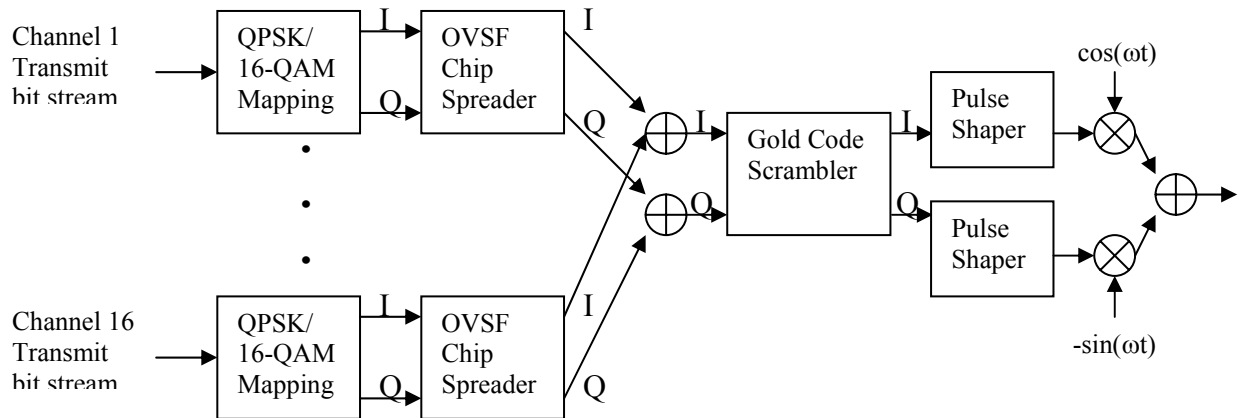


Modulating Signal Description

There are two separate systems described in this application: (1) an HSDPA demonstration system using a commercial base station with prototype boards transmitting to a fixed prototype mobile system, and (2) a UMTS demonstration system using a commercial base station transmitting to and receiving from several commercial UMTS mobiles. The HSDPA system only requires one 5MHz band for downlink, while the UMTS system requires two 5MHz bands (one for downlink and one for uplink).

For the HSDPA system, the transmit signal is modulated according to the 3GPP Release 5 specification for the HS-PDSCH and CPICH channels (3GPP TS 25.213). For the HS-PDSCH channel, up to 15 subchannels can carry transmit data. The data is mapped to QPSK or 16-QAM modulation symbols, with each subchannel carrying 240kps. The modulation symbols are then spread to the 3.84Mcps chip-rate using a 16-chip Orthogonal Variable Spreading Factor code. The CPICH channel can be represented as an additional subchannel using only one point in a QPSK constellation.

All 16 subchannels (including the CPICH) are summed together and passed through a Gold Code scrambler. A root-raised cosine filter with rolloff factor $\alpha = 0.22$ is used for pulse shaping. The final result is modulated by multiplying the I component by $\cos(\omega t)$, the Q component by $-\sin(\omega t)$, and summing the results as shown.



For the UMTS system, the transmit signals are modulated according to the 3GPP Release 99 specification. The above figure can generally represent the UMTS system, except that there are more than 16 possible channels, and only BPSK and QPSK modulation are supported.