

Boosting Network Capacity in Urban Areas: How a 24-Port Antenna Transformed High-Density Coverage

■ Background

One of Africa's largest mobile network operators faced mounting challenges in the high-density urban areas of South Africa. With a rapid surge in the number of mobile users, the provider's existing network infrastructure struggled to maintain adequate capacity, leading to a noticeable decline in service quality. Previously, the provider had been relying on a traditional 2L4H 65-degree common beam antenna to manage GSM1800/UMTS2100 for 4T4R tri-sector coverage, as well as LTE2600 for another 4T4R tri-sector configuration. However, as urban traffic increased, this setup could no longer keep pace with demand. To resolve these problems and ensure a better user experience, the provider required a robust solution that could increase capacity, improve coverage, and support the rising traffic demand in these densely populated areas.



■ Challenges

Two key challenges surfaced for the operator:

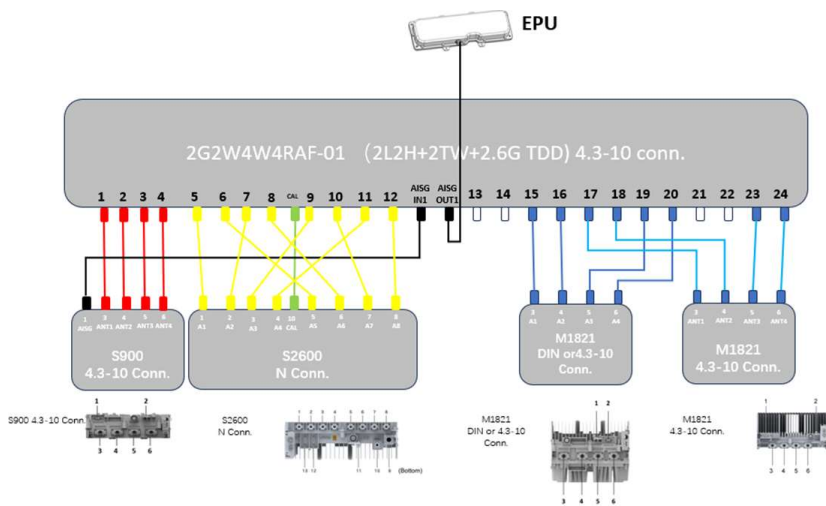
- 1. Capacity Strain in High-Density Areas:** The urban environment presented unique challenges, as a growing number of users placed excessive strain on the network. The traditional infrastructure could no longer support the traffic volume, leading to significant degradation in user experience. The provider needed a scalable solution to meet growing demand without compromising on performance.
- 2. Technical Hurdles in Deployment:** The deployment of a new antenna system to handle increased capacity brought its own technical difficulties. Complexities with antenna connections and the weight distribution during the configuration of soft split beams made the implementation process particularly challenging.

■ Solutions

To meet these demands, the telecom provider collaborated with PROSE, a company with expertise in cutting-edge antenna technology. PROSE proposed the implementation of a 24-port hybrid beam antenna, specifically designed to boost capacity and improve signal quality in high-density urban settings.

The 24-port antenna solution offered several advantages over the traditional setup:

- **Sectorization Expansion:** The introduction of the 24-port antenna allowed the provider to shift from a tri-sector to a six-sector configuration. This expansion was achieved by adding an additional GSM1800/UMTS2100 and LTE2600 radio per sector. The result was a significant increase in coverage, allowing the network to support a higher user load.



GSM1800/UMTS2100 Hard Split: Hard split beams were employed in these frequency bands to deliver more focused and efficient coverage, improving capacity in areas with high demand.

- **LTE2600 Soft Split:** Soft split beams were implemented in the LTE2600 band, enhancing the provider’s ability to handle increased data traffic, particularly in urban areas where mobile data consumption was at its peak.

This new setup was particularly beneficial in high-density environments, where existing infrastructure constraints—such as space and weight limits on towers—made it difficult to deploy larger, more traditional solutions.

■ Results

Following the deployment of the 24-port antenna solution in high-density urban areas, a week-long drive test produced the following results:

- **LTE2600 Band (Soft Split):**
 - ✓ Capacity enhancement: 2.0X increase in capacity.
 - ✓ Physical Resource Block (PRB) utilization: 20% reduction, improving the network’s efficiency in allocating resources.
 - ✓ User throughput: 1.5X improvement, providing faster data speeds and a more consistent user experience in heavily congested areas.
- **GSM1800 & UMTS2100 Bands (Hard Split):**
 - ✓ Capacity enhancement: 2.0X increase in capacity.
 - ✓ User throughput: 3.83X improvement, which delivered a substantial boost in performance, particularly in high-traffic zones.
 - ✓ Downlink Physical Resource Block (DL PRB) utilization: 27% decrease, indicating more efficient use of network resources and reduced congestion.

These results demonstrate the effectiveness of the 24-port antenna solution in addressing the network’s capacity challenges in urban settings. By doubling the coverage sectors and implementing both hard and soft split beams, the provider was able to accommodate more users while significantly improving performance metrics such as throughput and resource utilization.

The deployment of PROSE’s 24-port antenna solution proved to be a game-changer for the telecom provider, enabling it to overcome the significant network challenges posed by high-density urban environments. The move from tri-sector to six-sector coverage allowed for a major expansion in network capacity, helping the operator manage increased traffic without compromising on quality.

