

HIGH POWER ROUTER TEST REPORT

“HIGH POWER”



user's manual



Quick Install Guide



Cable



DC Power Adapter



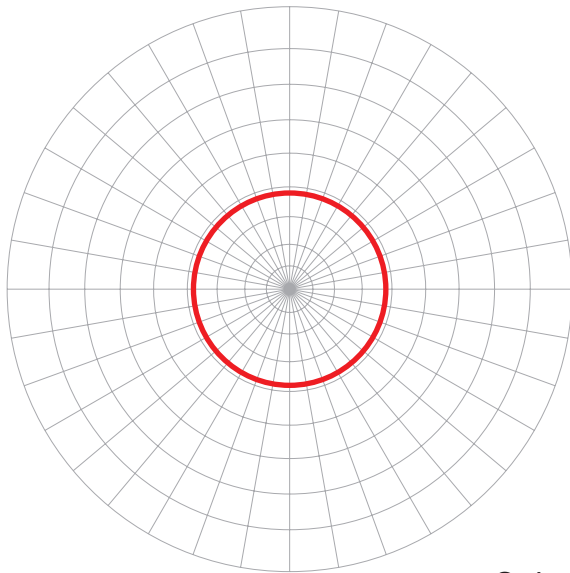
Wireless Local Area Network , also known as WLAN (Wireless LAN) , has become a popular network mode with more and more users. It is quite convenient for users since there is no need to wire. When we use it , sometimes we may find that the wireless signal is unstable, data transmission speeds may slow down. A router of high quality should be equipped with the following functions.

1. Reasonable design of basic hardware ,safe, reliable, low power consumption, long life span ;
2. Stable and applicable software which provides value-added upgrade service;
3. Long-distance stable transmission of wireless signal requires broad bandwidth and wide coverage,

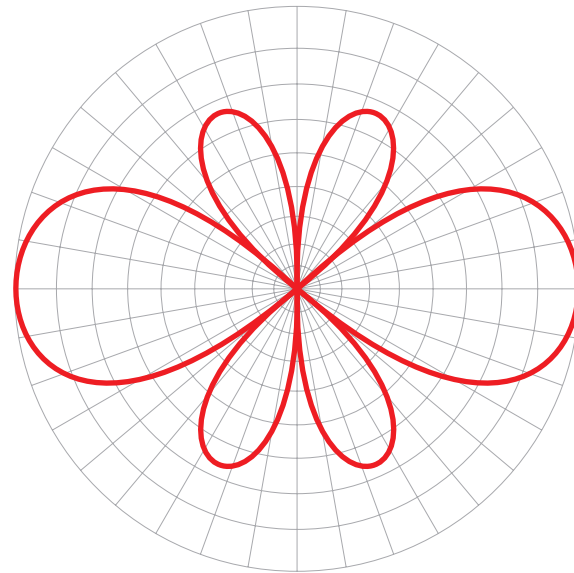
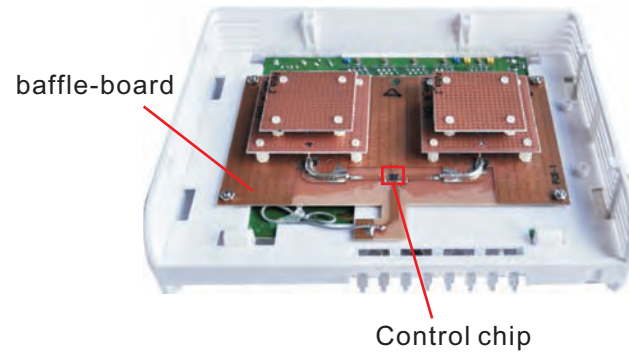
Among them the third point is the problem of industry, because the RF recognized the size of wireless transmission power and the transmission distance is proportional to relationship, but vast quantities of power radiation on human safety is harmful, and therefore must enhance wireless signals, the only way is to improved antenna, enhance antenna gain, reducing the wireless signals loss in transit, and then combining of mainboard, which all improve spectrum efficiently. BL-WH01 use a new type of high power gain antenna - aperture type phased antenna, this technology has in patent application, and it is anticipated to get patent certificate in June 2012.

First we make a simple comparison between the ordinary dipole antenna and the aperture type phased antenna:

The common Original Dipole antenna

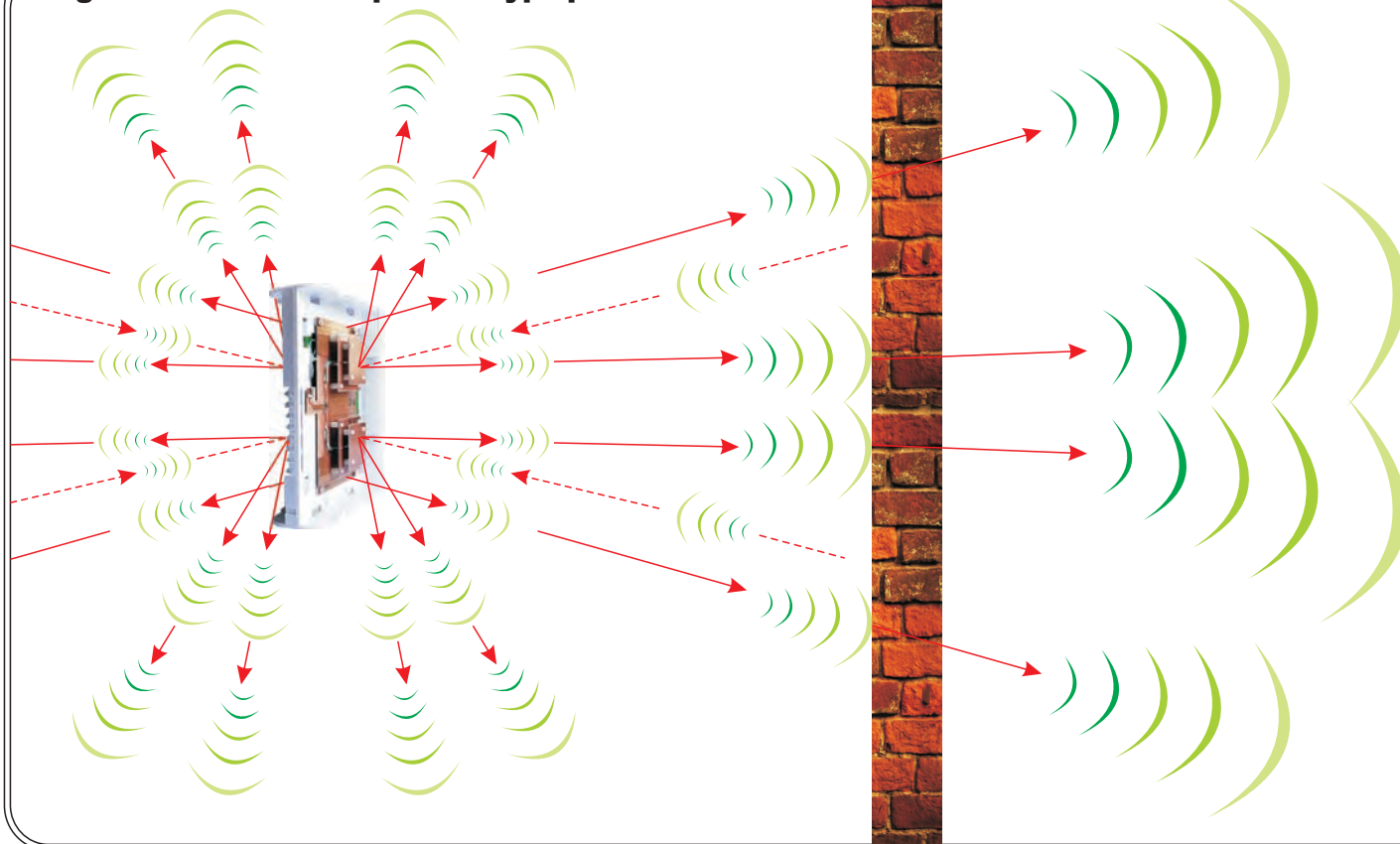


Aperture type phased antenna



Schematic of signal coverage

Signal schematic of aperture type phased antenna



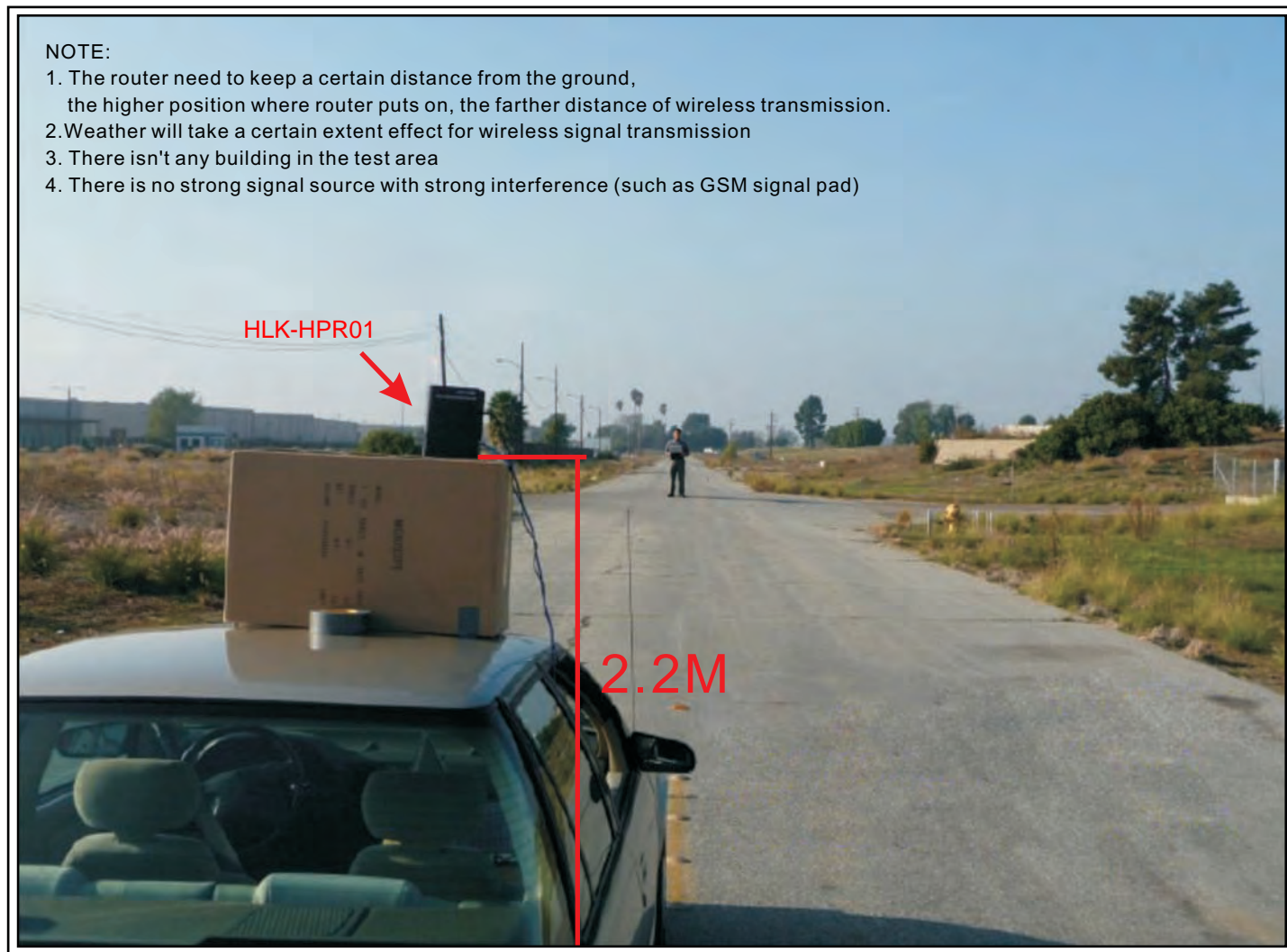
From the diagram of above we can see it is a prominent superiority for this new type of aperture type phased

1. With aperture and linear transmission, effective anti-interference ,farther distance of transmission and strong penetrating power
2. Increases phase control chip, transmission efficiency is higher;
3. Designs a reflex plate and high power gain,that can recycle signal that reflects by multiple paths

| Electrical specifications | | | | | | | | | |
|---------------------------|---------------|------------|---------------|--------------|---------------|----------------|------|---------------------|-------|
| Frequency Range | 2.40-2.50 GHz | VSWR | 1.5:1 typical | Isolation | >30dB typical | HPBW/Azimuth | 41°C | Front-to-back ratio | 21dBc |
| Peak Gain | 12dBi typical | Efficiency | >90% | Polarization | Linear | HPBW/Elevation | 53°C | Impedance | 50Ohm |

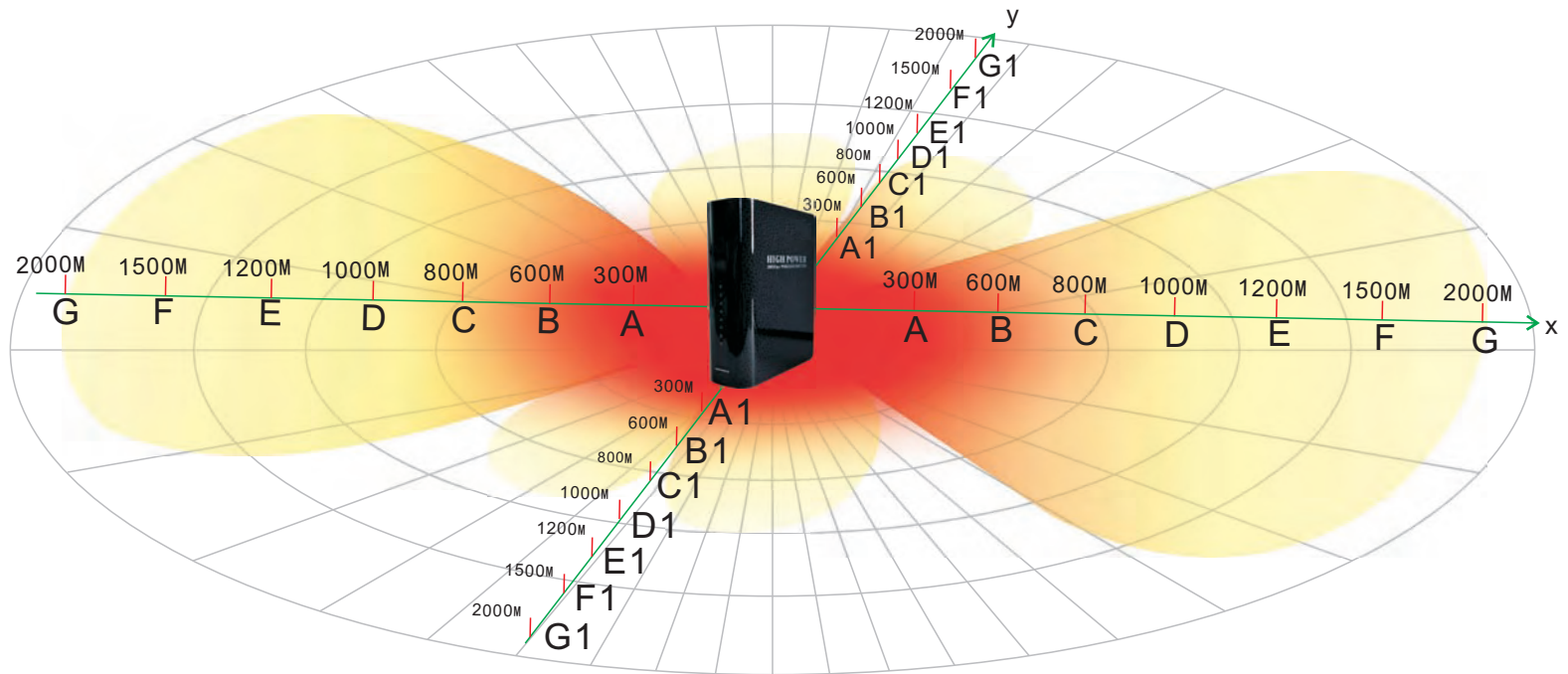
According to this new type,software of HighPower router improves technical algorithms of OFDM and FEC to counter the effect of multi-path transmission, noise and non line-of-sight (NLOS) environment. Capability which enhanced by OFDM modulation technique,makes client get a stable wireless connection under non line-of-sight environment or approximate visual environment.

Figure of outdoor signal test



HLK-HPR01 router,Lenovo Z460 notebook,150M wireless card

Figure of outdoor signal coverage



Note: According to different wireless cards of clients ,the actual distance and speed transmission will vary .

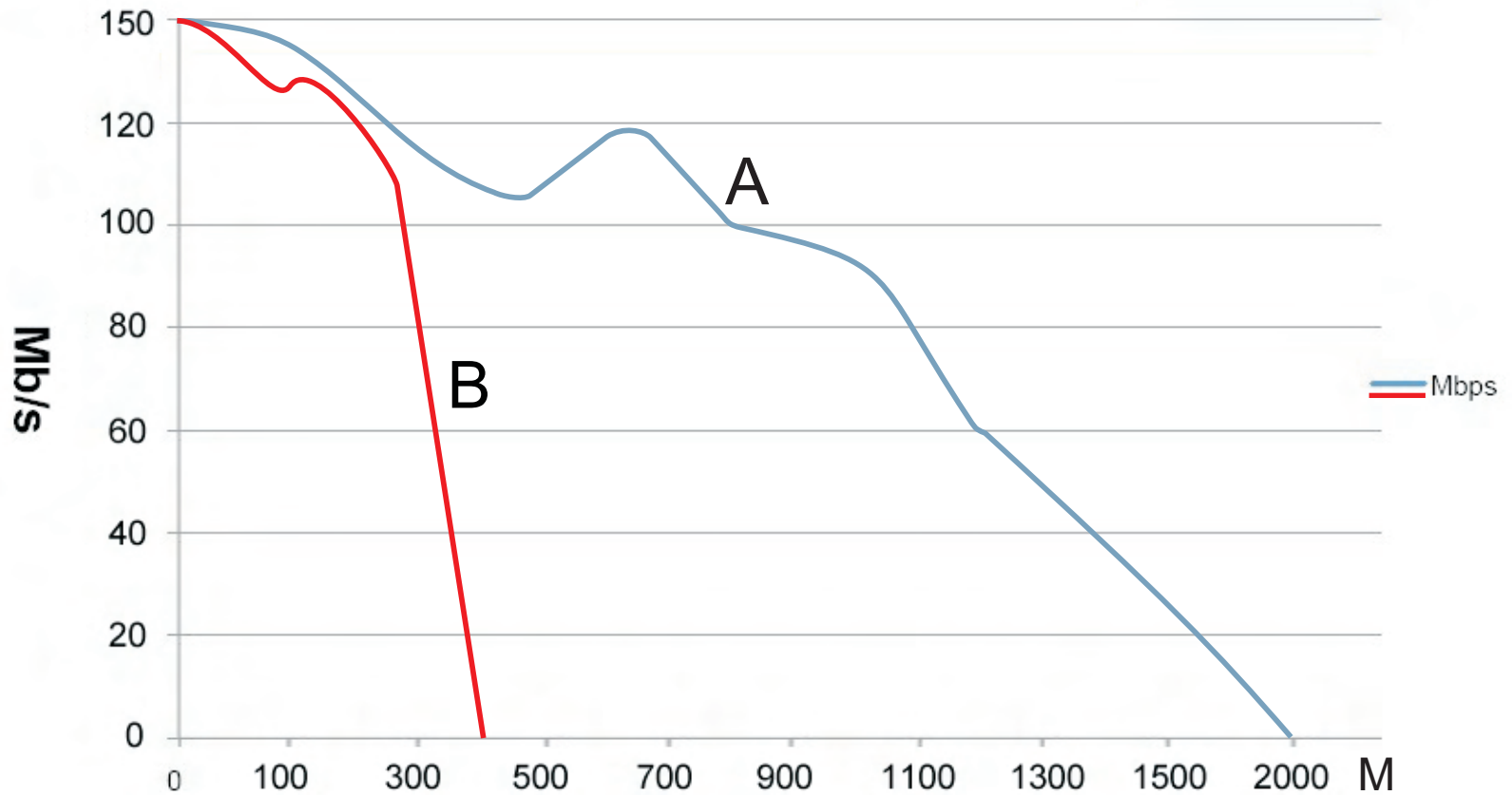
1. The router should be placed vertically, in order to get the best wireless signal.

2. the strongest signal is from the positive and negative sides of router

Test results

| | | | | | | | |
|------------------|-----|-----|-----|----|----|----|----|
| position | A | B | C | D | E | F | G |
| Signal strength% | 85 | 72 | 65 | 55 | 42 | 30 | 10 |
| Nic speed Mbps | 135 | 135 | 108 | 54 | 54 | 30 | 11 |
| position | A1 | B1 | C1 | D1 | E1 | F1 | G1 |
| Signal strength% | 75 | 30 | 10 | | | | |
| Nic speed Mbps | 108 | 30 | 11 | | | | |

Compared with ordinary router



A:HLK-HPR01

B:Ordinary router

Indoor wireless test

Generally, the outdoor distance of routers that sold on the market is well, but it will be difficult to cover 100 square meters indoor, the reason is very simple, in be used actually, 2.4 G waves are absorbed or reflected by those objects such as the ground, obstacles blocking. Signal attenuation loss serious.

These obstacles are known by us like walls, partitions, floors, glass, doors, windows and so on. The size, thickness and structure of obstacles is different, impact is not the same degree.

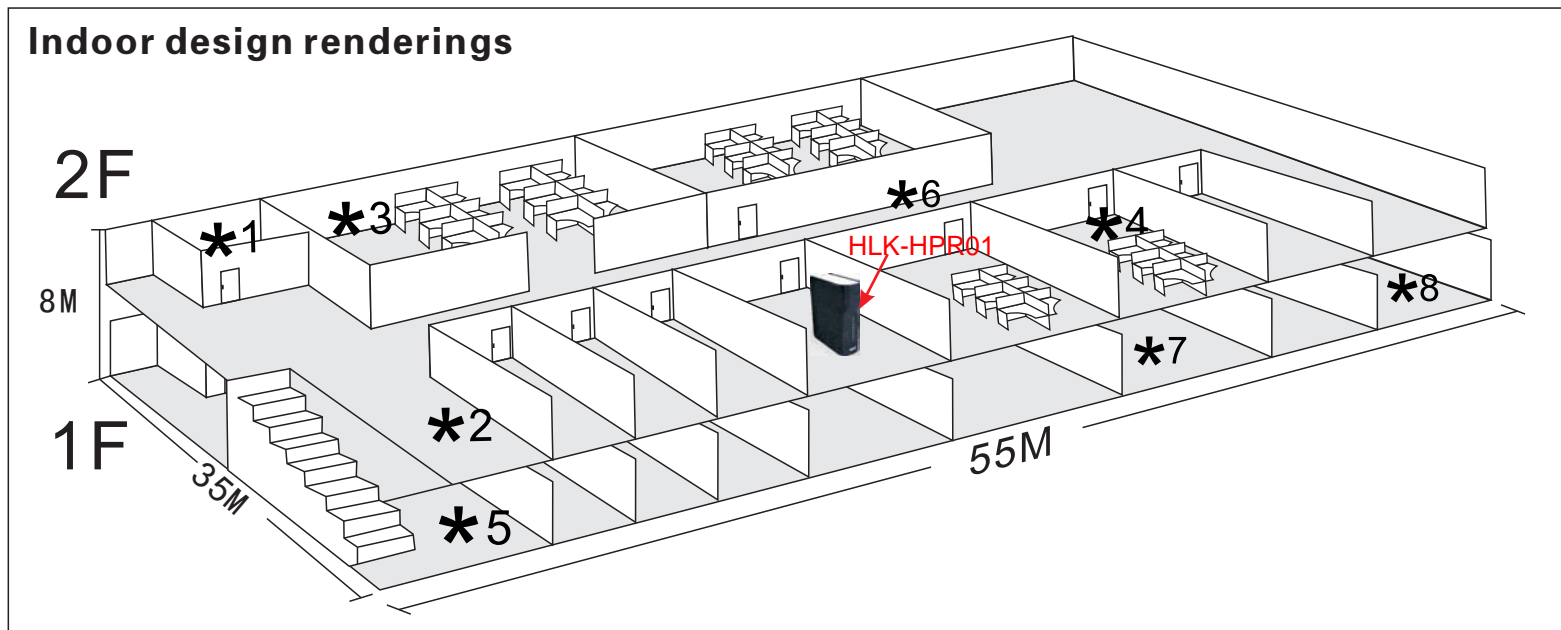
According to the experiment, Value of building penetration loss that 2.4G radio wave through a variety of building materials as below:

- A. Wooden walls (5 ~ 10cm) : attenuate 5 ~ 6dB
- B. Glass (0.5 ~ 1cm) : attenuate 5 ~ 7dB
- C. Concrete wall (15 ~ 25cm) : attenuate 10 ~ 12dB
- D. Steel mixing with water walls (25 ~ 45cm) attenuate 25 ~ 33 dB



Real Imaging figure

Indoor design renderings



Note:

1. Keep away from cordless phones, microwave ovens, refrigerators and other interference sources;
2. When there are some other 2.4G access points around, it is required the interval is more than 12M and avoiding the adjacent channel;
3. The router position appropriate to high place, so that the wireless signal coverage will better;
4. Keep away from the troubled waters of steel objects, walls or metal railings, because they can attenuate or absorb signal;
5. Note, it should be placed indoors and avoid the sunshine and rain or lightning;
6. Keep away from fire and heat, attention to ventilation.

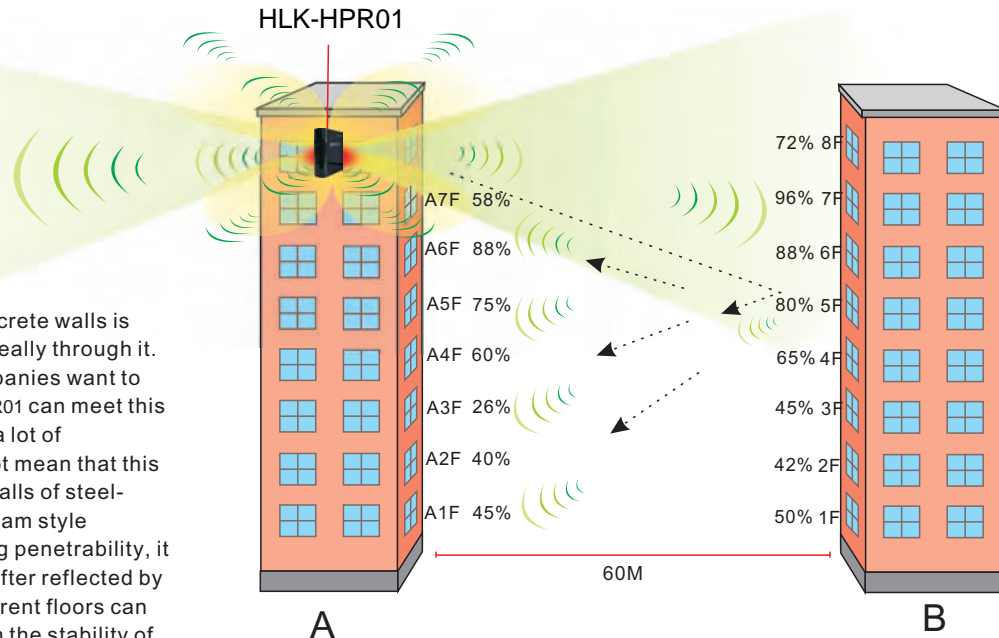
Test results

| Position | * 1 | * 2 | * 3 | * 4 | * 5 | * 6 | * 7 | * 8 |
|------------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Partition number | 5walls | 4walls | 2walls | 3walls | 4walls | 5walls | 4walls | 5walls |
| Test distance | 15. 6M | 9M | 13M | 17M | 18M | 30M | 23M | 33M |
| Test data | signal:65% | signal:75% | signal:75% | signal:95% | signal:50% | signal:80% | signal:50% | signal:42% |
| | 90Mbps | 150Mbps | 120Mbps | 150Mbps | 60Mbps | 150Mbps | 60Mbps | 54Mbps |

Testing between the floors

schematic diagram

The 2.4G radio wave through steel and concrete walls is very difficult, most wireless routers do not really through it. But in actually use, many families and companies want to share wireless network cross-floor. HLK-HPR01 can meet this demand, its effect has been accepted with a lot of companies and hotels customers, it does not mean that this product will be able to penetrate the thick walls of steel-concrete, but means the antenna is hole-beam style transmission, good anti-jamming and strong penetrability, it reduces the transmission loss. Of course, after reflected by objects, signal is very strong, users in different floors can access to wireless Internet and work rely on the stability of the reflected signal.



Test results

| Position | 1F | 2F | 3F | 4F | 5F | 6F | 7F | 8F |
|------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| Signal strength% | 50 | 42 | 45 | 65 | 80 | 88 | 96 | 72 |
| Nic speed Mbps | 60 | 45 | 60 | 90 | 135 | 150 | 150 | 120 |
| Position | A1F | A2F | A3F | A4F | A5F | A6F | A7F | |
| Signal strength% | 45 | 40 | 26 | 60 | 75 | 88 | 58 | |
| Nic speed Mbps | 45 | 40 | 30 | 90 | 120 | 135 | 90 | |

Note:

The signal strength is associated with distance between A and B building, height of building and the environment around .

LAN+WAN test result

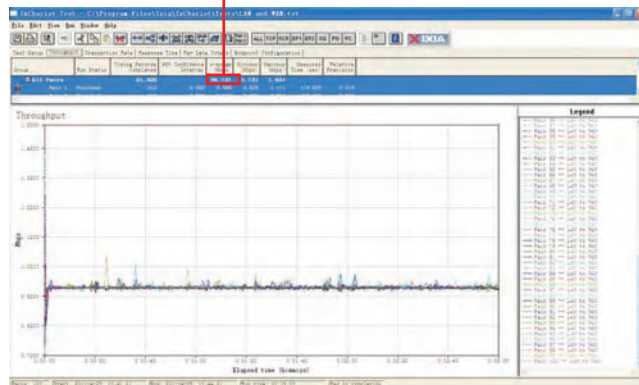
This test uses the Chariot 5.4 software ,a common software accepted by industry operators. IxChariot texts the network and network equipment by simulating a variety of real applications. Advantage of doing this test is to verify the performance of network or network device in specific applications. For any network or network device, if its performance is good in actual application, then we can consider that all aspects of the network system is good, and this is where the characteristics of the application layer testing.

The topology for this test and measurement results are shown as below:

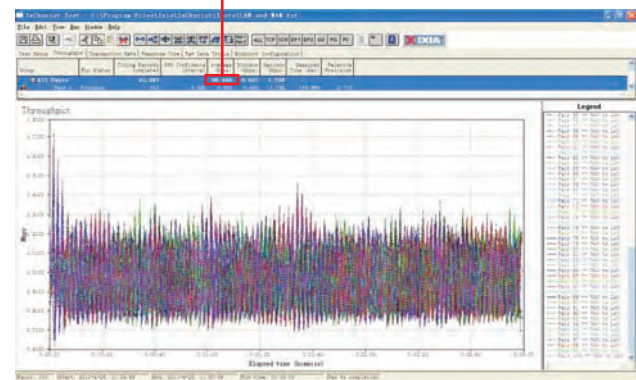


100 pairs WAN and LAN download and upload speed test

94.737M compare with the average speed value of ordinary router, it is stabler



94.446M compare with the average speed value of ordinary router, it is stabler



Note: 100 pairs LAN and WAN upload speed test and download speed test should be on the LAN PC LAN port mapping, to avoid the built-in firewall prevent the router from the WAN Active connections, resulting in test failure.

Basic RF Testing

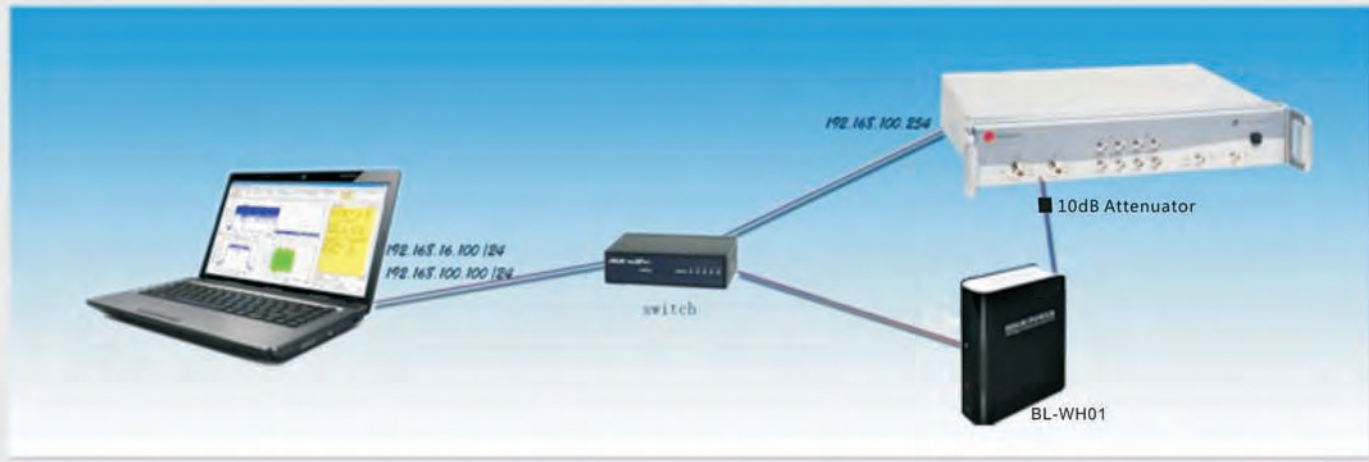
Test Environment

Hardware device

1. Litepoint IQ VIEW
2. PC
3. Switch

Software platforms

1. QA test.
2. IQsignal 1.4.0
3. IQsignal for MIMO



Transmit Spectrum Mask

Procedure

1. Configure the hardware setup as Test Environment.
2. Select test channel and set "Conti. Tx" from the QA test utility.
3. Record the transmit spectrum mask from Spectrum Analyzer.

Pass Criteria

For transmitted spectral mask for 11n 20MHz shall be less than -45dB for $f_c - 30\text{MHz} < f < f_c + 30\text{MHz}$.

| | | |
|--------------------------------|---------------------------|--|
| Standards and protocol | | IEEE 802.11n、IEEE 802.11g、IEEE 802.11b、IEEE 802.3、IEEE 802.3u、CSMA/CA、CSMA/CD、TCP/IP、DHCP、ICMP、NAT、PPPoE |
| port | WAN | One 10/100M self-adapting RJ-45 WAN port (when working in gateway mode,it's a WAN port,when working in other modes,it's a LAN port) |
| | LAN | Four 10/100M self- adapting RJ-45 LAN ports |
| Wireless parameters | Frequency Range | 2. 4-2. 4835GHz |
| | Wireless Signal Rates | 11n: Up to 300Mbps 11g: Up to 54Mbps 11b: Up to 11Mbps |
| | Working channel | 1~14 channel (according to the country or region you choose) |
| | spread spectrum | DSSS (Direct Sequence Spread Spectrum) |
| | Modulation Technology | DBPSK、DQPSK、CCK and OFDM(BPSK/QPSK/16-QAM/64-QAM) |
| | Receiver Sensitivity @PER | 300M:-84dBm@10% PER 150M:-84dBm@10% PER 130M: -84dBm@10% PER 108M: -84dBm@10% PER 54M: -87dBm@10% PER 11M: -87dBm@8% PER 6M: -100dBm@10% PER 1M: -102dBm@8% PER |
| | transmission range | Indoor: 300M ; outdoor: 2000M (depends on environment) |
| | RF power | 20dBm EIRP |
| | Antenna | 12dBi high-gain omnidirectional antenna |
| | Network Media | 10Base-T : 3e UTP or above; 100Base-TX : 5e UTP |
| LED | WLAN | Link/Act (connection/working) |
| | WAN | Link/Act (connection/working) |
| | LAN | Link/Act (connection/working) |
| | Other | SEC (WPS status) power |
| Unit's dimensions (L×W×H) (mm) | | 180 × 140 × 58 |
| Operation environment | | Operation temperature : 0℃ ~ 45℃;Operating Humidity: 10% ~ 90%(non-condensing) Storage temperature : -40℃ ~ 70℃;Storage Humidity: 5% ~ 90%(non-condensing) |
| External power | | Power adapter output: DC12V/1A |

Appendix

♦Transmitting antenna from the router directly to the wave hitting the receiving point is called direct wave; as the waves hitting the ground, by ground reflex and reach the waves called method-the peak-trough reflection wave. Obviously, the receiving point of the signal should be direct and reflected waves synthesis. Shows the presence of ground reflection, making the signal strength of the spatial distribution becomes quite complex, BL-WH01 although optimized synthetic wave, but the receiver the quality of the wireless network card is also very critical, the farther distance, the quality requirement of the wireless network card is higher also, for example in the fight against multi-path waves, the ability to filter noise better than some.

♦ That the actual measurement: beyond a certain distance R_i , with the distance from the antenna height increases or reduction in signal strength will plummet. Theoretical ideal distance R_i and are given a high degree of HT and the receiver antenna height HR of the relationship: $R_i = (4 HT * HR) / L$, then L is the wavelength. For example, HT and HR are set as 3m and 3 m, wireless transmission within $R_i = 288m$ would be relatively ideal.

♦When 2.4G radio waves transmit, it will come across obstacles (like high building, hill etc) which reflect waves ,so there will be multiple reflected wave(generally, ground reflected wave is included) ,this phenomenon is called multi-path propagation. Since there is multi-path propagation,spatial distribution of signal strength is very complicated,it fluctuate wildly and will increase in some place but reduce in other place. With the effect of multi-path propagation,direction of wave polarization will change ,besides, there will be defferent reflecting capacity between different obstacles. For example,the reflecting capacity of concrete structures is stronger than the capacity of brick wall. We need to overcome the negative effects of multi-path propagation .

♦Meanwhile,we have to know diffraction propagation of waves,electromagnetic wave will diffract spread when there is an obstruction, electric wave spread will bypass the obstacles and go ahead. This phenomenon is called wave diffraction. diffraction of a 2.4G microwave is weak, behind the tall buildings signal strength is small, there will form a "shadow areas". This signal quality will be affected. For example there is a building, its height is 10m, quality of receiving signal barely affected in a distance of 100m behind the building, but in 50m, receiving signal decreased obviously than 100 m.

♦According to the experience, when setting a same frequency between each adjacent wireless router, it will be requested interval 25 meters or more; when setting an adjacent frequency between each adjacent wireless router, it will be requested interval of 16 meters or more; when setting an apart frequency, it will be required intervals 12 meters or more. To keep a good quality of WLAN, you need to consider the number of users, it should not exceed 30 wireless users or 200 wire users online when using one single wireless router At present, many wireless routers support WEP,WPA and WPA-2PSK encryption algorithm , it will enhance the security of home networks, but it also affects the speed of data transmission more or less.