CLAIMS

1 – Method for locating a transmitter device (20i) on the basis of N stations (10j) in a communications network, each of the stations being equipped with at least one receiver (12), by using at least one date-stamping benchmark common to all the N stations, the network comprising at least one master station (1) suitable for managing measurements of instant of arrival, characterized in that it comprises at least the following steps:

- triggering one or more synchronized acquisitions on N stations for a given frequency, a bandwidth and a given instant t, values of the given frequency, the bandwidth and the given instant t being chosen as a function of a transmitter device of interest characterized by its frequency, its bandwidth,
- for an acquisition:
  - calculating the N(N-1)/2 measurements of arrival time delay TDOA between all the N(N-1)/2 pairs of stations,
  - choosing a number P of measurements out of the M=N(N-1)/2 measurements, with 3<P<N(N-1)/2 and forming K vectors of measurements associated with the K possible combinations of P out of M with:

$$K = \frac{M!}{P!(M-P)!}$$

  - for each of the K vectors, estimating an elementary value of location of the transmitter device by minimizing a quadratic criterion taking into account a matrix corresponding to the covariance of the P measurements of arrival time delay and by iteration starting from a first value of a vector $\vec{X}_0$ of initial position of the transmitter, the position is situated as near as possible to the sought-after minimum and then by iterating on the first estimation by successively estimating locations making it possible to decrease the criterion to be minimized until a threshold value is satisfied,

where:

$\Lambda_P(\sigma^2_{TDOA_1},\ldots,\sigma^2_{TDOA_P})$ designates a diagonal matrix of size (PxP) whose diagonal terms are written $\sigma^2_{TDOA_i}$ with i ranging from 1 to P,

$\sigma^2_{TDOA_i}$ is the variance of the ith measurement of TDOA,

$\Lambda_N(\sigma^2_{TOA_1},\ldots,\sigma^2_{TOA_N})$ designates a diagonal matrix of size (NxN) whose diagonal terms are written $\sigma^2_{TOA_i}$ with i ranging from 1 to N,

$\sigma^2_{TOA_i}$ is the variance of the date-stamping measurement on the ith station.

5 – Method according to Claim 3, characterized in that the covariance matrix is determined using arrival delay measurements and by defining diagonal terms of the covariance matrix Σ corresponding to the variances of each of the TDOA measurements with:

$$Vi = \frac{1}{Nacqui} * \sum_{n=1}^{Nacqui} \left(TDOA_{i,n} - \overline{TDOA_i}\right)^2$$

with

N_{acqui} being the number of acquisitions taken into account for the calculation of the variance

$TDOA_{i,n}$ corresponds to the n_{th} value obtained at the nth acquisition of the ith TDOA corresponding to the ith pair of stations

$\overline{TDOA_i}$ corresponds to the average, over the N_{acqui} acquisitions of the measurements of the ith TDOA.

6 – Method according to one of the preceding claims, characterized in that during the step of initializing the first location, the initialization value $\vec{X}_0$ is calculated on the basis of a priori information about the location of the transmitter device or on the basis of TDOA measurements making it possible to determine an initialization value automatically.