lamaPLC Communication: NFC

Near-field communication (**NFC**) is a set of communication protocols that enables communication between two electronic devices over a distance of 4 cm (1+1⁄2 in) or less. NFC offers a low-speed connection through a simple setup that can be used to bootstrap capable wireless connections. Like other proximity card technologies, NFC is based on inductive coupling between two electromagnetic coils present on an NFC-enabled device such as a smartphone. NFC communicating in one or both directions uses a frequency of 13.56 MHz in the globally available unlicensed radio frequency ISM band, compliant with the ISO/IEC 18000-3 air interface standard at data rates ranging from 106 to 848 kbit/s.

The NFC Forum has helped define and promote the technology, setting standards for certifying device compliance. Secure communications are available by applying encryption algorithms, as is done for credit cards, if they fit the criteria for being considered a personal area network.

NFC standards

NFC standards cover communications protocols and data exchange formats and are based on existing radio-frequency identification (RFID) standards, including ISO/IEC 14443 and FeliCa. The standards include ISO/IEC 18092 and those defined by the NFC Forum. In addition to the NFC Forum, the **GSMA group** defined a platform for deploying GSMA NFC Standards within mobile handsets. GSMA's efforts include Trusted Services Manager, Single Wire Protocol, testing/certification, and secure element. For example, NFC-enabled portable devices can be provided with application software to read electronic tags or make payments when connected to an NFC-compliant system. These are standardized to NFC protocols, replacing proprietary technologies used by earlier systems.

NFC wireless charging (WLC)

Near-field communication (NFC) technology supports data transmission and enables wireless charging, providing a dual functionality that is particularly beneficial for small, portable devices. The NFC Forum has developed a specific wireless charging specification, known as *NFC Wireless Charging* (**WLC**), which allows devices to charge with up to 1W of power over distances of up to 2 cm (3⁄4 in). This capability is especially suitable for smaller devices like earbuds, wearables, and other compact *Internet of Things* (IoT) appliances.

Compared to the more widely known Qi wireless charging standard by the Wireless Power Consortium, which offers up to 15W power over distances up to 4 cm (1+5⁄8 in), NFC WLC provides a lower power output but benefits from a significantly smaller antenna size. This makes NFC WLC an ideal solution for devices with premium space and less critical high-power charging.

The NFC Forum also facilitates a certification program labeled as *Test Release 13.1* (TR13.1), which ensures that products adhere to the WLC 2.0 specification. This certification aims to establish trust and consistency across NFC implementations, minimize risks for manufacturers, and provide assurance to consumers about the reliability and functionality of their NFC-enabled wireless charging devices.

France Brevets, a patent fund created in 2011, is deploying a patent licensing program for NFC. Via Licensing Corporation, an independent subsidiary of Dolby Laboratories, developed this program, which was terminated in May 2012. A platform-independent, free, open-source NFC library, libnfc, is available under the GNU Lesser General Public License.

Present and anticipated applications include contactless transactions, data exchange, and simplified setup of more complex communications such as Wi-Fi. In addition, when one of the connected devices has Internet connectivity, the other can exchange data with online services.

Standards

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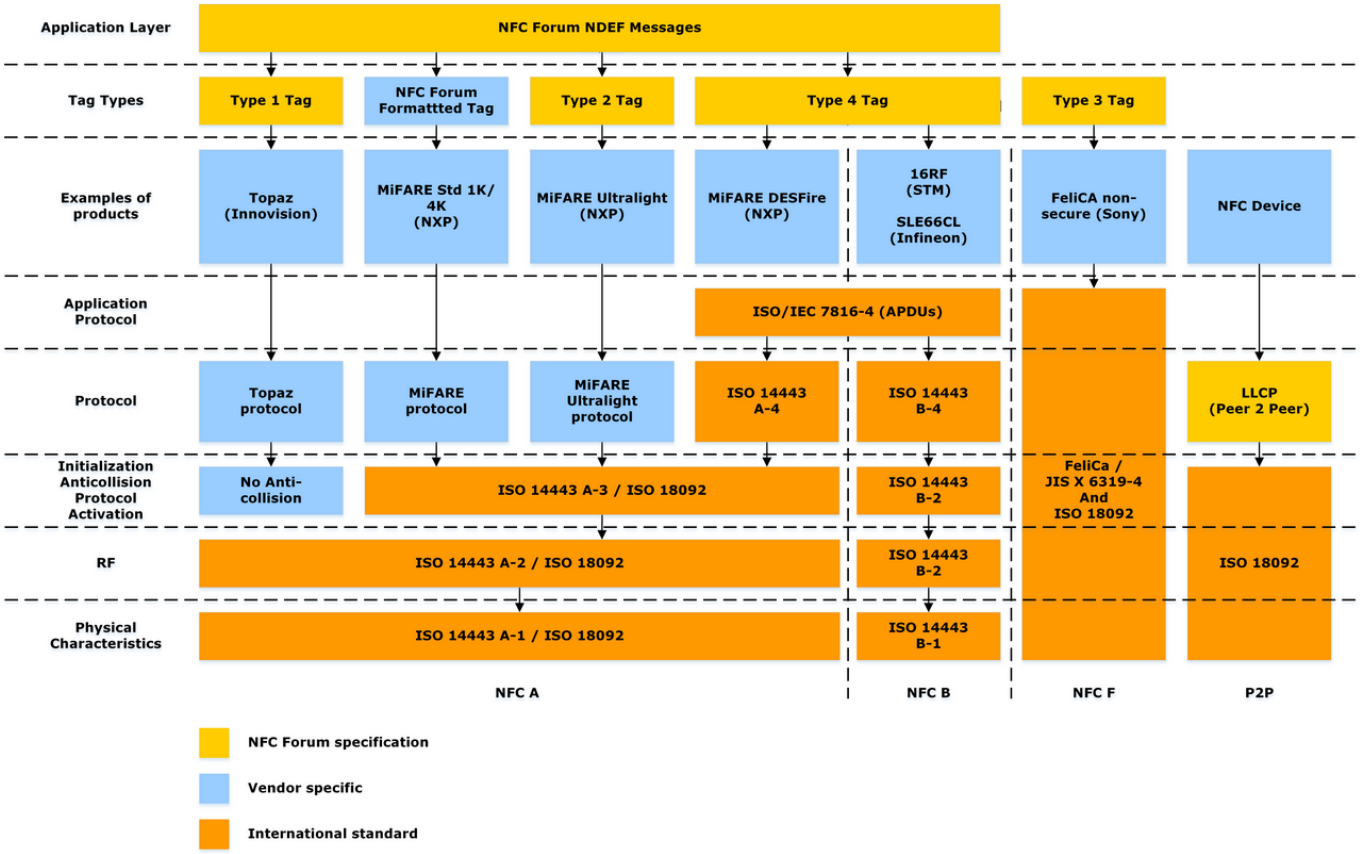


ISO/IEC 18092 standard

The ISO/IEC 18092 standard supports 106, 212, or 424 kbit/s data rates.

The communication takes place between an active *“initiator”* device and a target device, which may either be:

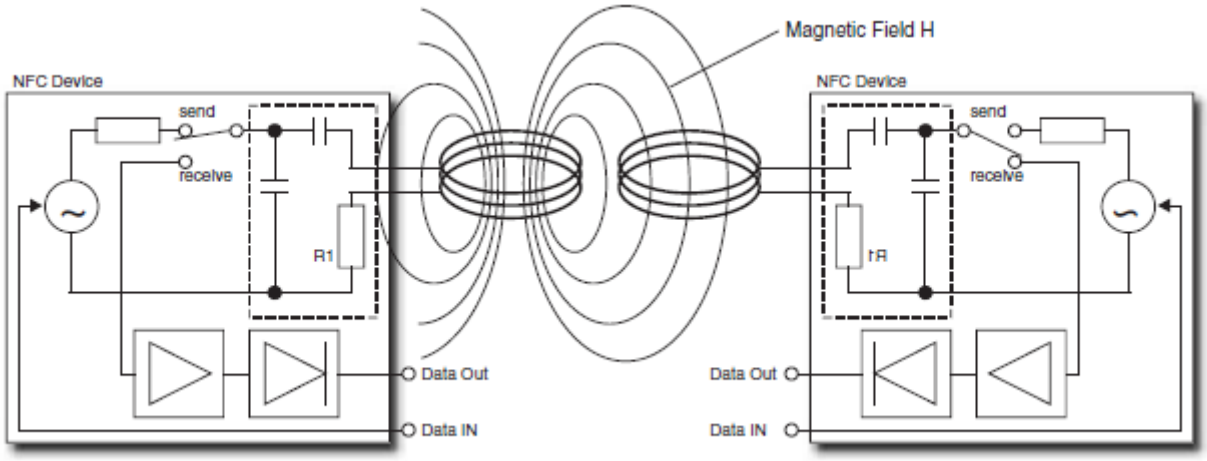
Passive
The initiator device provides a carrier field, and the target device, acting as a transponder, communicates by modulating the incident field. The target device may draw its operating power from

the initiator-provided magnetic field in this mode.

Active
Both the initiator and target device communicate by alternately generating their fields. One device stops transmitting data to receive it from the other. This mode requires that both devices include power supplies.

Speed (kbit/s)	Active device	Passive device
424	Manchester, 10% ASK	Manchester, 10% ASK
212	Manchester, 10% ASK	Manchester, 10% ASK
106	Modified Miller, 100% ASK	Manchester, 10% ASK

To transmit data between two NFC interfaces in active mode, one of the NFC interfaces first activates its transmitter and thus works as the NFC initiator. The high-frequency current in the antenna induces an alternating magnetic field H, which spreads around the antenna loop. Part of the induced magnetic field moves through the antenna loop of the other NFC interface, which is located close by. Then, a voltage U is induced in the antenna loop and can be detected by the receiver of the other NFC interface. If the NFC interface receives signals and the corresponding commands of an NFC initiator, this NFC interface automatically adopts the role of an NFC target.



For data transmission between the NFC interfaces, the amplitude of the emitted magnetic alternating field is modulated (ASK modulation), similar to the data transmission between an RFID reader and transponder. However, the difference between an NFC target in active mode and an RFID transponder is that the magnetic alternating field has to supply the transponder with power to operate the microchip. In contrast, the electronic device containing the NFC interface supplies the interface with power.

The transmission direction is reversed to send data from the NFC target to the NFC initiator. This means the NFC target activates the transmitter, and the NFC initiator switches to receiving mode. Both NFC interfaces alternately induce magnetic fields, where data is transmitted only from the transmitter to the receiver.

Smartphone automation and NFC tags

NFC-equipped smartphones can be paired with NFC Tags or stickers that NFC apps can program.

These programs can change phone settings, text, launch apps, or execute commands.

Such apps do not rely on a company or manufacturer, but can be utilized immediately with an NFC-equipped smartphone and an NFC tag.

The NFC Forum published the Signature Record Type Definition (RTD) 2.0 in 2015 to add integrity and authenticity for NFC Tags. This specification allows an NFC device to verify tag data and identify the tag author.

Bluetooth comparison

NFC and Bluetooth are both relatively short-range communication technologies available on mobile phones. NFC operates at slower speeds than Bluetooth and has a much shorter range, but consumes far less power and doesn't require pairing.

NFC sets up more quickly than standard Bluetooth but has a lower transfer rate than Bluetooth low-energy. With NFC, instead of performing manual configurations to identify devices, the connection between two NFC devices is automatically established in less than .1 second. NFC's maximum data transfer rate (424 kbit/s) is slower than that of Bluetooth V2.1 (2.1 Mbit/s).

NFC's maximum working distance of less than 20 cm (7+7⁄8 in) reduces the likelihood of unwanted interception. It is particularly suitable for crowded areas that complicate correlating a signal with its transmitting physical device (and by extension, its user).

Sources

Wikipedia (here)

NFC on lamaPLC

Page	Date	Tags
• ISM Band	2026/04/23 21:51	ism, ism band, rfid, nfc, dash7, hc-12, arduino, zigbee, z-wave, bluetooth, wi-fi, thread, miwi, nrf24, starlink, wiegand, rf, communication, bus, radio, ku band, ka band, k band, x band
• lamaPLC Communication: IoT	2026/04/23 21:51	communication, iot, internet, iomt, 6lowpan, ipv4, ipv6, bluetooth, ble, li-fi, nfc, rfid, wi-fi, zigbee, z-wave, lte-advanced, 5g, lora, dash7, lpwan, lorawan, sigfox, nb-iot, weightless, rpma, mioty, vsat, ethernet, thread, matter
• lamaPLC Communication: NFC	2026/04/23 21:51	communication, nfc, rfid, bluetooth, ble, manchester, ask, iso iec 18092
• lamaPLC Communication: RFID	2026/04/23 21:51	communication, rfid, radio, rf, aidc, prat, arpt, arat, bap, uhf, nfc, em4100, t5557, tag, manchester, fsk, psk, biphase, nrz

communication, NFC, RFID, Bluetooth, BLE, Manchester, ASK, ISO/IEC 18092