

H04B

TRANSMISSION

Definition statement

This place covers:

The transmission of information carrying signals, the transmission being independent of the nature of the information. Monitoring and testing arrangements and the suppression and limitation of noise and interference.

The user is referred to the IPC definitions of individual main groups of subclass [H04B](#):

Transmission systems characterised by the waveband used for transmission:

Radio waves - see definition for main group [H04B 7/00](#).

Light, infrared waves or corpuscular radiation - see definition for main group [H04B 10/00](#).

Ultrasonic, sonic or infrasonic waves - see definition for main group [H04B 11/00](#).

Transmission systems characterised by the medium used for transmission:

Conductors - see definition for main group [H04B 3/00](#).

Free-space propagation - see definition for main groups [H04B 5/00](#), [H04B 7/00](#), [H04B 10/00](#), [H04B 11/00](#).

Earth, water or body - see definition for main group [H04B 13/00](#).

Transmission systems characterised by the carrier modulation used for transmission:

Pulse modulation - see definition for main group [H04B 14/00](#).

Relationships with other classification places

If the transmission systems are specially adapted for particular applications classification is also made in subclasses listed in section "Informative references".

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Transmission systems for measured values, control or similar signals	G08C
Speech analysis or synthesis	G10L
Coding, decoding or code conversion	H03M
Broadcast communication	H04H
Multiplex communication	H04J
Secret communication	H04K
Transmission of digital information	H04L
Telephonic communication	H04M
Pictorial communication	H04N
Wireless communication networks	H04W

Special rules of classification

Transmission systems characterised by the medium used for transmission or by band of employing waves should be classified in groups [H04B 3/00- H04B 11/00](#) or in residual group [H04B 13/00](#).

Transmission systems characterised by the use of carrier modulation or sub-carrier should be classified in group [H04B 14/00](#) and details thereof in group [H04B 1/00](#).

H04B 1/00

Details of transmission systems, not covered by a single one of groups [H04B 3/00](#) - [H04B 13/00](#); Details of transmission systems not characterised by the medium used for transmission

Definition statement

This place covers:

Details of transmission systems that are general for transmission systems covered by two or more groups [H04B 3/00-H04B 13/00](#).

Details of transmission systems not characterized by the medium used for transmission.

Relationships with other classification places

If the transmission systems are specially adapted for particular applications classification is also made in subclasses listed in section "Informative references".

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Narrow band interference in spread spectrum systems	H04B 1/71
Line transceivers	H04B 3/54
Monitoring; testing	H04B 17/00
Spatial arrangements of component circuits in radio pills for living beings	A61B 5/07
Waveguides; Resonators, lines or other devices of the waveguide type	H01P
Antennas	H01Q
Battery chargers	H02J 7/00
Demodulation or transference of modulation from one carrier to another	H03D
Amplifier circuits	H03F
Modifications of amplifiers to reduce non-linear distortion	H03F 1/3241
Gain Control circuits	H03G
Filter circuits	H03H
Tuning resonant circuits	H03J
Power saving arrangements	H04W 52/02

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Homodyne receiver	A receiver which involves multiplying the modulated received signal by a local oscillator which has the same frequency as that associated with the received signal, so that the received signal will be directly converted into the baseband.
Superheterodyne receiver	A receiver in which the frequency of the incoming signal is reduced in a mixer or frequency changer by heterodyning with another frequency at the local oscillator. (Heterodyning: combining two sinusoidal frequencies radio frequency waves in a non-linear device resulting in sum and difference frequencies).
Synchrodyne receiver	A receiver in which a mixing carrier signal is inserted in exact synchronism with the original carrier at the transmitter. Used for the selective detection of signals coded in a certain way.

H04B 1/0003

{Software-defined radio [SDR] systems, i.e. systems wherein components typically implemented in hardware, e.g. filters or modulators/demodulators, are implemented using software, e.g. by involving an AD or DA conversion stage such that at least part of the signal processing is performed in the digital domain (digital baseband systems [H04L 25/00](#); digital modulation/demodulation [H04L 27/00](#); CDMA [H04B 1/707](#); TDMA [H04B 7/2643](#); image transmission [H04N 5/00](#))}

Definition statement

This place covers:

Systems wherein components typically implemented in hardware, e.g. filters

modulators/demodulators, are implemented using software, e.g. by involving an AD or DA conversion stage such that at least part of the signal processing is performed in the digital domain.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cdma	H04B 1/707
Tdma	H04B 7/2643
Digital baseband systems	H04L 25/00
Digital modulation/demodulation	H04L 27/00
Image transmission	H04N 5/00

H04B 1/001

{Channel filtering, i.e. selecting a frequency channel within the SDR system (multiplexing of multicarrier modulation signals being represented by different frequencies [H04L 5/06](#); multiplexing of multicarrier modulation signals [H04L 5/023](#))}

Definition statement

This place covers:

selecting a frequency channel within the SDR system

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Multiplexing of multicarrier modulation signals	H04L 5/023
Multiplexing of multicarrier modulation signals being represented by different frequencies	H04L 5/06

H04B 1/0017

{Digital filtering ([H04B 1/001](#) takes precedence; digital filters per se [H03H 17/00](#))}

References

Limiting references

This place does not cover:

Using channel filtering with AD/DA conversion at radiofrequency or intermediate frequency stage	H04B 1/001
Impedance networks using digital techniques	H03H 17/00

H04B 1/0021

{Decimation, i.e. data rate reduction techniques ([H04B 1/0025](#) takes precedence)}

References

Limiting references

This place does not cover:

Using a sampling rate lower than twice the highest frequency component of the sampled signal	H04B 1/0025
--	-----------------------------

H04B 1/0025

{using a sampling rate lower than twice the highest frequency component of the sampled signal (for demodulation of angle-modulated signals [H03D 3/006](#))}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Demodulation of angle-modulated signals	H03D 3/006
---	----------------------------

H04B 1/0032

{with analogue quadrature frequency conversion to and from the baseband (quadrature modulators and demodulators per se [H03D 3/007](#), [H03C 3/40](#))}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Quadrature demodulators	H03C 3/40
Quadrature modulators	H03D 3/007

H04B 1/0035

{Channel filtering, i.e. selecting a frequency channel within a software radio system (multiplexing of multicarrier modulation signals being represented by different frequencies [H04L 5/06](#); multiplexing of multicarrier modulation signals [H04L 5/023](#))}

Definition statement

This place covers:

selecting a frequency channel within the SDR system

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Multiplexing of multicarrier modulation signals	H04L 5/023
Multiplexing of multicarrier modulation signals being represented by different frequencies	H04L 5/06

H04B 1/0042

{Digital filtering ([H04B 1/0035](#) takes precedence; digital filters per se [H03H 17/00](#))}

References

Limiting references

This place does not cover:

Using channel filtering with AD/DA conversion at baseband stage	H04B 1/0035
Impedance networks using digital techniques	H03H 17/00

H04B 1/005

{adapting radio receivers, transmitters and transceivers for operation on two or more bands, i.e. frequency ranges}

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Band	a frequency range with a bandwidth larger than a signal or channel bandwidth, in general covering several communication channels, e.g. AM broadcast band (Medium Wave) or mobile telephone communications band [such as the GSM-900MHz band]
------	--

H04B 1/006

{using switches for selecting the desired band ([H04B 1/0057](#) takes precedence)}

References

Limiting references

This place does not cover:

Using diplexing or multiplexing filters for selecting the desired band	H04B 1/0057
--	-----------------------------

H04B 1/0064

{with separate antennas for the more than one band ([H04B 1/0053](#) takes precedence)}

References

Limiting references

This place does not cover:

Common antenna for more than one band	H04B 1/0053
---------------------------------------	-----------------------------

H04B 1/0071

{using a common intermediate frequency for more than one band ([H04B 1/0075](#) takes precedence)}

References**Limiting references**

This place does not cover:

Using different intermediate frequencies for the different bands	H04B 1/0075
--	-----------------------------

H04B 1/02**Transmitters****References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Spatial arrangements of component circuits in radio pills for living beings	A61B 5/07
---	---------------------------

H04B 1/03**Constructional details, e.g. casings, housings****References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Arrangements or equipments adapted for airplanes	B64D
--	----------------------

H04B 1/034**Portable transmitters****References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Means for indicating the location of accidentally buried persons	A63B 29/021
Distress beacons	G01S 1/68

H04B 1/036

Cooling arrangements

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cooling transformers	H01F 27/08
Cooling discharge tubes	H01J 7/24 , H01J 19/74

H04B 1/04

Circuits

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Power supplies	H04B 1/1607
Oscillators	H03B
Modulators	H03C 1/00 , H03C 3/00 , H03C 5/00
Amplifiers	H03F
Of television transmitters	H04N 5/38

H04B 1/0458

{Arrangements for matching and coupling between power amplifier and antenna or between amplifying stages (matching circuits in general [H03H](#))}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Matching circuits in general	H03H
------------------------------	----------------------

H04B 1/0466

{Fault detection or indication ([H04B 1/0483](#) takes precedence)}

References

Limiting references

This place does not cover:

Transmitters with multiple parallel paths	H04B 1/0483
---	-----------------------------

H04B 1/0475

{with means for limiting noise, interference or distortion ([H04B 1/0483](#) takes precedence)}

References**Limiting references**

This place does not cover:

Transmitters with multiple parallel paths	H04B 1/0483
---	-----------------------------

Informative references

Attention is drawn to the following places, which may be of interest for search:

Detection of non-compliance or faulty performance in transmitters	H04B 17/17
---	----------------------------

H04B 1/06**Receivers****References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Control of amplification	H03G
Television receivers	H04N 5/44 , H04N 5/64

H04B 1/082

{to be used in vehicles ([H04B 1/086](#) takes precedence; holding or mounting accessories [B60R 11/02](#))}

References**Limiting references**

This place does not cover:

Portable receivers	H04B 1/086
--------------------	----------------------------

Informative references

Attention is drawn to the following places, which may be of interest for search:

Holding or mounting accessories	B60R 11/02
---------------------------------	----------------------------

H04B 1/10

Means associated with receiver for limiting or suppressing noise or interference

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Spread spectrum systems	H04B 1/7097
Equalising on HF or IF	H04B 7/005
Diversity systems	H04B 7/02
Elimination of image frequencies	H03D 7/18
Noise suppression by control of amplification	H03G 3/00 , H03G 5/00 , H03G 7/00
Squelching	H03G 3/26 , H03G 3/34

H04B 1/1009

{Placing the antenna at a place where the noise level is low and using a noise-free transmission line between the antenna and the receivers (screened aerials [H01Q 7/04](#); feeders for aerials [H01Q 9/00](#))}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Screened aerials	H01Q 7/04
Feeders for aerials	H01Q 9/00

H04B 1/1018

{noise filters connected between the power supply and the receiver (suppression or limitation of noise from electric apparatus [H04B 15/00](#); demodulation [H03D](#); ripple filters [H02M 1/14](#); filters in general [95G](#), [H03H](#); power supplies [H04B 1/1607](#))}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Power supplies	H04B 1/1607
Suppression or limitation of noise from electric apparatus	H04B 15/00
Ripple filters	H02M 1/14
Demodulation	H03D
Filters in general	H03H

H04B 1/1036

{with automatic suppression of narrow band noise or interference, e.g. by using tuneable notch filters ([H04B 1/123](#) takes precedence; filter circuits [H03H](#))}

References

Limiting references

This place does not cover:

Using adaptive balancing or compensation means	H04B 1/123
Narrow band interference reduction in spread spectrum systems	H04B 1/71

Informative references

Attention is drawn to the following places, which may be of interest for search:

Filter circuits	H03H
-----------------	----------------------

H04B 1/1081

{Reduction of multipath noise (by equalising [H04B 7/005](#))}

References

Limiting references

This place does not cover:

Reduction of multipath noise by equalising	H04B 7/005
--	----------------------------

H04B 1/109

{by improving strong signal performance of the receiver when strong unwanted signals are present at the receiver input}

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Unwanted signal	signals outside the wanted signal bandwidth
-----------------	---

H04B 1/12

Neutralising, balancing, or compensation arrangements

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Balancing ripple filters	H04B 15/005 , H02M 1/143
--------------------------	---

H04B 1/123

{using adaptive balancing or compensation means (adaptive filter circuits and algorithms [H03H](#))}

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Adaptive filter circuits and algorithms	H03H
---	----------------------

H04B 1/126

{having multiple inputs, e.g. auxiliary antenna for receiving interfering signal (aerials in general [H01Q](#))}

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Aerials in general	H01Q
--------------------	----------------------

H04B 1/16**Circuits****References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Demodulators	H03D
--------------	----------------------

H04B 1/1607

{Supply circuits (converters [H02M](#); filters therefor [H02M 1/14](#); voltage stabilisers [G05F 1/46](#))}

References**Limiting references**

This place does not cover:

Voltage stabilisers	G05F 1/46
Converters	H02M
Filters for converters	H02M 1/14
Power saving arrangements	H04W 52/02

H04B 1/1615

{Switching on; Switching off, e.g. remotely (battery saving circuits associated with selective call operation [H04W 52/00](#); details of power consumption reduction in a PLL, [H03L 7/0802](#), [H03L 7/14](#), [H03L 2207/08](#), [H03L 2207/18](#); muting amplifiers by gain control see [H03G 3/34](#))}

References

Limiting references

This place does not cover:

Muting amplifiers by gain control	H03G 3/34
Details of power consumption reduction in a PLL	H03L 7/0802 , H03L 7/14 , H03L 2207/00
Power saving arrangements	H04W 52/02

H04B 1/163

{Special arrangements for the reduction of the damping of resonant circuits of receivers (amplifiers [H03F](#); negative impedance networks for line transmission systems [H04B 3/16](#))}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Negative impedance networks for line transmission systems	H04B 3/16
Amplifiers	H03F

H04B 1/1638

{Special circuits to enhance selectivity of receivers not otherwise provided for (resonant circuits [H03H](#))}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Resonant circuits; filters	H03H
----------------------------	----------------------

H04B 1/1646**{adapted for the reception of stereophonic signals}****References*****Informative references****Attention is drawn to the following places, which may be of interest for search:*

Broadcast stereophonic receivers	H04H 40/36
----------------------------------	----------------------------

H04B 1/1692**{using companding of the stereo difference signal, e.g. FMX (volume compression or expansion in amplifiers [H03G 7/00](#))}****References*****Informative references****Attention is drawn to the following places, which may be of interest for search:*

Volume compression or expansion in amplifiers	H03G 7/00
---	---------------------------

H04B 1/20**for coupling gramophone pick-up, recorder output, or microphone to receiver****References*****Informative references****Attention is drawn to the following places, which may be of interest for search:*

Constructional details for associated working of receivers and recording devices	G11B 31/003
For television signals only	H04N 5/00

H04B 1/202**{by remote control}****References*****Informative references****Attention is drawn to the following places, which may be of interest for search:*

Remote controllers	G08C
--------------------	----------------------

H04B 1/207

{with an audio or audio/video bus for signal distribution ([H04B 1/205](#) takes precedence)}

References**Limiting references**

This place does not cover:

With control bus for exchanging commands	H04B 1/205
--	----------------------------

H04B 1/24

the receiver comprising at least one semiconductor device having three or more electrodes

References**Limiting references**

This place does not cover:

Older documents covering circuits with vacuum tubes	H04B 1/22
---	---------------------------

H04B 1/28

the receiver comprising at least one semiconductor device having three or more electrodes

References**Limiting references**

This place does not cover:

Older documents covering circuits with vacuum tubes	H04B 1/28
---	---------------------------

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Superheterodyne receiver	A receiver in which the frequency of the incoming signal is reduced in a mixer or frequency changer by heterodyning with another frequency at the local oscillator. (Heterodyning: combining two sinusoidal frequencies radio frequency waves in a non-linear device resulting in sum and difference frequencies).
If	Intermediate Frequency
Lo	local oscillator

H04B 1/30

for homodyne or synchrodyne receivers (demodulator circuits [H03D 1/22](#))

Definition statement

This place covers:

Additionally, super-regenerative receivers can be found in this group

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Homodyne receiver	A receiver which involves multiplying the modulated received signal by a local oscillator which has the same frequency as that associated with the received signal, so that the received signal will be directly converted into the baseband.
Synchrodyne receiver	A receiver in which a mixing carrier signal is inserted in exact synchronism with the original carrier at the transmitter. Used for the selective detection of signals coded in a certain way.

H04B 1/302

{for single sideband receivers (demodulator circuits [H03D 1/24](#))}

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Demodulator circuits	H03D 1/24
----------------------	---------------------------

H04B 1/38

Transceivers, i.e. devices in which transmitter and receiver form a structural unit and in which at least one part is used for functions of transmitting and receiving

References**Limiting references**

This place does not cover:

Construction of portable transceivers	H04B 1/034
Specially adapted to be fitted into airplanes	B64D 43/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Paging systems	G08B 3/10
Traffic between a small number of stations with amplifiers or loudspeakers	H04M 9/001
Wireless communication networks	H04W

H04B 1/3816

Mechanical arrangements for accommodating identification devices, e.g. cards or chips; with connectors for programming identification devices

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Details of identification cards	G06K 19/00
---------------------------------	----------------------------

H04B 1/3822

specially adapted for use in vehicles ([H04B 1/3827](#) takes precedence)

References**Limiting references**

This place does not cover:

Portable transceivers	H04B 1/3827
Arrangements for holding or mounting accessories	B60R 11/02

H04B 1/3838

{Arrangements for reducing RF exposure to the user, e.g. by changing the shape of the transceiver while in use}

References**Limiting references**

This place does not cover:

Means for shaping the antenna pattern	H01Q 1/245
---------------------------------------	----------------------------

H04B 1/3877

Arrangements for enabling portable transceivers to be used in a fixed position, e.g. cradles or boosters

Definition statement

This place covers:

Cradles ; Car kits ; boosters

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

For portable telephone terminals	H04M 1/724
----------------------------------	----------------------------

H04B 1/3883**Arrangements for mounting batteries or battery chargers****References*****Limiting references****This place does not cover:*

Battery chargers	H02J 7/00
------------------	---------------------------

H04B 1/401**for selecting or indicating operating mode****References*****Informative references****Attention is drawn to the following places, which may be of interest for search:*

In portable telephone terminals	H04M 1/724
---------------------------------	----------------------------

H04B 1/406**{with more than one transmission mode, e.g. analog and digital modes}****References*****Informative references****Attention is drawn to the following places, which may be of interest for search:*

Multiband transceivers	H04B 1/005
------------------------	----------------------------

H04B 1/44**Transmit/receive switching****References*****Limiting references****This place does not cover:*

Transmit/receive switching in radar systems	G01S 7/034
---	----------------------------

H04B 1/46**by voice-frequency signals; by pilot signals****References*****Limiting references****This place does not cover:*

Echo suppression	H04B 3/20
------------------	---------------------------

H04B 1/48

in circuits for connecting transmitter and receiver to a common transmission path, e.g. by energy of transmitter {([H04B 1/46](#) takes precedence)}

References**Limiting references**

This place does not cover:

By voice-frequency signals; by pilot signals	H04B 1/46
--	---------------------------

H04B 1/52

Hybrid arrangements, i.e. arrangements for transition from single-path two-direction transmission to single-direction transmission on each of two paths or vice versa

References**Limiting references**

This place does not cover:

Microwave multiplexers	H01P 1/213
Multipoint networks	H03H 7/46

H04B 1/525

with means for reducing leakage of transmitter signal into the receiver

References**Limiting references**

This place does not cover:

For repeater stations	H04B 7/15564
-----------------------	------------------------------

H04B 1/58

Hybrid arrangements, i.e. arrangements for transition from single-path two-direction transmission to single-direction transmission on each of two paths or vice versa

References**Limiting references**

This place does not cover:

microwave multiplexers	H01P 1/213
Conjugate coupling devices of the waveguide type	H01P 5/16
For two-way amplifiers	H03F 3/62
Balance/unbalance networks	H03H 7/42 , H03H 11/32

multiport networks	H03H 7/46
Multiport networks	H03H 7/48
In multiplex communication	H04J 1/10

Informative references

Attention is drawn to the following places, which may be of interest for search:

Construction of transformers	H01F
------------------------------	----------------------

H04B 1/587

{using opto-couplers (light transmission systems [H04B 10/00](#))}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Light transmission systems	H04B 10/00
----------------------------	----------------------------

H04B 1/59

Responders; Transponders

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Relay systems	H04B 7/14
---------------	---------------------------

H04B 1/62

for providing a predistortion of the signal in the transmitter and corresponding correction in the receiver, e.g. for improving the signal/noise ratio

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

For optical transmitters	H04B 10/58
--------------------------	----------------------------

H04B 1/64**Volume compression or expansion arrangements****References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

For amplifiers	H03G 7/00
----------------	---------------------------

H04B 1/66**for reducing bandwidth of signals; for improving efficiency of transmission
([H04B 1/68](#) takes precedence)****References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Vocoders	G10L
In pictorial communication systems	H04N

H04B 1/665**{using psychoacoustic properties of the ear, e.g. masking effect}****References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Perceptual coders	G10L 19/02
-------------------	----------------------------

H04B 1/68**for wholly or partially suppressing the carrier or one side band****References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Single sideband receivers	H04B 1/302
Modulator circuits	H03C 1/52 , H03C 1/60
For data transmission	H04L 27/02

H04B 1/69

Spread spectrum techniques

Definition statement

This place covers:

Spread spectrum techniques representing methods by which communication energy generated in a particular bandwidth is deliberately spread in the frequency domain, resulting in a signal with a wider bandwidth.

Relationships with other classification places

With regard to code multiplexing, the borderline between [H04B 1/69](#) and [H04J 13/00](#) should be determined based on whether the features relevant for classification are focused on the code multiplexing aspects or the implementation of the spread-spectrum technique (e.g. details of how the signals are physically transmitted, received and processed).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Narrowband interference reduction	H04B 1/1036
Code multiplexing	H04J 13/00
Carrier synchronization per se	H04L 7/06
Multicarrier techniques	H04L 27/2601

Special rules of classification

Classification of invention and additional information:

The invention information (main focus of the document) is classified in CPC groups and is compulsory.

Additional information is classified in Indexing Codes corresponding to the CPC groups. Classification of additional information is compulsory.

Indexing Codes which have no corresponding CPC group are used to classify invention information (compulsory) or additional information (compulsory). When classifying invention information, the most appropriate CPC group must also be assigned.

Examples:

Invention relating to spread spectrum chirp is assigned [H04B 2001/6912](#) and [H04B 1/69](#)

Invention relating to spread spectrum time hopping with additional information on frequency hopping is assigned [H04B 2001/6908](#) and [H04B 1/69](#) and [H04B 1/713](#)

Invention relating to impulse radio with additional information on time hopping is assigned [H04B 1/7163](#) and [H04B 2001/6908](#)

Combinations

For cases where the invention relates to combining the features of two or more subgroups, the following should be applied:

If the relevant information relates only to the fact that the aspects are combined, the documents are classified with CPC in the group above the concerned subgroups and assigned an Indexing Code in

each of the concerned subgroups. If there is a dedicated entry for combinations this CPC is assigned instead of the subgroup.

If, besides the combination, aspects relating to the subgroups are also relevant, then multiple CPC groups may be assigned as appropriate.

Examples:

Invention relating to frequency hopping/direct sequence combination is assigned [H04B 1/692](#), [H04B 1/707](#), [H04B 1/713](#)

Invention relating to frequency hopping/direct sequence system with a focus on frequency hopping interference issues is assigned [H04B 1/692](#), [H04B 1/707](#), [H04B 1/715](#)

Invention relating to frequency hopping interference issues which can be applied to Frequency hopping/Direct Sequence systems is assigned [H04B 1/715](#), [H04B 1/692](#), [H04B 1/707](#)

Inventive combination of parallel and subtractive interference cancellation for direct sequence system is assigned [H04B 1/7107](#), [H04B 1/71072](#), [H04B 1/71075](#)

Note(s)

When classifying in this group, any aspect of code division multiplexing, which is considered to represent information of interest for search, may also be classified in group [H04J 13/00](#).

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Rake	A receiver comprising sub-receivers called fingers wherein each finger detects a single multipath component. The contributions of the fingers can be combined at a later stage
------	--

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

UWB	ultra-wideband
DSSS	direct sequence spread spectrum
CDMA	code division multiple access
FH	frequency hopping

H04B 1/692

Hybrid techniques using combinations of two or more spread spectrum techniques

Definition statement

This place covers:

Hybrids of spread spectrum techniques, e.g. frequency hopping/direct-sequence systems, time-hopping/direct-sequence systems.

H04B 1/707

using direct sequence modulation

Definition statement

This place covers:

Direct-sequence spread-spectrum techniques which directly modulate the data being transmitted by a spreading code whose frequency (chip rate) is much higher than the modulated bandwidth of the data signal (symbol rate).

An example of direct sequence modulation is CDMA (Code Division Multiple Access). Examples of systems are IS-95 (Interim Standard 2000), CDMA 2000, UMTS (Universal Mobile Telephone System), WCDMA (Wideband Code Division Multiple Access).

References

Limiting references

This place does not cover:

Aspects relating to the codes e.g. types of codes, code generation and code allocation	H04J 13/00
Carrier synchronization per se	H04L 7/06

H04B 1/713

using frequency hopping

Definition statement

This place covers:

Frequency-hopping spread spectrum techniques which involve transmitting radio signals by switching a carrier among many frequency channels, using a hopping sequence known to both transmitter and receiver.

H04B 1/7163

using impulse radio

Definition statement

This place covers:

Impulse radio spread spectrum which involve an ultra-wideband (UWB) communication system that transmits baseband pulses of very short duration (typically of the order of a nanosecond) with bandwidths that span from near dc to several GHz.

References

Limiting references

This place does not cover:

Non-pulse systems which meet the requirements of the FCC mask for UWB communication (e.g. UWB OFDM systems)	H04J 11/00 , H04L 27/26 or H04L 5/00
---	--

Special rules of classification

From 01/04/2011 documents relating to pulse-related aspects are classified in [H04B 1/717](#) and the backlog for such documents is continuously being reclassified from [H04B 1/7163](#).

H04B 1/72

Circuits or components for simulating antennas, e.g. dummy antennas

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Dissipative waveguide terminations	H01P 1/26
------------------------------------	---------------------------

H04B 1/76

Pilot transmitters or receivers for control of transmission or for equalising

Special rules of classification

This group is not used. See [H04W 52/00](#) or [H04L 25/00](#)

H04B 3/00

Line transmission systems (combined with near-field transmission systems [H04B 5/00](#))

Definition statement

This place covers:

Transmission systems characterized by the medium being electrical conductors (e.g. wires, metal cables) or waveguides.

subgroups [H04B 3/00-H04B 3/50](#), [H04B 3/34-H04B 3/52](#) cover

Data or signal transmission using twisted pair, coaxial cable, submarine cables, wave guides. These subgroups deal as well with the reliability of the line transmission system, including testing of the line transmission parameters, compensation of echo due to impedance mismatching, equalizing and interference

- subgroup [H04B 3/32](#) covers

These subgroup deal with all technical aspects concerning crosstalk compensation or cancellation in a multi-wire line transmission.

- subgroups [H04B 3/54-H04B 3/60](#) cover

Data communication using existing mains power cable already installed in the building infrastructure or in vehicles. This subgroup contains as well data transmission over high voltage (HV) power cables.

References

Limiting references

This place does not cover:

Near-field transmission system	H04B 5/00
--------------------------------	---------------------------

Informative references

Attention is drawn to the following places, which may be of interest for search:

Hybrid circuits for transceivers	H04B 1/52 , H04B 1/58
Wireless repeater	H04B 7/155
Suppression or limitation of noise or interference	H04B 15/00
Electricity meters	G01R 22/06
Testing cables properties	G01R 31/00
Alarm system using power transmission lines	G08B 25/06
Communication cables or conductors	H01B 11/00
Load coils	H01F 17/08
Waveguides; Resonators, lines or other devices of the waveguide type	H01P
Hybrid junctions of waveguide	H01P 5/16
Circuit arrangements for providing remote indication of network condition	H02J 13/00
Control of amplification in general	H03G
Transversal Filters	H03H 15/00
Digital adaptive filters	H03H 21/0012
Error detection and prevention	H04L 1/00
Multi-carrier modulation system	H04L 5/0001
Power over Ethernet	H04L 12/10
Home Automation Networks	H04L 12/2803
Extract feeding power from signals	H04L 25/02
Differential Transmission	H04L 25/0272
Decision Feedback Equalizers	H04L 25/03057
Shaping frequency spectrum at the transmitter	H04L 25/03343
Line Equalizers	H04L 25/03878
Acoustic echo cancellation	H04M 9/082

Special rules of classification

Indexing Codes for the subgroups [H04B 3/54-H04B 3/58](#), to be used for classifying additional information:

[H04B 2203/54](#)

Methods of transmitting or receiving signals via power distribution lines

[H04B 2203/5408](#)

using protocols including special data frame format, hybrid networks

[H04B 2203/5412](#)

by modifying waveform of the power source. Including interrupting power mains waveform via a switch, Triac, Scr.

[H04B 2203/5416](#)

by adding signals to the wave form of the power source. Injecting in the mains a modulated signal at much higher frequency of the mains

[H04B 2203/542](#)

using zero crossing information

[H04B 2203/5425](#)

improving S/N ratio and or coupling factor by impedance matching, noise reduction, gain control

[H04B 2203/5429](#)

Applications for powerline communications

[H04B 2203/5433](#)

Remote metering, smart grids, AMR

[H04B 2203/5437](#)

Wired telephone (Eg. PSTN, ADSL). Including interfaces between power line network and wired telephone network

[H04B 2203/5441](#)

Wireless systems or telephone. Including interfaces between power line network and wireless network (e.g.. GSM, RF transmission, Infrared)

[H04B 2203/5445](#)

Local network. Using the power line to create a local network

[H04B 2203/545](#)

Audio/video application, (e.g. interphone, audio video broadcasting)

[H04B 2203/5454](#)

Adapter and plugs. Including Home Plug and smart sockets.

[H04B 2203/5458](#)

Monitor sensor, Load control or drive; Alarm systems, Home automation, Zigbee.

[H04B 2203/5462](#)

Systems for power line communications

[H04B 2203/5466](#)

using three phases conductors

[H04B 2203/547](#)

via DC power distribution e.g. vehicles

[H04B 2203/5475](#)

adapted for drill or well combined with data transmission [H04B 2203/5479](#) using repeaters

[H04B 2203/5483](#)- [H04B 2203/5487](#)

using coupling circuits, cables

[H04B 2203/5491](#)

using filtering and bypassing

[H04B 2203/5495](#)

having measurements and testing channel

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

Plc	Power line communication
Plcc	Power line carrier communication
Mv	Medium Voltage
Hv	High Voltage
Odfm	Orthogonal Frequency Division Multiplexing
Lan	Local Area Network
Pstn	Public Switched Telephone Network

H04B 3/03

Hybrid circuits (for transceivers [H04B 1/52](#), [H04B 1/58](#))

References

Limiting references

This place does not cover:

For transceivers	H04B 1/52 , H04B 1/58
------------------	---

Informative references

Attention is drawn to the following places, which may be of interest for search:

Hybrid junctions of the waveguide type	H01P 5/16
--	---------------------------

H04B 3/04

Control of transmission; Equalising

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Control of amplification in general	H03G
-------------------------------------	----------------------

H04B 3/26

Improving frequency characteristic by the use of loading coils

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Loading coils per se	H01F 17/08
----------------------	----------------------------

H04B 3/36

Repeater circuits ([H04B 3/58](#) takes precedence)

References

Limiting references

This place does not cover:

Repeater circuits	H04B 3/58
-------------------	---------------------------

Informative references

Attention is drawn to the following places, which may be of interest for search:

Amplifiers therefor	H03F
---------------------	----------------------

H04B 3/58

Repeater circuits

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Amplifiers therefor	H03F
---------------------	----------------------

H04B 5/00

Near-field transmission systems, e.g. inductive loop type

Definition statement

This place covers:

Transmission systems of a limited range wherein the information signal transmission is inductive or capacitive, rather than electromagnetic, e.g. inductive loop type

Transmission systems operating in the low frequency and high frequency bands with reduced range and relatively short reading distances well within the radian sphere defined by $\lambda/2\pi$ (wherein λ corresponds to the wavelength of the transmission signal). Near field communication systems are asymmetrical systems which do not allow a duplex communication initiated at both ends. The transmission of power is also inductive or capacitive, rather than electromagnetic.

References

Limiting references

This place does not cover:

Read/write systems for railways	B61L 3/12
Radiating cables for railways	B61L 3/22
Record carriers	G06K 7/00 , G06K 19/00
Paging systems in general	G08B
Transmitting signals using magnetically coupled devices	G08C 17/04
Transmitting signals using capacity coupling	G08C 17/06
Transformers or inductances adapted for inductive coupling	H01Q 7/00
Leaky cables per se	H01Q 13/20

Informative references

Attention is drawn to the following places, which may be of interest for search:

Sensing electronic for record carriers	G06K 7/10336 , G06K 7/10118
Card readers, RFID cards	G06K 19/0723 , G06K 7/0008
Rfid in payment systems	G07F 7/00 , G06Q 20/00 , G07G , G07F 11/00
Transmitting signals using magnetically coupled devices	G08C 17/04
Transmitting signals using capacity coupling	G08C 17/06

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Nfc	near field communication
-----	--------------------------

H04B 5/0031

{for data transfer}

Definition statement

This place covers:

Only data transfer

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Data and power transfer	H04B 5/0037
-------------------------	-----------------------------

H04B 5/0037**{for power transfer}****References*****Informative references****Attention is drawn to the following places, which may be of interest for search:*

Data and power transfer	H04B 5/0037
-------------------------	-----------------------------

H04B 5/0056**{for use in interrogation, identification or read/write systems (record carriers [G06K 7/00](#), [G06K 19/00](#); for railways [B61L 3/12](#))}****References*****Limiting references****This place does not cover:*

Record carriers for railways	B61L 3/12
------------------------------	---------------------------

H04B 5/0062**{in RFID [Radio Frequency Identification] Systems}****Glossary of terms***In this place, the following terms or expressions are used with the meaning indicated:*

Rfid	Radio Frequency Identification
------	--------------------------------

H04B 5/0075**{using inductive coupling (transformers or inductances adapted for inductive coupling [H01F 38/14](#))}****References*****Limiting references****This place does not cover:*

Transformers or inductances adapted for inductive coupling	H01F 38/14
--	----------------------------

H04B 5/0081**{with antenna coils (loop aerials [H01Q 7/00](#))}****References****Limiting references***This place does not cover:*

Loop aerials	H01Q 7/00
--------------	---------------------------

H04B 7/00**Radio transmission systems, i.e. using radiation field ([H04B 10/00](#), [H04B 15/00](#) take precedence)****Definition statement***This place covers:*

Radio transmission systems wherein the information signal transmission is by electromagnetic waves other than light or infra-red.

References**Limiting references***This place does not cover:*

Near-field transmission systems, e.g. inductive loop type	H04B 5/00
Transmission systems employing beams of corpuscular radiation, or electromagnetic waves other than radio waves, e.g. light, infra-red	H04B 10/00
Suppression or limitation of noise or interference	H04B 15/00

Informative references*Attention is drawn to the following places, which may be of interest for search:*

Diversity systems specially adapted for direction finding	G01S 3/72
Systems using reradiation of radio waves, e.g. secondary radar systems; Analogous systems	G01S 13/74
Aerials	H01Q
Selecting arrangements to which subscribers are connected via radio links	H04W

Synonyms and Keywords*In patent documents, the following abbreviations are often used:*

CDMA	Code Division Multiple Access
CDMA - TDMA	Hybrid Code- Time Division Multiple Access
FDMA	Frequency Division Multiple Access
FDMA - TDMA	Hybrid Frequency Time Division Multiple Access
SDMA	Space Division Multiple Access

SSMA	Spread-Spectrum Multiple Access
TDMA	Time Division Multiple Access

H04B 7/005

Control of transmission; Equalising

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Equalizers	H04L 25/00 , H04L 27/00
------------	---

H04B 7/01

Reducing phase shift

Definition statement

This place covers:

Reducing phase shift to compensate for Doppler effect

H04B 7/02

Diversity systems; Multi-antenna system, i.e. transmission or reception using multiple antennas (RAKE receivers [H04B 1/7115](#))

Definition statement

This place covers:

- the use of one or more antennas to transmit or receive signals, characterised by separation in time, phase, frequency, polarisation, angle or spacing; the improvement thereby being of channel quality and reliability;
- aspects of diversity, beamforming and antenna weighting;
- the generation of antenna weights for multiple antennas;
- the feedback of information in order to assign weights for multiple antennas;
- the transmission through multiple beams, for single or multiple users;
- the combination or selection of signals from one or more fading channels by using characteristics thereof or correlation.

Aspects related to diversity, beamforming and antenna weighting:

- when the signal has diverse possibilities of being transmitted/ received through one or several antennas with different characteristics (including time, frequency, space, polarization, angle, phase...); "diverse possibilities" means the signal does not always have to be transmitted by more than one antenna. The diversity in this case would be achieved in the channel between the transmitter and receiver. This channel diversity is aimed to increase quality and reliability at the receiver;
- exploiting gain of one or more fading channels either uncorrelated or correlated (such as single beamforming and pre-coding);
- transmission through multiple beams for single user and multiple user;
- feedback of information in order to assign weights and improve reliability of the signal in transmission/ reception;

Definition statement

- generation of antenna weights for multiple antennas;
- transmission of a plurality of different signals from different antennas, wherein at least one of said signals is transmitted (potentially weighted) from more than one antenna; for example MIMO transmission for N different streams via M different antennas, where M linear combinations of the N streams are transmitted, each linear combination being transmitted from each antenna.

Relationships with other classification places

Antenna redundancy, namely the inclusion of spare antennas for the easy replacement of malfunctioning antennas, is not considered to be a multi-antenna system and therefore is not covered by this group. Details of transmission systems for increasing reliability, e.g. using redundancy, are covered by group [H04B 1/74](#).

References

Limiting references

This place does not cover:

Reducing multipath interference in spread spectrum systems	H04B 1/7115
RAKE receivers	H04B 1/7115

Informative references

Attention is drawn to the following places, which may be of interest for search:

Relay systems	H04B 7/15
Specially adapted for satellite systems	H04B 7/18534
Direction finding	G01S 3/72
Aerial arrays or systems	H01Q
Pure time diversity	H04L 1/00
For digital data transmission as such	H04L 1/02
Space-time coding	H04L 1/0618
Pre-equalising for ISI-reduction	H04L 25/03343
Providing wireless coverage using beam steering for defining the cell structure, e.g. space division multiple access [SDMA]	H04W 16/28

H04B 7/022

Site diversity; Macro-diversity (using two or more spaced independent antennas [H04B 7/04](#))

References

Limiting references

This place does not cover:

Site diversity or macro-diversity using two or more spaced independent antennas	H04B 7/04
---	---------------------------

Informative references

Attention is drawn to the following places, which may be of interest for search:

Multicasting of data during hand-off to several target access points	H04W 36/026
--	-----------------------------

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Site diversity	The technique of linking two or more ground stations receiving the same signal. This way, if the signal is heavily attenuated in one area, other ground stations can compensate.
Macro-diversity	In the field of wireless communication, macro-diversity is a kind of spatial diversity scheme using several antennas to transmit or receive wireless signals, wherein the distance between the antennas is much longer than the wavelength in use. This diversity technique limits the effects of fading in radio communications. The terms 'macro-diversity' and 'site diversity', are sometimes used synonymously in the art.

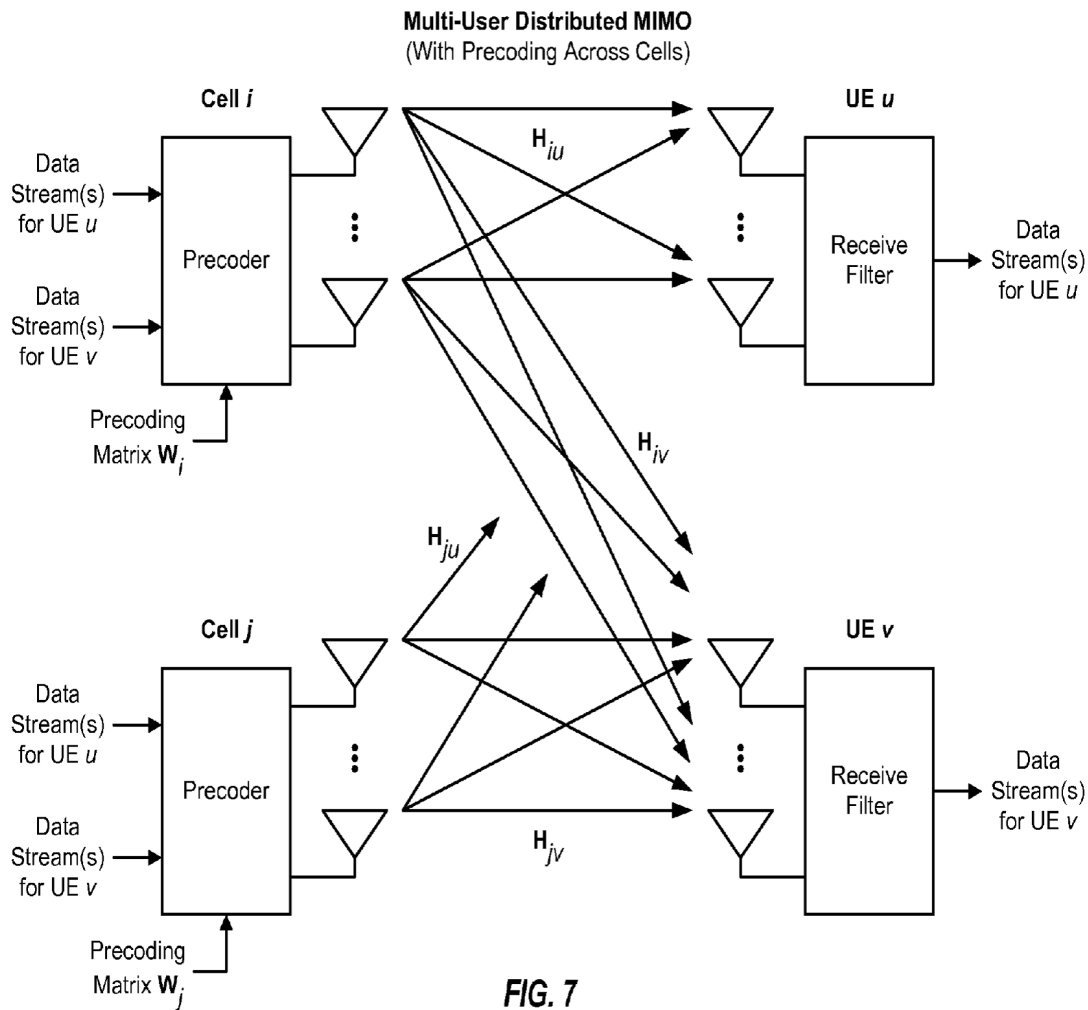
H04B 7/024

Co-operative use of antennas of several sites, e.g. in co-ordinated multipoint or co-operative multiple-input multiple-output [MIMO] systems

Definition statement

This place covers:

Example of documents classified here: see US2010034146 (figure 7):



H04B 7/026

Co-operative diversity, e.g. using fixed or mobile stations as relays

References

Limiting references

This place does not cover:

Relay systems	H04B 7/14
relays per se in CoMP	H04B 7/15592
cooperative coding	H04L 1/0077

H04B 7/028

{Spatial transmit diversity using a single antenna at the transmitter}

Definition statement

This place covers:

Example of documents classified in this group: see e.g. US2011070840 (abstract): "... The antenna(s) are spatially translated in an arbitrary trajectory. As the antenna(s) is being spatially translated, a data processing means samples the incoming signal at set intervals based on a clock signal provided by a system clock. By sampling the incoming signal at different times at different spatial locations on the arbitrary trajectory, the system acts as a synthetic antenna array. The different samplings of the incoming signal at different times and positions provide signal diversity gain as well as different readings which can be used to estimate and/or calculate various parameters of the incoming signal."

H04B 7/04

using two or more spaced independent antennas

Definition statement

This place covers:

Plurality of spaced independent aerials, both correlated (beamforming) or non-correlated (diversity) at transmitter or receiver or both, either using simultaneous transmission/reception (e.g. for beamforming) or successive transmission/reception (antenna switching/selection).

H04B 7/0408

using two or more beams, i.e. beam diversity

Definition statement

This place covers:

Example of documents classified here: see WO2009046409 (figures 4, 7)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Transmitter beamforming	H04B 7/0617
-------------------------	-----------------------------

H04B 7/0413

MIMO systems

Definition statement

This place covers:

transmission of a plurality of different signals from different antennas, wherein at least one of said signals is transmitted (potentially weighted) from more than one antenna; for example MIMO transmission for N different streams via M different antennas, where M linear combinations of the N streams are transmitted, each linear combination being transmitted from each antenna.

Special rules of classification

This group takes precedence over the transmit/receive diversity groups [H04B 7/06](#) and [H04B 7/08](#).

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

MIMO	Multiple Input Multiple Output
SIMO	Single Input Multiple Output
MISO	Multiple Input Single Output

H04B 7/0417

Feedback systems

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Details of feedback	H04B 7/0619
---------------------	-----------------------------

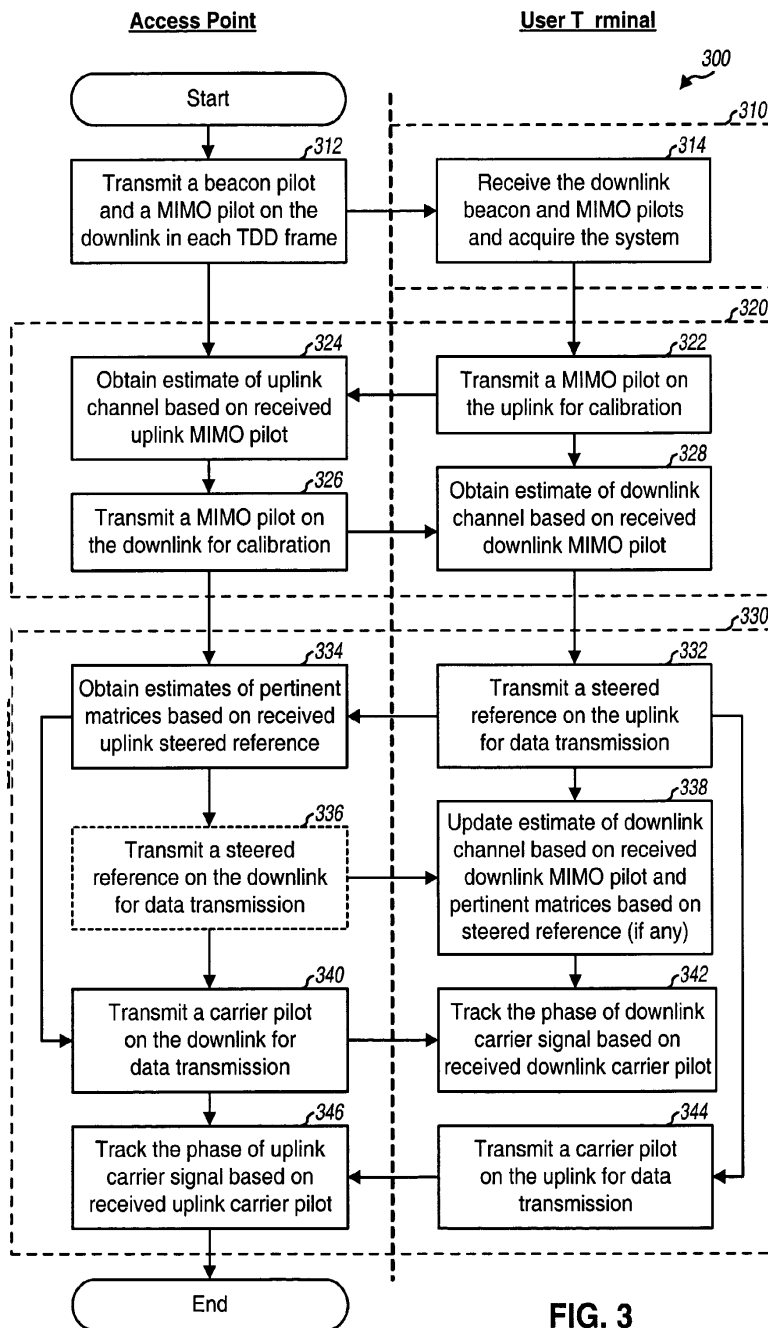
H04B 7/0421

{utilizing implicit feedback, e.g. steered pilot signals}

Definition statement

This place covers:

Example of documents classified here: US2004179627 (figure 3):



H04B 7/0426

Power distribution

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Power control in diversity systems	H04W 52/42
------------------------------------	----------------------------

H04B 7/0491

using two or more sectors, i.e. sector diversity

Definition statement

This place covers:

Example of document classified here: see e.g. US2008004016 (abstract): "A base station for establishing a picocell is configured so as to provide multiple sectors, with spatial diversity between sectors. The combination of the multiple sectors and the spatial diversity reduces signal power requirements in the air interface within a confined space and provides improvements in quality of service."

H04B 7/06

at the transmitting station

Definition statement

This place covers:

Plurality of spaced independent aerials at the transmitter (correlated or uncorrelated)

References

Limiting references

This place does not cover:

Mimo systems	H04B 7/0413
--------------	-----------------------------

H04B 7/0602

{using antenna switching ([H04B 7/0686](#) takes precedence; antenna beam directivity switching [H01Q 3/24](#))}

References

Limiting references

This place does not cover:

Hybrid systems, i.e. switching and simultaneous transmission	H04B 7/0686
--	-----------------------------

Informative references

Attention is drawn to the following places, which may be of interest for search:

Antenna beam directivity switching	H01Q 3/24
------------------------------------	---------------------------

Special rules of classification

[H04B 7/0686](#) takes precedence.

H04B 7/0619

{using feedback from receiving side (feedback signaling for adaptive modulation/coding [H04L 1/0001](#))}

References**Limiting references**

This place does not cover:

Feedback signalling for adaptive modulation and coding	H04L 1/0001
--	-----------------------------

H04B 7/0641

{Differential feedback}

Definition statement

This place covers:

Example of documents classified in this group: see e.g. WO2008157620 (fig. 2 and paragraph [0031]):

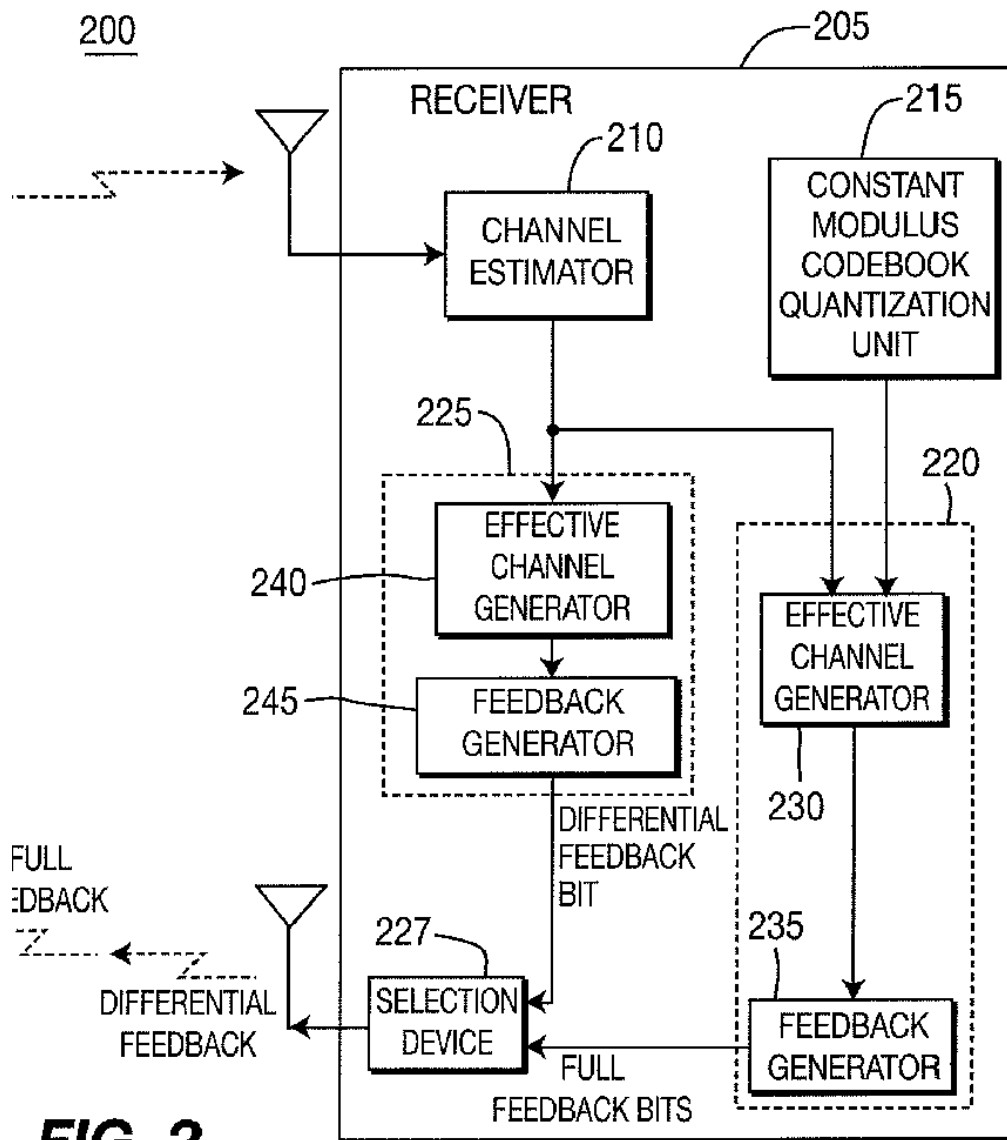


FIG. 2

H04B 7/065

{Variable contents, e.g. long-term or short-short}

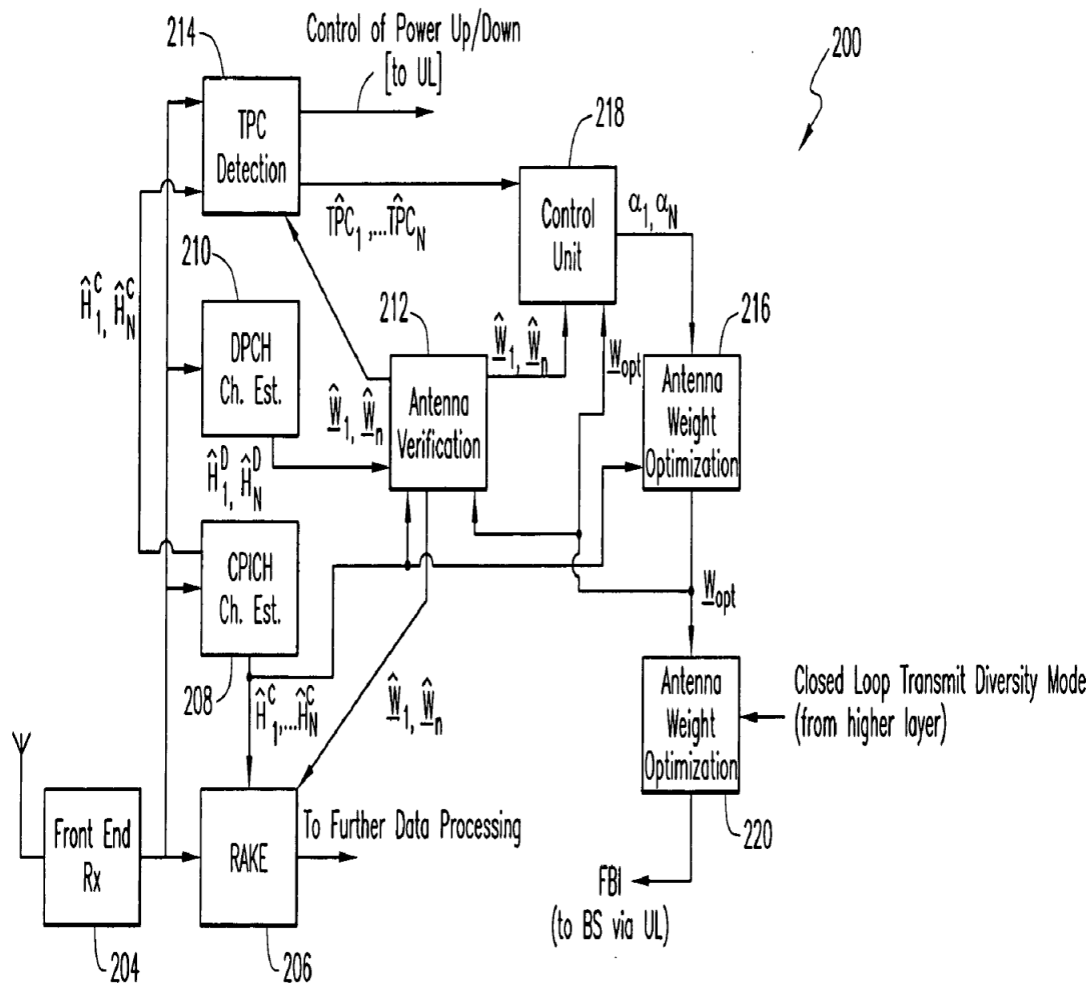
Definition statement

This place covers:

Example of document classified here: see e.g. WO2008157620 (fig. 2 and paragraph [0031]).

H04B 7/0654**{at the receiver, e.g. antenna verification at mobile station}****Definition statement***This place covers:*

Example of document classified here: see US2006068791 (fig. 2, paragraph [0031]):



or abstract of Seeger A; Sikora M, "Antenna weight verification for closed loop transmit diversity, GLOBECOM'03. 2003 - IEEE GLOBAL TELECOMMUNICATIONS CONFERENCE. CONFERENCE PROCEEDINGS. SAN FRANCISCO, CA, DEC. 1 - 5, 2003; [IEEE GLOBAL TELECOMMUNICATIONS CONFERENCE], 20031201; 20031201 - 20031205, NEW YORK, NY : IEEE, US, XP010678496: "Closed loop transmit diversity (CLTD) for FDD WCDMA relies on low-rate feedback to achieve both beamforming and diversity gain. Since the feedback channel is not immune to errors, occasionally base station (BS) uses different antenna weight vector from the one requested by mobile station (MS).

Surprisingly, most of the resulting performance degradation is caused not by reduced power of the Rx signal, but by erroneous dedicated channel estimation at the MS relying on knowledge of used weight vector. In this paper we introduce a general trellisbased antenna weight verification algorithm, which attempts to detect feedback errors and determine the most likely weight vector."

H04B 7/0656**{at the transmitter, e.g. error detection at base station}****Definition statement***This place covers:*

For example error detection/ correction of feedback bits at diversity transmitter.

H04B 7/0663**{using vector or matrix manipulations}****Definition statement***This place covers:*

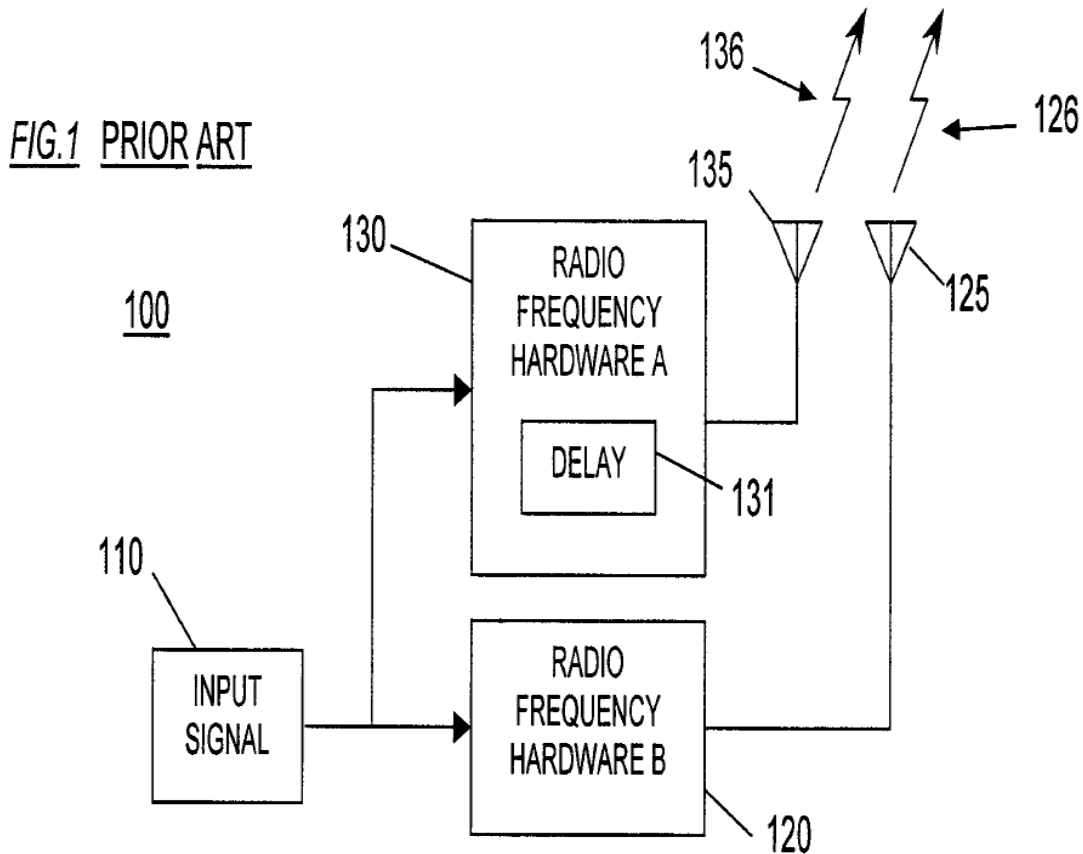
Example of document classified here: see US2006056531 (abstract): "Feedback bandwidth may be reduced in a closed loop MIMO system by Householder transformations, vector quantization using codebooks, and down-sampling in the frequency domain. A column of a beamforming matrix is quantized using a codebook, a Householder reflection is performed on the beamforming matrix to reduce the dimensionality of the beamforming matrix, and the quantizing and performing of Householder reflection on the previously dimensionality reduced beamforming matrix is recursively repeated to obtain a further reduction of dimensionality of the beamforming matrix."

H04B 7/0669**{using different channel coding between antennas (space-time coding [H04L 1/0618](#))}****References*****Limiting references****This place does not cover:*

Space-time coding	H04L 1/0618
-------------------	-----------------------------

H04B 7/0671**{using different delays between antennas}****Definition statement***This place covers:*

Example of document classified here: see WO0011806 (abstract and figure 1):

**H04B 7/0678****{using different spreading codes between antennas (code allocation [H04J 13/16](#))}****References****Limiting references***This place does not cover:*

Code allocation	H04J 13/16
-----------------	----------------------------

H04B 7/068

{using space frequency diversity (space-frequency coding [H04L 1/0606](#))}

References

Limiting references

This place does not cover:

Space-frequency coding	H04L 1/0606
------------------------	-----------------------------

H04B 7/0682

{using phase diversity (e.g. phase sweeping)}

Definition statement

This place covers:

Example of documents classified here: see US2006172710 (abstract) for phase sweeping diversity.

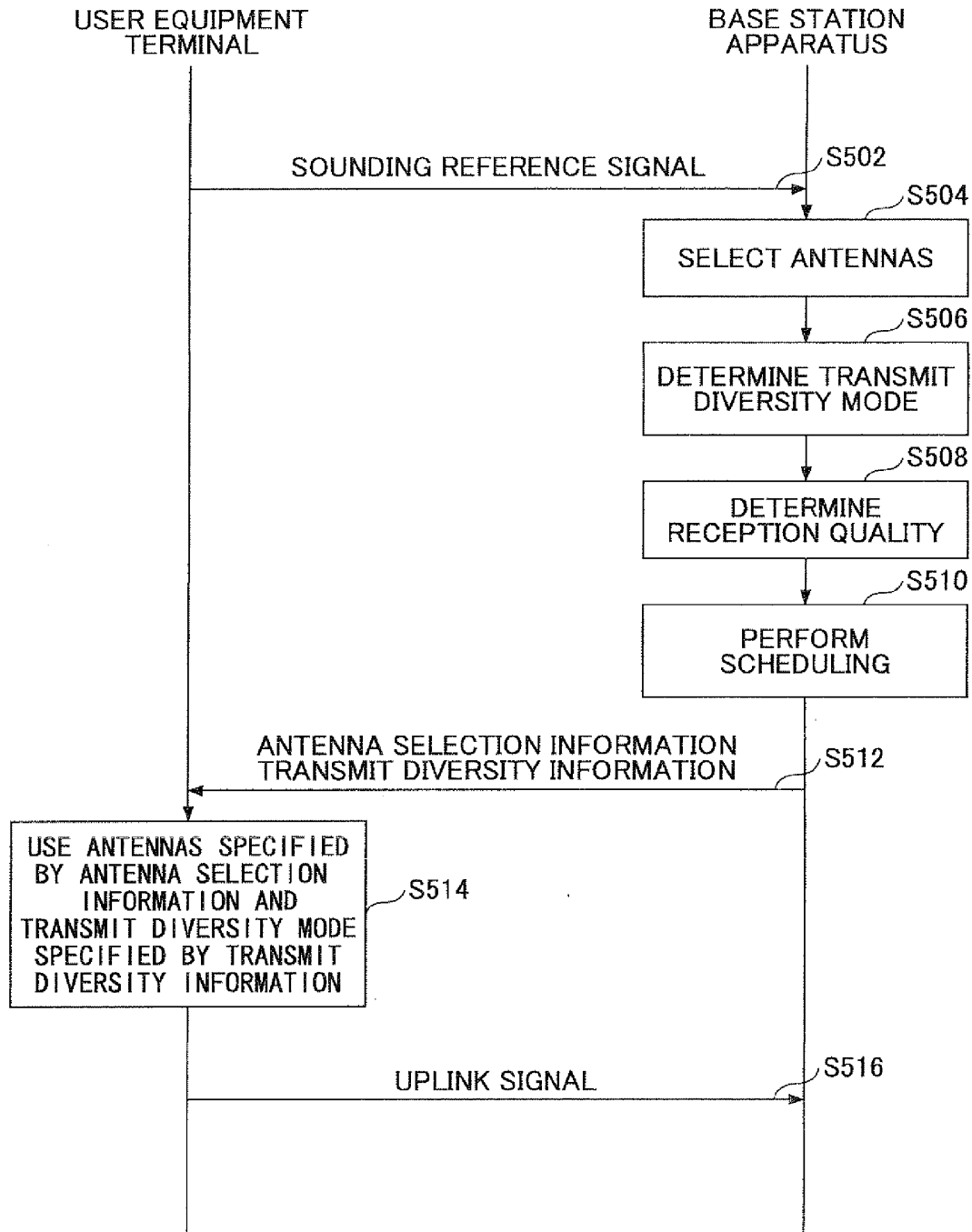
H04B 7/0689

{using different transmission schemes, at least one of them being a diversity transmission scheme}

Definition statement

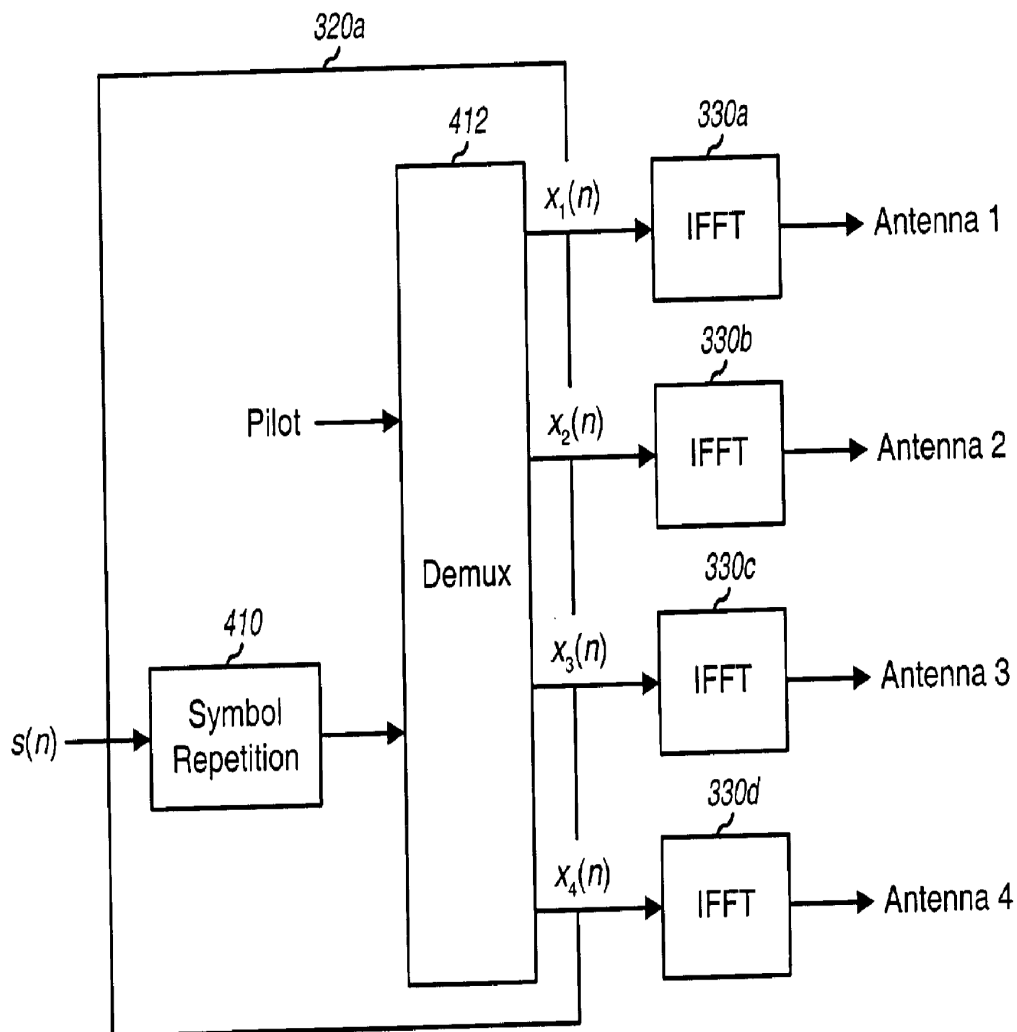
This place covers:

Example of document classified here: see e.g. EP2276305 (figure 5):



H04B 7/0697**{using spatial multiplexing}****Definition statement***This place covers:*

Example of document classified here: see e.g. US2003235147:

**FIG. 4****H04B 7/08****at the receiving station****Definition statement***This place covers:*

Plurality of spaced independent aerials at the receiver (correlated or uncorrelated).

References

Limiting references

This place does not cover:

Mimo systems	H04B 7/0413
--------------	-----------------------------

H04B 7/0802

{using antenna selection ([H04B 7/0868](#) takes precedence; antenna beam directivity switching [H01Q 3/24](#))}

References

Limiting references

This place does not cover:

Hybrid systems, i.e switching and combining	H04B 7/0868
Antenna beam directivity switching	H01Q 3/24

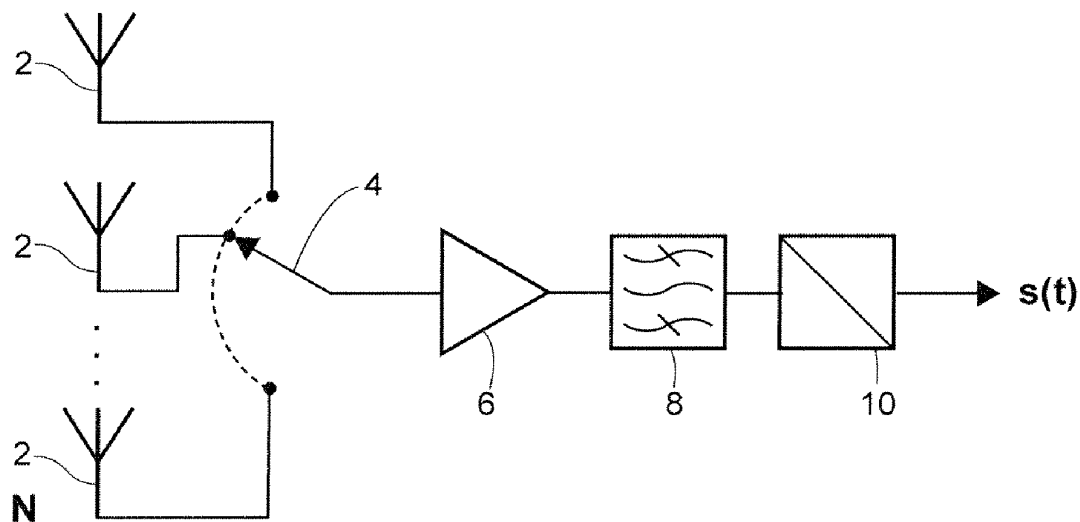
H04B 7/0805

{with single receiver and antenna switching ([H04B 7/0822](#) takes precedence)}

Definition statement

This place covers:

Example of documents classified here for receive antennas switched to a single receiver circuit; see US2010075603 (figure 1):



References

Limiting references

This place does not cover:

according to predefined selection scheme	H04B 7/0822
--	-----------------------------

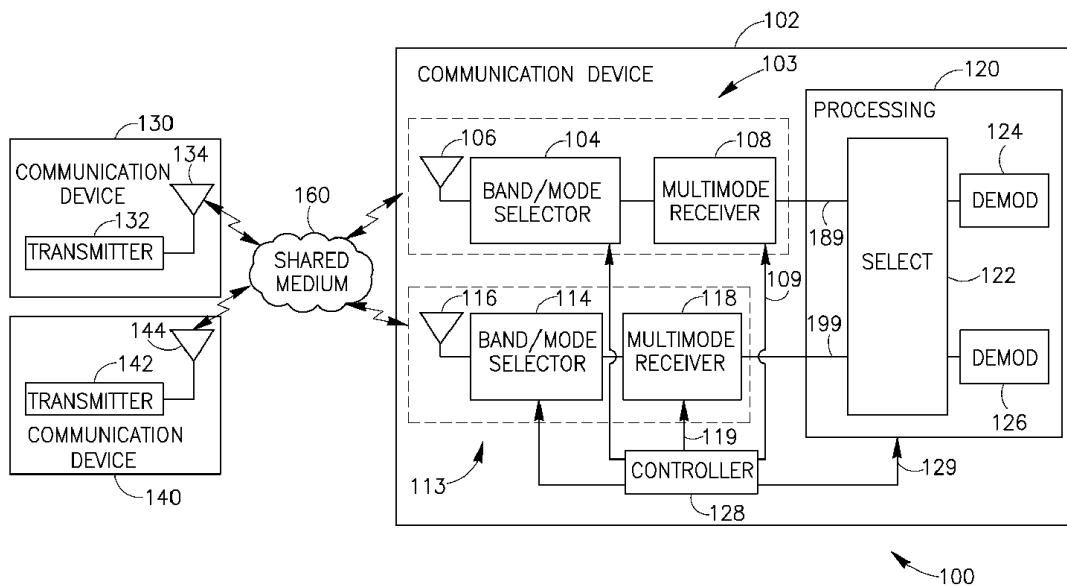
H04B 7/0817

{with multiple receivers and antenna path selection}

Definition statement

This place covers:

Example of document classified here: where the selection criterion is not necessarily identified, see WO2008003029 (figure 1):



H04B 7/0837

{using pre-detection combining ([H04B 7/0868](#) takes precedence)}

References

Limiting references

This place does not cover:

Hybrid systems, i.e switching and combining	H04B 7/0868
---	-----------------------------

H04B 7/084

{Equal gain combining, only phase adjustments (antenna beam scanning or forming by phase or amplitude control [H01Q 3/26](#), e.g. phased arrays)}

References

Limiting references

This place does not cover:

Antenna beam scanning or forming by phase or amplitude control; phased arrays	H01Q 3/26
---	---------------------------

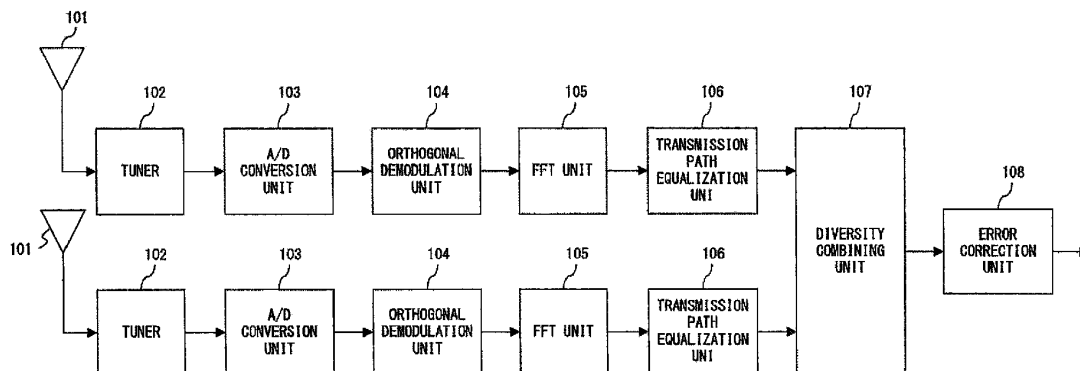
H04B 7/0845

{per branch equalization, e.g. by an FIR-filter or RAKE receiver per antenna branch (rake receivers as such [H04B 1/7115](#))}

Definition statement

This place covers:

Example of documents classified here: see US2009097577 (figure 1):



References

Limiting references

This place does not cover:

Rake receivers as such	H04B 1/7115
------------------------	-----------------------------

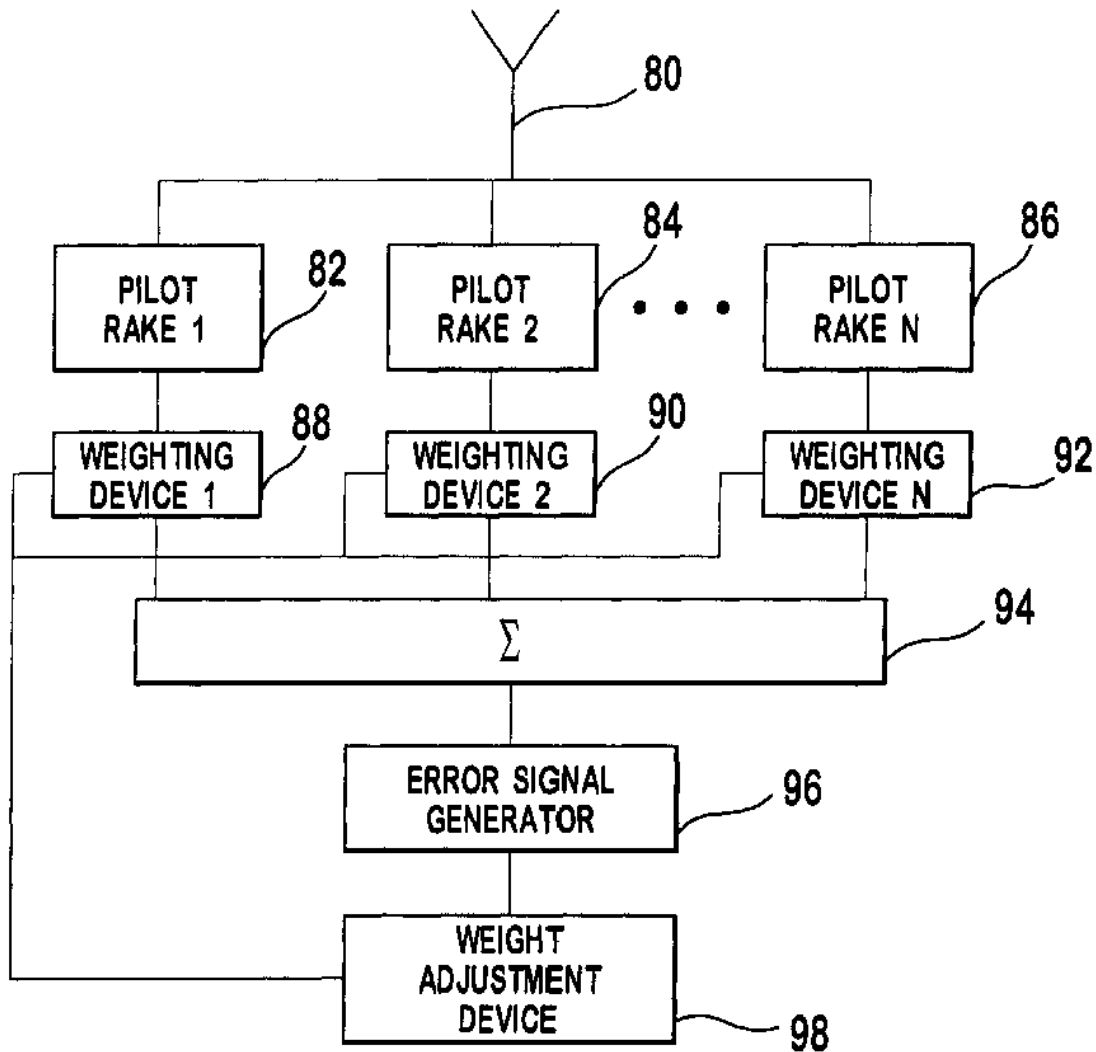
H04B 7/0851

{using training sequences or error signal (minimizing error signal [H04B 7/0854](#))}

Definition statement

This place covers:

Example of documents classified here: see US6115406 (figure 5):



References

Limiting references

This place does not cover:

Minimizing error signal	H04B 7/0854
-------------------------	-----------------------------

H04B 7/086

{using weights depending on external parameters, e.g. direction of arrival [DOA], predetermined weights or beamforming}

Definition statement

This place covers:

Beamforming at the receiver included here.

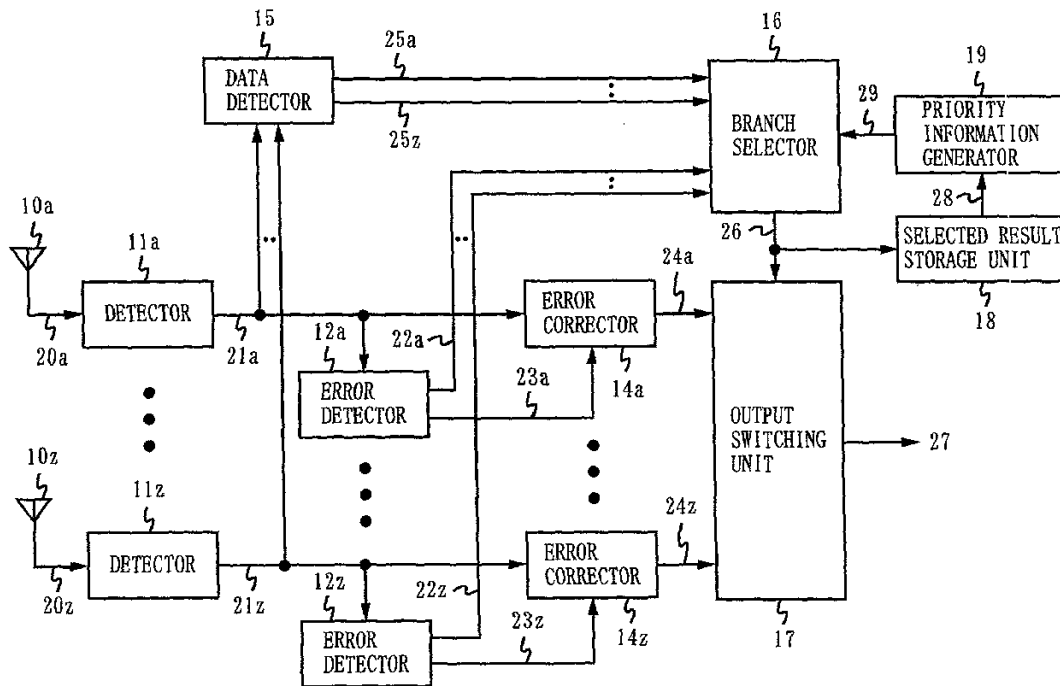
H04B 7/0882

{using post-detection diversity}

Definition statement

This place covers:

Example of documents classified here: see EP1257070 (figure 1):



H04B 7/0891

{Space-time diversity (rake receivers [H04B 1/7115](#); space-time decoding [H04L 1/0631](#))}

References

Limiting references

This place does not cover:

Rake receivers	H04B 1/7115
Space-time coding	H04L 1/0631

H04B 7/0897

{using beamforming per multi-path, e.g. to cope with different directions of arrival [DOA] at different multi-paths}

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Sdma	Space Division Multiple Access
------	--------------------------------

H04B 7/14

Relay systems

Definition statement

This place covers:

Radio relay systems are divided into passive relay systems ([H04B 7/145](#)) and active relay systems ([H04B 7/15](#)).

A passive relay is a relay on which a signal is only reflected.

Active relay systems are used by communication arrangements to receive, to process and to retransmit signals between devices separated by air or space.

Mobility is possible between the devices of the active relay system and the transmission can be unidirectional or bidirectional.

The processing within the relay is of a wide range. For instance the relay processing covers the following issues. The signals relayed can be a multiplex of a plurality of signals. The processing minimizes the interference between the signal received and retransmitted. Signal are regenerated, signals are switched in the relay before retransmission. Further processing details are indicated in the subgroups of [H04B 7/15](#).

Moreover, as indicated below, the active relay systems are further subdivided into ground based relay stations, airborne relay stations and space based relay station (satellites).

Relationships with other classification places

Broadcast communication	H04H
Multiplexing	H04J
Telephony	H04M
Wireless communication networks	H04W

References

Limiting references

This place does not cover:

Repeater in line transmission systems	H04B 3/36
Repeater in transmission systems employing waves other than radio waves	H04B 10/29 , H04B 10/291
Cosmonautic vehicle (e.g. satellite per se)	B64G 1/00

Limiting references

Geolocalisation	G01S 5/00
Interrogator-responder	G01S 13/00
Aircraft piloting	G05D 1/00
Traffic control for aircraft	G08G 5/00
Antenna orientation	H01Q 3/00
Details of amplifier gain control	H03G 3/00
Details of error protection techniques processed in relay station	H04L 1/00
Details of modulation techniques processed in relay station	H04L 27/00
Metering arrangements	H04M 15/00
Network planning: Network coordinated processing with regard to cell extension	H04W 16/26
Details of wireless communication routing	H04W 40/00
Generic documents concerning resource allocation e.g. time, frequency and/or codes	H04W 72/04 , H04L 5/00 , H04J 13/00
Wireless communication terminal adapted for relaying to or from other wireless communication terminal	H04W 88/04

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Aerial array	H01Q 21/00
Catv (Community Antenna Television) systems	H04H 20/78
Broadcast receiver	H04H 40/00
Multiplexing	H04L 5/00
Synchronisation of receiver with transmitter	H04L 7/00
Television systems	H04N 7/00
Relay systems adapted for television	H04N 7/20
Selective content distribution	H04N 21/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Diversity systems	H04B 7/02
Scatter propagation systems	H04B 7/22
Broadcast systems	H04H 20/00
Secret and secure communications	H04L 9/00
Data switching networks	H04L 12/00
Protocols in data network	H04L 29/06
Synchronization in wireless networks	H04W 56/00

H04B 7/145

Passive relay systems

Definition statement

This place covers:

A passive relay is a relay on which a signal is only reflected. No processing is done by such a relay. A passive relay is used to scatter a signal.

Radio waves, below a certain frequency, are reflected by the ionosphere. This allows propagation beyond the horizon.

Meteor burst communication or meteor scatter communication uses the ionized trail of a meteor for radio wave reflection.

Two antennas linked by a waveguide assure radio relaying. This is used for example to allow reception in a tunnel.

Reflection can be achieved by the use of a passive airborne platform.

To enable radio wave transmission in buildings, passive antennas, material transparent to radio waves ... are used.

References

Limiting references

This place does not cover:

Construction of passive reflectors	G01S 13/75
------------------------------------	----------------------------

H04B 7/155

Ground-based stations ([H04B 7/204](#) takes precedence)

Definition statement

This place covers:

Relays are used for range extension, to cover shadowed regions, to allow communication with the inside of a building, to transmit signals over long distances.

Microwaves relays working from 2 to 5 GHz with fixed stations in line of sight allow point to point high data rate transmission for telephony or broadcasting signals.

Shortwave relay are used for broadcasting.

Relays are used in a wireless network for radio cell extension.

Cooperative relays are used for signals diversity.

References

Limiting references

This place does not cover:

Multiple access	H04B 7/204
-----------------	----------------------------

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ground-based stations for satellite systems	H04B 7/18517
---	------------------------------

Special rules of classification

[H04B 7/204](#) takes precedence

H04B 7/15507

{Relay station based processing for cell extension or control of coverage area, (network planning with network coordinated processing with regard to cell extension [H04W 16/26](#); network topologies using dedicated repeater stations [H04W 84/047](#); terminal devices adapted for relaying to or from an other terminal [H04W 88/04](#))}

References**Limiting references**

This place does not cover:

Network topologies using dedicated repeater stations	H04W 84/047
--	-----------------------------

H04B 7/15514

{for shadowing compensation (for satellite mobile telephony service systems [H04B 7/18536](#))}

References**Limiting references**

This place does not cover:

Shadowing compensation for satellite mobile telephony service systems	H04B 7/18536
---	------------------------------

H04B 7/15521

{combining by calculations packets received from different stations before transmitting the combined packets as part of network coding (network coding aspects for detection or prevention of errors in the information received [H04L 1/0076](#); network traffic management with optimizing of information sizing, e.g. header compression, by using assembly and disassembly of packets [H04W 28/065](#))}

References**Limiting references**

This place does not cover:

Network coding aspects for detection or prevention of errors in the information received	H04L 1/0076
--	-----------------------------

Network traffic management with optimizing information sizing e.g. header compression, by using assembly and disassembly of packets	H04W 28/065
---	-----------------------------

H04B 7/15535

{Control of relay amplifier gain (amplifier gain control in general [H03G 3/00](#); gain control reducing self - or loop interference [H04B 7/15578](#))}

References

Limiting references

This place does not cover:

Gain control to reduce self- or loop interference	H04B 7/15578
Amplifier gain control in general,	H03G 3/00

H04B 7/15542

{Selecting at relay station its transmit and receive resources (selection of wireless resources by user or terminal [H04W 72/02](#); arrangements affording multiple use of the transmission path by two-dimensional division of the resources [H04L 5/0003](#), or by allocating sub-channels [H04L 5/003](#))}

References

Limiting references

This place does not cover:

Arrangements affording multiple use of the transmission path by two dimensional division of the resources or by allocating subchannels	H04L 5/0003 , H04L 5/003
Selection of wireless resources by user or user terminal	H04W 72/02

H04B 7/15592

{Adapting at the relay station communication parameters for supporting cooperative relaying, i.e. transmission of the same data via direct - and relayed path (cooperative diversity [H04B 7/024](#))}

References

Limiting references

This place does not cover:

cooperative diversity	H04B 7/026
-----------------------	----------------------------

H04B 7/165

employing angle modulation

Special rules of classification

Group for consultation only. Documents are classified in [H04B 7/15564](#) .

H04B 7/17

employing pulse modulation, e.g. pulse code modulation

Special rules of classification

Group for consultation only. Documents are classified in [H04B 7/15564](#) .

H04B 7/185

Space-based or airborne stations; {Stations for satellite systems} ([H04B 7/204](#) takes precedence)

Special rules of classification

[H04B 7/204](#) takes precedence.

H04B 7/18504

{Aircraft used as relay or high altitude atmospheric platform}

Definition statement

This place covers:

The stations are navigating in the stratosphere (below 50 km).

The airborne station is an unmanned airborne device or an aircraft covering a region (for example in case of an emergency situation when communications are disrupted during a catastrophically event). The relay is a lighter than air device, a balloon, a dirigible, a device called HALE (High Altitude Low Expenditure), HAAP (High Altitude Atmospheric Platform), SHARP (Stationary High Altitude Relay Platform) or an unmanned aerial vehicle (UAV).

The airborne station works alone or is part of a network of other stations. The communications can then be handed over to another platform. A satellite can be part of the network. The technical characteristics of these devices, their trajectory are adapted for communication. The relays are drifting in the sky or they are stabilized in position and altitude.

H04B 7/18506

{Communications with or from aircraft, i.e. aeronautical mobile service}

Definition statement

This place covers:

Communications with or from an aircraft without relaying through a satellite.

The system are communication systems for commercial aircrafts and used for transmission between the passengers and the ground for voice or data communication. The systems are as well for communications between the cockpit and earth control stations for air traffic control, for aircraft short messages service ...

Such systems are as well used for transport devices like a bus or ship.

The communications are multiplexed on the up and down link and must be demultiplexed. Antenna aspects in such systems.

A network of ground stations is necessary to follow the aircraft. A call is handed over between ground stations.

Definition statement

A network can be established between aircrafts. Other aircrafts must be localized.

The aircraft flies over regions with different ground systems and regulations

A communication network exists on board allowing on board broadcasting to the passengers or communications between users and the crew. Data transmission for in-flight entertainment, for use of Internet.

The aircraft can be equipped with terminals or the user can use his own voice or data terminal. Security. The use of a terminal is potentially dangerous because of its radiations.

A user on board of an aircraft must be localized by the ground system to establish the link and for billing.

Communication equipment and specific aircraft devices like navigation apparatuses are integrated on board. Relaying toward earth of aircraft sensor values.

H04B 7/18508

{with satellite system used as relay, i.e. aeronautical mobile satellite service}

Definition statement

This place covers:

Communications with or from an aircraft with relaying through a satellite for commercial aircrafts and for communications between the cockpit and earth control. Systems for aircrafts and for devices like a bus or ship.

The communication aspects covered are identical as for [H04B 7/18506](#) but at least one satellite is involved in the aircraft-ground link.

Use of geostationary satellites or not. Localisation of the satellites by the aircraft.

Handover between satellites.

The antennas of the aircraft are oriented towards the satellite.

The transmission delay is increased with use of a satellite.

Particular application: video broadcasting.

H04B 7/1851

{Systems using a satellite or space-based relay ([H04B 7/18508](#), [H04B 7/18521](#) take precedence; providing specific services [H04B 7/18523](#) - [H04B 7/18576](#))}

Definition statement

This place covers:

Satellites are used for relaying communications.

Satellite systems for varied applications exist. Communication aspects for such systems. Satellite applications can be: earth observation, weather forecast data transmission, emergency calls, fleet tracking, space based radar, aircraft guidance and navigation, navigation systems using satellites, land observing satellites.

Special rules of classification

[H04B 7/18508](#), [H04B 7/18521](#) take precedence.

For providing specific services [H04B 7/18523](#) - [H04B 7/18576](#)

H04B 7/18513

{Transmission in a satellite or space-based system}

Definition statement

This place covers:

All aspects relating to communications in uplink and downlink in a satellite system such as:

- Feeder link and user link.
- Frequency allocation. Frequency sharing and reuse. Frequency hopping.
- Modulation. Polarisation. Power control. Interleaving.
- Channel modelling. Diversity reception. Use of a plurality of satellites, a plurality of beams. Rake receivers.
- Link margin. Interference reduction. Doppler Effect. Effective Isotropic Radiated Power (EIRP). Rain effect. Fading: Rician, Rayleigh fading. Signal shadowing.

H04B 7/18515

{Transmission equipment in satellites or space-based relays}

Definition statement

This place covers:

Equipment on board of the satellite. Telecommunication payload, bus and platform equipments.

All equipment on-board involved in transmission such as: transponder, amplifier, multiplexer, demultiplexer, on-board digital processors, antennas.

H04B 7/18517

{Transmission equipment in earth stations}

Definition statement

This place covers:

All equipments used in earth-based stations.

These stations can be: a hub station, a control station, a gateway, a user terminal, a Small Aperture Terminal.

H04B 7/18519

{Operations control, administration or maintenance}

Definition statement

This place covers:

Spare satellite. Replacement satellite. Backup satellite. Reconfiguration of a satellite.

Measuring performance of a system. Calibration of a system. Reception quality. Fault diagnostic.

Monitoring, control, telemetry.

Satellite attitude and orbital control to optimize communication performance.

System simulation.

H04B 7/18521

{Systems of inter linked satellites, i.e. inter satellite service (for optical links between satellites [H04B 10/118](#))}

Definition statement

This place covers:

The link between satellites can be radio or optical.

Constellation of satellites with inter-satellite links to route a communication through the network of satellites.

References

Limiting references

This place does not cover:

Optical links between satellites	H04B 10/118
----------------------------------	-----------------------------

H04B 7/18523

{Satellite systems for providing broadcast service to terrestrial stations, i.e. broadcast satellite service (arrangements specially adapted for satellite broadcast receiving [H04H 40/90](#); picture transmission via satellite [H04N 1/00103](#); television transmission via satellite [H04N 7/20](#))}

Definition statement

This place covers:

Simulcast (simultaneous broadcasting). Multicasting (transmission to a group of users). Geocast (transmission to geographic areas).

Feedback from the user (thru satellite or thru terrestrial network) for interactive system.

On-board transponders.

Relationships with other classification places

Arrangements specially adapted for satellite broadcast	H04H 40/90
Receiving picture transmission via satellite	H04N 1/00103
Television transmission via satellite	H04N 7/20

Special rules of classification

This group is not used if the satellite is transparent to the broadcast service.

H04B 7/18526

{Arrangements for data linking, networking or transporting, or for controlling an end to end session (data switching networks [H04L 12/00](#))}

References

Limiting references

This place does not cover:

Data switching networks	H04L 12/00
-------------------------	----------------------------

H04B 7/18528

{Satellite systems for providing two-way communications service to a network of fixed stations, i.e. fixed satellite service or very small aperture terminal [VSAT] system}

Definition statement

This place covers:

Mainly for Very Small Aperture Terminal (VSAT) system.

Fixed satellite service. for telephony, telecommunication and data communication.

The satellites used are geostationary, geosynchronous.

H04B 7/18532

{Arrangements for managing transmission, i.e. for transporting data or a signalling message}

Definition statement

This place covers:

Transport of data or signalling messages. Transport of voice channels.

Traffic channels, dedicated control channels, broadcast channels, paging channels, beacon signal, pilot channels, synchronisation channels.

Spot beams antennas for creation of communication cells.

H04B 7/18534

{for enhancing link reliability, e.g. satellites diversity}

Definition statement

This place covers:

In particular for diversity used to increase link quality.

Resources seamlessly added or subtracted.

Transmission with multidirectional antennas from the base station to achieve diversity.

H04B 7/18536

{Shadowing compensation therefor, e.g. by using an additional terrestrial relay}

Definition statement

This place covers:

Shadowing due to blockage of signals. Use of an additional terrestrial relay or other techniques.

H04B 7/18539

{Arrangements for managing radio, resources, i.e. for establishing or releasing a connection}

Definition statement

This place covers:

Allocation of radio resources for establishing or releasing a connection.

Resource allocation for load balancing.

Determination and dissemination of information through the network of gateway for resource planning.

Frequency planning.

Frequency attributed according to need, to a reuse pattern, to limit interference.

Power control in real and non real time.

Time slot allocation.

Channel allocation: fixed, borrowed, dynamic.

H04B 7/18541

{for handover of resources}

Definition statement

This place covers:

A communication is handed over from one satellite to another according to the satellites rotations.

Handoff beam to beam, satellite to satellite, frequency to frequency.

Network controlled handover, mobile controlled handover, mobile assisted handover.

H04B 7/18543

{for adaptation of transmission parameters, e.g. power control (for detecting or preventing errors in the information received [H04L 1/00](#))}

References**Limiting references**

This place does not cover:

Detecting or preventing errors in the information received	H04L 1/00
--	---------------------------

H04B 7/18545

{Arrangements for managing station mobility, i.e. for station registration or localisation}

Definition statement

This place covers:

Terminal registration process. Local or global registration.

Location update of terminal.

Registration in a local and global database with user identification and position.

Re-registration. Periodic registration of a mobile, registration after loss of a signal (outage), terminal unavailability.

H04B 7/18547

{for geolocation of a station (position fixing by direction or distance determination [G01S 5/00](#))}

Definition statement

This place covers:

Geolocation of a user for radio localisation, call barring, call billing, synchronisation.

References**Limiting references**

This place does not cover:

Position fixing by direction or distance determination	G01S 5/00
--	---------------------------

H04B 7/1855

{using a telephonic control signal, e.g. propagation delay variation, Doppler frequency variation, power variation, beam identification}

Definition statement

This place covers:

Measure of propagation delay variation, Doppler frequency variation, power variation, beam identification.

Measure of time delay satellite-user.

H04B 7/18552

{using a telephonic control signal and a second ranging satellite (determining absolute distances from a plurality of spaced points of known location [G01S 5/14](#))}

References***Limiting references***

This place does not cover:

Determining absolute distances from a plurality of spaced points of known location	G01S 5/14
--	---------------------------

H04B 7/1856

{for call routing}

Definition statement

This place covers:

Routing through terrestrial network with only node-satellite-terminal links.

Mobile to mobile call.

Mobile to fixed, fixed to mobile call.

Routing tables used are changed according to network topology (link usage, congestion, failure, shutdown).

Optimization of transmission path (minimum hop route, packet delay).

Satellite in relation with more than one node for control.

H04B 7/18563

{Arrangements for interconnecting multiple systems (data switching networks [H04L 12/00](#))}

Definition statement

This place covers:

Use of a terrestrial and a satellite system (dual mode).

Protocol conversion between different satellites, terrestrial systems.

Use of a terminal adapted for the two systems. Characteristics differ: antenna used (orientation), power transmitted (higher for a satellite system, user head protection).

H04B 7/18565

{Arrangements for preventing unauthorised access or for providing user protection (arrangements for secret or secure communication [H04L 9/00](#))}

References

Limiting references

This place does not cover:

Arrangements for secret or secure communication	H04L 9/00
---	---------------------------

H04B 7/18576

{Satellite systems for providing narrowband data service to fixed or mobile stations, e.g. using a minisatellite, a microsatellite (for selecting [H04W](#))}

Definition statement

This place covers:

Use of a minisatellite, a microsatellite. Miniaturized satellites. Milli, micro, nano, picosatellites.

Little LEO. Smaller low cost satellites on a low earth orbit.

Satellite formation flying, trailing formation, cluster formation.

Fractionated spacecraft.

Systems for data, asset or vehicle tracking, messaging, emergency, alert services, disaster, medicine, education, data acquisition, meter reading, e-mail, fax, store and forward messaging.

Terminals adapted to system function.

H04B 7/18578

{Satellite systems for providing broadband data service to individual earth stations (for selecting [H04W](#); provisions for broadband connection, [H04Q 11/0478](#))}

Definition statement

This place covers:

Data communication for users which can be mobile using a satellite as relay between the user and a control station. The data transported are of large band.

References

Limiting references

This place does not cover:

Provisions for broadband connection	H04Q 11/0478
-------------------------------------	------------------------------

H04B 7/1858

{Arrangements for data transmission on the physical system, i.e. for data bit transmission between network components}

Definition statement

This place covers:

Description of the transmission equipments of the system. Satellite, terminal and control station. Description of the transport of the information. Modulation, demodulation, antenna, radio link between earth and satellite, bit synchronisation.

H04B 7/18582

{Arrangements for data linking, i.e. for data framing, for error recovery, for multiple access}

Definition statement

This place covers:

Construction of the frame, preamble, multiplexing, demultiplexing, TDMA, CDMA, FDMA, frequency hopping, frame synchronisation, error control (ARQ, FEC), data packet queuing or scheduling.

H04B 7/18586

{Arrangements for data transporting, e.g. for an end to end data transport or check}

Definition statement

This place covers:

Segmentation and reassembly.

Connection oriented, connectionless communication. Establishment of the physical links.

Transport of bits, bytes, packets.

Multiplexing, demultiplexing on a single link.

Congestion control. Flow control.

Fiability of the transport.

Error detection and recovery (forward error correction, repetition, automatic repetition).

H04B 7/18593

{Arrangements for preventing unauthorised access or for providing user protection (arrangements for secret or secure communication [H04L 9/00](#))}

Definition statement

This place covers:

Encryption. Decryption. Use of SIM card. Adaptor card or conditional access. Scrambling, descrambling. Billing.

References

Limiting references

This place does not cover:

Arrangements for secret or secure communication	H04L 9/00
---	---------------------------

H04B 7/19

Earth-synchronous stations

Definition statement

This place covers:

The satellite is on a geostationary, an equatorial, a geosynchronous orbit or semi-synchronous orbit.

Description of the constellation of satellites, of the orbital parameters.

H04B 7/195

Non-synchronous stations

Definition statement

This place covers:

The orbits are low earth orbit (LEO), medium earth orbit (MEO) or high earth orbit (HEO) according to the altitude of the satellite. Mixed constellation.

Inclined orbit, polar orbit, sun synchronous orbit, circular orbit, elliptical orbit, Molnia, Tundra.

H04B 7/204

Multiple access

Definition statement

This place covers:

On board of a satellite.

Special rules of classification

Group for consultation only. Documents are classified in [H04B 7/18515](#).

H04B 7/2041

{Spot beam multiple access}

Definition statement

This place covers:

On board of a satellite.

Antennas. Multi-beams antenna. Beam forming network. Phased array antenna. Multispots antenna.

Scanning beams. Grid of multiple fixed beams. Beam rotation for satellite roaming compensation. Beam hopping. Beams alternatively transmitting, receiving. Panels. Grids of complex shape (hexagonal).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Satellite on board equipment.	H04B 7/18515
-------------------------------	------------------------------

H04B 7/2043

{Mixed mode, TDM and FDM systems}

Definition statement

This place covers:

On board of a satellite.

Special rules of classification

Group for consultation only. Documents are classified in [H04B 7/18515](#).

H04B 7/2045

{SS-FDMA, FDMA satellite switching}

Definition statement

This place covers:

On board of a satellite.

Special rules of classification

Group for consultation only. Documents are classified in [H04B 7/18515](#).

H04B 7/2046

{SS-TDMA, TDMA satellite switching}

Definition statement

This place covers:

On board of a satellite.

Special rules of classification

Group for consultation only. Documents are classified in [H04B 7/18515](#).

H04B 7/2048

{Frame structure, synchronisation or frame acquisition in SS-TDMA systems}

Definition statement

This place covers:

On board of a satellite.

Special rules of classification

Group for consultation only. Documents are classified in [H04B 7/18515](#).

H04B 7/208

Frequency-division multiple access {[FDMA]}

Definition statement

This place covers:

On board of a satellite.

Special rules of classification

Group for consultation only. Documents are classified in [H04B 7/18515](#).

H04B 7/212

Time-division multiple access {[TDMA]}

Definition statement

This place covers:

On board of a satellite.

Special rules of classification

Group for consultation only. Documents are classified in [H04B 7/18515](#).

H04B 7/2121

{Channels assignment to the different stations}

Definition statement

This place covers:

On board of a satellite.

Special rules of classification

Group for consultation only. Documents are classified in [H04B 7/18515](#).

H04B 7/2123

{Variable assignment, e.g. demand assignment}

Definition statement

This place covers:

On board of a satellite.

Special rules of classification

Group for consultation only. Documents are classified in [H04B 7/18515](#).

H04B 7/2125**{Synchronisation}****Definition statement***This place covers:*

On board of a satellite.

H04B 7/2126**{using a reference station}****Definition statement***This place covers:*

On board of a satellite.

Special rules of classificationGroup for consultation only. Documents are classified in [H04B 7/18515](#).**H04B 7/2128****{Changing of the reference station}****Definition statement***This place covers:*

On board of a satellite.

Special rules of classificationGroup for consultation only. Documents are classified in [H04B 7/18515](#).**H04B 7/216****Code division or spread-spectrum multiple access {[CDMA, SSMA]}****Definition statement***This place covers:*

On board of a satellite.

References**Informative references***Attention is drawn to the following places, which may be of interest for search:*

Spread spectrum techniques in general	H04B 1/69
---------------------------------------	---------------------------

Special rules of classificationGroup for consultation only. Documents are classified in [H04B 7/18515](#).

H04B 7/22

Scatter propagation systems {, e.g. ionospheric, tropospheric or meteor scatter}

Definition statement

This place covers:

Use of ionosphere, troposphere reflexion or meteor scatter.

In such systems, the radio propagation is not a line of sight propagation between two devices. The signals are reflected, refracted or scattered by natural components of the earth atmosphere. A network using such reflexions and the radio link between the divers network components are described.

Passive relay are described in [H04B 7/145](#).

Radio waves are refracted by the ionized layers of the upper atmosphere. These layers are influenced by the sun. Such communications are used for amateur radio, marine and aircraft communications, shortwave broadcast.

Tropospheric scatter is a method of communication in which signals at particular frequencies are randomly scattered by the upper layers of the troposphere allowing the transmission of signals on a distance of hundred of kilometres. Only a small amount of the transmitted power is received. A narrow frequency band is generally used.

A meteor burst communication system uses the ionized meteor trails as radio reflector between two stations. These trails exit at an altitude of approximately 100 km and allow a long range, low data rate intermittent communication of a few seconds on a distance of 2000 km.

Auroral ionization, rain, lightning can create scattering.

References

Limiting references

This place does not cover:

Relay systems	H04B 7/14
Wireless communication networks	H04W

Informative references

Attention is drawn to the following places, which may be of interest for search:

Passive relay systems	H04B 7/145
-----------------------	----------------------------

H04B 7/24

for communication between two or more posts (wireless communication networks [H04W](#))

Definition statement

This place covers:

In a communication network, the physical link and the signals transmitted between the divers network components are described. The link can be wired or wireless, the network components are fixed in this head group, mobile in the different sub-groups.

Transmission medium: twisted pairs, copper wires, coaxial cable, air ...

Definition statement

Nature of information transmitted: voice, video, data ...

Description of the signal to be transmitted: analogue, digital transmission, analogue/digital conversion, voice codec.

Coding of the signal, PCM, line codes (NRZ, unipolar, bipolar, Manchester encoding...).

Modulation used (QPSK, PSK, QAM, FSK, PSK, ASK). Amplitude, phase, frequency modulation.

Transmission and reception of the signal. Demodulation. Decoding.

Error recovery and correction. Error correction codes (linear, cyclic, BCH, convolutional codes). Channel codes. Signal repetition (ARQ).

Description of the network: star, mesh, ring network.

References

Limiting references

This place does not cover:

Relay systems	H04B 7/14
Wireless systems	H04W

Informative references

Attention is drawn to the following places, which may be of interest for search:

Spread spectrum communications	H04B 1/69
Equalisation	H04B 7/005
Diversity system	H04B 7/02
Scatter propagation system	H04B 7/22
Broadcast systems	H04H 20/00
Time Division Multiplex communication	H04J 3/00
Error protection	H04L 1/00
Multiplexing	H04L 5/00
Synchronisation	H04L 7/00
Secret and secure communications	H04L 9/00
Data switching networks	H04L 12/00
Modulation	H04L 27/00
Protocol in data network	H04L 29/06
Synchronization in wireless networks	H04W 56/00

H04B 7/26

at least one of which is mobile

Definition statement

This place covers:

In a wireless communication network, the radio link, called air interface, between the divers network components is described.

Different mobile systems exist. For example: cordless telephony is a short range system.

The mobile telephony has evolved toward cellular telecommunication systems for voice, narrowband or broadband data transmission.

Relationships with other classification places

The physical channel, channel access procedures and multiple access are the lower levels of the transmission system linking users and are the object of these groups. The higher levels control the flow of messages between the network components and allow the building up of a communication and are the subject of [H04W](#) in general.

H04B 7/2603

{Arrangements for wireless physical layer control ([H04B 7/2612](#) takes precedence)}

Definition statement

This place covers:

The signals transmitted on the air interface and the apparatuses therefore are described.

The frequency band or time interval allocated is separated in physical wireless channels.

Definition of the physical and logical channels, mapping of the logical channels on the physical channels. Logical channels for traffic of voice or data. Logical channels for control: dedicated control channels, broadcast channels, paging channels, access grant logical channels, random access channels, pilot channels, synchronisation channels ... Frequencies, time slots used, number of bits, format, overhead bits, preamble, guard periods ...

Emission: digitization, source coding, interleaving, ciphering, burst formatting, modulation. BPSK, QAM, hierarchical modulation.

Transmission: path loss, multipath fading, noise, interference, error and error correction (equalisation, error correction codes, interleaving ...).

Reception: source decoding, channel decoding, desinterleaving, deciphering, burst formatting, demodulation.

Special rules of classification

[H04B 7/2612](#) takes precedence.

H04B 7/2606

{Arrangements for base station coverage control, e.g. by using relays in tunnels}

Definition statement

This place covers:

Relays are used for linking a user equipment with a base station.

Relays for lightening dark zones. Use of relays in tunnels, in buildings, in closed environments.

Roadway communication systems.

Fixed relay, mobile relay.

Relays for cell extension.

Multiplicity of relays.

Relay selection.

Cooperative relays.

Multihop communication.

Use of multiple antennas. Antenna characteristics, antenna patterns, spacing of antennas.

Relay functionality and design. Half-duplex, full duplex repeater. TDD (Time Division Duplex), frequency change, frequency selective repeaters, amplify and forward, decode and forward repeaters. Loop-back interference cancellation. Signal delay. Link with the base station, link with a user equipment. Protocols implemented in the relay.

H04B 7/2612

{Arrangements for wireless medium access control, e.g. by allocating physical layer transmission capacity ([H04B 7/2615](#) - [H04B 7/2643](#) take precedence; provision for broadband connection [H04Q 11/0478](#))}

Definition statement

This place covers:

Allocation of a physical layer transmission capacity.

Transport channels for carrying the logical channels.

Channel access control mechanisms.

Error recovery, ARQ (Automatic Repeat Request).

Multiplexing/demultiplexing techniques such as: random access protocols (ALOHA, CSMA; CSMA/CD), fixed assignment protocols (TDMA, FDMA, CDMA, SDMA), demand assignment protocols (polling, reservation protocols (centralized), token passing protocols (decentralized)).

References

Limiting references

This place does not cover:

Provision for broadband connection	H04Q 11/0478
------------------------------------	------------------------------

Special rules of classification

[H04B 7/2615](#) - [H04B 7/2643](#) take precedence.

H04B 7/2621

{using frequency division multiple access [FDMA] ([H04B 7/2615](#) takes precedence)}

Definition statement

This place covers:

OFDM (Orthogonal Frequency Multiplexing).

FDD (Frequency Division Duplex).

Special rules of classification

[H04B 7/2615](#) takes precedence.

H04B 7/2625

{using common wave}

Definition statement

This place covers:

Using a common frequency.

Single frequency network.

A network of stations broadcasting on a single frequency for example.

For DVB-T (Digital Video Broadcasting Terrestrial), DVB-H (handheld), DVB-SH (satellite handheld), DTMB (Digital Terrestrial Media Broadcasting) , DAB (Digital Audio Broadcasting), mediaflo (forward link only).

Repeaters synchronized, adaptive equalization.

Use of OFDM (Orthogonal Frequency Division Modulation), COFDM (Coded Orthogonal Frequency Division Modulation; FEC convolutional coding, time and frequency interleaving).

H04B 7/2628

{using code-division multiple access [CDMA] or spread spectrum multiple access [SSMA] ([H04B 7/2618](#) takes precedence)}

Definition statement

This place covers:

Divers types of spread spectrum systems:

Definition statement

- Direct-sequence spread spectrum.
- Frequency-hopping spread spectrum.
- Time-hopping spread spectrum.
- Chirp spread-spectrum.
- Ultra wide band.

Codes used:

- Pseudo-random noise code.
- Orthogonal codes, Walsh-Hadamard codes.
- Non Orthogonal codes, shift-register sequences, M-sequences, Gold codes, Kasami codes.

Transceiver:

- Auto-correlation, cross correlation, long codes, short codes.
- Synchronous, asynchronous systems.
- Near far problem, power control.
- Code synchronization, acquisition and tracking.
- Correlator, delay lock loop, thau dither loop, extended Kalman filter.

Special rules of classification

[H04B 7/2618](#) takes precedence.

H04B 7/2631

{for broadband transmission}

Definition statement

This place covers:

Transmission of information on a plurality of parallel channels.

Protocols such as WCDMA (Wideband CDMA), HSPA (High Speed Packet Access).

H04B 7/2643

{using time-division multiple access [TDMA] ([H04B 7/2615](#), [H04B 7/2618](#) take precedence)}

Definition statement

This place covers:

TDD (Time Division Duplex).

Superframes, frames, time slots.

Formats used for the frames and the time slots. Description of the burst, the information in the time slot.

Guard bands to avoid overlapping of the signals.

Preamble, training, equalisation, synchronisation, start/stop bits.

Uplink, downlink frame.

Special rules of classification

[H04B 7/2615](#), [H04B 7/2618](#) take precedence.

H04B 7/2662**{Arrangements for Wireless System Synchronisation}****Special rules of classification**Group used for consultation only. Documents are classified in [H04W 56/00](#).**H04B 7/2665****{Arrangements for Wireless Frequency Division Multiple Access [FDMA] System Synchronisation}****Special rules of classification**Group used for consultation only. Documents are classified in [H04W 56/00](#).**H04B 7/2668****{Arrangements for Wireless Code-Division Multiple Access [CDMA] System Synchronisation, (for code acquisition [H04B 1/7075](#), for code tracking [H04B 1/7085](#))}****References****Limiting references***This place does not cover:*

Cdma code acquisition	H04B 1/7075
Cdma code tracking	H04B 1/7085

Special rules of classificationGroup used for consultation only. Documents are classified in [H04W 56/00](#).**H04B 7/2671****{Arrangements for Wireless Time-Division Multiple Access [TDMA] System Synchronisation}****Special rules of classification**Group used for consultation only. Documents are classified in [H04W 56/00](#).**H04B 7/2675****{Frequency synchronisation}****Special rules of classification**Group used for consultation only. Documents are classified in [H04W 56/00](#).

H04B 7/2678**{Time synchronisation}****Special rules of classification**Group used for consultation only. Documents are classified in [H04W 56/00](#).**H04B 7/2681****{Synchronisation of a mobile station with one base station}****Special rules of classification**Group used for consultation only. Documents are classified in [H04W 56/00](#).**H04B 7/2684****{Synchronisation of a mobile station with more than one base station}****Special rules of classification**Group used for consultation only. Documents are classified in [H04W 56/00](#).**H04B 7/2687****{Inter base stations synchronisation}****Special rules of classification**Group used for consultation only. Documents are classified in [H04W 56/00](#).**H04B 7/269****{Master/slave synchronisation}****Special rules of classification**Group used for consultation only. Documents are classified in [H04W 56/00](#).**H04B 7/2693****{Centralised synchronisation, i.e. using external universal time reference, e.g. by using a global positioning system [GPS] or by distributing time reference over the wireline network}****Special rules of classification**Group used for consultation only. Documents are classified in [H04W 56/00](#).**H04B 7/2696****{Over the air autonomous synchronisation, e.g. by monitoring network activity ([H04B 7/2693](#) takes precedence)}****Special rules of classification**Group used for consultation only. Documents are classified in [H04W 56/00](#).

H04B 10/00

Transmission systems employing electromagnetic waves other than radio-waves, e.g. infrared, visible or ultraviolet light, or employing corpuscular radiation, e.g. quantum communication

Definition statement

This place covers:

- electromagnetic waves in the optical spectrum, e.g. visible, infrared, ultraviolet
- optical corpuscular radiation, i.e. photons
- non-optical electromagnetic waves other than radio-waves, e.g. low-frequency Terahertz waves
- non-optical corpuscular radiation, i.e. beams of atomic or subatomic discrete particles

Relationships with other classification places

[H04B 10/00](#) deals with the physical layer of an optical communication system, i.e. dealing with the physical properties of the optical data signal, e.g., power, distortion, optical-electrical and electric-optical conversion of data.

[H04J 14/00](#) deals with the optical multiplexing layer, e.g. dealing with the optical signals as channels necessary for data transfer, e.g. routing, allocation, add-dropping, WDM networks, WDM protection.

Optical switching is covered by [H04Q 11/0001](#).

Light guide arrangements as components or modules per se are classified in [G02B 6/00](#), e.g. modules based on light guides for coupling, splitting, mixing, switching and dispersion compensation

Lasers and fibre amplifiers per se are classified in [H01S](#) and [H01S 3/067](#)

Optical devices per se for changing the optical properties of the signals based on a change in refractive index, e.g. modulators are classified in [G02F](#).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Measuring characteristics of optical pulses	G01J 11/00
Testing of optical devices, fibres, OTDR,	G01M 11/00
Optical elements, systems or apparatus	G02B
Optical coupling devices, e.g. optical fibres, dispersion compensators	G02B 6/00
Devices or arrangements, the optical operation of which is modified by changing the optical properties of the medium of the devices or arrangements for control of the intensity, color, phase, polarization or directing of light, e.g. switching, gating, modulating or demodulating; Frequency changing Non-linear optics; Optical analogue/digital converters	G02F
Optical devices that change the state (intensity, phase, polarisation) of light, e.g. modulators	G02F 1/00
Wavelength converters	G02F 2/004
Arrangements for handling particles or ionizing radiation e.g. focusing or moderating	G21K 1/00

Informative references

Semiconductor devices sensitive to infrared radiation, light, electromagnetic radiation of shorter wavelength or corpuscular radiation	H01L 31/00
Lasers, optical amplifiers using stimulated emission	H01S 3/00
Semiconductor lasers	H01S 5/00
Time-division multiplex systems , e.g.SDH, SONET, OTN-networks	H04J 3/00
Optical multiplex systems	H04J 14/00
Optical clock recovery	H04L 7/00
Quantum cryptography	H04L 9/00
Bus networks	H04L 12/40
Digital modulated systems	H04L 27/00
Optical switching	H04Q 11/00

Special rules of classification

If appropriate, multiple classes for different technical features in the same document should be assigned

Optical - Non-optical transmission systems

Non-optical transmission systems, falling within the scope of this group, are only classified in group [H04B 10/90](#).

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Station	head-end or subscriber network terminal
Soliton	an optical pulse that does not change during propagation because of a balance between non-linear and linear effects in the fibre
Air	the standard gaseous mixture of nitrogen and oxygen or this mixture with varying amounts of moisture and particulate matter, enveloping the earth; the atmosphere
Fluid	liquid
Corpuscular radiation	the beams of atomic or subatomic discrete particles, e.g. photon, alpha particle, neutron, fission fragment or fissionable isotope

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

SMF	Single Mode Fibre
MMF	Multi Mode Fibre
CD	Chromatic Dispersion
DPSK	Differential Phase Shift Keying
PSK	Phase Shift Keying
OTDR	Optical Time Domain Reflectometry
OSNR	Optical Signal to Noise Ratio
PMD	Polarization Mode Dispersion

RoF	Radio over Fibre
FWM	Four Wave Mixing
SPM	Self Phase Modulation
XPM	Cross Phase Modulation
ASK	Amplitude Shift Keying
FSK	Frequency Shift Keying
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature PSK

H04B 10/03

Arrangements for fault recovery

Definition statement

This place covers:

Subject matter wherein a corrective action is taken to return an inoperative or malfunctioning optical communication system or its component to a satisfactory operating condition.

References

Limiting references

This place does not cover:

Fault recovery specific to wavelength division multiplex [WDM] systems	H04J 14/02
Counter-measures to a fault in digital transmission systems	H04L 29/14

H04B 10/032

using working and protection systems {([H04J 14/0287](#) takes precedence)}

Definition statement

This place covers:

Subject matter wherein the recovery is provided by a predetermined protection path in parallel with the working path that provides protection when the working path has a failure.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Working and protection systems specific to wavelength division multiplex [WDM] systems	H04J 14/02
--	----------------------------

H04B 10/035

using loopbacks

Definition statement

This place covers:

Subject matter wherein data signals are detoured in a reverse path through the network to avoid the malfunctioning component.

H04B 10/038

using bypasses

Definition statement

This place covers:

Subject matter including a provision for alternate routing around the malfunctioning component.

H04B 10/07

Arrangements for monitoring or testing transmission systems; Arrangements for fault measurement of transmission systems

Definition statement

This place covers:

Subject matter including means for monitoring, measurement or testing for evaluating an operational condition of an optical communication system or its components.

H04B 10/071

using a reflected signal, e.g. using optical time-domain reflectometers [OTDRs]

Definition statement

This place covers:

Subject matter wherein at least one communication parameter is determined by information from a signal reflected from a location in the communication network.

H04B 10/073

using an out-of-service signal ([H04B 10/071](#) takes precedence)

Definition statement

This place covers:

Subject matter wherein the operational condition of an optical communication network or its component is tested or evaluated using an external stimulus signal while the system is not in operation.

References

Limiting references

This place does not cover:

Using a reflected signal, e.g. using optical time-domain reflectometers [OTDR]	H04B 10/071
--	-----------------------------

H04B 10/075

using an in-service signal ([H04B 10/071](#) takes precedence)

Definition statement

This place covers:

Subject matter wherein the operational condition of an optical communication network or its component is tested or evaluated signal while the system is in operation.

References

Limiting references

This place does not cover:

Using a reflected signal, e.g. using optical time-domain reflectometers [OTDR]	H04B 10/071
--	-----------------------------

H04B 10/077

using a supervisory or additional signal

Definition statement

This place covers:

Subject matter wherein at least one communication parameter is determined by information from a control signal provided in addition to the data signal. The additional signal can for example be modulated on the data signal or placed on a separate wavelength.

H04B 10/079

using measurements of the data signal

Definition statement

This place covers:

Subject matter wherein at least one communication parameter is determined by information derived from a measurement of the data signal, e.g. measurement of system performance parameters, e.g. OSNR, quality factor, dispersion value, power.

H04B 10/11

Arrangements specific to free-space transmission, i.e. transmission through air or vacuum

Definition statement

This place covers:

Subject matter wherein a signal-carrying optical beam is propagated such that the beam is transmitted through air or a vacuum and not spatially confined in any optical component or medium.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Light signal transmission through water	H04B 10/80
---	----------------------------

H04B 10/112

Line-of-sight transmission over an extended range

Definition statement

This place covers:

Subject matter wherein the optical beam is transmitted in a straight line to the receiver across longer distances outdoors, e.g. between buildings.

H04B 10/1129

{Arrangements for outdoor wireless networking of information}

Definition statement

This place covers:

Subject matter wherein one central station is communicating wirelessly with a plurality of terminal stations. Even if the document focuses on one such connection, but it is clear from the description and drawings it is for a network, the document should be classified here.

H04B 10/114

Indoor or close-range type systems

Definition statement

This place covers:

Subject matter wherein the optical beam is propagated between nearby apparatuses or elements within an indoor space, directly or via diffuse communication.

H04B 10/1141**{One-way transmission}****Definition statement**

This place covers:

Subject-matter wherein two devices are communicating only one-way, e.g. remote controllers.

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Transmission systems for measured values or control using light, e.g, remote controls per se	G08C 23/04
--	----------------------------

H04B 10/1149**{Arrangements for indoor wireless networking of information}****Definition statement**

This place covers:

Subject matter wherein one central station is communicating wirelessly with a plurality of terminal stations. Even if the document focuses on one such connection, but it is clear from the description and drawings it is for a network, the document should be classified here.

H04B 10/116**Visible light communication****Definition statement**

This place covers:

Subject matter wherein the signal-carrying optical beam includes or consists of light having a wavelength in the visible light spectrum, e.g. a modulated lighting device or a modulated overhead light.

H04B 10/118**specially adapted for satellite communication****Definition statement**

This place covers:

Subject matter wherein the optical beam is propagated to or from an Earth-orbiting object.

H04B 10/25**Arrangements specific to fibre transmission****Definition statement**

This place covers:

Subject matter including one or more transparent elongated structures (e.g., rods, fibers, or pipes) which are used to transmit light waves from one point to another within the confines of their outer surface by means of internal reflections or modal transmission.

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Optical waveguides per se	G02B 6/00
---------------------------	---------------------------

H04B 10/2507**for the reduction or elimination of distortion or dispersion****Definition statement**

This place covers:

Subject matter comprises means for correcting or reducing distortion induced by (1) scattering in a light beam as it travels along the fiber or (2) overlapping of a light signal on one wavelength onto different wavelengths because of reflected rays and different refractive indices of the optical fiber material.

H04B 10/2513**due to chromatic dispersion****Definition statement**

This place covers:

Subject matter comprising means for correcting or reducing distortion that is caused by the broadening of the signal as it travels the length of the fiber.

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Dispersion compensators per se	G02B 6/29394
--------------------------------	------------------------------

H04B 10/25133

{including a lumped electrical or optical dispersion compensator
([H04B 10/2519](#), [H04B 10/2525](#) takes precedence)}

References

Limiting references

This place does not cover:

Using Bragg gratings	H04B 10/2519
Using dispersion-compensating fibres	H04B 10/2525

Informative references

Attention is drawn to the following places, which may be of interest for search:

Optical dispersion compensators involving optical fibres per se	G02B 6/293
---	----------------------------

H04B 10/2519

using Bragg gratings

Definition statement

This place covers:

Subject matter comprising means for correcting or reducing distortion caused by chromatic dispersion using a fiber Bragg grating.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Bragg gratings per se	G02B 6/02076
Devices with fibre gratings for dispersion control per se	G02B 6/29316

H04B 10/2525

using dispersion-compensating fibres

Definition statement

This place covers:

Subject matter wherein a correction fibre of specified length and amount of dispersion is used to compensate for chromatic dispersion.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Dispersion-tailored and dispersion compensation fibres per se	G02B 6/02214
---	------------------------------

H04B 10/25253

{with dispersion management, i.e. using a combination of different kind of fibres in the transmission system}

Definition statement

This place covers:

Subject matter wherein over the whole fibre span a combination of different fibres are used to compensate for the dispersion of the span (does not cover a combination of fibres within a device)

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Devices with different kinds of fibres for dispersion compensation per se	G02B 6/29374
---	------------------------------

H04B 10/2531

using spectral inversion

Definition statement

This place covers:

Subject-matter wherein dispersion is compensated through mid-span spectrum inversion.

H04B 10/2537

due to scattering processes, e.g. Raman or Brillouin scattering

Definition statement

This place covers:

Subject matter comprising means for correcting or reducing distortion caused by the interaction of the signal with molecules in the fiber.

H04B 10/2543

due to fibre non-linearities, e.g. Kerr effect

Definition statement

This place covers:

Subject matter comprising means for correcting or reducing distortion caused by variations in the optical properties of the fiber, e.g. due to the Kerr effect.

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Devices based on non-linear optics	G02F 1/35
------------------------------------	---------------------------

H04B 10/255**Self-phase modulation [SPM]****Definition statement**

This place covers:

Subject matter comprising means for compensating for Self-phase modulation. SPM is caused by the Kerr effect which produces a variation in the refractive index of the fibre. This variation in refractive index will produce a phase shift in the pulse, leading to a change of the pulse's frequency spectrum.

H04B 10/2557**Cross-phase modulation [XPM]****Definition statement**

This place covers:

Subject matter comprising means for compensating for Cross-phase modulation. XPM is caused by the Kerr effect which produces a variation in the refractive index of the fibre. This leads to one wavelength of light potentially affecting the phase of another wavelength of light.

H04B 10/2563**Four-wave mixing [FWM]****Definition statement**

This place covers:

Subject matter comprising means for compensating for Four-wave mixing. FWM is an intermodulation phenomenon in optical systems; when three wavelengths interact in a nonlinear medium, they give rise to a fourth wavelength.

H04B 10/2569**due to polarisation mode dispersion [PMD]****Definition statement**

This place covers:

Subject matter which comprises means for correcting or reducing distortion caused by modal dispersion where two different polarizations of light in a waveguide, which normally travel at the same speed, travel at different speeds due to random imperfections and asymmetries, causing random spreading of optical pulses.

H04B 10/2575**Radio-over-fibre, e.g. radio frequency signal modulated onto an optical carrier****Definition statement**

This place covers:

RF-over-Fiber architecture, wherein a data-carrying RF (Radio Frequency) signal with a high frequency is imposed on a lightwave signal before being transported over the optical link. Wireless signals are optically distributed to base stations directly at high frequencies and converted from the optical to the electrical domain at the base stations before being amplified and radiated by an antenna.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Sub-carrier multiplexing	H04J 14/0298
--------------------------	------------------------------

H04B 10/25751

{Optical arrangements for CATV or video distribution (adaptations of television systems for optical transmission [H04N 7/22](#))}

Definition statement

This place covers:

RF-over-Fiber systems used specially for CATV or video distribution

References

Limiting references

This place does not cover:

adaptations of television systems for optical transmission	H04N 7/22
--	---------------------------

H04B 10/25753

{Distribution optical network, e.g. between a base station and a plurality of remote units}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

WDM networks in general	H04J 14/0278
-------------------------	------------------------------

H04B 10/2581

Multimode transmission

Definition statement

This place covers:

Subject matter comprising systems using more than one mode for transmission using multimode fibres.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Mode multiplex systems	H04J 14/04
------------------------	----------------------------

H04B 10/2587

using a single light source for multiple stations

Definition statement

This place covers:

Subject matter wherein the light source in a first station is used to transmit an optical data signal to at least a second station and the second station modulates the received light to transmit an optical data signal to the first station. The at least second station does not comprise a local light source.

H04B 10/27

Arrangements for networking

Definition statement

This place covers:

Subject matter wherein an optical communication system is comprised of a specific arrangement of interconnections.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Free-space networks	H04B 10/11
Specific to radio-over-fibre	H04B 10/25753
WDM networks	H04J 14/0278

H04B 10/272

Star-type networks {or tree-type networks}

Definition statement

This place covers:

Subject matter wherein an optical data distribution system contains a common node connected to one end of each of three or more branches and the other end of which is connected to each member of a local area network multiplex system to permit optical information flow between all of the members.

H04B 10/275

Ring-type networks

Definition statement

This place covers:

Subject matter wherein the local area network consists of a series of stations connected to each other and the last station is connected to the first station.

H04B 10/278

Bus-type networks

Definition statement

This place covers:

Subject matter wherein multiple optical stations are interconnected via a network of fiber optics in a bus configuration to enable transmission and reception between the stations.

H04B 10/29

Repeaters

Definition statement

This place covers:

Subject matter including apparatus for receiving a light wave signal and reradiating the signal at a same or different carrier frequency.

Note. The recreating or retransmitting signal is usually at a higher power level or in a desired direction.

Note. The information content of the transmitted signal is not changed with respect to that of the received signal.

H04B 10/291

in which processing or amplification is carried out without conversion of the main signal from optical form

Definition statement

This place covers:

Subject matter in which the optical data signal is regenerated without conversion into the electrical domain. Feedback or control signals may be converted from optical to electrical.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Fibre optical amplifiers per se	H01S 3/067
---------------------------------	----------------------------

H04B 10/2914

{using lumped semiconductor optical amplifiers [SOA]}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Semiconductor optical amplifiers per se	H01S 5/50
---	---------------------------

H04B 10/2916**{using Raman or Brillouin amplifiers}****References*****Informative references****Attention is drawn to the following places, which may be of interest for search:*

Raman or Brillouin amplifiers per se	H01S 3/302
--------------------------------------	----------------------------

H04B 10/293**Signal power control****Definition statement***This place covers:*

Subject matter in which the regeneration leads to a constant signal power level.

H04B 10/294**in a multiwavelength system, e.g. gain equalisation****Definition statement***This place covers:*

Subject matter wherein the power control takes place in a wavelength division multiplexing [WDM] system

References***Informative references****Attention is drawn to the following places, which may be of interest for search:*

Power control in WDM systems in general	H04J 14/0221
---	------------------------------

H04B 10/296**Transient power control, e.g. due to channel add/drop or rapid fluctuations in the input power****Definition statement***This place covers:*

Subject matter in which compensation is provided if the power of the signal changes rapidly due to changes in system parameters.

H04B 10/297

Bidirectional amplification

Definition statement

This place covers:

Subject matter in which the regeneration is provided using a single device that retransmits both upstream and downstream signals. The single device may contain different devices that interact with each other. A single fibre is used for upstream and downstream signals, the regeneration device can however comprise separate amplifiers for upstream and downstream signals.

H04B 10/299

Signal waveform processing, e.g. reshaping or retiming

Definition statement

This place covers:

Subject matter in which the shape and/or timing of the signal is processed prior to regeneration, e.g. 3R amplifiers.

H04B 10/40

Transceivers

Definition statement

This place covers:

Subject matter wherein an optical transmitter and a receiver are at a common location for transmission and reception of separate optical signals in such a manner that an optical signal is transmitted using some of the same equipment used for the reception of another optical signal. The optical transmitter and receiver are usually confined to a common housing in a transceiver and termed "a station".

Simultaneously operating transmitter and receiver elements that are completely separated physically are excluded from this subclass.

H04B 10/43

using a single component as both light source and receiver, e.g. using a photoemitter as a photoreceiver

Definition statement

This place covers:

Subject matter wherein a same diode element is used both to transmit or receive signals depending on how it is biased.

H04B 10/50

Transmitters

Definition statement

This place covers:

Subject matter including an opto-electric circuit for converting an information signal into a modulated optical signal suitable for propagation through or along a transmission medium. The opto-electric

Definition statement

circuit includes, for example, opto-electronic light sources such as LEDs, laser diode, incandescent bulbs, an optical modulator and other elements associated with fiber optic or infrared transmission system required to communicate an information signal from one location to another via an optical beam.

H04B 10/506**{Multiwavelength transmitters}****References*****Informative references***

Attention is drawn to the following places, which may be of interest for search:

WDM systems in general	H04J 14/02
------------------------	----------------------------

H04B 10/508**Pulse generation, e.g. generation of solitons****Definition statement**

This place covers:

Subject matter comprising details of a process in which the optical energy is transformed into pulses having a particular characteristic before information signal coding or modulation is applied to the optical energy.

H04B 10/516**Details of coding or modulation****Definition statement**

This place covers:

Subject matter comprising details of a process in which information signal is coded into beams of optical energy by use of a carrier wave.

H04B 10/524**Pulse modulation****Definition statement**

This place covers:

Subject matter in which modulation is produced by modulating a carrier light wave by a series of digital pulses and varying a non-amplitude attribute of the pulses (e.g., position, width) to represent information in the optical beam.

References***Informative references***

Attention is drawn to the following places, which may be of interest for search:

Intensity modulation	H04B 10/54
----------------------	----------------------------

H04B 10/532

Polarisation modulation

Definition statement

This place covers:

Subject matter in which the polarization of the carrier light wave is controlled to represent information

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Polarisation multiplexed systems	H04J 14/06
----------------------------------	----------------------------

H04B 10/54

Intensity modulation

Definition statement

This place covers:

Subject matter in which modulation is produced by varying the amplitude of a carrier light wave as a function of the information signal.

H04B 10/548

Phase or frequency modulation

Definition statement

This place covers:

Subject matter in which angle modulation is produced by proportionally varying the instantaneous phase angle of a sine wave carrier with the instantaneous value of an amplitude of a modulating signal, or by causing the instantaneous frequency of a sine wave carrier to depart from a carrier frequency an amount that is proportional to the instantaneous value of a modulating signal.

H04B 10/556

Digital modulation, e.g. differential phase shift keying [DPSK] or frequency shift keying [FSK]

Definition statement

This place covers:

Subject matter in which the modulation is produced by creating discrete variations of the phase or frequency of the optical signal.

H04B 10/564

Power control

Definition statement

This place covers:

Subject matter comprising details of regulating the energy level output from the transmitting laser or light emitter.

H04B 10/572

Wavelength control

Definition statement

This place covers:

Subject matter comprising details of regulating the wavelength output from the transmitting laser or light emitter. Regulating the wavelength output may include wavelength tuning or wavelength stabilization.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Controlling the intensity, frequency, phase, polarisation or direction of the emitted radiation	H01S 3/10
Arrangements for controlling the laser output parameters	H01S 5/06

H04B 10/58

Compensation for non-linear transmitter output

Definition statement

This place covers:

Subject matter wherein at least one output of the opto-electric circuit is modified to be an approximately linear function of its inputs. (techniques for making the output of the transmitter into a linear output)

H04B 10/588

in external modulation systems

Definition statement

This place covers:

Subject matter including particular details of varying the output of at least one laser diode element using another element outside of the laser diode to provide the optically transmitted signal.

H04B 10/60

Receivers

Definition statement

This place covers:

Subject matter including an opto-electric circuit for retrieving information from a modulated optical signal propagated through or along a transmission medium.

H04B 10/61

Coherent receivers

Definition statement

This place covers:

Subject matter wherein a received wave is combined with a locally generated wave to produce one or more beat frequency signals at the output for detection of the transmitted information signal.

References

Limiting references

This place does not cover:

Delay line interferometer based DPSK optical receivers	H04B 10/677
--	-----------------------------

H04B 10/615

{Arrangements affecting the optical part of the receiver}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of polarisation beam splitters	H04B 10/614
Adjustment of the frequency or phase of the local oscillator in homodyne receivers	H04B 10/63

H04B 10/6166

{Polarisation demultiplexing, tracking or alignment of orthogonal polarisation components}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Polarisation multiplex systems	H04J 14/06
--------------------------------	----------------------------

H04B 10/63

Homodyne {, i.e. coherent receivers where the local oscillator is locked in frequency and phase to the carrier signal}

Definition statement

This place covers:

A receiver that demodulates the received signal by mixing it with a local oscillator signal synchronized in frequency and phase to the carrier of the received signal.

H04B 10/64

Heterodyne {, i.e. coherent receivers where, after the opto-electronic conversion, an electrical signal at an intermediate frequency [fIF] is obtained}

Definition statement

This place covers:

A receiver that demodulates the received signal by mixing it with a local oscillator signal having a different frequency than the carrier of the received signal.

H04B 10/66

Non-coherent receivers, e.g. using direct detection

Definition statement

This place covers:

Subject matter in which the data signal is directly converted from optical to electrical without the use of an oscillator.

H04B 10/67

Optical arrangements in the receiver

Definition statement

This place covers:

Subject matter in which the detection of the signal is enhanced by an optical arrangement in the receiver that is provided in addition to the photodetection means.

H04B 10/69

Electrical arrangements in the receiver

Definition statement

This place covers:

Subject matter in which the detection of the signal is enhanced by an electrical arrangement within the receiver that is provided in addition to the photodetection means.

H04B 10/70

Photonic quantum communication

Definition statement

This place covers:

Subject matter wherein characteristics of single photons are varied to represent respective bits of data and these photons are transmitted and/or received in a communication system to convey an information-bearing message.

References

Limiting references

This place does not cover:

Systems wherein the photons represent a cryptographic key	H04L 9/00
---	---------------------------

H04B 10/80

Optical aspects relating to the use of optical transmission for specific applications, not provided for in groups [H04B 10/03](#) - [H04B 10/70](#), e.g. optical power feeding or optical transmission through water

Definition statement

This place covers:

Optical aspects relating to specific applications of optical communication not provided for in any of the previous subgroups, e.g. optical power feeding, optical transmission through water or rotary joints,.

References

Limiting references

This place does not cover:

Arrangements for fault recovery	H04B 10/03
Arrangements for monitoring or testing transmission systems; Arrangements for fault measurement of transmission systems	H04B 10/07
Arrangements specific to free-space transmission, i.e. transmission through air or vacuum	H04B 10/11
Arrangements specific for fibre transmission	H04B 10/25
Arrangements for networking	H04B 10/27
Repeaters	H04B 10/29
Transceivers	H04B 10/40
Transmitters	H04B 10/50
Receivers	H04B 10/60
Photonic quantum communication	H04B 10/70

H04B 10/808**{Electrical power feeding of an optical transmission system}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Power feeding arrangements in general	H04B 3/44
---------------------------------------	---------------------------

H04B 10/85**Protection from unauthorised access, e.g. eavesdrop protection****Definition statement***This place covers:*

Subject-matter dealing with protection from unauthorised access, e.g. eavesdrop protection. Concerning eavesdrop protection it is noted that it is irrelevant whether the signal to be protected from eavesdropping is encrypted or not.

H04B 10/90**Non-optical transmission systems, e.g. transmission systems employing non-photonic corpuscular radiation****Definition statement***This place covers:*

Non-optical transmission systems that fall under the scope of the title of the main group; e.g. transmission system using Terahertz waves below the far infrared range or particles.

H04B 11/00**Transmission systems employing sonic, ultrasonic or infrasonic waves****Definition statement***This place covers:*

Transmission systems employing ultrasonic, sonic or infrasonic waves.

References**Informative references***Attention is drawn to the following places, which may be of interest for search:*

Speech analysis or synthesis; Speech recognition	G10L
Telephonic communication	H04M
Loudspeakers, microphones or like acoustic electromechanical transducers	H04R
Stereophonic systems	H04S

H04B 13/00

Transmission systems characterised by the medium used for transmission, not provided for in groups [H04B 3/00](#) - [H04B 11/00](#)

Definition statement

This place covers:

Transmission systems where the medium for transmission is more pertinent than the type of signal.

H04B 13/005

{Transmission systems in which the medium consists of the human body}

Definition statement

This place covers:

Transmission systems where the medium is the human body.

H04B 13/02

Transmission systems in which the medium consists of the earth or a large mass of water thereon, e.g. earth telegraphy

Definition statement

This place covers:

Transmission systems where the medium is the earth or a large mass of water.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Line transmission systems with earth or water return	H04B 3/00
Geophysics, detecting hidden masses	G01H , G01V 1/16 , G01V 1/18 , G01V 3/00
Sonars	G01S 1/72
Applications of earth currents	G01S 1/72 , H05F 7/00
Direction and distance determination with lead cables	G01S 13/00

H04B 14/00

Transmission systems not characterised by the medium used for transmission (details thereof [H04B 1/00](#))

Definition statement

This place covers:

Transmission systems characterised by the use of a carrier modulation;

Transmission systems characterised by the use of pulse modulation, differential modulation or subcarrier modulation.

References

Limiting references

This place does not cover:

details of transmission systems not characterized by the medium used	H04B 1/00
Data mapping in impulse radio systems	H04B 1/7176
Polarisation modulation and/or switching with transmission through light guides	H04B 10/532
Amplitude modulation	H03C 1/00
Angle modulation	H03C 3/00
Ofdm modulation techniques	H04L 27/2601

Informative references

Attention is drawn to the following places, which may be of interest for search:

Impulse radio	H04B 1/7163
Demodulation or transference of modulation from one carrier to another	H03D
Coding, decoding or code conversion, in general	H03M
Frequency modulated carrier systems	H04L 27/10
Amplitude modulated carrier systems	H04L 27/34

H04B 14/02

characterised by the use of pulse modulation (in radio transmission relays [H04B 7/17](#))

References

Limiting references

This place does not cover:

in radio transmission relays	H04B 7/17
------------------------------	---------------------------

Informative references

Attention is drawn to the following places, which may be of interest for search:

Transmission of digital information per se	H04L
--	----------------------

H04B 14/04

using pulse code modulation

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Analogue/digital or digital/analogue conversion per se	H03M 1/00
--	---------------------------

For TV signals	H04N 7/24
----------------	---------------------------

H04B 14/06

using differential modulation, e.g. delta modulation

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Conversion of analogue values to or from differential modulation	H03M 3/00
--	---------------------------

H04B 15/00

Suppression or limitation of noise or interference (by means associated with receiver [H04B 1/10](#))

Definition statement

This place covers:

Reduction or elimination of unwanted disturbances of the information transmission.

References

Limiting references

This place does not cover:

Suppression or limitation of noise or interference by means associated with receiver	H04B 1/10
--	---------------------------

Informative references

Attention is drawn to the following places, which may be of interest for search:

Structural association with measuring or protective devices or electric components with suppressor for radio interference	H02K 11/00
Screening of apparatus or components against electric or magnetic fields	H05K 9/00

H04B 15/02

Reducing interference from electric apparatus by means located at or near the interfering apparatus

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Structural association with measuring or protective devices or electric components with suppressor for radio interference	H02K 11/00
Screening of apparatus or components against electric or magnetic fields	H05K 9/00

H04B 15/025

{Reducing interference from ignition apparatus of fuel engines (cables with high resistance [H01B](#))}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cables with high resistance	H01B
-----------------------------	----------------------

H04B 15/04

the interference being caused by substantially sinusoidal oscillations, e.g. in a receiver or in a tape-recorder

Definition statement

This place covers:

interference from harmonics of clock frequency generators in transmission equipment

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

In computer clock generators	G06F 1/08
reducing parasitic oscillations	H03B , H03F
In PLL frequency synthesizers	H03L 7/18
Screening	H05K 9/00

H04B 17/00

Monitoring; Testing (of line transmission systems [H04B 3/46](#); arrangements for monitoring or testing transmission systems employing electromagnetic waves other than radio waves [H04B 10/07](#))

Definition statement

This place covers:

- Methods and apparatus for determining the manner in which a transmission system is functioning
- Methods and apparatus for determining the existence, type and location of any trouble
- Monitoring of the communications radio link between the transmitter and the receiver
- Measurements of quality parameters of the transmission/reception signal
- Monitoring of the transmission/reception path
- Modelling the propagation channel

References

Limiting references

This place does not cover:

Monitoring, testing line transmission systems	H04B 3/46
Arrangements for monitoring or testing transmission systems employing electromagnetic waves other than radio waves, e.g. infrared, visible or ultraviolet light	H04B 10/07

Informative references

Attention is drawn to the following places, which may be of interest for search:

Details of Transmitters	H04B 1/02
Details of Receivers	H04B 1/06
Monitoring arrangements in multiplex communication	H04J 1/16 ; H04J 3/14
Monitoring arrangements; Testing arrangements in data switching networks	H04L 41/06
Supervisory, testing and monitoring arrangements for wireless communication networks	H04W 24/00

H04B 17/17

Detection of non-compliance or faulty performance, e.g. response deviations ([H04B 17/18](#) takes precedence)

Definition statement

This place covers:

Arrangements to detect conditions or status of non-compliance or faulty performance due to failure or degradation.

References

Limiting references

This place does not cover:

Monitoring during normal operation	H04B 17/18
------------------------------------	----------------------------

H04B 17/18

Monitoring during normal operation

Definition statement

This place covers:

Arrangements to monitor performance of the transmission system when in use.

H04B 17/27

for locating or positioning the transmitter

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Locating or presence detecting by the use of reflection or reradiation of radio waves	G01S 13/00
Satellite radio beacon positioning systems	G01S 19/00
Locating users or terminals for network management purposes	H04W 64/00

H04B 17/309

Measuring or estimating channel quality parameters

Definition statement

This place covers:

Arrangements to calculate the present and/or past channel quality parameters based on the present and/or past measured values.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Predicting channel quality parameters	H04B 17/373
---------------------------------------	-----------------------------

H04B 17/373

Predicting channel quality parameters

Definition statement

This place covers:

Arrangements to project the future channel quality parameters based on the present and/or past measured values.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Measuring or estimating channel quality parameters	H04B 17/309
--	-----------------------------

H04B 17/382**for resource allocation, admission control or handover****References*****Informative references****Attention is drawn to the following places, which may be of interest for search:*

Central resource management	H04W 28/16
Hand-off or reselecting arrangements	H04W 36/00
Access restriction; Network selection; Access point selection	H04W 48/00
Local resource management	H04W 72/00

H04B 17/391**Modelling the propagation channel****Definition statement***This place covers:*

- Simulation to reproduce propagation environment on computers
- Emulation of actual propagation environment using testing apparatus