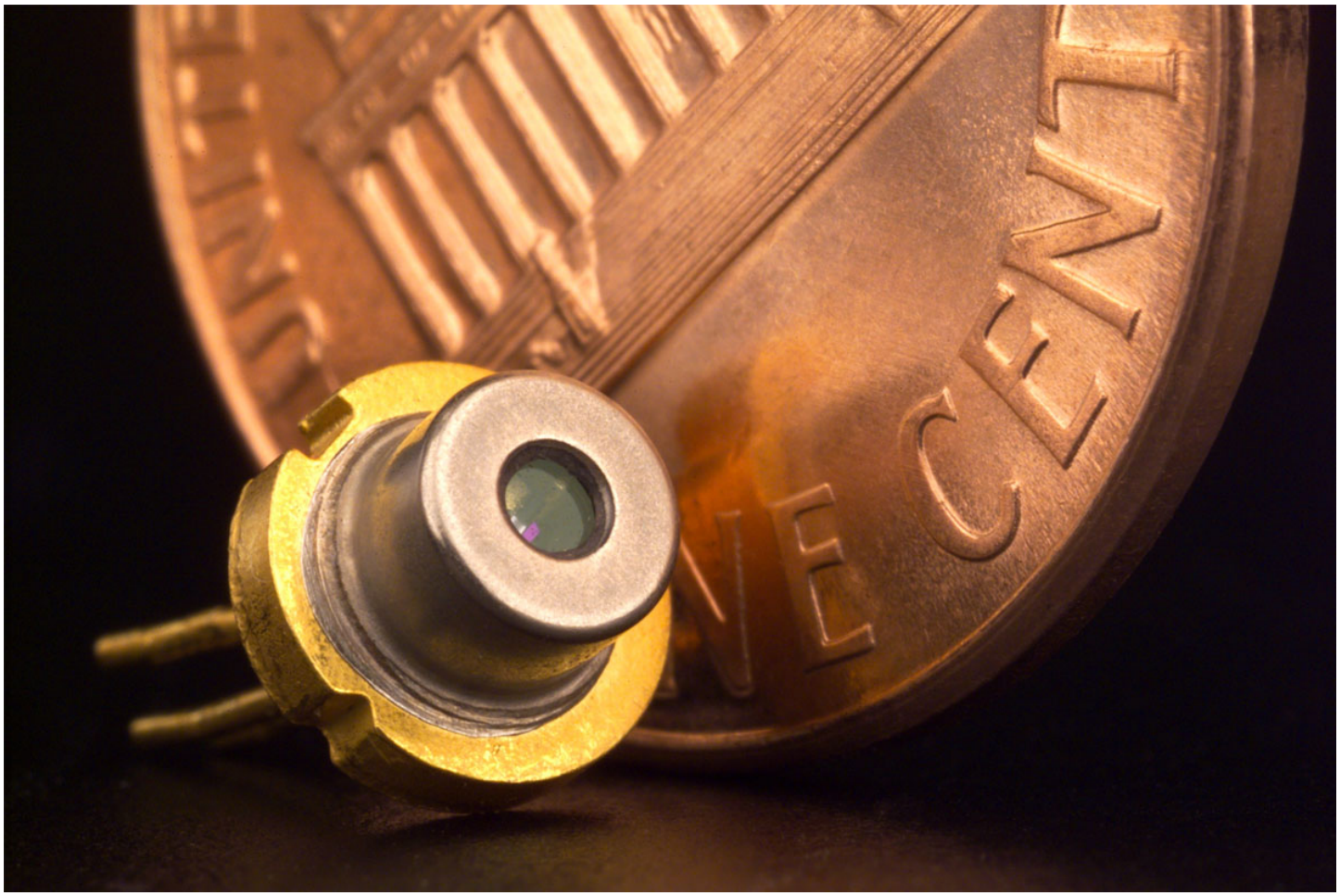
SRL Advance self-contained navigation system components



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Ultra-compact navigation systems, a focal aria of science development in the field of personal self-

contained finding (independent of global systems GPS/GLONASS) are based on the use of quantum standards of nuclear magnetic resonance frequency and gyroscopes. The key condition for making these equipments is to develop microminiature semiconductor laser emitters with the unique stability of emission profile which is the main task for the Scientific Research Laboratory.

The scientists will work on the creation and study of temperature independent vcsels for practical use in microminiature quantum advance miniature nuclear magnetic resonance gyroscope frequency standards.

Such equipments are used to reduce navigation system vulnerability, using a satellite signal and to create antijam secure communication systems.

Concerning the laboratory target:

The target of starting up the laboratory is to develop and study dimensional single-mode temperature independent vcsels with the spectral range of 780-795 and 850-895 nm with fixed laser polarization meant for the practical use in quantum frequency standards and advance nuclear magnetic resonance gyroscopes.

Concerning the tasks for 2014-2016:

- theoretical and experimental studies of various functional engineering ways of providing sustained dimensional single-mode generation with fixed laser polarization in vcsel structures, that provide meeting the requirements to the developing resources of laser emission;
- studies of the possibility to reduce the optical spectrum linewidth and frequency noise level of vcsels by means of the optimisation of lasing region features and the optical microresonator design;
- studies of the way to provide sustained and secure vcsels performance at elevated operating temperatures by means of the optimisation of lasing region features, adjustment of precision control methods and of best configuration of lasing region and the optical microresonator, the optimization of the current injection circuit and reducing of equipment thermoresistance;
- development and implementation of gas cell models including miniature cells made with the use of integrated technology to produce quantum frequency standards and advance nuclear magnetic resonance gyroscopes;
- preparation for the test bed for developed vcsel crystals with developed compact gas cells as part of key components of advance self-contained navigation time equipments;
- studies in the search for new materials and ways to design emission sources for using them in advance quantum frequency standards and nuclear magnetic resonance gyroscopes.

The final results are planned to be in broadening the idea of physical processes and basic mechanisms, defining the characteristics of dimension single mode polarized sustained vcsels with the spectral range of 780-795 and 850-895 nm with lasing region based on intense quantum wells

and submonolayer quantum dots in A1InGaAs system, in studying the ways of achieving the required equipment characteristics. It is also aimed to study the variations of vcsel crystal constructions that provide meeting the requirements to laser emission sources for microminiature quantum frequency standards and microminiature advance nuclear magnetic resonance gyroscopes. Created vcsel models will be tested as key part of advance navigation time equipment.

Advanced Research Foundation approved the work along setting up national component base for quantum frequency standards and advance nuclear magnetic resonance gyroscopes. The coordination of the concrete technical tasks content and scope of finance for 2014-2016 is being carried out with estimated chief executives.

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