

Formula 1

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Formula 2

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Formula 3

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Related Content

Title	Type	Slug
Blast Design Excel Template v4.2	resource	blast-design-excel-template
Drill Rig Maintenance Inspection Checklist	resource	drill-rig-maintenance-checklist
Rock Mass Rating (RMR) Field Survey Sheet	resource	rmr-field-survey-sheet
Drilling Energy Benchmarking Dashboard (Power BI)	resource	drilling-energy-dashboard
TBM Advance Rate Prediction Curve Library	resource	tbm-advance-rate-library

Detailed Explanation

Underground localization presents unique challenges due to the absence of reliable GNSS signals, dynamic environmental conditions (e.g., shifting debris, poor lighting, metallic reflections), and constrained infrastructure limiting anchor deployment. The test report systematically evaluates how tightly integrated sensor modalities—primarily LiDAR for geometric mapping and odometry, UWB for centimeter-accurate short-range ranging to fixed anchors, and opportunistic GNSS (at portal

ingress/egress)—compensate for each other’s weaknesses. Core testing involves deploying high-fidelity ground-truth systems (e.g., robotic total stations, survey-grade RTK-GNSS at accessible zones, or pre-mapped inertial reference trajectories) alongside the candidate localization stack across representative underground routes (ramps, stopes, intersections) under varying operational loads and environmental stressors. Performance is analyzed statistically over time—reporting mean/median 3D position error, CEP (Circular Error Probable), trajectory divergence, and failure modes (e.g., UWB anchor loss-induced drift, LiDAR feature starvation in smooth-walled tunnels). Crucially, the report links localization fidelity to downstream AHS safety-critical functions: path tracking error budgets, collision avoidance margins, and docking precision for autonomous loading/unloading—thereby informing system certification, redundancy design, and maintenance intervals.

Key Components

#	Component
1	Multi-Sensor Fusion Architecture
2	Ground-Truth Reference System
3	Underground Test Environment Characterization

Applications

#	Application
1	Autonomous Haul Truck Navigation in Deep Mines
2	Fleet Management System Localization Calibration
3	Regulatory Compliance Certification for Underground AHS

Related Concepts

#	Concept
1	Simultaneous Localization and Mapping (SLAM)

#	Concept
2	Sensor Fusion (Kalman/Particle Filters)
3	Underground Mine Communication Infrastructure

Tags

underground mining, autonomous vehicles, multi-sensor localization

Underground Localization Performance Test Report (GNSS/LiDAR/UWB)

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