

Comparing Weigh Station Bypass Technologies

New Research Compares
Transponders and Mobile Apps





PrePass Safety Alliance (formerly HELP Inc.) introduced the concept of electronic weigh station bypassing more than 25 years ago. Since then, trucks from qualified fleets have been pre-cleared to continue past weigh stations at highway speeds when their in-cab transponders are queried by overhead readers. The process verifies that the fleet's safety record and credentials meet federal and state standards and the vehicle is operating within legal weight limits as shown by weigh-in-motion (WIM) readings. This is good news for truckers – who save time, money and fuel by not stopping. And it is good news for commercial vehicle enforcement – who can better focus on the trucks without transponders or those needing more scrutiny.

The transponders currently in use for electronic bypass and virtually every electronic tolling system globally, are based on RFID technology – Radio Frequency Identification – utilizing the 915 MHz radio frequency. RFID may also utilize the 5.9 GHz radio spectrum - the technology that is currently the choice of the U.S. Department of Transportation (USDOT) for connected and autonomous vehicles. The USDOT made this choice because RFID is extremely fast, accurate and reliable, all critical components of crash prevention technologies.

For a successful electronic bypass, the system must attribute the right safety rating, the right credentials and the right WIM readings to the right truck, all at highway speeds in the midst of other traffic and in split seconds. RFID transponders do that very well. For example, PrePass transponders, from PrePass Safety Alliance's electronic bypass system, are 99.99% accurate.



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Technology is always on the move. Today, electronic bypass is also possible using CMRS technology – Commercial Mobile Radio Services. You know it better as cellular technology. CMRS is flexible... it can be an “app” on a smart phone, a tablet, or as part of an on-board computer platform (telematics device) in a truck. CMRS communicates with GPS defined “geo-fences” near weigh stations. That can allow jurisdictions to “geo-fence” roadside inspection areas without the poles and overhead readers RFID would require.


On the other hand, in addition to documenting CMRS concerns for connected and autonomous vehicle technology, the USDOT also expressed

concerns about CMRS performance in its Phase II Wireless Roadside Inspection pilot due to issues such as CMRS “connectivity” (dropped calls) and “latency” (slow loading of data).

So, how do RFID or CMRS compare to one another? Thanks to research by the Texas A&M Transportation Institute (TTI), we have some answers.

TTI, a highly recognized scientific research entity, was commissioned by the PrePass Safety Alliance Board of Directors with the intent of determining the degree of accuracy with which a CMRS mobile application could identify

and correlate a truck with its weight and credentials in an accurate and timely manner to allow bypass at a weigh facility. TTI engaged in extensive background research and verified testing methodologies before conducting tests of a CMRS bypass app on smartphones and tablets under controlled conditions and in real-world highway operations. Testing different wireless providers and devices allowed TTI to assess the impact of signal strength, while on-board GPS compared vehicle location to what was read by the app. The test runs included different vehicle speeds and distances between test vehicles and also multiple geo-fence locations and geo-fence diameters associated with the WIMs.



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The study concluded, for acceptable results to be achieved, CMRS apps require a second geo-fence near the WIM scale. At the first geo-fence, the truck is identified and the carrier’s safety rating and credential data are transmitted, and the second geo-fence adds the results from the WIM scale. The size and location of the WIM geo-fence are critical components of data transmission accuracy.

Unlike electronic bypass with RFID transponders, CMRS technology can have difficulty distinguishing vehicles traveling close together (a distance the TTI researchers call “headway”). Headway affects the accuracy of CMRS at weigh facilities with WIM scales by limiting the ability to attribute the correct safety, credentials and weight to the correct vehicle. Researchers call a failure in this area “miscorrelation”. As with RFID bypass programs, the result of any miscorrelation by a CMRS system should result in a “red light,” directing the trucker to pull in.

Headway is impacted by two factors: vehicle speed and traffic volumes. At higher speeds, vehicles are naturally spaced farther apart. Heavy traffic volumes tend to slow speeds and vehicles subsequently follow more closely. That suggests CMRS technology will be more useful at sites where “free flow” traffic conditions exist; however, sites with heavy traffic may be prone to a greater number of miscorrelations. The study found that CMRS technology performed best at headways greater than three (3) seconds.



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Weak cell signals do not appear to be a problem for CMRS technology — so long as connectivity is maintained and “calls” are not dropped. Wireless signal connectivity should be examined wherever CMRS technology is to be used. TTI tracked the accuracy of CMRS technology at a WIM-equipped site where cellular connectivity was strong and there was optimal geo-fence placement at different headways, measured by time between test vehicles.

The TTI Study suggests that both RFID and CMRS technologies have a place in electronic weigh station bypass — so long as commercial vehicle enforcement and trucking industry users know what can be reasonably expected from each:

- CMRS technology is flexible. Its apps can be installed on smart devices and on-board computer platforms already in the truck.
- CMRS can allow the geo-fencing of “virtual” weigh stations at locations where wireless signal connectivity is strong and where it may not be cost-effective to install the roadside hardware required by RFID.
- CMRS technology is not as fast, accurate, or reliable as RFID technology. There will be more “red lights” with CMRS — more trucks directed into weigh stations, even when credentials should allow them to bypass.
- RFID transponders are also used for toll payment capture, a function that will not be available on CMRS platforms in the foreseeable future. Many truck fleets use the same transponders for both weigh station bypass and electronic tolling.
- When approaching a weigh station that accepts both technologies, the CMRS app should automatically defer to the more accurate RFID transponder, with a “follow the in-cab transponder” message, ensuring that a driver will not be confused by a “red light” from one device and a “green light” from the other).
- Fleets and enforcement agencies can help mitigate some of the headway issues which affect CMRS accuracy: fleets can train drivers to keep a reasonable following distance when approaching a weigh station. Jurisdictions can also post advisory signs to the same effect.

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In conclusion, there are benefits to both CMRS apps and RFID transponders when used for weigh station bypass. CMRS apps can meet the needs of some users who prefer mobile applications for convenience, travel past weigh stations without PrePass readers, and are willing to accept higher pull-in rates. The TTI study referenced in this paper tested the PrePass MOTION bypass application within a controlled environment. The accuracy of CMRS can depend on the bypass provider, mobile device model, cellular data provider, connectivity and headway. RFID transponder technology remains the gold standard for its accuracy and reliability. The optimal solution is to use a CMRS app alongside an RFID transponder to leverage the reliability of a transponder for bypass and electronic toll payment, along with enhanced coverage afforded at non-RFID sites by a mobile application.



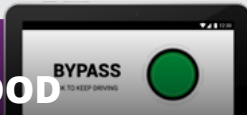


Maximize Bypass Opportunities with PrePass

PrePass is the most reliable, widely utilized weigh station bypass system in North America. Through PrePass, over a half million commercial vehicles from qualified fleets are electronically pre-screened for compliance with federal and state safety and credential requirements.

Within seconds of approaching a PrePass-equipped inspection facility, PrePass' electronic pre-screening quickly lets drivers know if they're cleared to stay on the road and bypass the truck scales at highway speed, or if they need to pull in.

As part of the weigh station bypass service, PrePass offers carriers technology options. The PrePass transponder is 99.99% reliable and provides the additional benefit of electronic toll payment services. In addition or as an alternative to the transponder, PrePass offers the MOTION mobile application.

Compare Our Solutions

	 GOOD	 BETTER	 BEST
Technology	MOTION app on mobile or telematics device	Transponder on windshield	MOTION app with Transponder
Connectivity	Cellular network	Radio Frequency Identification (RFID)	Cellular and RFID
Locations	Available at all PrePass sites*	Available at PrePass and third party sites** with readers	Available at all PrePass and third-party sites
Benefits	<ul style="list-style-type: none"> • Location coverage 	<ul style="list-style-type: none"> • Higher bypass rates • Third-party sites • Toll payment service 	<ul style="list-style-type: none"> • Location coverage • Higher bypass rates • Third-party sites • Toll payment service

*Excluding Iowa **NORPASS and Oregon Green Light

Contact PrePass today for a personalized consultation.

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