with the University of Minnesota to conduct medical research, including both private and government-sponsored.

Law Enforcement Background

4. I have substantial law enforcement experience. I obtained an associate of science degree in criminal justice and law enforcement in 2005, hold a full-time peace officer license in the State of Minnesota, and currently work as a deputy sheriff for the Meeker County (Minnesota) Sheriff's Office. I have previous experience as a police officer and firefighter/emergency medical technician. I served nine years in the military reserve as a medical corps officer, and currently serve as a medical director to several EMS agencies in the upper Midwest. I previously

served as a medical director of an urban Special Weapons and Tactics ("SWAT") team, and regularly consult with law enforcement agencies and government on issues of arrest-related death ("ARD") and conducted energy weapons ("CEWs").

Axon/TASER Background

5. I currently serve as medical director and as an independent expert consultant to Axon Enterprise, Inc. ("Axon"), formerly TASER International, Inc. ("TASER"), on ARD issues, and have provided expert opinions and testimony on TASER® CEW effects on human subjects in several legal cases nationally and internationally. My expertise includes personal research in the areas of sudden and unexpected death in law-enforcement related incidents, as well as the physiologic effects of CEWs on human subjects and animals. I maintained a TASER CEW instructor certification from September 2004 to April 2017, and have personally received TASER CEW applications in both drive-stun (contact/touch mode) and probe-deployment mode on numerous occasions. I am a co-editor of the academic textbook *TASER® Electronic Control Devices: Physiology, Pathology, and Law*. Berlin: Springer Science Media (2009), in which I authored chapters on electrocardiographic effects of CEWs (Chap. 10), and serum and skin effects of CEW applications (Chap. 11). I am a co-editor of the academic textbook *Atlas of Conducted Electrical Weapon Wounds and Forensic Analysis* (2012), in which I co-authored chapters on Conducted Electrical Weapon Deployed Probe Wounds (Chap. 3), and Conducted Electrical Weapon Drive-Stun Wounds (Chap. 4).

Mental Health Background

6. As a law enforcement officer, EMS director and emergency room physician at a major metropolitan trauma center, I have considerable experience with mentally ill and psychotic individuals. I care for hundreds if not thousands of these patients each year in my emergency

medicine practice. I also participated in and am an author of a peer-reviewed article published in the American Journal of Emergency Medicine ("AJEM") in 2007 titled, "Impact of conducted electrical weapons in a mentally ill population: a brief report." [**A**][1] This study analyzed 2,452 CEW field uses on mentally ill and suicidal subjects over a six-year period and found no connection between CEW use in mentally ill persons and a subsequent death. I also presented a poster in Dublin, Ireland in October 2017 titled "Presentation of the Conducted Electrical Weapon De-Escalates Violence in the Healthcare Setting," 10th Euro Congress on Violence in Clinical Psychiatry. [**B**]

Original Research and Testing

7. Beginning in 2004, I have conducted extensive medical research on CEWs, and have had my work published in peer-reviewed medical journals and presented at national and international meetings and assemblies. My original research and published works have been in the areas of in-custody or arrest-related death, and CEW testing concerning cardiac, respiratory, and blood chemistry results in numerous human and animal studies.

8. Research funding at HCMC comes from a variety of private and government sources, including sometimes Axon. As a salaried employee of HCMC, I am not compensated for research directly from Axon or any other source. Our research at HCMC is conducted by a team of doctors and scientists, many of whom have no connection to Axon. Moreover, each research project requires approval of HCMC's Institutional Review Board ("IRB") and the Minneapolis Medical Research Foundation Conflict of Interest Committee. The publication

[1] True and correct copies of all articles, papers and posters referenced in this declaration [**A-N**] may be accessed at the following link: _____

process, which often can take more than two and a half years, further subjects our methods and findings to rigorous scientific scrutiny.

9. Generally, once the research data is collected, an abstract is prepared and submitted for peer-review and acceptance for presentation at a scientific assembly. Once accepted for presentation, a "poster" or oral presentation is generally created and publicly presented at scientific research forums. I personally have been involved in more than 60 such presentations of CEW data. A formal paper is usually then prepared, submitted, accepted, peer-reviewed and finally accepted for publication.

10. I have conducted and published significant research regarding potential secondary effects of CEW exposure to human physiology and have consistently found no clinically significant changes in blood chemistry following CEW applications.

11. For example, I participated in a study using electrocardiography ("EKG") before, during and after probe deployment of a TASER X26E™ CEW to 100 adults for either a 5-second or 10-second discharge cycle. As part of this study, we also collected blood serum at various intervals up to 24-hours after CEW exposure and found no evidence of elevated potassium (hyperkalemia) or induced acidosis. *See* "Cardiovascular and Physiologic Effects of Conducted Electrical Weapon Discharge in Resting Adults," published by the Society for Academic Emergency Medicine ("SAEM") in 2006 (*Acad Emerg Med*, 2006;13:589-595). [**C**]

12. Some of my publications involving metabolic acidosis and catecholamines include:

a. "Acidosis and Catecholamine Evaluation Following Simulated Law Enforcement ''Use of Force'' Encounters," published by SAEM in 2010 (*Acad Emerg Med*, 2010;17:E60-E68) and awarded the 2010 International Association of Chiefs of Police

("IACP")/Sprint Excellence in Law Enforcement Research Award at the IACP Annual Meeting on October 24, 2010. [**D**] In this study simulating common law enforcement arrest-related situations, test subjects were assigned to one of five task groups: (1) a 150-meter sprint and wall hurdle (simulated flight from arrest); (2) 45 seconds of striking a heavy bag (simulated physical resistance); (3) a 10-second continuous TASER X26E CEW exposure in deployed probe mode; (4) a fleeing and resistance exercise involving a law enforcement canine; or (5) an oleoresin capsicum ("OC" or pepper spray) exposure to the face and neck. Vital signs, serum pH, lactate, potassium, troponin I, catecholamines (epinephrine, norepinephrine, and dopamine), and creatine kinase ("CK") were evaluated pre and post task. The simulations of physical resistance and fleeing on foot led to the greatest changes in markers of acidosis and catecholamines. Results for the CEW group were consistent with other studies that showed minimal serum pH, lactate, and potassium changes and no associated troponin I elevations. The CEW also produced the lowest total catecholamine increase of all groups, including the OC group. The study concluded that CEW exposure may have less negative consequences for acidosis and catecholamine levels than physical resistance or allowing the subject to flee, and therefore may be a safer approach to restraint.

b. "Prolonged TASER [CEW] use on exhausted humans does not worsen markers of acidosis," published by the AJEM in 2009 (*Am J Emerg Med*, 2009;27:413-418). [**E**] This paper involved a 15-second continuous CEW probe application to already exhausted acidotic volunteers, and found no worsening acidosis (i.e., no further change in pH, lactate, etc.) in repeated blood serum biomarker evaluation.

c. "The neuroendocrine effects of the TASER X26[E CEW]: A brief report," published in Forensic Science International ("FSI") in 2009 (*Forensic Sci Int*, 2009;183:14-19).

[**F**] This study compared human stress response from a 5-second TASER X26E CEW probe exposure to other pain generators (0°C cold water tank or OC/pepper spray) or defensive tactics and canine capture drills. The test indirectly measured catecholamine levels though saliva via a protein enzyme biomarker (amylase) that elevates in conjunction with catecholamine release. The study data suggests that the human stress response is most activated by physical exertion from resisting custodial arrest or from fleeing from officers, and least activated by CEW application.

d. "Lactate and pH evaluation in exhausted humans with prolonged TASER X26[E CEW] exposure or continued exertion," published by FSI in 2009 (*Forensic Sci Int*, 2009;190:80-86). [**G**] This study used blood sampling to compare acidosis levels in exhausted subjects who were allowed to continue to exert themselves versus receiving a 15-second continuous TASER X26E CEW probe application, and concluded the CEW application did not worsen acidosis any differently than those allowed to continue to struggle.

13. These results and conclusions are consistent with human studies by others, including those funded by the National Institute of Justice ("NIJ"), the U.S. Department of Justice's research forum. *See* Bozeman, et al. "Safety and Injury Profile of Conducted Electrical Weapons Used by Law Enforcement Officers Against Criminal Suspects," published in April 2009 (*Annals of Emerg Med*, 2009;53(4):480-89). [**H**] This study examined existing literature regarding the physiologic and cardiovascular effects of CEW applications in humans and found "no evidence of dangerous respiratory or metabolic effects using standard (5-second), prolonged (15-second), and extended (up to 45-second) conducted electrical weapon discharges." [*Id*. at 486] This study identifies 20 other CEW studies conducted on human volunteers in 2006–2008, many of which included metabolic laboratory tests to evaluate potential secondary effects on

blood chemistry, all with similar non-dangerous findings. I am unaware of any published study to the contrary.

Research Specific to CEW Drive Stun (Contact/Touch) Applications

14. Most human CEW studies have focused on applications in probe-deployment mode because such methodology should yield worst-case scenario results due to the greater separation distance of the electrical current contact points. But I have also conducted research specific to TASER CEW drive (contact or touch) stuns. *See* "Confirmation of Respiration during Trapezial Conducted Electrical Weapon [drive, contact, or touch stun] Application," published by the SAEM in 2008 (*Acad Emerg Med*, 2008;15:398). [**I**] I have also presented the following drive-stun related "posters" at various professional assemblies: (1) "Prolonged TASER [CEW] 'Drive Stun' Exposure in Humans Does Not Cause Worrisome Biomarker Changes," June 2008 Canadian Association of Emergency Physicians Annual Meeting and January 2008 National Association of EMS Physicians Annual Meeting; (2) "Cardiac and Diaphragm ECHO Evaluation During TASER Device Drive Stun," July 2008 Australian College of Emergency Medicine ("ACEM") Annual Meeting and September 2008 National Association of Medical Examiners Annual Meeting ("NAME"); and (3) "TASER [CEW] Wound Progression in Two Deployment Modes," February 2009 American Academy of Forensic Sciences Annual Meeting. [**J**]

15. The bottom line of all of these and other related studies is that CEW exposure in humans does not worsen acidosis that is already present regardless of deployment mode or duration.

CEW Drive-Stun Applications and Injury Profile

16. The term "drive stun" originally described forcefully pushing the front of the CEW into specific points on the body where nerve bundles were close to the surface of the skin to optimize the intended effect and increase the probability of achieving compliance. However, not all CEW contact exposures are technically "drive" stuns; they simply involve the CEW being touched or placed into direct contact with a subject. My use of the term "drive stun" here includes all contact or touch exposures.

17. A CEW drive-stun application is much less intrusive than a typical probe deployment and produces substantially less significant physiological effects. This is due in part to the significant resistance of the skin barrier (approximately 600+ ohms ("Ω")). Accordingly, based on the studies discussed above and others showing no clinically significant changes in blood chemistry following CEW applications in probe mode, it is clear a CEW drive stun also would not result in any clinically significant changes in blood chemistry.

18. CEW drive-stun injuries are typically limited to superficial localized application burns that do not extend below the epidermis and dermis layers of the skin. Moreover, because the electrical current in a drive-stun application passes between 2 fixed electrodes only 4 centimeters ("cm") (1.6 inches) apart on the surface of the skin, it affects a very limited area, does not create any major body mass involvement, and does not result in Neuro-Muscular Incapacitation ("NMI"). Thus, in drive-stun mode, a CEW is merely a pain compliance tool.

19. Individuals in the midst of a psychotic episode often experience a mind-body disconnect and do not perceive pain in the same manner as a person in a non-psychotic state. Psychotic subjects are often described as being impervious to pain or having a high pain tolerance. However, even if a CEW drive stun caused some pain, no published research to date

validates the suggestion that CEW-induced stress or pain from drive stuns may cause secondary adverse changes in blood chemistry. The relevant published literature directly contradicts it.

20. No medical or scientific evidence exists today that multiple CEW drive-stun applications cause any clinically significant adverse physiological effect in humans or contribute to a person's sudden death. Because the human body does not act as a capacitor or store electrical energy, multiple CEW applications do not have a cumulative additive electrical effect.

21. No published peer-reviewed article or study has ever suggested that a CEW drive stun directly causes any injury beyond minor contact burns. Indeed, after conducting a literature review of thousands of volunteers and individuals in law enforcement custody who received CEW drive stuns "with no untoward effects beyond local skin effects," the AAEM released a Clinical Practice Statement dated July 12, 2010 that medical screening of patients post CEW drive stun "should focus on local skin effects at the exposure site, which may include local skin irritation or minor contact burns." [**K**, later published as "Emergency Department Evaluation after Conducted Energy Weapon Use: Review of the Literature for the Clinician," *J Emerg Med* 2011;40(5):598-604] This is consistent with other published papers.

22. There is no generally accepted or prevailing view in the medical or scientific community that CEW drive stuns pose any significant health risk. I am unaware of any testing, study or report in the public domain suggesting that multiple CEW drive stuns, regardless of duration or application in rapid succession, adversely affect a person's blood chemistry to any clinically significant degree.

23. I have never witnessed and am unaware of any reported incident in the CEW literature of a drive stun inducing unconsciousness in a subject. I know of no established or

reported mechanism that would cause a person to lose consciousness from a CEW drive-stun exposure in preferred target zones, which include the back.

CEWs Are the Most Studied Force Option and Least Likely Modality to Result in Significant Injury, Including Hands-On Physical Force

24. TASER CEWs have been on the market since 1994, have incorporated NMI technology since 1999, and have been studied more than any other law enforcement force option. In addition to volunteer studies, hundreds of animal, scientific, modelling, and studies of actual CEW field use by law enforcement have been peer reviewed and published.

25. For example, the NIJ study discussed in paragraph 13 above also examined actual CEW use in the field on 1,201 subjects in six U.S. law enforcement agencies over a 36-month period. [**H** at 480] As noted in the study, these subjects had a wide variety of medical and psychiatric conditions, and nearly half (49.5%) involved documented alcohol or drug intoxication. More than 200 of these subjects were transported to a hospital for medical or psychiatric evaluation, yet, the study found mild or no CEW injuries in 99.75% of the cases.

26. A separate NIJ study published in July 2010, "Multi-Method Evaluation of Police Use of Force Outcomes," examined more than 24,000 use-of-force incidents in the field across twelve law enforcement agencies and found a subject's risk of being injured actually decreased by almost 60% when a CEW was used instead of hands-on physical force. [**L** at 8-3] Similarly, a 2017 Bozeman study, "Injuries Associated with Police Use of Force" published in the Journal of Trauma and Acute Care Surgery, found that CEW use was the force modality least likely to result in significant injury, including hands-on physical force. [**M**]

27. I concur with the independent conclusion of the NIJ after a 5-year CEW study that "if a goal is minimization of harm, it is appropriate to use the force application that is associated with the least likelihood of injury. CE[W] use is associated with a significantly lower risk of

injury than physical force, so it should be considered as an alternative in situations that would otherwise result in the application of physical force." [**N** at 31]

28. Pursuant to the authority of 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge, information and belief.

EXECUTED this 16th day of November, 2018 at Minneapolis, Minnesota.