

EDUCATION

Nanjing University

College of Engineering and Applied Sciences

Nanjing, Jiangsu

Doctor of Philosophy

Optical Engineering

Q.E. – Top 15%



Nonlinear Fourier Optics



2025 '27

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 '24

Northeastern University

School of Physics, College of Science

Shenyang, Liaoning

Bachelor of Science

Applied Physics

GPA Rank – 1/400



DDTank Aimbots



2020 '22

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 '18

RESEARCH PROJECTS

3D Vector Nonlinear
Fourier Crystal OpticsSolving
$$\left[(\nabla \times)^2 - k_0^2 \bar{\epsilon} \right] \mathbf{E}(\mathbf{r}) = k_0^2 \bar{\chi} : \mathcal{F}_\omega^{-1} \left[\tilde{\mathbf{E}}_p \tilde{\mathbf{E}}_p \right] (\mathbf{r})$$
 analytically 2023.05

- The first and fastest white box solver ever for this inhomogeneous wave equation
 - or other similar equations, with unprecedented efficiency-accuracy product
- No competitors for the time being: other methods or software including
 - 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:
 - [N.P.](#) #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

Complex Vector Linear
Fourier Crystal OpticsAnalytic solution $\mathbf{E}(\mathbf{r})$ to
$$\left[(\nabla \times)^2 - k_0^2 \bar{\epsilon} \right] \mathbf{E}(\mathbf{r}) = \mathbf{0}$$
 where $\epsilon_{ij} \in \mathbb{C}$ 2023.02

- 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):
 - [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.](#)

Real Scalar Nonlinear
Fourier Crystal OpticsClosed-form $E_3(\mathbf{r})$ in
$$(\nabla^2 + k_3^2) E_3(\mathbf{r}) = -k_{03}^2 \chi(\mathbf{r}) E_1(\mathbf{r}) E_2(\mathbf{r})$$
 2022.02

- Solving multivariable/field nonlinear convolution equations directly on my own
- Strong alternative to Green's Function, pseudo-spectral, split-step Fourier methods
- Reproduced well-known papers & models with higher both accuracy & efficiency:
 - [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.](#)

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ACADEMIC FOCUS

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



















SKILLS

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

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

Academia	Doctor's Qualification Exam (Oral) 	Excellent 	Top 15%	Nanjing U.	2024.01
	Bachelor Dissertation  & 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