














EDUCATION

Nanjing University	College of Engineering and Applied Sciences	Nanjing, Jiangsu
Doctor of Philosophy	Optical Engineering	Q.E. – Top 15%  Nonlinear Fourier Optics  – 2025.06
Dissertation:	“Analytic 3D vector linear non-uniform & nonlinear Fourier crystal optics in arbitrary $\bar{\epsilon}$, $\bar{\chi}$ dielectrics” 	
Master’s Studies	Quantum Electronics	Courses Score – 93.5  THz OAM Source  – 2022.06
Northeastern University	School of Physics, College of Science	Shenyang, Liaoning
Bachelor of Science	Applied Physics	GPA Rank – 1/400  DDTank Aimbots  – 2020.06
Thesis:	“Research & design of nonlinear holography based on lithium niobate 3D nonlinear photonic crystal”  	
Freshman in College	Science	Sichuan Prov. – Top 2% 3 e-books with C++  2016.09 –

RESEARCH PROJECTS

3D Vector Nonlinear Fourier Crystal Optics	Solving $\left[(\nabla \times)^2 - k_0^2 \bar{\epsilon} \cdot \right] \mathbf{E}(\mathbf{r}) = k_0^2 \bar{\chi} : \mathcal{F}_\omega^{-1} \left[\tilde{\mathbf{E}}_p \tilde{\mathbf{E}}_p \right] (\mathbf{r})$ analytically 2023.05 – <ul style="list-style-type: none">• The first & fastest white box solver ever for this inhomogeneous wave equation<ul style="list-style-type: none">◦ or other similar equations, with unprecedented efficiency-accuracy product• No competitors for the time being: other methods or software including<ul style="list-style-type: none">◦ k-space RK4, pseudo-spectral, SSF, Green’s Function methods, FDTD, COMSOL...• Reproduced well-known papers, all of which provide either zero or wrong theory:<ul style="list-style-type: none">◦ Nat.Photo. #proven theoretically wrong by this project #femtosecond pump◦ O.E. #Bloembergen’s legacy2 #experiment O.M.E. #z-component◦ O.E. Q.E. #high N.A. #$\bar{\chi}$ anisotropy PPT 1 2 3 ... 
Complex Vector Linear Fourier Crystal Optics	Analytic solution $\mathbf{E}(\mathbf{r})$ to $\left[(\nabla \times)^2 - k_0^2 \bar{\epsilon} \cdot \right] \mathbf{E}(\mathbf{r}) = 0$ where $\epsilon_{ij} \in \mathbb{C}$ 2023.02 – <ul style="list-style-type: none">• Drawing insights from PRS.A. #M.V.Berry’s legacy A.O.P. A.P.B. J.QSRT.• The next generation of this project will come really close to the exact solution• Reproduced well-known papers, some are purely experimental (too hard to model):<ul style="list-style-type: none">◦ J.O.S.A. #Bloembergen’s legacy1 J.O. O.M. O.M. J.O. L.P.R.◦ JOSA.A. O.E. #tightly focus #$\bar{\epsilon}$ anisotropy Light.Sci.App. O.E. PPT 1 2 3 ... 
Real Scalar Nonlinear Fourier Crystal Optics	Closed-form $E_3(\mathbf{r})$ in $\left[\nabla^2 + k_3^2 \right] E_3(\mathbf{r}) = -k_{03}^2 \chi(\mathbf{r}) E_1(\mathbf{r}) E_2(\mathbf{r})$ 2022.02 – <ul style="list-style-type: none">• Solving this multivariable/field nonlinear convolution equation on my own• Strong alternative to Green’s Function, pseudo-spectral, split-step Fourier methods• Reproduced well-known papers & models with maximum accuracy & efficiency:<ul style="list-style-type: none">◦ P.R.L. #Green P.R.L. #experiment #quantum P.R.L. #experiment #scatter P.R.L.◦ L.P.R. #SSF #quantum Matlab #RCWA A.P.L. #femtosecond pump◦ O.L. P.R.A. PPT 1 2 3 4 ... 

SCIENTIFIC ACTIVITIES

- [0] **The 4th Nanjing University Doctoral Interdisciplinary Innovation Forum** **Nanjing, Jiangsu**
“Analytic vector linear & nonlinear Fourier crystal optics in arbitrary $\bar{\epsilon}, \bar{\chi}$ dielectrics” | Oral [PPT] 2024.05.29
- [-1] **2023 CSOE-NJU Book Club Meeting & Sharing Session** **Nanjing, Jiangsu**
“A guided tour to Ray & Wave Optics Simulation” | Oral [PPT] 2023.12.09
- [-2] **Academic Café Salon of the Research Group** **Nanjing, Jiangsu**
“Bi-directional notes on Nonlinear Optics in a roam-like app: RoamEdit” | Oral [PDF] 2021.05.21

PUBLICATIONS

- [0] P. Chen, X. Xu, T. Wang, C. Zhou, D. Wei, J. Ma, J. Guo, X. Cui, X. Cheng, **C. Xie**, S. Zhang, S. Zhu, M. Xiao, and Y. Zhang, “Laser nanoprinting of 3D nonlinear holograms beyond 25000 pixels-per-inch for inter-wavelength-band information processing”, *Nature Communications* **14**, 5523 (2023)
- [-1] J. Guo, Y. Zhang, H. Ye, L. Wang, P. Chen, D. Mao, **C. Xie**, Z. Chen, X. Wu, M. Xiao, and Y. Zhang, “Spatially Structured-Mode Multiplexing Holography for High-Capacity Security Encryption”, *ACS Photonics* **10**, 757–763 (2023)

ACADEMIC FOCUS

- Next generation** high N.A. 3D vector non-uniform analytic linear & nonlinear Fourier crystal optics 2024.06 –
- High N.A.** 3D vector non-uniform analytic linear & nonlinear Fourier crystal optics 2024.03 –
- !Paraxial k_0^ω **3D** vector non-uniform analytic linear & nonlinear Fourier crystal optics 2023.12 –
- Emphasizing G_{xyz}^ω **Vector** non-uniform analytic linear & nonlinear Fourier crystal optics 2023.06 –
- Involving $\bar{\chi}_{\omega}^{(2)}$ anisotropy **Non-uniform** analytic linear & nonlinear Fourier crystal optics 2023.03 –
- !Unitary $G_\omega^\pm \Leftarrow$!Hermitian $\bar{\epsilon}_r^\omega \Rightarrow$ **Analytic** linear & nonlinear Fourier crystal optics 2022.09 –
- Solution E_ω^\pm to $(\nabla^2 + k_{\omega\pm}^2) E_\omega^\pm \propto P_{\omega\pm}^{(2)}$ **Nonlinear** angular spectrum theory for SFG 2022.06 –
- Solution $\mathcal{F}[E_3] = \mathcal{F}[f(\mathcal{F}^{-1}[\cdot])]$ to the Eq. below **Nonlinear** convolution solution to SFG 2022.03 –
- Solution $\mathcal{F}[E_3] = \iiint$ to $(\nabla^2 + k_3^2) E_3(r) \propto P_3^{(2)}(r)$ **Quit THz project formally** | COMSOL – 2022.01
- Nonlinear THz LiNbO₃-based metasurface Mathematica | BookxNote Pro – 2021.12
- BWOPO + THz optical parametric amplification Mathematica | VBA Excel – 2021.11
- THz backward optical parametric oscillator (BWOPO) RoamEdit | Blender – 2021.11
- Multi-cycle THz orbital angular momentum (OAM) source Python | Blender – 2021.10
- Narrow-band THz OAM source via Optical Rectification (OR) RoamEdit | VBA Excel – 2021.07
- Electricity $\xrightarrow{\text{produce}}$ Acoustics $\xrightarrow{\text{modulate}}$ Optics BookxNote Pro | GeoGebra | VBA Excel – 2021.06
- Visible Photons $\xrightarrow{\text{SPDC}}$ THz Spectroscopy Paint 3D | RoamEdit | GeoGebra | VBA Excel – 2021.05
- Cavity Phase Matching = Sheet OPO Matlab | GeoGebra | VBA Excel – 2021.01
- THz Holography via Optical Rectification GeoGebra | VBA Excel – 2020.12
- Femtosecond laser $\xrightarrow{\text{Optical Rectification}}$ Terahertz (THz) VBA PowerPoinT – 2020.10
- Multicycle THz pulse generation by OR in LiNbO₃ ... crystals



















SKILLS

- **Skill Group:** List of technologies
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LANGUAGES

- **Language:** language proficiency level
- **EXAM:** details
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HONORS & AWARDS

Academia	Doctor's Qualification Exam (Oral) 	Excellent 	Top 15%	Nanjing U.	2024.01
	Bachelor Thesis  & Defense 	Excellent 	1/90	Northeastern U.	2020.06
Competition	Three Provinces Achievement Expo 	Exhibition 	Leader	Three Prov.	2019.10
	"Challenge Cup" Tech Competition 	Grand prize 	Leader	Liaoning Prov.	2019.06
Scholarships & Fellowships	Academic Fellowship	1st class	¥40,000	Nanjing U.	2020-24
	"Jinchuan" Scholarship	1st place 	¥5,000	Northeastern U.	2019.04
	Academic Scholarship	1st place 	¥2,000	Northeastern U.	2018.06
	Entrance Scholarship	3rd place	¥5,000	Leshan No.1 H.S.	2013.09
Honors & Titles	Graduation with Honor 	Outstanding		Northeastern U.	2020.07
	League Member 	Excellent 		Northeastern U.	2019.11
	Undergraduate Student	Excellent 		Northeastern U.	2018.12
Memberships	Chinese Society for Optical Engineering	Member 		Nanjing U.	2021-25
	"Qian Sanqiang" Talent Class	Head 		I.H.E.P. 	2017-20

EXTRACURRICULAR ACTIVITIES

- Member at Some Club 2017–Current
Detailed explanation of what you do at this club
- Member at Some Club 2016–2017
Detailed explanation of what you do at this club
- Volunteer at Some Event Fall 2019
Detailed explanation of what you do in this event
- Volunteer at Some Event Winter 2015
Detailed explanation of what you do in this event