# Alternatives related to 3Tx partial coherent codebook extension

Alt1 (leaving open the issue of rank-3 and TPMI optimization).

·       The rank-1, 2, and 3 partially-coherent precoders are based on the QPSK alphabet and derived from the Rel-15 2Tx full-coherent/4Tx partially-coherent design, with a total of 8 precoders across ranks 1 and 2

* + - Note: the amplitude of the QPSK elements in a rank-3 partial-coherent precoder~~s~~ can be different to equalize ~~because of aligned/even Tx~~ transmitted power across layers and Tx ports.
    - Note: The already agreed 7 non-coherent precoders (cf. RAN1#116) are unchanged

Alt2 (finalize rank-3 and TPMI design).

·       The rank-1, 2, and 3 partially-coherent precoders are based on the QPSK alphabet and derived from the Rel-15 2Tx full-coherent/4Tx partially-coherent design, with a total of 10 precoders across ranks 1, 2, and 3

* + - Note: the amplitude of the QPSK elements in a rank-3 partial-coherent precoder~~s~~ can be different to equalize ~~because of aligned/even Tx~~ transmitted power across layers and Tx ports.
    - Note: Combined with the already agreed 7 non-coherent precoders (cf. RAN1#116), this yields a 17-precoder 3-antenna-port UL codebook

Alt3 (merging Alt1 and Alt2).

* The rank-1, 2, and 3 partially-coherent precoders are based on the QPSK alphabet and derived from the Rel-15 UL 2Tx full-coherent/4Tx partially-coherent design, with a total of 8 precoders across ranks 1 and 2, and up to 2 precoders for rank 3
  + - Note: the amplitude of the QPSK elements in a rank-3 partial-coherent precoder~~s~~ can be different to equalize ~~because of aligned/even Tx~~ transmitted power across layers and Tx ports.
    - Note: The already agreed 7 non-coherent precoders (cf. RAN1#116) are unchanged and combined with the partially-coherent precoders to yield a 3-antenna-port UL codebook.

# Related to 3Tx non-codebook based operation

* Add a UE capability to support non-codebook based operation in Rel-19 for 3 Tx UEs