

Division of Mechanical Science and Engineering	Research field	Applied Optical Physics	Lab. ID
			MS03
Laboratory web site	http://www.me.se.kanazawa-u.ac.jp/e/lab/06.html		
Research subjects			
<p>In our laboratory, studies on optical precision measurement, advanced laser-based measurement, and complex photonics are conducted currently.</p> <p>In the research of the optical precision measurement, we are developing measurement methods of a three-dimensional shape by using interferometer, which are applicable under vibration environment. We are also developing spatially-resolved precision measurements method of x,y,z-direction components of deformation of light-reflecting surfaces by using lasers and one color camera.</p> <p>In the research of the advanced laser-based measurement, we are carrying out researches on the advanced optical measurement technology that are capable of measuring variety of subjects ranging from mechanical materials to living tissues in a non-invasive manner. By applying precise laser-control technology, we are developing novel type of lasers such as variable coherence lasers and phase-locked two-mode lasers, as well as lightwave detection technique using superconductive materials. Their applications include highly sensitive measurement of Terahertz waves and high precision brain activity measurement.</p> <p>In the study of complex photonics, we are carrying out researches on the interaction of light and materials, especially on the lasing phenomenon in micro resonators from the point of view of non-linear and non-equilibrium physics. Also, we are carrying out researches on techniques to control lasing modes and its dynamics by designing the cavity shapes of microlasers, and will develop high-speed random signal generators based on optical chaotic dynamics.</p>			
Master/Doctor course: Education policy, curriculum, typical activity in the laboratory			
<p>Students who are once assigned to our laboratory will be divided into three teams depending on their favorite research themes. They are supposed to take part in seminars, and do their research works under the instruction of their teachers. Each team conducts specific seminars once or twice a week, where students are supposed to present their progress reports and make discussions on their research topics. Most of the students will also work on experimental researches under the instruction of their teachers, whereas some students will entirely work on computer-based researches. In any team, students will be able to acquire comprehensive knowledge and experiences from the fundamental level to the advanced one for their researches. Depending on their research themes, students will be also able to learn about electronic circuits, high-frequency radio-wave technology, image-processing technology, and handling of precise optical equipment. It is also possible to master useful programming languages such as LabVIEW, Fortran, and C.</p>			
Daily life in the laboratory, etc.			
<p>Each student is provided with a personal desk and a personal computer, and the students are able to freely carry out their research work. They are divided into three teams, depending on their research themes, and the teacher in charge will take excellent care of them. Since both undergraduate and graduate students work together, students are easy to obtain their seniors' advices, and can quickly get used to the laboratory life. It is recommended that the students spend regular life by coming to the lab. in the morning, and actively discuss with each other for their researches.</p>			
Message or comments by the laboratory faculty staffs			
<p>Since we are carrying out variety of leading-edge researches using lasers and lightwaves, students are encouraged to present their research outcomes at academic conferences. Although it never be an easy thing to wrap up a respectable graduation thesis or master's thesis, an experience which was accomplished with considerable difficulty, must become a property over the course of your lifetime. Do not regret your effort, set higher goals, and please try to challenge in everything! We are ready to support any motivated students with utmost effort.</p>			
Recent Master theses in these 3 years (+ more if appropriate)			
year.month	Thesis title (including English translation of Japanese thesis title)		
2017.3	Wavelength control of an external cavity diode laser		
2017.3	Optical phase locking of two longitudinal modes of a dual-mode microchip laser		
2017.3	Optical measurement technique utilizing angular intensity distribution of scattered light		
2017.3	Formation of optical virtual nano-probes using a radially polarized beam		
2017.3	3D-shape measurement of 14 μ m-step sample using white light interferometry under random vibration along an optical axis		
2017.3	3D-shape measurement of rough surface using wavelength-shifted speckle interferograms captured under air fluctuation		
2017.3	3D-shape measurement using 3 color interferograms captured under vibration amplitude less than 0.1 μ m along an optical axis		
2016.3	High precision deformation-distribution measurement along X,Y,Z directions for pulling mild steel sheet		

2016.3	Influence of object vibration perpendicular to a light-axis in 3D-shape measurement technique using wavelength-shifted many speckle interferograms, and an improving approach
2016.3	Polarization-state control of external-cavity diode laser
2016.3	Numerical study of optical pulling force acting on dielectric micro-objects
2015.3	3D-shape measurement method of a rough surface using wavelength-scanning-laser interferograms captured under vertical vibration
2015.3	Shape-measurement method using wavelength-scanning laser and Digital Holography, which can be used under vibration environments
2015.3	Chaotic photonic integrated circuits and its application to high-precision reflectometry
2015.3	Study on luminescence of X-ray irradiated alkali halide crystals
2015.3	Deformation and luminescence of X-ray irradiated KCl:Ag
2015.3	Interaction between divalent impurity aggregation and dislocation
2014.3	Continuous measurement method of three direction components of deformation using three color lasers and one camera
2014.3	3D-shape measurement method using the phase-shift calculated from a ellipsoidal ratio of a plotted figure, which is X-Y plots of light intensity changes along a certain line in two white-light
2014.3	Real-time and high precision measurement method of vibrational vertical displacement using FPGA
2014.3	Study on characteristics of gold leaf
2014.3	Interaction between divalent impurities and dislocation in NaBr crystals
2014.3	Interaction between dislocation and impurities in NaBr crystals by application of oscillation
2014.3	Study on yield process of KCl:Ca ²⁺ crystals by using deformation luminescence
2013.3	Real-time and high-precision measurement method of vibrational vertical displacement using FPGA and a high speed line-camera
2013.3	3D-shape measurement method using three color-intensity components of white-light interferograms captured under vertical scanning of an object
Recent Doctoral theses in these 3 years (+ more if appropriate)	
year.month	Thesis title (including English translation of Japanese thesis title)
Laboratory mail address	Laboratory of Mechano-Physics <amech-physlab*at*ml.kanazawa-u.ac.jp>