

CEL-FI 5G UPGRADE

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Nextivity is rolling out 5G software updates in Q1, 2021.

Cel-Fi is the only relay system capable of relaying 5G-DSS at 100 dB of gain (both MBSFN and non-MBSFN modes supported).

CEL-FI 5G UPGRADE



- This is a software update to add the option to boost 5G to QUATRA 1000/2000/4000, GO and SOLO products.
- The booster can only boost 5G signal in the bands that are supported by the hardware. Therefore, 5G support will depend on when network operators deploy 5G signals in the bands supported by your hardware.
- The software update includes support for 5G-DSS (with auto configuration) and 5G-NR NSA and SA (with manual configuration).
- Following the software update, systems boosting 5G-NR NSA and SA signals will need to be manually configured. The system configurations are not available yet. They will be rolled out in the coming months as network operators enable 5G signals in various markets. We are working with the network operators to update the available configurations as quickly as possible.

5G TERMINOLOGY

5G – A name for a collection of new services that will be offered by network operators using a variety of technical means.

5G NR – the name for one of the new technologies used to implement 5G. Specifically, it refers to the make-up of the actual signal that goes between a 5G phone and the base station.

5G mmWAVE - the name of one of the new technologies used to implement 5G. Specifically, it refers to using very high frequencies (12GHz or 23GHz or even higher) between a phone and the base station. These signals don't propagate well but can support very fast data rates.

5G sub-6GHz - the name of one of the new technologies used to implement 5G. Specifically, it refers to using frequencies below 6GHz between the phone and the base station. These signals propagate better than mmWAVE signals and provide greater coverage areas.

5G-DSS – Dynamic Spectrum Sharing (DSS) is a technology that is used by network operators to share their spectrum between 4G LTE services and 5G services, in a single hybrid channel.

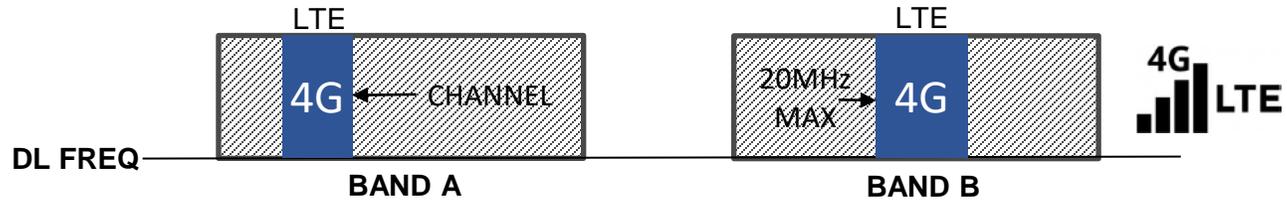
NSA – Non-standalone mode (NSA) of operation means that in order for 5G signals to be received on your phone, your phone must also be connected to a 4G LTE signal. The way you can think about this is that the network uses the 4G LTE signal to tell your phone how to access the 5G signals.

SA – Standalone mode (SA) of operation means your phone can directly connect to a 5G network, just like it connects to LTE network today.

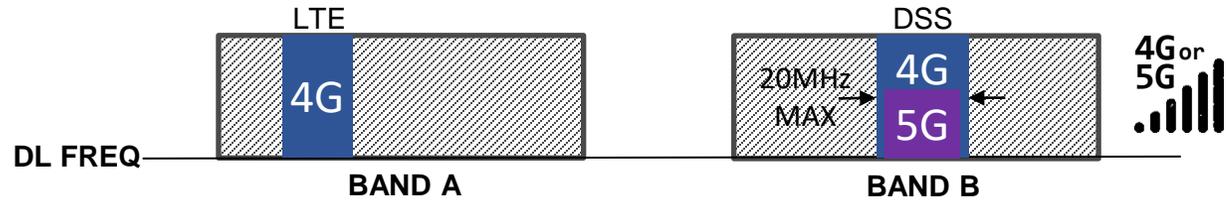
MBSFN – Multi-band Single Frequency Network (MBSFN) is a technique used by LTE networks to create space for special services to be sent from a base station to a phone. This space can be used to deliver broadcast content for example or can be used to send 5G signals to a phone. One option an operator has is to create space in the LTE network for 5G using a MBSFN configuration, and then filling that space with 5G signals creating a 5G-DSS system.

Non-MBSFN – a different technique to share the spectrum between 4G LTE and 5G, but the results is the same – a 5G DSS system.

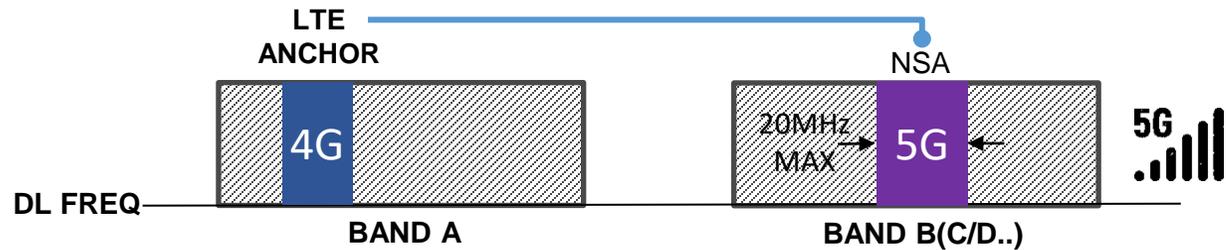
SINGLE OPERATOR CHANNEL EXAMPLES



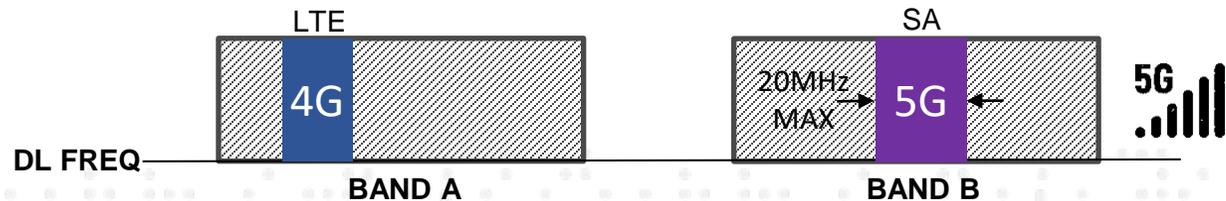
AN OPERATOR HAVING 4G/LTE IN BANDS A AND B. PHONES SHOW 4G



BAND B HYBRID DSS 4G + 5G (DYNAMIC SPECTRUM SHARING). 4G PHONES USE 4G FOR BAND B 5G PHONES USE 5G FOR BAND B



AN ANCHOR LTE CHANNEL IN BAND A REDIRECTS TO A NSA (NON-STAND ALONE) 5G CHANNEL IN BAND B



A 5G SA (STAND ALONE) CHANNEL IS IN BAND B (NO ANCHOR CHANNEL)

**AUTO-
OPTIMIZED
FULL 100 dB
GAIN & POWER**

**AUTO-
OPTIMIZED
FULL 100 dB
GAIN & POWER**

**MANUAL
CHANNEL
SETTING**

**MANUAL
CHANNEL
SETTING**

CEL-FI 5G UPGRADE: DSS 5G



For 5G-DSS in existing product supported bands, you only need to update your Cel-Fi software using the WAVE App or WAVE Portal.

NOTE: The WAVE APP or WAVE Portal radio data may only show 4G/LTE even if DSS exists on the channel. But your phone should display 5G when using any DSS channel.

OPTIONAL:

Your Cel-Fi device automatically determines the best bands to relay. However, a band with DSS may not relay if the signal quality from the network is poor. If this happens and you still want DSS, you may change the relayed bands in Settings to force a DSS band if you prefer

CEL-FI 5G UPGRADE: 5G NR SIGNALS



Step 1: Upgrade the software of your Cel-Fi device, using the WAVE App or WAVE Portal.

Step 2: Determine the frequency being used by your operator to deliver 5G signals in your area.

By June 2021, you will be able to do this by using the WAVE App. Until such time, please contact our customer support staff if you need to enable 5G NSA or SA at a specific site.

Step 3: Using “Settings”, the WAVE App or WAVE Portal, Enable the 5G carrier frequency to be boosted from the list of available 5G carrier frequencies. If the carrier frequency reported by the WAVE app is not available on the list, please contact support@cel-fi.com and we will add it to the list. Once added, you may need to update your Cel-Fi software again to see the newly added channel.

Step 4: Your Cel-Fi will now boost the Enabled 5G NR channel.



- **How Resources will be shared between the LTE and NR and what is the goal from DSS?**
Resources will be dynamically assigned based on traffic conditions.
- **What is the main goal and motivation for using 4G DSS?**
 - I. The Main goal is wide area coverage.
 - II. Current NR frequencies are in mid and high bands which are important for capacity.
 - III. Lower operating bands must be used, and those bands are currently occupied by LTE.
- **What do LTE and NR Need to boost performance and work together?**
LTE and NR systems need to be synchronized in both time and frequency domain. When using 15 kHz sub-carrier spacing for NR, both technologies can operate on a common time/frequency grid. NR can also operate in a 30 kHz spacing.
- **Is DSS Visible to LTE only Devices?**
DSS is transparent to LTE devices This means NR must operate around LTE's "Always On" signals such as the cell specific reference signal



Thank You



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