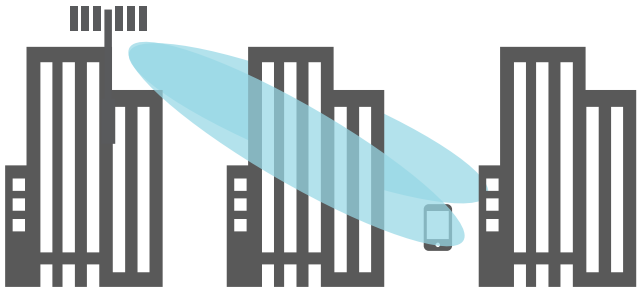
VIAVI Solutions

Application Note

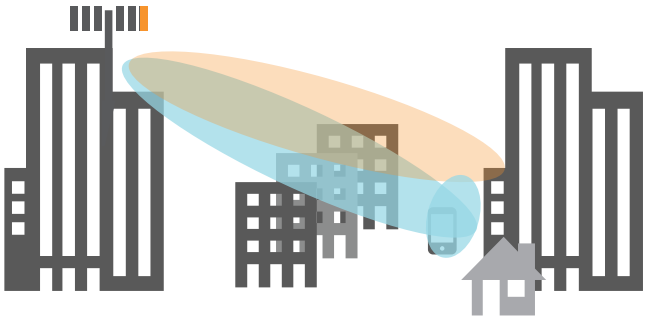
CellAdvisor RFoFiber and LTE MIMO Imbalances

LTE MIMO technology supports the use of multiple antennas for transmission and reception between cell sites and mobile devices. It provides two main benefits:

- In areas with low reception, it operates in diversity mode, transmitting the same data stream though two or more antennas
- In areas with high reception, it operates in spatial multiplexing mode, transmitting different data streams through two or more antennas to effectively multiply bandwidth capacity

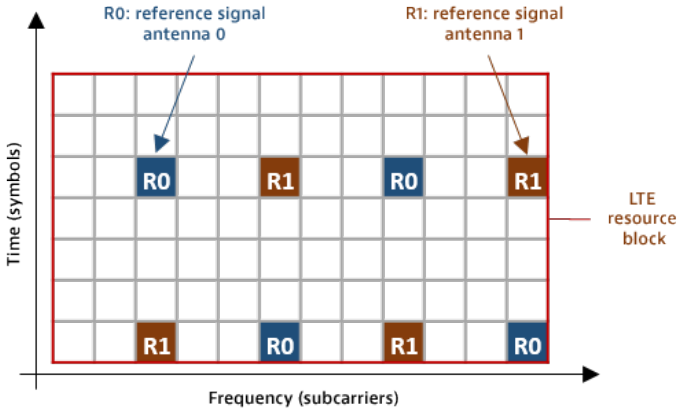


MIMO diversity mode



MIMO spatial multiplexing mode

Major mobile operators use LTE services to support higher capacities by transmitting different data streams in a single LTE carrier that uses MIMO technology in spatial multiplexing mode. Each data stream transmits from different antennas (for example, antenna 0 and antenna 1). Mobile devices recognize the MIMO mode of operation and subsequently differentiate data streams transmitted by each antenna based on the corresponding reference signals on the LTE frame.



LTE MIMO reference signals

The Operator Challenge

Mobile operators require a portable solution with which they can measure power differences or imbalance from each transmitting antenna (MIMO imbalances) to ensure adequate coverage through diversity and sufficient capacity through spatial multiplexing.

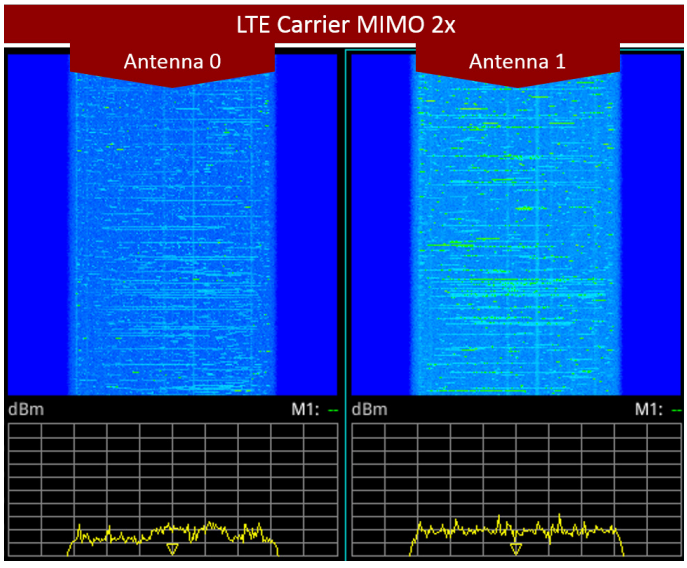
RF measurements in modern cell sites with fiber-based fronthaul typically require access to the remote radio head installed in the tower. And, a technician must conduct side-by-side measurements of MIMO to compare the power levels of both transmitting antennas.

The Solution

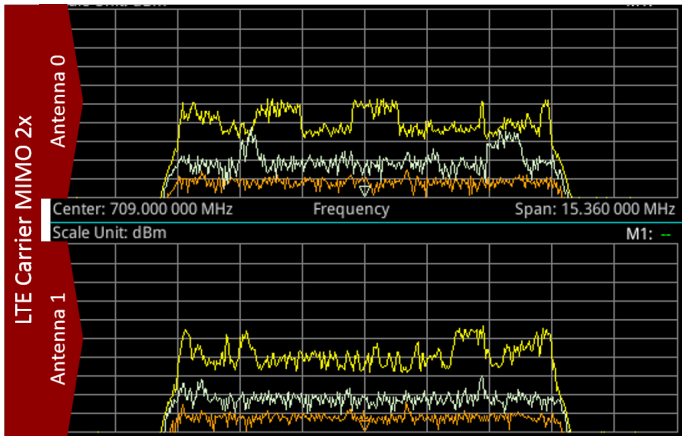
VIAVI Solutions CellAdvisor™ analyzers support RFoFiber technology that performs RF measurements on fiber-based fronthaul cell sites with either CPRI or OBSAI interfaces. Eliminating tower climbs, CellAdvisor enables comprehensive testing from the ground.

CellAdvisor RFoFiber

In addition, CellAdvisor performs side-by-side spectrum measurements of signals transmitted by different antenna ports of the same LTE carrier.



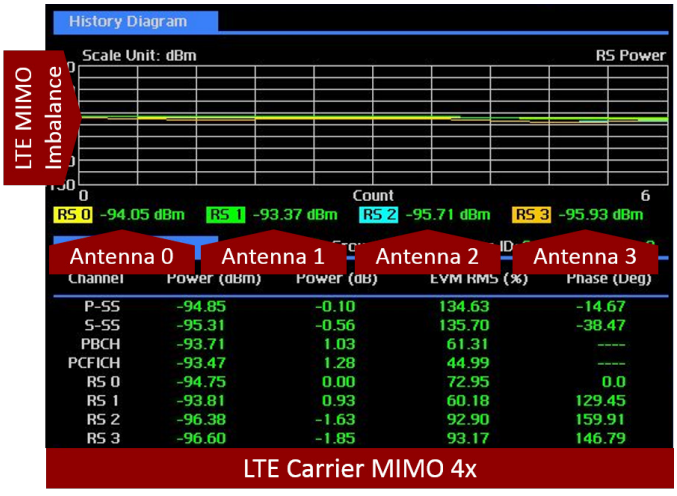
RFoFiber dual spectrogram



CellAdvisor RFoFiber Dual Spectrogram

CellAdvisor LTE analysis can also be performed over-the-air under the following conditions:

- Direct line-of-sight to the radio
- Channel power >-70 dBm
- Expected RS EVM <20%



CellAdvisor LTE MIMO (4x)
Power imbalance test over-the-air

Summary

LTE with MIMO significantly enhances coverage (diversity) and capacity (spatial multiplexing). However, its operation relies on transmitting power balanced from multiple antennas; otherwise, mobile users cannot acquire the data of multiple transmitters, eliminated the benefits that MIMO brings.

CellAdvisor analyzers are the most advanced and complete portable test solutions for installing and maintaining cell sites. They support all wireless technologies: GSM/GPRS/EDGE, CDMA/EV-DO, WCDMA/HSPDA, and LTE-FDD/LTE-TDD, as well as advanced capabilities such as LTE-MBMS, LTE-Advanced, fiber inspection, cloud services, RFoCPRI™, and RFoOBSAI.

StrataSync™
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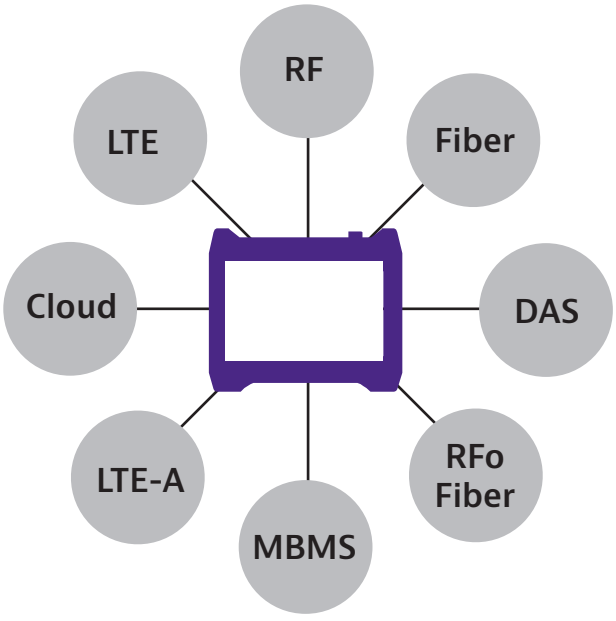

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