

# Current Status of 5G Indoor Coverage

## The common problems in indoor coverage construction:

- The digital indoor coverage systems based on optical fiber/network cable support multi-channel 5G-NR and network management. While these products have problems in construction costs, construction difficulties and long construction periods.
- Traditional DAS indoor coverage: Make full use of the cable used in the original 2G/3G system and no construction is required, but bit rate of 5G is only half of the supposed value. 2T2R MIMO can be achieved with dual cables, but it is necessary to lay a new cable. The cost paid for construction and the property management company is high. Furthermore, the losses of the two cables are different and power balance for MIMO is impossible, which leads to poor 5G experience.

### DAS indoor coverage scenario

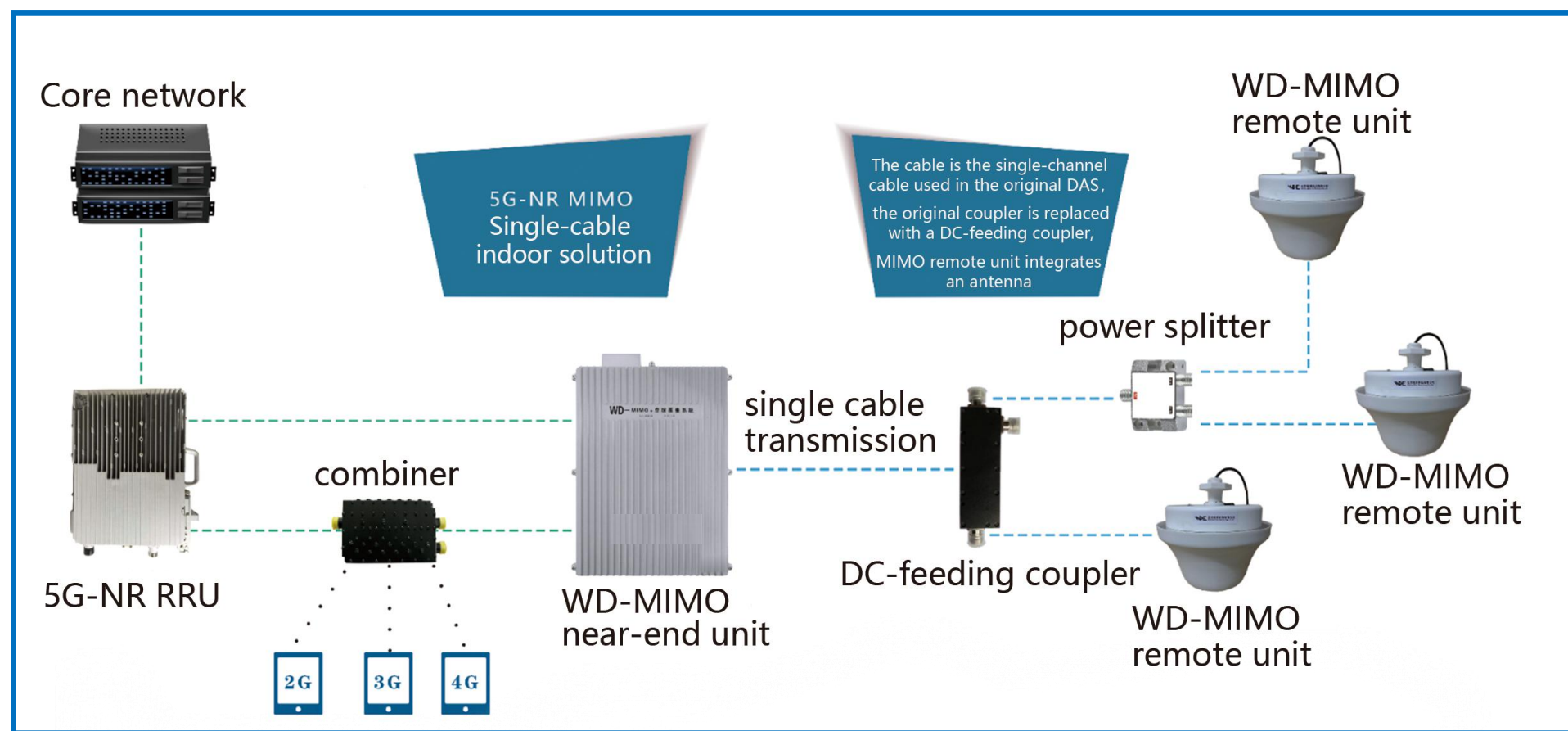
- The single cable transmission speed is low, the loss in the far-end is large, and the user's experience is poor.
- The existed cable is probably useless in Dual cables'senario due to the different loss between the old and new cable, which can leads to power balance problem.
- Passive equipment cannot be managed and controlled, and the maintenance is difficult.

### Digital Indoor coverage scenario

- High construction cost, low investment income ratio.
- High power consumption, operating costs is greatly increased.
- Difficulty in construction, prolong the construction period.

# WIDE 5G Indoor Coverage Solution-System Overview

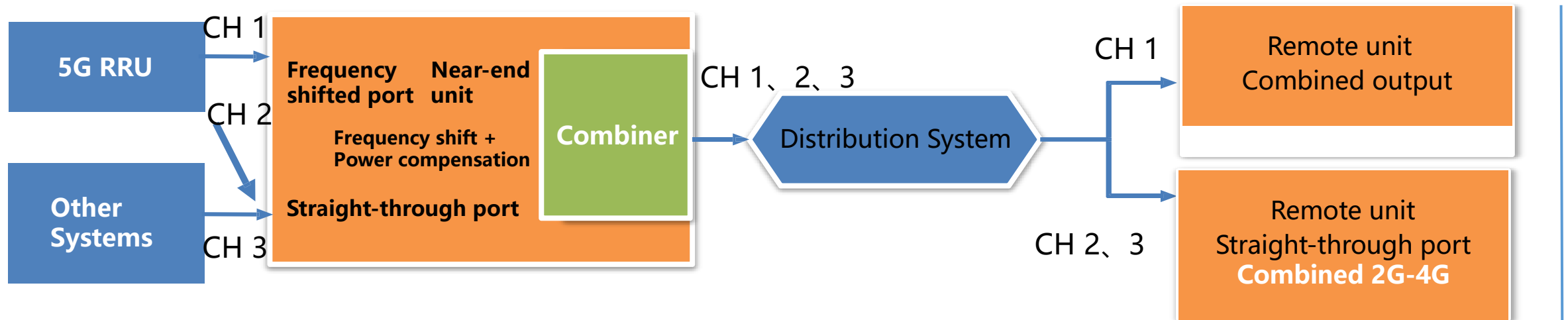
The WD-MIMO+5G frequency-shifting indoor coverage system provide a solution for 5G MIMO based on the single RF cable existing in the traditional DAS system and 2T2R in single cable and 4T4R in dual cables can be achieved. The system has the advantages of high transmission rate, network managemen, support for dynamic adjustment of power balance, low construction cost, simple construction, low operating costs, and seamless compatibility with the original 2G/3G/4G network.



Through the transformation of DAS, the 5G indoor coverage supports 2T2R transmission with single cable and all antennas can be managed and controlled.

# WIDE 5G Indoor Coverage Solution-System Overview

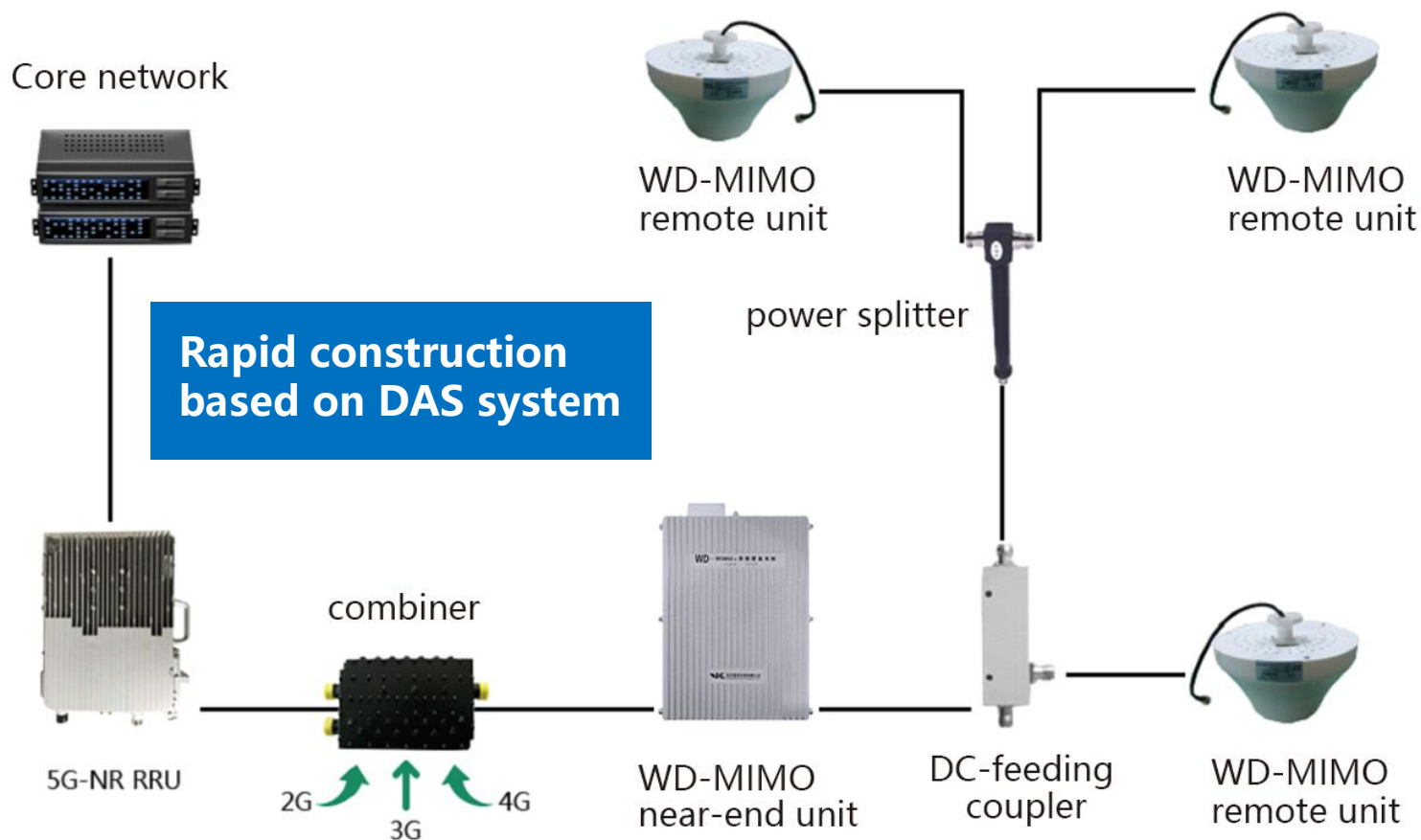
Using frequency shift technology to achieve 2T2R signal transmission in one cable, one of the two channels is frequency-shifted and combined with the other signals to be fed into one cable and transmitted to the remote unit. The shifted frequency is restored in the remote unit to achieve 2T2R MIMO coverage.



- ✓ **Power supply:** The near-end unit feeds DC to RF cable and transmits to the remote unit. The power consumption of the near-end and remote unit is 15W/2-4W respectively. The DC voltage is 48V.
- ✓ **Frequency shifting:** Support 2515-2675MHz with 160M bandwidth.
- ✓ **Power balance:** The remote unit monitors the power of the two NR channels and balances them automatically. The power difference is within 1dB.
- ✓ **Network management:** NM can be supported when upgrading passive systems to active systems

## WIDE 5G Indoor Coverage Solution - Transformation steps

### Rapid transformation and upgrade to 5G MIMO, indoor coverage system



Transformation of passive DAS system into WD-MIMO+5G frequency-shifting indoor coverage system via one original cable:

Step 1: Add a near-end unit after RRU;

Step 2: Replace the coupler with a dc-feeding coupler;

Step 3: Replace the original single-polarized antenna with the remote unit (antenna integrated).

Only three steps to achieve MIMO 2T2R/4T4R 5G coverage quickly to solve the problem of getting reconstruction permit.

# WIDE 5G Indoor Coverage Solution - Advantages and Features

WIDE 5G indoor coverage solution combines the advantages of DAS indoor coverage and digital indoor coverage techniques. A new 5G indoor active coverage solution for the existed DAS system, which is a complementary solution for other 5G indoor coverage solutions.

01

## “Three Increases”

Increase transmission rate  
network management  
Increase coverage area

02

## “Three Decreases”

Reduce construction costs  
Reduce construction difficulties  
Reduce maintenance costs

03

## “One Keep”

compatible with the original system  
2G/3G/4G seamlessly

Features of WIDE 5G Indoor Coverage System

# | Advantages and Features- "Three Increases"

## ● Increasing network speed

The system's unique **power automatic balance algorithm** is used to monitor the power of the two NR channels and balance them automatically. The power difference is less than 1dB, and the **transmission rate is increased by more than 1.8 times** compared to traditional single cable system. The download peak value is above **800Mbps**, and the average value is more than **500Mbps**.

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After the transformation, the performance is close to the theoretical value of 2T2R, allowing users to intuitively experience the speed increase of 5G.

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## ● Network management

All antennas can be **managed and controlled** and all parameters can be monitored in real-time, including output power detection, abnormal alarm, offline detection.

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Real-time monitoring of cables and antennas ensures that the network management can find any problem before users' complaint.

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## ● Increasing edge coverage performance

Utilizing the unique **dynamic power compensation mechanism** of the system, when the output power of the antenna is low, the corresponding power will be automatically compensated and amplified to the standard value, ensuring the best transmission rate and overcoming the power of high-frequency 5G signals in the long-distance transmission situation. Power loss problem is resolved by the intelligent **power compensation algorithm**.

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Make full use of the original cable without manual adjustment, ensure the transmission rate and coverage, and compensate the power loss of the 5G high-frequency signal introduced by the cables and passive components.

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# | Advantages and Features- "Three Reductions"

At this stage, investment - income ratio, construction difficulty, and construction costs of digital indoor coverage system have to be considered. The advantages of the WD-MIMO+ single-cable frequency-shifting system may be more suitable for the early 5G indoor coverage and old DAS renovation. The construction cost, maintenance cost and construction difficulty are greatly reduced compared to the digital solutions.

WD-MIMO+ supports on-demand transformation. If one RRU is used to cover different type of areas, the remote unit integrated antenna can be used to realize MIMO multi-stream transmission in the hot spots and the original single-polarized antennas keep unchanged to meet basic 5G indoor coverage in other areas.

| Construction Scheme            | Construction method                                                                                | Transmission cable                                                | Original DAS system                                                                                                                              | Network management | Construction difficulty   | Operation and maintenance cost (power consumption)                            |
|--------------------------------|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------|-------------------------------------------------------------------------------|
| WD-MIMO+                       | The original single cable is used by frequency-shifting system and upgraded to realize MIMO system | The original single cable                                         | The old DAS indoor coverage system is combined with 5G frequency-shifting system. A single near-end unit supports 64 remote units (antennas)     | YES                | Easy, Simple coordination | Remote Unit: 1 ~ 4W, Near-end Unit: 15W, 30 antennas with RRU: less than 900W |
| Digital Indoor Coverage System | MIMO is realized by using network cable or optical fiber transmission                              | Replace the original RF cable with network cable or optical fiber | The original RRU needs to be removed, and rHUB is added in every floor. A single rHUB supports 8 pRRUs, which is used to replace passive antenna | YES                | Difficult                 | 30 pRRU More than 2200W                                                       |



## Advantages and Features- "Power Saving"

- The full-load power consumption of the remote unit is less than 4W and less than 1W in power saving mode. The full-load power consumption of the near-end unit is less than 15W.
- With 30 antennas, the power consumption of 5G single-cable indoor coverage system is less than 150W, and the total power consumption is less than 900W when RRU is considered;
- Compared with the traditional single-cable/dual-cable DAS system, the power consumption is increased by less than 20%.
- In the same scenario, the power consumption is less than 50% of the digital indoor coverage system, which greatly reduces the operation and maintenance cost.
- In smart power saving mode, the frequency-shifting channel can be automatically shut down when the traffic flow of 5G is low and the power consumption of the remote machine is reduced to below 1W. When the traffic flow is higher than the threshold in the coverage area, the 5G frequency-shifting channel is automatically turned on to achieve MIMO effect.

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### WD-MIMO+ 5G 单缆覆盖系统

### 检测结果

报告编号: B19X42090

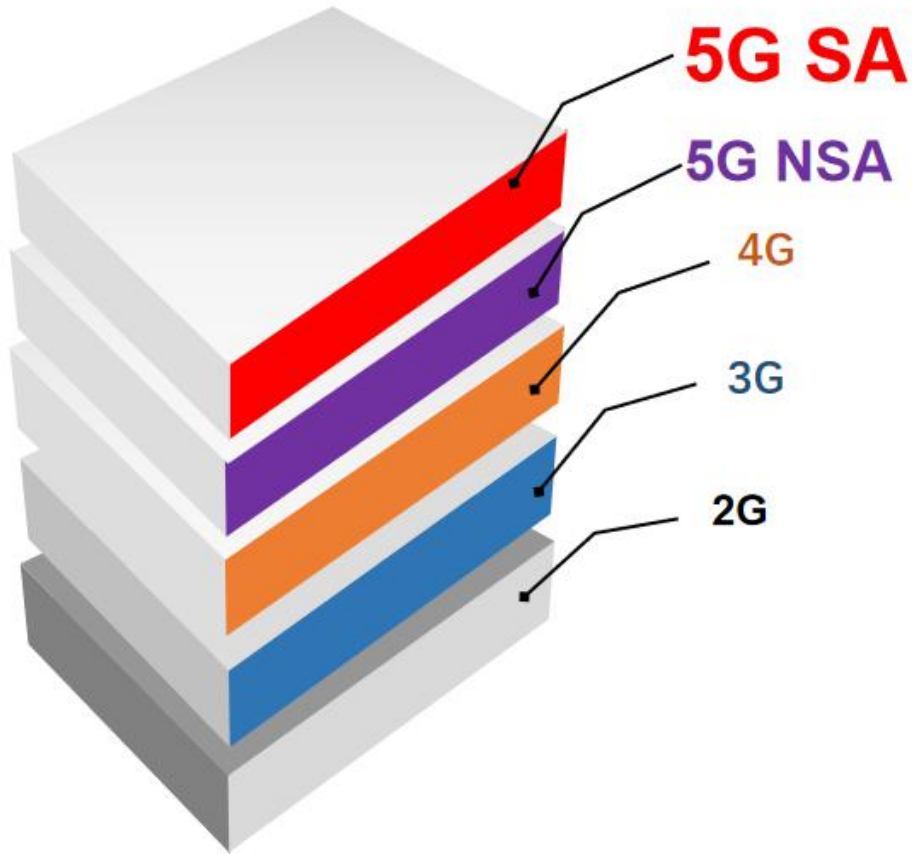
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| 序号 | 检测项目  | 单位 | 标准与要求                                                                                                                                                      |                       | 检测结果  | 检测结论 |
|----|-------|----|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------|------|
| 10 | 系统安全性 |    | (1) 当系统发生故障或断电时, 需保持原 NR 及其他信号 (TD-LTE、FDD-LTE、TD-SCDMA、GSM、DCS 等) 正常传输覆盖;<br>(2) 系统需具备短路自动保护功能, 当系统内设备器件或线路发生短路时, 近端设备将自动切断远端供电, 同时近端设备指示灯提示异常, 进入短路保护状态。 |                       | 符合要求  | 合格   |
| 11 | 功耗    | W  | 近端机                                                                                                                                                        | ≤15W (不携带远端设备)        | 14.21 | 合格   |
|    |       |    | 远端机                                                                                                                                                        | ≤4W (下行输出功率为 20dBm 时) | 3.32  |      |

Testing Report from China Telecommunication Technology Labs



## Advantages and Features-"Keep Unchanged"



- Support both NSA and SA networking;
- Keep the original system TDD-LTE/FDD-LTE/TDSCDMA/WCDMA/CDMA2000/GSM transparent;
- Maintain the original coverage signal strength of 2G/3G/4G;
- The system has a high fault-tolerant mechanism. In the event of an abnormal situation, the original single-cable transmission rate can still be guaranteed, and the original 2G/3G/4G DAS system can be used normally;
- Easy installation and maintenance. Workers can install and debug the 5G single-cable room coverage system without additional technical guidance.

# WIDE 5G Indoor Coverage Solution - Applicable Scenarios

## ● Scenarios suitable for WD-MIMO<sup>+</sup>

In the following scenarios, WD-MIMO<sup>+</sup> is a better construction option.

### Poor coverage

The built DAS cable cannot meet the coverage requirement of 5G signal

Renovation to increase the field strength of weak points to ensure that 5G signal coverage is the same

### High Traffic Flow

High average daily traffic, high commercial value has not been fully tapped

Increase the traffic rate to more than 180% of the original rate, creating greater traffic revenue

### Many physical partitions

The room area is small and there are many partitions, where the cost of building a digital indoor coverage

The coverage area of WD-MIMO<sup>+</sup> remote machine is suitable for small scenes

### Poor user perception

The measured speed via single cable DAS is 200~400Mbps

WD-MIMO<sup>+</sup> 5G can reach 360~800Mbps, which is amount to dual cable 2T2R.

According to the characteristics of the WD-MIMO<sup>+</sup> 5G frequency-shifting indoor coverage system: traffic flow increasing, rapid construction, low cost and manageable and controllable system, the scenarios suitable for transformation can be selected.

