

# H01S

## DEVICES USING STIMULATED EMISSION

### Definition statement

*This subclass/group covers:*

This subclass 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

### Relationship between large subject matter areas

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 micro-laser 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 relevant to classification in this subclass

*This subclass/group does not cover:*

This subclass 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	<a href="#">B23K 26/00</a>
Printers	<a href="#">B41J 2/00</a>
Combustion engines	<a href="#">F02P 23/00</a>
Lamps	<a href="#">F21K 99/00</a>
Measurements using light	<a href="#">G01C</a>
Measurement of light	<a href="#">G01J 11/00</a>
Optical spectroscopy	<a href="#">G01N 21/00</a>
LIDAR	<a href="#">G01S 17/00</a>
Photolithography	<a href="#">G03F 7/00</a>
Scanning	<a href="#">G06K 15/00</a>
CD/DVD recorder/player	<a href="#">G11B 7/00</a> )
Transmission using light	<a href="#">H04B 10/00</a>
Reproduction	<a href="#">H04N 1/00</a>
Displays	<a href="#">H04N 9/00</a>
X-ray generation	<a href="#">H05G 2/00</a>
Plasma generation	<a href="#">H05H 1/00</a>

### **Special rules of classification within this subclass**

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:

[H01S 3/098](#) 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 5/06-065](#)) 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 subclass/group 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. CO<sub>2</sub> laser.

### **References relevant to classification in this group**

*This subclass/group does not cover:*

Far-infrared and THz-lasers based on	<a href="#">H01S 5/00</a>
--------------------------------------	---------------------------

semiconductor lasers	
Quantum cascade lasers with for example intra-band transitions	<a href="#">H01S 5/34</a>

### 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	<a href="#">G02F 1/35</a> , <a href="#">H01L 31/00</a> , <a href="#">H01Q</a>
--	---

### H01S 1/06

**gaseous, [N: i.e. beam masers (atomic clocks G04F5/14; circuits using beam masers as a reference frequency for regulating frequency of oscillators H03L7/26; molecular or atomic beam generation H05H3/02)]**

### Informative references

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

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

### 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 ([N:**

## **stimulated Brillouin or Raman effects H01S3/30]; semiconductor lasers H01S5/00)**

### **Definition statement**

*This subclass/group 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 relevant to classification in this group**

*This subclass/group does not cover:*

Semiconductor lasers	<a href="#">H01S 5/00</a>
----------------------	---------------------------

### **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:

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

## **H01S 3/02**

**Constructional details [N: ( housings or packages of fibre lasers H01S3/06704)]**

## References relevant to classification in this group

*This subclass/group does not cover:*

Housings or packages of fibre lasers	<a href="#">H01S 3/06704</a>
--------------------------------------	------------------------------

## H01S 3/03

**of gas laser discharge tubes [N: (gas discharge tubes in general H01J17/00, H01J61/00)]**

## Informative references

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

Gas discharge tubes in general	<a href="#">H01J 17/00</a> , <a href="#">H01J 61/00</a>
--------------------------------	---

## H01S 3/034

**Optical devices within, or forming part of, the tube, e.g. windows, mirrors (reflectors having variable properties or position for initial adjustment of the resonator H01S3/086)**

## References relevant to classification in this group

*This subclass/group does not cover:*

Reflectors having variable properties or position for initial adjustment of the resonator	<a href="#">H01S 3/086</a>
---	----------------------------

## 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 ([N: H01S3/031 takes precedence; cooling arrangements for gas lasers H01S3/041; gas dynamic lasers H01S3/0979; in general H01J17/22, H01J61/24])**

## References relevant to classification in this group

*This subclass/group does not cover:*

Metal vapour lasers	<a href="#">H01S 3/031</a>
---------------------	----------------------------

Cooling arrangements for gas lasers	<a href="#">H01S 3/041</a>
Gas dynamic lasers	<a href="#">H01S 3/0979</a>

### 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	<a href="#">H01J 17/22</a> , <a href="#">H01J 61/24</a>
--	---

### H01S 3/0612

**[N: Non-homogeneous structure (H01S3/07 takes precedence)]**

#### Definition statement

*This subclass/group 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 relevant to classification in this group

*This subclass/group does not cover:*

Construction or shape of active medium consisting of a plurality of parts	<a href="#">H01S 3/07</a>
---	---------------------------

### H01S 3/0617

**[N: having a varying composition or cross-section in a specific direction]**

#### Definition statement

*This subclass/group 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 [N: (optical pumping thereof H01S3/094003; controlling the output parameters H01S3/10; stabilisation of the output parameters H01S3/13; characterised by scattering effects, i.e. stimulated Brillouin or Raman effects, H01S3/302)]**

### References relevant to classification in this group

*This subclass/group does not cover:*

Optical pumping thereof	<a href="#">H01S 3/094003</a>
Controlling the output parameters	<a href="#">H01S 3/10</a>
Stabilisation of the output parameters	<a href="#">H01S 3/13</a>
Scattering effects, i.e. stimulated Brillouin or Raman effects	<a href="#">H01S 3/302</a>

### Informative references

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

Transmission using light	<a href="#">H04B 10/00</a>
Optical fibres and packages comprising optical fibres	<a href="#">G02B 6/00</a>

### Special rules of classification within this group

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

**[N: Fibre amplifiers (H01S3/06708 takes precedence)]**

## References relevant to classification in this group

*This subclass/group does not cover:*

Constructional details of the fibre	<a href="#">H01S 3/06708</a>
-------------------------------------	------------------------------

## Special rules of classification within this group

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 (H01S3/067 takes precedence)

## References relevant to classification in this group

*This subclass/group does not cover:*

Fibre lasers	<a href="#">H01S 3/067</a>
--------------	----------------------------

## H01S 3/08

Construction or shape of optical resonators or components thereof [N: (waveguide lasers H01S3/063; controlling the laser output H01S3/10; stabilising H01S3/13)]

## References relevant to classification in this group

*This subclass/group does not cover:*

Waveguide lasers	<a href="#">H01S 3/063</a>
Controlling the laser output	<a href="#">H01S 3/10</a>
Stabilising	<a href="#">H01S 3/13</a>

## H01S 3/08086

## [N: Multiple-wavelength emission]

### Definition statement

*This subclass/group 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

### [N: Zig-zag travelling beam through the active medium]

### Definition statement

*This subclass/group covers:*

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

### References relevant to classification in this group

*This subclass/group does not cover:*

"Active mirror" lasers with a singly folded path through the laser medium,	<a href="#">H01S 3/0602</a> , <a href="#">H01S 3/0619</a>
--	---

## H01S 3/082

defining a plurality of resonators, e.g. for mode selection [N: (single longitudinal mode control H01S3/08022)]

### References relevant to classification in this group

*This subclass/group does not cover:*

Longitudinal mode control, e.g. specifically multimode	<a href="#">H01S 3/08022</a>
--	------------------------------

## H01S 3/083

Ring lasers (ring laser gyrometers G01C19/66; [N: fibre ring lasers H01S3/06791])

## References relevant to classification in this group

*This subclass/group does not cover:*

Fibre ring lasers	<a href="#">H01S 3/06791</a>
-------------------	------------------------------

## 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 H01S3/10; stabilisation of the laser output H01S3/13)

## References relevant to classification in this group

*This subclass/group does not cover:*

Varying a parameter of the laser output during operation	<a href="#">H01S 3/10</a>
Stabilisation of the laser output	<a href="#">H01S 3/13</a>

## H01S 3/094076

[N: Pulsed or modulated pumping (H01S3/1024 takes precedence)]

## Definition statement

*This subclass/group 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 relevant to classification in this group

*This subclass/group does not cover:*

Pulse generation	<a href="#">H01S 3/1024</a>
------------------	-----------------------------

## H01S 3/0941

of a laser diode

## References relevant to classification in this group

*This subclass/group does not cover:*

Details of laser diodes	<a href="#">H01S 5/00</a>
-------------------------	---------------------------

## H01S 3/095

using chemical or thermal pumping [N: (generating plasma, e.g. by combustion H02K44/00, H05H1/24)]

## Informative references

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

Generating plasma, e.g. by combustion	<a href="#">H02K 44/00</a> , <a href="#">H05H 1/24</a>
---------------------------------------	--

## H01S 3/0955

using pumping by high energy particles [N: (H01S3/0903, H01S3/0906, H01S3/09707 take precedence)]

## References relevant to classification in this group

*This subclass/group does not cover:*

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

## H01S 3/0971

transversely excited (H01S3/0975 takes precedence)

## References relevant to classification in this group

*This subclass/group does not cover:*

Gas discharge using inductive or capacitive excitation	<a href="#">H01S 3/0975</a>
--	-----------------------------

---

## H01S 3/0977

having auxiliary ionisation means [N: (H01S3/09713 takes precedence)]

### References relevant to classification in this group

*This subclass/group does not cover:*

Auxiliary ionisation means for transversely excited lasers, e.g. double discharge excitation	<a href="#">H01S 3/09713</a>
--	------------------------------

## H01S 3/10

Controlling the intensity, frequency, phase, polarisation or direction of the emitted radiation, e.g. switching, gating, modulating or demodulating (mode locking [N: H01S3/1106]; controlling of light beams, frequency-changing, non-linear optics, optical logic elements, in general G02F)

### References relevant to classification in this group

*This subclass/group does not cover:*

Mode locking	<a href="#">H01S 3/1106</a>
Controlling of light beams, frequency-changing, non-linear optics, optical logic elements, in general	<a href="#">G02F</a>

### Special rules of classification within this group

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

## H01S 3/10046

[N: Pulse repetition rate control (H01S3/11 takes precedence)]

### Definition statement

*This subclass/group covers:*

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

### References relevant to classification in this group

*This subclass/group does not cover:*

Pulse generation, e.g. Q-switching, mode locking	<a href="#">H01S 3/11</a>
--	---------------------------

### 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 G02B26/10; electro-, magneto- or acousto-optical deflection G02F1/29; [N: control of position or direction of light beam generating device in general G05D3/00])**

### Informative references

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

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

### H01S 3/102

**by controlling the active medium, e.g. by controlling the processes or apparatus for excitation (H01S3/13 takes precedence)**

### References relevant to classification in this group

*This subclass/group does not cover:*

Stabilisation of laser output parameters, e.g. frequency, amplitude	<a href="#">H01S 3/13</a>
---	---------------------------

---

## H01S 3/1024

[N: for pulse generation]

### Definition statement

*This subclass/group 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,

### 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	<a href="#">H01S 5/00</a>
---	---------------------------

## H01S 3/108

using a non-linear optical device, e.g. exhibiting Brillouin- or Raman-scattering [N: (mode locking using a non-linear element H01S3/1112)]

### References relevant to classification in this group

*This subclass/group does not cover:*

Mode locking using a non-linear element	<a href="#">H01S 3/1112</a>
---	-----------------------------

## H01S 3/11

[N: Pulse generation, e.g. Q-switching, mode locking]

### Definition statement

*This subclass/group covers:*

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

## H01S 3/1628

## [N: characterised by a semiconducting matrix]

### Definition statement

*This subclass/group covers:*

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

## H01S 3/1685

### [N: Ceramics]

### Definition statement

*This subclass/group covers:*

Ceramic lasers

### Special rules of classification within this group

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 [N: (glass manufacture, shaping or supplementary processes C03B; compositions for laserable glass C03C4/0071)]**

### Informative references

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

Glass manufacture, shaping or supplementary processes	<a href="#">C03B</a>
Compositions for laserable glass	<a href="#">C03C 4/0071</a>

## H01S 4/00

**Devices using stimulated emission of wave energy other than those covered by groups H01S1/00, H01S3/00 AND H01S5/00, e.g. phonon maser, gamma maser**

## Definition statement

*This subclass/group 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 relevant to classification in this group

*This subclass/group 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	<a href="#">H05G 2/00</a>
--	---------------------------

## H01S 5/00

### Semiconductor lasers [N: (superluminescent diodes H01L33/0045)]

#### Definition statement

*This subclass/group 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.

#### Relationship between large subject matter areas

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

### References relevant to classification in this group

*This subclass/group does not cover:*

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

## H01S 5/022

[N: Mountings; Housings (packaging and electrical lead-through per se H01L23/00)]

### Definition statement

*This subclass/group covers:*

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

### References relevant to classification in this group

*This subclass/group does not cover:*

Packaging and electrical lead-through per se	<a href="#">H01L 23/00</a>
--	----------------------------

## H01S 5/024

Cooling arrangements [N: (cooling solid state junction devices H01L23/34; Heating arrangements (H01S5/0261 takes precedence)]

### References relevant to classification in this group

*This subclass/group does not cover:*

Cooling solid state junction devices	<a href="#">H01L 23/34</a>
Non-optical elements	<a href="#">H01S 5/0261</a>

## H01S 5/026

Monolithically integrated components, e.g. waveguides, monitoring photo-detectors, drivers (stabilisation of output H01S5/06; coupling light guides with opto-electronic elements G02B6/42; devices consisting of a plurality of semiconductor or other solid state components formed in or on a common substrate, adapted for light emission H01L27/15)

### Informative references

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

Stabilisation of output	<a href="#">H01S 5/06</a>
-------------------------	---------------------------

Coupling light guides with opto-electronic elements	<a href="#">G02B 6/42</a>
Devices consisting of a plurality of semiconductor or other solid state components formed in or on a common substrate, adapted for light emission	<a href="#">H01L 27/15</a>

## H01S 5/04

**Processes or apparatus for excitation, e.g. pumping, [N: e.g. by electron beams] (H01S5/06 takes precedence)**

### References relevant to classification in this group

*This subclass/group does not cover:*

Arrangements for controlling the laser output parameters	<a href="#">H01S 5/06</a>
--	---------------------------

## H01S 5/06

**Arrangements for controlling the laser output parameters, e.g. by operating on the active medium (transmission systems employing light H04B10/00)**

### Definition statement

*This subclass/group covers:*

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

### References relevant to classification in this group

*This subclass/group does not cover:*

Control/stabilisation of the external cavity elements	<a href="#">H01S 3/10</a> , <a href="#">H01S 3/13</a>
---	---

### Informative references

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

Transmission systems employing light	<a href="#">H04B 10/00</a>
--------------------------------------	----------------------------

## H01S 5/0604

[N: comprising a non-linear region, e.g. generating harmonics of the laser frequency]

### Definition statement

*This subclass/group covers:*

Frequency conversion inside the semiconductor laser chip

### References relevant to classification in this group

*This subclass/group does not cover:*

SHG in an external cavity is	<a href="#">H01S 3/109</a>
------------------------------	----------------------------

## H01S 5/062

by varying the potential of the electrodes (H01S5/065 takes precedence)

### References relevant to classification in this group

*This subclass/group does not cover:*

Mode locking; Mode suppression; Mode selection; Self pulsating	<a href="#">H01S 5/065</a>
---	----------------------------

## H01S 5/068

Stabilisation of laser output parameters (H01S5/0625 takes precedence)

### References relevant to classification in this group

*This subclass/group does not cover:*

Multi-section lasers	<a href="#">H01S 5/0625</a>
----------------------	-----------------------------

## H01S 5/06825

[N: Protecting the laser, e.g. during switch-on/off, detection of malfunctioning or degradation]

### Definition statement

*This subclass/group covers:*

This group covers :

Circuitry comprising diodes for overvoltage or surge protection

### Informative references

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

Monolithic integration	<a href="#">H01S 5/0261</a>
------------------------	-----------------------------

## H01S 5/10

**Construction or shape of the optical resonator, [N: e.g. extended or external cavity, coupled cavities, bent-guide, varying width, thickness or composition of the active region (H01S5/20 takes precedence)]**

### References relevant to classification in this group

*This subclass/group 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	<a href="#">H01S 5/20</a>
--	---------------------------

## H01S 5/1003

[N: Waveguide having a modified shape along the axis, e.g. branched, curved, tapered, voids]

### Definition statement

*This subclass/group covers:*

Structures of the laser diode chip (and its waveguide)

## **H01S 5/1071**

**[N: Ring-lasers]**

### **References relevant to classification in this group**

*This subclass/group does not cover:*

Laser diode with an external ring resonator for wavelength definition	<a href="#">H01S 5/14</a>
---	---------------------------

## **H01S 5/12**

the resonator having a periodic structure, e.g. in distributed feed-back lasers (DFB-lasers) (H01S5/18 takes precedence)  
**[N: (forward coupled structures, i.e. DFC lasers, H01S5/1028)]**

### **References relevant to classification in this group**

*This subclass/group does not cover:*

Forward coupled structures, i.e. DFC lasers	<a href="#">H01S 5/1028</a>
Surface-emitting lasers	<a href="#">H01S 5/18</a>

## **H01S 5/14**

**External cavity lasers [N: (external cavity elements, their control or stabilisation H01S3/08, H01S3/10 and H01S3/13)]**

### **Informative references**

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

External cavity elements, their control or stabilisation	<a href="#">H01S 3/08</a> , <a href="#">H01S 3/10</a> , <a href="#">H01S 3/13</a>
--	---

### **Special rules of classification within this group**

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 [N: (H01S5/227 takes precedence)]**

### References relevant to classification in this group

*This subclass/group does not cover:*

Buried mesa structure; Striped active layer	<a href="#">H01S 5/227</a>
---	----------------------------

## H01S 5/2238

**[N: with a terraced structure]**

### Definition statement

*This subclass/group 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 (H01S5/34, H01S5/36 take precedence)**

### References relevant to classification in this group

*This subclass/group 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 (GRIN SCH lasers)	<a href="#">H01S 5/34</a>
--	---------------------------

The active region comprising organic materials	<a href="#">H01S 5/36</a>
--	---------------------------

## H01S 5/32358

[N: containing very small amounts, usually less than 1%, of an additional III or V compound to decrease the band-gap strongly in a non-linear way by the bowing effect

### Definition statement

*This subclass/group covers:*

Doping with small amounts of group III or V compounds

## H01S 5/34

comprising quantum well, [N: 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 (GRIN SCH lasers) (H01S5/36 takes precedence)

### References relevant to classification in this group

*This subclass/group does not cover:*

The active region comprising organic materials	<a href="#">H01S 5/36</a>
--	---------------------------

## H01S 5/343

in A(III)-B(V) compounds, e.g. AlGaAs-laser, [N: InP-based laser]

### 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	<a href="#">H01S 5/32358</a>
---	------------------------------

## H01S 5/36

comprising organic materials (dye lasers H01S3/213)

### References relevant to classification in this group

*This subclass/group does not cover:*

Dye lasers	<a href="#">H01S 3/213</a>
------------	----------------------------

## H01S 5/40

Arrangement of two or more semiconductor lasers, not provided for in groups H01S5/02 to H01S5/30 (H01S5/50 takes precedence)

### References relevant to classification in this group

*This subclass/group does not cover:*

Structural details or components not essential to laser action	<a href="#">H01S 5/02</a>
Processes or apparatus for excitation	<a href="#">H01S 5/04</a>
Arrangements for controlling the laser output parameters	<a href="#">H01S 5/06</a>
Construction or shape of the optical resonator	<a href="#">H01S 5/10</a>
Structure or shape of the semi-conductor body to guide the optical wave; Confining structures perpendicular to the optical axis	<a href="#">H01S 5/20</a>
Structure or shape of the active region; Materials used for the active region	<a href="#">H01S 5/30</a>
Amplifier structures not provided for in groups <a href="#">H01S 5/02</a> to <a href="#">H01S 5/30</a>	<a href="#">H01S 5/50</a>

## H01S 5/4006

## [N: Injection locking]

### Definition statement

*This subclass/group 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

[N: Array arrangements, e.g. constituted by discrete laser diodes or laser bar (H01S5/42 takes precedence)]

### Definition statement

*This subclass/group covers:*

Laser diode arrays / bars

### References relevant to classification in this group

*This subclass/group does not cover:*

Cooling of laser diode bars	<a href="#">H01S 5/024</a>
Arrays of surface emitting lasers	<a href="#">H01S 5/42</a>

## H01S 5/4062

[N: with an external cavity or using internal filters, e.g. Talbot filters]

### Special rules of classification within this group

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 H01S5/02 to H01S5/30 (as repeaters in transmission systems H04B10/17)

### Informative references

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

Amplifier structures as repeaters in transmission systems	<a href="#">H04B 10/17</a>
---	----------------------------