



项目名

Project Name

关键成就 Key Achievements

代表大学以及QS排名
Representative University & QS ranking



China International College Students'
Innovation Competition 2024(CICSIC)

I ILLINOIS

Star Domain Tech



Pioneering 5G Communication Satellite
Internet-Terminal Flat-panel Antennas

Representative University

xxxxxxx

1 产品介绍 **Product Introduction**

产品介绍
Product Introduction

1 Product Introduction



Flat-Panel Antenna Terminal

Low Cost

High Efficiency

Low Profile

Light Weight

As a ground terminal, it transmits and receives signals to/from the satellite.



Flat-Panel Antenna
Product Diagram



1. Radiation Layer
2. Polarization Synthesis Layer
3. First Feed Network Layer
4. Second Feed Network Layer

Weights less than **xkg**, suitable for portable installation and application

Terminals include antennas, signal processors, power modules, and software services.

Technical performance comparable to expensive phased array antennas **at 1/x to 1/x of the cost**

Complete technical development
Advanced to industrial testing stage

2 背景 Background

竞争格局+关键政策+核心数据+行业痛点

Competitive Landscape, Key Policies, Core Data, and Industry Pain Points

2 Background



Satellite internet has captured the attention of **nations worldwide.**

SpaceX's Starlink network

the world's largest low-orbit satellite Internet network.

xx,000 low-orbit satellites are planned to be launched.

x,000 satellites have been deployed as of 2024.

x0 countries are covered worldwide.



Low-orbit satellites offer
lower latency and higher speeds.

The International Telecommunication Union (ITU) adopted the principle of

“first come, first served.”

Early-mover

countries gain
significant
advantages!



2 Background



The race to seize the high ground in future communication technologies is accelerating

Global low-orbit Earth satellite layout and proportion in 2029



Data Source: CCID Consulting, Yongxing Securities Research Institute

Starlink has captured over **xx%** of the market by reducing costs through mass launches, effectively monopolizing the sector.



Starlink not only launches multiple satellites but also **installs ground terminals.**

2 Background



The Chinese version of “StarLink” is accelerating
and calling for domestic ground terminals

Qianfan

The first satellites network for
megaconstellation of China's low-
orbit Internet

xx,000 low-orbit broadband
multimedia satellites



GW

Led by China Satellite Network
Group

xx,000 low Earth orbit
satellites



Hongyan&Hongyun

Important components of China's
low-orbit satellite Internet
program.



2 Background



Satellite Internet + 5G has become the trend of future communication

5G Communication

Full coverage is difficult to achieve

Poor mobile support stability

Inadequate for natural disaster response

Satellite Internet

Expands connectivity for **marine, aviation, polar** applications that are difficult to deploy.

Stable mobile signal support,
not easily affected by terrain.

Terminals are **easier to install,**
expanding signal coverage.

3 市场分析 **Market Analysis**

市场规模预测+政策
Market Size Forecast, and Policies

3 Market Analysis



The demand for flat-panel antennas grows rapidly.

Global Satellite Ground Equipment Industry Market Size Forecast (2024-2030)



The global flat-panel antenna market by 20xx

xx.xx Billion USD

Compound Annual Growth Rate (CAGR)

xx.xx%

Asia-Pacific satellite communication terminal market size in 2023

xx.xx Billion USD

By 2033

xxx.xx Billion USD

CAGR **xx.xx%**

China's 5G Flat-Panel Antenna Market Size and Growth Rate (2021-2025)



Sources: Satellite Flat Panel Antenna Market - A Global and Regional Analysis, 2024-2034: Focus on Application, Steering Mechanism, Type, Frequency Band, and Country-wise Analysis; China Satellite Internet Industry Research Report 2024, Chance Investment Bank

4 技术痛点 **Technical Pain Points**

现有技术缺陷

Top 3 Tech Weaknesses

4 Technical Pain Points



High demand for flat-panel antennas but insufficient technology

Low-bandwidth flat-panel antennas are widespread.

Single frequency range, low bandwidth

Current panel antennas support only **single frequencies** or **low bandwidths**, limiting their use in wireless communication, satellite communication and so on.



*Often **fail** to achieve optimal electrical size and directional sidelobes*

Low transmission efficiency & **high** loss

Panel antennas have **low radiation efficiency** and **high power loss**, limiting their competitiveness in efficient energy transfer and low-loss systems.

$$\epsilon_R = \frac{P_{\text{radiated}}}{P_{\text{input}}}$$

*External directional antennas are **susceptible** to environmental interference.*

Weak interference resistance

Panel antennas are **less reliable** in high-density urban environments due to weak interference resistance.



There is need for a **low cost, low weight, high efficiency** antenna product

5 核心技术 **Core Technology**

痛点以及解决方案+创新结构对比+专利壁垒

Pain Points & Solutions, Innovative Structure Comparison, and Patent Barriers

5 Core Technology



Our innovations can **effectively address these pain points**

Pain Points

Single frequency range

*Low transmission efficiency
and large loss*

Weak anti-interference ability

Our Solutions

**Double-layer air microstrip wire feeding
network structure**

Dual-layer air microstrip line

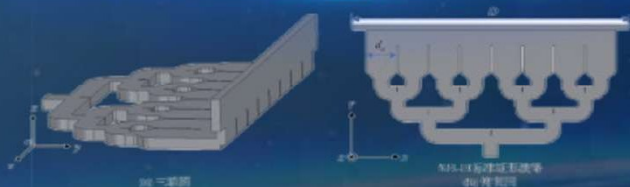
**Cross waveguide orthogonal mode
coupler structure**

5 Core Technology



Dual-layer air microstrip line feeding network structure,
addressed profile and frequency issues

Traditional structure



Heavy, large volume

complex metal processing
technology

High cost

Limited broadband operation
performance

Limitation

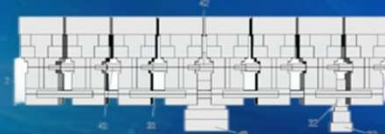
Big

Cost

High

VS

Dual-layer air microstrip line feeding network structure



The radiation layer—the polarization synthesis layer

The first feeding network layer—the second feeding network layer

Low profile

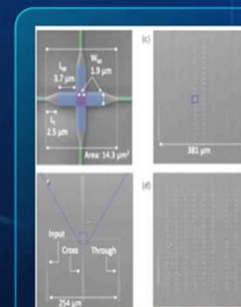
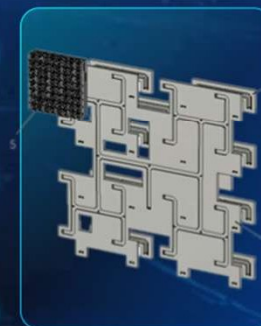
Double layer plate

Low cost

Integrated design

Broadband operation

High frequency & millimeter waves

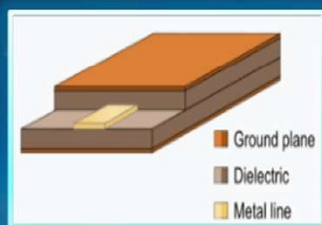


5 Core Technology

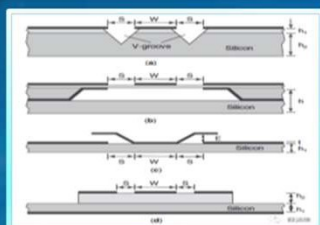


Dual-layer air microstrip line, enhanced transfer efficiency

Traditional microstrip line



Ground plane
Dielectric
Metal line



Strip line

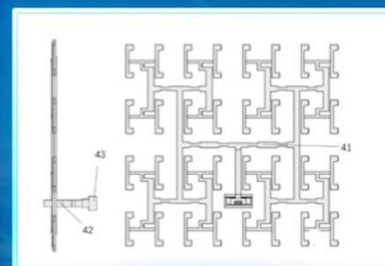
Coplanar waveguide

The manufacturing process is relatively **complex**

Most lines are **only suitable** for broadband and high-frequency applications.

VS

Dual-layer air microstrip line



Low loss of air medium

High conductivity

Open structure

Variable impedance

Applications in High frequency (e.g. GHz range): Improved transmission efficiency of **xx% ~xx%**



Applications in extremely High frequency (e.g. MMW range): Improved transmission efficiency of **xx% ~xx%**



5 Core Technology



Cross waveguide orthogonal mode coupler structure, enhanced resistance to interference

Conventional coupler

Large space, high loss, low efficiency



Design and Simulation of Elliptical Crossing Waveguide Based on Multimode Interference

Le Zichun¹, Xu Zili¹, Sun Chen¹, Du Ying¹, Dong Wen¹

¹College of Science, Zhejiang University of Technology, Hangzhou, Zhejiang 310023, China;

²College of Science, Zhejiang University of Technology, Hangzhou, Zhejiang 310023, China;

Design of a Wideband Meander-Line Circular Polarizer for Ka-band

Applications

REN Wang¹, WU Xi-dong², LIU Gao-dong²

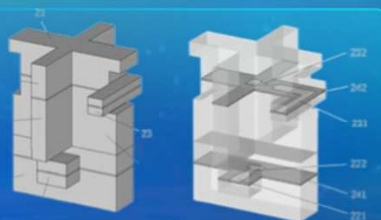
¹College of Electronics Science and Engineering, Zhejiang Gongshang University, Hangzhou 310018, China;

²Department of Electronics Science and Engineering, Zhejiang University, Hangzhou 310027, China)

Abstract: This paper proposes a new approach to design circularly polarized antennas for Ka-band millimeter-wave satellite communications. Circular polarization can be obtained through the use of a meander-line polarizer (MLP) located in front of a linearly polarized horn antenna without any internal changes. It can be compatible with existing linearly polarized millimeter-wave antenna consistently with the advantages of low cost, low design complexity and high flexibility. The influences of the MLP parameters on antenna axial ratio are investigated by parametric studies using CST. The antenna is fabricated and tested. Using the proposed method, a circularly polarized antenna with an axial ratio (AR) lower than 3dB over the 27.5-32.5GHz frequency band can be achieved.

Key words: meander-line; millimeter wave antenna; circular polarizer; axial ratio

Cross waveguide orthogonal mode coupler



Small
Space

Low
Loss

High
Efficiency

Compact structure design

High conductivity material

High-precision NC machining

3D and integration technology

VS

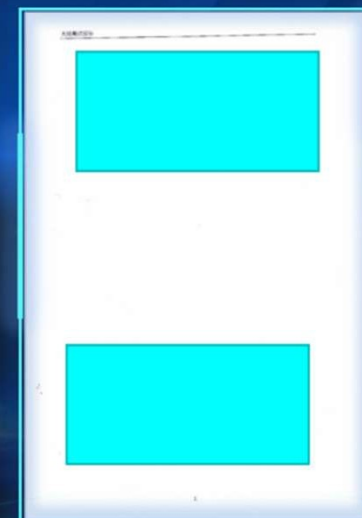
KPI	Traditional waveguide coupler	Cross waveguide orthogonal mode coupler structure
Space	$X \times \text{cm}^2$	$x \times \text{cm}^2$
Loss	$0.x-1.x \text{ dB}$	$0.x-0.x \text{ dB}$
Efficiency	$xx-xx\%$	Beyond $xx\%$

5 Core Technology



High Technical Barriers

xx IEEE and other core journal papers, **x** authoritative product test report,
xx antenna research patents



6 应用场景 **Application Scenarios**

3个应用案例
3 Application cases

6 Application Scenarios



Connecting to the State Grid to support **power system maintenance**

- *Challenges of Communication Infrastructure in Mountainous Areas*
- *Real-Time Communication Issues for Mountain Grid Inspectors*

Our Solution

Deploying Mobile Antenna Terminals to Cover Mountainous Communication Blind Spots

Coverage Area

x-x km Radius

Power Grid Inspection

Inspection efficiency
Employee Safety

Communication Infrastructure

Mountainous
Communication



Preliminary Cooperation Reached with **State Grid**



STATE GRID
CORPORATION OF CHINA



Collaboration Case

In xxx Village, Xinjiang, flat-panel antenna terminals are used to cover blind spots, enabling full grid communication.

6 Application Scenarios



Provide **emergency communication** during natural disasters



During natural disasters, ground base stations become inoperable due to **infrastructure damage**.

Natural Disasters:

Since 2020, the frequency of natural disasters has continued to rise, with **xxx to xxx** medium to large-scale disasters occurring globally each year.

By 20xx, it's projected that there will be **xxx** disasters annually, equivalent to **1.x disasters per day**.

Advantages



The flat-panel antenna is easy to install, can be quickly deployed, and is **minimally affected** by terrain or weather conditions.

The flat-panel antenna supports **smart rescue**, ensuring communication for drones and rescue robots, aiding remote operations.



6 Application Scenarios



Commercial low-cost satellite connectivity solutions

Our flat-panel antennas provide stable connectivity for **vehicles in motion** and ensure reliable communication for **outdoor adventurers** in remote areas.

Advantages

Flexible installation

Stable signal in motion

Lower costs



Signal instability on high-speed rails with **xx-xx%** bridge and tunnel coverage

Incidence of hiking accidents increased by **xx.xx%**

Reliability of mobile location services remains low

Outdoor travel increased by **xx%** But lack high-speed internet access during journeys



6 Application Scenarios



Guidance for enhanced **smart security monitoring** and patrol

Challenges

Traditional border patrols rely on manual methods like foot and horseback inspections, often in **difficult terrain** and **extreme weather**.



While drones have been introduced, the vast area and complex terrain still pose technical challenges such as **signal loss**.

Our solution

Deploying flat-panel antenna **navigation terminals** in key areas, and provide drones with reliable signal guidance

Remote ctrl
Better route



Signal Loss
On-site inspection



7 竞品分析 **Competitors Analysis**

竞品对比

Product Comparison

7 Competitors Analysis



On par with leading international flat-panel antenna companies

Corp.	StarWin	Viasat	Star Domain	Low-Cost Satellite Transceiver Design
Price (USD)	0.xM~0.xxM	x.xM~x.xM	Market Price 0.xxM~0.xxM	--Mechanical Tracking x-x times lower than market price
Size	xx0mm (L) xx0mm (W) xx0mm (H)	xxx0mm (L) xxx0mm (W) xx0 mm (H)	xxxmm(L)>xxmm xmm (W) xxxmm (H)	Efficient Working Mode Design --Ka-band dual circular polarization --Ku-band cross waveguide structure x0~x0% aperture efficiency
Weight	xxkg	≤xx kg	xxkg	Lightweight Product Design --Low-profile technology x-x times thinner x-x times lighter than other products
Polarization	Linear	Circular	Circular	
Application	Portable terminal <i>Low polarization sensitivity Weak anti-interference capability.</i>	Airborne terminal	In-vehicle terminals <i>High price, large size, and heavy weight.</i>	

8 商业模式 **Business Model**

合作模型+核心资源

Partnership Model and Core Resources

8 Business Model



Our key business activities include the following three aspects

B2C Selling Terminal Products



We will manufacture **satellite internet terminals**, including flat-panel antennas, signal processors, power modules, and other components.

For individual terminal purchases, we also offer users **after-sales support** to **increase the product's added value**.

The price of the antenna is approximately between **xxxx and xxxx USD**, and the net profit margin is around **xx% to xx%**.

B2B Direct Sale of Flat-Panel Antenna



We will sell our flat-panel antennas **directly to large customers**, such as telecommunications companies.

For example, our flat-panel antennas are compatible with various satellite signals, which can enhance the efficiency and quality of satellite communications.

The price of the antenna is approximately between **xxxx and xxxx USD**, and the net profit margin is around **xx% to xx%**.

Customized Antenna Services



We offer **customized satellite internet terminal antenna services** based on clients' specific requirements.

We can customize the size, shape, and other parameters. We also handle design, installation, debugging, and maintenance. Additionally, we optimize cost, benefits, and quality metrics.

The price of the antenna is approximately between **xxxx and xxxx USD**, and the net profit margin is around **xx% to xx%**.

8 Business Model



R&D and Manufacturing

Upstream suppliers

Jointly develop new materials with universities and the **Functional Materials Institute of NICE**

Develop **high-performance 5G Flat-Panel Antenna**

Leveraging university research strengths, we will transfer the model to **hardware manufacturers** for mass production and testing.



NICE



Provide technology transformation services for Star Domain Tech and have agreed to **co-develop lightweight materials**

University of Illinois



Utilize the laboratory platform of the College of Information Science and Electronic Engineering for technology development.



Wuxi Yuanhe Microelectronics Co



Assist in the development of Ka-band **CTS structure** flat-panel antennas and Ka-band **near-field testing systems**



UC Berkeley UPenn

Cooperate with the University of California, Berkeley Wireless Research Center and the University of Pennsylvania GRASP Laboratory

8 Business Model



Sales and Partnership

◆ Downstream customers

Provide low-priced and high-quality **general or customized** 5G communication solutions

Projected to establish **the sales and marketing team** by late November 2024 and fully launch operations

Government

Widely used in emergency communication, remote communication, and major event support; we are actively negotiating collaborations.



Commercial satellite operator

We help these clients enhance their signal reception and transmission capabilities to meet their communication needs in various scenarios.



Private Sector

We help the public to achieve stable satellite internet access and various information services in outdoor or remote areas, or on high-speed vehicles.



9 商业分析 **Business Analysis**

财务预测+融资计划

Financial Projections and Financing Plan

9 Business Analysis



Financial Forecast: It is expected to account for approximately **x%** of China's satellite communication terminal market by 20xx.



Project Evaluating in 2029

NPV (Net Present Value)

xx.xx million USD

IRR (Internal Rate of Return)

xx%

9 Business Analysis



Funding Program: **x million** USD has been invested in research. We plan to start the financing of **0.xx million** USD in an angel round

Funding Program



Shareholding Structure



Functional Materials
Institute of NICE

It provides special materials for manufacturing flat-panel antennas, with an anticipated investment of **x.x million USD**.



The company's total equity is planned at **xxxx** USD, with **xxxx** USD from technology and **xxxx** USD from team members. The first round of financing will raise **xxxx** USD, offering **x%** of shares for product testing, team building, and expansion.

We have submitted a business registration application to the Market Supervision Bureau and is preparing for the **official launch**

10 专家指导 **Chief Advisor**

专家背书+具体评价

Expert Endorsement and Detailed Evaluation

10 Chief Advisor



Technology Innovation Chief

- **Deputy Chair** of the Millimeter and Submillimeter Wave Committee, and **Deputy Director** of the Institute of Computational Intelligence and Signal Processing.
- Achieved the **world's first** xxx-degree multi-beam scanning antenna at xxGHz. Led research projects for the National Natural Science Foundation and the xxx Program.
- Published over 30 papers in international journals and serves as a **reviewer for IEEE Transactions on Microwave Theory and Techniques**.

XXX

The Chief advisor of our team has published **over xx** papers in international journals and at major conferences, including the **Asia-Pacific Microwave Conference**. Notably, he has authored **x** papers on antenna research in **the Journal of Microwaves, the only academic journal in China** focused on microwave studies.



- 1. An electrically reconfigurable plasmonic lens using graphene
2020 Asia-Pacific Microwave Conference (APMC), Hong Kong, China, 2020
Y. Wang, X. Wu, and Y. Dai
- 2. A tunable linear-to-circular polarizer based on resonator-loaded metasurface at 30 GHz
2020 Asia-Pacific Microwave Conference (APMC), Hong Kong, China, 2020
Y. Wang, Q. Jiang, J. Shen, X. Wu, and J. Zhou
- 3. Hybrid reconfigurable MIMO antenna/divider using SRR technology
2020 International Conference on Microwave and Millimeter Wave Technology (ICMMT2020), Shanghai, China, 2020
J. H. Z. Chen, C. Wang, and X. Wu
- 4. A 5GHz dual-band continuous transceiver with 0.7dB antenna array with substrate suppression
APSCAP2020, Montreal, Quebec, Canada, pp. 1-4, 2020
J. H. Z. Chen, X. Wu, and J. Zhou
- 5. A substrate plasmonic crystal waveguide divider multiplexer based on graphene surface plasmon polaritons
APSCAP2020, Montreal, Quebec, Canada, pp. 119-120, 2020
J. H. Z. Chen, X. Wu, and J. Zhou

Students in our lab have published 3 papers at the **Photonics and Electromagnetics Research Symposium (PIERS)** which is a leading conference in photonics, electromagnetics, microwave engineering, and antenna technology with significant global impact.

11 团队介绍 **Team introduction**

核心成员+职责+背景

Core Members, Responsibilities, and Backgrounds

11 Team introduction



Core Members

CEO

XXX

UIUC Electrical Engineering major, participant in the UN Youth Training Program with a **UN recommendation letter**. Outstanding student in the Everbright Bank study tour, with experience at Bloomberg and China Life Insurance. Skilled in **leadership, project management, and corporate operations**.

XXX

CFO

QUB Economics and Finance major, interned at **Everbright Bank and Starbucks**. Strong knowledge of **economics, finance**, and business operations.

XXX

COO

UIUC ECE major with strong business management skills. Interned at All In Pay's Supervision and Audit Department, familiar with **corporate operations**.

XXX

CMO

UIUC ME major and experienced in promotional work, managing multiple school social media platforms such as X, Instagram, and Bilibili, dedicated to **building brand image**.

XXX

CTO

UIUC Mechanical Engineering major with experience in **new technology** development and provincial research project leader.

XXX

CHO

UIUC Hosting Team Captain and networking head, skilled in business-talent connections and multilingual communication to **attract global talent**.

XXX

CIO

UIUC EE major. Head of the Student Union Innovation Center, skilled in resource integration and **optimizing business decisions** through tech trend analysis.

12 个人成长 Personal growth

个人收获+心得体会+生活经历

Personal Gains, Reflections/Insights, and Life Experiences

12 Personal growth

个人收获+心得体会
Personal Gains + Reflections And Insights

生活经历
Life Experiences



13 发展战略 **Development Strategy**

3步战略规划
3-Step Strategic Plan

13 Development Strategy



Strategic Planning

Stable Launch (2024-2027)

Innovation to expand the market

- Angel round financing **0.xxM USD** and pre-A round **1.x M USD**
- Successfully pass industrial validation and gradually expanded the production line.
- Expanding the market through Three Major Business Models

Rapid Growth (20xx-20xx)

R&D for application scenarios

- Leveraging laboratory resources to advance electronic tracking technology and develop lightweight materials.
- Expand application scenarios and build a stable customer base.
- Capture over **xx%** of the domestic market share.

Global Expansion (20xx-20xx)

Leading brand for sustainability

- Prioritize building renowned brands and establishing a high-quality image.
- Enhance the company's industry contribution and influence, shaping a new industry landscape.
- Embrace social responsibility and actively give back to society.

14 校创融合 **University-Innovation Integration**

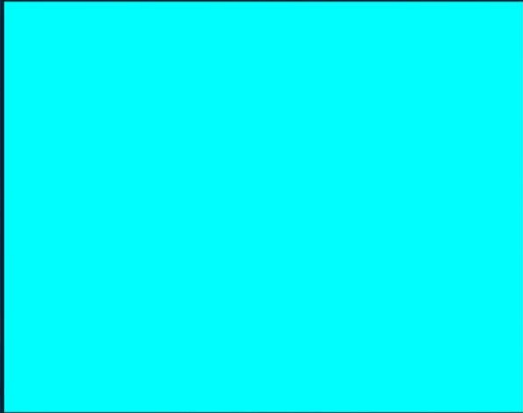
学校支持+产学研创新+科研实力

University Support, Industry-Academia-Research Innovation, and
Research Capabilities

14 University-Innovation Integration



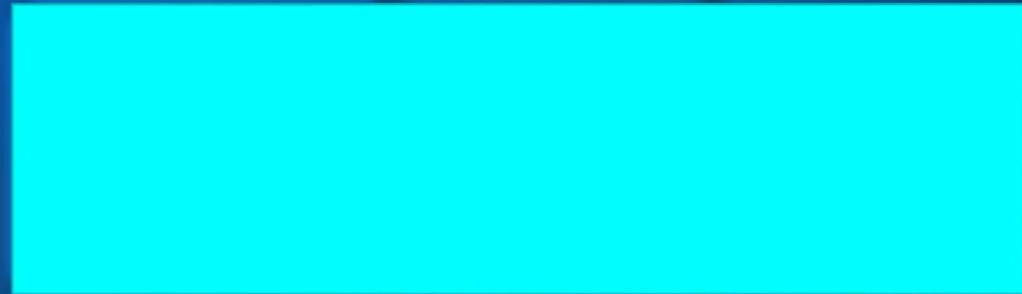
Academia-Industry Innovation Integration



The company promotes collaboration to convert research into products, enhancing conversion rates through **resource sharing and complementary strengths**.

Leading education

We offer university **internships** to train satellite communication talent, open **public tours**, and leverage UIUC's strengths with **academic lectures**.



xxx, technical leader of the team, was introducing the flat plate antenna to the public

Team member xxx was giving lectures and answering questions about satellite communications

15 社会效益 **Social Impact**

促进就业+国际交流+社会使命

Employment, International Exchange, and Societal Mission

15 Social Impact



Boost employment

Direct

Creating **1xx+** jobs in technology, sales, and other roles within 4 years.

Indirect

Upstream and downstream material suppliers, manufacturers, and telecommunications companies will create **1,xxx+** new jobs.



ACM SIGCOMM

MWC
GSMA



IEEE ICC®

IEEE International Conference on Communications
9-13 June 2024 // Denver, CO, USA
Scaling the Peaks of Global Communications

International exchange

The company will partner with global universities, attend major events, and co-develop advanced satellite communication technologies.

Bridge information poverty

Enabling **global communication coverage**, connecting remote areas to social networks and public life, building a global village.



Establish global communication coverage



Team members participated in and organized a survey of a non-signal area



愿景 *Vision*

关键成就 Key Achievements

代表大学以及QS排名
Representative University & QS ranking



China International College Students'
Innovation Competition 2024(CICSIC)

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