# Chen-Zhu Xie



Portfolio: 🗘 🔼 in

Scholar:  $\Gamma$ 

Preference: 6

Contact: **∠** X

Personality: aries INTP ab

## EDUCATION

Nanjing University	College of Engineering and Applied Sciences Nanjing, J				
Doctor of Philosophy	Optical Engineering	<i>Q.E.</i> − <i>Top 15%</i>	Nonlinear Fourier Optics	2025 '27	
<b>Dissertation:</b> "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 
$$\left[ (\nabla \times)^2 - k_0^2 \bar{\bar{\varepsilon}} \cdot \right] E(r) = k_0^2 \bar{\bar{\chi}} : \mathcal{F}_{\omega}^{-1} \left[ \tilde{E}_{p} \tilde{E}_{p} \right] (r) \right]$$
 analytically 2023.05

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

**Complex Vector Linear** 

Fourier Crystal Optics

- Analytic solution E(r) to  $\left[ \left[ (\nabla \times)^2 k_0^2 \bar{\varepsilon} \cdot \right] E(r) = 0 \right]$  where  $\varepsilon_{ij} \in \mathbb{C}$  2023.02
- test
- $\bullet$  Reproduced well-known papers & models with less time & higher accuracy:
  - JOSA.A. | O.E. #tightly focus  $\#\bar{\varepsilon}$  anisotropy,

Real Scalar Nonlinear

Fourier Crystal Optics

Closed-form 
$$E_3(\mathbf{r})$$
 in  $\left[ (\nabla^2 + k_3^2) E_3(\mathbf{r}) = -k_{03}^2 \chi(\mathbf{r}) E_1(\mathbf{r}) E_2(\mathbf{r}) \right]$  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 Course Name (COURSE CODE) Spring 2019

• Teaching Assistant at University Name

Course Name (COURSE CODE)

Spring 2017

## ACADEMIC FOCUS

<b>Next generation</b> high N.A. 3D vector non-uniform analytic linear & nonlinear Fourier crystal optics 😱		
!Paraxial ${m k}_0^\omega$ High N.A. 3D vector non-uniform analytic linear & nonlinear Fourier crystal optics ${f Q}$		
Emphasizing $G_{\mathrm{xyz}}^{\omega}$ 3D vector non-uniform analytic linear & nonlinear Fourier crystal optics $\mathbb{C}$		
Involving $\bar{\bar{\chi}}^{(2)}_{\omega}$ anisotropy <b>Vector</b> non-uniform analytic linear & nonlinear Fourier crystal optics $\bar{\chi}^{(2)}_{\omega}$		
!Unitary $G^\pm_\omega \Leftarrow$ !Hermitian $\bar{\bar{\varepsilon}}^\omega_{\mathrm{r}} \Rightarrow$ Non-uniform analytic linear & nonlinear Fourier crystal optics $\P$		
Solution $E^\pm_\omega$ to $\left(  abla^2 + k^2_{\omega\pm}  ight) E^\pm_\omega \! \propto \! P^{(2)}_{\omega\pm}$ Analytic l	inear & nonlinear Fourier crystal optics 🜎	2022.09
Solution $\mathcal{F}[E_3] = \mathcal{F}[f(\mathcal{F}^{-1}[\cdot])]$ to the Eq. below <b>Nonl</b>	inear angular spectrum theory for SFG 😱	2022.06
Solution $\mathcal{F}[E_3] = \iiint$ to $(\nabla^2 + k_3^2)E_3(r) \propto P_3^{(2)}(r)$	Nonlinear convolution solution to SFG 😱	2022.03
♠ Nonlinear THz LiNbO <sub>3</sub> -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
$\bigcirc$ Electricity $\xrightarrow{\text{produce}}$ Acoustics $\xrightarrow{\text{modulate}}$ Optics	RoamEdit   VBA Excel	2021.07
$\bigcirc$ 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
$\square$ Femtosecond laser $\xrightarrow{\text{Optical Rectification}}$ Terahertz (THz)	GeoGebra   VBA Excel	2020.12
$\bigcirc$ Multicycle THz pulse generation by OR in LiNbO $_3$ crystals	VBA PowerPoinT	2020.10

Skills Languages

• Skill Group: List of technologies

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• **Skill Group:** List of technologies

• Skill Group: List of technologies

• Language: language proficiency level

- EXAM: details

• Language: language proficiency level

• Language: language proficiency level

## Honors & Awards

Academia	Doctor's Qualification Exam (Oral)		Excellent		<i>Top 15%</i>	Nanjing	U.	2024.01
	Bachelar Dissertation 🖓 & Defense		Excellent		1/90	Northeaster	n U.	2020.06
Competition	Three Provinces Achievement Expo	<b>(</b>	Exhibition		Leader	Three	Prov.	2019.10
	"Challenge Cup" Tech Competition	<b>(</b>	Grand prize	e <b>(7</b> )	Leader	Liaoning	Prov.	2019.06
Scholarships & Fellowships	Academic Fellowship		1st class		¥40,000	Nanjing	U.	2020-24
	"Jinchuan" Scholarship		1st place		¥5,000	Northeaster	n U.	2019.04
	Academic Scholarship		1st place		¥2,000	Northeaster	n U.	2018.06
	Entrance Scholarship		3rd place		¥5,000	Leshan No.	H.S.	2013.09
Honors	Graduation with Honor	<b>(</b>	Outstandin	g		Northeaster	n U.	2020.07
&	League Member	<b>(</b>	Excellent	0		Northeaster	n U.	2019.11
Titles	Undergraduate Student		Excellent	(7)		Northeaster	n U.	2018.12
Memberships	Chinese Society for Optical Engineer	ing	Member			Nanjing	U.	2021-25
	"Qian Sanqiang" Talent Class		Head			I.H.E.P.		2017-20

#### Extracurricular Activities

Detailed explanation of what you do in this event

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