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Ruggedized LTE Devices

Ruggedized Long Term Evolution (LTE) devices are cellular-connected mobile devices built to withstand harsh environmental and physical conditions. This category includes push-to-talk (PTT) radios, which provide basic voice communications, and smartphones, which allow for advanced data transmissions. Emergency responders can use these devices to ensure communications and other essential tasks remain possible in extreme conditions.

Ruggedized LTE devices fall under AEL Number: 06CC-01-CELL.

Overview

LTE is a wireless broadband communication standard used by many mobile devices. Smartphones and PTT radios used by public safety agencies are often supported by LTE networks on various frequency bands. In North America, most LTE networks use bands in the radio frequency (RF) spectrum from 700 MHz to 900 MHz. Band 14 within this spectrum is specifically reserved for communications among public safety agencies using FirstNet (see below).



A Ruggedized LTE Smartphone
Image courtesy of Blackview

Many LTE devices comply with Military Standard 810 (MIL-STD-810) [1], which characterizes the durability of ruggedized devices. Devices that meet this standard satisfy various test requirements to ensure their durability in a variety of environments including temperature extremes, immersion, shock, and humidity. Both the internal device hardware and external case on such devices are ruggedized for strained use.

Ruggedized devices may also be assigned a two-digit ingress protection (IP) rating, as specified by the International Electrotechnical Commission (IEC) Standard 60529:1989 [2]. The first digit of an IP rating indicates the level of solid particle protection and the second digit indicates the level of liquid ingress protection. An IP rating of IP67, for example, indicates a device is dust-tight and can be temporarily immersed to a depth of one meter.

A device's compliance with MIL-STD-810 and IP rating may also affect its ability to be decontaminated. For example, a device that meets the high temperature limit specified by MIL-STD-810 would be able to withstand heat treatment needed after exposure to a biological agent. Similarly, a ruggedized device's liquid IP rating should allow for protection against water jets, which might be required for chemical decontamination.

The U.S. Department of Homeland Security (DHS) established the System Assessment and Validation for Emergency Responders (SAVER) Program to help emergency responders improve their procurement decisions.

Located within the Science and Technology Directorate (S&T), the National Urban Security Technology Laboratory (NUSTL) manages the SAVER Program and conducts objective operational assessments of commercial equipment and systems relevant to the emergency responder community.

The SAVER Program gathers and reports information about equipment that falls within the categories listed in the DHS Authorized Equipment List (AEL).

SAVER publications focus on answering two main questions: "What equipment is available?" and "How does it perform?"

SAVER knowledge products are created for the nation's first responders and made available to help them make operational and procurement decisions.

To explore the full reports library and to learn more, visit SAVER online at www.dhs.gov/science-and-technology/SAVER.

For additional information on the SAVER Program, email NUSTL at NUSTL@hq.dhs.gov.

Usability and Accessories

Emergency responders must also consider the usability of ruggedized LTE devices. The environments for which these devices are designed often require the use of heavy personal protective equipment (PPE), such as gloves or chemically resistant suits.

Responders must ensure that communications devices are still usable when PPE is necessary. For example, gloves may be a challenge when pressing a PTT button on a radio or using a smartphone's touch screen. A chemically resistant suit required for a hazardous materials response, likewise, may limit physical access to communication devices. Some ruggedized devices, however, use capacitive touch screens that sense when something, such as a fingertip, conducts electricity.



Ruggedized LTE PTT Radios
Image courtesy of L3 Harris

Accessories like headsets or body-mounted PTT buttons can also help overcome difficulties using mobile devices. If responders choose to use external accessories, they must make sure those accessories are compatible with their LTE device's hardware and are sufficiently rugged for their applications.

Network Compatibility

Public safety agencies may need to ensure their ruggedized LTE devices are compatible with the FirstNet network. FirstNet is an LTE network created specifically for use by public safety agencies and operated by AT&T. FirstNet provides "always-on" priority and preemption to public safety, thereby mitigating the risk of degraded communications during emergency incidents when commercial networks can become congested—a consequence of limited available bandwidth when civilians overuse commercial networks. This issue is addressed by the network's provision of LTE channels that are allocated for emergency response communications.

FirstNet primarily operates on LTE Band 14 and has priority and preemption capabilities on all of AT&T's commercial spectrum.

The National Institute of Standards and Technology (NIST) and FirstNet maintain lists of certified devices compatible with FirstNet [3, 4]. The lists are reference tools for both emergency responders and technology developers.

The fifth generation of cellular network standards (5G) is expected to replace 4G LTE. Going forward, compatibility with 5G—which has higher bandwidth than current networks—will be an important factor for ruggedized LTE devices. Many, but not all currently available 4G LTE devices are compatible with 5G. Going forward, 5G will become more prevalent in commonly available devices.

National Defense Authorization Act

Emergency response agencies must consider the 2019 National Defense Authorization Act (NDAA) [5] when procuring LTE devices of any kind. Section 889 of the NDAA addresses the usage of technologies produced and distributed by foreign companies. This section prohibits the federal acquisition or usage of telecommunications and surveillance products and services provided by Huawei Technologies Company, ZTE Corporation, Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, and Dahua Technology Company. Section 889 also prohibits using federal funds to procure these devices.

References

- [1] Institute of Environmental Studies and Technology, "MIL-STD-810H," 2019. <https://www.iest.org/Standards-RPs/MIL-STD-810H>.
- [2] International Electrotechnical Commission, "IEC 60529:1989/AMD2:2013/COR1:2019," 2019. <https://webstore.iec.ch/publication/64427>.
- [3] J. D. Kahn, "Process Document list for the NIST List of Certified Devices (v. 30)," <https://www.nist.gov/ctl/pscr/process-document-nist-list-certified-devices>.
- [4] "FirstNet Phones and Devices," <https://www.firstnet.com/devices/phones.html>.
- [5] 115th Congress, "H.R.5515 National Defense Authorization, 2019," <https://www.congress.gov/bill/115th-congress/house-bill/5515/text>.