Creating Infinite Possibilities.

SCTE
a subsidiary of CableLabs

Drone Innovation: Proactive and Reactive Network Maintenance

Jack Morrison

Technology Consultant
Liberty Tech' (Liberty Global)
jamorrison@libertyglobal.com

SCTE CABLE-TEC EXPO 22
SEPTEMBER 19-22 • PHILADELPHIA, PA

2022 Fall Technical Forum
SCTE • CABLELABS • NCTA

Liberty Global Network Innovation Team

LIBERTY GLOBAL

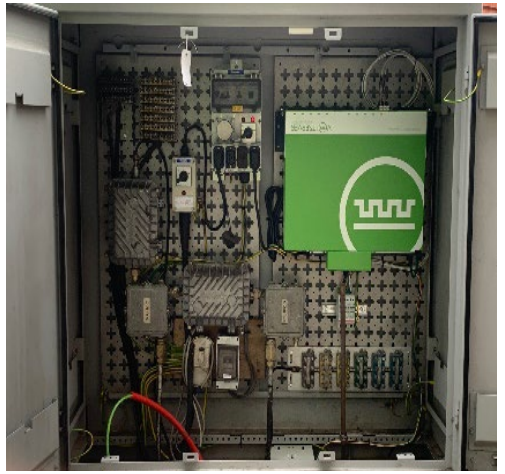
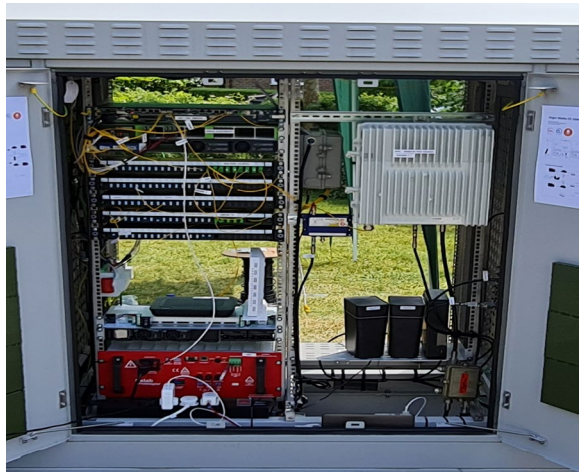
Network Innovation Team

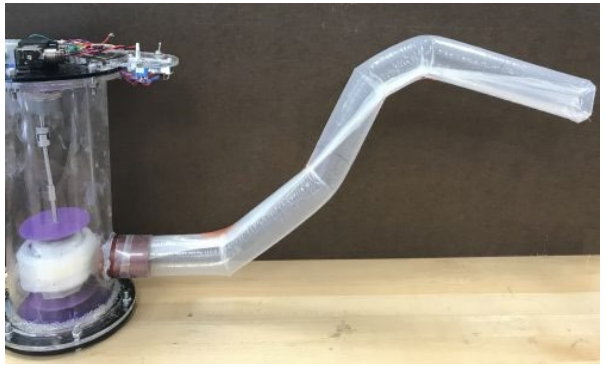
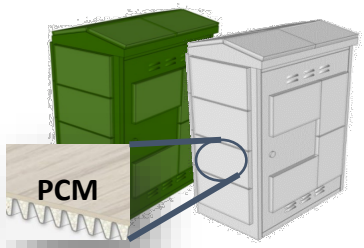
- Disrupt/Challenge Network Roadmaps
- Compliment Network Roadmaps
- Identify Opportunities

- Identify and evaluate emerging Access technologies
- Conceptualize new products/opportunities
- Conduct POCs early in the technology lifecycle.
- Accelerate Access Roadmap development by rationalizing & refining Access technology options.
- Influence Vendor product roadmaps; Leveraging disruptors to deliver significant change & benefit.
- Act as primary external Interface to Industry and Academia

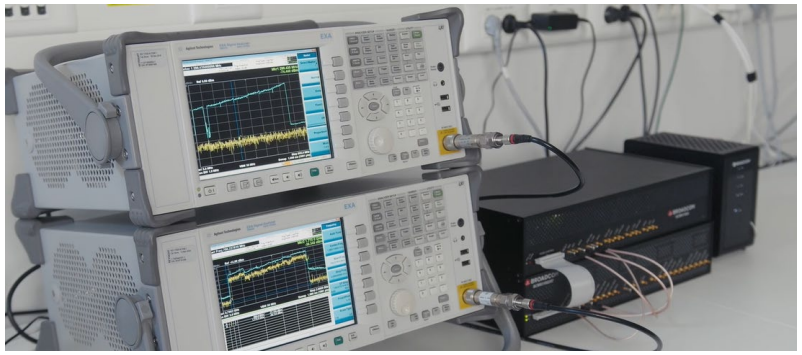
LG Innovation Successes





Mobile Operators Are Well Positioned

“The drone services market size is expected to grow to $63.6 billion by 2025.”
Insider Intelligence

“We forecast a $100 billion market opportunity for drones—helped by growing demand from the commercial and civil government sectors”
Goldman Sachs

Todays Use-Cases

- Infrastructure Surveys
- Operations Logistics
- Radio Planning
- Videography
- Digital Twins

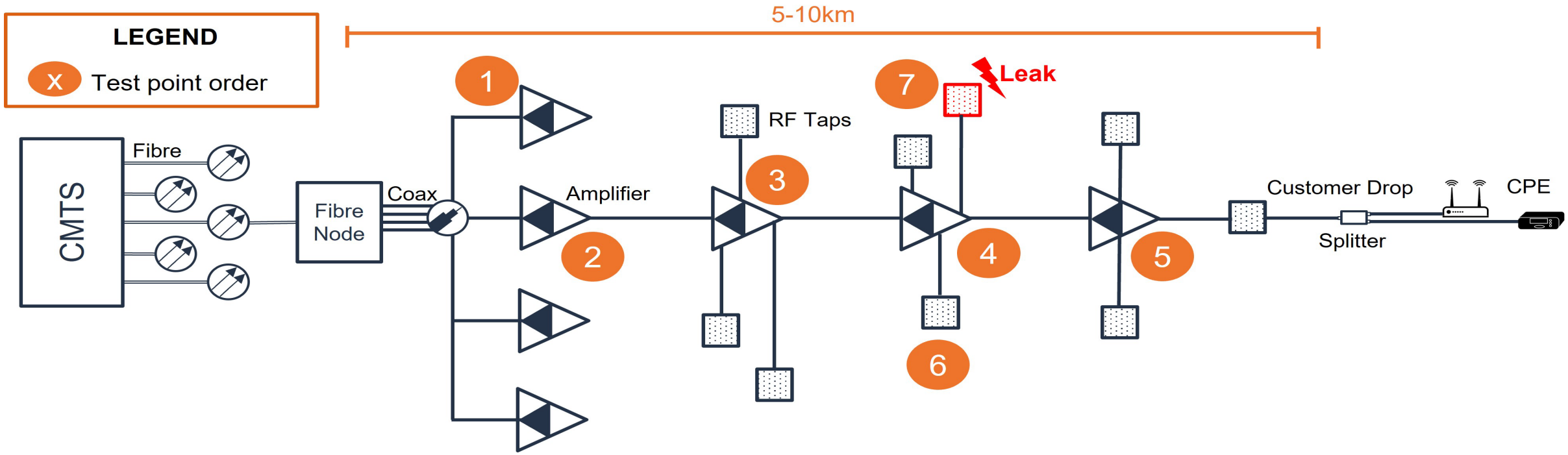
- Network planning
- Thermal Surveys
- Consumer Logistics
- Disaster Recovery
- Network Maintenance

Problem Statement

- Globally, millions of dollars are spent each year identifying and resolving HFC ingress/egress faults
- Ingress contributes to poor network performance > poor customer experience > poor NPS and increases churn.
- Not all operators adopt PNM tooling to identify network leaks. Those that do often have variable levels of integration with GIS and topology systems.
- Over 90% of HFC leakage events are attributed to either: Cable damage, poorly terminated connectors and uncapped taps
- **Fault finding and resolution is both expensive and time consuming**

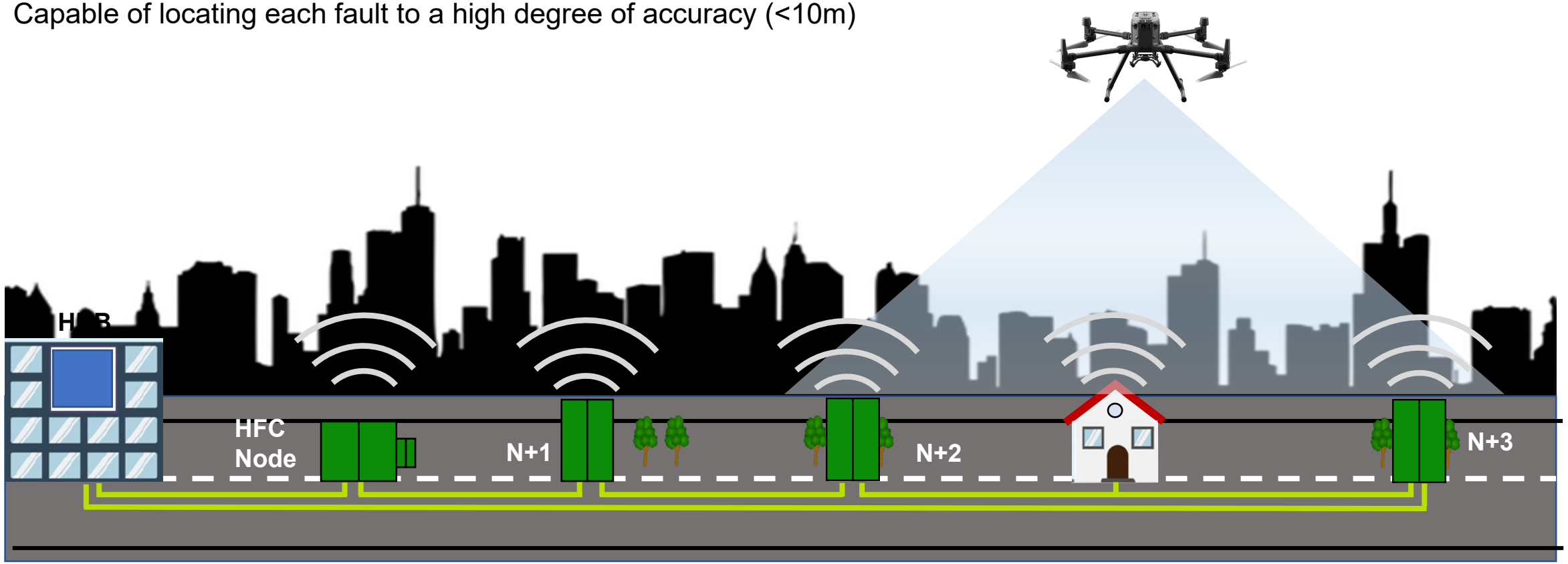
Today's Approach

- In one LG operating country the average ticket life for a major (>500µVm) HFC leakage fault was 12+ hours (including 6 hours post-resolution monitoring)
- The average truck roll for a single fault ranges between 5-7 hours, equating to x100 £,$,€



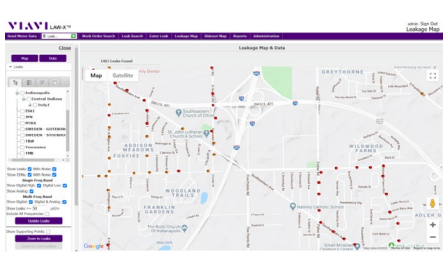
The Conceptual Solution

- Develop a drone mounted RF detection system
- Ability to identify all network egress events across an entire town
- Capable of locating each fault to a high degree of accuracy (<10m)



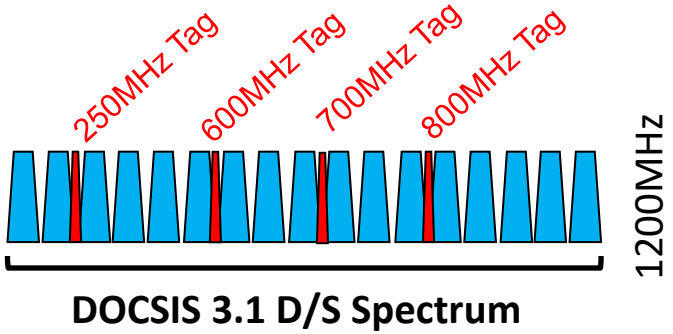
Challenge One: Detecting Leaks

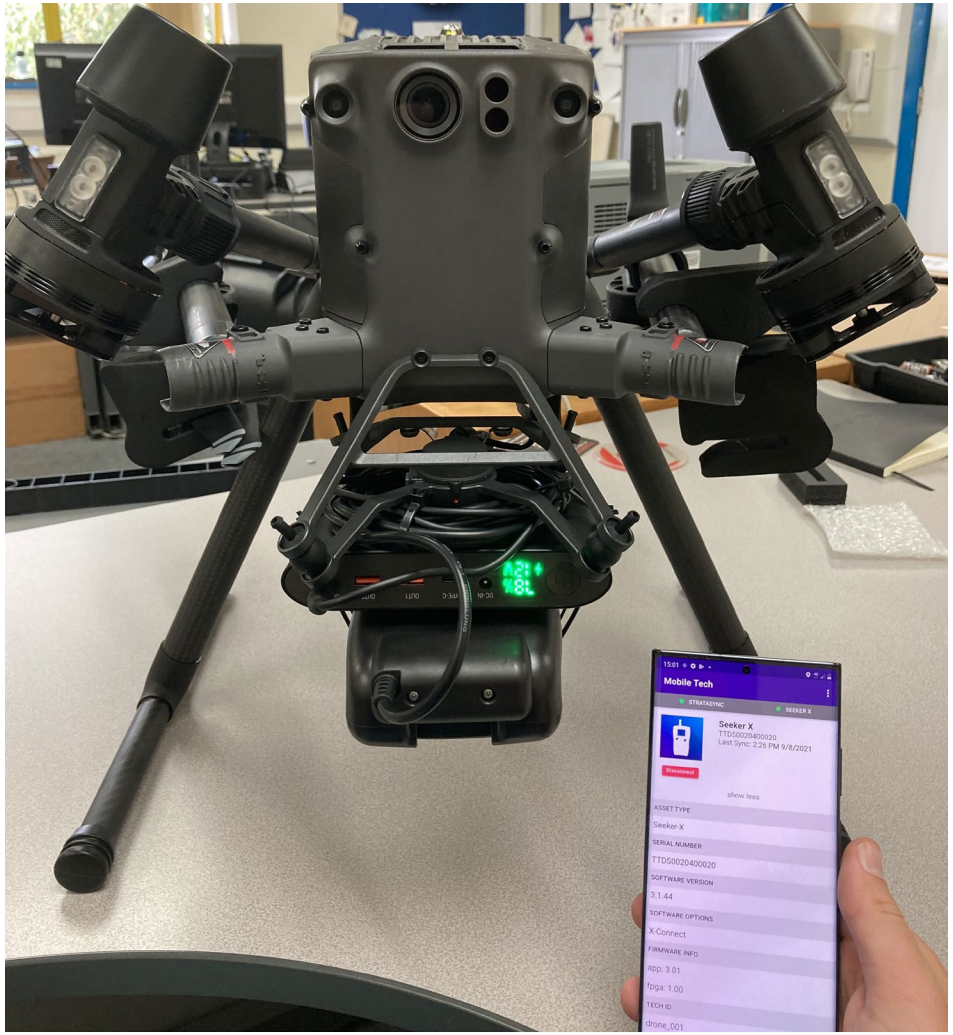
CT-X Tagging Chassis



Law-X Platform

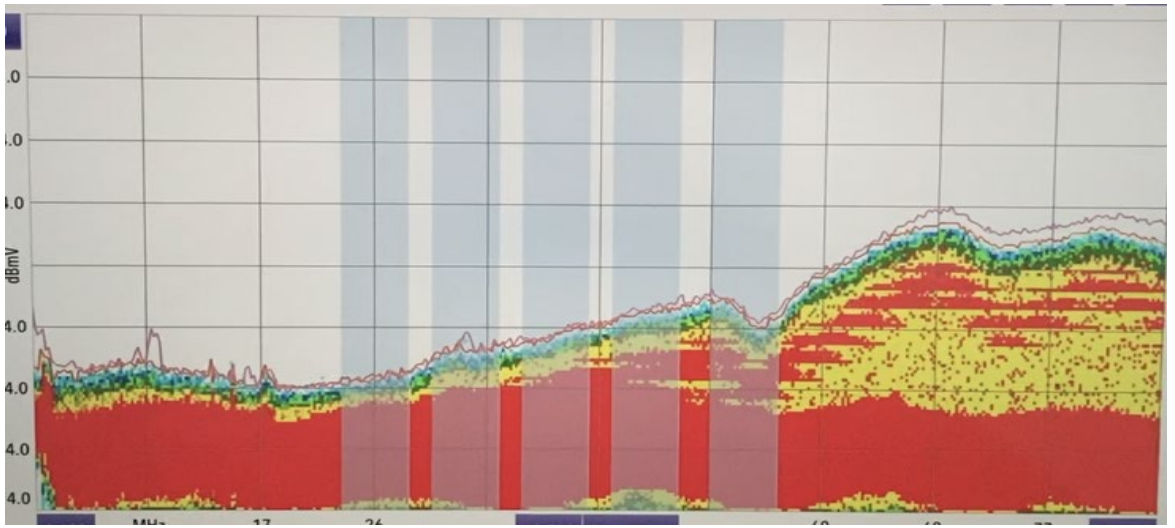
RF Meter

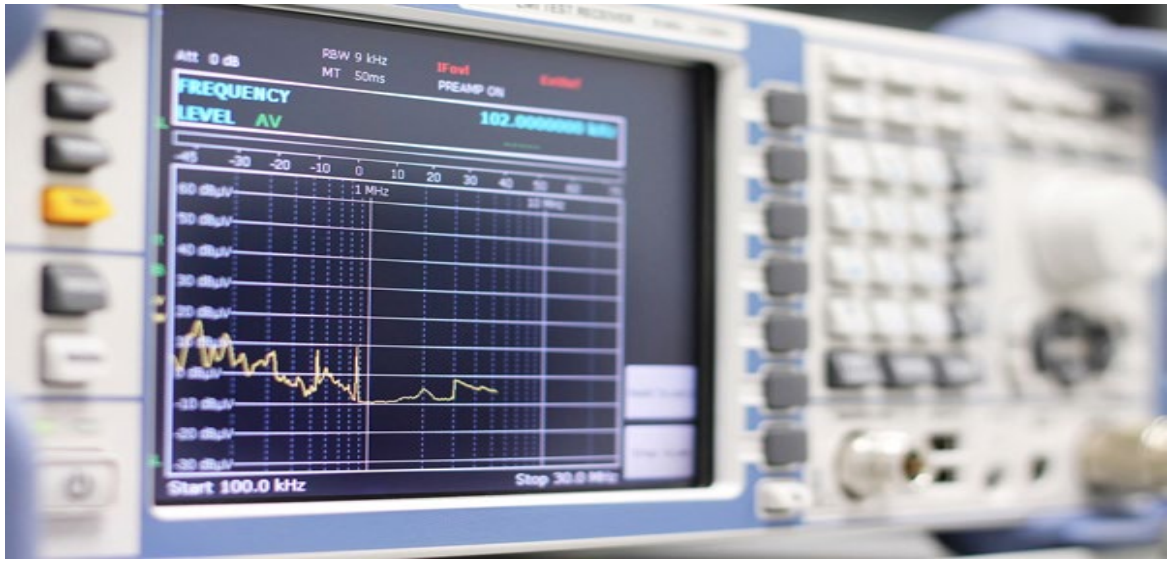




Challenge Two: Electromagnetic Interference

0 – 2000MHz



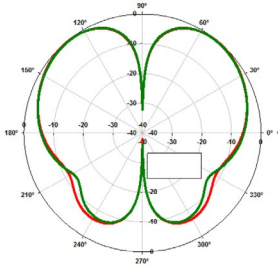


Stand-Off Designs

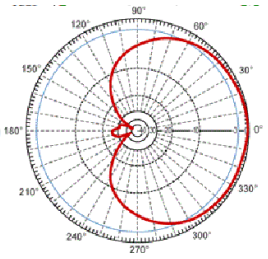
Stand-off bracket design

Challenge Three: Antenna Design

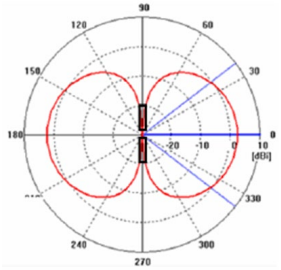
Fin



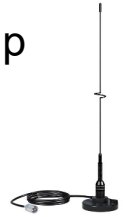
Bi-Directional

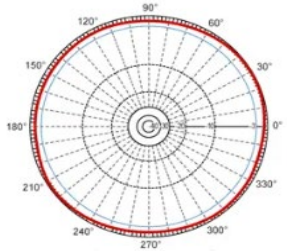


Di-Pole

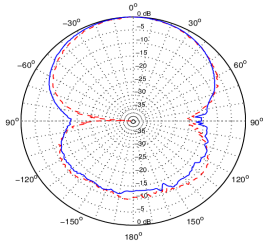


Whip

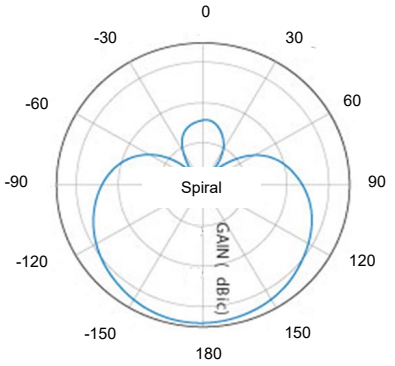


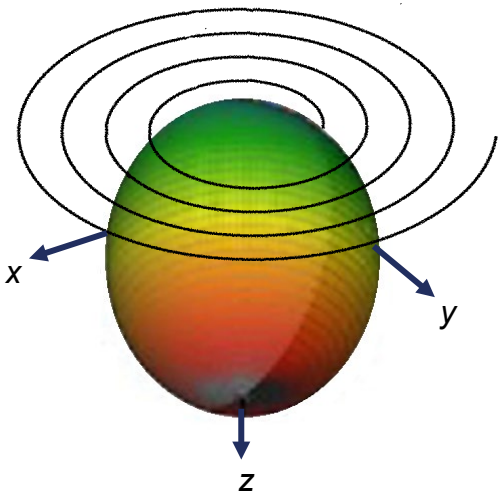


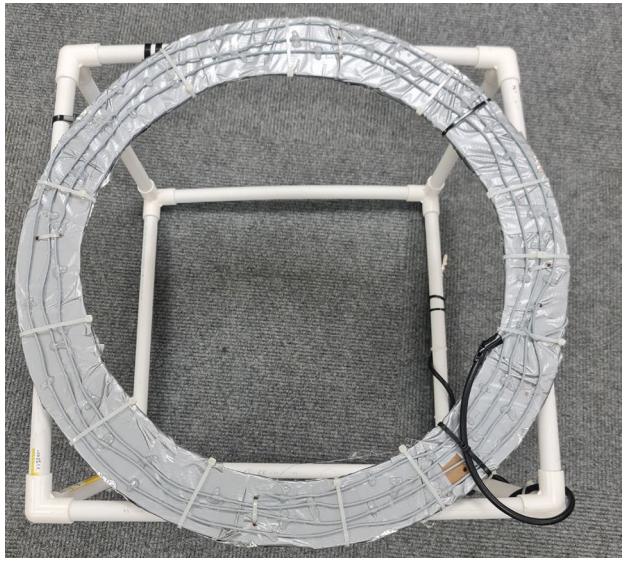
YAGI

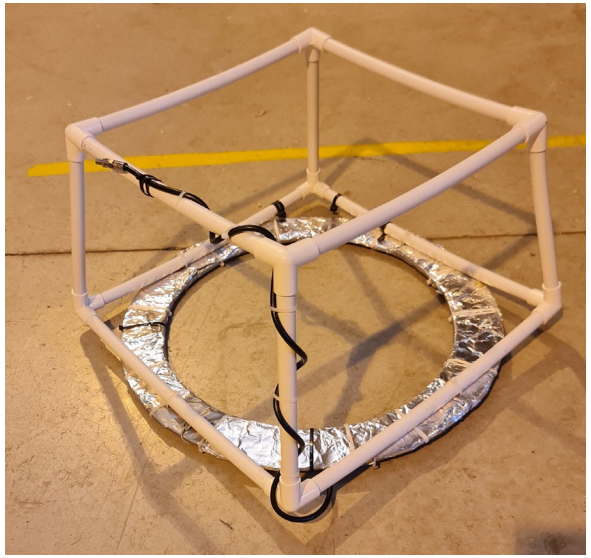


Spiral Antenna Design



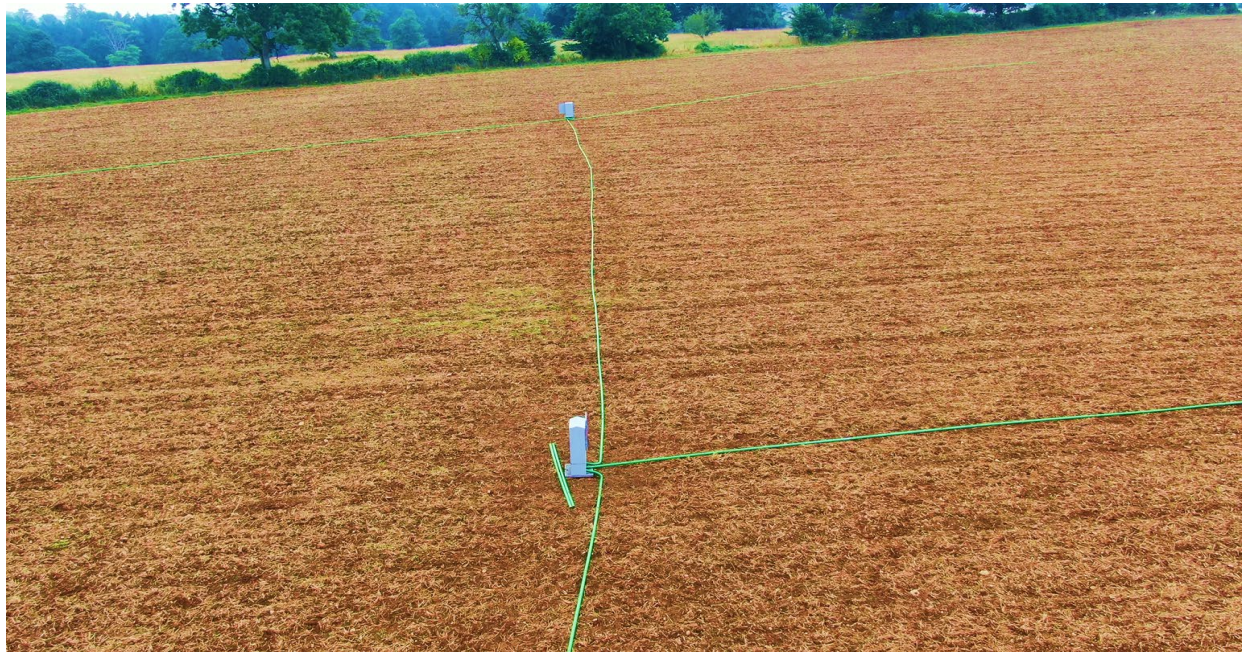


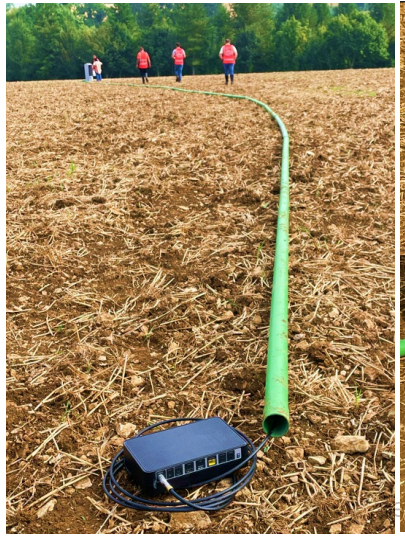




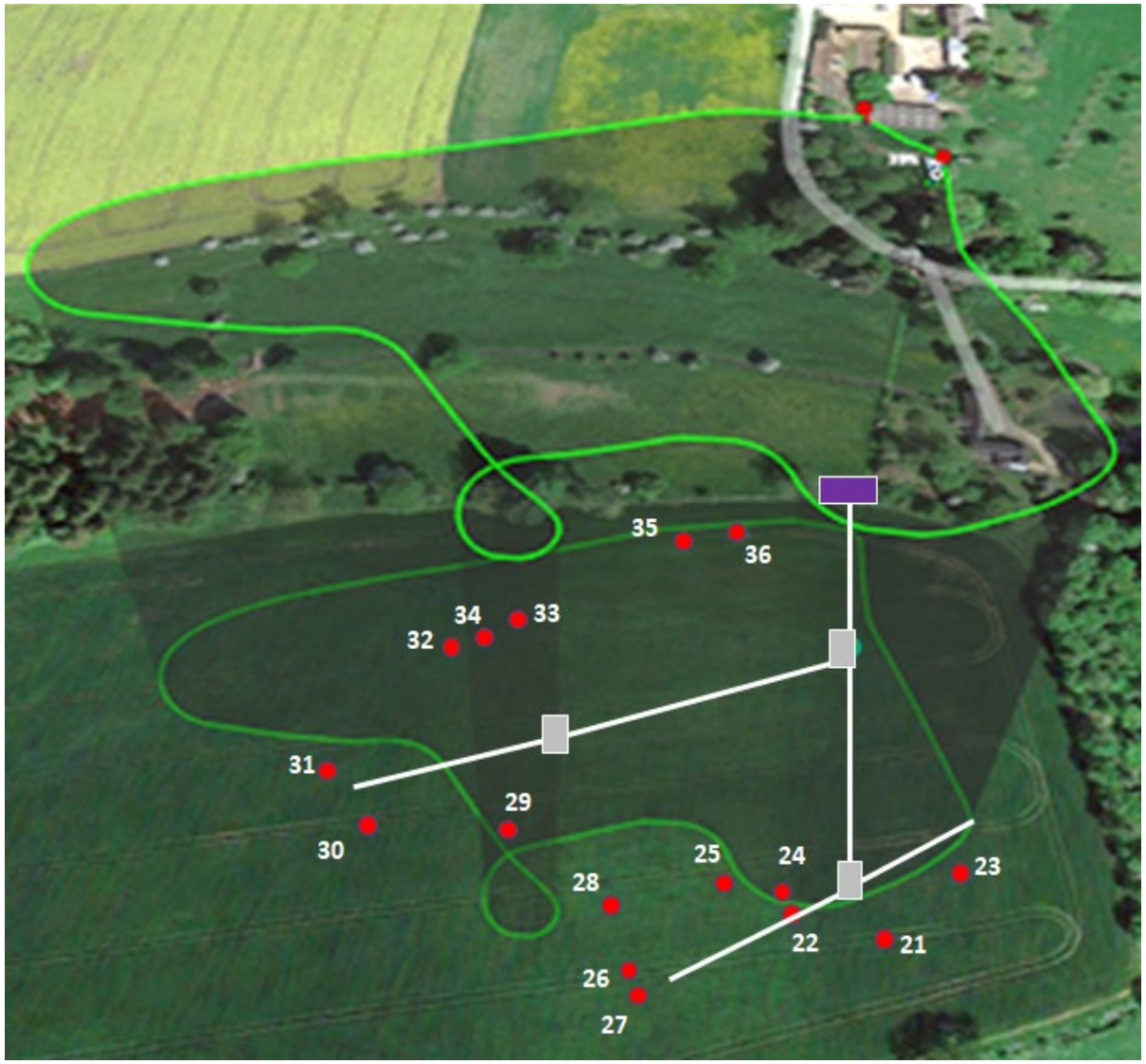
Final Solution Design

Proof of Concept (PoC)



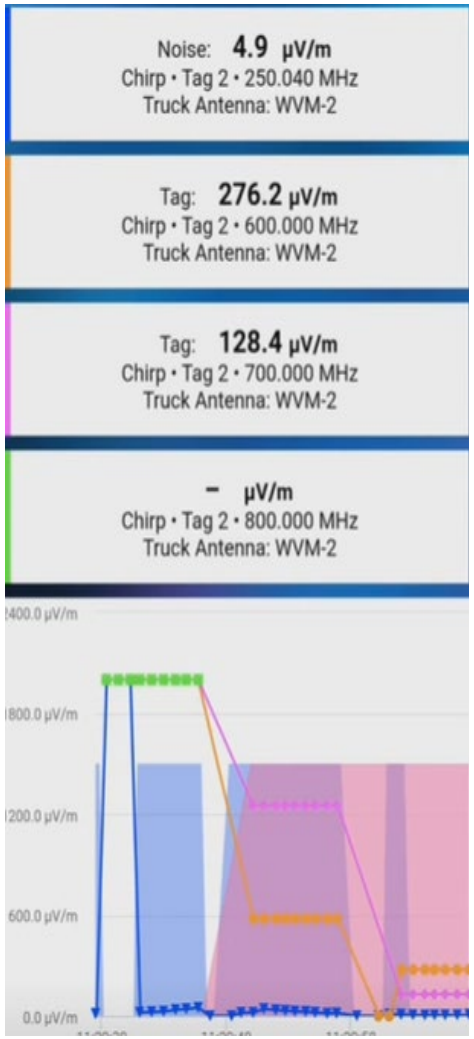


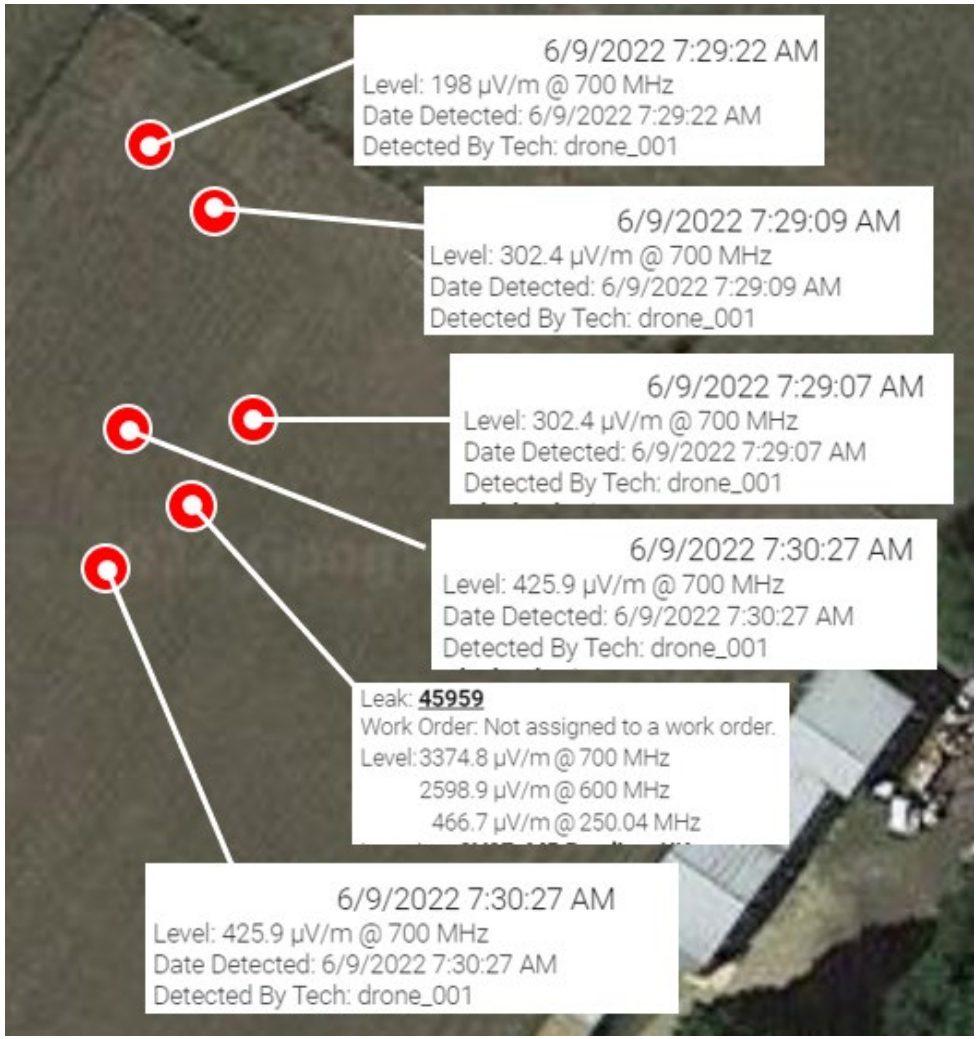
Proof of Concept: Day 1



Leak Number	Leak Size	Location Long/Lat	UAV Height
21	289.7µVm	-1.4072 51.90868	50.1ft
22	2000µVm	-1.40757 51.90874	79ft
23	469.4µVm	-1.40689 51.90884	127.2ft
24	276.6µVm	-1.40764 51.9088	138.7ft
25	188.2µVm	-1.40785 51.90881	139.0ft
26	155.4µVm	-1.40826 51.90861	145.9ft
27	106.7µVm	-1.40822 51.90855	145.9ft
28	320.0µVm	-1.40832 51.90876	145.9ft
29	909.5µVm	-1.40876 51.90894	155.1ft
30	2000µVm	-1.40933 51.90894	153.5ft
31	1464µVm	-1.4095 51.90909	155.1ft
32	1204.4µVm	-1.40898 51.90938	153.5ft
33	663.1µVm	-1.40871 51.90945	153.5ft
34	864.5µVm	-1.40885 51.90941	153.5ft
35	129.6µVm	-1.40801 51.90963	153.1ft
36	59.7µVm	-1.40781 51.90967	150.9ft

Proof of Concept: Day 2





Conclusions & Next Steps

What could this mean for Liberty Global?

- Reduced fault resolution times from an average of 6 hours to <1 hour
- Ability to identify all faults in a given area.
- Ability to proactively clean the network with a high degree of efficiency
- Reclaim truck roll hours and resource
- An opportunity to improve NPS through network health and reduce customer churn

What's Next?

- Work with tooling vendors and antenna manufacturers to further develop the system, increasing accuracy and efficiency.
- Coordinate further Proof of Concepts (PoC) over suburban neighbourhoods within Europe.
- Determine the logistics around adoption and scaling such a solution within a European MSO.

Creating Infinite Possibilities.

Thank You!

Jack Morrison

Technology Consultant
Liberty Global