

Project	IEEE 802.16 Broadband Wireless Access Working Group < http://ieee802.org/16 >	
Title	Link Adaptation with the Feedback of Rician Channel k-factor	
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Re:	Call for Contributions of IEEE 802.16m_08/024 on the topic of “Link Adaptation Schemes”	
Abstract	The Rician k-factor is an indicator for channel status and should be used as one of parameters for link adaptation. This contribution proposes a Link Adaptation with Rician Channel k-factor feedback for 802.16m systems.	
Purpose	Discussion and approval by the task group.	
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Patent Policy	The contributor is familiar with the IEEE-SA Patent Policy and Procedures: < http://standards.ieee.org/guides/bylaws/sect6-7.html#6 > and < http://standards.ieee.org/guides/opman/sect6.html#6.3 >. Further information is located at < http://standards.ieee.org/board/pat/pat-material.html > and < http://standards.ieee.org/board/pat/ >.	

Introduction

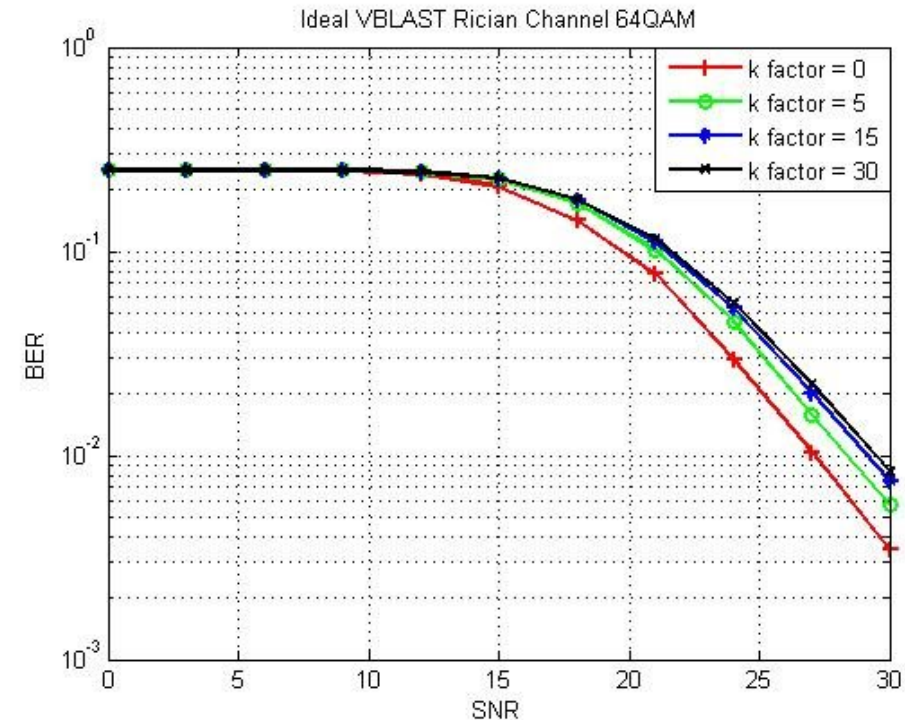
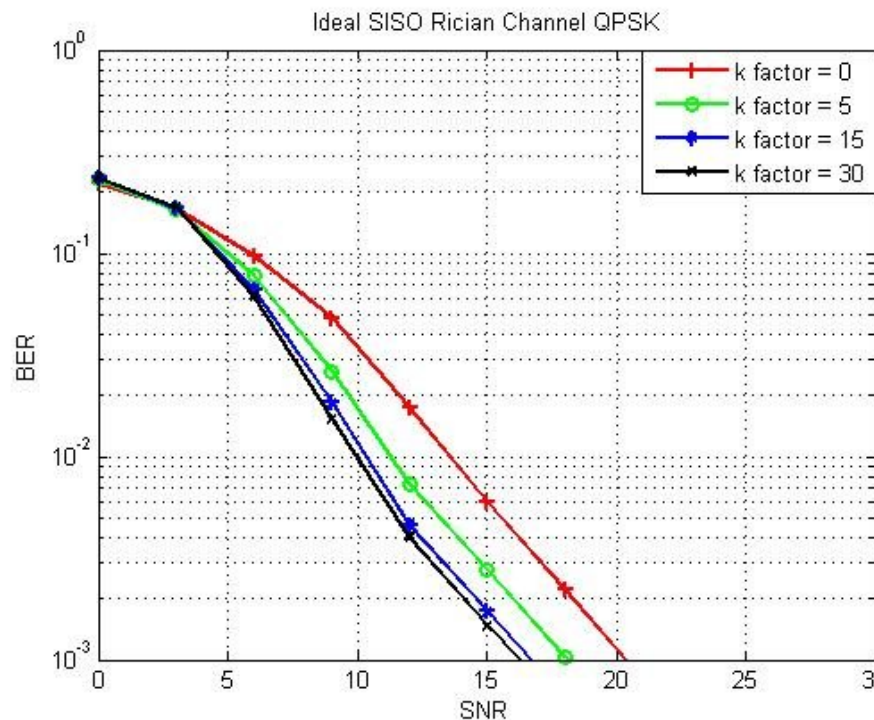
- # In a typical wireless communication environment, a transmitter and receiver are surrounded by objects which reflect and scatter the transmitted energy, causing several waves to arrive at the receiver via different routes.
- # If there is a direct path between transmitter and receiver, then it is called LOS propagation.
- # If the direct wave from the transmitter to receiver is blocked by buildings, walls, and etc, the propagation is termed as NLOS propagation.
- # NLOS component is composed of random multipath signals, resulting in Rayleigh distributed amplitude.
- # The theoretical distribution which applies in this case is Rician distribution.
- # Rician k-factor is proportional to the strength of LOS component and coherent bandwidth.
- # Therefore, the Rician k-factor is an indicator for channel status and could be used as one of parameters for link adaptation.

Proposed Link Adaptation with the Feedback of Rician k-factor

Adaptation of MIMO Transmission Mode

- For SISO mode, BER is worse in channel with greater k-factor.
- For MIMO mode, BER is worse in channel with smaller k-factor.
- Therefore, k-factor can be used for mode selection.

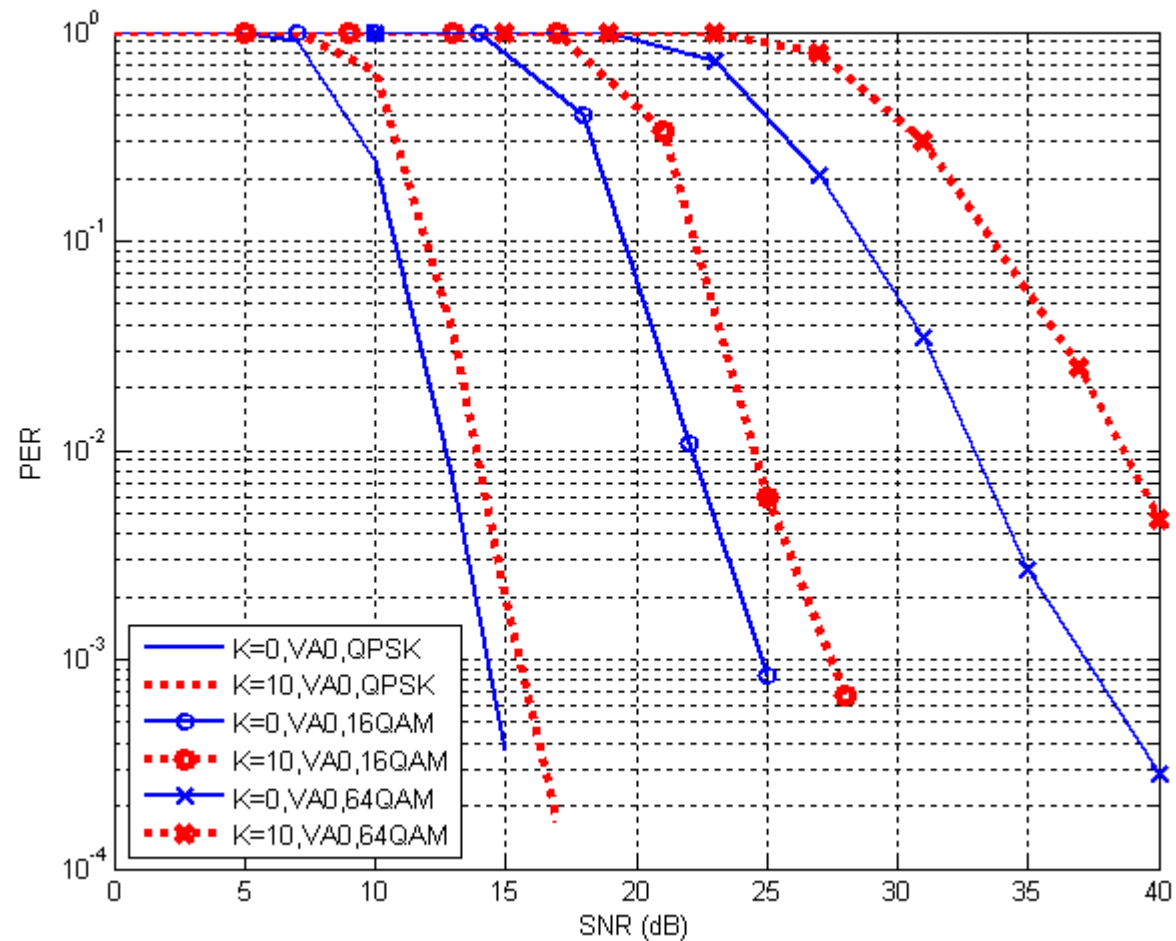
System	Proposed channel condition
SISO	high k-factor, high SNR
STBC	middle k-factor, high SNR
VBLAST	low k-factor, high SNR



Proposed Link Adaptation with the Feedback of Rician k-factor (cont.)

▣ Adaptation of Modulation Mode

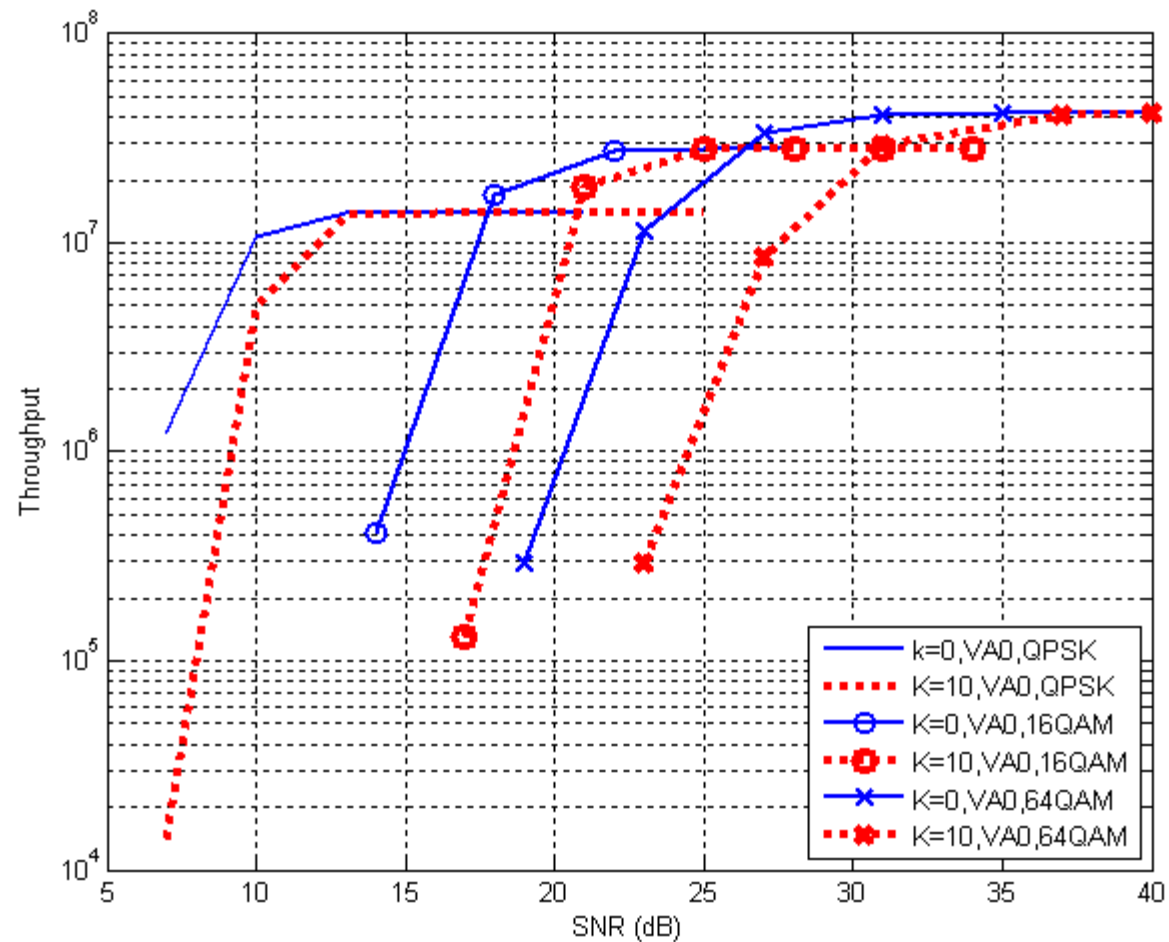
● 2x2 SM



Proposed Link Adaptation with the Feedback of Rician k-factor (cont.)

▣ Adaptation of Modulation Mode

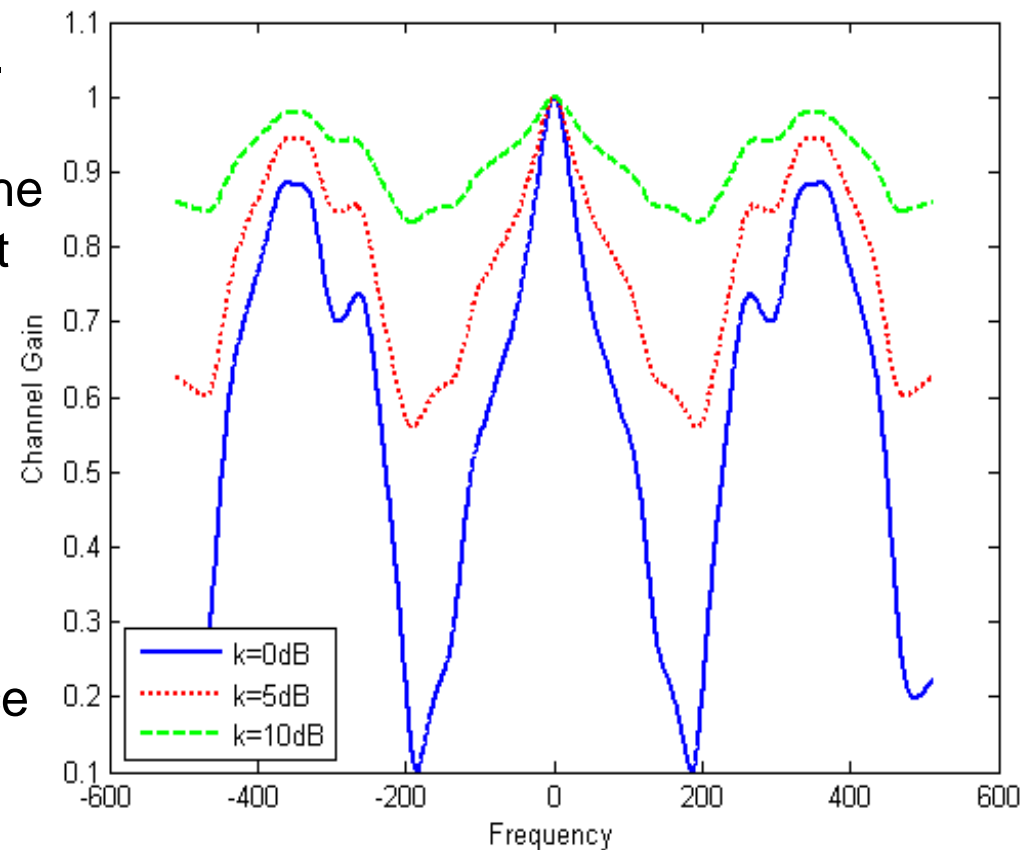
● 2x2 SM



Proposed Link Adaptation with the Feedback of Rician k-factor (cont.)

Channel frequency responses of multi-path channels with different k-factors

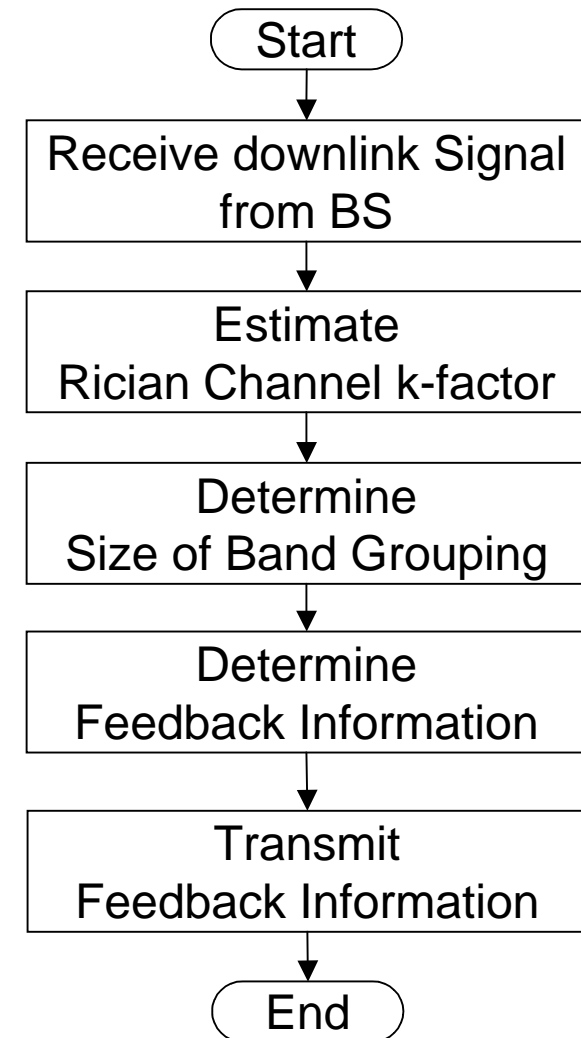
- k-factor can be used as an indicator for channel flatness.
- Greater k-factor implies the LOS component dominates the signal transmission, such that the channel is relative flat.
- k-factor can be used to determine the size of band grouping for different modulation and coding schemes.
- k-factor can be used to reduce the feedback overhead if the channel is relative flat.



Proposed Link Adaptation with the Feedback of Rician k-factor (cont.)

Procedure at Mobile Station

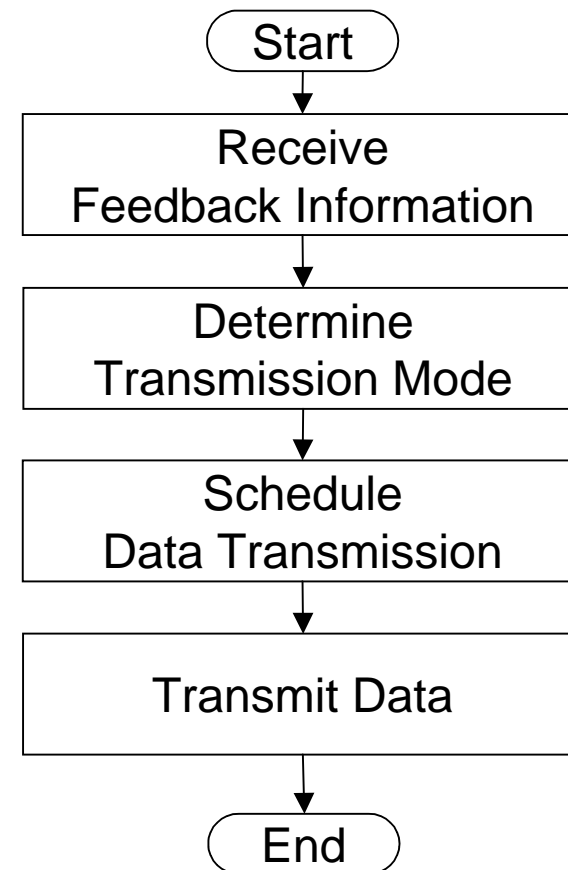
- First, the MS estimates the Rician channel k-factor based on the received DL signal.
- Secondly, the MS determines the size of frequency band grouping and determines the channel information needed to feedback to the BS.
- The feedback information includes Rician k-factor, SNR, SINR, etc.
- Thirdly, the MS transmits the feedback information.



Proposed Link Adaptation with the Feedback of Rician k-factor (cont.)

Procedure at Base Station

- First, the BS receives the feedback information from the MS.
- Secondly, the BS determines the transmission mode, such as modulation and coding schemes, MIMO schemes, etc, for each band.
- Finally, the BS schedules the data and transmits them to the MS.



Proposed Text

11 Physical layer

● 11.x Link Adaptation Schemes

- ▶ Rician channel k-factor can be considered in link adaptation for 802.16m systems. It can be used for the determination of transmission mode, size of band grouping, and size of channel feedback overhead.

● 11.x Channel Quality Feedback Information

- ▶ Rician channel k-factor can be included in CQI feedback. The reduction of CQI feedback overhead can be supported by the estimation of Rician channel k-factor.