Claims

1. A system for sonar pulse location ~~(100)~~ for a submarine, ~~characterized in that it~~wherein the system comprises:

- two antennas of linear general shape and substantially parallel with each other ~~(101, 102)~~, arranged on the submarine, the two antennas comprising a detection antenna ~~(101)~~ and a focusing antenna ~~(102)~~, the detection antenna ~~(101)~~ being of small size with respect to the length of the second antenna ~~(102)~~, each antenna comprising a set of sensors ~~(1010, 1020)~~,
- at least one interception module ~~(51)~~ for determining the direction of a sonar emission emitted by an emitter and intercepted by the detection antenna ~~(101)~~, and
- a focusing module ~~(52)~~ for determining the distance of the emitter by focusing the paths on the basis of the signals provided by the sensors of the focusing antenna ~~(102)~~, in the direction of the emission determined by the ~~detection~~ interception module ~~(101)~~.

2. The system for sonar pulse location as claimed in claim 1, ~~characterized in that~~wherein the detection antenna ~~(101)~~ is spatially well sampled.

3. The system for sonar pulse location as claimed in claim 2, ~~characterized in that~~wherein the inter-sensor distance of the detection antenna ~~(101)~~ is strictly less than $\lambda/2$, where λ designates the wavelength of the intercepted signal.

4. The system for sonar pulse location as claimed in any one of the preceding claims, ~~characterized in that~~wherein the focusing antenna ~~(102)~~ is spatially undersampled.

5. The system for sonar pulse location as claimed in claim 4, ~~characterized in that~~wherein the inter-sensor distance of the focusing antenna ~~(102)~~ is strictly greater than λ, where λ designates the wavelength of the intercepted signal.

6. The system for sonar pulse location ~~(100)~~ as claimed in any one of the preceding claims, ~~characterized in that~~wherein the length of the first antenna ~~(101)~~ is strictly less than 20λ, where λ designates the wavelength of the intercepted signal.

7. The system for sonar pulse location ~~(100)~~ as claimed in claim 6, ~~characterized in that~~wherein the length of the second antenna ~~(102)~~ is strictly greater than 200λ, where λ designates the wavelength of the intercepted signal.

8. The system for sonar pulse location ~~(100)~~ as claimed in any one of the preceding claims, ~~characterized in that~~ wherein the detection antenna ~~(101)~~ comprises a single segment, associated with a single interception module ~~(51)~~.

9. The system for sonar pulse location ~~(100)~~ as claimed in claim 8, ~~characterized in that~~ wherein the detection antenna ~~(101)~~ is located substantially at the center of the focusing antenna ~~(102)~~.

10. The system for sonar pulse location ~~(100)~~ as claimed in any one of claims 1 to 7, ~~characterized in that~~wherein the detection antenna ~~(101)~~ comprises two segments ~~(1011, 1012)~~ located at a given distance from each other, and in that the interception module ~~(51)~~ comprises two auxiliary interception modules ~~(5101, 5102)~~ each providing an angle measurement corresponding to the associated antenna segment, and an average-calculation module ~~(53)~~ configured to determine the average of the 2 angle measurements provided by the auxiliary interception modules ~~(5101 and 5102)~~.

11. The system for sonar pulse location ~~(100)~~ as claimed in claim 10, ~~characterized in that~~wherein each segment of the detection antenna ~~(101)~~ is located substantially at one end of the focusing antenna ~~(102)~~.

12. The system for sonar pulse location ~~(100)~~ as claimed in any one of the preceding claims 8 to 11, ~~characterized in that~~ wherein each interception module associated with a segment of the antenna ~~(101)~~ comprises a detector ~~(510)~~ configured to detect the pulses in the surveillance field of the segment of the associated antenna ~~(101)~~ and a function for measuring the characteristics of the detected pulse ~~(511)~~.

13. The system for sonar pulse location ~~(100)~~ as claimed in claim 12, ~~characterized in that~~ wherein the measurement function ~~(511)~~ of each interception module is configured to measure the direction and the parameters of the pulse on the basis of the detected pulses.

14. The system for sonar pulse location ~~(100)~~ as claimed in any one of the preceding claims, ~~characterized in that~~wherein the detection antenna ~~(101)~~ and the focusing antenna ~~(102)~~ are integrated into the acoustic modules of the same acoustic assembly.

15. The system for sonar pulse location ~~(100)~~ as claimed in claim 14, ~~characterized in that~~wherein the acoustic assembly comprises a plurality of acoustic modules ~~(800)~~ placed side by side along the same axis, and in that each sensor of the focusing antenna is arranged in a distinct acoustic module of the acoustic assembly.

16. The system for sonar pulse location ~~(100)~~ as claimed in claim 15, ~~characterized in that~~ wherein the sensors of the same segment of the detection antenna are arranged in the same acoustic module of the acoustic assembly.

17. The system for sonar pulse location ~~(100)~~ as claimed in any one of the preceding claims, ~~characterized in that~~wherein the formation of focused paths is carried out over the signal time slice determined by the pulse start and end which are estimated by the detection function.

18. The system for sonar pulse location ~~(100)~~ as claimed in claim 17, ~~characterized in that~~wherein the formation of focused paths comprises the determination of the distance of the emitter on the basis of the maxima of the energy integrated in the band and over the duration of the Sonar Interception, for all the concerned points in the distance/angle space.

19. The system for sonar pulse location ~~(100)~~ as claimed in any one of claims 17 and 18, ~~characterized in that~~wherein the formation of focused paths comprises beforehand:

- the application of a coarse delay to each signal provided by a sensor of the focusing antenna, the delay being determined on the basis of the sensor number, the real inter-sensor distance, and the angular distance of the emitter with respect to the axis formed by the sensors, and
- the application of a fine delay to each signal provided by a sensor of the focusing antenna corresponding to the curvature of the wave front, the fine delay applied to each signal being determined on the basis of the sensor number, of the real inter-sensor distance, the angular distance of the emitter with respect to the axis formed by the sensors and of the focusing distance.

20. The system for sonar pulse location ~~(100)~~ as claimed in any one of the preceding claims, ~~characterized in that~~wherein the detection antenna ~~(101)~~ and the focusing antenna ~~(102)~~ are substantially aligned along the same axis.

21. A method for sonar pulse location ~~(100)~~ for a submarine comprising the steps consisting ~~in~~of:

- providing two antennas of linear general shape ~~(101, 102)~~ and substantially parallel with each other, arranged on the submarine, the two antennas comprising a detection antenna ~~(101)~~ and a focusing antenna ~~(102)~~, the detection antenna ~~(101)~~ being of small size with respect to the length of the second antenna ~~(102)~~, each antenna comprising a set of sensors ~~(1010, 1020)~~,
- determining the direction of a sonar emission emitted by an emitter and intercepted by the detection antenna ~~(101)~~, and
- determining the distance of the emitter by focusing the paths from the signals provided by the sensors of the focusing antenna ~~(102)~~, in the determined direction of the sonar emission ~~determined by the detection module (101)~~.