

# PIR SENSORS IN IEDs USING CONSTANT POTENTIAL GENERATORS

By Teledyne ICM

## INTRODUCTION

For EOD teams, the use of PIR (Passive Infrared) sensors in explosive devices can be a major concern as they are sensitive to X-Ray, and then can trigger a device while performing the inspection.

The classic X-Ray method used does not allow to manage kV then it becomes very difficult to be undetected by PIR. With the technology evolving, Constant Potential X-Ray generators have appeared and allow to adjust kV and mA while being able to set the duration of a shot. When having the parameters of

the generator set to low kV and mA, we can remain undetected by PIR sensors.

To prove this theory, we have conducted a study to determine the operability of CP (Constant Potential) Battery operated generators below the sensor sensitivity while keeping a sufficient image quality.

## SAMPLE OF PIR SENSORS

For this study, a non-exhaustive sample selection of PIR sensors has been used:



Chacon 34310 type EFE 700



Goodbay art. 95172 #827-115



DeleyCon MK2993



Maclean Energy MCE20

The 4 PIR sensors appeared to have very similar results so we will focus on the Chacon to demonstrate the findings.

TYPE OF GENERATOR USED FOR THE STUDY



Features	Teledyne ICM LITEX
Generator type	Constant Potential
Beam	Directional
Power supply	Dewalt Battery
Output voltage range	40 to 120 kV
Tube current range	0,05 to 0,25 mA
Tube current at full output	0,25 mA
Weight	2,5 kg / 5,51 lbs
Focal spot (EN12543)	0,8 x 0,5 mm
Beam angle	50 x 50°
IP Level	IP54
Operating temperature	-25 to +50°C / -13 to +122°F
Connections	Bluetooth / Wired

MAIN CHARACTERISTICS



LIGHT-WEIGHT



BATTERY OPERATED



SMALL FOCAL SPOT



DR-READY



UP TO 120 KV



ROTATING TANK

- Adjustable kV, mA and exposure time
- Compatibility with X-Ray Scanners and Amorphous Silicon digital detectors

TYPE OF DETECTOR USED FOR THE STUDY



Features	Unit	Teledyne ICM TACTX
Sensor type	-	aSi
Resolution	lp/mm	4.16
Pixel size	μm	120
Dynamic range (Grey levels)	bits	16
Active area	mm / in diag.	246 x 307 / 10 x 12
Maximum penetration	mm / in of steel	35 / 1.3 (with CP120B)
	mm / in of steel	45 / 1.7 (with CP160B)
Number of covered sides	-	3 (left, bottom, right)
Dead zone	mm / in	4.6 / 0.15 (from bottom) 15 / 0.59 (from side)
External dimensions	mm / in	327.3 x 285.6 x 18.65 / 12.87 x 15.15 x 0.7
Weight	Kg / lbs	~2.9 / 6.39
Operating temperature	°C / °F	-20 to +50 / -4 to +122
Storage temperature	°C / °F	-20 to +65 / -4 to +149
Communication protocols	-	Bluetooth / Wifi or cable driven (optional)
Work with	-	CP120B / CP160B / LiteX X-ray generators
Imaging Station	-	Notebook, toughbook, Tablet, toughpad

## SENSITIVITY TESTS

Target: identifying triggering limit versus operating conditions based on kV and mA, distance and duration.

### a. Effect on duration

**Test conditions:**

- PIR Sensor: Chacon
- 120kV, 0.25mA (Full power)

Duration (s)	Triggering limit between ... cm / in	and ... cm / in
1	220/86,6"	240/94,5"
2	220/86,6"	240/94,5"
10	220/86,6"	240/94,5"
60	220/86,6"	240/94,5"

**Conclusion:**

While shooting at full power of the LiteX generator, the PIR sensor triggers immediately when x-rayed, the duration has no effect even at 1 second.

### b. Effect of kV – mA adjustment

**Test conditions:**

- PIR Sensor: Chacon

kV	mA	Triggering limit between ... cm	and ... cm
120	0.1	110	120
120	0.2	220	240
100	0.1	100	110
100	0.2	180	200
80	0.1	70	80
80	0.2	140	160

**Conclusion:**

The kV and mA adjustment capabilities of the LiteX CP generator make it possible to reduce the distance.

## IMAGE QUALITY

Now the question is, can we get a good quality image while not triggering the PIR sensor?

### a. Image quality using TactX with LiteX



Parameters:

kV	80 kV
mA	0.1 mA
Distance	80 cm
Time	60"

### b. Corrected image quality using TactX with LiteX



Parameters:

kV	80 kV
mA	0.1 mA
Distance	80 cm
Time	60"

### c. Corrected image quality using TactX with LiteX – SNR Value

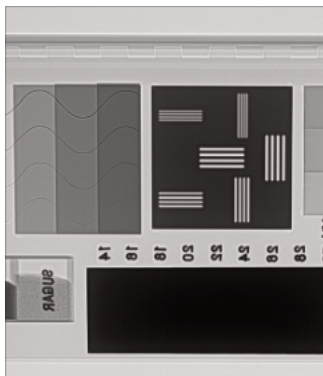


Parameters:

kV	80 kV
mA	0.1 mA
Distance	80 cm
Time	60"

SNR Value: 190

### d. Processed image quality using TactX with LiteX



Parameters:

kV	80 kV
mA	0.1 mA
Distance	80 cm
Time	60"

## CONCLUSION

Constant potential generators can operate below PIR triggering limit while having a good average flux and an excellent image quality because:

- Signal is continuous
- Focal spot is smaller
- kV and mA are adjustable
- Time is adjustable

So, when PIR systems are used, the best way to not trigger them is to decrease kV and mA but increase exposure time. This will offer a great image quality while remaining undetectable. ■

## ABOUT TELEDYNE ICM

Teledyne ICM has over 25 years of expertise in developing innovative portable radiography solutions. Its portable generators have excellent technical capabilities and when coupled with high-resolution detectors, provide highly accurate radiographs. Contact: [icm.sales@teledyne.com](mailto:icm.sales@teledyne.com)