



Channel 51: Spectrum clearing & concurrent operations



T-Mobile

How T-Mobile collaborates & achieves success with broadcasters.

The Background

When T-Mobile purchases 700 MHz A Block spectrum from any of its competitors – or different low-band spectrum owned by others – America's Un-carrier acquires the opportunity to significantly boost coverage and establish better in-building penetration in all kinds of metropolitan, suburban and even rural markets across the United States.

Because low-band spectrum can propagate further as well as penetrate buildings better than mid-range spectrum, T-Mobile has an interest – and track record – in clearing this spectrum and making it available to the carrier's 63 million-plus consumers as quickly as possible.

In 2014, T-Mobile acquired significant tracks of 700 MHz A Block spectrum – spectrum that is immediately adjacent to broadcasters using Channel 51 in many markets. At the time of this acquisition, T-Mobile's Executive Vice President & Chief Technology Officer Neville Ray said it best, "We won't be sitting on this spectrum."

Strategically and tactically – and based on previous collaborative work with the broadcast industry – it is clear to T-Mobile that when broadcast spectrum ownership rights are sold to wireless carriers, close cooperation with broadcast station engineers is critical to achieving timely success.

The Challenge

T-Mobile's acquisition of 700 MHz A Block spectrum from a competitor in 2014, is a prime example of how T-Mobile's radio frequency and network engineers cooperate with the broadcast industry. This same strategy is being applied to additional markets where T-Mobile continues to acquire low-band spectrum.

In more than 10 markets where Channel 51 broadcasters moved to a different station, T-Mobile paid for the technology costs of the move. Throughout the move to a lower channel, the broadcaster and T-Mobile make sure the needed spectrum clearing occurs in a timely fashion – to meet the needs of the local broadcasters and T-Mobile.

In approximately a dozen markets, Channel 51 broadcasters and T-Mobile have agreed to concurrent operations.



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Testing concurrent operations

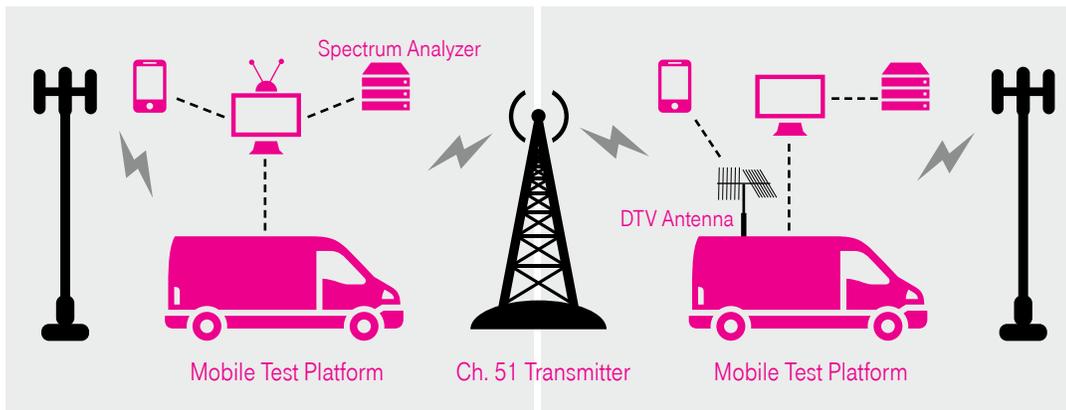
The concurrent operations agreements that T-Mobile enters are carefully planned – especially knowing that Channel 51 broadcasts must be protected from interference under the requirements of the Federal Communications Commission.

Establishing concurrent operations means working with Channel 51 station broadcast engineers. With one broadcaster in America's Southeast, T-Mobile initiated a thorough pilot project that would be shared with other broadcasters interested in concurrent operations.

Together, the broadcaster and carrier planned out a series of lab tests and field tests to determine possible interference issues between digital TV (DTV) broadcasts and T-Mobile's LTE signals. Here are two diagrams of the field test equipment – the first showing the TV antenna setup for core network tests (e.g. where rabbit ears are effective) and the second one for moderate and fringe tests (where an outdoor antenna is needed for television reception):

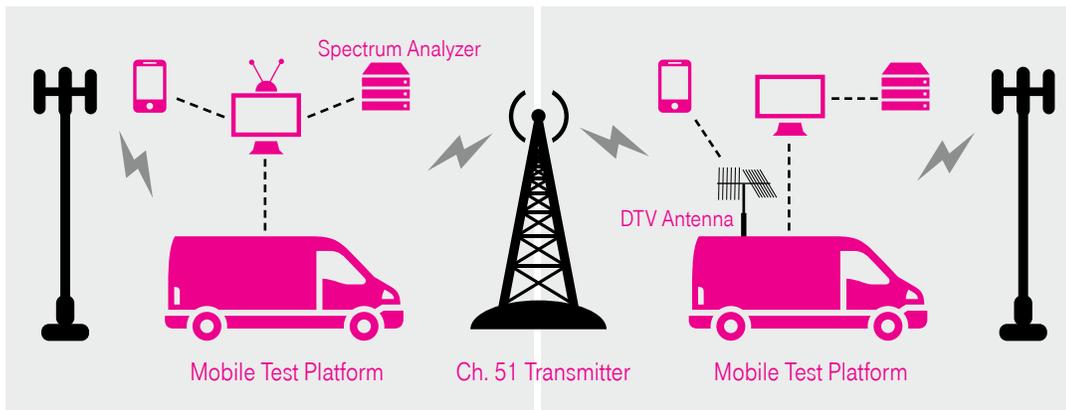
1 CORE LOCATION

Where rabbit ears can be used



2 MODERATE & FRINGE LOCATIONS

Where outdoor antennas must be used



During lab testing, it was determined that in very rare instances, interference was possible. This rare occurrence was only feasible when a number of factors were all simultaneously occurring, including: 1) the television broadcast signal was weak – or at its threshold, 2) the T-Mobile radio frequency signal was also weak – which meant the mobile device power automatically throttled up to connect to the weak RF signal, and 3) when manually over-riding T-Mobile's preferred prioritization of Band 4 to use Band 12.

The Epilogue

As concurrent operations in more than six markets have gone live, T-Mobile has expected the best and has thoroughly prepared with the broadcasters for responding to questions and issues.

In addition to setting up engineering and technology-focused response teams for some Channel 51 broadcasters, T-Mobile established a specific trouble-shooting email address and an 800-number to handle broadcast customers' issue or complaints.

Across all six markets and over a period of more than one year, we have been informed of no interference issues as a result of concurrent operations. Should any interference issues be brought to our attention, T-Mobile will respond quickly and in close cooperation with the broadcast station.

For More Information

To learn more about T-Mobile's work with broadcasters – on Channel 51 repacking or concurrent operations, or regarding AWS-BAS interference – please contact Dan Wilson or Mark Combs:

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The real world results

- 1 Field tests were conducted using commercially available digital televisions within proximity of many different T-Mobile LTE cell sites.
- 2 Reception was evaluated across the geographic spread of the Channel 51 exclusion zone – at core, moderate, and fringe areas within the channel's service contour.
- 3 Functionality of the T-Mobile network – using voice and data services – was tested to assess the full range of services that can potentially cause interference.
- 4 There are large signal margins throughout the Channel 51 service contour that allow digital TV receivers to tolerate T-Mobile's wireless transmission.
- 5 Field tests demonstrated that concurrent operations are indeed possible.
- 6 Even while LTE interference on Channel 51 broadcasts is mathematically possible, it is not realistic in a live LTE network.



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