Lasery

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Osnova

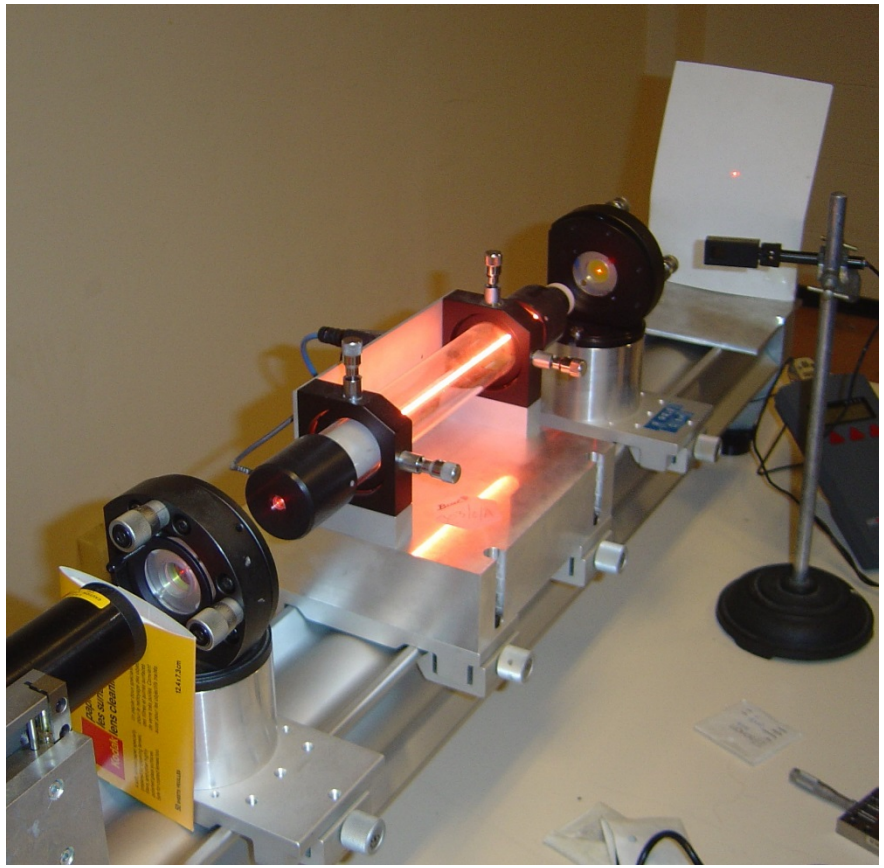
1. Co je to laser a co je jeho cílem?
2. Kvantové jevy v laseru
3. Základní součásti laseru
4. Princip laseru

Laser

obr. 1: laserové ukazovátko 532 nm

obr. 2: robotická ruka s laserem

Laser



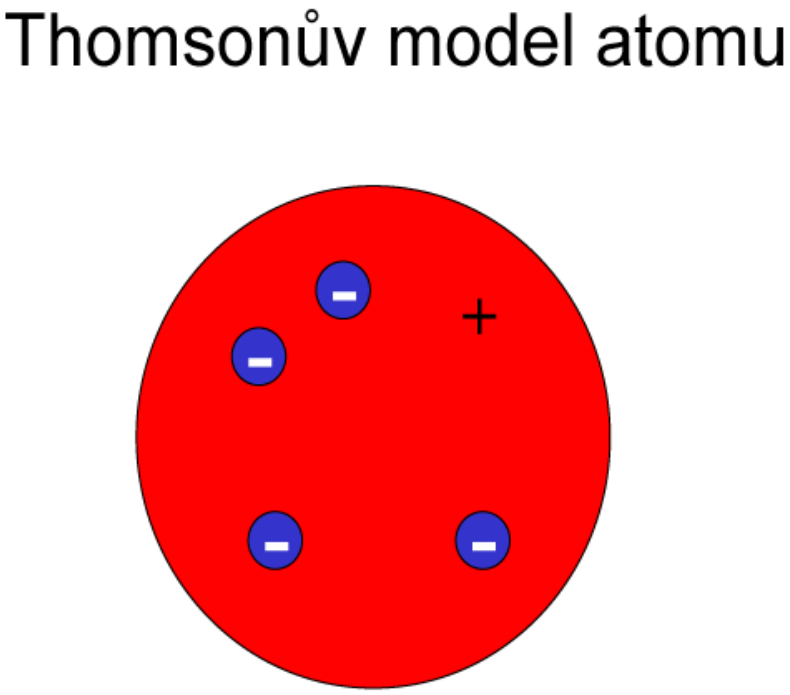
obr. 3: He-Ne laser

obr. 4: řezací laser

Kvantové jevy v laseru

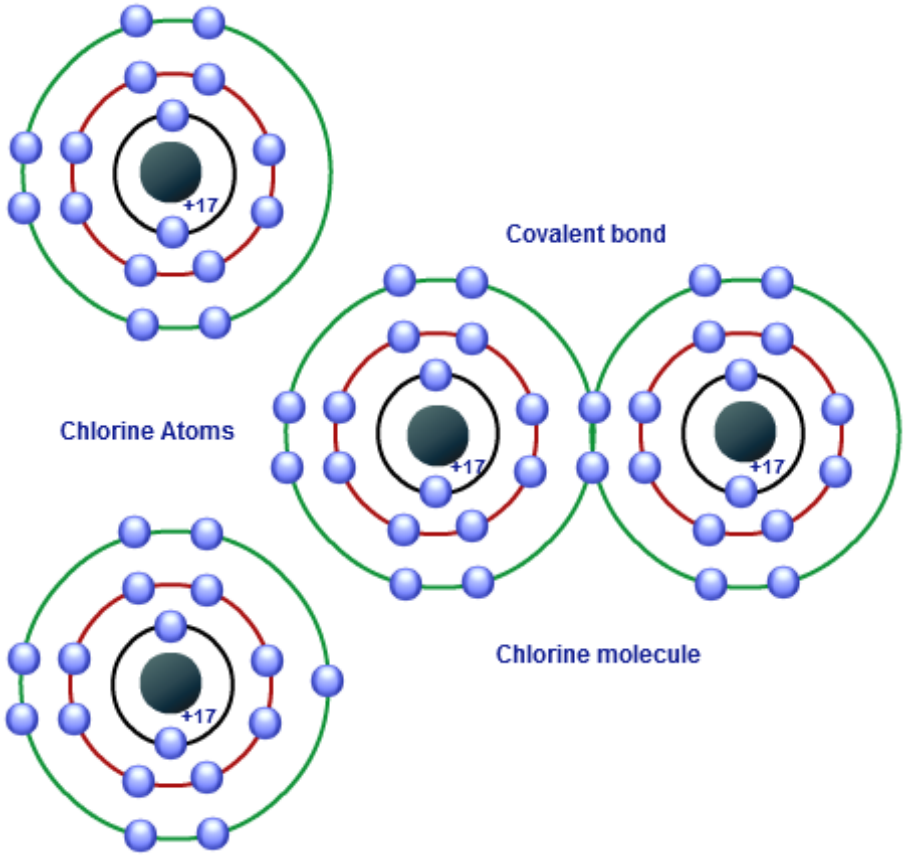
1. model atomu
2. excitace
3. emise

Model atomu



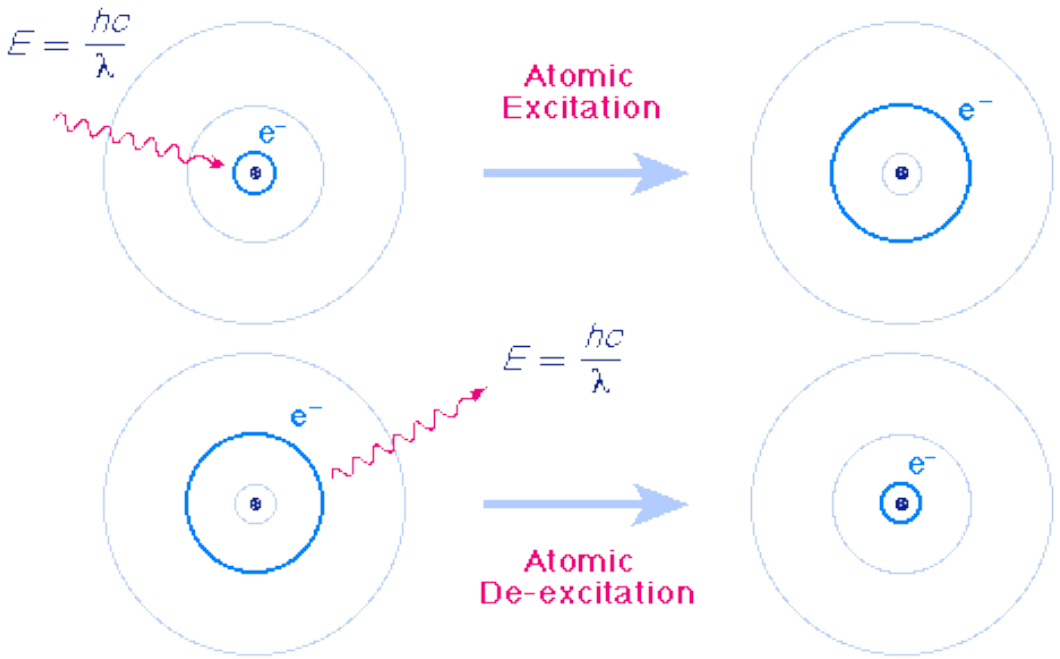
obr. 5: Thomsonův model atomu

Tak jinak!

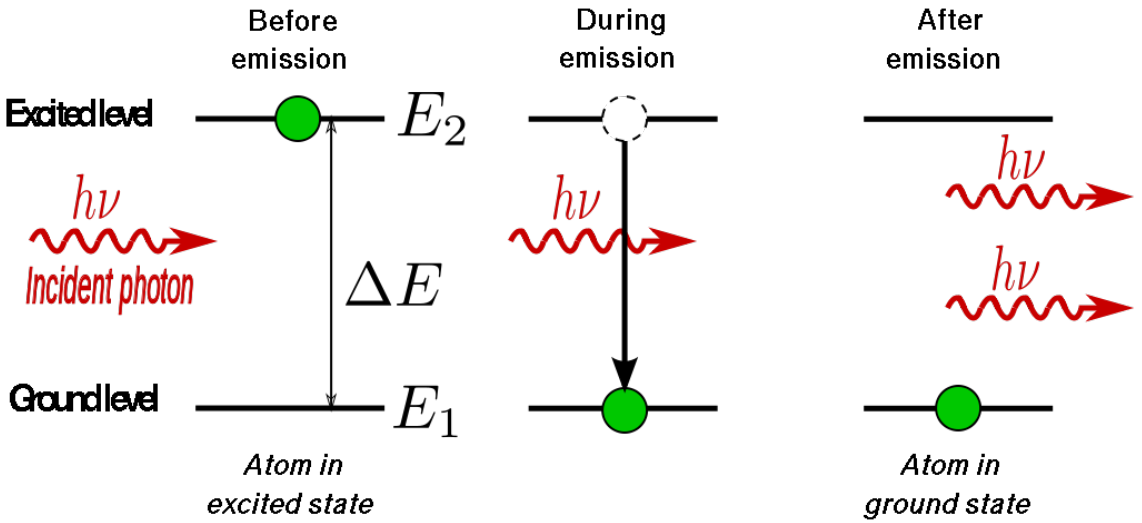


obr. 6: kvantově-mechanický model atomu

Excitace a emise



obr. 7: excitace a spontánní emise

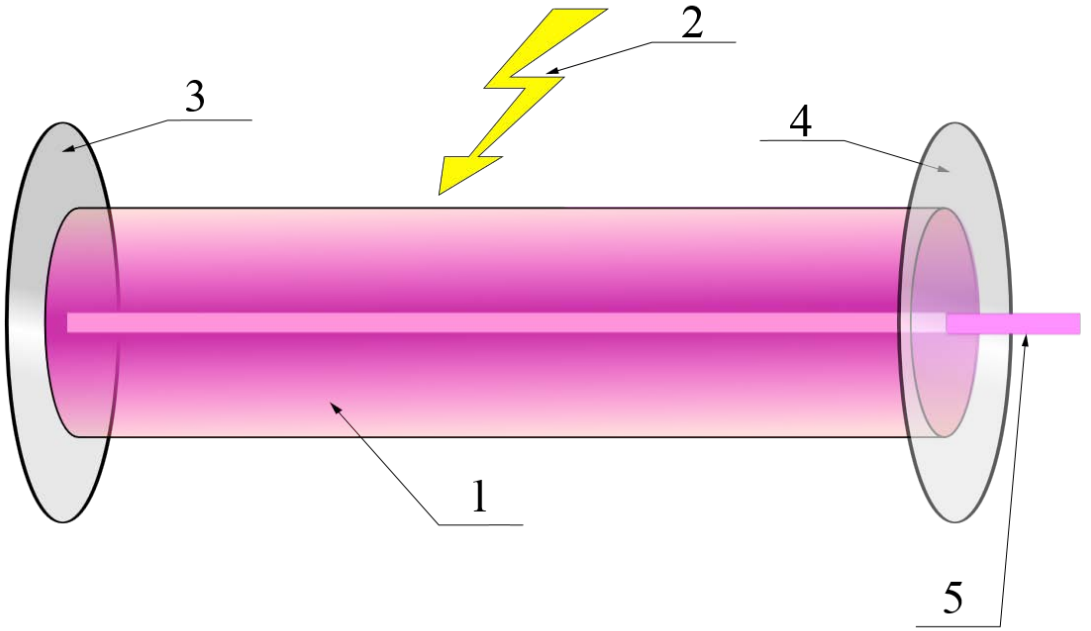


$$E_2 - E_1 = \Delta E = h\nu$$

obr. 8: stimulovaná emise

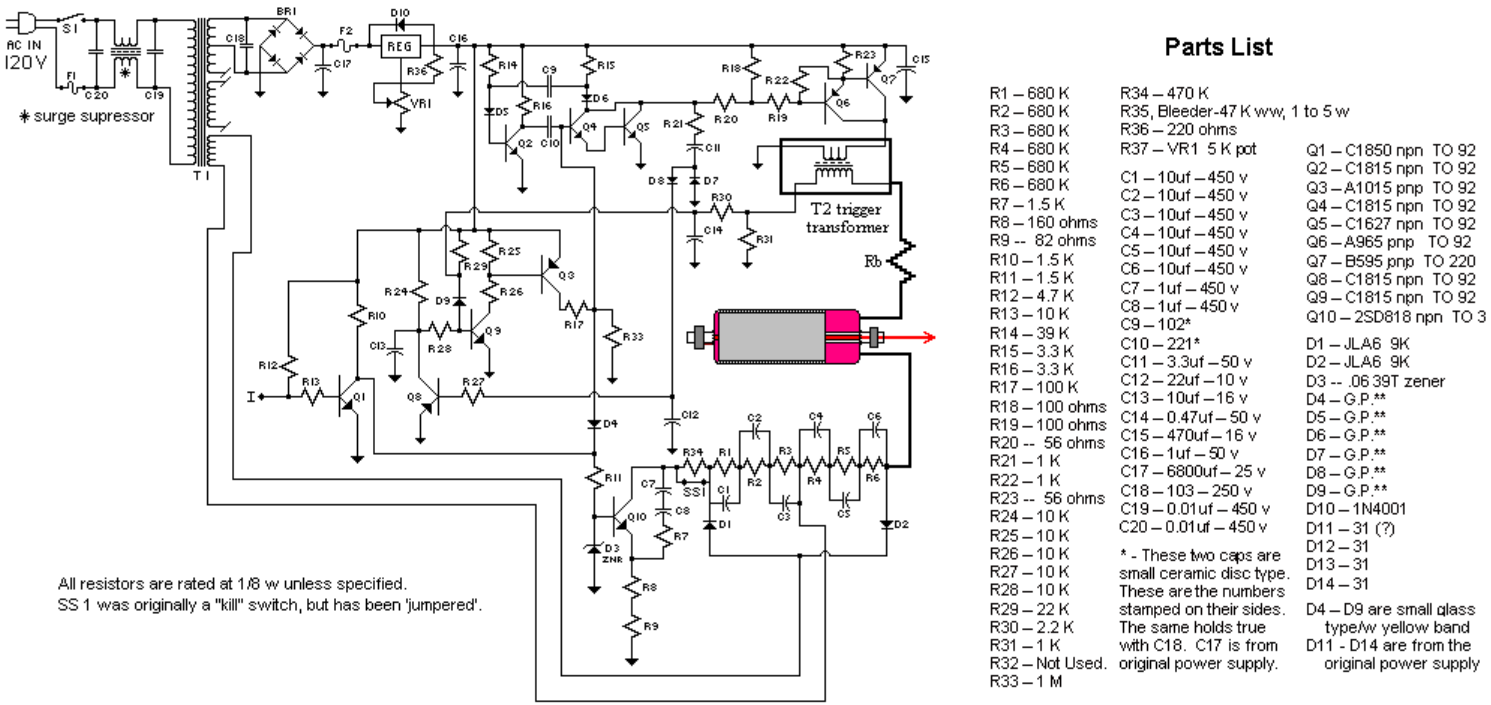
Základní součásti laseru

1. aktivní prostředí
2. zdroj energie
3. zrcadlo
4. polopropustné zrcadlo
5. výstupní svazek



obr. 9: schéma laseru

Zdroj energie



Parts List

R1 – 680 K
R2 – 680 K
R3 – 680 K
R4 – 680 K
R5 – 680 K
R6 – 680 K
R7 – 1.5 K
R8 – 160 ohms
R9 -- 82 ohms
R10 – 1.5 K
R11 – 1.5 K
R12 – 4.7 K
R13 – 10 K
R14 – 39 K
R15 – 3.3 K
R16 – 3.3 K
R17 – 100 K
R18 – 100 ohms
R19 – 100 ohms
R20 -- 56 ohms
R21 – 1 K
R22 – 1 K
R23 -- 56 ohms
R24 – 10 K
R25 – 10 K
R26 – 10 K
R27 – 10 K
R28 – 10 K
R29 – 22 K
R30 – 2.2 K
R31 – 1 K
R32 – Not Used.
R33 – 1 M
R34 – 470 K
R35, Bleeder-47 K ww, 1 to 5 w
R36 – 220 ohms
R37 – VR1 5 K pot

C1 – 10uf – 450 v
C2 – 10uf – 450 v
C3 – 10uf – 450 v
C4 – 10uf – 450 v
C5 – 10uf – 450 v
C6 – 10uf – 450 v
C7 – 1uf – 450 v
C8 – 1uf – 450 v
C9 – 102*
C10 – 221*
C11 – 3.3uf – 50 v
C12 – 22uf – 10 v
C13 – 10uf – 16 v
C14 – 0.47uf – 50 v
C15 – 470uf – 16 v
C16 – 1uf – 50 v
C17 – 6800uf – 25 v
C18 – 103 – 250 v
C19 – 0.01uf – 450 v
C20 – 0.01uf – 450 v

* - These two caps are small ceramic disc type. These are the numbers stamped on their sides. The same holds true with C18. C17 is from original power supply.

Q1 – C1850 npn TO 92
Q2 – C1815 npn TO 92
Q3 – A1015 pnp TO 92
Q4 – C1815 npn TO 92
Q5 – C1627 npn TO 92
Q6 – A965 pnp TO 92
Q7 – B595 pnp TO 220
Q8 – C1815 npn TO 92
Q9 – C1815 npn TO 92
Q10 – 2SD818 npn TO 3

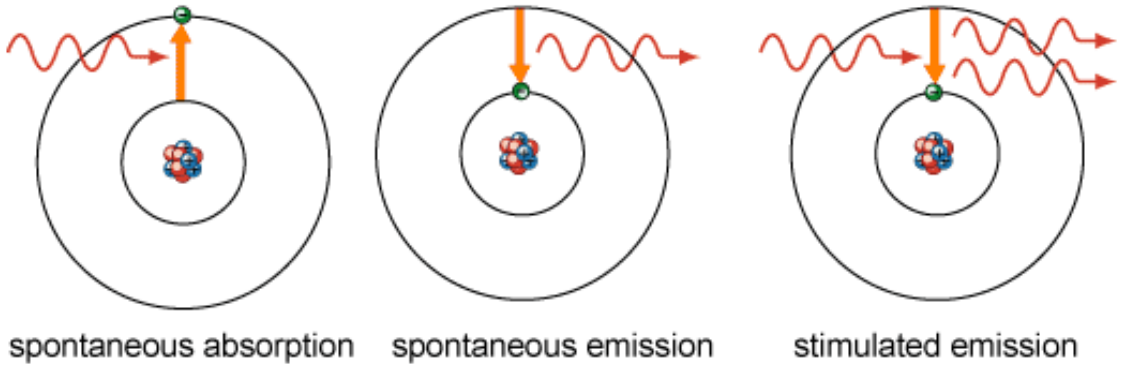
D1 – JLA6 9K
D2 – JLA6 9K
D3 -- .06 39T zener
D4 – G.P.**
D5 – G.P.**
D6 – G.P.**
D7 – G.P.**
D8 – G.P.**
D9 – G.P.**
D10 – 1N4001
D11 – 31 (?)
D12 – 31
D13 – 31
D14 – 31

D4 – D9 are small glass type/w yellow band
D11 - D14 are from the original power supply

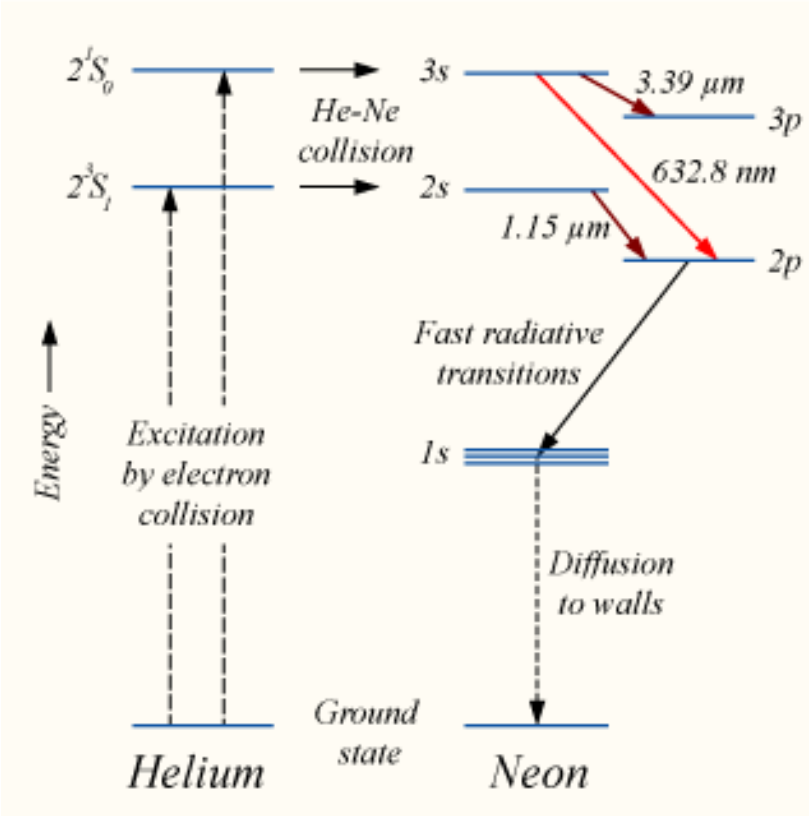
HeNe Laser Power Supply from LaserDisc Player 1 (LP-HL1)

obr. 10: přehledné schéma zdroje pro He-Ne laser

Aktivní prostředí

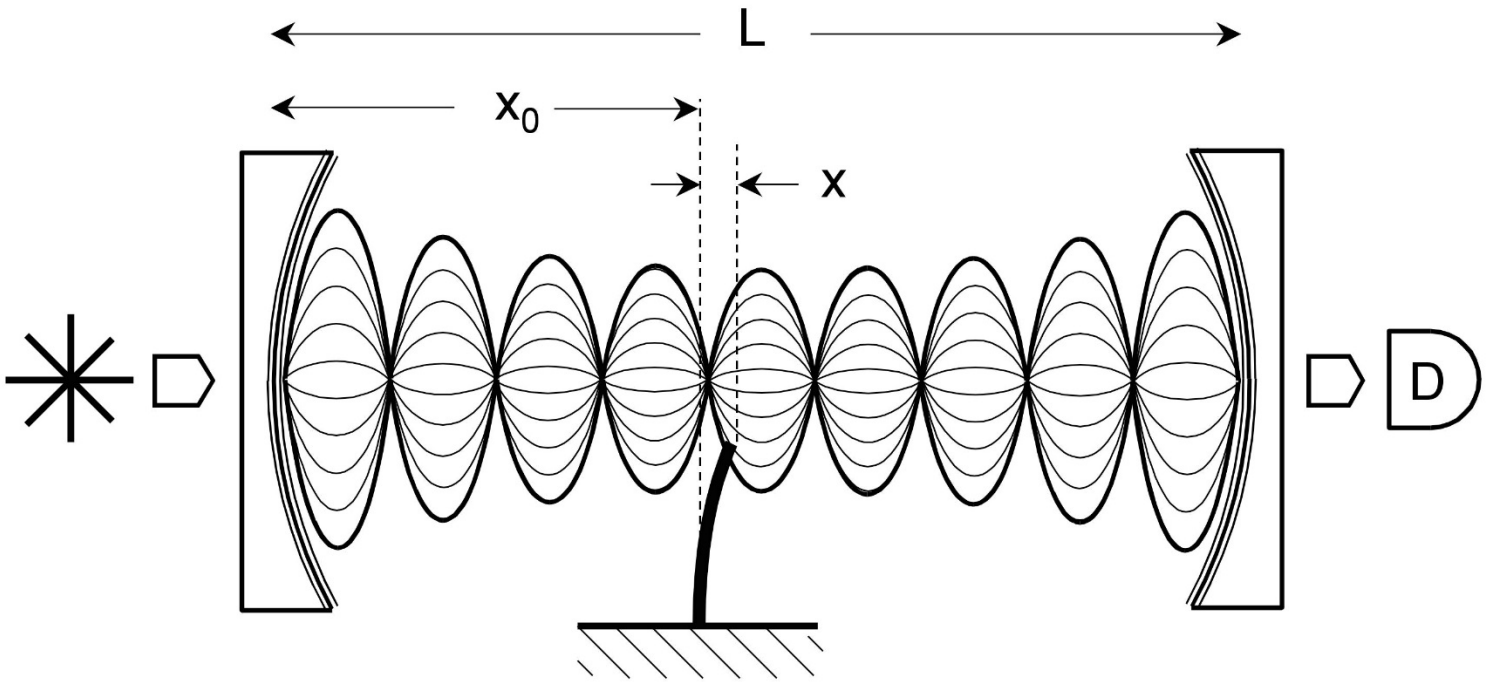


obr. 11: princip aktivního prostředí



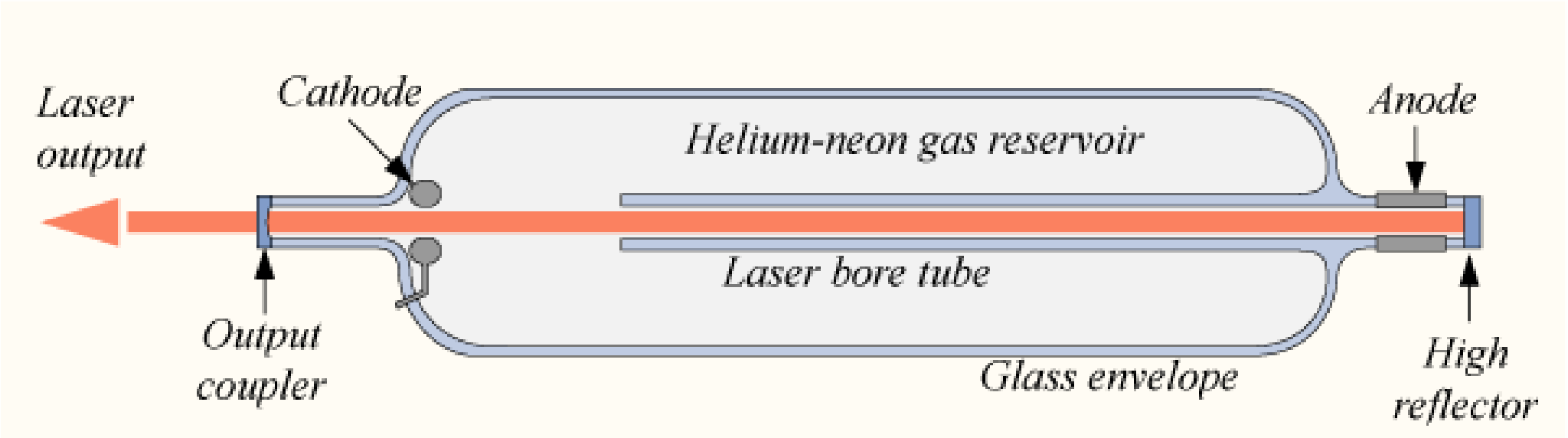
obr. 12: energetické hladiny He-Ne

Rezonátor



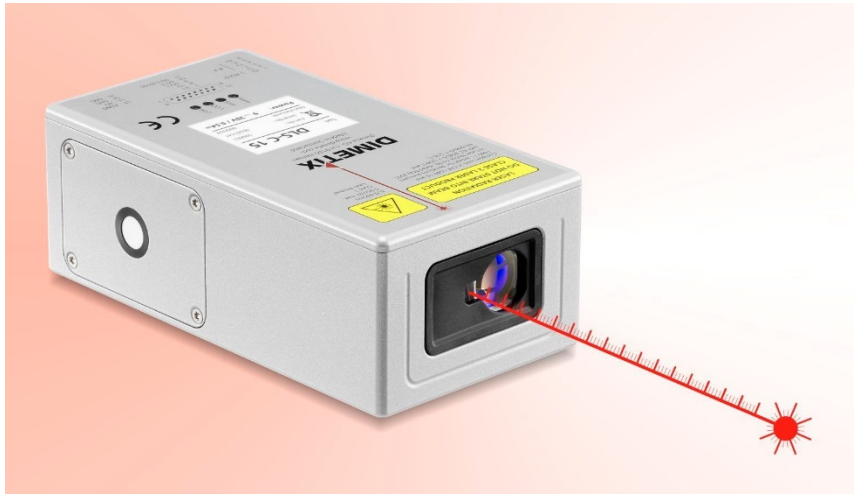
obr. 13: rezonátor

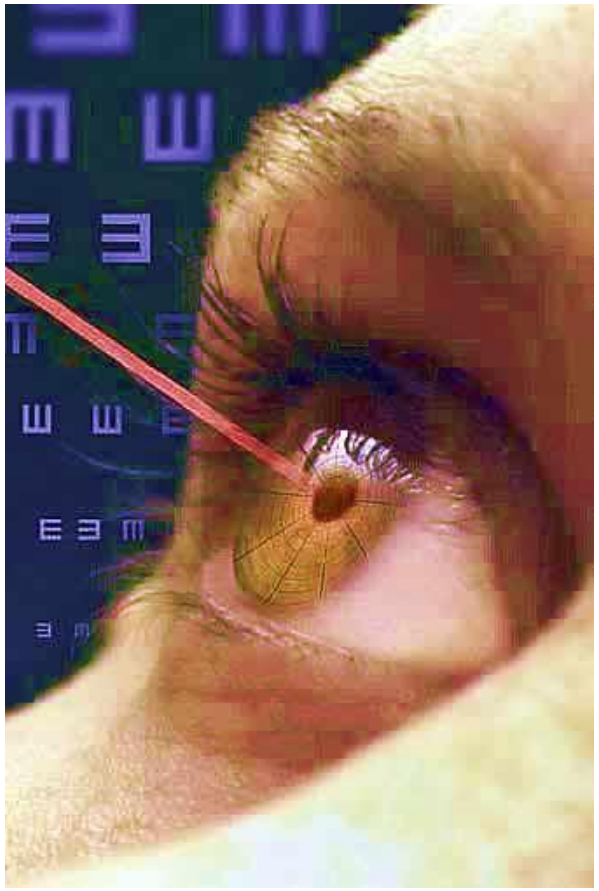
Přehled

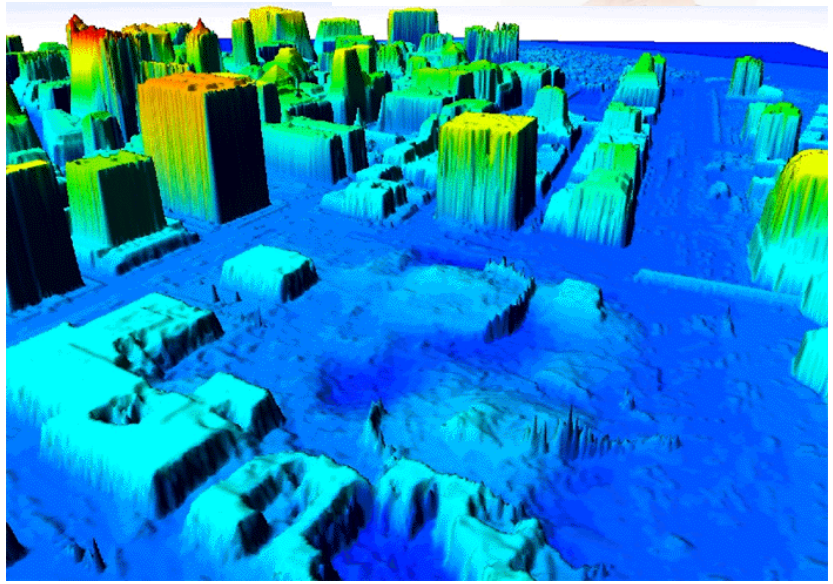


obr. 14: schéma He-Ne laseru

Využití laserů







Let the force be with you!

Zdroje obrázků

1. http://www.besta-shop.cz/fotky28000/fotos/_vyr_164laser1.gif
2. http://image.made-in-china.com/2f0j00svJEwKiFKnch/Robot-Cutting-Machine-TQL-RFW400W-.jpg
3. http://upload.wikimedia.org/wikipedia/commons/4/4b/Laser_DSC09088.JPG
4. http://www.sign-in-china.com/data/uppath/12-05/1336980808_e44fbf85.jpg
5. http://3pol.cz/img/pic/0/2009/05/modely_atomu_03.png
6. http://images.tutorvista.com/cms/images/81/example-of-chlorine-atom.png
7. http://csep10.phys.utk.edu/astr162/lect/light/excitation.gif
8. http://upload.wikimedia.org/wikipedia/commons/thumb/0/09/Stimulated_Emission.svg/1020px-Stimulated_Emission.svg.png
9. http://upload.wikimedia.org/wikipedia/commons/1/1f/Laser.svg
10. http://www.repairfaq.org/sam/lphl1sch.gif
11. princip aktivního prostředí
12. energetické hladiny He-Ne
13. http://www.nano.physik-uni-muenchen.de/research/rep08/Eva/Khaled/Karrai_Fig2.jpg
14. schéma He-Ne laseru