

Pilot Pattern Proposal for 16m PUSC

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*<http://standards.ieee.org/faqs/affiliationFAQ.html>>

Re:

IEEE 80216m-08/052 “Call for Contributions on Project 802.16m System Description Document (SDD)” in response to the following section: “11.6.4 Uplink Physical Structure for Legacy Support”

Base Contribution:

None

Purpose:

To be discussed and adopted by TGm for use in stage 3 document development

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<http://standards.ieee.org/guides/bylaws/sect6-7.html#6> and <http://standards.ieee.org/guides/opman/sect6.html#6.3>.

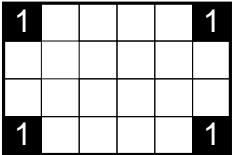
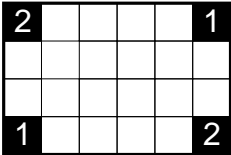
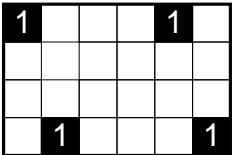
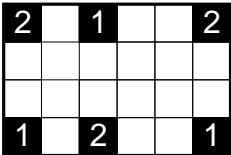
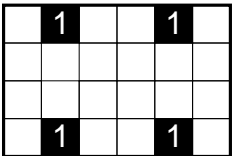
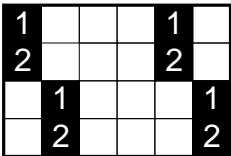
Further information is located at <http://standards.ieee.org/board/pat/pat-material.html> and <http://standards.ieee.org/board/pat>.

Pilot Pattern Proposal for 16m PUSC

Samsung Electronics

Jeongho Park

Candidates

One stream case			Two streams case		
Option	Pattern	Pilot OH	Option	Pattern	Pilot OH
1-1		16.7%	2-1		16.7%
1-2		16.7%	2-2		25%
1-3		16.7%	2-3		33%

Simulation Conditions

- 2D MMSE Channel estimation
 - With Perfect Information
 - Delay profile
 - MS velocity
- 2 Rx MMSE receiver
- Channel
 - ITU Ped B 3km/h, Veh A 120km/h
 - Uncorrelated for MIMO case
- **Pilot boosting : 0dB**
- **No freq. and timing offset**
- Data rate definition
 - Data rate = MPR * (1-PER) * (1-OH)
 - MPR = Mod. Order * code rate
 - PER : packet error rate
 - OH : pilot overhead

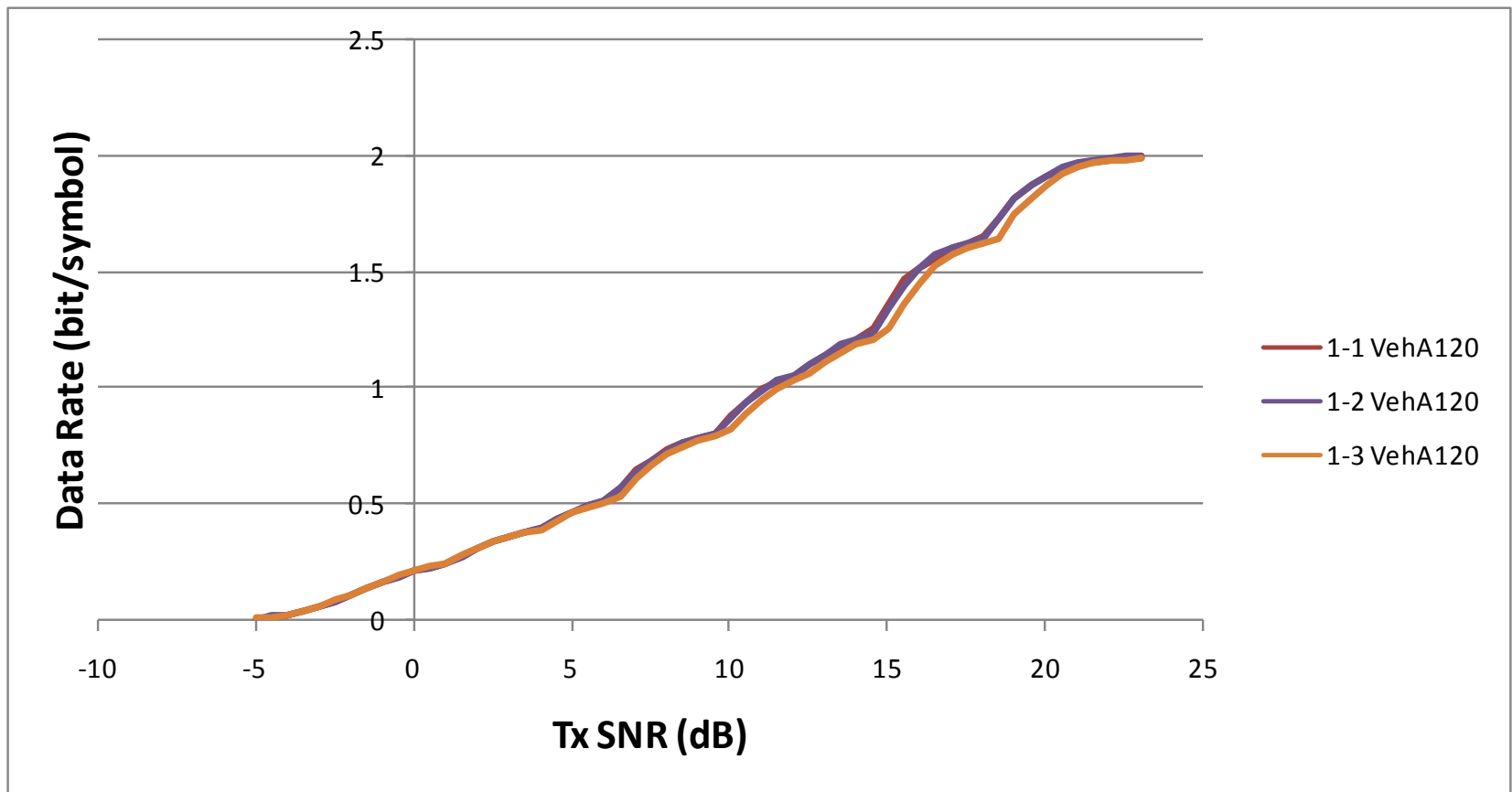
- MCS Levels

Mod. Order	Code rate
2	1/3
2	1/2
2	2/3
4	2/3
4	3/4
6	2/3
6	4/5

One Stream Case

: Simulation Results

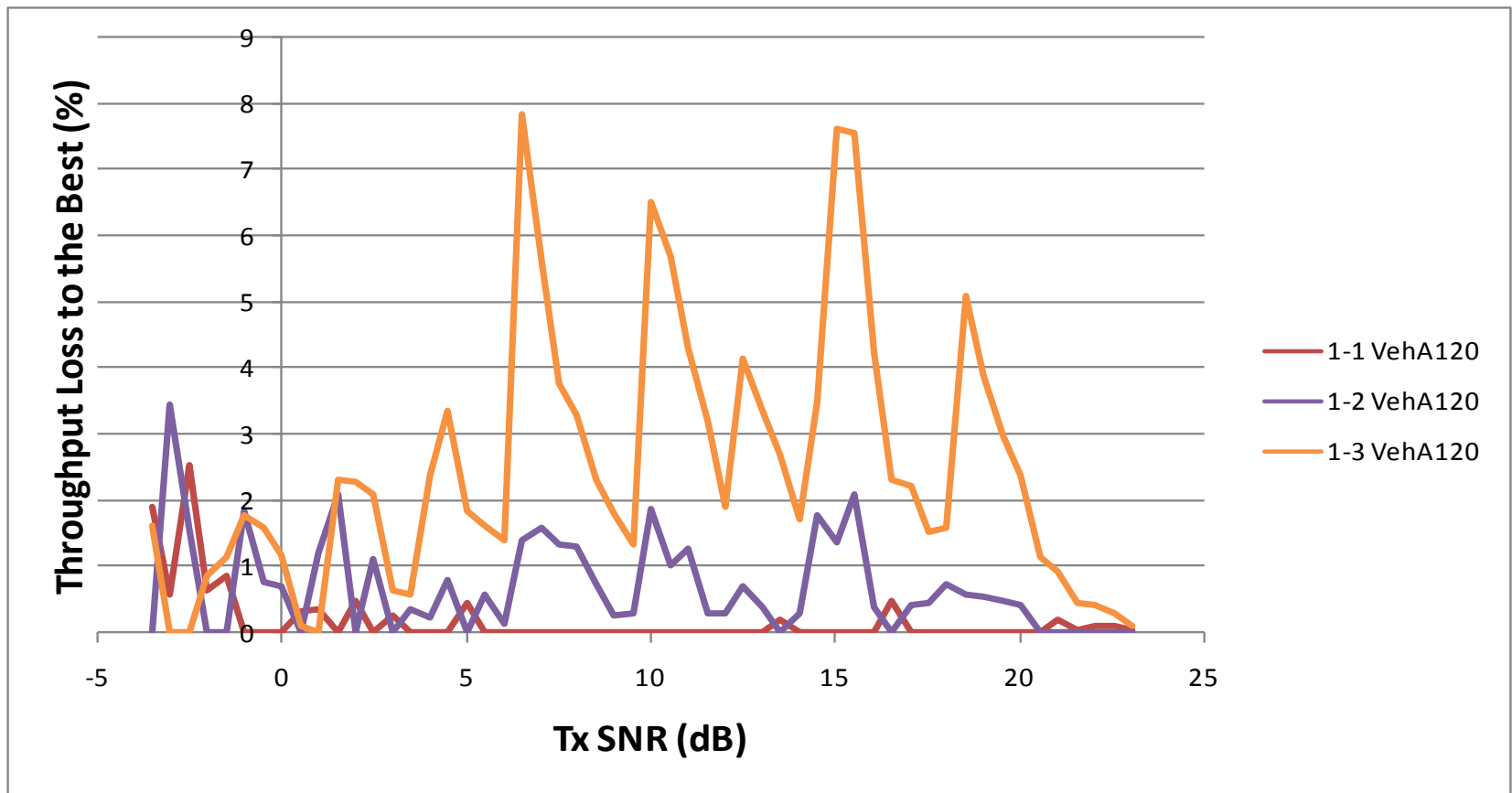
- Data Rate in Veh A 120km/h



One Stream Case

: Simulation Results

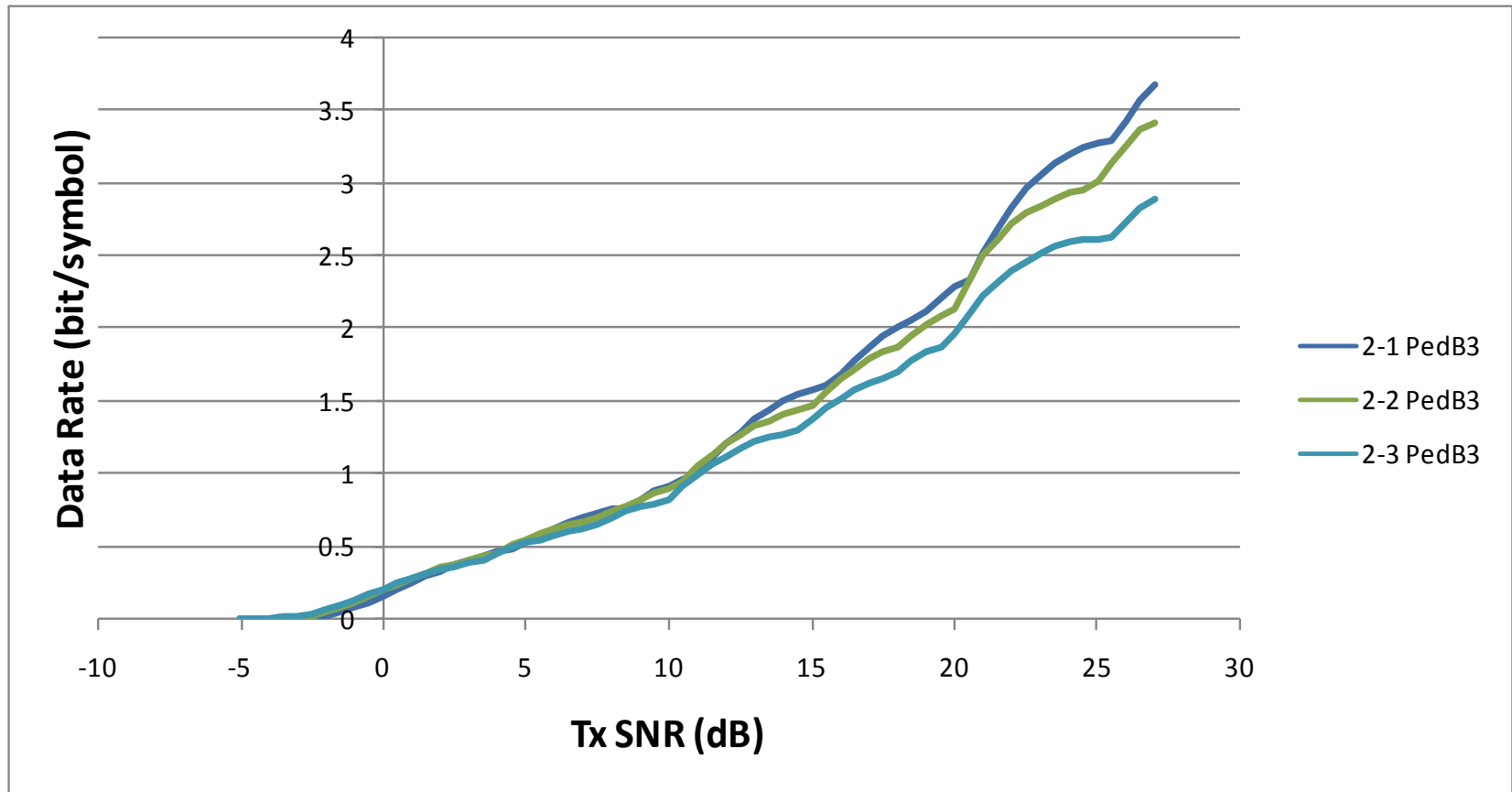
- Throughput Loss to Best Veh A 120km/h



Two Streams Case

: Simulation Results

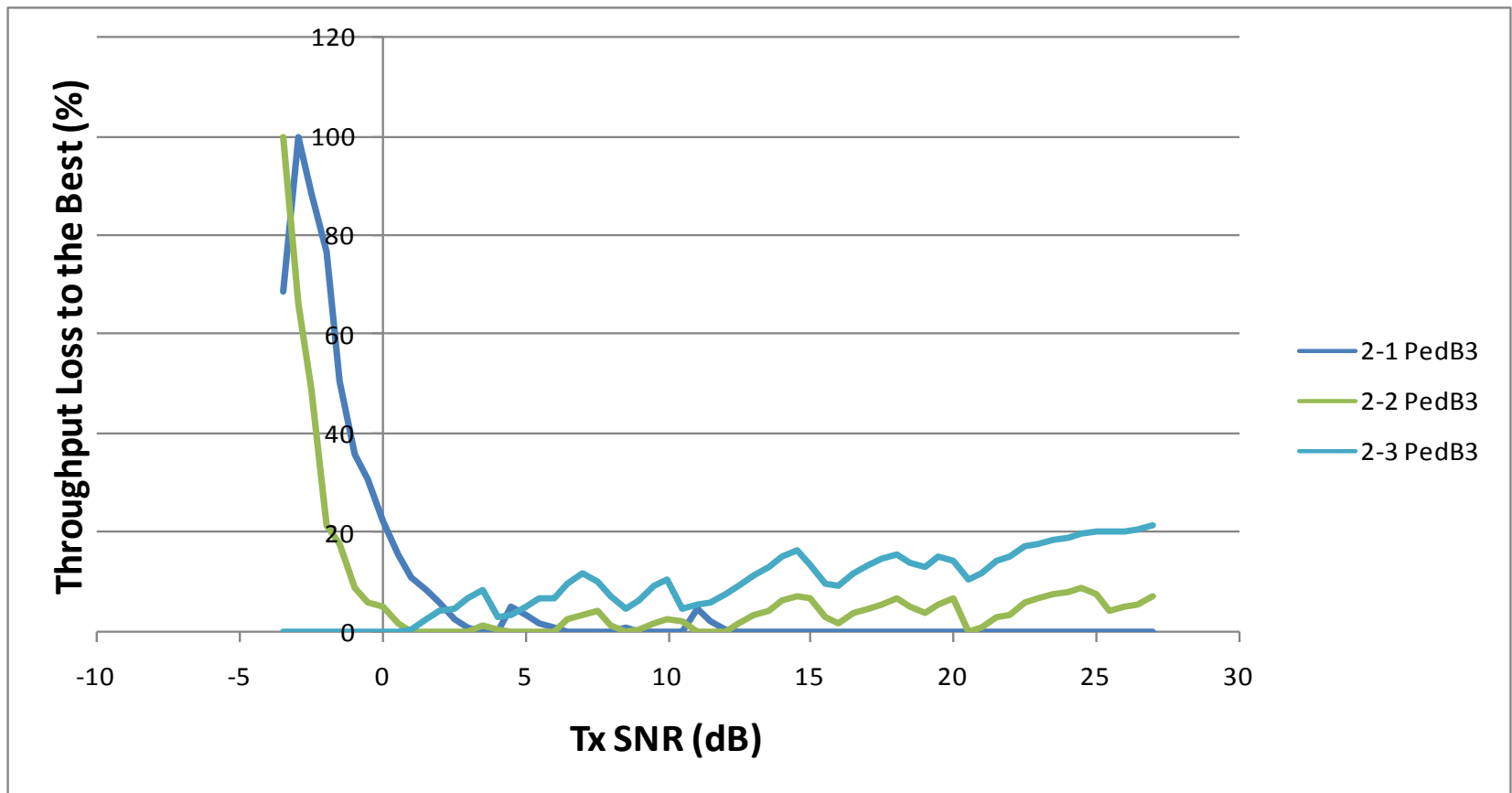
- Data Rate in Ped B 3km/h



Two Streams Case

: Simulation Results

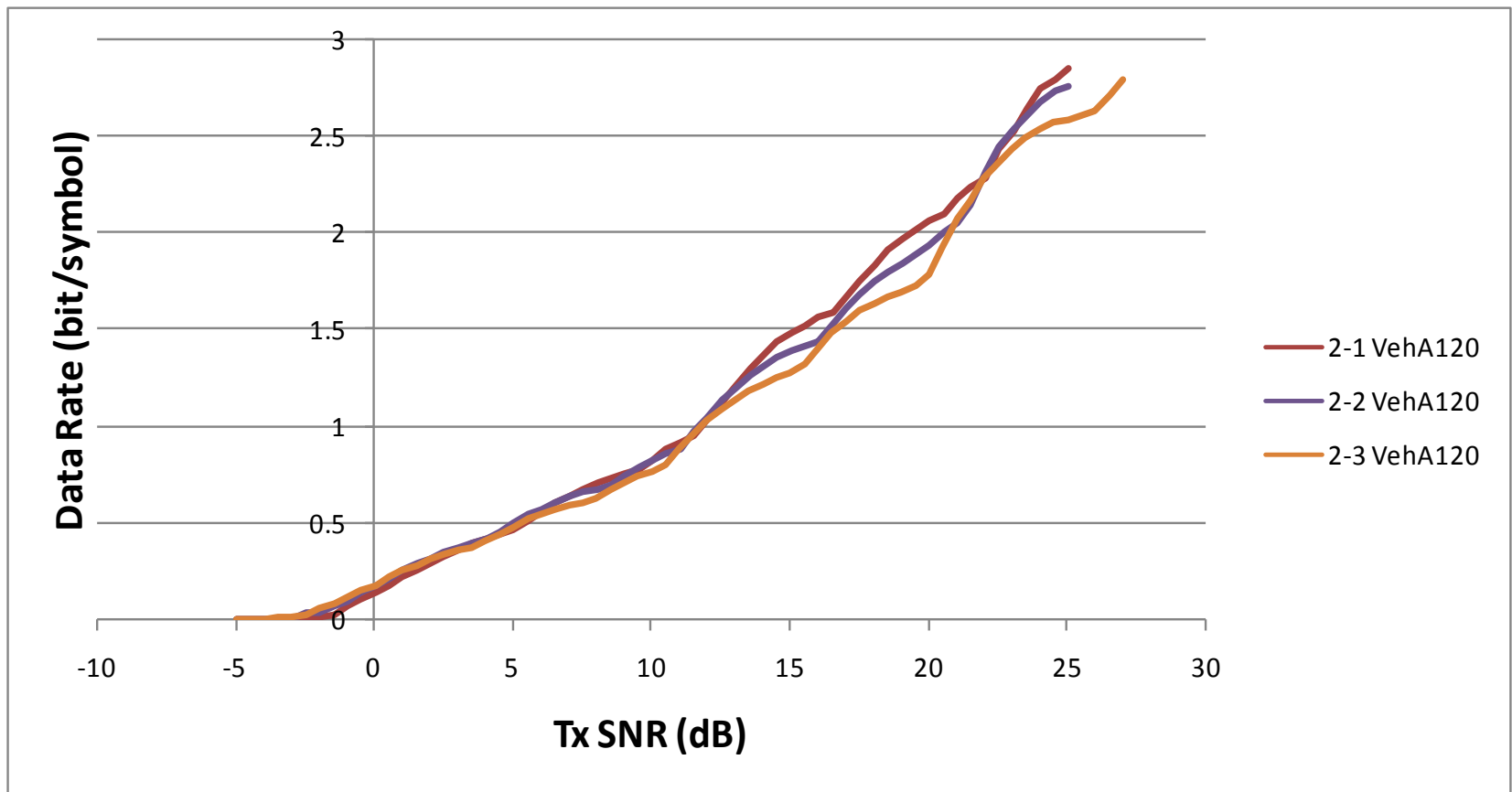
- Throughput Loss to Best in Ped B 3km/h



Two Streams Case

: Simulation Results

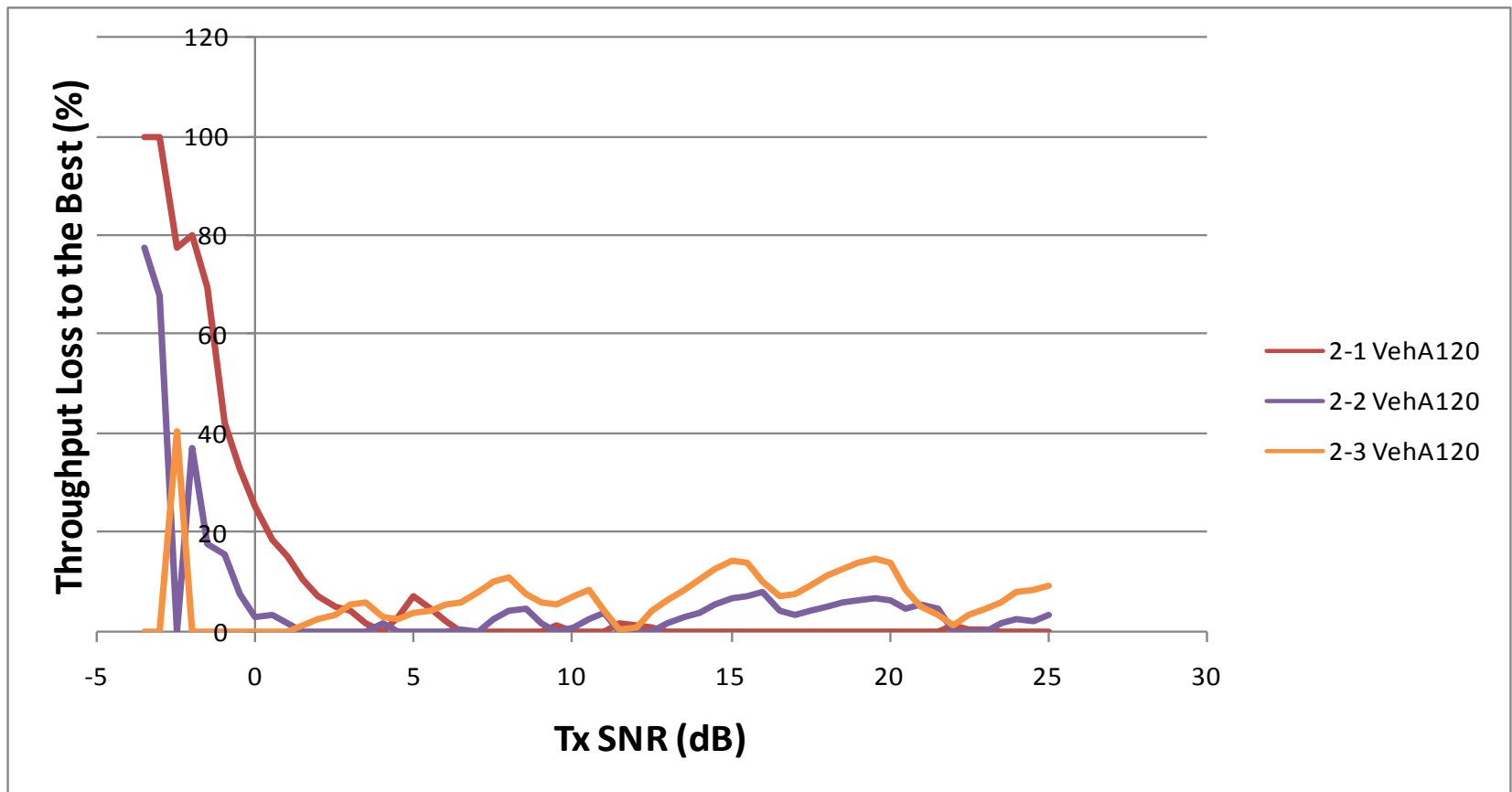
- Data Rate in Veh A 120km/h



Two Streams Case

: Simulation Results

- Throughput Loss to Best in Veh A 120km/h



Observations

- One Stream Case
 - Option 1-1 is best for given conditions
 - In slow time varying, all options show same performance
 - In fast time varying, option 1-1 shows better performance
- Two Streams Case
 - Option 2-1 is best for given conditions
 - Note that 2-1 is poor in SNR region under 3dB, though
 - Due to lack of pilots in a tile
 - But cell edge users are not likely to operate in 2 streams (2Tx SM or CSM)

Comparisons between Option 1-1 and 1-2

- When option 2-1 is used for two streams

Choice	Option 1-1	Option 1-2
Pros	<ul style="list-style-type: none">- Better CH. Est. performance for ideal assumptions- Same pilot position for stream 1 & 2	<ul style="list-style-type: none">- Better for pilot power boosting- Better CH. Est. performance for non-ideal assumptions*
Cons	<ul style="list-style-type: none">- Inefficiency for pilot power boosting	<ul style="list-style-type: none">- Different rules for alloc/de-alloc of data (higher complexity)

* See Appendix

Proposed Text

- *Insert the following text and figure into latest SDD document (IEEE802.16m-08/003r6)*

----- *Text start* -----

11.6.4 Uplink Physical Structure for Legacy Support

11.6.4.1 Distributed Resource Unit for 16m PUSC

Unlike a DRU structure defined in 11.6.1.1, a DRU in 16m PUSC contains six tiles which size is $4 \times N_{\text{sym}}$ where N_{sym} depends on the subframe type. Figure 46 shows a tile structure when a subframe has 6 symbols. *Pilot pattern is TBD.*

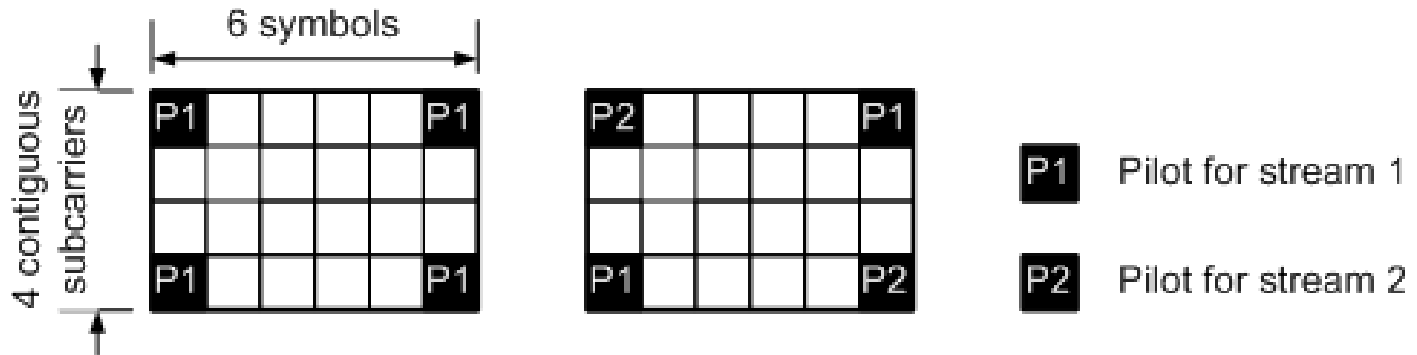


Figure 46 Tile structure in 16m PUSC

----- *Text End* -----

Appendix

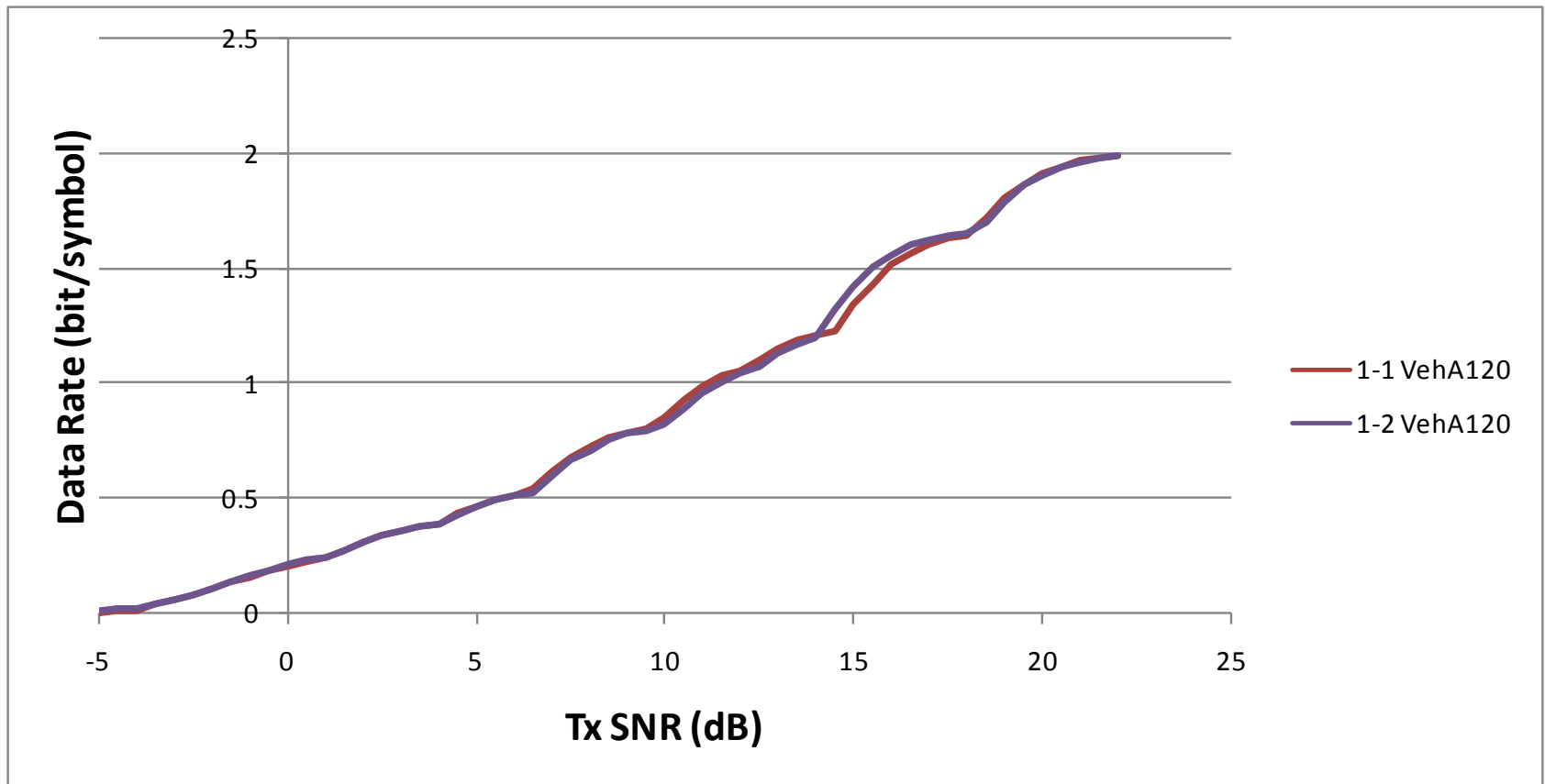
: Imperfect 2D MMSE Estimator

- For 2D MMSE Estimator
 - Delay profile and Velocity Info are required
 - Fixed delay profile as
 - Exponential decay with 6 taps within 5us
 - Fixed velocity of MS as
 - 60km/h

One Stream Case

: Simulation Results

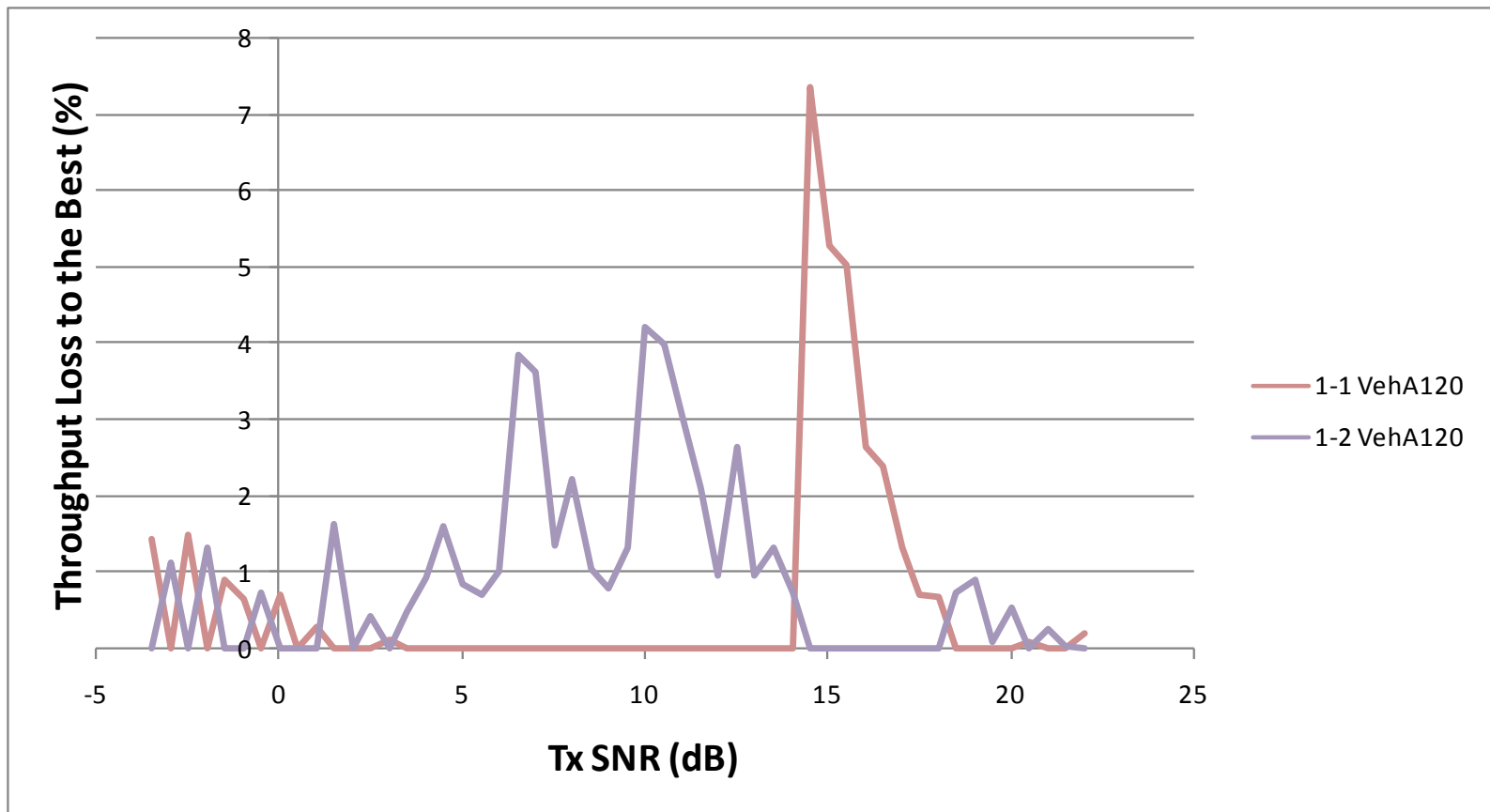
- Data Rate in Veh A 120km/h



One Stream Case

: Simulation Results

- Throughput Loss to Best in Veh A 120km/h



Observations

- Optimal Pilot Pattern
 - Could be different with different conditions
- For given conditions
 - Option 1-2 is better in some SNR region