Exhibit 12 Technical Circuit Description - Confidential

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EJIAXIA		TA8AKRC161436-1		
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Exhibit 12 – Technical Circuit Description, FCC ID: TA8AKRC161436-1

Contents

1 2.1033(c) Circuit Description

1.1 (2) FCC ID: TA8AKRC161436-1

This RRU (Remote Radio Unit, RRUS 82 B41) is a synthesized Transmitter and Receiver designed for use in the 3GPP (Third Generation Partnership) for UMTS 3G (Universal Mobile Telephone System) and supports LTE (Long Term Evolution).

This RRU operates in operating frequency band 41 (B41) defined by 3GPP. The Transmitter and Receiver parts of this RRU operate in the frequency band of 2496 MHz to 2690 MHz.

This RRU supports modulations of QPSK, 16QAM and 64QAM. The Channel Bandwidth is configurable within 10 MHz, 15 MHz and 20 MHz with possibility to activate 50, 75 and 100 Resource Blocks (RB). It is able to transmit both single carrier and multi carriers. It supports MIMO (Multiple Input Multiple Output).

This RRU has following functions:

- Supports LTE Time Division Duplexing (TDD)
- Transmitting Receiving Processing (TRP)
- Uplink and downlink filtering
- Power Amplifier (PA) functions
- 8-RX (Receiver) diversity
- Supports the function of Remote Electrical Tilt (RET)
- Support for external antenna equipment such as Antenna System Controller (ASC) and RETU Interface Unit (RIU)

Figure 1 RRUS 82 B41

1.2 (4) Type of Emission

LTE:

10M0F9W Channel bandwidth $BW_{Channel}$: 10 MHz
Transmission bandwidth configuration N_{RB} (Number of Resource Blocks): 50
Transmission bandwidth configuration, DL (TX): 9.015 MHz
Transmission bandwidth configuration, UL (TX): 9.000 MHz

15M0F9W Channel bandwidth $BW_{Channel}$: 15 MHz
Transmission bandwidth configuration N_{RB} (Number of Resource Blocks): 75
Transmission bandwidth configuration, DL (TX): 13.515 MHz

Transmission bandwidth configuration, UL (TX): 13.500 MHz

20M0F9W Channel bandwidth $BW_{Channel}$: 20 MHz
Transmission bandwidth configuration N_{RB} (Number of Resource Blocks): 100
Transmission bandwidth configuration, DL (TX): 18.015 MHz
Transmission bandwidth configuration, UL (TX): 18.000 MHz

1.3 (5) Frequency Range

Downlink frequency range (TX): Band 41, 2496 MHz – 2690 MHz
Uplink frequency range (RX): Band 41, 2496 MHz – 2690 MHz

1.4 (6) Range of Operating Power

This Remote Radio Unit is designed to supply a nominal power level of 37.0 dBm / 40.0 dBm / 41.8 dBm / 43.0 dBm on each TX output connector.

The dynamic power range is the difference between the maximum and the minimum scheduled output power in the supported bandwidth when the output power is P_{cell} (in case no cell range reduction is required, P_{cell} = P_{nom}).

Table 1 Power dynamic ranges (LTE)

Supported BW (MHz)	Power dynamic range relative to P_{cell} as defined above (dB)
10	-17
15	-19
20	-20

1.5 (7) Maximum Power Rating

The maximum nominal power rating for one 8TX RRU (8 RF chains are identical) is equal to 8x43.0 dBm / 8x20 W with tolerance ± 2 dB.

1.6 (8) Final Amplifier voltage and current in normal operation

Table 2 Final amplifier voltage and current

	Max Average Power for 8x20W output power Values for Power Amplifier Unit
Voltage	29 V
Current	8 x 2.4 A

1.7 (9, 10) Frequency stabilizing circuit description

The RRU has a stabilizing clock circuit of 30 MHz. This clock is phase-locked to an incoming 30.72 MHz clock reference from the Digital Unit (DU) board. The radio (transmitter and receiver) in the RRU has a 10 MHz reference, which is locked to the 30 MHz clock above. The TX (transmitter) part has a Local Oscillator (PLL) which is mixed with the base band I and Q signals in the I&Q-modulator to the actual transmit frequency and then fed to the Power Amplifier. The Local Oscillator is locked to the 10 MHz reference. The 30.72 MHz clock reference is generated in a voltage controlled oscillator placed in the DU Board. This clock is phase-locked to an 8 kHz oscillator also placed in the DU. This oscillator is in turn locked to the extracted frame-sync of 8 kHz from the PCM Transmission Link. As an option the DU can be directly frequency synchronized with a GPS source (1 PPS).

There are 8 Transmitters (TX) inside RRUS 82, each consists of a main and peak branch to support a digital Doherty Power Amplifier (PA). Each TX branch is base band filtered and then fed to a DAC (Digital to Analog Converter). The DAC output is filtered and then up-converted to RF. The TX RF signal passes through two VGA´s and one switch before it is output (to the PA). The TX is capable of delivering a 10MHz wide transmit band for LTE. The DGB (Dynamic Gate Base) functionality is also a part of the TX.

Placed in the transmitter there is a Transmitter Observation Receiver (TOR) to support Doherty. It consists of a down converting mixer, an anti-alias filter and an ADC, with one analog IF frequency of 184.32 MHz.

The Receiver (RX) is a single down converting receiver with one analog IF frequency, 184.32 MHz (LO 2341.68 MHz – 2475.68 MHz). It consists of one dual mixer, AGC, VGA (Variable Gain Amplifier) and several filter stages – including RF bandpass, image, IF SAW and anti-alias. 16 bit data from ADC transfers to WARP with 122.88 MHz sampling frequency. The receiver supports 8 way diversity and 3 carriers.

The RRU with the above FCC Identifier has a FSK/OOK modem to communicate with mast mounted equipment via antenna cable. This modem is not activated during normal operation; it is only used to set up site and in case of alarm.

Figure 2 shows a simplified block diagram for the RRUS 82 B41.

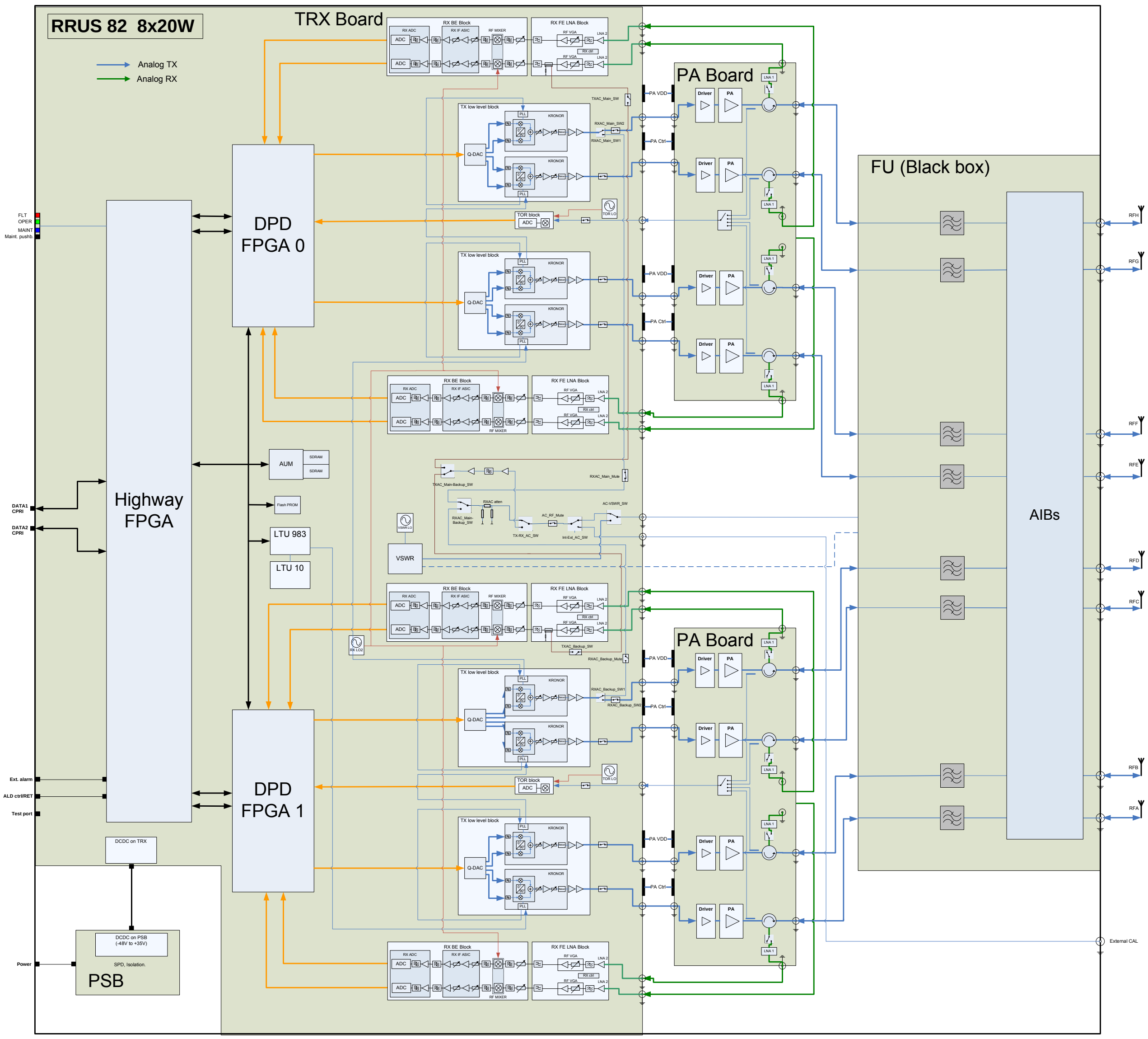

Figure 2 Block diagram for the RRUS 82 B41

1.8 (10) Spurious and Harmonic suppression

Spurious and harmonic suppression is achieved by using two separate band-pass filters of ceramic type in the exciter (in RRU) for each RF chain. A filter module at the output (in RRU) works like a band-pass filter around the carrier.

1.9 (9, 10) Power Tune up - Limiting Power

The RRU measures the output power at its output connector via a RF-detector and the detected value is used by the power loop control block to steer the variable gain amplifiers in the exciter amplifier. The dynamic power control included in the system is controlled by the exciter amplifier in the RRU.

1.10 (10) LTE Downlink Transmission

1.10.1 Physical-layer processing

The downlink physical-layer processing of transport channels consists of the following steps:

- CRC insertion: 24 bit CRC is the baseline for PDSCH;
- Channel coding: Turbo coding based on QPP inner interleaving with trellis termination;
- Physical-layer hybrid-ARQ processing;
- Channel interleaving;
- Scrambling: transport-channel specific scrambling on DL-SCH, BCH, and PDH. Common MCH scrambling for all cells involved in a specific MBSFN transmission;
- Modulation: QPSK, 16QAM, and 64QAM;
- Layer mapping and pre-coding;
- Mapping to assigned resources and antenna ports.

1.10.2 Channel Coding

The error correcting coder selected for DL_SCH is Parallel Concatenated Convolutional Code (PCCC) with two 8-state constituent encodes and one turbo code internal interleaver (simply called “the Turbo code” in the following). The coding rate of the Turbo encoder is 1/3. This is the same Turbo code used as in R6 UMTS, with exception that the internal interleaver works differently.

1.10.3 OFDM baseband signal generation

The downlink transmission modulation scheme is based on conventional OFDM (Orthogonal Frequency Division Multiplexing) using a cyclic prefix. The OFDM sub-carrier spacing is Δf = 15 kHz. 12 consecutive sub-carriers during one slot corresponding to one downlink *resource block*. In the frequency domain, the number of resource blocks, N_{RB}, can range from N_{RB}-min=6 to N_{RB}-man=50. In addition there is also a reduced sub-carrier spacing Δf_{low} = 7.5 kHz, only for MBMS dedicated cell.

Table 3 lists the value of $N_{CP,l}$ that shall be used. Note that different OFDM symbols within a slot in some cases have different cyclic prefix lengths.

Table 3 OFDM parameters

Configuration		Cyclic prefix length $N_{CP,l}$
Normal cyclic prefix	Δf = 15 kHz	160 for l = 0 144 for l = 1,2,…6
Extended cyclic prefix	Δf = 15 kHz	512 for l = 0,1,…5
	Δf = 7.5 kHz	1024 for l = 0,1,2

1.10.4 Modulation and upconversion

Modulation and upconversion to the carrier frequency of the complex-valued OFDM baseband signal for each antenna port is shown in Figure 3.

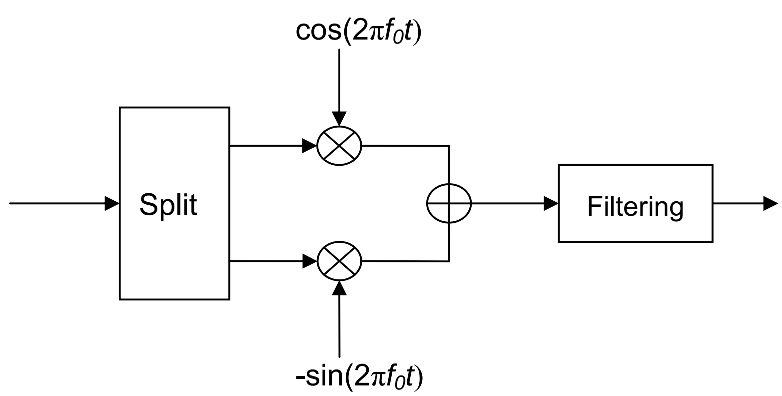

Figure 3 Downlink modulation

1.10.5 Modulation mapper

The modulation mapper takes binary digits, 0 or 1, as input and produces complex-valued modulation symbols, $x=I+jQ$, as output.

1.10.5.1 BPSK

In case of BPSK modulation, a single bit, $b(i)$, is mapped to a complex-valued modulation symbol $x=I+jQ$ according to Table 4.

Table 4 BPSK modulation mapping

$b(i)$	***I***	***Q***
0	$1/\sqrt{2}$	$1/\sqrt{2}$
1	$-1/\sqrt{2}$	$-1/\sqrt{2}$

1.10.5.2 QPSK

In case of QPSK modulation, a single bit, $b(i),b(i+1),$ are mapped to a complex-valued modulation symbol $x=I+jQ$ according to Table 5.

Table 5 QPSK modulation mapping

$b(i), b(i+1)$	***I***	***Q***
00	$1/\sqrt{2}$	$1/\sqrt{2}$
01	$1/\sqrt{2}$	$-1/\sqrt{2}$
10	$-1/\sqrt{2}$	$1/\sqrt{2}$
11	$-1/\sqrt{2}$	$-1/\sqrt{2}$

1.10.5.3 16QAM

In case of 16QAM modulation, a single bit, $b(i),b(i+1),b(i+2),b(i+3),$ are mapped to a complex-valued modulation symbol $x=I+jQ$ according to Table 6.

Table 6 16QAM modulation mapping

$b(i), b(i+1),b(i+2),b(i+3)$	***I***	***Q***
0000	$1/\sqrt{10}$	$1/\sqrt{10}$
0001	$1/\sqrt{10}$	$3/\sqrt{10}$
0010	$3/\sqrt{10}$	$1/\sqrt{10}$
0011	$3/\sqrt{10}$	$3/\sqrt{10}$
0100	$1/\sqrt{10}$	$-1/\sqrt{10}$
0101	$1/\sqrt{10}$	$-3/\sqrt{10}$

0110	$3/\sqrt{10}$	$-1/\sqrt{10}$
0111	$3/\sqrt{10}$	$-3/\sqrt{10}$
1000	$-1/\sqrt{10}$	$1/\sqrt{10}$
1001	$-1/\sqrt{10}$	$3/\sqrt{10}$
1010	$-3/\sqrt{10}$	$1/\sqrt{10}$
1011	$-3/\sqrt{10}$	$3/\sqrt{10}$
1100	$-1/\sqrt{10}$	$-1/\sqrt{10}$
1101	$-1/\sqrt{10}$	$-3/\sqrt{10}$
1110	$-3/\sqrt{10}$	$-1/\sqrt{10}$
1111	$-3/\sqrt{10}$	$-3/\sqrt{10}$

1.10.5.4 64QAM

In case of 64QAM modulation, a single bit, $b(i)$, $b(i+1)$, $b(i+2)$, $b(i+3)$,$b(i+4)$, $b(i+5)$, are mapped to a complex-valued modulation symbol $x=I+jQ$ according to Table 7.

Table 7 64QAM modulation mapping

$b(i),b(i+1),b(i+2), b(i+3),b(i+4),b(i+5)$	*I*	*Q*	$b(i),b(i+1),b(i+2), b(i+3),b(i+4),b(i+5)$	*I*	*Q*
000000	$3/\sqrt{42}$	$3/\sqrt{42}$	100000	$-3/\sqrt{42}$	$3/\sqrt{42}$
000001	$3/\sqrt{42}$	$1/\sqrt{42}$	100001	$-3/\sqrt{42}$	$1/\sqrt{42}$
000010	$1/\sqrt{42}$	$3/\sqrt{42}$	100010	$-1/\sqrt{42}$	$3/\sqrt{42}$
000011	$1/\sqrt{42}$	$1/\sqrt{42}$	100011	$-1/\sqrt{42}$	$1/\sqrt{42}$
000100	$3/\sqrt{42}$	$5/\sqrt{42}$	100100	$-3/\sqrt{42}$	$5/\sqrt{42}$
000101	$3/\sqrt{42}$	$7/\sqrt{42}$	100101	$-3/\sqrt{42}$	$7/\sqrt{42}$
000110	$1/\sqrt{42}$	$5/\sqrt{42}$	100110	$-1/\sqrt{42}$	$5/\sqrt{42}$
000111	$1/\sqrt{42}$	$7/\sqrt{42}$	100111	$-1/\sqrt{42}$	$7/\sqrt{42}$
001000	$5/\sqrt{42}$	$3/\sqrt{42}$	101000	$-5/\sqrt{42}$	$3/\sqrt{42}$
001001	$5/\sqrt{42}$	$1/\sqrt{42}$	101001	$-5/\sqrt{42}$	$1/\sqrt{42}$
001010	$7/\sqrt{42}$	$3/\sqrt{42}$	101010	$-7/\sqrt{42}$	$3/\sqrt{42}$
001011	$7/\sqrt{42}$	$1/\sqrt{42}$	101011	$-7/\sqrt{42}$	$1/\sqrt{42}$
001100	$5/\sqrt{42}$	$5/\sqrt{42}$	101100	$-5/\sqrt{42}$	$5/\sqrt{42}$
001101	$5/\sqrt{42}$	$7/\sqrt{42}$	101101	$-5/\sqrt{42}$	$7/\sqrt{42}$
001110	$7/\sqrt{42}$	$5/\sqrt{42}$	101110	$-7/\sqrt{42}$	$5/\sqrt{42}$
001111	$7/\sqrt{42}$	$7/\sqrt{42}$	101111	$-7/\sqrt{42}$	$7/\sqrt{42}$
010000	$3/\sqrt{42}$	$-3/\sqrt{42}$	110000	$-3/\sqrt{42}$	$-3/\sqrt{42}$
010001	$3/\sqrt{42}$	$-1/\sqrt{42}$	110001	$-3/\sqrt{42}$	$-1/\sqrt{42}$
010010	$1/\sqrt{42}$	$-3/\sqrt{42}$	110010	$-1/\sqrt{42}$	$-3/\sqrt{42}$
010011	$1/\sqrt{42}$	$-1/\sqrt{42}$	110011	$-1/\sqrt{42}$	$-1/\sqrt{42}$
010100	$3/\sqrt{42}$	$-5/\sqrt{42}$	110100	$-3/\sqrt{42}$	$-5/\sqrt{42}$
010101	$3/\sqrt{42}$	$-7/\sqrt{42}$	110101	$-3/\sqrt{42}$	$-7/\sqrt{42}$
010110	$1/\sqrt{42}$	$-5/\sqrt{42}$	110110	$-1/\sqrt{42}$	$-5/\sqrt{42}$
010111	$1/\sqrt{42}$	$-7/\sqrt{42}$	110111	$-1/\sqrt{42}$	$-7/\sqrt{42}$
011000	$5/\sqrt{42}$	$-3/\sqrt{42}$	111000	$-5/\sqrt{42}$	$-3/\sqrt{42}$
011001	$5/\sqrt{42}$	$-1/\sqrt{42}$	111001	$-5/\sqrt{42}$	$-1/\sqrt{42}$
011010	$7/\sqrt{42}$	$-3/\sqrt{42}$	111010	$-7/\sqrt{42}$	$-3/\sqrt{42}$
011011	$7/\sqrt{42}$	$-1/\sqrt{42}$	111011	$-7/\sqrt{42}$	$-1/\sqrt{42}$
011100	$5/\sqrt{42}$	$-5/\sqrt{42}$	111100	$-5/\sqrt{42}$	$-5/\sqrt{42}$
011101	$5/\sqrt{42}$	$-7/\sqrt{42}$	111101	$-5/\sqrt{42}$	$-7/\sqrt{42}$
011110	$7/\sqrt{42}$	$-5/\sqrt{42}$	111110	$-7/\sqrt{42}$	$-5/\sqrt{42}$
011111	$7/\sqrt{42}$	$-7/\sqrt{42}$	111111	$-7/\sqrt{42}$	$-7/\sqrt{42}$

1.10.6 Physical channels

A downlink physical channel corresponds to a set of resource elements carrying information originating from higher layers and is the interface defined between 36.212 and 36.211. The following downlink physical channels are defined:

- Physical Downlink Shared Channel, PDSCH

- Physical Broadcast Channel, PBCH

- Physical Multicast Channel, PMCH

- Physical Control Format Indicator Channel, PCFICH

- Physical Downlink Control Channel, PDCCH

- Physical Hybrid ARQ Indicator Channel, PHICH

1.10.7 Physical signals

A downlink signal corresponds to a set of resource elements used by the physical layer but does not carry information originating from higher layers. The following downlink physical signals are defined:

- Reference signal

- Synchronization signal

1.10.8 General structure for downlink physical channels

This section describes a general structure, applicable to more than one physical channel.

The baseband signal representing a downlink physical channel is defined in terms of the following steps:

- Scrambling of coded bits in each of the code words to be transmitted on a physical channel

- Modulation of scrambled bits to generate complex-valued modulation symbols

- Mapping of the complex-valued modulation symbols onto one or several transmission layers

- Precoding of the complex-valued modulation symbols for each antenna port to resource elements

- Generation of complex-valued time-domain OFDM signal for each antenna port

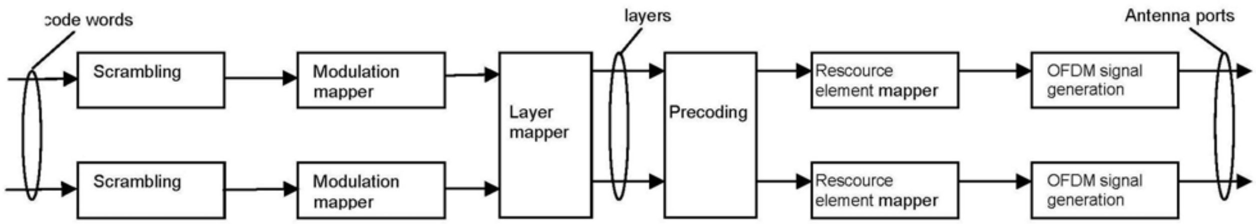

Figure 4 Overview of physical channel processing

1.10.8.1 IQ combining

The real valued chip sequence on the Q branch shall be complex multiplied with j and summed with the corresponding real valued chip sequence on the I branch, thus resulting in a single complex valued chip sequence.

1.10.8.2 Scrambling

The bits in the code word are scrambled with specific scrambling sequence prior to modulation.

1.10.8.3 Modulation

Standard QPSK, 16QAM or 64QAM modulation mapping, resulting in complex modulation symbols carrying 2, 4 or 6 coded bits respectively.

1.10.8.4 Layer mapping

The modulation symbols from one or two (scrambled) code words are mapped onto 1, 2, antenna ports. Thus, this step is related to MIMO or TX diversity operation. Basically, a layer corresponds to a spatial multiplexed channel.

1.10.8.5 Precoding

This step is also related to MIMO or TX diversity. Precoding is applied to allow the UE to separate the different antenna streams.

1.10.8.6 Resource Element Mapping

The precoded code words are mapped onto a number of 2-dimension time-frequency Resource Elements available for the transmission.

1.10.8.7 OFDM Signal Generation

OFDM symbols are created, as described in chapter 1.10.3, using the number of sub-carriers allocated for transmission. A cyclic prefix is appended to each OFDM symbol and the symbols (with CP) are then mapped onto 2 consecutive radio frame slots constituting a subframe. The Resource Element Mapping stage and the OFDM Signal Generation stage takes place separately for each antenna port assigned for the transmission.