OptoFidelity Video Multimeter Test Report

Mobile Video Streaming and Local Video Playback on Mobile Devices Are Rising – How do Different Devices Perform?

Smartphones and tablets are playing a key role in the consumption of videos. Thanks to evolving technology, streaming media with mobile devices is more popular than ever. Maybe the biggest driver in the streaming media industry is the increasing demand among consumers for music and video. There are extensive entertainment options for the whole family. Services like Netflix, Amazon Prime Video and Hulu offer a huge amount of on-demand content at a low monthly cost, not forgetting there are free YouTube videos. In addition to home videos consumers use their mobile devices to record streamed videos and TV shows for later enjoyment.

Although performance depends on the quality of the service and internet connection, the device plays a big role in the final user experience. In addition to jerkiness and dropped frames, one other key feature of the user experience is 'lip sync' – the synchronized timing of audio and video.

OptoFidelity

1. Measuring Video Performance with OptoFidelity Video Multimeter

The OptoFidelity Video Multimeter is a professional measurement solution for measuring objectively the true video playback performance of a mobile, tablet or any multimedia device. It is a perfect tool for R&D design verification, test laboratory use and other R&D applications. The Video Multimeter also has an option to measure lip sync.

2. Test Devices

In this test case video performance was measured with two tablets. The following devices were compared:

- Apple® iPad Pro™ (128 GB, Wi-Fi)
- Microsoft® Surface™ Pro 4 (i5 CPU version)

Both local video playback and streamed video playback were tested. For streaming video we used the YouTube service and the native YouTube application in the device. Measurements of video and audio performance were made with OptoFidelity's Video Multimeter.

3. Test Set-Up

First of all the Video Multimeter was coupled to the device display with optical fiber cable. Audio was captured from the headphones connector.

One of the benefits of using the OptoFidelity Video Multimeter for performance testing is that there is no need for special software – the Video Multimeter measurement is fully non-intrusive.

The Video Multimeter outputs MOS (Mean Opinion Score) for each measured KPI (Key Performance Indicator).

MOS (Mean Opinion Score)	Quality	Impairment
4 - 5	Excellent	Imperceptible
3 - 4	Good	Perceptible but not annoying
2 - 3	Fair	Slightly annoying
1 - 2	Poor	Annoying
< 1	Bad	Very annoying

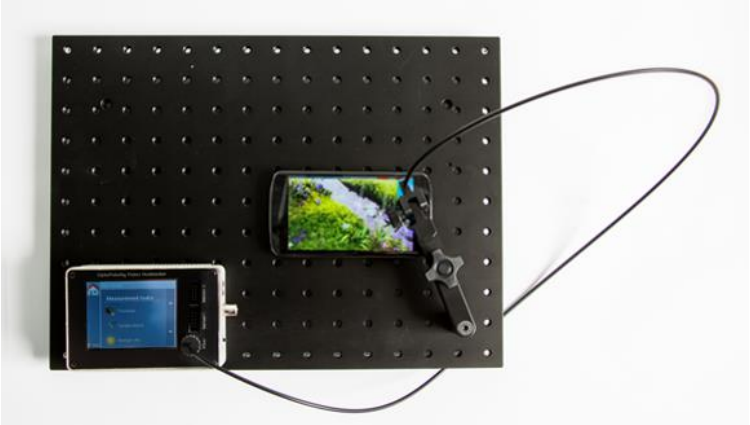
Picture 1. Mean Opinion Score (MOS)

Composite MOS can be broken down into Individual MOS and ultimately to raw parameters and metrics.

4. Test Material

We tested the local video playback including four different quality video files (.mp4) uploaded to the device memory. The OptoFidelity Video Multimeter comes with OptoFidelity's test video generator software, with which you can create test videos of needed length and save them in the format of your choice.

After downloading the test video file to your device under test (DUT), you can play the test video and let the OptoFidelity Video Multimeter measure the true video and dropped frame rate count performance as they are seen on the device's display.



Picture 2. Test Setup

In both cases 51s long video clips of the following resolution and frame rate were used:

- Full HD, 30 fps
- Full HD, 60 fps
- 4K, 30 fps
- 4K, 60 fps

Also streamed video playback was measured with four different quality video files played from YouTube.

The following test video clips were used (clip length 51 seconds each):

- Full HD, 30 fps
- Full HD, 60 fps
- 4K, 30 fps
- 4K, 60 fps

The internet connection used in this test was high-speed internet via Wi-Fi.

5. Results and Conclusion

The overall video playback quality of the both devices was close to excellent. However, the audio/video synchronization could be better in both devices.

iPad Pro's YouTube application downscaled the video automatically to full HD, so it was not able to playback any 4K content with the native resolution. In addition, the audio playback in iPad Pro was ~35 ms **ahead** of the video playback. This can easily be perceived by the viewer and most people find this annoying.

Device: Apple iPad Pro

Resolution	FPS	Source	cMOS	Jerkiness	Jitter	Drops	Lipsync	Notes
FHD	30	Youtube	4,8	4,5	5	5	4,3	
FHD	60	Youtube	4,8	5	5	5	4,1	
4K	30	Youtube	4,8	4,5	5	5	4,4	Player downscaled to FHD
4K	60	Youtube	4,8	5	5	5	4,2	Player downscaled to FHD
FHD	30	Local	4,4	4,5	5	5	2,6	
FHD	60	Local	4,5	5	5	5	2,4	
4K	30	Local	4,3	4,5	5	5	2,1	
4K	60	Local	4,4	5	5	5	2,2	
			4,6					

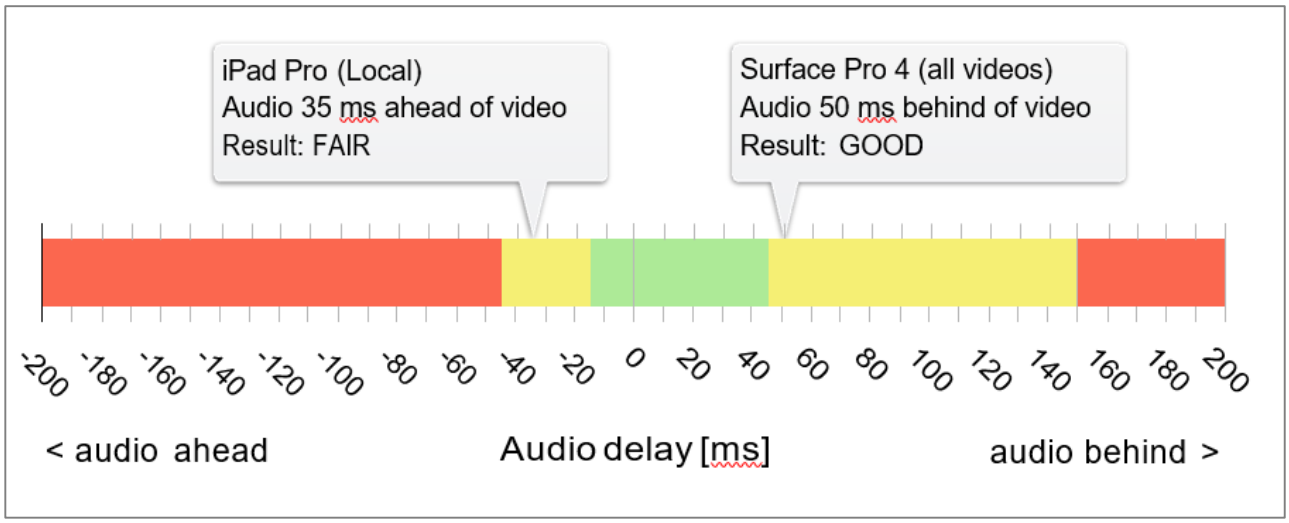
Picture 3. Test results: Apple iPad Pro

Microsoft Surface Pro 4 was not able to playback 4K @ 60 fps content from YouTube with the native resolution, but 4K @ 30 fps was successfully played. Furthermore, the audio playback in Surface Pro was ~50 ms **behind** of the video playback. Most viewers don't perceive this.

Device: Microsoft Surface 4 i5
CPU

Resolution	FPS	Source	cMOS	Jerkiness	Jitter	Drops	Lipsync	Notes
FHD	30	Youtube	4,4	4,5	4,3	5	3,4	
FHD	60	Youtube	4,6	5	5	5	3,2	
4K	30	Youtube	4,6	4,5	4,8	5	3,5	
4K	60	Youtube	4,6	5	5	5	3,1	Player downscaled to FHD
FHD	30	Local	4,6	4,5	5	5	3,7	
FHD	60	Local	4,8	5	5	5	3,8	
4K	30	Local	4,7	4,5	5	5	3,8	
4K	60	Local	4,8	5	5	5	3,8	
			4,64					

Picture 4. Test results: Microsoft Surface Pro 4 i5 CPU



Picture 5. Test results: Audio Delay (ms)

6. More Information on OptoFidelity Video Multimeter

OptoFidelity has significant expertise in user experience reporting. We have a proven track record on testing and reporting touch accuracy, video playback performance and graphical UI performance. Our unique test system can measure the end-to-end user-perceived quality of video performance.

The OptoFidelity Video Multimeter is a great tool in R&D design verification, in test laboratory use and it can be used as a part of Continuous Integration (CI) practice. You will get reliable and repeatable results fast, and with the standard USB connection. You can transfer all the data into your own test software and design database for complete analysis. You can save the measurement results and download those to your computer.

Find more information at: http://www.optofidelity.com/products-and-services/test-automation/video-playback-performance/video-multimeter/

OptoFidelity Video Multimeter on YouTube: https://www.YouTube.com/playlist?list=PLg3J_XlZzhnU3V1rCzuYVl9yNP6FypxiL

If you have any questions, please contact sales@optofidelity.com