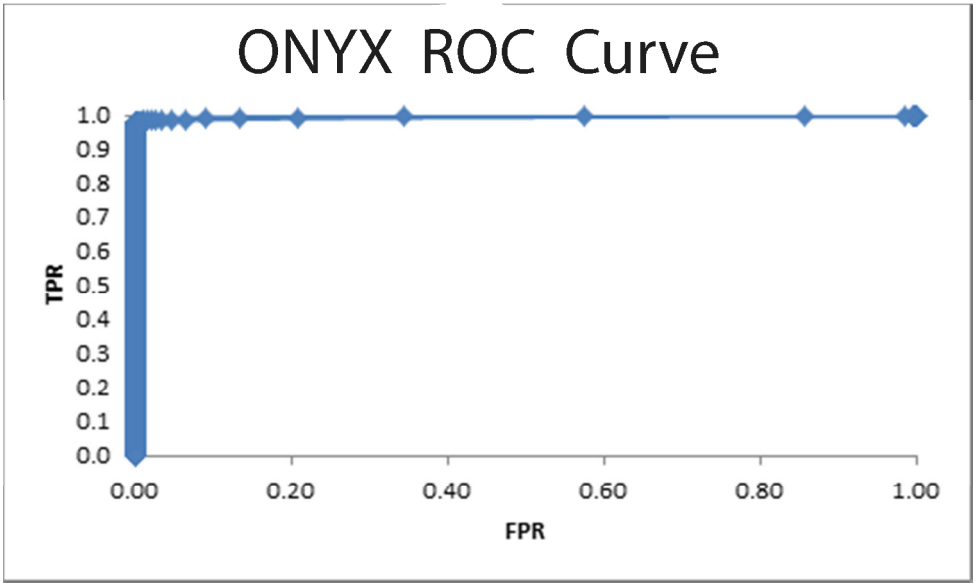
Diamond Fortress Technologies
ONYX™ and DFT Matcher Test Results

Diamond Fortress Technologies, Inc. (DFT) has completed internal testing of its touchless mobile fingerprint collection and processing software ONYX™ and proprietary fingerprint matcher.

The test was built and supervised by Dr. Joel D. Burcham, Ph.D. and William C. Lucas, M.S.C.S. Dr. Burcham as over a decade experience in optical systems with a focus on biometrics and a Doctorate degree in Physics from Clemson University. Mr. Lucas has ten years of computer programming experience with a focus on image processing and holds an M.S. in Computer Science from the University of Alabama in Huntsville.

Dr. Burcham and Mr. Lucas conducted a test to determine the accuracy of DFT's proprietary fingerprint matching software utilizing fingerprint images collected and processed by ONYX. The test disclosed a False Acceptance Rate (FRR) of .00034% and a False Reject Rate (FRR) of 3.7%. The following Receiver Operating Characteristics (ROC) graph illustrates the accuracy findings:



Dataset:
Finger Images: 1,340 collected from 14 subjects. There are approximately 10 images collected per subject for each subject finger. The set includes five fingers from each subject hand, including thumbs and little fingers (pinkies). All of the finger images were stored in a method that prevents any association of a subject's identity with their provided data.

Matching Threshold Value:

The matching threshold was set to '100' which corresponds to the number of points on each fingerprint which must be found to match to qualify as a positive match. The points consist of minutiae and other identifiable unique fingerprint features.

Scanner Type:
Optical: ONYX was installed on several Android based smartphones, the rear-facing camera was used to collect images, and the images were processed on the devices. The light associated with the rear facing cameras was on for the collections. The processed images were electronically transported to a desktop machine which ran DFT's proprietary matcher and testing program. The following devices were used for collection and image processing:

1 Samsung Galaxy Note II
2 Motorola Razr M
3 Samsung Galaxy S III

Resolution:
The fingerprint images are sampled down to 500dpi.

Testing Procedure:
FRR: The false rejection rate was calculated by comparing all of the images collected for each finger as a set. Since ten images of the same finger were collected in these sets, all the images in each set should match. Any non-matches increase the FRR value. The match score for each comparison was recorded. Using the selected match threshold, typically '100' for this matcher, the match and no match results were tabulated. The final FRR value is the ratio of the matches and non-matches.

FAR: The false acceptance rate was calculated by comparing each finger in a ten finger set against all the other images outside that set. This was done for all the images in the full dataset. All of the compared images were from different fingers. Any matches increase the FAR score. The match score for each comparison was recorded. Using the selected match threshold, typically '100' for this matcher, the match and no match results were tabulated. The final FAR value is the ratio of the matches and non-matches.

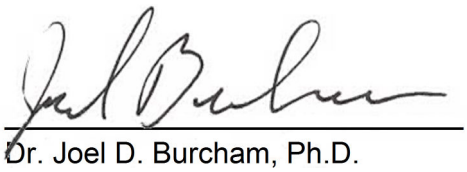
Results:
FAR - .00034%
FRR - 3.7%
EER - 1.5%[1]

Additional Information:

[1] The matching software was set to analyze fingerprints as if on a 2D plane thus eliminating tolerance for finger roll/rotation. DFT's commercially available matcher will include finger roll/rotation tolerance, substantially improving the FRR and EER numbers.

In addition to the world class results from DFT's internal matcher, Dr. Burcham's general observations reveal a 5% -10% accuracy improvement of third-party matchers utilizing images from iONYX.

Results certified by:



Dr. Joel D. Burcham, Ph.D.