P-MIMO Innovative In-Building Coverage Solution

Creating an Ultimate Indoor 5G Experience

Ultimate 5G Indoor Experience

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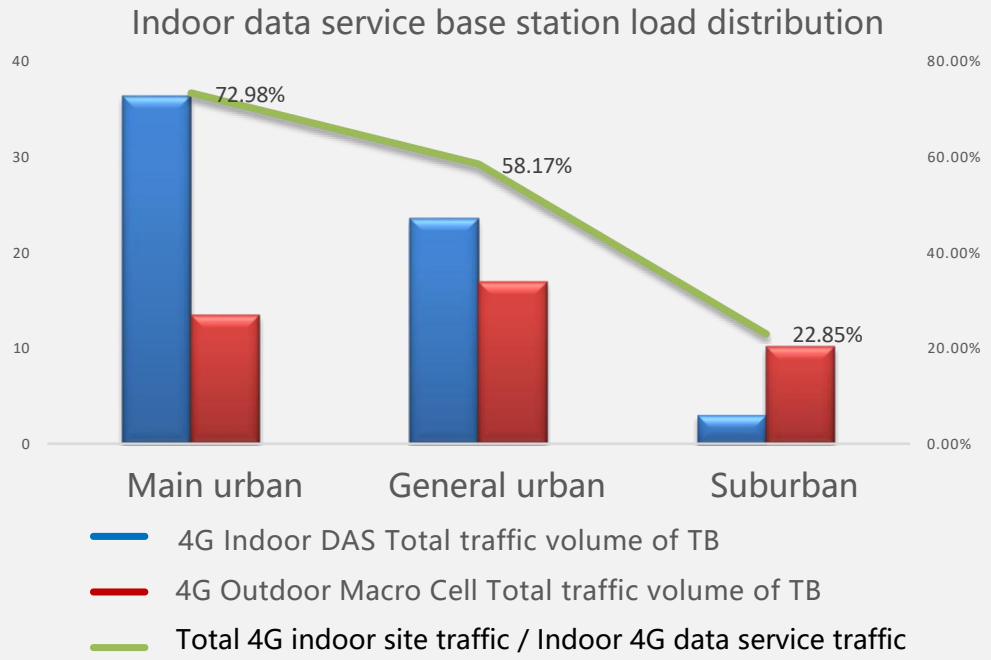
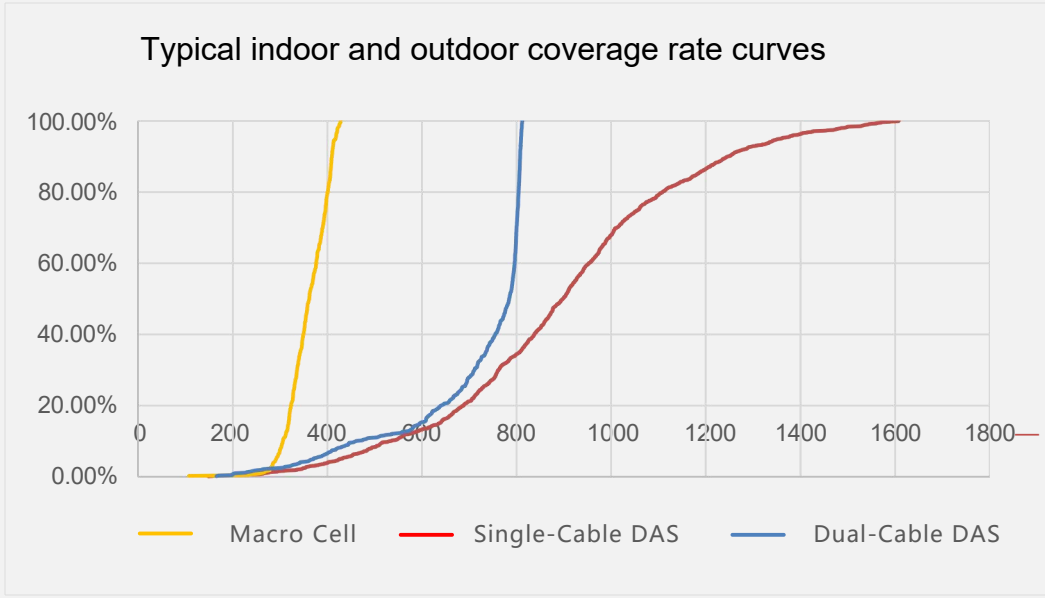
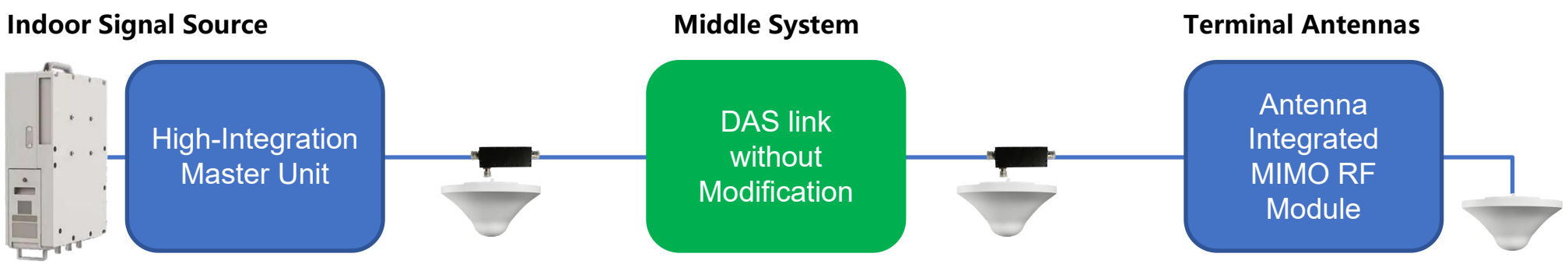
70% of Traffic Occurs Indoors, Single-Carrier DAS Becomes a 5G Experience Bottleneck

According to the '5G User Perception Quality Assessment Report' released by China Telecom Research Institute, the indoor 5G coverage rate is only about 60%, and the coverage rate in enclosed areas such as elevators and underground parking lots is less than 50%, while 73% of users' network usage scenarios occur indoors.





Innovative In-Building MIMO Solution: No Need to Modify Existing Cabling, Dual-Stream Transmission Over a Single Cable



Highly Integrated Frequency-Shifting MIMO Master Unit

Combines signal source and frequency-shifting in one design, with self-developed DPD algorithm for high-efficiency power amplification, reduced noise floor, and support for 100/200MHz large bandwidth.

No Modification to the Middle System

No need to add new feeder cables or replace Couplers/Splitter, Maximizing the reuse of existing lines.

In-Building Antenna with Integrated Frequency-Shifting Module

Integrated Aantenna and Frequency-Shifting design, highly integrated, passive frequency-shifting with low power consumption, environmentally friendly.

Key Product Design Specifications

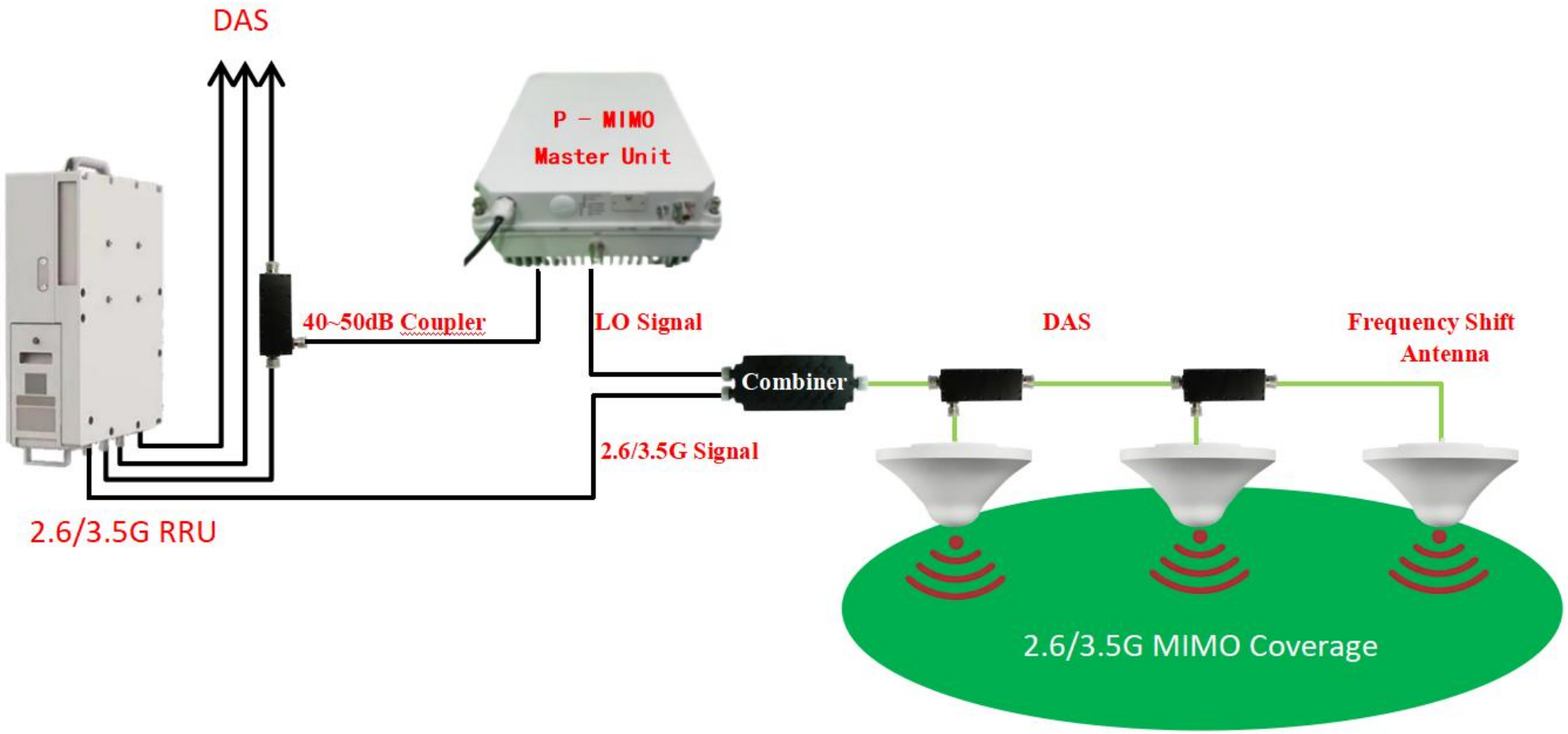


Figure 1-1 Schematic diagram of 2.6/3.5GHz frequency-shifted MIMO device networking

Innovative Passive MIMO Solution vs. Active Frequency-Shifting Solution

Active Frequency-Shifting Solution

- Requires Replacement
- Requires External Power
- Higher Cost

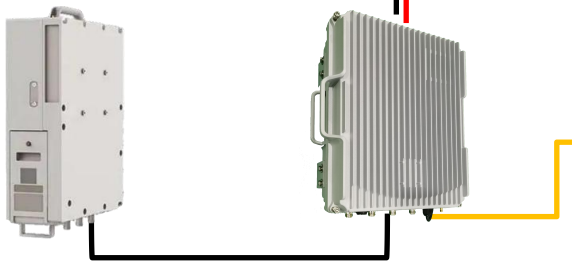
Passive Frequency-Shifting Solution

- No Replacement
- More Energy-Efficient
- Lower Cost

Cost Reduction: 30-60%
Deployment Time: -50%

Innovative Passive MIMO Solution vs. Active Frequency-Shifting Solution

Active Solution



5G RRU+ A-Master Unit

1：Independent Power Supply

2：DC-PASS Coupler

Active Antenna Requires Power Supply renovation, with complex operations and high costs

Passive Solution

Low Cost

5G RRU+ P-Master Unit

Existing DAS

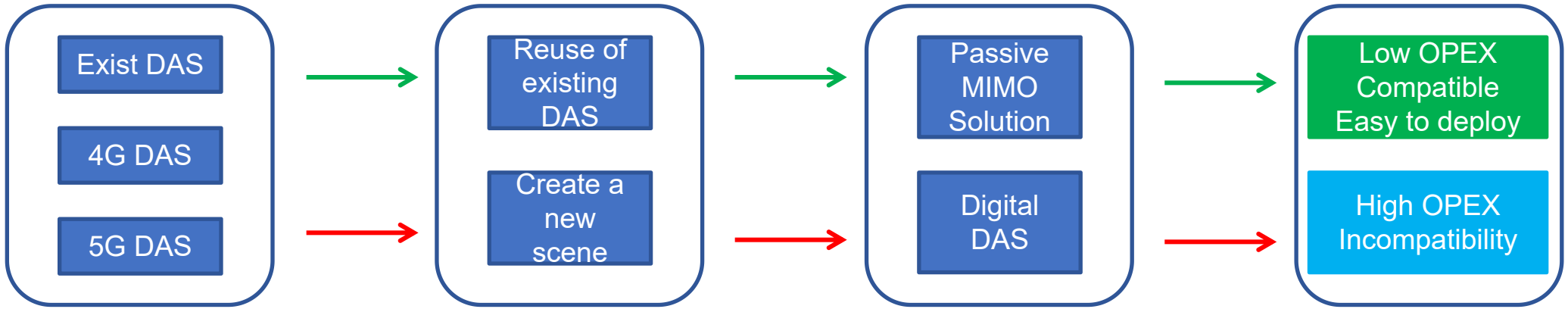
Reuse DAS

Passive/Saving Energy

Passive Antenna

Target Deployment Scenarios for Passive MIMO: Existing Single-Carrier DAS Experience Bottlenecks

The Passive MIMO solution is particularly suitable for high-value scenarios with existing single-carrier DAS coverage, such as large shopping malls, transportation hubs, office buildings, and hotels, and can quickly improve the 5G user experience in these areas.



★Scene Characteristics:Traditional DAS has a limited coverage area.
★Difficulty points:Difficulty in expansion, high maintenance cost

★Sore Issue: Compatibility with Exist-DAS systems, with high complexity in upgrading.

★Application Value: Application value: Easy to upgrade, flexible expansion, cost reduction

Content

Test Site and Renovation Illustration

Location of the Site

- Typical commercial office buildings in the core urban area
- Covering complex partitions and spacious office areas, highly representative

Building characteristics

- Multi-layered frame structure, with metal coverings on the ceiling
- The 3~4 Layer are the key renovation floors, featuring 10 standard Omin Antenna positioning points.

Environmental verification item

No	Test Item	Verification purpose	Layer
1	Coverage Test	Verify the actual coverage of passive MIMO systems	3
2	Connection test	Verify the success rate of user access	3
3	Speed Test	Verify the increase in throughput before and after the modification	3/4
4	Interference Test	Verify interference control under multi-user concurrent operation	3

Renovation implementation and on-site real scene

Construction renovation

All 10 omnidirectional antennas on the 3rd floor have been fully renovated. On the 4th floor, 5 antennas have been upgraded, with the remaining ones retained as the control group.

On-site environment

The original office partition and corridor layout is restored, with antennas installed in a concealed manner to simulate ceiling obstruction scenarios.

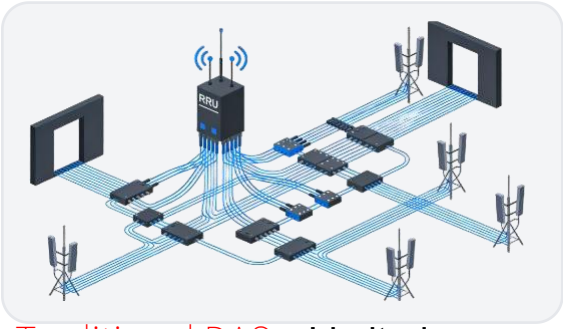
Summary of Environmental Authenticity Assurance:

This test targets a typical complex commercial office building. By renovating and retaining 15 test points on its 3rd and 4th floors, a "real-scenario simulation + comparative verification" dual-assurance system was established. On-site, physical constraints in actual deployment—such as ceiling obstacles and wall partitions—were fully replicated to ensure test data accurately reflects post-deployment network performance.

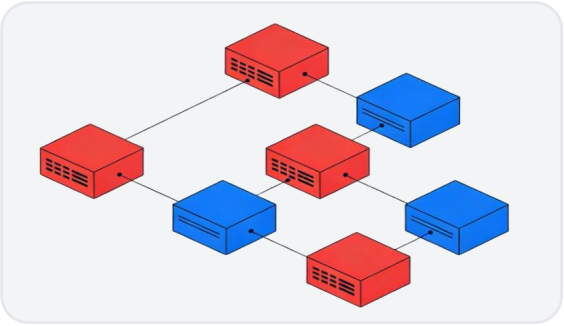
Engineering Renovation Efficiency Comparison

★ Renovation Scene:

A typical on-site scene of an Indoor DAS renovation, with metal ceiling as the ceiling environment.

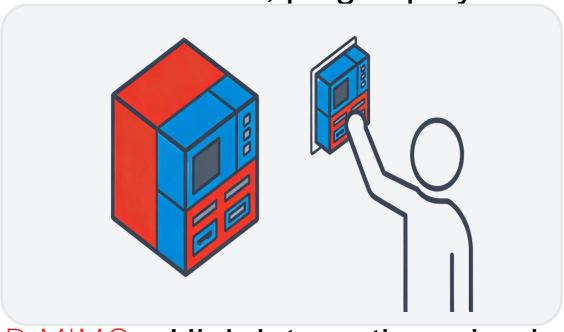


Traditional DAS: Limited space, complex wiring



P-MIMO Construction: Modular installation, plug-&-play

Traditional DAS: High cost, low return rate



P-MIMO: High integration, simple deployment

★ Renovation Efficiency:

Comparison	P-MIMO	DAS	Advantage
Installation Duration	~30min	~4Hour	Time reduction 87.5%
Human resources investment	1 Person	2~3 people collaboratively	Significantly reduce labor costs
Overall construction period	Less 1 Day	Require 2~3 Day	Plug & Play, quick setup and Activation
Construction complexity	Modular wiring-free design	Redeployed with new Feeder/Antenna	Reduce the damage to the existing decoration

Core value:

Via integrated design, the P-MIMO solution turns the traditional model's high time/labor costs into rapid deployment and simplified construction, marking a qualitative efficiency leap.

Coverage Performance Test

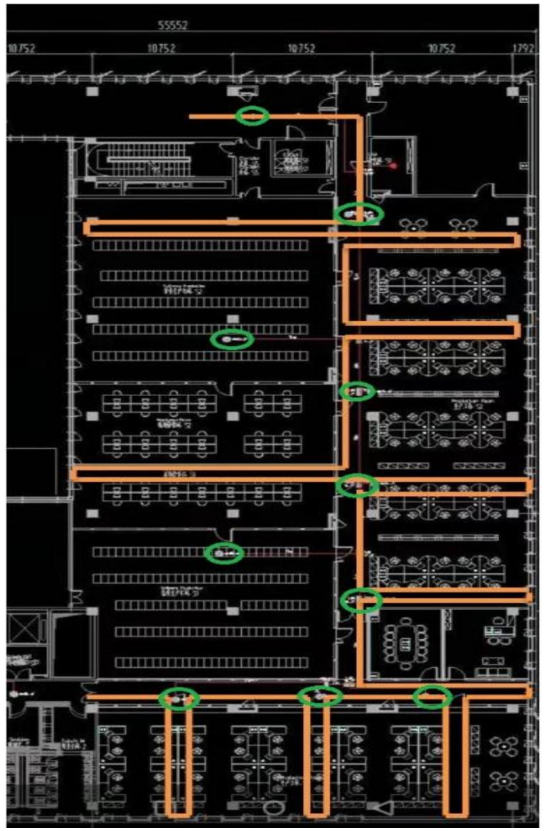
★Test Purpose:Shows the comparison charts of RSRP and SINR before and after renovation, and explains: RSRP measures signal strength, and SINR reflects signal quality.

★Test Conclusion:The test results show that the P-MIMO solution ensures good signal quality while maintaining coverage.

★Scene Description：

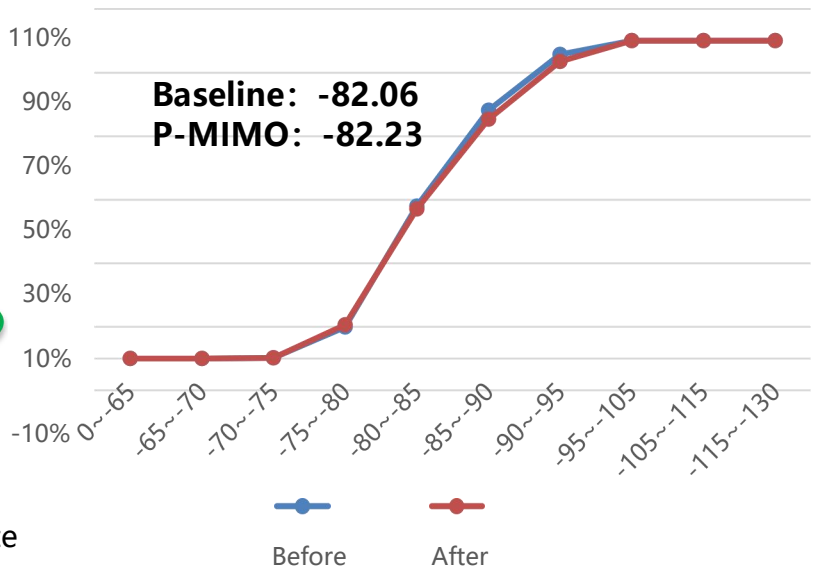
Area	Antenna	Avg Spacing	Max Spacing	Min Spacing
≈2800m²	10pcs	13.9m	20m	10m

Antenna position and test route diagram

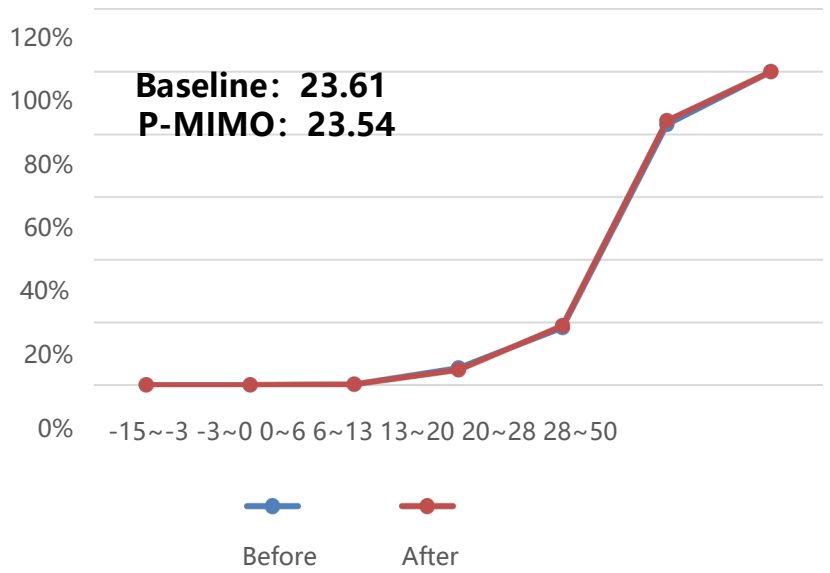


★Test Data Comparison：

RSRP CDF before and after renovation



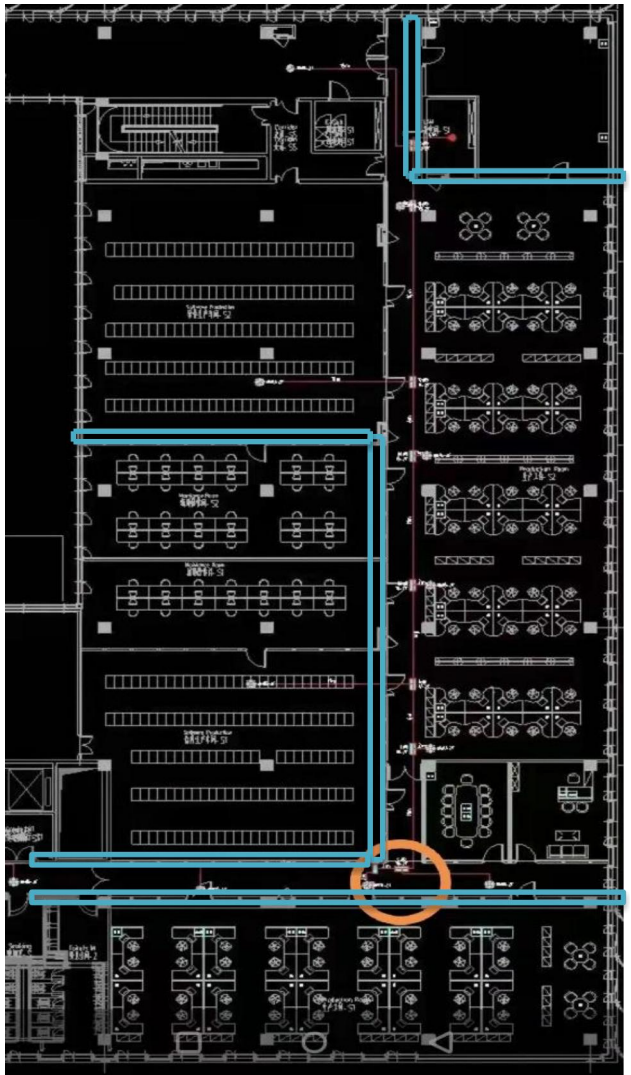
SINR CDF before and after renovation



NR Cell Access Success Rate Test

★Test purpose: Test the access performance of NR cells using P-MIMO, and analyze access success rate variations across different scenarios.

★Test conditions:
Fixed-point combined with traversal testing is adopted to cover typical indoor scenarios like glass partitions, with terminals supporting 5G NR.



★Test conclusion: P-MIMO solution delivered a 100% access success rate, fully demonstrating its stability and reliability.

★Test statistics data:

N	NARFCN 627264	PCI 171	SS-RSRP -78.86	SS-SINR 26.9
次数	时间		状态	类型
10	02:45:39.056		成功	Power On
10	02:45:38.053		成功	Power Off
9	02:45:33.045		成功	Power On
9	02:45:32.041		成功	Power Off
8	02:45:27.034		成功	Power On
8	02:45:26.031		成功	Power Off
7	02:45:21.025		成功	Power On
7	02:45:20.020		成功	Power Off
6	02:45:15.015		成功	Power On
6	02:45:14.012		成功	Power Off
5	02:45:09.006		成功	Power On
5	02:45:08.002		成功	Power Off
4	02:45:02.996		成功	Power On
4	02:45:01.993		成功	Power Off
3	02:44:56.985		成功	Power On
3	02:44:55.979		成功	Power Off
2	02:44:50.973		成功	Power On
2	02:44:49.970		成功	Power Off

Ping Test

P-MIMO Solution significantly reduces latency and boosts user experience

Shows the latency comparison bar charts for Ping32Byte and Ping2000Byte, highlighting the lower latency advantage of the P-MIMO solution, and explains the importance of low latency for user experience in online games, video calls, etc.

Online games run more smoothly

Low latency cuts game operation response time, eliminates lag, and ensures instant feedback for competitive gamers, boosting both win rates and experience.

Video calls are clearer

Low latency ensures lag-free HD video calls with perfect audio-visual sync, making remote communication feel just like talking in person.

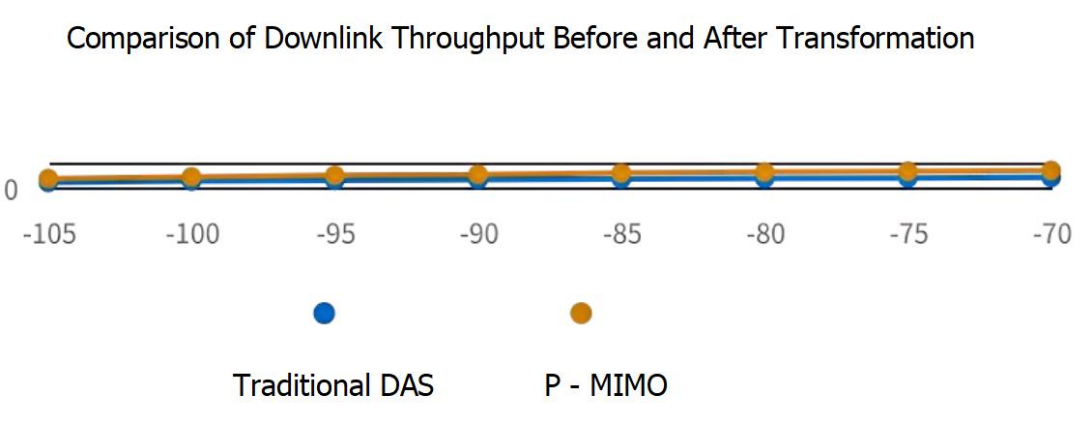
Conclusion： the P-MIMO solution directly addresses high real-time requirement pain points via significant network latency reduction, greatly improving user satisfaction with network services.

Single User Performance Test

★ Test Purpose： Verify the single-user rate performance of indoor P-MIMO systems vs Traditional single-path DAS, and quantify the experience gains from 5G network upgrades.

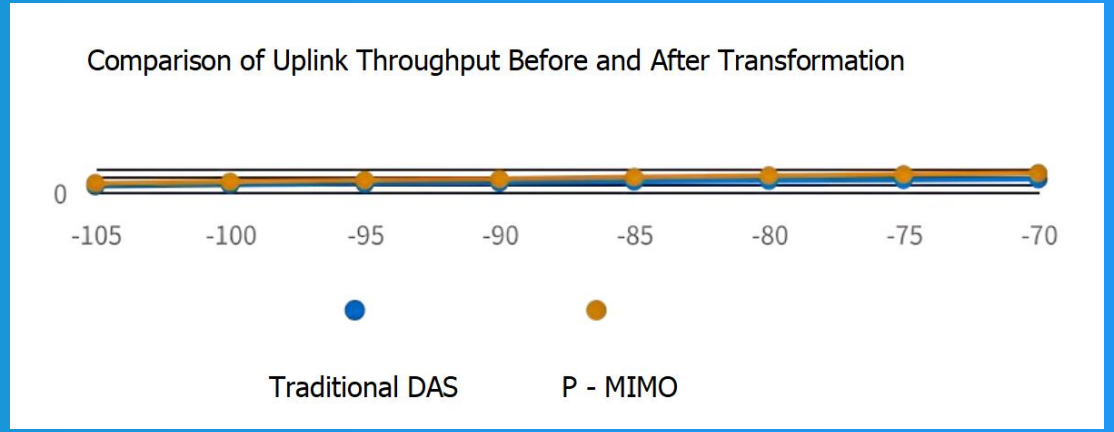
Downlink performance： P-MIMO vs DAS Improvement70.4%

Scenario	SSRSRP	DLMCS	Rank	DL Tput	Gain
P-MIMO	-86.2	20.5	2.0	544.2	70.4%
T-DAS	-86.0	13.7	1.0	319.2	-



Uplink performance： P-MIMO vs DAS Improvement35.8%

Scenario	SSRSRP	ULMCS	Rank	UL Tput	Gain
P-MIMO	-86.4	10.6	1.04	33.7	35.8%
T-DAS	-86.3	7.6	1.00	24.8	-



Business Value： The drastically improved download speed eliminates buffering issues with 4K/8K videos and cloud game loading lags; the enhanced upload speed ensures low-latency, high-quality live streaming and video conferencing, delivering a true "gigabit experience".

Multi-User Distribution Performance Test: 10-User Concurrency Scenario Validation

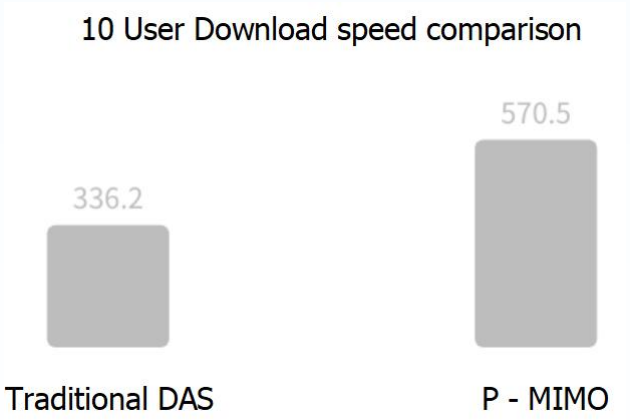
Test Purpose

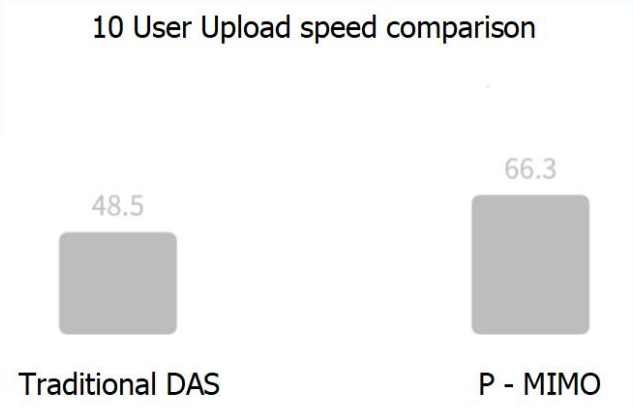
Verify the network capacity and user experience of the P-MIMO solution under 10-user concurrency, and compare performance variances with the traditional single-path DAS

Illustration of multi-user concurrent scenario

Test Conclusion： Versus traditional single-path DAS, the P-MIMO solution delivers an average 69.7% uplift in downlink performance, 36.7% in uplink performance, and excels in high-concurrency scenarios.

Scene indicators	Solution	SSRSRP	MAC layer rate	Rank	Gain
10 User Downlink	P-MIMO	-84.5	570.5 Mbps	2.00	69.7%
	T-DAS	-83.8	336.2 Mbps	1.00	
10User Uplink	P-MIMO	-84.7	66.3 Mbps	1.39	36.7%
	T-DAS	-84.2	48.5 Mbps	1.00	





Core Value：Multi-user performance is the direct determinant of network capacity ceiling. The P-MIMO solution guarantees stable user experience under high concurrency through substantial uplink and downlink rate improvements.

THANK YOU!

感谢聆听