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Year	Meeting	Date	Location
2018	CLEO: Applications and Technology (conference.cfm?meetingid=123&yr=2018) CLEO: QELS_Fundamental Science (conference.cfm?meetingid=155&yr=2018) CLEO: Science and Innovations (conference.cfm?meetingid=124&yr=2018)	13–18 May	San Jose, California, United States
2017	CLEO: Applications and Technology (conference.cfm?meetingid=123&yr=2017) CLEO: QELS_Fundamental Science (conference.cfm?meetingid=155&yr=2017) CLEO: Science and Innovations (conference.cfm?meetingid=124&yr=2017)	14–19 May	San Jose, California, United States
2016	CLEO: Applications and Technology (conference.cfm?meetingid=123&yr=2016) CLEO: QELS_Fundamental Science (conference.cfm?meetingid=155&yr=2016) CLEO: Science and Innovations (conference.cfm?meetingid=124&yr=2016)	5–10 June	San Jose, California, United States
2015	CLEO: Applications and Technology (conference.cfm?meetingid=123&yr=2015) CLEO: QELS_Fundamental Science (conference.cfm?meetingid=155&yr=2015) CLEO: Science and Innovations (conference.cfm?meetingid=124&yr=2015)	10–15 May	San Jose, California, United States
2014	CLEO: Applications and Technology (conference.cfm?meetingid=123&yr=2014) CLEO: QELS_Fundamental Science (conference.cfm?meetingid=155&yr=2014) CLEO: Science and Innovations (conference.cfm?meetingid=124&yr=2014)	8–13 June	San Jose, California, United States
2013	CLEO: Applications and Technology (conference.cfm?meetingid=123&yr=2013) CLEO: QELS_Fundamental Science (conference.cfm?meetingid=155&yr=2013) CLEO: Science and Innovations (conference.cfm?meetingid=124&yr=2013)	9–14 June	San Jose, California, United States

CLEO: Science and Innovations

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Pair-Id=APKAJCG2JT6MM5LOVHMA)
- Science_and_Innovations2018_PartII.zip (http://cdn.opticsinfobase.org/__v201805141725008880/Science_and_Innovations2018_PartII.zip?Expires=1527240248&Signature=a~YgPO70~gBOs8dXXOVDyVB7DVYb8yeKN8T6TK4HP53RFps-v8f3AMuYXvWlEmgvNYC3yr0-JKdJE9vGZH-6xKTF3NEF4bca-Gaf6TRNdoXKEM1aLWvNVuQB3oVrhI0BIJcIIKnf9FwA3jVUwXMUeo8J3X8s-Fga7x9gUyNC4lJ1q8CwYRAEh09RKonH~obrGdrqAosyhVaiqpP6n7QpG658b7uvdDDI0LV9kqZ7S39OSVIElzDTEbX-8DivZyTz3AGK7RBjwnBvwNEVFCM2MXpBNmWSAiDJw5AIQFWNVGkhseI-HDcnSr~sH-0wA2LNIwIFSCO-rjJA6H6A8g-4gg__&Key-Pair-Id=APKAJCG2JT6MM5LOVHMA)

1358 papers in 136 sessions

Change year: 2018

Actions

SF1N - Ultrafast Mid-IR Sources

SF2A - Nonlinear Photonics in Integrated Structures

SF2G - Mid-infrared Semiconductor Lasers

SF2I - Electrooptic and Nanophotonic Materials

SF2J - Cavity Optomechanics

SF2K - Novel Fiber Technology

SF2N - Ultrafast Oscillators

SF3A - Integrated Photonics (III-V Heterogeneric)

SF3G - Quantum Cascade Lasers

SF3I - Materials for Fiber and Solid State Lasers

SF3J - Mid IR Sensing and Optical Forces

SF3K - Mode-Locked Fiber Lasers

SF3N - Ultrafast Pulse Manipulation

SM1B - Nonlinear and Microwave Integrated Photonics

SM1C - RF Photonic & Radio-over-fiber

SM1D - Nonlinear Resonators

SM1I - Modulator on Integrated Platform

SM1K - Raman Scattering and Applications

SM1L - Precision Clocks and Time Transfer

SM1N - Advanced Laser Technologies

SM1O - Fundamentals of Light-matter Interaction

SM2B - Novel Nanophotonic Structures and Devices

SM2C - Short Reach Communication

SM2D - Nonlinear Optical Phenomena

SM2I - Integrated Detectors

SM2K - Fiber Sensing and Measurement

SM2L - Optical Microwave Generation

SM2N - Fiber and Wave Guide Lasers

SM2O - Light Matter Interaction in Plasmonic & Metameterials

SM3A - Terahertz Nonlinear Spectroscopy

SM3B - Optical Modulators

SM3C - SDM Communications I

SM3D - Nonlinear Optics in Fibers and Waveguides

SM3I - Optical Phase Arrays

SM3K - Billouim Scattering and Applications

SM3L - Photonic Frequency References and Sources

SM3N - High Power Lasers

SM3O - Fundamentals of Laser Material Processing

SM4A - THz High-field Generation and Detection

SM4B - Microrings and Novel Modulation Schemes

SM4C - SDM Communication II

SM4D - Optical Metrology Nonlinear Optical Technologies

High rep-rate, high peak power 1450 nm laser source based on optical parametric chirped pulse amplification (/abstract.cfm?uri=CLEO_SI-2018-SM4D.1)
Pengfei Wang, Yanyan Li, Wenkai Li, Hongpeng Su, Yujie Peng, and Yuxin Leng
SM4D.1 CLEO: Science and Innovations (CLEO_SI) 2018 **View: PDF (/ViewMedia.cfm?uri=CLEO_SI-2018-SM4D.1&seq=0)**

Near-infrared to visible upconversion detection for active imaging using a broadband pump laser (/abstract.cfm?uri=CLEO_SI-2018-SM4D.2)
Romain Demur, Arnaud Grisard, Eric Lallier, Loïc Morvan, Luc Leviandier, Nicolas Treps, and Claude Fabre
SM4D.2 CLEO: Science and Innovations (CLEO_SI) 2018 **View: PDF (/ViewMedia.cfm?uri=CLEO_SI-2018-SM4D.2&seq=0)**

Intra-cavity Self-illuminated Image Up-conversion System based on SHG in a Compact Laser (/abstract.cfm?uri=CLEO_SI-2018-SM4D.3)
A. J. Torregrosa, H. Maestre, M. L. Rico, and J. Capmany
SM4D.3 CLEO: Science and Innovations (CLEO_SI) 2018 **View: PDF (/ViewMedia.cfm?uri=CLEO_SI-2018-SM4D.3&seq=0)**

Mid-Infrared (6 - 10 μm) upconversion in LiInS2 using 1064 nm CW pump (/abstract.cfm?uri=CLEO_SI-2018-SM4D.4)
A. Barh, L. Høgstedt, P. Tidemand-Lichtenberg, and C. Pedersen
SM4D.4 CLEO: Science and Innovations (CLEO_SI) 2018 **View: PDF (/ViewMedia.cfm?uri=CLEO_SI-2018-SM4D.4&seq=0)**

Optical Companding (/abstract.cfm?uri=CLEO_SI-2018-SM4D.5)
Yunshan Jiang and Bahram Jalali
SM4D.5 CLEO: Science and Innovations (CLEO_SI) 2018 **View: PDF (/ViewMedia.cfm?uri=CLEO_SI-2018-SM4D.5&seq=0)**

Nonlinear Dielectric Metasurfaces for Wavefront Control (/abstract.cfm?uri=CLEO_SI-2018-SM4D.6)
Lei Wang, Sergey Kruk, Kirill Koshelev, Ivan Kravchenko, Barry Luther-Davies, and Yuri Kivshar
SM4D.6 CLEO: Science and Innovations (CLEO_SI) 2018 **View: PDF (/ViewMedia.cfm?uri=CLEO_SI-2018-SM4D.6&seq=0)**

Giant nonlinear frequency shift in epsilon-near-zero aluminum zinc oxide thin films (/abstract.cfm?uri=CLEO_SI-2018-SM4D.7)
E. G. Carnemolla, V. Bruno, L. Caspani, M. Clerici, S. Vezzoli, T. Roger, C. DeVault, J. Kim, A. Shaltout, V. Shalaev, A. Boltasseva, D. Faccio, and M. Ferrera
SM4D.7 CLEO: Science and Innovations (CLEO_SI) 2018 **View: PDF (/ViewMedia.cfm?uri=CLEO_SI-2018-SM4D.7&seq=0)**

SM4I - Novel Emitters

SM4K - Nonlinear Fiber Optics

SM4L - Frequency Comb Development &Technology

SM4M - Power Scaling of Ultrafast Sources

SM4N - Laser Materials

SM4O - Structured Light for Material Processing

STh1A - Novel Structures and Devices

STh1B - Integrated Photonic Sensors

STh1C - Machine Learning for Communication

STh1I - Novel Fabrication Methods

STh1J - OCT & Biomedical Imaging

STh1L - MIR to the THz Dual Combs

STh1N - Ultrafast Applications

STh3A - Photonic Crystals

STh3B - Networks on a Chip

STh3F - Mid-IR Nonlinear Devices

STh3G - Quantum Information Processing on Photonic Nanostructures

STh3I - Integrated Photonic Platforms

STh3J - Optofluidics & High Throughput Florescence

STh3K - Multimode Fiber Optics

STh3L - Imaging and Ranging

STh3N - Ultrafast Metrology I

STh4A - Waveguide Structures

STh4B - On-chip and Offchip Coupling Schemes

STh4F - Optical Parametric Oscillators

STh4I - Mid-IR Optoelectronics

STh4K - Long Wavelength Fiber Sources

STh4L - Optical Sensing in Combustion

STh4N - Ultrafast Metrology II

STu3A - Quantum Photonic Technology

STu3B - OAM and Photodetective

STu3C - Advanced Short Reach and Free Space Communications

STu3D - Terahertz Communications

STu3F - Nonlinear Integrated Photonic Platforms

STu3K - Novel Fibers

STu3M - High Peak Power Lasers & Technologies

STu3N - Chemical Sensing

STu3P - Precision Spectroscopy

STu3Q - Advances in VCSELs

STu4B - Wavelength and Phase-sensitive Integrated Devices

STu4C - Nonlinearity Compensation

STu4D - Terahertz QCLs

STu4F - Nonlinear Optical Phononics & Optomechanics

STu4K - Fiber Frequency Combs

STu4N - 2D Materials in Photonic Structures

STu4O - Laser Facilities

STu4P - Advanced Sensing Concepts

STu4Q - UV-visible Semiconductor Lasers

SW3A - Microresonator Combs

SW3B - Hybrid Lasers on Silicon

SW3C - High Capacity Transmission

SW3D - Terahertz Nano-imaging and Spectroscopy

SW3I - Low-dimensional and Phase-change Materials

SW3J - Biosensors & Photonic Devices

SW3K - Few Mode Fibers and OAM

SW3L - Fiber and Waveguide Sensing

SW3M - Beam Control & Measurement

SW3N - Few-cycle Sources

SW3Q - Semiconductor Lasers for Integration

SW4A - High-Q Microcavities

SW4B - Nitride-based Integrated Photonics

SW4C - Optical Switching

SW4D - Novel THz Techniques

SW4I - Silicon Hybrid Integration

SW4J - Advanced Microscopy Methods

SW4K - Fiber Lasers and Amplifiers

SW4L - NIR Dual Combs

SW4M - Application of Microresonator Frequency Combs

SW4N - Ultrafast Phenomena

SW4Q - Novel Semiconductor Emitters

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Intra-cavity Self-illuminated Image Up-conversion System based on SHG in a Compact Laser

A. J. Torregrosa, H. Maestre, M. L. Rico, and J. Capmany

Conference on Lasers and Electro-Optics OSA Technical Digest (online) (Optical Society of America, 2018), paper SM4D.3

• https://doi.org/10.1364/CLEO_SI.2018.SM4D.3 (https://doi.org/10.1364/CLEO_SI.2018.SM4D.3)

Abstract

We present a compact architecture for image up-conversion from infrared to visible based on intra-cavity SHG by type-II phase matching. The proposed system stands out for using the same laser for image illumination and up-conversion so that reflected images by a Nd^{3+}:YVO_4 laser at 1342 nm are polarization-coupled into an intra-cavity KTP crystal for frequency-doubling.

PDF Article (viewmedia.cfm?uri=CLEO_SI-2018-SM4D.3&seq=0)

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From the session **Optical Metrology Nonlinear Optical Technologies (SM4D)** (/conference.cfm?meetingid=124&yr=2018#SM4D)

Intra-cavity Self-illuminated Image Up-conversion System based on SHG in a Compact Laser

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Abstract: We present a compact architecture for image up-conversion from infrared to visible based on intra-cavity SHG by type-II phase matching. The proposed system stands out for using the same laser for image illumination and up-conversion so that reflected images by a Nd^{3+}:YVO_4 laser at 1342 nm are polarization-coupled into an intra-cavity KTP crystal for frequency-doubling.
OCIS codes: (190.4223) Nonlinear wave mixing, (110.3080) Infrared imaging, (140.3613) Laser up-conversion

1. Introduction

Intra-cavity up-conversion of images by sum-frequency mixing (SFM) in nonlinear crystals [1] has been widely documented in the last few years as a competitive option to visualize infrared images in real time by CCD or CMOS video cameras [2, 3]. The transfer of images from the targeted spectral region to the silicon response band takes place inside the cavity of a continuous wave (CW) solid state laser where the external image is focused into the nonlinear crystal and mixed with the laser beam. The resolution of the up-converted image is constrained by the laser beam size allowed for the cross-sectional aperture of the nonlinear crystal [2, 3]. This limitation also has to do with the nonlinear mixing technique: Whilst quasi-phase matching (QPM) in non-linear poled crystals (like PPLN or PPKTP) provides higher up-conversion efficiencies and wider angular tolerances than perfect birefringent phase matching in bulk crystals of lower effective non-linear coefficients, the current fabrication techniques for poled crystals limit their cross-sectional apertures. In this way, off-the-shelf KTP bulk crystals with large cross-section allows for a potential increase in resolution of up-converted images while the up-conversion efficiency is compensated by intra-cavity schemes. Furthermore, the use of such nonlinear crystals in intra-cavity SFM by type II birefringent phase matching has been recently proposed for miniaturization of image up-conversion systems [4]. There, external images are polarization-coupled inside the laser cavity by a simple polarizing beam splitter (PBS) to enable the nonlinear interaction with the cross-polarized laser beam. Thus, external image coupling by polarization opens a way to explore intra-cavity second harmonic generation (SHG) by type II phase matching for image up-conversion applications unlike usual techniques in SFM based on image coupling by dichroic beam splitters [2, 3].

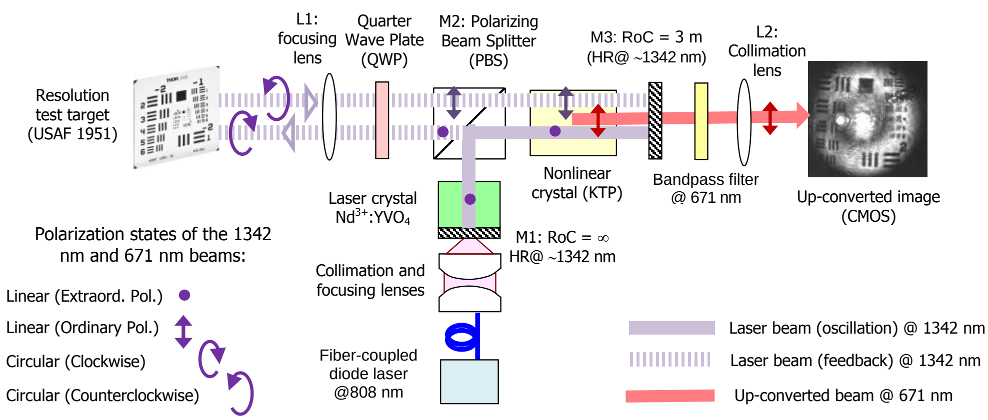

Fig.1. Experimental set-up of the proposed image up-conversion system.

2. Intracavity up-conversion of images by SHG

We present a compact system based on intra-cavity SHG by type II birefringent phase matching for image up-conversion from infrared to visible. Unlike recent up-conversion systems based on SFM, the proposed system stands out for using the same laser to illuminate and to perform the image intra-cavity up-conversion. The experimental set-up is shown in Fig. 1. It consists of a 808 nm diode-pumped Nd^{3+}:YVO_4 solid state laser whose emission at 1342 nm is also used as illumination source. Reflected images are polarization-coupled into the laser resonator where a KTP crystal is placed to perform the image up-conversion at 671 nm by CW intra-cavity frequency-doubling. The laser cavity follows a linear configuration folded at a right angle by a PBS acting as a mirror (M2) and delimited by a dielectric mirror (M1) deposited on the input facet of the laser crystal and by an almost flat mirror (M3) of 3 m radius of curvature as an output coupler (long enough to avoid distortion on converted images). The Nd^{3+}:YVO_4 crystal (3×3×4 mm^3, with flat-parallel faces and 1% at. Nd doping) is *a*-cut to provide linearly-polarized laser emission according to the PBS configuration (S-polarization) to perform as a folding mirror and also according to the extraordinary polarization (parallel to the optical axis of the KTP crystal) involved in a type II phase matching. The KTP crystal (6×6×8 mm^3) is cut at θ~60^o, φ=0^o for type II SHG at 671 nm. The use of a quarter wave plate (QWP) is also required at the output of M2 to couple the external image into the laser cavity. Thus, linearly-polarized laser emission changes to circular before illuminating targets. After reflection, the resultant light beam remains circularly-polarized but with reversed direction while propagating back, and after passing again through the QWP, polarization changes to linear with a rotation of 90 degrees with respect to that oscillating inside. The infrared image was coupled through a 5 cm focal length lens, and the output up-converted image was focused on the sensor of a CMOS camera with a positive 15 cm lens through a 671 bandpass filter (10 nm FWHM) to block undesired wavelengths.

3. Results and conclusions

Fig.2 shows the up-converted image taken by a monochrome camera at 671 nm from the reflection of a standardized resolution test target (USAF 1951) after illuminating the region corresponding to groups 2 and 3 (resolution up to 14.3 lp/mm) with the Nd^{3+}:YVO_4 laser emission.

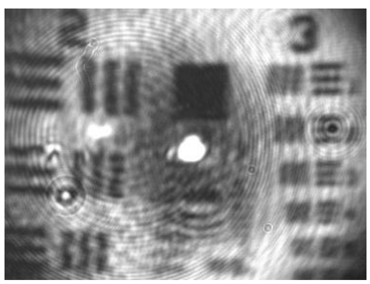

Fig. 2. Up-converted image by intra-cavity SHG at 671 nm (monochrome camera).

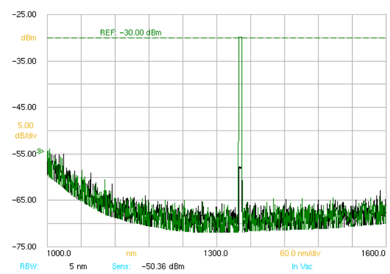

Fig.3. Orthogonal polarization components of the fundamental wave (1342 nm) at the output of M2

The image also reveals the presence of a light spot in the middle as a result of intra-cavity SHG even in absence of the feedback of the reflected beam (external image). This is due to the birefringence exhibited by KTP and Nd^{3+}:YVO_4 crystals leading to depolarization of the linearly-polarized emission of the laser. Thus, intra-cavity orthogonal components of the fundamental wave associated to ordinary (black trace) and extraordinary (green trace), as shown in Fig. 3, are responsible for such undesirable intra-cavity SHG component and also for causing extra losses at the PBS. Additional changes in birefringence due to the misalignment of principal axes of KTP and Nd^{3+}:YVO_4 crystals can also cause polarization instability in the fundamental laser oscillation and therefore affecting the quality of the up-converted image. In order to mitigate these constraints, usual techniques based on active temperature control of the doubling crystal or by inserting polarizing components inside the cavity in order to stabilize polarization in intra-cavity doubled-frequency systems [5] could be applied to the proposed image up-conversion system. Further details will be presented and discussed at the conference.

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