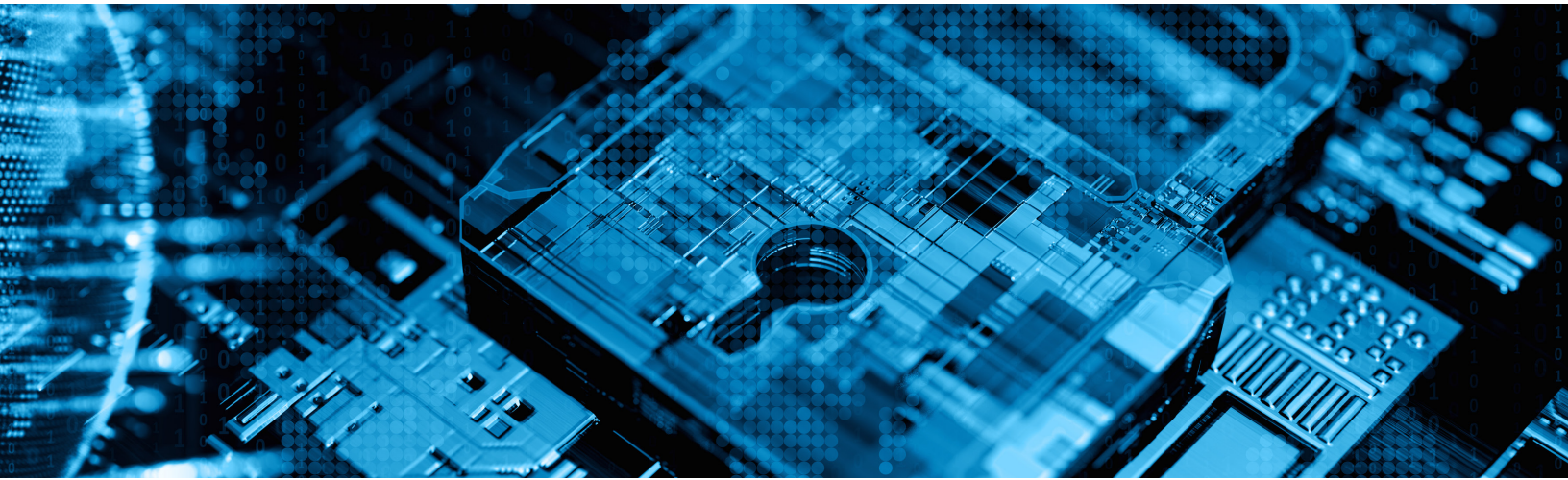




## **Automated Vehicle Identification for Tolling and Parking: RFID vs ANPR**

By Michael Hrabina, Executive Vice President, FEIG ELECTRONICS INC



This paper analyzes ANPR versus RFID on key vehicle access control features and recommends the most secure and cost-effective solution for automatic vehicle identification. Security is one of the most important areas within vehicle identification especially if it is being used for financial transactions, such as parking and tolling. Today, the license plate recognition system called ANPR or automatic number-plate recognition

system is frequently used for identifications of vehicles. However, much concern has been centered around the misidentification, high error rates, and increased government spending related to the ANPR technology. The long-range RFID or Radio Frequency Identification vehicle identification could resolve these issues in a more secure and cost-effective way.

It is important to compare the attributes of two AVI (automated vehicle identification) technologies available in the market today. The ANPR uses infrared cameras with Optical Character Recognition (OCR) to read the vehicle registration plates for purposes of law enforcement, pay-per-use roads, toll collection and to monitor traffic in gated or parking areas.

Radio-Frequency Identification (RFID), where tags or labels are mounted on vehicles and fixed RFID infrastructure is placed at strategic locations such as entry/exit gates, weigh-bridges, and parking lots. Some of the main characteristics in comparing RFID VS ANPR include the following: provisioning, detection rate, data accuracy, environmental immunity, multiple lanes handling and security.



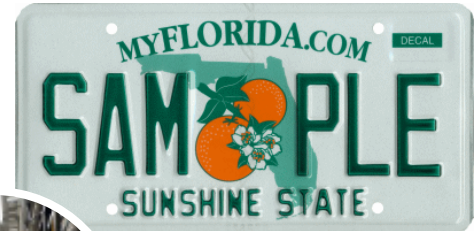
VS.



## Provisioning

User provisioning is the process of creating, maintaining and deactivating access rights and privacy while ensuring enterprise resource security. Today, the ANPR or automatic number plate recognition system, is in the form of license plate. RFID technology requires placing a windshield tag on to the vehicle itself. Both technologies work with a back-end system that associates the identifier (the license plate or the RFID tag) to a user account. This data can either be locally stored, served up on a server or served up into the cloud.

One reason ANPR is often a choice for those in the toll and parking lot business is the lower provisioning costs. This is because ANPR identifies the vehicle thanks to the government-registered plate, which is a credential readily available for use. Many states and countries are already using government-issued RFID transponders that the driver must attach to the windshield, including the state of Florida where drivers use the Sun Pass tag to pay for tolls and airport parking facilities.



## Detection Rate

Comparing the detection rate between ANPR and RFID requires a consistently applied measurement. For this purpose the total number of vehicles detected by an external trigger, such as a loop detector, is compared to the total number of tags or plates captured. Visual identification ANPR techniques require great optical, computing and digitizing capabilities that slow down the recognition of plates per second. Depending on the environment and shutter speed, an ANPR systems can detect license plates at around one per second on cars travelling up to 100 mph (160 km/h).<sup>1</sup>

Long-range, UHF RFID technology can well serve these challenges of high-speed vehicle identification. RFID systems are in use today where cars can pass through toll-collection points at very high speeds without slowing down at all – with vehicle identification and authentication tested at more than 150 miles per hour.<sup>2</sup> The Massachusetts Department of Transportation or MassDOT demonstrates the RFID system accuracy, revealing that its E-ZPass system improved over the course of six months by over 99 percent based on transponder-powered tolling in comparison to pay-by-plate systems used in the past.<sup>3</sup>

<sup>1</sup>[https://www.cs.mcgill.ca/~rwest/wikispeedia/wpcd/wp/a/Automatic\\_number\\_plate\\_recognition.htm](https://www.cs.mcgill.ca/~rwest/wikispeedia/wpcd/wp/a/Automatic_number_plate_recognition.htm)

<sup>2</sup><https://www.feig.de/en/press-news/detail/view/new-tolling-security-and-speed-requirements-with-ucode-dna/>

<sup>3</sup>Source: MassLive.com May 8, 2018



## Data Accuracy

Data accuracy is a measure of the number of characters captured and transmitted correctly. RFID uses an air protocol to incorporate Cyclic Redundancy Check (CRC) as a method to prevent errors in data transmission between tag and reader. While ANPR depends on a software algorithm and voting logic to determine the likelihood of the character recognition. Because RFID self-checks data, it offers superior data accuracy in comparison to ANPR. In fact, ANPR's data accuracy rate can be less compelling than that of RFID. One main concern is that ANPR has four errors per 100 readings.<sup>4</sup> In one example the IT West reported that in the UK the ANPR system uses 9,000 cameras, to store up to 30 million vehicle records each year and reported a staggering (up to) 1.2 million false readings of number plates every day! That's the equivalent to over 400 million incorrect readings each year!<sup>5</sup>

### RFID ACCURACY

Air protocol incorporates CRC check as a method to prevent errors in data transmission between tag and reader.

### ANPR ACCURACY

Dependent on a software algorithm and voting logic to determine likelihood of the character recognition



## License Plate Recognition – 1 Million Mistakes a Day!

## Environmental Factors

As an optical technology, ANPR is affected by environmental conditions including snow or dirt that can obscure a portion of a license plate number. Sun or vehicle headlight glare can also cause the camera to see a white flashback that covers the license plate number. Additionally, licence plates with red-coloured numbers and letters produce a very low contrast to an infrared camera resulting in a dramatic reduction in their detection rate.

The RFID technology is immune from these external factors from external factors. A tag does not need a line-of-sight and it can be read through fog, snow, paint and other harsh environmental conditions at remarkable high speeds. RFID equipment has a longer lifetime than optical recognition equipment with minimum maintenance while fostering configuration flexibility.

<sup>4</sup><https://www.rac.co.uk/drive/news/motoring-news/concern-over-anpr-camera-accuracy/>

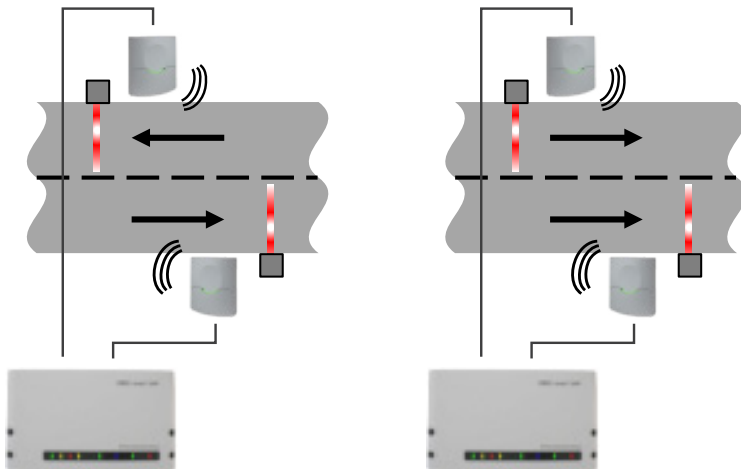
<sup>5</sup><https://www.itwest.co.uk/licence-plate-recognition-1-million-mistakes-day/>

## External Factors



## Handling Multiple Lanes

A single RFID reader is capable of managing two lanes. Each antenna is uniquely identified distinguishing its lane assignment.



Access control panel requires a Wiegand signal from each lane to control the gate actuator



A single RFID reader is able to manage two lanes, thanks to FEIG ELECTRONICS' recent SIA award winning Wiegand Switch. The Wiegand Switch transmits the Wiegand signal to the access control panel depending on the reading event at a specific antenna. This can be accomplished whether the RFID reader is reading tags on cars going in the same direction or different directions. Since each antenna has unique identifiers for lane assignment, it can differentiate which direction to read the tag to help control the gates individually. The RFID + Wiegand Switch solution saves on time and cost because of its ability to reduce the number of readers, easy installation and signal conditioning.

For ANPR technology, multiple lanes require multiple readers to identify vehicle license plates. ANPR can get expensive because it requires more hardware purchases and higher maintenance costs to service and maintain. However, RFID readers help reduce these costs. That's because RFIDs have multiple antenna outputs that can provide support to various read points. Since an RFID is just a fraction of the hardware cost, one can potentially save in comparison to buying multiple hardware pieces to achieve the same results.

## Security

Security is one of the most important areas within vehicle identification especially if it is being used for financial transactions, such as parking and tolling. However, in license plate recognition there is no security built into the system. For example, a good quality counterfeit image of a license plate placed over a license will easily fool ANPR camera systems.

Now there are forms of RFID that have no security such as inventory control or asset management type RFID tags. However, RFID technology used can

include security or the ability to put passwords into the transponder, and access to the data is not allowed without the password. There is also encrypted security, where the password itself becomes key encrypted and this is commonly used in access control systems. With encrypted security, one cannot decrypt the password without the key. The highest form of security is NXP Semiconductors' UCODE DNA chip which incorporates tamper-evident features, such as cryptographic algorithms, to deter thieves and counterfeiters while offering high performance even at high speeds.

## Final Thoughts

RFID technology has proven to save millions of dollars in false readings, offering a modern, reliable and highly secure solution. RFID reduces inaccuracies from external factors while fostering configuration flexibility. another solution is a hybrid approach where **ANPR** and **RFID** solutions can also be combined to good effect at the same entrance to prevent unauthorized vehicles and overcome the inaccuracies with ANPR. In fact, many countries are issuing RFID fitted to, or embedded within, the license plate.

In comparison to ANPR, RFID is more:

- ✓ Accurate
- ✓ Secure
- ✓ Immune to environmental factors
- ✓ Reliable
- ✓ Flexible to configure



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FEIG ELECTRONICS INC, a leading global supplier of RFID readers and antennas, is one of the few suppliers worldwide offering RFID readers and antennas for all standard operating frequencies.

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