G01S  RADIO DIRECTION-FINDING; RADIO NAVIGATION; DETERMINING DISTANCE OR VELOCITY BY USE OF RADIO WAVES; LOCATING OR PRESENCE-DETECTING BY USE OF THE REFLECTION OR RERADIATION OF RADIO WAVES; ANALOGOUS ARRANGEMENTS USING OTHER WAVES ( { for special applications, see the relevant subclasses, e.g. A61B, G01F, G01N, G02B; measuring dimensions or angles of objects G01B; navigation in general G01C; measuring infrasonic, sonic or ultrasonic vibrations in general G01H; measuring infra-red, visible, or ultra-violet radiation in general G01J; transducers per se, see the relevant subclasses, e.g. G01L, H01L, H04R; measuring direction or velocity of flowing fluids by reception or emission of radiowaves or other waves and based on propagation effects caused in the fluid itself G01P; measuring electric or magnetic variables in general G01R }; detecting masses or objects by methods not involving reflection or radiation of radio, acoustic or other waves G01V; { time-interval measuring G04F }; aerials H01Q )

NOTES
1. In this subclass, the following term is used with the meaning indicated:
   • “transponder” means an arrangement which reacts to an incoming interrogating or detecting wave by emitting a specific answering or identifying wave.

2. Attention is drawn to the Notes following the title of class G01 and to Note (1) following the title of subclass G09B.

WARNINGS
1. The following IPC groups are not in the CPC scheme. The subject matter for these IPC groups is classified in the following CPC groups:
   - G01S 7/26 covered by G01S 7/06

2. In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

1/00  Beacons or beacon systems transmitting signals having a characteristic or characteristics capable of being detected by non-directional receivers and defining directions, positions, or position lines fixed relatively to the beacon transmitters; Receivers co-operating therewith (position fixing by co-ordinating a plurality of determinations of direction or position lines G01S 5/00)  
   1/02 . . . using radio waves (G01S 19/00 takes precedence)  
   1/022 . . . {Means for monitoring or calibrating}  
   1/024 . . . {of beacon transmitters}  
   1/026 . . . {of associated receivers}  
   1/028 . . . {Simulation means, e.g. of beacon signals therefor (for teaching or training purposes G09B 9/00)}  
   1/04 . . . Details  
   1/042 . . . {Transmitters}  
   1/045 . . . {Receivers}  
   1/047 . . . {Displays or indicators (G01S 1/06 takes precedence)}  

1/06 . . . Means for providing multiple indication, e.g. coarse and fine indications  
   1/08 . . . Systems for determining direction or position line (aerial arrangements for changing or varying the orientation or the shape of the directional pattern H01Q 3/00; combinations of different interacting units for giving a desired directional characteristic H01Q 21/29; aerials or aerial systems providing at least two radiation patterns H01Q 25/00)  
   1/10 . . . using amplitude comparison of signals transmitted sequentially from antennas or antenna systems having differently-oriented overlapping directivity characteristics, e.g. equi-signal A-N type  
   1/12 . . . the signals being transmitted sequentially from an antenna or antenna system having the orientation of its directivity characteristic periodically varied, e.g. by means of sequentially effective reflectors
1/14 . . . . using amplitude comparison of signals transmitted simultaneously from antennas or antenna systems having differently oriented overlapping directivity-characteristics
1/16 . . . . Azimuthal guidance systems, e.g. system for defining aircraft approach path, localiser system
1/18 . . . . Elevational guidance systems, e.g. system for defining aircraft glide path
1/20 . . . . using a comparison of transit time of synchronised signals transmitted from non-directional antennas or antenna systems spaced apart, i.e. path-difference systems
1/22 . . . . the synchronised signals being frequency modulations on carrier waves and the transit times being compared by measuring difference of instantaneous frequencies of received carrier waves
1/24 . . . . the synchronised signals being pulses or equivalent modulations on carrier waves and the transit times being compared by measuring the difference in arrival time of a significant part of the modulations [. e.g. LORAN systems]
1/245 . . . . {Details of receivers cooperating therewith, e.g. determining positive zero crossing of third cycle in LORAN-C}
1/26 . . . . Systems in which pulses or time-base signals are generated locally at the receiver and brought into predetermined time-relationship with received signals, e.g. pulse duration coincides with time interval between arrival of significant part of modulation of signals received from first and second antennas or antenna systems
1/28 . . . . wherein the predetermined time-relationship is maintained automatically
1/30 . . . . the synchronised signals being continuous waves or intermittent trains of continuous waves, the intermittency not being for the purpose of determining direction or position line and the transit times being compared by measuring the phase difference
1/302 . . . . {Systems in which the direction is determined by using an interferometric type transmitting antenna array}
1/304 . . . . {Analogous systems in which a beat frequency, obtained by heterodyning the signals, is compared in phase with a reference signal obtained by heterodyning the signals in a fixed reference point and transmitted therefrom, e.g. LORAC (long range accuracy) or TORAN systems}
1/306 . . . . {Analogous systems in which frequency-related signals (harmonics) are compared in phase, e.g. DECCA systems}
1/308 . . . . {particularly adapted to Omega systems}
1/32 . . . . Systems in which the signals received, with or without amplification, or signals derived therefrom, are compared in phase directly
1/34 . . . . Systems in which first and second synchronised signals are transmitted from both antennas or antenna systems and a beat frequency, obtained by heterodyning the first signals with each other is compared in phase with a beat frequency obtained by heterodyning the second signals with each other
1/36 . . . . Systems in which a beat frequency, obtained by heterodyning the synchronised signals, is compared in phase with a reference signal having a phase substantially independent of direction
1/38 . . . . using comparison of [1] the phase of the envelope of the change of frequency, due to Doppler effect, of the signal transmitted by an antenna moving, or appearing to move, in a cyclic path with [2] the phase of a reference signal, the frequency of this reference signal being synchronised with that of the cyclic movement, or apparent cyclic movement, of the antenna
1/40 . . . . the apparent movement of the antenna being produced by cyclic sequential energisation of fixed antennas
1/42 . . . . Conical-scan beacons transmitting signals which indicate at a mobile receiver any displacement of the receiver from the conical-scan axis, e.g. for “beam-riding” missile control
1/44 . . . . Rotating or oscillating beam beacons defining directions in the plane of rotation or oscillation
1/46 . . . . Broad-beam systems producing at a receiver a substantially continuous sinusoidal envelope signal of the carrier wave of the beam, the phase angle of which is dependent upon the angle between the direction of the receiver from the beacon and a reference direction from the beacon, e.g. cardioid system
1/465 . . . . {using time-varying interference fields}
1/48 . . . . wherein the phase angle of the direction-dependent envelope signal is a multiple of the direction angle, e.g. for “line” bearing indication [TACAN]
1/50 . . . . wherein the phase angle of the direction-dependent envelope signal is compared with a non-direction-dependent reference signal, {e.g. VOR}
1/52 . . . . wherein the phase angles of a plurality of direction-dependent envelope signals produced by a plurality of beams rotating at different speeds or in different directions are compared
Narrow-beam systems producing at a receiver a pulse-type envelope signal of the carrier wave of the beam, the timing of which is dependent upon the angle between the direction of the receiver from the beacon and a reference direction from the beacon; Overlapping broad beam systems defining a narrow zone and producing at a receiver a pulse-type envelope signal of the carrier wave of the beam, the timing of which is dependent upon the angle between the direction of the receiver from the beacon and a reference direction from the beacon

Timing the pulse-type envelope signals derived by reception of the beam wherein a characteristic of the beam transmitted or of an auxiliary signal is varied in time synchronously with rotation or oscillation of the beam

Varying frequency of beam signal or of auxiliary signal

Varying phase-relationship between beam and auxiliary signal

Varying pulse timing, e.g. varying interval between pulses radiated in pairs

Superimposing direction-indicating intelligence signals, e.g. speech, Morse

Marker, boundary, call-sign, or like beacons transmitting signals not carrying directional information

[using pulse modulation, e.g. pulse frequency modulation]

using electromagnetic waves other than radio waves

using gamma or X-rays

using ultrasonic, sonic or infrasonic waves

[signalling devices G08B]

[Marker, boundary, call-sign or like beacons transmitting signals not carrying directional information]

[Displaying or indicating means therefor]

Systems for determining direction or position line (sound focusing or directing using electrical steering of transducer arrays, e.g. beam steering, in general G10K 11/34)

[using the Doppler shift introduced by the relative motion between beacon and receiver]

[Conical-scan beam beacons transmitting signals which indicate at a mobile receiver any displacement of the receiver from the conical-scan axis]

using amplitude comparison of signals transmitted from transducers or transducer systems having differently-oriented characteristics

[the signals being transmitted sequentially]

[the signals being transmitted simultaneously]

using a comparison of transit time of synchronised signals transmitted from non-directional transducers or transducer systems spaced apart, i.e. path-difference systems

[the synchronised signals being frequency modulations on carrier waves and the transit times being compared by measuring difference of instantaneous frequencies of received carrier waves]

[the synchronised signals being pulses or equivalent modulations on carrier waves and the transit times being compared by measuring the difference in arrival time of a significant part of the modulations]

[the synchronised signals being continuous waves or intermittent trains of continuous waves, the intermittency not being for the purpose of determining direction or position line and the transit times being compared by measuring the phase difference]

Rotating or oscillating beam beacons defining directions in the plane of rotation or oscillation

Direction-finders for determining the direction from which infrasonic, sonic, ultrasonic, or electromagnetic waves, or particle emission, not having a directional significance, are being received (position fixing by co-ordinating a plurality of determinations of direction or position lines G01S 5/00; for geophysical measurement G01C; telescope mountings G02B)

using radio waves

[Monitoring or calibrating]

[Simulating means therefor]

Details

[Receivers]

[Displays or indicators]

Means for increasing effective directivity, e.g. by combining signals having differently oriented directivity characteristics or by sharpening the envelope waveform of the signal derived from a rotating or oscillating beam antenna (comparing amplitude of signals having differently oriented directivity characteristics to determine direction G01S 3/16, G01S 3/28)

[by using non-directional aerial]

Means for reducing polarisation errors, e.g. by use of Adcock or spaced loop antenna systems

[by using spaced loop aerial antenna systems]

Means for reducing or compensating for quadrant, site, or like errors

Means for determining sense of direction, e.g. by combining signals from directional antenna or goniometer search coil with those from non-directional antenna (determining direction by amplitude comparison of signals derived by combining directional and non-directional signals G01S 3/24, G01S 3/34)

Systems for determining direction or deviation from predetermined direction (aerial arrangements for changing or varying the orientation or the shape of the directional pattern H01Q 3/00; combinations of different interacting aerial units for giving a desired directional characteristic H01Q 21/29; aerials or aerial systems providing at least two radiation patterns H01Q 25/00)

[by vectorial combination of signals derived from differently oriented antennae]
Phase or time difference between signals using antennas spaced apart and measuring signal (G01S 3/16 system, e.g. to give a maximum or minimum antenna system to give a desired condition of directivity characteristic of an antenna or an antenna system having periodically-varied directivity characteristic to produce maximum or minimum signal, e.g. rotatable loop antenna or equivalent goniometer system.

Using amplitude comparison of signals derived from different combinations of signals from separate antennas, e.g. comparing sum with difference derived directly from separate directional antennas. Using amplitude comparison of signals derived simultaneously from receiving antennas or antenna systems having differently-oriented directivity characteristics.

The separate antennas comprising one directional antenna and one non-directional antenna, e.g. combination of loop and open antennas producing a reversed cardioid directivity characteristic.

The separate antennas having differently-oriented directivity characteristics.

Using amplitude comparison of signals derived simultaneously from receiving antennas or antenna systems having differently-oriented directivity characteristics derived directly from separate directional systems.

Derived from different combinations of signals from separate antennas, e.g. comparing sum with difference derived directly from separate directional systems.

{Automatic tracking systems}

The separate antennas comprising one directional antenna and one non-directional antenna, e.g. combination of loop and open antennas producing a reversed cardioid directivity characteristic.

The separate antennas having differently-oriented directivity characteristics.

Using adjustment of real or effective orientation of directivity characteristic of an antenna or an antenna system to give a desired condition of signal derived from that antenna or antenna system, e.g. to give a maximum or minimum signal (G01S 3/16, G01S 3/28 take precedence).

Adjusting orientation of a single directivity characteristic to produce maximum or minimum signal, e.g. rotatable loop antenna or equivalent goniometer system.

The desired condition being maintained automatically.

The adjustment being varied periodically or continuously until it is halted automatically when the desired condition is attained.

Using antennas spaced apart and measuring phase or time difference between signals therefrom, i.e. path-difference systems.

{The waves arriving at the aerials being frequency modulated and the frequency difference of signals therefrom being measured}

The waves arriving at the antennas being continuous or intermittent and the phase difference of signals derived therefrom being measured.

The waves arriving at the antennas being pulse modulated and the time difference of their arrival being measured.

Using a receiving antenna moving, or appearing to move, in a cyclic path to produce a Doppler variation of frequency of the received signal.

The apparent movement of the antenna being produced by coupling the receiver cyclically and sequentially to each of several fixed spaced antennas.

Conical-scan beam systems using signals indicative of the deviation of the direction of reception from the scan axis.

Rotating or oscillating beam systems using continuous analysis of received signal for determining direction in the plane of rotation or oscillation or for determining deviation from a predetermined direction in such a plane (G01S 3/14 takes precedence).

Broad-beam systems producing in the receiver a substantially sinusoidal envelope signal of the carrier wave of the beam, the phase angle of which is dependent upon the angle between the direction of the transmitter from the receiver and a reference direction from the receiver, e.g. cardioid system.

Wherein the phase angle of the signal is indicated by a cathode-ray tube.

Wherein the phase angle of the signal is determined by phase comparison with a reference alternating signal varying in synchronism with the directivity variation.

Narrow-beam systems producing in the receiver a pulse-type envelope signal of the carrier wave of the beam, the timing of which is dependent upon the angle between the direction of the transmitter from the receiver and a reference direction from the receiver; Overlapping broad-beam systems defining in the receiver a narrow zone and producing a pulse-type envelope signal of the carrier wave of the beam, the timing of which is dependent upon the angle between the direction of the transmitter from the receiver and a reference direction from the receiver.

Wherein the timing of the pulse-type envelope signal is indicated by cathode-ray tube (radar cathode-ray tube indicators providing co-ordinated display of distance and direction G01S 7/10).

Wherein the timing of the pulse-type envelope signal is determined by bringing a locally-generated pulse-type signal into coincidence or other predetermined time-relationship with the envelope signal.

Diversity systems specially adapted for direction-finding.
Multi-channel systems specially adapted for direction-finding, i.e. having a single antenna system capable of giving simultaneous indications of the directions of different signals (systems in which the directions of different signals are determined sequentially and displayed simultaneously) (G01S 3/04, G01S 3/14)

using electromagnetic waves other than radio waves

(Means for monitoring or calibrating)

using gamma or X-rays

Details

Systems for determining direction or deviation from predetermined direction

using amplitude comparison of signals derived from static detectors or detector systems

(using coding masks)

using a mosaic of detectors

using adjustment of orientation of directivity characteristics of a detector or detector system to give a desired condition of signal derived from that detector or detector system

the desired condition being maintained automatically, i.e. tracking systems; (G01S 3/783 takes precedence)

(Solar tracking systems)

(mounted on a moving platform, e.g. space vehicle)

(T.V. type tracking systems)

(using correlation of the live video image with a stored image)

(Star trackers (navigation using star trackers G01C 21/025))

(using horizon sensors)

using rotating reticles producing a direction-dependant modulation characteristic

producing a frequency modulation characteristic

using rotating or oscillating beam systems, e.g. using mirrors, prisms

using ultrasonic, sonic or infrasonic waves

(Diversity systems specially adapted for direction finding)

(Multi-channel systems specially adapted for direction-finding, i.e. having a single aerial system capable of giving simultaneous indications of the directions of different signals)

Details (G01S 3/82, G01S 3/84, G01S 3/86 take precedence)

Systems for determining direction or deviation from predetermined direction (sound-focusing or directing by electrical steering of transducer arrays, e.g. beam steering, in general G10K 11/34)

(using the Doppler shift introduced by the relative motion between source and receiver)

(Conical-scan beam systems using signals indicative of the deviation of the direction of reception from the scan axis)

(By vectorial composition of signals received by plural, differently-oriented transducers)

using amplitude comparison of signals derived from receiving transducers or transducer systems having differently-oriented directivity characteristics

 wherein the signals are derived sequentially)

 wherein the signals are derived simultaneously)

derived directly from separate directional systems)

derived from different combinations of signals from separate transducers comparing sum with difference)

using adjustment of real or effective orientation of directivity characteristics of a transducer or transducer system to give a desired condition of signal derived from that transducer or transducer system, e.g. to give a maximum or minimum signal

adjusting orientation of a single directivity characteristic to produce maximum or minimum signal)

the desired condition being maintained automatically

using transducers spaced apart and measuring phase or time difference between signals therefrom, i.e. path-difference systems

determining direction of source)

(determining other position line of source)

Rotating or oscillating beam systems using continuous analysis of received signal for determining direction in the plane of rotation or oscillation or for determining deviation from a predetermined direction in such a plane

with means for adjusting phase or compensating for time-lag errors

with indication presented on cathode-ray tubes

with means for eliminating undesired waves, e.g. disturbing noises

Position-fixing by co-ordinating two or more direction or position line determinations; Position-fixing by co-ordinating two or more distance determinations (using active systems G01S 13/00, G01S 15/00, G01S 17/000)

Transmission of position information to remote stations (transmission of measured values in general, G08C; services making use of location of users or terminals, H04W 4/02)

Transmission from mobile station to base station

(of actual mobile position, i.e. position determined on mobile)

(of measured values, i.e. measurement on mobile and position calculation on base station)

Transmission from base station to mobile station (G01S 5/009 takes precedence)

(of actual mobile position, i.e. position calculation on base station)

(of measured values, i.e. measurement on base station and position calculation on mobile)

Transmission between mobile stations, e.g. anti-collision systems

Transmission between base stations

Transmission of differential positioning data to mobile

using radio waves (G01S 19/00 takes precedence)

Details)
5/021. . . [Calibration, monitoring or correction (G01S 5/0252 takes precedence)]
5/0215. . . [interference or multipath issues related to signal reception]
5/0221. . . [of receivers or network of receivers]
5/0226. . . [of transmitters or network of transmitters (wireless system synchronisation per se H04B 7/2662)]
5/0231. . . [Emergency, distress or locator beacons]
5/0236. . . [Receiving assistance data, e.g. base station almanac]
5/0242. . . [locating transmitters to be used for positioning (G01S 5/0289 takes precedence)]
5/0247. . . [Determination of attitude (using inertial means G01C 9/00; control of attitude G05D 1/08)]
5/0252. . . [by comparing measured values with pre-stored measured or simulated values]
5/0257. . . [Hybrid positioning solutions (by coordinating position lines of different shape G01S 5/12)]
5/0263. . . [employing positioning solutions derived from one of several separate positioning systems]
5/0268. . . [employing positioning solutions derived from a single positioning system]
5/0273. . . [using multipath or indirect path propagation signals in position determination]
5/0278. . . [involving statistical or probabilistic considerations (G01S 5/0252; G01S 5/0294 take precedence)]
5/0284. . . [Relative positioning]
5/0289. . . [of multiple transceivers, e.g. in ad hoc networks]
5/0294. . . [Tracking, i.e. predictive filtering, e.g. Kalman filtering]
5/04. . . Position of source determined by a plurality of spaced direction-finders
5/06. . . Position of source determined by co-ordinating a plurality of position lines defined by path-difference measurements (G01S 5/12 takes precedence)
5/08. . . Position of single direction-finder fixed by determining direction of a plurality of spaced sources of known location
5/10. . . Position of receiver fixed by co-ordinating a plurality of position lines defined by path-difference measurements (e.g. omega or decca systems) (G01S 5/12 takes precedence; beacons and receivers cooperating therewith G01S 1/306, G01S 1/308)]
5/12. . . by co-ordinating position lines of different shape, e.g. hyperbolic, circular, elliptical, radial (radar indicators providing co-ordinated display of direction and distance G01S 7/10)
5/14. . . Determining absolute distances from a plurality of spaced points of known location
5/145. . . [Using a supplementary range measurement, e.g. based on pseudo-range measurements]
5/16. . . using electromagnetic waves other than radio waves
5/163. . . [Determination of attitude (using inertial means G01C 9/00; control of attitude G05D 1/08)]
5/166. . . [using gamma or X-rays]
5/18. . . using ultrasonic, sonic, or infrasonic waves
5/183. . . [Emergency, distress or locator beacons]
5/186. . . [Determination of attitude (using inertial means G01C 9/00; control of attitude G05D 1/08)]
5/20. . . Position of source determined by a plurality of spaced direction-finders
5/22. . . Position of source determined by co-ordinating a plurality of position lines defined by path-difference measurements (G01S 5/28 takes precedence)
5/24. . . Position of single direction-finder fixed by determining direction of a plurality of spaced sources of known location
5/26. . . Position of receiver fixed by co-ordinating a plurality of position lines defined by path-difference measurements (G01S 5/28 takes precedence)
5/28. . . by co-ordinating position lines of different shape, e.g. hyperbolic, circular, elliptical, radial (sonar indicators providing co-ordinated display of direction and distance G01S 7/62)
5/30. . . Determining absolute distances from a plurality of spaced points of known location
7/00 Details of systems according to groups G01S 13/00, G01S 15/00, G01S 17/00 (apparatus for measuring unknown time-intervals by electronic means, e.g. Vernier method G04F 10/00)
7/003. . . [Transmission of data between radar, sonar or lidar systems and remote stations (in general G08C)]
7/006. . . [using shared front-end circuitry, e.g. antennas (G01S 13/765; G01S 13/825 take precedence)]
7/02. . . of systems according to group G01S 13/00
7/021. . . [Auxiliary means for detecting or identifying radar signals or the like, e.g. radar jamming signals (multi-channel PRF-analysers, per se G01R 23/155)]
7/022. . . [Road traffic radar detectors]
7/023. . . [interference mitigation, e.g. reducing or avoiding non-intentional interference with other HF-transmitters, base station transmitters for mobile communication or other radar systems, e.g. using electromagnetic interference [EMI] reduction techniques (means for anti-jamming G01S 7/30; auxiliary means for detecting or identifying radar signals or the like G01S 7/021)]
7/024. . . [using polarisation effects (in waveguides H01P 1/165; for ariels H01Q, e.g. H01Q 15/22, H01Q 15/24, H01Q 19/195)]
7/025. . . [involving the transmission of linearly polarised waves]
7/026. . . [involving the transmission of elliptically or circularly polarised waves]
2007/027. . . [Housing details, e.g. form, type, material, ruggedness]
2007/028. . . [involving miniaturizing aspects, e.g. surface mounted device (SMD) packaging or housing]
7/03. . . Details of HF subsystems specially adapted therefor, e.g. common to transmitter and receiver (TR boxes H01J 17/64; waveguides or resonators or other devices of the waveguide type H01P; ariels H01Q; basic electronic circuitry, e.g. generation of oscillations, modulation, demodulation, amplification, pulse technique H03; impedance networks, resonators H03H)
7/032. . . [Construcional details for solid-state radar subsystems]
Details of pulse systems

H01Q 21/29, H01Q 25/00)

[Means providing a modification of the
radiation pattern for cancelling noise, clutter or
interfering signals, e.g. side lobe suppression,
side lobe blanking, null-steering arrays
(specially adapted to secondary radar systems
G01S 13/762; aerials or aerials systems
H01Q 21/29, H01Q 25/00)]

| 7/34 | . . .  | [Duplexers (switching devices for waveguides
H01P 1/10; transmit-receive switching in
transceivers H04B 1/44)]
| 7/36 | . . .  | [involving a transfer mixer (mixers in
general, H03D 7/00)]
| 7/38 | . . .  | [Feedthrough nulling circuits]
| 7/04 | . . .  | Display arrangements
| 7/06 | . . .  | [Cathode-ray tube displays (or other two-
dimensional or three-dimensional displays
(cathode ray oscilloscopes in general
G01R 13/20)]

**WARNING**

Groups G01S 7/062 - G01S 7/24 are not complete pending a reorganization. See provisionally G01S 7/06

| 7/062 | . . .  | [in which different colours are used]
| 7/064 | . . .  | [using a display memory for image
processing (G01S 7/298 takes precedence)]
| 7/066 | . . .  | [with means for showing the history of the
radar trails, e.g. artificial remanence]
| 7/068 | . . .  | [with data-rate converters preceding the
display, e.g. flicker free display, constant
brightness display (G01S 7/298 takes
precedence)]
| 7/08 | . . .  | with vernier indication of distance, e.g. using
two cathode-ray tubes
| 7/10 | . . .  | Providing two-dimensional and co-ordinated
display of distance and direction (in general
G01R 13/20)
| 7/12 | . . .  | Plan-position indicators, i.e. P.P.I.
| 7/14 | . . .  | Sector, off-centre, or expanded angle
display
| 7/16 | . . .  | Signals displayed as intensity modulation
with rectangular co-ordinates representing
distance and bearing, e.g. type B
| 7/18 | . . .  | Distance-height displays; Distance-
elevation displays, e.g. type RHI type E
| 7/20 | . . .  | Stereooscopic displays; Three-dimensional
displays; Pseudo-three-dimensional displays
(in general G01R 13/20)]
| 7/22 | . . .  | Producing cursor lines and indicia by
electronic means (in general G01R 13/30)
| 7/24 | . . .  | the display being orientated or displaced in
accordance with movement of object
carrying the transmitting and receiving
apparatus, e.g. true-motion radar
| 7/28 | . . .  | Details of pulse systems
| 7/2806 | . . .  | [Employing storage or delay devices which
preserve the pulse form of the echo signal, e.g.
for comparing and combining echoes received
during different periods]
| 7/2813 | . . .  | [Means providing a modification of the
radiation pattern for cancelling noise, clutter or
interfering signals, e.g. side lobe suppression,
side lobe blanking, null-steering arrays
(specially adapted to secondary radar systems
G01S 13/762; aerials or aerials systems
H01Q 21/29, H01Q 25/00)]

| 7/282 | . . .  | Transmitters
| 7/285 | . . .  | Receivers
| 7/288 | . . .  | Coherent receivers

2007/2883 | . . .  | [using FFT processing]

2007/2886 | . . .  | [using I/Q processing]

7/292 | . . .  | Extracting wanted echo-signals (Doppler
systems G01S 13/50)

7/2921 | . . .  | [based on data belonging to one radar
period]

7/2922 | . . .  | [by using a controlled threshold]

7/2923 | . . .  | [based on data belonging to a number of
consecutive radar periods]

7/2925 | . . .  | [by using shape of radiation pattern]

7/2926 | . . .  | [by integration]

7/2927 | . . .  | [by deriving and controlling a threshold
value]

7/2928 | . . .  | [Random or non-synchronous
interference pulse cancellers]

7/295 | . . .  | Means for transforming co-ordinates or for
evaluating data, e.g. using computers

7/2955 | . . .  | [Means for determining the position of the
radar coordinate system for evaluating
the position data of the target in another
coordinate system (G01S 7/24 takes
precedence; sighting devices adapted for
indirect laying of fire F41G 3/16; inertial
navigation G01C 21/16)]

7/298 | . . .  | Scan converters

7/32 | . . .  | Shaping echo pulse signals; Deriving non-
pulse signals from echo pulse signals

7/34 | . . .  | Gain of receiver varied automatically during
pulse-recurrence period, e.g. anti-clutter gain
control

7/35 | . . .  | Details of non-pulse systems

7/352 | . . .  | [Receivers]

7/354 | . . .  | [Extracting wanted echo-signals (Doppler
systems G01S 13/50)]

2007/356 | . . .  | [involving particularities of FFT processing]

2007/358 | . . .  | [using I/Q processing]

7/36 | . . .  | Means for anti-jamming (in general H04K 3/00 )
{ e.g. ECCM, i.e. electronic counter-counter
measures for irregular PRF see also G01S 13/22,
G01S 13/528; for frequency agility of carrier
wave see also G01S 13/24; G01S 7/2813 takes
precedence; random interference pulse cancellers
G01S 7/2928; identification of radar jamming
signals G01S 7/2021)

7/38 | . . .  | Jamming means, e.g. producing false echoes
(in general H04K 3/00 [reflecting surfaces
comprising a plurality of reflecting particles,
e.g. chaff, H01Q 15/145; identification of radar
signals G01S 7/2021])

7/40 | . . .  | Means for monitoring or calibrating
| 7/4004 | . . .  | [of parts of a radar system (see provisionally
also G01S 7/40)]

7/4008 | . . .  | [of transmitters]

2007/4013 | . . .  | [involving adjustment of the transmitted
power]

7/4017 | . . .  | [of HF systems]

7/4021 | . . .  | [of receivers]

7/4026 | . . .  | [Antenna boresight]

2007/4035 | . . .  | [in azimuth, i.e. in the horizontal plane]

2007/4034 | . . .  | [in elevation, i.e. in the vertical plane]
of systems according to group G01S 17/00
7/4802 . . . {using analysis of echo signal for target characterisation; Target signature; Target cross-section
7/4804 . . . {Auxiliary means for detecting or identifying lidar signals or the like, e.g. laser illuminators
7/4806 . . . {Road traffic laser detectors
7/4808 . . . {Evaluating distance, position or velocity data
7/481 . . . Constructional features, e.g. arrangements of optical elements
7/4811 . . . {common to transmitter and receiver
7/4812 . . . {transmitted and received beams following a coaxial path
7/4813 . . . {Housing arrangements
7/4814 . . . {of transmitters alone
7/4815 . . . {using multiple transmitters
7/4816 . . . {of receivers alone
7/4817 . . . {relating to scanning
7/4818 . . . {using optical fibres
7/483 . . . Details of pulse systems
7/484 . . . {Transmitters
7/486 . . . Receivers
7/4861 . . . {Details of detection, sampling, integration or read-out circuits
7/4863 . . . {of detector arrays
7/4865 . . . {Details of time delay measurement, e.g. time of flight or time of arrival measurement, determining the exact position of a peak
7/4866 . . . {by fitting a model or function to the received signal
7/4868 . . . {Controlling received signal intensity or exposure of sensor
7/487 . . . Extracting wanted echo signals, e.g. pulse detection
7/4873 . . . {by deriving and controlling a threshold value
7/4876 . . . {by removing unwanted signals
7/489 . . . Gain of receiver varied automatically during pulse-recurrence period
7/491 . . . Details of non-pulse systems
7/4911 . . . {Transmitters
7/4912 . . . {Receivers
7/4913 . . . {Details of detection, sampling, integration or read-out circuits
7/4914 . . . {of detector arrays
7/4915 . . . {Details of time delay measurement or phase measurement
7/4916 . . . {using self-mixing in the laser cavity
7/4917 . . . {superposing optical signals in a photodetector, e.g. optical heterodyne detection
7/4918 . . . {Controlling received signal intensity, gain or exposure of sensor
7/493 . . . Extracting wanted echo signals
7/495 . . . Counter-measures or counter-counter-measures {using electronic or electro-optical means
7/497 . . . Means for monitoring or calibrating
7/4972 . . . {Alignment of sensor
2007/4975 . . . {of sensor obstruction by, e.g. dirt- or ice-coating, e.g. by reflection measurement on front-screen
2007/4977 . . . {including means to prevent or remove the obstruction
7/499 . . . using polarisation effects {measuring polarisation of light G01J
7/51 . . . Display arrangements
7/52 . . . of systems according to group G01S 15/00
7/52001 . . . {Auxiliary means for detecting or identifying sonar signals or the like, e.g. sonar jamming signals (multi-channel PRF- analysers per se G01K 23/155)
7/52003 . . . {Techniques for enhancing spatial resolution of targets (beam formers in general G10K 11/34; G01S 7/52046 takes precedence)
7/52004 . . . {Means for monitoring or calibrating (short-range imaging G01S 7/5205)
7/52006 . . . {with provision for compensating the effects of temperature
2007/52007 . . . {involving adjustment of transmitted power
2007/52009 . . . {of sensor obstruction, e.g. dirt- or ice-coating
2007/52011 . . . {including means to prevent or remove the obstruction
2007/52012 . . . {involving a reference ground return

{involving a reference reflector integrated in the sensor or transducer configuration}

[7/52015] [Diversity systems]

[7/52017] [particularly adapted to short-range imaging (G01S 7/53 takes precedence)]

[7/52019] [Details of transmitters]

[7/5202] [for pulse systems]

[7/52022] [using a sequence of pulses, at least one pulse manipulating the transmissivity or reflectivity of the medium]

[7/52023] [Details of receivers]

[7/52025] [for pulse systems (G01S 7/52034 takes precedence)]

[7/52026] [Extracting wanted echo signals (Doppler systems G01S 15/50; Doppler short range imaging systems G01S 15/8979)]

[7/52028] [using digital techniques]

[7/5203] [for non-pulse systems, e.g. CW systems (G01S 7/52034 takes precedence)]

[7/52031] [Extracting wanted echo signals]

[7/52033] [Gain control of receivers (for seismic signals G01V 1/245)]

[7/52034] [Data rate converters]

[7/52036] [using analysis of echo signal for target characterisation]

[7/52038] [involving non-linear properties of the propagation medium or of the reflective target]

[7/52039] [exploiting the non-linear response of a contrast enhancer, e.g. a contrast agent (diagnostic techniques involving the use of contrast agents A61B 8/481)]

[7/52041] [detecting modification of a contrast enhancer, e.g. detecting the destruction of a contrast agent by an acoustic wave, e.g. loss of correlation (diagnostic techniques involving the use of contrast agents A61B 8/481)]

[7/52042] [determining elastic properties of the propagation medium or of the reflective target (diagnostic techniques involving the measurement of strain A61B 8/485)]

[7/52044] [Scan converters]

[7/52046] [Techniques for image enhancement involving transmitter or receiver (image enhancement by image data processing G067 5/00)]

[7/52047] [for elimination of side lobes or of grating lobes; for increasing resolving power (beam formers in general G10K 11/34)]

[7/52049] [using correction of medium-induced phase aberration]

[7/5205] [Means for monitoring or calibrating]

[7/52052] [with simulation of echoes]

[7/52053] [Display arrangements]

[7/52055] [in association with ancillary recording equipment]

[7/52057] [Cathode ray tube displays (cathode ray oscilloscopes in general G01R 13/20)]

[7/52058] [displaying one measured variable; A-scan display]

[7/5206] [Two-dimensional coordinated display of distance and direction; B-scan display]

[7/52061] [Plan position indication (PPI display); C-scan display]

[7/52063] [Sector scan display]

[7/52065] [Compound scan display, e.g. panoramic imaging]

[7/52066] [Time-position or time-motion displays]

[7/52068] [Stereoscopic displays; Three-dimensional displays; Pseudo 3D displays (G01S 15/8992 takes precedence)]

[7/52069] [Grey-scale displays]

[7/52071] [Multicolour displays; using colour coding; Optimising colour or information content in displays, e.g. parametric imaging]

[7/52073] [Production of cursor lines, markers or indicia by electronic means]

[7/52074] [Composite displays, e.g. split-screen displays; Combination of multiple images or of images and alphanumeric tabular information]

[7/52076] [Luminous indicators]

[7/52077] [with means for elimination of unwanted signals, e.g. noise or interference]

[7/52079] [Constructional features (constructional features related to power management, e.g. saving or prolonging life of electronic components (details of power supplies for ultrasonic medical diagnostic imaging devices A61B 8/44)]

[7/5208] [with integration of processing functions inside probe or scanhead]

[7/52082] [involving a modular construction, e.g. a computer with short range imaging equipment (modular ultrasonic medical diagnostic devices A61B 8/4411)]

[7/52084] [related to particular user interfaces (special user input means for ultrasonic medical diagnostic devices A61B 8/4671)]

[7/52085] [Details related to the ultrasound signal acquisition, e.g. scan sequences (control of medical diagnostic ultrasound devices A61B 8/54)]

[7/52087] [using synchronization techniques (control of medical diagnostic ultrasound devices involving acquisition triggered by a physiological signal A61B 8/543)]

[7/52088] [involving retrospective scan line rearrangements (medical diagnostic ultrasound devices involving retrospective matching to a physiological signal A61B 8/5284)]

[7/5209] [using multibeam transmission]

[7/52092] [using frequency diversity]

[7/52093] [using coded signals (G01S 15/8959 takes precedence)]

[7/52095] [using multilane receive beamforming]

[7/52096] [related to power management, e.g. saving power or prolonging life of electronic components (details of power supplies for ultrasonic medical diagnostic imaging devices A61B 8/56)]

[7/52098] [related to workflow protocols]

[7/521] [Constructional features (constructional features of transducers B06B; mounting transducers G10K 11/00)]
Systems for determining distance or velocity not using reflection or reradiation (direction-finders G01S 3/00; position-fixing by co-ordinating two or more distance determinations G01S 5/00)
Systems determining position data of a target (based on relative movement of target G01S 13/56)

Systems determining the presence of a target

Systems for measuring distance only (indirect measurement G01S 13/46)

using transmission of interrupted pulse modulated waves (determination of distance by phase measurement G01S 13/32)

(particularities of the measurement of the distance (G01S 13/12, G01S 13/16, G01S 13/18 and G01S 13/20 take precedence))

(using transmission of pulses having some particular characteristics (G01S 13/12, G01S 13/22, G01S 13/24, G01S 13/26, G01S 13/28 and G01S 13/30 take precedence))

wherein the pulse-recurrence frequency is varied to provide a desired time relationship between the transmission of a pulse and the receipt of the echo of a preceding pulse

wherein a voltage or current pulse is initiated and terminated in accordance respectively with the pulse transmission and echo reception

using counters

wherein range gates are used

whereby multiple time-around echoes are used or eliminated

using irregular pulse repetition frequency (G01S 13/12 takes precedence)

(using random or pseudorandom pulse repetition frequency)

(with cyclic repetition of a non-uniform pulse sequence, e.g. staggered PRF)

(with repetitive trains of uniform pulse sequences, each sequence having a different pulse repetition frequency)

using frequency agility of carrier wave

wherein the transmitted pulses use a frequency- or phase-modulated carrier wave

with time compression of received pulses

(using a frequency modulated carrier wave (G01S 13/286 takes precedence))

(using coded pulses)

[frequency shift keyed]

[phase modulated]

using more than one pulse per radar period

using transmission of continuous unmodulated waves, amplitude-, frequency- or phase-modulated waves

(using transmission of coded signals, e.g. P.S.K. signals)

using transmission of frequency-modulated waves and the received signal, or a signal derived therefrom, being heterodyned with a locally-generated signal related to the contemporaneous transmitted signal to give a beat-frequency signal

(wherein the rate of change of the transmitted frequency is adjusted to give a beat of predetermined constant frequency, e.g. by adjusting the amplitude or frequency of the frequency-modulating signal)

(using sinusoidal modulation)

(using sawtooth modulation)

(using triangular modulation)

(using noise modulation)

(using more than one modulation frequency)

(using square or rectangular modulation, e.g. diplex radar for ranging over short distances)

with phase comparison between the received signal and the contemporaneously transmitted signal

wherein more than one modulation frequency is used

wherein the frequency of transmitted signal is adjusted to give a predetermined phase relationship

Simultaneous measurement of distance and other co-ordinates (indirect measurement G01S 13/46)

[sequential lobing, e.g. conical scan]

[Stacked beam radar]

(Scanning radar, e.g. 3D radar (G01S 13/66 takes precedence))

(within the pulse scanning systems)

Monopulse radar, i.e. simultaneous lobing

[HF sub-systems particularly adapted thereto, e.g. circuits for signal combination (multi-lobing aerials or aerial systems H01Q 25/00)]

(with means for eliminating radar-dependent errors in angle measurements, e.g. multipath effects)

(with means for eliminating the target-dependent errors in angle measurements, e.g. glint, scintillation effects)

(with means specially adapted to maintain the same processing characteristics between the monopulse signals)

(amplitude comparisons monopulse, i.e. comparing the echo signals received by an antenna arrangement with overlapping squinted beams)

(phase comparisons monopulse, i.e. comparing the echo signals received by an interferometric antenna arrangement)

(using phased arrays)

(with means specially adapted to airborne monopulse systems (clutter elimination using Doppler effect: G01S 13/449))

{Monopulse hybrid systems, e.g. conopulse}
Radar-tracking systems; Analogous systems where angle and range tracking, track-while-scan radar for two-dimensional tracking, e.g. combination of simultaneous lobing techniques; using transmission of interrupted pulse modulated waves and based upon the Doppler effect resulting from movement of objects, with reference to the surrounding clutter echo signal, e.g. non coherent MTI, clutter referenced MTI, externally coherent MTI.

Eliminating objects that have not moved between successive antenna scans, e.g. area MTI.

For presence detection [(presence detection using near field arrangements G01V 3/00, e.g. G01V 3/08; G01V 3/12; burglar, theft or intruder alarms with electrical actuation G08B 13/22 - G08B 13/26)]

Velocity or trajectory determination systems; Sense-of-movement determination systems [(systems applied to the controlling of traffic G01S 13/92)]

Using transmission of interrupted pulse modulated waves and based upon the Doppler effect resulting from movement of targets.

Adapted for simultaneous range and velocity measurements.

Using transmission of continuous unmodulated waves, amplitude-, frequency-, or phase-modulated waves and based upon the Doppler effect resulting from movement of targets.

Adapted for simultaneous range and velocity measurements.

Processing the video signal in order to evaluate or display the velocity value.

Using, or combined with, frequency tracking means.

Using optical means (optical computing devices in general G06E).

[deriving the velocity value from the range measurement]

[measuring the velocity vector]

[wherein the transmitter and receiver are mounted on the moving object, e.g. for determining ground speed, drift angle, ground track (G01S 13/64 takes precedence)]

Using a pattern, backscattered from the ground, to determine speed or drift by measuring the time required to cover a fixed distance.

Sense-of-movement determination [(G01S 13/589 takes precedence)]

Velocity measuring systems using range gates.

Radar-tracking systems; Analogous systems where the wavelength or the kind of wave is irrelevant.

for angle tracking only

[ranging using simultaneous lobing techniques]

for range tracking only

for two-dimensional tracking, e.g. combination of angle and range tracking, track-while-scan radar

(by using numerical data)
13/726 . . . [Multiple target tracking]
13/74 . . Systems using reradiation of radio waves, e.g. secondary radar systems; Analogous systems
13/75 . . using transponders powered from received waves, e.g. using passive transponders [], or using passive reflectors]
13/751 . . . [wherein the responder or reflector radiates a coded signal]
13/753 . . . [using frequency selective elements, e.g. resonator]
13/755 . . . [using delay lines, e.g. acoustic delay lines]
13/756 . . . [using a signal generator for modifying the reflectivity of the reflector (G01S 13/758 takes precedence)]
13/758 . . . [using a signal generator powered by the interrogation signal]
13/76 . . . wherein pulse-type signals are transmitted
13/762 . . . [with special measures concerning the radiation pattern, e.g. S.L.S. (aerials or aerial systems providing at least two radiation patterns, e.g. providing sum and difference patterns, H01Q 25/00)]
13/765 . . . [with exchange of information between interrogator and responder]
13/767 . . . [Responders; Transponders (teaching or practice apparatus for gun-aiming or gun-laying using reflecting targets or active targets F41G 3/26)]
13/78 . . . discriminating between different kinds of targets, e.g. IIF-radar, i.e. identification of friend or foe (G01S 13/75, G01S 13/767 take precedence)
13/782 . . . . . . [using multimoing or selective addressing]
13/784 . . . . . . [Coders or decoders therefor; Degarbling systems; Defruiting systems]
13/785 . . . . . . [Distance Measuring Equipment [DME] systems]
13/787 . . . . . . [co-operating with direction defining beacons]
13/788 . . . . . . [Coders or decoders therefor; Special detection circuits]
13/79 . . . Systems using random coded signals or random pulse repetition frequencies, [e.g. "Separation and Control of Aircraft using Non synchronous Techniques" [SECANT]]
13/82 . . . wherein continuous-type signals are transmitted
13/825 . . . [with exchange of information between interrogator and responder]
13/84 . . . . . . for distance determination by phase measurement
13/86 . . . Combinations of radar systems with non-radar systems, e.g. sonar, direction finder (combination of sonar systems with non-sonar or non-radar systems G01S 15/025; combination of lidar systems with systems other than lidar, radar or sonar G01S 17/023)
13/862 . . . [Combination of radar systems with sonar systems]
13/865 . . . [Combination of radar systems with lidar systems]
13/867 . . . [Combination of radar systems with cameras]
13/87 . . . Combinations of radar systems, e.g. primary radar and secondary radar
13/872 . . . . (Combinations of primary radar and secondary radar)
13/874 . . . . (Combination of several systems for attitude determination (in general G01C, control of attitude G05D 1/08])
13/876 . . . . (Combination of several spaced transponders or reflectors of known location for determining the position of a receiver (G01S 13/874 takes precedence))
13/878 . . . . (Combination of several spaced transmitters or receivers of known location for determining the position of a transponder or a reflector (G01S 13/874 takes precedence))
13/88 . . . . Radar or analogous systems specially adapted for specific applications (electromagnetic prospecting or detecting of objects, e.g. near-field detection, G01V 3/00)
13/881 . . . . [for robotics]
13/882 . . . . [for altimeters (measuring height using barometric means G01C 5/06)]
13/883 . . . . [for missile homing, autodirectors (missile guidance systems F41G 7/22])
13/885 . . . . (for ground probing (prospecting or detecting using electromagnetic waves G01V 3/12))
13/886 . . . . [for alarm systems (alarms with electrical actuation G08B 13/22)]
13/887 . . . . [for detection of concealed objects, e.g. contraband or weapons]
13/888 . . . . [through wall detection]
13/89 . . . . [for mapping or imaging

WARNING
Group G01S 13/89 is impacted by reclassification into group G01S 13/895.
Groups G01S 13/89 and G01S 13/895 should be considered in order to perform a complete search.

13/895 . . . . [Side looking radar [SLR]]

WARNING
Group G01S 13/895 is incomplete pending reclassification of documents from group G01S 13/89.
Groups G01S 13/89 and G01S 13/895 should be considered in order to perform a complete search.

13/90 . . . . using synthetic aperture techniques [, e.g. synthetic aperture radar [SAR] techniques]

WARNING
Group G01S 13/90 is impacted by reclassification into groups G01S 13/9004, G01S 13/9019, G01S 13/9021, G01S 13/9027, G01S 13/904, G01S 13/9054, G01S 13/9056 and G01S 13/9089.
All groups listed in this Warning should be considered in order to perform a complete search.
13/9004 . . . [SAR image acquisition techniques]

**WARNING**

Group **G01S 13/9004** is incomplete pending reclassification of documents from group **G01S 13/90**.

Groups **G01S 13/90** and **G01S 13/9004** should be considered in order to perform a complete search.

13/9005 . . . . . . [with optical processing of the SAR signals]

13/9011 . . . . . . [with frequency domain processing of the SAR signals in azimuth] (**G01S 13/9005** takes precedence)

13/9017 . . . . . . [with time domain processing of the SAR signals in azimuth] (**G01S 13/9005** takes precedence)

13/9019 . . . . . . [Auto-focussing of the SAR signals]

**WARNING**

Group **G01S 13/9019** is incomplete pending reclassification of documents from group **G01S 13/90**.

Groups **G01S 13/90** and **G01S 13/9019** should be considered in order to perform a complete search.

13/9021 . . . . . . [SAR image post-processing techniques]

**WARNING**

Group **G01S 13/9021** is incomplete pending reclassification of documents from group **G01S 13/90**.

Groups **G01S 13/90** and **G01S 13/9021** should be considered in order to perform a complete search.

13/9023 . . . . . . [combined with interferometric techniques]

**WARNING**

Group **G01S 13/9023** is impacted by reclassification into group **G01S 13/9092**.

Groups **G01S 13/9023** and **G01S 13/9092** should be considered in order to perform a complete search.

13/9027 . . . . . . [Pattern recognition for feature extraction]

**WARNING**

Group **G01S 13/9027** is incomplete pending reclassification of documents from group **G01S 13/90**.

Groups **G01S 13/90** and **G01S 13/9027** should be considered in order to perform a complete search.

13/9029 . . . . . . [specially adapted for moving target detection within a single SAR image or within multiple SAR images taken at the same time]

13/904 . . . . . . [SAR modes]

**WARNING**

Group **G01S 13/904** is incomplete pending reclassification of documents from group **G01S 13/90**.

Groups **G01S 13/904** is also impacted by reclassification into groups **G01S 13/9054** and **G01S 13/9056**.

All groups listed in this Warning should be considered in order to perform a complete search.

13/9041 . . . . . . [Squint mode]

13/9043 . . . . . . [Forward-looking SAR]

13/9047 . . . . . . [Doppler beam sharpening mode]

13/9052 . . . . . . [Spotlight mode]

13/9054 . . . . . . [Stripmap mode]

**WARNING**

Group **G01S 13/9054** is incomplete pending reclassification of documents from groups **G01S 13/90** and **G01S 13/904**.

Groups **G01S 13/90** and **G01S 13/9054** should be considered in order to perform a complete search.

13/9056 . . . . . . [Scan SAR mode]

**WARNING**

Group **G01S 13/9056** is incomplete pending reclassification of documents from groups **G01S 13/90** and **G01S 13/904**.

Groups **G01S 13/90** and **G01S 13/9056** should be considered in order to perform a complete search.

13/9058 . . . . . . [Bistatic or multistatic SAR]

13/9064 . . . . . . [Inverse SAR [ISAR]]

13/9076 . . . . . . [Polarimetric features in SAR]

13/9082 . . . . . . [Rotating SAR [ROSAR]]

13/9088 . . . . . . [Circular SAR [CSAR, C-SAR]]

13/9089 . . . . . . [SAR having an irregular aperture]

**WARNING**

Group **G01S 13/9089** is incomplete pending reclassification of documents from group **G01S 13/90**.

Groups **G01S 13/90** and **G01S 13/9089** should be considered in order to perform a complete search.

13/9092 . . . . . . [combined with monopulse techniques]

**WARNING**

Group **G01S 13/9092** is incomplete pending reclassification of documents from group **G01S 13/9023**.

Groups **G01S 13/9023** and **G01S 13/9092** should be considered in order to perform a complete search.

13/9094 . . . . . . [Theoretical aspects]
13/91 . . . for traffic control (G01S 13/93 takes precedence)

**WARNING**

Group G01S 13/91 is impacted by reclassification into group G01S 13/917.
Groups G01S 13/91 and G01S 13/917 should be considered in order to perform a complete search.

13/913 . . . [for landing purposes]
13/916 . . . [Airport surface monitoring [ASDE]]
13/917 . . . [for marine craft or other waterborne vessels]

**WARNING**

Group G01S 13/917 is incomplete pending reclassification of documents from group G01S 13/91.
Groups G01S 13/91 and G01S 13/917 should be considered in order to perform a complete search.

13/92 . . . for velocity measurement
13/93 . . . for anti-collision purposes
13/9303 . . . [between aircraft or spacecraft in flight, e.g. secant (terrain-avoidance systems G01S 13/94)]
13/9307 . . . [between marine crafts; between marine crafts and fixed obstacles]
13/931 . . . [between land vehicles; between land vehicles and fixed obstacles]
13/9314 . . . [for parking operations]
13/9317 . . . [for driving backwards]
13/9321 . . . [for velocity regulation, e.g. cruise control]
13/9325 . . . [for intervehicle distance regulation, e.g. navigating in platoons]
13/9328 . . . [for vehicles on rails]
13/9332 . . . [for monitoring blind spots]
13/9335 . . . [on airport surface (taxiing)]
13/9339 . . . [co-operating with reflectors or transponders]
13/9342 . . . [controlling the steering]
13/9346 . . . [controlling the brakes]
13/935 . . . [controlling the accelerator]
13/9353 . . . [using own vehicle data, e.g. ground speed, steering wheel direction]
13/9357 . . . [using additional data, e.g. driver condition, road state, weather data]
13/936 . . . [combined with communication equipment with other vehicles and/or with base stations(s)]
13/9364 . . . [Alternative operation using ultrasonic waves]
13/9367 . . . [Alternative operation using light waves]
13/9371 . . . [Sensor installation details]
13/9375 . . . [in the front of the vehicle]
13/9378 . . . [in the back of the vehicle]
13/9382 . . . [on the top of the vehicle]
13/9385 . . . [on the side(s) of the vehicle]
13/9389 . . . [in the bumper area (ultrasonic transducer in bumper area G01S 2015/938; bumper with obstacle sensor of electric or electronic type B60R 19/483)]
13/9392 . . . [in the windshield area]
13/9396 . . . [in the lights]

13/94 . . . for terrain-avoidance
13/95 . . . for meteorological use
13/951 . . . [ground based]
13/953 . . . [mounted on aircraft]
13/955 . . . [mounted on satellite]
13/956 . . . [mounted on ship or other platform]
13/958 . . . [Theoretical aspects]

15/00 Systems using the reflection or reradiation of acoustic waves, e.g. sonar systems

**NOTES**

1. This group covers:
   • systems for detecting the presence of an object, e.g. by reflection or reradiation from the object itself, or from a transponder associated with the object, for determining the distance or relative velocity of an object, for providing a co-ordinated display of the distance and direction of an object or for obtaining an image thereof;
   • systems arranged for mounting on a moving craft or vehicle and using the reflection of waves from an extended surface external to the craft, e.g. the surface of the earth, to determine the velocity and direction of motion of the craft relative to the surface.

2. This group does not cover:
   • systems for determining the direction of an object by means not employing reflection or reradiation, which are covered by groups G01S 11/00 or G01S 3/00;
   • systems for determining distance or velocity of an object by means not employing reflection or reradiation, which are covered by group G01S 11/00.

15/003 . . . [Bistatic sonar systems; Multistatic sonar systems]
15/006 . . . [Theoretical aspects]
15/02 . . . using reflection of acoustic waves (G01S 15/66 takes precedence)
15/0025 . . . [Combination of sonar systems with non-sonar or non-radar systems, e.g. with direction finder]
15/04 . . . Systems determining presence of a target
15/06 . . . Systems determining the position data of a target
15/08 . . . Systems for measuring distance only (indirect measurement G01S 15/46)
15/10 . . . using transmission of interrupted pulse-modulated waves (determination of distance by phase measurement G01S 15/32)
15/101 . . . [Particularities of the measurement of distance (G01S 15/12, G01S 15/14, and G01S 15/18 take precedence)]
15/102 . . . [using transmission of pulses having some particular characteristics]
15/104 . . . [wherein the transmitted pulses use a frequency- or phase-modulated carrier wave]
15/105 . . . [using irregular pulse repetition frequency]
15/107 . . . [using frequency agility of carrier wave]
15/108 . . . [using more than one pulse per sonar period]
15/12 . . . . wherein the pulse-recurrence frequency is varied to provide a desired time relationship between the transmission of a pulse and the receipt of the echo of a preceding pulse

15/14 . . . . wherein a voltage or current pulse is initiated and terminated in accordance respectively with the pulse transmission and echo reception

15/18 . . . . wherein range gates are used

15/32 . . . . using transmission of continuous unmodulated waves, amplitude-, frequency-, or phase-modulated waves

15/325 . . . . [using transmission of coded signals, e.g. of phase-shift keyed [PSK] signals]

15/34 . . . . using transmission of frequency-modulated waves and the received signal, or a signal derived therefrom, being heterodyned with a locally-generated signal related to the contemporaneous transmitted signal to give a beat-frequency signal

15/36 . . . . with phase comparison between the received signal and the contemporaneously transmitted signal

15/42 . . . . Simultaneous measurement of distance and other co-ordinates (indirect measurement G01S 15/46)

15/46 . . . . Indirect determination of position data

2015/465 . . . . [by Trilateration, i.e. two transducers determine separately the distance to a target, whereby with the knowledge of the baseline length, i.e. the distance between the transducers, the position data of the target is determined]

15/50 . . . . Systems of measurement, based on relative movement of the target

15/52 . . . . Discriminating between fixed and moving objects or between objects moving at different speeds

15/523 . . . . [for presence detection (burglar, theft or intruder alarms G08B 13/00, e.g. G08B 13/16)]

15/526 . . . . [by comparing echos in different sonar periods]

15/58 . . . . Velocity or trajectory determination systems; Sense-of-movement determination systems [velocity measurement in imaging systems G01S 15/8979]

15/582 . . . . [using transmission of interrupted pulse-modulated waves and based upon the Doppler effect resulting from movement of targets]

15/584 . . . . [with measures taken for suppressing velocity ambiguities, i.e. anti-aliasing]

15/586 . . . . [using transmission of continuous unmodulated waves, amplitude-, frequency-, or phase-modulated waves and based upon the Doppler effect resulting from movement of targets]

15/588 . . . . [measuring the velocity vector]

15/60 . . . . wherein the transmitter and receiver are mounted on the moving object, e.g. for determining ground speed, drift angle, ground track

15/62 . . . . Sense-of-movement determination

15/66 . . . . Sonar tracking systems

15/74 . . . . Systems using reradiation of acoustic waves, e.g. IFP, i.e. identification of friend or foe {teaching or practice apparatus for gun-arming or gun-laying using reflecting targets or active targets F41G 3/26}

15/87 . . . . Combinations of sonar systems

15/872 . . . . [Combination of several systems for attitude determination (using inertial means G01C 9/00, control of attitude G05D 1/08)]

15/874 . . . . [Combination of several spaced transponders or reflectors of known location for determining the position of a receiver (G01S 15/872 takes precedence)]

15/876 . . . . [Combination of several spaced transmitters or receivers of known location for determining the position of a transponder or a reflector (G01S 15/872 takes precedence)]

15/878 . . . . [wherein transceivers are operated, either sequentially or simultaneously, both in bi-static and in mono-static mode, e.g. cross-echo mode]

15/88 . . . . Sonar systems specially adapted for specific applications (seismic or acoustic prospecting or detecting G01V 1/00)

15/885 . . . . [Meteorological systems]

15/89 . . . . for mapping or imaging

15/8902 . . . . [Side-looking sonar]

15/8904 . . . . [using synthetic aperture techniques]

15/8906 . . . . [Short-range imaging systems; Acoustic microscope systems using pulse-echo techniques]

15/8909 . . . . [using a static transducer configuration (sound-focusing or directing per se G10K 11/26)]

15/8911 . . . . [using a single transducer for transmission and reception]

15/8913 . . . . [using separate transducers for transmission and reception]

15/8915 . . . . [using a transducer array]

15/8918 . . . . [the array being linear]

15/892 . . . . [the array being curvilinear]

15/8922 . . . . [the array being concentric or annular]

15/8925 . . . . [the array being a two-dimensional transducer configuration, i.e. matrix or orthogonal linear arrays]

15/8927 . . . . [using simultaneously or sequentially two or more subarrays or subapertures]

15/8929 . . . . [using a three-dimensional transducer configuration]

15/8931 . . . . [co-operating with moving reflectors]

15/8934 . . . . [using a dynamic transducer configuration (mounting transducers, e.g. provided with mechanical moving or orienting device per se G10K 11/004)]

15/8936 . . . . [transducers mounted for mechanical movement in three dimensions]

15/8938 . . . . [transducers mounted for mechanical movement in two dimensions]

15/894 . . . . [by rotation about a single axis]

15/8943 . . . . [co-operating with reflectors]
[using transducers mounted for linear mechanical movement]

[using transducers movable by (electro)magnetic means]

(characterised by the transmitted frequency spectrum]

[using discrete, multiple frequencies]

[using a broad-band spectrum]

[using frequencies at or above 20 MHz]

[using coded signals for correlation purposes]

[using pulse compression]

[using pulse inversion]

[using acousto-optical or acousto-electronic conversion techniques]

[using acoustical modulation of a light beam (acousto-optical light control devices G02F 1/11, G02F 1/33)]

[using application of holographic techniques (holography per se G03H)]

[with optical reconstruction of the image]

[using acoustical image/electron beam converter tubes (tubes therefor H01J 31/495)]

[using special techniques for image reconstruction, e.g. FFT, geometrical transformations, spatial deconvolution, time deconvolution (digital image processing per se G06T 1/00)]

[Combined Doppler and pulse-echo imaging systems]

[Discriminating between fixed and moving objects or between objects moving at different speeds, e.g. wall clutter filter]

[Measuring the velocity vector]

[with measures taken for suppressing velocity ambiguities, i.e. anti-aliasing]

[Colour Doppler imaging]

[Combination of imaging systems with ancillary equipment]

[Three dimensional imaging systems]

[Combining images from different aspect angles, e.g. spatial compounding]

[using synthetic aperture techniques]

[for anti-collision purposes]

[between land vehicles; between land vehicles and fixed obstacles]

[sensor installation details (constructional features of transducers G01S 7/521 and B06B; casing of transducers, e.g. housing, cover or filler details, G10K 9/22; mounting of transducers, i.e. fixture, fitting or holder details, G10K 11/004)]

[in the bumper area (radar in bumper area G01S 2013/9389; bumper with obstacle sensor of electric or electronic type B60R 19/483)]

[vertical stacking of sensors, e.g. to enable obstacle height determination]

[for locating fish]

Systems using the reflection or reradiation of electromagnetic waves other than radio waves, e.g. lidar systems (photogrammetry or videogrammetry G01C 11/00)

NOTE

The note after group G01S 13/00 also applies to this group.

[Bistatic lidar systems; Multistatic lidar systems]

(Theoretical aspects)

[Systems using the reflection of electromagnetic waves other than radio waves (G01S 17/66 takes precedence)]

[Combination of lidar systems, with systems other than lidar, radar or sonar, e.g. with direction finder]

[for detecting the presence of an object]

[Systems determining position data of a target]

[for measuring distance only (indirect measurement G01S 17/46; active triangulation systems G01S 17/48; passive systems using a parallactic triangle G01C 3/10, G01C 3/22, G01C 3/24, G01C 3/26)]

[using transmission of interrupted pulse-modulated waves (determination of distance by phase measurements G01S 17/32)]

[wherein the transmitted pulses use a frequency- or phase modulated carrier wave, e.g. for pulse compression of received signals]

[wherein a voltage or current pulse is initiated and terminated in accordance respectively with the pulse transmission and echo-reception, e.g. using counters]

[wherein range gates are used]

[using transmission of continuous unmodulated waves, amplitude-, frequency-, or phase-modulated waves]

[using transmission of frequency-modulated waves and the received signal, or a signal derived therefrom, being heterodyned with a locally-generated signal related to the contemporaneous transmitted signal to give a beat-frequency signal]

[with phase comparison between the received signal and the contemporaneously transmitted signal]

[Simultaneous measurement of distance and other co-ordinates (indirect measurement G01S 17/46)]
17/46 . . . Indirect determination of position data
17/48 . . . Active triangulation systems, i.e. using
the transmission and reflection of
electromagnetic waves other than radio
waves (passive systems using a parallactic
triangle G01C 3/10, G01C 3/22, G01C 3/24,
G01C 3/26; active systems for automatic
generation of focusing signals G02B 7/32)
17/50 . . . Systems of measurement based on relative
movement of target
17/58 . . . Velocity or trajectory determination systems;
Sense-of-movement determination systems
17/66 . Tracking systems using electromagnetic waves
other than radio waves
17/74 . Systems using reradiation of electromagnetic waves
other than radio waves, e.g. IFF, i.e. identification
of friend or foe (teaching or practice apparatus for
gun-arming or gun-laying using reflecting targets or
active targets F41G 3/26)
17/87 . Combinations of systems using electromagnetic
waves other than radio waves
17/875 . . . Combination of several systems for attitude
determination
17/88 . . . Lidar systems specially adapted for specific
applications
17/89 . . . for mapping or imaging
17/895 . . . [using synthetic aperture techniques]
17/93 . . . for anti-collision purposes
17/933 . . . [between aircrafts or spacecrafts; between
aircrafts or spacecrafts and fixed obstacles]
17/936 . . . [between land vehicles; between land vehicles
and fixed obstacles]
17/95 . . . for meteorological use
19/00 Satellite radio beacon positioning systems;
Determining position, velocity or attitude using
signals transmitted by such systems

NOTE
In this group, or in the patent documents classified
in this group, the following abbreviations are often
used:
• PDOP = Position Dilution of Precision
• RAIM = Receiver Autonomous Integrity
  Monitoring
19/01 . . . Satellite radio beacon positioning systems
transmitting time-stamped messages, e.g. GPS
[Global Positioning System], GLONASS [Global
Orbiting Navigation Satellite System] or GALILEO
19/015 . . . [Arrangements for jamming, spoofing or other
methods of denial of service of such systems]
19/02 . . . Details of the space or ground control segments
19/03 . . . Cooperating elements; Interaction or
communication between different cooperating
elements or between cooperating elements and
receivers

NOTE
The term “cooperating elements” designates
additional elements or subsystems, including
receivers of other users, which interact or
communicate with the receiver or the satellite
positioning system.
19/04 . . . providing carrier phase data
19/05 . . . providing aiding information
19/06 . . . employing an initial estimate of the location
of the receiver as aiding data or in generating
aiding data
19/07 . . . providing data for correcting measured
positioning data, e.g. DGPS [differential GPS]
or ionosphere corrections
19/08 . . . providing integrity information, e.g. health of
satellites or quality of ephemeris data
19/09 . . . providing processing capability normally
carried out by the receiver
19/10 . . . providing dedicated supplementary positioning
signals
19/11 . . . wherein the cooperating elements are
pseudolites or satellite radio beacon
positioning system signal repeaters
19/12 . . . wherein the cooperating elements are
telecommunication base stations
19/13 . . . Receivers
19/14 . . . specially adapted for specific applications
19/15 . . . Aircraft landing systems
19/16 . . . Anti-theft; Abduction
19/17 . . . Emergency applications
19/18 . . . Military applications
19/19 . . . Sporting applications
19/20 . . . Interference monitoring, fault detection or fault
isolation of space segment
19/21 . . . Interference related issues; [Issues related to
cross-correlation, spoofing or other methods
of denial of service (interference-related
aspects in spread spectrum receivers per se
H04B 1/7097)]
19/215 . . . [issues related to spoofing]
19/22 . . . Multipath-related issues
19/23 . . . Testing, monitoring, correcting or calibrating of
receiver elements
19/235 . . . [Calibration of receiver components]
19/24 . . . Acquisition or tracking [or demodulation]
of signals transmitted by the system
[synchronisation aspects of direct sequence
spread spectrum modulation H04B 1/7073]
19/243 . . . [Demodulation of navigation message]
19/246 . . . [involving long acquisition integration times,
extended snapshots of signals or methods
specifically directed towards weak signal
acquisition]
19/25 . . . involving aiding data received from a
coooperating element, e.g. assisted GPS
19/252 . . . [Employing an initial estimate of location
in generating assistance data]
19/254 . . . [relating to Doppler shift of satellite
signals]
19/256 . . . [relating to timing, e.g. time of week, code
phase, timing offset]
19/258 . . . [relating to the satellite constellation, e.g.
almanac, ephemeris data, lists of satellites
in view]
19/26 . . . involving a sensor measurement for aiding
acquisition or tracking
19/27 . . . creating, predicting or correcting ephemeris
or almanac data within the receiver
19/28 . . . Satellite selection
19/29 . . . carrier, [including Doppler.] related
[(G01S 19/246 takes precedence)]
Acquisition or tracking of other signals for positioning

Multimode operation in a single same satellite system, e.g. GPS L1/L2

Multimode operation in different systems which transmit time stamped messages, e.g. GPS/GLONASS

Power consumption

Constructional details or hardware or software details of the signal processing chain relating to the receiver front end

Hardware or software details of the signal processing chain

Determining a navigation solution using signals transmitted by a satellite radio beacon positioning system

the satellite radio beacon positioning system transmitting time-stamped messages, e.g. GPS [Global Positioning System], GLONASS [Global Orbiting Navigation Satellite System] or GALILEO

Correcting position, velocity or attitude

Differential correction, e.g. DGPS [differential GPS]

Determining position

{ by combining or switching between position solutions or signals derived from different satellite radio beacon positioning systems; by combining or switching between position solutions or signals derived from different modes of operation in a single system }

{ by combining or switching between position solutions derived from different satellite radio beacon positioning systems }

{ by combining or switching between signals derived from different satellite radio beacon positioning systems }

{ by combining or switching between position solutions or signals derived from different modes of operation in a single system }

{ using multipath or indirect path propagation signals in position determination }

using carrier phase measurements, e.g. kinematic positioning; using long or short baseline interferometry

Carrier phase ambiguity resolution; Floating ambiguity; LAMBDA [Least-squares AMBiguity Decorrelation Adjustment] method

by combining measurements of signals from the satellite radio beacon positioning system with a supplementary measurement

the supplementary measurement being of a radio-wave signal type

the supplementary measurement being an inertial measurement, e.g. tightly coupled inertial

by combining or switching between position solutions derived from the satellite radio beacon positioning system and position solutions derived from a further system whereby the further system is an inertial position system, e.g. loosely-coupled

whereby the position solution is constrained to lie upon a particular curve or surface, e.g. for locomotives on railway tracks

Relative positioning

Determining velocity

Determining attitude

using carrier phase measurements; using long or short baseline interferometry

Carrier phase ambiguity resolution; Floating ambiguity; LAMBDA [Least-squares AMBiguity Decorrelation Adjustment] method

Transmission of position information to remote stations

for traffic control, mobile tracking, guidance, surveillance or anti-collision

for aircraft positioning relative to the ground

for aircraft positioning relative to other aircraft

for emergency situations

for management of a communication system

using a mobile telephone network