

# White paper on TGR10



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## Version history

<b>Date</b>	<b>Version</b>	<b>Version description</b>
2018-08-29	1.0	The 1 <sup>st</sup> version of white paper on TGR10

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# White paper on TGR10

**Abstract:** TGR10 is a 24GHz Gate Radar millimeter wave radar performed ultimately of the industry. it adopts international advanced microwave high-precision positioning technology and high-speed digital signal processing technology, with the features of high precision, debugging-free, high stability, etc. It suitable for vehicle monitoring in parking lots of entrances & exits, realize automatic rising and falling of parking lot gates, control camera collection of license plate numbers, identify illegal vehicles, provide reliable basis for parking charges and management, which is indispensable for intelligent parking system and it can meet the needs of unattended parking lots and efficient management for key entrances & exits.

**Key words:** TGR10, 1T1R, resistance radar, Trigger radar, high cost-efficient

## 1 TGR10 application requirements

### 1.1 Development of the entrance & exit management system

Recently, the number of motor vehicles in cities has increased year by year, and the difficulty of traveling and parking has become increasingly prominent. At the government level, in order to solve the problem of parking difficulties for residents, the National Development and Reform Commission specially issued the “Recent work points and task division on speeding up the city parking lot construction” on January 25, 2016. According to this document. On the one hand, it is required to speed up the construction of parking lots, especially to promote units, communities and individuals to use their own space to build parking lots, and to open parking space resources of enterprises and institutions to social vehicles. However, once it is opened to the use of social vehicles, it will bring security management problems; On the other hand, it is required to speed up high-tech application of license plate recognition and parking guidance in the parking field, and promote the development of parking and Internet integration for the increasingly congested traffic conditions.

At present, the traditional solution mainly are sense coil and infrared radiation in the intelligent parking system. They have problems of damaging to the road surface, inability to distinguish between people & vehicles, and easy to be disturbed. There are often incidents of

“smashing the vehicle” and “smashing people”. TGR10 adopts international advanced microwave high-precision positioning technology and high-speed digital signal processing technology, with the features of high precision, debugging-free, high stability, which can accurately identify the vehicles & people of entrance & exits, and the capture rate reaches 100%. It can distinguish people & vehicles to avoid being blocked by mistakes of vehicle, through logical judgment, The barrier gate will drop when the vehicles have passed, while it will not drop if the person precede the vehicle. It has the function of barrier gate falling resistance to avoid smashing people & vehicle. It suitable for vehicle control of parking lots in entrances & exits. With the vigorous promotion and construction of a new generation of unattended intelligent parking system, TGR10 has become an indispensable part of the overall system construction, and the market has broad prospects for development.

## **1.2 TGR10 application requirements**

Traditional solution mainly are sense coil and infrared radiation. The traditional coil trigger needs to cut the road surface, then repair it. The construction is difficult and it influences beauty! The traditional coil trigger can only recognize the car not the person, which may cause the phenomenon of "smashing people".

Infrared radiation using a flat beam of radiation, even if a leaf is blocked, can cause false triggering and installation. And it require routing which is inconvenient.

TGR10 adopts 24GHz microwave detection technology, which has stronger performance, no need to cut the road surface, and can recognize both vehicles & people to avoid smashing. The background can be automatically recognized according to the reflected wave, which can effectively filter target of the false trigger. The environmental adaptability is strong, and detection performance is not affected by external environment of light, dust, rain and snow. Coils generally need to be replaced in 1-2 years, but radar can be used for 5-10 years, and it can reduce construction and maintenance costs with less manpower, shorter duration.

## 2 Product overview of TGR10

### 2.1 Product features

TGR10 is a cost-effective short-range K-band radar altimeter. It adopts FMCW modulation mode, which can accurately detect people & vehicles. and it has high ability to differentiate between people & vehicles.

■	Target classification
■	Distance
■	Speed
■	Angle

TGR10 has the function of identification people & vehicles to avoid smashing. The product function diagram is as follows:

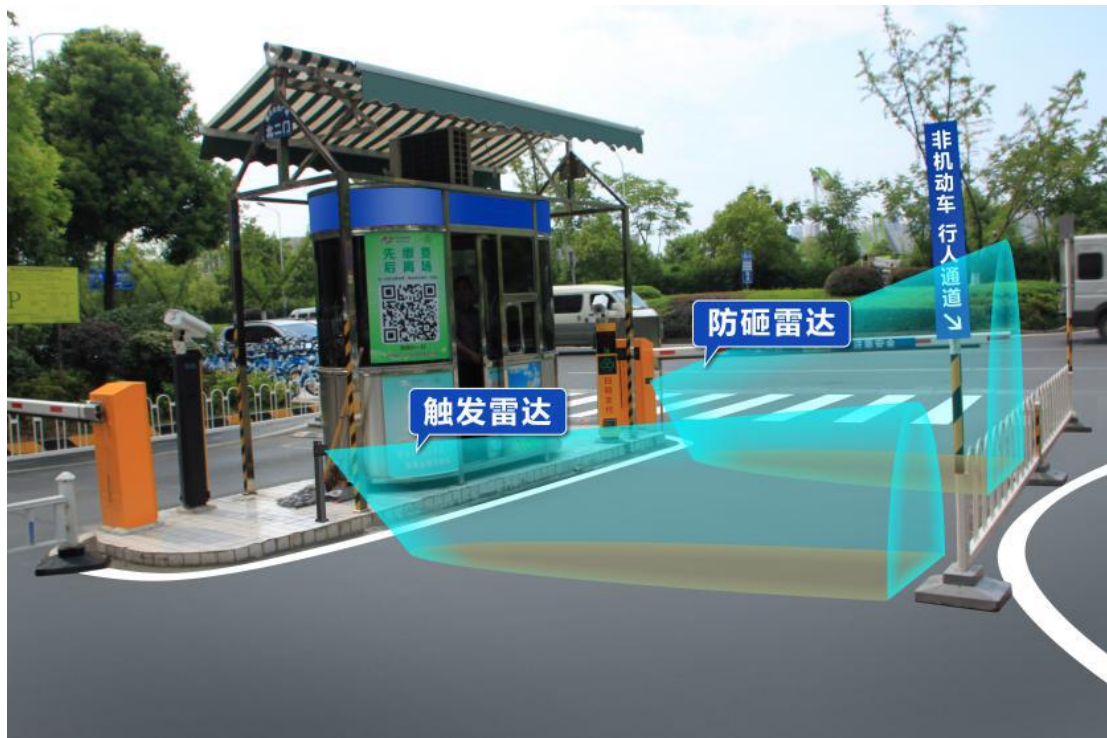


Figure 1 TGR10 function diagram

### 2.2 Product parameters

TGR10 parameters are as following table:

Table 1 TGR10 performance parameters

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
<b>System characteristics</b>					
Transmit frequency		24.00		24.25	GHz
Output power (EIRP)			10		dBm
Update rate			20		ms
Power consumption			1.5	2	W
<b>Detection characteristics</b>					
Detection distance		0.1	3	10	m
Detection target			People、 vehicle		
Distinguish following cars			0.6		m
<b>Antenna characteristics</b>					
Beam width/TX	Azimuth(-6dB)		22		deg
	Elevation(-6dB)		37		deg
<b>Other characteristics</b>					
Supply voltage		6	12	24	V DC
Supply current		0.1	0.12	0.3	A
Operating temperature		-40		85	°C
Protection level		IP66			

TGR10 adopts 1T1R antenna, with precise azimuth ranging resolution. A narrow beam is used on the azimuth plane radiation pattern of the transmitting & receiving antenna to improve the target noise ratio. And the low side-lobe technology is used to design the pitch plane pattern of the transmitting & receiving antennas, which can effectively suppress ground clutter interference. The TGR10 system pattern is as follows:

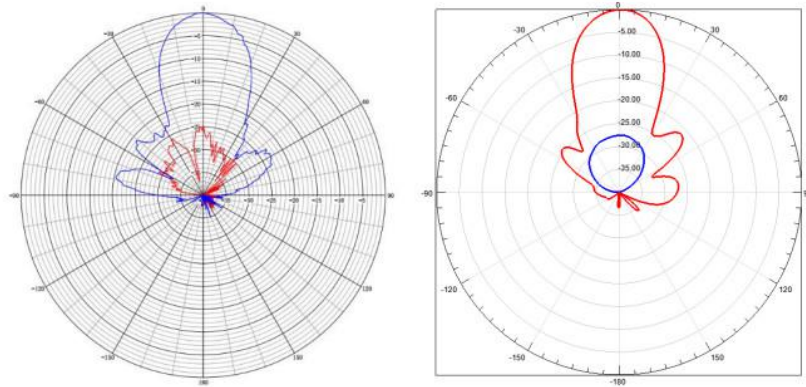


Figure 2 TGR10 system pattern

product outline is as follows:

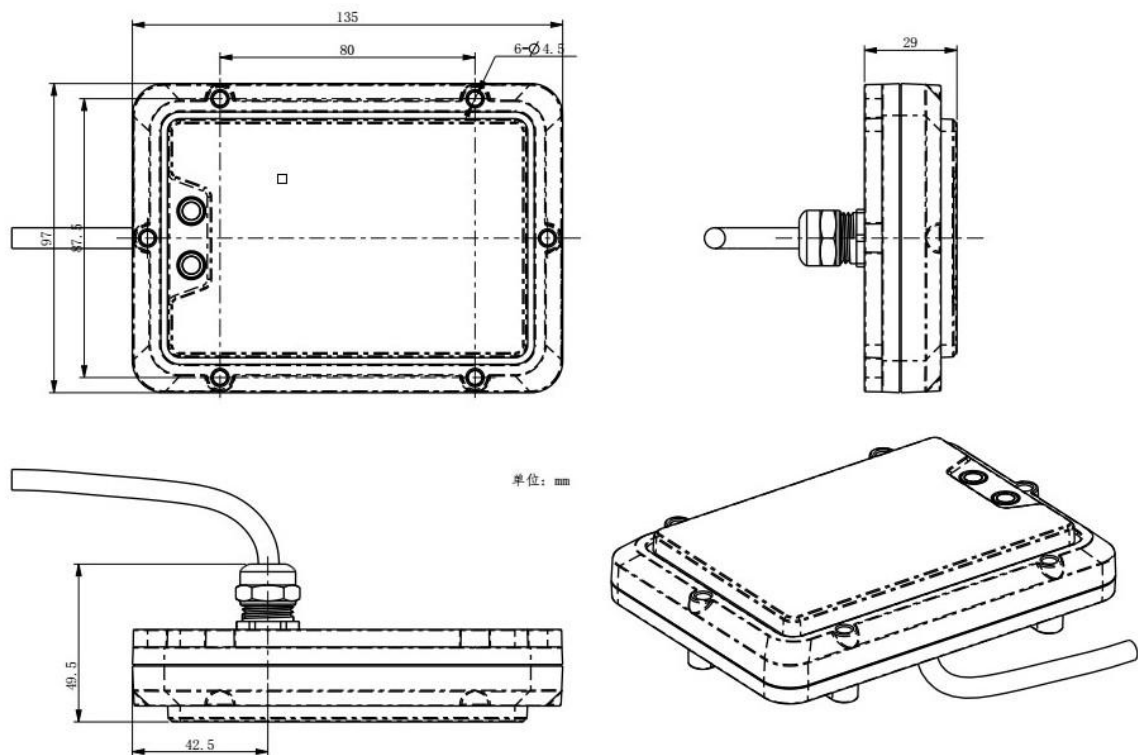


Figure 3 TGR10 outline

### 2.3 Product application field

- Parking lot entrance & exits
- Expressway toll lane
- Key control entrance & exits
- Port entrance & exits



### 3 Typical application example

#### 3.1 Application 1: Trigger for camera shooting & barrier gate raising

At the entrance of the residential lane, the camera receives the radar trigger signal to take photos of the passing vehicles if it enters the radar detection area. The trigger position is consistent, and the trigger accuracy rate is 100%.

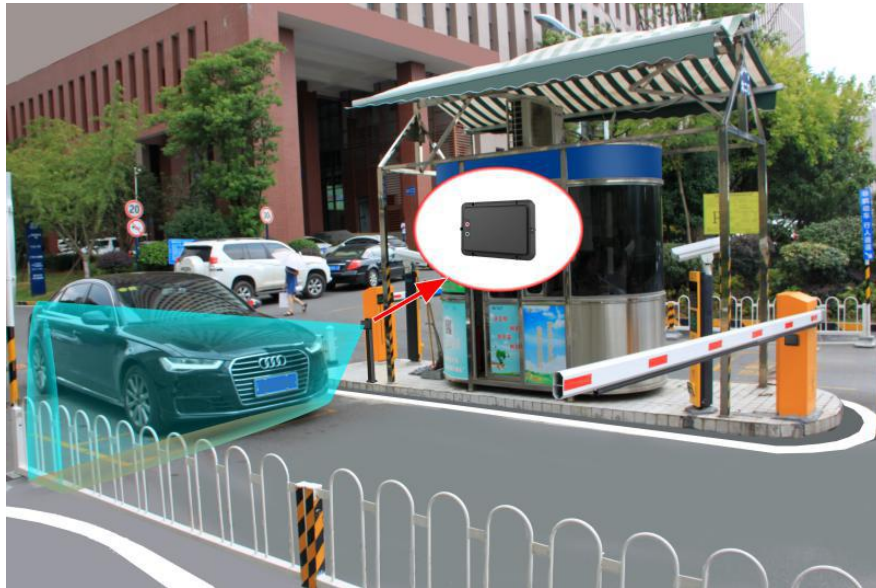


Figure 4 TGR10 function diagram of trigger radar

#### 3.2 Application 2: Barrier Gate Falling Resistance for People & Vehicle

People & Vehicle can be identified when barrier gate falling is controlled by TGR10. The barrier gate will drop when the vehicles have passed, while it will not drop when people pass. And in the short time of the barrier gate falling, it will be lifted urgently once detecting someone passes.

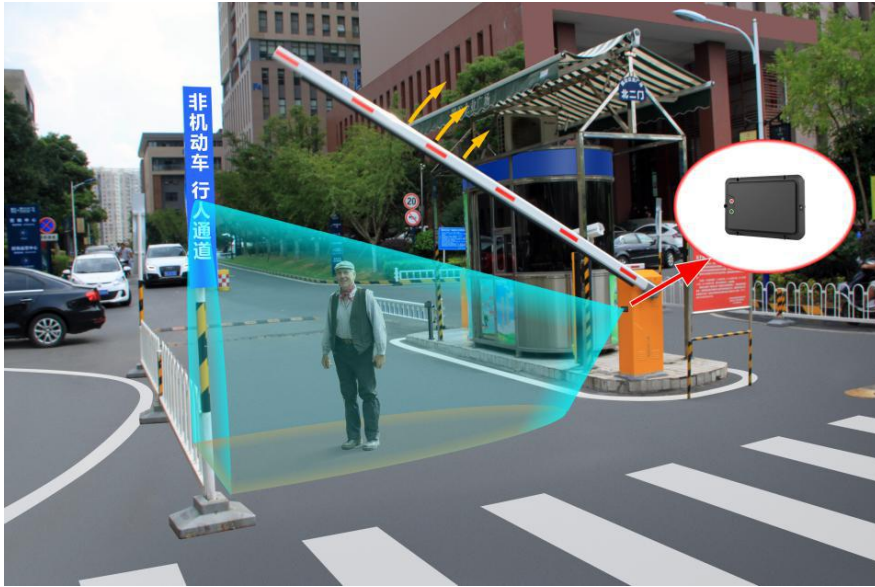


Figure 5 TGR10 resistance functional diagram

### TGR10 Advantages in the application of entrances & exits

- 1、 Advanced signal processing technology can be used to detect pedestrians & vehicles stably, and effectively prevent "smashing vehicles and people".
- 2、 simple installation, no need to destroy the ground, greatly reducing the difficulty of construction and maintenance costs.
- 3、 It has communication function of RS485 and WIFI , equipped with Web interface and APP of mobile phone , which is convenient and quick for parameter configuration.
- 4、 Radar detection distance and area can be adjusted, and it can effectively prevent escape incidents.
- 5、 Integrated design, small and beautiful, easy to integrate inside & outside.
- 6、 Strong environmental adaptability, radar performance is not affected by light, dust, rain and snow, haze and other harsh environment.
- 7、 Long service life: The life of the ground coil is generally 1~2 years, but the radar can reach 5~10 years.

## 4 Conclusion

TGR10 is a short-range gate millimeter wave radar independently developed by Nanoradar. It adopts advanced MMIC and signal processing technology, with accurate ranging and stable performance, which can be widely used in parking lot entrances & exits, ports and other fields. The product can significantly improve the efficiency of entrance & exit, improve the safety performance of pedestrians and vehicles, and reduce the incident of smashing People & vehicle.

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