

# Gunshot Detection

Increasing detection. Decreasing response time.



**Facility managers and safety professionals** have a need for immediate recognition of a gunshot. Relying on victims or bystanders to notify authorities can take too much precious time. Reliability and volume of information about the event location can change rapidly from initial incoming 911 calls to when law enforcement arrives on scene.

## Objectives

- Place cameras with the ability to receive an audio signal in an area where gunshots may occur.
- Reliably detect a gunshot as compared to talking or yelling in the area.
- Detect a gunshot close to the camera.
- Ignore a gunshot further away from the camera. Ignoring a gunshot further away allows the proper camera(s) to create an audio alarm notification and direct authorities to the proper area in real time as the event unfolds quickly and from geographic area to geographic area in a building or on a campus.

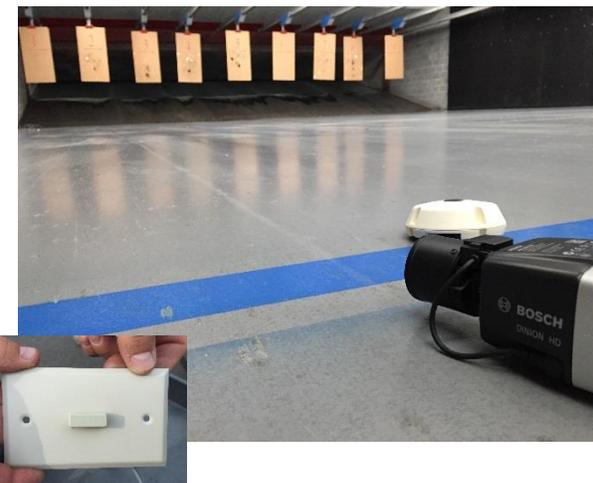
## Test Equipment

- Four Bosch cameras
- Four microphones of various design
- Laptop with web browser interface to cameras
- Various guns from 9mm handgun to a .223 Remington rifle
- Cinder block wall between gun ranges
- Gun fire from adjoining gun range

## Setup

Microphones of different types by Crown, Louroe, and other manufacturers were connected to amplifiers which were connected to the Bosch cameras' line level audio inputs. The microphones were spread around the range which was approximately 25 meters x 25 meters in size.

Most models of Bosch Security Systems IP cameras have the ability to evaluate an incoming line level audio signal based on volume and frequency. For this test, we viewed the differences between same-room gunshots and distant area gunshots.

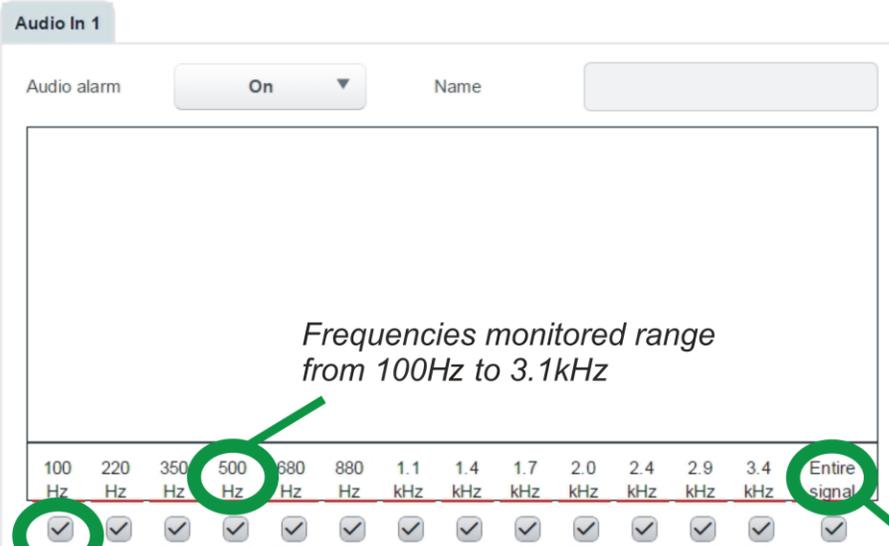


The diagram below shows the test screens of the four cameras and microphones. There were four cameras, each with one microphone. The top of the image shows the specific test being conducted.



The image below depicts the frequencies that are monitored by the Bosch cameras:

### Audio Alarm

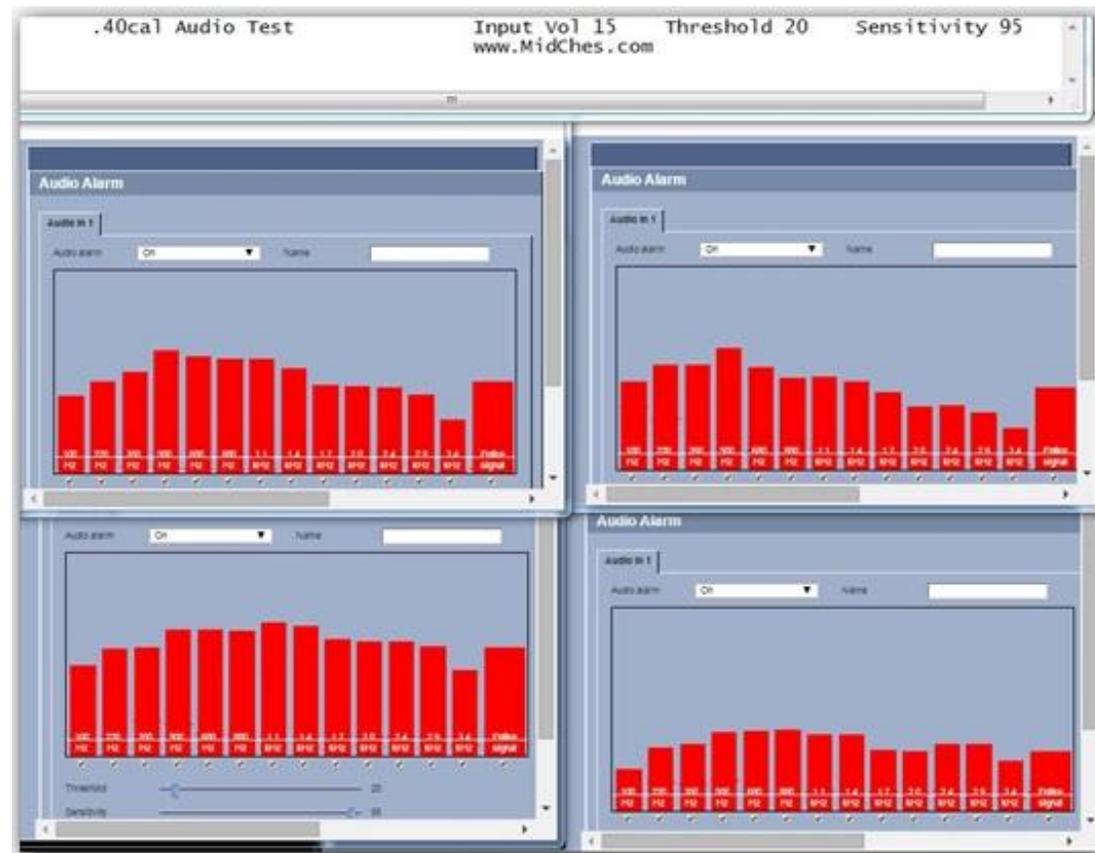
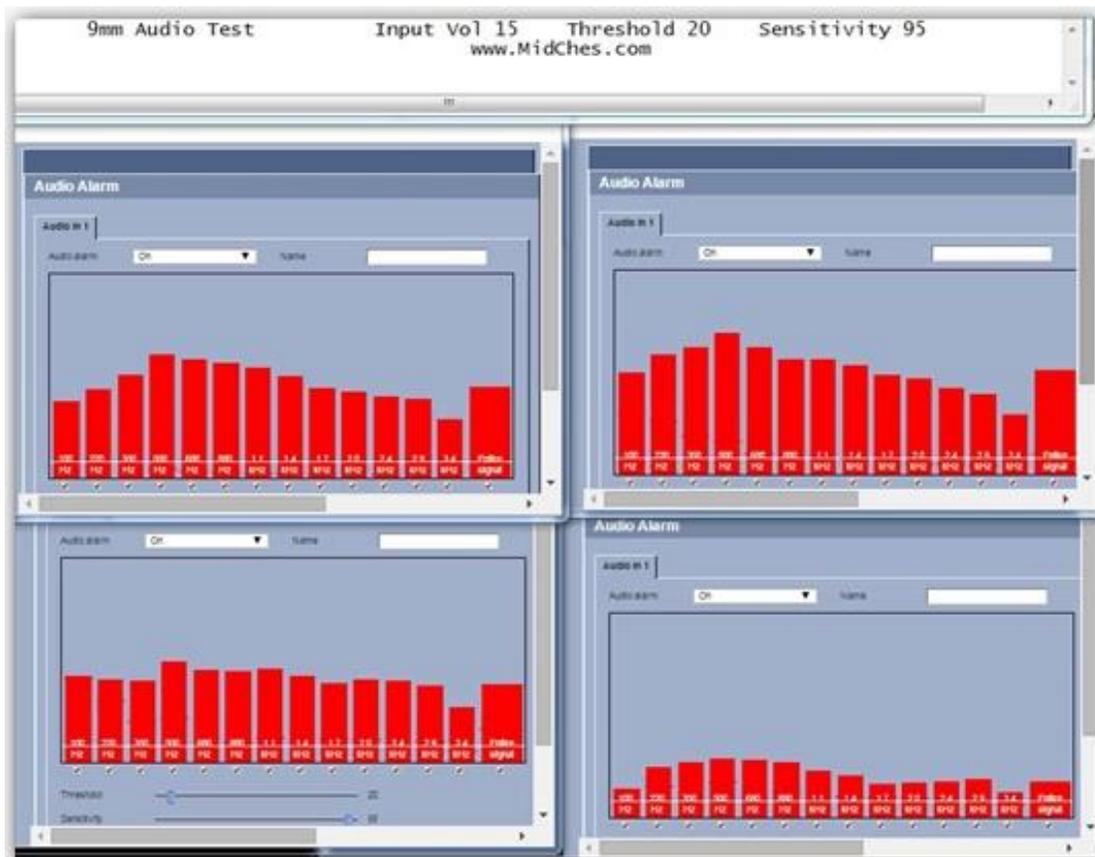


*Frequencies monitored range from 100Hz to 3.1kHz*

*Specific frequencies can be selected or de-selected*

*Overall signal can be monitored rather than or in conjunction with specific frequencies*

Below are the actual screen shots from each of the four cameras for each weapon type.

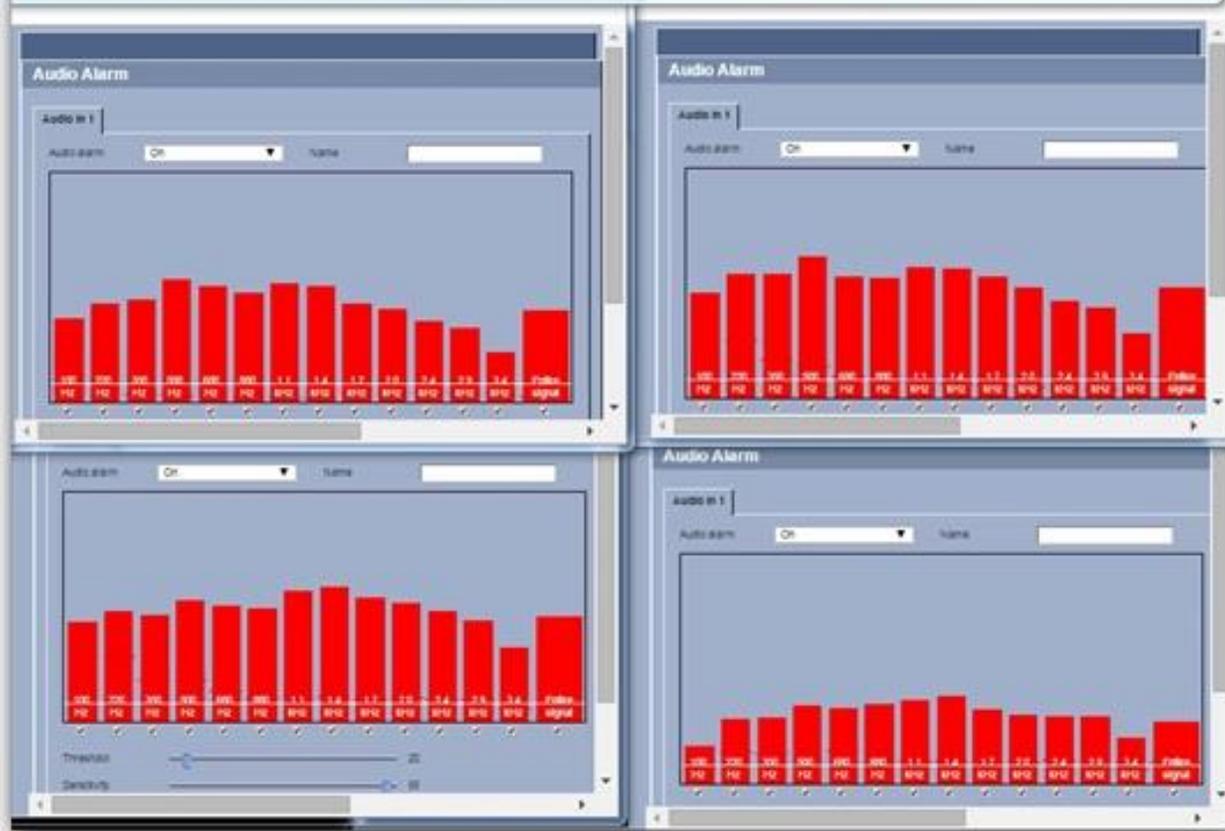


.45acp Audio Test

Input Vol 15  
www.MidChes.com

Threshold 20

Sensitivity 95

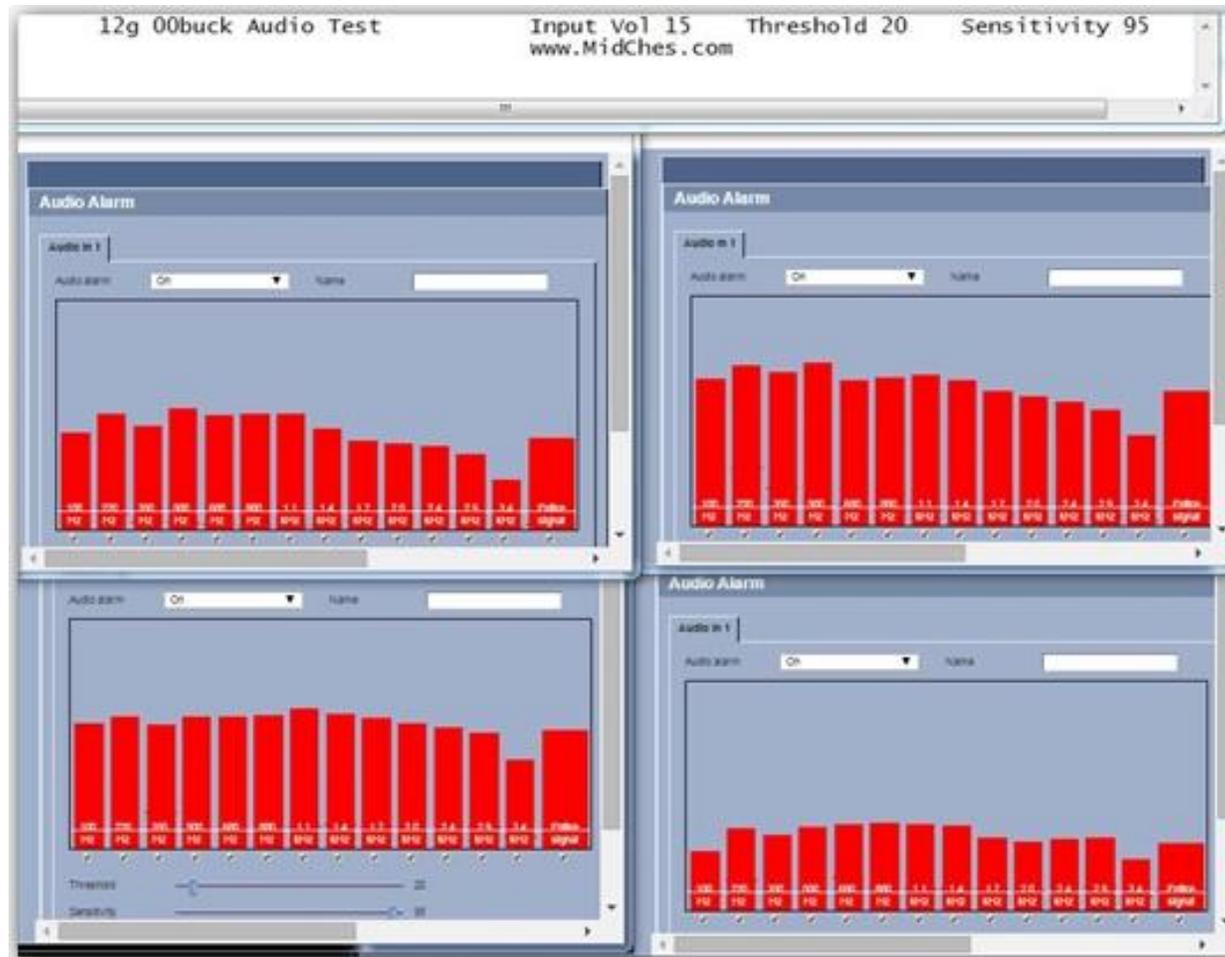


12g 00buck Audio Test

Input Vol 15  
www.MidChes.com

Threshold 20

Sensitivity 95

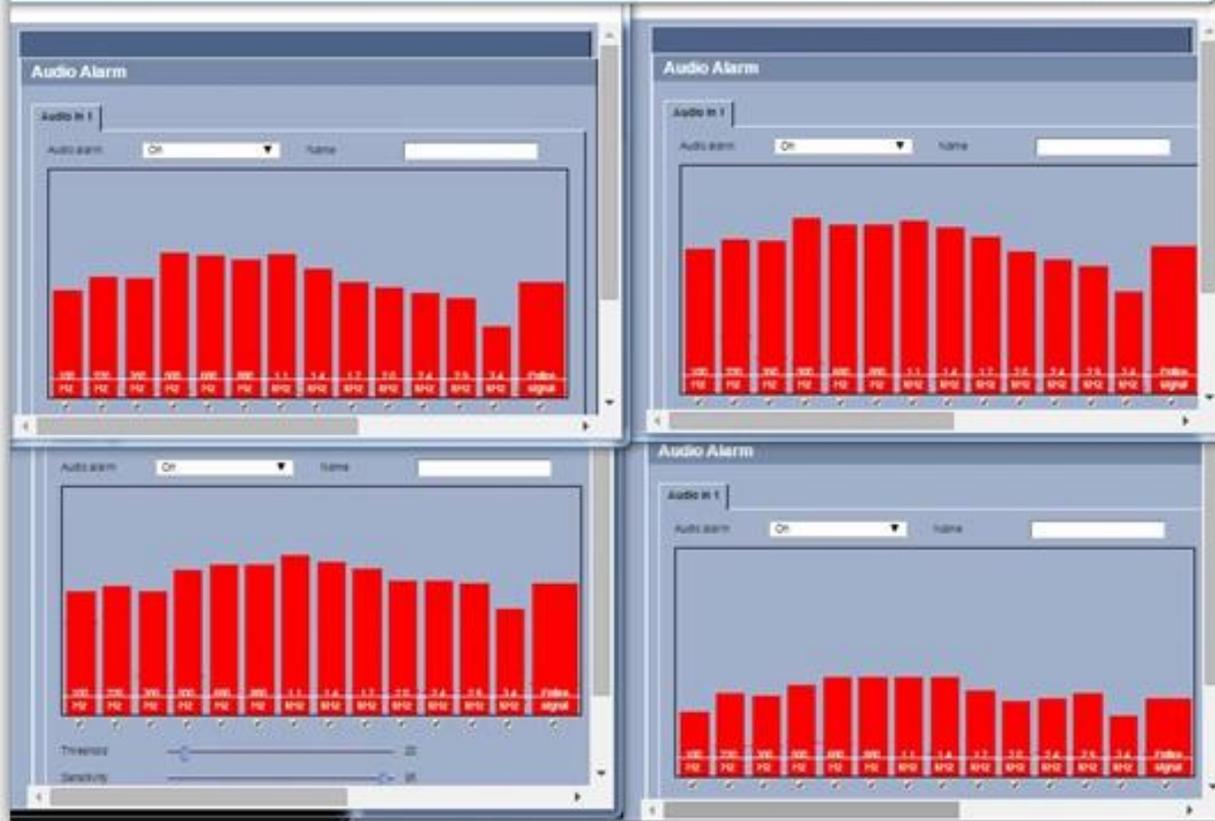


.223 Rem Audio Test

Input Vol 15  
www.MidChes.com

Threshold 20

Sensitivity 95

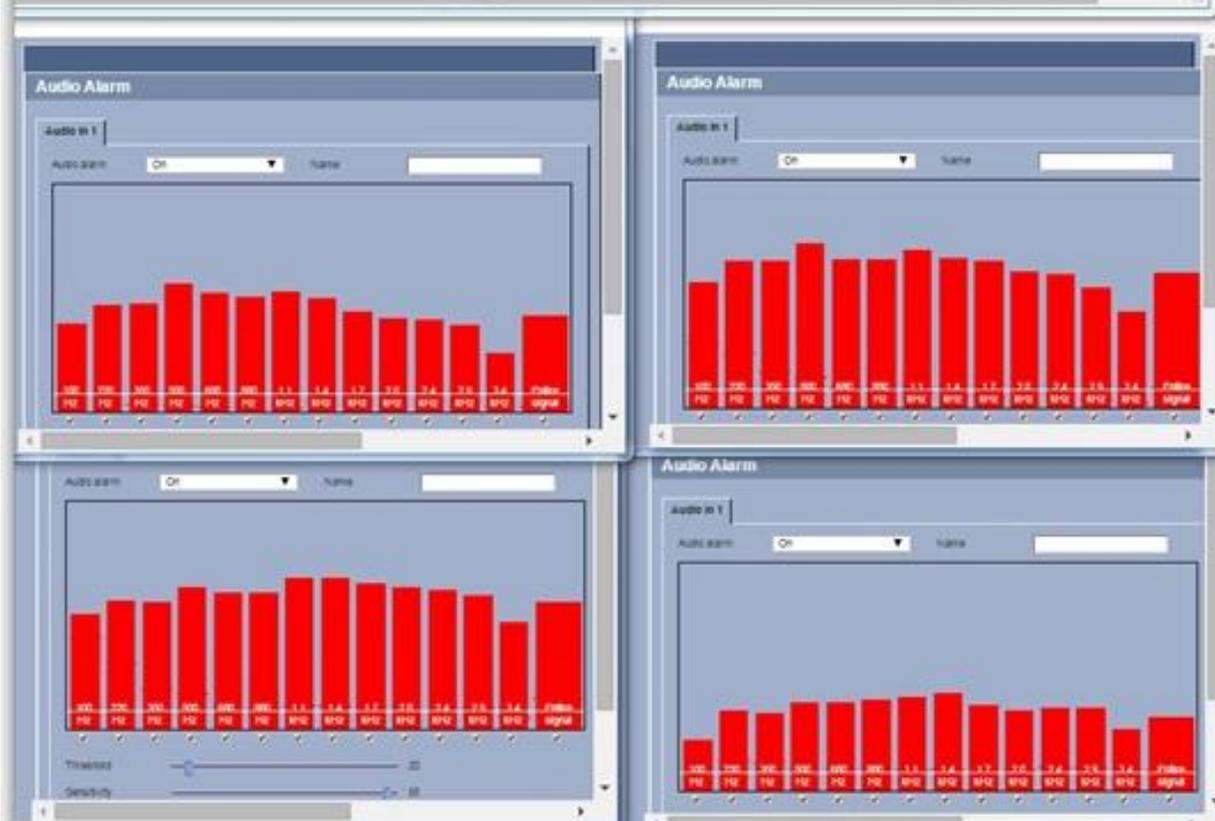


7.62X39 Audio Test

Input Vol 15  
www.MidChes.com

Threshold 20

Sensitivity 95



## Technology application

The ability to detect a specific frequency at a specific volume is only half of the process. Once the “alarm state” is recognized by the camera, the next steps need to take place. The camera must be connected to another system to cause a notification to occur:

- Email from the camera with snapshot attached sent to supervisors or staff
- Alarm sent to video management system for camera call-up
- Relay out of camera to send alarm over a wire to a monitored alarm system
- Integration of systems to initiate a lockdown or evacuation
- Integration of systems to initiate mass notification of instructions

Watch the gunshot data collection video [here](#)



Read and watch Nice Systems’ testing of Bosch audio alarms [here](#)

