f-RaCE

Future Railway Communication Equipment: the cab radio that accelerates innovation towards FRMCS

LEONARDO

The transition to FRMCS (Future Railway Mobile Communication System) is a crucial process for the evolution of communications in the railway sector, capable at the same time of ensuring alignment with the reference standards, interoperability, greater safety and full valorization of the increasingly valuable data flows. The main targets for railway infrastructure and service managers, towards which to balance the implementation strategy, are:

- Improve the competitiveness and attractiveness of the service offered through a fast, effective and efficient use of already available broadband communication technologies

- Ensure operational continuity and the necessary coexistence with GSM-R technology, promoting a controlled migration towards the new standard

Designed and built today, to connect the present to the future of railway communication, f-RaCE is the new Cab Radio capable of managing all the voice and data functions of the GSM-R standard on board the train. It is already set up for coexistence with 4G/5G networks and capable of implementing the functions provided by FRMCS.

One CAB radio, two Technologies.

f-RaCE, THE CAB RADIO THAT ACCELERATES FRMCS INNOVATION

Leonardo is a leader in the development of on-board and network solutions for railway operators thanks to its long-standing experience in critical communications and technologies supporting the world of transport.

Leonardo is also a member of industry standardization organizations (GSM-R Industry Group, UNITEL, ETSI group TCCA and others) allowing us to participate in technological evolutions and specifically to be a front-runner in the development of the Future Railway Mobile Communication System (FRMCS) specification.

Leonardo's experience and recognized expertise are the basis for the design and implementation of a new Cab Radio, called f-RaCE, with the ability to manage the dual communication technology GSM(-R) and 5G (FRMCS).

f-RaCE is an on-board train communication system, fully equipped and configurable to meet the different needs and requirements of sector operators.

The device includes a GSM-R radio module for voice applications with all the special railway and shunting operations functionalities.

f-RaCE also includes a Control Unit with an integrated radio module for the management of future FRMCS communication with the possibility of being used in Over-The-Top (OTT) mode also on terrestrial and Satellite broadband radio communications.

The highly flexible design allows a wide range of customized applications such as the integration of the Train Communication Network (TCN) or the Multifunction Vehicle Bus (MVB) inside each carriage to manage services such as the Driver Safety Device (DSD) or real-time positioning and diagnostics.

The solution also includes an intelligent display to host the graphic interface, quick selection keys, handset with Push-To-Talk, external speaker and microphone.

FUTURE PROOF FEATURES

In detail the main features of the CAB Radio f-RaCE components are:

Standard 3U 19" radio rack (Radio and control parts) including:

- → GSMR Duplexer
- → GSMR class 2 Radio Module
- → Control Unit with integrated 4G/5G radio module (FRMCS radio module will be integrated when available on the market)

→ Gateway BUS MVB - Multifunction Vehicle Bus that allows the exchange of even critical data between the various components of a railway vehicle, such as control systems, sensors and actuators
→ Gateway UIC 568 to transmit data and commands between locomotive and passenger carriages (audio messages, train destination, door control and others)
→ Power supply (24V ÷ 110V)

Intelligent MMI display that provides a unified view between the traditional GSM-R MMI and the innovative FRMCS MMI and features the following main features:

→ Handset with PTT Push-To-Talk
→ External speaker
→ Microphone
→ Hard-key for UIC interface, Secondary Controller and Emergency Calls (train or shunting)
→ Color display with large TFT screen
→ Power supply (24V ÷ 110V)
→ Mechanics and wiring backwards compatible with currently operating systems that allow for an easy upgrade to new systems without changing the cabin layout

The MMI Display is much more than a touchscreen monitor, as it has been designed and built to ensure technological evolution and the possibility of stand-alone operation in particular contexts where required.

The MMI Display is equipped with an embedded CPU, Linux operating system, RAM memory, eMMC flash memory and Ethernet and I/O network ports with management capacity for any interface to external systems

f-RaCE complies with industry standards, among others: RED Directive (2014/53/EU), EN50155, EN60950, EN50121, EN301-489-7, EN45545, TS 102933-2, TS44.018, T543.2222

ADVANCED FEATURES

The GSM-R network interface of the Cab Radio is implemented with a dedicated GSM-R module connected to the rack radio via a dedicated antenna cable.

The main voice services available are the following:

a. ASCI (Advanced Speech Call Items) features:
→ Voice Group Call Service
→ Voice Broadcast Service
→ Priority (or access to the network (Enhanced Multi-level Precedence and Pre-emption)

The main voice services available are the following:

b. Railway services:
→ Functional Addressing (also accessible for roaming on public networks)
→ Location-dependent addressing
→ Railway Emergency Call (REC) and Confirmation of High Priority Calls
→ Services requested by the national traffic agency on the national territory

The device already integrates the possibility of managing railway functions on 5G networks or OTT on auxiliary networks as well as allowing the coexistence between GSM-R and FRMCS offering a wider range of voice and data services. In particular, the system will be able to manage:

→ Operational and emergency communications.
→ Support for railway traffic control, in particular that defined in the European context ERTMS/ETCS (European Rail Traffic Management System/European Train Control System) to improve the safety and efficiency.
→ High-speed data transmission, using 5G technologies to support advanced applications, primarily that of Enabling the digitalization of ATO (Automatic Train Operation) and TCMS (Train Control Management System).
→ International interoperability between different railway networks in Europe and beyond.

KEY FEATURES

→ **Future proof solution for the railway world**

→ **Continuity and compatibility during the technological transition to FRMCS**

→ **Interoperability between GSMR-FRMCS railway networks at national level and between countries**

→ **Readiness for a wide range of advanced services on 5G networks and OTT on broadband and satellite networks**

f-RaCE: EMPOWERING THE PRESENT, ANTICIPATING THE FUTURE

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