Project	**IEEE 802.16 Broadband Wireless Access Working Group** <http://ieee802.org/16>	
Title	Enhanced Hierarchical Modulations	
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Re:	IEEE 802.16m-07/040 Call for Contributions on Project 802.16m SDD	
Abstract	The traditional hierarchical modulation scheme, which is simply superposing two user's signal together, is not optimal, most due to strong inter-layer interference. We propose an enhanced hierarchical modulation scheme by rotating enhancement layer(s). We can show that it help achieve higher achievable throughputs, less inter-layer interference, and lower peak-to-average power ratio (PAPR), etc.	
Purpose	For discussion and approval by TGM	
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Suggested ToC Topic for IEEE 802.16m SDD: Enhancements on Multicast and Broadcast Services (MBS)

Title: Enhanced Hierarchical Modulations

Description: Hierarchical modulation can be taken as an implementation of superposition precoding, which outperform time multiplexing and frequency multiplexing in most time. This can be illustrated in Fig. 1

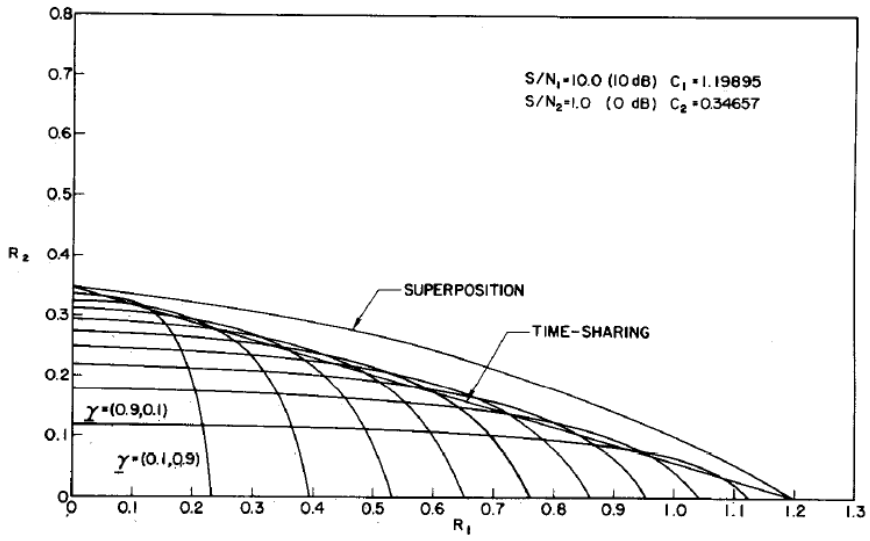

Figure 1. Achievable rates (Bergmans and Cover, 1974)

Hierarchical modulations are widely used in digital broadcast system design, including both dedicated network: DVB-T, Media-FLO, UMB-BCMCS, and hierarchical network: DVB Multiplexing. Hierarchical modulations can help provide different QoS's to users with different profiles, e.g. higher throughput for users with advanced receiver. provide unequal protection on different contents, e.g., video, audio, text, update system to provide better service to new users with advanced receiver with keeping existing users unchanged. However, the traditional hierarchical modulation scheme, which is simply superposing two user's signal together, is not optimal. It is known that there is strong inter-layer interference, which limits the demodulation performance. The enhanced hierarchical modulation scheme by rotating enhancement layer(s) is proposed here. It is help achieve higher achievable throughputs, less inter-layer interference, higher effective SNR, higher effective power, higher modulation efficiency and lower peak-to-average power ratio (PAPR) for next generation wireless systems.

Related Area(s) in SRD: Section 6.7: Enhanced multicast broadcast service