

CPC**COOPERATIVE PATENT CLASSIFICATION****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](#))

Guidance heading:**H05H 1/00****Generating plasma; Handling plasma**

- H05H 1/0006 . {Investigating plasma, e.g. degree of ionisation (electron temperature) }
- H05H 1/0012 .. {by using radiation }
- H05H 1/0018 ... {Details }
- H05H 1/0025 ... {by using photoelectric means ([H05H 1/0031](#) to [H05H 1/0043](#) take precedence) }
- H05H 1/0031 ... {by interferrometry }
- H05H 1/0037 ... {by spectrometry (see [G01N 3/00](#)) }
- H05H 1/0043 ... {by using infra-red or ultra-violet radiation }
- H05H 1/005 ... {by using X-rays or alpha rays (see [G01N 23/00](#)) }
- H05H 1/0056 ... {by using neutrons (see [G01N 23/00](#)) }
- H05H 1/0062 ... {by using microwaves (see [G01N 23/34](#)) }
- H05H 1/0068 .. {by thermal means (see [G01N 25/00](#)) }
- H05H 1/0075 ... {Langmuir probes }
- H05H 1/0081 .. {by electric means (see [G01N 27/00](#), [G01R](#)) }
- H05H 1/0087 .. {by magnetic means (see [G01N 27/00](#), [G01R](#)) }
- H05H 1/0093 .. {by acoustic, e.g. ultrasonic means (see [G01N 29/02](#)) }

- H05H 1/02 . Arrangements for confining plasma by electric or magnetic fields; Arrangements for heating plasma ({ [G21B 1/00](#) takes precedence; } electron optics [H01J](#))
- H05H 1/03 .. using electrostatic fields
- H05H 1/04 .. using magnetic fields substantially generated by the discharge in the plasma
- H05H 1/06 ... longitudinal pinch devices
- H05H 1/08 ... Theta pinch devices {e.g. SCYLLA }
- H05H 1/10 .. using externally-applied magnetic field only {e.g. Q-machines, Yin-Yang, base-ball }
- H05H 1/105 ... {using magnetic pumping }
- H05H 1/11 ... using cusp configuration ([H05H 1/14](#) takes precedence)

- H05H 1/12 . . . wherein the containment vessel forms a closed or nearly closed loop { [\(G21B 1/05 takes precedence\)](#) }
- H05H 1/14 . . . wherein the containment vessel is straight and has magnetic mirrors {[electron mirrors G21K 1/08B](#) }
- H05H 1/16 . . using externally-applied electric and magnetic field
- H05H 1/18 . . . wherein the field oscillate at very high frequency, e.g. in the microwave range {[e.g. using cyclotron resonance](#) }
- H05H 1/20 . . Ohmic heating
- H05H 1/22 . . for injection heating { [\(G21B 1/15 takes precedence\)](#) }
- H05H 1/24 . Generating plasma { [\(gas-filled discharge reactors H01J 37/32; nuclear fusion reactors G21B 1/00; ohmic heating H05H 1/20; injection heating H05H 1/22\)](#) }
- H05H 1/2406 . . { [Dielectric barrier discharges](#) }
- H05H 1/2475 . . { [Acoustic pressure discharge](#) }
- H05H 1/26 . . Plasma torches { [\(metal working with constricted arc B23K 10/00, H05H 10/02; metal spraying B05B 7/18, B05B 7/20\)](#) }
- H05H 1/28 . . . Cooling arrangements
- H05H 1/30 . . . using applied electromagnetic fields, e.g. high frequency or microwave energy [\(H05H 1/28 takes precedence\)](#)
- H05H 1/32 . . . using an arc [\(H05H 1/28 takes precedence\)](#)
- H05H 1/34 Details, e.g. electrodes, nozzles {[cf. B23K 9/24](#) }
- H05H 1/3405 {[Arc stabilising or constricting arrangements, e.g. by an additional gas flow \(by externally applied magnetic fieldH05H 1/40; by using powders or liquidsH05H 1/42; using coaxial protecting fluidH05H 1/341\)](#) }
- H05H 1/341 {[using coaxial protecting fluid \(arc stabilising or constricting arrangementsH05H 1/3405; introducing materials into the plasmaH05H 1/42\)](#) }
- H05H 1/36 Circuit arrangements [\(H05H 1/38 ,H05H 1/40 take precedence\)](#)
- H05H 1/38 Guiding or centering of electrodes
- H05H 1/40 using applied magnetic fields, e.g. for fucusing or rotating the arc {[cf. B23K 9/08, B23K 9/06C5](#) }
- H05H 1/42 with provision 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](#) }
- H05H 1/44 using more than one torch
- H05H 1/46 . . using applied electromagnetic fields, e.g. high frequency or microwave energy [\(H05H 1/26 takes precedence\)](#)
- H05H 1/48 . . using an arc [\(H05H 1/26 takes precedence\)](#)
- H05H 1/50 . . . and using applied magnetic fields, e.g. for focusing or rotating the arc
- H05H 1/52 . . using exploding wires or spark gaps [\(H05H 1/26 takes precedence; spark gaps in general H01T \)](#)
- H05H 1/54 . Plasma accelerators
- H05H 3/00 Production or acceleration of neutral particle beams, e.g. molecular or atomic beams**

- 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](#)) }
- H05H 3/04
 - Acceleration by electromagnetic wave pressure
- H05H 3/06
 - Generating neutron beams (targets for producing nuclear reactions [H05H 6/00](#); neutron sources [G21G 4/02](#))
- H05H 5/00**

Direct voltage accelerators; Accelerators using single pulses ([H05H 3/06](#) takes precedence)
- H05H 5/02
 - Details (targets for producing nuclear reactions [H05H 6/00](#))
- 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](#))
- H05H 5/04
 - { energised by electrostatic generators }
- H05H 5/042
 - { of the van de Graaf type }
- H05H 5/045
 - { High voltage cascades, e.g. Greinacher cascade }
- H05H 5/047
 - { Pulsed generators }
- H05H 5/06
 - { Multistage accelerators }
- H05H 5/063
 - { Tandems }
- H05H 5/066
 - { Onion-like structures }
- H05H 5/08
 - Particle accelerators using step-up transformers, e.g. resonance transformers
- 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](#) }
- H05H 6/005
 - {Polarised targets (polarising devices, e.g. for obtaining a polarised ion beam [G21K 1/16](#)) }
- H05H 7/00**

Details of devices of the types covered by groups [H05H 9/00](#), [H05H 11/00](#), [H05H 13/00](#)
- H05H 7/001
 - { Arrangements for beam delivery or irradiation (irradiation systems per se [G21K 5/00](#)) }
- H05H 7/02
 - Circuits or systems for supplying or feeding radio-frequency energy (radio-frequency generators [H03B](#))
- H05H 7/04
 - Magnet systems {e.g. undulators, wigglers (free-electron laser [H01S 3/0903](#)) }; Energisation thereof
- H05H 7/06
 - Two-beam arrangements; Multi-beam arrangements {storage rings }; Electron rings

- H05H 7/08 . Arrangements for injecting particles into orbits
- H05H 7/10 . Arrangements for ejecting particles from orbits
- H05H 7/12 . Arrangements for varying final energy of beam
- H05H 7/14 . Vacuum chambers ([H05H 5/03](#) takes precedence)
- H05H 7/16 . . of the waveguide type
- H05H 7/18 . . Cavities; Resonators { (travelling-wave tubes [H01J 23/18](#); hyperfrequency cavities in general [H01P 7/04](#), [H01P 7/06](#)) }
- H05H 7/20 . . . with superconductive walls
- H05H 7/22 . Details of linear accelerators, e.g. drift tubes ([H05H 7/02](#) to [H05H 7/20](#) take precedence)

- H05H 9/00 Linear accelerators**
- H05H 9/005 . { Dielectric wall accelerators }
- H05H 9/02 . Travelling-wave linear accelerators {travelling-wave tubes [H01J 25/34](#) }
- H05H 9/04 . Standing-wave linear accelerators
- H05H 9/041 . . { Hadron LINACS }
- H05H 9/042 . . . { Drift tube LINACS }
- H05H 9/044 . . . { Coupling cavity LINACS, e.g. side coupled }
- H05H 9/045 . . . { Radio frequency quadrupoles }
- H05H 9/047 . . . { Hybrid systems }
- H05H 9/048 . . { Lepton LINACS }

- H05H 11/00 Magnetic induction accelerators, e.g. betatrons**
- H05H 11/02 . Air-cored betatrons
- H05H 11/04 . Biased betatrons

- H05H 13/00 Magnetic resonance accelerators; Cyclotrons { (strophotrons, turbine tubes [H01J 25/62](#)) }**
- H05H 13/005 . { Cyclotrons }
- H05H 13/02 . Synchrocyclotrons, i.e. frequency modulated cyclotrons
- H05H 13/04 . Synchrotrons
- H05H 13/06 . Air-cored magnetic resonance accelerators
- H05H 13/08 . Alternating-gradient magnetic resonance accelerators

- H05H 13/085 .. { [Fixed-field alternating gradient accelerators \[FFAG \]](#) }
- H05H 13/10 . Accelerators comprising one or more linear accelerating sections and bending magnets or the like to return the charged particles in a trajectory parallel to the first accelerating section, e.g. microtrons

H05H 15/00 Methods or devices for acceleration of charged particles not otherwise provided for

Guidance heading:

H05H 2001/00 Generating plasma; Handling plasma

- H05H 2001/24 . Generating plasma { [\(gas-filled discharge reactors H01J 37/32; nuclear fusion reactors G21B 1/00; ohmic heating H05H 1/20; injection heating H05H 1/22\)](#) }
- H05H 2001/2406 .. { [Dielectric barrier discharges](#) }
- H05H 2001/2412 ... the dielectric being interposed between the electrodes
- H05H 2001/2418 ... the electrodes being embedded in the dielectric
- H05H 2001/2425 ... the electrodes being flush with the dielectric
- H05H 2001/2431 ... Cylindrical electrodes
- H05H 2001/2437 ... Multilayer systems
- H05H 2001/2443 ... Flow through, i.e. the plasma fluid flowing in a dielectric tube
- H05H 2001/245 Internal electrodes
- H05H 2001/2456 External electrodes
- H05H 2001/2462 Ring electrodes
- H05H 2001/2468 Spiral electrodes
- H05H 2001/2475 .. { [Acoustic pressure discharge](#) }
- H05H 2001/2481 ... Piezoelectric actuators
- H05H 2001/2487 ... Mechanical actuators
- H05H 2001/2493 ... Horns
- H05H 2001/26 .. Plasma torches { [\(metal working with constricted arc B23K 10/00, H05H 10/02; metal spraying B05B 7/18, B05B 7/20\)](#) }
- H05H 2001/32 ... using an arc ([H05H 1/28](#) takes precedence)
- H05H 2001/34 Details, e.g. electrodes, nozzles {cf. [B23K 9/24](#) }
- H05H 2001/3415 indexing scheme associated with 1/34
- H05H 2001/3421 transferred arc mode
- H05H 2001/3426 pilot arc
- H05H 2001/3431 coaxial cylindrical electrodes
- H05H 2001/3436 hollow cathode with internal coolant flow
- H05H 2001/3442 cathode with inserted tip
- H05H 2001/3447 rod-like cathode
- H05H 2001/3452 supplementary electrodes between cathode and anode, e.g. cascade
- H05H 2001/3457 nozzle protection devices
- H05H 2001/3463 oblique nozzle

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|---------------------|-------|--|
| H05H 2001/3468 | | vortex generator |
| H05H 2001/3473 | | safety means |
| H05H 2001/3478 | | geometrical details |
| H05H 2001/3484 | ..... | convergent/divergent nozzle |
| H05H 2001/3489 | ..... | contact starting |
| H05H 2001/3494 | ..... | discharge parameter control |
| H05H 2001/46 | .. | using applied electromagnetic fields, e.g. high frequency or microwave energy (H05H 1/26 takes precedence) |
| H05H 2001/4607 | ... | Microwave discharges |
| H05H 2001/4615 | .... | Surface waves |
| H05H 2001/4622 | .... | Waveguides |
| H05H 2001/463 | .... | Antennas or applicators |
| H05H 2001/4637 | .... | Cables |
| H05H 2001/4645 | ... | Radiofrequency discharges |
| H05H 2001/4652 | .... | Inductively coupled |
| H05H 2001/466 | ..... | Electrodes |
| H05H 2001/4667 | ..... | Coiled antennas |
| H05H 2001/4675 | .... | Capacitively coupled |
| H05H 2001/4682 | .... | Associated power generators, e. G. Circuits, matching networks |
| H05H 2001/469 | ... | Flow through, i.e the plasma fluid flowing in a non-dielectric vessel |
| H05H 2001/4692 | .... | dielectric barrier discharge (H05H 1/2406 takes precedence) |
| H05H 2001/4695 | .... | Arc discharge |
| H05H 2001/4697 | .... | Glow discharge |
| H05H 2001/48 | .. | using an arc (H05H 1/26 takes precedence) |
| H05H 2001/481 | ... | Corona discharges |
| H05H 2001/483 | .... | Pointed electrodes |
| H05H 2001/485 | .... | Cylindrical electrodes, e.g. Rotary drums electrodes |
| H05H 2001/486 | .... | Filamentary electrodes |
| H05H 2001/488 | .... | Segmented electrodes |
| H05H 2006/00 | | 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 } |
| H05H 2006/002 | . | Windows |
| H05H 2006/007 | . | Radiation protection arrangements , e.g. screens |
| H05H 2007/00 | | Details of devices of the types covered by groups H05H 9/00, H05H 11/00, H05H 13/00 |
| H05H 2007/001 | . | { Arrangements for beam delivery or irradiation (irradiation systems per se G21K 5/00) } |
| H05H 2007/002 | .. | for modifying beam trajectory , e.g. gantries |

- H05H 2007/004 . . for modifying beam energy, e.g. spread out Bragg peak devices
- H05H 2007/005 . . for modifying beam emittance , e.g. stochastic cooling devices, stripper foils
- H05H 2007/007 . . for focusing the beam to irradiation target
- H05H 2007/008 . . for measuring beam parameters

- H05H 2007/02 . Circuits or systems for supplying or feeding radio-frequency energy ([radio-frequency generators H03B](#))
- H05H 2007/022 . . Pulsed systems
- H05H 2007/025 . . Radiofrequency systems
- H05H 2007/027 . . Microwave systems

- H05H 2007/04 . Magnet systems {e.g. [undulators](#), [wigglers](#) ([free-electron laser H01S 3/0903](#)) }; Energisation thereof
- H05H 2007/041 . . for beam bunching , e.g. undulators
- H05H 2007/043 . . for beam focusing
- H05H 2007/045 . . for beam bending
- H05H 2007/046 . . for beam deflection
- H05H 2007/048 . . for modifying beam trajectory , e.g. gantry systems

- H05H 2007/06 . Two-beam arrangements; Multi-beam arrangements {[storage rings](#) }; Electron rings
- H05H 2007/065 . . Multi-beam merging , e.g. funneling

- H05H 2007/08 . Arrangements for injecting particles into orbits
- H05H 2007/081 . . Sources
- H05H 2007/082 . . . Ion sources, e.g. ECR, duoplasmatron, PIG, laser sources
- H05H 2007/084 . . . Electron sources
- H05H 2007/085 . . by electrostatic means
- H05H 2007/087 . . by magnetic means
- H05H 2007/088 . . by mechanical means, e.g. stripping foils

- H05H 2007/12 . Arrangements for varying final energy of beam
- H05H 2007/122 . . by electromagnetic means , e.g. RF cavities
- H05H 2007/125 . . by mechanical means , e.g. stripping foils
- H05H 2007/127 . . by emittance variation , e.g. stochastic cooling

- H05H 2007/22 . Details of linear accelerators, e.g. drift tubes ([H05H 7/02](#) to [H05H 7/20](#) take precedence)
- H05H 2007/222 . . drift tubes
- H05H 2007/225 . . coupled cavities arrangements
- H05H 2007/227 . . power coupling , e.g. coupling loops

Guidance heading:

- H05H 2240/00 **Test**
- H05H 2240/10 . at atmospheric pressure

H05H 2240/20 . Non-thermal plasma

Guidance heading:

H05H 2242/00 Auxiliary systems

H05H 2242/10 . Cooling arrangements
H05H 2242/1005 . . Power supply other than for plasma torches

H05H 2245/00 test

H05H 2245/104 . spiral electrodes

H05H 2245/12 . Applications
H05H 2245/121 . . treatment of exhaust gas, e.g. Ambient air, ozonizers
H05H 2245/1215 . . . Exhaust gas
H05H 2245/122 . . medical applications { e.g. plasma scalpels, blades, bistouri }
H05H 2245/1225 . . . Sterilization of objects
H05H 2245/123 . . surface treatments
H05H 2245/1235 . . . coating of large volume items
H05H 2245/124 . . production of nanostructures
H05H 2245/125 . . portable devices

H05H 2277/00 Applications

H05H 2277/10 . Medical devices
H05H 2277/11 . . Radiotherapy
H05H 2277/113 . . . Diagnostic systems
H05H 2277/116 . . . Isotope production

H05H 2277/12 . Ion implantation

H05H 2277/13 . High energy applications , e.g. fusion

H05H 2277/14 . Portable devices
H05H 2277/1405 . . Detection systems