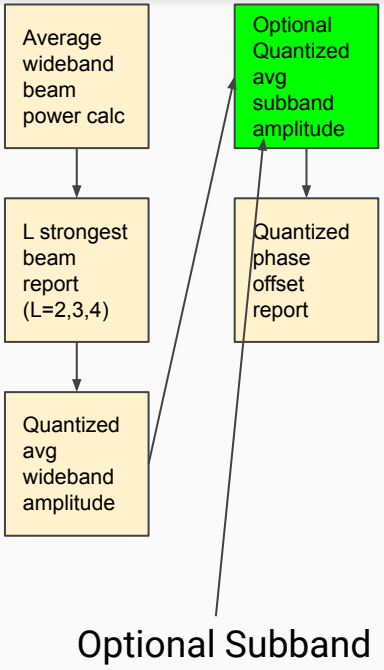
Bite-sized 5G NR – snippet 06

Did you know?



1. **Type 2 vs. Type 1** CSI-feedback in a general sense can be differentiated as “Type 1 indicates the parameters to target a beam towards the UE”, whereas “Type 2 indicates the parameters to target a beam towards the UE and keep the sidelobes away from it”. Hence, Type 2 is beneficial for Massive MIMO use cases.
2. CSI feedback can be **Type 1** or **Type 2**
   a. Each with **Single-panel** or **Multi-panel** (panel refers to the antenna panel 1D/2D configuration)
3. Mathematically, Type 2 includes the **Amplitude information** whereas Type 1 does not
4. With Type 2, if **subband** PMI is utilized, then subband amplitude information is also provided
5. The amplitude information is indicated by a number of 3-bits for Wideband (0 to 7) where each step is 3db
6. The amplitude information is indicated by a number of 1-bit for subband where 0 means -3db and 1 means 0db
7. Due to the quantization (clipping of the values for 3db intervals), this information loses some channel characteristics

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Bite-sized 5G NR – snippet 05

Did you know?

1. 5G DCI (Downlink Control Information) uses 24-bit CRC. (LTE used 16)
2. For every CCE in the CORESET (1 CCE = 6 REG = 6 * 12 RE = 72 REs), 25% of REs are utilized for DMRS and are unavailable for PDCCH transmission
3. PDSCH DMRS can be 1 (default) and additional DMRS symbols can be upto 3 (total=4) per slot. DMRS can be of length 1 or 2 (2 consecutive symbols as well). The additional DMRS and their position depends on the number of symbols allocated for the PDSCH/PUSCH and the PDSCH/PUSCH Mapping Type. (DMRS Mapping type is different than PDSCH/PUSCH Mapping type)
    a. DMRS Mapping Types can be Type 1 or 2 [Changes the frequency domain distribution]
    b. PDSCH/PUSCH Mapping types can be Type A or B [Determines starting symbol of DMRS based on the PDSCH allocation]

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Bite-sized 5G NR – snippet 04

Did you know?

1. The transport block size is not signaled separately (like LTE). It is not determined via utilization of 3GPP defined tables as well (which was done in LTE). The receiver calculates the TBS via the allocated Overheads, MCS, RB duration in symbols using formula based approach.
2. Uplink transform precoding (DFT to SC-FDMA or DFT-S-OFDM conversion) is optional step in Uplink. (SC-FDMA would help power limited users reach gNB better)
3. pi/2 BPSK modulation scheme is only available if Transform Precoding is enabled.

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Bite-sized 5G NR – snippet 03

Did you know?

1. **3GPP Rel16+** supports enhanced **Sidelink channels** (PSCCH/PSSCH/PSBCH etc) for V2X multicast communication **without** the use of Cellular network. (LTE Rel14 was broadcast only)
2. The CSI-RSRP & CSI-SINR for L1 is measured **only** on antenna port **3000** (or **3000 + 3001**)
3. **PRS** (Positioning Reference Symbols) will help devices even in Indoor setting to determine accurate position and would evolve for Drone localization while connected to 5G

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Bite-sized 5G NR – snippet 02

Did you know?

1. As 5G NR DL **Precoding** (layers to antenna port) step is not specified in the standard (but present), PDSCH-DMRS goes through the same precoding as the data, hence once UE decodes the DMRS, it already knows the precoder characteristics during **channel estimation**
2. DMRS are allowed in symbol **2** or **3** only for **PDSCH Mapping Type A**.
3. **PDSCH Mapping Type B** has the DMRS in the first symbol with PDSCH present

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Bite-sized 5G NR – snippet 01

Did you know?

1. 5G Numerology of **240 KHz** can only be used for **SSB**
2. 5G RB is only defined in **Frequency Domain**. LTE RB is defined in both Frequency and Time domain (7 symbols)
3. 5G NR uses **1 codeword** for Layers <= 4 and **2 codewords** for 4 < layers <= 8

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