

## H05H

**PLASMA TECHNIQUE** (fusion reactors [G21B](#); ion-beam tubes [H01J 27/00](#); magnetohydrodynamic generators [H02K 44/08](#); producing X-rays involving plasma generation [H05G 2/00](#)); **PRODUCTION OF ACCELERATED ELECTRICALLY-CHARGED PARTICLES OR OF NEUTRONS** (obtaining neutrons from radioactive sources [G21](#), e.g. [G21B](#), [G21C](#), [G21G](#)); **PRODUCTION OR ACCELERATION OF NEUTRAL MOLECULAR OR ATOMIC BEAMS** (atomic clocks [G04F 5/14](#); devices using stimulated emission [H01S](#); frequency regulation by comparison with a reference frequency determined by energy levels of molecules, atoms, or subatomic particles [H03L 7/26](#))

### Definition statement

*This place covers:*

Systems and methods for handling plasma, i.e.:

Generating plasma;

Confining plasma.

These systems are essentially related to experimental plasma systems used for studying the conditions for a controlled thermonuclear fusion.

Methods for investigating plasma, i.e. for measuring plasma parameters;

Systems and methods for generating local plasma to be used in industrial applications, e.g. plasma torches for cutting, welding, spraying or incinerating;

Systems and methods for generating and/or accelerating neutral particle beams, i.e. atomic or molecular beams, neutron beams;

Targets for producing nuclear reactions under irradiation;

Systems and methods for accelerating charged particle beams, i.e. electrostatic accelerators, linear accelerators, magnetic induction accelerators, magnetic resonance accelerators.

### References

#### Limiting references

*This place does not cover:*

Nuclear fusion reactors	<a href="#">G21B 1/00</a>
Ion beam tubes	<a href="#">H01J 27/00</a>
Gas-filled discharge tubes for surface treatments	<a href="#">H01J 37/32</a>
Mass spectrometers	<a href="#">H01J 49/00</a>
Producing X-rays involving plasma generation	<a href="#">H05G 2/00</a>

#### Informative references

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

Atomic clocks	<a href="#">G04F 5/14</a>
Obtaining neutrons from radioactive sources	<a href="#">G21</a>

Radioactive neutron sources	<a href="#">G21G 4/02</a>
Techniques for handling particles or ionising radiation not otherwise provided for; Irradiation devices; Gamma ray or X-ray microscopes	<a href="#">G21K</a>
Lasers	<a href="#">H01S</a>
Magnetohydrodynamic generators	<a href="#">H02K 44/08</a>
Frequency regulation by comparison with a reference frequency determined by energy levels of molecules, atoms, or subatomic particles	<a href="#">H03L 7/26</a>

## H05H 1/00

### Generating plasma; Handling plasma

#### Definition statement

*This place covers:*

- Methods for investigating plasma, i.e. for measuring plasma parameters;
- Systems and methods for confining a plasma by electric, magnetic or electromagnetic means;
- Systems and methods for heating and sustaining a plasma, in particular for performing nuclear fusion reactions, at laboratory scale;
- Systems and methods for generating plasma for industrial applications.

#### References

##### Limiting references

*This place does not cover:*

Nuclear fusion reactors	<a href="#">G21B</a>
Discharge vessels for exposing objects to the discharge	<a href="#">H01J 37/32</a>

## H05H 1/0006

### {Investigating plasma, e.g. degree of ionisation (electron temperature)}

#### Definition statement

*This place covers:*

Methods for measuring different parameters inherently associated with plasma, by using radiation, thermal, electric, magnetic or acoustic means.

#### References

##### Limiting references

*This place does not cover:*

Measuring the arc parameters in a plasma arc torch	<a href="#">H05H 1/34</a> , <a href="#">H05H 1/36</a>
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**H05H 1/0025**

{by using photoelectric means ([H05H 1/0031](#) - [H05H 1/0043](#) take precedence)}

**References****Limiting references**

*This place does not cover:*

Investigating by interferometry	<a href="#">H05H 1/0031</a>
Investigating by spectrometry	<a href="#">H05H 1/0037</a>
Investigating by using infra-red or ultra-violet radiation	<a href="#">H05H 1/0043</a>

**H05H 1/0037**

{by spectrometry (see [G01N 3/00](#))}

**References****Limiting references**

*This place does not cover:*

Mass spectrometry	<a href="#">H01J 49/00</a>
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**Informative references**

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

Investigating strength properties of solid materials by application of mechanical stress	<a href="#">G01N 3/00</a>
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**H05H 1/005**

{by using X-rays or alpha rays (see [G01N 23/00](#))}

**References****Limiting references**

*This place does not cover:*

Investigating materials by particle radiation	<a href="#">G01N 23/00</a>
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**H05H 1/0056**

{by using neutrons (see [G01N 23/00](#))}

**References****Limiting references**

*This place does not cover:*

Investigating materials by neutron radiation	<a href="#">G01N 23/00</a>
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**H05H 1/0062****{by using microwaves (see [G01N 23/223](#))}****References*****Limiting references****This place does not cover:*

Investigating materials by use of microwaves	<a href="#">G01N 22/00</a>
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**H05H 1/0068****{by thermal means (see [G01N 25/00](#))}****References*****Limiting references****This place does not cover:*

Investigating materials by use of thermal means	<a href="#">G01N 25/00</a>
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**H05H 1/0081****{by electric means (see [G01N 27/00](#), [G01R](#))}****References*****Limiting references****This place does not cover:*

Investigating materials by use of electric means	<a href="#">G01N 27/00</a>
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**H05H 1/0087****{by magnetic means (see [G01N 27/00](#), [G01R](#))}****References*****Limiting references****This place does not cover:*

Investigating materials by use of magnetic means	<a href="#">G01N 27/00</a>
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**H05H 1/0093****{by acoustic, e.g. ultrasonic means (see [G01N 29/02](#))}****References*****Limiting references****This place does not cover:*

Investigating materials by use of ultrasonic waves	<a href="#">G01N 29/00</a>
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## H05H 1/02

Arrangements for confining plasma by electric or magnetic fields;  
Arrangements for heating plasma ({[G21B 1/00](#) takes precedence;} electron optics [H01J](#))

### Definition statement

*This place covers:*

Systems and methods for confining a plasma; systems and methods for heating and sustaining the confined plasma.

### References

#### Limiting references

*This place does not cover:*

Closed discharge vessels for plasma treatment of objects exposed to the discharge	<a href="#">H01J 37/32</a>
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## H05H 1/11

using cusp configuration ([H05H 1/14](#) takes precedence)

### References

#### Informative references

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

Plasma containment vessels with magnetic mirrors	<a href="#">H05H 1/14</a>
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## H05H 1/12

wherein the containment vessel forms a closed or nearly closed loop  
{([G21B 1/05](#) takes precedence)}

### Definition statement

*This place covers:*

Laboratory systems in which plasma is confined in closed toroidal or helical loops by externally applied magnetic fields.

### Relationships with other classification places

Nuclear fusion reactors (operated as prototypes for industrial energy production) based on closed-loop plasma containment systems are classified in [G21B](#).

### References

#### Limiting references

*This place does not cover:*

Field Reversed Confinement nuclear reactors	<a href="#">G21B 1/052</a>
Stellarator nuclear reactors	<a href="#">G21B 1/055</a>
Tokamak nuclear reactors	<a href="#">G21B 1/057</a>

**H05H 1/14**

wherein the containment vessel is straight and has magnetic mirrors

**References****Limiting references**

*This place does not cover:*

Electron mirrors	<a href="#">G21K 1/08</a>
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**H05H 1/16**

using externally-applied electric and magnetic fields

**Definition statement**

*This place covers:*

Laboratory systems in which plasma is generated and confined by application of external magnetic fields and electric fields.

**References****Limiting references**

*This place does not cover:*

Discharge vessels in which objects are exposed to the discharge	<a href="#">H01J 37/32</a>
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**H05H 1/18**

wherein the fields oscillate at very high frequency, e.g. in the microwave range  
{, e.g. using cyclotron resonance}

**Definition statement**

*This place covers:*

Laboratory systems in which plasma is generated and confined by application of external electromagnetic fields at RF or microwave frequency, often operated in condition of electron-cyclotron resonance or ion-cyclotron resonance.

**References****Limiting references**

*This place does not cover:*

Discharge vessels operated at RF or microwave frequency, in which objects are exposed to the discharge	<a href="#">H01J 37/32009</a>
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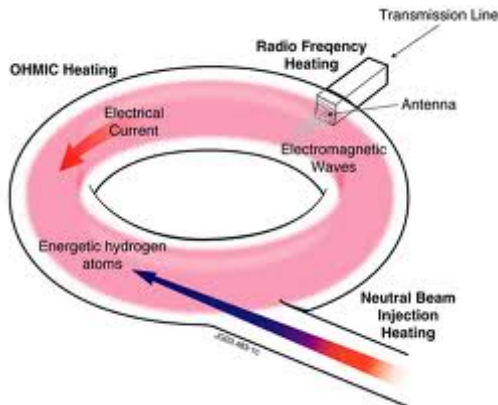
## H05H 1/20

### Ohmic heating

#### Definition statement

*This place covers:*

Laboratory systems in which the plasma is heated by inducing a current through it. The current is induced by an electromagnetic winding linked with the plasma torus, i.e. the plasma acts as the secondary winding of a transformer.



#### References

##### Limiting references

*This place does not cover:*

Nuclear fusion reactors	<a href="#">G21B 1/05</a>
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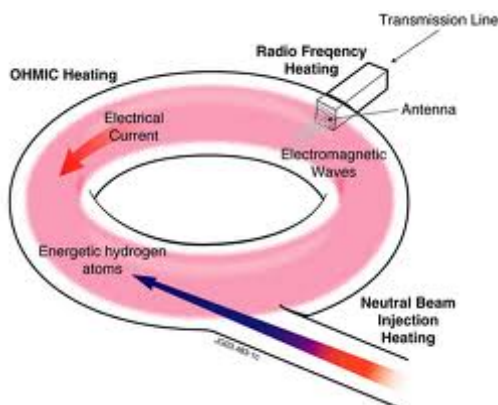
## H05H 1/22

for injection heating {([G21B 1/15](#) takes precedence)}

#### Definition statement

*This place covers:*

Laboratory systems in which high-energy atoms are injected into the ohmically heated, magnetically confined plasma. The atoms are ionized as they pass through the plasma and are trapped by the magnetic field. The high-energy ions then transfer part of their energy to the plasma particles in repeated collisions, increasing the plasma temperature.



## References

### Limiting references

*This place does not cover:*

Nuclear fusion reactors	<a href="#">G21B 1/05</a>
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## H05H 1/24

**Generating plasma** {(gas-filled discharge reactors [H01J 37/32](#); nuclear fusion reactors [G21B 1/00](#); ohmic heating [H05H 1/20](#); injection heating [H05H 1/22](#))}

### Definition statement

*This place covers:*

Arrangements for generating plasma to be used in industrial applications, i.e.

- Plasma torches for cutting, welding, surface treatments or spectrometry;
- Plasma systems, other than torches, for treatment of objects or incineration;
- Devices using a plasma discharge for specific applications, e.g. spark gaps, plasma guns;
- Microplasma systems;
- Plasma acceleration systems;
- Power supply systems for the arrangements covered by this group.

### Relationships with other classification places

Thermonuclear plasma generating and confining systems for use in nuclear fusion reactor plants are dealt with in [G21B 1/00](#). Plasma generating and confining systems for laboratory nuclear fusion studies are dealt with in [H05H 1/00](#) - [H05H 1/22](#). [H01J 49/00](#) covers the particle spectrometer or separator tubes. [H05H 1/24](#) covers the plasma generation and therefore includes the torches used to generate a plasma from a gas. In gas spectrometry, a gas is normally turned into plasma and the electromagnetic emission is analysed. The torches used to turn such gas into plasma are generally classified in the lower subgroup [H05H 1/30](#), because they use an electromagnetic field to activate the plasma gas.

## References

### Limiting references

*This place does not cover:*

Ohmic heating	<a href="#">H05H 1/20</a>
Injection heating	<a href="#">H05H 1/22</a>
Nuclear fusion reactors	<a href="#">G21B 1/00</a>
Gas-filled discharge tubes for surface treatments	<a href="#">H01J 37/32</a>

## H05H 1/2406

**{Dielectric barrier discharges}**

### Definition statement

*This place covers:*

Arrangements for generating plasma using dielectric-barrier discharges, i.e. a dielectric is interposed between the plasma generating electrodes.



## References

### Limiting references

*This place does not cover:*

Dielectric-barrier discharges in gas-filled discharge tubes	<a href="#">H01J 37/32</a>
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## H05H 1/2475

{Acoustic pressure discharge}

### Definition statement

*This place covers:*

Arrangements for generating local plasma by application of pressure waves to a gas or liquid-filled medium, i.e. cavitation, sonoluminescence.

## References

### Limiting references

*This place does not cover:*

Plasma generated by shock-waves	<a href="#">H05H 1/52</a>
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## Glossary of terms

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

Cavitation	Collapse of gas bubbles trapped in a liquid medium
Sonoluminescence	Emission of light by compression and collapse of gas bubbles in a liquid medium

## H05H 1/26

Plasma torches {(metal working with constricted arc [B23K 10/00](#), [B23K 10/02](#); metal spraying [B05B 7/18](#), [B05B 7/20](#))}

### Definition statement

*This place covers:*

Plasma torches, whereby a plasma torch is meant as a device for generating a directed flow of plasma, e.g. used for cutting or welding metals, for localized surface treatment of objects or spectroscopic analysis. In particular, this group covers:

- Torches in which plasma is generated by applied electromagnetic fields, e.g. torches for spectrometry;
- Torches in which plasma is generated by establishment of an arc, e.g. non-transferred arc, transferred arc or both.

### Relationships with other classification places

Systems for metal working which include a plasma generating torch are dealt with in [B23K 9/00](#) and [B23K 10/00](#).

## References

### Limiting references

*This place does not cover:*

Generation of plasma by RF or microwaves	<a href="#">H05H 1/46</a>
Devices external to, and connected to, the plasma generating torch.	<a href="#">B23K 10/00</a>
Generation of plasma in a gas-filled tube	<a href="#">H01J 37/32</a>

### Informative references

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

Metal spraying	<a href="#">B05B 7/18</a> , <a href="#">B05B 7/20</a>
Metal working with constricted arc	<a href="#">B23K 10/00</a>

## H05H 1/28

### Cooling arrangements

#### Definition statement

*This place covers:*

Arrangements within a plasma torch for cooling the components of the torch and evacuating the heat produced during the torch service.

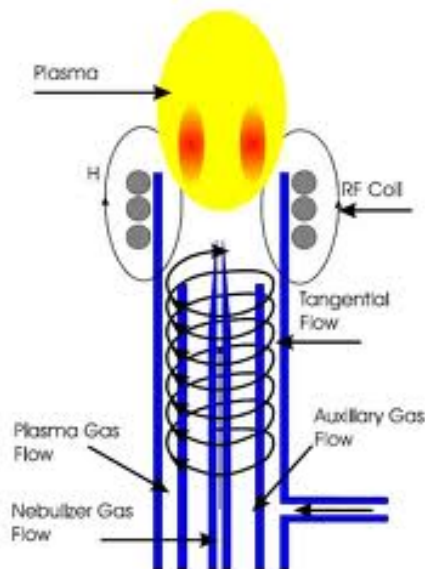
## H05H 1/30

using applied electromagnetic fields, e.g. high frequency or microwave energy ([H05H 1/28](#) takes precedence)

### Definition statement

*This place covers:*

Torches in which plasma is generated by high-frequency electromagnetic fields (e.g. inductive coils enveloping the torch), in particular used for spectroscopic analysis.



### References

#### Limiting references

*This place does not cover:*

Cooling arrangements	<a href="#">H05H 1/28</a>
Arrangements for arc stabilization by means of externally applied magnetic fields	<a href="#">H05H 1/40</a>

#### Informative references

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

Mass spectrometry	<a href="#">H01J 49/00</a>
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## H05H 1/32

using an arc ([H05H 1/28](#) takes precedence)

### Definition statement

*This place covers:*

Torches in which plasma is generated by establishing an arc discharge between two electrodes.

## References

### Limiting references

*This place does not cover:*

Generation of plasma by RF or microwaves	<a href="#">H05H 1/46</a>
Devices external to, and connected to, the plasma generating torch	<a href="#">B23K 10/00</a>
Generation of plasma in a gas-filled tube	<a href="#">H01J 37/32</a>

### Informative references

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

Metal spraying	<a href="#">B05B 7/00</a>
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## H05H 1/34

Details, e.g. electrodes, nozzles {(cf. [B23K 9/24](#))}

### Definition statement

*This place covers:*

Details related to the electrical and mechanical components of a plasma arc torch.

## References

### Limiting references

*This place does not cover:*

Circuits for supplying power to the torch	<a href="#">H05H 1/36</a>
Features related to welding or cutting electrodes	<a href="#">B23K 9/24</a>

## H05H 1/3405

{Arc stabilising or constricting arrangements, e.g. by an additional gas flow (by externally applied magnetic field [H05H 1/40](#); by using powders or liquids [H05H 1/42](#); using coaxial protecting fluid [H05H 1/341](#))}

### Definition statement

*This place covers:*

Arrangements for controlling the discharge generating arc, e.g. shaped nozzles, secondary gas circuits.

## References

### Limiting references

*This place does not cover:*

Arrangements providing protecting fluids coaxial with the plasma jet	<a href="#">H05H 1/341</a>
Arrangements for arc stabilization by means of externally applied magnetic fields	<a href="#">H05H 1/40</a>

## H05H 1/341

{using coaxial protecting fluid (arc stabilising or constricting arrangements [H05H 1/3405](#); introducing materials into the plasma [H05H 1/42](#))}

### Definition statement

*This place covers:*

Arrangements for protecting the plasma jet exiting from the torch, e.g. from mixing with and/or cooling by the surrounding atmosphere.

### References

#### Limiting references

*This place does not cover:*

Arrangements for controlling the plasma jet	<a href="#">H05H 1/3405</a>
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## H05H 1/36

Circuit arrangements ([H05H 1/38](#), [H05H 1/40](#) take precedence)

### Definition statement

*This place covers:*

Circuits arrangements for supplying electric power to the torch, and arrangements for supplying gases to the torch.

### Relationships with other classification places

The arc welding or cutting systems, in which a plasma arc torch is inserted, are dealt with in [B23K 10/00](#) and [B23K 9/00](#).

### References

#### Limiting references

*This place does not cover:*

Guiding or centering of electrodes	<a href="#">H05H 1/38</a>
Applied magnetic fields, e.g. for focusing or rotating the arc	<a href="#">H05H 1/40</a>
Circuits for arc welding systems	<a href="#">B23K 9/09</a> , <a href="#">B23K 9/10</a>

## H05H 1/38

Guiding or centering of electrodes

### Definition statement

*This place covers:*

Systems for guiding consumable electrodes in the torch.

## References

### Limiting references

*This place does not cover:*

Automatic systems for feeding consumable electrodes to the torch	<a href="#">B23K 9/12</a>
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## H05H 1/40

using applied magnetic fields, e.g. for focusing or rotating the arc {(cf. [B23K 9/08](#), [B23K 9/073](#))}

### Definition statement

*This place covers:*

Arrangements for controlling the discharge generating arc with magnetic means.

## References

### Limiting references

*This place does not cover:*

Arrangements for controlling the discharge generating arc with mechanical means	<a href="#">H05H 1/3405</a>
Circuits for magnetic control of the arc in arc welding systems	<a href="#">B23K 9/08</a> , <a href="#">B23K 9/0737</a>

## H05H 1/42

with provisions for introducing materials into the plasma, e.g. powder, liquid (electrostatic spraying, spraying apparatus with means for charging the spray electrically [B05B 5/00](#) {cf. [B23K 9/324](#), [B05B 7/22](#); arc stabilising or constricting arrangements [H05H 1/3405](#); coaxial protecting fluids [H05H 1/341](#))}

### Definition statement

*This place covers:*

Torches provided with arrangements for introducing materials into the plasma, e.g. precursors for material treatment, either within the torch or at the torch plasma jet exit.

## References

### Limiting references

*This place does not cover:*

Electrostatic spraying apparatuses	<a href="#">B05B 5/00</a>
Devices for supplying a welding powder	<a href="#">B23K 9/324</a>

## H05H 1/46

using applied electromagnetic fields, e.g. high frequency or microwave energy  
([H05H 1/26](#) takes precedence)

### Definition statement

*This place covers:*

- Plasma systems, other than torches, for treatment of objects, wherein plasma is generated by applied electromagnetic fields, e.g. microwaves, radiofrequency;
- Microplasma systems.

### Relationships with other classification places

Discharge tubes or vessels for plasma treatment of objects under controlled pressure are dealt with in [H01J 37/32](#).

### References

#### Limiting references

*This place does not cover:*

Dielectric barrier discharge devices	<a href="#">H05H 1/2406</a>
Plasma torches	<a href="#">H05H 1/26</a>
Plasma devices using an arc	<a href="#">H05H 1/48</a>

#### Informative references

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

Discharge tubes with provision for introducing objects or material to be exposed to the discharge	<a href="#">H01J 37/32</a>
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## H05H 1/48

using an arc ([H05H 1/26](#) takes precedence)

### Definition statement

*This place covers:*

Plasma systems, other than torches, for treatment of objects, wherein plasma is generated by establishment of an arc, e.g. incinerators.

### References

#### Limiting references

*This place does not cover:*

Plasma torches	<a href="#">H05H 1/26</a>
Systems with plasma generated by EM fields	<a href="#">H05H 1/46</a>

## H05H 2001/481

### {Corona discharges}

#### Definition statement

*This place covers:*

Plasma systems, other than torches, for treatment of object surfaces, wherein plasma is generated by a corona discharge (i.e. the discharge occurs when the strength of the electric field around the electrode is high enough to form a conductive region, but not high enough to cause electrical breakdown or arcing to the object).

#### References

##### Limiting references

*This place does not cover:*

Dielectric barrier discharge devices	<a href="#">H05H 1/2406</a>
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## H05H 1/50

and using applied magnetic fields, e.g. for focusing or rotating the arc

#### References

##### Limiting references

*This place does not cover:*

Torches where plasma is generated by applied EM fields	<a href="#">H05H 1/30</a>
Controlling the arc by EM fields	<a href="#">H05H 1/40</a>

## H05H 1/52

using exploding wires or spark gaps ([H05H 1/26](#) takes precedence; spark gaps in general [H01T](#))

#### Definition statement

*This place covers:*

Systems using local plasma generation for specific applications.

#### References

##### Limiting references

*This place does not cover:*

Plasma torches	<a href="#">H05H 1/26</a>
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##### Informative references

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

Spark gaps in general	<a href="#">H01T 1/00</a>
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## H05H 1/54

### Plasma accelerators

#### Definition statement

*This place covers:*

System and methods for accelerating ions and/or electrons out of a plasma.

#### References

##### Limiting references

*This place does not cover:*

Ion thrusters	<a href="#">F03H 1/00</a>
Ion sources for ion beam tubes	<a href="#">H01J 27/02</a>
Electron sources for spectroscopy	<a href="#">H01J 49/08</a>
Ion sources for spectroscopy	<a href="#">H01J 49/10</a>

## H05H 3/00

### Production or acceleration of neutral particle beams, e.g. molecular or atomic beams

#### Definition statement

*This place covers:*

Systems and methods for generating atomic beams, molecular beams and neutron beams, as well as systems and methods for generating electromagnetic radiation.

#### References

##### Limiting references

*This place does not cover:*

X-ray or gamma detectors	<a href="#">G01T 1/00</a>
Neutron detectors	<a href="#">G01T 3/00</a>
Manipulation of neutral molecules by optical means	<a href="#">G02B 21/32</a>
Charge exchange devices	<a href="#">G21K 1/14</a>
Irradiation devices	<a href="#">G21K 5/00</a>

## H05H 3/02

**Molecular or atomic beam generation** {(charge exchange devices [G21K 1/14](#); polarising devices [G21K 1/16](#); using resonance or molecular beams for analysing or investigating materials [G01N 24/002](#); atomic clock [G04F 5/14](#); beam masers [H01S 1/06](#))}

### Definition statement

*This place covers:*

Systems and methods for generating a beam of molecular or atomic particles, e.g. by irradiation of a target or by neutralization of charged particles.

### References

#### Limiting references

*This place does not cover:*

Neutron generation	<a href="#">H05H 3/06</a>
Molecular beams for analysing or investigating materials	<a href="#">G01N 24/002</a>
Optical traps	<a href="#">G02B 21/32</a>
Atomic clocks	<a href="#">G04F 5/14</a>
Charge exchange devices	<a href="#">G21K 1/14</a>
Polarising devices	<a href="#">G21K 1/16</a>
Cathodic sputtering	<a href="#">H01J 37/34</a>
Beam masers	<a href="#">H01S 1/06</a>

## H05H 3/04

### Acceleration by electromagnetic wave pressure

#### Definition statement

*This place covers:*

Systems and methods for accelerating electrically neutral particles by means of electromagnetic fields (e.g. by exploiting their dipolar electric moment, levitation devices) and for accelerating or cooling atom beams (e.g. atom traps, atom chips).

### References

#### Limiting references

*This place does not cover:*

Use of photons for propulsive thrust	<a href="#">F03H 3/00</a>
Manipulation of neutral molecules by optical means	<a href="#">G02B 21/32</a>
Handling charged particles	<a href="#">G21K 1/00</a>

## H05H 3/06

Generating neutron beams (targets for producing nuclear reactions [H05H 6/00](#); neutron sources [G21G 4/02](#))

### Definition statement

*This place covers:*

Systems and methods for generating neutron beams, e.g. by impacting a target in a sealed envelope, by collision of particle beams, for logging tools, for material detection).

### References

#### Limiting references

*This place does not cover:*

Targets for producing nuclear reactions	<a href="#">H05H 6/00</a>
Radiation detectors	<a href="#">G01T</a>
Neutron prospection and detection	<a href="#">G01V 5/00</a> , <a href="#">G01V 5/10</a>
Neutron generation by low-temperature nuclear fusion	<a href="#">G21B 3/00</a>
Neutron generation in fission nuclear reactors	<a href="#">G21C</a>
Radioactive neutron sources	<a href="#">G21G 4/02</a>

## H05H 5/00

Direct voltage accelerators; Accelerators using single pulses ([H05H 3/06](#) takes precedence)

### References

#### Limiting references

*This place does not cover:*

Generating neutron beams	<a href="#">H05H 3/06</a>
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## H05H 5/02

Details (targets for producing nuclear reactions [H05H 6/00](#))

### References

#### Limiting references

*This place does not cover:*

Targets for producing nuclear reactions	<a href="#">H05H 6/00</a>
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## H05H 5/03

Accelerating tubes (vessels or containers of electric discharge tubes with improved potential distribution over surface of vessel [H01J 5/06](#); shields of X-ray tubes associated with vessels or containers [H01J 35/16](#))

### References

#### Limiting references

*This place does not cover:*

Vessels or containers of electric discharge tubes with improved potential distribution over surface of vessel	<a href="#">H01J 5/06</a>
Shields of X-ray tubes associated with vessels or containers	<a href="#">H01J 35/16</a>

## H05H 5/045

{High voltage cascades, e.g. Greinacher cascade}

### Definition statement

*This place covers:*

Electrostatic generators provided with high-voltage cascades, e.g. Greinacher cascade.

## H05H 6/00

Targets for producing nuclear reactions (supports for targets or objects to be irradiated [G21K 5/08](#) {; preparation of tritium [C01B 4/00](#); targets, e.g. pellets for fusion reactions by laser or charged particles beam injection [H05H 1/22](#)})

### Definition statement

*This place covers:*

Materials and devices used as a target for producing secondary particles upon impact of an impinging beam.

This subclass includes also auxiliary components of the targets, such as windows, radiation protective screens, cooling arrangements.

### References

#### Limiting references

*This place does not cover:*

Pellets for fusion reactions	<a href="#">G21B 1/19</a>
Arrangements for converting chemical elements by target irradiation	<a href="#">G21G 1/00</a>
Recovery of isotopes from an irradiated target	<a href="#">G21G 1/00</a>
Systems for treating objects by irradiation	<a href="#">G21K 5/00</a>
Supports for objects to be irradiated	<a href="#">G21K 5/08</a>

## H05H 6/005

{Polarised targets (polarising devices, e.g. for obtaining a polarised ion beam [G21K 1/16](#))}

### Definition statement

*This place covers:*

Polarised targets used in quantum physics (e.g., targets for polarising neutron beams, spin-polarised thermonuclear fuels) and arrangements for their production.

### References

#### Limiting references

*This place does not cover:*

Manipulation of particles by means of polarising devices	<a href="#">G21K 1/16</a>
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## H05H 7/00

Details of devices of the types covered by groups [H05H 9/00](#), [H05H 11/00](#), [H05H 13/00](#)

### Definition statement

*This place covers:*

Constructive arrangements and components of linear accelerators, magnetic induction accelerators and magnetic resonance accelerators (e.g. magnet systems, power supply systems), their auxiliary systems (e.g. beam injection systems, undulators) and irradiation systems using such accelerators.

### References

#### Limiting references

*This place does not cover:*

Direct voltage accelerators	<a href="#">H05H 5/00</a>
Irradiation of objects	<a href="#">G21K 5/00</a>

### Synonyms and Keywords

*In patent documents, the following words/expressions are often used as synonyms:*

- "LINAC" and "Linear accelerator"
- "CW" and "Continuous wave"

## H05H 7/001

{Arrangements for beam delivery or irradiation (irradiation systems per se [G21K 5/00](#))}

### Definition statement

*This place covers:*

Systems for delivering the accelerated beam of particles to the target.

## References

### Limiting references

*This place does not cover:*

Radiation diagnosis	<a href="#">A61B 6/00</a>
Gantries for radiation therapy	<a href="#">A61N 5/00</a>
Product irradiation systems	<a href="#">G21K 5/00</a>

## H05H 7/02

**Circuits or systems for supplying or feeding radio-frequency energy (radio-frequency generators [H03B](#))**

### Definition statement

*This place covers:*

Systems for supplying microwave or radio-frequency energy to the different components and auxiliaries of the accelerator, e.g. accelerating cavities, electromagnets, particle sources.

## References

### Limiting references

*This place does not cover:*

Radio-frequency generators	<a href="#">H03B</a>
Klystrons	<a href="#">H03B 9/04</a>

## H05H 7/04

**Magnet systems {, e.g. undulators, wigglers (free-electron laser [H01S 3/0903](#))}; Energisation thereof**

### Definition statement

*This place covers:*

All kind of magnets and superconducting magnets used in particle accelerators, e.g. for beam bunching (undulators, wigglers), focusing, bending or deflecting.

## References

### Limiting references

*This place does not cover:*

Free-electron lasers	<a href="#">H01S 3/0903</a>
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### Informative references

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

Magnets in general	<a href="#">H01F</a>
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## H05H 7/06

### Two-beam arrangements; Multi-beam arrangements {storage rings}; Electron rings

#### Definition statement

*This place covers:*

Arrangements for storing and accelerating plural particle beams at the same time (e.g. for beam collision purposes) and for beam merging (e.g. funneling).

#### References

##### Limiting references

*This place does not cover:*

Beam collisioners for nuclear fusion	<a href="#">G21B 3/006</a>
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## H05H 7/08

### Arrangements for injecting particles into orbits

#### Definition statement

*This place covers:*

Systems and methods for forming and injecting particle beams into an accelerator by mechanical, electrostatic or magnetic means (e.g. ion and electron sources, pre-accelerators).

#### Glossary of terms

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

ECR	Electron Cyclotron Resonance
PIG	Cathodic source of light ions
EBIS	Electron-Beam Ion Source
CSD	Charge State Distribution

## H05H 7/10

### Arrangements for ejecting particles from orbits

#### Definition statement

*This place covers:*

Arrangements for extracting the charged particles from the accelerators, e.g. septa, stripping foils.

#### References

##### Limiting references

*This place does not cover:*

Arrangements for modifying the trajectory of the extracted beam (gantries)	<a href="#">A61K</a>
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## H05H 7/12

### Arrangements for varying final energy of beam

#### Definition statement

*This place covers:*

Systems and methods for varying the energy of the extracted beam, by electromagnetic or mechanical means or by emittance variation (e.g. RF cavities, stripping foils, stochastic cooling).

## H05H 7/14

### Vacuum chambers ([H05H 5/03](#) takes precedence)

#### Definition statement

*This place covers:*

The vacuum chambers, cavities and resonators used in a charged particle accelerator and their auxiliary systems (e.g. vacuum pumps, cryostats).

#### References

##### Limiting references

*This place does not cover:*

Accelerating tubes for direct-voltage accelerators	<a href="#">H05H 5/03</a>
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## H05H 7/18

### Cavities; Resonators {(travelling-wave tubes [H01J 23/18](#); hyperfrequency cavities in general [H01P 7/04](#), [H01P 7/06](#))}

#### References

##### Limiting references

*This place does not cover:*

Travelling-wave tubes	<a href="#">H01J 23/18</a>
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##### Informative references

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

Hyper-frequency cavities in general	<a href="#">H01P 7/04</a> , <a href="#">H01P 7/06</a>
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## H05H 7/22

### Details of linear accelerators, e.g. drift tubes ([H05H 7/02](#) - [H05H 7/20](#) take precedence)

#### Definition statement

*This place covers:*

Specific components and systems of linear accelerators (e.g. drift tubes, arrangements for coupling cavities, arrangements for coupling power to cavities) and of the accelerators covered by [H05H 15/00](#).



## References

### Limiting references

*This place does not cover:*

Details of the accelerators covered by <a href="#">H05H 9/00</a> - <a href="#">H05H 13/10</a>	<a href="#">H05H 7/00</a>
Other details	<a href="#">H05H 7/02</a> - <a href="#">H05H 7/20</a>

### Informative references

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

RF supplying systems	<a href="#">H05H 7/02</a>
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## H05H 9/00

### Linear accelerators

#### Definition statement

*This place covers:*

Hadron linacs, drift-tube linacs, side-coupled cavity linacs, RF quadrupoles, lepton linacs and hybrid linacs.

## References

### Limiting references

*This place does not cover:*

DC linear accelerators	<a href="#">H05H 5/00</a>
Gantries for radiotherapy	<a href="#">A61N 5/00</a>

## H05H 9/02

### Travelling-wave linear accelerators {(travelling-wave tubes [H01J 25/34](#))}

#### Definition statement

*This place covers:*

Systems and methods for accelerating electron beams by means of an electromagnetic wave (microwave) travelling in a tube serving as waveguide.

## References

### Limiting references

*This place does not cover:*

Travelling-wave tubes	<a href="#">H01J 25/34</a>
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## H05H 9/04

### Standing-wave linear accelerators

#### Definition statement

*This place covers:*

Linear accelerators wherein electric fields are set up as standing waves within a resonant cavity, with drift tubes suspended along the central axis.

Linear accelerators for hadron particles, e.g. protons, neutrons and ions.

#### Glossary of terms

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

HADRON	composite particle subject to strong interaction
LINAC	Linear Accelerator

## H05H 9/042

### {Drift tube LINACS}

#### Definition statement

*This place covers:*

Linear accelerators with drift tubes suspended along the central axis.

## H05H 9/047

### {Hybrid systems}

#### Definition statement

*This place covers:*

Linear accelerators combining the features of [H05H 9/042](#) - [H05H 9/045](#).

## H05H 9/048

### {Lepton LINACS}

#### Definition statement

*This place covers:*

Linear accelerators for lepton particles, e.g. electrons.

#### Glossary of terms

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

LEPTON	Elementary particle not subject to strong interaction
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**H05H 11/00****Magnetic induction accelerators, e.g. betatrons****Definition statement**

*This place covers:*

Betatrons.

**H05H 13/00****Magnetic resonance accelerators; Cyclotrons {(strophotrons, turbine tubes [H01J 25/62](#))}****Definition statement**

*This place covers:*

Cyclotrons, synchrotrons, synchrocyclotrons, fixed-field alternating-gradient accelerators and microtrons.

**References****Informative references**

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

Strophotrons, turbine tubes	<a href="#">H01J 25/62</a>
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**H05H 15/00****Methods or devices for acceleration of charged particles not otherwise provided for****Definition statement**

*This place covers:*

Systems and methods for accelerating or decelerating charged particles by means other than linear or magnetic resonance accelerators, e.g. laser pulses, resonance converters, magnetic monopole accelerators, dielectric-wall accelerators, inductive amplification of particle energy.