

Radar device for the detection of unmanned, slow- and low-flying flying objects

The invention relates to a radar device for detecting unmanned, slow- and low-flying flying objects with the features of the preamble of patent claim 1.

Radar devices for detecting flying objects are known in best available technology. In air-near-range air defense systems, generic sensor units are used as radar devices, whereby the sensor units have a plurality of radar sensors, in particular a search radar and a following radar, as well as further electro-optical sensors. The sensor unit used in the air-close range air defense system "Skyshield" has an X-band radar sensor. These sensor units are suitable for detecting and monitoring flying objects at distances of several kilometers, for example up to 20 kilometers. The flying objects can have a small radar cross section.

Unmanned, slow- and low-flying flying objects are also referred to as LSS flying objects (low-flying, slow-flying and small). Such LSS flying objects can be remote-controlled floating platforms - so-called multicopter - with several propellers or rotors. There are such floating platforms with, for example, four, six, eight or twelve propellers. Other LSS flying objects can be remote controlled helicopters. LSS flying objects can be moved at low speeds close to the ground and along the facades or near trees. The rotating propellers, for example, may have a similar radar signature, such as moving leaves of trees and the like.

The abovementioned radar devices for the detection of flying objects are not optimally designed for the detection of LSS flying objects. LSS flying objects can approach a target by using the topography of the environment. In particular, when such LSS flying objects are used in a city, the LSS flying objects of both approaches of the target can be directed along a trajectory that extends close to facades and trees and the like. With a conventional sensor unit, which is used in air-near-range air defense systems, flying objects can be easily recognized, which are not hidden in ground clutter - the so-called ground clutter. The average radar scattering cross section of the LSS flying objects is relatively low in the X band (approx. 8 to 12 GHz). Due to the expansion of the cluttering cell, the average radar scattering cross-section of the urban ground clutter in the X-band can be relatively large. The detection of LSS flying objects based on their spectral properties and the proximity to buildings and trees is thereby difficult because the LSS flying objects could be masked by the ground clutter.

The use of radar sensors in vehicles is known.

For example, DE 42 01 806 A1 is known to equip a vehicle in the rear range with a radar sensor so that the distance to an obstacle during a reverse travel can be determined by means of the radar sensor.

It is also known to use an automobile radar sensor module in vehicles for distance and speed measurement in the forward direction of travel. In fig. 1, the from prior art known application range of an automobile radar sensor module 16 is illustrated. A corresponding automobile radar sensor module 16 is arranged on a motor vehicle 17 in the front range. This automobile radar sensor module 16 is used here to determine the relative speed to other preceding vehicles or the corresponding obstacles (not shown). The automobile radar sensor module 16 is thus oriented such that a measuring range 18 is wide and flat, whereby the azimuth angle to preceding vehicles or obstacles can be determined. The measuring range 18 can also be designated as a detection range. An ellipse 19 illustrates in fig. 1 the extent of the measuring range 18 parallel to the road.

The invention is therefore based on the object of developing and designing the abovementioned radar device for the detection of unmanned, slow- and low-flying flying objects such that the detection of unmanned, slow- and low-flying flying objects is improved.

This object based on the invention is now solved by a radar device having the features of patent claim 1. At least one of the radar sensors is configured as an automobile radar sensor module, in which such an automotive radar sensor module could also be used in motor vehicles. Such automobile radar sensor modules are used in the prior art to measure the distances and the relative speed of previously exiting vehicles or obstacles. The use of an automobile radar sensor module for the detection of flying objects has the advantage that the automobile radar sensor module is particularly well suited for use in an urban environment. These automobile radar sensor modules are well suited to distinguish smaller flying objects from other disturbance data in an urban environment. The radar devices can be used to monitor ground-level zones, such as street gullies or the like, because the automobile radar sensor modules are designed to produce little interfering data in urban environments. Further, such automobile radar sensor modules are robust. The automobile radar sensor modules are to be provided cost-effectively.

The automotive radar sensor module has a range of in particular less than 1 kilometer, in particular less than 500 meters, in particular of 200 meters or less. It is conceivable to use the radar device for detecting and / or tracking ground-level flying objects at distances of up to 60 meters or up to 200 meters. In the range up to 60 meters, a close-range measurement can be carried out and a long-range measurement can be carried out in the range up to 200 meters. The automobile radar sensor module preferably measures the relative speed and the angle ratio between the automobile radar sensor module and the flying object at the same time. The term low flying means flying objects, which cannot be detected by long-range military radar systems. This applies in particular to flying objects that fly in house sheds or mountain valleys. By means of the automobile radar sensor module, it is preferably possible to monitor a ground-near zone which extends at least 10 meters, preferably at least 20 meters, above the ground. In particular, the ground-near zone also covers a range of 20 to 30 meters above ground.

In particular, the distance and the speed of the flying object can be measured by means of the automobile radar sensor module. The Doppler effect can be used to measure the speed. The automobile radar sensor module is preferably designed as a continuous wave radar, in particular as a modulated continuous wave radar. The automobile radar sensor module is preferably equipped with a CAN bus (controller area network) as an interface for data transmission. The automobile radar sensor module may have a radar operating frequency band between 76 and 81 GHz, in particular between 76 and 77 GHz. The automobile radar sensor module is operable with a DC voltage, for example with a DC voltage of 12 volts, 24 volts or 48 volts.

Another advantage is that the dimensions of such an automobile radar sensor module are small and the automobile radars sensor module is light. As a result, the radar device can also be designed compactly and / or lightly. The automobile radar sensor module may have, for example, a length of less than 20 cm. The weight of the automobile radar sensor module may be less than 1 kg, in particular less than 0.5 kg. In a preferred embodiment, the automobile radar sensor module is arranged rotatably. Thus, the monitoring range of the radar device is not limited to the current measuring range of the automobile radar sensor module. The monitoring range can be increased by rotating the automobile radar sensor module and thus the measuring range. Furthermore, the radar device can thereby also be used for tracking flying objects. In particular, the automobile radar sensor module is rotatably arranged relative to a vertical axis. In particular, the radar device has a holder, in which the holder carries at least one automobile radars

sensor module. The holder preferably carries a plurality of automobile radars sensor modules. The holder can be formed by a housing. The holder is rotatably arranged. The holder can be connected to a rotatably supported rotary table. By turning the turntable, the measuring range of the automobile radar sensor module sweeps over or the different measuring ranges of the automobile wheel sensor modules now sweep over the surroundings of the rotary position of the turntable. The rotation of the automobile radar sensor module makes it possible, in particular, to scan a 360° spectrum.

Compared to the use of such an automobile radar sensor module in motor vehicles, the automobile radar sensor module is in each case arranged on the holder rotated in particular by 90°. This has the advantage that the resolution of the radar device with respect to the azimuth angle is correspondingly large. The automobile radar sensor module detects a measuring range with an elevation detection angle and an azimuthal detection angle. The elevation detection angle of the measuring range is preferably greater than the azimuth detection angle of the measuring range. The elevation detection angle can, for example, be more than 15°, in particular more than 30°, preferably more than 45°. In a preferred embodiment, the elevation detection angle can be in the close range - i.e. up to, for example, 60m - 56° and in the long range - i.e. up to, for example, 200m - 19°. The azimuth detection angle of the measuring range can be, in particular, less than 15°, in particular less than 10°, preferably less than 5°. In a preferred embodiment, the azimuth detection angle can be 4.3°. It is also conceivable that the automobile radar sensor module is oriented such that the elevation detection angle of the measuring range is smaller than the azimuth detection angle of the measuring range.

It is conceivable that each radar device comprises a plurality of automobile radars sensor modules. These automobile radar sensor modules can be aligned on a holder in different elevation directions. In one embodiment, a first automotive radar sensor module may be further upwardly aligned than a second automotive radar sensor module, whereby the first automotive radar sensor module detects an upper elevation range and the second automatic radar sensor module detects a lower elevation range. In an embodiment of the radar device, a first automobile radars sensor module is provided for detecting an upper elevation range and a second automobile radars sensor module for detecting a lower elevation range, as well as a third automotive radar sensor module for detecting a medium elevation range between the upper elevation range and the lower elevation range. It is advantageous if the automobile radar sensor module

modules are arranged on the holder in different azimuthal directions and/or different elevation angles in order to achieve a higher updating rate per revolution and / or to cover a larger range of operation and/or to cover a larger elevation range. The holder can, for example, be designed as a column, whereby each column side has at least one window for at least one of the automobile radar sensor modules in each case. If the column now has a rectangular, in particular quadratic base area and correspondingly four column sides, each column side can be assigned at least one automobile radar sensor module. In an embodiment of the invention, at least one TV camera and / or at least one IR camera is functionally assigned to at least one automobile radars sensor module arranged on a holder. The signal of the TV and / or IR camera can serve the identification of the detected type of the LSS flying object. The identification of the type LSS flying object allows the assessment of the overall situation, for example, by comparison with stored standard type object data.

In a further embodiment, the automobile radar sensor module is aligned with a pivotable reflector, whereby the measuring range of the automobile radar sensor module can be varied by pivoting the reflector. The automobile radar sensor module is arranged stationary and is not rotatably arranged. Since the measuring range can be varied by pivoting, in particular by turning, the reflector, a movement of the mass of the automobile radar sensor module can be dispensed. The moment of inertia is less, when the automobile radar sensor modules are arranged rotatably on a holder. Due to the smaller moment of inertia, the corresponding drive for the reflector can be dimensioned smaller. Furthermore, in this embodiment, no electrical rotary couplings must be provided for the automobile radar sensor module. This allows that the structure of the radar device is simplified and cost for an electric rotary clutch can be saved. The cabling of the automobile radar sensor module is static. By pivoting the reflector, the measuring range can be varied and thus the monitoring range is increased. Thus, it is possible to use less automobile radar sensor modules in order to monitor a particular monitoring range.

The reflector is preferably designed as a well conducting plate, in particular as a metal sheet. The reflector is designed in particular as a reflector plate or reflector polygon. The automobile radar sensor module is aligned with its antenna array on the reflector and is not moved. The reflector is preferably pivotable around an upright axis, preferably about a vertical axis. The reflector can be driven by means of a drive. The position of the reflector can in particular be determined by means of a position sensor, in particular

by means of a position switch. Start and stop times are preferably determined by means of the position switches, whereby a scanning takes place by means of the automobile radar sensor module depending on the start and stop times. The scan rate is doubled when using the front and rear of the reflector. The azimuth scan profile corresponds in particular to a saw tooth profile.

In one embodiment, the reflector can be periodically pivoted from one end position to another end position back to the first end position. In this case, in particular, only one side of the reflector is used, this means irradiated from the antenna array. In a preferred embodiment, the reflector is pivoted in such a way that the reflector rotates around an axis, whereby the different sides of the reflector are now irradiated accordingly successively by the antenna array. This embodiment avoids a periodic braking and accelerating of the reflector, which benefits the service life of the driving mechanism of the reflector. The rotating movement of the reflector can take place either clockwise or counterclockwise. However, the rotational direction is maintained in this operating mode during rotation.

The radar device preferably has at least one interface for data transmission to a central station. The radar device in particular has at least one transmission module which transmits the radar data to the central station with the rotational position of the rotary actuator. The transmission module provides, in particular, a radio interface. The transmission module may, for example, comprise an ISM module, a GSM module, a UMTS module or a LTE module. The transmission module may be located within the column or on the column. The transmission module receives the radar data via the CAN interfaces and the rotational position from a drive or a sensor. The rotary position and the associated radar data are forwarded by means of the transmission module to a central station, whereby in the control center the data of the radar devices are evaluated.

It is now possible to construct a particularly advantageous radar arrangement with a plurality of such radar devices. The radar arrangement has at least one radar device which, in particular, monitors a lower, ground-level zone. A plurality of radar devices are preferably arranged at a distance from one another, whereby the radar devices detect different monitoring ranges, whereby the different monitoring ranges preferably overlap. In this case, the radar devices can be arranged elevated on buildings in order to be able to monitor well road gullies or the like. The overlapping monitoring regions form a

monitoring ring around an object to be protected. The object to be protected can be, for example, a building, a sports facility or the like. In order to form such a monitoring ring, the corresponding radar devices are now arranged at a distance from each other so that the monitoring ranges of the individual radar devices overlap and form the monitoring ring as a whole.

The radar arrangement preferably has at least one sensor unit of an air-near-range air defense system, whereby the sensor unit has at least one radio sensor for monitoring an upper zone. The sensor unit monitors the upper zone above the houses, buildings or trees in an urban environment. The sensor unit can be arranged higher for this purpose. For example, the sensor unit is arranged on a house roof. The sensor unit is well suited for the detection of higher flying objects. It is preferable to provide a sensor unit of the air near range air defense system "Skyshield" with an X-band radar sensor. The radar arrangement is particularly advantageous, since here in the lower, near-ground, clutter-rich zone, the corresponding radar devices can be used with automobile radar sensors to be able to detect slow- and low-flying, unmanned flying objects.

The disadvantages mentioned above are therefore avoided and corresponding advantages have been achieved.

There are now a number of possible ways of designing and further developing the inventive radar device and the inventive radar arrangement in an advantageous manner. Therefore, reference may be made firstly to the claims subordinated to patent claim 1. In the following, different embodiments of the inventive radar device are explained in more detail with reference to the drawing and the accompanying description.

In the drawing shows:

- Fig. 1 in a schematic representation a motor vehicle with an automobile radar sensor module,
- Fig. 2 in a schematic representation an urban environment with a sensor unit and with a slow- and low-flying, unmanned flying object,
- Fig. 3 in a schematic representation the urban environment with the sensor unit and the flying object, whereby an inventive radar device is additionally provided,

- Fig. 4 in a schematic, perspective representation a first embodiment of the radial device,
- Fig. 5 in a schematic plan view, the first embodiment of the radar device,
- Fig. 6 in a schematic plan view, a second embodiment of the radar device,
- Fig. 7 in a schematic perspective representation a third embodiment of the radar device,
- Fig. 8 in a schematic, perspective representation, a fourth embodiment of the radar device,
- Fig. 9 in a schematic plan view the fourth embodiment of the radar device in plan view in a first operating mode, and
- Fig. 10 in a schematic plan view the fourth embodiment of the radar device in plan view in a second alternative operating mode.

Before the radar devices 1, 2, 3, 27 may be considered in more detail with reference to fig. 4 to 7 and 8 to 9, the preferred field of application of the radar devices 1, 2, 3, 27 will now be explained in more detail with reference to figs. 2 and 3.

Figs. 2 and 3 show an urban environment with several buildings 4, 5, 6. There are trees 7 between the two buildings 5 and 6. A sensor unit 8 is installed or arranged on the roof of the building 4. The sensor unit 8 comprises a radar sensor 9. In addition to the radar sensor 9, the sensor unit 8 has, in particular, further electro-optical sensors and / or further radar sensors (not shown). An air structure can be created with the sensor unit 8, whereby flying objects can be made visible in particular in the range of 360° and up to a maximum distance of, for example, 20 km. Such sensor units 8 are well suited to detecting and tracking flying objects in an upper zone 10.

In fig. 2, a boundary line 11 is schematically indicated here. Below the border line 11 is a lower, ground-level zone 12, whereby the corresponding buildings 4, 5, 6, the trees 7 and the like are located in this lower zone 12. This lower zone 12 cannot be optimally monitored with the sensor unit 8 and the radar sensor 9 because a plurality of radar interference signals can occur. The lower zone 12 can therefore also be referred to as a ground clutter zone. The lower zone 12 can, in particular, extend to the gables. Roofs of buildings 4, 5, 6 extend.

Fig. 2 and fig. 3 show that a remote-controlled, small and slow, unmanned flying object 13 is moved low-flying along a flight path 14. The flying object 13 is difficult to detect and track by means of the sensor unit 8 because the flying object 13 is moved close to along the facade of the building 6 and near the trees 7.

In order to improve the detection, several radar devices 1, 2, 3 (see Figs. 3 to 7) and/or radar devices 27 (see Figs. 8 to 10) are additionally provided. Each of the radar devices 1, 2, 3, 27 has at least one radar sensor 15. The disadvantages mentioned above are now avoided by the fact that at least one radar sensor 15 is configured as an automobile radar sensor module 16. This has the advantage that the detection of corresponding slow flying objects 13 is improved, in particular in the lower zone 12 near the ground. Preferably, all of the radar sensors 15 are configured as automobile radar sensor modules 16. These automobile radar sensor modules 16 are also suitable for distinguishing smaller flying objects 13 from interfering data in an urban environment. Furthermore, such automobile radar sensor modules 16 are robust and cost-effective.

In the case of the radar devices 1 shown in Figs. 3 to 7 for the detection of the corresponding flying objects 13, the automobile radar sensor module 16 is now rotated by 90° in comparison with the use in motor vehicles (see fig. 1 and the associated description) so that the measuring range 20 is larger in the vertical than in the horizontal direction.

The radar devices 1, 2, 3 each have a holder 21, which serves for mounting or arrangement for the automobile radar sensor module 16. The holder 21 is fixedly connected to a rotary table 22. As a result, the corresponding automotive radar sensor modules 16 are functionally rotatably arranged. The turntable 22 can be rotatably mounted on a corresponding foot. The turntable 22 is drivable by means of its drive (not shown). In this case, the rotational position of the turntable 22 is detected. By means of the automobile radar sensor module 16, the corresponding measuring range 20 can now be rotated by rotating the turntable 22 in order to scan the lower zone 12 for corresponding flying objects 13. As soon as a flying object 13 has been detected by the automobile radar sensor module 16, the turntable 22 can be controlled such that the measuring range 20 follows the flying object 13. The rotary movement 24 of the turntable 22 is indicated by an arrow in each case. The rotary movement 24 can either follow clockwise or counterclockwise.

The radar devices 1, 2, 3, 27 each have in particular a transmission module 23. By means of the transmission module 23, the radar data and/or in the case of the radar devices 1, 2, 3, the rotational position of the turntable 22 can be forwarded to a central station. The transmission module 23 transmits the corresponding data, in particular by radio, or provides a radio link.

The transmission module 23 may comprise a GSM module, an ISM module, a UMTS module and/or a LTE module (not shown). In an alternative embodiment it is conceivable that the transmission module 23 transmits the corresponding data in a wire-bound manner to the center.

In the embodiment shown in Figs. 4 and 5, the radar device 1 has exactly one automobile radar sensor module 16. In order to increase the update rate, it is conceivable for a plurality of automobile radar sensor modules 16 are provided, which are arranged on the holder 21 and point in different azimuthal directions, as is indicated, for example, in fig. 6. Here, four automobile radar sensor modules 16 are directed in four azimuth directions (unspecified). These azimuth directions are, in particular, in each case spaced by 90° to one another. However, it is conceivable to assign a different number of automobile radars sensor modules 16 to different azimuth directions. For example, two, three, five or more azimuth ranges can be covered by corresponding automobile motor sensor modules 16. This increases the update rate per revolution.

In the embodiment shown in fig. 7, the monitoring range is enlarged in the vertical direction by different aligned automotive radar sensors 16. A first automobile radar sensor module 16 for an upper elevation range 25 and a second automobile radar sensor module 16 for a lower elevation range 26 are provided. It is conceivable in this case additionally to arrange additional automobile radar sensor modules 16, which are directed in other azimuthal directions on the holder 21, as shown in fig. 6.

Figs. 8 to 10 show a radar device 27. The radar device 27 also has a radar sensor 15. The radar sensor 15 is designed as an automobile radar sensor 16. The automobile radar sensor 16 is arranged rotated around 90° in comparison to the use in motor vehicles so that the measuring range 20 is greater in the vertical than in the horizontal. Alternatively, however, the measuring range 20 can also be smaller in the vertical than in the horizontal. In this embodiment, the automobile wheel module 16 is kept stationary by a holder (not shown). The radar device 27 now comprises a reflector 28 at a distance from the automobile radar sensor module 16. The reflector 28 is preferably designed as

a conductive plate (not further described). The reflector 28 may have a rectangular surface or a square surface or a polygonal surface. The reflector 28 is rotatably arranged around an upright axis 29. The direction of rotation 30 is indicated here by an arrow. The axle 29 is oriented upright. The automobile wheel sensor module 16 is aligned with the reflector 28. As a result of that the automobile radar sensor module 16 is aligned with the pivotable reflector 28, the measuring range 20 of the automobile radar sensor module 16 can be changed by pivoting the reflector 28. The automobile wheel sensor module 16 is stationary and is itself non-rotatable. Since the measuring range 20 can be changed by pivoting, in particular by turning, the reflector 28, the use of an electrical rotary coupling for power supply and for data transmission can be dispensed with.

The reflector 28 is functionally operatively coupled with a drive 31. The drive 31 is here arranged below the reflector 28 in the range of the axis 29. The drive 29 can, for example, have a turntable, whereby the turntable can be driven by the drive 31. By means of the drive 31, the reflector 28 can be pivoted around the axis 29. When the reflector 28 is now pivoted, the measuring range 20 radiated by the reflector 28 changes. The movement direction 32 of the measuring range 20 is indicated here by an arrow.

Two position switches 33, 34 are now provided as position sensors. The position switches 33, 34 serve for radar control and/or for drive control. The position of the reflector 28 can be determined by means of the position switches 33, 34. Start and stop times are preferably determined by means of the position switches 33, 34, whereby a scanning takes place by means of the automobile radar sensor module 16 depending on the start and stop times. The azimuth scan profile corresponds in particular to a saw tooth profile.

In the following, reference may be made in more detail to Figs. 9 and 10. Figs. 9 and 10 show two different operating modes.

It is shown in fig. 9 that in order to enlarge the range to be searched, the reflector 28 can be pivoted into a first end position and into a second end position, whereby the movement of the reflector 28 is reversed by means of the drive 31 when the opposite end position is reached. The reflector 28 oscillates between the two end positions. The measuring range 20 is varied periodically within the sector 36 in the propagation direction 35, whereby the size of the sector 36 is determined by the two end positions of

the reflector 28. The monitoring range is formed here by the sector 36. The automobile radar sensor module 16 is thereby always aligned on the same side of the reflector 28. As a result, the monitoring range is only enlarged to one side.

Fig. 10 shows a further operating mode in which the reflector 28 always rotates in the same direction of rotation. The reflector 28 rotates 360° . The rotary movement of the reflector 28 is therefore endless. In this case, the automobile radar sensor module is aligned once on one side of the reflector 28 and is once aligned on the other side of the reflector 28. By this embodiment, a two-sided scanning is made possible within two sectors 39, 40. The rotary movement can take place either clockwise or counterclockwise. Fig. 10 schematically shows the direction of propagation 37 of the measuring range 20 for the first side and the direction of propagation 38 for the second side. This results in two different sectors 39, 40, in which the measuring range 20 is moved, depending on how the reflector 28 is aligned relative to the automobile radar sensor module 16. The scan rate is doubled when the front and rear of the reflector 28 are used. Furthermore, the monitoring range is thereby enlarged, whereby the monitoring range extends on both sides of the reflector.

It is conceivable that the multiple automobile radar sensor modules 16 are each aligned in different elevation directions on one or more rotatable reflectors 28 in order to detect different elevation ranges. For example, in this embodiment, a first automobile radar sensor module 16 can also be provided for detecting an upper elevation range and a second automobile radar sensor module 16 for detecting a lower elevation range (not shown in detail).

Alternatively, a first automobile radar sensor module 16 may be provided for detecting an upper elevation range 25 and a second automobile radar sensor module 16 for detecting a lower elevation range 26 as well as a third automobile radar sensor module 16 for detecting a medium elevation range between the upper elevation range 25 and the lower elevation range 26. It is conceivable to assign a separate reflector 28 to each automobile radar sensor module 16, or the multiple automobile radar sensor module 16 can share a reflector 28.

The disadvantages mentioned above are therefore avoided and corresponding advantages are reduced.

REFERENCE LIST

- 1 Radar device
- 2 Radar device
- 3 Radar device
- 4 Building
- 5 Building
- 6 Building
- 7 Tree
- 8 Sensor unit
- 9 Radarsensor
- 10 Upper zone
- 11 Borderline
- 12 Lower zone
- 13 Flying object
- 14 Flight path
- 15 Radar sensor
- 16 Automobile radar sensor module
- 17 Motor vehicle
- 18 Measuring range
- 19 Ellipse
- 20 Measuring range
- 21 Holder

22	Turntable
23	Transmission module
24	Rotational movement
25	Upper elevation range
26	Lower elevation range
27	Radar device
28	Reflector
29	Axis
30	Rotation direction
31	Drive
32	Movement direction
33	Position switch
34	Position switch
35	Direction of propagation
36	Sector
37	Direction of propagation
38	Direction of propagation
39	Sector
40	Sector

PATENT CLAIMS

1. A radar device (1, 2, 3, 27) for detecting unmanned, slow- and low-flying flying objects (13), with at least one radar sensor (15), characterized in that at least one radar sensor (15) is configured as an automobile radar sensor module (16).
2. A radar device according to claim 1, characterized in that the automobile radar sensor module (16) is oriented such that a measuring range (20) of the automobile radar sensor module (16) has an azimuth detection angle and an elevation detection angle, whereby the elevation detection angle is greater than the azimuth detection angle.
3. A radar device according to claim 1, characterized in that the automobile radar sensor module (16) is oriented such that a measuring range (20) of the automobile radar sensor module (16) has an azimuth detection angle and an elevation detection angle, whereby the elevation detection angle is less than the azimuth detection angle.
4. Radar device according to one of the preceding claims, characterized in that at least one automobile radar sensor module (16) is arranged on a holder (21), whereby the holder (21) is rotatably mounted in a functionally effective manner.
5. A radar device according to the preceding claim, characterized in that the holder (21) is fixedly connected to a turntable (22), whereby the turntable (22) is rotatably mounted, whereby the turntable (22) is drivable by means of a drive.
6. Radar device according to one of the preceding claims, characterized in that a plurality of automobile radar sensor modules (16) are aligned on a holder (21) in different azimuth directions.
7. Radar device according to one of the preceding claims, characterized in that a plurality of automobile radar sensor modules (16) are aligned on a holder (21) in different elevation directions.

8. A radar device according to one of the preceding claims, characterized in that a first automobile radar sensor module (16) is provided for detecting an upper elevation range (25) and a second automobile radar sensor module (16) for detecting a lower elevation range (26).
9. A radar device according to one of the preceding claims, characterized in that a first automobile radar sensor module (16) is provided for detecting an upper elevation range (25) and a second automobile radar sensor module (16) for detecting a lower elevation range (26) and a third automotive radar sensor module (16) for detecting a medium elevation range between the upper elevation range (25) and the lower elevation range (26).
10. A radar device according to one of the preceding claims 4 to 9, characterized in that the holder (21) is designed as a column, whereby on different column sides at least one window is provided for respectively at least one automobile radars sensor module (16), whereby at least one automobile radar sensor module (16) is associated with this column side.
11. A radar device according to one of the preceding claims, characterized in that at least one TV camera and/or at least one IR camera is functionally assigned to at least one automobile radar sensor module (16) arranged on a holder (21).
12. A radar device according to one of the preceding claims, characterized in that a transmission module (23) is provided for transmitting radar data from at least one automobile radar sensor module (16) and/or a rotational position to a central station.
13. Radar device according to the preceding claim, characterized in that the transmission module (23) provides a radio link.
14. Radar device according to one of the preceding claims, characterized in that the automobile radar sensor module (16) is aligned on a pivotable reflector (28), whereby the measuring range (20) of the automobile radar sensor module (16) can be changed by pivoting the reflector.

15. Radar arrangement, characterized by at least one radar device (1, 2, 3, 27) according to one of the preceding claims, whereby at least one radar device (1, 2, 3, 27) monitors a monitoring range in a bottom zone (12).
16. Radar arrangement according to the preceding claim, characterized in that a plurality of radar devices (1, 2, 3, 27) are arranged at a distance from one another, whereby the radar devices (1, 2, 3, 27) detect different monitoring ranges, whereby the different monitoring ranges overlap.
17. Radar arrangement according to the preceding claim, characterized in that the overlapping monitoring ranges form a monitoring ring around an object to be protected.
18. Radar arrangement according to one of the preceding claims 5 to 7, characterized in that a sensor unit (8) of an air-near-range air defense system is provided, whereby the sensor unit is provided with at least one radar sensor (9) for monitoring an upper zone (10), whereby the upper zone (10) is above the lower zone (12).