Radar Detectors – Facts and Fiction

By Scott Witt

Let's talk radar detectors. Lots of folks in Heart O' Dixie club have them, but many do not. There is quite a bit to know about radar detectors if you want to use them efficiently and legally. But first, some basics:

RADAR is an acronym for RAdio Detection And Ranging. The police use purpose-built radar transceivers for speed detection.

LIDAR is a variation on radar. LIght Detection and Ranging uses a purpose-built transceiver that radiates in the near-infrared portion of the electromagnetic spectrum. This light is not visible to you. It's often referred to as LASER radar.

All police radars work at specific frequencies in the electromagnetic spectrum. You can think of frequency as the number of radio or light waves sent or received per second, commonly called cycles per second. The unit of measure is called a Hertz (1 cycle). It's usually used in multiples: 1,000 Hertz is 1 kilohertz (kHz), a million Hertz is 1 megahertz (MHz); a billion Hertz is 1 gigahertz (GHz). Police radar works in very specific frequency ranges, called bands. They are:

X-band: 10.525 GHz

K-band: 24.125 GHz and 24.150 GHz

Ka-band: 33.4 – 36.0 GHz

Near Infrared: 331.6 THz

Your radar detector is specifically designed to detect the frequencies that the police use. Unfortunately, the police are not unique in the frequencies they use. Other emissions in the same part of the frequency spectrum (mostly K-band) include automatic door openers and traffic-sensing radar, as well as blind-spot monitoring, adaptive cruise control, and pre-crash braking on many newer vehicles. These IVT's (In-Vehicle Transmitters) are the reasons for most false alerts.

Police radar is trying to precisely measure your speed and it can do this in a variety of circumstances using the Doppler effect. You are likely most familiar with the Doppler effect as a result of listening to a train pass while operating its horn. As it passes, the pitch appears to go down. The reason is that the relative position between you and the train's horn is changing as a result of the train's motion, changing the frequency that your ears received from the train's horn. The frequency increases or decreases according to the speed at which the distance is increasing or decreasing. Police radar measures speed by precisely measuring the frequency of the returned signal that bounced off your car. Doppler weather radars work on the same principle.

The most common circumstance is when the police car is parked alongside the road ahead of you somewhere. The radar transmits a signal in your direction. If the returned frequency is higher than what the radar gun transmitted, the amount of change is used to calculate your speed.

Police can also measure speed while they are in motion, driving down the highway, and they can measure the speed of cars in front of them and also behind them if they are properly equipped. The newest versions of moving radar are particularly difficult to defeat. *Same Lane* mode allows the officer to clock same-direction vehicles ahead of the rolling cruiser. If it has a rear-mounted antenna, it can clock faster vehicles as they come up behind.

Fastest Speed mode allows the radar to sample multiple targets and display the speed of the fastest. You can't hide in a crowd of vehicles anymore! Most state highway patrols prefer moving radar to stationary, hand-held radar, except in Pennsylvania, where State Police are only allowed to use K-band radar in stationary mode.

Some things to know when using your radar detector:

They are legal in all states except Virginia and Washington DC. You will be ticketed if they see one in your window. Police in these areas have special equipment (Stealth RDD) that can detect your radar detector when it is plugged in. Also, most military bases will require you to not use radar detectors on the base. There are a few radar detectors that can't be detected by the police (Escort Redline X is a popular one).

False alarms are common, but with experience, you will learn which alerts are the ones to pay attention to. Most radar detectors will give you an audible and visual indication of what band it has detected. Ka-band is almost always a police radar, so pay attention. K-band radars are still in use by some police departments, especially rural ones, but K-band is also used by many other devices, as I mentioned earlier.

The least likely radar you will encounter will be X-band; only about 1 percent of the 100,000 or so radars out there are X-band. About 15 percent are K-band, and the remaining 84 percent are Ka-band. LIDAR or laser radar is coming on quickly, though, so if your detector doesn't have laser detection, you might want to think about it.

The range at which you can be clocked by police radar depends on the model of their radar, the frontal area cross-section of your vehicle, terrain, weather, the amount of traffic and the expertise of the officer using it. You'll be surprised to learn that in practice, the radar range is very often no more than a quarter of a mile, and frequently less than 700 feet if the officer is following the rules. Radar case law dictates that the officer must first witness the violation (speeding), identify the vehicle and visually estimate the target's speed. Only then should he activate the radar to confirm the speed estimate and, if necessary, take enforcement action.

On a busy highway, a moving-mode clocking usually occurs at less than 1,000 feet and often much closer. The radar just displays the speed; it's the officer's responsibility to identify which vehicle the radar is looking at. Legally, the officer is required to establish a 'tracking history' before taking action. This can take several seconds, more than enough time for an alert driver to get on the brakes.

How far away can you detect police radar? That depends, but generally it's going to be well before the officer gets close enough to clock you. A lot of alerts will occur well before you see the police cruiser. Most detectors have some way of

indicating the signal strength of the radar, and this is a good way to estimate how close the radar is. I personally have detected police radar more than 5 miles away on a long straight stretch of I-25 in New Mexico. But that is with a very good detector (more about that later). An exception to this notion is the use of instant-on radar, sometimes called POP. In this case, the officer does not turn on the radar until he's very close, probably coming up behind you, or sitting in an obscured position alongside the road as you pass by. The officer is still required to establish a tracking history, so get on the brakes anyway.

Weather can affect radar. Heavy rain makes it nearly impossible to get a good reading. LIDAR will not work reliably in fog, light rain, dust, etc.

What about jammers? Radar jammers are illegal to operate in every state; it is a federal offense to do so, with fines of up to $50,000! Jammers are easily detected by police radar transceivers. In any case, most radar jammers offered for sale do not work reliably. Most police radar transceivers use digital signal processing that rejects the noise created by the jammer.

On the other hand, laser jammers are legal in 24 states, including Alabama (but not Tennessee, South Carolina, Texas or Oklahoma). As I mentioned earlier, LIDAR is becoming more and more often deployed with highway patrol. It is a game-changer. LIDAR emits a beam of invisible infrared light. The beam is only about 20 inches wide at 1,000 feet, so if your laser detector goes off, you are definitely being beamed. LIDAR can measure speeds to a tenth of a mile per hour, and it does so nearly instantaneously, so track history establishment is not necessary. Typically, the patrolman will aim at your headlights or license plate to get the best reflection return, so it's possible that you can be beamed and not even know it because the narrow beam does not hit your detector.

Under normal conditions, LIDAR has a greater range than radar and can measure your speed up to 4,000 feet away, although typical police usage is usually under 2,000 feet. By the way, LIDAR is often used at night. Also, by the way, conviction rates with LIDAR are much higher. Some of the LIDAR guns can even take a picture of your car.

Laser jamming is an expensive process when done well. A laser jammer detects a police laser gun's beam, decodes the signal and transmits bursts of invisible infrared light on the same frequency in return. If this return signal is at the correct

frequency and the same pulse repetition frequency (PRF), the laser gun is confused and does not display a speed.

Generally, at least two laser transceivers each are necessary at the front and back of your car. They should be located near the bright spots, i.e., the headlights, taillights and license plates. They need to be in the beam sent by the patrolman to work. If laser jamming is important to you, spend the money on a good system and money on a good installation. Otherwise, it won't work.

There is another product that can help with defeating laser radar. It goes by the name "Veil Stealth Coating," and is a liquid that is applied to highly reflective surfaces to reduce their reflectivity, weakening the return signal to the laser gun, which might buy you some time to slow down.

By the way, it's now estimated that somewhere around 25 percent of speeding tickets are issued as a result of laser radar tracking.

If you're thinking about buying a radar detector, do some homework. There are a lot of brands and models out there. Three of the most popular are the Escort models, Valentine and Beltronics. Talk to someone who has one and ask them what they like or don't like about it. Whatever you do, don't go cheap. Some of the best and latest models have GPS onboard so they can precisely locate the signals they detect. If the same signal is detected in the same place three times in a row, it will lock it out because it's likely it is a door opener or some other signal source that is stationary. Some models connect through your smartphone to the cellular system for live, crowd-sourced updates on where the latest radars are operating; think of it as Waze for radar detectors. Both of these capabilities happen automatically and can be very handy in crowded urban environments with significant police presence.

For what it's worth, I have used Escort Passport series radar detectors since 2002 and have been very happy with their performance. They are easy to use, have quickly available alert lockouts, have very long range, and I can also program out certain K-band frequencies to stop a lot of the annoying non-police alerts.

Be prepared to spend money on updating your equipment. A lot of work is going on to make driverless vehicles safe to operate on the road, and there is a lot of radar sensing involved with this. At this point, a lot of the sensing is in the K-band, as we have discussed. There is a move afoot in the United States to

consolidate most of the sensing into a dedicated band at 24.0 to 24.250 GHz. The Europeans are hoping to set a worldwide standard for radar sensing for driverless vehicles as well as piloted vehicles (known as Advanced Driver Assistance Systems, or ADAS) in the 79 GHz band. Generally, the higher the frequency, the greater the bandwidth available, and these new systems are very data intensive. All the data generated by the ADAS systems is used by the vehicle to make ongoing, split-second decisions.

There is much opinion about whether radar detectors work that well in saving you from speeding tickets, or whether they are even worth the money. I'll just say that if you get one, you have to learn to use it and understand it. As to whether they save you from speeding tickets, my personal answer is an unqualified "Yes!"

If you don't ever speed, pay no attention to the above article. You are good to go!