What is claimed is:

1. A method implemented by a wireless transmit/receive unit, WTRU, for transmission of symbols using aggregated channels, comprising:

receiving, at the WTRU, a set of bits;

generating at least two complex-valued symbols based on the set of bits using dual modulation at least in part by (i) mapping the set of bits to a first symbol using a first constellation mapping associated with a first constellation and (ii) mapping the set of bits to a second symbol using a second constellation mapping associated with a second constellation, wherein the first constellation mapping and the second constellation mapping each map the set of bits to different constellation signal points and the second constellation mapping is representative of a mapping which is associated with a rotated first constellation; and

transmitting, by the WTRU using the aggregated channels, (1) a first transmission of the first symbol using a first single carrier (SC) channel in the aggregated channels and a second transmission of the second symbol using a second SC channel in the aggregated channels,

wherein:

the first transmission of the first symbol and the second transmission of the second symbol are at least spatially offset from each other, and

the first SC channel and the second SC channel are indexed using a single index.

2. The method of claim 1, wherein the first SC channel includes a first spatial stream of a MIMO transmission and the second SC channel includes a second spatial stream of the MIMO transmission.

3. The method of claim 2, wherein the second SC channel is temporally offset from the first SC channel.

4. The method of claim 1, wherein the first constellation mapping and the second constellation mapping are selected such that adjacent constellations point pairs in the first mapping are non-adjacent in the second mapping.

5. The method of claim 1, wherein the generating of at least two complex-valued symbols using the dual modulation further comprises, performing any one of: (i) a bit-wise operation to the set of bits prior to mapping the set of bits to the second symbol; or (ii) a symbol-wise operation performed on the first symbol to obtain the second symbol.

6. The method of claim 1, wherein the mapping of the set of bits to the second symbol using the second constellation mapping comprises at least modifying IQ values of the first symbol to generate the second symbol.

7. The method of claim 1, wherein at least one of the first constellation mapping and the second constellation mapping is a square 64-QAM constellation mapping.

8. The method of claim 1, further comprising allocating the second SC channel for the second symbol, wherein the allocating of the second SC channel for the second symbol is carried out according to a function that is based on parameters of the first SC channel.

9. A wireless transmit/receive unit (WTRU) configured to transmit symbols using aggregated channels, comprising:

a processor configured to:

generate complex baseband symbols from a set of bits using dual modulation at least in part by (i) mapping the set of bits to a first symbol using a first constellation mapping associated with a first constellation and by (ii) mapping the set of bits to a second symbol using a second constellation mapping associated with a second constellation, wherein the first constellation mapping and the second constellation mapping each map the set of bits to different constellation signal points and the second constellation mapping is representative of a mapping which is associated with a rotated first constellation, and;

transmitter circuitry configured to transmit, using the aggregated channels, (1) a first transmission of the first symbol using a first single carrier (SC) channel in the aggregated channels and a second transmission of the second symbol using a second SC channel in the aggregated channels,

wherein:

the first transmission of the first symbol and the second transmission of the second symbol are at least spatially offset from each other, and

the first SC channel and the second SC channel are indexed using a single index.

10. The WTRU of claim 9, wherein the first SC channel includes a first spatial stream of a MIMO transmission and the second SC channel includes a second spatial stream of the MIMO transmission.

11. The WTRU of claim 10, wherein the second SC channel is temporally offset from the first SC channel.

12. The WTRU of claim 9, wherein the processor is configured to perform at least one of (i) a bit-wise operation to the set of bits prior to mapping the set of bits to the second symbol or (ii) a time-varying symbol-wise operation performed on the first symbol to obtain the second symbol.

13. The WTRU of claim 9, wherein the processor is configured to any of: (1) at least modify IQ values of the first symbol to generate the second symbol; or (2) interleave the first symbol and the second symbol prior to selection of the first and second SC channels.

14. The WTRU of claim 9, wherein any of: the first constellation mapping or the second constellation mapping is a square 64-QAM constellation mapping.