

Media Release

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Centimetres and picoseconds without satellites or atomic clocks – Locata performance dominates results in EU’s new A-PNT Report

- ▶ Locata has demonstrated unmatched positioning and timing performance in a new European Commission (EC) Technical Report, published after exhaustive and completely independent testing of all other candidate Alternative Positioning, Navigation, and Timing (A-PNT) technologies.
- ▶ The EU, USA, and many others are increasingly concerned about the single-point-of-failure that GPS and other Global Navigation Satellite Systems (GNSS) represents to their nation. They all now seek alternatives to act as a ‘backup for critical national systems’. These EU tests are the most extensive ever conducted, globally, to date.
- ▶ The EC Report shows that Locata was the only technology, from all seven tested companies, to demonstrate positioning and timing across every test environment (indoor and outdoor), delivering:
 - cm-level positioning accuracy in all tests, indoor and outdoor, under static and kinematic conditions (see Table 18 below, extracted from the EC Report);
 - picosecond-level time transfer using Locata’s proprietary TimeLoc™ technology, over multiple media types including RF over distances of more than 105 kilometres and over fibreoptic and/or coaxial cables (see Table 17 below, extracted from the EC Report).
- ▶ These validated Locata capabilities now promise to open up previously unattainable, satellite-free A-PNT performance for autonomous vehicles, logistics, indoor positioning, critical national infrastructure, aviation and importantly – better levels of synchronisation to improve mobile phone and digital data networks.
- ▶ Locata’s products have been deployed commercially for a decade, delivering cm-level positioning (via sales and IP licences) to globally recognised partners, including systems now certified for safety-of-life level operation of autonomous vehicles. Prominent government customers include [NASA](#), and [the USAF, which runs a large world-first Locata network that covers over 6,500 sq. km](#) for aviation use when GPS is being jammed or spoofed.

Table 18 from page 76, EC Alternative PNT Report – showing Locata’s positioning performance
Summary of the **position performance results** at 95th percentile; values refer to planar position and are in [m]

2D Positioning Performance	Static Outdoors [m]	Static Indoor [m]	Kinematic Outdoors [m]	Kinematic Indoors [m]
Satelles Inc.	17.0	15.0	N.A.	N.A.
Locata	< 0.01	< 0.01	< 0.02	< 0.02
NextNav LLC	9.0	14.0	11.0	N.A.

Table 17 from page 76, EC Alternative PNT Report – showing Locata’s timing performance
Summary of the **time performance results** at 99.7 percentile; values in [ns] unless otherwise stated.

Timing Performance	Time Generation [days]	MTIE [ns]	Time Transfer Fibre [ns]	Time Transfer Networks [ns]	Time Transfer OTA Outdoors [ns]	Time Transfer OTA Indoors [ns]
OPNT	N.A.	N.A.	0.057	N.A.	< 200 (±100)	N.A.
7 Solutions SL	80	280	0.089	N.A.	N.A.	N.A.
SCPTIME	1	< 1000	N.A.	35	N.A.	N.A.
GMV	100	57	1	500	N.A.	N.A.
Satelles Inc.	110	364	N.A.	N.A.	145	< 340
Locata	1	< 1000	0.4 (4.9)	0.4 (6.1)	0.7 (6.1)	0.2 (5.2)
NextNav LLC	11.6	40	N.A.	N.A.	N.A.	< 39

Locata results show both network internal time transfer *and* external time transfer (in brackets)
Results should not be taken as pure benchmarks but as qualitative assessments of platforms under test

Europe’s Independent Evaluation of Alternatives to Satellite-based Positioning and Timing

Positioning and timing technology experts from the EC’s Joint Research Centre (JRC) in Italy report they have now completed a rigorous, independent scientific test campaign, run over a period of eight months. It was designed to quantify the performance characteristics of all candidate A-PNT demonstration technologies for – as the Report Title states – ‘Potential Deployment in the EU’. The tests covered a wide variety of PNT test cases and technology features considered to be a priority as a ‘backup to mitigate the impact of a potential disruption of GNSS’.

This performance evaluation assessment was run under a globally-open Tender launched by the EC's Directorate-General for Defence Industry and Space (DEFIS). It sought submissions from suppliers wishing to demonstrate their technology's capacity to:

- (a) deliver all selected PNT services (or a subset thereof), independent of GNSS;
- (b) provide effective PNT backup in the event of GNSS disruption; and
- (c) provide PNT services in environments where GNSS cannot be delivered (such as indoors).

The EC Report confirms that Locata's terrestrial network was the only technology tested which could demonstrate non-GPS-based centimetre-level positioning accuracy in every area where GNSS does not work, including indoors.

The Report also verified Locata's unique ability to deliver picosecond levels of network self-synchronisation and time transfer across the large areas covered by Locata signals, without requiring satellites or atomic clocks. This new capability, enabled by Locata's proprietary TimeLoc™ developments, could underpin performance improvement for applications in mobile telecoms markets, and many other digital data systems that also need precise time synchronisation.

"Our team is very happy to finally see this Report published so the entire industry can now reap the benefit of studying these results, which have been derived from in-depth, independent evaluation," said Mr Nunzio Gambale, co-founder and CEO of Locata.

"We knew our performance in these tests would demonstrate a genuine paradigm-shift change for the PNT industry – advancing what is currently possible using radio-based signals for PNT. Any expert in this field that spends time analysing the complete suite of Locata PNT test results, all meticulously quantified by skilled engineers at the EC's famed Joint Research Centre, will recognise they are seeing previously unachievable radio-based PNT performance."

"Our team has laboured through years of industry skepticism, tolerating comments like, 'How do you expect to deliver millimetre-level positioning indoors'? My personal favourite was being told, 'Picoseconds transmitted over-the-air sounds like spooky Black Magic'.

"Well frankly, I think it's time PNT engineers read this Report very carefully, because the EC's measurements speak for themselves. It's up to the industry to now learn from us how this can be done, and begin leveraging our decades of work for the benefit of their products, their nations, and PNT as a whole," Mr Gambale said.

The DEFIS Project Tender sought applications from around the world, from every potential candidate claiming they could provide 'an alternative to Global Navigation Satellite-based PNT'. Over 30 companies applied, and this number was then down-selected by an expert panel to the seven technologies that were, in the end, independently evaluated.

Locata was the only technology that was granted two contract slots, and the only technology which completed every timing and positioning test, in every indoor and outdoor environment, sought by the EU.

“In the Locata system accurate time synchronisation is a precursor to accurate positioning, with time being deeply engrained in our DNA in the form of our TimeLoc invention,” said Mr David Small, co-founder, inventor and Chief Innovation Officer of Locata.

“This is how we achieve centimeter positioning without the need for differential corrections. At the same time, we deliver picosecond time transfer by removing tropospheric and multipath errors in real-time. Time and position naturally fit together, and can be considered as one and the same.”

This test campaign confirms Europe, like most nations, now recognise that the need for a ‘backup to GNSS’ has become a challenging but growing global necessity. Many recent government-funded studies have highlighted the dire consequences resulting from even a short-term loss of GPS/GNSS services. Those reports identify billions of dollars per day in economic losses, creating serious disruptions in almost every sector of a nation’s economy.

“Locata is a PNT system that matches the capabilities of GPS in unique ways. It is a GNSS-alternative that can answer the question: ‘When GNSS fails or is unavailable, what could you use in its place’? said Dr Chris Rizos, Emeritus Professor at the University of New South Wales in the fields of Geodesy, Surveying and Navigation.

“Locata has developed a breakthrough PNT technology that no other company, academic research group or government agency, anywhere in the world has been able to achieve – despite numerous efforts over the past few decades.”

“Addressing this ‘backup problem’ is critical if a nation, or even an industry sector, wants to have assured access to PNT services, at all times. With every escalation of geopolitical instability around the world, PNT services provided by GPS and GNSS become more vulnerable to disruption. Locata is a PNT service that can be under the complete sovereign control of a single nation or jurisdiction and can be integrated into existing infrastructure such as telecommunication networks, as necessary.

“Locata’s technology is therefore unique in not only offering significant PNT performance improvements to all users, in all environments, but doing so via a terrestrial technology that overcomes the single-point-of-failure vulnerability that GPS/GNSS represents for everyone. This is something that should be valued by the government of any nation,” Dr Rizos said.

Locata’s business model today is fundamentally similar to that of ‘Intel Inside’. The company sells or licenses their technology to global partners who then utilise these new enabling capabilities within their own products and applications. Locata’s intellectual property developments have already been granted over 150 patents internationally, with many more in the pipeline. Industrial automation was an early adopter of Locata technology. In fact, the accuracy, reliability and control delivered by Locata has allowed partners to gain, for the first time, ISO safety-of-life-level certifications for radio-based navigation of fully-autonomous machines.

“Locata did not participate in these tests merely to meet some modest levels of, ‘currently accepted industry standards’. We wanted to show the industry how to move the state-of-the-art even further forward. Having our performance validated by an unimpeachable, independent team of expert engineers was our chance to demonstrate that,” Mr Gambale said.

“The excellent results reported here are based on our current devices. Yet we already have further improvements on the way. Our next-gen devices are designed to be chip-based, and ultimately embeddable IP cores that partners can incorporate into their products. That process has already begun, and it will eventually allow Locata licensed partners to embed our unparalleled performance into all manner of consumer devices, including mobile phones.”

The JRC Science for Policy Report, titled *Assessing Alternative Positioning, Navigation and Timing Technologies for Potential Deployment in the EU*, documents Locata’s capabilities as follows (and as per Tables 17 and 18 above):

- ▶ Radio-based picosecond-level time transfer;
 - Outdoors over distances greater than 105 kilometers,
 - Indoors, and through indoor-to-outdoor non-line-of-sight obstructions like brick walls,
 - To mobile roving receivers, indoors and outdoors;
- ▶ Equivalent time transfer performance through other tested mediums – fibreoptic or coaxial cables;
- ▶ Point-to-point as well as point-to-multi point time transfer with mixed mediums (say time input from fibreoptic which is then output to fibreoptic, radio-based, and coaxial cables simultaneously);
- ▶ Nanosecond synchronization accuracy to an EU-supplied UTC reference time source;
- ▶ cm-level positioning in indoor and outdoor environments, enabled by Locata’s unique VRay™ Orb and Correlator Beamforming (CBF)™ technologies, in indoor and multipath-rich environments;
- ▶ Reliability and resilience of the Locata network, matching safety-of-life level certification requirements; and,
- ▶ Remote monitoring and access control capabilities that meet recognised industrial requirements.

The JRC’s A-PNT Report (the Summary of all their tests) is on the EC’s official website, here:

<https://bit.ly/3K905ib>

The full, 141-page Technical Report specifically covering all Locata technology tests (Appendix 7 of the JRC’s EC Report above) is also on that website, and available for download here:

<https://bit.ly/40iC11V>

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About Locata

Locata Corporation is a privately-owned Australian company that has invented new radio-location technology that gives precise positioning and time synchronisation in the many environments where GPS is ineffective.

Locata has the unique ability to replicate an entire GPS constellation of satellites, locally, on the ground. This allows entities as diverse as mines, ports, construction sites, warehouses, airports, critical national infrastructure sites, cities and more to mitigate the escalating risks posed by critical dependency upon single-point-of-failure signals from satellites. Locata empowers both commercial end-users and governments alike to now decide for themselves the reliability and accuracy of positioning they wish to deploy – under their own sovereign control and with complete local autonomy.

Locata's technology provides independent GPS-style survey-grade performance, within its' network coverage area, without requiring satellites or atomic clocks. Locata is the inventor and sole supplier of this revolutionary step-change technology. The company's inventions are protected by a large and continually growing portfolio of internationally-granted patents.

Early adopters of Locata technology include mining, ports, military, aviation, warehousing and logistics markets and include "reference customers" such as the USAF, NASA, and a roster of globally-recognized commercial partners.

About GPS

GPS was designed in the 1970's to deliver position, navigation and timing information to military users in open sky environments. It produces signals from a global constellation of satellites, each one equipped with at least three atomic clocks.

The original 1970's GPS engineering team could never have imagined a world of mobile phones working indoors and outdoors, personal computers, flat screen TV's and emerging fully-autonomous cars. Each of those modern applications, and many others, now struggle to deliver acceptable next-gen positioning performance – especially in built-up urban areas and indoors where people spend the majority of their time.

The satellite-based systems are now also proving to be a headache for military users. As demonstrated every day in places like the Ukraine and Syria, it is simple for adversaries to jam or 'spooF' the signals received from space.

Those military applications are well-know and often reported by mainstream media. The reality, however, is that today over 95% of all applications for GPS are civilian, rather than military. Every nation and their digital economies now depend on GPS-based signals for positioning and timing applications. It underpins markets as diverse as transport, banking, telecommunications, aviation, electricity networks, manufacturing, agriculture, and more.