THALES
BROADCAST & MULTIMEDIA
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DIGITAL MODULATION CHARACTERISTICS - MediaFLO

The digital modulation format is Coded Orthogonal Frequency Division Multiplexing (COFDM) with a QPSK, 16-QAM, or layered constellation with the OFDM symbol rate and occupied bandwidth optimized for a 6 MHz Forward Link Only (FLO) RF channel. FLO Modulation techniques applied in use with this product adhere to the FLO Air Interface Specification, Rev 1.1, which is a FLO™ Forum[1] approved specification that is currently being standardized within the TIA (TR47.1 sub-committee).

The Forward Error Correction (FEC) used employs a concatenated approach consisting of an outer Reed-Solomon (RS) code and an inner Parallel Concatenated Convolutional Code (PCCC), or Turbo Code. The outer RS code is intended for use as an erasure correction code, with each RS code block distributed over the duration of 1 second, referred to as a superframe. The RS code can correct erasures caused by impulsive-type interference and time-selective fading, ensuring robust operation over a wide range of mobile speeds from pedestrian (e.g., 3 km/hr) to highway (over 100 km/hr) reception.

Each RS code block consist of multiple packets, to each of which is appended a Cyclic Redundancy Checksum (CRC). After addition of the CRC, the packet is Turbo encoded using one of the supported data rates {1/3, ½, 2/3}. The bits in each Turbo encoded packet are interleaved, scrambled and then mapped to modulation symbols from either a QPSK or 16-QAM constellation. FLO also supports the use of layered modulation, which enables the transmission of two component bit streams through the Physical layer with different levels of robustness to reception. The two components are referred to as the base and enhancement components. In the case of layered modulation, a packet each for the base and the enhancement component is independently Turbo encoded, bit interleaved, and scrambled prior to combining the bits in the processed packets to generate modulation symbols from either a 16-QAM or non-uniform 16-QAM constellation.

The constellations supported by FLO are depicted in Figures 1 – 3.

[1] Further information on the FLO™ Forum can be found at www.floforum.org.

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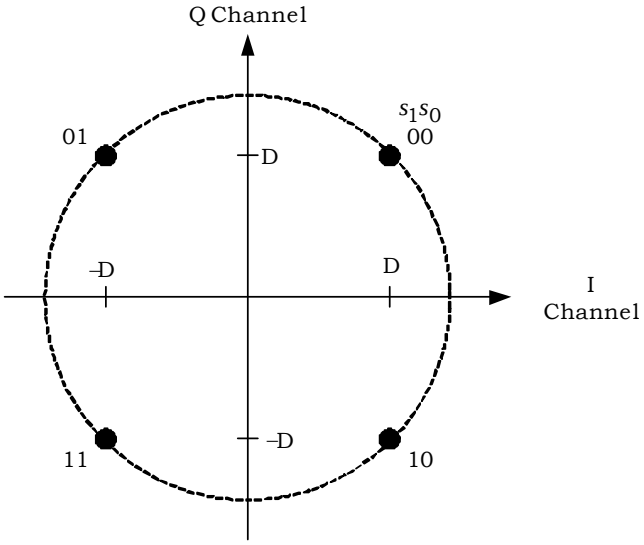

Figure 1: QPSK Constellation.

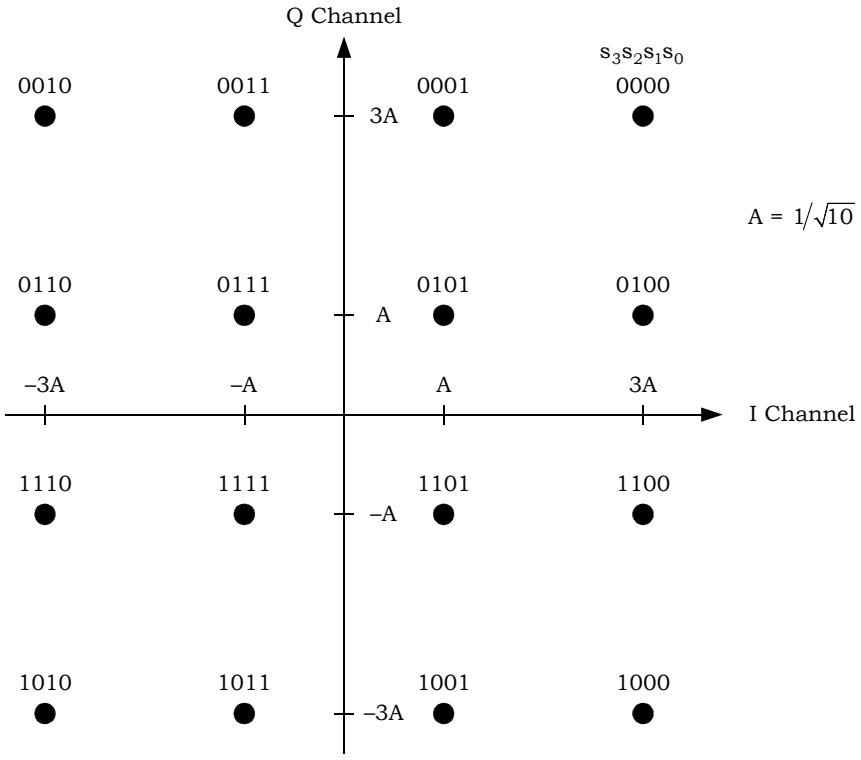

Figure 2: 16-QAM Constellation.

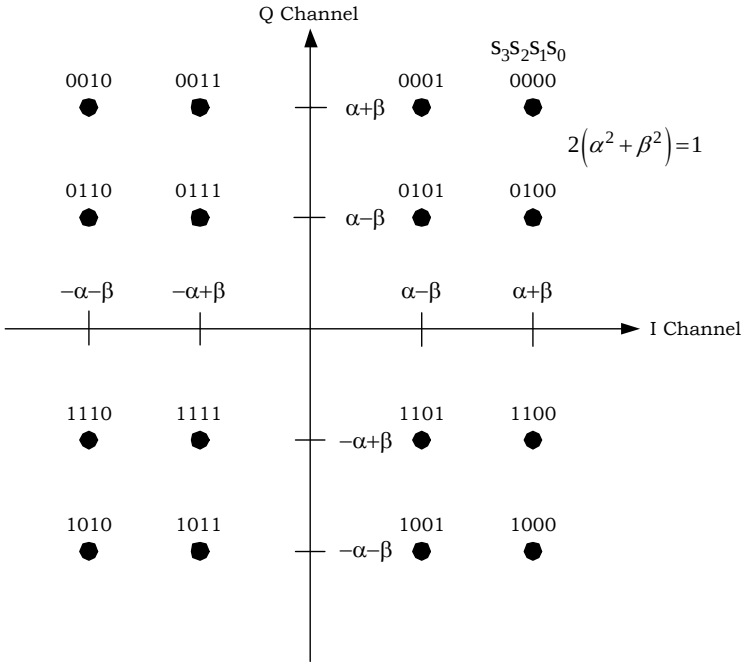

Figure 3: Layered Constellation.

The digital modulation format is summarized in the following table:

Table 1: Digital Transmission Format.

Parameter	Format
Specification	Forward Link Only (FLO)
Modulation	QPSK, 16-QAM, Layered
Format	COFDM
FFT Size	4k
Guard Interval	1/8
Code Rate	1/3, ½, 2/3
Transmission Band	698-746 MHz
Channel bandwidth	6 MHz

FCC Section 2.1033 (c)