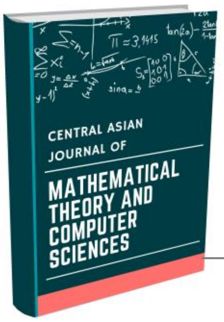


CENTRAL ASIAN JOURNAL OF MATHEMATICAL THEORY AND COMPUTER SCIENCES

http://cajmtcs.centralasianstudies.org/index.php/CAJMTCS

Volume: 02 Issue: 10 | Oct 2021 ISSN: 2660-5309

Development of Quantum Electronics

Rano Mehrievna Saidova, Dilafruz Axmatovna Muhammadova

Lecturers of Bukhara State University

Abstract:

The development of experimental methods of quantum optics has led to the emergence and rapid growth of a new field - quantum communication and quantum computing. The Laboratory of Quantum Optical Technologies is working on solving key scientific problems in the field of quantum technologies: the creation of quantum cryptography and quantum communication systems, the physics of cold atoms and their interaction with light fields, integral photonics and quantum state engineering, new methods of quantum measurements and quantum tomography.

A R T I C L E I N F O

Article history:
Received 30 Aug 2021
Revised form 22 Sep 2021
Accepted 29 Oct 2021

Keywords: quantum optics, experimental groups, fiber optic quantum cryptography, atmospheric quantum cryptography, quantum computing with single neutral atoms, femtosecond laser printing, integral quantum photonics, quantum optics, quantum light state engineering.

---***---

Introduction

The laboratory includes several experimental groups: fiber optic quantum cryptography, atmospheric quantum cryptography, quantum computing with single neutral atoms, femtosecond laser printing and integral quantum photonics, quantum optics and quantum light state engineering.

QUANTUM ELECTRONICS, the section of physics, which studies the methods of amplification, generation and conversion of electricity ¬Magnetic waves in a wide-range of wavelengths (including radio and optical bands), based on based on the effect of discharging radiation and non-linear interaction of the electromag nitrous radiation with substance and use of feedback. K. e. studies also the properties of quantum amplifiers and generators and their application.

Sources of radiation in K. e. is a laser and a maser, the radiation of which is monochromatic, con ¬ guided and high-intensity. Principled difference between lasers and masers from natural substances. Radiation sources is the ability to control the frequency, flow, duration and spec tralling properties of radiation.

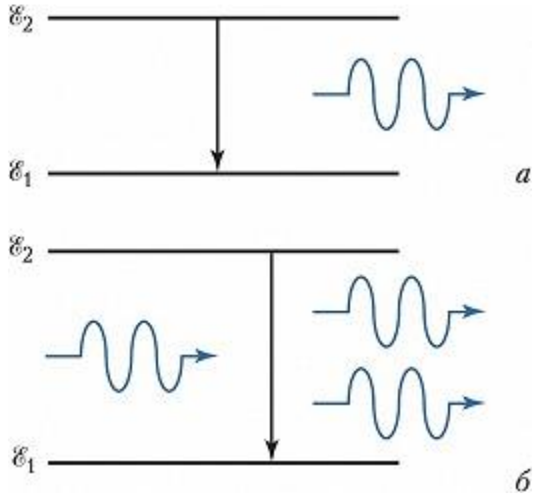
Materials and Methods

Physical foundations of quantum electronics.

Electro-magnetic radiation is emitted by atoms, molecules, and other quantum systems, with some excess int. energy. When an atom moves from a higher energy level E2E2 to a lower level E1E1, a quantum is released. radiation (photon) with a frequency νν, determined by Bohr's condition

$\nu=(E_2-E_1)/\hbar,(*)(*)\nu=(E_2-E_1)/\hbar,$

where $\hbar\hbar$ is the constant Planck. Such transitions “down” can be self-arbitrary and you-need-to-be (for example, under wie with an external electromagnetic field). Transitions from the lower level to the upper level can only be forced out, since they are connected with the Absorption of a quantum of radiation, the frequency of which is determined by the condition (*).



The state of the excited particles is unsteady, they can self-arbitrarily (spontaneously) use - to release a quantum of radiation (Fig. 1, a). Spontaneous radiation is chaotic. character: photons are used decomp. parts in diff. Moments of time, have different frequencies, polarization and direction of propagation. All non-laser light sources (heating lamps, gas discharge lamps, etc.) they emit light as a result of acts of spontaneous discharge [1-6]. In the radio-range, the noise of electronic devices and the heat radio output have the same character. The presence of heated bodies.

Excited particles can emit photons not only on their own, but also out - but under the influence of external radiation, the frequency of which satisfies lions (*) (Fig. 1, b). Two quanta of radiation are involved in the process of removing ¬ waiting and secondary, exhausted by an excited atom and not different from the primary it, having exactly the same frequency, phase, polarization and direction of. distribution Station nenia, that is, co-herent with the first.

For the generation of radiation, there is no need for feedback, for this, the active environment is replaced into the resonator (volumetric or open), in which the electromagnet waves can be generated - those who are brought out outside with the help of specials [7-14]. devices (for example, a semi-transparent mirror for light waves). When the power of the discharging radiation of the radiation exceeds the power of the loss for heating the walls of the resonator torus, scattering of radiation, etc., as well as to useful radiation into the external space, in the resonant cavity, there are non-damping vibrations, that is, there is a radio radiation.

The history of the development of quantum electronics

Although the position is about the expelled radiation, on which is the basis of the K. e., The form it grew to be an addition to optics, the development of K. e. it began in radio-physics. Neono chroma tichnost radiation sources sources optical. range and lack of optics of methods and concepts, well developed in radio because of the reason that the masers are were seen earlier than lasers.

In the 1st floor. 20th century radiophysics and optics have evolved in different ways: in optics, quantum new representations, in radio-fizzyk – wave. The generality of radio physics and optics, due to the generality of the quantum nature of the electromagnet wave processes, did not appear until the radio spectroscopy appeared, studying the spectra molecules, atoms, ions in the microwave range [15-26]. An important feature of the radio is radio inspection. the research was using the sources of monochromatic. radiation.

This has led to a thundering increase in the feeling -sti radio-spectroscopes in comparison with optical. Spectroscopa¬mi. In the radio-radio band, in contrast to the optical. range, excited levels in conditions of thermodynamics. Equality is heavily populated, and the spontaneous radiation is much weaker.

Heat movement can forcefully inflate the excited radio levels and cannot inflate the carriage. The aforementioned factors have led to the fact that radio spectroscopy has become the basis of work on quantum howling electronics.

However, the sorting of the excited and unreported particles in most environments is impossible. –on. To create an inversion of the population, N.G. Basov and A.M. Prokhorov proposed the use of There is a three-level pumping method (1955), which has received a wide distribution. N. Blombergen applied this method to create amplifiers on paramagnetic crystals (1956).

Since in optical.

it is not possible to build a volumetric resonator,

Prokhorov in 1958 proposed an open reZonnator, which in the submillmillimetr vom diapazono represented two parallel, that well-reflecting metal. disk, and in optical it was reduced to two parallel mirrors.

The further development of quantum electronics was associated with the perfection of the by using in them non-linear interactions between the field and the environment, as well as non-linear interactions in optical fibers, allowing to abandon inertial and unreliable me Hanic and electrical shutters.

The purpose of all these improvements was to shorten the impulse to generate niya. By 2008, there are lasers that generate radiation at frequencies up to range; It is being developed, but the gamma laser has not yet been created.

The necessary frequency of the generated radiation can also be obtained with the help of nay-nogo transformation of the laser frequency, but this leads to a decrease in the intensity of the radiation. There are also lasers with re-adjustable frequency (usually lasers with dyes). The use of the Q-factor modulation allowed the creation of laser systems, the generator operating pulses of pulses (duration of the order of 10^{-12} s), and the addition of the principle of sin Chro-nizationation of modes - systems of generation of femto¬second-laser pulses (10^{-15} s). For the creation of a chamber using femtosecond laser pulses and read instant pictures of molecules in the process of the fastest chemicals. reactions, A. Zi-veil was honored with Nobelevskaya pr. in 1999. In 2001, laser second-hand pulses (10-18 s), representing representing most allowable in terms of shortness light energy, containing several. vibrating light field (up to one).

At to seconds pulses allow to receive images an image electronic structure structure of atoms and after - Dit the dynamics of electronic processes in atomic systems with a resolution of the order of 100 ac.

With the appearance of lasers, ideas arose and began to develop the idea of cooling atoms, creating atomic traps (capable of holding one atom in a practically immobile state), mov, etc. the atomic laser, when the coherent state of the en-sambel of atoms is reached (see Atomic optyka). These ideas were successfully developed by G. A. Askaryan and V. S. Letokhov [27-31]. For the creation of a method for cooling and trapping atoms with a laser beam W. Phillips, K. Ko ¬en-Tannuji and S. Chu were placed on the Nobelevskaya pr. (1997).

Conclusion

To conclude, success was achieved by T. Hensham and J. Hall in precision laser spectroscopy, including Chaya technique of changes meaning, based on the use of tot totny bёnok in the optic skikh standards tah tah ty (Nobelevskaya pr., 2005).

REFERENCES

1. E.S. Shears, Trans. Brit. Ceram. Soc., 61, 225 (1962)
2. W.W. Goldschmadt, Skr. Norsk vid.-akad. Oslo, №5 (1925), №7 (1927).
3. K. Löhberg, Z. phys. Chem., B-28, №5, 402 (1935)

4. R.S. Roth, S.J. Schneider, J.Res. NBS, 64A, 309 (1960)
5. J. Warschaw, R. Roy, J. phys. Chem. 65, №11, 2048 (1961)
6. M.V. Shafer, R. Roy, J. Amer. Ceram. Soc., 42, 563 (1959)
7. L. Wolf, H. Bärnighausen, J. prackt. Chem., 3(4), №3/4, 228 (1956)
8. A. Jandelli, Gazz. Chim. Ital., 77 №7/8, 312 (1947)
9. В.В. Серебренников. Химия редкоземельных элементов, т.1 Томск (1959)
10. Г.Э. Кремерс. В сб. «Редкоземельные металлы. Металлургия редкоземельных металлов», ИЛ, М., стр.7 (1962)
11. Б.Лав. В сб. «Редкоземельные металлы. Металлургия редкоземельных металлов», ИЛ, М., стр.76 (1962)
12. Lee Linda, N.D. Green «Corrosion», 20, №5, 145 (1964)
13. K.S. Vorres, Le Roy Eering, Rare Earth Research., ed. By Kleber, E.V. Macmillan Co. N. Y., S. 119 (1961)
14. W. H. Zachariasen, Z. phys. Chem., 123, 124 (1926)
15. L. Pauling, Z. cristallochem., 69, 415 (1928); 75, 128 (1930)
16. R. M. Douglass, Analyt. Chem., 28, №4, 551 (1956)
17. O. J. Guentert, R. J. Mozzi, Acta crystallogr., 11, №10, 746 (1958)
18. R. M.Douglass,E. Staritzky, Analyt. Chem., 28, №4, 552 (1956)
19. M. Foex, Bull. Soc.,chim. France, №1, 137 (1962)
20. В. Б. Глушкова, А. Г. Боганов, Изв. АН СССР, серю хим., №7, 1131 (1965)
21. А. Г. Боганов, В. С. Руденко, ДАН СССР, 161, №3, 611 (1963)
22. G. Brauer, R. Müller, Z. anogram. Allgem. Chem., 321, №5/6, 234 (1963)
23. H. R. Hockstra, K. A. Gingerich, Science, 146, 1163 (1964); Inorg. Chem. 5, 754, (1966)
24. B. H. Justice, E. F. Westrum, J. Phys. Chem.., 67, №2, 339 (1963)
25. E. F. Westrum. Progress in the Science and Technology of the rare earths, vol. 11, ed. Le Roy Eyring (1964)
26. Atoyeva, M. F. (2017). Use of Periodicity in Teaching Physics. Eastern European Scientific Journal, (4), 35-39.
27. M.F. Atoyeva. Didactic foundations of inter-media relations in the training of university students. International Scientific Journal. Theoretical & Applied Science. p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online). Year: 2020 Issue: 06 Volume: 86, P. 124.
28. Заир-Бек С.И., Муштавинская И.В.Развитие критического мышления на уроке: Пособие для учителя. – М.: Просвещение, 2004. – 175 с.
29. Atoyeva, M. F. Pedagogical Tests As An Element Of Types Of Pedagogical Technologies. The American Journal of Applied Sciences, 2(09), 2689-09. DOI-10.37547/tajas Volume 2 Issue 9, 19.09.2020. ISSN 2689-09. 92 The USA Journals, USA www.usajournalshub.com/index.php/tajas 164-169. Имп.5.2.
30. M.F. Atoyeva. The significance of periodicity at teaching physics. The Way of Science. – Volgograd, 2016. – № 10 (32). – P.62-64.
31. Атоева, М. Ф. (2016). Эффективность обучения электродинамике на основе технологии периодичности. Путь науки, (10), 65-66.