Q 15: Nichtlineare optische Effekte und Lichtquellen III

Zeit: Montag 16:30–18:00 Raum: 5J

Q 15.1 Mo 16:30 5J

Effiziente resonatorinterne Erzeugung derzweiten und dritten harmonischen eines gütegeschaltetenNd:YVO$_4$ Lasers — •Florian Lenhardt[1], Thorsten Bauer[2], Martin Nittmann[2], Jürgen Bartschke[2] und Johannes L'huillier[1] — [1]TechnischeUniversität Kaiserslautern, Fachbereich Physik,Erwin-Schrödinger-Strasse 46, 67663 Kaiserslautern — [2]Xiton Photonics GmbH, Opelstrasse 10, D-67661Kaiserslautern

Resonatorinterne Frequenzkonversion von gütegeschalteten Festkörperlasern ist eine attraktive Methode zur Erzeugung von Wellenlängen im sichtbaren (532 nm) und ultravioletten (355 nm) Spektralbereich. Auf Basis eines gütegeschalteten Diodenlaser gepumpten Nd:YVO$_4$-Lasers mit einer Impulsrepetitonsrate von 15 kHz, einer Impulsdauer von < 10 ns und einer mittleren Leistung von 5 W wurde resonatorintern die zweite (SHG) und dritte (THG) Harmonische in Lithiumtriborat (LBO) durch Typ I bzw. Typ II Phasenanpassung erzeugt. Experimentell wurde eine mittlere Ausgangsleistung von 4.3 W bei 532 nm erreicht. Die Konversionseffizienz betrug 86 % und die Impulsdauer war <12 ns. Die Strahlung der zweiten Harmonischen war nahezu beugungsbegrenzt ($M_x^2 < 1.4$ bzw. $M_y^2 < 1.2$) und die Schwankung der Ausgangsleistung betrug $\leq 0.5\%$ in 30 Min. Bei 355 nm wurde eine mittlere Ausgangsleistung von 456 mW bei einer Impulsdauer von < 8 ns mit Leistungsschwankungen $\sigma < 1\%$ über 30 Min. erzielt. Die THG-Strahlung war beugungsbegrenzt ($M_x^2 < 1.1$ und $M_y^2 < 1.2$). Das realisierte Konzept ermöglicht damit die effiziente Erzeugung von leistungsstarker Strahlung im Sichtbaren und Ultravioletten.

Q 15.2 Mo 16:45 5J

Phase-dependent light propagation in atomic vapors — •Sarah Kajari-Schröder[1], Giovanna Morigi[2], Sonja Franke-Arnold[3], and Gian-Luca Oppo[4] — [1]Institut für Quantenphysik, University of Ulm, D-89069 Ulm, Germany — [2]Grup d'Optica, Departament de Fisica, Universitat Autonoma de Barcelona, 08193 Bellaterra, Spain — [3]Department of Physics, University of Glasgow, G12 8QQ Glasgow, Scotland, U.K. — [4]Department of Physics, University of Strathclyde, G14 0NG Glasgow, Scotland, U.K.

We analyse the propagation of light in an atomic medium whose coupled energy levels form a ◇-configuration. This atomic configuration is characterised by a closed cycle of radiation-induced transitions, hence its dynamics and steady-state depend critically on the relative phase between the driving lasers [1]. In fact, depending on the phase at the input, the response of the medium can vary from opaque to semi-transparent, as coherences form due to interference in the atomic excitations [2]. Alkali-earth atoms with zero nuclear spin are ideal candidates for observing these phenomena which could offer new perspectives in control techniques in quantum electronics.

[1] G. Morigi et al., Phys. Rev. A 66, 053409 (2002)
[2] S. Kajari-Schröder et al., physics/0605176

Q 15.3 Mo 17:00 5J

Gradient induced position trapping and guiding of solitary structures in an LCLV single feedback experiment — •Carsten Cleff, Björn Gütlich, and Cornelia Denz — Institut für Angewandte Physik und Center for Nonlinear Science - Westfälische Wilhelms-Universität Münster - Corrensstraße 2, 48149 Münster, Germany

Solitary structures are localised spots, which are interesting for optical data processing because of their binary features. For potential applications, control of the solitary structures is required, because of mutual interaction and spontaneous dynamics. We use an incoherent external amplitude control in an LCLV single feedback experiment to control the static and dynamic positions of the solitary structures. The interaction of stationary and drifting solitary structures with different spatial intensity distributions (e.g. conus, hexagonal latices, obstacles, linestructures etc) is studied. The control method allows to arrange stationary solitary structures in arbitrary geometries whereas the possibility of traping depends on the wavelength of the trapgeometrie. Trapping can also be induced with a conus intensity distribution. We show that the induced velocity depends linearly on the conus gradient while the solitary structure is attracted to the conus. Also, the interaction of drifting solitary structures with line structures is investigated. The guiding of drifting solitary structures by these lines is demonstrated. External amplitude control also enables to control the velocity of drifting solitary structures and to create a position selector.

Q 15.4 Mo 17:15 5J

Experimental synchronization of spatiotemporal disorder — •Katharina Havermann, Björn Gütlich, and Cornelia Denz — Institut für Angewandte Physik, Westfälische Wilhelms-Universität, Corrensstr. 2, 48149 Münster, Germany

In the last years, the experimental investigation of synchronization of temporal chaotic systems has received increased attention. In this field synchronization of chaos in space and time is a rather new and hardly explored topic with great potential for new phenomena. An interesting model system showing various types of spatiotemporal dynamic is the liquid crystal light valve (LCLV) single feedback system. Subsequently to first successful experiments of synchronization of unidirectional coupled systems the role of spatial inhomogeneities is analyzed in detail. The degree of synchronization is measured for different coupling strengths. The whole range of spontaneous structures of the nonlinear optical system with focus on spatiotemporal disordered states is considered. For analysis cross-correlation functions and mutual information are used.

Q 15.5 Mo 17:30 5J

Control of self-organized patterns in a photorefractive single feedback system by seeding — •Nicoletta Brauckmann, Philip Jander, and Cornelia Denz — Institut für Angewandte Physik and Center for Nonlinear Science, Westfälische Wilhelms-Universität, Corrensstraße 2, 48149 Münster, Germany

The photorefractive single feedback system is known to show a rich variety of transverse patterns (hexagonal patterns, squeezed hexagons, rectangles and rhombohedrons). Different temporal and spatial control approaches, such as pattern manipulation by frequency detuning or pattern selection by Fourier control, turned out to be powerful techniques of pattern control. In this contribution, we consider direct control of pattern formation by seeding the pump beam with patterns of selectable contrast, orientation, scale and symmetry via a liquid crystal amplitude light modulator. In addition to generating new system solutions, the addressing of states which are already stable or unstable fix points is of special interest. In these cases, we can realize an adaptive control scheme, where the control signal is diminished as the system approaches the desired state. The remaining control signal level is only needed to counter noise-induced fluctuations, and thus can be used as a measure of the impact of noise on the stability of different patterned states. Beyond seeding the system with a single pattern, we prestructure the pump beam with domains of different symmetries and scale in order to observe induced competition between the addressed patterns.

Q 15.6 Mo 17:45 5J

Weak localisation of light in disordered nonlinear media — •Thomas Wellens[1] and Benoit Gremaud[2] — [1]Institut für Theoretische Physik, Universität Erlangen-Nürnberg, Staudtstr. 7, 91058 Erlangen — [2]Laboratoire Kastler Brossel, Université Pierre et Marie Curie, 4 Place Jussieu, 75252 Paris Cedex 05

In general, transport of waves in disordered media cannot fully be described as a simple diffusion process, since interference effects lead to a reduction or even complete suppression of the diffusion constant (weak or strong localisation) and the appearance of a coherent backscattering peak.

On the present poster, we examine the impact of nonlinearities on the interferential corrections to the diffusive transport. Using diagrammatic methods in combination with a dilute medium approximation, we derive equations describing the coherent transport of the average wave intensity in the nonlinear medium. In the case where the wave intensity is conserved, we predict an effective dephasing mechanism induced by the nonlinearity, which reduces the height of the coherent backscattering peak. The opposite occurs for amplifying media, where coherent backscattering factors larger than the linear barrier two can be observed.