

Event-Triggered and Repeated Measurements Using m+p Analyzer

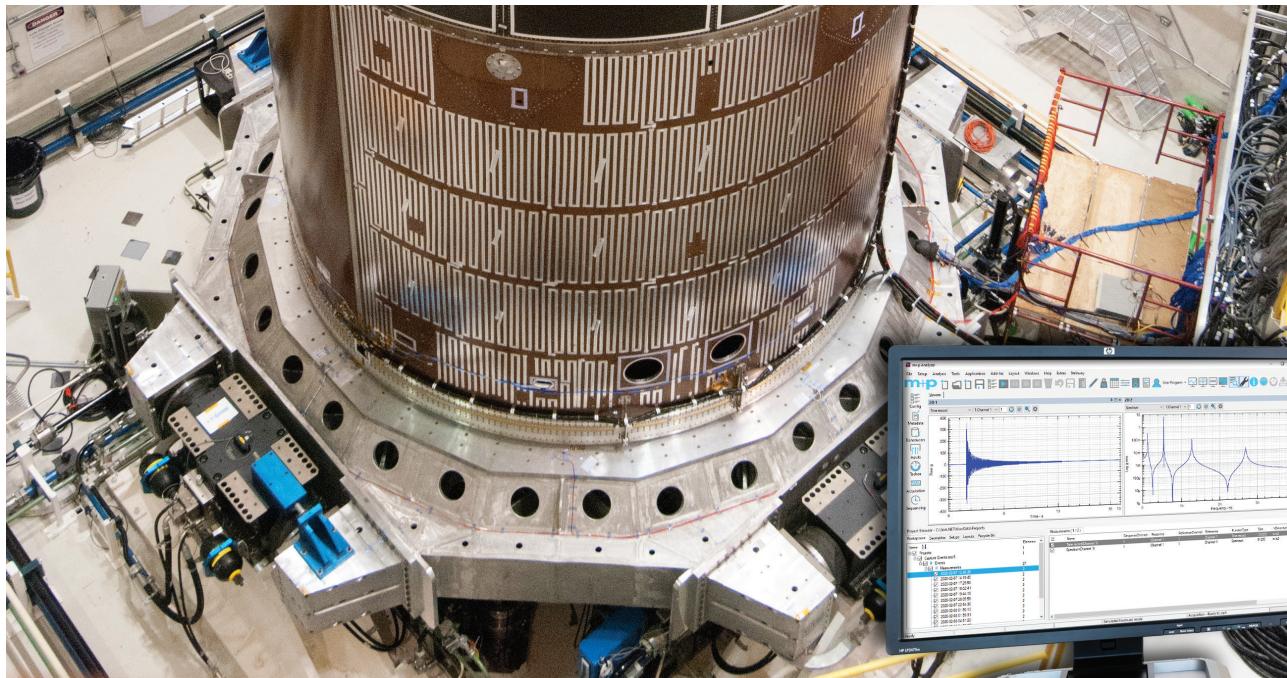


Photo courtesy of NASA, USA

Key Features

- Triggered data acquisition
- Regularly repeated measurements
- Long-term monitoring of tests or events
- m+p Analyzer for data capture and throughput recording
- m+p VibPilot, m+p VibRunner, m+p VibMobile acquisition hardware

1. Introduction

This application note describes the various capabilities of m+p Analyzer when it comes to triggered and repeated measurements. Triggered measurements allow “watching” a certain measurement channel and only record a measurement when a certain signal level is exceeded. Modal impact testing is a typical example of triggered measurements where the recording is triggered by the impact of the hammer. Repeated measurements can be useful when long tests or events must be monitored without the need of recording all the data completely. E.g. during a vibration test running several hours it might be required to record the spectra of all channels every 10 minutes to monitor the status of the device under test. This task can be easily accomplished using m+p Analyzer’s Sequencing feature.

2. Triggered Measurements

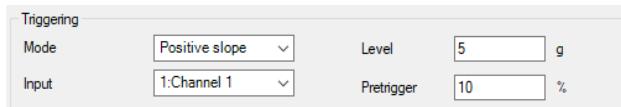


Figure 1: Trigger configuration

Triggering is useful when very short events or transient signals need to be recorded. By configuring a trigger channel, acquisition can be configured to capture only the data for a short time before and after an event, e.g. when the trigger reaches a certain level. Different trigger modes allow configuring a feasible trigger for different applications.

Trigger Settings

■ Mode

Positive/Negative slope indicating whether the measurement should be started when trigger channel exceeds/falls below trigger level value

Zone entry/Zone exit starts the measurement when the absolute value of a signal is lower/higher than the value specified

■ Level

The value to be exceeded/fall below to start the measurement

■ Input

The channel to be used to detect the triggering

■ Pretrigger

Specifying a pretrigger allows to record “past” values that have been measured before the trigger level was exceeded

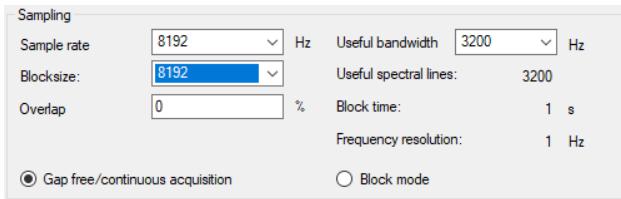


Figure 2: Configuring Block mode or Continuous mode („Gap-free/continuous acquisition“)



Figure 3: Recorded data using trigger on a pulse train:
Block mode (green) and Continuous mode (orange)

Furthermore, the measurement mode can be switched between Block mode or Continuous mode as shown in Figure 2. Based on the selection, the acquisition behavior of the system is slightly different. In Block mode the system expects a trigger for each measurement block while in Continuous mode the system will record the total number of blocks (gap-free) after the first trigger was detected. Figure 3 shows this behavior on a pulse train. The green and orange boxes indicate the recorded data based on the selected mode. m+p Analyzer was configured to measure 3 blocks. In Continuous mode, once the trigger was detected all blocks are acquired in direct succession. In Block mode, only one block is acquired on trigger detection, this is done 3 times on individual trigger events.

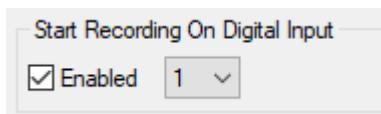


Figure 4: Options > Acquisition (m+p):
Start Recording On Digital Input

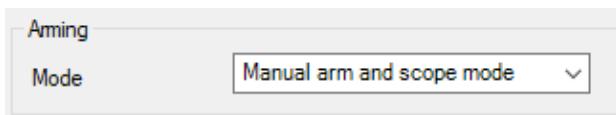


Figure 5: Acquisition configuration:
Manual arm and scope mode

If the purpose of triggering is only to start recording of data without the need for precise timing, m+p Analyzer offers the possibility to use a digital input channel¹. In “Options > Acquisition (m+p)” enable “Start Recording On Digital Input” (Figure 4) and select the digital input channel. On Acquisition Config page set “Manual arm and scope mode” (Figure 5). Once acquisition is started in scope mode, the data is shown on the screen. When the selected input channel is set to High, recording of data is started.

3. Repeated Measurements

Sequencing (formerly called Throughput Sequencing) is now available as an independent feature. It can be used in combination with all other setup features and with or without throughput recording.

To enable Sequencing, select the Sequencing tab in the configuration window and set the “Activated” checkbox. If there is no Sequencing tab available, click “Advanced” and select “Sequencing” to make the tab visible (Figure 6). You should see the Sequencing icon



in the Configuration tabs now.

First, define the “Overall time”. This may be e.g. the total time of your long test that you want to monitor. Then define the interval (“Repeat every”) which is the time between the start of two successive recordings. The recording time and number of blocks respectively are as specified on the Acquisition page. Setting “Repeat every” to 0 will restart the measurement directly after storing the data of the previous measurement. However, the data will not be continuous as during storage of data and initialization for next acquisition no data will be recorded.

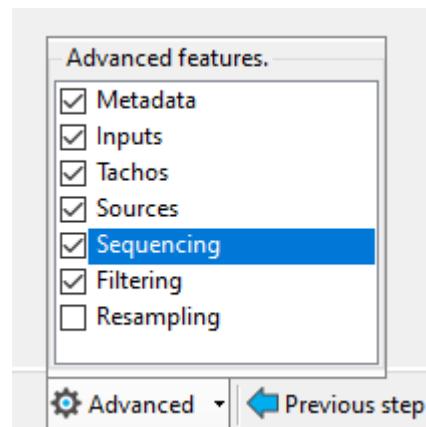


Figure 6: Advanced features in acquisition configuration

¹ Only available with m+p hardware (m+p VibPilot, m+p VibRunner, m+p VibMobile)

Sequencing

Activated

Overall time	Repeat every (0 for immediate restart)
Days	0
Hours	10
Minutes	0
Seconds	0
Total Seconds	36000
	900

Figure 7: Sequencing settings

To create a new workspace for each recording, check “Add timestamp” on Config page (Figure 9). If you uncheck “Add timestamp”, all measurements will be stored in the same workspace.

Figure 10 and Figure 11 below show the different results when “Add timestamp” is checked or unchecked during a sequenced measurement run.

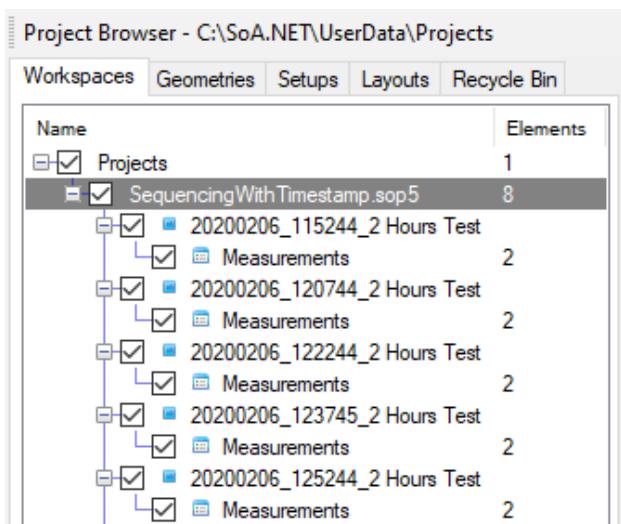


Figure 10: Results in project browser with timestamp

The settings in Figure 7 and Figure 8 will result in a recording over 5 blocks with a block length of 1 s every 15 minutes over a period of 2 hours. So, you will end up with 8 recordings (4 recordings per hour x 2 hours).

Sampling

Sample rate	16384 Hz	Useful bandwidth	6400 Hz
Blocksize:	16384	Useful spectral lines:	6400
Overlap	0 %	Block time:	1 s
		Frequency resolution:	1 Hz

Gap free/continuous acquisition Block mode

Total Test Time

Acquisition blocks	5	Time :	5 s
Processed blocks	5	(Overlap%, resampling)	

Figure 8: Acquisition settings

General Settings

Result workspace	2 Hours Test
<input checked="" type="checkbox"/>	Add timestamp

Figure 9: Naming of result workspace

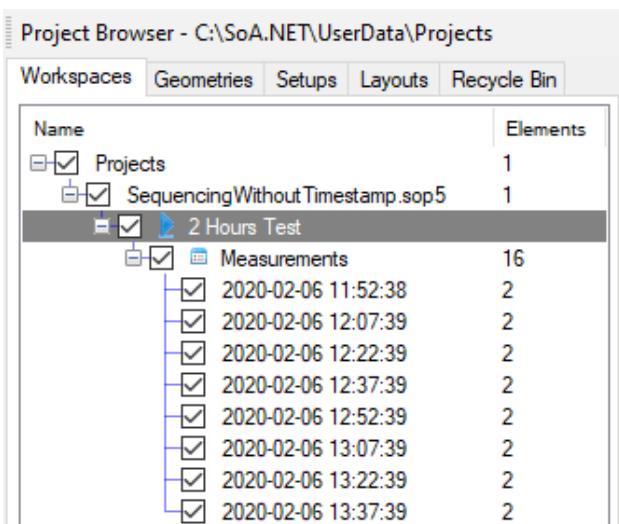


Figure 11: Results in project browser without timestamp

4. Combining Triggering and Sequencing

Combining the features described in the preceding sections 2 and 3 opens a huge number of possible applications. Let us assume the following measurement task: Over 24 hours record a 30 s time record for each event exceeding a certain signal level.

Configuration for this scenario is simple:

- Configure individual workspace by checking “Add timestamp” on Config page
 - On Transducers page configure all input channels
 - Go to Acquisition page to set sample rate and block time as required
 - Select the number of acquisition blocks to hit the 16 s recording time
 - Specify the trigger channel and set trigger mode and level. Define a pre-trigger to be sure you don’t miss the beginning of the event
 - Enable Sequencing for an “Overall time” of 24 hours
 - Leave “Repeat every” equal to 0 to make the system restart immediately
 - The last step will be to select time record and time history on the Save page
 - Now you are ready to start the measurement

After 24 hours the recording will stop automatically. Each event exceeding the trigger level on the defined trigger channel will record a 16 s time history of the recorded event. The measurement times directly indicate the time when the recorded events occurred (Figure 12).

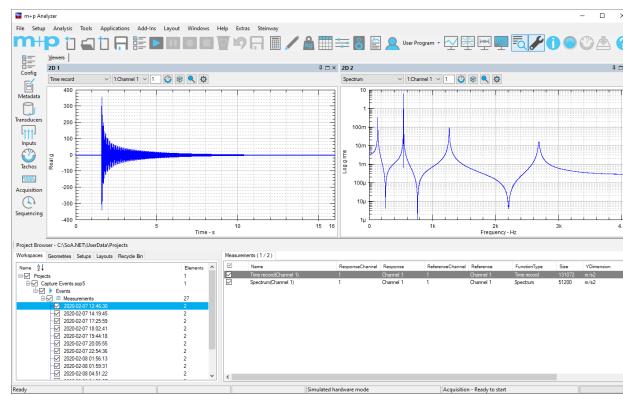


Figure 12: m+p Analyzer mainframe after capturing shock events of 16 s each over 24 hours

5. Conclusion

This application note shows the possibilities in running triggered and repeated measurements using m+p Analyzer. Different configurations, combinations of settings and example applications are given.

If you have any further questions on these or other features, feel free to contact us via support.analyzer@mpihome.com.



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