

# FM broadcast coverage system for underground parking lot

## 1. Overview

The system adopts the method of "digital FM broadcast repeater + indoor passive distribution system", which can introduce aerial FM broadcast signals (up to 16 channels of broadcast frequencies) into all corners of the underground parking lot; and in an emergency, through these 16 channels frequency broadcasts the traffic regulation instructions of the parking lot management department to make the vehicles evacuate quickly and orderly.

## 2. System features

- The system equipment is simple: only one active device (repeater) can realize all forwarding functions, and the engineering installation is simple;
- Multiple forwarding programs: up to 16 channels of FM radio programs can be forwarded on the same frequency, which can meet the broadcasting needs of most cities;
- High-fidelity sound quality: broadcast-level technical indicators, beautiful sound quality, and clear voice.
- Low interference in the same frequency at entrances and exits: Using digital co-channel forwarding technology, there is almost no interference at the entrance and exit of the parking lot;
- Traffic diversion: In case of emergency, the parking lot management department can use the 16 channels of broadcasts to divert traffic.
- Stable and reliable: using software radio technology, fully sealed wall-mounted chassis, small in size and extremely safe.
- Remote monitoring: The remote monitoring and control of the system can be realized through network cable, optical cable or 4G network.

## 3. System composition and working principle

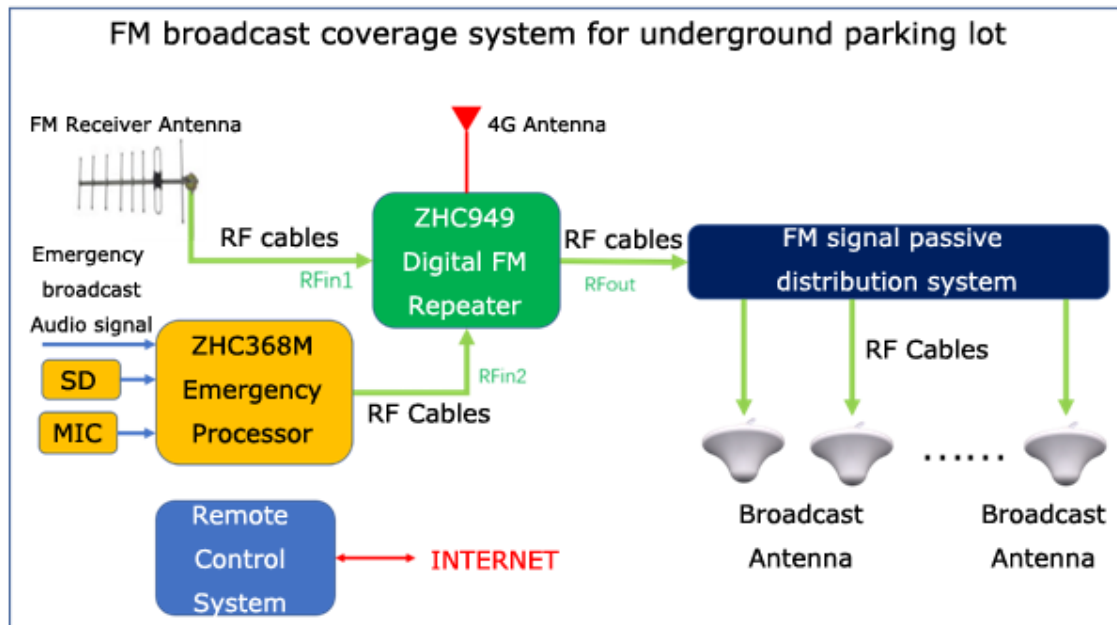
### A. System composition

A complete underground parking lot FM broadcast coverage system consists of the following parts:

- 1) FM full-band receiving antenna
- 2) FM broadcast repeater (digital technology)

- 3) Broadcast signal passive distribution and transmission system equipment (distributor, coupler, transmitting antenna, etc.)
- 4) Emergency broadcast processor (optional, optional when traffic diversion is required)
- 5) Remote monitoring and monitoring system software and hardware (optional, select when remote monitoring is required)

**The system composition diagram is as follows:**



## B. Working principle

FM broadcasting (87-108MHz) radio waves are mainly linear transmission and have a certain degree of diffraction ability. The underground parking lot is covered by car radios, and the coverage field strength can reach 35dBuV/m, which can be well received.

In view of the transmission characteristics and coverage field strength requirements of FM broadcasting, and considering the system construction cost and cost-effectiveness, it is appropriate to adopt "digital FM broadcasting repeater + indoor passive distribution system", and adopt a wideband miniaturized transmitting antenna at the end for coverage. For the general parking structure, a set of underground parking lot broadcast coverage system can achieve the coverage of 16 channels of FM broadcast programs with a construction area of about 20,000 square meters.

The core equipment of the system is the "digital FM broadcast repeater". The main function of this equipment is to perform low-noise amplification (LNA), 16-channel digital frequency selection, and emergency broadcast on the full-band FM broadcast signal received by the FM broadcast receiving antenna. Signal switching, radio frequency broadband linear amplification, band-pass filter output; and integrated 4G router, which can realize remote monitoring and monitoring of equipment.

The FM broadcast signal output by the digital FM broadcast repeater is transmitted to each small transmitting antenna for wireless transmission through a passive distribution system composed of several power distributors, power couplers, coaxial cables, etc., according to the different plane structure of the basement. The basement is covered seamlessly.

In order to give full play to the functions of the system, the system can be used to command underground vehicles and divert traffic in emergency situations. At this point, you only need to turn on the "emergency broadcast processor" and switch the "digital FM broadcast repeater" to the emergency broadcast mode, and you can hear the content of the emergency broadcast in the 16 channels of FM broadcast signals. The emergency broadcast processor has a variety of audio signal source inputs: microphone input for voice broadcast, SD card playback to achieve recorded programs, or emergency audio signals sent by other audio playback devices.

In order to facilitate the management, the repeater can be remotely monitored and monitored. The working status of the repeater can be observed on the monitoring server of the monitoring center, and the repeater can be remotely controlled to switch the working mode (normal mode and emergency mode). The data communication method between the monitoring server and the repeater can be through 4G network, optical fiber, network cable, etc.

## **4. The main equipment of the system**

### **(1) Digital FM broadcast repeater (model: ZHC949-25W)**



ZHC949-25W digital FM broadcast repeater is a product specially developed for underground parking lots or small tunnels. It has an integrated design for receiving and sending, and the output RF power is 25W. It can forward up to 16 channels of FM broadcast programs at the same time; it can be realized with an emergency broadcast interface. Emergency broadcasting function. Built-in 4G router can realize 4G transmission remote monitoring.

The repeater mainly consists of RF receiving and amplification, 16-channel digital frequency selection, emergency broadcast signal switching, RF broadband linear amplification, output band-pass filtering, DC switching power supply, 4G router, central control unit and other functional modules. It adopts fully enclosed structure, three-proof design, natural cooling without fan, and long life design. All input and output interfaces are connected and led out from the rear panel.

The repeater, in conjunction with a passive signal distribution system and a transmitting antenna, can achieve an underground parking lot of approximately 20,000 square meters and 16 channels of FM broadcast signals without blind spots.

## **(2) Receiving antenna (model: FM-DV1)**

Set up an FM receiving antenna outside the parking lot at a relatively open and high altitude location to receive the 87-108MHz open-circuit FM broadcast signal and send it to the RFin1 interface of the repeater. If the local received FM broadcast signal is very weak, it can be amplified by a dedicated antenna amplifier before sending it to a repeater.



### (3) Emergency broadcast processor (model: ZHC368M)



The emergency broadcast processor has a built-in high-fidelity microphone pre-amplifier, and is equipped with a U disk socket and an SD card socket to play MP3 audio signals, and a digital FM modulator. When you need to insert an emergency broadcast signal, just turn on the processor to output the FM radio frequency signal to the RFin2 input port of the repeater; after switching the repeater working mode to the emergency broadcast mode, the 16 FM broadcast channels will all insert the emergency broadcast signal .

### (4) Power divider (model: ZHC-SP2)

The power divider is used for the second distribution of radio frequency signal power in the frequency modulation band below 100W. The PCB microstrip circuit design has a small standing wave ratio, low RF signal insertion loss, and good working stability. It is suitable for the main circuit power distribution output of the radio frequency power of the repeater (remote machine) of the tunnel broadcasting system.



**(5) Power coupler (model: ZHC-BR4)**

This coupler is used for power split coupling of radio frequency signals in the frequency modulation band below 50W. The design of the magnetic ring coil has a small standing wave ratio and good working stability. It is suitable for the coupling output of radio frequency power in the repeater (remote machine) of the tunnel broadcasting system.

**(6) Miniaturized transmitting antenna (model: ZHC-CX2)**

This miniaturized antenna is used for broadband transmission of terminal FM broadcast signals. Adopting special spiral structure design, frequency band type, high power bearing capacity.

Using refractory materials, safe and reliable;

High gain and large coverage area;

Small size and easy installation.



**(7) Remote monitoring system**

The system consists of a monitoring center server, system monitoring software and data transmission equipment. It can realize remote real-time detection and monitoring of repeater status.

According to the distance between the repeater and the monitoring server, the data transmission equipment can use 4G network, network cable or network optical modem.