Milesight

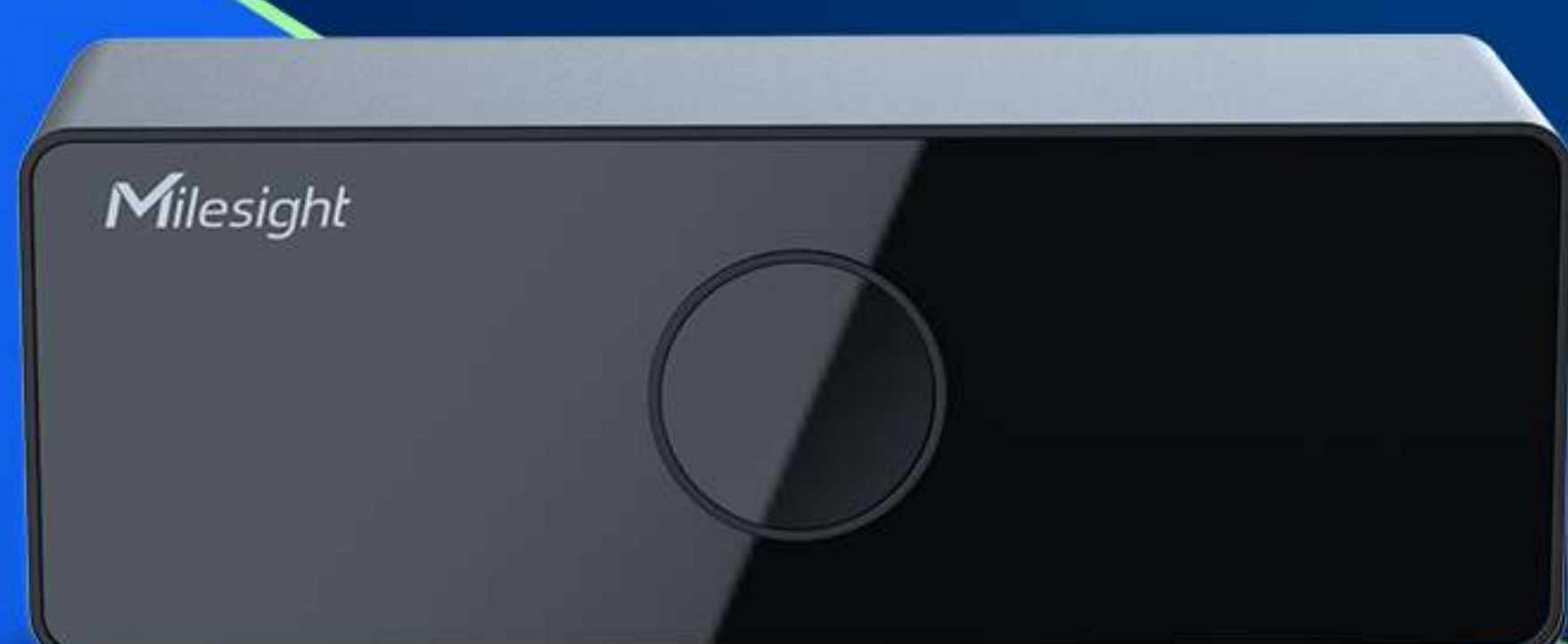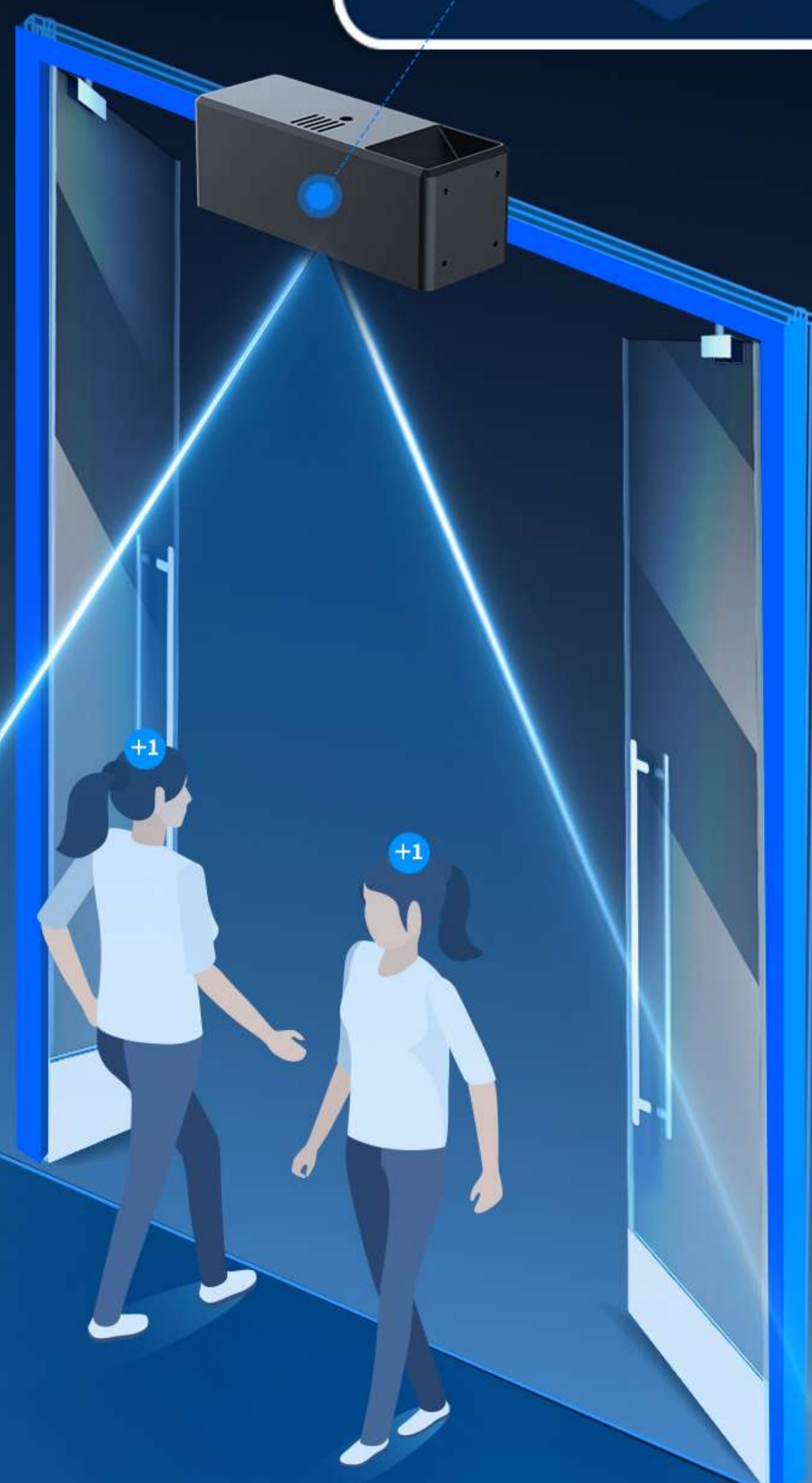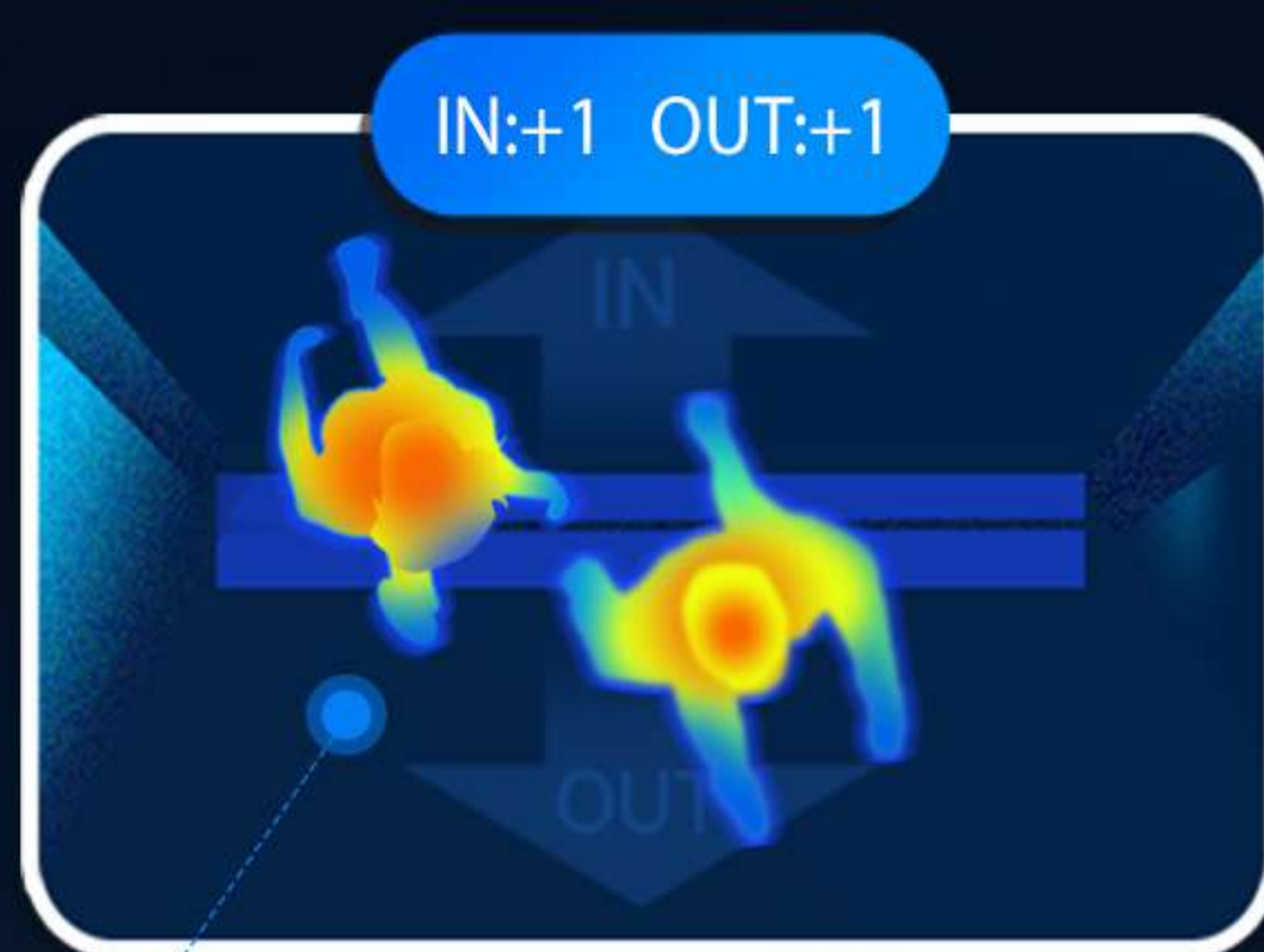## Accuracy Testing Report

VS132 3D ToF People Counter

### Speak Louder with the High-Accuracy Results

IN:+1 OUT:+1

Milesight 3D ToF People Counter takes the advantage of the Time of Flight technology to realize rich highlights like 99.5% ultra-high accuracy and 100% unparalleled anonymous detection. It offers second-to-one bi-directional people counting ability, laying a solid foundation for further data-based analytics and management.

Covered Detection Area

The detection area covered by the 3D ToF People Counter is related to the field of view angle of the device, the installation height and the target height. The length of the detection area is approximately x=2.1×(H-hmin) and the width of the detection area is approximately y=1.32 x (H-hmin).
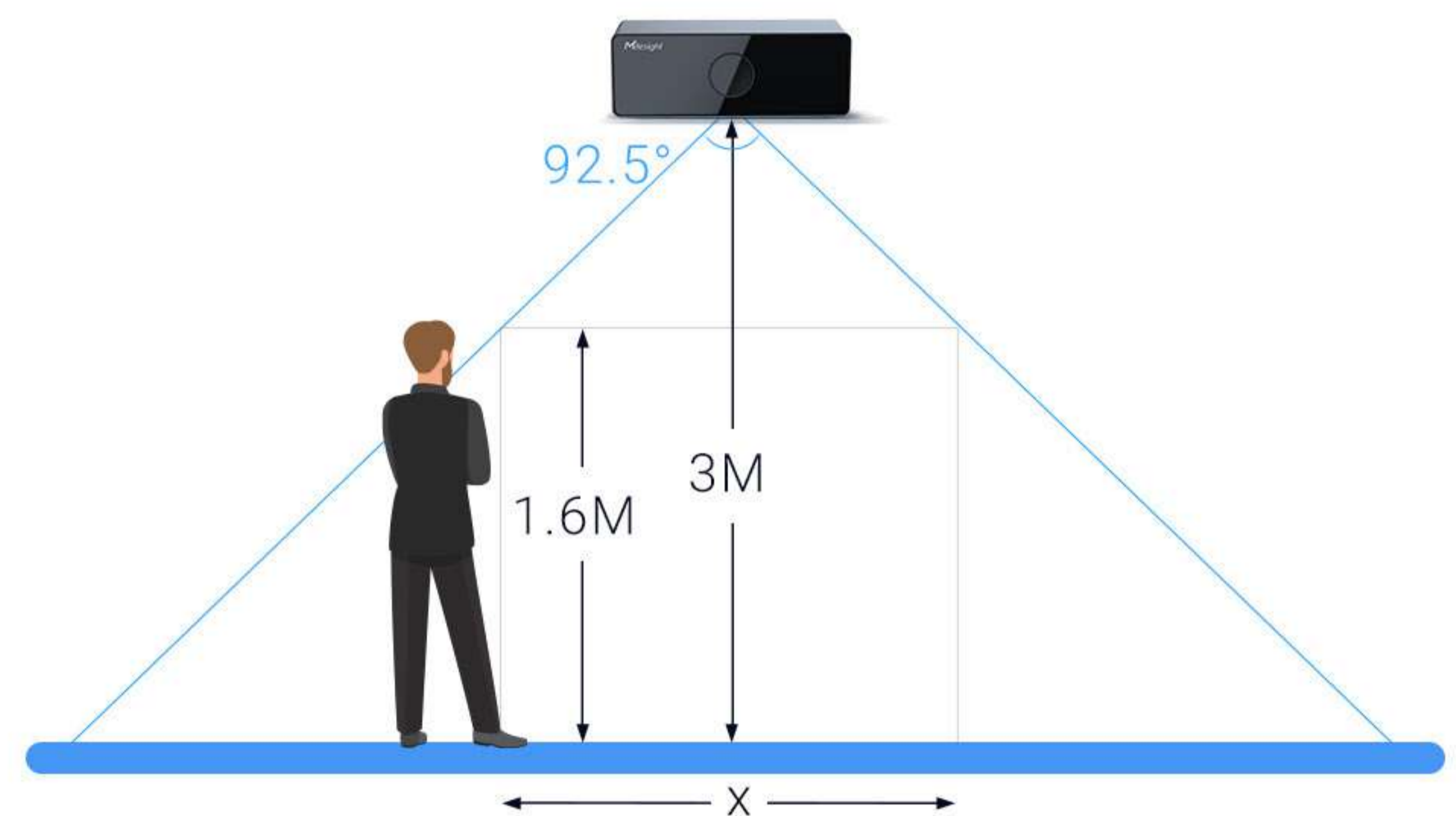
For example, if the minimum height of pedestrians is 1.6 m, the detection area corresponding to each installation height is as follows:

Installation Height	FoV Monitored Area (m)	Detection Area (m)
2.4	5.01 × 3.18	1.67 × 1.06
2.5	5.22 × 3.31	1.88 × 1.19
2.6	5.43 × 3.44	2.09 × 1.32
2.7	5.64 × 3.57	2.30 × 1.46
2.8	5.85 × 3.71	2.51 × 1.59
2.9	6.06 × 3.84	2.72 × 1.72
3.0	6.27 × 3.97	2.92 × 1.85

Testing Environment

Indoor Entrance
Installation Height: 2747mm
Entrance Width: 2100mm

Configuration

Max Target Height: 2000mm
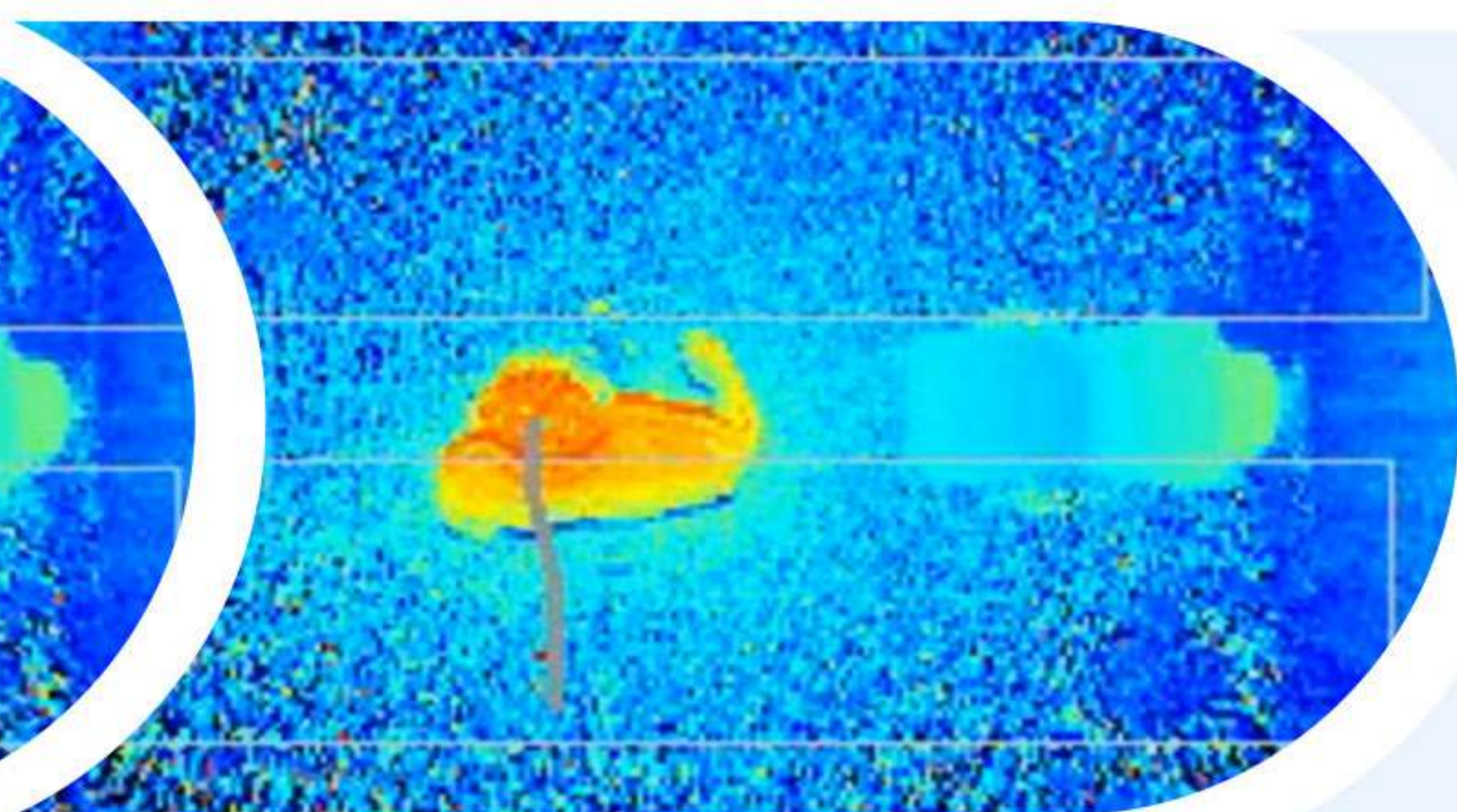Min Target Height: 1000mm

Testing Results

1 General Scenarios

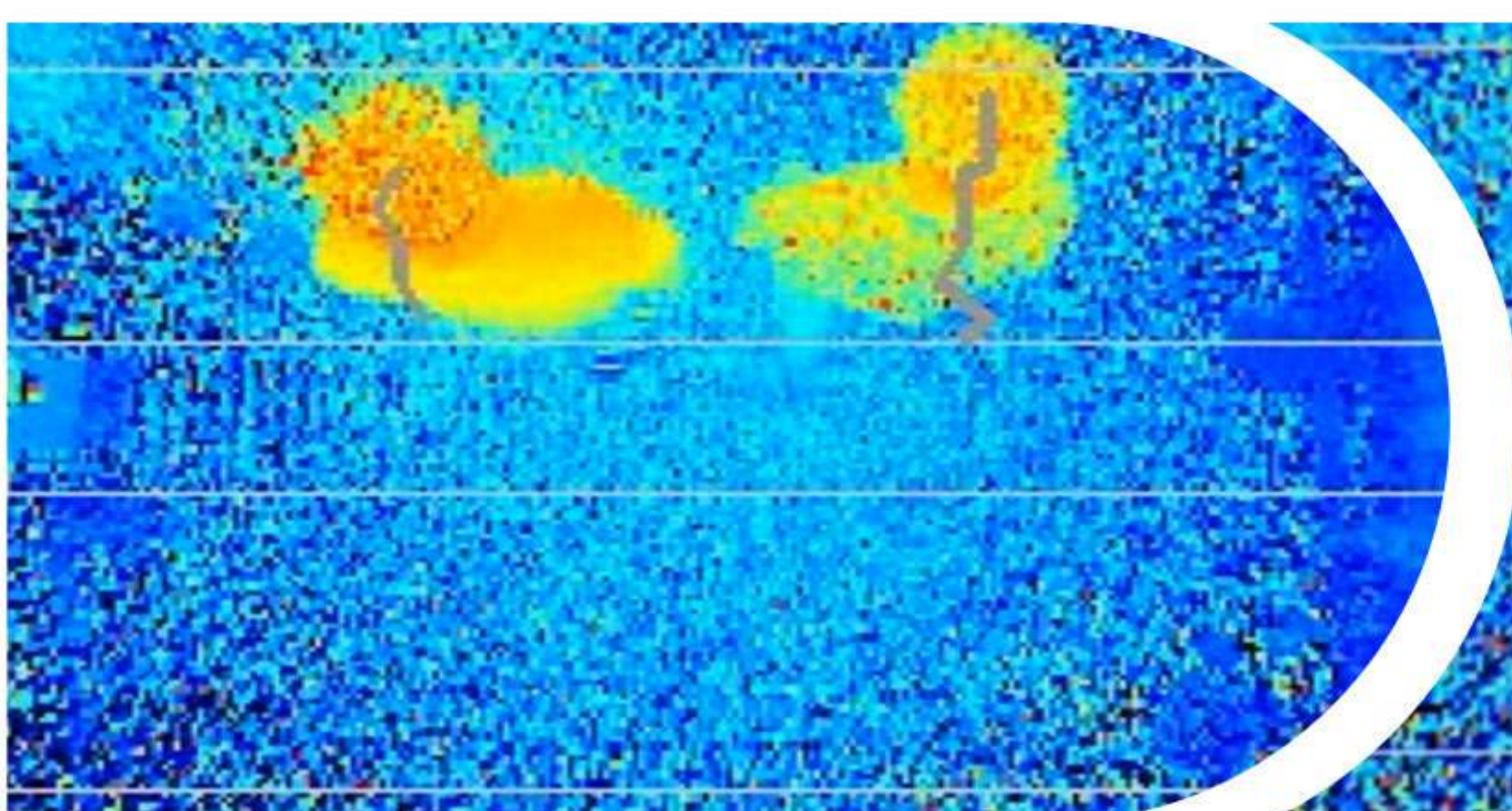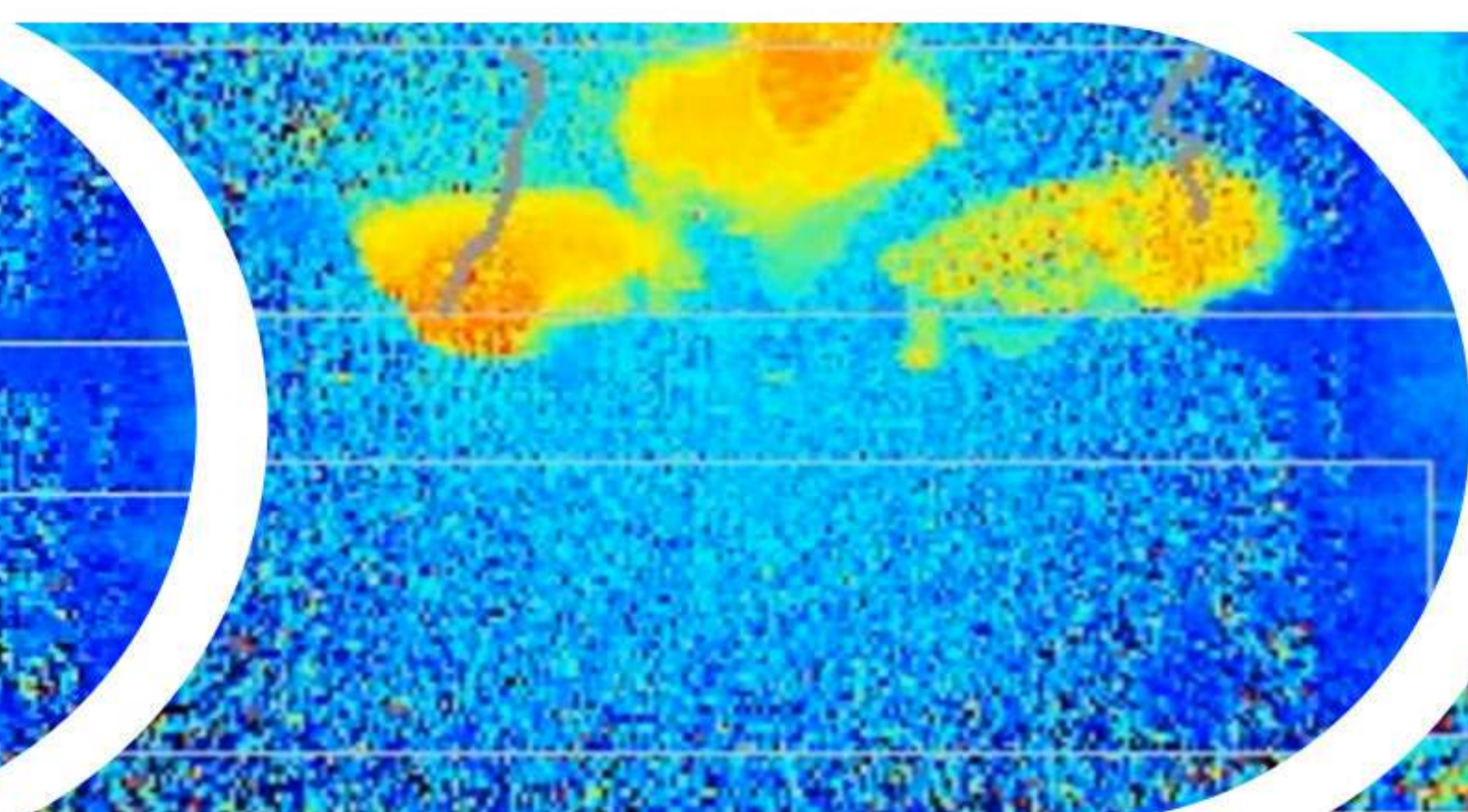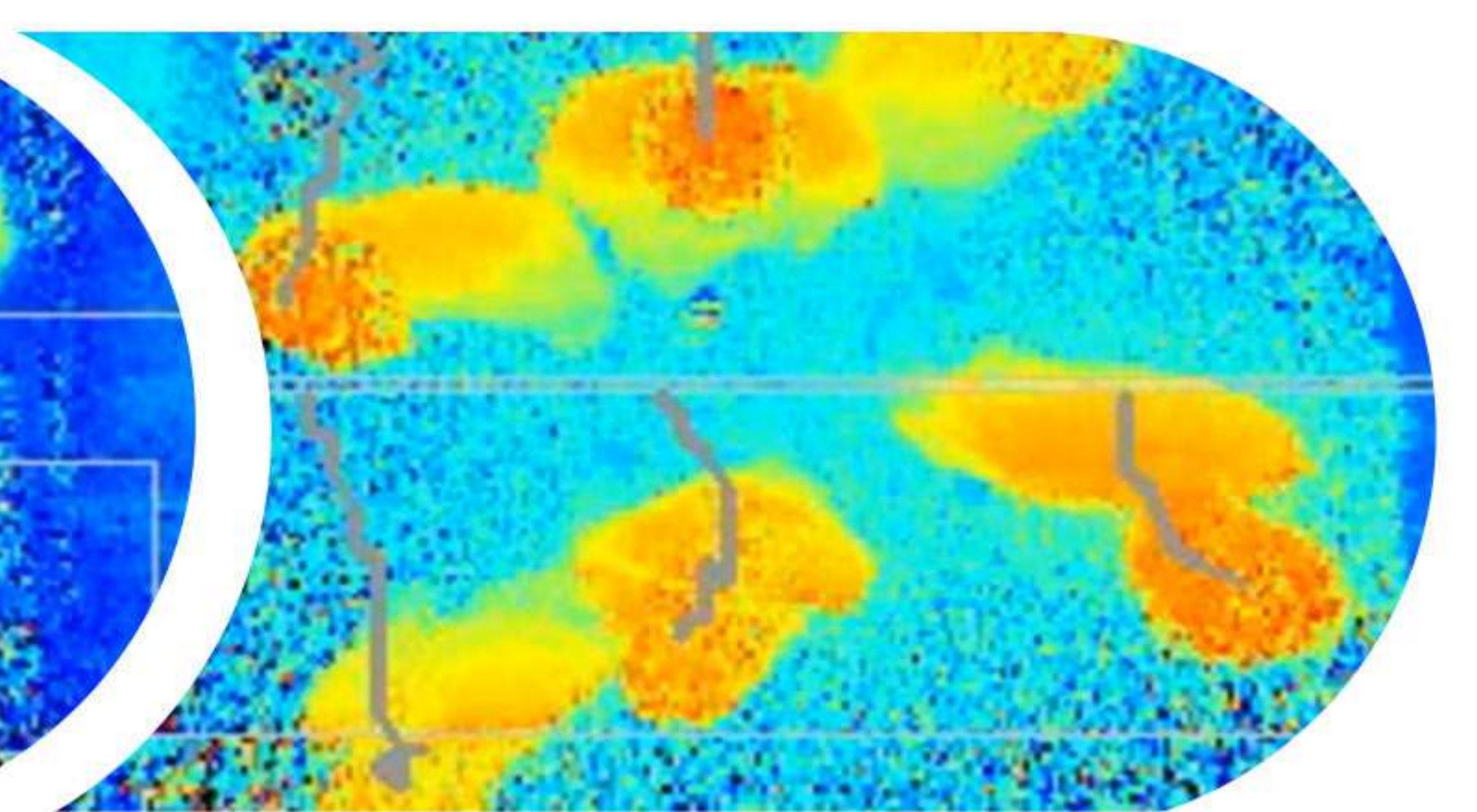| Testing Items	Total Number of People	Counting Number of People	Accuracy
Slowly Walking (A Person)	20	20	100.00%
Fast Running (A Person)	22	22	100.00%
Cross Line Forward and Backward	56	56	100.00%
Simultaneously Line Crossing(2 Persons)	46	46	100.00%
Simultaneously Line Crossing(3 Persons)	75	75	100.00%
Simultaneously Line Crossing(6 Persons)	48	48	100.00%

Testing Sample Pictures
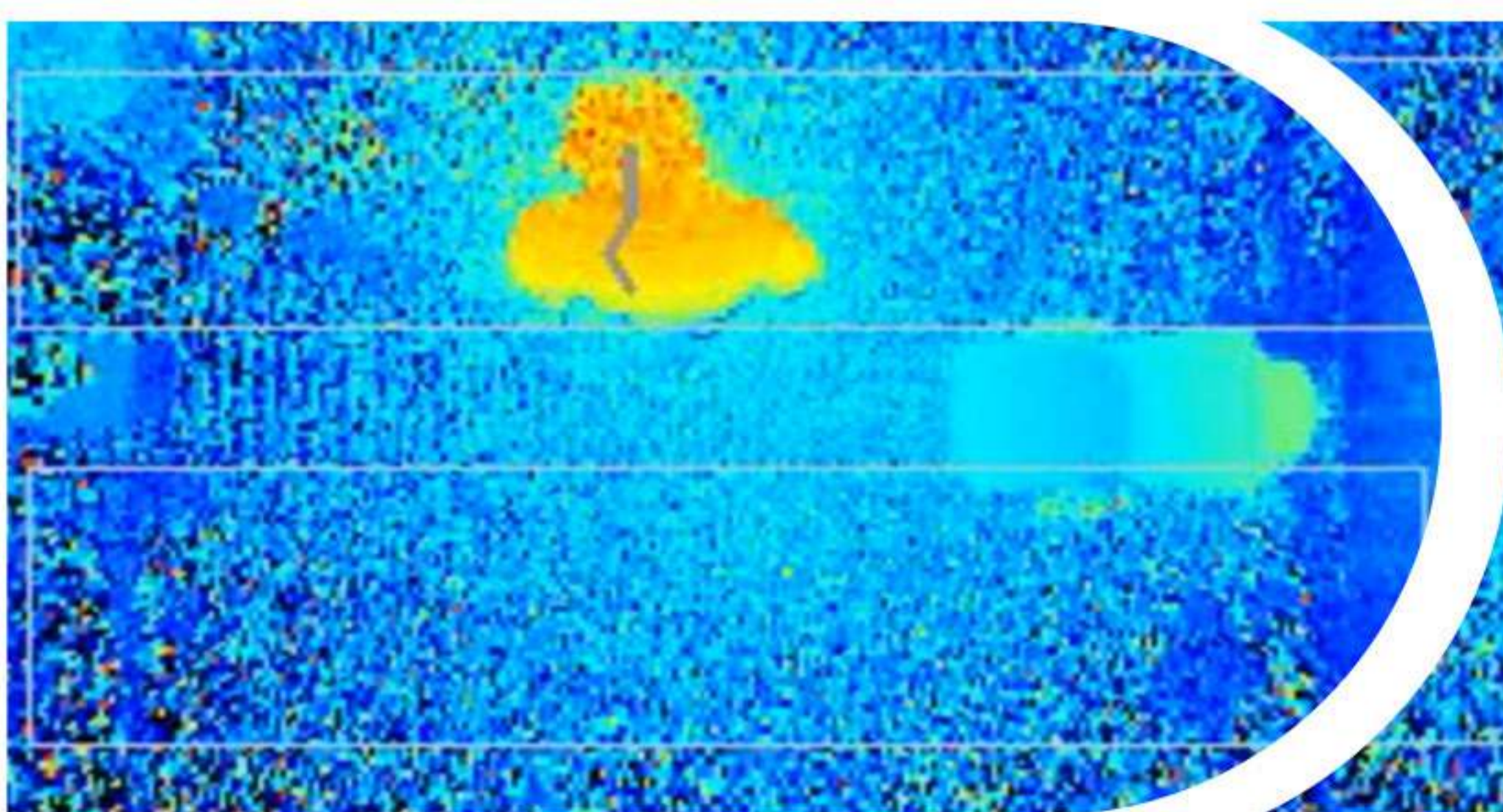
Slowly Walking (A Person)

Fast Running (A Person)

Simultaneously Line Crossing (2 Persons)

Simultaneously Line Crossing (3 Persons)

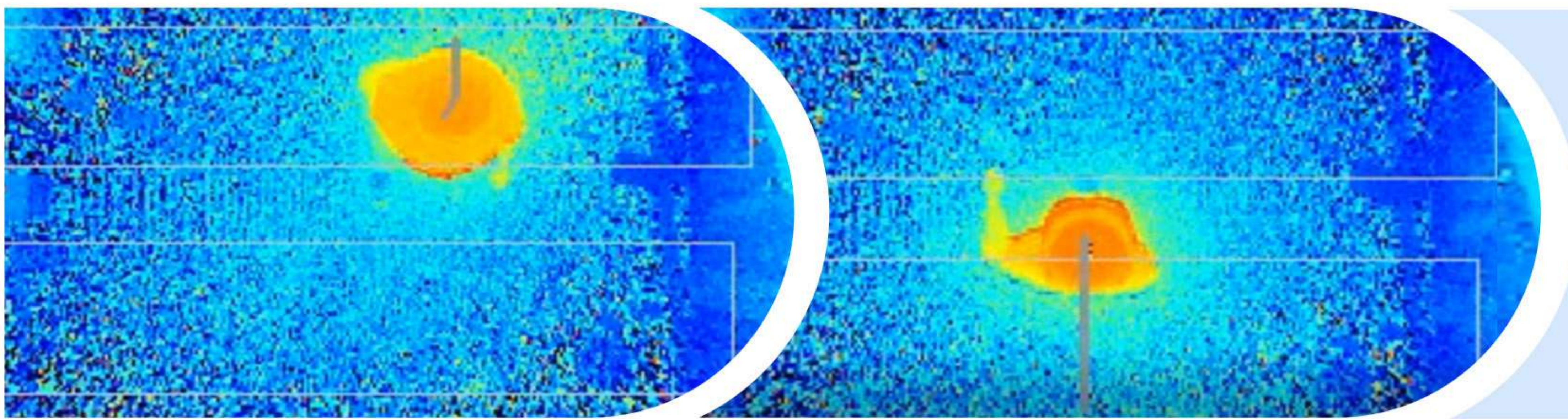Simultaneously Line Crossing (6 Persons)

Analytics

The accuracy is high in general scenarios.

2 Hat Testing

Testing Items	Total Number of People	Counting Number of People	Accuracy
People with Bucket Hat	26	25	96.15%
People with Helmet	21	21	100.00%

Testing Sample Pictures


| People with Bucket Hat | People with Helmet

Analytics

Since the device is installed above. It may cause a loss because bucket hats could change the objects' three dimension imaging.

3 Lighting Environment Testing

Testing Items	Total Number of People	Counting Number of People	Accuracy
Indoor Cold Tone	20	20	100.00%
Indoor Warm Light	26	26	100.00%
Outdoor Hard Light	18	18	100.00%

Testing Sample Pictures
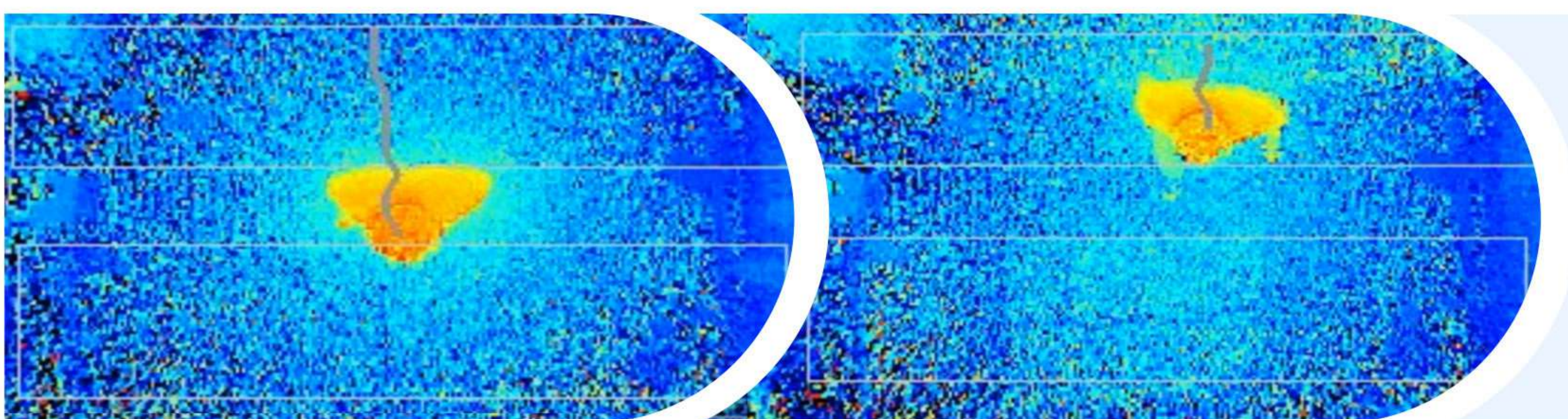
| Indoor Warm Light | Outdoor Hard Light

Analytics

Sunlight has an obvious impact on ToF devices. But according to the test result, the counting won't be influenced if the 3D ToF People Counter doesn't expose to direct lighting of strong light.

4 Environment Adaptability Testing

Testing Items	Total Number of People	Counting Number of People	Accuracy
Low Light	21	21	100.00%
Completely Dark	27	27	100.00%

Testing Sample Pictures
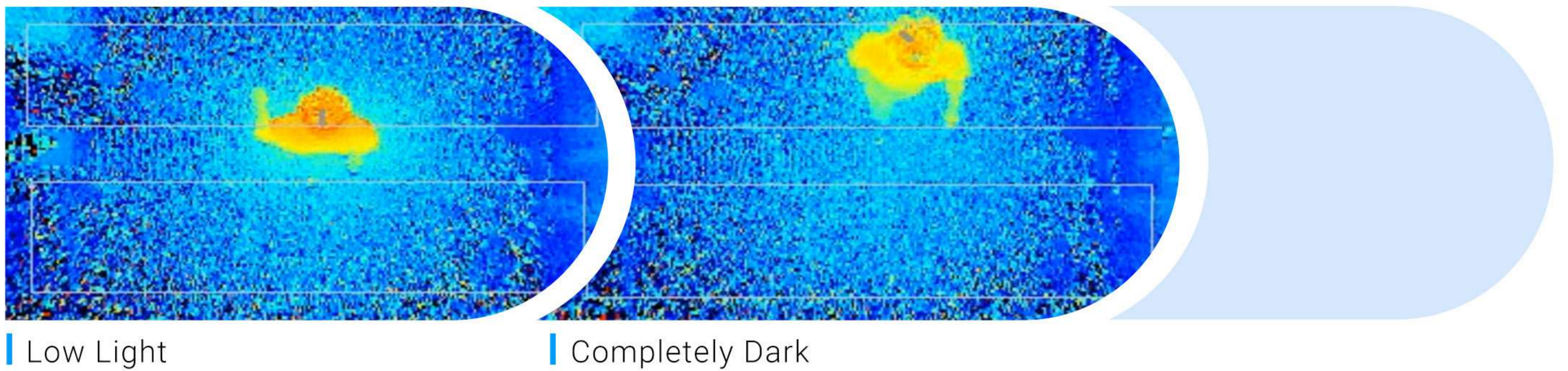

Low Light

Completely Dark

Analytics

ToF stands out compared with other people counting technologies which can't operate efficiently under low light even in completely dark environments. The ambient light doesn't influence its performance since it projects active light itself. The accuracy can be ensured in low light environments.

5 Clothing Influence Testing

Testing Items	Total Number of People	Counting Number of People	Accuracy
People Dressed in Black	20	20	100.00%

Testing Sample Pictures
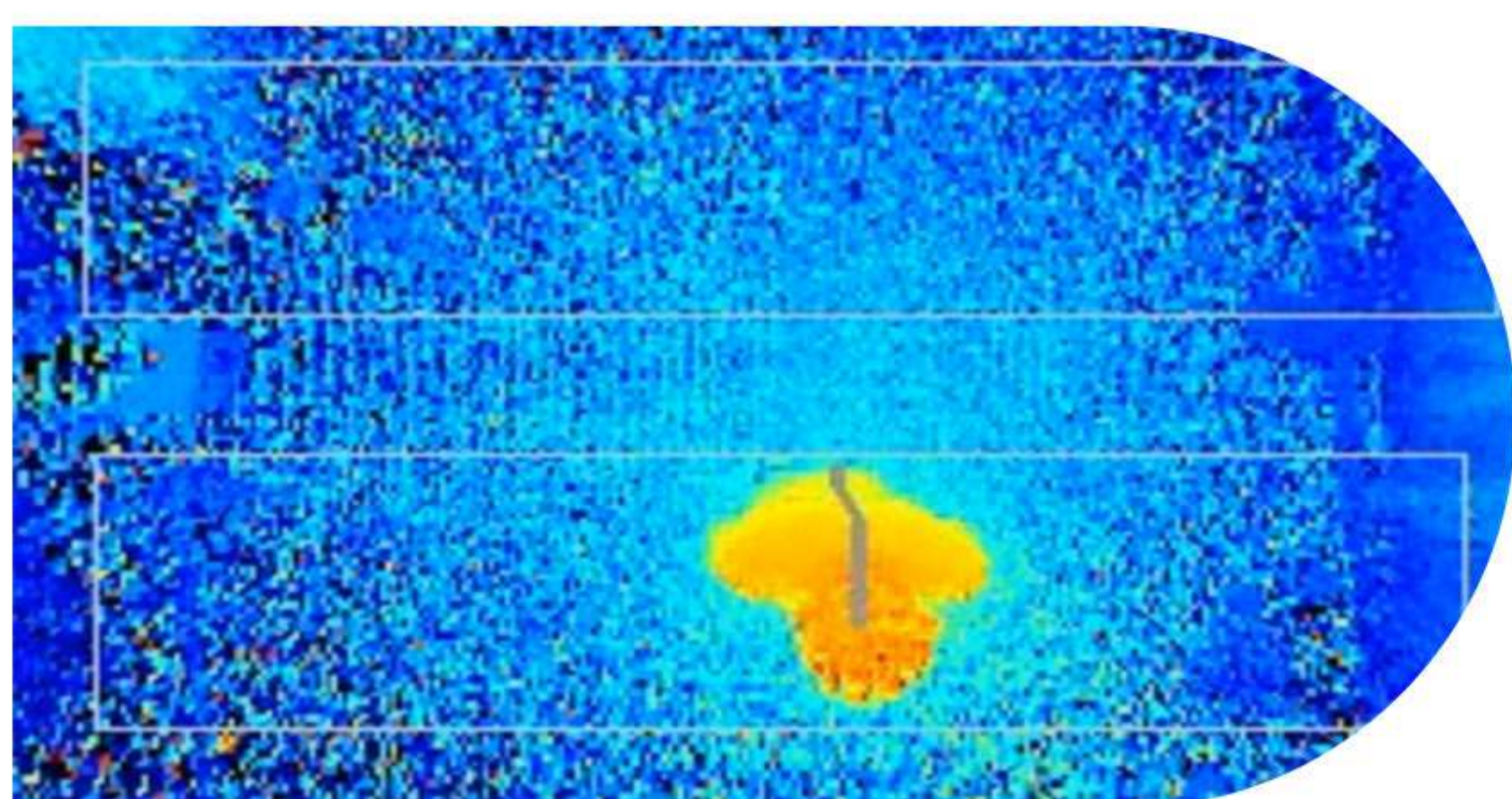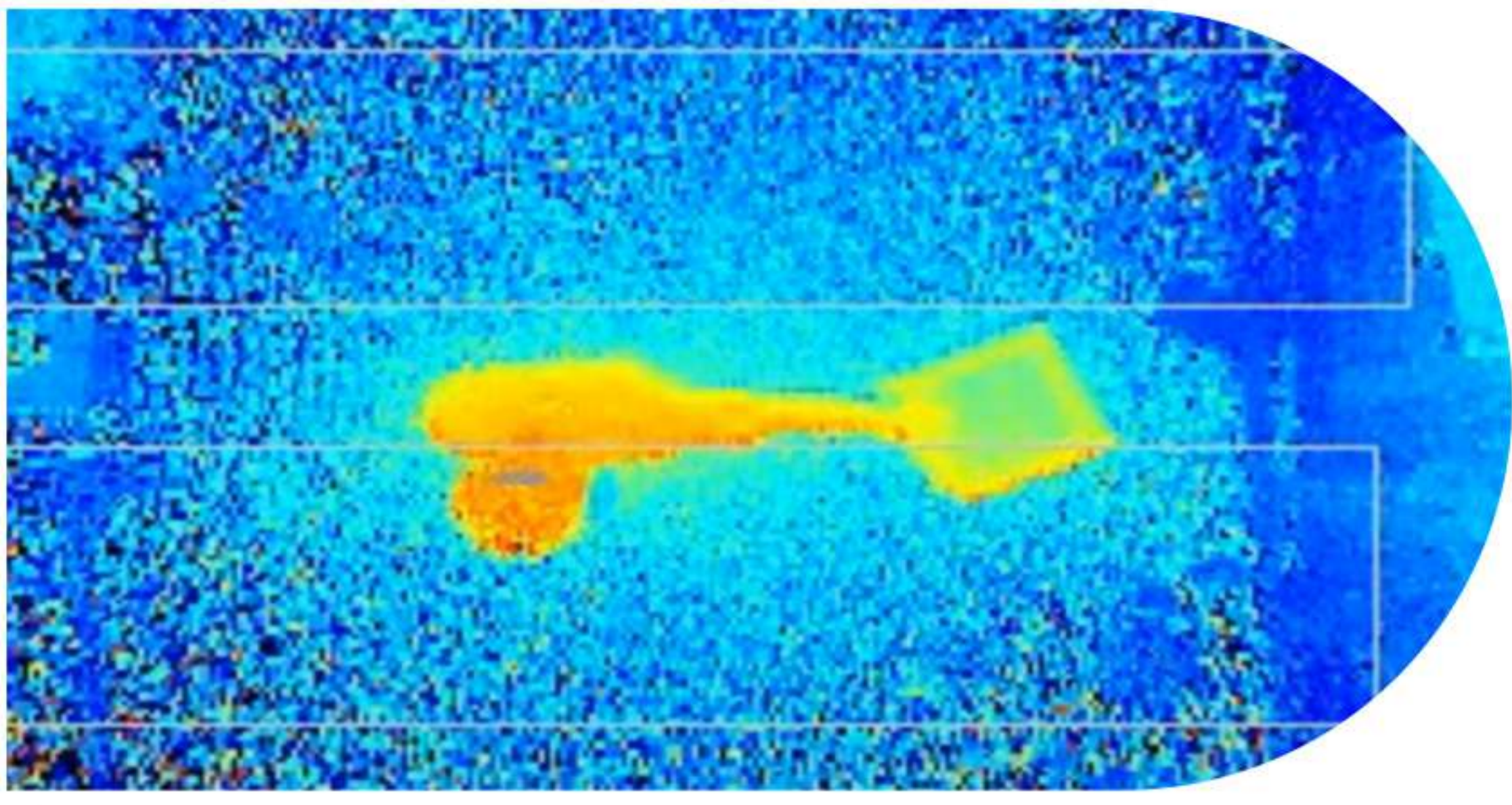

People Dressed in Black

Analytics

Black objects can also influence ToF technology theoretically. But the testing result eliminates the worry. The accuracy keeps at a high level.

6 Sundries Testing

| Testing Items	Total Number of People	Counting Number of People	Accuracy
People with Sundries or Equipment	23	22	95.65%

Testing Sample Pictures

Sundries

Analytics

Carrying a sundry with a human-like shape will be a problem for accurately counting. It may cause false detection. But if the sundry is not similar to human shape, it won't affect a lot.

Influence Factors

Influence Factors		Influenced or Not	Description
Object	Hair Color	No	The color is not the detection dimension of ToF, which is different from images produced by the RGB principle. So it won't influence the counting results.
	Peaked Cap / Helmet	No	Under ceiling mount circumstances, it won't change the shape of the objects detected and influence the counting results.
	Bucket Hat	Yes	It will influence the 3D depth information of detected objects, which is not a human-like shape. It lowers the counting accuracy.
	Carry Stick or Plank	Yes	
	Moving Objects with Human-like Shapes	Yes	It may cause false detection if the object can't be filtered by height. For example, the human-like dolls.
	Non Moving Objects That Are Not Human-like Shapes	No	Carts, suitcases, movable desks and wheelchairs won't make confusion as objects not in human-like shpaes won't influence the counting results.
	Jump over Line	Yes	The jump will change the height of the detected objects to affect the counting results.
Environment	Lighting Condition	No	Low light or completely dark environments won't cause any problem for accurate people counting.
	Directly Lighting	Yes	Direct light will influence the counting result especially when the direct light is in between the area of in and out.
	Outdoor Sunlight Shines on the Indoor Area	No	It doesn't influence the counting results.
Installation	Short Distance Between Sensors	Yes	The visual view angle should be taken into consideration when deploying. Or the ToF light source will interact between sensors.
	The Sensor Installed Leaning Against the Wall	Yes	When the sensor is installed leaning against the wall, the ToF light source will reflect from the wall, which influences the distance judgement. It will cause people counting accuracy problems.
	The Sensor Installed Near Light Source	No	Most indoor lighting sources are visible light, the Infrared band is weak, and the ToF infrared light is modulated. So the factor has little influence to counting results.
	The Sensor Installed Aslant	Yes	The suggested installed angle of inclination is -10°~10°. The over angle of inclination will cause influence.

Sample Pictures of Influence Factors
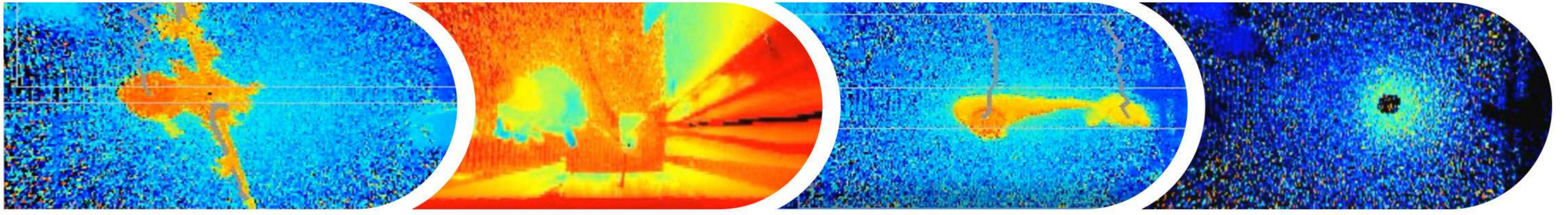
Carry Stick

Installed Leaning Against the Wall

Moving Objects with Human-like Shaps

Direct Light

Conclusion

The 3D ToF People Counter will truly accomplish its values for reliable data-driven management on condition that the high accuracy is ensured. Through massive testing, the accuracy result is obvious. With 3D ToF technology, it can efficiently count people regardless of the effects of complicated objects, environments and installations. But Inevitably, some factors like human-like objects, direct light, installation leaning against the wall, etc., still challenge the results. Avoiding those adverse factors, it will unleash its best performance for applications.