Efficient Jammer Detection and Classification Using GNSS Receivers on a Highway Overhead Structure

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SUMMARY

Recent years have seen an increase in drivers turning to cheap GNSS jamming devices in order to move around undetected or to thwart built-in anti-theft systems. These jammers not only knock out their own GNSS receiver, but they also block GNSS signal reception in a radius of several hundred of meters. There is a growing demand for automatic detection of these illegal jammers to help catching the offending driver.

The presentation will show how a multi-antenna GNSS receiver with built-in RF spectrum monitor and adequate processing tool can efficiently detect and classify the jamming events and identify the offending car or truck.

The presented material comes from a 5-day long test where two Septentrio AsteRx-U dual-antenna receivers were installed on an overhead structure above a busy highway. In parallel to the GNSS tracking functionality, the AsteRx-U is able to simultaneously sample the RF signal from its two antennas. One of the objective of the test was to evaluate the possibility to perform lane detection by cross-correlating the jamming signal received by the two antennas. In addition, the antennas were mounted with a significant inclination angle to create an asymmetrical reception pattern. The goal was to assess the feasibility of detecting the driving direction from the time series of the received jammer power. Such lane or direction detection would greatly help identifying the offending driver in heavy traffic conditions when more than one vehicle crosses the overhead structure at the time of the jamming.

Over the 5 days of the experiment, no less than 45 jamming events have been recorded and analyzed, most of them intentional (CW, chirp or even less-known pulse

jammers).

The presentation starts by describing the setup that was installed on the overhead structure. We then explain how the jamming events have been automatically detected and classified by the processing tool, and we present selected cases illustrating the different types of jammer. We then address the algorithm developed to detect the driving direction and the lane on which the offending vehicle is moving, and present results. Next to lane and direction detection, we found out that the unique RF fingerprint of jammers can further help identifying the culprit. We show how this allowed to link some of the jamming events to a single truck passing every day under the overhead structure.