



F21 Terrestrial Light Detection And Ranging (LiDAR) Scanning (TLS), Admissibility of 3D “Point Cloud” Evidence and Testimony

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Learning Overview: The goal of this presentation is to provoke thinking about the admissibility requirements for TLS both foundationally and as applied. There have been reported decisions regarding 2D LiDAR (for speed and distance) but almost none regarding TLS 3D “point cloud,” either as demonstrative evidence or a basis for expert testimony.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by helping lawyers, judges, and experts (e.g., engineers, accident deconstructionists, crime scene evaluators) prepare to proffer TLS “point cloud” evidence or to critique or oppose such evidence if it is not established in the particular case to have foundational validity and validity as applied.

The purpose of this presentation is to stimulate thinking about the validity and limitations of Terrestrial LiDAR Scanning (TLS) for forensic purposes and to address the admissibility of TLS as a basis for demonstrative evidence or expert testimony in the trial court. It is the hypothesis of this presentation that the validity of TLS technology has been established in the scientific community and foundational validity can be established as to an individual vendor’s products. The applications of TLS used to create demonstrative evidence or used as a basis for an expert opinion will require an individualized determination of admissibility and scope.

TLS is based on light detection and ranging technology, hence the name, LiDAR. It is a form of laser technology in which a target is illuminated with laser light. The target reflects the light, and it is captured by a laser scanning device. The scanning device derives complex geometric data from the reflected light, which is interpreted as a 3D representation of the target. When deployed at a scene, it can be used to create a “point cloud” which, in turn, can be interpreted as a 3D representation of an expansive area.

LiDAR itself is not a new technology as it relates to either speed computations or 2D computations relating to position or distance. For instance, LiDAR devices are used in lieu of the hand-held Radio Detection And Ranging (RADAR) devices for traffic police to “clock” the speed of motorists. LiDAR has also been used to determine the distance from one point to another where a roll-a-tape may be inconvenient, for instance, in determining whether a sex offender’s residence is within the prohibited distance from a school.

TLS, used to create 3-D reconstructions, has been used for scientific research, primarily in archeological, architectural, topographical, or geographical studies. TLS is newer in its forensic applications but has been used to create 3D models or computer recreations for demonstrative evidence or as a basis for an expert opinion at trial. Oddly, TLS, unlike 2D LiDAR, has seldom been reviewed for its foundational validity or validity as applied in significant reported decisions.

This presentation will review the cases in which TLS has been discussed as well as some of the issues that should be addressed in motions *in limine* to determine admissibility and the scope of demonstrative evidence or testimony based on TLS. Work is being done on both the foundational validity and validity as applied of TLS. For instance, the National Institute of Justice (NIJ) Working Group for Criminal Justice Applications issued its first report on TLS in July 2020 that recognized that there are “no standardized, vendor agnostic guidelines” for criminal justice applications of TLS.

Meanwhile, TLS continues to be used in criminal and civil litigation at the trial court level. Even after the NIJ or other “best practices” are developed, trial judges—with the guidance of lawyers proffering the evidence and lawyers opposing it—will continue to have to make determinations as the “gatekeeper,” case by case. The questions of validity will have to be litigated and determined as to whether TLS foundationally or as applied meets the requirements of *Daubert* and *Kumho Tire*, as well as Federal Rules of Evidence 702, 703 and 403 (and their state analogs).^{1,2}

It will be the conclusion of this presentation that TLS is fundamentally reliable as a scientific technology, although proprietary algorithms may have to be disclosed in order to evaluate the validity of a particular vendor’s product. There is peer-reviewed literature on TLS in general, and there is the ability to do “black box” proficiency studies of a particular vendor’s instrument. The bigger issue in actual litigation will be the validity of TLS as applied. Before TLS is allowed, either in the creation of demonstrative evidence or as a basis for an expert’s opinion, the trial court will have to make an individualized determination that the application meets the proper scientific standards and that the final evidence is of assistance to and not unduly prejudicial to the jury.

Reference(s):

1. *Daubert v. Merrell Dow Pharmaceuticals*. US Supreme Court 509.U.S.579,113S.Ct.2786, 125L. Ed.2d 469. 1993.
2. *Kumho Tire Co. v. Carmichael*, 526 U.S. 13.7

LiDAR, Admissibility, Point Cloud