

# CPC COOPERATIVE PATENT CLASSIFICATION

## G PHYSICS (NOTES omitted)

### INSTRUMENTS

## G10 MUSICAL INSTRUMENTS; ACOUSTICS (NOTES omitted)

## G10H ELECTROPHONIC MUSICAL INSTRUMENTS (electronic circuits in general [H03](#))

### NOTE

This subclass covers musical instruments in which individual notes are constituted as electric oscillations under the control of a performer and the oscillations are converted to sound-vibrations by a loud-speaker or equivalent instrument.

### WARNING

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

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| <b>1/00</b> | <b>Details of electrophonic musical instruments</b><br>(keyboards applicable also to other musical instruments <a href="#">G10B</a> , <a href="#">G10C</a> ; arrangements for producing a reverberation or echo sound <a href="#">G10K 15/08</a> )                                       | 1/053  | . . . during execution only {(voice controlled instruments <a href="#">G10H 5/005</a> )}   |
| 1/0008      | . {Associated control or indicating means (teaching of music per se <a href="#">G09B 15/00</a> )}  | 1/0535 | . . . . {by switches incorporating a mechanical vibrator, the envelope of the mechanical vibration being used as modulating signal}  |
| 1/0016      | . . {Means for indicating which keys, frets or strings are to be actuated, e.g. using lights or leds}  | 1/055  | . . . . by switches with variable impedance elements   |
| 1/0025      | . . {Automatic or semi-automatic music composition, e.g. producing random music, applying rules from music theory or modifying a musical piece (automatically producing a series of tones <a href="#">G10H 1/26</a> )}   | 1/0551 | . . . . . {using variable capacitors}  |
|             |  | 1/0553 | . . . . . {using optical or light-responsive means}  |
|             |  | 1/0555 | . . . . . {using magnetic or electromagnetic means}  |
|             |  | 1/0556 | . . . . . {using piezo-electric means}   |
| 1/0033      | . {Recording/reproducing or transmission of music for electrophonic musical instruments (of accompaniment <a href="#">G10H 1/361</a> )}  | 1/0558 | . . . . . {using variable resistors}   |
| 1/0041      | . . {in coded form (see also <a href="#">G10H 7/002</a> )}   | 1/057  | . . . . by envelope-forming circuits   |
| 1/005       | . . . {on magnetic tape}   | 1/0575 | . . . . . {using a data store from which the envelope is synthesized (tones synthesized from a data store <a href="#">G10H 7/00</a> )}   |
| 1/0058      | . . . {Transmission between separate instruments or between individual components of a musical system ( <a href="#">G10H 1/0083</a> takes precedence)}   | 1/06   | . . Circuits for establishing the harmonic content of tones {, or other arrangements for changing the tone colour}   |
| 1/0066      | . . . . {using a MIDI interface}   | 1/08   | . . . by combining tones ( <a href="#">G10H 1/14</a> , <a href="#">G10H 1/16</a> take precedence; chord <a href="#">G10H 1/38</a> ; analysis or synthesis of sound waves per se <a href="#">G10L</a> ) |
| 1/0075      | . . . . . {with translation or conversion means for unavailable commands, e.g. special tone colors}  | 1/10   | . . . . for obtaining chorus, celeste or ensemble effects (continuous modulation <a href="#">G10H 1/043</a> )  |
| 1/0083      | . . {using wireless transmission, e.g. radio, light, infrared}   | 1/12   | . . . by filtering complex waveforms ( <a href="#">G10H 1/14</a> , <a href="#">G10H 1/16</a> take precedence)  |
| 1/0091      | . {Means for obtaining special acoustic effects (combined with modulation <a href="#">G10H 1/043</a> )}  | 1/125  | . . . . {using a digital filter (digital filters per se <a href="#">H03H 17/02</a> )}  |
| 1/02        | . Means for controlling the tone frequencies, e.g. attack, decay; Means for producing special musical effects, e.g. vibrato, glissando {(for instruments using voltage controlled oscillators and amplifiers or voltage controlled oscillators and filters <a href="#">G10H 5/002</a> )} | 1/14   | . . . during execution (modulation during execution <a href="#">G10H 1/053</a> {; voice controlled instruments <a href="#">G10H 5/005</a> )}   |
| 1/04        | . . by additional modulation   | 1/16   | . . . by non-linear elements ( <a href="#">G10H 1/14</a> takes precedence; generation of non-sinusoidal basic tones <a href="#">G10H 5/10</a> )  |
| 1/043       | . . . Continuous modulation  | 1/18   | . Selecting circuits   |
| 1/045       | . . . . by electromechanical means   | 1/181  | . . {Suppression of switching-noise}   |
| 1/047       | . . . . by acousto-mechanical means, e.g. rotating speakers or sound deflectors  | 1/182  | . . {Key multiplexing ( <a href="#">G10H 1/185</a> takes precedence)}  |

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| 1/183       | . . {Channel-assigning means for polyphonic instruments}   | 3/02        | . using mechanical interrupters  |
| 1/185       | . . . {associated with key multiplexing}   | 3/03        | . using pick-up means for reading recorded waves, e.g. on rotating discs {drums, tapes or wires}   |
| 1/186       | . . . . {Microprocessor-controlled keyboard and assigning means}   | 3/06        | . . using photoelectric pick-up means  |
| 1/187       | . . . {using multiplexed channel processors ( <a href="#">G10H 1/186 takes precedence</a> )}   | 3/08        | . . using inductive pick-up means  |
| 1/188       | . . . {with means to assign more than one channel to any single key}   | 3/09        | . . . using tapes or wires   |
| 1/20        | . . for transposition  | 3/10        | . . using capacitive pick-up means   |
| 1/22        | . . for suppressing tones; Preference networks   | 3/12        | . using mechanical resonant generators, e.g. strings or percussive instruments, the tones of which are picked up by electromechanical transducers, the electrical signals being further manipulated or amplified and subsequently converted to sound by a loudspeaker or equivalent instrument   |
| 1/24        | . . for selecting plural preset register stops   | 3/125       | . . {Extracting or recognising the pitch or fundamental frequency of the picked up signal}   |
| 1/26        | . . for automatically producing a series of tones ( <a href="#">musical toys A63H 5/00</a> )   | 3/14        | . . using mechanically actuated vibrators with pick-up means ( <a href="#">G10H 3/24 takes precedence</a> )  |
| 1/28        | . . . to produce arpeggios   | 3/143       | . . . {characterised by the use of a piezo-electric or magneto-strictive transducer (piezo-electric or magnetostrictive loudspeakers for mechanical vibrations <a href="#">B06B</a> , <a href="#">G10K</a> ; piezo-electric or magneto-strictive transducers or microphones <a href="#">H04R 15/00</a> , <a href="#">H04R 17/00</a> )}   |
| 1/30        | . . . to reiteratively sound two tones   | 3/146       | . . . {using a membrane, e.g. a drum; Pick-up means for vibrating surfaces, e.g. housing of an instrument}   |
| 1/32        | . Constructional details   | 3/16        | . . . using a reed   |
| 1/34        | . . Switch arrangements, e.g. keyboards or mechanical switches peculiar to electrophonic musical instruments ( <a href="#">G10H 1/055 takes precedence</a> ); keyboards applicable also to other musical instruments <a href="#">G10B</a> , <a href="#">G10C</a> )         | 3/18        | . . . using a string, e.g. electric guitar {(mechanical features <a href="#">G10D 1/085</a> )}   |
| 1/342       | . . . {for guitar-like instruments with or without strings and with a neck on which switches or string-fret contacts are used to detect the notes being played (electric guitars in which the tones are generated by the vibration of strings <a href="#">G10H 3/18</a> )} | 3/181       | . . . . {Details of pick-up assemblies}  |
| 1/344       | . . . {Structural association with individual keys (electrically operated wind-actuated organs <a href="#">G10B 3/22</a> )}  | 3/182       | . . . . {using two or more pick-up means for each string}  |
| 1/346       | . . . . {Keys with an arrangement for simulating the feeling of a piano key, e.g. using counterweights, springs, cams}   | 3/183       | . . . . {in which the position of the pick-up means is adjustable}   |
| 1/348       | . . . . {Switches actuated by parts of the body other than the fingers (pedals or pedal mechanisms for wind-actuated organs <a href="#">G10B 3/14</a> , for pianos <a href="#">G10C 3/26</a> )}  | 3/185       | . . . . {in which the tones are picked up through the bridge structure}  |
| 1/36        | . Accompaniment arrangements   | 3/186       | . . . . {Means for processing the signal picked up from the strings (filtering <a href="#">G10H 1/12</a> )}  |
| 1/361       | . . {Recording/reproducing of accompaniment for use with an external source, e.g. karaoke systems}   | 3/187       | . . . . . {for distorting the signal, e.g. to simulate tube amplifiers (changing the tone color by non-linear elements <a href="#">G10H 1/16</a> )}  |
| 1/363       | . . . {using optical disks, e.g. CD, CD-ROM, to store accompaniment information in digital form (recording/reproducing by optical means <a href="#">G11B 7/00</a> )}   | 3/188       | . . . . . {for converting the signal to digital format (transmission using a MIDI interface <a href="#">G10H 1/0066</a> )}   |
| 1/365       | . . . {the accompaniment information being stored on a host computer and transmitted to a reproducing terminal by means of a network, e.g. public telephone lines}   | 3/20        | . . . using a tuning fork, rod or tube   |
| 1/366       | . . . {with means for modifying or correcting the external signal, e.g. pitch correction, reverberation, changing a singer's voice}  | 3/22        | . . using electromechanically actuated vibrators with pick-up means ( <a href="#">G10H 3/24 takes precedence</a> )   |
| 1/368       | . . . {displaying animated or moving pictures synchronized with the music or audio part}   | 3/24        | . . incorporating feedback means, e.g. acoustic  |
| 1/38        | . . Chord  | 3/26        | . . . using electric feedback  |
| 1/383       | . . . {Chord detection and/or recognition, e.g. for correction, or automatic bass generation}  | <b>5/00</b> | <b>Instruments in which the tones are generated by means of electronic generators (<a href="#">G10H 7/00 takes precedence</a>)</b>   |
| 1/386       | . . . {One-finger or one-key chord systems}  | 5/002       | . {Instruments using voltage controlled oscillators and amplifiers or voltage controlled oscillators and filters, e.g. Synthesisers}   |
| 1/40        | . . Rhythm ( <a href="#">metronomes G04F 5/02</a> )  | 5/005       | . {Voice controlled instruments}   |
| 1/42        | . . . comprising tone forming circuits   | 5/007       | . {Real-time simulation of <a href="#">G10B</a> , <a href="#">G10C</a> , <a href="#">G10D</a> -type instruments using recursive or non-linear techniques, e.g. waveguide networks, recursive algorithms (establishing the harmonic content of tones by non-linear elements <a href="#">G10H 1/16</a> ; synthesising waveforms using a recursive algorithm <a href="#">G10H 7/12</a> )} |
| 1/44        | . Tuning means   | 5/02        | . using generation of basic tones  |
| 1/46        | . Volume control   |             |  |
| <b>3/00</b> | <b>Instruments in which the tones are generated by electromechanical means</b>   |             |  |

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|----------------|---|----------|---|
| 5/04           | . . with semiconductor devices as active elements<br>( <a href="#">G10H 3/10</a> , <a href="#">G10H 3/12</a> take precedence)   | 2210/015 | . . Accompaniment break, i.e. interrupting then restarting  |
| 5/06           | . . tones generated by frequency multiplication or division of a basic tone   | 2210/021 | . . Background music, e.g. for video sequences, elevator music ( <a href="#">musical accompaniment G10H 2210/005</a> )  |
| 5/07           | . . . resulting in complex waveforms  | 2210/026 | . . for games, e.g. videogames  |
| 5/08           | . . tones generated by heterodyning   | 2210/031 | . . Musical analysis, i.e. isolation, extraction or identification of musical elements or musical parameters from a raw acoustic signal or from an encoded audio signal ( <a href="#">neural networks for electrophonic musical instruments or musical processing G10H 2250/311</a> ) |
| 5/10           | . . using generation of non-sinusoidal basic tones, e.g. saw-tooth {( <a href="#">G10H 5/06</a> takes precedence)}  | 2210/036 | . . of musical genre, i.e. analysing the style of musical pieces, usually for selection, filtering or classification  |
| 5/12           | . . using semiconductor devices as active elements  | 2210/041 | . . based on mfcc [mel -frequency spectral coefficients]  |
| 5/14           | . . using electromechanical resonators, e.g. quartz crystals, as frequency determining element<br>{( <a href="#">G10H 5/02</a> , <a href="#">G10H 5/08</a> take precedence)}  | 2210/046 | . . for differentiation between music and non-music signals, based on the identification of musical parameters, e.g. based on tempo detection   |
| 5/16           | . . using cathode ray tubes   | 2210/051 | . . for extraction or detection of onsets of musical sounds or notes, i.e. note attack timings  |
| <b>7/00</b>    | <b>Instruments in which the tones are synthesised from a data store, e.g. computer organs (synthesis of acoustic waves not specific to musical instruments <a href="#">G10K 15/02</a>, <a href="#">G10L</a>)</b>  | 2210/056 | . . for extraction or identification of individual instrumental parts, e.g. melody, chords, bass; Identification or separation of instrumental parts by their characteristic voices or timbres  |
| 7/002          | . . {using a common processing for different operations or calculations, and a set of microinstructions (programme) to control the sequence thereof}  | 2210/061 | . . for extraction of musical phrases, isolation of musically relevant segments, e.g. musical thumbnail generation, or for temporal structure analysis of a musical piece, e.g. determination of the movement sequence of a musical work  |
| 7/004          | . . {with one or more auxiliary processor in addition to the main processing unit}  | 2210/066 | . . for pitch analysis as part of wider processing for musical purposes, e.g. transcription, musical performance evaluation; Pitch recognition, e.g. in polyphonic sounds; Estimation or use of missing fundamental   |
| 7/006          | . . {using two or more algorithms of different types to generate tones, e.g. according to tone color or to processor workload}  | 2210/071 | . . for rhythm pattern analysis or rhythm style recognition ( <a href="#">rhythm pattern per se G10H 2210/341</a> )   |
| 7/008          | . . {Means for controlling the transition from one tone waveform to another ( <a href="#">glissando or legato per se G10H 1/02</a> )}   | 2210/076 | . . for extraction of timing, tempo; Beat detection ( <a href="#">tempo display G10H 2220/081</a> ; <a href="#">tempo control G10H 2210/375</a> )   |
| 7/02           | . . in which amplitudes at successive sample points of a tone waveform are stored in one or more memories   | 2210/081 | . . for automatic key or tonality recognition, e.g. using musical rules or a knowledge base   |
| 7/04           | . . in which amplitudes are read at varying rates, e.g. according to pitch  | 2210/086 | . . for transcription of raw audio or music data to a displayed or printed staff representation or to displayable MIDI-like note-oriented data, e.g. in pianoroll format  |
| 7/045          | . . . {using an auxiliary register or set of registers, e.g. a shift-register, in which the amplitudes are transferred before being read}   | 2210/091 | . . for performance evaluation, i.e. judging, grading or scoring the musical qualities or faithfulness of a performance, e.g. with respect to pitch, tempo or other timings of a reference performance  |
| 7/06           | . . in which amplitudes are read at a fixed rate, the read-out address varying stepwise by a given value, e.g. according to pitch   | 2210/095 | . . Inter-note articulation aspects, e.g. legato or staccato  |
| 7/08           | . . by calculating functions or polynomial approximations to evaluate amplitudes at successive sample points of a tone waveform   | 2210/101 | . . Music Composition or musical creation; Tools or processes therefor  |
| 7/10           | . . using coefficients or parameters stored in a memory, e.g. Fourier coefficients ( <a href="#">G10H 7/12</a> takes precedence)  | 2210/105 | . . Composing aid, e.g. for supporting creation, edition or modification of a piece of music  |
| 7/105          | . . . {using Fourier coefficients}  | 2210/111 | . . Automatic composing, i.e. using predefined musical rules  |
| 7/12           | . . by means of a recursive algorithm using one or more sets of parameters stored in a memory and the calculated amplitudes of one or more preceding sample points  | 2210/115 | . . . using a random process to generate a musical note, phrase, sequence or structure ( <a href="#">using a random process to build a rhythm pattern G10H 2210/356</a> ; <a href="#">random rhythm pattern selection G10H 2210/366</a> )   |
| <b>2210/00</b> | <b>Aspects or methods of musical processing having intrinsic musical character, i.e. involving musical theory or musical parameters or relying on musical knowledge, as applied in electrophonic musical tools or instruments (<a href="#">processing aspects without intrinsic musical character G10H 2250/00</a>)</b> | 2210/121 | . . . . using a knowledge base  |
| 2210/005       | . . Musical accompaniment, i.e. complete instrumental rhythm synthesis added to a performed melody, e.g. as output by drum machines ( <a href="#">background music G10H 2210/021</a> )  |          |   |
| 2210/011       | . . Fill-in added to normal accompaniment pattern   |          |   |

- 2210/125 . . Medley, i.e. linking parts of different musical pieces in one single piece, e.g. sound collage, DJ mix
- 2210/131 . . Morphing, i.e. transformation of a musical piece into a new different one, e.g. remix
- 2210/136 . . . Morphing interpolation, i.e. interpolating in pitch, harmony or time, tempo or rhythm, between two different musical pieces, e.g. to produce a new musical work
- 2210/141 . . Riff, i.e. improvisation, e.g. repeated motif or phrase, automatically added to a piece, e.g. in real time
- 2210/145 . . Composing rules, e.g. harmonic or musical rules, for use in automatic composition; Rule generation algorithms therefor
- 2210/151 . . using templates, i.e. incomplete musical sections, as a basis for composing
- 2210/155 . Musical effects
- 2210/161 . . Note sequence effects, i.e. sensing, altering, controlling, processing or synthesising a note trigger selection or sequence, e.g. by altering trigger timing, triggered note values, adding improvisation or ornaments, also rapid repetition of the same note onset, e.g. on a piano, guitar, e.g. rasgueado, drum roll ([smooth variations of amplitude, pitch or timbre within a note without distinct onsets, e.g. vibrato G10H 2210/201](#))
- 2210/165 . . . Humanizing effects, i.e. causing a performance to sound less machine-like, e.g. by slightly randomising pitch or tempo
- 2210/171 . . . Ad-lib effects, i.e. adding a musical phrase or improvisation automatically or on player's request, e.g. one-finger triggering of a note sequence
- 2210/175 . . . Fillnote, i.e. adding isolated notes or passing notes to the melody
- 2210/181 . . . Gracenote, i.e. adding a different and very short ornamental note at the beginning or at the end of a melody note, e.g. appoggiatura, acciaccatura, sparsh-swar
- 2210/185 . . . Arpeggio, i.e. notes played or sung in rapid sequence, one after the other, rather than ringing out simultaneously, e.g. as a chord; Generators therefor, i.e. arpeggiators; Discrete glissando effects on instruments not permitting continuous glissando, e.g. xylophone or piano, with stepwise pitch variation and on which distinct onsets due to successive note triggerings can be heard
- 2210/191 . . . Tremolo, tremulando, trill or mordent effects, i.e. repeatedly alternating stepwise in pitch between two note pitches or chords, without any portamento between the two notes ([other common forms of tremolo, e.g. same note repetition, bisbigliando, amplitude tremolo, tremulants, percussion roll G10H 2210/161 or G10H 2210/205](#))
- 2210/195 . . Modulation effects, i.e. smooth non-discontinuous variations over a time interval, e.g. within a note, melody or musical transition, of any sound parameter, e.g. amplitude, pitch, spectral response, playback speed ([stepwise or discontinuous variations over time, e.g. sequence effects G10H 2210/161](#))
- 2210/201 . . . Vibrato, i.e. rapid, repetitive and smooth variation of amplitude, pitch or timbre within a note or chord ([discontinuities, note sequences or separate note onsets during the variation G10H 2210/161](#); tremolo, i.e. stepwise pitch alternation [G10H 2210/191](#))
- 2210/205 . . . . Amplitude vibrato, i.e. repetitive smooth loudness variation without pitch change or rapid repetition of the same note, bisbigliando, amplitude tremolo, tremulants ([percussion roll G10H 2210/161](#))
- 2210/211 . . . . Pitch vibrato, i.e. repetitive and smooth variation in pitch, e.g. as obtainable with a whammy bar or tremolo arm on a guitar ([non-repetitive smooth pitch variation, e.g. glissando G10H 2220/221](#); repeatedly alternating stepwise in pitch between two notes [G10H 2210/191](#))
- 2210/215 . . . . Rotating vibrato, i.e. simulating rotating speakers, e.g. Leslie effect
- 2210/221 . . . Glissando, i.e. pitch smoothly sliding from one note to another, e.g. gliss, glide, slide, bend, smear, sweep; (["discrete glissando" on instruments not permitting continuous glissando, like the xylophone or the piano, e.g. arpeggio G10H 2210/185](#))
- 2210/225 . . . . Portamento, i.e. smooth continuously variable pitch-bend, without emphasis of each chromatic pitch during the pitch change, which only stops at the end of the pitch shift, as obtained, e.g. by a MIDI pitch wheel or trombone ([pitch bend with emphasis of each chromatic pitch during pitch change, e.g. glissando, G10H 2210/221](#))
- 2210/231 . . . Wah-wah spectral modulation, i.e. tone color spectral glide obtained by sweeping the peak of a bandpass filter up or down in frequency, e.g. according to the position of a pedal, by automatic modulation or by voice formant detection; control devices therefor, e.g. wah pedals for electric guitars
- 2210/235 . . . Flanging or phasing effects, i.e. creating time and frequency dependent constructive and destructive interferences, obtained, e.g. by using swept comb filters or a feedback loop around all-pass filters with gradually changing non-linear phase response or delays
- 2210/241 . . . Scratch effects, i.e. emulating playback velocity or pitch manipulation effects normally obtained by a disc-jockey manually rotating a LP record forward and backward
- 2210/245 . . Ensemble, i.e. adding one or more voices, also instrumental voices
- 2210/251 . . . Chorus, i.e. automatic generation of two or more extra voices added to the melody, e.g. by a chorus effect processor or multiple voice harmonizer, to produce a chorus or unison effect, wherein individual sounds from multiple sources with roughly the same timbre converge and are perceived as one
- 2210/255 . . . . Unison, i.e. two or more voices or instruments sounding substantially the same pitch, e.g. at the same time



- 2210/261 . . . Duet, i.e. automatic generation of a second voice, descant or counter melody, e.g. of a second harmonically interdependent voice by a single voice harmonizer or automatic composition algorithm, e.g. for fugue, canon or round composition, which may be substantially independent in contour and rhythm
- 2210/265 . . Acoustic effect simulation, i.e. volume, spatial, resonance or reverberation effects added to a musical sound, usually by appropriate filtering or delays ([physical modeling of room acoustics G10H 2250/531](#); [formant synthesis G10H 2250/481](#))
- 2210/271 . . . Sympathetic resonance, i.e. adding harmonics simulating sympathetic resonance from other strings
- 2210/275 . . . . Helmholtz resonance effect, i.e. using, exciting or emulating air resonance in a cavity
- 2210/281 . . . Reverberation or echo
- 2210/285 . . . . Electromechanical effectors therefor, i.e. using springs or similar electromechanical audio delay units
- 2210/291 . . . . Reverberator using both direct, i.e. dry, and indirect, i.e. wet, signals or waveforms, indirect signals having sustained one or more virtual reflections
- 2210/295 . . . Spatial effects, musical uses of multiple audio channels, e.g. stereo ([Helmholtz resonance effects G10H 2210/275](#); [reverberation or echo G10H 2210/281](#))
- 2210/301 . . . . Soundscape or sound field simulation, reproduction or control for musical purposes, e.g. surround or 3D sound; Granular synthesis
- 2210/305 . . . . Source positioning in a soundscape, e.g. instrument positioning on a virtual soundstage, stereo panning or related delay or reverberation changes; Changing the stereo width of a musical source
- 2210/311 . . Distortion, i.e. desired non-linear audio processing to change the tone color, e.g. by adding harmonics or deliberately distorting the amplitude of an audio waveform ([distortion functions G10H 2250/201](#), [G10H 2250/205](#))
- 2210/315 . . Dynamic effects for musical purposes, i.e. musical sound effects controlled by the amplitude of the time domain audio envelope, e.g. loudness-dependent tone color or musically desired dynamic range compression or expansion ([crossfading or envelope processing per se G10H 2250/025](#))
- 2210/321 . . Missing fundamental, i.e. creating the psychoacoustic impression of a missing fundamental tone through synthesis of higher harmonics, e.g. to play bass notes pitched below the frequency range of reproducing speakers
- 2210/325 . Musical pitch modification ([pitch analysis G10H 2210/066](#); [musical effects G10H 2210/155](#))
- 2210/331 . . Note pitch correction, i.e. modifying a note pitch or replacing it by the closest one in a given scale
- 2210/335 . . . Chord correction, i.e. modifying one or several notes within a chord, e.g. to correct wrong fingering or to improve harmony ([natural chords G10H 2210/586](#))
- 2210/341 . Rhythm pattern selection, synthesis or composition ([Rhythm analysis G10H 2210/071](#); [accompaniment G10H 2210/005](#))
- 2210/346 . . Pattern variations, break or fill-in ([accompaniment G10H 2210/005](#))
- 2210/351 . . Inserting a drum roll, e.g. as pattern break
- 2210/356 . . Random process used to build a rhythm pattern
- 2210/361 . . Selection among a set of pre-established rhythm patterns
- 2210/366 . . Random process affecting a selection among a set of pre-established patterns
- 2210/371 . . Rhythm syncopation, i.e. timing offset of rhythmic stresses or accents, e.g. note extended from weak to strong beat or started before strong beat
- 2210/375 . Tempo or beat alterations; Music timing control ([tempo display G10H 2220/081](#); [tempo analysis G10H 2210/076](#); [humanising effect G10H 2210/165](#); [scratch effect G10H 2210/241](#))
- 2210/381 . . Manual tempo setting or adjustment ([tempo setting by interpretation of conducting movements G10H 2220/206](#))
- 2210/385 . . Speed change, i.e. variations from preestablished tempo, tempo change, e.g. faster or slower, accelerando or ritardando, without change in pitch ([with repetitive changes in pitch, e.g. scratch DJ effects G10H 2210/241](#))
- 2210/391 . . Automatic tempo adjustment, correction or control
- 2210/395 . Special musical scales, i.e. other than the 12-interval equally tempered scale; Special input devices therefor ([keyboards G10H 2220/221](#))
- 2210/401 . . Microtonal scale, i.e. continuous scale of pitches, also interval-free input devices, e.g. continuous keyboards for violin, singing voice or trombone synthesis
- 2210/405 . . Honkytonk scale, for producing, e.g. a honkytonk piano effect, i.e. with deliberately detuned notes within each octave
- 2210/411 . . Railsback scale, i.e. stretched scale for piano tuning with bass keys having lower pitches and treble keys having higher pitches than foreseen by the equally tempered scale
- 2210/415 . . Equally tempered scale, i.e. note tuning scale in which every pair of adjacent notes has an identical frequency ratio equal to 2 to the power 1/n if the scale has n notes per octave
- 2210/421 . . . 10 equal intervals per octave
- 2210/425 . . . 19 equal intervals per octave, offering better major thirds, far better minor thirds and overall far greater consonance than normal 12-semitone equal temperament, at the cost of a flatter fifth
- 2210/431 . . . Quarter tone scale, i.e. 24 equal intervals per octave, e.g. for Arabic music ([other Arabic scales, double harmonic scale or major locrian scale G10H 2210/511](#))
- 2210/435 . . . Huygens scale, i.e. 31 equal intervals per octave, provides near-just major thirds, and provides decent matches for harmonics up to at least 13, despite a slightly less accurate fifth than the standard 12 interval equally tempered scale

- 2210/441 . . . Janko scale, i.e. 41 equal intervals per octave, e.g. as used in the "tonal plexus" keyboard with 211 keys per octave arranged in 12 staggered columns, i.e. in 41 regions of 5 keys each plus 6 duplicate enharmonic keys ([janko keyboards, i.e. not using the janko scale G10H 2220/251](#))
- 2210/445 . . . 45 equal intervals per octave
- 2210/451 . . . Holder scale or Holdrian comma, i.e. 53 equal intervals per octave, with 31 intervals equal to an almost just perfect fifth; Keyboards therefor, e.g. "generalized keyboard" of Robert Holford Macdowall Bosanquet
- 2210/455 . . . 70 equal intervals per octave
- 2210/461 . . . Jankovski scale or twelfth tone scale, i.e. octave divided in 72 equal intervals, e.g. moria in Byzantine music theory ([janko keyboard G10H 2220/251](#))
- 2210/465 . . . 84 equal intervals per octave
- 2210/471 . . Natural or just intonation scales, i.e. based on harmonics consonance such that most adjacent pitches are related by harmonically pure ratios of small integers ([pitch correction only when playing chords to ensure chord consonance G10H 2210/586](#))
- 2210/476 . . . Zarlino scales, e.g. octave subdivision based on the pitch ratios  $9/8 + 10/9 + 16/15 + 9/8 + 10/9 + 9/8 + 16/15$
- 2210/481 . . . Pythagorean scale, i.e. in which the frequency relationships of all intervals should be based on the perfect fifth, with ratio 3:2
- 2210/486 . . . Werckmeister scales, i.e. family of scales with 12 mostly rational intervals, e.g. for organs
- 2210/491 . . . Meantone scales, i.e. in which all non-octave intervals are generated from a stack of tempered perfect fifths; and wherein, by choosing an appropriate size for major and minor thirds, the syntonic comma is tempered to unison, e.g. quarter comma meantone, syntonic comma, d'Alembert modified meantone
- 2210/496 . . . Redfield scales, i.e. 12 intervals per octave, based on note ratios equal to  $(2^{**}p)(3^{**}q)(5^{**}r)$  with p, q, r positive or negative integers
- 2210/501 . . . Altered natural scale, i.e. 12 unequal intervals not foreseen in the above
- 2210/506 . . . Danielou 53 interval scale, with note ratios equal to  $(2^{**}p)(3^{**}q)(5^{**}r)$ , with p, q, r positive or negative integers ([53 interval equally tempered Holder scale G10H 2210/451](#))
- 2210/511 . . Arabic scales, i.e. either double harmonic scale or major locrian scale; vosta or zaid modes ([17 or 24 equal interval scales used in arabic music G10H 2210/415 or G10H 2210/431](#))
- 2210/515 . . Balinese scales, e.g. for gamelan, with instruments played in pairs and tuned slightly apart to produce interference beating ideally at a consistent speed for all pairs of notes in all registers; Balinese pentatonic scales, e.g. Balinese slendro scale, or five-tone modes of the heptatonic pelog scale, itself substantially a 7-note subset of 9-tone equal temperament ([pentatonic javanese slendro scale G10H 2210/541](#))
- 2210/521 . . . Polynesian scales
- 2210/525 . . . Diatonic scales, e.g. aeolian, ionian or major, dorian, locrian, lydian, mixolydian, phrygian, i.e. seven note, octave-repeating musical scales comprising five whole steps and two half steps for each octave, in which the two half steps are separated from each other by either two or three whole steps
- 2210/531 . . . Bluenote scale, i.e. 7-tone scale of  $2+1+2+1+3+1+2$  semitones ([hexatonic blues scales G10H 2210/535](#))
- 2210/535 . . . Hexatonal or hexatonic scales, i.e. six pitches or notes per octave, e.g. whole tone scale, augmented scale, Prometheus scale, blues scale
- 2210/541 . . . Pentatonal or pentatonic scale, i.e. five pitches or notes per octave, e.g. basic chinese musical scale, black piano keys, javanese gamelan slendro scale, japanese shakuhachi flute ([balinese pentatonic scales with deliberate interference beating, e.g. balinese gamelan slendro scale G10H 2210/515](#))
- 2210/545 . . . Yona Nuki, i.e. a family of pentatonic scales without fourth or seventh, e.g. Hirajoshi, Iwato, Kumoi, Sino-indian [Raga Amritavarsini] used, e.g. for japanese traditional music, koto or shamisen tunings
- 2210/551 . . . Okinawa pentatonic scale, i.e. Okinawan min'yo, e.g. including the half-steps omitted in the min'yo pentatonic scale used in the main japanese islands
- 2210/555 . . Tonality processing, involving the key in which a musical piece or melody is played ([tonality analysis, detection or identification G10H 2210/081](#))
- 2210/561 . . . Changing the tonality within a musical piece
- 2210/565 . . . Manual designation or selection of a tonality
- 2210/571 . . Chords; Chord sequences ([special keyboards for playing chords, e.g. accordion G10H 2230/245, janko keyboard G10H 2220/251](#))
- 2210/576 . . . Chord progression
- 2210/581 . . . Chord inversion
- 2210/586 . . . Natural chords, i.e. adjustment of individual note pitches in order to generate just intonation chords ([scale natural G10H 2210/471; chord correction G10H 2210/335; musical analysis G10H 2210/031](#))
- 2210/591 . . . Chord with a suspended note, e.g. 2nd or 4th
- 2210/596 . . . Chord augmented
- 2210/601 . . . Chord diminished
- 2210/606 . . . Chord ninth, i.e. including ninth or above, e.g. 11th or 13th
- 2210/611 . . . Chord ninth or above, to which is added a tension note
- 2210/616 . . . Chord seventh, major or minor
- 2210/621 . . . Chord seventh dominant
- 2210/626 . . . Chord sixth
- 2220/00 Input/output interfacing specifically adapted for electrophonic musical tools or instruments**
- 2220/005 . . Non-interactive screen display of musical or status data ([graphical user interfaces specifically adapted for electrophonic musical instruments G10H 2220/091; fingering displays G10H 2220/041](#))
- 2220/011 . . Lyrics displays, e.g. for karaoke applications

- 2220/015 . . Musical staff, tablature or score displays, e.g. for score reading during a performance. ([graphical musical score editing G10H 2220/121](#); [musical score displays resulting from a transcription G10H 2210/086](#))
- 2220/021 . Indicator, i.e. non-screen output user interfacing, e.g. visual or tactile instrument status or guidance information using lights, LEDs, seven segments displays ([screen displays G10H 2220/005](#), [graphical user interfaces adapted for electrophonic musical instruments G10H 2220/091](#); [tactile key feedback G10H 2220/311](#))
- 2220/026 . . associated with a key or other user input device, e.g. key indicator lights
- 2220/031 . . . Blinking or flashing indicator lights
- 2220/036 . . . Chord indicators, e.g. displaying note fingering when several notes are to be played simultaneously as a chord
- 2220/041 . . . Remote key fingering indicator, i.e. fingering shown on a display separate from the instrument itself or substantially disjoint from the keys
- 2220/046 . . . Drumpad indicator, e.g. drumbeat strike indicator light on a drumpad or rim
- 2220/051 . . . Fret indicator, e.g. for playing guidance on a string instrument or string instrument emulator
- 2220/056 . . . Hand or finger indicator, e.g. for indicating which hand or which specific finger should be used
- 2220/061 . . . LED, i.e. using a light-emitting diode as indicator
- 2220/066 . . . . Colour, i.e. indications with two or more different colours
- 2220/071 . . . Pedal indicator, e.g. guitar pedal status lights
- 2220/076 . . . String indicator, e.g. on a stringed musical instrument for indicating which string is to be played, plucked or bowed
- 2220/081 . . Beat indicator, e.g. marks or flashing LEDs to indicate tempo or beat positions ([analysis tempo G10H 2210/076](#); [tempo or beat alterations G10H 2210/375](#); [rhythm pattern G10H 2210/341](#))
- 2220/086 . . Beats per minute [bpm] indicator, i.e. displaying a tempo value, e.g. in words or as numerical value in beats per minute ([analysis tempo G10H 2210/076](#); [tempo or beat alterations G10H 2210/375](#))
- 2220/091 . Graphical user interface [GUI] specifically adapted for electrophonic musical instruments, e.g. interactive musical displays, musical instrument icons or menus; Details of user interactions therewith ([GUI in general G06F 3/048](#))
- 2220/096 . . using a touch screen ([touch screen note input, e.g. using a displayed keyboard G10H 2220/241](#); [personal digital assistant \[PDA\] G10H 2230/015](#))
- 2220/101 . . for graphical creation, edition or control of musical data or parameters
- 2220/106 . . . using icons, e.g. selecting, moving or linking icons, on-screen symbols, screen regions or segments representing musical elements or parameters
- 2220/111 . . . . for graphical orchestra or soundstage control, e.g. on-screen selection or positioning of instruments in a virtual orchestra, using movable or selectable musical instrument icons ([soundstage sound field effects G10H 2210/305](#))
- 2220/116 . . . for graphical editing of sound parameters or waveforms, e.g. by graphical interactive control of timbre, partials or envelope ([non-graphical waveform editing G10H 2250/615](#))
- 2220/121 . . . for graphical editing of a musical score, staff or tablature ([mere score display G10H 2220/015](#); [score transcription G10H 2210/086](#))
- 2220/126 . . . for graphical editing of individual notes, parts or phrases represented as variable length segments on a 2D or 3D representation, e.g. graphical edition of musical collage, remix files or pianoroll representations of MIDI-like files
- 2220/131 . . . for abstract geometric visualisation of music, e.g. for interactive editing of musical parameters linked to abstract geometric figures
- 2220/135 . Musical aspects of games or videogames; Musical instrument-shaped game input interfaces ([game background music G10H 2210/026](#); [musical game scoring or performance evaluation G10H 2210/091](#))
- 2220/141 . . Games on or about music, i.e. based on musical knowledge, e.g. musical multimedia quizzes ([teaching of music per se G09B 15/00](#))
- 2220/145 . . Multiplayer musical games, e.g. karaoke-like multiplayer videogames
- 2220/151 . . Musical difficulty level setting or selection
- 2220/155 . User input interfaces for electrophonic musical instruments ([graphical user interfaces specifically adapted for electrophonic musical instruments G10H 2220/091](#); [input means in general G06F 3/00](#))
- 2220/161 . . with 2D or x/y surface coordinates sensing ([graphical user interface or touchscreen input G10H 2220/091](#); [microtonal keyboard G10H 2210/401](#))
- 2220/165 . . for string input, i.e. special characteristics in string composition or use for sensing purposes, e.g. causing the string to become its own sensor ([transducers, e.g. piezoelectric or magnetic G10H 2220/461](#); [plectrum sensors G10H 2220/191](#); [guitar neck sensors or fret switches G10H 2220/301](#))
- 2220/171 . . . using electrified strings, e.g. strings carrying coded or AC signals for transducing, sustain, fret length or fingering detection
- 2220/175 . . . using nonmagnetic string materials, e.g. nylon; Sensors specially adapted therefor ([piezoelectric transducers G10H 2220/525](#))
- 2220/181 . . . by nonresonant wave interaction, i.e. string sensing using wavelengths unrelated to string resonant wavelengths, e.g. ultrasonic waves, microwave or light waves, propagated along a musical instrument string to measure its fret length, e.g. for MIDI transcription
- 2220/185 . . Stick input, e.g. drumsticks with position or contact sensors ([stick for music conducting applications, e.g. conductor baton movement detection G10H 2220/206](#))
- 2220/191 . . Plectrum or pick sensing, e.g. for detection of string striking or plucking ([Plectra in general, e.g. for stringed musical instruments G10D 3/173](#))

- 2220/195 . . Particle energy or molecular configuration used as musical control data
- 2220/201 . . for movement interpretation, i.e. capturing and recognizing a gesture or a specific kind of movement, e.g. to control a musical instrument
- 2220/206 . . . Conductor baton movement detection used to adjust rhythm, tempo or expressivity of, e.g. the playback of musical pieces
- 2220/211 . . for microphones, i.e. control of musical parameters either directly from microphone signals or by physically associated peripherals, e.g. karaoke control switches or rhythm sensing accelerometer within the microphone casing ([microphones per se H04R](#))
- 2220/215 . . using a magnetic strip on a card or sheet
- 2220/221 . . Keyboards, i.e. configuration of several keys or key-like input devices relative to one another ([details of individual keys or key-like devices G10H 2220/265](#); [continuous keyboards or keyboards implementing specific musical scales, e.g. quartertone G10H 2210/395](#); [switch matrix keyboards, e.g. on guitar necks G10H 2220/295](#))
- 2220/226 . . . Whole-tone keyboards, i.e. having as many keys on the upper row as on the lower row
- 2220/231 . . . Alphanumeric, used for musical purposes or with additional musical features, e.g. typewriter or pc-type keyboard reconfigured such that letters or symbols are assigned to musical notes
- 2220/236 . . . representing an active musical staff or tablature, i.e. with key-like position sensing at the expected note positions on the staff ([active keyboard representation on a touchscreen G10H 2220/241](#))
- 2220/241 . . . on touchscreens, i.e. keys, frets, strings, tablature or staff displayed on a touchscreen display for note input purposes
- 2220/246 . . . with reduced number of keys per octave, some notes missing
- 2220/251 . . . arranged as 2D or 3D arrays; Keyboards ergonomically organised for playing chords or for transposing, e.g. Janko keyboard ([special keyboards for playing chords, e.g. accordion G10H 2230/245](#))
- 2220/256 . . . foldable or rollable, e.g. for transport
- 2220/261 . . . Numeric keypad used for musical purposes, e.g. musical input via a telephone or calculator-like keyboard
- 2220/265 . . Key design details; Special characteristics of individual keys of a keyboard; Key-like musical input devices, e.g. finger sensors, pedals, potentiometers, selectors ([keyboards G10H 2220/221](#), [special musical scales G10H 2210/395](#))
- 2220/271 . . . Velocity sensing for individual keys, e.g. by placing sensors at different points along the kinematic path for individual key velocity estimation by delay measurement between adjacent sensor signals ([velocity sensing common to several keys G10H 2220/221](#))
- 2220/275 . . . Switching mechanism or sensor details of individual keys, e.g. details of key contacts, hall effect or piezoelectric sensors used for key position or movement sensing purposes; Mounting thereof
- 2220/281 . . . . with two contacts, switches or sensor triggering levels along the key kinematic path
- 2220/285 . . . . with three contacts, switches or sensor triggering levels along the key kinematic path
- 2220/291 . . . . with four or more contacts, switches or sensor triggering levels along the key kinematic path
- 2220/295 . . . . Switch matrix, e.g. contact array common to several keys, the actuated keys being identified by the rows and columns in contact
- 2220/301 . . . . . Fret-like switch array arrangements for guitar necks
- 2220/305 . . . using a light beam to detect key, pedal or note actuation ([light beams in general G10H 2220/411](#))
- 2220/311 . . . with controlled tactile or haptic feedback effect; output interfaces therefor
- 2220/315 . . for joystick-like proportional control of musical input; Videogame input devices used for musical input or control, e.g. gamepad, joysticks ([joysticks per se G06F 3/033](#), [G05G 9/047](#), [A63F 13/20](#))
- 2220/321 . . Garment sensors, i.e. musical control means with trigger surfaces or joint angle sensors, worn as a garment by the player, e.g. bracelet, intelligent clothing ([vital parameter sensing G10H 2220/371](#); [wearable interfaces in general G06F 3/00](#))
- 2220/326 . . . Control glove or other hand or palm-attached control device
- 2220/331 . . . Ring or other finger-attached control device
- 2220/336 . . . Control shoe or boot, i.e. sensor-equipped lower part of lower limb, e.g. shoe, toe ring, sock, ankle bracelet or leg control attachment ([garment sensors G10H 2220/321](#); [floor sensing devices, e.g. sensing mats G10H 2220/341](#))
- 2220/341 . . Floor sensors, e.g. platform or groundsheet with sensors to detect foot position, balance or pressure, steps, stepping rhythm, dancing movements or jumping ([shoe sensors G10H 2220/336](#))
- 2220/346 . . . Hopscotch sensing mats, i.e. including several step sensing zones, e.g. for detection of rhythmic dancing in time to background music according to stepping indications ([games involving music G10H 2220/135](#); [performance evaluation or scoring G10H 2210/091](#), [videogames in general A63F 13/00](#))
- 2220/351 . . Environmental parameters, e.g. temperature, ambient light, atmospheric pressure, humidity, used as input for musical purposes
- 2220/355 . . . Geolocation input, i.e. control of musical parameters based on location or geographic position, e.g. provided by GPS, WiFi network location databases or mobile phone base station position databases
- 2220/361 . . Mouth control in general, i.e. breath, mouth, teeth, tongue or lip-controlled input devices or sensors detecting, e.g. lip position, lip vibration, air pressure, air velocity, air flow or air jet angle



- 2220/365 . . . Bow control in general, i.e. sensors or transducers on a bow; Input interface or controlling process for emulating a bow, bowing action or generating bowing parameters, e.g. for appropriately controlling a specialised sound synthesiser ([bowed string instrument sound synthesis per se G10H 2250/445](#); [electronic stringed instrument details G10H 2230/075](#))
- 2220/371 . . . Vital parameter control, i.e. musical instrument control based on body signals, e.g. brainwaves, pulsation, temperature, perspiration; biometric information ([signals from body positions or movements G10H 2220/321](#))
- 2220/376 . . . using brain waves, e.g. EEG
- 2220/381 . . . using glottal signals from an electroglottograph [EGG] or from a neck-worn glottis pick-up device
- 2220/386 . . . using genetic information [DNA] or unique characterizing features of individuals, e.g. fingerprints, iris, facial or vocal features
- 2220/391 . . . Angle sensing for musical purposes, using data from a gyroscope, gyrometer or other angular velocity or angular movement sensing device ([angles measured by an accelerometer or gravimeter G10H 2220/395](#); [angles calculated from 3D position sensing G10H 2220/401](#); [player body joint angle sensing G10H 2220/321](#))
- 2220/395 . . . Acceleration sensing or accelerometer use, e.g. 3D movement computation by integration of accelerometer data, angle sensing with respect to the vertical, i.e. gravity sensing. ([conductor baton movement sensing G10H 2220/206](#), [angle sensing without reference to gravity G10H 2220/391](#); [player body joint angle sensing G10H 2220/321](#))
- 2220/401 . . . 3D sensing, i.e. three-dimensional (x, y, z) position or movement sensing. ([movement pattern or gesture sensing G10H 2220/201](#); [geolocation sensing G10H 2220/355](#), [3D sensing with accelerometer G10H 2220/395](#))
- 2220/405 . . . Beam sensing or control, i.e. input interfaces involving substantially immaterial beams, radiation, or fields of any nature, used, e.g. as a switch as in a light barrier, or as a control device, e.g. using the theremin electric field sensing principle ([theremins G10H 2230/051](#))
- 2220/411 . . . Light beams ([key actuation detection using light G10H 2220/305](#))
- 2220/415 . . . . Infrared beams
- 2220/421 . . . . Laser beams
- 2220/425 . . . Radio control, i.e. input or control device involving a radio frequency signal
- 2220/431 . . . . Use of microwaves
- 2220/435 . . . Ultrasound, i.e. input or control device involving inaudible pressure waves, e.g. focused as a beam
- 2220/441 . . . Image sensing, i.e. capturing images or optical patterns for musical purposes or musical control purposes ([image analysis, inspection, positioning or tracking G06T 7/00](#), [pattern recognition G06K 9/00](#))
- 2220/445 . . . Bar codes or similar machine readable optical code patterns, e.g. two dimensional mesh pattern, for musical input or control purposes ([bar codes G06K 7/10](#))
- 2220/451 . . . . Scanner input, e.g. scanning a paper document such as a musical score for automated conversion into a musical file format
- 2220/455 . . . . Camera input, e.g. analyzing pictures from a video camera and using the analysis results as control data
- 2220/461 . . . Transducers, i.e. details, positioning or use of assemblies to detect and convert mechanical vibrations or mechanical strains into an electrical signal, e.g. audio, trigger or control signal ([contact microphones for use on musical instrument H04R 1/46](#))
- 2220/465 . . . Bridge-positioned, i.e. assembled to or attached with the bridge of a stringed musical instrument
- 2220/471 . . . . at bottom, i.e. transducer positioned at the bottom of the bridge, between the bridge and the body of the instrument
- 2220/475 . . . . on the side, i.e. picking up vibrations from a side of the bridge
- 2220/481 . . . . on top, i.e. transducer positioned between the strings and the bridge structure itself
- 2220/485 . . . . One transducer per string, e.g. 6 transducers for a 6 string guitar
- 2220/491 . . . . Two or more transducers per string, e.g. 8 transducers on a 4-string violin bridge
- 2220/495 . . . . Single bridge transducer, common to all strings
- 2220/501 . . . . Two or more bridge transducers, at least one transducer common to several strings
- 2220/505 . . . Dual coil electrodynamic string transducer, e.g. for humbucking, to cancel out parasitic magnetic fields
- 2220/511 . . . . Stacked, i.e. one coil on top of the other
- 2220/515 . . . . Staggered, i.e. two coils side by side
- 2220/521 . . . Hall effect transducers or similar magnetic field sensing semiconductor devices, e.g. for string vibration sensing or key movement sensing
- 2220/525 . . . Piezoelectric transducers for vibration sensing or vibration excitation in the audio range; Piezoelectric strain sensing, e.g. as key velocity sensor; Piezoelectric actuators, e.g. key actuation in response to a control voltage
- 2220/531 . . . . made of piezoelectric film
- 2220/535 . . . . . Piezoelectric polymer transducers, e.g. made of stretched and poled polyvinylidene difluoride [PVDF] sheets in which the molecular chains of vinylidene fluoride CH<sub>2</sub>-CF<sub>2</sub> have been oriented in a preferential direction
- 2220/541 . . . . using piezoceramics, e.g. lead titanate [PbTiO<sub>3</sub>], zinc oxide [Zn<sub>2</sub>O<sub>3</sub>], lithium niobate [LiNbO<sub>3</sub>], sodium tungstate [NaWO<sub>3</sub>], bismuth ferrite [BiFeO<sub>3</sub>]
- 2220/545 . . . . . Barium titanate piezoceramics [BaTiO<sub>3</sub>]
- 2220/551 . . . . . using LZT or PZT [lead-zirconate-titanate] piezoceramics [Pb[Zr<sub>x</sub>Ti<sub>1-x</sub>]O<sub>3</sub>, 0=x=1]
- 2220/555 . . . . Bimorph transducers, i.e. piezoelectric bending multilayer structures with one or more piezoelectric layers, e.g. piezo on metal, serial bimorph or parallel bimorph
- 2220/561 . . . Piezoresistive transducers, i.e. exhibiting vibration, pressure, force or movement - dependent resistance, e.g. strain gauges, carbon-doped elastomers or polymers for piezoresistive drumpads, carbon microphones

- 2220/565 . . Shielding, electromagnetic or magnetic, e.g. for transducers, i.e. for controlling, orienting or suppressing magnetic fields or for preventing unintentional generation, propagation and reception of electromagnetic energy in electrophonic musical instruments, their vicinity or their interconnections ([dual coil humbucking transducers G10H 2220/505](#))
- 2230/00 General physical, ergonomic or hardware implementation of electrophonic musical tools or instruments, e.g. shape or architecture**
- 2230/005 . Device type or category
- 2230/011 . . Hybrid piano, e.g. combined acoustic and electronic piano with complete hammer mechanism as well as key-action sensors coupled to an electronic sound generator
- 2230/015 . . PDA [personal digital assistant] or palmtop computing devices used for musical purposes, e.g. portable music players, tablet computers, e-readers or smart phones in which mobile telephony functions need not be used ([touch-screen interfaces G10H 2220/096](#))
- 2230/021 . . Mobile ringtone, i.e. generation, transmission, conversion or downloading of ringing tones or other sounds for mobile telephony; Special musical data formats or protocols herefor ([mobile telephone transmission specifically adapted for electrophonic musical tools or instruments G10H 2240/251](#))
- 2230/025 . Computing or signal processing architecture features
- 2230/031 . . Use of cache memory for electrophonic musical instrument processes, e.g. for improving processing capabilities or solving interfacing problems
- 2230/035 . . Power management, i.e. specific power supply solutions for electrophonic musical instruments, e.g. auto power shut-off, energy saving designs, power conditioning, connector design, avoiding inconvenient wiring
- 2230/041 . . Processor load management, i.e. adaptation or optimization of computational load or data throughput in computationally intensive musical processes to avoid overload artifacts, e.g. by deliberately suppressing less audible or less relevant tones or decreasing their complexity
- 2230/045 . Special instrument [spint], i.e. mimicking the ergonomics, shape, sound or other characteristic of a specific acoustic musical instrument category
- 2230/051 . . Spint theremin, i.e. mimicking electrophonic musical instruments in which tones are controlled or triggered in a touch-free manner by interaction with beams, jets or fields, e.g. theremin, air guitar, water jet controlled musical instrument, i.e. hydro-lauphone
- 2230/055 . . Spint toy, i.e. specifically designed for children, e.g. adapted for smaller fingers or simplified in some way; Musical instrument-shaped game input interfaces with simplified control features
- 2230/061 . . Spint organ, i.e. mimicking acoustic musical instruments with pipe organ or harmonium features; Electrophonic aspects of acoustic pipe organs or harmoniums; MIDI-like control therefor
- 2230/065 . . Spint piano, i.e. mimicking acoustic musical instruments with piano, cembalo or spinet features, e.g. with piano-like keyboard; Electrophonic aspects of piano-like acoustic keyboard instruments; MIDI-like control therefor
- 2230/071 . . . Spint harpsichord, i.e. mimicking plucked keyboard instruments, e.g. harpsichord, virginal, muselar, spinet, clavictherium, ottavino, archicembalo
- 2230/075 . . Spint stringed, i.e. mimicking stringed instrument features, electrophonic aspects of acoustic stringed musical instruments without keyboard; MIDI-like control therefor ([string instrument sound synthesis G10H 2250/441](#))
- 2230/081 . . . Spint viola
- 2230/085 . . . Spint cello
- 2230/091 . . . Spint hurdygurdy, i.e. mimicking characteristics of acoustic instruments with rosined wheel rubbing against strings
- 2230/095 . . . Spint zither, i.e. mimicking any neckless stringed instrument in which the strings do not extend beyond the sounding board
- 2230/101 . . . . Spint koto, i.e. mimicking any traditional asian-style plucked zither with movable bridges
- 2230/105 . . . . Spint dulcimer, i.e. mimicking any zither-like instrument with small hand-played mallet hammers ([Appalachian dulcimer G10H 2230/095](#))
- 2230/111 . . . Spint ukulele, i.e. mimicking any smaller guitar-like flat bridge string instruments
- 2230/115 . . . Spint sitar, i.e. mimicking any long-necked plucked string instrument with a large number of additional non-playable sympathetic resonating strings or an additional gourd-like resonating chamber
- 2230/121 . . . Spint mandolin, i.e. mimicking instruments of the lute family with hard sounding board, e.g. with strings arranged and tuned in pairs for tremolo playing ([lute with skin-like sounding board G10H 2230/151](#))
- 2230/125 . . . Spint harp, i.e. mimicking harp-like instruments, e.g. large size concert harp, with pedal
- 2230/131 . . . . Spint harp celtic, i.e. mimicking smaller sized harps without pedal, eg. celtic harp, lever harp, folk harp, Irish harp
- 2230/135 . . . Spint guitar, i.e. guitar-like instruments in which the sound is not generated by vibrating strings, e.g. guitar-shaped game interfaces
- 2230/141 . . . . Spint guitar drum, i.e. mimicking a guitar used at least partly as a percussion instrument
- 2230/145 . . . . Spint guitar keyboard, i.e. mimicking a combination of a guitar-like instrument, with or without strings, and a piano-like keyboard, e.g. with white and black keys arranged like on a piano
- 2230/151 . . . Spint banjo, i.e. mimicking a stringed instrument with a piece of plastic or animal skin stretched over a circular frame or gourd, e.g. shamisen or other skin-covered lutes

- 2230/155 . . . Spint wind instrument, i.e. mimicking musical wind instrument features; Electrophonic aspects of acoustic wind instruments; MIDI-like control therefor. ([wind instrument sound synthesis G10H 2250/461](#); [mouth control, e.g. breath G10H 2220/361](#); [natural aerodynamic noise synthesis, e.g. wind G10H 2250/431](#))
- 2230/161 . . . Spint whistle, i.e. mimicking wind instruments in which the air is split against an edge, e.g. musical whistles, three tone samba whistle, penny whistle, pea whistle; whistle-emulating mouth interfaces; MIDI control therefor, e.g. for calliope
- 2230/165 . . . . Spint recorder, i.e. mimicking any end-blown whistle flute with several finger holes, e.g. recorders, xiao, kaval, shakuhachi and hocchiku flutes
- 2230/171 . . . Spint brass mouthpiece, i.e. mimicking brass-like instruments equipped with a cupped mouthpiece, e.g. allowing it to be played like a brass instrument, with lip controlled sound generation as in an acoustic brass instrument; Embouchure sensor or MIDI interfaces therefor
- 2230/175 . . . . Spint trumpet, i.e. mimicking cylindrical bore brass instruments, e.g. bugle
- 2230/181 . . . . Spint trombone, i.e. mimicking trombones or other slide musical instruments permitting a continuous musical scale ([microtonal scale G10H 2210/401](#))
- 2230/185 . . . . Spint horn, i.e. mimicking conical bore brass instruments ([hornpipes G10H 2230/241](#))
- 2230/191 . . . . . Spint French horn, i.e. mimicking an orchestral horn with valves for switching pipe lengths ([English horn G10H 2230/231](#))
- 2230/195 . . . Spint flute, i.e. mimicking or emulating a transverse flute or air jet sensor arrangement therefor, e.g. sensing angle, lip position, etc, to trigger octave change; ([input breath G10H 2220/361](#); [end-blown flutes G10H 2230/161](#))
- 2230/201 . . . . Spint piccolo, i.e. half-size transverse flute, e.g. ottavino ([piccolo clarinet G10H 2230/241](#))
- 2230/205 . . . Spint reed, i.e. mimicking or emulating reed instruments, sensors or interfaces therefor
- 2230/211 . . . . Spint harmonica, i.e. mimicking mouth operated wind instruments with multiple tuned free reeds, a.k.a. harmonica, blues harp, mouth organ, pitch pipe, ChengGong, ([free reed instruments not operated by mouth, e.g. accordion G10H 2230/245](#))
- 2230/215 . . . . Spint bagpipe, i.e. mimicking instruments with enclosed reeds fed from a constant reservoir; Bagpipe-like electrophonic instrument; Midi-like interfaces therefor
- 2230/221 . . . . Spint saxophone, i.e. mimicking conical bore musical instruments with single reed mouthpiece, e.g. saxophones, electrophonic emulation or interfacing aspects therefor
- 2230/225 . . . . Spint oboe, i.e. mimicking double reed woodwind with conical bore, e.g. oboe
- 2230/231 . . . . . Spint english horn
- 2230/235 . . . . Spint bassoon, i.e. mimicking double reed low range woodwind with doubled back conical bore, e.g. bassoon
- 2230/241 . . . . Spint clarinet, i.e. mimicking any member of the single reed cylindrical bore woodwind instrument family, e.g. piccolo clarinet, octocontrabass, chalumeau, hornpipes, zhaleika
- 2230/245 . . . Spint accordion, i.e. mimicking accordions; Electrophonic instruments with one or more typical accordion features, e.g. special accordion keyboards or bellows, electrophonic aspects of mechanical accordions, Midi-like control therefor
- 2230/251 . . . Spint percussion, i.e. mimicking percussion instruments; Electrophonic musical instruments with percussion instrument features; Electrophonic aspects of acoustic percussion instruments, MIDI-like control therefor ([gensound percussion G10H 2250/435](#))
- 2230/255 . . . Spint xylophone, i.e. mimicking any multi-toned percussion instrument with a multiplicity of tuned resonating bodies, regardless of their material or shape, e.g. xylophone, vibraphone, lithophone, metallophone, marimba, balafon, ranat, gamban, anklong
- 2230/261 . . . Spint triangle
- 2230/265 . . . Spint maracas, i.e. mimicking shells or gourds filled with seeds or dried beans, fitted with a handle, e.g. maracas, rumba shakers, shac-shacs
- 2230/271 . . . Spint gong, i.e. mimicking circular flat, nipped or bowl-shaped metallic percussion instruments ([G10H 2230/321 takes precedence](#))
- 2230/275 . . . Spint drum
- 2230/281 . . . . Spint drum assembly, i.e. mimicking two or more drums or drumpads assembled on a common structure, e.g. drum kit ([multi-toned percussion instruments G10H 2230/255](#))
- 2230/285 . . . . Spint drum tomtom, i.e. mimicking side-mounted drums without snares, e.g. in a drumkit
- 2230/291 . . . . Spint drum bass, i.e. mimicking bass drums; Pedals or interfaces therefor
- 2230/295 . . . . Spint drum brush, i.e. mimicking use of a brush to generate or trigger a percussive sound
- 2230/301 . . . . Spint drum rim, i.e. mimicking using or striking the rim of a drum or percussion instrument, rimshot; Interfacing aspects of the generation of different drumsound harmonic contents when a drum sensor is struck closer to the rim
- 2230/305 . . . . Spint drum snare, i.e. mimicking using strands of snares made of curled metal wire, metal cable, plastic cable, or gut cords stretched across the drumhead, e.g. snare drum, side drum, military drum, field drum
- 2230/311 . . . . Spint bongo
- 2230/315 . . . . Spint conga
- 2230/321 . . . Spint cymbal, i.e. mimicking thin center-held gong-like instruments made of copper-based alloys, e.g. ride cymbal, china cymbal, sizzle cymbal, swish cymbal, zill, i.e. finger cymbals

- 2230/325 . . . Spint cymbal crash, i.e. mimicking thin-edged cymbals designed to produce a loud, sharp "crash", either mounted on a stand and played with a drum stick, e.g. crash cymbal, or played in pairs by hand, e.g. clash cymbals
- 2230/331 . . . Spint cymbal hihat, e.g. mimicking high-hat cymbal; Details of the pedal interface, of the pedal action emulation or of the generation of the different sounds resulting from this pedal action
- 2230/335 . . . Spint cyldrum [cylindrical body hit or struck on the curved surface for musical purposes, e.g. drinking glass, oil drum]
- 2230/341 . . . Spint claves, i.e. mimicking a pair of thick dowels producing a bright clicking sound when struck against each other
- 2230/345 . . . Spint castanets, i.e. mimicking a joined pair of concave shells held in the hand to produce clicks for rhythmic accents or a ripping or rattling sound consisting of a rapid series of clicks, e.g. castanets, chácara, krakebs, qraqib, garagab
- 2230/351 . . . Spint bell, i.e. mimicking bells, e.g. cow-bells ([bells in general G10K 1/06](#))
- 2230/355 . . Spint spint, i.e. electrophonic musical instruments with features of acoustic instruments covered by [G10D 17/00](#), electrophonic aspects of acoustic instruments covered by [G10D 17/00](#), e.g. aeolian harps, MIDI-like control therefor
- 2230/361 . . Spint mechatronic, i.e. electrophonic musical instruments with features of traditional mechanical automatic acoustic instruments, e.g. electrophonic emulation of historic mechanical pianoroll pianos, electrophonic aspects of partly mechanical automatic acoustic instruments covered by [G10F](#), e.g. hybrid pianos, MIDI-like control therefor
- 2230/365 . Ergonomics of electrophonic musical instruments
- 2230/371 . . Using hook and loop-type fastener or similar attachment to fasten detachable elements
- 2240/00 Data organisation or data communication aspects, specifically adapted for electrophonic musical tools or instruments**
- 2240/005 . Data structures for use in electrophonic musical devices; Data structures including musical parameters derived from musical analysis ([audio retrieval G06F 16/60](#))
- 2240/011 . Files or data streams containing coded musical information, e.g. for transmission ([audio coding G10L 19/00](#))
- 2240/016 . . File editing, i.e. modifying musical data files or streams as such ([editing by means of a graphical user interface G10H 2220/091](#))
- 2240/021 . . . for MIDI-like files or data streams
- 2240/026 . . File encryption of specific electrophonic music instrument file or stream formats, e.g. MIDI, note oriented formats, sound banks, wavetables ([digital rights management \[DRM\] G06F 21/00; encryption H04L 9/00](#))
- 2240/031 . . File merging MIDI, i.e. merging or mixing a MIDI-like file or stream with a non-MIDI file or stream, e.g. audio or video
- 2240/036 . . File multilingual, e.g. multilingual lyrics for karaoke
- 2240/041 . . File watermark, i.e. embedding a hidden code in an electrophonic musical instrument file or stream for identification or authentication purposes ([audio watermarking G10L 19/018](#))
- 2240/046 . . File format, i.e. specific or non-standard musical file format used in or adapted for electrophonic musical instruments, e.g. in wavetables ([details of musical waveform synthesis G10H 2250/541](#))
- 2240/051 . . . AC3, i.e. Audio Codec 3, Dolby Digital
- 2240/056 . . . MIDI or other note-oriented file format
- 2240/061 . . . MP3, i.e. MPEG-1 or MPEG-2 Audio Layer III, lossy audio compression
- 2240/066 . . . MPEG audio-visual compression file formats, e.g. MPEG-4 for coding of audio-visual objects ([MP3 G10H 2240/061](#))
- 2240/071 . . . Wave, i.e. Waveform Audio File Format, coding, e.g. uncompressed PCM audio according to the RIFF bitstream format method
- 2240/075 . Musical metadata derived from musical analysis or for use in electrophonic musical instruments ([additional information unrelated to its juxtaposed musical file data G10H 2240/091; audio retrieval G06F 16/60](#))
- 2240/081 . . Genre classification, i.e. descriptive metadata for classification or selection of musical pieces according to style ([analysis genre G10H 2210/036](#))
- 2240/085 . . Mood, i.e. generation, detection or selection of a particular emotional content or atmosphere in a musical piece
- 2240/091 . Info, i.e. juxtaposition of unrelated auxiliary information or commercial messages with or between music files ([metadata G10H 2240/075](#))
- 2240/095 . Identification code, e.g. ISWC for musical works; Identification dataset
- 2240/101 . . User identification
- 2240/105 . . . User profile, i.e. data about the user, e.g. for user settings or user preferences
- 2240/111 . . . User Password, i.e. security arrangements to prevent third party unauthorised use, e.g. password, id number, code, pin
- 2240/115 . . Instrument identification, i.e. recognizing an electrophonic musical instrument, e.g. on a network, by means of a code, e.g. IMEI, serial number, or a profile describing its capabilities
- 2240/121 . Musical libraries, i.e. musical databases indexed by musical parameters, wavetables, indexing schemes using musical parameters, musical rule bases or knowledge bases, e.g. for automatic composing methods ([audio retrieval G06F 16/60](#))
- 2240/125 . . Library distribution, i.e. distributing musical pieces from a central or master library
- 2240/131 . . Library retrieval, i.e. searching a database or selecting a specific musical piece, segment, pattern, rule or parameter set
- 2240/135 . . . Library retrieval index, i.e. using an indexing scheme to efficiently retrieve a music piece
- 2240/141 . . . Library retrieval matching, i.e. any of the steps of matching an inputted segment or phrase with musical database contents, e.g. query by humming, singing or playing; the steps may include, e.g. musical analysis of the input, musical feature extraction, query formulation, or details of the retrieval process



- 2240/145 . . Sound library, i.e. involving the specific use of a musical database as a sound bank or wavetable; indexing, interfacing, protocols or processing therefor
- 2240/151 . . Thumbnail, i.e. retrieving, playing or managing a short and musically relevant song preview from a library, e.g. the chorus ([thumbnail extraction, analysis phrases G10H 2210/061](#))
- 2240/155 . . Library update, i.e. making or modifying a musical database using musical parameters as indices ([data structures involving musical parameters G10H 2240/005](#))
- 2240/161 . . Memory and use thereof, in electrophonic musical instruments, e.g. memory map ([data structures G10H 2240/005](#); [memory cache G10H 2230/031](#); [libraries G10H 2240/121](#); [files G10H 2240/011](#))
- 2240/165 . . Memory card, i.e. removable module or card for storing musical data for an electrophonic musical instrument
- 2240/171 . . Transmission of musical instrument data, control or status information; Transmission, remote access or control of music data for electrophonic musical instruments ([details about the transmitted data contents G10H 2240/011](#))
- 2240/175 . . for jam sessions or musical collaboration through a network, e.g. for composition, ensemble playing or repeating; Compensation of network or internet delays therefor
- 2240/181 . . Billing, i.e. purchasing of data contents for use with electrophonic musical instruments; Protocols therefor; Management of transmission or connection time therefor
- 2240/185 . . Error prevention, detection or correction in files or streams for electrophonic musical instruments
- 2240/191 . . . CRC, i.e. error detection using a cyclic redundancy check
- 2240/195 . . . Reed-solomon error detection or correction, i.e. by considering the message symbols as polynomial coefficients
- 2240/201 . . Physical layer or hardware aspects of transmission to or from an electrophonic musical instrument, e.g. voltage levels, bit streams, code words or symbols over a physical link connecting network nodes or instruments
- 2240/205 . . . Synchronous transmission of an analog or digital signal, e.g. according to a specific intrinsic timing, or according to a separate clock
- 2240/211 . . . Wireless transmission, e.g. of music parameters or control data by radio, infrared or ultrasound ([beam G10H 2220/405](#))
- 2240/215 . . . Spread spectrum, i.e. transmission on a bandwidth considerably larger than the frequency content of the original information
- 2240/221 . . . Time division multiplexing, with different channels in different time slots, the data in the time slots may be in digital or analog form
- 2240/225 . . . Frequency division multiplexing
- 2240/231 . . . Quadrature modulation, e.g. QAM
- 2240/235 . . . Pulse amplitude modulation, e.g. quantized or analog
- 2240/241 . . . Telephone transmission, i.e. using twisted pair telephone lines or any type of telephone network
- 2240/245 . . . . ISDN [Integrated Services Digital Network]
- 2240/251 . . . . Mobile telephone transmission, i.e. transmitting, accessing or controlling music data wirelessly via a wireless or mobile telephone receiver, analog or digital, e.g. DECT GSM, UMTS ([smartphone, PDA or palmtop used for musical purposes G10H 2230/015](#); [mobile ringtone G10H 2230/021](#))
- 2240/255 . . . Optical fibre transmission for electrophonic musical instrument purposes, e.g. hum mitigation
- 2240/261 . . . Satellite transmission for musical instrument purposes, e.g. processing for mitigation of satellite transmission delays
- 2240/265 . . . CATV transmission, i.e. electrophonic musical instruments connected to community antennas or cable television networks
- 2240/271 . . . Serial transmission according to any one of RS-232 standards for serial binary single-ended data and control signals between a DTE and a DCE
- 2240/275 . . . Musical interface to a personal computer PCI bus, "peripheral component interconnect bus"
- 2240/281 . . Protocol or standard connector for transmission of analog or digital data to or from an electrophonic musical instrument
- 2240/285 . . . USB, i.e. either using a USB plug as power supply or using the USB protocol to exchange data
- 2240/291 . . . SCSI, i.e. Small Computer System Interface
- 2240/295 . . . Packet switched network, e.g. token ring ([circuit-switched networks, e.g. traditional analog telephone transmission G10H 2240/241](#))
- 2240/301 . . . . Ethernet, e.g. according to IEEE 802.3
- 2240/305 . . . . Internet or TCP/IP protocol use for any electrophonic musical instrument data or musical parameter transmission purposes
- 2240/311 . . . MIDI transmission ([G10H 2240/056 takes precedence](#))
- 2240/315 . . . Firewire, i.e. transmission according to IEEE1394
- 2240/321 . . . Bluetooth
- 2240/325 . . Synchronizing two or more audio tracks or files according to musical features or musical timings ([synchronised lyrics, e.g. for karaoke G10H 2220/011](#))
- 2250/00 Aspects of algorithms or signal processing methods without intrinsic musical character, yet specifically adapted for or used in electrophonic musical processing (methods with intrinsic musical character G10H 2210/00)**
- 2250/005 . . Algorithms for electrophonic musical instruments or musical processing, e.g. for automatic composition or resource allocation ([mathematical functions therefor G10H 2250/131](#); [details of musical waveform synthesis G10H 2250/541](#))
- 2250/011 . . Genetic algorithms, i.e. using computational steps analogous to biological selection, recombination and mutation on an initial population of, e.g. sounds, pieces, melodies or loops to compose or otherwise generate, e.g. evolutionary music or sound synthesis
- 2250/015 . . Markov chains, e.g. hidden Markov models [HMM], for musical processing, e.g. musical analysis or musical composition

- 2250/021 . . . Dynamic programming, e.g. Viterbi, for finding the most likely or most desirable sequence in music analysis, processing or composition ([Viterbi decoding H03M 13/41](#))
- 2250/025 . . Envelope processing of musical signals in, e.g. time domain, transform domain or cepstrum domain
- 2250/031 . . Spectrum envelope processing
- 2250/035 . . Crossfade, i.e. time domain amplitude envelope control of the transition between musical sounds or melodies, obtained for musical purposes, e.g. for ADSR tone generation, articulations, medley, remix ([audio mixers H04H 60/04](#))
- 2250/041 . . Delay lines applied to musical processing ([reverberation effects G10H 2210/281](#); [time-delay networks H03H 9/30](#); [chain of active-delay devices H03K 5/133](#))
- 2250/046 . . with intermediate taps
- 2250/051 . . with variable time delay or variable length
- 2250/055 . . Filters for musical processing or musical effects; Filter responses, filter architecture, filter coefficients or control parameters therefor ([tone controls H03G 5/00](#); [graphic equalizers H03G 9/00](#); [digital filters in general H03H 17/00](#); [current or voltage-controlled filters H03H 11/1291](#))
- 2250/061 . . Allpass filters
- 2250/065 . . . Lattice filter, Zobel network, constant resistance filter or X-section filter, i.e. balanced symmetric all-pass bridge network filter exhibiting constant impedance over frequency
- 2250/071 . . All pole filter, i.e. autoregressive [AR] filter ([IIR defined by their temporal impulse response G10H 2250/121](#))
- 2250/075 . . All zero filter, i.e. moving average [MA] filter or finite impulse response [FIR] filter ([FIR defined by their temporal impulse response G10H 2250/115](#))
- 2250/081 . . Autoregressive moving average [ARMA] filter
- 2250/085 . . Butterworth filters
- 2250/091 . . Chebyshev filters ([Chebyshev polynomials G10H 2250/191](#))
- 2250/095 . . Filter coefficient interpolation
- 2250/101 . . Filter coefficient update; Adaptive filters, i.e. with filter coefficient calculation in real time
- 2250/105 . . Comb filters
- 2250/111 . . Impulse response, i.e. filters defined or specified by their temporal impulse response features, e.g. for echo or reverberation applications ([reverberation effects G10H 2210/281](#))
- 2250/115 . . . FIR impulse, e.g. for echoes or room acoustics, the shape of the impulse response is specified in particular according to delay times ([FIR filters for musical processing G10H 2250/075](#))
- 2250/121 . . . IIR impulse ([all pole filters for musical processing G10H 2250/071](#))
- 2250/125 . . Notch filters
- 2250/131 . . Mathematical functions for musical analysis, processing, synthesis or composition ([algorithms for musical processing G10H 2250/005](#); [computation of mathematical functions G06F 17/10 and G06F 7/544](#))
- 2250/135 . . Autocorrelation
- 2250/141 . . Bessel functions, e.g. for smoothing or modulating, for FM audio synthesis or for expressing the vibration modes of a circular drum membrane
- 2250/145 . . Convolution, e.g. of a music input signal with a desired impulse response to compute an output ([transforms, i.e. mathematical transforms into domains appropriate for musical signal processing, coding or compression G10H 2250/215](#))
- 2250/151 . . Fuzzy logic
- 2250/155 . . Graham function, i.e. mathematical description of the fluid dynamics of air flowing through a gap, where there is a given pressure differential on either side of the gap, e.g. to model air velocity in wind instruments for physical modeling sound synthesis
- 2250/161 . . Logarithmic functions, scaling or conversion, e.g. to reflect human auditory perception of loudness or frequency
- 2250/165 . . Polynomials, i.e. musical processing based on the use of polynomials, e.g. distortion function for tube amplifier emulation, filter coefficient calculation, polynomial approximations of waveforms, physical modeling equation solutions
- 2250/171 . . . Hermite polynomials
- 2250/175 . . . Jacobi polynomials of several variables, e.g. Heckman-Opdam polynomials, or of one variable only, e.g. hypergeometric polynomials
- 2250/181 . . . . Gegenbauer or ultraspherical polynomials, e.g. for harmonic analysis
- 2250/185 . . . . Legendre polynomials, e.g. for the modeling of air flow dynamics in wind instruments
- 2250/191 . . . . Chebyshev polynomials, e.g. to provide filter coefficients for sharp rolloff filters ([Chebyshev filters G10H 2250/091](#); [Chebyshev windows G10H 2250/271](#))
- 2250/195 . . . Lagrange polynomials, e.g. for polynomial interpolation or cryptography
- 2250/201 . . . Parabolic or second order polynomials, occurring, e.g. in vacuum tube distortion modeling or for modeling the gate voltage to drain current relationship of a JFET
- 2250/205 . . . Third order polynomials, occurring, e.g. in vacuum tube distortion modeling
- 2250/211 . . Random number generators, pseudorandom generators, classes of functions therefor ([musical processes using white noise or nonwhite noise generators G10H 2250/295](#); [noise formant generator G10H 2250/495](#); [magnetic or electromagnetic noise shielding G10H 2220/565](#))
- 2250/215 . . Transforms, i.e. mathematical transforms into domains appropriate for musical signal processing, coding or compression
- 2250/221 . . . Cosine transform; DCT [discrete cosine transform], e.g. for use in lossy audio compression such as MP3 ([MP3 format G10H 2240/061](#))
- 2250/225 . . . . MDCT [Modified discrete cosine transform], i.e. based on a DCT of overlapping data ([adaptive MDCT compression, e.g. ATRAC \[adaptive transform acoustic coding\] G10H 2250/575](#))
- 2250/231 . . . Fermat transform
- 2250/235 . . . Fourier transform; Discrete Fourier Transform [DFT]; Fast Fourier Transform [FFT]

- 2250/241 . . . Hadamard transform, Walsh-Hadamard transform, Hadamard-Rademacher-Walsh transform, Walsh transform, or Walsh-Fourier transform
- 2250/245 . . . Hartley transform,; Discrete Hartley transform [DHT]; Fast Hartley transform [FHT]
- 2250/251 . . . Wavelet transform, i.e. transform with both frequency and temporal resolution, e.g. for compression of percussion sounds; Discrete Wavelet Transform [DWT]
- 2250/255 . . . Z-transform, e.g. for dealing with sampled signals, delays or digital filters
- 2250/261 . . Window, i.e. apodization function or tapering function amounting to the selection and appropriate weighting of a group of samples in a digital signal within some chosen time interval, outside of which it is zero valued
- 2250/265 . . . Blackman Harris window
- 2250/271 . . . Chebyshev window ([Chebyshev polynomials G10H 2250/191](#); [Chebyshev filters G10H 2250/091](#))
- 2250/275 . . . Gaussian window
- 2250/281 . . . Hamming window
- 2250/285 . . . Hann or Hanning window
- 2250/291 . . . Kaiser windows; Kaiser-Bessel Derived [KBD] windows, e.g. for MDCT
- 2250/295 . Noise generation, its use, control or rejection for music processing ([white noise or pseudorandom generators G10H 2250/211](#); [use of noise in formant synthesis G10H 2250/495](#); [automatic gain control H03G 3/32](#); [speech or noise detection G10L 25/84](#))
- 2250/301 . . Pink 1/f noise or flicker noise
- 2250/305 . . Noise or artifact control in electrophonic musical instruments ([transducer shielding G10H 2220/565](#); [filter notch G10H 2250/125](#); [waveform aliasing G10H 2250/545](#))
- 2250/311 . Neural networks for electrophonic musical instruments or musical processing, e.g. for musical recognition or control, automatic composition or improvisation ([musical analysis G10H 2210/031](#); [neural networks G06N 3/02](#))
- 2250/315 . Sound category-dependent sound synthesis processes [Gensound] for musical use ([details of musical waveform synthesis G10H 2250/541](#); [general musical sound synthesis principles G10H 2250/471](#)); Sound category-specific synthesis-controlling parameters or control means therefor
- 2250/321 . . Gensound animals, i.e. generating animal voices or sounds
  - 2250/325 . . . Birds
  - 2250/331 . . . Ducks
  - 2250/335 . . . Sea birds, e.g. seagulls
  - 2250/341 . . . Cats
  - 2250/345 . . . Cattle, e.g. cows
  - 2250/351 . . . Dogs
  - 2250/355 . . . Elk or other animals in the Cervidae family, e.g. moose, wapiti, reindeer
  - 2250/361 . . . Insects, e.g. cricket
- 2250/365 . . Gensound applause, e.g. handclapping; Cheering; Booming ([crowd sounds G10H 2250/401](#))
- 2250/371 . . Gensound equipment, i.e. synthesizing sounds produced by man-made devices, e.g. machines
- 2250/375 . . . Harbour, i.e. sounds which are part of a harbour soundscape, e.g. ships, fog horn, buoy, bells, cranes
- 2250/381 . . . Road, i.e. sounds which are part of a road, street or urban traffic soundscape, e.g. automobiles, bikes, trucks, traffic, vehicle horns, collisions
- 2250/385 . . . Train, i.e. sounds which are part of a railroad soundscape, e.g. steam engines, diesel, electric, train whistles, rail wheels, railway crossing
- 2250/391 . . Gensound footsteps, i.e. footsteps, kicks or tap-dancing sounds
- 2250/395 . . Gensound nature
- 2250/401 . . . Crowds, e.g. restaurant, waiting hall, demonstration, subway corridor at rush hour ([applause, cheering, booing G10H 2250/365](#))
- 2250/405 . . . Fire, e.g. cracks and pops of burning wood
- 2250/411 . . . Water, e.g. seashore, waves, brook, waterfall, dripping faucet
- 2250/415 . . . Weather
- 2250/421 . . . . Rain
- 2250/425 . . . . Thunder
- 2250/431 . . . . Natural aerodynamic noises, e.g. wind gust sounds, rustling leaves, beating sails ([gensound wind instruments G10H 2250/461](#); [spint wind instruments G10H 2230/155](#))
- 2250/435 . . Gensound percussion, i.e. generating or synthesising the sound of a percussion instrument; Control of specific aspects of percussion sounds, e.g. harmonics, under the influence of hitting force, hitting position, settings or striking instruments such as mallet, drumstick, brush, hand ([spint percussion G10H 2230/231](#))
- 2250/441 . . Gensound string, i.e. generating the sound of a string instrument, controlling specific features of said sound ([spint piano G10H 2230/065](#); [spint stringed instruments G10H 2230/075](#))
- 2250/445 . . . Bowed string instrument sound generation, controlling specific features of said sound, e.g. use of fret or bow control parameters for violin effects synthesis ([bow interfaces per se G10H 2220/365](#); [modulation effects G10H 2210/195](#); [spint viola G10H 2230/081](#); [spint cello G10H 2230/085](#))
- 2250/451 . . . Plucked or struck string instrument sound synthesis, controlling specific features of said sound ([spint harpsichord G10H 2230/071](#); [spint stringed instruments G10H 2230/075](#))
- 2250/455 . . Gensound singing voices, i.e. generation of human voices for musical applications, vocal singing sounds or intelligible words at a desired pitch or with desired vocal effects, e.g. by phoneme synthesis ([formant synthesis G10H 2250/481](#); [parcor synthesis G10H 2250/505](#); [modulation effects G10H 2210/195](#); [ensemble effects G10H 2210/245](#); [speech synthesis in general G10L 13/00](#))

- 2250/461 . . Gensound wind instruments, i.e. generating or synthesising the sound of a wind instrument, controlling specific features of said sound ([spint wind instruments G10H 2230/155](#); [mouth or breath sensors G10H 2220/361](#); [natural aerodynamic noise synthesis, e.g. wind G10H 2250/431](#))
- 2250/465 . . . Reed instrument sound synthesis, controlling specific features of said sound ([spint reed G10H 2230/205](#))
- 2250/471 . General musical sound synthesis principles, i.e. sound category-independent synthesis methods ([details of musical waveform synthesis G10H 2250/541](#); [special instrument \[spint\] G10H 2230/045](#); [sound category-specific synthesis G10H 2250/315](#))
- 2250/475 . . FM synthesis, i.e. altering the timbre of simple waveforms by frequency modulating them with frequencies also in the audio range, resulting in different-sounding tones exhibiting more complex waveforms
- 2250/481 . . Formant synthesis, i.e. simulating the human speech production mechanism by exciting formant resonators, e.g. mimicking vocal tract filtering as in LPC synthesis vocoders, wherein musical instruments may be used as excitation signal to the time-varying filter estimated from a singer's speech ([gensound singing voices G10H 2250/455](#); [parcor synthesis G10H 2250/505](#); [effect Helmholtz G10H 2210/275](#))
- 2250/485 . . . Formant correction therefor
- 2250/491 . . . Formant interpolation therefor
- 2250/495 . . . Use of noise in formant synthesis
- 2250/501 . . . Formant frequency shifting, sliding formants ([wah-wah spectral modulation G10H 2210/231](#))
- 2250/505 . . Parcor synthesis, i.e. music synthesis using partial autocorrelation techniques, e.g. in which the impulse response of the digital filter in a parcor speech synthesizer is used as a musical signal ([gensound singing voices G10H 2250/455](#); [formant synthesis G10H 2250/481](#))
- 2250/511 . . Physical modelling or real-time simulation of the acoustomechanical behaviour of acoustic musical instruments using, e.g. waveguides or looped delay lines ([models in general G05B 17/00](#))
- 2250/515 . . . Excitation circuits or excitation algorithms therefor
- 2250/521 . . . Closed loop models therefor, e.g. with filter and delay line
- 2250/525 . . . Pluridimensional array-based models therefor
- 2250/531 . . . Room models, i.e. acoustic physical modelling of a room, e.g. concert hall ([reverberation or echo G10H 2210/281](#); [soundscape or sound field simulation G10H 2210/301](#))
- 2250/535 . . . Waveguide or transmission line-based models
- 2250/541 . Details of musical waveform synthesis, i.e. audio waveshape processing from individual wavetable samples, independently of their origin or of the sound they represent ([sound category-dependent sound synthesis G10H 2250/315](#); [special instruments \[spint\] G10H 2230/045](#); [general musical sound synthesis principles G10H 2250/471](#))
- 2250/545 . . Aliasing, i.e. preventing, eliminating or deliberately using aliasing noise, distortions or artifacts in sampled or synthesised waveforms, e.g. by band limiting, oversampling or undersampling, respectively
- 2250/551 . . Waveform approximation, e.g. piecewise approximation of sinusoidal or complex waveforms
- 2250/555 . . . Piecewise linear waveform approximation
- 2250/561 . . . Parabolic waveform approximation, e.g. using second order polynomials or parabolic responses ([parabolic or second order polynomials G10H 2250/201](#))
- 2250/565 . . . Polynomial waveform approximation, i.e. using polynomials of third order or higher ([third order polynomials G10H 2250/205](#))
- 2250/571 . . Waveform compression, adapted for music synthesisers, sound banks or wavetables ([audio compression G10L 19/00](#))
- 2250/575 . . . Adaptive MDCT-based compression, e.g. using a hybrid subband-MDCT, as in ATRAC ([non adaptive MDCT G10H 2250/225](#))
- 2250/581 . . . Codebook-based waveform compression
- 2250/585 . . . . CELP [code excited linear prediction]
- 2250/591 . . . DPCM [delta pulse code modulation]
- 2250/595 . . . . ADPCM [adaptive differential pulse code modulation]
- 2250/601 . . . Compressed representations of spectral envelopes, e.g. LPC [linear predictive coding], LAR [log area ratios], LSP [line spectral pairs], reflection coefficients
- 2250/605 . . . Dynamic range companding algorithms, e.g. "mu"-law, primarily used in the digital telephone systems of North America and Japan, or A-law as used in European digital telephone systems
- 2250/611 . . Waveform decimation, i.e. integer division of the sampling rate for reducing the number of samples in a discrete-time signal, e.g. by low-pass anti-alias filtering followed by the actual downsampling
- 2250/615 . . Waveform editing, i.e. setting or modifying parameters for waveform synthesis. ([graphical sound editing G10H 2220/116](#))
- 2250/621 . . Waveform interpolation
- 2250/625 . . . Interwave interpolation, i.e. interpolating between two different waveforms, e.g. timbre or pitch or giving one waveform the shape of another while preserving its frequency or *vice versa*
- 2250/631 . . Waveform resampling, i.e. sample rate conversion or sample depth conversion ([waveform decimation G10H 2250/611](#))
- 2250/635 . . Waveform resolution or sound quality selection, e.g. selection of high or low sampling rates, lossless, lossy or lossier compression algorithms
- 2250/641 . . Waveform sampler, i.e. music samplers; Sampled music loop processing, wherein a loop is a sample of a performance that has been edited to repeat seamlessly without clicks or artifacts
- 2250/645 . . Waveform scaling, i.e. amplitude value normalisation