

塑造智慧变革



HEXAGON

海克斯康



北京
国家会议中心

2018年

9月10-12日

2018.hexagonchina.com.cn

徠卡 Pegasus

Alessandro Nuzzo – 移动扫描产品经理

2018年9月11日

目前世界人口75亿，而且还在增加

每周有300万人移居到城市



施工延误的主要原因是意外因素

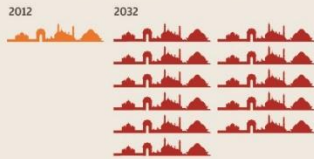


城市的挑战

The Urban Effect

Cities

In 20 years, India's cities will have to accommodate 250 million to 300 million more people than they do today. That's the equivalent of 11 New Delhis.



Electricity

Of the 1.4 billion people of the world who have no access to electricity in the world, India accounts for over 300 million.

Water

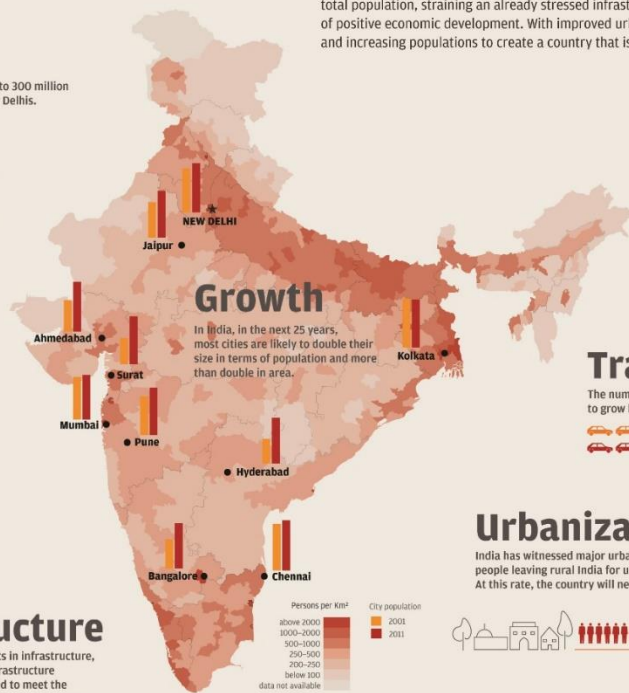
Only 74% of urban households in India are served by piped water supply. No Indian city has piped water 24 hours a day, seven days a week—4 to 5 hours of supply per day is the average.

Infrastructure

Despite increased investments in infrastructure, an estimated \$1 trillion in infrastructure improvements will be required to meet the country's resource needs over the next 5 years.

Sustaining Growth in India through Better Urban Planning

With a population of more than 1.2 billion, India is projected to be the world's most populous country by 2025. By 2050, it is estimated that India's urban population will constitute nearly half of the country's total population, straining an already stressed infrastructure. The good news: urbanization is an indicator of positive economic development. With improved urban planning, India can tackle urbanization challenges and increasing populations to create a country that is poised for sustainable growth.



Pollution

By 2015, India is expected to become the world's third largest emitter of carbon dioxide—it ranked fifth in 2005.

Transportation

The number of private vehicles in India is expected to grow by more than 3 times by 2021.



Urbanization

India has witnessed major urbanization in recent times, with an estimated 30 people leaving rural India for urban areas every minute during the next 20 years. At this rate, the country will need some 500 new cities in the next two decades.



为什么城市化是一个挑战？

- 城市扩张对于基础设施的规划和实现来说是一项挑战
- 城市周边区域需要连接到交通网络
- 基础设施的规划建设跟不上城市化扩张的速度

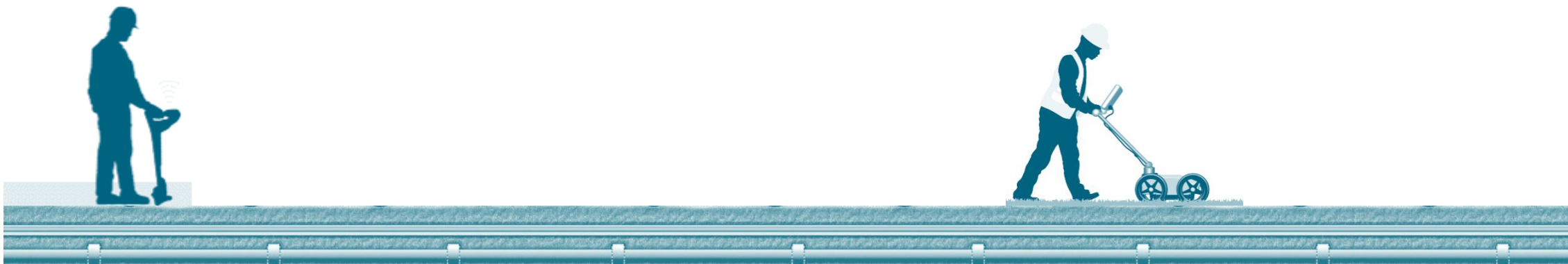


地上和地下资产管理

- 管道定位
- 埋藏对象探测
- 空洞探测
- 泄漏探测
- 获取海量数据



地下设施探测技术



探管仪

优势:

- 操作简单
- 体积更小
- 价格更低

不足:

- 只能探测金属管道
- 受电磁噪声影响
- 没有地图显示

探地雷达

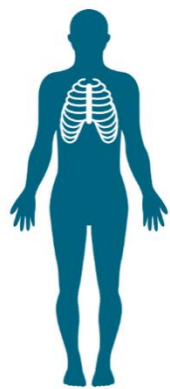
优势:

- 可以探测任何材质管线
- 精准定位管线位置和深度
- 地图显示

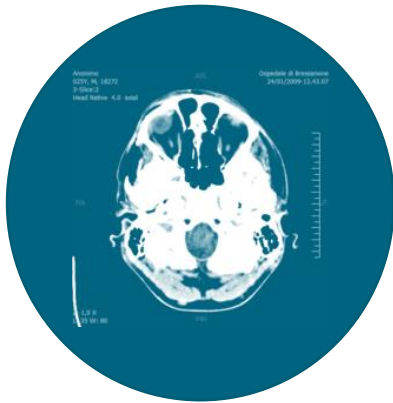
不足:

- 体积较大, 重量较重
- 需要专业人员进行操作
- 价格更高

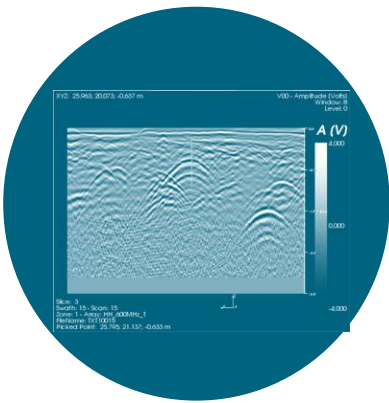
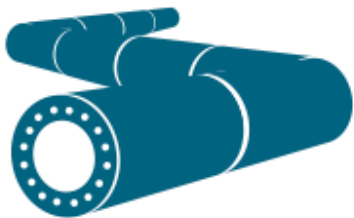
探地雷达原理



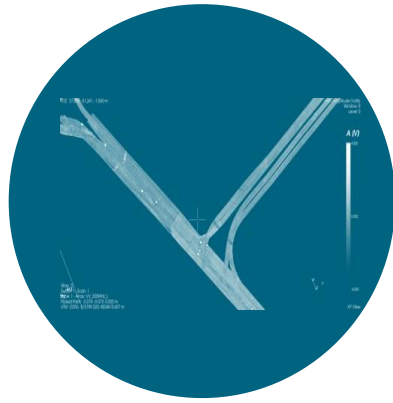
放射线照相术



X线断层摄影术

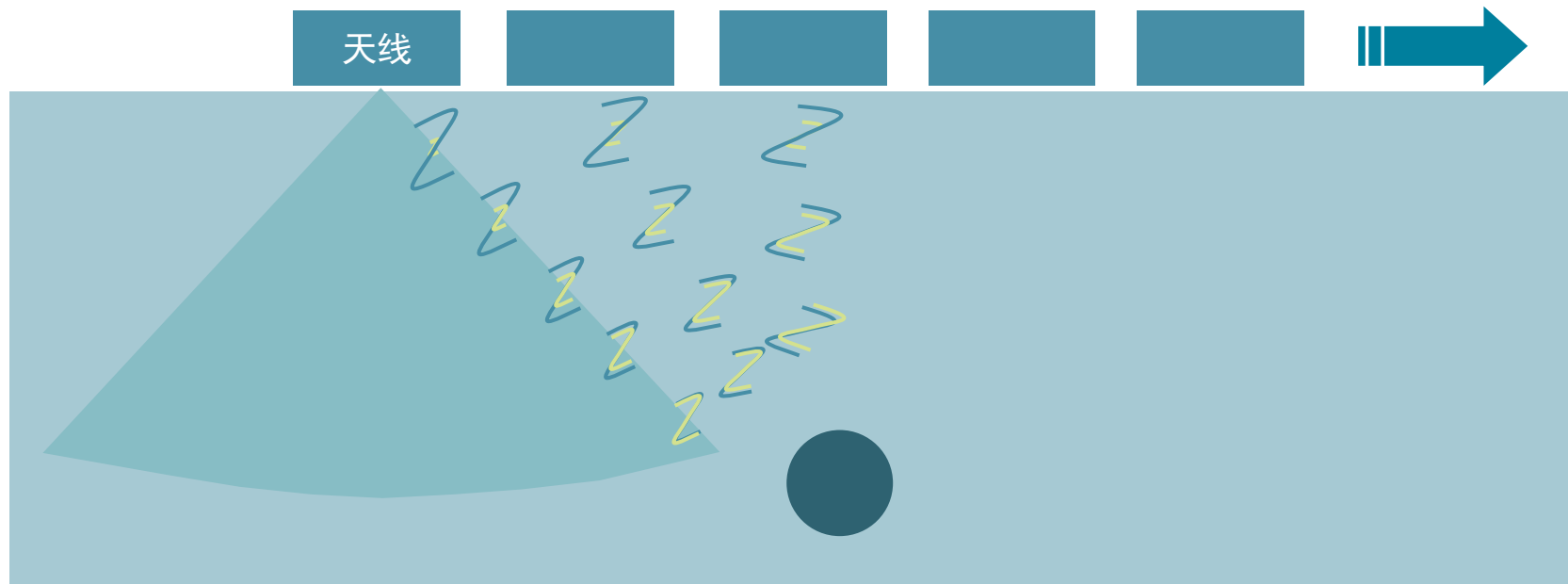


B型超声波扫描

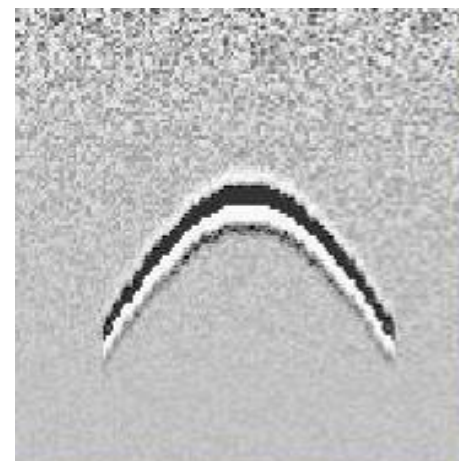
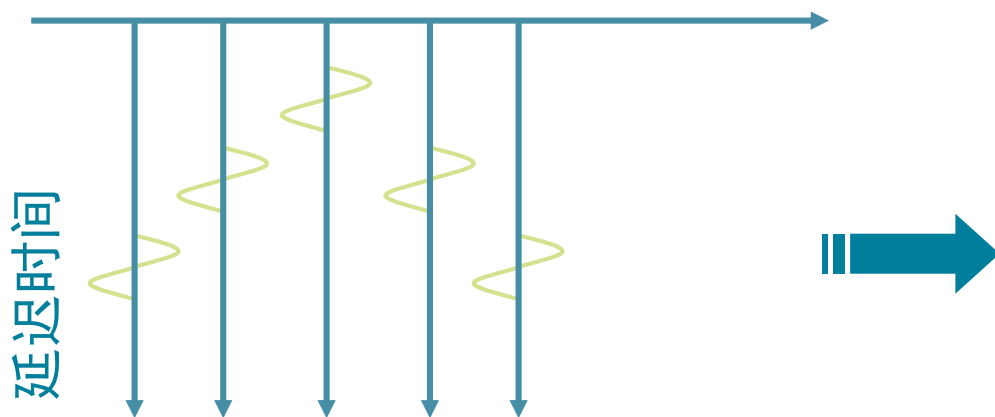


C-型扫描 (X线断层摄影术)

探地雷达原理

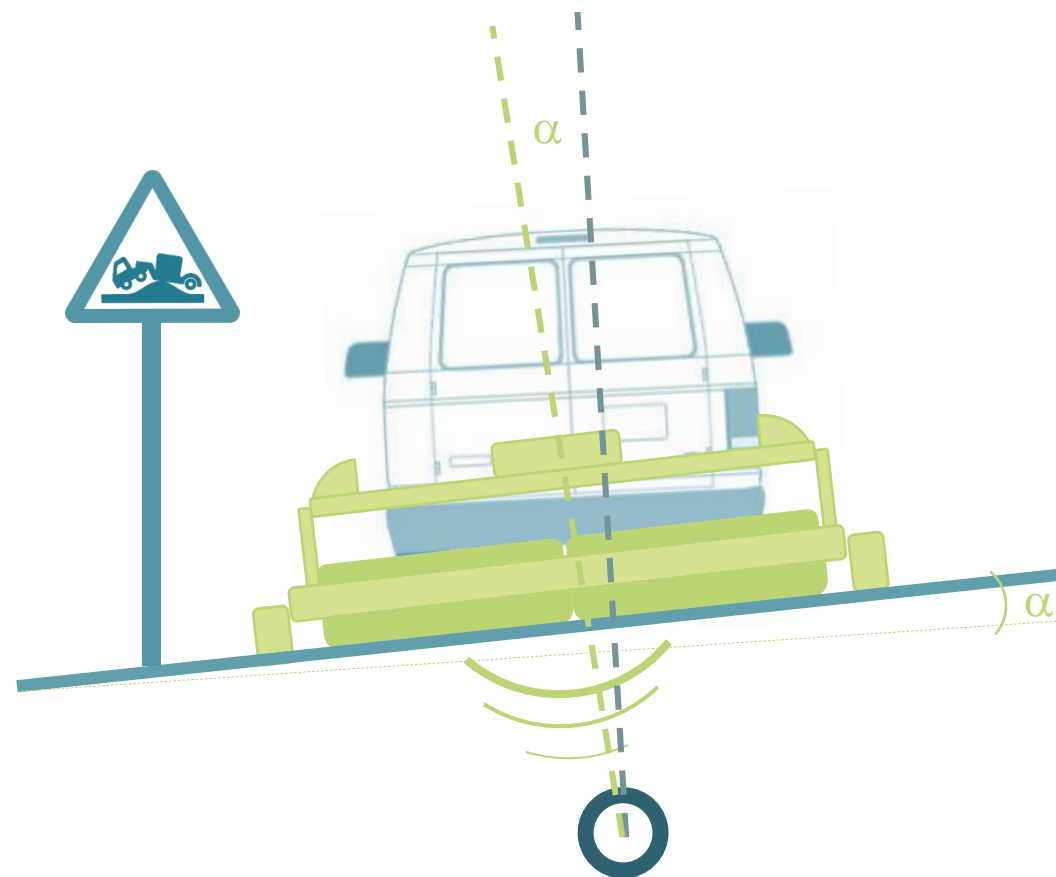
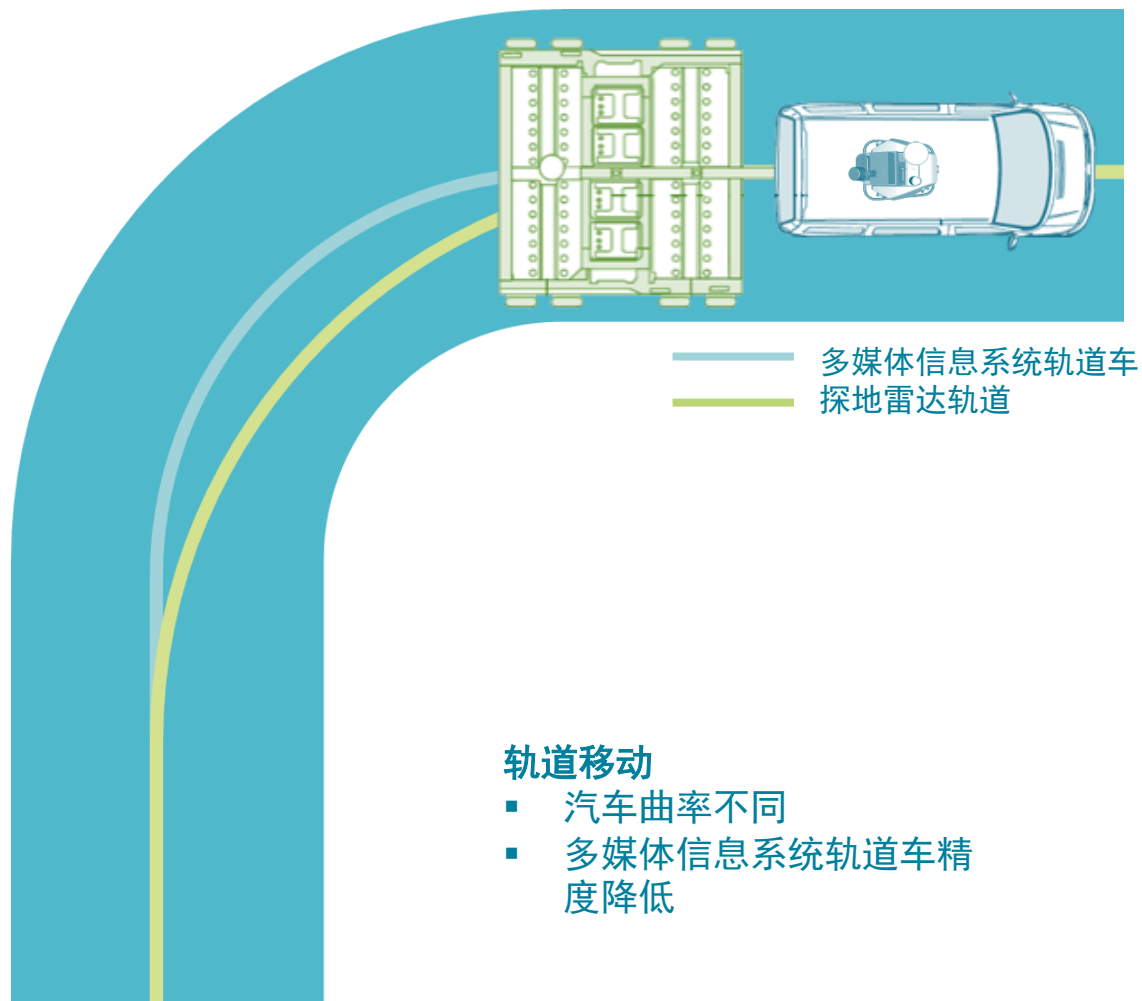


- 雷达通过天线传送一小股电磁脉冲
- 从不连续面反射的能量被天线捕获和接收.
- 时间延迟包含目标深度的信息





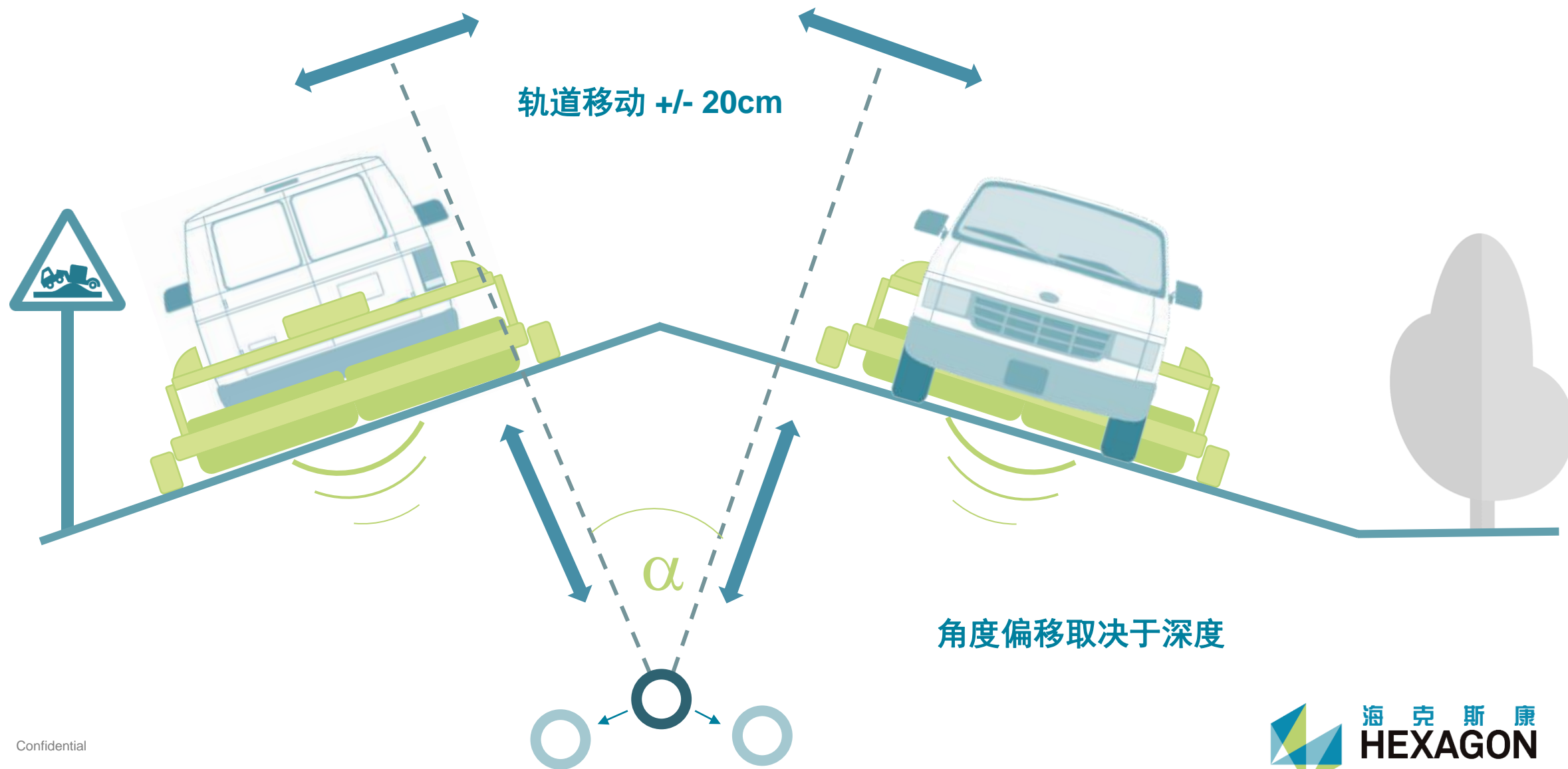
移动探地雷达面临的挑战



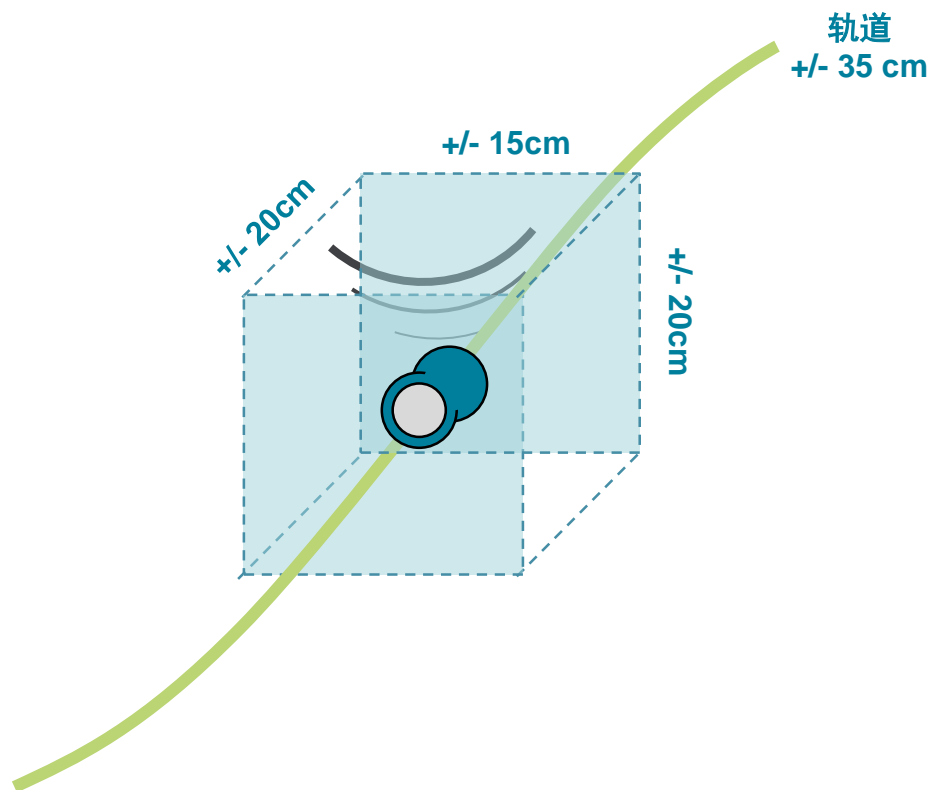
倾斜及摇晃偏差

- 车辆和探地雷达的倾斜及摇晃程度不同
- 惯性测量单元测量的是汽车的角度，而不是探地雷达的角度

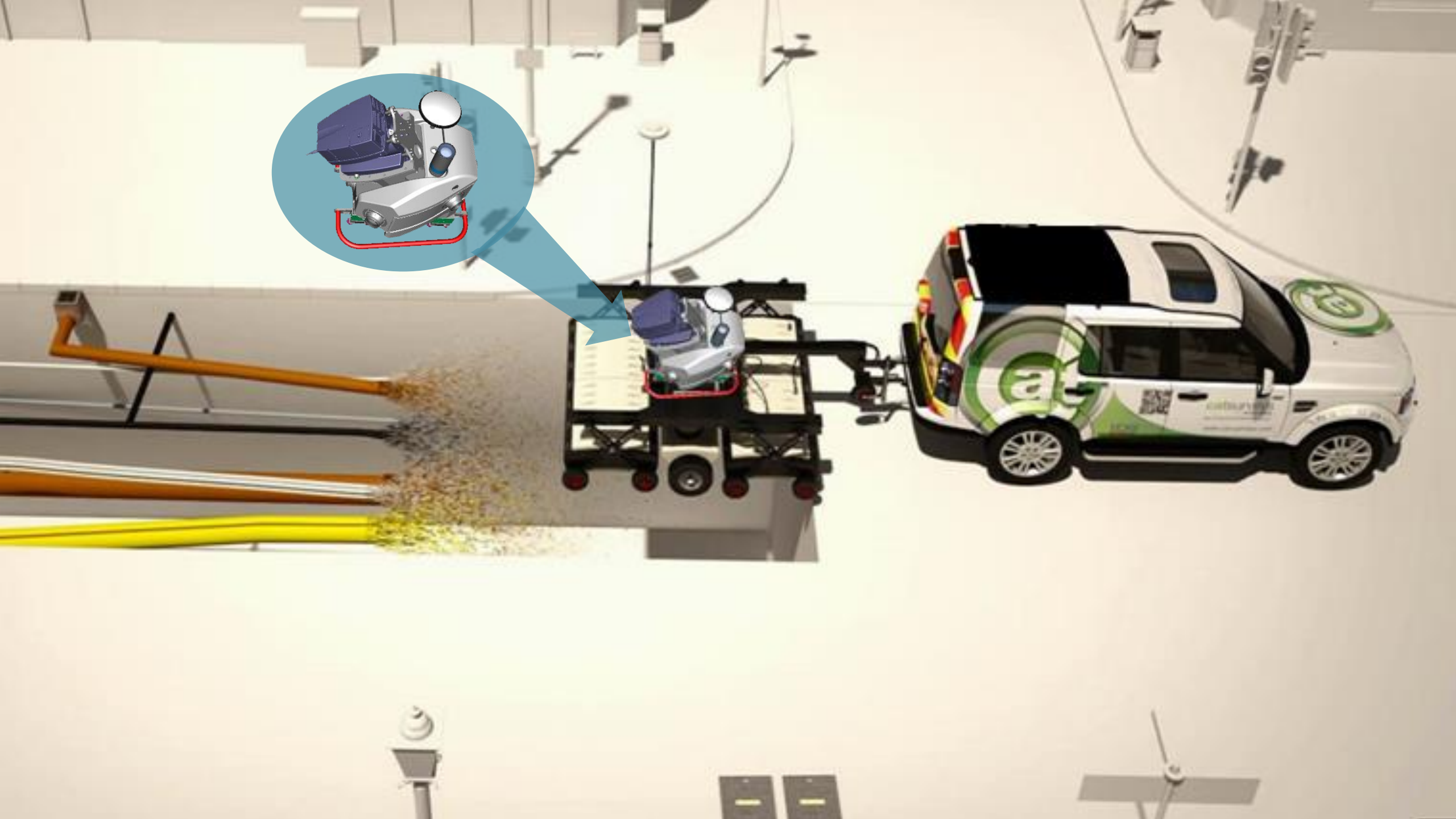
移动探地雷达面临的挑战



移动探地雷达面临的挑战



不确定性高达70厘米



公共设备探测及绘图



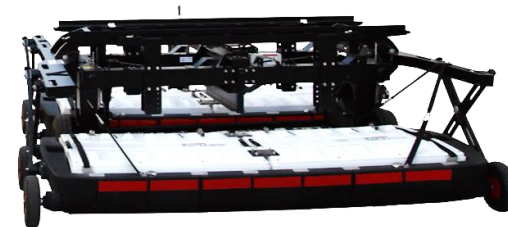
- 利用 GNSS及IMU, 1.5cm绝对定位
- 三维激光雷达, 每秒扫描100万点
- 360° 全景图像
- 摄影测量
- 道路分析
- 结合本地ArcGIS 以及 AutoCAD
- 独立灵活的车辆

- 探测深度可达地下10米
- 5米处的绝对误差为5cm
- 水平和垂直扫描
- 地下三维可视化
- 扫描速度15km/h
- 每天可获取100km数据
- ArcGIS 和 AutoCAD 工作流程

徕卡 Pegasus:两种使用方法



Leica Pegasus:Two

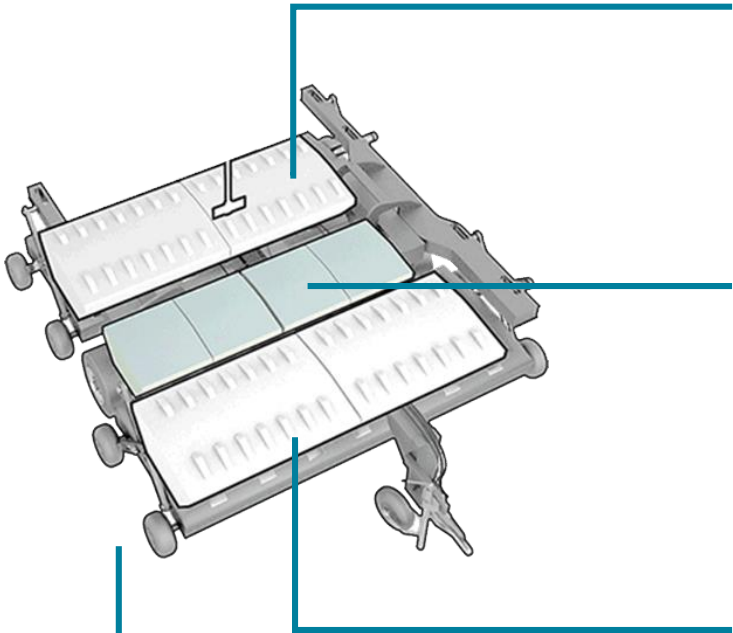


IDS Stream EM

探地雷达天线布局



框架宽度2.1米



40个天线阵



深层对象
第一DML天线阵列200MHz
→检测的主线

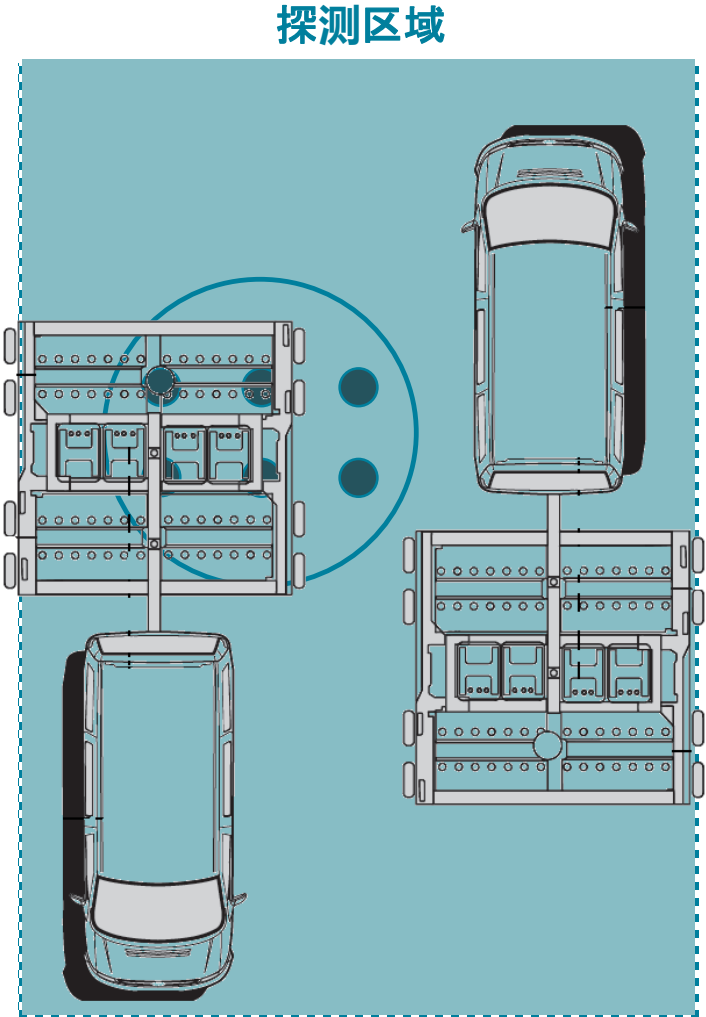
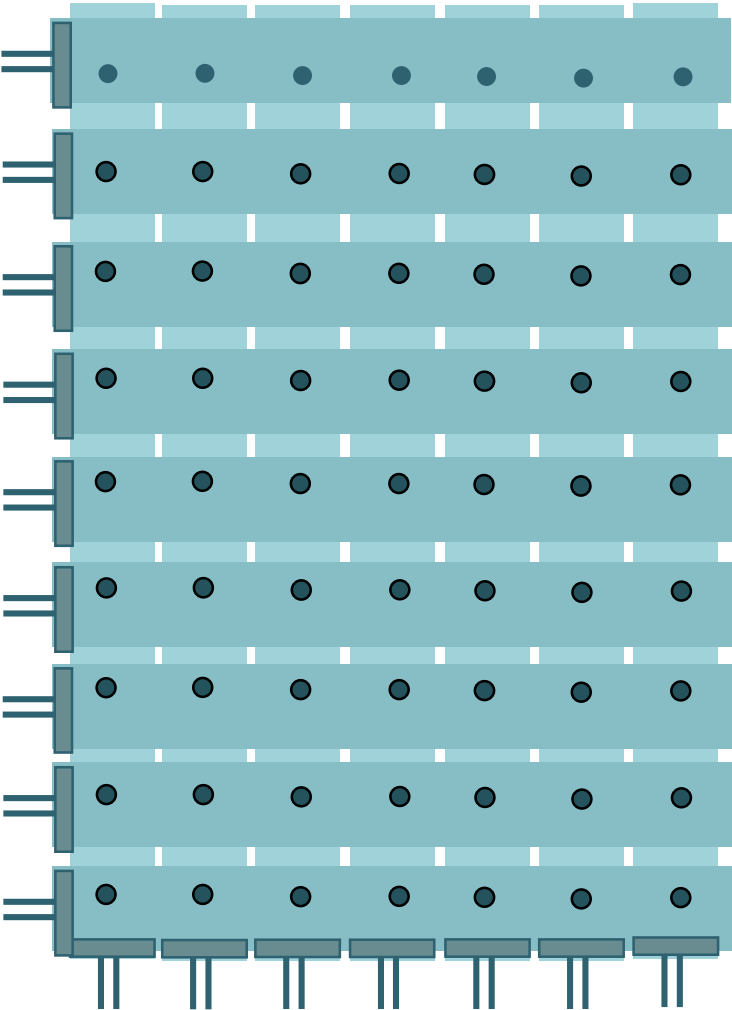


深层 & 浅层对象
第一DCL天线阵列, 600MHz
+ 200MHz
→检测交叉线



深层对象
第二DML天线阵列200MHz
→检测的主线

传统公共设备绘图 VS Pegasus工作流程



优势效益

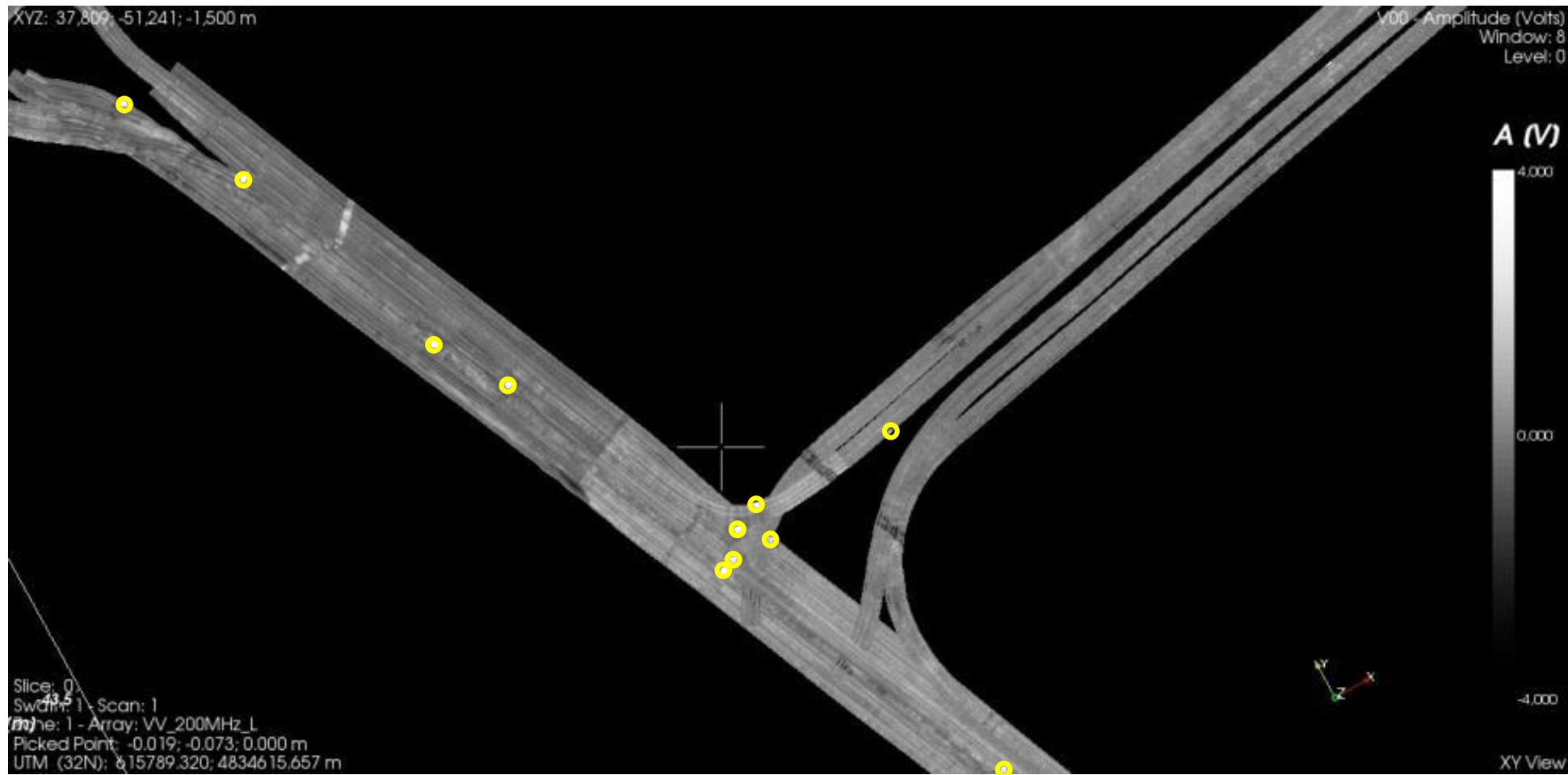
- 移动探地雷达方案 (速度 > 15 Km/h).
- 精准定位
- 纵向收集数据 (不需要横向移动数据组)。探测公共设施
- 交通管理需求最小化
- 保障安全, 降低风险
- 消除不必要的侵入性工作
- 每天可记录100公里数据
- 与传统的推进式探地雷达相比, 节省了成本和时间
- 实时进行三维记录
数据/可视化/检测



维修堵塞沙井



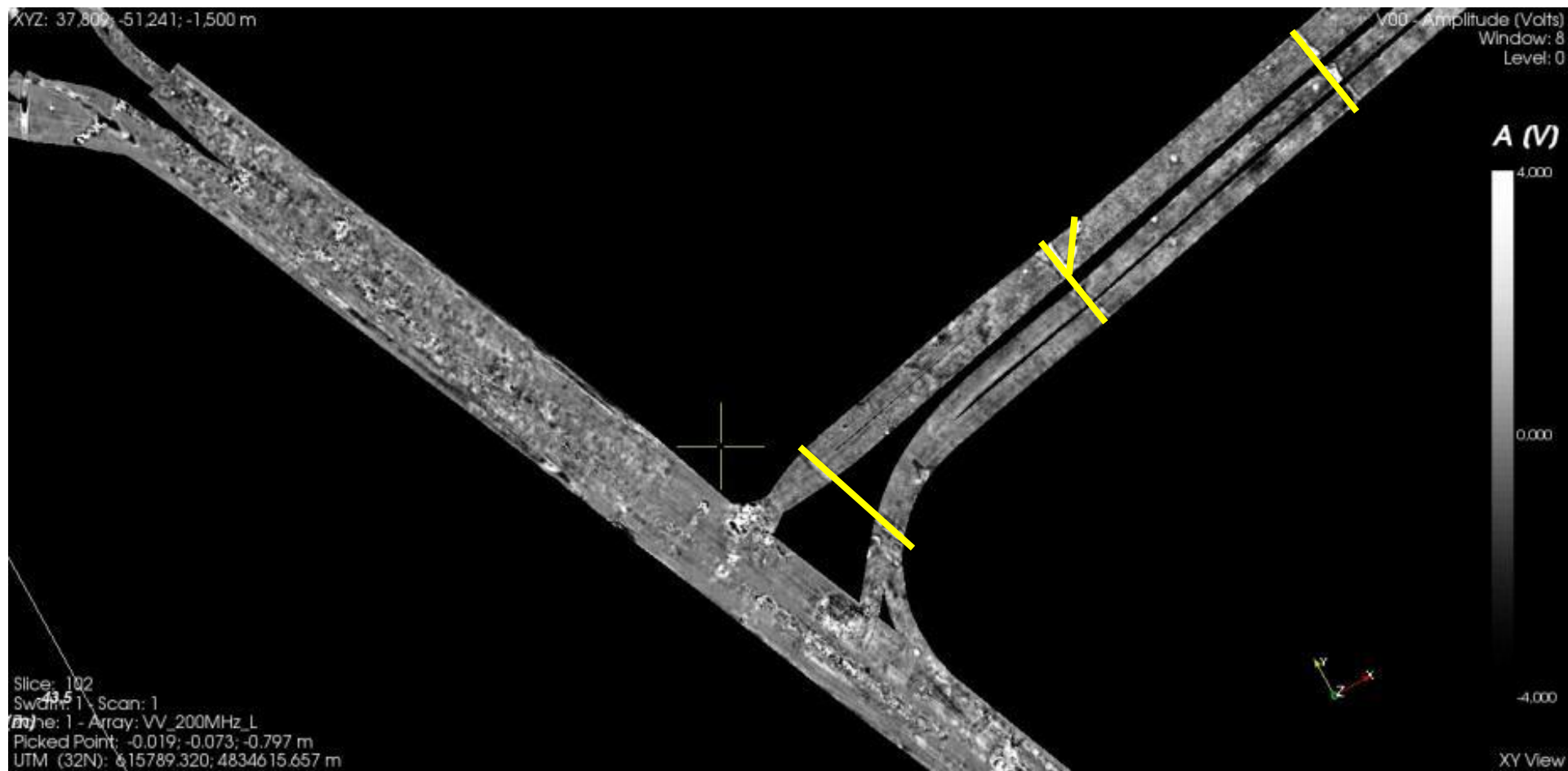
IDS GRED HD – 特征提取(检修孔)



未知管道堵塞了现场



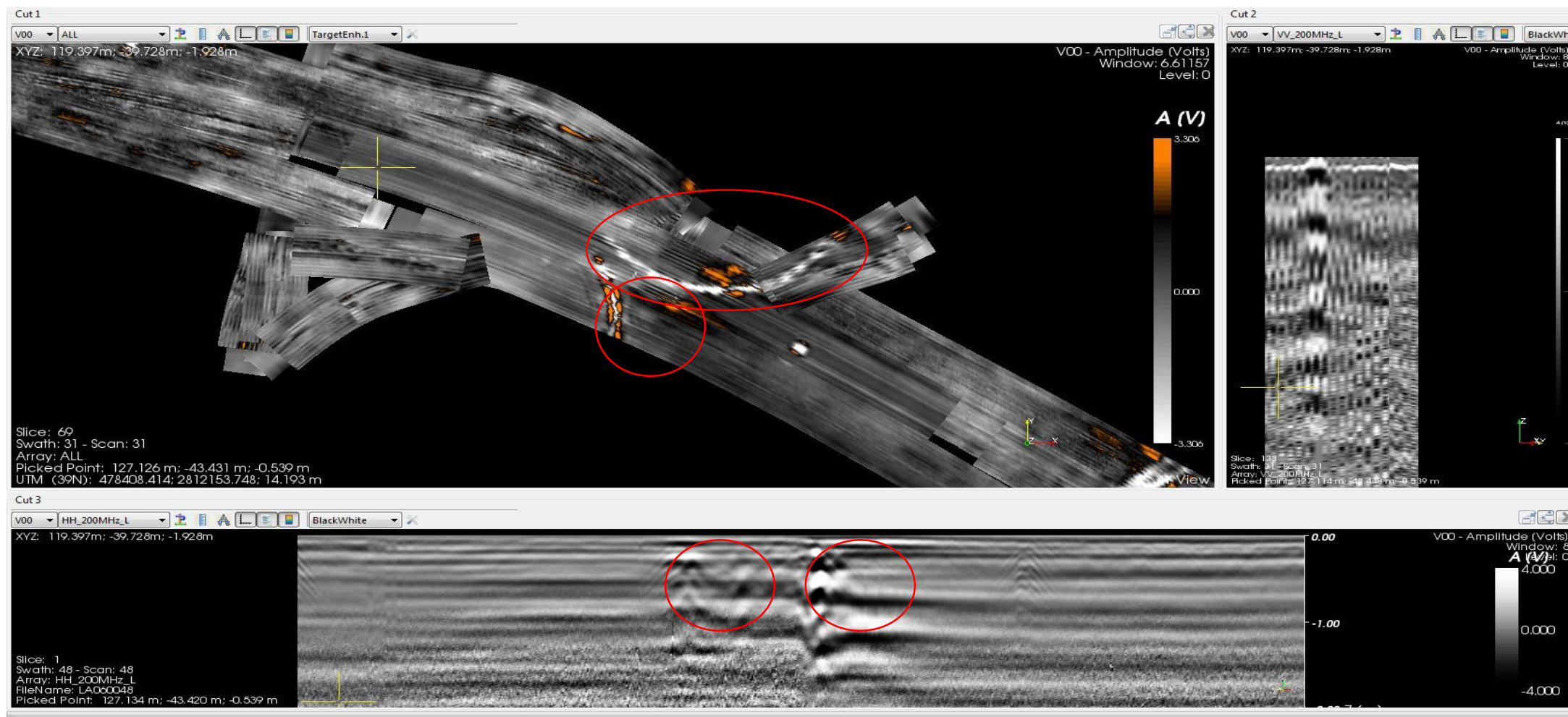
IDS GRED HD –特征提取(管道)



二战的轰炸影响了建设的进行



IDS GRED HD – 特征提取(埋藏对象)



路面塌陷街道



海克斯康
HEXAGON



澳大利亚，布里斯班

公共设备探测 – 工业地带

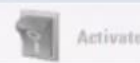
完整的工作流程



Pegasus:Two

Mission Name : P:\Pegasus\Mission\2015-SEP-02_Road_office

Dataset : P:\Pegasus\Mission\2015-SEP-02_Road_office\Track_



Activate



Start REC



Stop REC



Deactivate

Battery : 58%

756.57 Gb free on P:



Download

System Camera Info



Cam5 - 1.9 fps



Cam6 - 1.9 fps



Cam1 - 1.9 fps



Cam2 - 1.9 fps



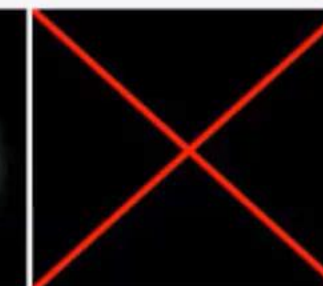
Cam3 - 1.9 fps



Cam4 - 1.9 fps



Cam7 - 1.9 fps



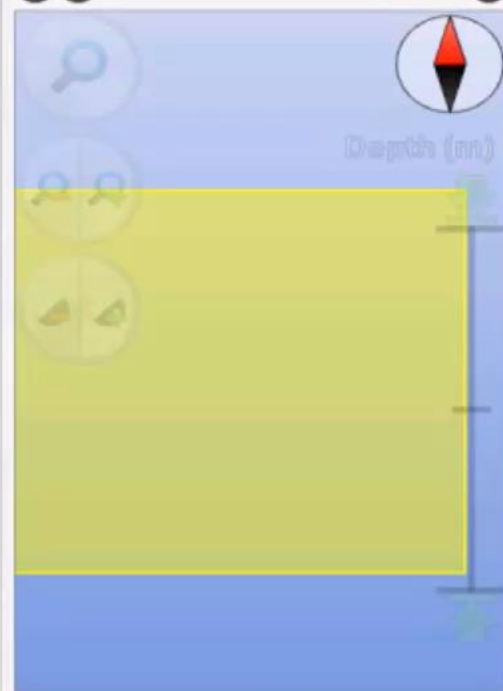
Cam8

Survey_2015.09.02_007 - OneVision

Current Swath: 1 Array 200 VV



C-Scan



B-Scan1

- Ch. 9



B-Scan2

- Ch. 38



Controls



1.2 km/h



C-Scan

B-Scan1

B-Scan2

T-Scan

Address : 172.20.4.100

8MB Part:4

18 Profiler.part4 Drive:Internal

E 15259.4540

5 percent -

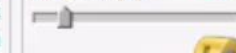
dt	Events	Lost Frames	GRSS/IRS Error
-0.01	257	2 2 2 2 2 2 2 256	0.2
Space / Speed		Frame distance/ CPU load	Cams overload
490.3 [1][0.3]		1.9	
SAT	IRS status	GRSS status	Static/ZUPT
19	IRS Good	SOL_COMPUTED	

SPAN Log : "24517473.gps" (9405.75 Kb)



Mission Control Miscellaneous Hardware Setup

Coordinates :
499099.80
6978538.28
52.29

Image Acquisition :
Frame dist (m) 2.0

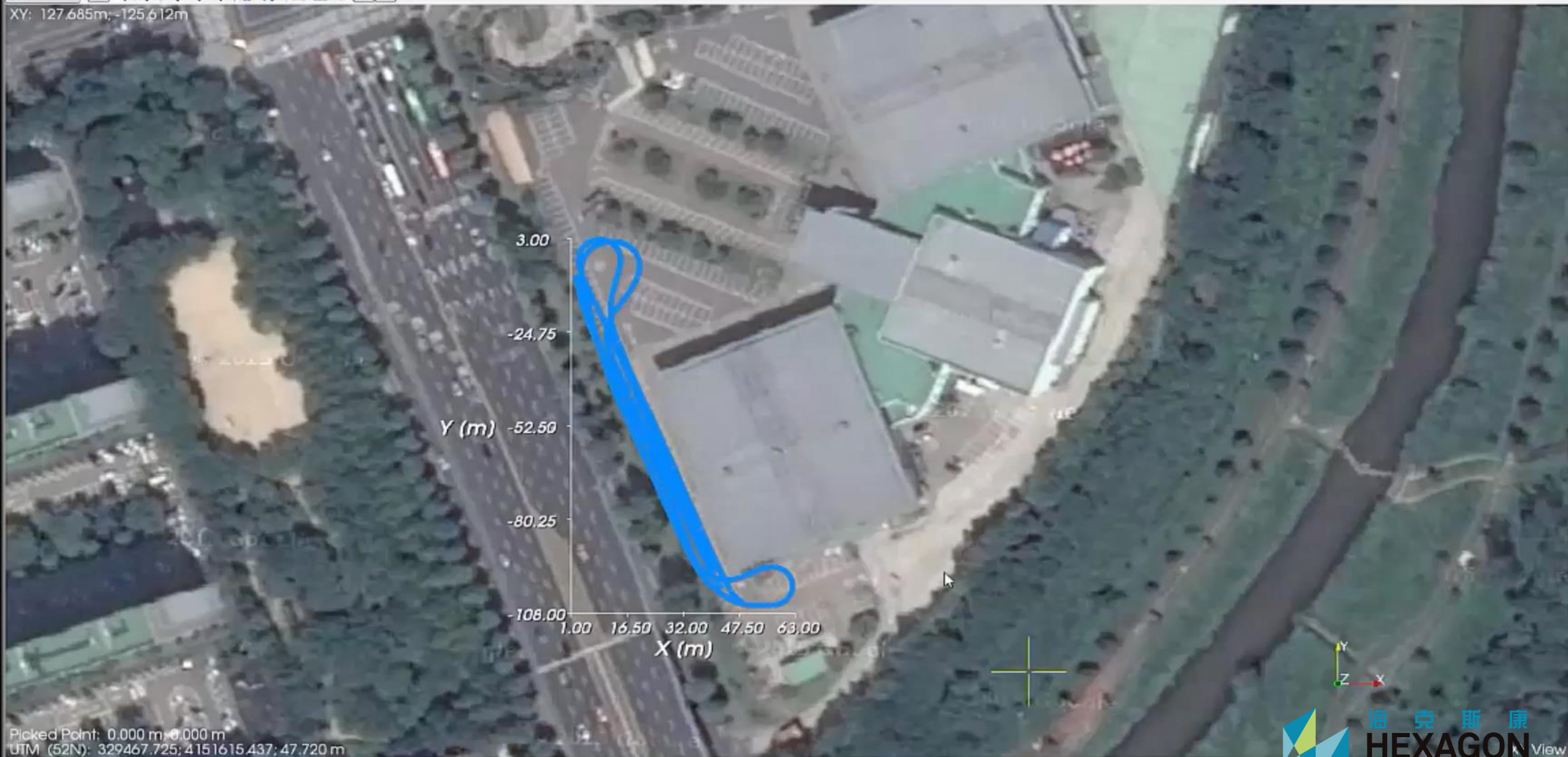
Timers :
From Start REC : 00.07.41
From Stop REC :

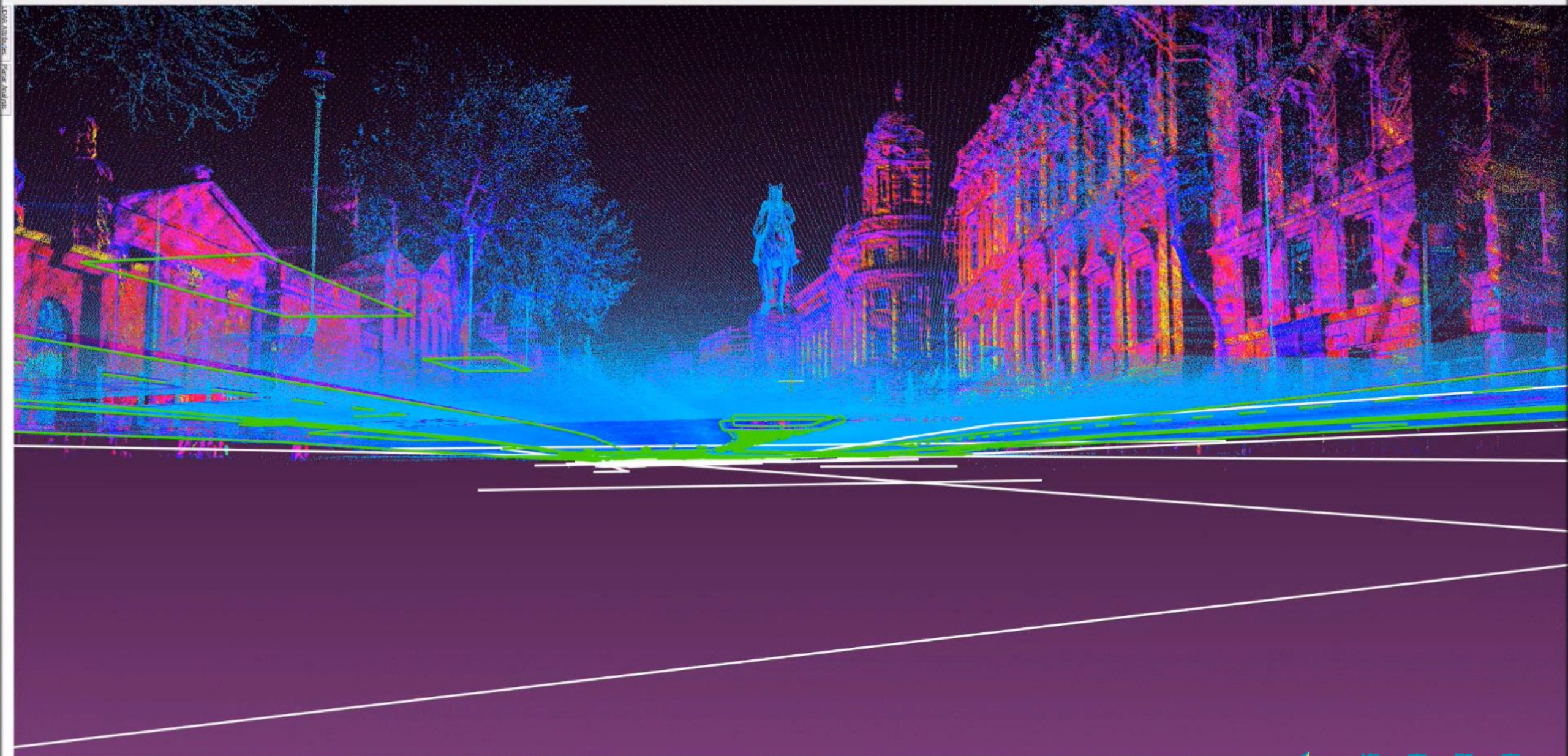
Annotation (F10) >>>

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HEXAGON



XY: 127.685m; -125.612m





699 438.531, 5 709 812.824 50.199 0.058

D Snap

0.2

2D

3D

Parallax: 0

FOV: 0

☒ Minimum point thickness

ROT

海克斯康
HEXAGON



英国，伦敦

公共设备探测 – 希思罗机场

2011年，希思罗新雪基地

Heathrow Winter Resilience Enquiry

Report of the
Heathrow Winter Resilience Enquiry



- 设备投资5000万英镑
- 目前雪基地不够大
- 政府要求为下一场大雪来临做好准备
- 由于时间紧急，没有时间做额外的调查
- 新雪基地设计花费800万英镑
- 截止日期为11月

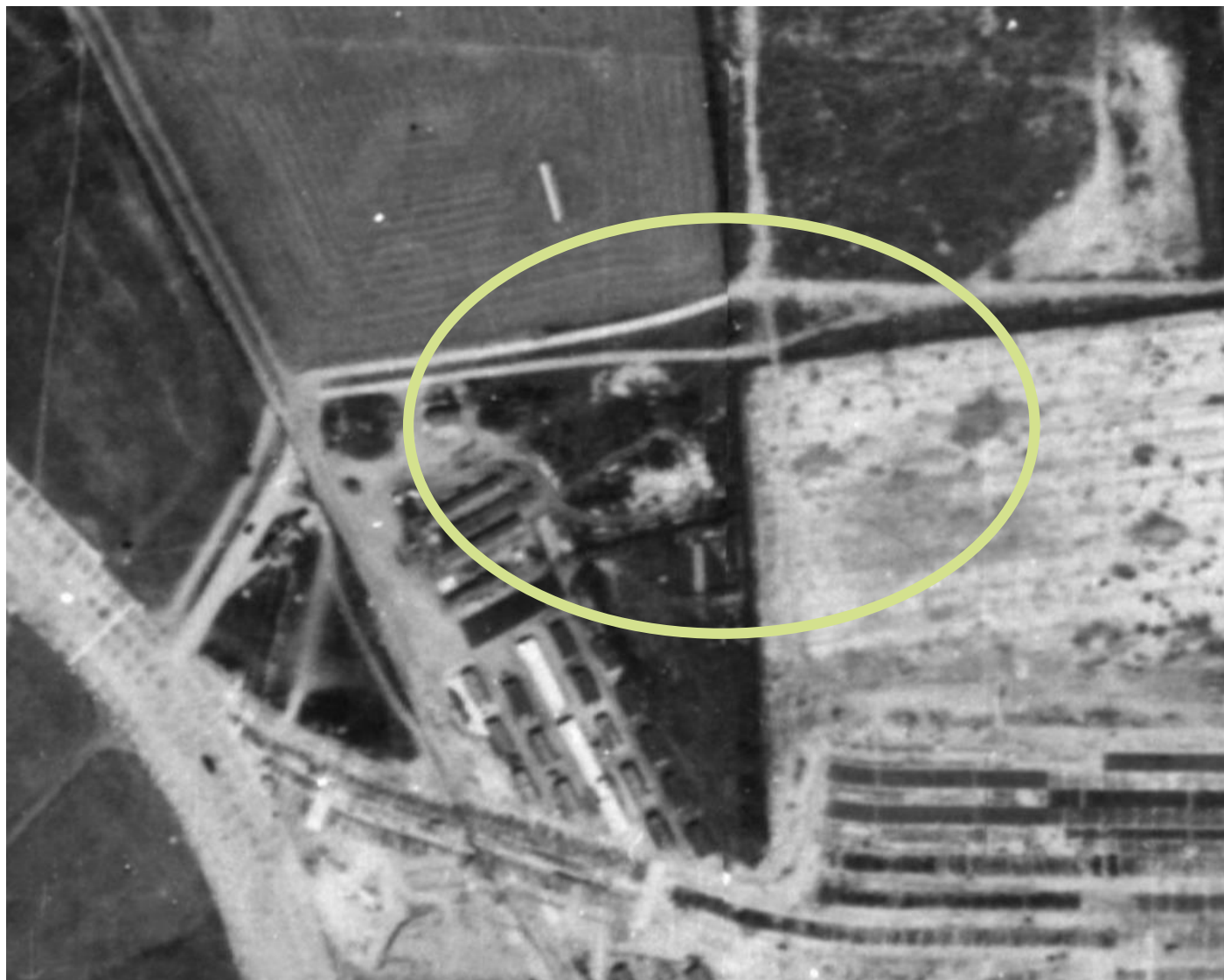
依据已知信息进行设计



1947雪基地



1949雪基地



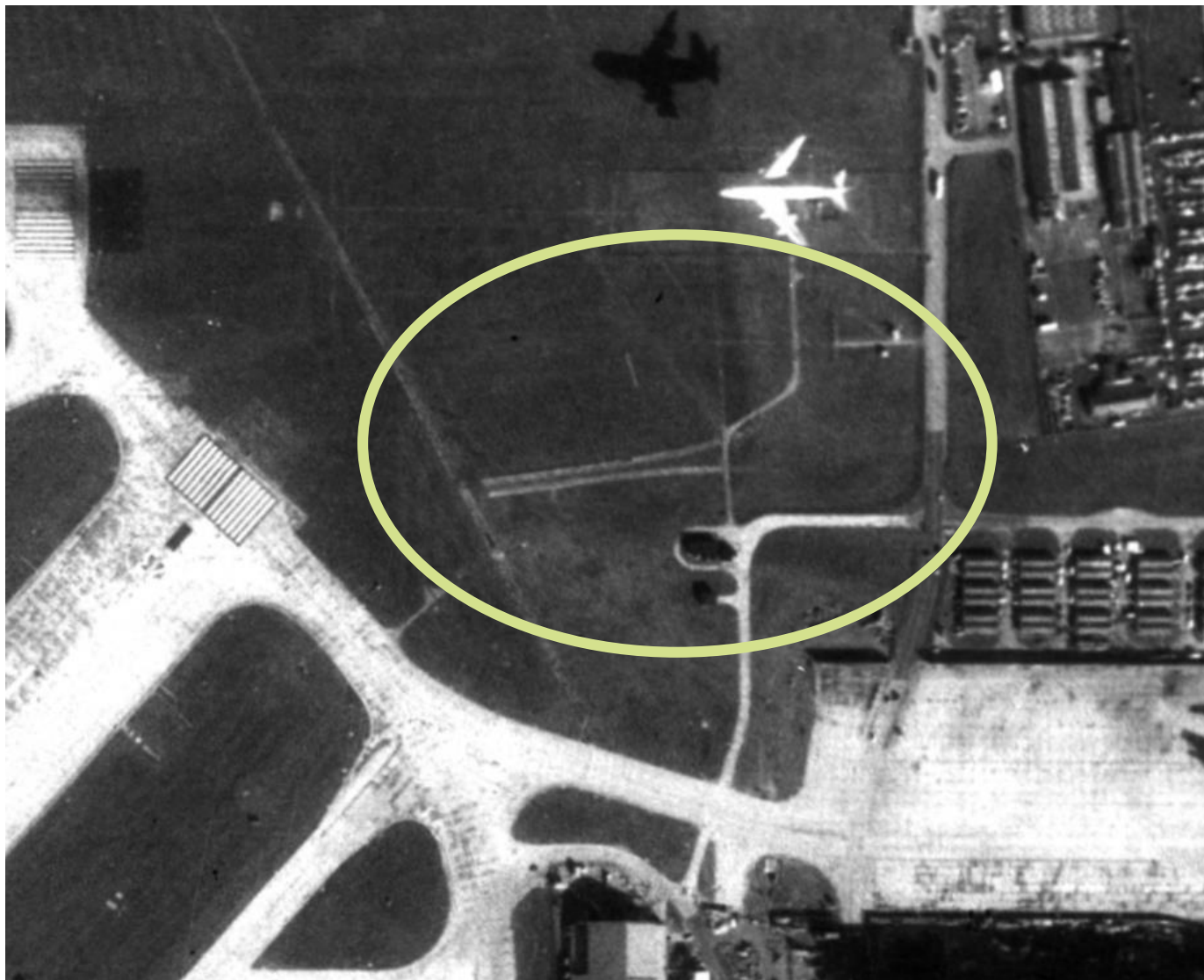
1951雪基地



1959雪基地



1973雪基地



1987雪基地



1996雪基地



2009雪基地



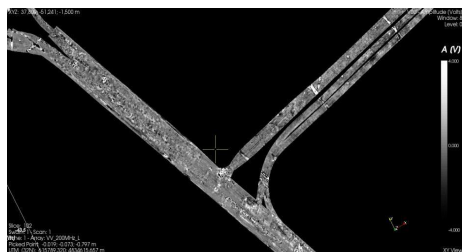
2013雪基地



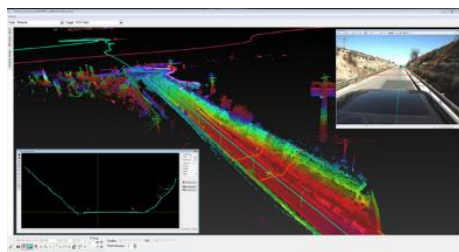
希思罗机场服务



大规模的数字化方案在高投资回报率下提供了最佳的决策



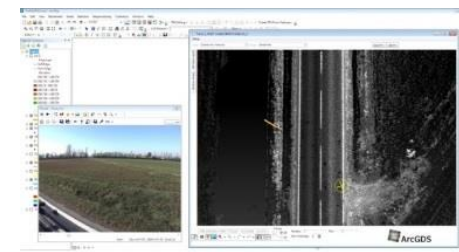
管道探测



横截面



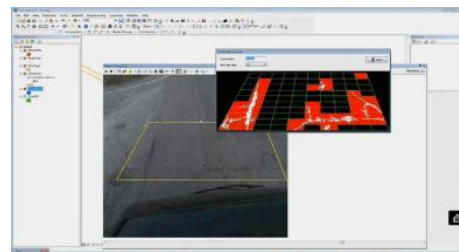
360° 全景



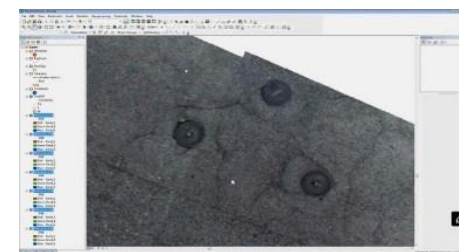
路线提取



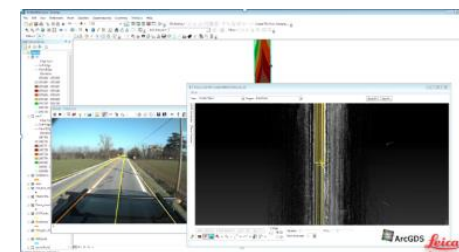
路标检测



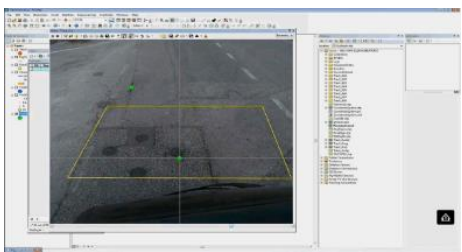
路面裂缝指数



高分辨率图像



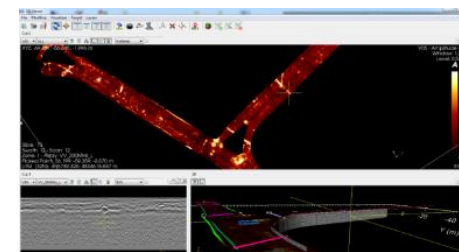
路面变形



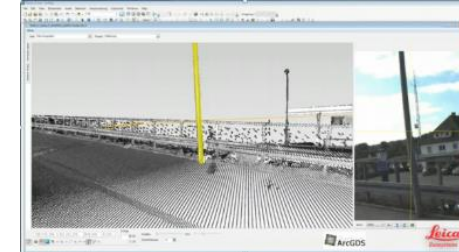
深度分析



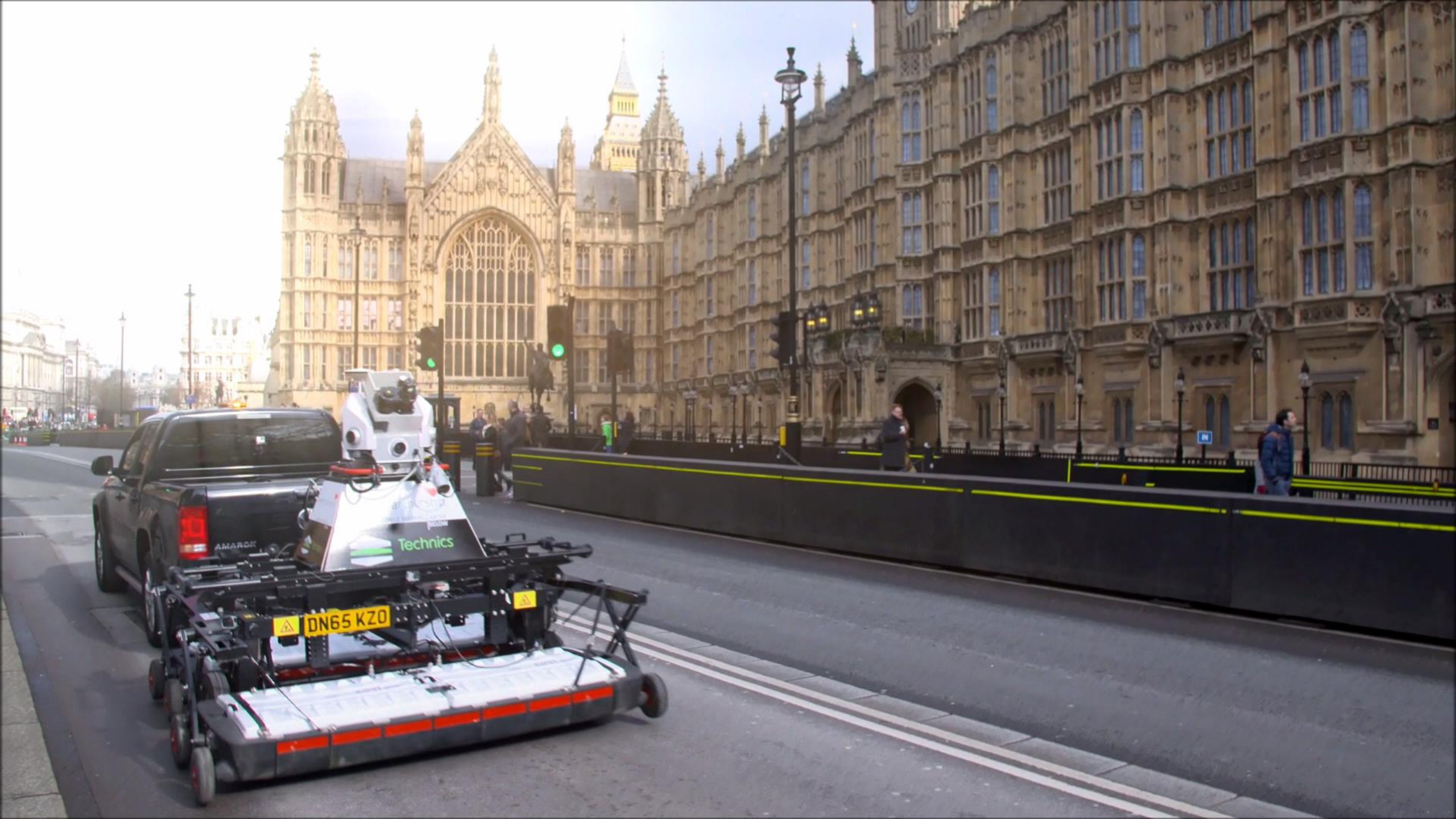
间隙分析



空洞检测



极点提取



—— 谢 谢 ——

A decorative graphic at the bottom of the slide consisting of multiple nested chevrons pointing upwards. The chevrons are colored in a gradient of blues and greens, with the innermost chevron being a vibrant green and the outer ones transitioning through various shades of blue.