Spirent Chromatic 1.7 User Manual

5280 Corporate Drive,
Frederick, MD. 21703

Document Version: 2.1
August 2014

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1   Introduction

1.1   Overview

Spirent Communication's Chromatic is a frame delivery testing system, for quantifying and benchmarking mobile video performance. This section provides an overview of the Chromatic workflow. Chromatic comes pre-configured and requires no software installation. The remainder of this guide is structured along the sequential processes needed to run Chromatic.

- Hardware Configuration
- Prepare the mobile device
- Open the Chromatic software.
- Specify the settings.
- Confirm the device positioning.
- Start the test.
- Collect and analyze your results.

Each of these steps is explained in detail in the following sections.

1.2   Hardware Configuration

Upon opening the Chromatic box, you should see a partially configured system as in the following image.
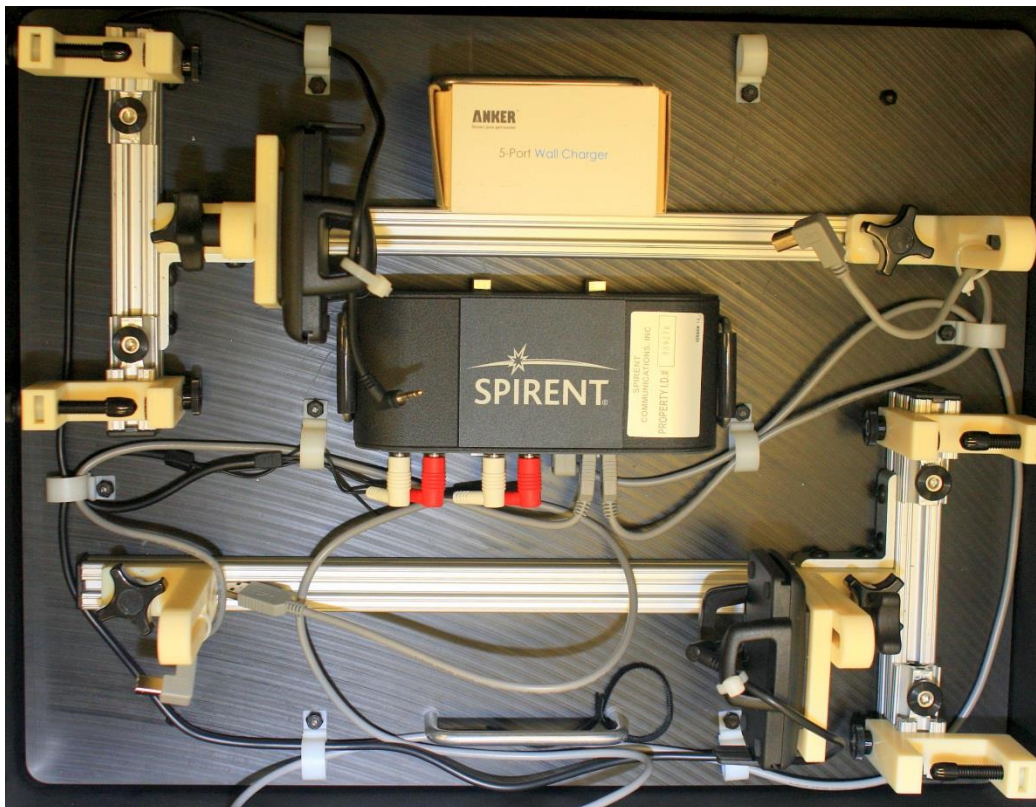
Figure 1-1 Chromatic unpacking

Remove the Wall Charger box and install the cameras, which are provided separately in the clear plastic shipping container

Figure 1-2 Camera

Install the cameras and attach the cell phone. The finished assembly should look like the following image.

Figure 1-3 Hardware Mounting Fixture Side View

Remove the chromatic box and configure the cables as shown in the following image and directions.

Figure 1-4 Cable Connections

From the front of the device, connect the following.
1. Cell phones to channel 1 or channel 2 (Red to red and white to white).
2. Cameras to Cam 1 and/or Cam2.
3. PC to the USB port of your laptop.

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4.   Optional GPS cable to the GPS port and use the auxiliary ports (AUX) for the cell phone chargers
5.   Audio capture modules and the GPS receiver to the USB hubs.
6.   Plug in the power cord to power up the unit. There is no on/off switch.

The USB hardware detection occurs upon the first connection. A notification displays when the automatic driver installation procedure finishes.

During testing, each test device is mounted to the hardware fixture. The following diagram shows the Chromatic system configuration
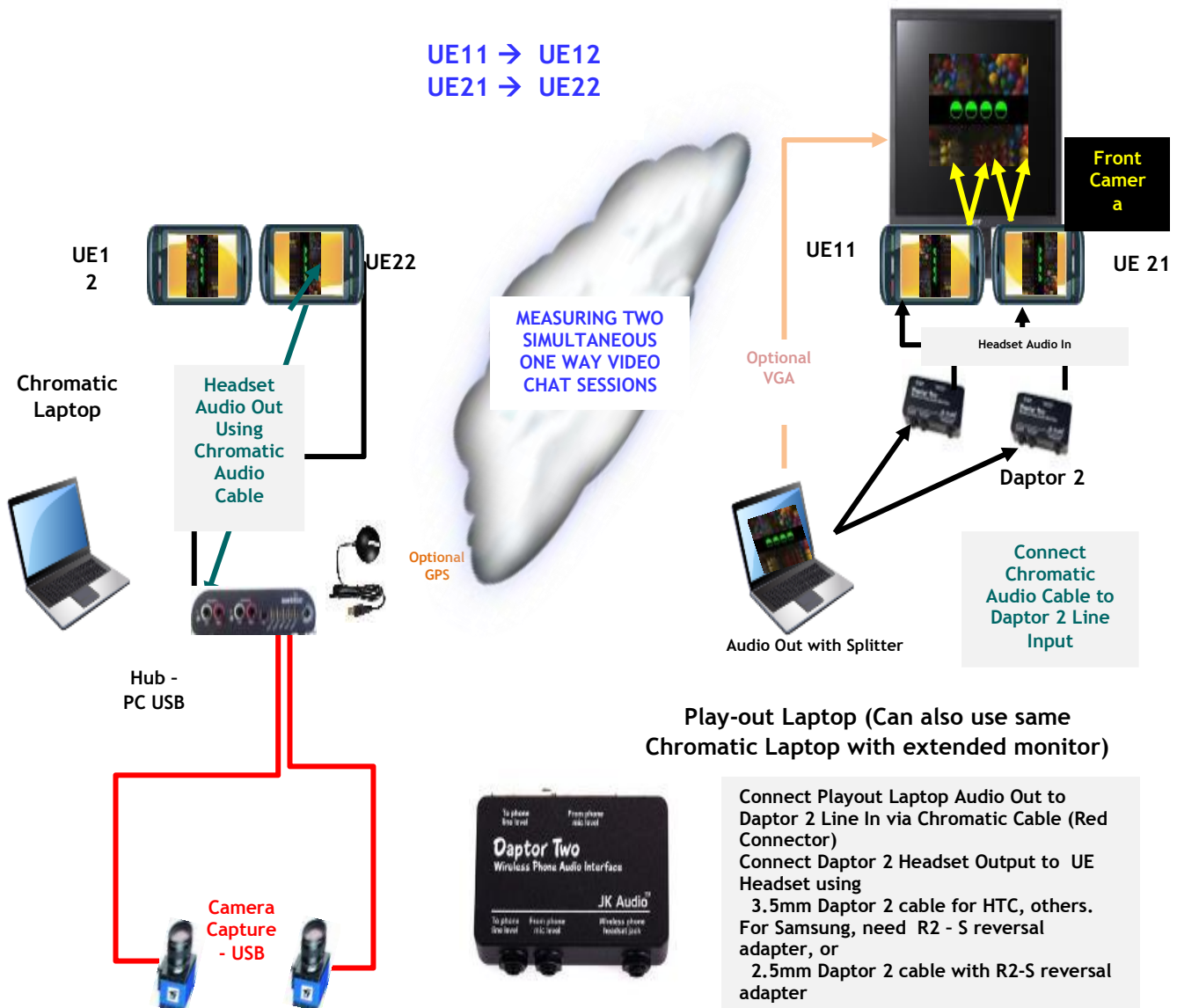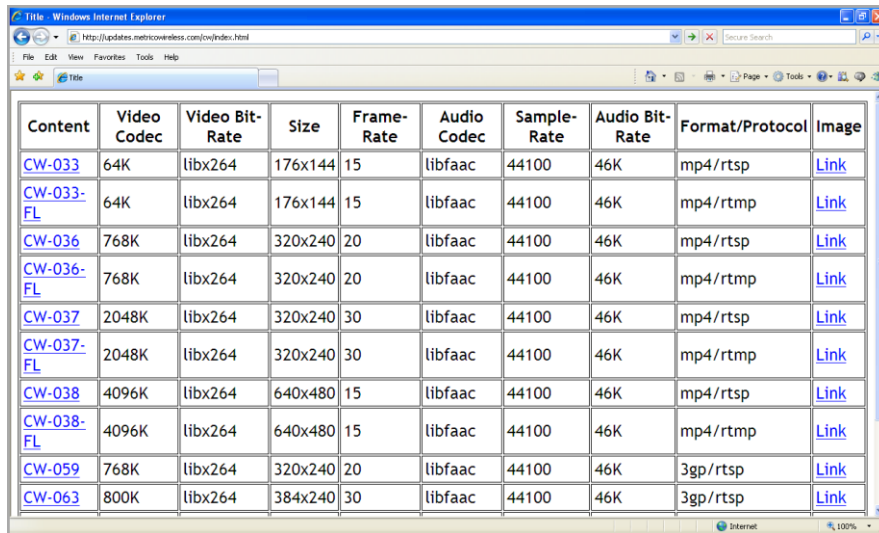
Figure 1-5 Chromatic System Overview

1.3   Mobile Device Configuration

Perform the following steps to configure the test devices for Chromatic testing.

1.   Turn on each test device.
2.   In the device's web browser, navigate to the standard Spirent or custom test site containing a series of test videos:

- Standard Spirent test site: http://updates.metricowireless.com/cw/index.html
- Custom test site. Navigate to the custom test clip URL listed at the bottom of the Capture tab in the Chromatic software.

3. The videos on the test site use different video codes and frame rates. The videos marked FL are in Flash format and can be played in a web browser. The others use standard Real Time Streaming Protocol (RTSP) for use in a video player.

Figure 1-6 Video Test Site

4. Click any item in the **Content** column to select the test video.
5. Adjust the **handset volume level** to approximately 75% of the maximum.
6. Connect an **audio cable** from each audio capture module to the headset jack of each mobile device.
7. Position the **test devices** in the rig.

1.4   Ensure Proper Positioning

Use the Chromatic software to ensure the test devices are properly positioned in front of the cameras. This section discusses the basics of positioning and configuring the camera. Fine tuning is discussed in the next chapter.

Figure 1-7 Chromatic Software

From this screen perform the following steps:

1. To begin video performance testing, double-click the Chromatic ![icon] icon on the Windows Desktop, or from the Windows Start Menu select **All Programs> Chromatic**. The first time Chromatic is opened, an internet connection is required for product activation.
2. . Click **Camera Settings** and the following screen displays.
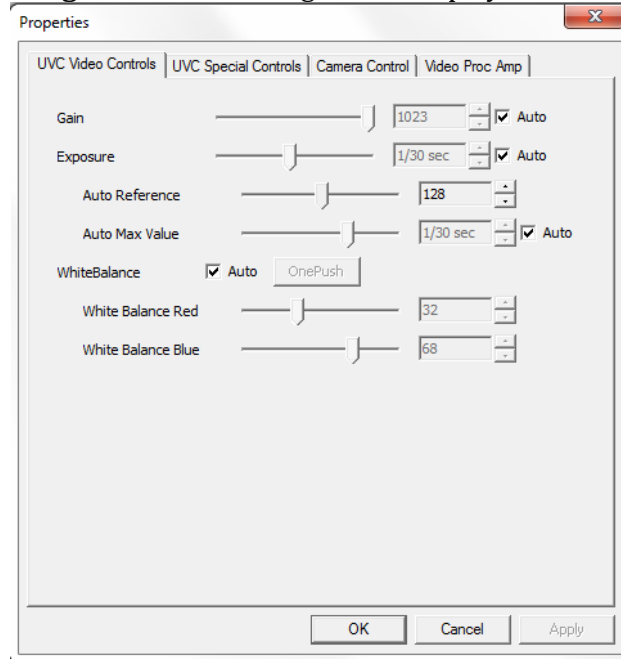
Figure 1-8   Camera Settings Starting Point

Spirent offers the following recommendations for optimal camera settings. If possible, adjust your camera settings while playing a test video directly stored on the device (for example, on the SD card)

- The camera should be positioned under the same light shade you will be using for your test.
- If possible, set the phone screen brightness to a fixed value, around 75% of the maximum.
- Use the settings below as a default, then make small adjustments to the gain to produce the desired level of picture contrast:
  - Disable automatic gain control
  - Disable automatic exposure control
  - Set exposure to 1/120 s
  - Set gain to 645 – adjust as necessary

2   Setting User Preferences

Prior to first use, Chromatic must be configured with user preferences. To configure the program, specify General Settings, GPS/Time Settings, and Capture/Processing Settings. Each of these configuration options is accessible from the Chromatic Settings tab. The default settings are suitable for most users.
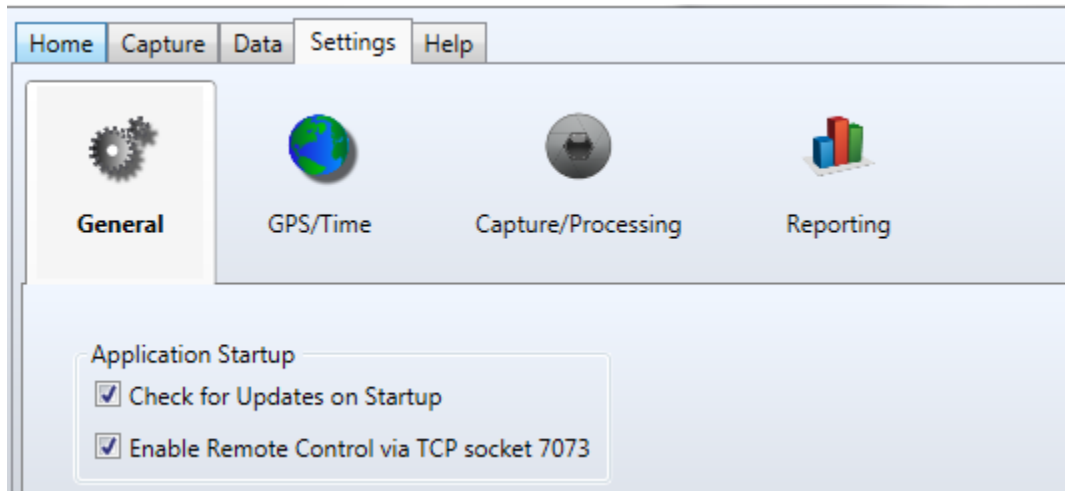
Figure 2-1 Accessing the Chromatic Settings Tab

2.1   General

To specify general settings for Chromatic, choose whether to **Check for Updates on Startup** to determine whether a newer version of Chromatic is available (recommended).
The Enable Remote Control via TCP socket 7073 option is only visible to customers who have purchased this optional command set for controlling Spirent's Nomad remotely via any socket client. This option should be selected in order to access Remote Control functionality. Remote functionality includes Time synchronization, which consists of:
- Configuration of capture channels
- Starting/stopping a capture session
- Performing post-processing on a session

For full details see the Spirent Chromatic Remote Control Guide.

2.2   GPS/Time

Use this option to specify settings related to time synchronization and GPS on the **GPS/Time** tab.
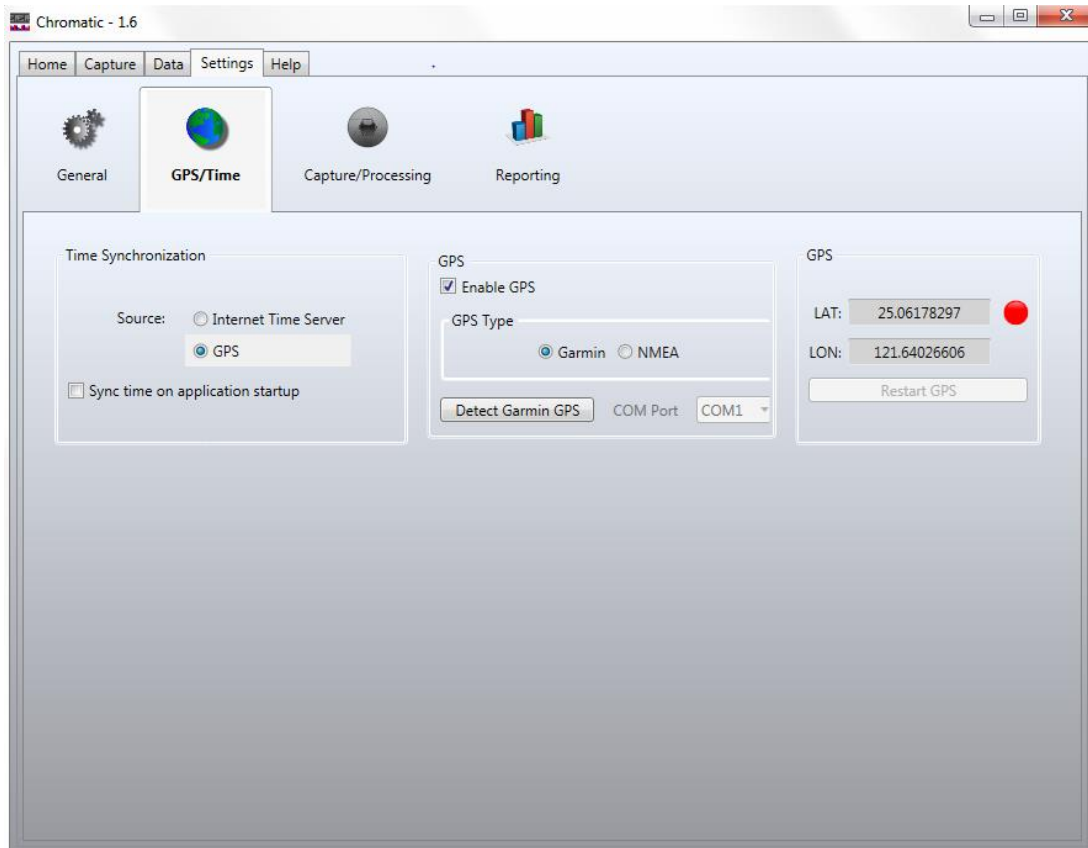
Figure 2-2 GPS/Time Settings

2.2.1 Time Synchronization

Time synchronization is required when the data captured with Chromatic will be correlated with Qualcomm eXtensible Diagnostic Monitor (QXDM) data collected on another device. Time synchronization should also be performed on the QxDM collection device (if necessary, through the operating system) for proper correlation. To specify time synchronization options in Chromatic perform the following steps.

1. **Internet Time Server** – Chromatic will synchronize the PC's clock to internet time on demand. In order to use this method you must have a dedicated internet connection.
2. **GPS** - Spirent recommends using GPS for mobile environments. ITS may encounter latency issues in a drive test. **GPS** – Chromatic will synchronize the PC's clock to GPS time on demand. Spirent recommends using this time synchronization method for mobile tests.
3. **Sync time** -on application startup to automatically perform time synchronization when the Chromatic software is opened. Do not select this option if the locally captured Chromatic data is to be correlated with QXDM data collected on another device.

2.2.2 GPS

Chromatic can record GPS information during testing. Location information can be used to display data testing results graphically in MapInfoTM and similar mapping applications.

To capture GPS information with Chromatic, perform the following steps.

1. Connect a GPS device and enable the device to acquire a signal.
2. In the GPS area of the Settings dialog, confirm that the Enable GPS box is selected.

3. Select the GPS Type as Garmin or NMEA (for DeLorme or any device that supports this standard). For a Garmin device, click the Detect Garmin GPS button to activate. For an NMEA device, select the corresponding COM Port.

If available, live GPS data will display here. This includes:

- Current latitude and longitude
- GPS Fix status, which is indicated by the colored circle in this area. Hover over the circle for the status tooltip. The status is provided as NO FIX, 2-D DIFF, 3-D or 3-D DIFF. DIFF status refers to a lock on differential GPS sensors, providing a more accurate location reading than standard GPS.
- The blinking heart ♥ blinks each time a GPS message is received.
- The yellow triangle ⚠ indicates an error. Click the Restart GPS button to activate (in some cases it may be necessary to click this button twice).

2.3 Capture/Processing

Specify settings related to video capture and processing on the **Capture/Processing** tab. The different areas of this tab are discussed in detail below.
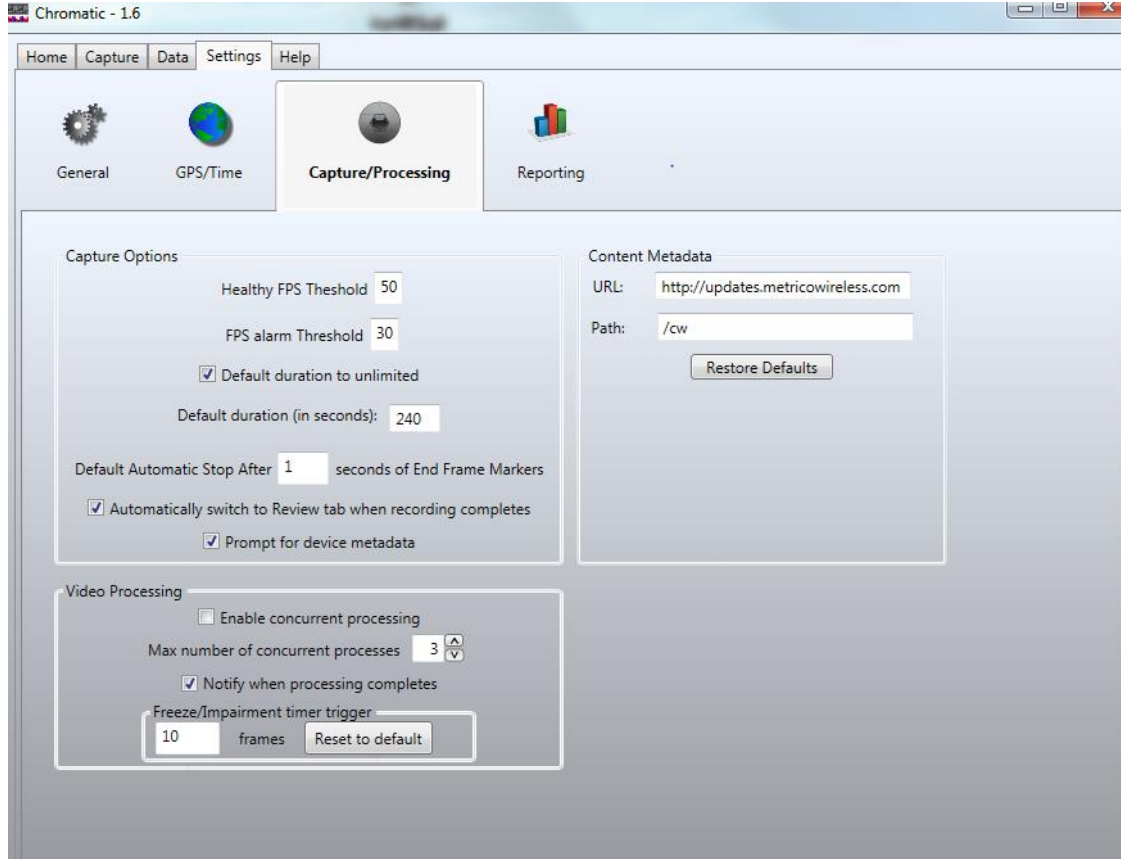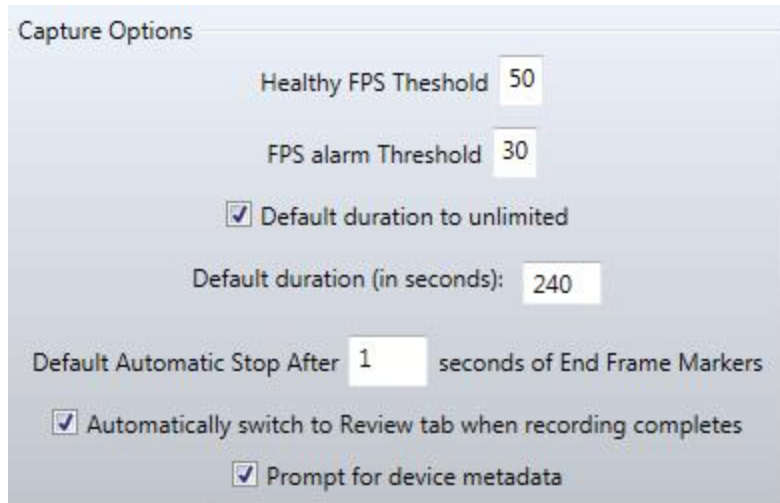
Figure 2-3 Capture/Processing Settings

2.3.1 Capture Options
Use these fields to control the recording session.

Figure 2-4 Capture Options Area

- **Healthy FPS Threshold –** The limit of frames per second. This is primarily internal testing data and not intended for customer use.
- **FPS Alarm Threshold -** This is primarily internal testing data and not intended for customer use.
- **Default duration to unlimited** – Select this option to end the test session manually by clicking **Stop**.
- **Default duration (in seconds)** – When Default duration to unlimited is left unchecked, this field provides the test duration.
- **Automatically switch to Review tab when recording completes** – At the end of the test session, Chromatic automatically display this screen to replay the recorded video or review the raw data in the session folder.
- **Prompt for device metadata** – Select this option to display fields in the Record and Config dialogs for entering device Make, Model, Role and HW Identifier information. If entered, this information will appear in the Chromatic output report.

2.3.2 Content Metadata
Enter the **URL** and the **Path** of the test videos in use. The **URL** and **Path** must match the destination entered on the mobile device.
The default settings point to the standard Spirent-hosted video test clips and are appropriate in most cases. The files contained in the directory specified here are listed upon test initiation, allowing the user to specify the actual file in use for the test.

2.3.3 Video Processing
Use these fields to control the processing of session data.

2.3.3.1 Enable concurrent processing
Check this box to allow Chromatic to process multiple output files at the same time for data analysis. This option may shorten overall processing time on powerful, multi-core systems. In some cases, concurrent processing may result in a drastic decline in processing speed. If this occurs, Spirent recommends disabling this option or lowering the **Max number of concurrent processes** allowed.

2.3.3.2   Max number of concurrent processes

Use this option to specify the maximum number of simultaneous processes allowed when concurrent processing is enabled. Raise this value to take advantage of powerful processing capabilities of multi-core systems and lower overall processing time. The maximum value allowed in this field corresponds to the machine's number of processors. Lower this value if performance suffers with concurrent processing on less powerful machines. The standard Spirent-provided Chromatic laptop contains a processor with eight cores, allowing up to eight captures to be processed simultaneously. Set the **Max number of concurrent processes** to eight to take advantage of the laptop's computing capabilities. This option maximizes efficiency by shortening overall processing time in batch mode.

2.3.3.3   Notify when processing completes

Select this option if you wish Chromatic to issue a pop up message when the test completes.

2.3.3.4   Freeze/Impairment timer trigger (FITT)

Use this option to set the number of individually impaired images the system will ignore before registering the test as impaired. For example, the system comes configured to 10 (an allowed range of 1 to 10 with the default as 10), then it would require 10 or more impaired images to qualify for impaired status. Spirent recommends you set this parameter to 6. Assuming the image is transmitting at 10 frames per second, a setting of six would be 200 Ms.

To create a 200 ms threshold (corresponding to human eye sensitivity) you would use the following formula.

*FITT = .2 * framerate of the test video.*
If the testframe = 30 FPS then the FITT = 6.

The FITT impacts the calculation of frozen and impaired frames as a low FITT (1) makes Chromatic very sensitive where as a FITT of 10 would be more forgiving.

If you change the FIT you do not need to recreate the capture. You only need to re-run post processing as shown in section….

2.4   Reporting

Use these fields to define the **BadAVSync%** parameter on the **Validation** tab of the Chromatic output report. In the ideal case, the test video and corresponding audio are captured simultaneously by the Chromatic software. While a small amount of offset (with audio either leading or lagging the video) is acceptable, a large offset between the audio and video is often undesirable. The **BadAVSync%** parameter captures the frequency of undesirable offset conditions.
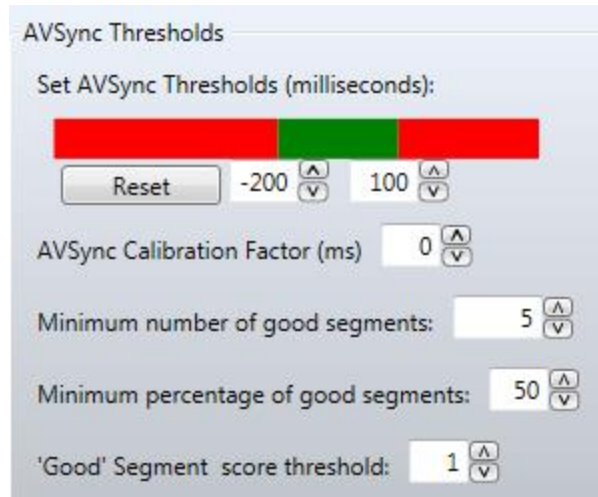
Figure 2-5 AVSync Thresholds Area

- **Set AVSync Thresholds (milliseconds)** – Offset within the green center area of the thresholds bar is considered acceptable. Set the maximum acceptable audio lag using the left-hand threshold setting. Set the maximum acceptable audio lead using the right-hand threshold setting.
- **AVSync Calibration Factor** – The offset value off which the **AVSync Thresholds** are based. With the **Calibration Factor** set at 0 and the **AVSync Thresholds** at -200 ms and 50 ms, offsets between -200 ms and 50 ms are considered acceptable. With the **Calibration Factor** set at 50 and the **AVSync Thresholds** at -200 ms and 50 ms, offsets between -150 ms and 100 ms are considered acceptable.

Note: In most cases, the default settings in this area should be maintained. If adjustment is necessary, please contact Spirent Support for more information.

3   Confirming Device Positioning

Prior to testing, the position of each test device must be confirmed using the **Config** option on the **Capture** tab.
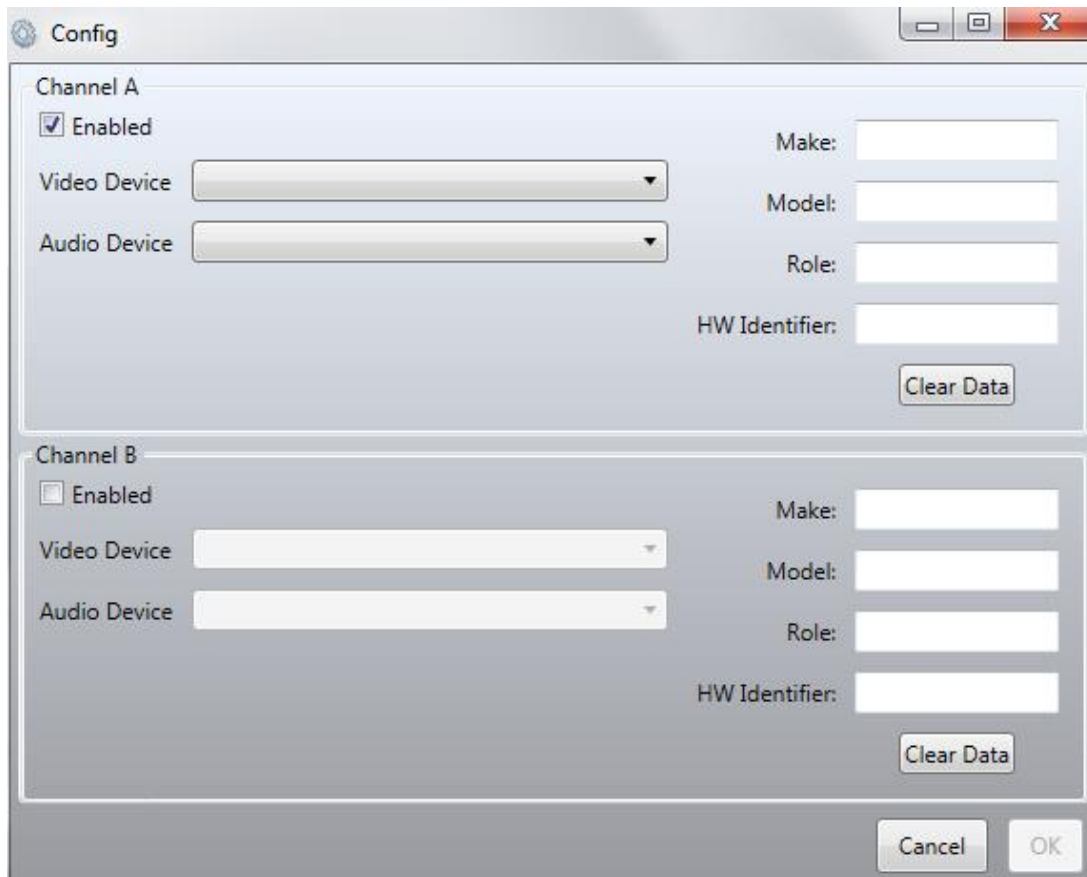
Figure 3-1 Chromatic Capture Tab

To confirm that the test devices are positioned correctly perform the following steps.

1. Check the **Enabled** box for each device to be used during testing.
2. Select the **Video Device** that will be capturing video for the channel.
3. Select the **Audio Device** that will be capturing audio for the channel. Note that capturing audio is optional and is not required to perform tests.
4. If the metadata fields (**Make, Model, Role, HW Identifier**) appear, populate as desired. This information will appear in the Chromatic output report. To control whether these fields appear, use the **Prompt for device metadata** setting on the **Settings> Capture/Processing** tab.
5. Click **OK** to accept the settings or click **Cancel** to exit without saving.

At this time, the test videos will appear in the **Video A** and/or **Video B** windows. The audio and video sampling statistics that appear in the **Information** area are used to ensure that the test devices are positioned properly.
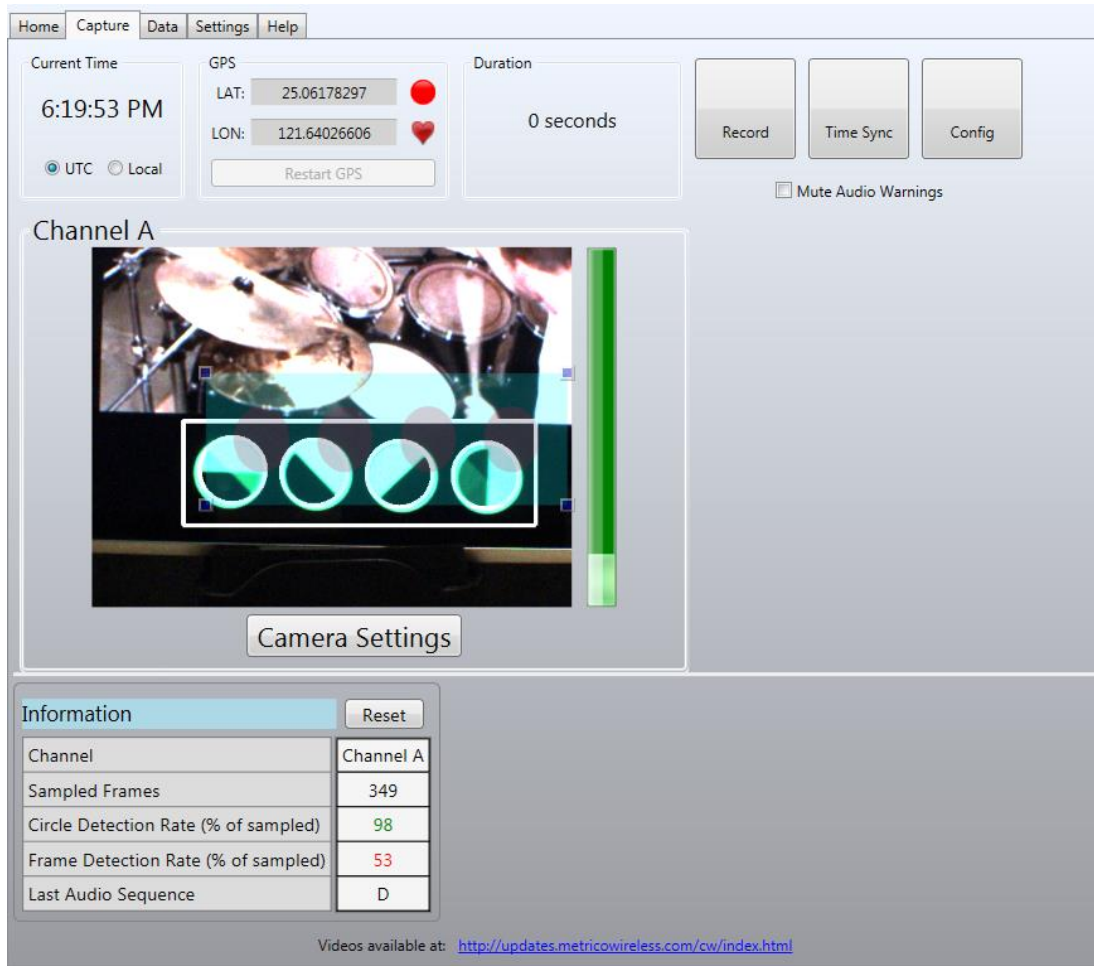
Figure 3-2 Device Setup on the Capture Tab

1. Confirm that the test video is actively playing on the test device.
2. For the best test results, the **Circle Detection Rate** and the **Frame Detection Rate** should be as high as possible. These values are color-coded green, yellow and red to indicate good, fair and poor performance with respect to detection rate.
3. Physically adjust the cameras or use the **Camera Settings** button to maximize the **Circle Detection Rate** and the **Frame Detection Rate**. See **Appendix A** for recommendations on finding the optimal camera settings. For the best results:
   - **Circle Detection Rate** should be equal to 100%.
   - **Frame Detection Rate** should fall between 50% and 100%.
4. Press **Reset** following any camera changes to confirm the metrics.
5. Inspect the audio performance bar to the right of the video playback area to confirm that audio is playing at an acceptable level. The audio bar background color indicates the volume level:
   - Green background indicates that the audio is at an acceptable level.
   - Yellow background indicates that the audio level is too low or missing.
   - Red background indicates that the audio level is too high.
6. If the volume is too high or too low, confirm that the device volume is set to approximately 75% of the maximum level. The audio level can then be adjusted by rotating the **SENS** control knob on the audio capture module.
7. You can also check the detected audio level by the device from the Windows **Sound** menu:

- Right-click on the **Volume** icon in the Windows System Tray.
- Select Recording Devices.
- Check the meter to the right of each Chromatic audio capture unit to determine the level of audio detected by the device.

8. Confirm that the GPS is reporting location if enabled.
9. If **Sync time on application startup** is not selected, manually synchronize the time if time sync is required for correlation with data collected from another source such as QXDM
10. On the Chromatic **Capture** tab, select the **Time Sync** button.
11. Select the Source as Internet Time Server or GPS.
12. Select the **Sync Now** button.
13. Once the status shows as **Time sync completed successfully**, click **OK** to dismiss the **Time Sync** dialog.
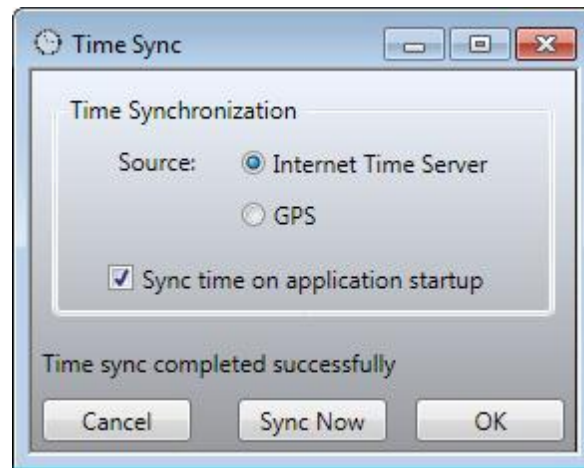
Figure 3-3 Time Sync Dialog

4 Initiating the Test

4.1 Overview

The system streams a test video from the hosted video server to the test device. The Spirent-supplied test video shows both a live action sequence and a series of circular symbols that are frame markers. The symbol position changes as the video plays and identifies the video frame number, as shown in the following image.

Figure 4-1 Test Video Sample

Chromatic marks individual frames with symbols, which it automatically interprets as frame numbers during playback on the test device. Chromatic automatically detects these symbols when observing video played back on the test device, as shown in the following image.
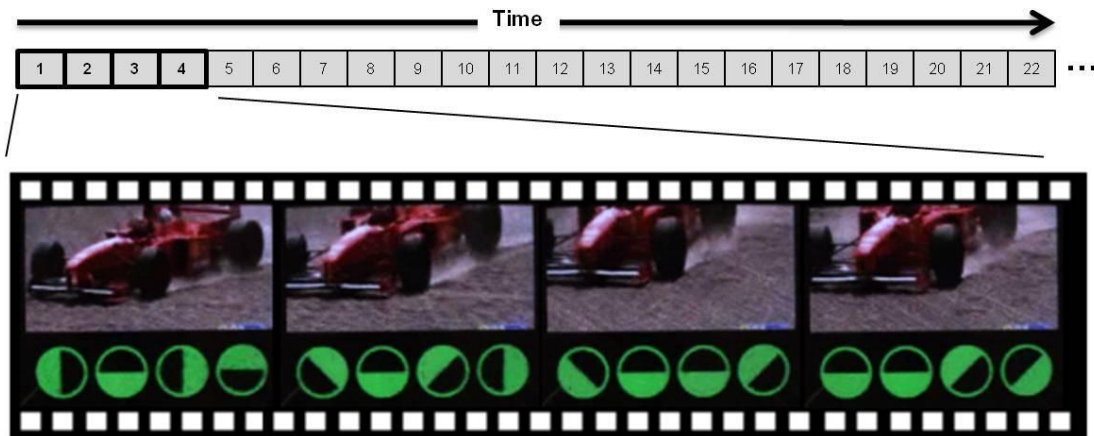
Figure 4-2 Chromatic Video Stream

The video camera and control software record the captured video from the handset. Chromatic processes this video and assesses each frame based upon timing and video integrity using a Gross Error Detection algorithm. Chromatic uses a five-point video quality score to summarize performance.

Chromatic also assesses streaming media audio performance. The audio portion of the Chromatic test clip plays a repeating sequence of dual-tone multi-frequency signaling (DTMF). The system records and scores the audio and based upon the number of tones correctly received. The processing software also keeps timing information about which video frames correspond to the audio tones.

Chromatic also reports impaired and frozen frames. In a frozen frame the circular frame symbols are distinguishable, but, no change can be detected from the previous frame. As shown in the following image.

Figure 4-3 Impaired Frame

The following figure displays Chromatic frame detection.
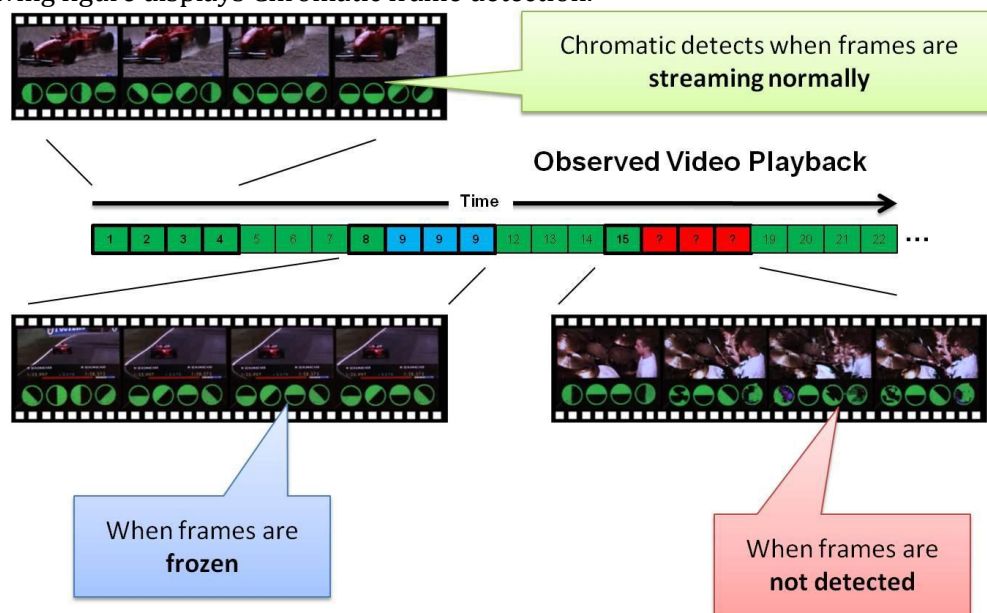
Figure 4-4 Video Playback

Combined, the video score, audio score, impairment and freeze metrics provide a quantitative assessment of mobile video performance.

4.2 Testing

When the video, audio, and GPS devices are working, start testing by perfuming the following steps.

1. Click **Record** to begin testing.

Figure 4-5 Record Options Dialog

2. Either enter the **Max Record Time** in **Hours**, **Minutes,** and **Seconds;** or, check **Unlimited** to continue recording until stopped by the user. The setting in the **Max Record Time** area defaults to the **Default Duration** specified on the **Settings** tab.

3. Enter an identifying **Description** (such as handset type) to be used as the file name for each capture in this session.
    Note: Spirent recommends entering the device name and video content clip name in this field. For example: "Device XYZ, CW-064-FL".

4. If the metadata fields (**Make, Model, Role, HW Identifier**) appear, populate as desired. This information will appear in the Chromatic output report. To control whether or not these fields appear, use the **Prompt for device metadata** setting on the **Settings>Capture Processing** tab.

5. In the Video Content area, use the drop-down or the Chooser [...] to match the video playing on the test mobile. Click OK to confirm the selection. If you changed the test videos in use through the Content Metadata area of the Settings>Capture/Processing tab, click Refresh in the Content Selection dialog to display the correct file list.

Content Selection

Directory
◢ http://updates.metricowireless.com/cw

Files

Name	Description	FPS	Resolution	Protocol	vcodec	acodec	bitrate
CW-033-F	CW-033-F	15	176x144	rtmp	libx264	libfaac	64K
CW-033-FL	CW-033-FL	15	176x144	rtmp	libx264	libfaac	64K
CW-033	CW-033	15	176x144	rtsp	libx264	libfaac	64K
CW-036-FL	CW-036-FL	20	320x240	rtmp	libx264	libfaac	768K
CW-036	CW-036	20	320x240	rtsp	libx264	libfaac	768K
CW-037-FL	CW-037-FL	30	320x240	rtmp	libx264	libfaac	2048K
CW-037	CW-037	30	320x240	rtsp	libx264	libfaac	2048K
CW-038-FL	CW-038-FL	15	640x480	rtmp	libx264	libfaac	4096K
CW-038	CW-038	15	640x480	rtsp	libx264	libfaac	4096K

[Refresh] [Cancel] [OK]

Figure 4-6 Content Selection Dialog

Click Start in the Record Options dialog to start the test. During testing, each test video will appear in the **Video A** or **Video B** area of the **Capture** tab, and the **Duration** and **Information** areas will update continuously as shown in the following example.
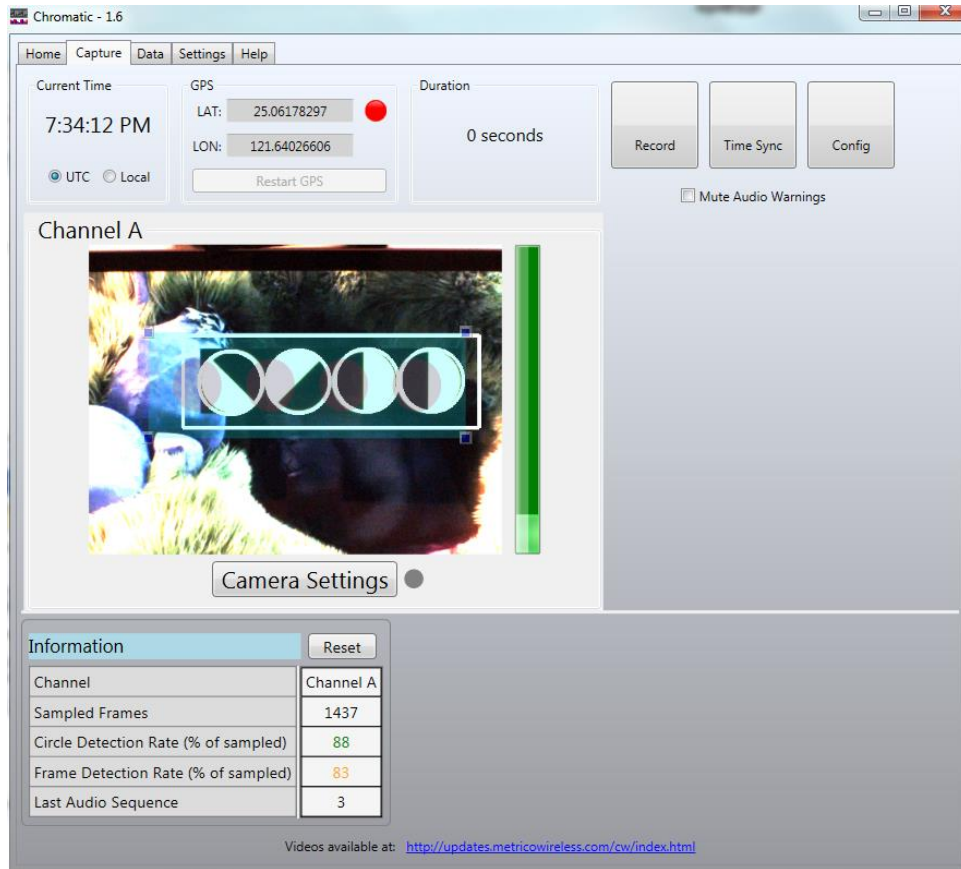
Figure 4-7 Capture Tab during Device Testing

The video that appears is a sample of the live video being captured. As a result, not every video frame is displayed.

An audio warning (an electronic pulse) sounds if the camera is not properly positioned and cannot detect the frame or circles for more than one second. Check the **Mute Audio Warnings** box to disable these notifications.

Use the **Insert Event Marker** button to log a playback interruption.

Figure 4-8 Event Type Selection

Select whether this is an instance of **Device Interrupted Playback** or **User Interrupted Playback**. The **Event Type** and **Time** will appear in the **Events** dialog accessible from the **Data > Review** page. Events are also presented in the Chromatic output report.

5 Analyzing Results

Click **Stop** to end the test and enter an optional description. The system adds the test file to the list of files to be processed. Check **Discard session** to delete all files associated with this capture.
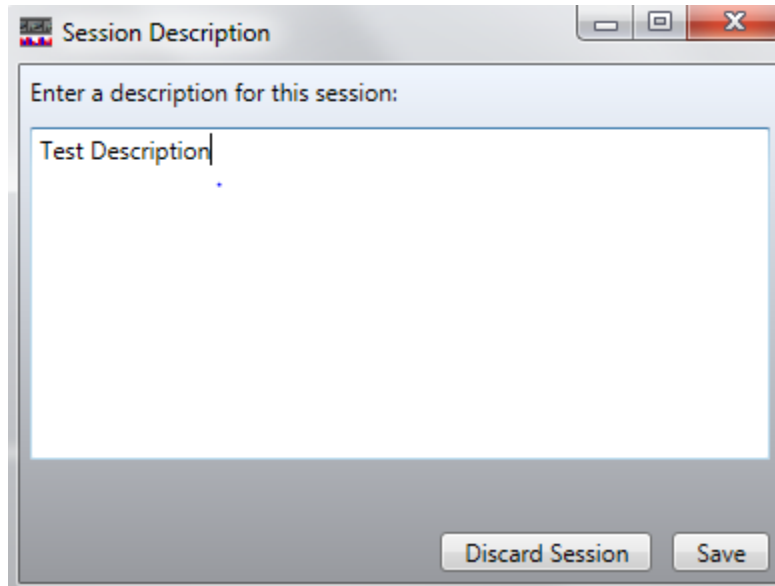
Figure 5-1 Session Description Dialog

The steps to analyze video quality data captured with Chromatic include:
- Reviewing the recorded video and captured session files for data integrity
- Processing the data into a meaningful format for analysis
- Summarizing the results
- Interpreting the results

These steps are described in the following sections. Additionally, Chromatic data may be correlated with RF data from QXDM or IP data from a network sniffer.

5.1 Reviewing for Data Integrity

When data collection is complete, navigate to the **Data Review** tab. **The Data Review** tab may appear if the **Automatically switch to Review tab when recording completes** option has been selected on the **Settings** tab.
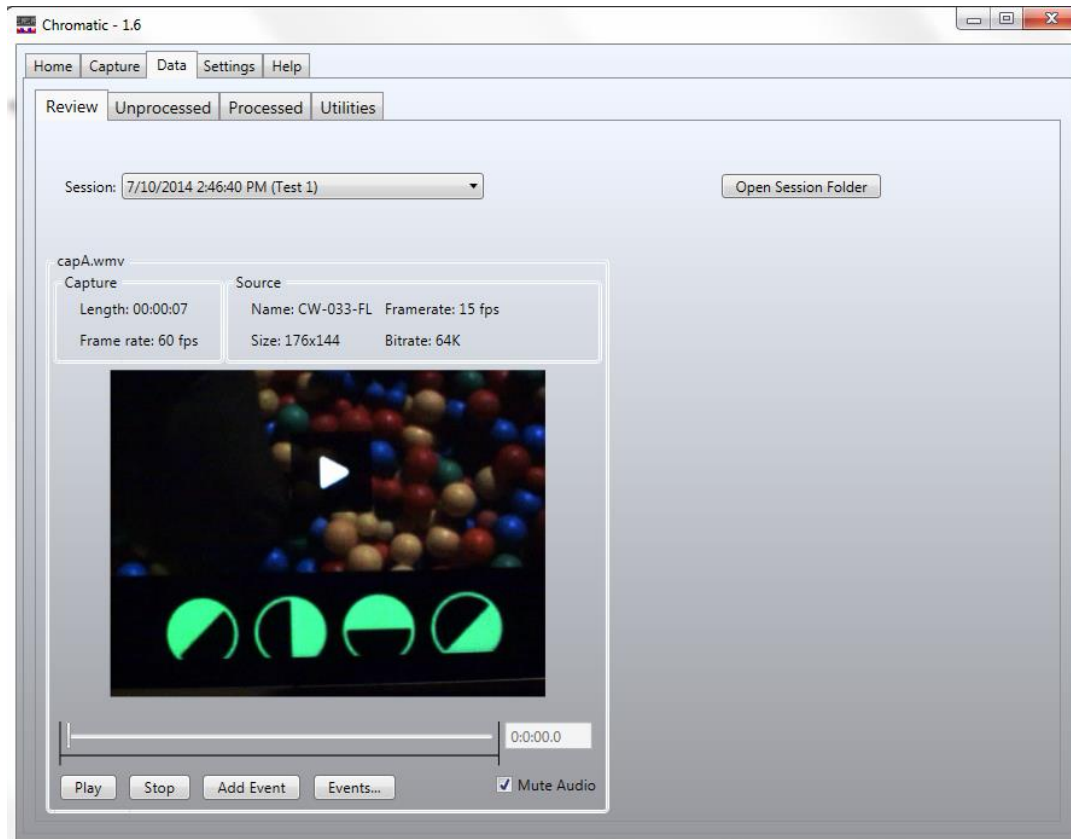
Figure 5-2 Data>Review Tab

This tab allows the verification of data integrity prior to processing the results into a formatted output. The review mechanisms available here are:
- Playing the recorded video
- Opening the Session Folder

These review techniques are described in the following sections.

5.1.1 Play

To gauge user perception of video quality and to ensure that captured results align with expectations, the video captured during each Chromatic test may be played back on the **Data>Review** screen. You can also use this screen to:
- Set the session start and end times
- Exclude portions of data from report calculations
- Flag significant events
- Measure the time between playback initiation and the first frame seen

To play the video:
1. Select the desired test file from the **Session** drop-down.
2. Click **Play** in the video playback area.

Setting the **Session Start** and **Session End** limits the reporting for the session to data collected between these time markers. To set the **Session Start** and **Session End**:
1. Position the playback cursor at the desired session start time.
2. Select Add Event >Set Session Start and End> Session Start.
3. Position the playback cursor at the desired session end time and repeat, choosing **Session End** this time.

4. The **Session Start** and **Session End** times will appear in the **Events** dialog. Data occurring before the **Session Start** marker and after the **Session End** marker will be ignored in the Chromatic output report.

The **Exclude Video Range/Segment** choice provides the option to mark data for exclusion from the final report. To exclude a range:

1. Select Add Event>Exclude Video Range/Segment > Range.
2. In the **Define Range** dialog, slide the red markers along the playback bar to define the range to exclude.
3. In the **Description** box, enter descriptive text giving the reason for the exclusion.
4. Click **OK** to continue.
5. The excluded range will appear in the **Events** dialog. Data within this range will be ignored in the Chromatic output report.

Note: The actual time range excluded will start at the beginning of the 12-second segment containing the **start** marker and finish at the end of the 12-second segment containing the "end" marker. For example, if the user selects to exclude 10 seconds to 20 seconds, the actual excluded time range will be from 0 seconds to 24 seconds. Chromatic operates exclusively in 12-second segments.

To exclude a segment:

1. Position the playback cursor at the time to exclude.
2. Select Add Event >Exclude Video Range/Segment>Segment.
3. Enter an Event Description.
4. The 12-second range containing the selected point will appear in the **Events** dialog. Data within this range will be ignored in the Chromatic output report.
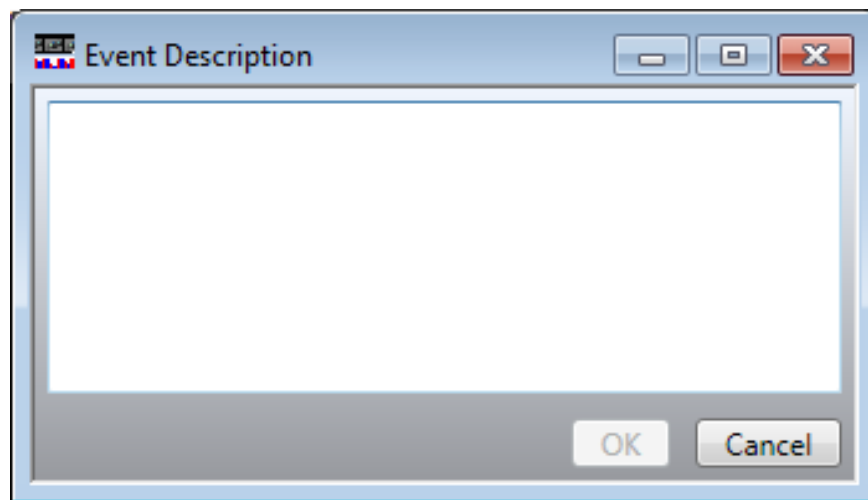
Figure 5-3 Event Description Dialog

To manually mark an event in the recorded video:

1. Position the playback cursor at the desired event time.
2. Select **Add Event >Add Event** and then one of the three options:
   - User Interrupted Playback
   - Device Interrupted Playback
   - **Custom** – When this option is selected, it is necessary to enter an **Event Description**.

The marked event will appear in the **Events** dialog and in the Chromatic output report.

To measure the time between playback initiation and first frame seen:
1. Position the playback cursor at the time of playback initiation. This is usually the time when the user's finger can be seen manually pressing the button to start the video.
2. Select **Add Event> First Frame Time Measurement> Playback Initiated**.
3. Wait until you see the video start to play.
4. Select **Add Event> First Frame Time Measurement>First Frame Seen**.
5. The **Playback Initiated** and **First Frame Seen** events will appear in the **Events** dialog and in the Chromatic output report. The time difference between the **First Frame Seen** and the **Playback Initiated** is reported as the **Startup Time** on the **Validation** tab of the Chromatic output report.
6. Select the **Events** button on the **Data > Review** tab to view all events entered during and after testing.
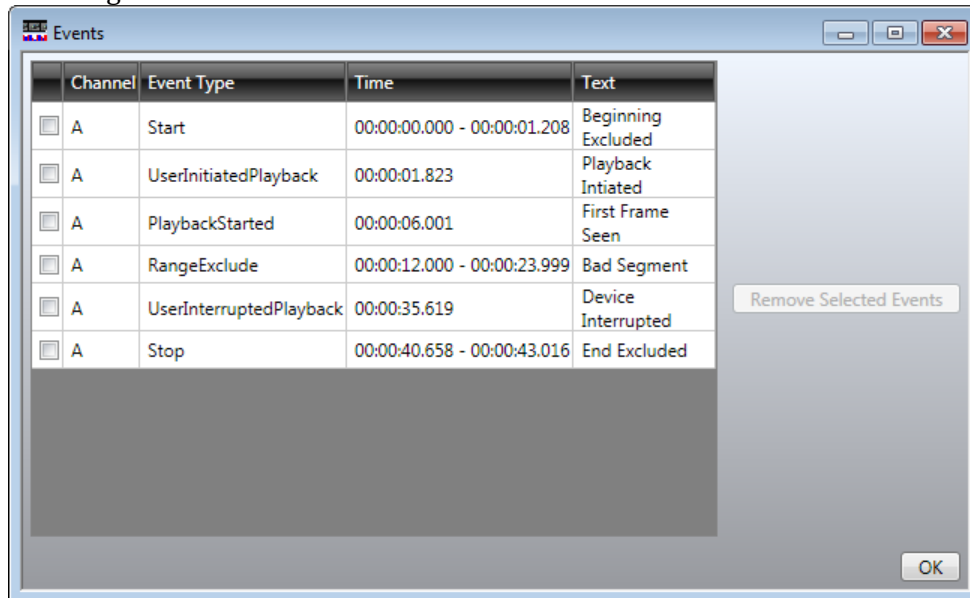
Figure 5-4 Events Dialog

5.1.2   Open Session Folder
The **Session Folder** for each recorded test includes the recorded *.WMV file and associated GPS and capture logs. After processing (see Section 9.2), this folder will also contain video and audio scores in text and comma delimited format, as well as a time-series plot depicting key test metrics. Access to this raw data may be desirable for detailed analysis or data manipulation.
To access the **Session Folder**:
1. On the **Data>Review** tab, select the desired test file from the **Session** drop-down.
2. Click the **Open Session Folder** button.
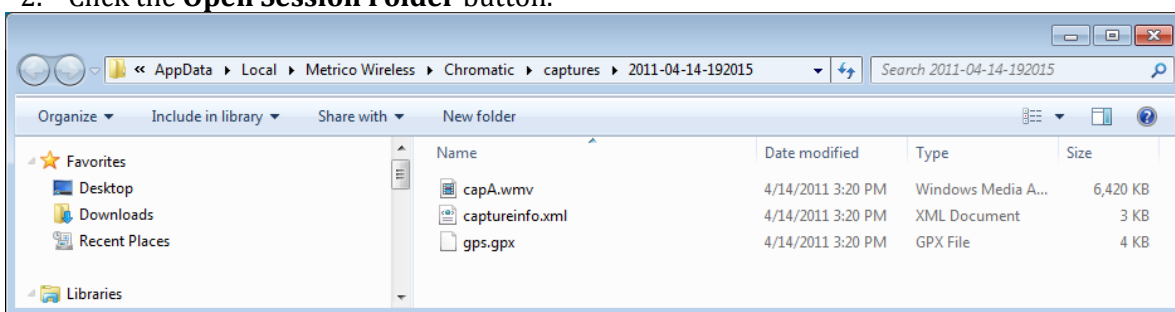
Figure 5-5 Session Folder Contents Prior to Processing

3. After processing the screen will look like the following.
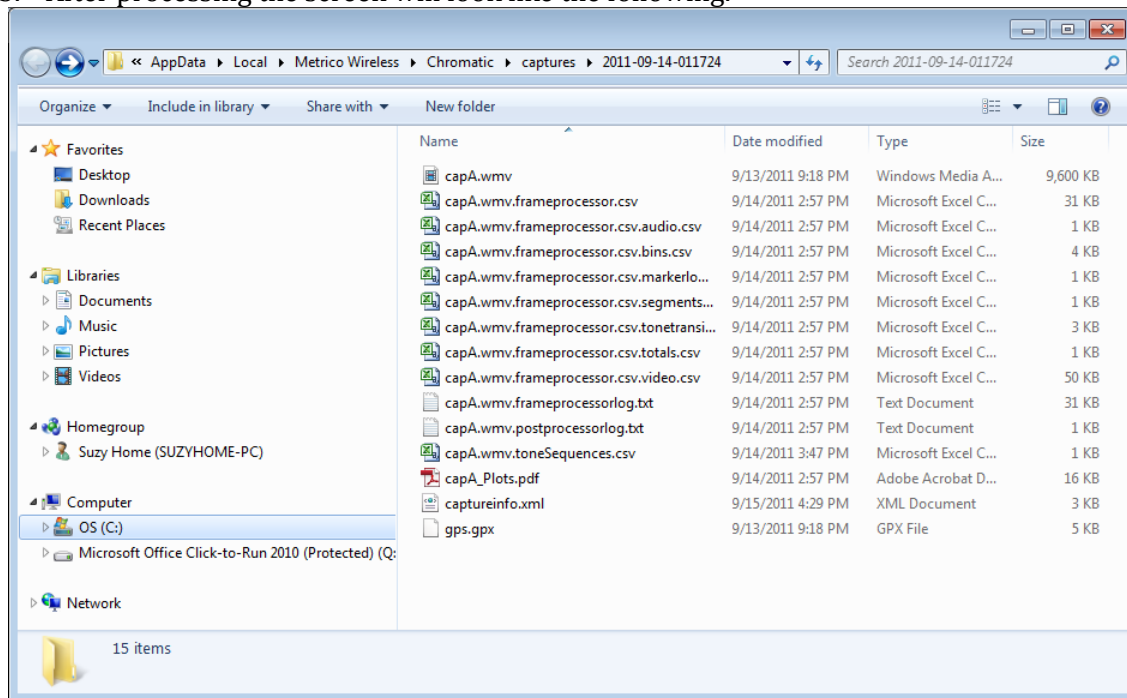
Figure 5-6 Session Folder Contents after Processing

5.2   Processing the Data

To process the data perform into a useable format perform the following steps.

1. Navigate to the **Data>Unprocessed** screen.
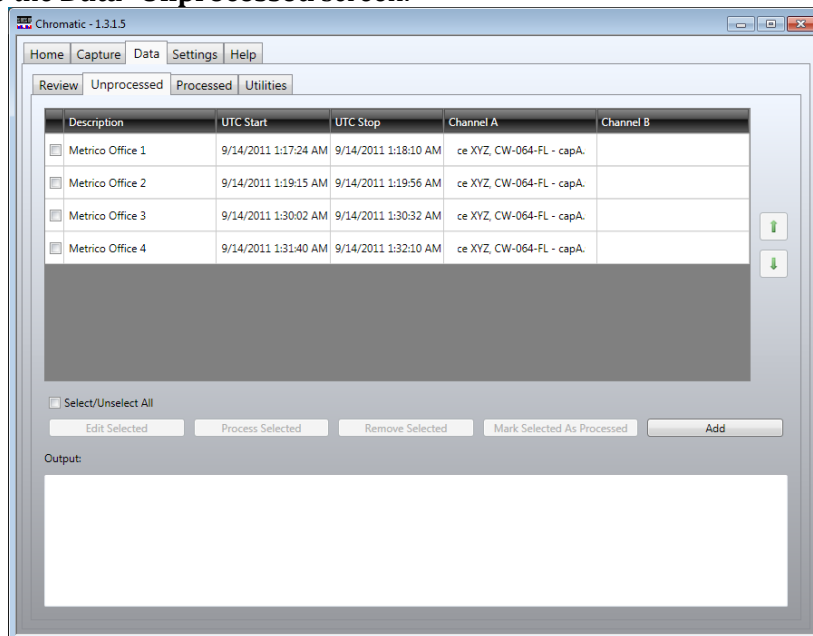
Figure 5-7 Data >Unprocessed Screen

2. The processing queue lists Unprocessed test files. Use the **Add** button to add locally stored files to the queue for processing. Use the **Remove Selected** button to remove files from the

queue. Files removed from the queue will not be deleted and can be processed at a later time.

3. Use the Edit Selected button to modify the processing parameters for a file. In most cases, the default parameters should be maintained. Please accept the defaults and do not change them unless instructed by Spirent Support.
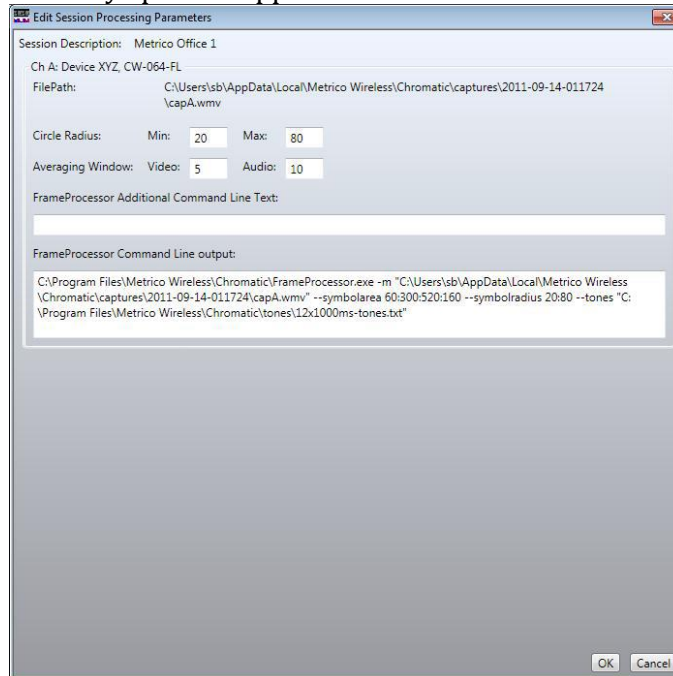
Figure 5-8 Edit Session Processing Parameters Dialog

- The **Circle Radius Min** and the **Circle Radius Max** settings are detected from the information stored within the capture file. If post-processing is not working, these settings may need to be manually adjusted. Please contact Spirent Product Support for more information.
- The Averaging Window (Video and Audio) settings refer to the number of frames used as the unit of measurement for determining how many expected frames were actually captured. For example, if the test video frame rate is 15 frames/second and the Video Averaging Window is 5 seconds, you would expect to receive 75 frames during that time. If fewer than 75 frames are received, the video will be considered impaired or frozen for that measurement.
- The **FrameProcessor Additional Command Line Text** field is generally reserved for Spirent use. Please contact Spirent Product Support for assistance with this field.

4. Click **OK** to accept the settings and exit the **Edit Session Processing Parameters** dialog.
5. Select one or more unprocessed files from the list on the **Data> Unprocessed** screen. The selections made in the **Video Processing** area of the **Settings** tab affect the processing sequence:
   - Checking **Enable Concurrent Processing** on the **Settings** tab allows Chromatic to process multiple files at the same time. This option may shorten overall processing time on powerful, multi-core systems.
   - If performance suffers with the **Concurrent Processing** option, lower the **Max number of concurrent processes** setting, or disable concurrent processing entirely.
6. Click the **Process Selected** button underneath the file list.
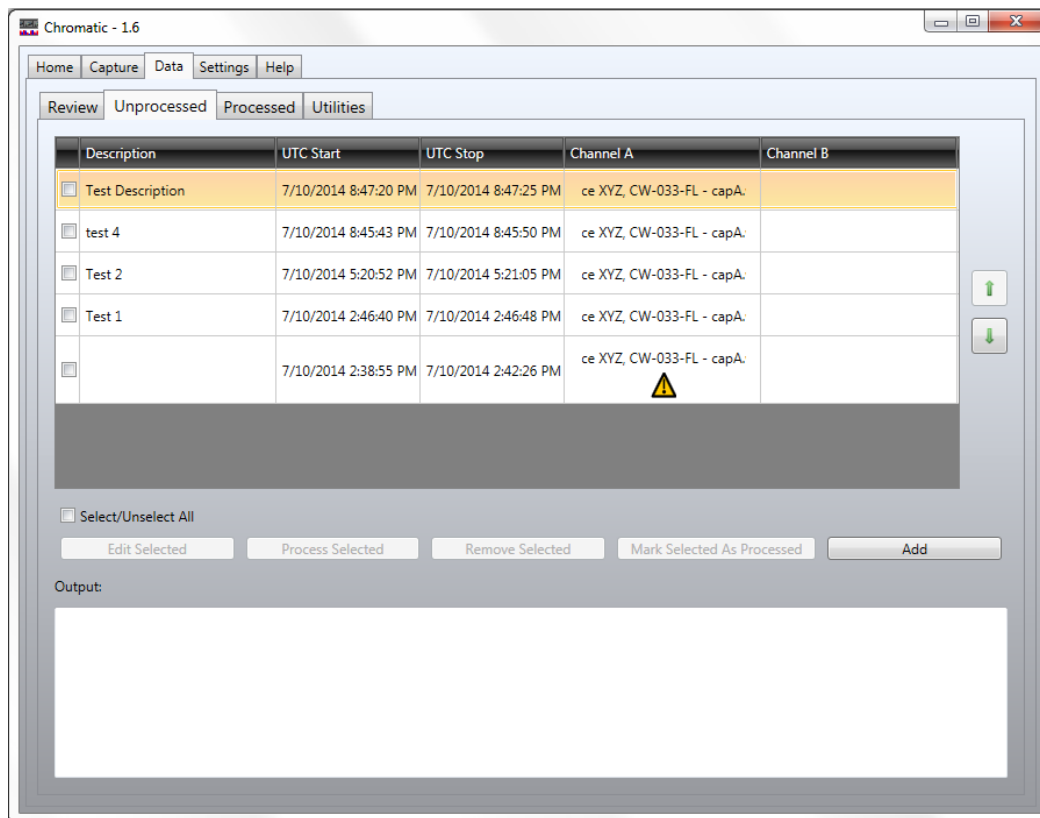
Figure 5-9 Processing the Data

7. Each file that has been successfully processed will move from the **Data> Unprocessed** screen to the **Data> Processed** screen.
8. The **Processing Complete** dialog will appear after all files have been processed. Note that the processing for each file will take at least as long as the capture and may take up to twice as long.
9. Click **OK** to exit.

5.3   Summarizing the Results

Navigate to the **Data> Processed** screen to summarize the results.
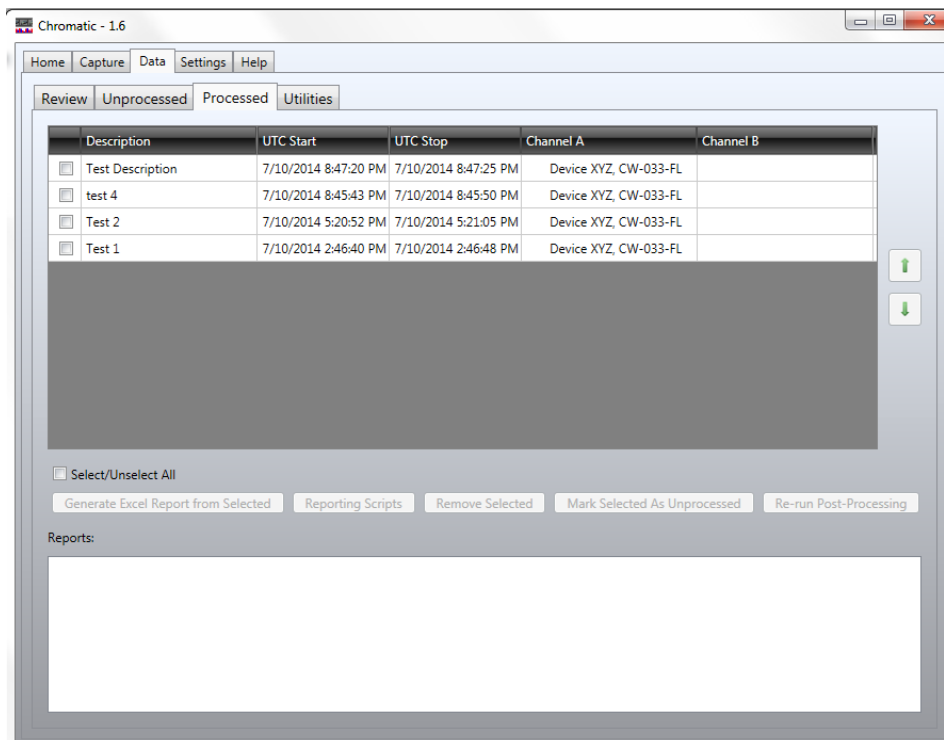
Figure 5-10 Data > Processed Screen

5.3.1   Reporting Scripts

The **Reporting Scripts** button on the **Data >Processed** page provides access to informational charts for any file that has been processed. Analysis options here include:

- Compare Time-Series Data
- Compare Video Score PDFs
- Compare Audio Score PDFs
- A/V Sync Report

To display the analytical charts perform the following steps.
1   Select the desired test file(s).
2   Click **Reporting Scripts** and choose the desired action.
3   Confirm that each file to be compared has been added in the Compare Time-Series Data dialog.
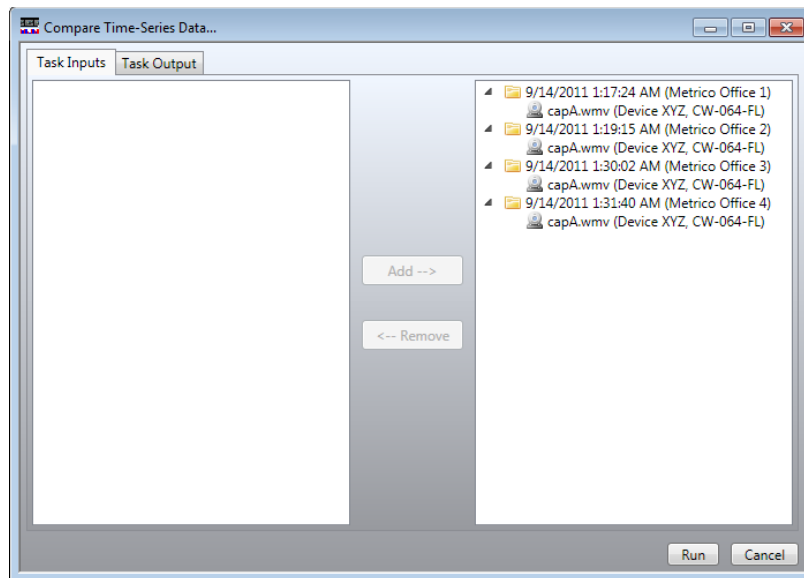
Figure 5-11 Task Inputs / Task Outputs Dialog

4   The time-series data, video score PDFs or audio score PDFs will appear together for comparison.
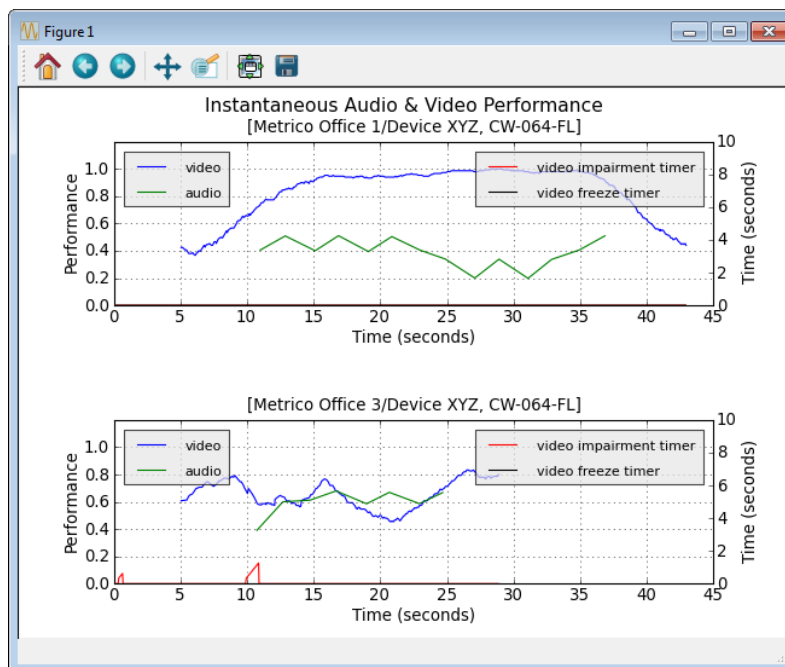
Figure 5-12 Compare Time-Series Data Output
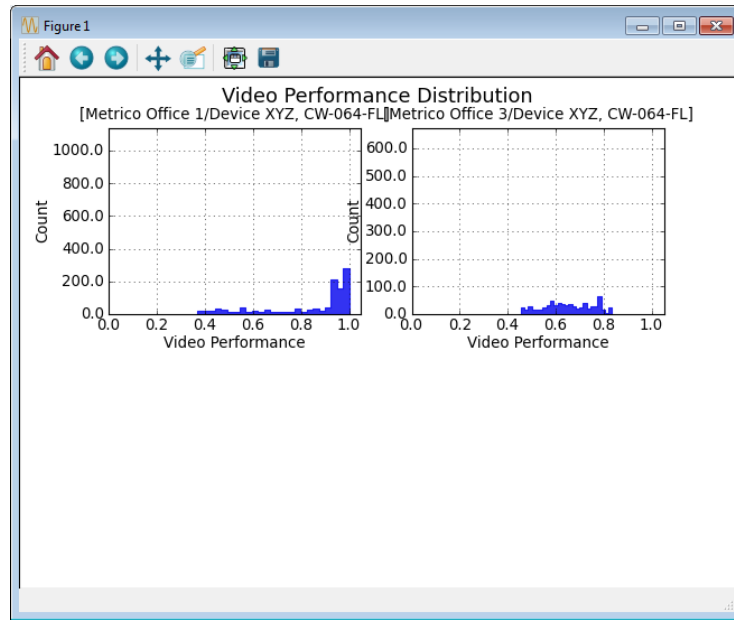
Figure 5-13 Compare Video Score PDFs Output
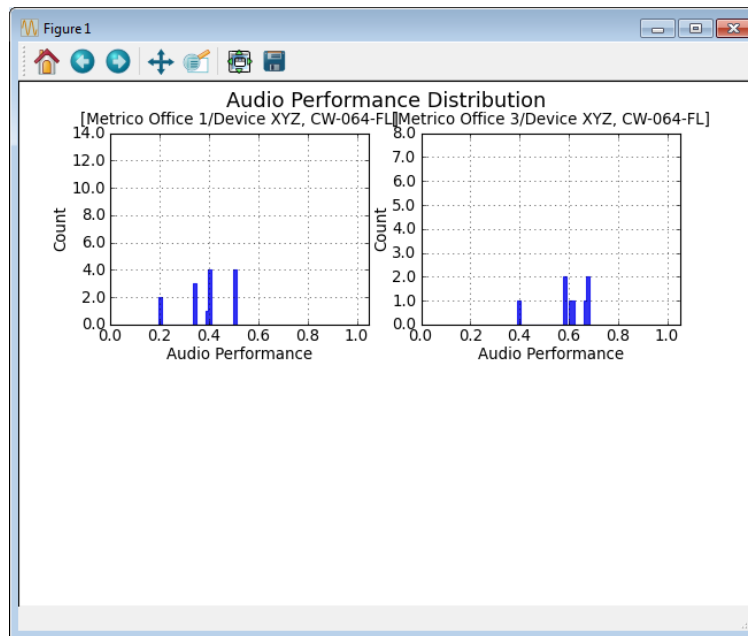
Figure 5-14 Compare Audio Score PDFs Output

5   The **A/V Sync Report** provides both time-series and distribution views for audio variation. Audio variation refers to the time offset between the captured video and audio. When the audio leads the video, audio variation is reported as a positive number. When the audio lags the video, audio variation is reported as a negative number.
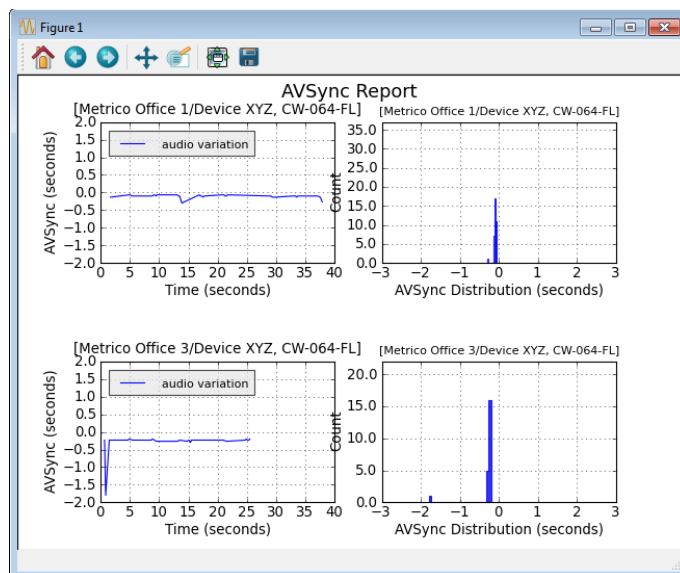
Figure 5-15 A/V Sync Report

5.3.2   Generate Excel Report From Selected

The **Data> Processed** page also provides the option to generate an Excel report containing overall, session-level and segment-level statistics for the data. To generate the Excel report perform the following steps.

1. Select the desired test file(s).
2. Use the up and down arrows to order the sessions as you wish for them to appear in the report.
3. Select the Generate Excel Report from Selected button.
4. Enter a file name and save.

The video performance table and charts shown below are included on the formatted **REPORT** tab of the Excel output report. Similar analysis views are provided for audio performance. Additional report tabs provide statistics for the data aggregated by channel, session and video segment.

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	Video Scores by Segment			
	Device XYZ, CW-064-FL	Device XYZ, CW-064-FL	Device XYZ, CW-064-FL	Device XYZ, CW-064-FL
Session Score (Average)	4.90	4.29	3.46	4.60
Standard Deviation		0.42		
Maximum Score	4.90	4.59	3.46	4.60
Segment Count	1	2	1	1
Duration (seconds)	12.0	23.9	12.0	12.0
% of time Frozen	0.00%	0.00%	0.00%	0.00%
% of time Impaired	0.00%	0.00%	0.00%	0.00%
% greater than or equal to 3.0	100.00%	100.00%	100.00%	100.00%
% less than 2.0	0.00%	0.00%	0.00%	0.00%
% greater than or equal to 4.0	100.00%	50.00%	0.00%	100.00%
Device Playback Interrupted	1	2	-	-

Figure 5-16 Video Scores by Segment
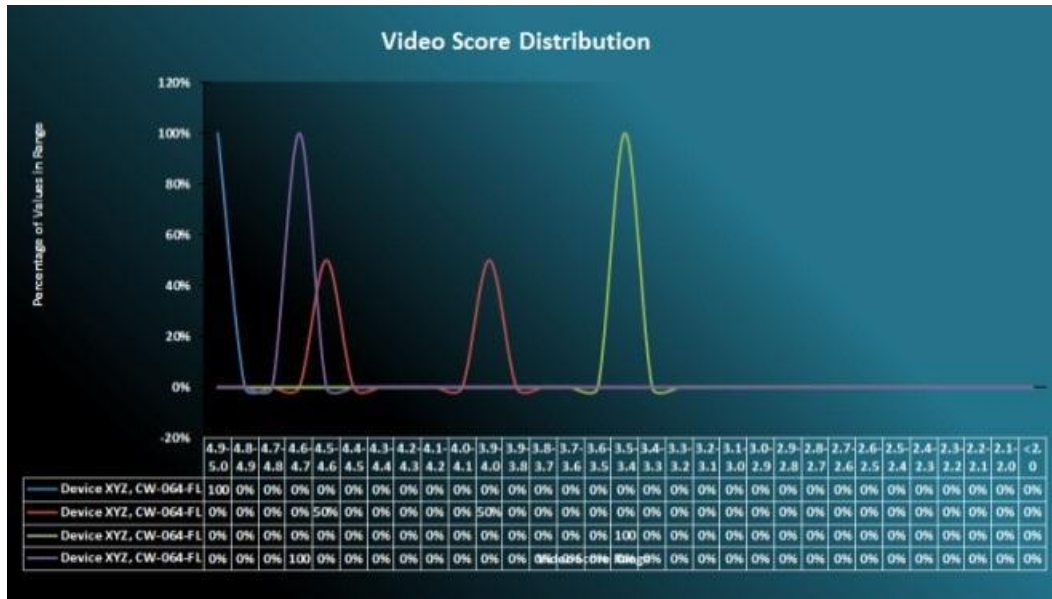
Figure 5-17 Video Score Distribution
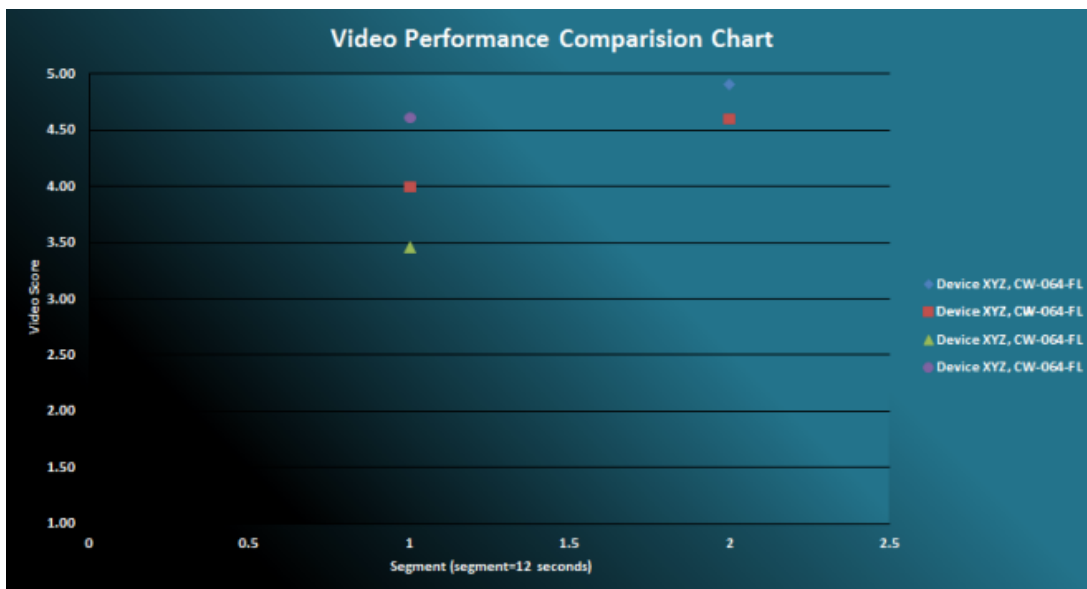
Figure 5-18 Video Performance Comparison Chart
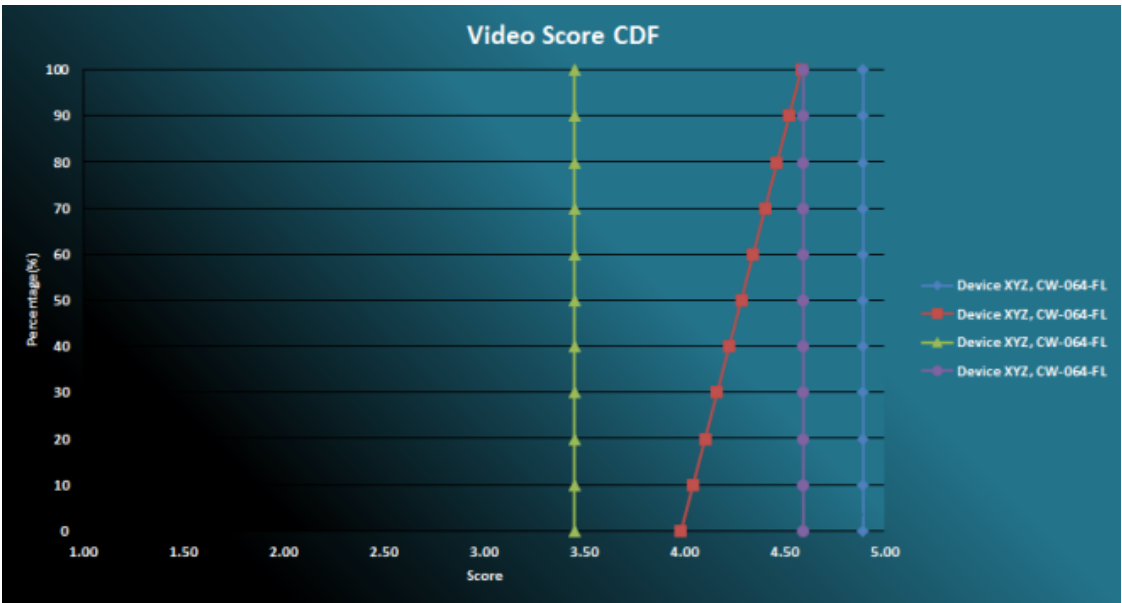
Figure 5-19 Video Score CDF

	Audio			
	Device XYZ, CW-064-FL	Device XYZ, CW-064-FL	Device XYZ, CW-064-FL	Device XYZ, CW-064-FL
Average	2.00	3.01	1.89	1.89
Standard Deviation	0.39	0.00	0.77	0.77
Maximum Score	2.34	3.01	2.34	2.34
Segment Count	4	4	3	3
Duration (seconds)	47.9	47.9	35.9	35.9
% greater than or equal to 3.0	0.00%	100.00%	0.00%	0.00%
% less than 2.0	50.00%	0.00%	33.33%	33.33%
% greater than or equal to 4.0	0.00%	0.00%	0.00%	0.00%

Figure 5-20 Audio Score Statistics
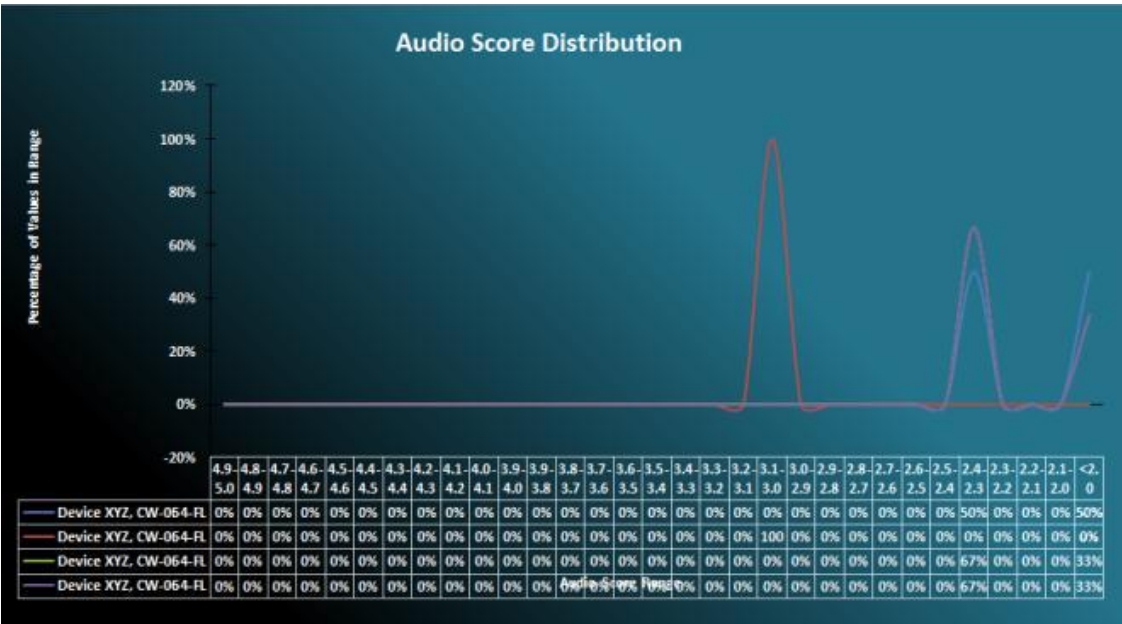
Figure 5-21 Audio Score Distribution
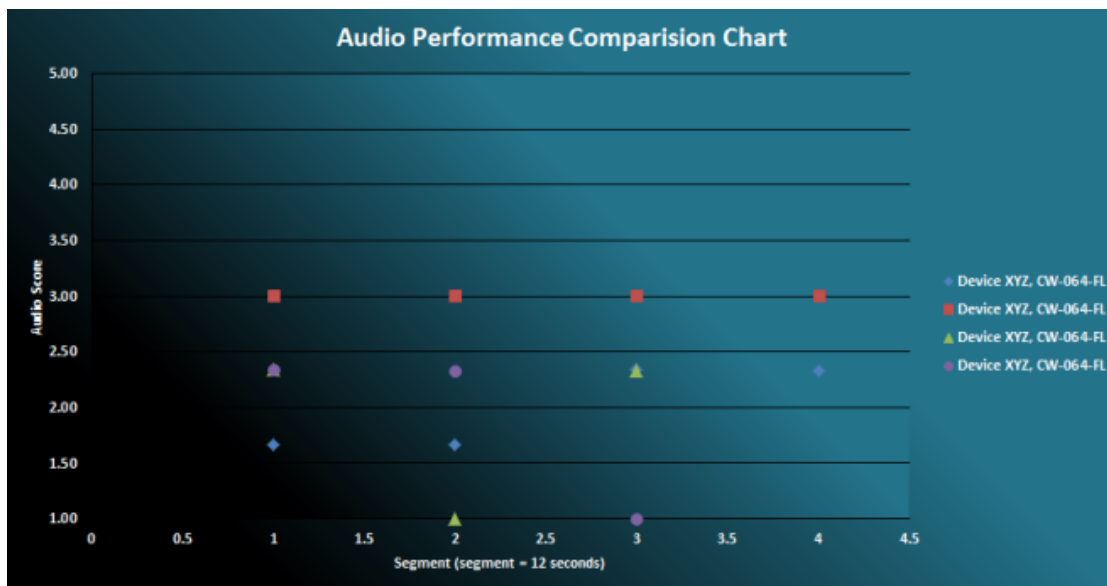
Figure 5-22 Audio Performance Comparison Chart
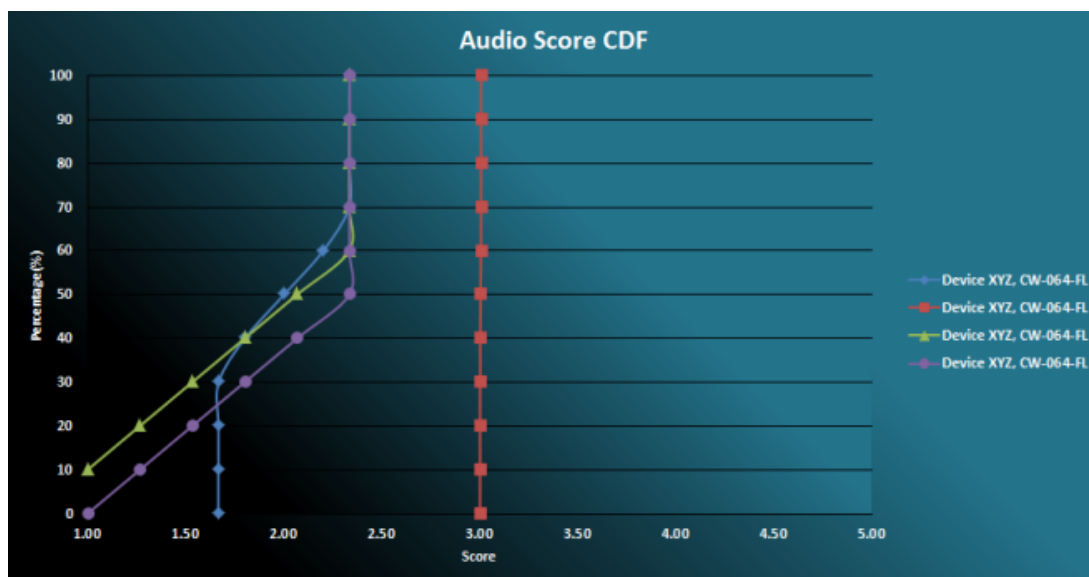
Figure 5-23 Audio Score CDF

5.3.3   Mark Selected As Unprocessed

Use this option to change the status of a processed file to that of unprocessed. You have the reverse option under the Processed tab.

5.3.4   Re-Run Post Processing

Should you wish to change or correct the FITT, as discussed in section 2.4, you can use this option to re-run an already finished capture at a different FITT.

5.4   AV Sync KPIs" Tab

The **AV Sync KPIs** tab provides a comprehensive list of summary performance data and Key Performance Indicators (KPIs) relating to the audio/video sync performance of the capture session(s).

	AV Sync KPIs			
	Capture 1	Capture 2	Capture 3	Capture 4
AV Sync - Lead Limit, ms	50	50	50	50
AV Sync - Lag Limit, ms	-200	-200	-200	-200
Average of AV Sync Lead, ms	97	94	87	None
Average of AV Sync Lag, ms	-159	-99	-162	-110
Max AV Sync Lead, ms	110	111	107	0
Max AV Sync Lag, ms	-400	-100	-403	-110
Segment Count (12s each)	11	10	10	10
No of Segments > +50ms	3	2	2	0
No of Segments <-200ms	2	0	2	0
No of Segments within Limits	6	8	6	10
% Segments Within Limits	54.5%	80.0%	60.0%	100.0%

AV Sync – Lead Limit, ms	The audio lead threshold. The default value is 50ms, but it can be changed according to the operator's requirement.
AV Sync – Lead Limit, ms	The audio lag threshold. The default value is -200ms, but it can be changed according to the operator's requirement.
Average of AV Sync Lead, ms	The average of the audio lead for all leading segments.
Average of AV Sync Lag, ms	The average of the audio lag for all lagging segments.
Max AV Sync Lead, ms	The maximum segment value of the audio lead for all leading segments.
Max AV Sync Lag, ms	The maximum (absolute) segment value of the audio lag for all lagging segments.
Segment Count (12s each)	The number of 12-second video segments included in this session.
No of Segments > +50ms	The number of segments which had leading AV audio higher than the lead threshold.
No of Segments < -200ms	The number of segments which had lagging audio less than the lag threshold.
No of Segments within Limits	The number of segments in which the audio lead or lag was within the threshold limits.
% Segments within Limits	The % of segments in which the audio lead or lag was within the threshold limits.

Figure 5-24 AV Sync KPIs

5.5   Interpreting the Results

Chromatic calculates video and audio scores based on the difference between the observed and expected results during testing. This section describes how Chromatic calculates the video and audio scores, and how these scores correlate to user-perceived quality.

5.5.1   Interpreting Video Scores

Chromatic calculates the video score by comparing the number of observed and expected video frames. Expected frames are calculated as the number of unique video frames that should appear in each 12-second segment based on the frame rate of the source video. Observed frames are calculated based on the circular markers captured in each frame of the recorded video.

- An **impaired frame** is distorted and users can no longer detect the circular marker symbols.
- A **frozen frame** is one in which the circular frame symbols are distinguishable, but no change has been detected from the previous frame.

The video score is the ratio of observed video frames to expected video frames, represented on a 5-point scale:

Score	Video Quality
5	Excellent
4	Good
3	Fair
2	Poor
1	Bad

Figure 5-25 Video Quality Score

5.5.2   Interpreting Audio Scores

Chromatic calculates the audio score by comparing the number of observed and expected audio tones in each 12-second segment. The audio track contains a sequence of DTMF tones. The Chromatic software assesses whether the expected tones are recognized.

The audio score is the ratio of observed audio tones to expected audio tones, represented on a 5-point scale.

Score	Audio Quality
5	Excellent
4	Good
3	Fair
2	Poor
1	Bad

Figure 5-26 Audio Quality Score

In addition, the DTMF audio tones are synchronized to specific video frames. Chromatic evaluates the timing of the tones with respect to the video frames. The result is presented as an audio advance or delay with respect to the video in the **A/V Sync Report**. Typically, the smaller the advance or delay, the higher the quality of the end user experience.

5.6 Correlating Chromatic and Third Party Data

Reserved for future use

5.7 Playback Delivery KPIs

The Playback Delivery of KPIs tab provides comprehensive data to evaluate the performance of streaming videos on networks. Carriers will use this to determine the quality behavior of their transmissions. The Excel spread sheet from this tab will indicate the start and stop time of videos as well as accurate assessments of the access/buffer phase and playout phase.

Description	The nomenclature used to label or identify this test as entered in the setup.
Channel	The description of the capture channel as entered in the Record Options dialog at the start of the test
Playback Success	Chromatic automatically tags a capture as successful or not successful depending upon a threshold timeout ratio of N seconds I
Finish Frame Reached	Chromatic recording ends when end frames are encountered.
Measured Duration	Measures duration is from the first moving frame, to the timestamp of the first occurrence
Latency to First Moving Frame	Measures the startup latency from "Play" to "First Moving Frame."
Total Impaired Duration	When the Video is lost (no circles detected) vs when the video is tiled (at least one circle detected, but no frame is detected
Impaired Period Count	The number of times and durations that the playback was interrupted.
Rebuffering	Re-buffering time will be measured as the Total Playback time minus the source clips known duration.
Playback Percentage	Playback percentage is a function of Total playback time and re-buffering time. It should be measured as: ([TotalPlaybackTime]-[RebufferingTime]/[TotalPlaybackTime])
Test Video Length	Actual length of the video with a known length with a special indicator that marks its end
Timeout Threshold	Pre-set seconds of the timeout threshold.

Figure 5-27 Playback Delivery of KPI Statistics

6   Screen Capture (optional)

If you purchase the screen capture option, you will be able to remotely capture images on your cellphone, import them into chromatic, and analyze the results. Screen capture is a separate program that requires you purchase a license.

The maximum length of a video you can capture is 90 minutes at 60 fps. The audio will be between192 and 196 kbps.

To run this upgrade, perform the following steps:

1. Contact Spirent Technical Support to obtain a screen capture download.
2. After receiving the file, use any unzip tool to perform an extract all. After the extracts are complete, Spirent recommends you create a shortcut icon on your desktop. Also, set your desktop view to 100%.
3. Click on the desktop executable and a screen like the following displays.
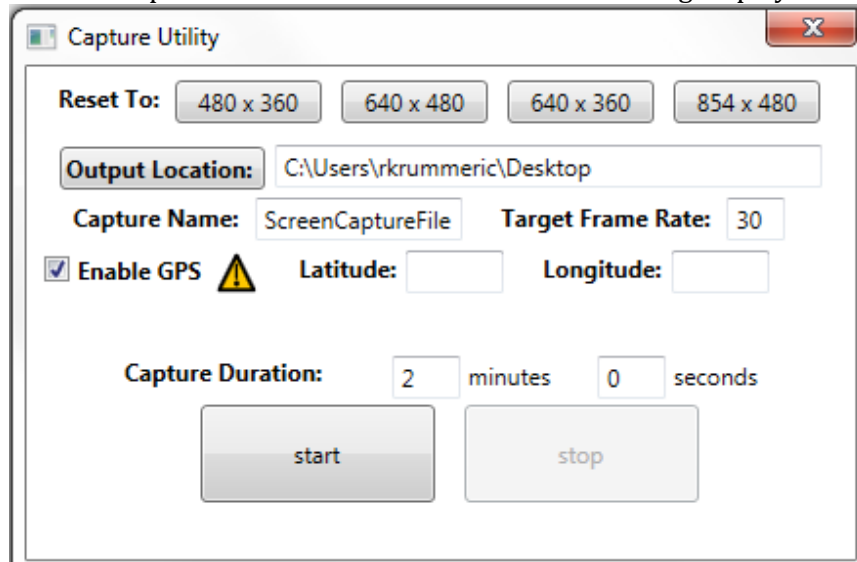
Figure 6-1 Capture Utility

4. From the Capture Utility menu select an aspect ratio to record the video.
5. Set the Output Location as the folder in which you wish to store the data you captured in the images. These files will be imported into Chromatic.
6. Enable the GPS option if desired (and connect your GPS device).
7. By unclicking the show capture option you can remove the red capture box until you need it.
8. Connect the **ROXIO GAMECAP HD PRO** (provided by Spirent) to the laptop and the cellphone. As shown in the following image.

Figure 6-2 ROXIO Profile

9. Connect the cellphone to the ROXIO unit and connect the unit to the USB port on your laptop as in the following image.

Figure 6-3 ROXIO Setup

10. Open the ROXIO software and a screen like the following displays.
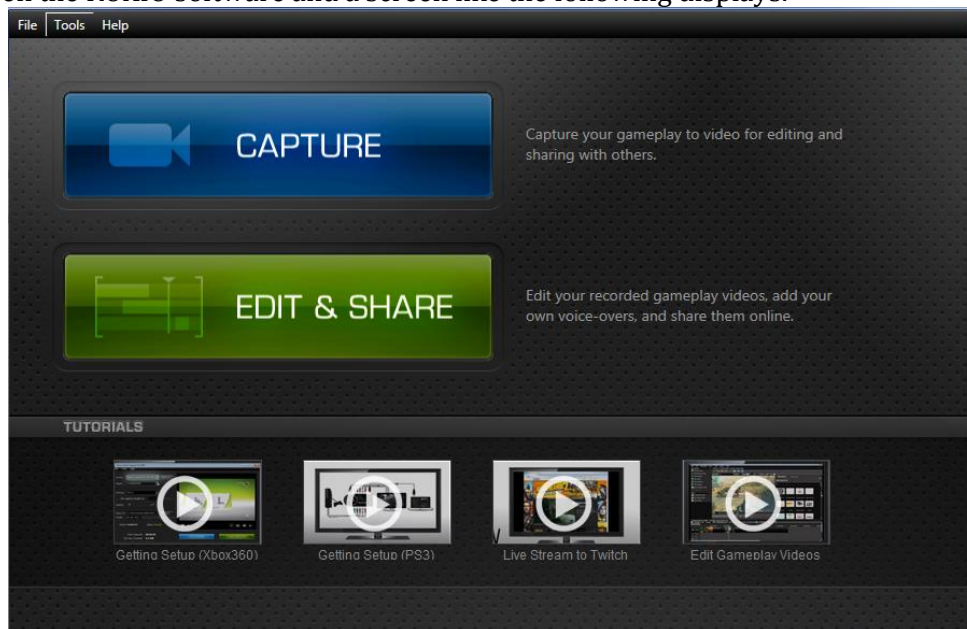
Figure 6-4 Image Capture Tool

11. Attach your cell phone and begin playing your video. You may use the recommended Spirent approved test videos found at http://www.youtube.com/user/seshsimha.

12. When the image is playing, click **Capture** on the ROXIO screen and the image on the telephone should appear as in the following screen. If you do not see the screen, verify that the Input is set to HDMI. If you still do not see the screen, try restarting your cellphone.
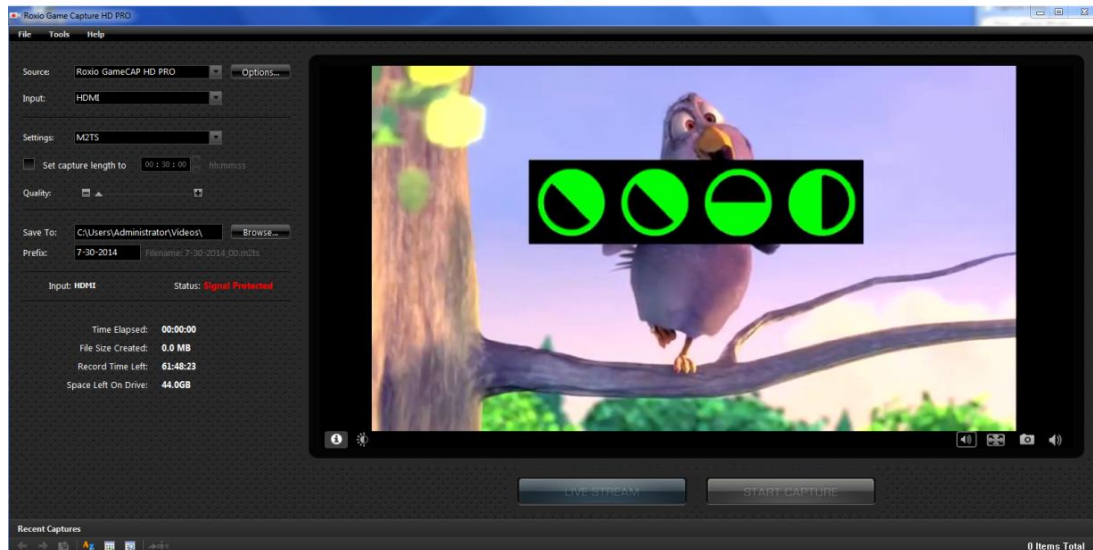
Figure 6-5 Image Capture Example

13. Center the two red boxes over the image with the smaller, interior, darker box centered over the spinning circles as in the following image.
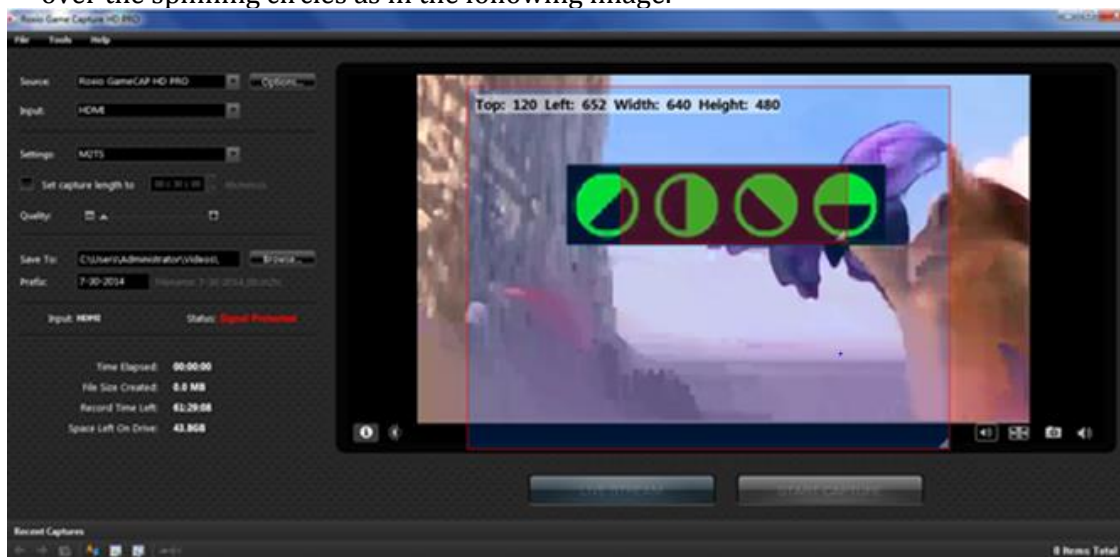
Figure 6-6 Centering the Capture Screen

14. Begin recording your chosen video by clicking **Start** on the Chromatic software.
15. Click **Start** on the Capture Utility and the system automatically replaces the red capture field with flashing green brackets.
16. Click **Stop** to end the session**.**
17. After stopping and storing the file, return to the main Chromatic program and import the file through the **Import Screen Capture File** under the **Add** dropdown menu of the **Data>Unprocessed** tabs. As shown in the following figure. You will not see this option unless you have obtained the license for **Chromatic Screen Capture**.
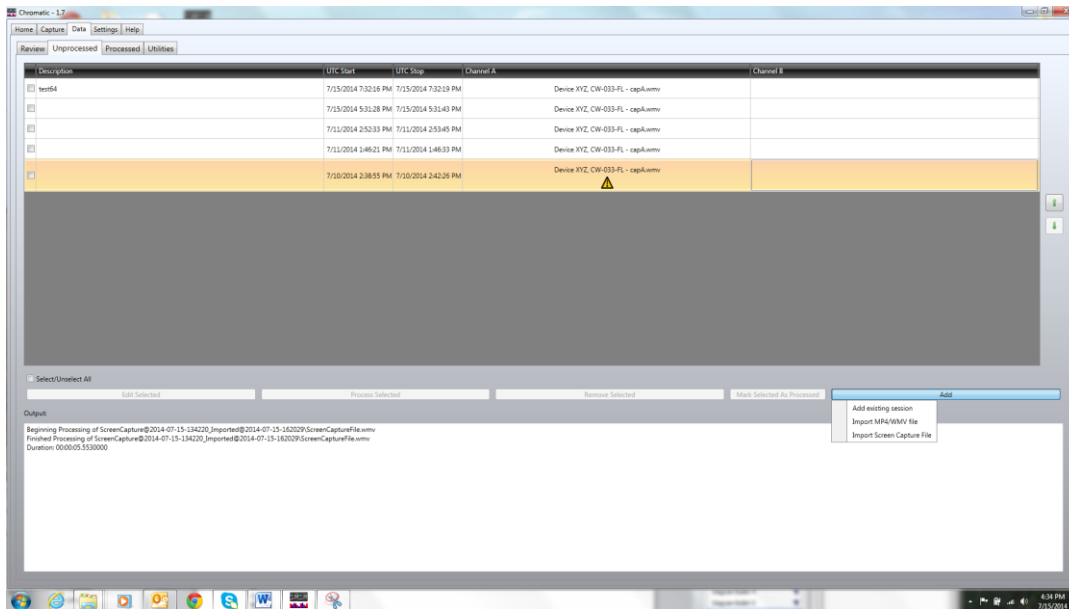
Figure 6-7 Import Screen Capture

18. Click **Import Screen Capture File,** select the file you saved and it appears in the list as shown in the following screen.
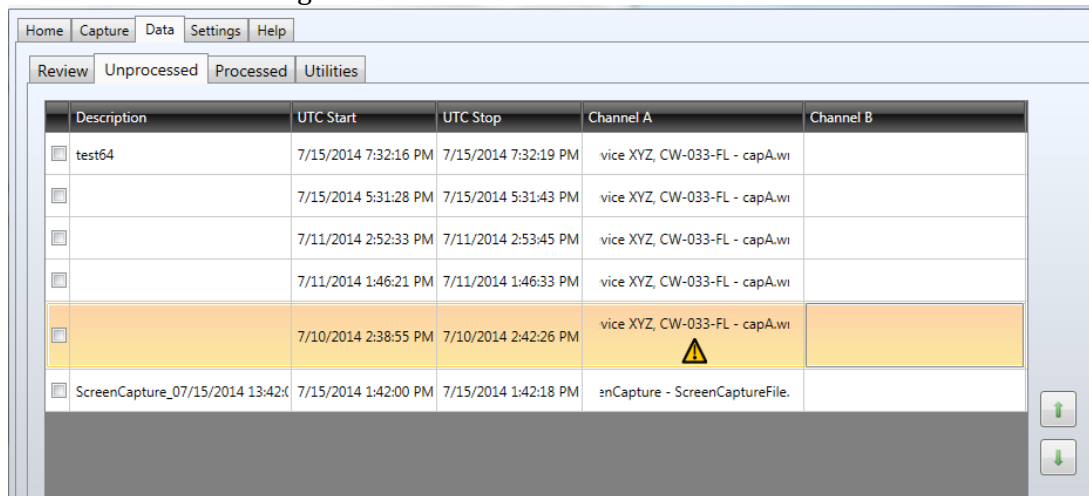
Figure 6-8 Selecting a File to Import

19. Select the file or multiple files and click **Process Selected.**
20. You can now perform the same data analysis that you would on a standard Chromatic file.

7 Chat

Use the Chat function to test the video quality of your transmissions. You can configure, as shown in the previous diagrams, Chromatic to simultaneously capture two video from different cameras. You can use this to measure video chat latency between source stimulus and UERx, or between UETx, and UERx.

Chromatic treats this as any other data input. To install and enable the Chat function, perform the following steps.

1. Open your laptop as seen in the following figure.

Figure 7-1 Chat Setup

2. Set up devices for Skype.
3. Set up Daptor 2.
4. Play Stimulus video BBBBIG20A-30min.mp4 on the laptop or play the 3rd UE (Stimulus UE) download from https://www.dropbox.com/s/97zl1elcrpwa93d/BBBBIG20A-30min.mp4 or set up chat between the Tx and Rx UEs.
5. Align the camera and achieve a minimum of a 40% frame detection.
6. Verify the audio is transmitting from Tx to Rx. Keep recording levels medium to keep the tones from becoming distorted.
7. Record for 3-10 minutes at a frame detection rate of 40 percent for Chat.
8. Click **Stop.**
9. Process the **KPIs**

10. Note that Chromatic Score and Weighted Session Scores are referenced to 20fps for Chat when you use 20fps stimulus.
11. Review your Excel output, which should look like the following example.

Time Offset		CamA FrameNo	MarkerA No			CamB FrameNo	MarkerB No			Unadj LKPI	Calib Offset	Adj LKPI
6.149	FRAME	369	12		5.566	FRAME	333	12		0.583	0.350	0.233
6.165	FRAME	370	12		5.583	FRAME	334	13		#NAME?	0.350	#NAME?
6.182	FRAME	371	13		5.599	FRAME	335	13		0.583	0.350	0.233
6.199	FRAME	372	14		5.616	FRAME	336	14		0.583	0.350	0.233
6.215	FRAME	373	14		5.633	FRAME	337	14		0.582	0.350	0.232
6.232	FRAME	374	14		5.649	FRAME	338	15		#NAME?	0.350	#NAME?
6.249	FRAME	375	15		5.666	FRAME	339	15		0.583	0.350	0.233
6.265	FRAME	376	15		5.683	FRAME	340	16		#NAME?	0.350	#NAME?
6.282	FRAME	377	16		5.699	FRAME	341	16		0.583	0.350	0.233
6.299	FRAME	378	16		5.716	FRAME	342	17		#NAME?	0.350	#NAME?
6.315	FRAME	379	17		5.733	FRAME	343	17		0.582	0.350	0.232
6.332	FRAME	380	17		5.749	FRAME	344	18		#NAME?	0.350	#NAME?
6.349	FRAME	381	18		5.766	FRAME	345	18		0.583	0.350	0.233
6.365	FRAME	382	18		5.783	FRAME	346	19		#NAME?	0.350	#NAME?
6.382	FRAME	383	19		5.799	FRAME	347	19		0.583	0.350	0.233
6.399	FRAME	384	20		5.816	FRAME	348	20		0.583	0.350	0.233
6.415	FRAME	385	20		5.833	FRAME	349	20		0.582	0.350	0.232
6.432	FRAME	386	21		5.849	FRAME	350	21		0.583	0.350	0.233
6.449	FRAME	387	21		5.866	FRAME	351	21		0.583	0.350	0.233
6.465	FRAME	388	22		5.883	FRAME	352	22		0.582	0.350	0.232
6.482	FRAME	389	22		5.899	FRAME	353	22		0.583	0.350	0.233
6.499	FRAME	390	23		5.916	FRAME	354	23		0.583	0.350	0.233
6.515	FRAME	391	23		5.933	FRAME	355	23		0.582	0.350	0.232
6.532	FRAME	392	23		5.949	FRAME	356	24		#NAME?	0.350	#NAME?
6.549	FRAME	393	24		5.966	FRAME	357	24		0.583	0.350	0.233
6.565	FRAME	394	24		5.983	FRAME	358	25		#NAME?	0.350	#NAME?
6.582	FRAME	395	25		5.999	FRAME	359	25		0.583	0.350	0.233
6.599	FRAME	396	25		6.016	FRAME	360	26		#NAME?	0.350	#NAME?
6.615	FRAME	397	26		6.033	FRAME	361	26		0.582	0.350	0.232
6.632	FRAME	398	26		6.049	FRAME	362	27		#NAME?	0.350	#NAME?

This report contains a specific comparison file (indicated in yellow).By comparing the time offsets for the same Marker Number in Captures A and B, the report displays the end-to-end latency. In this example, the LKPI = 233 ms

Appendix A Definitions of Exported Result Fields

The **Data > Processed** page in Chromatic provides the **Generate Excel Report from Selected** option as a way to obtain detailed setup and performance results. This Appendix describes many parameters that can be found in the exported result file.

REPORT Tab

This formatted tab summarizes video and audio performance for the selected sessions. Portions of the data marked by the user for exclusion are omitted from the calculations on the **REPORT** tab.

Video Score Statistics

Session Score (Average)	The mean video score for this session.
Standard Deviation	The spread of the video score data for the session about the mean.
Maximum Score	The maximum video score for this session.
Segment Count	The number of 12-second video segments included in this session.
Duration (seconds)	The length of the session in seconds.
% of time Frozen	The amount of time the video was frozen divided by the total session duration. Frozen video occurs when the circular frame markers are distinguishable but no change was detected from the previous frame.
% of time Impaired	The amount of time the video was impaired divided by the total session duration. Impaired video occurs when the video is so distorted it is not possible to distinguish the circular frame markers.
% greater than or equal to 3.0	The percentage of video score measurements for the session with a value greater than or equal to 3.0.
% less than 2.0	The percentage of video score measurements for the session with a value less than 2.0.
% greater than or equal to 4.0	The percentage of video score measurements for the session with a value greater than or equal to 4.0.
Device Playback Interrupted	The number of events marked by the user either during testing or during data reviews. This statistic includes playback interruptions by both the device and the user.

Audio Score Statistics

Average	The mean audio score for this session.
Standard Deviation	The spread of the audio score data for the session about the mean.
Maximum Score	The maximum audio score for this session.
Segment Count	The number of 12-second video segments included in this session.
Duration (seconds)	The length of the session in seconds.
% greater than or equal to 3.0	The percentage of audio score measurements for the session with a value greater than or equal to 3.0.
% less than 2.0	The percentage of audio score measurements for the session with a value

	less than 2.0.
% greater than or equal to 4.0	The percentage of audio score measurements for the session with a value greater than or equal to 4.0.

Validation Tab

This tab contains statistics to quickly help determine whether valid data was captured during each test session.

Session	A unique identifier for each test session included in the data set.
Channel	The Chromatic video capture channel.
Channel Description	The description of the capture channel as entered in the **Record Options** dialog at the start of the test.
Source Frame rate	The frame rate of the captured video content.
Observed FPS Mean	This is the calculated FPS (frames per second) measurement based on the data collected by Chromatic. This value should be relatively close to the **Frame rate (fps)** value set in the Chromatic **Config** dialog. If the **Frame rate (fps)** setting exceeds the observed value by more than 10%, the parameter may have been set incorrectly.
Detected Markers	In this test session, the number of frames in which Chromatic was able to interpret a frame number as a percentage of all observed frames.
Camera Capture FPS Setting	This is the default setting of the Chromatic camera for FPS. This value should be set to 60.
Camera Capture FPS Mean	This is the mean value calculated by Chromatic as a check to confirm the camera is capturing at a rate close to the **Camera Capture FPS Setting**. If the calculated value is not within 10% of the setting, it is an indication that the PC may not have captured all the video frames and a re-test should be considered.
Camera Capture FPS Min	This is the minimum value calculated by Chromatic as a check to confirm the camera is capturing at a rate close to the **Camera Capture FPS Setting**. If the calculated value is not within 10% of the setting, it is an indication that the PC may not have captured all the video frames and a re-test should be considered.
Included Seg Count	The number of 12-second video segments in this test session to be included in report calculations. The user has the option to exclude segments after testing on the Chromatic **Data >Review** tab.
Excluded Seg Count	The number of 12-second video segments in this test session to be excluded from report calculations. The user has the option to exclude segments after testing on the Chromatic **Data >Review** tab.
Event Count	The total number of events marked by the user on the Chromatic **Data > Review** tab.
Interrupt Count	The number of interrupt events marked by the user on the Chromatic **Data >Review** tab. This statistic includes playback interruptions by both the device and the user.
Startup Time (seconds)	The time (in seconds) between the **Playback Initiated** and **First Frame Seen** events marked by the user on the Chromatic **Data > Review** tab.
Bad AVSync%	The percentage of audio variation measurements that fall into the "Bad" range as defined in the **AVSync Thresholds** area of the **Settings>Capture/Processing** tab. Audio variation refers to the time offset between the captured video and audio. In the ideal case, the test video and corresponding audio are captured simultaneously by the Chromatic software. While a small amount of offset (with audio either leading or lagging the video) is acceptable, a large offset

	between the audio and video is often undesirable. This parameter captures the frequency of undesirable offset conditions.

Channel-Summary and Channel-Summary (Raw) Tabs

These tabs contain aggregated high-level statistics for each test channel captured in the report. Portions of the data marked by the user for exclusion are omitted from the calculations on the **Channel-Summary** tab. The calculations on the **Channel-Summary (Raw)** tab include all data.

Channel	The Chromatic video capture channel.
Description	An aggregate of the unique descriptions provided at test startup for this channel.
Mean	The mean video score for the channel.
Median	The median video score for the channel.
Max	The maximum video score for the channel.
Min	The minimum video score for the channel.
% Greater than 3	The percentage of video score measurements for the channel with a value greater than 3.
% Less than 2	The percentage of video score measurements for the channel with a value less than 2.
% Greater than 4	The percentage of video score measurements for the channel with a value greater than 4.
Stdev	The spread of the video score data for the channel about the mean.
95% Confidence	The range about the mean video score in which you expect the actual mean to fall with 95% certainty for any number of times the test is repeated based on the test channel data. As a general rule, Spirent recommends collecting enough samples such that the confidence interval falls below 10% of the mean.
Count	The number of video samples for this channel.
Skewness	A measure of the asymmetry of the PDF for the video score data for this channel.
Kurtosis	A measure of the peakedness of the PDF for the video score data for this channel.
Mean (Audio)	The mean audio score for the channel.
Median (Audio)	The median audio score for the channel.
Max (Audio)	The maximum audio score for the channel.
Min (Audio)	The minimum audio score for the channel.

Session-Summary and Session-Summary (Raw) Tabs

These tabs contain high-level statistics for each test session captured in the report. Portions of the data marked by the user for exclusion are omitted from the calculations on the **Session-Summary** tab. The calculations on the **Session-Summary (Raw)** tab include all data.

Session	A unique identifier for each test session included in the data set.
Channel	The Chromatic video capture channel.
Channel Description	The description of the capture channel as entered in the Record Options dialog at the start of the test.

Mean	The mean video score for the session.
Median	The median video score for the session.
Max	The maximum video score for the session.
Min	The minimum video score for the session.
% Greater than 3	The percentage of video score measurements for the session with a value greater than 3.
% Less than 2	The percentage of video score measurements for the session with a value less than 2.
% Greater than 4	The percentage of video score measurements for the session with a value greater than 4.
Stdev	The spread of the video score data for the session about the mean.
95% Confidence	The range about the mean video score in which you expect the actual mean to fall with 95% certainty for any number of times the test is repeated based on the test session data. As a general rule, Spirent recommends collecting enough samples such that the confidence interval falls below 10% of the mean.
Included Seg Count	The number of 12-second video segments in this test session to be included in report calculations. The user has the option to exclude segments after testing on the Chromatic Data>Review tab.
Excluded Seg Count	The number of 12-second video segments in this test session to be excluded from report calculations. The user has the option to exclude segments after testing on the Chromatic Data>Review tab.
Skewness	A measure of the asymmetry of the PDF for the video score data for this session.
Kurtosis	A measure of the peakedness of the PDF for the video score data for this session.
Mean (Audio)	The mean audio score for the channel.
Median (Audio)	The median audio score for the channel.
Max (Audio)	The maximum audio score for the channel.
Min (Audio)	The minimum audio score for the channel.
Make	The test device manufacturer as recorded in the metadata area of the Config or Record Options dialog.
Model	The test device model name as recorded in the metadata area of the Config or Record Options dialog.
Role	The role this device plays in the current test (i.e. "Reference", "DUT", etc.) as recorded in the metadata area of the Config or Record Options dialog.
HW Identifier	The device's serial number (i.e. "ESN", "IMEI", etc.) as recorded in the metadata area of the Config or Record Options dialog.

Events

This tab lists each event marked by the user both during capture using the **Insert Event Marker** button and after capture from the **Data>Review** tab.

Session	A unique identifier for each test session included in the data set.
Channel	The Chromatic video capture channel.
Time	The timestamp at which the event occurred.
Type	Describes the event selected by the user.
Text	Provides detailed information about the selected event by either the system or by the user.

Session-Data and Session-Data (Raw) Tabs

These tabs contain in-depth statistics for each test session captured in the report.
Portions of the data marked by the user for exclusion are omitted from the calculations on the
Session-Data tab. The calculations on the **Session-Data (Raw)** tab include all data.

Session	A unique identifier for each test session included in the data set.
Description	The Session Description as entered at the end of each Chromatic test session.
Channel	The Chromatic video capture channel.
Channel Description	The description of the capture channel as entered in the **Record Options** dialog at the start of the test.
Date	The session capture date.
Start	The session start time in UTC.
Duration	The length of the session in seconds.
DetectionRate	In this test session, the number of frames in which Chromatic was able to interpret a frame number as a percentage of all observed frames.
Capture fps	This is the mean value calculated by Chromatic as a check to confirm the camera is capturing at a rate close to the **Camera Capture FPS Setting**. If the calculated value is not within 10% of the setting, it is an indication that the PC may not have captured all the video frames and a re-test should be considered.
Impair Ratio	The amount of time the video was frozen divided by the total session duration. Frozen video occurs when the circular frame markers are distinguishable but no change was detected from the previous frame.
Freeze Ratio	The amount of time the video was impaired divided by the total session duration. Impaired video occurs when the video is so distorted it is not possible to distinguish the circular frame markers.
Overall Session Performance	The ratio of observed video frames to expected video frames for the entire duration of the test. Note that for the purpose of this parameter, the test duration is considered to start at the beginning the first included segment, and end at the conclusion of the last included segment.
Mean Seg Score	The mean video score for the session.
Med Seg Score	The median video score for the session.
Max Seg Score	The maximum video score for the session.
Min Seg Score	The minimum video score for the session.
% Greater than 3	The percentage of video score measurements for the session with a value greater than 3.
% Less than 2	The percentage of video score measurements for the session with a value less than 2.
% Greater than 4	The percentage of video score measurements for the session with a value greater than 4.
St dev	The spread of the video score data for the session about the mean.
95% Confidence	The range about the mean video score in which you expect the actual mean to fall with 95% certainty for any number of times the test is repeated based on the test session data. As a general rule, Spirent recommends collecting enough samples such that the confidence interval falls below 10% of the mean.
Segment Count	The number of 12-second video segments in this test session to be included in report calculations.
Skewness	A measure of the asymmetry of the PDF for the video score data for this session.
Kurtosis	A measure of the peakedness of the PDF for the video score data for this session.
Mean (Audio)	The mean audio score for the session.
Median (Audio)	The median audio score for the session.
Max (Audio)	The maximum audio score for the session.

Min (Audio)	The minimum audio score for the session.
Capture Frames	The total number of frames analyzed in this test session. In the ideal case, Chromatic analyzes 60 frames per second.
Detected Markers	In this test session, the number of frames in which Chromatic was able to interpret a frame number.
Unique Markers	In this test session, the number of unique frame markers interpreted. Note that because Chromatic analyzes 60 frames per second, if the source video plays at 30 frames per second, Chromatic will ideally interpret the marker for each frame twice.
Perfect Tones	The number of perfect audio tone sequences detected in this test session.
Freeze Periods	The number of time periods within this test session when the circular frame markers were distinguishable but no change was detected from the previous frame.
Total Freeze Time	The total time during this test session in which video was frozen.
Max Freeze Period	The maximum length of a single freeze period for this test session.
Mean Freeze Period	The mean freeze period length for this test session.
Impaired Periods	The number of time periods within this test session when the video was so distorted it was not possible to distinguish the circular frame markers.
Total Impair Time	The total time during this test session in which video was impaired.
Max Impair Period	The maximum length of a single impairment period for this test session.
Mean Impair Period	The mean impairment period length for this test session.
Source Framerate	The frame rate of the captured video content.
Path	The file path of the captured test video.

Segment-Data Tab

This tab contains in-depth statistics for each 12-second video segment captured in the report. Portions of the data marked by the user for exclusion are highlighted in dark gray on this tab.

Session	A unique identifier for each test session included in the data set.
Channel	The Chromatic video capture channel.
Cycle	The identifier of the 12-second video segment under consideration.
Exclude	An "x" in this column indicates that the user has marked this segment for exclusion using the options available on the Chromatic **Data>Review** tab.
Video Score	The video score of this segment as the observed video frames to expected video frames, represented on a 5-point scale.
Audio Score	The audio score of this segment as the observed audio tones to expected audio tones, represented on a 5-point scale.
Avg AV Sync	The mean time offset between the captured video and each audio tone for the current segment (audio minus video). In the ideal case, the test video and corresponding audio are captured simultaneously by the Chromatic software. While a small amount of offset (with audio either leading or lagging the video) is acceptable, a large offset between the audio and video is often undesirable.
Date	The capture date.
Segment Start	The segment start time in UTC.
Segment End	The segment end time in UTC.

Relative Start	The start time of the segment in seconds relative to the entire captured video.
Relative End	The end time of the segment in seconds relative to the entire captured video.
Length	The length of the segment in seconds, defined as the difference between the relative end and relative start times.
Seg Perf Index	The ratio of observed video frames to expected video frames for this segment.
Capture Frames	The total number of frames analyzed in this 12-second segment of the recorded video. In the ideal case, Chromatic analyzes 60 frames per second.
Detected Markers	In this 12-second video segment, the number of frames in which Chromatic was able to interpret a frame number.
Unique Markers	In this 12-second video segment, the number of unique frame markers interpreted. Note that because Chromatic analyzes 60 frames per second, if the source video plays at 30 frames per second, Chromatic will ideally interpret the marker for each frame twice.
Perfect Tones	The number of perfect audio tone sequences detected in this 12-second segment.
Freeze Periods	The number of time periods within this segment when the circular frame markers were distinguishable but no change was detected from the previous frame.
Freeze Time	The total time during this segment in which video was frozen.
Max Freeze	The maximum length of a single freeze period for this segment.
Mean Freeze	The mean freeze period length for this segment.
Impair Periods	The number of time periods within this segment when the video was so distorted it was not possible to distinguish the circular frame markers.
Impair Time	The total time during this segment in which video was impaired.
Max Impair	The maximum length of a single impairment period for this segment.
Mean Impair	The mean impairment period length for this segment.
Observed Framerate	This is the calculated FPS (frames per second) measurement based on the data collected by Chromatic. This value should be relatively close to the **Frame rate (fps)** value set in the Chromatic **Config** dialog. If the **Frame rate (fps)** setting exceeds the observed value by more than 10%, the parameter may have been set incorrectly.
Audio Perf Index	The ratio of observed audio tones to expected audio tones for this segment.
Audio Tones Sequences	Total number of tone sequences detected during this segment. This number includes all tone sequences that begin in this segment.
Tone Sequences exceeding threshold	The number of tone sequences with AV Sync Offset exceeding either the upper or lower **AVSync Threshold** as set by the user on the Chromatic **Settings>Capture/Processing** tab.
Max AV Sync Offset	The maximum time offset between the captured video and each audio tone for the current segment (audio minus video). In the ideal case, the test video and corresponding audio are captured simultaneously by the Chromatic software. While a small amount of offset (with audio either leading or lagging the video) is acceptable, a large offset between the audio and video is often undesirable.
Start Lat	The geographic latitude at the start of this segment as reported by the GPS.
Start Lon	The geographic longitude at the start of this segment as reported by the GPS.
End Lat	The geographic latitude at the end of this segment as reported by the GPS.
End Lon	The geographic longitude at the end of this segment as reported by the GPS.
File Location	The name of the captured test video containing this segment.

SessionMetadata Tab

This tab defines each test session, including details of the video sample in use.

Session	A unique identifier for each test session included in the data set.
Description	The Session Description as entered at the end of each Chromatic test session.
Date	The session capture date.
Start	The session start time in UTC.
End	The session end time in UTC.
Channel	The Chromatic video capture channel.
Ch Description	The description of the capture channel as entered in the Record Options dialog at the start of the test.
(VC)name	The name of the video content file selected for capture.
(VC)description	The description of the video content file selected for capture.
(VC)v-fr	The frame rate of the captured video content.
(VC)v-size	The frame or image size of the captured video content.
(VC)v-codec	The video codec of the captured video content.
(VC)a-codec	The audio codec of the captured video content.
(VC)a-freq	The audio sample rate of the captured video content.
(VC)v-br	The video bit rate of the captured video content.
(VC)a-br	The audio bit rate of the captured video content.
(VC)uri	The URL of the test video clip.
(VC)image-uri	The name of the sample image available on the server for this video.
(VC)protocol	The network protocol used to play the test video.
(VC)format	The container format of the test video clip.
(VC)group	Please contact Spirent Product Support for information about this parameter.
(VC)duration	The actual length of the source video. Note that the video may be configured to replay from the server when it completes.
(VC)loop_duration	The defined segment duration within the source video.
(VC)frameschema-uri	Please contact Spirent Product Support for information about this parameter.
(VC)audioschema-uri	Please contact Spirent Product Support for information about this parameter.