Digital Forensic Report

Prepared for:

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Executive Summary

On Saturday, January 3, 2026, I received two videos from counsel . I was asked to analyze these videos to determine their authenticity.

A digital file, forensic, and visual analysis supports, to a reasonable degree of scientific certainty, the conclusion that the two videos in question are authentic. A biometric analysis is consistent with the conclusion that the appearance of the adult male in the videos matches Representative Eric Swalwell.

Background and Materials

In my analysis, I considered the following questions:

1. are the videos fully AI generated?
2. have the videos been manipulated to change the depicted identity or actions?
3. are the videos authentic?
4. do the videos depict Representative Eric Swalwell?

The two videos, recorded-1283021554306.mov and recorded-1283369659042.mov, are of length 6.60 seconds and 4.04 seconds, and a compression ratio of 8.85 Mbps and 9.17 Mbps, respectively. They are each of a resolution of 1232 x 656 and a frame rate of 30 frames per second.

I will refer to these videos as “06” and “42”, respectively.

The MD5 hashes for these videos are:

```
MD5 (recorded-1283021554306.mov) = a42adacc03753034e8bce10683f214d3
MD5 (recorded-1283369659042.mov) = 17b9217fcccad5166848eac65b37bdf1
```

File Analysis

By way of background, metadata for a digital image or video is the information about the camera make and model, the camera settings, the date and time of recording, the GPS location of recording, and more. This metadata is written directly into the underlying media file by the recording device, and may be modified by any subsequent photo- or video-editing software.

The metadata extracted from the 06 and 42 videos can be found in Appendix A.

Each video has in-tact metadata. This metadata indicates that the 06 video was recorded on July 13, 2021 at 04:55 AM (Pacific Time) and the 42 video was recorded on the same day at 04:56 AM (Pacific Time).

Each video has a GPS geo-tag placing the location at: 36 deg 10' 0.12" N, 115 deg 8' 55.32” W, corresponding to Las Vegas, NV.

The metadata also contains camera information consistent with an Apple device. While a resolution of 1232 x 656 is *not* consistent with any native Apple device, it is consistent with a video recorded through the SnapChat application on an iPhone[1].

The metadata contains no information that would indicate that the video was manipulated or altered after recording.

Conclusion: The video metadata is consistent with an original recording. Metadata, however, can be relatively easily edited/manipulated so this analysis alone is not sufficient to authenticate the videos.

Forensic Analysis

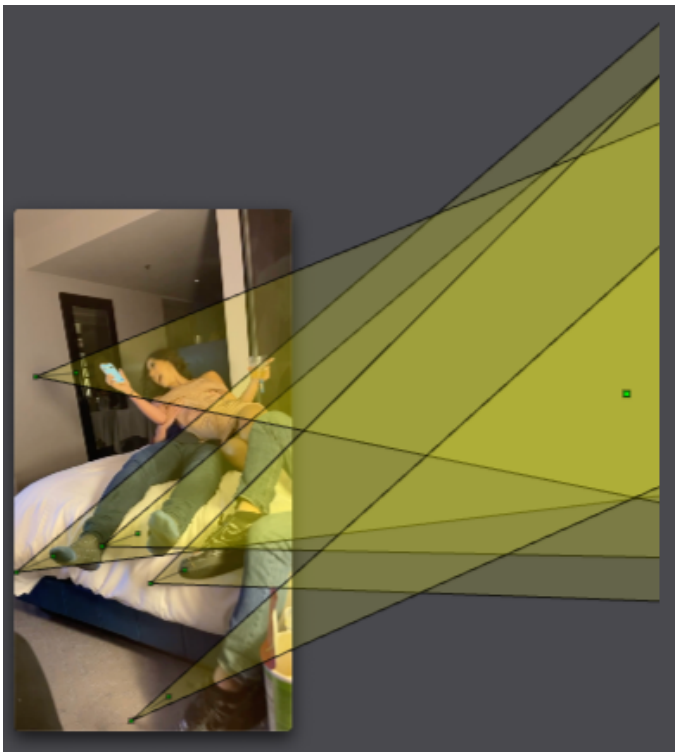
Watermarks: By way of background, some (but not all) generative-AI systems add a visible and/or invisible watermark to the underlying content (image, audio, or video). While the visible watermarks can be relatively easily manipulated, invisible watermarks are more difficult (but not impossible) to add or remove.

There are no visible watermarks in the video that would suggest that the video is AI generated. Neither video (nor the attached audio) contains an invisible SynthID watermark that would be added by any of Google's AI-generation tools.

Physics-Based Forensics: By way of background, fully AI-generated videos are the result of a statistical inference process, and not a process that models the full three-dimensional (3D) properties of the physical world. As a result AI-generated images and videos often violate basic geometric and physical properties of natural scenes[2].

I analyzed two representative video frames from the 06 video to determine if they are physically plausible (the shorter 42 video depicts the same basic scene).

Illustrated to the right is the result of the first cast shadow analysis in which each yellow-shaded triangular region corresponds to an object-shadow pairing. In an authentic scene, these cast-shadow constraints will be consistent with the dominant light source in the scene. Because the four

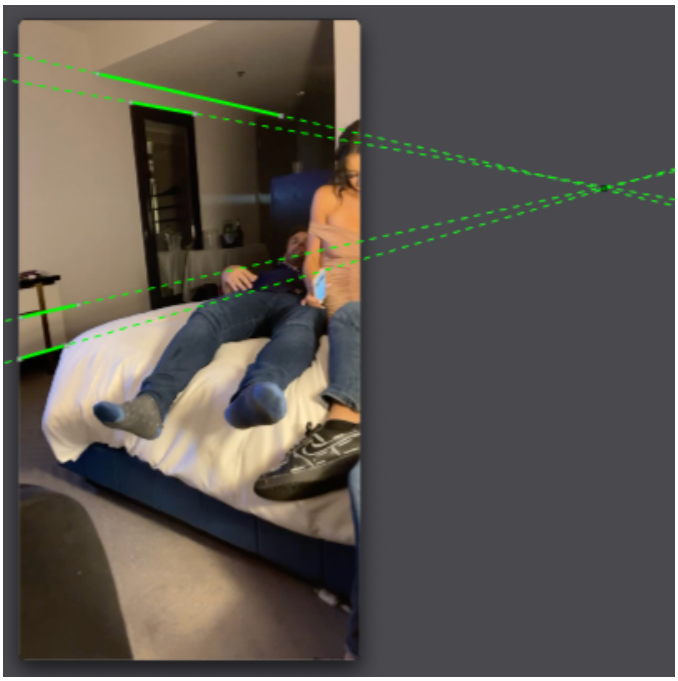


[1] Malley, Angela Rae. "A Comparison Analysis of Saved Snapchat Video Files on Androids vs iPhones." Master's thesis, University of Colorado at Denver, 2021.

[2] Farid, Hany. "Mitigating the harms of manipulated media: Confronting deepfakes and digital deception." PNAS Nexus 4, no. 7 (2025).

cast-shadows constraints have a consistent intersection (denoted with a small green square), these shadows are physically plausible.

Illustrated to the right is the result of a second perspective geometry analysis in which each green line corresponds to parallel lines on the wall. In an authentic scene, these parallel lines in the 3D scene will (assuming no camera lens distortion) converge to a consistent vanishing point. Because the four constraints have a consistent intersection, the scene geometry in the room is physically plausible.



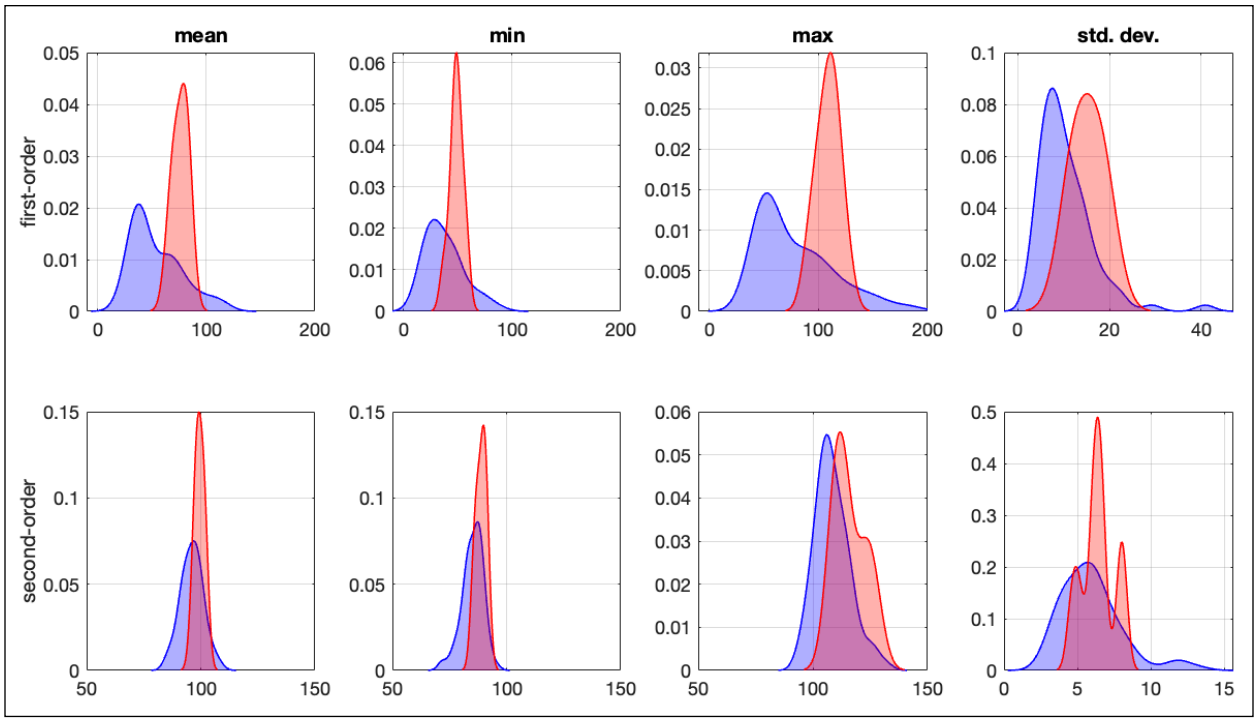
Video Forensics: By way of background, while the field of image and audio forensics is well developed, the field of video forensics is more nascent. This is because it was only until fairly recently that it was possible to generate visually compelling AI-generated videos (e.g., using tools such as Sora and Veo). There are, nevertheless, some effective techniques that can be applied to analyze the videos in question here.

I forensically analyzed the 06 and 42 videos for temporal patterns consistent with natural and AI-generated videos. This analysis[3] looks for subtle differences in how videos evolve over time. In particular, it has been shown that when real videos are passed through the same type of system used generate AI videos, their internal representations tend to change smoothly along relatively "straight" paths, reflecting the predictable structure of the physical world. In contrast, AI-generated videos follow more irregular, "curvier" paths in this representation space. By measuring simple geometric properties of these paths, we can determine if a video is consistent with natural videos.

Although this analysis is not as mature and well tested as the other forensic and biometric analyses in this report, it is a useful analysis that provides some insight into the authenticity of the videos in question.

I compared these temporal properties of the 06 and 42 videos to ten natural videos with generally similar length and appearance. Illustrated below is a comparison of eight geometric measurements made from these natural videos (blue) and the 06 and 42 videos (red). While there are some slight differences in these properties, the distributions are relatively similar as can be seen by their overlap. This analysis reveals no compelling evidence that the videos are fully AI generated.

[3] Internò, Christian, Robert Geirhos, Markus Olhofer, Sunny Liu, Barbara Hammer, and David Klindt. "AI-Generated Video Detection via Perceptual Straightening." arXiv preprint arXiv:2507.00583 (2025).



Voice: There is not enough human speech in either video to perform a voice analysis to determine if the voice(s) are natural or AI generated.

Conclusion: There are no obvious artifacts in either video that would suggest that the videos are AI generated or otherwise manipulated.

Visual Analysis

While the above quantitative forensic analyses can detect evidence of AI-generation or manipulation, qualitative expert visual analyses still plays an important role in authenticating visual content. For example, visual inspection can reveal unrealistic actions, distorted body shapes, or anomalous appearance/disappearance of content.

A visual inspection of each video reveals no obvious artifacts that would suggest video tampering or AI generation. This includes both a static, frame-by-frame analysis as well as a dynamic analysis of the motion in the videos with a particular focus on the face and body of the adult male depicted in the videos.

Conclusion: There are no obvious visual anomalies in either video that would suggest that the videos are AI generated or otherwise manipulated.

Biometric Analysis

By way of background, automatic facial biometric identification is a well established technique for identifying the faces of individuals in images/videos. Identification is

performed by extracting a numerical representation of a reference face and then comparing this representation to another face.

Using a widely-used facial biometric analysis[4], I first extracted the face of the adult male from two video frames in which the face was unobstructed and turned maximally towards the camera. I should note that neither of these "probe" images are ideal for a facial biometric analysis as they are relatively low resolution and deviate significantly from a frontal view, violating the conditions that are best for facial biometrics.

probe 1	probe 2
	

I then extracted the face of Rep. Swalwell from five "reference" images taken from the Getty Images website[5]. The first three of these reference images were selected due to their similar head pose as compared to the probe images, and to have been taken contemporaneous with the 2021 video timestamp (February 10, 2021, June 30, 2021, and June 2, 2022). The next two of these reference images were selected due to their more typical frontal head pose and to also have been taken contemporaneous with the 2021 video timestamp (February 2, 2022 and April 6, 2022).

reference 1	reference 2	reference 3	reference 4	reference 5
				

[4] Deng, Jiankang, Jia Guo, Niannan Xue, and Stefanos Zafeiriou. "Arcface: Additive angular margin loss for deep face recognition." In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp. 4690-4699. 2019.

[5] https://www.gettyimages.com/detail/news-photo/representative-eric-swalwell-a-democrat-from-california-news-photo/1231083227; https://www.gettyimages.com/detail/news-photo/speaker-of-the-house-nancy-pelosi-d-calif-hugs-metropolitan-news-photo/1233737947; https://www.gettyimages.com/detail/news-photo/rep-eric-swalwell-speaks-during-a-house-judiciary-committee-news-photo/1400679557; https://www.gettyimages.com/detail/news-photo/representative-eric-swalwell-a-democrat-from-california-news-photo/1238709144; and https://www.gettyimages.com/detail/news-photo/rep-eric-swalwell-speaks-alongside-sen-jack-reed-during-a-news-photo/1389947958

On a scale of -1.0 to 1.0, where 1.0 is a perfect facial biometric match, the two probe images match the five reference images with the following scores:

	reference 1	reference 2	reference 3	reference 4	reference 5
probe 1	0.47	0.48	0.57	0.57	0.54
probe 2	0.49	0.57	0.59	0.60	0.55

These scores should be interpreted relative to a threshold of 0.35 that I use for a positive biometric match. Based on this threshold the probe images are a biometric match to reference images of Rep. Swalwell. It is worth noting, however, that the scores are lower than the more typical positive biometric match of 0.85. Thus, the biometric similarity scores fall somewhere between the identification threshold and a typical positive match score.

Although there is no forensic or visual evidence that the facial region in either video was altered to change the person's identity (a so-called face-swap deepfake), I performed a secondary biometric analysis to examine the likelihood of this type of manipulation. In particular, because a face-swap deepfake only manipulates the face eyebrow-to-chin and cheek-to-cheek, the remaining parts of the person's appearance may not be consistent with the face[6].

Although a weaker biometric, the ears are somewhat distinct and can be used to identify individuals[7]. I therefore compared the right ear of the adult male from one frame of the 42 video to right ear of Rep. Swalwell from a "reference" image taken from Getty Images[8]. This image was selected due to its similar head pose as compared to the probe image.

reference	probe
	

[6] Farid, Hany. "Creating, using, misusing, and detecting deep fakes." Journal of Online Trust and Safety 1, no. 4 (2022).

[7] Abaza, Ayman, Arun Ross, Christina Hebert, Mary Ann F. Harrison, and Mark S. Nixon. "A survey on ear biometrics." ACM Computing Surveys (CSUR) 45, no. 2 (2013): 1-35.

[8] https://www.gettyimages.com/detail/news-photo/california-rep-eric-swalwell-announced-that-he-is-ending-news-photo/1321275802

I then rotated and scaled the probe image to align it to the reference image and adjusted the brightness and contrast of both the reference and probe images to make them more visually legible. As illustrated below, the aural details between the reference and probe images qualitatively match. Based on this analysis, there are no visible discrepancies that would exclude a positive biometric match.

Lastly, other features like general body shape and hairline are consistent between the video and reference images of Rep. Swalwell.

Conclusion: A facial biometric analysis is consistent with the conclusion that the adult male in the videos is Representative Eric Swalwell. A secondary aural biometric analysis supports this conclusion. This analysis does not, however, include a consideration of other identities to determine the uniqueness of this biometric match.

Background and Qualifications

I am a Professor at the University of California, Berkeley with a joint appointment in Electrical Engineering & Computer Sciences and the School of Information. I also hold an appointment in the Vision Science Program and am a member of the Berkeley Artificial Intelligence Research Lab and the Center for Innovation in Vision and Optics.

I received my undergraduate degree in Computer Science and Applied Mathematics from the University of Rochester in 1989, my M.S. in Computer Science from SUNY Albany in 1992, and my Ph.D. in Computer Science from the University of Pennsylvania in 1997. Following a two-year post-doctoral fellowship in Brain and Cognitive Sciences at MIT, I joined the faculty at Dartmouth College in 1999 where I remained until 2019.

Between 2011 and 2018, I was a co-founder and Chief Technology Officer of Fourandsix Technologies, a company dedicated to developing software to detect manipulated images. I am currently a co-founder and Chief Scientific Officer of Get Real Security, a company dedicated to developing software to detect manipulated and AI-generated images, audio, and video. I also advise small to large-sized technology companies on a variety of issues ranging from research and development to software development and online safety policies.

My academic research focuses on digital forensics, forensic science, misinformation, image analysis, and human perception. In the course of my 25-year academic career, I have published over 200 papers in these areas of scholarship. I have received numerous grants from federal agencies and technology companies to support my academic research in these areas of scholarship.

I am the recipient of an Alfred P. Sloan Fellowship, a John Simon Guggenheim Fellowship, and am a Fellow of the National Academy of Inventors.

My curriculum vitae is available at https://farid.berkeley.edu/downloads/cv.pdf.

The opinions expressed in this report are mine alone and do not reflect those of the University of California, Berkeley or GetReal Security.

Appendix A (video metadata)

```
ExifTool Version Number         : 12.76
File Name                       : recorded-1283021554306.mov
Directory                       : .
File Size                       : 7.3 MB
File Modification Date/Time     : 2021:07:13 04:55:48-07:00
File Access Date/Time           : 2026:01:03 12:50:07-08:00
File Inode Change Date/Time     : 2026:01:03 12:50:07-08:00
File Permissions                : -rw-rw-r--
File Type                       : MOV
File Type Extension             : mov
MIME Type                       : video/quicktime
Major Brand                     : Apple QuickTime (.MOV/QT)
Minor Version                   : 0.0.0
Compatible Brands               : qt
Movie Header Version            : 0
Create Date                     : 2026:01:03 18:18:34
Modify Date                     : 2026:01:03 18:18:34
Time Scale                      : 600
Duration                        : 6.60 s
Preferred Rate                  : 1
Preferred Volume                : 100.00%
Preview Time                    : 0 s
Preview Duration                : 0 s
Poster Time                     : 0 s
Selection Time                  : 0 s
Selection Duration              : 0 s
Current Time                    : 0 s
Next Track ID                   : 3
Track Header Version            : 0
Track Create Date               : 2026:01:03 18:18:34
Track Modify Date               : 2026:01:03 18:18:34
Track ID                        : 1
Track Duration                  : 6.60 s
Track Layer                     : 0
Track Volume                    : 100.00%
Balance                         : 0
Audio Format                    : mp4a
Audio Channels                  : 1
Audio Bits Per Sample           : 16
Audio Sample Rate               : 44100
Purchase File Format            : mp4a
Matrix Structure                : 0 1 0 -1 0 0 656 0 1
Image Width                     : 1232
Image Height                    : 656
Clean Aperture Dimensions       : 1232x656
Production Aperture Dimensions  : 1232x656
Encoded Pixels Dimensions       : 1232x656
Media Header Version            : 0
Media Create Date               : 2026:01:03 18:18:34
Media Modify Date               : 2026:01:03 18:18:34
Media Time Scale                : 600
```

```
Media Duration                  : 6.60 s
Media Language Code             : und
Graphics Mode                   : ditherCopy
Op Color                        : 32768 32768 32768
Handler Class                   : Data Handler
Handler Vendor ID               : Apple
Handler Description             : Core Media Data Handler
Compressor ID                   : avc1
Source Image Width              : 1232
Source Image Height             : 656
X Resolution                    : 72
Y Resolution                    : 72
Compressor Name                 : H.264
Bit Depth                       : 24
Video Frame Rate                : 30
Handler Type                    : Metadata Tags
GPS Coordinates (und-US)        : 36 deg 10' 0.12" N, 115 deg 8' 55.32" W
Media Data Size                 : 7300579
Media Data Offset               : 5655
GPS Coordinates                 : 36 deg 10' 0.12" N, 115 deg 8' 55.32" W
Image Size                      : 1232x656
Megapixels                      : 0.808
Avg Bitrate                     : 8.85 Mbps
GPS Latitude                    : 36 deg 10' 0.12" N
GPS Longitude                   : 115 deg 8' 55.32" W
Rotation                        : 90
GPS Position                    : 36 deg 10' 0.12" N, 115 deg 8' 55.32" W

ExifTool Version Number         : 12.76
File Name                       : recorded-1283369659042.mov
Directory                       : .
File Size                       : 4.6 MB
File Modification Date/Time     : 2021:07:13 04:56:04-07:00
File Access Date/Time           : 2026:01:03 12:50:07-08:00
File Inode Change Date/Time     : 2026:01:03 12:50:04-08:00
File Permissions                : -rw-rw-r--
File Type                       : MOV
File Type Extension             : mov
MIME Type                       : video/quicktime
Major Brand                     : Apple QuickTime (.MOV/QT)
Minor Version                   : 0.0.0
Compatible Brands               : qt
Movie Header Version            : 0
Create Date                     : 2026:01:03 18:18:33
Modify Date                     : 2026:01:03 18:18:34
Time Scale                      : 600
Duration                        : 4.04 s
Preferred Rate                  : 1
Preferred Volume                : 100.00%
Preview Time                    : 0 s
Preview Duration                : 0 s
Poster Time                     : 0 s
Selection Time                  : 0 s
Selection Duration              : 0 s
```

```
Current Time                    : 0 s
Next Track ID                   : 3
Track Header Version            : 0
Track Create Date               : 2026:01:03 18:18:33
Track Modify Date               : 2026:01:03 18:18:34
Track ID                        : 1
Track Duration                  : 4.04 s
Track Layer                     : 0
Track Volume                    : 100.00%
Balance                         : 0
Audio Format                    : mp4a
Audio Channels                  : 1
Audio Bits Per Sample           : 16
Audio Sample Rate               : 44100
Purchase File Format            : mp4a
Matrix Structure                : 0 1 0 -1 0 0 656 0 1
Image Width                     : 1232
Image Height                    : 656
Clean Aperture Dimensions       : 1232x656
Production Aperture Dimensions  : 1232x656
Encoded Pixels Dimensions       : 1232x656
Media Header Version            : 0
Media Create Date               : 2026:01:03 18:18:33
Media Modify Date               : 2026:01:03 18:18:34
Media Time Scale                : 600
Media Duration                  : 4.04 s
Media Language Code             : und
Graphics Mode                   : ditherCopy
Op Color                        : 32768 32768 32768
Handler Class                   : Data Handler
Handler Vendor ID               : Apple
Handler Description             : Core Media Data Handler
Compressor ID                   : avc1
Source Image Width              : 1232
Source Image Height             : 656
X Resolution                    : 72
Y Resolution                    : 72
Compressor Name                 : H.264
Bit Depth                       : 24
Video Frame Rate                : 30.173
Handler Type                    : Metadata Tags
GPS Coordinates (und-US)        : 36 deg 10' 0.12" N, 115 deg 8' 55.32" W
Creation Date                   : 2021:07:13 01:56:04-07:00
Media Data Size                 : 4632604
Media Data Offset               : 4244
GPS Coordinates                 : 36 deg 10' 0.12" N, 115 deg 8' 55.32" W
Image Size                      : 1232x656
Megapixels                      : 0.808
Avg Bitrate                     : 9.17 Mbps
GPS Latitude                    : 36 deg 10' 0.12" N.
GPS Longitude                   : 115 deg 8' 55.32" W
Rotation                        : 90
GPS Position                    : 36 deg 10' 0.12" N, 115 deg 8' 55.32" W
```