CRASH LAB ADAPTATION FOR ERA GLONASS VALIDATION AND HOMOLOGATION TESTS

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ABSTRACT

The ERA-GLONASS system aims to save lives and mitigate injuries of road traffic accident victims or casualties in other emergencies on Russian roads.

By using modern navigation, telecommunications and information technologies, the ERA-GLONASS system can reduce the time-to-arrival of the emergency services by 30% on average [1]. In the event of an accident, the car automatically establishes a call to the public emergency service and sends data (MSD) with the basic information and the GPS position.

In order to assure this system is working properly it must be tested and finally homologated by the official entity. Therefore, crash test laboratories have to be adapted in order to be able to carry out validation tests. This paper describes the testing requirements and the technical solutions achieved to provide car manufacturers a complete validation and homologation process for the ERA-GLONASS system built into cars.

INTRODUCTION

The Russian Federation aims to have intelligent telematics-based vehicle safety systems in place to speed up emergency response times in order to save human lives. Emergency Road Assistance (ERA) - Glonass is an additional safety system which works in communication with on-board sensors (e.g. the airbag sensors). When the ERA-GLONASS system registers a serious road accident, it automatically calls the emergency call number 112. The automatic notification of the road accident enables the emergency services (e.g. medical and fire services, police) to arrive in a shorter time. The average reduction of time-to-arrive is 30% [1].

In order to assure this system is working properly, it must be tested and finally homologated by the official entity. Therefore, crash test laboratories have to be adapted to carry out validation and homologation tests.

This paper describes the testing requirements and technical solutions achieved to provide car manufacturers a complete validation and homologation process for the ERA-GLONASS system built into cars.

RUSSIAN STANDARD AND TESTING PROTOCOL

According to Annex No. 3 of the Customs Union Technical Regulation "On the safety of wheeled vehicles" (TR CU 018/2011) paragraphs 16 and 17 [2]:
- All vehicle M and N categories affected
- Transmission of minimum set of data (MSD) – current position of vehicle, speed and direction, information about vehicle type etc.
- Duplex voice communication via cellular mobile network

In additional to Technical Regulation, test procedures are described in several interstate Standards - GOST:

- 55532-2013 - Test methods for evaluation of in-vehicle emergency call system conformity to accident detection requirements
- 54620-2011 - In-vehicle emergency call system/device General technical requirements
- 34003-2016 - Test Methods In Respect To Automatic Triggering Of In-Vehicle Emergency Call Device/System In The Event Of Vehicle Rollover

It is necessary to understand the main differences between Technical Regulation and Interstate Standard (GOST). The methods described in the Interstate Standard have lower priority as

Technical Regulation but give information about test procedure.

According to Interstate Standards, in-vehicle emergency system should be tested under emulated cellular network with possibility to perform the Emergency Call to 112 Number.

LABORATORY ADDAPTATION REQUIREMENTS AND SOLUTIONS

Laboratory adaptation was divided into three parts: GSM and GPS signals inside the crash lab, PSAP server for validation tests and complete emulated telephone network including PSAP server for homologation test.

There is an important difference between type-approval and validation tests: for validation tests it is possible to use telephone numbers other than 112 which are related to PSAP server. In this case the public cellular network could be used. The adaptation of the laboratory in this case is easier than the for type-approval test.
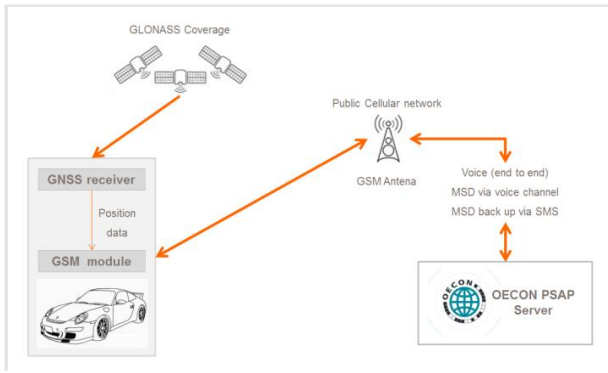

Figure 1. Validation test setup IDIADA

For this kind of test IDIADA uses:

- Public cellular network
- IDIADA OECON PSAP server
- Repeater of GPS / GLONASS signal

For type-approval of ERA GLONASS it is required to use 112 telephone number and emulated ERA GLONASS cellular network.

The emulation of GSM network was only possible by using Rhode&Schwarz equipment for ERA GLONASS with CMW 500 + KA095.
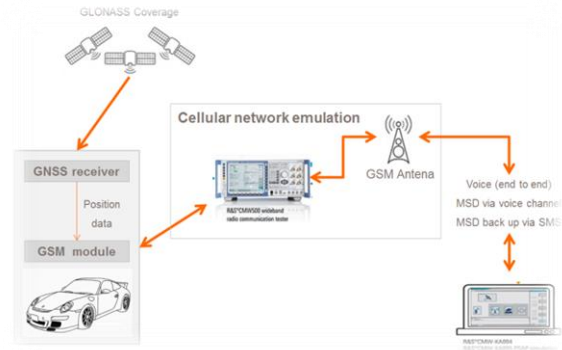

Figure 2. Emulated Network test setup IDIADA

Although there are many players in the market capable of emulating a GSM telephone network, the reason for this unique possibility is due to the regulation itself, which stipulates that the equipment must be registered in Russia as measurement equipment, and the only one registered at that time was Rhode & Schwarz CMW500.

A GSM antenna and an amplifier have been installed to provide coverage for the impact area (1), outside area (2) and acceleration tunnel (3). The antenna that has been installed is omnidirectional and with a range of 150 meters radius.

On the other hand, the tests performed in the laboratory are in an indoor space isolated from the GLONASS signals. There are two ways to solve this:

- simulate a GLONASS Navigation signal via the Rhode &Schwarz CMW500 (SMBV100A)

- mount a GPS / GLONASS antenna on the roof of the laboratory and provide this signal to impact area and acceleration tunnel through repeater mounted inside laboratory.

IDIADA has decided to use the second option to be able to perform tests without using the CMW 500 (SMBV100A) module.

Figure 3. Laboratory Setup: 1- Impact area; 2- outside area; 3- acceleration tunnel

Validation

Our two systems (OECON Server and Emulated network performed a lot of validation connectivity tests. It was able to perform connectivity test for ERA GLONASS and eCALL.

The connectivity test for the emulated network was performed in different points inside and outside the laboratory, with different devices.

To test dynamic performances such as cork screw rollover any lack of network coverage must be avoided.

ISSUES AND SOLUTIONS

During the validation process several technical issues were identified:

1. Not stable connection with test vehicle – adapt Network parameter to test vehicle communication unit.
2. Call to emulated 112 number was redirected to real 112 number.
3. Registration unexpected devices in emulated network – special software makes it possible to control all registration in emulated network.

On the other hand coverage of GSM signal from emulated network is limited by only using in crash laboratory area.

By using emulator is it strictly necessary to have an operator in front of emulator all the time to check all registration in emulated network. Although the time period by using emulated network is less than one hour we are not able to disturb any emergency calls in the area close to the crash laboratory.

CONCLUSIONS

The adaptation of the laboratory to ERA GLONASS validation and certification test provided IDIADA with new business opportunities. The use of the emulated network would help all kinds of crash tests to be performed for other markets, not only the Russian one.

Since IDIADA started to use this system several validation tests and official type approvals for ERA GLONASS test have already been performed.

REFERENCES

[1] http://en.glonassunion.ru/era-glonass

[2] Technical Regulation of the Customs Union "Wheeled Vehicles Safety" (CU TR 018/2011)

[3] 55532-2013 - Test methods for evaluation of in-vehicle emergency call system conformity to accident detection requirements

[4] 54620-2011 - In-vehicle emergency call system/device General technical requirements

[5] 34003-2016 - Test Methods In Respect To Automatic Triggering Of In-Vehicle Emergency Call Device/System In The Event Of Vehicle Rollover

[6] SMBV100A_CMW500_Test_ac_en_5214-5532-92_v0300.pdf – Rode and Schwarz