
T-Mobile boosts 5G mid-band coverage by 30% with Carrier Aggregation
• Carrier Aggregation for coverage extension
• TDD 2.5 GHz mid-band
• FDD 600 MHz low-band
NOKIA
T-Mobile

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“With Nokia, we’re leveraging the possibilities of Carrier Aggregation to drive a true 5G experience for our customers. 2CC CA is live in our networks today, combining low-band uplink reach with mid-band downlink bandwidth.”

Egil Grönstad

Sr. Director Technology Development and Strategy, T-Mobile

T-Mobile US is relentlessly evolving its 5G network to be the preferred choice for American mobile users.

The operator’s spectrum assets include low-band allocations in the 600 MHz band, enabling large coverage range per cell, and mid-band allocations in the 2.5 GHz band, providing massive capacity and high data rates.

The case study illustrates how aggregating low-band and mid-band spectrum assets can significantly extend the availability of mid-band bandwidth, providing enhanced quality of experience for mobile users in urban centers as well as in suburban and rural areas.

Nokia is a key Radio Access Network (RAN) provider for T-Mobile. To make best use of its spectrum assets, the operator chose Nokia’s 5G Carrier Aggregation solution, unleashing the power of mid-band bandwidth for an extended range.

Objective: making mid-band data rates seamlessly available

T-Mobile US is aiming to be #1 in customer choice and #1 in customers' hearts. In 2021, the operator added 5G to its mid-band sites, which enabled ultra-capacity 5G for 210 million people.

In the same year, the operator provided extended range 5G to over 310 million people using low-band spectrum. Together, the combination of spectrum assets is ideal for high user data rates and capacity required in urban areas, while enabling T-Mobile to reach its target for providing wide geographic coverage across the country.

While the mid-band TDD frequency allocations below 6 GHz typically provide the best combination of bandwidth and coverage per cell, 5G users can experience a sharp drop in data rates at the edge of cell coverage. When approaching the edge, the users can still receive downlink data, but the signal emitted by the phone is too weak to maintain the uplink channel. Reliable wireless communication builds on the availability of a feedback channel, which means that extending the uplink reach also extends the availability of the downlink channel.

T-Mobile turned to Nokia for a solution that brings reliable data rates for its subscribers throughout the network.

	2021	2022
Extended range 5G FDD 600 MHz	310 million people covered	320 million people covered
Ultra-capacity 5G TDD 2.5 GHz	210 million people covered	250 million people covered

Solution: 5G Carrier Aggregation for enhanced user experience

In 2021, T-Mobile selected Nokia's 5G FDD-TDD Carrier Aggregation solution to combine low-band uplink reach with mid-band downlink bandwidth.

In urban areas, T-Mobile was running 5G in non-standalone (NSA) mode, which allowed it to tap additional bandwidth with Enhanced UTRAN New Radio – Dual Connectivity (EN-DC) technology. The objective for deploying 5G FDD-TDD Carrier Aggregation was to increase the mid-band availability.

5G Carrier Aggregation is a software feature of Nokia AirScale baseband, optimized for providing best Carrier Aggregation performance and easy to activate in a live network.

Nokia, as a key 5G RAN supplier, helped activate the 5G FDD-TDD Carrier Aggregation in T-Mobile's network with a software upgrade for AirScale baseband.

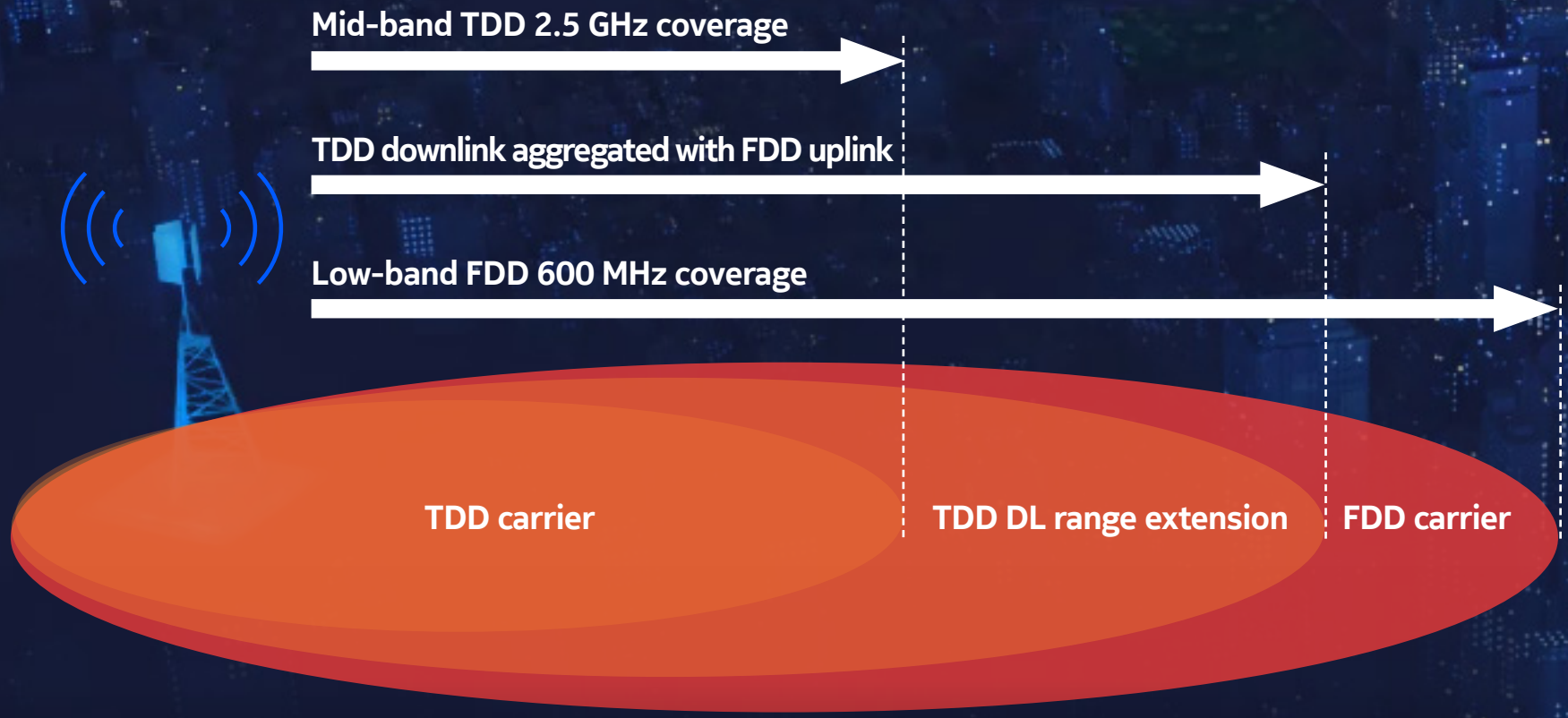
The combined component carriers included:

- 10 MHz component carrier on FDD 600 MHz frequency
- 100 MHz component carrier on TDD 2.5 GHz frequency

The key results show a significant improvement in particular in the mid-band availability, and additionally, the operator was able to improve in-building performance in urban topographies.

As we can see from the results, combining the two component carriers with 5G Carrier Aggregation expanded 5G service availability, as well as boosting the geographic availability of mid-band downlink data rates beyond the intrinsic coverage of mid-band cells.

> In 2021, the commercial smartphone ecosystem was not yet supporting more than two aggregated component carriers (2CC CA).



Aggregating mid-band TDD with low-band FDD:

- Extends the coverage of TDD downlink.
- Enables consistent throughput also when user moves further from the cell center.

5G

Result

30%

Mid-band coverage extension in suburban and rural areas

5G Carrier Aggregation is the key to making best use of spectrum assets

With the introduction of 5G, many operators are relying on the mid band frequencies for superior data rates, but they also need a solid coverage foundation provided by low-band spectrum. The higher the spectrum band, the lower is the coverage that can be reached.

The 5G FDD-TDD Carrier Aggregation solution from Nokia discussed in this case study is available for operators throughout the world. It illustrates how already the Carrier Aggregation with two component carriers provides significant value to operators, enhancing subscriber experience. Supported since 2021 by the commercial smartphone ecosystem, 2CC CA enables doubling user data rates while increasing the coverage of mid-band cells for a seamless experience.

This case study is based on a network that utilizes 2.5 GHz mid-band TDD spectrum. Many operators are relying on the higher 3.5 GHz band, and they will see coverage extension exceeding 30% with Carrier Aggregation.

A seamless high-speed 5G user experience powered by mid-band bandwidth and low-band coverage makes a big difference in mobile user experience. 5G Carrier Aggregation helps make the best use of existing infrastructure, minimizing the need for building new sites for additional coverage and helping operators keep the network costs at bay.

Visit Carrier Aggregation webpage to learn more

> Nokia's Carrier Aggregation solution runs on market-leading AirScale baseband, optimized for enabling best CA performance

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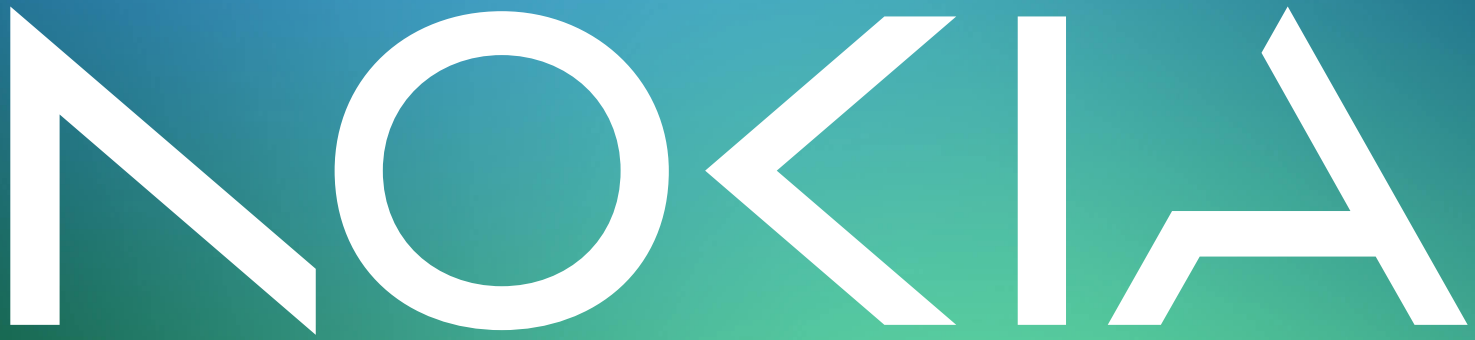

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As a B2B technology innovation leader, we are pioneering the future where networks meet cloud to realize the full potential of digital in every industry.

Through networks that sense, think and act, we work with our customers and partners to create the digital services and applications of the future.