

# TECHNICAL BULLETIN

## Why we use HFD sensing technology, not Ultrasonic?

### OVERVIEW

IR-TEC is proud to be the company that created the world's 1st PIR+HFD dual technology wall switch sensor for mounting with NEMA standard single gang wall box. Each Dual-Tech WALLSENZR employs a digital Passive Infrared (PIR) sensor together with an advanced High Frequency Doppler (HFD) sensor to provide second to none occupancy sensing performance.

The question may be asked, why IR-TEC uses HFD, and not the prevalent Ultrasonic Doppler (USD) which has been applied in a majority of dual tech occupancy sensors in the market? To better answer all relevant questions about the sensing technology, we believe it would be helpful to prepare this technical bulletin for all to get a better understanding about the HFD sensing technology.

### BACKGROUND OF INNOVATION

Being a specialist in the designing and manufacturing of various types of motion sensors for more than 30 years, IR-TEC is aware of all the "positives" and "negatives" of major sensing technologies for occupancy sensors. Simply speaking, not any single sensing technology is "perfect" for all occupancy sensing control applications. Thus, dual technology sensors were created to provide better occupancy sensing performance through the combination of two sensing technologies with different operating principles.

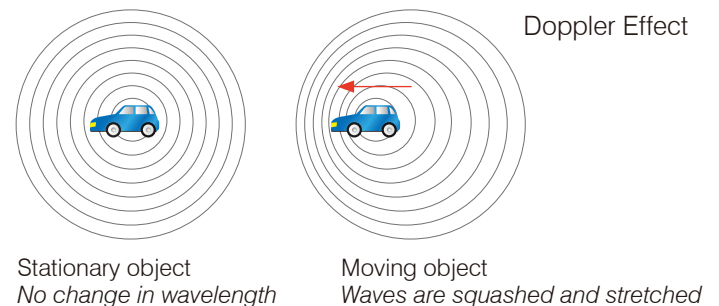
Since dual tech occupancy sensors were first introduced in the 1990's, the majority of dual tech occupancy sensors sold in the American market use PIR as the primary, and USD as the secondary sensing technologies. The dominance of PIR+USD dual tech sensors has successfully misled the market into a scenario that USD seems to be the only option for secondary sensing technology. The only other choice has been dual tech sensors with combined PIR and Acoustic sensing solutions sold by a single manufacturer.

As a veteran of motion sensors, IR-TEC designed and manufactured ultrasonic motion detector in the early 1980's, and has been manufacturing dual tech motion detectors for intruder detection since the mid 1990's. Therefore, we believe we have a very strong understanding of all of these technologies. As a result we chose HFD, not the legacy USD, as the secondary sensing technology for all IR-TEC dual tech occupancy sensors when we set out to deliver better dual tech sensors to the lighting control market.

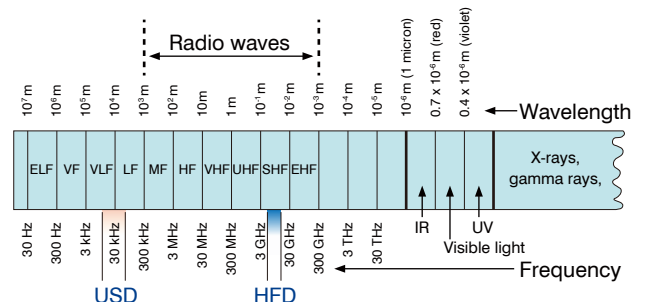


### OPERATION PRINCIPLE

Both the HFD and USD motion sensing technologies are operating with the same principle, the Doppler Effect. Both technologies transmit duty-cycle pulses in specific frequency and measure the changes of returned signal in reflection off a moving object.



The main difference is operational frequency. The HFD is operating with Super High Frequency (SHF, typically 4 GHz ~ 12 GHz) radio waves, and the USD is operating with Low Frequency (LF, typically 25 KHz ~ 45 KHz) radio waves.



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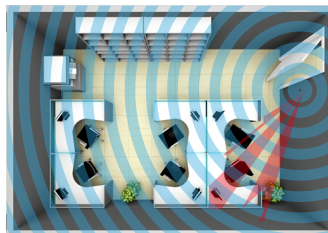
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## OPERATION PRINCIPLE - Cont.

Having the same operating principle, both technologies provide better minor motion (e.g. typing, reading) detection capability and do not require unobstructed line-of-sight like PIR sensors, thus making them suitable for applications such as an open office with partitions, a library with cubicles, a reading area, or a restroom with stalls.



Restroom with Partitions



Office with Partitions

Due to the fact of different operation frequency, HFD and USD sensors feature distinctive characters in design and performance. The most obvious distinction is; all USD sensors require grid openings on the front cover to allow transmitting and receiving the ultrasonic pulses, while HFD sensors can operate within a fully enclosed plastic housing. The second character is; USD sensor can only detect a maximum range up to 40 ft., and HFD can exceed that distance while giving better sensing performance.

## HISTORY OF HFD APPLICATION

Many people may consider HFD a brand new sensing technology. In fact, HFD sensors have been used in numerous intruder detection devices as the primary, or secondary, sensing technology since the 1980's, or earlier. The common name historically has been "Microwave Sensor" in the security industry which refers to its operational radio frequency band.

Until today, HFD sensors are undoubtedly the most prevalent "secondary" sensing technology used in the dual tech motion detectors for intruder detection due to its proven reliability and superior performance. Unlike the lighting control market, we seldom see any dual tech motion detectors utilizing USD as the secondary technology in the professional security market which demands a higher level of reliability and performance.

## ADVANTAGES OF HFD TECHNOLOGY

The followings highlight some clear advantages of HFD technology:

### Better Detection

HFD sensors can provide detection coverage relatively larger than USD sensors, and with better sensitivity to detect the motions, either minor or major. This also represents that IR-TEC Dual Tech WALLSENZR could effectively reduce the false-off possibility.

### Better Reliability

As HFD sensors are operating with extremely high radio frequency up to 10 GHz range, the environmental interferences are greatly reduced compared to those that could commonly cause false triggering on the USD sensors.

### Better Aesthetics

The requirement of grid openings on USD sensors has long been considered a major concern in terms of interior décor aesthetics, product safety, and operation reliability. HFD sensors do not require any openings for operation which enables us to create an aesthetically pleasing appearance for our Dual Tech WALLSENZR.

### Better Safety

The fully enclosed sensor cover of IR-TEC Dual Tech WALLSENZR also attracts less curiosity from the public, especially the kids. This definitely provides better vandalism protection and higher product safety for all facility management professionals.

## WHY NOT MANY PIR+HFD DUAL TECH IN THE MARKET?

Since HFD sensors have so many advantages, and are clearly a better technology to work together with PIR, why don't we see many PIR+HFD dual tech occupancy sensors (including wall mount and ceiling mount) in the market?

As a sensor manufacturer who embraces technical challenges, we can say that it would be because of the difficulty in overcoming the space limitation and the costs involved to do so. Now that IR-TEC has developed solutions to overcome both of these issues, we believe we are at the forefront of a technology jump in occupancy sensors. We invite everyone to join us in this revolutionary advance in occupancy sensor industry.