

CPC COOPERATIVE PATENT CLASSIFICATION

H ELECTRICITY

(NOTE omitted)

H04 ELECTRIC COMMUNICATION TECHNIQUE

(NOTE omitted)

H04B TRANSMISSION (transmission systems for measured values, control or similar signals [G08C](#); coding, decoding, code conversion, in general [H03M](#); broadcast communication [H04H](#); multiplex systems [H04J](#); secret communication [H04K](#); transmission of digital information [H04L](#))

NOTE

This subclass covers the transmission of information-carrying signals, the transmission being independent of the nature of the information, and includes monitoring and testing arrangements and the suppression and limitation of noise and interference.

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 (tuning resonant circuits [H03J](#))

NOTE

In this group, group [H04B 1/0003](#) takes precedence over groups [H04B 1/005](#) - [H04B 1/76](#)

1/0003 . {Software-defined radio [SDR] systems, i.e. systems wherein components typically implemented in hardware, e.g. filters or modulators/demodulators, are implented 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](#))}

WARNING

Groups [H04B 1/0003](#) and subgroups are not complete pending a reorganisation. See also group [H04B 1/406](#)

1/0007 . . {wherein the AD/DA conversion occurs at radiofrequency or intermediate frequency stage}

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](#))}

1/0014 . . . {using DSP [Digital Signal Processor] quadrature modulation and demodulation}

1/0017 . . . {Digital filtering ([H04B 1/001](#) takes precedence; digital filters per se [H03H 17/00](#))}

1/0021 . . . {Decimation, i.e. data rate reduction techniques ([H04B 1/0025](#) takes precedence)}

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](#))}

1/0028 . . {wherein the AD/DA conversion occurs at baseband stage}

1/0032 . . . {with analogue quadrature frequency conversion to and from the baseband (quadrature modulators and demodulators per se [H03D 3/007](#), [H03C 3/40](#))}

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](#))}

1/0039 . . . {using DSP [Digital Signal Processor] quadrature modulation and demodulation}

1/0042 . . . {Digital filtering ([H04B 1/0035](#) takes precedence; digital filters per se [H03H 17/00](#))}

1/0046 . . . {Decimation, i.e. data rate reduction techniques}

1/005 . {adapting radio receivers, transmitters and transceivers for operation on two or more bands, i.e. frequency ranges}

1/0053 . . {with common antenna for more than one band}

1/0057 . . . {using diplexing or multiplexing filters for selecting the desired band}

1/006 . . . {using switches for selecting the desired band ([H04B 1/0057](#) takes precedence)}

1/0064 . . {with separate antennas for the more than one band ([H04B 1/0053](#) takes precedence)}

1/0067 . . {with one or more circuit blocks in common for different bands}

1/0071 . . . {using a common intermediate frequency for more than one band ([H04B 1/0075](#) takes precedence)}

1/0075 . . . {using different intermediate frequencied for the different bands}

1/0078 {with a common intermediate frequency amplifier for the different intermediate frequencies, e.g. when using switched intermediate frequency filters}

1/0082 . . . {with a common local oscillator for more than one band}

- 1/0085 {where one band is the image frequency band of the other and the band selection is done by image rejection}
- 1/0089 {using a first intermediate frequency higher than the highest of any band received}
- 1/0092 {using a wideband front end}
- 1/0096 . . {where a full band is frequency converted into another full band}
- 1/02 . Transmitters (spatial arrangements of component circuits in radio pills for living beings [A61B 5/07](#))
- 1/03 . . Constructional details, e.g. casings, housings {[adapted for airplanes B64D](#)}
- 1/034 . . . Portable transmitters {(distress beacons [G01S 1/68](#); means for indicating the location of accidentally buried persons [A63B 29/021](#))}
- 1/0343 {to be carried on the body}
- 1/0346 {Hand-held transmitters}
- 1/036 . . . Cooling arrangements ([cooling transformers H01F 27/08](#); [cooling discharge tubes H01J 7/24, H01J 19/74](#))
- 1/04 . . Circuits (of television transmitters [H04N 5/38](#); {oscillators [H03B](#); modulators [H03C 1/00, H03C 3/00, H03C 5/00](#); amplifiers [H03F](#); power supplies [H04B 1/1607](#)})
- 2001/0408 {with power amplifiers}
- 2001/0416 {having gain or transmission power control}
- 2001/0425 {with linearisation using predistortion}
- 2001/0433 {with linearisation using feedback}
- 2001/0441 {with linearisation using feed-forward}
- 2001/045 {with means for improving efficiency}
- 1/0458 . . . {Arrangements for matching and coupling between power amplifier and antenna or between amplifying stages ([matching circuits in general H03H](#))}
- 1/0466 . . . {Fault detection or indication ([H04B 1/0483](#) takes precedence)}
- 1/0475 . . . {with means for limiting noise, interference or distortion ([H04B 1/0483](#) takes precedence)}
- 1/0483 . . . {Transmitters with multiple parallel paths}
- 2001/0491 . . . {with frequency synthesizers, frequency converters or modulators}
- 1/06 . Receivers (control of amplification [H03G](#); television receivers [H04N 5/44, H04N 5/64](#))
- 1/08 . . Constructional details, e.g. cabinet
- 1/082 . . . {to be used in vehicles ([H04B 1/086](#) takes precedence; holding or mounting accessories [B60R 11/02](#))}
- 2001/084 {with removable front panel}
- 1/086 . . . {Portable receivers}
- 1/088 {with parts of the receiver detachable or collapsible}
- 1/10 . . Means associated with receiver for limiting or suppressing noise or interference {induced by transmission ([interference reduction in 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](#))}
- 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](#))}
- 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](#))}
- 1/1027 . . . {assessing signal quality or detecting noise/interference for the received signal}
- 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](#))}
- 2001/1045 {Adjacent-channel interference}
- 2001/1054 {by changing bandwidth}
- 2001/1063 {using a notch filter}
- 2001/1072 {by tuning the receiver frequency}
- 1/1081 . . . {Reduction of multipath noise ([by equalising H04B 7/005](#))}
- 1/109 . . . {by improving strong signal performance of the receiver when strong unwanted signals are present at the receiver input}
- 1/12 . . . Neutralising, balancing, or compensation arrangements {([balancing ripple filters H04B 15/005, H02M 1/143](#))}
- 1/123 {using adaptive balancing or compensation means ([adaptive filter circuits and algorithms H03H](#))}
- 1/126 {having multiple inputs, e.g. auxiliary antenna for receiving interfering signal ([aerials in general H01Q](#))}
- 1/14 . . . Automatic detuning arrangements
- 1/16 . . Circuits {([demodulators H03D](#))}
- 1/1607 . . . {Supply circuits ([converters H02M](#); [filters therefor H02M 1/14](#); [voltage stabilisers G05F 1/46](#))}
- 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](#))}
- 1/1623 {using tubes}
- 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](#))}
- 1/1638 . . . {Special circuits to enhance selectivity of receivers not otherwise provided for ([resonant circuits H03H](#))}
- 1/1646 . . . {adapted for the reception of stereophonic signals}
- 1/1653 {Detection of the presence of stereo signals and pilot signal regeneration}
- 1/1661 {Reduction of noise by manipulation of the baseband composite stereophonic signal or the decoded left and right channels}
- 1/1669 {of the demodulated composite stereo signal}

- 1/1676 {of the sum or difference signal}
- 1/1684 {of the decoded left or right stereo channel}
- 1/1692 {using companding of the stereo difference signal, e.g. FMX (volume compression or expansion in amplifiers [H03G 7/00](#))}
- 1/18 Input circuits, e.g. for coupling to an aerial or a transmission line (input circuits for amplifiers in general [H03F](#); coupling networks between aerials or lines and receivers independent of the nature of the receiver [H03H](#))
- 1/20 for coupling gramophone pick-up, recorder output, or microphone to receiver{, e.g. for Hi-Fi systems or audio/video combinations (constructional details for associated working of receivers and recording devices [G11B 31/003](#); for television signals only [H04N 5/00](#))}
- 1/202 {by remote control}
- 1/205 {with control bus for exchanging commands between units}
- 1/207 {with an audio or audio/video bus for signal distribution ([H04B 1/205](#) takes precedence)}
- 1/22 for receivers in which no local oscillation is generated
- 1/24 the receiver comprising at least one semiconductor device having three or more electrodes
- 1/26 for superheterodyne receivers (multiple frequency-changing [H03D 7/16](#))
- 1/28 the receiver comprising at least one semiconductor device having three or more electrodes
- 1/30 for homodyne or synchrodyne receivers (demodulator circuits [H03D 1/22](#))
- 1/302 {for single sideband receivers (demodulator circuits [H03D 1/24](#))}
- 2001/305 {using dc offset compensation techniques}
- 2001/307 {using n-port mixer}
- 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
- 1/3805 with built-in auxiliary receivers
- 2001/3811 {Split configuration of transmission devices}
- 1/3816 Mechanical arrangements for accommodating identification devices, e.g. cards or chips; with connectors for programming identification devices
- 1/3818 Arrangements for facilitating insertion or removal of identification devices
- WARNING**
- Group [H04B 1/3818](#) is incomplete pending reclassification of documents from group [H04B 1/3816](#)
- Until reclassification is complete, groups [H04B 1/3816](#) and [H04B 1/3818](#) should be considered in order to perform a complete search
- 1/3822 specially adapted for use in vehicles ([H04B 1/3827](#) takes precedence)
- 1/3827 Portable transceivers
- 1/3833 {Hand-held transceivers}
- 1/3838 {Arrangements for reducing RF exposure to the user, e.g. by changing the shape of the transceiver while in use}
- 2001/3844 {with means to alert the user that a certain exposure has been reached}
- 1/385 {Transceivers carried on the body, e.g. in helmets}
- 2001/3855 {carried in a belt or harness}
- 2001/3861 {carried in a hand or on fingers}
- 2001/3866 {carried on the head}
- 2001/3872 {with extendable microphones or earphones}
- 1/3877 Arrangements for enabling portable transceivers to be used in a fixed position, e.g. cradles or boosters
- 1/3883 Arrangements for mounting batteries or battery chargers
- 1/3888 Arrangements for carrying or protecting transceivers
- 2001/3894 {Waterproofing of transmission device}
- 1/40 Circuits
- 1/401 for selecting or indicating operating mode
- 1/403 using the same oscillator for generating both the transmitter frequency and the receiver local oscillator frequency
- 1/405 with multiple discrete channels
- 1/406 {with more than one transmission mode, e.g. analog and digital modes}
- 1/408 the transmitter oscillator frequency being identical to the receiver local oscillator frequency
- 1/44 Transmit/receive switching
- 1/46 by voice-frequency signals; by pilot signals
- 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)}
- 2001/485 {inhibiting unwanted transmission}
- 1/50 using different frequencies for the two directions of communication
- 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*
- 1/525 with means for reducing leakage of transmitter signal into the receiver
- 1/54 using the same frequency for two directions of communication ([H04B 1/44](#) takes precedence)
- 1/56 with provision for simultaneous communication in two directions
- 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*
- 1/581 {using a transformer}
- 1/582 {with automatic balancing}
- 1/583 {using a bridge network}
- 1/585 {with automatic balancing}
- 1/586 {using an electronic circuit}
- 1/587 {using opto-couplers (light transmission systems [H04B 10/00](#))}
- 1/588 {using sampling gates}

1/59	<ul style="list-style-type: none"> Responders; Transponders (relay systems H04B 7/14) <p>WARNING</p> <p>contains no documents, see provisionally G01S 13/74</p>	1/70757	<ul style="list-style-type: none"> {with increased resolution, i.e. higher than half a chip (H04B 1/70758 takes precedence)}
1/60	<ul style="list-style-type: none"> Supervising unattended repeaters 	1/70758	<ul style="list-style-type: none"> {Multimode search, i.e. using multiple search strategies}
1/62	<ul style="list-style-type: none"> for providing a predistortion of the signal in the transmitter and corresponding correction in the receiver, e.g. for improving the signal/noise ratio {(for optical transmitters H04B 10/58)} 	1/7077	<ul style="list-style-type: none"> Multi-step acquisition, e.g. multi-dwell, coarse-fine or validation
1/64	<ul style="list-style-type: none"> Volume compression or expansion arrangements {(for amplifiers H03G 7/00)} 	1/70775	<ul style="list-style-type: none"> {Multi-dwell schemes, i.e. multiple accumulation times}
1/66	<ul style="list-style-type: none"> for reducing bandwidth of signals (in pictorial communication systems H04N); for improving efficiency of transmission (H04B 1/68 takes precedence; {vocoders G10L}) 	1/708	<ul style="list-style-type: none"> Parallel implementation
1/662	<ul style="list-style-type: none"> {using a time/frequency relationship, e.g. time compression or expansion} 	1/7083	<ul style="list-style-type: none"> Cell search, e.g. using a three-step approach
1/665	<ul style="list-style-type: none"> {using psychoacoustic properties of the ear, e.g. masking effect} 	1/7085	<ul style="list-style-type: none"> using a code tracking loop, e.g. a delay-locked loop
1/667	<ul style="list-style-type: none"> {using a division in frequency subbands (for TV signals H04N 19/63)} 	2001/70855	<ul style="list-style-type: none"> {Dithering}
1/68	<ul style="list-style-type: none"> for wholly or partially suppressing the carrier or one side band {or by using special modulation methods (modulator circuits H03C 1/52, H03C 1/60; single sideband receivers H04B 1/302; for data transmission H04L 27/02)} 	1/7087	<ul style="list-style-type: none"> Carrier synchronisation aspects
1/69	<ul style="list-style-type: none"> Spread spectrum techniques 	1/709	<ul style="list-style-type: none"> Correlator structure
2001/6904	<ul style="list-style-type: none"> {using code hopping} 	1/7093	<ul style="list-style-type: none"> Matched filter type
2001/6908	<ul style="list-style-type: none"> {using time hopping} 	2001/70935	<ul style="list-style-type: none"> {using a bank of matched filters, e.g. Fast Hadamard Transform}
2001/6912	<ul style="list-style-type: none"> {using chirp} 	1/7095	<ul style="list-style-type: none"> Sliding correlator type
2001/6916	<ul style="list-style-type: none"> {Related theory} 	1/7097	<ul style="list-style-type: none"> Interference-related aspects
1/692	<ul style="list-style-type: none"> Hybrid techniques using combinations of two or more spread spectrum techniques <p>WARNING</p> <p>Not complete pending the completion of reclassification; see also group H04B 1/69</p>	1/71	<ul style="list-style-type: none"> the interference being narrowband interference
1/707	<ul style="list-style-type: none"> using direct sequence modulation 	1/7101	<ul style="list-style-type: none"> {with estimation filters}
2001/70706	<ul style="list-style-type: none"> {using a code tracking loop, e.g. a delay locked loop} 	1/7102	<ul style="list-style-type: none"> {with transform to frequency domain}
1/70712	<ul style="list-style-type: none"> {with demodulation by means of convolvers, e.g. of the SAW type (SAW convolvers in general G06G 7/195)} 	1/7103	<ul style="list-style-type: none"> the interference being multiple access interference
1/70718	<ul style="list-style-type: none"> {with asynchronous demodulation, i.e. not requiring code synchronisation} 	1/7105	<ul style="list-style-type: none"> Joint detection techniques, e.g. linear detectors
2001/70724	<ul style="list-style-type: none"> {featuring pilot assisted reception} 	1/71052	<ul style="list-style-type: none"> {using decorrelation matrix}
1/7073	<ul style="list-style-type: none"> Synchronisation aspects 	1/71055	<ul style="list-style-type: none"> {using minimum mean squared error [MMSE] detector}
1/70735	<ul style="list-style-type: none"> {Code identification (H04B 1/7083 takes precedence)} 	1/71057	<ul style="list-style-type: none"> {using maximum-likelihood sequence estimation [MLSE]}
1/7075	<ul style="list-style-type: none"> with code phase acquisition 	1/7107	<ul style="list-style-type: none"> Subtractive interference cancellation
1/70751	<ul style="list-style-type: none"> {using partial detection (H04B 1/70758 takes precedence)} 	1/71072	<ul style="list-style-type: none"> {Successive interference cancellation}
1/70752	<ul style="list-style-type: none"> {Partial correlation} 	1/71075	<ul style="list-style-type: none"> {Parallel interference cancellation}
1/70753	<ul style="list-style-type: none"> {Partial phase search} 	2001/71077	<ul style="list-style-type: none"> {Partial interference cancellation}
1/70754	<ul style="list-style-type: none"> {Setting of search window, i.e. range of code offsets to be searched (H04B 1/70758 takes precedence)} 	1/711	<ul style="list-style-type: none"> the interference being multi-path interference
1/70755	<ul style="list-style-type: none"> {Setting of lock conditions, e.g. threshold} 	1/7113	<ul style="list-style-type: none"> Determination of path profile
1/70756	<ul style="list-style-type: none"> {Jumping within the code, i.e. masking or slewing (H04B 1/70758 takes precedence)} 	1/7115	<ul style="list-style-type: none"> Constructive combining of multi-path signals, i.e. RAKE receivers
		1/7117	<ul style="list-style-type: none"> Selection, re-selection, allocation or re-allocation of paths to fingers, e.g. timing offset control of allocated fingers
		1/712	<ul style="list-style-type: none"> Weighting of fingers for combining, e.g. amplitude control or phase rotation using an inner loop
		1/713	<ul style="list-style-type: none"> using frequency hopping
		1/7136	<ul style="list-style-type: none"> Arrangements for generation of hop frequencies, e.g. using a bank of frequency sources, using continuous tuning or using a transform
		2001/71362	<ul style="list-style-type: none"> {using a bank of frequency sources}
		2001/71365	<ul style="list-style-type: none"> {using continuous tuning of a single frequency source}
		2001/71367	<ul style="list-style-type: none"> {using a transform}
		1/7143	<ul style="list-style-type: none"> Arrangements for generation of hop patterns
		1/715	<ul style="list-style-type: none"> Interference-related aspects
		2001/7152	<ul style="list-style-type: none"> {with means for suppressing interference}
		2001/7154	<ul style="list-style-type: none"> {with means for preventing interference}
		1/7156	<ul style="list-style-type: none"> Arrangements for sequence synchronisation
		2001/71563	<ul style="list-style-type: none"> {Acquisition}

- 2001/71566 {Tracking}
 1/7163 . . using impulse radio
- WARNING**
 As 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](#)
- 1/71632 . . . {Signal aspects ([H04B 1/7172](#) and [H04B 1/7176](#) take precedence)}
 1/71635 . . . {Transmitter aspects ([H04B 1/7174](#) takes precedence)}
 1/71637 . . . {Receiver aspects ([H04B 1/7183](#) takes precedence)}
 1/717 . . . Pulse-related aspects
- WARNING**
 Not complete pending the completion of reclassification; see also group [H04B 1/7163](#)
- 1/7172 {Pulse shape (in general [H04L 25/03834](#))}
 1/7174 {Pulse generation (in general [H04L 25/03834](#))}
 1/7176 . . . Data mapping, e.g. modulation
 1/7183 . . . Synchronisation
 1/719 . . . Interference-related aspects
 1/72 . . Circuits or components for simulating aerials, e.g. dummy aerial ([dissipative waveguide terminations H01P 1/26](#))
- WARNING**
 contains no documents, see [H03H](#), e.g. [H03H 7/38](#), [H03H 11/28](#)
- 1/74 . . for increasing reliability, e.g. using redundant or spare channels or apparatus ({[replacing by standby devices for amplifiers H03F 1/52](#), [H03F 1/542](#)})
 1/745 . . {using by-passing or self-healing methods}
 1/76 . . Pilot transmitters or receivers for control of transmission or for equalising
- 3/00 Line transmission systems** ([combined with near-field transmission systems H04B 5/00](#); [constructional features of cables H01B 11/00](#))
- 3/02 . . Details
 3/03 . . Hybrid circuits ([for transceivers H04B 1/52](#), [H04B 1/58](#); [hybrid junctions of the waveguide type H01P 5/16](#))
- WARNING**
 not used, see [H04B 1/52](#), [H04B 1/58](#)
- 3/04 . . Control of transmission; Equalising ([control of amplification in general H03G](#))
 3/06 . . . by the transmitted signal
 3/08 in negative-feedback path of line amplifier
 3/10 . . . by pilot signal
 3/11 using pilot wire ([H04B 3/12](#) takes precedence)
 3/12 in negative-feedback path of line amplifier
 3/14 . . . characterised by the equalising network used
 3/141 {using multiequalisers, e.g. bump, cosine, Bode}
 3/142 {using echo-equalisers, e.g. transversal}
- 3/143 {using amplitude-frequency equalisers}
 3/144 {fixed equalizers}
 3/145 {variable equalisers}
 3/146 {using phase-frequency equalisers}
 3/147 {fixed equalizers}
 3/148 {variable equalisers}
 3/16 . . . characterised by the negative-impedance network used
 3/18 wherein the network comprises semiconductor devices
 3/20 . . Reducing echo effects or singing; Opening or closing transmitting path; Conditioning for transmission in one direction or the other
 3/21 . . . using a set of bandfilters
 3/23 . . . using a replica of transmitted signal in the time domain, e.g. echo cancellers
 3/231 {Echo cancellers using readout of a memory to provide the echo replica}
 3/232 {using phase shift, phase roll or frequency offset correction}
 3/234 {using double talk detection}
 3/235 {combined with adaptive equaliser}
 3/237 {using two adaptive filters, e.g. for near end and for end echo cancelling}
 3/238 {using initial training sequence}
 3/26 . . Improving frequency characteristic by the use of loading coils ([loading coils per se H01F 17/08](#))
 3/28 . . Reducing interference caused by currents induced in cable sheathing or armouring
 3/30 . . Reducing interference caused by unbalance current in a normally balanced line
 3/32 . . Reducing cross-talk, e.g. by compensating
 3/34 . . . by systematic interconnection of lengths of cable during laying; by addition of balancing components to cable during laying
 3/36 . . Repeater circuits ([H04B 3/58](#) takes precedence; [amplifiers therefor H03F](#))
 3/38 . . . for signals in two different frequency ranges transmitted in opposite directions over the same transmission path
 3/40 . . Artificial lines; Networks simulating a line of certain length
 3/42 . . Circuits for by-passing of ringing signals
 3/44 . . Arrangements for feeding power to a repeater along the transmission line
 3/46 . . Monitoring; Testing
 3/462 . . . Testing group delay or phase shift, e.g. timing jitter
 3/466 Testing attenuation in combination with at least one of group delay and phase shift
 3/48 . . . Testing attenuation ([H04B 3/466](#) takes precedence)
 3/487 . . . Testing crosstalk effects
 3/493 . . . Testing echo effects or singing
 3/50 . . Systems for transmission between fixed stations via two-conductor transmission lines ([H04B 3/54](#) takes precedence)
 3/52 . . Systems for transmission between fixed stations via waveguides
 3/54 . . Systems for transmission via power distribution lines
 3/542 . . {the information being in digital form}

- 3/544 . . {Setting up communications; Call and signalling arrangements}
 - 3/546 . . {Combination of signalling, telemetering, protection (circuits for remote indication of supply or distribution network condition [H02J 13/00](#))}
 - 3/548 . . {the power on the line being DC (arrangements for feeding power [H04L 12/10](#); extracting feeding power from signals [H04L 25/02](#))}
 - 3/56 . . Circuits for coupling, blocking, or by-passing of signals
 - 3/58 . . Repeater circuits (amplifiers therefor [H03F](#))
 - 3/60 . . Systems for communication between relatively movable stations, e.g. for communication with lift ([H04B 3/54](#) takes precedence)
 - 5/00 Near-field transmission systems, e.g. inductive loop type**
 - 5/0006 . {using a receiver structurally associated with a loudspeaker or an earphone}
 - 5/0012 . {using capacitive coupling}
 - 5/0018 . {using leaky or radiating cables, e.g. leaky coaxial cables or power lines for inductive transmission (leaky cables *per se* [H01Q 13/20](#); for railways [B61L 3/22](#))}
 - 5/0025 . {Near field system adaptations}
 - 5/0031 . . {for data transfer}
 - 5/0037 . . {for power transfer}
 - 5/0043 . . {for taking measurements, e.g. using sensor coils}
 - 5/005 . . {for isolation purposes}
 - 5/0056 . {for use in interrogation, identification or read/write systems (record carriers [G06K 7/00](#), [G06K 19/00](#); for railways [B61L 3/12](#))}
 - 5/0062 . . {in RFID [Radio Frequency Identification] Systems}
 - 5/0068 . . {in transponders}
 - 5/0075 . {using inductive coupling (transformers or inductances adapted for inductive coupling [H01F 38/14](#))}
 - 5/0081 . . {with antenna coils (loop aerials [H01Q 7/00](#))}
 - 5/0087 . . {with multiple coils at either side}
 - 5/0093 . . {with one coil at each side, e.g. with primary and secondary coils}
 - 5/02 . using transceiver
 - 5/04 . Calling systems, e.g. paging system
 - 5/06 . using a portable transmitter associated with a microphone
 - 7/00 Radio transmission systems, i.e. using radiation field ([H04B 10/00](#), [H04B 15/00](#) take precedence)**
 - 7/002 . {Reducing depolarization effects}
 - 7/005 . Control of transmission; Equalising
 - 7/01 . Reducing phase shift
 - 7/015 . Reducing echo effects
 - 7/02 . Diversity systems; Multi-antenna systems, i.e. transmission or reception using multiple antennas
 - 7/022 . . Site diversity; Macro-diversity (using two or more spaced independent antennas [H04B 7/04](#))
 - 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
 - 7/026 . . . Co-operative diversity, e.g. using fixed or mobile stations as relays
 - 7/028 . . {Spatial transmit diversity using a single antenna at the transmitter}
 - 7/04 . . using two or more spaced independent antennas
 - 7/0404 . . . the mobile station comprising multiple antennas, e.g. to provide uplink diversity
 - 7/0408 . . . using two or more beams, i.e. beam diversity
 - 7/0413 . . . MIMO systems
- WARNING**
- Group [H04B 7/0413](#) and subgroups are not complete pending reorganisation. See also [H04W 52/42](#)
- 7/0417 Feedback systems
 - 7/0421 {utilizing implicit feedback, e.g. steered pilot signals}
 - 7/0426 Power distribution
 - 7/043 {using best eigenmode, e.g. beam forming or beam steering}
 - 7/0434 {using multiple eigenmodes}
 - 7/0439 {utilizing channel inversion}
 - 7/0443 {utilizing "waterfilling" technique}
 - 7/0447 {utilizing uniform distribution}
 - 7/0452 Multi-user MIMO systems
 - 7/0456 Selection of precoding matrices or codebooks, e.g. using matrices antenna weighting
 - 7/046 {taking physical layer constraints into account}
 - 7/0465 {taking power constraints at power amplifier or emission constraints, e.g. constant modulus, into account}
 - 7/0469 {taking special antenna structures, e.g. cross polarized antennas into account}
 - 7/0473 {taking constraints in layer or codeword to antenna mapping into account}
 - 7/0478 {Special codebook structures directed to feedback optimization}
 - 7/0482 {Adaptive codebooks}
 - 7/0486 {taking channel rank into account}
 - 7/0491 . . . using two or more sectors, i.e. sector diversity
 - 7/0495 using overlapping sectors in the same base station to implement MIMO for antennas
 - 7/06 . . . at the transmitting station
 - 7/0602 {using antenna switching ([H04B 7/0686](#) takes precedence; antenna beam directivity switching [H01Q 3/24](#))}
 - 7/0604 {with predefined switching scheme}
 - 7/0606 {Random or pseudo-random switching scheme}
 - 7/0608 {Antenna selection according to transmission parameters}
 - 7/061 {using feedback from receiving side}
 - 7/0613 {using simultaneous transmission ([H04B 7/0686](#) takes precedence)}
 - 7/0615 {of weighted versions of same signal}
 - 7/0617 {for beam forming}
 - 7/0619 {using feedback from receiving side (feedback signaling for adaptive modulation/coding [H04L 1/0001](#))}
 - 7/0621 {Feedback content}

7/0623	. . . . .	{Auxiliary parameters, e.g. power control [PCB] or not acknowledged commands [NACK], used as feedback information}	7/0691	. . . . .	{using subgroups of transmit antennas}
7/0626	. . . . .	{Channel coefficients, e.g. channel state information [CSI]}	7/0693	. . . . .	{switching off a diversity branch, e.g. to save power}
7/0628	. . . . .	{Diversity capabilities}	7/0695	. . . . .	{using beam selection}
7/063	. . . . .	{Parameters other than those covered in groups H04B 7/0623 - H04B 7/0634 , e.g. channel matrix rank or transmit mode selection}	7/0697	. . . . .	{using spatial multiplexing}
7/0632	. . . . .	{Channel quality parameters, e.g. channel quality indicator [CQI]}	7/08	. . . . .	at the receiving station
7/0634	. . . . .	{Antenna weights or vector/matrix coefficients}	7/0802	. . . . .	{using antenna selection (H04B 7/0868 takes precedence; antenna beam directivity switching H01Q 3/24)}
7/0636	. . . . .	{Feedback format}	7/0805	. . . . .	{with single receiver and antenna switching (H04B 7/0822 takes precedence)}
7/0639	. . . . .	{Using selective indices, e.g. of a codebook, e.g. pre-distortion matrix index [PMI] or for beam selection}	7/0808	. . . . .	{comparing all antennas before reception}
7/0641	. . . . .	{Differential feedback}	7/0811	. . . . .	{during preamble or gap period}
7/0643	. . . . .	{Feedback on request}	7/0814	. . . . .	{based on current reception conditions, e.g. switching to different antenna when signal level is below threshold}
7/0645	. . . . .	{Variable feedback}	7/0817	. . . . .	{with multiple receivers and antenna path selection}
7/0647	. . . . .	{Variable feedback rate}	7/082	. . . . .	{selecting best antenna path}
7/065	. . . . .	{Variable contents, e.g. long-term or short-short}	7/0822	. . . . .	{according to predefined selection scheme}
7/0652	. . . . .	{Feedback error handling}	7/0825	. . . . .	{with main and with auxiliary or diversity antennas}
7/0654	. . . . .	{at the receiver, e.g. antenna verification at mobile station}	7/0828	. . . . .	{with delay elements in antenna paths}
7/0656	. . . . .	{at the transmitter, e.g. error detection at base station}	7/0831	. . . . .	{Compensation of the diversity switching process for non-uniform properties or faulty operations of the switches used in the diversity switching process}
7/0658	. . . . .	{Feedback reduction}	7/0834	. . . . .	{based on external parameters, e.g. subscriber speed or location}
7/066	. . . . .	{Combined feedback for a number of channels, e.g. over several subcarriers like in orthogonal frequency division multiplexing [OFDM]}	7/0837	. . . . .	{using pre-detection combining (H04B 7/0868 takes precedence)}
7/0663	. . . . .	{using vector or matrix manipulations}	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)}
7/0665	. . . . .	{Feed forward of transmit weights to the receiver}	7/0842	. . . . .	{Weighted combining}
7/0667	. . . . .	{of delayed versions of same signal (using space-time coding H04L 1/0618)}	7/0845	. . . . .	{per branch equalization, e.g. by an FIR-filter or RAKE receiver per antenna branch (rake receivers as such H04B 1/7115)}
7/0669	. . . . .	{using different channel coding between antennas (space-time coding H04L 1/0618)}	7/0848	. . . . .	{Joint weighting}
7/0671	. . . . .	{using different delays between antennas}	7/0851	. . . . .	{using training sequences or error signal (minimizing error signal H04B 7/0854)}
7/0673	. . . . .	{using feedback from receiving side}	7/0854	. . . . .	{using error minimizing algorithms, e.g. minimum mean squared error [MMSE], "cross-correlation" or matrix inversion}
7/0676	. . . . .	{using random or pseudo-random delays}	7/0857	. . . . .	{using maximum ratio combining techniques, e.g. signal-to- interference ratio [SIR], received signal strenght indication [RSS]}
7/0678	. . . . .	{using different spreading codes between antennas (code allocation H04J 13/16)}	7/086	. . . . .	{using weights depending on external parameters, e.g. direction of arrival [DOA], predetermined weights or beamforming}
7/068	. . . . .	{using space frequency diversity (space-frequency coding H04L 1/0606)}	7/0862	. . . . .	{receiver computing weights based on information from the transmitter}
7/0682	. . . . .	{using phase diversity (e.g. phase sweeping)}	7/0865	. . . . .	{Independent weighting, i.e. weights based on own antenna reception parameters}
7/0684	. . . . .	{using different training sequences per antenna}			
7/0686	. . . . .	{Hybrid systems, i.e. switching and simultaneous transmission}			
7/0689	. . . . .	{using different transmission schemes, at least one of them being a diversity transmission scheme}			

- 7/0868 {Hybrid systems, i.e. switching and combining}
- 7/0871 {using different reception schemes, at least one of them being a diversity reception scheme}
- 7/0874 {using subgroups of receive antennas}
- 7/0877 {switching off a diversity branch, e.g. to save power}
- 7/088 {using beam selection}
- 7/0882 {using post-detection diversity}
- 7/0885 {with combination}
- 7/0888 {with selection}
- 7/0891 {Space-time diversity ([rake receivers H04B 1/7115](#); [space-time decoding H04L 1/0631](#))}
- 7/0894 {using different delays between antennas}
- 7/0897 {using beamforming per multi-path, e.g. to cope with different directions of arrival [DOA] at different multi-paths}
- 7/10 . . Polarisation diversity; Directional diversity
- 7/12 . . Frequency diversity
- 7/14 . . Relay systems
- 7/145 . . Passive relay systems
- 7/15 . . Active relay systems
- 7/155 . . . Ground-based stations ([H04B 7/204 takes precedence](#); [for satellite systems H04B 7/18517](#))
- 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](#))}
- 7/15514 {for shadowing compensation (for [satellite mobile telephony service systems H04B 7/18536](#))}
- 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](#))}
- 7/15528 {Control of operation parameters of a relay station to exploit the physical medium}
- 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](#))}
- 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](#))}
- 7/1555 {Selecting relay station antenna mode, e.g. selecting omnidirectional -, directional beams, selecting polarizations}
- 7/15557 {Selecting relay station operation mode, e.g. between amplify and forward mode, decode and forward mode or FDD - and TDD mode}
- 7/15564 {Relay station antennae loop interference reduction}
- 7/15571 {by signal isolation, e.g. isolation by frequency or by antenna pattern, or by polarization}
- 7/15578 {by gain adjustment}
- 7/15585 {by interference cancellation}
- 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](#))}
- 7/165 employing angle modulation
- 7/17 employing pulse modulation, e.g. pulse code modulation
- 7/185 . . . Space-based or airborne stations; {Stations for satellite systems} ([H04B 7/204 takes precedence](#))
- 7/18502 {Airborne stations}
- 7/18504 {Aircraft used as relay or high altitude atmospheric platform}
- 7/18506 {Communications with or from aircraft, i.e. aeronautical mobile service}
- 7/18508 {with satellite system used as relay, i.e. aeronautical mobile satellite service}
- 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](#))}
- 7/18513 {Transmission in a satellite or space-based system}
- 7/18515 {Transmission equipment in satellites or space-based relays}
- 7/18517 {Transmission equipment in earth stations}
- 7/18519 {Operations control, administration or maintenance}
- 7/18521 {Systems of inter linked satellites, i.e. inter satellite service ([for optical links between satellites H04B 10/118](#))}
- 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](#))}
- 7/18526 {Arrangements for data linking, networking or transporting, or for controlling an end to end session ([data switching networks H04L 12/00](#))}
- 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}
- 7/1853 {Satellite systems for providing telephony service to a mobile station, i.e. mobile satellite service ([for selecting H04W](#))}
- 7/18532 {Arrangements for managing transmission, i.e. for transporting data or a signalling message}

- 7/18534 {for enhancing link reliability, e.g. satellites diversity}
- 7/18536 {Shadowing compensation therefor, e.g. by using an additional terrestrial relay}
- 7/18539 {Arrangements for managing radio, resources, i.e. for establishing or releasing a connection}
- 7/18541 {for handover of resources}
- 7/18543 {for adaptation of transmission parameters, e.g. power control (for detecting or preventing errors in the information received [H04L 1/00](#))}
- 7/18545 {Arrangements for managing station mobility, i.e. for station registration or localisation}
- 7/18547 {for geolocalisation of a station (position fixing by direction or distance determination [G01S 5/00](#))}
- 7/1855 {using a telephonic control signal, e.g. propagation delay variation, Doppler frequency variation, power variation, beam identification}
- 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](#))}
- 7/18554 {using the position provided by an existing geolocalisation system}
- 7/18556 {using a location database}
- 7/18558 {Arrangements for managing communications, i.e. for setting up, maintaining or releasing a call between stations}
- 7/1856 {for call routing}
- 7/18563 {Arrangements for interconnecting multiple systems ([data switching networks H04L 12/00](#))}
- 7/18565 {Arrangements for preventing unauthorised access or for providing user protection ([arrangements for secret or secure communication H04L 9/00](#))}
- 7/18567 {Arrangements for providing additional services to the basic mobile satellite telephony service}
- 7/18569 {Arrangements for system physical machines management, i.e. for construction operations control, administration, maintenance}
- 7/18571 {for satellites; for fixed or mobile stations}
- 7/18573 {for operations control, administration or maintenance}
- 7/18576 {Satellite systems for providing narrowband data service to fixed or mobile stations, e.g. using a minisatellite, a microsatellite (for selecting [H04W](#))}
- 7/18578 {Satellite systems for providing broadband data service to individual earth stations (for selecting [H04W](#); provisions for broadband connection, [H04Q 11/0478](#))}
- 7/1858 {Arrangements for data transmission on the physical system, i.e. for data bit transmission between network components}
- 7/18582 {Arrangements for data linking, i.e. for data framing, for error recovery, for multiple access}
- 7/18584 {Arrangements for data networking, i.e. for data packet routing, for congestion control ([data switching networks H04L 12/00](#))}
- 7/18586 {Arrangements for data transporting, e.g. for an end to end data transport or check}
- 7/18589 {Arrangements for controlling an end to end session, i.e. for initialising, synchronising or terminating an end to end link}
- 7/18591 {Arrangements for interconnecting multiple systems ([data switching networks H04L 12/00](#))}
- 7/18593 {Arrangements for preventing unauthorised access or for providing user protection ([arrangements for secret or secure communication H04L 9/00](#))}
- 7/18595 {Arrangements for adapting broadband applications to satellite systems}
- 7/18597 {Arrangements for system physical machines management, i.e. for construction, operations control, administration, maintenance}
- 7/19 Earth-synchronous stations
- 7/195 Non-synchronous stations
- 7/204 Multiple access
- 7/2041 {Spot beam multiple access}
- 7/2043 {Mixed mode, TDM and FDM systems}
- 7/2045 {SS-FDMA, FDMA satellite switching}
- 7/2046 {SS-TDMA, TDMA satellite switching}
- 7/2048 {Frame structure, synchronisation or frame acquisition in SS-TDMA systems}
- 7/208 Frequency-division multiple access {[FDMA]}
- 7/212 Time-division multiple access {[TDMA]}
- 7/2121 {Channels assignment to the different stations}
- 7/2123 {Variable assignment, e.g. demand assignment}
- 7/2125 {Synchronisation}
- 7/2126 {using a reference station}
- 7/2128 {Changing of the reference station}
- 7/216 Code division or spread-spectrum multiple access ({CDMA, SSMA} ; [spread spectrum techniques in general H04B 1/69](#))
- 7/22 Scatter propagation systems{, e.g. ionospheric, tropospheric or meteor scatter}
- 7/24 for communication between two or more posts ([wireless communication networks H04W](#))
- 7/26 at least one of which is mobile
- 7/2603 {Arrangements for wireless physical layer control ([H04B 7/2612](#) takes precedence)}
- 7/2606 {Arrangements for base station coverage control, e.g. by using relays in tunnels}
- 7/2609 {Arrangements for range control, e.g. by using remote antennas}

- 7/2612 . . . {Arrangements for wireless medium access control, e.g. by allocating physical layer transmission capacity ([H04B 7/2615 - H04B 7/2643 take precedence](#); [H04Q 11/0478](#))}
- 7/2615 . . . {using hybrid frequency-time division multiple access [FDMA-TDMA]}
- 7/2618 . . . {using hybrid code-time division multiple access [CDMA-TDMA]}
- 7/2621 . . . {using frequency division multiple access [FDMA] ([H04B 7/2615 takes precedence](#))}
- 7/2625 . . . {using common wave}
- 7/2628 . . . {using code-division multiple access [CDMA] or spread spectrum multiple access [SSMA] ([H04B 7/2618 takes precedence](#))}
- 7/2631 {for broadband transmission}
- 7/2634 {for channel frequency control}
- 7/2637 {for logical channel control}
- 7/264 {for data rate control}
- 7/2643 . . . {using time-division multiple access [TDMA] ([H04B 7/2615, H04B 7/2618 take precedence](#))}
- 7/2646 {for broadband transmission}
- 7/265 {for channel frequency control}
- 7/2653 {for logical channel control}
- 7/2656 {for structure of frame, burst}
- 7/2659 {for data rate control}
- 7/2662 . . . {Arrangements for Wireless System Synchronisation}
- 7/2665 {Arrangements for Wireless Frequency Division Multiple Access [FDMA] System Synchronisation}
- 7/2668 {Arrangements for Wireless Code-Division Multiple Access [CDMA] System Synchronisation, ([for code acquisition H04B 1/7075, for code tracking H04B 1/7085](#))}
- 7/2671 {Arrangements for Wireless Time-Division Multiple Access [TDMA] System Synchronisation}
- 7/2675 {Frequency synchronisation}
- 7/2678 {Time synchronisation}
- 7/2681 {Synchronisation of a mobile station with one base station}
- 7/2684 {Synchronisation of a mobile station with more than one base station}
- 7/2687 {Inter base stations synchronisation}
- 7/269 {Master/slave synchronisation}
- 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}
- 7/2696 {Over the air autonomous synchronisation, e.g. by monitoring network activity ([H04B 7/2693 takes precedence](#))}

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**

NOTE

Groups [H04B 10/03](#), [H04B 10/07](#), [H04B 10/11](#), [H04B 10/25](#), [H04B 10/27](#), [H04B 10/29](#) and [H04B 10/40 - H04B 10/90](#), and their subgroups are based on IPC2013.01

10/03 . Arrangements for fault recovery

WARNING

This group and its subgroups are not complete pending reclassification; see also [H04B 10/07](#) and subgroups [H04B 10/071 - H04B 10/0799](#)

10/032 . . using working and protection systems {([H04J 14/0287 takes precedence](#))}

10/035 . . using loopbacks

10/038 . . using bypasses

10/07 . Arrangements for monitoring or testing transmission systems; Arrangements for fault measurement of transmission systems

10/0705 . . {Prevention or detection of unauthorized access, e.g. tapping}

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

10/073 . . using an out-of-service signal ([H04B 10/071 takes precedence](#))

10/0731 . . . {Testing or characterisation of optical devices, e.g. amplifiers}

10/075 . . using an in-service signal ([H04B 10/071 takes precedence](#))

10/077 . . . using a supervisory or additional signal

10/0771 {Fault location on the transmission path}

10/0773 {Network aspects, e.g. central monitoring of transmission parameters}

10/0775 {Performance monitoring and measurement of transmission parameters}

10/0777 {Monitoring line amplifier or line repeater equipment}

10/0779 {Monitoring line transmitter or line receiver equipment}

10/079 . . . using measurements of the data signal

10/0791 {Fault location on the transmission path}

10/0793 {Network aspects, e.g. central monitoring of transmission parameters}

10/0795 {Performance monitoring; Measurement of transmission parameters}

10/07951 {Monitoring or measuring chromatic dispersion or PMD}

10/07953 {Monitoring or measuring OSNR, BER or Q}

10/07955 {Monitoring or measuring power}

10/07957 {Monitoring or measuring wavelength}

10/0797 {Monitoring line amplifier or line repeater equipment}

10/0799 {Monitoring line transmitter or line receiver equipment}

10/11 . Arrangements specific to free-space transmission, i.e. transmission through air or vacuum

10/112 . . Line-of-sight transmission over an extended range

10/1121 . . . {One-way transmission}

- 10/1123 . . . {Bidirectional transmission}
 - 10/1125 {using a single common optical path}
 - 10/1127 {using two distinct parallel optical paths}
 - 10/1129 . . . {Arrangements for outdoor wireless networking of information}
 - 10/114 . . Indoor or close-range type systems
 - 10/1141 . . . {One-way transmission}
 - 10/1143 . . . {Bidirectional transmission}
 - 10/1149 . . . {Arrangements for indoor wireless networking of information}
 - 10/116 . . . Visible light communication
- WARNING**
- This group is not complete pending reclassification; see also [H04B 10/114](#) and its other subgroups
- 10/118 . . specially adapted for satellite communication
 - 10/12 . . {Transmission through light guides, e.g. optical fibres ([H04B 10/25](#) takes precedence)}
- WARNING**
- This group and its subgroups is no longer used for classification of new documents as from March 1, 2012. If not indicated differently for a particular subgroup, the backlog of its subgroups is being continuously reclassified to [H04B 10/25](#) - [H04B 10/2587](#)
- 10/14 . . {Terminal stations}
- WARNING**
- This group and its subgroups is no longer used for classification of new documents as from March 1, 2012. The backlog of this group and its subgroups is being continuously reclassified to [H04B 10/40](#) - [H04B 10/69](#)
- 10/142 . . . {Coherent homodyne or heterodyne systems}
 - 10/152 . . . {Non-coherent direct-detection systems}
 - 10/22 . . {Transmission between two stations which are mobile relative to each other}
- WARNING**
- This group and its subgroup is no longer used for classification of new documents as from March 1, 2012. The backlog of this group and its subgroup is being continuously reclassified to [H04B 10/25](#) - [H04B 10/2587](#) and [H04B 10/70](#)
- 10/225 . . {using optical fibre links}
 - 10/25 . . Arrangements specific to fibre transmission {(optical fibres [per se](#), structural details of arrangements comprising optical fibres or other optical elements [G02B 6/00](#))}
- WARNING**
- This group and its subgroups are not complete pending reclassification; see also [H04B 10/12](#) and its subgroups
- 10/2503 . . {Bidirectional transmission}
 - 10/2504 . . {Transmission components ([H04B 10/40](#) takes precedence)}
 - 10/2507 . . for the reduction or elimination of distortion or dispersion
 - 10/25073 . . . {using spectral equalisation, e.g. spectral filtering}
 - 10/25077 . . . {using soliton propagation}
 - 10/2513 . . . due to chromatic dispersion
 - 10/25133 {including a lumped electrical or optical dispersion compensator ([H04B 10/2519](#), [H04B 10/2525](#) take precedence) ; optical dispersion compensators involving optical fibres [per se](#) [G02B 6/293](#)}
 - 10/25137 {using pulse shaping at the transmitter, e.g. pre-chirping or dispersion supported transmission [DST]}
 - 10/2519 using Bragg gratings {(Bragg gratings [per se](#) [G02B 6/02076](#); devices using fibre gratings for dispersion control [per se](#) [G02B 6/29316](#))}
 - 10/2525 using dispersion-compensating fibres {(dispersion-tailored or dispersion compensation fibres [per se](#) [G02B 6/02214](#))}
 - 10/25253 {with dispersion management, i.e. using a combination of different kind of fibres in the transmission system (devices with different kinds of fibres for dispersion control [per se](#) [G02B 6/29374](#))}
 - 10/2531 using spectral inversion
 - 10/2537 . . . due to scattering processes, e.g. Raman or Brillouin scattering
 - 10/2543 . . . due to fibre non-linearities, e.g. Kerr effect {(non-linear optical devices [G02F 1/35](#))}
 - 10/255 Self-phase modulation [SPM]
 - 10/2557 Cross-phase modulation [XPM]
 - 10/2563 Four-wave mixing [FWM]
 - 10/2569 . . . due to polarisation mode dispersion [PMD]
 - 10/2572 . . . {due to forms of polarisation-dependent distortion other than PMD}
 - 10/2575 . . Radio-over-fibre, e.g. radio frequency signal modulated onto an optical carrier {(sub-carrier multiplexing [H04J 14/0298](#))}
 - 10/25751 . . . {Optical arrangements for CATV or video distribution (adaptations of television systems for optical transmission [H04N 7/22](#))}
 - 10/25752 . . . {Optical arrangements for wireless networks}
 - 10/25753 {Distribution optical network, e.g. between a base station and a plurality of remote units (WDM networks in general [H04J 14/0278](#))}
 - 10/25754 {Star network topology}
 - 10/25755 {Ring network topology}
 - 10/25756 {Bus network topology}
 - 10/25758 {between a central unit and a single remote unit by means of an optical fibre}
 - 10/25759 {Details of the reception of RF signal or the optical conversion before the optical fibre}
 - 10/2581 . . Multimode transmission {(mode multiplex systems [H04J 14/04](#))}
 - 10/2587 . . using a single light source for multiple stations
 - 10/27 . . Arrangements for networking {(free-space networks [H04B 10/11](#), WDM networks [H04J 14/0278](#), specific to radio-over-fibre [H04B 10/25753](#))}
 - 10/271 . . {Combination of different networks, e.g. star and ring configuration in the same network or two ring networks interconnected}
 - 10/272 . . Star-type networks {or tree-type networks}
 - 10/2725 . . . {Star-type networks without a headend}
 - 10/275 . . Ring-type networks

- 10/2755 . . . {Ring-type networks with a headend}
 - 10/278 . . Bus-type networks
 - 10/29 . Repeaters
 - 10/291 . . in which processing or amplification is carried out without conversion of the main signal from optical form {(fibre optical amplifiers [per se H01S 3/067](#))}
 - 10/2912 . . . {characterised by the medium used for amplification or processing}
 - 10/2914 {using lumped semiconductor optical amplifiers [SOA] (semiconductor optical amplifiers [per se H01S 5/50](#))}
 - 10/2916 {using Raman or Brillouin amplifiers (Raman or Brillouin amplifiers [per se H01S 3/302](#))}
 - 10/2918 . . . {Two-way repeaters, i.e. repeaters amplifying separate upward and downward lines}
 - 10/293 . . . Signal power control
 - 10/2931 {using AGC ([H04B 10/294 takes precedence](#))}
 - 10/2933 {considering the whole optical path}
 - 10/2935 {with a cascade of amplifiers}
 - 10/2937 {Systems with a repeater placed only at the beginning or the end of the system, i.e. repeaterless systems, e.g. systems with only post and pre-amplification}
 - 10/2939 {Network aspects}
 - 10/294 in a multiwavelength system, e.g. gain equalisation {(for general power control in WDM systems, [see also H04J 14/0221](#))}
 - 10/2941 {using an equalising unit, e.g. a filter ([H04B 10/296 takes precedence](#))}
 - 10/2942 {using automatic gain control [AGC] ([H04B 10/296 takes precedence](#))}
 - 10/296 Transient power control, e.g. due to channel add/drop or rapid fluctuations in the input power
 - 10/297 . . . Bidirectional amplification
 - 10/2971 {A single amplifier for both directions}
 - 10/2972 {Each direction being amplified separately}
 - 10/299 . . . Signal waveform processing, e.g. reshaping or retiming
 - 10/30 . {Transmission systems employing beams of corpuscular radiation ([arrangements for handling beams of corpuscular radiation, e.g. focusing, moderating, G21K 1/00](#))}
- WARNING**
- This group is no longer used for classification of new documents as from March 1, 2012. The backlog of this group and its subgroups is being continuously reclassified to [H04B 10/80](#) and [H04B 10/90](#)
- 10/40 . Transceivers
 - 10/43 . . using a single component as both light source and receiver, e.g. using a photoemitter as a photoreceiver
 - 10/50 . Transmitters
 - 10/501 . . {Structural aspects}
 - 10/502 . . . {LED transmitters}
 - 10/503 . . . {Laser transmitters}
 - 10/504 {using direct modulation}
 - 10/505 {using external modulation}
 - 10/5051 {using a series, i.e. cascade, combination of modulators}
 - 10/5053 {using a parallel, i.e. shunt, combination of modulators}
 - 10/5055 {using a pre-coder}
 - 10/5057 {using a feedback signal generated by analysing the optical output}
 - 10/50572 {to control the modulating signal amplitude including amplitude distortion}
 - 10/50575 {to control the modulator DC bias}
 - 10/50577 {to control the phase of the modulating signal}
 - 10/5059 {using a feed-forward signal generated by analysing the optical or electrical input}
 - 10/50593 {to control the modulating signal amplitude including amplitude distortion}
 - 10/50595 {to control the modulator DC bias}
 - 10/50597 {to control the phase of the modulating signal}
 - 10/506 . . . {Multi-wavelength transmitters ([WDM systems in general H04J 14/02](#))}
 - 10/508 . . Pulse generation, e.g. generation of solitons
 - 10/516 . . Details of coding or modulation
 - 10/5161 . . . {Combination of different modulation schemes}
 - 10/5162 . . . {Return-to-zero modulation schemes}
 - 10/5165 . . . {Carrier suppressed; Single sideband; Double sideband or vestigial}
 - 10/5167 . . . {Duo-binary; Alternative mark inversion; Phase shaped binary transmission}
 - 10/524 . . . Pulse modulation
 - 10/532 . . . Polarisation modulation {, e.g. polarization switching or transmission of a single data stream on two orthogonal polarizations ([polarization multiplexed systems H04J 14/06](#))}
 - 10/54 . . . Intensity modulation
 - 10/541 {Digital intensity or amplitude modulation}
 - 10/548 . . . Phase or frequency modulation
 - 10/556 Digital modulation, e.g. differential phase shift keying [DPSK] or frequency shift keying [FSK]
 - 10/5561 {Digital phase modulation}
 - 10/5563 {Digital frequency modulation}
 - 10/564 . . Power control
 - 10/572 . . Wavelength control
 - 10/58 . . Compensation for non-linear transmitter output
 - 10/588 . . . in external modulation systems
 - 10/60 . Receivers
 - 10/61 . . Coherent receivers {i.e., optical receivers using an optical local oscillator ([delay line interferometer based DPSK optical receivers H04B 10/677](#))}
 - 10/611 . . . {Intradyne, i.e., coherent receivers with a free running local oscillator having a frequency close but not phase-locked to the carrier signal}
 - 10/612 . . . {for optical signals modulated with a format different from binary or higher-order PSK [X-PSK], e.g. QAM, DPSK, FSK, MSK, ASK}
 - 10/613 . . . {including phase diversity, e.g., having in-phase and quadrature branches, as in QPSK coherent receivers}

- 10/614 . . . {comprising one or more polarization beam splitters, e.g. polarization multiplexed [PolMux] X-PSK coherent receivers, polarization diversity heterodyne coherent receivers ([H04J 14/06 takes precedence](#))}
 - 10/615 . . . {Arrangements affecting the optical part of the receiver ([adjustment of the frequency or phase of the local oscillator in homodyne receivers H04B 10/63](#), [use of polarization beam splitters H04B 10/614](#))}
 - 10/6151 {comprising a polarization controller at the receiver's input stage}
 - 10/616 . . . {Details of the electronic signal processing in coherent optical receivers}
 - 10/6161 {Compensation of chromatic dispersion}
 - 10/6162 {Compensation of polarization related effects, e.g., PMD, PDL}
 - 10/6163 {Compensation of non-linear effects in the fiber optic link, e.g. self-phase modulation [SPM], cross-phase modulation [XPM], four wave mixing [FWM]}
 - 10/6164 {Estimation or correction of the frequency offset between the received optical signal and the optical local oscillator}
 - 10/6165 {Estimation of the phase of the received optical signal, phase error estimation or phase error correction}
 - 10/6166 {Polarization demultiplexing, tracking or alignment of orthogonal polarization components ([polarisation multiplex systems H04J 14/06](#))}
 - 10/63 . . . Homodyne {, i.e., coherent receivers where the local oscillator is locked in frequency and phase to the carrier signal}
 - 10/64 . . . Heterodyne {, i.e., coherent receivers where, after the opto-electronic conversion, an electrical signal at an intermediate frequency [fIF] is obtained}
 - 10/66 . . Non-coherent receivers, e.g. using direct detection
 - 10/67 . . . Optical arrangements in the receiver
 - 10/671 {for controlling the input optical signal}
 - 10/672 {for controlling the power of the input optical signal}
 - 10/673 {using an optical preamplifier}
 - 10/674 {using a variable optical attenuator}
 - 10/675 {for controlling the optical bandwidth of the input signal, e.g. spectral filtering}
 - 10/676 {for all-optical demodulation of the input optical signal}
 - 10/677 {for differentially modulated signal, e.g. DPSK signals}
 - 10/69 . . . Electrical arrangements in the receiver
 - 10/691 {Arrangements for optimizing the photodetector in the receiver}
 - 10/6911 {Photodiode bias control, e.g. for compensating temperature variations}
 - 10/693 {Arrangements for optimizing the preamplifier in the receiver}
 - 10/6931 {Automatic gain control of the preamplifier}
 - 10/6932 {Bandwidth control of bit rate adaptation}
 - 10/6933 {Offset control of the differential preamplifier}
 - 10/695 {Arrangements for optimizing the decision element in the receiver, e.g. by using automatic threshold control}
 - 10/697 {Arrangements for reducing noise and distortion}
 - 10/6971 {using equalisation}
 - 10/6972 {using passive filtering}
 - 10/6973 {using noise matching networks}
 - 10/70 . . Photonic quantum communication
- WARNING**
- This group is not complete pending reclassification; see also [H04B 10/30](#)
- 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
 - 10/801 . . {using optical interconnects, e.g. light coupled isolators, circuit board interconnections}
 - 10/802 . . . {for isolation, e.g. using optocouplers}
 - 10/803 . . . {Free space interconnects, e.g. between circuit boards or chips}
 - 10/806 . . {Arrangements for feeding power}
 - 10/807 . . . {Optical power feeding, i.e. transmitting power using an optical signal}
 - 10/808 . . . {Electrical power feeding of an optical transmission system ([power feeding arrangements in general H04B 3/44](#))}
 - 10/85 . . Protection from unauthorised access, e.g. eavesdrop protection
 - 10/90 . . Non-optical transmission systems, e.g. transmission systems employing non-photonic corpuscular radiation
- WARNING**
- This group is not complete pending reclassification; see also [H04B 10/30](#)
- 11/00 Transmission systems employing sonic, ultrasonic or infrasonic waves**
- 13/00 Transmission systems characterised by the medium used for transmission, not provided for in groups [H04B 3/00](#) - [H04B 11/00](#)**
- 13/005 . . {Transmission systems in which the medium consists of the human body}
 - 13/02 . . Transmission systems in which the medium consists of the earth or a large mass of water thereon, e.g. earth telegraphy ([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](#))}
- 14/00 Transmission systems not characterised by the medium used for transmission (details thereof [H04B 1/00](#))**
- 14/002 . . {characterised by the use of a carrier modulation ([using subcarrier modulation H04B 14/08](#))}
 - 14/004 . . {Amplitude modulation}
 - 14/006 . . {Angle modulation}
 - 14/008 . . {Polarisation modulation}

- 14/02 . characterised by the use of pulse modulation (in radio transmission relays [H04B 7/17](#); transmission of digital information per se [H04L](#))
- 14/023 . . {using pulse amplitude modulation}
- 14/026 . . {using pulse time characteristics modulation, e.g. width, position, interval}
- 14/04 . . using pulse code modulation (analogue/digital or digital/analogue conversion per se [H03M 1/00](#); {for TV signals [H04N 7/24](#)})
- 14/042 . . . {Special circuits, e.g. comparators}
- 14/044 . . . {Sample and hold circuits (in general [G11C 27/02](#))}
- 14/046 . . . {Systems or methods for reducing noise or bandwidth}
- 14/048 {Non linear compression or expansion}
- 14/06 . . using differential modulation, e.g. delta modulation (conversion of analogue values to or from differential modulation [H03M 3/00](#))
- 14/062 . . . {using delta modulation or one-bit differential modulation [1DPCM]}
- 14/064 {with adaptive feedback}
- 14/066 . . . {using differential modulation with several bits [NDPCM]}
- 14/068 {with adaptive feedback}
- 14/08 . characterised by the use of a sub-carrier
- 15/00** **Suppression or limitation of noise or interference (by means associated with receiver [H04B 1/10](#))**
- 15/005 . {Reducing noise, e.g. humm, from the supply}
- 15/02 . Reducing interference from electric apparatus by means located at or near the interfering apparatus (structural association with dynamo-electric machines [H02K 11/00](#))
- 15/025 . . {Reducing interference from ignition apparatus of fuel engines (cables with high resistance [H01B](#))}
- 15/04 . . the interference being caused by substantially sinusoidal oscillations, e.g. in a receiver, in a tape-recorder (reducing parasitic oscillations [H03B](#), [H03F](#); screening [H05K 9/00](#))
- 15/06 . . . by local oscillators of receivers
- 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](#))**
- 17/0082 . {using service channels; using auxiliary channels}
- 17/0085 . . {using test signal generators}
- 17/0087 . . {using auxiliary channels or channel simulators}
- 17/10 . of transmitters
- 17/101 . . {for measurement of parameters}
- 17/102 . . . {of radiated power at antenna port}
- 17/103 . . . {of reflected power, e.g. return loss}
- 17/104 . . . {of other parameters, e.g. DC offset, delay or propagation times}
- 17/11 . . for calibration
- 17/12 . . . of transmit antennas, e.g. of the amplitude or phase
- 17/13 . . . of power amplifiers, e.g. gain or non-linearity
- 17/14 . . . of the whole transmission and reception path, e.g. self-test loop-back
- 17/15 . . Performance testing
- 17/16 . . . Test equipment located at the transmitter
- 17/17 . . . Detection of non-compliance or faulty performance, e.g. response deviations ([H04B 17/18](#) takes precedence)
- 17/18 . . . Monitoring during normal operation
- 17/19 . . . Self-testing arrangements
- 17/20 . of receivers
- 17/21 . . for calibration; for correcting measurements
- 17/23 . . Indication means, e.g. displays, alarms, audible means
- 17/24 . . with feedback of measurements to the transmitter
- 17/26 . . using historical data, averaging values or statistics
- 17/27 . . for locating or positioning the transmitter
- 17/29 . . Performance testing
- 17/30 . of propagation channels
- 17/309 . . Measuring or estimating channel quality parameters
- 17/318 . . . Received signal strength
- 17/327 Received signal code power [RSCP]
- 17/336 . . . Signal-to-interference ratio [SIR] or carrier-to-interference ratio [CIR]
- 17/345 . . . Interference values ([H04B 17/336](#) takes precedence)
- 17/354 . . . Adjacent channel leakage power
- 17/364 . . . Delay profiles
- 17/373 . . Predicting channel quality parameters
- 17/382 . . for resource allocation, admission control or handover
- 17/391 . . Modelling the propagation channel
- 17/3911 . . . {Fading models or fading generators}
- 17/3912 . . . {Simulation models}
- 17/3913 . . . {Predictive models}
- 17/40 . of relay systems
- 17/401 . . {with selective localization}
- 17/402 . . . {using different frequencies}
- 17/403 {generated by local oscillators}
- 17/404 {selected by local filters}
- 17/405 {generated by local multipliers, dividers, modulators}
- 17/406 . . . {using coded addresses}
- 17/407 . . {without selective localization}
- 17/408 . . . {using successive loop-backs}
- 17/409 . . . {by means of resistance, voltage or current measurement}
- 2201/00** **Indexing scheme relating to details of transmission systems not covered by a single group of [H04B 3/00](#) - [H04B 13/00](#)**
- 2201/69 . Orthogonal indexing scheme relating to spread spectrum techniques in general
- 2201/692 . . Cognitive radio
- 2201/694 . . WPAN
- 2201/696 . . relating to Downlink
- 2201/698 . . relating to Uplink
- 2201/707 . . relating to direct sequence modulation
- 2201/70701 . . . featuring pilot assisted reception
- 2201/70702 . . . Intercell-related aspects
- 2201/70703 . . . using multiple or variable rates
- 2201/70705 Rate detection
- 2201/70706 . . . with means for reducing the peak-to-average power ratio
- 2201/70707 . . . Efficiency-related aspects
- 2201/70709 with discontinuous detection
- 2201/7071 with dynamic control of receiver resources

2201/70711	. . . . . with modular structure	2203/5433	. . . Remote metering
2201/70713	. . . . Reducing computational requirements	2203/5437	. . . Wired telephone
2201/70714	. . . . Reducing hardware requirements	2203/5441	. . . Wireless systems or telephone
2201/70715	. . . with application-specific features	2203/5445	. . . Local network
2201/70716	. . . Quadrature	2203/545	. . . Audio/video application, e.g. interphone
2201/70718	. . . Particular systems or standards	2203/5454	. . . Adapter and plugs
2201/70719	. . . . CDMA2000	2203/5458	. . . Monitor sensor; Alarm systems
2201/7072	. . . . HDR	2203/5462	. . Systems for power line communications
2201/70722	. . . . HSDPA/HSUPA	2203/5466	. . . using three phases conductors
2201/70723	. . . . . Multi-carrier HSPA	2203/547	. . . via DC power distribution
2201/70724	. . . . UMTS	2203/5475	. . . adapted for drill or well combined with data transmission
2201/70726	. . . . Asynchronous CDMA	2203/5479	. . . using repeaters
2201/70727	. . . using fast Fourier transform	2203/5483	. . . using coupling circuits
2201/70728	. . . Frequency aspects	2203/5487	. . . . cables
2201/7073	. . . Direct sequence modulation synchronisation	2203/5491	. . . using filtering and bypassing
2201/70733	. . . . 2D search	2203/5495	. . . having measurements and testing channel
2201/70736	. . . . DSA		
2201/7097	. . . Direct sequence modulation interference	2210/00	Indexing scheme relating to optical transmission systems
2201/709709	. . . . Methods of preventing interference	2210/003	. Devices including multiple stages, e.g., multi-stage optical amplifiers or dispersion compensators
2201/709718	. . . . Determine interference	2210/006	. Devices for generating or processing an RF signal by optical means
2201/709727	. . . . GRAKE type RAKE receivers	2210/07	. Monitoring an optical transmission system using a supervisory signal (OAM for WDM transmission H04J 14/0272)
2201/709736	. . . . Hybrid interference mitigation schemes	2210/071	. . using alarms
2201/709745	. . . . Iterative interference mitigation schemes	2210/072	. . using an overhead signal
2201/709754	. . . . Blind joint detection	2210/074	. . using a superposed, over-modulated signal
2201/709763	. . . . Joint detection using feedback	2210/075	. . using a pilot tone
2201/709772	. . . . Joint detection using feedforward	2210/077	. . using a separate fibre
2201/709781	. . . . Linear detectors for joint detection	2210/078	. . using a separate wavelength
2201/70979	. . . . Fat finger issues in RAKE receivers	2210/08	. Shut-down or eye-safety
2201/713	. . Frequency hopping	2210/25	. Distortion or dispersion compensation
2201/71307	. . . Partial band interference	2210/252	. . after the transmission line, i.e. post-compensation
2201/71315	. . . Wide band interference	2210/254	. . before the transmission line, i.e. pre-compensation
2201/71323	. . . Adaptive systems	2210/256	. . at the repeater, i.e. repeater compensation
2201/7133	. . . Asymmetric systems	2210/258	. . treating each wavelength or wavelength band separately
2201/71338	. . . Asynchronous systems	2210/516	. Optical conversion of optical modulation formats, e.g., from optical ASK to optical PSK
2201/71346	. . . Bluetooth	2210/517	. Optical NRZ to RZ conversion, or <i>vice versa</i>
2201/71353	. . . Fast frequency hopping	2215/00	Reducing interference at the transmission system level
2201/71361	. . . Slow frequency hopping	2215/061	. Reduction of burst noise, e.g. in TDMA systems
2201/71369	. . . OFCHM	2215/062	. . by inhibiting burst transmission
2201/71376	. . . Threshold	2215/063	. . by smoothing the transmission power envelope
2201/71384	. . . Look-up tables	2215/064	. Reduction of clock or synthesizer reference frequency harmonics
2201/71392	. . . Asymmetric systems	2215/065	. . by changing the frequency of clock or reference frequency
2201/7163	. . Orthogonal indexing scheme relating to impulse radio	2215/066	. . by stopping a clock generator
2201/71632	. . . Diversity	2215/067	. . by modulation dispersion
2201/71634	. . . Applied to ranging	2215/068	. . by avoiding a reception frequency range
2201/71636	. . . Transmitted reference	2215/069	. Reduction of switch mode power supply ripple
2201/71638	. . . Spectrum issues		
2203/00	Indexing scheme relating to line transmission systems		
2203/54	. Aspects of powerline communications not already covered by H04B 3/54 and its subgroups (not used)		
2203/5404	. . Methods of transmitting or receiving signals via power distribution lines		
2203/5408	. . . using protocols		
2203/5412	. . . by modifying wave form of the power source		
2203/5416	. . . by adding signals to the wave form of the power source		
2203/542	. . . using zero crossing information		
2203/5425	. . . improving S/N by matching impedance, noise reduction, gain control		
2203/5429	. . Applications for powerline communications		