



## Independent Testing of GloPos Indoor Positioning Accuracy

VTT, The Technical Research Centre of Finland

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## Summary

This document summarizes the results of independent tests of the GloPos indoor positioning technology carried out in Helsinki, Finland by VTT, the Technical Research Center of Finland, on May 20th, 2010.

The main objective of the third party independent test was to evaluate indoor and underground accuracy of the pre-production version of GloPos positioning technology.

## Main Achievements:

At this stage of the GloPos technology development, the test results already confirm the original GloPos technology accuracy claims of indoor accuracy levels less than 30 meters.

The stationary indoors and underground tests show that the preproduction GloPos Cell Positioning is capable of non-filtered average positioning accuracy of 15.1-23.9 meters. When 25% of biggest offset values were discarded, the average position accuracy was 7.7-12.5 meters. This will measure the effect of moderate filtering. With filtering, the accuracy is as good as the outdoor accuracy with a normal GPS embedded in mobile phones. When comparing with state-of-the-art cell positioning (Google maps) the average accuracy is at least two times better and in some cases even ten times better.

### Summary Conclusions

Based on tests conducted by VTT, the Technical Research Center of Finland, GloPos positioning technology achieves:

- Indoor accuracy levels of less than 30 meters.
- Non-filtered average positioning accuracy of 15.1-23.9 meters.
- Positioning accuracy of 7.7-12.5 meters indoors when 25% of biggest offset values are discarded.

## Test Description

The GloPos positioning system utilises a mobile phone and cellular (GSM) network only to determine the position of the phone used. Measurement points were selected by VTT, so that exact locations were not known before actual tests. Only the area limits for the test zone had been given in advance as well as three indoor locations where tests were to be conducted. The Google Maps was used as state-of-the-art reference cell positioning method and only average offset was calculated.

### *Conclusions from VTT Report:*

*“In urban environment the GloPos system when properly filtered matches GPS in terms of accuracy.”*

*“When comparing the GloPos Technology with state-of-the-art cell positioning the average accuracy is at least two times more accurate and in some cases almost 10 times.”*

*“The results indoors of the GloPos system are even better than outdoors.”*

## Static Indoor and Underground measurements

The indoor measurements were made in selected indoor locations in the Helsinki City Center. At each location, static measurements were made for the duration of 2 minutes. Reference points were determined from the maps, which were used to calculate measurement offsets. Measurements were also made underground and outdoors (see result examples Figure 1-2). In the following table some statistical values for the all measurements are presented. Values are calculated from all the measurement points for the selected operator at the given location. The offset deviation describes the scattering of position. Percentile  $k$  describes the point of values are below that point. For example if the 50% percentile is 25 meters, half of the offsets are less than 25 meters.

Table 1. Static indoor collected offsets

GloPos Indoor Static Measurements						
Mall 1 Static Indoor Offsets						
	Average [m]	Average < 75 % [m]	Deviation [m]	Percentile 75% [m]	Maximum [m]	Minimum [m]
GloPos: Operator 1	23.9	12.5	20.8	29.2	63.6	3.6
Mall 2 Static Indoor Offsets						
	Average [m]	Average < 75 % [m]	Deviation [m]	Percentile 75% [m]	Maximum [m]	Minimum [m]
GloPos: Operator 2	15.1	7.7	10.7	23.2	39.8	1.5

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Figure 1. Graphical illustration of indoor measurements

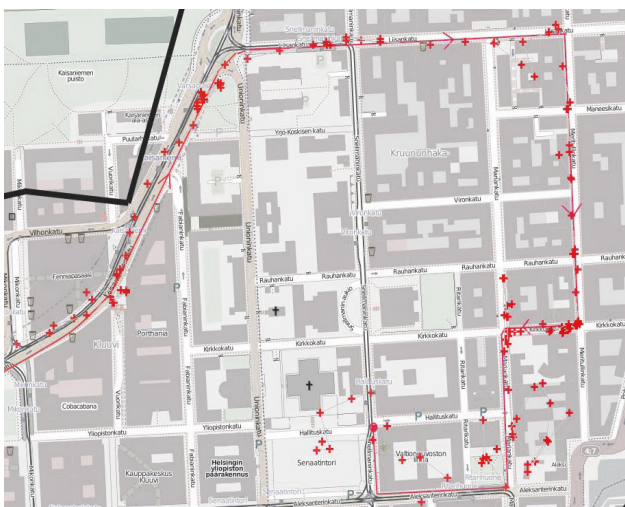


Figure 2. Graphical illustration of outdoor measurements

*“In urban environment the GloPos system when properly filtered matches GPS in terms of accuracy.”*

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