

Product Guide

Mining

Maximize mine
productivity and safety



A pioneer in the use of autonomous drones for underground stope mapping and powered by world-leading intelligence in Emesent SLAM, Emesent enables the largest mines worldwide with the technology to ensure a safer and more efficient mapping workflow.

Offering a uniquely versatile mine mapping solution, Emesent technology delivers options to deploy on a drone, LHD, vehicle, handheld or backpack - providing autonomous or manual mapping in stopes and vertical shafts, convergence monitoring in drifts, evaluation of new blast designs, and an accurate, up-to-date picture of inaccessible areas.

Emesent is a world leader in drone autonomy, premium SLAM-based 3D LiDAR mapping, and data analytics.

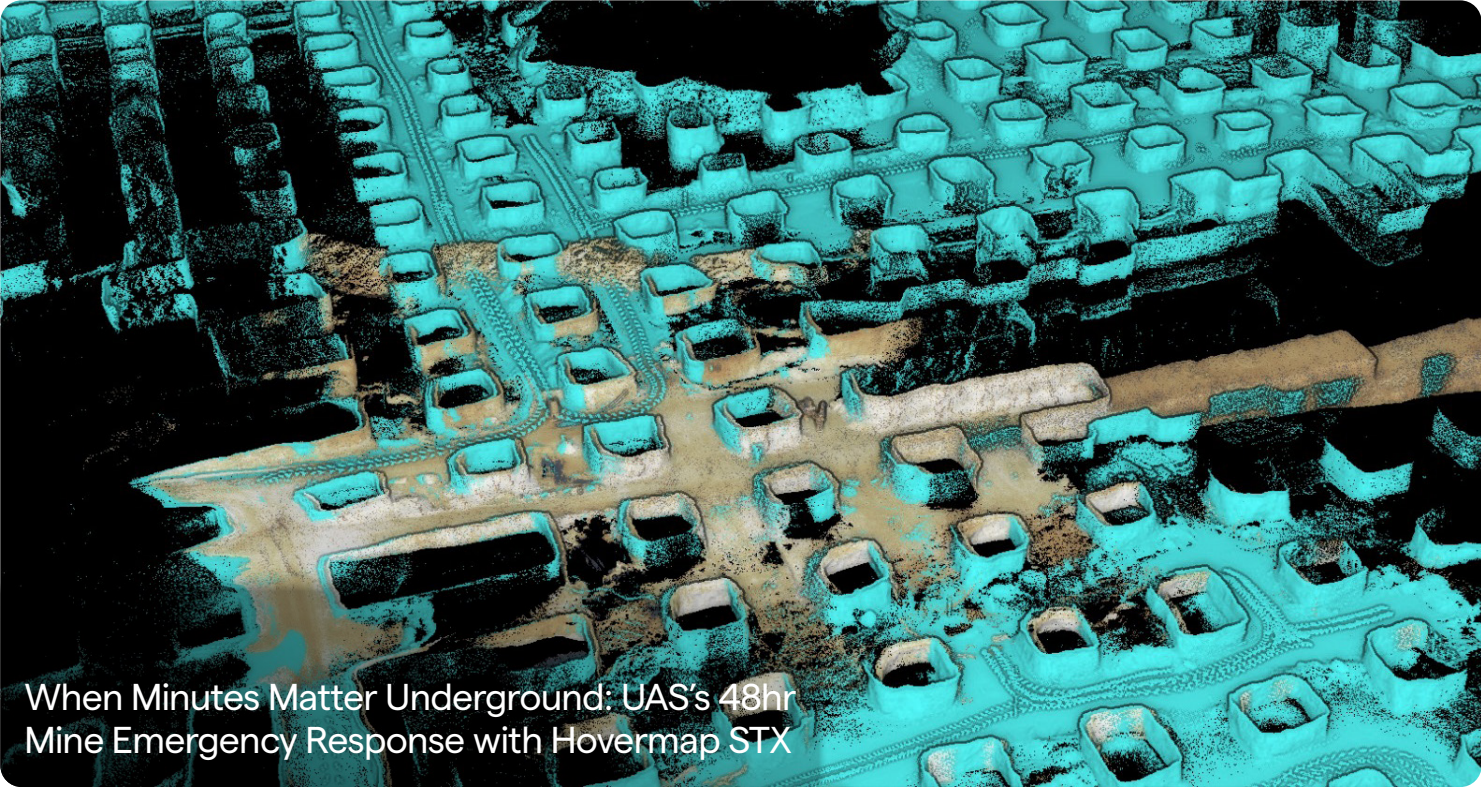
Founded in 2018, after a decade of cutting-edge research at the Robotics and Autonomous Systems arm of Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO), Emesent has built a reputation for delivering high quality data capture, working side-by-side with customers to provide revolutionary efficiency, safety, and operational insights.

Our expertise spans Robotics, Autonomy, AI, Machine Learning, and Data Analytics, with research and development exploring new possibilities and developing innovative technologies as we advance the autonomous digitization of the physical world.



Founders
Dr Farid Kendoul & Dr Stefan Hrabar

Client Success Stories



Trusted by world leaders























“From a geotechnical perspective, Hovermap captures the detail that we really need at a level of accuracy we weren’t able to get previously.”

— Sierra Mercer | Ground Control Engineer-in-Training, Glencore, Kidd Creek Site

Mine engineers, geotechnical engineers, LHD operators, production teams and mining organizations around the globe rely on Emesent solutions for:



Enhanced efficiency

Surveyors using Emesent technology have been able to capture data from voids and drifts up to 75% faster than using traditional survey methods. With the addition of Emesent's SLAM and remote autonomy capabilities, surveyors are able to conduct scans in more environments, faster and all while keeping humans safe.



Improved mine & personnel safety

Emesent technology provides improved awareness of ground and structural conditions, better visibility of hazards, and removes personnel from hazardous areas - mitigating risks before they become a problem and providing leaders with the confidence to know their team members will return home every day.



Reduce downtime and production losses

Emesent SLAM scanners deliver rapid data capture, enabling faster decision making — minimizing the length of production delays, and reducing associated operating costs during downtime.

Proactive data capture augments these benefits even more so, enabling mines to identify risks and operational inefficiencies well in advance.



Real time situational awareness

In GPS-denied environments, real time insights can be crucial to inform rapid decision making, saving lives, avoiding expensive mistakes, and risking costly production downtime. Access real time situational awareness with features like High Density Visualization - enabling remote operators with a direct view of operational risks such as rock fall or hanging edges.



Access the inaccessible

In dark and dangerous mine environments, there are many areas where scanning is risky, unsafe or completely inaccessible - due to FOG, ongoing seismic activity, recent blasts or simply the unknown. Emesent technology allows users to capture accurate, detailed 3D point clouds and images both manually or autonomously - not only improving personnel safety, but conducting scans that would not be possible any other way.



Improved compliance & reduced legal risk

More data equals greater insights into your operational risks - invaluable when addressing compliance and safety regulations, without the significant time burden of data collection. Mine managers can feel more confident knowing technology supports policies and processes to keep their people out of harms way.

Our clients use Emesent technology to conduct:

Underground Autonomous and Manual Surveying:

- Stope Mapping & Reconciliation
- Shaft Scanning

Underground and Open Pit Mine Mapping:

- Site Mapping & Reconciliation
- Stockpile Measurement

Underground Production and Geotechnical Scanning:

- Load Haul Dump (LHD) Operations
- Convergence Monitoring

Hovermap STX

Fast, accurate, high-detail
mobile data capture



Featuring AI-powered autonomous mapping, Hovermap incorporates the latest in LiDAR sensing technology to generate high density point clouds with exceptional coverage.

With a sensing range of up to 300 meters and the ability to capture more than a million points per second, Hovermap delivers detailed, survey-grade data over a wide area fast – accelerating your time to insight.

- Emesent SLAM
- GPS-denied Autonomy
- Hesai XT32M2X
- RTK integrations with Emlid, Trimble & Leica
- 360 colorization kit (GoPro Max), or Handheld 360 Image Kit
- 2 hours battery life

Hovermap STX Accessories



LHD Mount — Increase productivity, identify hazards, and reduce incidents

Connecting easily and securely to the LHD, Hovermap enables an operator to remotely conduct a 360-degree scan of the working face and visualize results in minutes for analysis, allowing them to safely identify obstacles and complex structural issues before they become a problem.



360° Image Kit — Augment Hovermap point cloud scans

The Handheld 360° Image Kit attaches a 360° camera directly to Hovermap, allowing users to capture panoramic imagery alongside LiDAR data in a single pass - adding visual context that makes point clouds easier to understand for non-technical stakeholders.



Drone RTK — Autonomous or assisted drone-based scans

Emesent Aura supports RTK, automating high accuracy georeferencing and drift correction for Hovermap scans on DJI's M300 and M350 drones, in addition to Astro and Astro Max. This enables the delivery of fast, accurate and precise above-ground drone scans on demand, without the need to lay out and georeference ground control points.



Backpack RTK/PPK — Fast, accurate, and repeatable results

Emesent's Backpack RTK/PPK automates high-accuracy georeferencing and drift-correction for backpack-based scans, to deliver fast, accurate and precise scans while reducing or eliminating the need to lay out and georeference ground control points.

Leveraging RTK, PPK and SLAM to optimize results, Backpack RTK/PPK ensures the most reliable, robust point cloud.



Vehicle RTK/PPK — Versatile, rapid vehicle-based scanning

Drone scan not suitable? Need to scan an area too large to walk? Emesent Vehicle RTK delivers confident scanning over large areas and of long, linear assets without the need for GCPs.

Mounted on your vehicle with heavy duty suction cups, the vehicle RTK kit enables even greater versatility in your workflows.



Protective Cage — Rugged shaft scanning protection for Hovermap

The Hovermap Protective Cage provides a complete scanning solution for those more challenging environments when walking, driving, or flying are just not an option.

The stainless steel frame provides hard wearing protection that is specially designed to slide smoothly, avoid snags and deliver great scans.

"The ability to regularly survey the Carrapateena mega cave marks an important de-risking event for ongoing operations and enables mine planning to be safely optimized for production.

— Richard Cheung | Digital Robotics & Automation Architect, BHP

GX1

Reliable, highly accurate
SLAM in one single,
integrated scanner



Emesent GX1 delivers the high accuracy and speed your mine demands — in an integrated unit that's simple enough for any operator, but powerful enough for your most critical decisions.

From drives and stopes to open pit faces and stockpiles, GX1 achieves 5–10mm accuracy at mobile scanning speeds. Deploy it on vehicle, backpack, survey pole, or handheld — one device handles underground production surveys, convergence monitoring, and surface mapping with the proven reliability of Emesent SLAM.

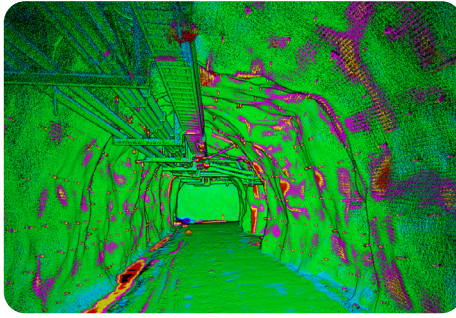
GX1 gives your surveyors, engineers, production operators and mine managers the validated data they need to make confident decisions.

GX1 Features



Emesent SLAM

Proven in some of the world's most extreme environments via autonomous drone mapping, Emesent SLAM is the powerful technology that drives GX1's impressive accuracy results.



Simplified, Efficient Scanning

With one single, integrated scanner, you reduce risk to your team and mine site - with less time required underground, less time spent wrangling multiple cables, batteries and accessories, and the time saved enabling more data capture for even better risk and safety management.



Superb 360° imagery

With 4x20MP cameras, 360° horizontal and 284° vertical coverage, GX1 captures every detail above-ground in a single pass. Underground, additional lighting delivers improved, high resolution imagery, and speeds up workflows with single pass data transfers.



Best-in-class LiDAR

1.92 million points per second, a 300m range for high-precision and 360° scanning for capturing accurate data quickly and reliably.



Integrated RTK

For projects where RTK is required, GX1's premium 448-channel RTK receiver delivers 0.6cm + 0.5ppm horizontal and 1cm + 0.5ppm vertical accuracy.



Enhanced End-to-End Workflow

A complete survey system from in-field monitoring and capture to point cloud processing - and integrations with industry platforms like Deswik, Maptek, Trimble and Pointerra.

GX1 Accessories



Quick Mount



Vehicle Mount



Backpack/Case



Handheld

"I have showed the scans to multiple people involved with the open pit, and they were rather impressed by how visible the veins and the surfaced chips are."

— Demeter Farkas | Mine Surveyor, Alkane Resources, Sweden

Your End-to-End Solution

Delivering insight to action in minutes

From capture to collaboration — access your data where you need it, when you need it. Our technology isn't just scanners — developments in Commander, Aura and Aura Cloud will enable users to better capture, process, visualize, share and collaborate on their data.



Unlock the power of your point clouds with Aura

Experience Emesent Aura - the all-in-one processing and visualization platform that takes your scans to the next level. Whether you're capturing data via drone, handheld, backpack, vehicle, or a combination, Aura streamlines your entire workflow.

Powerful automation, intelligent filtering, and advanced point cloud enhancement tools deliver precise, high-quality results with speed and ease. Now, with innovations in Aura Cloud - you'll be able to share 360 degree walkthroughs of your data more easily than ever before.

Mission control with Commander

Emesent Commander is your mission control app, designed to make mapping, pilot assist, and fully autonomous mission planning simple and intuitive. Commander is your gateway to Emesent Cortex, the intelligent software that powers Emesent's world class autonomy and smart navigation capabilities.

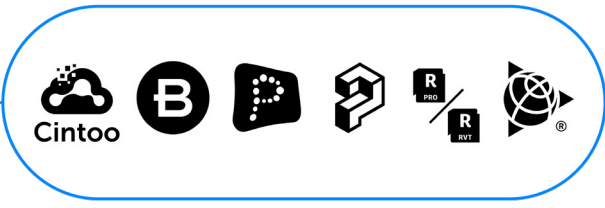
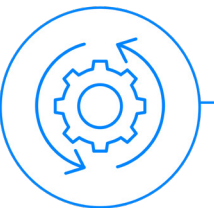
Technology we integrate with

01 Capture
Emesent Scanner

02 Process
Aura or Aura Cloud

03 Visualization & Sharing
Aura Cloud

04 Analyze
with 3rd party software





Emesent Assure

Stay operational. Minimize downtime.

When incidents happen, don't wait weeks for repairs. Emesent Assure is a proactive recovery solution designed to keep your team flying. With fast replacement swaps for Emesent scanners and drones, you stay productive and focused on your mission.

Emesent Advance

Never fall behind.

Emesent Advance ensures your investment stays current, secure, and supported - so you can focus on the mission, not the technology.

- Future-proof your operations - Automatic access to all software innovations means you're always equipped with the latest capabilities
- Maximize uptime - Expert support and proactive maintenance keep your teams productive.
- Protect your investment - Regular updates and security patches ensure reliability and longevity.

"Emesent provides great customer care...
It's really easy to get help from them."

— Ratu Vetaia Ogoogofou Vuinakelo | Underground Surveyor, Lion One Limited, Fiji

Specifications

*Specifications are indicative only and are subject to change without notice.

Emesent GX1 is powered by Emesent SLAM, a proprietary SLAM algorithm which is the key to unlocking stunning global accuracies in a variety of environments. All global accuracies are reported as 3D RMSE in accordance with good surveying practice. SLAM global accuracy is correlated with the density of features in the scan environment.

Global accuracy

Global accuracy - unconstrained¹ → 5mm (many features)
→ 10mm (few features)

Global accuracy - with GCPs² → 5mm (many features)
→ 8mm (few features)

Global accuracy - with RTK/PPK³ → 15mm

¹ Measured in test environments by performing a rigid alignment to control points.

² Measured in test environments by non-rigidly constraining the point cloud with control points and measuring global accuracy with check points. Constraint points are not used in the accuracy calculation.

³ Measured in a standard outdoor test environment using a local base station (<1km baseline).

Local accuracy & precision

Local accuracy¹ 5mm

Precision² Up to 2mm

¹ Reported as 3D RMSE. Measured in test environments by calculating point-to-point distances between control points. Constraint points are not used in the accuracy calculation.

² Reported at 1 standard deviation.

Integrated RTK

Channels 448

Horizontal Accuracy¹ 0.6cm + 0.5ppm

Vertical accuracy 1cm + 0.5ppm

PPK Yes

Connectivity Integrated 4G modem, nano size SIM

¹ RTK receiver accuracy only. Not indicative of overall global accuracy. Global accuracy is typically improved when combining RTK and SLAM data.

LiDAR

Model Hesai XT32M2X

Sensing range 300 meters / 984ft

Returns 3

Points/sec → 640,000 (single return)
→ 1,920,000 (triple returns)

Channels 32

Cameras

Cameras 4 x 20MP high-resolution cameras

Panorama field of view 360° x 284°

Ground sample distance → 0.96mm/px @ 1 meter
→ 4.8mm/px @ 5 meters

Scanner

Weight → 3.2kg / 7.05lbs (without battery)
→ 3.5kg / 7.71lbs (with battery)

IMU High-performance AHRS

Travel protection Store in custom-designed IP65 backpack

IP rating IP65

Operating temperature -10 to 45°C (14 to 113 °F)

External interfaces → RJ45 (Ethernet)
→ Multi-function connector
→ USB-C (USB3.2)
→ WiFi (2.4GHz)

Wireless interfaces → WiFi 2.4/5.8GHz
→ 4G

Storage → 2TB
→ SD card expansion (up to 2 TB)

Mounting methods → Backpack
→ Survey pole (5/8" thread)
→ Vehicle
→ Supported handheld

Battery & charging

Power 54Wh 10.8V Smart Li-Ion Battery (removable)

Battery life 60 minutes

External power → Multi-function connector (9-24V)
→ USB-C (65W, for offload and firmware upgrades only)

Charging → Dual-bay battery charger
→ In-device battery charging with external power

Charging time Approx 2 hours

Hovermap STX

Specifications

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Emesent Hovermap STX is powered by Emesent SLAM, a proprietary SLAM algorithm which is the key to unlocking stunning global accuracies in a variety of environments. All global accuracies are reported as 3D RMSE in accordance with good surveying practice. SLAM global accuracy is correlated with the density of features in the scan environment.

Global accuracy

Global accuracy	5 - 10mm
Global accuracy - RTK/PPK1	15 - 30mm

Local accuracy & precision

Local accuracy	5 - 10mm
Precision ²	Up to 2mm

² Reported at 1 standard deviation.

RTK

RTK georeferencing	With external RTK receivers: → Emlid RS2/RS2+/RS3 → Leica GS18/GS18I/GS18T → Trimble R10/R12/R12i/R980
PPK	Yes

Cameras

Cameras	Optional accessories: → 360 colorization kit (GoPro Max) → Handheld 360 Image Kit
Panorama field of view	360°

LiDAR

Model	Hesai XT32M2X
Sensing range	300 meters / 984ft
Returns	3
Points/sec	→ 640,000 (single return) → 1,920,000 (triple returns)
Channels	32

Battery & charging

Power	External battery (V-Mount compatible), or Platform power (drone or robot) 14-55V
Battery life	2 hours
Charging	Battery charger (with international adapters US/Canada/Japan, AUS/NZ, UK and Europe)
Charging time	Approx 3-4 hours

Scanner

Weight	1.57kg / 3.46lb
IMU	High-performance AHRS
Travel protection	→ Hardshell backpack or → Hovermap carry case
IP rating	IP65
Operating temperature	-10 to 45°C (14 to 113 °F)
External interfaces	→ USB-A (USB 3.0) → Push-pull connector → Smart connector (accessory expansion)
Wireless interfaces	WiFi (2.4GHz)
Storage	512 Gigabytes (<16 hours of sensor data)
Mounting methods	→ Handheld → Backpack → Vehicle → Drone → Boston Dynamics Spot Robot → LHD Mount → Cage → Telescopic boom pole → Cavity Monitoring System adapter kit

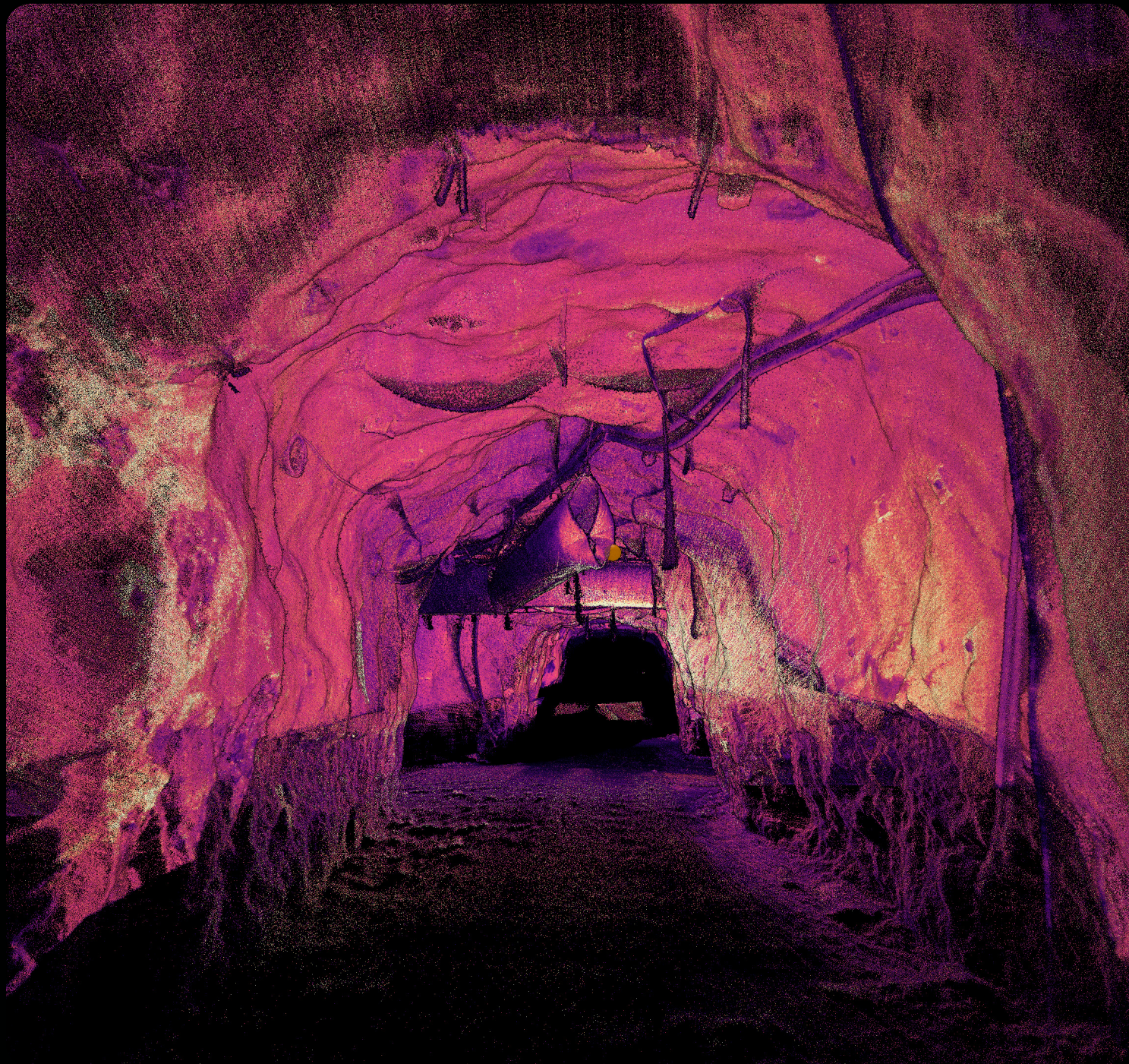
Other accessories & hardware

Supported drones	→ Freefly Astro → Astro Max → DJI M300 → M350
Additional hardware	→ Long Range Radio → Emesent Control Point targets → Samsung tablet and tablet display kit for DJI Smart Controller

Autonomy

Tap-to-fly and guided exploration	Waypoint, bounding box settings in real time 3D map and autonomous path planning.
Collision avoidance	→ LiDAR omnidirectional range of 1.2 to 40m (3.9 to 131 ft) → Size of an obstacle > 2 mm wire (3/32 in) → In-flight adjustable safety distance
Intelligent return to home	Autonomous Return To Home navigation triggered by low battery or excessive dust.
Assisted flight	Non-GPS flight, position hold, assisted flight, collision avoidance, regulated flight speed

See more.
Know more.
Act now.



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