

H01S

DEVICES USING STIMULATED EMISSION

Definition statement

This place covers:

Devices with electromagnetic waves being generated by stimulated emission

Details specific to the laser or maser action

Amplification by stimulated emission inside a resonator

Amplifiers utilizing stimulated emission, e.g. laser amplifiers, fibre amplifiers

Devices showing a specific control or stabilization of the stimulated emission action

Linear and nonlinear optical elements outside the resonator being specific for the stimulated emission device like specially shaped lenses adapted to the light emitting laser/maser or specific frequency conversion

Relationships with other classification places

It is distinguished with regard to the housing of a laser/maser between first and second level housing/packages. A first level housing is considered to be the housing of the laser/maser directly enclosing the (cooled) device. An example for a first level housing is a semiconductor laser or a microlaser in a TO-can ([H01S 5/022](#) and [H01S 3/025](#)).

A second level package or housing is considered to be a housing where this TO-can, for example, is integrated like a DVD recorder or a lamp or a beamer.

Second level packages are generally not covered by this subclass but should be in a subclass relating to the application of the device.

References

Limiting references

This place does not cover:

Light emitting devices where it is merely stated that they are a laser or maser, i.e. where the laser or maser is simply a "black box" without any specific details on the electromagnetic wave generation or feedback on it.

Informative references

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

Lasers are included in a variety of devices. A selection of important main groups where applications of devices utilizing stimulated emission are classified comprises:

Lasers used in medical applications	A61
Working by a laser beam	B23K 26/00
Printers	B41J 2/00
Combustion engines	F02P 23/00
Lamps	F21K 9/00 - F21K 99/00
Measurements using light	G01C
Measurement of light	G01J 11/00

Optical spectroscopy	G01N 21/00
LIDAR	G01S 17/00
Photolithography	G03F 7/00
Scanning	G06K 15/00
CD/DVD recorder/player	G11B 7/00
Transmission using light	H04B 10/00
Reproduction	H04N 1/00
Displays	H04N 9/00
X-ray generation	H05G 2/00
Plasma generation	H05H 1/00

Special rules of classification

The following IPC groups are not used in the internal ECLA classification scheme.

Subject-matter covered by these groups is classified in the following ECLA groups:

H01S3/098 covered by [H01S 3/08018](#), [H01S 3/11](#)

In [H01S](#) a document is classified according to the features disclosed, i.e. a similar strategy is applied as used for the F-terms of the Japanese patent documentation. Such features can be found, for example, in the figures depicting the embodiments and in the corresponding discussion of these figures in the description. Classification in [H01S](#) is not restricted to the wording of the claims or the summary of the invention. Even a detailed prior art device discussed into detail in the disclosure may be classified correspondingly.

In [H01S](#) it should be carefully distinguished between defining (e.g. [H01S 3/08](#) or [H01S 5/10](#)), controlling (e.g. [H01S 3/10](#) or [H01S 5/06-H01S 5/065](#)) and stabilising (e.g. [H01S 3/13](#) or [H01S 5/068](#)). This is illustrated with the following example: A grating as one end mirror of the cavity of a laser defines and therefore fixes the wavelength of the laser. As long as it is not disclosed that this grating is intentionally rotated, such a grating will be classified as being a part of the resonator only, e.g. in [H01S 3/08009](#) or in [H01S 5/141](#). As soon as it is disclosed, that the grating is rotated to tune the wavelength, this is considered to fall under a wavelength control by a grating which is classified in [H01S 3/1055](#), for example. When finally a feed-back loop is disclosed, e.g. with the help of a wavelength sensitive detector the intensity at a given wavelength is monitored and kept stable with the help of the feed-back loop, then a group in [H01S 3/139](#) will be allocated. As however in the [H01S 3/139](#) and sub-groups the nature of the wavelength defining reflector is not included, further classes in [H01S 3/08](#) and sub-groups should be used to characterize the resonator details, e.g. the reflector being a grating and the number of resonator mirrors present.

H01S 1/00

Lasers, i.e. devices for generation, amplification, modulation, demodulation, or frequency-changing, using stimulated emission, of electromagnetic waves of wavelength longer than that of infra-red waves

Definition statement

This place covers:

Masers, i.e. devices generating or amplifying light by stimulated emission from the infrared to the far-infrared/THz part of the electromagnetic wave spectrum, i.e. wavelengths longer than about 10 microns, e.g. CO₂ laser.

References

Limiting references

This place does not cover:

Far-infrared and THz-lasers based on semiconductor lasers	H01S 5/00
Quantum cascade lasers with for example intra-band transitions	H01S 5/34

Informative references

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

THz sources where stimulated emission is not explicitly involved, e.g. a fs-laser pulse illuminates an Auston switch or a Josephson contact and THz emission results from accelerating electrons according to the local amplitude of the applied electromagnetic field	G02F 1/35 , H01L 31/00 , H01Q
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H01S 1/06

gaseous {, i.e. beam masers (atomic clocks [G04F 5/14](#); circuits using beam masers as a reference frequency for regulating frequency of oscillators [H03L 7/26](#); molecular or atomic beam generation [H05H 3/02](#))}

References

Informative references

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

Atomic clocks	G04F 5/14
Circuits using beam masers as a reference frequency for regulating frequency of oscillators	H03L 7/26
Molecular or atomic beam generation	H05H 3/02

H01S 3/00

Lasers, i.e. devices for generation, amplification, modulation, demodulation, or frequency-changing, using stimulated emission, of infra-red, visible, or ultra-violet waves ({stimulated Brillouin or Raman effects [H01S 3/30](#)} ; semiconductor lasers [H01S 5/00](#))

Definition statement

This place covers:

Devices generating or amplifying light by stimulated emission from the infrared to the ultraviolet part of the spectrum.

Laser media including gaseous, liquid and solid gain media as a matrix and comprising generally atoms, ions or molecules as dopants having discrete spectral absorption and emission lines or bands.

References

Limiting references

This place does not cover:

Semiconductor lasers	H01S 5/00
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Informative references

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

Optical components for lasers per se are classified in the following groups/subclasses:

Laser crystal materials	C09K 11/00
Manufacturing of solid laser materials	C30B
Cooling means	F28F 3/00
Optical components like lenses, mirrors, gratings	G02B 1/00
Optical fibres	G02B 6/00
Linear and nonlinear optical components for control, modulation and frequency conversion of light	G02F 1/00

H01S 3/02

Constructional details {(housings or packages of fibre lasers [H01S 3/06704](#))}

References

Limiting references

This place does not cover:

Housings or packages of fibre lasers	H01S 3/06704
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H01S 3/03

of gas laser discharge tubes {(gas discharge tubes in general [H01J 17/00](#), [H01J 61/00](#))}

References

Informative references

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

Gas discharge tubes in general	H01J 17/00 , H01J 61/00
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H01S 3/034

Optical devices within, or forming part of, the tube, e.g. windows, mirrors (reflectors having variable properties or positions for initial adjustment of the resonator [H01S 3/086](#))

References

Limiting references

This place does not cover:

Reflectors having variable properties or position for initial adjustment of the resonator	H01S 3/086
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H01S 3/036

Means for obtaining or maintaining the desired gas pressure within the tube, e.g. by gettering, replenishing; Means for circulating the gas, e.g. for equalising the pressure within the tube {([H01S 3/031](#) takes precedence; cooling arrangements for gas lasers [H01S 3/041](#); gas dynamic lasers [H01S 3/0979](#); in general [H01J 17/22](#), [H01J 61/24](#))}

References

Limiting references

This place does not cover:

Metal vapour lasers	H01S 3/031
Cooling arrangements for gas lasers	H01S 3/041
Gas dynamic lasers	H01S 3/0979

Informative references

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

Means for obtaining or maintaining the desired gas pressure within the tube in general	H01J 17/22 , H01J 61/24
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H01S 3/0612

{Non-homogeneous structure ([H01S 3/07](#) takes precedence)}

Definition statement

This place covers:

Stepwise change of a dimension or a doping profile, e.g. undoped end caps on a doped laser rod or end flanges having a larger diameter than the part in between

References

Limiting references

This place does not cover:

Construction or shape of active medium consisting of a plurality of parts	H01S 3/07
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H01S 3/0617

{having a varying composition or cross-section in a specific direction}

Definition statement

This place covers:

Devices having a dopant gradient or a changing dimension of the laser crystal, i.e. there must a gradual change in the dopant profile or at least one of the laser material dimensions (e.g. tapering)

H01S 3/067

Fibre lasers {(optical pumping thereof [H01S 3/094003](#); controlling the output parameters [H01S 3/10](#); stabilisation of the output parameters [H01S 3/13](#); characterised by scattering effects, i.e. stimulated Brillouin or Raman effects, [H01S 3/302](#))}

References

Limiting references

This place does not cover:

Optical pumping thereof	H01S 3/094003
Controlling the output parameters	H01S 3/10
Stabilisation of the output parameters	H01S 3/13
Scattering effects, i.e. stimulated Brillouin or Raman effects	H01S 3/302

Informative references

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

Optical fibres and packages comprising optical fibres	G02B 6/00
Transmission using light	H04B 10/00

Special rules of classification

Fibre lasers are not classified in [H01S 3/0602-H01S 3/0627](#)

As soon as details specific to amplification by stimulated emission are disclosed, a corresponding group in [H01S 3/00](#) should be given, e.g. details on the amplification bandwidth, control or stabilisation of the fibre amplifier. The fact that for example merely a fibre amplifier is comprised by a device should not result in the allocation of a group in [H01S 3/00](#).

H01S 3/06754

{Fibre amplifiers ([H01S 3/06708](#) takes precedence)}

References

Limiting references

This place does not cover:

Constructional details of the fibre	H01S 3/06708
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Special rules of classification

Fibre amplifiers are generally not double classified by allocating in addition [H01S 3/2308](#), only in the case of for example double passes etc. a respective coding in [H01S 3/2325](#) and sub-groups is given.

Cascaded fibre amplifiers are only classified in [H01S 3/06758](#) and not in [H01S 3/2316](#).

H01S 3/07

consisting of a plurality of parts, e.g. segments ([H01S 3/067](#) takes precedence)

References

Limiting references

This place does not cover:

Fibre lasers	H01S 3/067
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H01S 3/08

Construction or shape of optical resonators or components thereof
{(waveguide lasers [H01S 3/063](#); controlling the laser output [H01S 3/10](#);
stabilising [H01S 3/13](#))}

References

Limiting references

This place does not cover:

Waveguide lasers	H01S 3/063
Controlling the laser output	H01S 3/10
Stabilising	H01S 3/13

H01S 3/08086

{Multiple-wavelength emission}

Definition statement

This place covers:

Laser generates having more than one laser wavelength, e.g. by internal frequency conversion

Outcoupling mirrors being at least partly transmissive for the at least two wavelengths, i.e. at least two laser beams at different wavelengths must be intentionally out-coupled

H01S 3/08095

{Zig-zag travelling beam through the active medium}

Definition statement

This place covers:

Devices with multiple bounces off of lateral, non-end mirror surfaces

References

Limiting references

This place does not cover:

"Active mirror" lasers with a singly folded path through the laser medium,	H01S 3/0602 , H01S 3/0619
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H01S 3/082

defining a plurality of resonators, e.g. for mode selection {(single longitudinal mode control [H01S 3/08022](#))}

References

Limiting references

This place does not cover:

Longitudinal mode control, e.g. specifically multimode	H01S 3/08022
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H01S 3/083

Ring lasers (ring laser gyrometers [G01C 19/66](#); {fibre ring lasers [H01S 3/06791](#)})

References

Limiting references

This place does not cover:

Fibre ring lasers	H01S 3/06791
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H01S 3/086

One or more reflectors having variable properties or positions for initial adjustment of the resonator (varying a parameter of the laser output during operation [H01S 3/10](#); stabilisation of the laser output [H01S 3/13](#))

References**Limiting references**

This place does not cover:

Varying a parameter of the laser output during operation	H01S 3/10
Stabilisation of the laser output	H01S 3/13

H01S 3/094076

{Pulsed or modulated pumping ([H01S 3/1024](#) takes precedence)}

Definition statement

This place covers:

Pulsed or modulated coherent pumping and no explicit effect of the pumping itself on a pulse forming, e.g. frequently Q-switched lasers are pumped in a pulsed way but the pulse duration is determined by the Q-switch and/or the resonator length and not the pumping means

References**Limiting references**

This place does not cover:

Pulse generation	H01S 3/1024
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H01S 3/0941

of a laser diode

References**Limiting references**

This place does not cover:

Details of laser diodes	H01S 5/00
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H01S 3/095

using chemical or thermal pumping {(generating plasma, e.g. by combustion [H02K 44/00](#), [H05H 1/24](#))}

References**Informative references**

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

Generating plasma, e.g. by combustion	H02K 44/00 , H05H 1/24
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H01S 3/0955

using pumping by high energy particles {([H01S 3/0903](#), [H01S 3/0906](#), [H01S 3/09707](#) take precedence)}

References**Limiting references**

This place does not cover:

Free-electron laser	H01S 3/0903
Electrical, electrochemical, or electron-beam pumping of a dye laser	H01S 3/0906
Gas discharge using an electron or ion beam	H01S 3/09707

H01S 3/0971

transversely excited ([H01S 3/0975](#) takes precedence)

References**Limiting references**

This place does not cover:

Gas discharge using inductive or capacitive excitation	H01S 3/0975
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H01S 3/0977

having auxiliary ionisation means {([H01S 3/09713](#) takes precedence)}

References**Limiting references**

This place does not cover:

Auxiliary ionisation means for transversely excited lasers, e.g. double discharge excitation	H01S 3/09713
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H01S 3/10

Controlling the intensity, frequency, phase, polarisation or direction of the emitted radiation, e.g. switching, gating, modulating or demodulating (mode locking {[H01S 3/1106](#)}; controlling of light beams, frequency-changing, non-linear optics, optical logic elements, in general [G02F](#))

References**Limiting references**

This place does not cover:

Mode locking	H01S 3/1106
Controlling of light beams, frequency-changing, non-linear optics, optical logic elements, in general	G02F

Special rules of classification

Group [H01S 3/10007](#) takes precedence over groups [H01S 3/102](#) - [H01S 3/104](#)

H01S 3/10046

{Pulse repetition rate control ([H01S 3/11](#) takes precedence)}

Definition statement

This place covers:

Control as defined in the subclass [H01S](#), i.e. the pulse repetition rate is controlled and not merely defined or fixed

References**Limiting references**

This place does not cover:

Pulse generation, e.g. Q-switching, mode locking	H01S 3/11
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H01S 3/101

Lasers provided with means to change the location from which, or the direction in which, laser radiation is emitted (optical-mechanical scanning systems in general [G02B 26/10](#); electro-, magneto- or acousto-optical deflection [G02F 1/29](#); {control of position or direction of light beam generating device in general [G05D 3/00](#)})

References**Informative references**

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

Optical-mechanical scanning systems in general	G02B 26/10
Electro-, magneto- or acousto-optical deflection	G02F 1/29
Control of position or direction of light beam generating device in general	G05D 3/00

H01S 3/102

by controlling the active medium, e.g. by controlling the processes or apparatus for excitation ([H01S 3/13](#) takes precedence)

References**Limiting references**

This place does not cover:

Stabilisation of laser output parameters, e.g. frequency, amplitude	H01S 3/13
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H01S 3/1024**{for pulse generation}****Definition statement***This place covers:*

the control of the pulse duration by the intensity or the duration of the coherent or non-coherent pulsed pump source, i.e. the duration of the generated pulse is changed with pump intensity/duration,

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

Details of laser diodes e.g. housing, cooling, electric circuitry	H01S 5/00
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H01S 3/108

using a non-linear optical device, e.g. exhibiting Brillouin- or Raman-scattering
 {(mode locking using a non-linear element [H01S 3/1112](#))}

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

Mode locking using a non-linear element	H01S 3/1112
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H01S 3/11**{Pulse generation, e.g. Q-switching, mode locking}****Definition statement***This place covers:*

Q-switching per se without any details of the kind of Q-switching

H01S 3/1628**{characterised by a semiconducting matrix}****Definition statement***This place covers:*

Devices with dopants in a bulk semiconductor matrix with discrete absorption / emission lines

H01S 3/1685**{Ceramics}****Definition statement***This place covers:*

Ceramic lasers

Special rules of classification

The solid laser material is additionally classified in [H01S 3/163](#) and the doping in [H01S 3/1601](#).

In the case a laser material is characterized by the (measured and depicted) amplification, [H01S 3/2308](#) should be allocated besides the laser material and doping if appropriate.

H01S 3/17

amorphous, e.g. glass {(glass manufacture, shaping or supplementary processes [C03B](#); compositions for laserable glass [C03C 4/0071](#))}

References

Informative references

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

Glass manufacture, shaping or supplementary processes	C03B
Compositions for laserable glass	C03C 4/0071

H01S 4/00

Devices using stimulated emission or wave energy other than those covered by groups [H01S 1/00](#) or [H01S 3/00](#), e.g. phonon maser, gamma maser

Definition statement

This place covers:

All devices generating or amplifying light by stimulated emission in spectral ranges with wavelengths longer than far-infrared/THz and shorter than ultraviolet.

References

Limiting references

This place does not cover:

X-ray sources where for example a plasma is initiated by a focused femtosecond laser pulse which results in the generation of X-rays as this kind of X-ray generation does not involve stimulated emission	H05G 2/00
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H01S 5/00

Semiconductor lasers {(superluminescent diodes [H01L 33/0045](#))}

Definition statement

This place covers:

Semiconductor lasers which are characterized by having a valence and a conduction band with a band-gap in between and light emission due to a transition across at least part of a band-gap or within a band in the case of quantum cascade lasers. In order to tune the laser transition, the composition of the semiconductor and its doping can be designed.

One exception to this rule relates to "organic laser diodes". These devices have generally a layer structure similar to a laser diode comprising a semiconductor substrate and laminate, but the active region comprises an organic material.

Because it is frequently not disclosed whether the transition responsible for light emission is across a bandgap or in between discrete energy states, all such devices are classified in [H01S 5/36](#) because the involvement of the semiconductor layers and the resonator structure being similar to that of a laser diode.

Relationships with other classification places

Semiconductor laser can be integrated with other electrical or optical components and has electrical circuitry for driving the laser diode. Details of such components per se are classified in for example the following main groups:

Optical components like lenses, mirrors, gratings	G02B 1/00
Optical fibres, packaging of semiconductor light sources and fibres	G02B 6/00
Beam manipulation and combination	G02B 26/00
Growth of semiconductors	H01L 21/02365
Cooling of semiconductors	H01L 23/34
Assemblies of semiconductors	H01L 25/00
Integration of semiconductors on a substrate	H01L 27/00
Photodiodes	H01L 31/00
LED	H01L 33/00
Organic light emitting devices (OLED)	H01L 51/50
Electrical circuits	H03K 3/00
Displays	H04N 9/00

References

Limiting references

This place does not cover:

Details of the external cavity components and control/stabilisation acting on components of semiconductor lasers	H01S 3/08 , H01S 3/10 , H01S 3/13
Optical pumping by coherent light of a laser diode	H01S 3/0941
Superluminescent diodes	H01L 33/0045

H01S 5/022

Mountings; Housings {(packaging and electrical lead-through per se [H01L 23/00](#))}

Definition statement

This place covers:

First level packages, e.g. a laser diode in a TO can or a butterfly housing.

References

Limiting references

This place does not cover:

Packaging and electrical lead-through per se	H01L 23/00
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H01S 5/024

Cooling arrangements {(cooling solid state junction devices [H01L 23/34](#); heating arrangements; [H01S 5/0261](#) takes precedence)}

References

Limiting references

This place does not cover:

Non-optical elements	H01S 5/0261
Cooling solid state junction devices	H01L 23/34

H01S 5/026

Monolithically integrated components, e.g. waveguides, monitoring photo-detectors, drivers (stabilisation of output [H01S 5/06](#); coupling light guides with opto-electronic elements [G02B 6/42](#); devices consisting of a plurality of semiconductor or other solid state components formed in or on a common substrate, adapted for light emission [H01L 27/15](#))

References

Informative references

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

Stabilisation of output	H01S 5/06
Coupling light guides with opto-electronic elements	G02B 6/42
Devices consisting of a plurality of semiconductor or other solid state components formed in or on a common substrate, adapted for light emission	H01L 27/15

H01S 5/04

Processes or apparatus for excitation, e.g. pumping, {e.g. by electron beams} ([H01S 5/06](#) takes precedence)

References

Limiting references

This place does not cover:

Arrangements for controlling the laser output parameters	H01S 5/06
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H01S 5/06

Arrangements for controlling the laser output parameters, e.g. by operating on the active medium (transmission systems employing light [H04B 10/00](#))

Definition statement

This place covers:

Control/stabilisation by applying voltages to the electrodes of the semiconductor laser chip or temperature tuning of the laser diode itself;

References

Limiting references

This place does not cover:

Control/stabilisation of the external cavity elements	H01S 3/10 , H01S 3/13
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Informative references

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

Transmission systems employing light	H04B 10/00
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H01S 5/0604

{comprising a non-linear region, e.g. generating harmonics of the laser frequency}

Definition statement

This place covers:

Frequency conversion inside the semiconductor laser chip

References

Limiting references

This place does not cover:

SHG in an external cavity is	H01S 3/109
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H01S 5/062

by varying the potential of the electrodes ([H01S 5/065](#) takes precedence)

References

Limiting references

This place does not cover:

Mode locking; Mode suppression; Mode selection; Self pulsating	H01S 5/065
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H01S 5/068

Stabilisation of laser output parameters ([H01S 5/0625](#) takes precedence)

References

Limiting references

This place does not cover:

Multi-section lasers	H01S 5/0625
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H01S 5/06825

{Protecting the laser, e.g. during switch-on/off, detection of malfunctioning or degradation}

Definition statement

This place covers:

Circuitry comprising diodes for overvoltage or surge protection

References

Informative references

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

Monolithic integration	H01S 5/0261
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H01S 5/10

Construction or shape of the optical resonator {, e.g. extended or external cavity, coupled cavities, bent-guide, varying width, thickness or composition of the active region ([H01S 5/20](#) takes precedence)}

References

Limiting references

This place does not cover:

Structure or shape of the semi-conductor body to guide the optical wave; Confining structures perpendicular to the optical axis, e.g. index- or gain-guiding, stripe geometry, broad area lasers, gain tailoring, transverse or lateral reflectors, special cladding structures, MQW barrier reflection layers	H01S 5/20
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H01S 5/1003

{Waveguide having a modified shape along the axis, e.g. branched, curved, tapered, voids}

Definition statement

This place covers:

Structures of the laser diode chip (and its waveguide)

H01S 5/1071**{Ring-lasers}****References****Limiting references***This place does not cover:*

Laser diode with an external ring resonator for wavelength definition	H01S 5/14
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H01S 5/12**the resonator having a periodic structure, e.g. in distributed feed-back [DFB] lasers ([H01S 5/18](#) takes precedence)****References****Limiting references***This place does not cover:*

Surface-emitting lasers	H01S 5/18
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Informative references*Attention is drawn to the following places, which may be of interest for search:*

Forward coupled structures, i.e. DFC lasers	H01S 5/1028
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H01S 5/14**External cavity lasers {(external cavity elements, their control or stabilisation [H01S 3/08](#), [H01S 3/10](#) and [H01S 3/13](#))}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

External cavity elements, their control or stabilisation	H01S 3/08 , H01S 3/10 , H01S 3/13
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Special rules of classification

In this group external cavity elements correspond to elements inside the laser cavity but outside the monolithic semiconductor body. These elements correspond to intra cavity elements in [H01S 3/00](#).

For external cavity lasers covered by [H01S 5/14](#) the group [H01S 5/06](#) is additionally allocated for the control/stabilisation by applying voltages to the electrodes of the semiconductor laser chip or temperature tuning of the laser diode itself.

H01S 5/223**Buried stripe structure** {([H01S 5/227](#) takes precedence)}**References****Limiting references***This place does not cover:*

Buried mesa structure; Striped active layer	H01S 5/227
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H01S 5/2238**{with a terraced structure}****Definition statement***This place covers:*

Asymmetric protrusions comprised in the layer structure, i.e. only one step in the height of the substrate or the laminate,

H01S 5/32**comprising PN junctions, e.g. hetero- or double- heterostructures** ([H01S 5/34](#), [H01S 5/36](#) take precedence)**References****Limiting references***This place does not cover:*

The active region comprising quantum well, quantum wire, quantum box or superlattice structures, e.g. single quantum well lasers (SQW lasers), multiple quantum well lasers (MQW lasers), graded index separate confinement heterostructure lasers (GRINSCH lasers)	H01S 5/34
The active region comprising organic materials	H01S 5/36

H01S 5/32358**{containing very small amounts, usually less than 1%, of an additional III or V compound to decrease the bandgap strongly in a non-linear way by the bowing effect}****Definition statement***This place covers:*

Doping with small amounts of group III or V compounds

H01S 5/34

comprising quantum well or superlattice structures, e.g. single quantum well lasers [SQW-lasers], multiple quantum well lasers [MQW-lasers] or graded index separate confinement heterostructure lasers [GRINSCH-lasers] ([H01S 5/36](#) takes precedence)

References**Limiting references**

This place does not cover:

The active region comprising organic materials	H01S 5/36
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H01S 5/343

in $A_{III}B_V$ compounds, e.g. AlGaAs-laser {, InP-based laser}

References**Informative references**

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

Doping with small amounts of group III or V compounds	H01S 5/32358
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H01S 5/36

comprising organic materials (dye lasers [H01S 3/213](#))

References**Limiting references**

This place does not cover:

Dye lasers	H01S 3/213
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H01S 5/40

Arrangement of two or more semiconductor lasers, not provided for in groups [H01S 5/02](#) - [H01S 5/30](#) ([H01S 5/50](#) takes precedence)

References**Limiting references**

This place does not cover:

Structural details or components not essential to laser action	H01S 5/02
Processes or apparatus for excitation	H01S 5/04
Arrangements for controlling the laser output parameters	H01S 5/06
Construction or shape of the optical resonator	H01S 5/10
Structure or shape of the semi-conductor body to guide the optical wave; Confining structures perpendicular to the optical axis	H01S 5/20

Structure or shape of the active region; Materials used for the active region	H01S 5/30
Amplifier structures not provided for in groups H01S 5/02 - H01S 5/30	H01S 5/50

H01S 5/4006

{Injection locking}

Definition statement

This place covers:

Master oscillator and (power) amplifier arrangements (MOPA), i.e. the wavelength of the amplifier is the same as of the laser diode acting as the oscillator

H01S 5/4025

{Array arrangements, e.g. constituted by discrete laser diodes or laser bar
([H01S 5/42](#) takes precedence)}

Definition statement

This place covers:

Laser diode arrays / bars

References

Limiting references

This place does not cover:

Cooling of laser diode bars	H01S 5/024
Arrays of surface emitting lasers	H01S 5/42

H01S 5/4062

{with an external cavity or using internal filters, e.g. Talbot filters}

Special rules of classification

External cavity lasers are additionally classified in group [H01S 5/06](#) and sub-groups when the control/stabilisation by applying voltages to the electrodes of the semiconductor laser chip or temperature tuning of the laser diode itself is of interest.

H01S 5/50

Amplifier structures not provided for in groups [H01S 5/02](#) - [H01S 5/30](#) (as repeaters in transmission systems [H04B 10/291](#))

References

Informative references

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

Amplifier structures as repeaters in transmission systems	H04B10/17
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