

# About Magic Lock Box

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**System Design Co., Ltd.**

**Confidential**

# Introduction

Smart keys, which are currently used in many automobiles, can be unlocked by simply touching the door knobs of the automobile without pressing a button, and driving is highly convenient. On the other hand, theft has been frequent by **relay attack** and **code grabber** that exploited the vulnerability.

Occasionally, the Japanese Ministry of Land, Infrastructure, Transport and Tourism has announced that it will be possible to use a smartphone to lock and unlock vehicle locking devices, immobilizers and theft alarms, **relay attacks**, **code grabbers**. We have developed the **Magic Lock Box** (Japanese patented), a mechanism proposed this time, which also helps prevent this.

The newly developed product has the following advantages compared to similar products from other companies.

- For personal use, there is no need to connect to the network when using.
- No special modifications to cars or smart keys are required.
- No need for complicated mechanisms and no choice of manufacturer.
- Can be used for other than new cars.
- Can provide services to existing car sharing / rent-a-car companies

We hope you will consider commercialization using the technology we have developed.

# Magic Lock Box (Car smart key control box)

## Overview of Magic Lock box functions

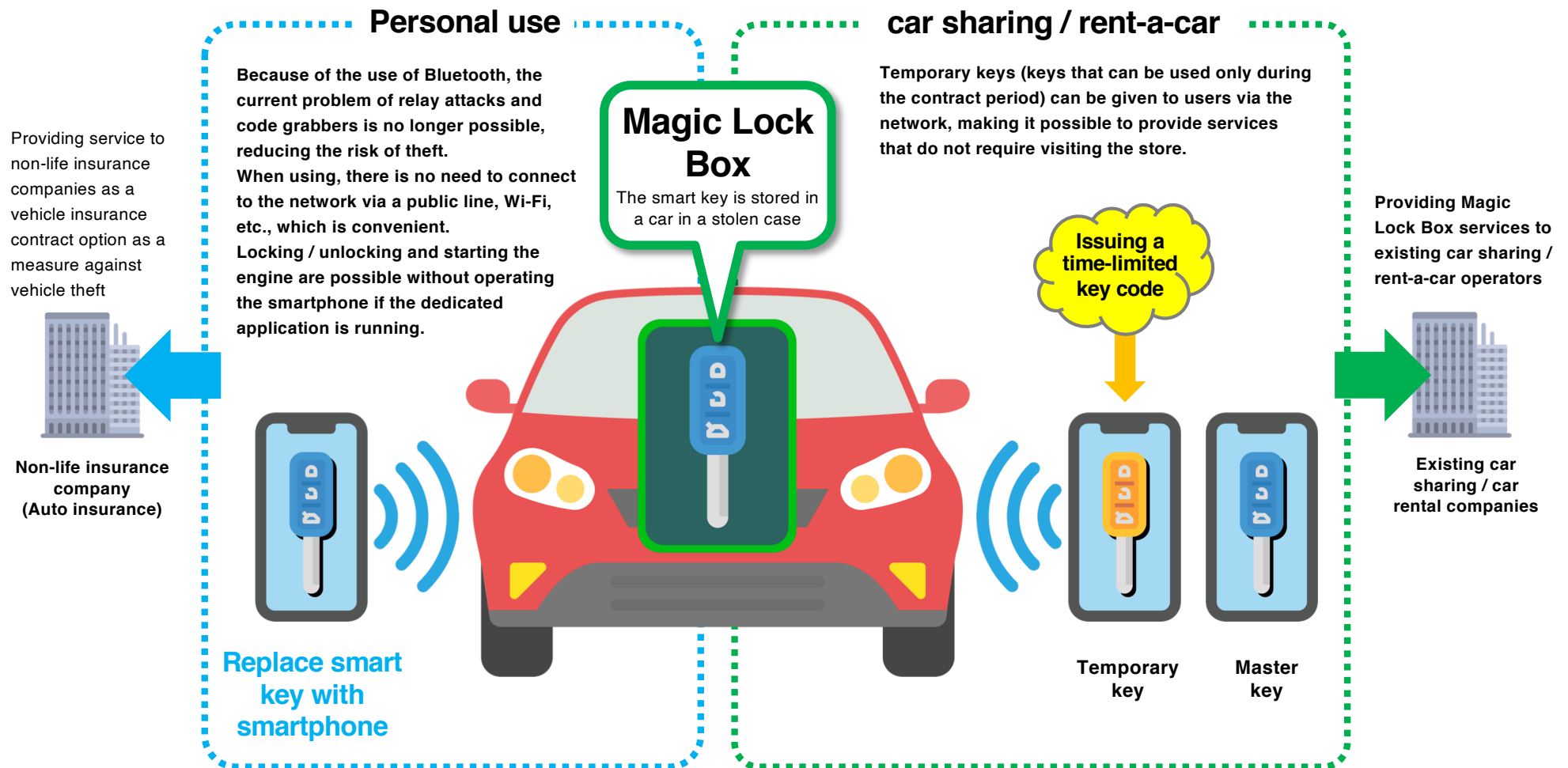
- Conversion of car keys to smartphones  
(Instead of having a smart key, just have a smartphone)
- Compatible with car sharing
- Enhance security (completely prevent relay attacks)
- Remote operation of engine start

## Magic Lock box features

- No need to modify cars  
However, wiring is required only when power is taken from the car and remote control for starting the engine. Basically, it's DIY and easy to undo.
- Compatible with cars equipped with smart keys worldwide
- There are three levels depending on the installation method

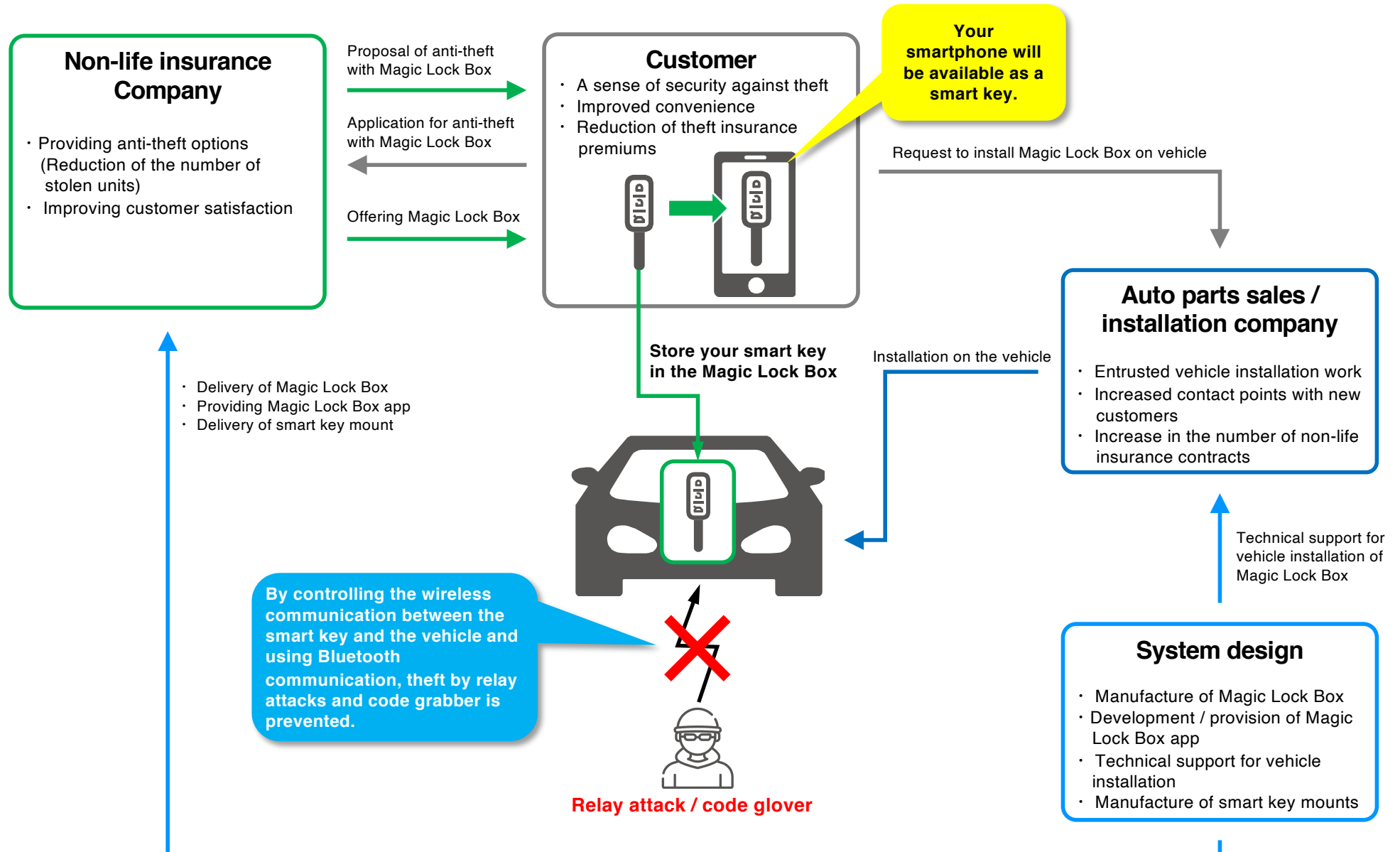
# Application examples

It can be applied from personal use to car sharing / rent-a-car.



## Usage example # 1 (anti-theft)

We will explain when a non-life insurance company (auto insurance) uses Magic Lock Box as a vehicle anti-theft option.



# Anti-theft overview

## Functional overview

The smart key receives LFMF (low frequency magnetic field) transmitted from the vehicle and communicates with the vehicle by UHF (ultra high frequency) based on this. The code grabber copies the UHF radio waves transmitted from the smart key during communication between the smart key and the vehicle, and transmits the same radio waves to make the vehicle misidentify it as a legitimate smart key. In Magic Lock Box, in order to prevent this, the smart key is put in the radio wave shield box in the vehicle, and by controlling the enable / disable of LFMF communication and the radio wave strength of UHF (patented), it is as convenient as the smart key on a smartphone.

By applying this technology to attenuate the UHF radio waves transmitted from the smart key inside the Magic Lock Box installed inside the vehicle, it becomes difficult to receive the radio waves from the smart key outside the vehicle and used by the code grabber. Prevents the device from receiving radio waves from the smart key.

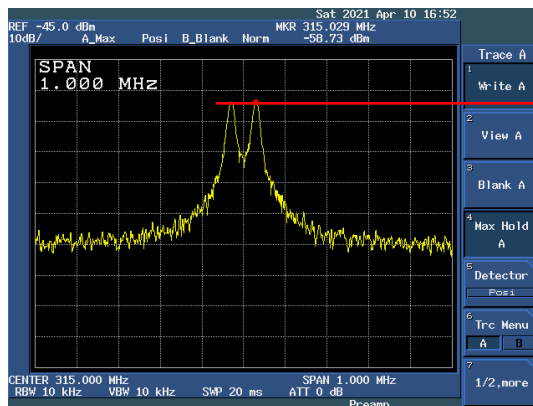


Fig. 1 Strength of radio waves transmitted from the smart remote controller

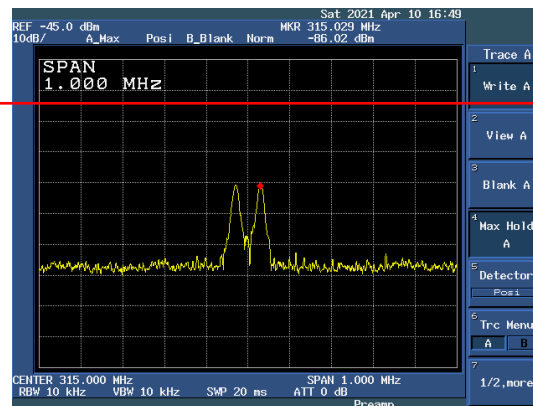


Fig. 2 Magic Lock Box Security setting "Low" The signal strength is about 1/500 of that without security.

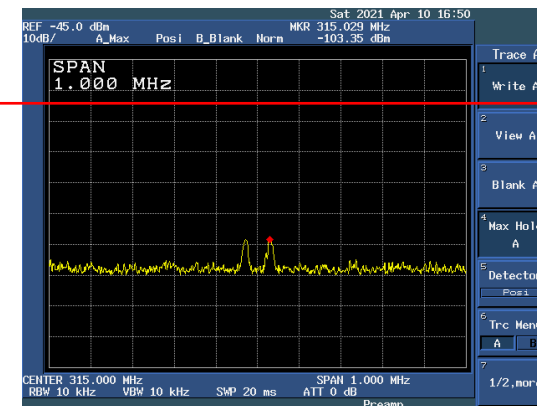


Fig. 3 Magic Lock Box Security setting "High" The strength of radio waves is about 1/50000 compared to without security.

The strength of radio waves transmitted from the smart remote controller

# Anti-theft overview

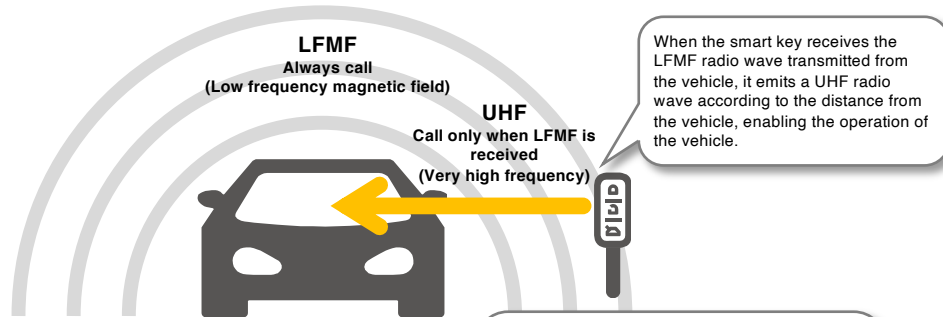


Fig. 4 Normal smart key operation

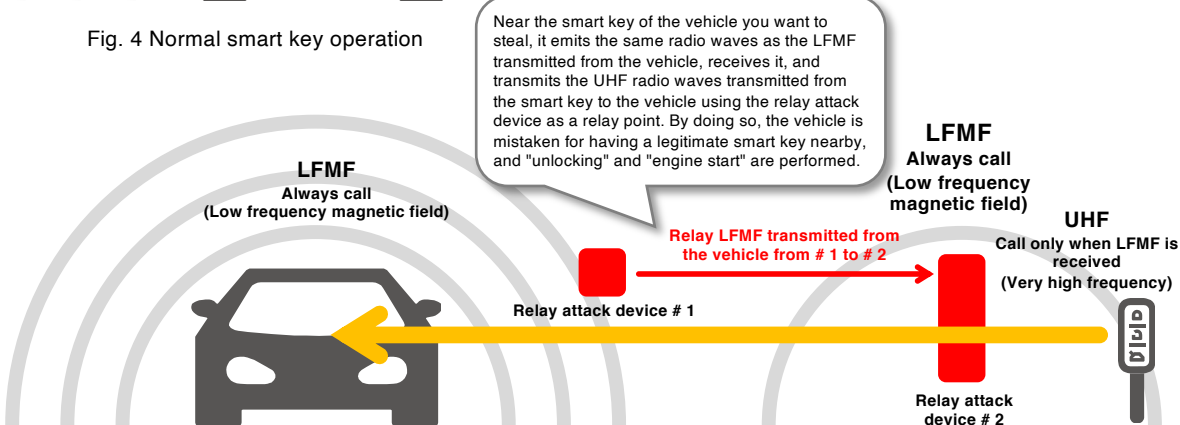


Fig. 5 Mechanism of relay attack

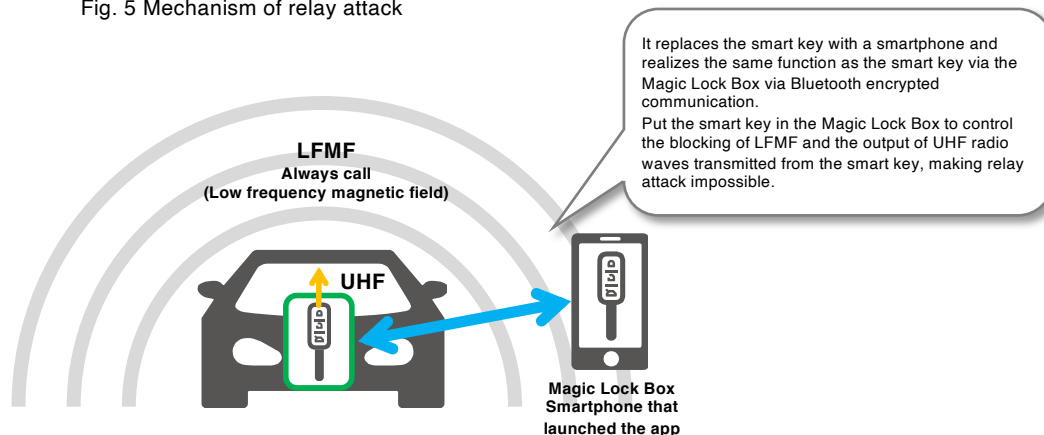


Fig. 6 How the Magic Lock Box works

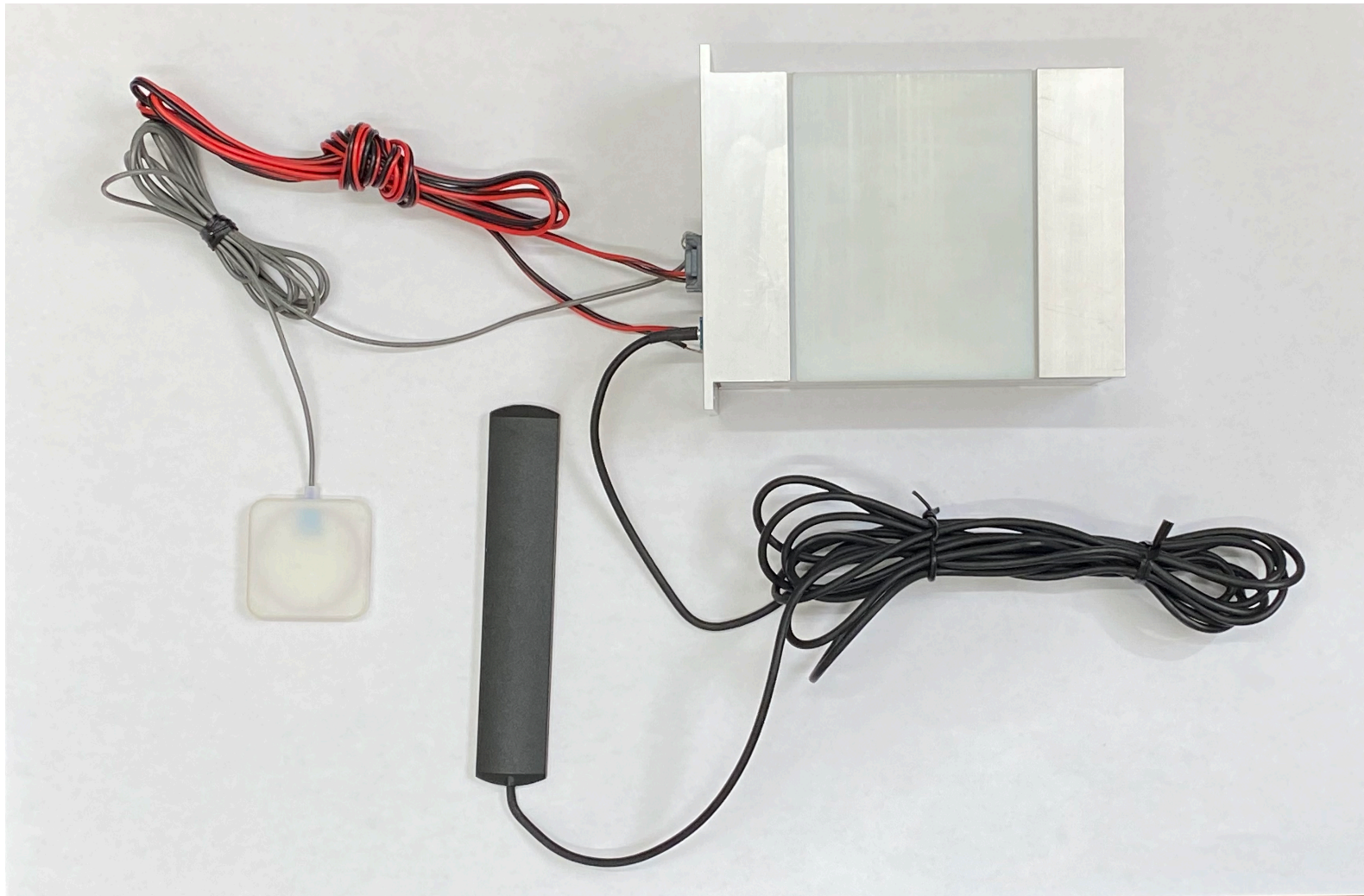
## Relay attack overview

LFMF transmitted from a vehicle is transmitted near a smart key using a special receiver, and the UHF radio wave transmitted from the smart key after receiving this radio wave is used as a relay point. Sends UHF radio waves to the vehicle. The vehicle mistakenly thinks that a legitimate smart key is nearby and unlocks it. Of course, it is also possible to start the engine using the radio waves.



# Magic Lock Box (prototype image)

**It can be installed on a car without special modification.**





# Product specifications

Operating temperature range	<b>-20 to 60 °C</b>
Size	50mm x 70mm x 120mm
Power supply	2 AA batteries or DC12V Class1-bluetooth is DC12V only
cable	Antenna LF1 Antenna LF2 Power supply 12V bluetooth antenna

# Necessary items for commercialization (excluding sales related)

## For personal use

- Design of smart key storage box, study of mounting method to automobile / mold production / manufacturing.
- Design / manufacture / manufacture of smartphone holder.
- In-vehicle antenna design / die making / manufacturing.
- Verification of operation on each car on the market.  
(Includes antenna installation position in the car)

## When using car share / rent-a-car

The following items are required in addition to the requirements for personal use

- Development of temporary use support to support car sharing / rent-a-car use.
- Development of management server for car sharing / rental car use.
- Development of a library for use with existing car sharing / car rental systems.