CLAIMS

1. A method performed by a User Equipment, UE, (1000) the method comprising:

   - (801) receiving from a network node (1100), via a higher layer, a configuration of one or more search space sets which are associated with one or more control resource sets, CORESETs, for one or more Physical Downlink Control Channels, PDCCHs, wherein each search space set is associated with a CORESET and comprises a number of PDCCH candidates and each PDCCH candidate comprises a number of resource elements or control channel elements, CCEs, and the UE (1000) monitoring for one or more Downlink Control Information, DCIs, of a format or formats as indicated via a higher layer in the configured PDCCH candidates; wherein
   - (802) a configuration or indication of an association of one or more of said search space sets with a search space set pool is provided to the UE (1000); and wherein at least two PDCCH candidates from one or more search space sets in the search space set pool comprise or carry the same DCI content; and

   - (803) applying the configuration or indication of the association for receiving one or more PDCCHs on the one or more search space sets.

2. The method according to claim 1, wherein the configuration or indication that provides the association of one or more of said search space sets with a search space set pool is provided to the UE (1000) via a higher layer from the network node (1100) or it is known to the UE (1000).

3. The method according to claim 1 or claim 2 further comprising, combining, and/or processing together multiple PDCCHs received on different PDCCH candidates during decoding of said DCI.

4. The method according to any one of the preceding claims, wherein the PDCCH candidates of the search space sets in the search space set pool that are associated with the same DCI content comprise the same numbers of CCEs or different number of CCEs or are associated with the same aggregation level.

5. The method according to any one of the preceding claims, wherein the i-th PDCCH candidates of aggregation level L of the at least two search space sets in the search space set pool are associated with the same DCI content.

6. The method according to any one of the preceding claims, wherein the search space sets in a search space set pool are configured with an identical set of aggregation levels and an identical number of PDCCH candidates for each aggregation level.

7. The method according to any one of the preceding claims, comprising, receiving from the network node (1100) a higher layer indication or configuration that provides an association of one or more search space sets with a search space set pool wherein a value of at least one of the following parameters configured for a search space set in said search space pool is identical to the corresponding parameter configured for another search space set within said search space set pool: search space type, DCI format(s) to be monitored, monitoring slot periodicity and offset, search space duration and downlink bandwidth where frequency domain resources of the associated CORESET are configured.

8. The method according to claim 1 comprising, monitoring a set of PDCCH candidates in one or more CORESETs on an active downlink bandwidth part on each activated serving cell configured with PDCCH monitoring according to corresponding search space sets.

9. The method according to claim 1, comprising, configuring the PDCCH candidates in a given slot, or in a given span in a cell, wherein a group g of PDCCH candidates comprises $p_g > 1$ PDCCH candidates which are associated with the same DCI content.

10. The method according to claim 9, comprising, performing a number of blind decoding attempts counted for group g in the given slot, or in the given span in the cell, wherein the number of blind decoding attempts is one of the following:
    - one blind decoding attempt,
    - a number s_g of blind decoding attempts, wherein s_g is less or equal to twice the number of PDCCH candidates in said group g.

11. The method according to any one of the preceding claims, wherein, if two or more search space sets are present in a search space set pool, the i-th PDCCH candidates or the PDCCH candidates with index i of aggregation level L of the at least two search space sets in the search space set pool are associated with the same DCI or DCI content.

12. The method according to claim 10 comprising, reporting to a network node or receiving from the network node via the PHY layer or a higher layer, one of the following:

- one or more values for the number of monitored PDCCH candidates and/or monitored CCEs and/or blind decoding attempts that are counted towards the UE's blind decoding capability with respect to a group of PDCCH candidates that are associated with the same DCI or DCI content; or
- one or more indices or parameters, each of which indicates a number of monitored PDCCH candidates and/or monitored CCEs and/or blind decoding attempts that are counted towards the UE's blind decoding capability with respect to a group of PDCCH candidates that are associated with the same DCI or DCI content.

13. The method according to any one of the preceding claims, comprising, receiving a PDCCH/DCI associated with more than one PDCCH candidate that schedules at least one PUSCH transmission, wherein the PDCCH/DCI comprises at least one SRS resource indicator (SRI) field or at least one SRI value that is associated with an SRS resource or SRS resource set transmission most recently transmitted by the UE before a certain time $\hat{t}$, wherein $\hat{t}$ is determined based on at least one of the following:
    - the PDCCH candidate or a symbol of the PDCCH candidate that starts or ends the earliest in time among the PDCCH candidates associated with said DCI,
    - a slot in which the PDCCH candidate that starts or ends earliest in time among the PDCCH candidates associated with said DCI is received.

14. The method according to any one of the preceding claims, comprising, reporting to the network node at least one of the following capabilities of the UE:

    - one or more values related to number of monitored PDCCH candidates and/or monitored CCEs and/or blind decoding attempts that may be counted towards the UE's monitoring or blind decoding capability with respect to a group of PDCCH candidates that are associated with the same DCI content,
    - a decoding method employed at the UE or the capability of the UE to employ a certain specific decoding method, which includes one or more of soft-combining, joint processing, selective decoding to decode a DCI that is associated with more than one PDCCH candidate
    - a maximum number of search space set pools that can be supported in a given downlink bandwidth part and/or cell
    - the maximum number of PDCCH candidates that can be monitored in a slot or span in a cell if the UE is capable of decoding a DCI associated with more than one PDCCH candidate, which may be subject to a number of groups of associated PDCCH candidates in given slot or span,

- the maximum number of CORESETs that can contain search space sets that are associated with search space set pools.

15. A method performed by a User Equipment, UE, (1000) the method comprising:
    - (801) receiving from a network node (1100), via a higher layer, a configuration of one or more search space sets which are associated with one control resource set, CORESET, for one or more Physical Downlink Control Channels, PDCCHs, wherein each search space set comprises a number of PDCCH candidates and each PDCCH candidate comprises a number of resource elements or control channel elements, CCEs, and the UE (1000) monitoring for one or more Downlink Control Information, DCIs, of a format or formats as indicated via a higher layer in the configured PDCCH candidates; wherein
    - (802) an association of two or more Transmission Configuration Indication, TCI, states with a single CORESET is obtained from the network node via a PHY-layer indication, a MAC-CE message, or via a higher layer indication; and
    - (803) applying quasi-colocation, QCL, assumptions provided in all of the two or more TCI-states associated with the single CORESET for the reception of at least one PDCCH on at least one of the search space set(s) in the CORESET during at least one monitoring occasion.

16. The method according to claim 15, comprising, if during a monitoring occasion in slot n, a CORESET comprises $s_n \geq 1$ search space set(s) to be monitored and there are $t_n > 1$ TCI-states associated with the CORESET, the UE performing one of the following actions:
    - applying the QCL assumptions from $s_m \leq s_n$ TCI-states to s_n search space sets after a certain ordering of the TCI-states and/or mapping between the TCI-states and the search space sets for the reception of at least one PDCCH in the s_n search space sets in the CORESET; or
    - applying the QCL assumptions from $t_m \leq t_n$ TCI-states to s_n search space sets after a certain ordering of the TCI-states and/or mapping between the TCI-states and the search space sets for the reception of at least one PDCCH in the s_n search space sets in the CORESET, wherein the variables s_n, t_n, s_m, t_m take any suitable values.

17. A User Equipment, UE (1000) comprising a processor (1010) and a memory (1020) containing instructions executable by the processor (1010), whereby said UE (1000) is configured to perform any one of the subject-matter of method claims 1-16.

18. A method performed by a network node (1100), the method comprising:

- (901) transmitting to a User Equipment, UE, (1000), via a higher layer, a configuration of one or more search space sets which are associated with one or more CORESETs, for one or more PDCCHs, wherein each search space set is associated with a CORESET and comprises a number of PDCCH candidates and each PDCCH candidate comprises a number of CCEs, for enabling the UE (1000) to monitor one or more DCIs of a format or formats as indicated via a higher layer in the configured PDCCH candidates; wherein
- (902) a configuration or an indication of an association of one or more said search space sets with a search space set pool is provided to the UE (1000), and wherein at least two PDCCH candidates from one or more search space sets in the search space set pool comprise or carry the same DCI content and.
- transmitting to the UE (1000), one or more PDCCHs on the one or more search space sets.

19. A method performed by a network node (1100), the method comprising:
    - transmitting to a User Equipment, UE, (1000), via a higher layer, a configuration of one or more search space sets which are associated with one CORESET, for one or more PDCCHs, wherein each search space set comprises a number of PDCCH candidates and each PDCCH candidate comprises a number of CCEs, for enabling the UE (1000) to monitor one or more DCIs of a format or formats as indicated via a higher layer in the configured PDCCH candidates; wherein
    - an association of two or more Transmission Configuration Indication, TCI, states with a single CORESET is provided by the network node (1100) to the UE (1000) via a PHY-layer indication, a MAC-CE message, or via a higher layer indication for enabling the UE (1000) to apply quasi-colocation, QCL, assumptions provided in said all of the two or more TCI states associated with the single CORESET; and
    - transmitting to the UE (1000), one or more PDCCHs on the one or more search space sets.

20. A network node (1100) comprising a processor (1110) and a memory (1120) containing instructions executable by the processor (1110), whereby said network node (1100) is configured to perform any one of the subject-matter of method claims 18-19.