

# Reconfigurable Intelligent Surfaces (RIS) Global Market 2025-2035

<https://marketpublishers.com/r/R989CBC8EF9AEN.html>

Date: September 2024

Pages: 215

Price: US\$ 1,250.00 (Single User License)

ID: R989CBC8EF9AEN

## Abstracts

RIS, also known as Intelligent Reflecting Surfaces (IRS) or software-controlled metasurfaces, are artificial structures composed of a large number of small, passive elements that can be electronically controlled to manipulate electromagnetic waves. These surfaces can reflect, refract, absorb, or focus incoming signals in desired directions, effectively shaping the wireless propagation environment. Due to recent advances in metamaterials, Reconfigurable Intelligent Surface (RIS) has emerged as a promising technology for future 6G wireless communications. Benefiting from its high array gain, low cost, and low power consumption, RISs are expected to greatly enlarge signal coverage, improve system capacity, and increase energy efficiency.

RIS technology offers revolutionary capabilities in manipulating electromagnetic waves, enabling enhanced coverage, capacity, and energy efficiency in wireless networks. As 5G networks expand and 6G development accelerates, RIS is expected to play a crucial role in overcoming current limitations in wireless communications. Key applications span telecommunications, smart cities, Industrial IoT, healthcare, automotive, aerospace, and consumer electronics. The market is driven by increasing demand for high-speed, low-latency communications, growth in IoT adoption, and the need for energy-efficient wireless solutions. However, challenges include high initial costs, technical complexities in large-scale deployment, and standardization issues.

Report contents include:

Market Size and Growth Projections: Detailed forecasts of the RIS market size and growth rate from 2025 to 2035, segmented by technology type, application, and geography.

**Technology Deep Dive:** Comprehensive analysis of various RIS technologies, including metasurfaces, liquid crystal-based RIS, MEMS-based RIS, and emerging approaches.

**Application Landscape:** Exploration of key application areas such as 5G/6G networks, IoT, smart cities, autonomous vehicles, and aerospace communications.

**Competitive Landscape:** Profiles of leading companies and emerging players in the RIS space, including their technologies, strategies, and market positioning. Companies profiled include Alcan Systems, Alphacore Inc., Edgehog Advanced Technologies, Evolv Technologies Inc., Fractal Antenna Systems Inc., Greenerwave, Huawei, Kymeta Corporation, Leadoptik Inc., Lumotive, META, Metaboards Limited, Metawave Corporation, Nokia, NTT DOCOMO, Pivotal Commware Inc., SK Telecom, Teraview Limited, and ZTE Corporation.

**Future Outlook:** Assessment of emerging trends, potential disruptions, and long-term prospects for RIS technology.

Developments in RIS technology, including:

Integration with AI and machine learning for adaptive control

Quantum RIS concepts pushing the boundaries of performance

Self-configuring and self-healing RIS for enhanced reliability

Holographic radio and terahertz communications enabled by RIS

Market Drivers and Opportunities

Challenges and Market Dynamics

Technology Benchmarking and Performance Analysis

Comprehensive comparison of different RIS technologies.

Integration with Wireless Communication Systems.

Environmental and Sustainability Considerations.

Standardization and Regulatory Landscape.

## Contents

### 1 EXECUTIVE SUMMARY

- 1.1 Overview of Reconfigurable Intelligent Surfaces (RIS)
- 1.2 Key Market Drivers and Challenges
- 1.3 Technology Trends
- 1.4 Metamaterial key to RIS
- 1.5 Market Size and Growth Projections
- 1.6 Competitive Landscape Overview
- 1.7 Future Outlook and Opportunities

### 2 INTRODUCTION

- 2.1 Technology overview
  - 2.1.1 Key features and functionality
  - 2.1.2 Frequencies
  - 2.1.3 Physics of Electromagnetic Wave Manipulation
    - 2.1.3.1 Reflection
    - 2.1.3.2 Refraction
    - 2.1.3.3 Diffraction
    - 2.1.3.4 Absorption
  - 2.1.4 RIS Operating Principles
    - 2.1.4.1 Passive RIS
    - 2.1.4.2 Active RIS
    - 2.1.4.3 Hybrid RIS
  - 2.1.5 Key Performance Parameters
    - 2.1.5.1 Reflection Coefficient
    - 2.1.5.2 Phase Shift Range
    - 2.1.5.3 Bandwidth
    - 2.1.5.4 Power Consumption
    - 2.1.5.5 Reconfiguration Speed
  - 2.1.6 Design Considerations for RIS
    - 2.1.6.1 Surface Element Design
    - 2.1.6.2 Array Configuration
    - 2.1.6.3 Control Mechanisms
    - 2.1.6.4 Integration with Existing Infrastructure
- 2.2 System Architecture
- 2.3 Importance in Modern Wireless Communications

- 2.4 Advantages Over Traditional Wireless Technologies
- 2.5 Current Limitations and Challenges
- 2.6 Comparison with Other Smart Electromagnetic (EM) Devices

### **3 RIS TECHNOLOGIES**

- 3.1 Metasurfaces
  - 3.1.1 Principles of Metasurfaces
  - 3.1.2 Types of Metasurfaces
  - 3.1.3 Fabrication Techniques
  - 3.1.4 Performance Characteristics
- 3.2 Liquid Crystal-based RIS
  - 3.2.1 Operating Principles
  - 3.2.2 Advantages and Limitations
- 3.3 MEMS-based RIS
  - 3.3.1 MEMS Technology Overview
  - 3.3.2 Design and Fabrication
  - 3.3.3 Performance Metrics
- 3.4 Varactor Diode-based RIS
  - 3.4.1 Overview
- 3.5 PIN Diode-based RIS
  - 3.5.1 Overview
- 3.6 Other Materials
  - 3.6.1 Ferroelectric materials
  - 3.6.2 Phase Change Materials
  - 3.6.3 Graphene
- 3.7 Comparison of RIS Technologies
  - 3.7.1 Performance Metrics
  - 3.7.2 Cost Analysis
  - 3.7.3 Scalability and Manufacturing Considerations

### **4 RIS IN WIRELESS COMMUNICATION SYSTEMS**

- 4.1 Integration with 5G Networks
  - 4.1.1 Enhanced Mobile Broadband (eMBB)
  - 4.1.2 Ultra-Reliable Low-Latency Communication (URLLC)
  - 4.1.3 Massive Machine-Type Communications (mMTC)
- 4.2 6G and Beyond
  - 4.2.1 RIS in Terahertz Communications

- 4.2.2 Holographic Radio
- 4.2.3 Intelligent Reflecting Surfaces for Satellite Communications
- 4.3 MIMO Systems and RIS
  - 4.3.1 RIS-assisted MIMO
  - 4.3.2 RIS-based Massive MIMO
  - 4.3.3 Performance Enhancements and Challenges
- 4.4 Beamforming and RIS
  - 4.4.1 Passive Beamforming
  - 4.4.2 Hybrid Beamforming with RIS
  - 4.4.3 Adaptive Beamforming Techniques
- 4.5 Energy Efficiency in Wireless Networks
  - 4.5.1 RIS for Green Communications
  - 4.5.2 Energy Harvesting with RIS
  - 4.5.3 Power Consumption Analysis

## **5 MARKETS AND APPLICATIONS**

- 5.1 Telecommunications
  - 5.1.1 Coverage Enhancement
  - 5.1.2 Capacity Improvement
  - 5.1.3 Interference Mitigation
  - 5.1.4 Market forecast
- 5.2 Smart Cities and IoT
  - 5.2.1 Urban Environment Monitoring
  - 5.2.2 Smart Transportation Systems
  - 5.2.3 Energy Management in Buildings
  - 5.2.4 Market forecast
- 5.3 Industrial IoT and Industry 4.0
  - 5.3.1 Factory Automation
  - 5.3.2 Warehouse Management
  - 5.3.3 Process Control and Monitoring
  - 5.3.4 Market forecast (IoT)
- 5.4 Healthcare and Medical Applications
  - 5.4.1 Wireless Body Area Networks
  - 5.4.2 Remote Patient Monitoring
  - 5.4.3 Medical Imaging Enhancement
- 5.5 Automotive and Transportation
  - 5.5.1 Vehicle-to-Everything (V2X) Communications
  - 5.5.2 Autonomous Vehicles

- 5.5.3 Intelligent Transportation Systems
- 5.5.4 Market forecast (IoT)
- 5.6 Aerospace and Defense
  - 5.6.1 Radar Systems Enhancement
  - 5.6.2 Secure Communications
  - 5.6.3 Stealth Technology
- 5.7 Smart Home and Consumer Electronics
  - 5.7.1 In-home Wireless Coverage Optimization
  - 5.7.2 Device-to-Device Communications
  - 5.7.3 Augmented and Virtual Reality Applications

## **6 MARKET ANALYSIS AND TRENDS**

- 6.1 Global Market Size and Growth Projections
  - 6.1.1 Market Segmentation by Technology
  - 6.1.2 Market Segmentation by Application
  - 6.1.3 Market Segmentation by Geography
- 6.2 Key Market Drivers
  - 6.2.1 Increasing Demand for High-Speed, Low-Latency Communications
  - 6.2.2 Growth in IoT and Smart Device Adoption
  - 6.2.3 Advancements in 5G and 6G Technologies
  - 6.2.4 Need for Energy-Efficient Wireless Solutions
- 6.3 Market Challenges and Barriers
  - 6.3.1 High Initial Implementation Costs
  - 6.3.2 Technical Complexities in Large-Scale Deployment
  - 6.3.3 Standardization and Interoperability Issues
  - 6.3.4 Regulatory and Compliance Challenges
- 6.4 Emerging Market Opportunities
  - 6.4.1 Integration with Edge Computing
  - 6.4.2 RIS for Satellite and Space Communications
  - 6.4.3 Advanced Materials for RIS
  - 6.4.4 AI and Machine Learning Integration
  - 6.4.5 Quantum RIS Concepts
  - 6.4.6 Cognitive RIS
  - 6.4.7 Self-configuring and Self-healing RIS
  - 6.4.8 Integration with Blockchain for Secure Communications
- 6.5 Future Outlook
  - 6.5.1 RIS in 6G and Beyond
  - 6.5.2 Holographic Communications

- 6.5.3 Space-based RIS Networks
- 6.5.4 AI and Machine Learning in RIS Control
- 6.5.5 RIS for Terahertz and Optical Wireless Communications
- 6.5.6 Biological and Health Implications of Large-Scale RIS Deployment

## **7 STANDARDIZATION AND REGULATORY ENVIRONMENT**

- 7.1 Current Standards Related to RIS
  - 7.1.1 IEEE Standards
  - 7.1.2 3GPP Specifications
  - 7.1.3 ETSI Standards
- 7.2 Spectrum Allocation and Management
  - 7.2.1 Safety and Electromagnetic Compatibility Regulations
  - 7.2.2 Data Privacy and Security Considerations

## **8 ENVIRONMENTAL AND SUSTAINABILITY CONSIDERATIONS**

- 8.1 Energy Efficiency of RIS-enabled Networks
- 8.2 Life Cycle Assessment of RIS Technologies
- 8.3 E-waste Management and Recycling
- 8.4 Sustainable Manufacturing Practices
- 8.5 RIS Role in Smart Grid and Energy Management
- 8.6 Environmental Impact of Large-Scale RIS Deployment

## **9 CHALLENGES AND LIMITATIONS**

- 9.1 Technical Challenges in RIS Implementation
- 9.2 Scaling Up Production and Cost Reduction
- 9.3 Integration with Existing Infrastructure
- 9.4 Performance in Complex Environments
- 9.5 Security and Privacy Concerns

## **10 COMPANY PROFILES 181 (19 COMPANY PROFILES)**

## **11 APPENDICES**

- 11.1 Glossary of Terms
- 11.2 12. List of Abbreviations
- 11.3 Research Methodology



## 12 REFERENCES

## List Of Tables

### LIST OF TABLES

Table 1. Key Market Drivers and Challenges in RIS.

Table 2. Future Outlook and Opportunities in RIS.

Table 3. Overview of different RIS types.

Table 4. RIS operation phases.

Table 5. RIS Hardware.

Table 6. Comparison of different RIS techniques.

Table 7. RIS functionalities.

Table 8. Challenges for fully functionalized RIS environments.

Table 9. Benchmarking of Reconfigurable Intelligent Surfaces (RIS) types.

Table 10. Comparison of Key Performance Metrics for Different RIS Technologies.

Table 11. Bandwidth and Frequency Ranges for Various RIS Technologies.

Table 12. Energy Efficiency Comparison: RIS-enabled vs. Traditional Wireless Networks.

Table 13. Reconfiguration Speed Comparison Across Different RIS Types.

Table 14. Advantages Over Traditional Wireless Technologies.

Table 15. Current Limitations and Challenges,

Table 16. RIS vs Other Smart Electromagnetic (EM) Devices.

Table 17. Metasurface fabrication techniques.

Table 18. Distinguishing between conductive and optical metamaterials.

Table 19. Advantages and Limitations of Liquid Crystal-based RIS.

Table 20. Comparison of RIS Performance in Different Environmental Conditions.

Table 21. Global market forecast for RIS Adoption in 5G/6G Networks (2025-2035), Millions USD.

Table 22. Global market forecast for RIS Adoption in Smart Cities (2025-2035), Millions USD.

Table 23. Global market forecast for RIS Adoption in IoT Applications (2025-2035), Millions USD.

Table 24. Global market forecast for RIS Adoption in Automotive and Transportation (2025-2035), Millions USD.

Table 25. Global RIS Market Size, by Technology Type, 2025-2035 (USD Million).

Table 26. Global RIS Market Size, by Application, 2025-2035 (USD Million).

Table 27. Global RIS Market Size, by Region, 2025-2035 (USD Million).

Table 28. Environmental Impact Comparison: RIS vs. Traditional Wireless Infrastructure,

Table 29. Glossary of Terms.

Table 30. List of Abbreviations.

## List Of Figures

### LIST OF FIGURES

Figure 1. A typical use case of an RIS, where it receives a signal from the transmitter and re-radiates it focused on the receiver.

Figure 2. Basic RIS application: coverage extension in a cellular network.

Figure 3. Schematic Diagram of a Typical RIS Structure.

Figure 4. Intelligent reflection and refraction.

Figure 5. Comparison of Reflection Coefficient Across Different RIS Technologies.

Figure 6. Comparison of Phase Shift Range Across Different RIS Technologies.

Figure 7. Power Consumption Comparison of RIS Technologies.

Figure 8. Reconfiguration Speed Ranges of RIS Technologies (Range Plot).

Figure 9. Feed modules, reconfigurable electromagnetic surfaces and control modules.

Figure 10. Scanning electron microscope (SEM) images of several metalens antenna forms.

Figure 11. Transparent and flexible metamaterial film developed by Sekishi Chemical.

Figure 12. Comparison between 5G and 6G wireless systems in terms of key-performance indicators.

Figure 13. RIS-enabled, self-sufficient ultra-massive 6G UM-MIMO base station design.

Figure 14. Active and passive beamforming in RIS-assisted cell-free massive MIMO.

Figure 15. Lumotive advanced beam steering concept.

Figure 16. RIS-assisted outdoor macro station .

Figure 17. RIS-assisted indoor enhancement of outdoor macro station coverage.

Figure 18. Global market forecast for RIS Adoption in 5G/6G Networks (2025-2035), Millions USD.

Figure 19. Global market forecast for RIS Adoption in Smart Cities (2025-2035), Millions USD.

Figure 20. Global market forecast for RIS Adoption in IoT Applications (2025-2035), Millions USD.

Figure 21. Global market forecast for RIS Adoption in Automotive and Transportation (2025-2035), Millions USD.

Figure 22. RIS-based satellite communication scenario.

Figure 23. Global RIS Market Size, by Technology Type, 2025-2035 (USD Million).

Figure 24. Global RIS Market Size, by Application, 2025-2035 (USD Million).

Figure 25. Global RIS Market Size, by Region, 2025-2035 (USD Million).

Figure 26. RIS-enabled wireless edge computing.

Figure 27. Edgehog Advanced Technologies Omnidirectional anti-reflective coating.

Figure 28. Evolv Edge screening system.

Figure 29. FM/R technology.

Figure 30. Metablade antenna.

Figure 31. MTenna flat panel antenna.

Figure 32. Kymeta u8 antenna installed on a vehicle.

Figure 33. LIDAR system for autonomous vehicles.

Figure 34. Light-control metasurface beam-steering chips.

Figure 35. Metaboard wireless charger.

Figure 36. Meta Nanoweb® Sekisui.

Figure 37. NTT DOCOMO transparent RIS.

Figure 38. ZTE dynamic reconfigurable intelligent surface 2.0 product.

## I would like to order

Product name: Reconfigurable Intelligent Surfaces (RIS) Global Market 2025-2035

Product link: <https://marketpublishers.com/r/R989CBC8EF9AEN.html>

Price: US\$ 1,250.00 (Single User License / Electronic Delivery)

If you want to order Corporate License or Hard Copy, please, contact our Customer Service:

[info@marketpublishers.com](mailto:info@marketpublishers.com)

## Payment

To pay by Credit Card (Visa, MasterCard, American Express, PayPal), please, click button on product page <https://marketpublishers.com/r/R989CBC8EF9AEN.html>

To pay by Wire Transfer, please, fill in your contact details in the form below:

First name:  
Last name:  
Email:  
Company:  
Address:  
City:  
Zip code:  
Country:  
Tel:  
Fax:  
Your message:

**\*\*All fields are required**

Customer signature \_\_\_\_\_

Please, note that by ordering from marketpublishers.com you are agreeing to our Terms & Conditions at <https://marketpublishers.com/docs/terms.html>

To place an order via fax simply print this form, fill in the information below and fax the completed form to +44 20 7900 3970