Chen-Zhu Xie 谢尘竹

Portfolio:
Scholar: Γ Γ
Preference:
Contact:
Personality: aries INTP ab

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 $\bar{\bar{\varepsilon}}, \bar{\bar{\chi}}$ 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 Optics

Solving $\left[(\boldsymbol{\nabla}\times)^2 - k_0^2 \bar{\bar{\varepsilon}}\cdot\right]\boldsymbol{E}(\boldsymbol{r}) = k_0^2 \bar{\bar{\chi}} : \mathcal{F}_\omega^{-1}\left[\widetilde{E}_\mathrm{p}\widetilde{\boldsymbol{E}}_\mathrm{p}\right](\boldsymbol{r})$ **analytically**　2023.05

- test
- Reproduced well-known papers & models with less time & higher accuracy:
  - O.E. | Q.E. (high N.A. | $\bar{\bar{\chi}}$ anisotropy),

Complex Vector Linear
Fourier Crystal Optics

Analytic solution $\boldsymbol{E}(\boldsymbol{r})$ **to** $\left[(\boldsymbol{\nabla}\times)^2 - k_0^2 \bar{\bar{\varepsilon}}\cdot\right]\boldsymbol{E}(\boldsymbol{r}) = \boldsymbol{0}$ **where** $\varepsilon_{ij} \in \mathbb{C}$　2023.02

- test
- Reproduced well-known papers & models with less time & higher accuracy:
  - JOSA.A. | O.E. (tightly focus | $\bar{\bar{\varepsilon}}$ anisotropy),

Real Scalar Nonlinear
Fourier Crystal Optics

Closed-form $E_3(\boldsymbol{r})$ **in** $\left(\boldsymbol{\nabla}^2 + k_3^2\right)E_3(\boldsymbol{r}) = -k_{03}^2 \chi(\boldsymbol{r})E_1(\boldsymbol{r})E_2(\boldsymbol{r})$　2022.02

- Direct approach to multivariable nonlinear convolution equations
- Strong alternative to Green's Function, pseudo-spectral, split-step Fourier methods
- Reproduced well-known papers & models with less time & higher accuracy:
  - P.R.L. (Green) | P.R.L. (experiment | quantum) | P.R.L. (experiment | scatter),
  - L.P.R. (SSF | quantum) | Matlab code (RCWA)

Scientific Activities

- **Head Teaching Assistant** at University Name　Spring 2019
  Course Name (COURSE CODE)

- **Teaching Assistant** at University Name　Spring 2017
  Course Name (COURSE CODE)

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 $\bar{\bar{\chi}}_\omega^{(2)}$ anisotropy   **Vector** non-uniform analytic linear & nonlinear Fourier crystal optics ⭕ 2023.06

!Unitary $G_\omega^\pm \Leftarrow$!Hermitian $\bar{\bar{\varepsilon}}_{\mathrm{r}}^\omega \Rightarrow$ **Non-uniform** analytic linear & nonlinear Fourier crystal optics ⭕ 2023.03

Solution $E_\omega^\pm$ to $\left(\nabla^2 + k_{\omega\pm}^2\right)E_\omega^\pm \propto P_{\omega\pm}^{(2)}$ **Analytic** linear & nonlinear Fourier crystal optics ⭕ 2022.09

Solution $\mathcal{F}\left[E_3\right] = \mathcal{F}\left[f\left(\mathcal{F}^{-1}\left[\cdot\right]\right)\right]$ to the Eq. below   **Nonlinear** angular spectrum theory for SFG ⭕ 2022.06

Solution $\mathcal{F}\left[E_3\right] = \iiiint$ to $\left(\nabla^2 + k_3^2\right)E_3(\boldsymbol{r}) \propto P_3^{(2)}(\boldsymbol{r})$ **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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- **Skill Group:** List of technologies

Languages

- **Language:** language proficiency level
  - **EXAM:** details
- **Language:** language proficiency level
- **Language:** language proficiency level

Honors & Awards

Category	Award	Level	Rank/Prize	Institution	Date
Academia	Doctor's Qualification Exam (Oral)	Excellent	Top 15%	Nanjing U.	2024.01
	Bachelar 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