

# Downlink open-loop single user MIMO

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Wookbong Lee, Bin-Chul Ihm

LG Electronics

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E-mail: [wbong@lge.com](mailto:wbong@lge.com), [bcihm@lge.com](mailto:bcihm@lge.com)

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Abstract:

Comment for DL OL-SU-MIMO

Purpose:

Discussion and adoption

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# OL SU-MIMO structure

- $\mathbf{P}(k) = \mathbf{D}(k)\mathbf{W}(k)$ .

- $$\mathbf{D}(k) = \begin{bmatrix} e^{j\theta_0 k} & 0 & \dots & 0 \\ 0 & e^{j\theta_1 k} & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \dots & e^{j\theta_{(N_T-1)} k} \end{bmatrix}$$

- Examples of  $\theta$  :  $\theta_1 = 0$ ,  $\theta_1 = -2*\pi/N_{fft}*D$ ,  $\theta_2=2*\theta_1$ ,  $\theta_3 =3*\theta_1$

- Examples of  $\mathbf{W}(k)$

- Hadamard Matrix

- DFT based codebook size = 16

- Antenna hopping matrix size = 6

- $k, u$  are defined in physical subcarrier index

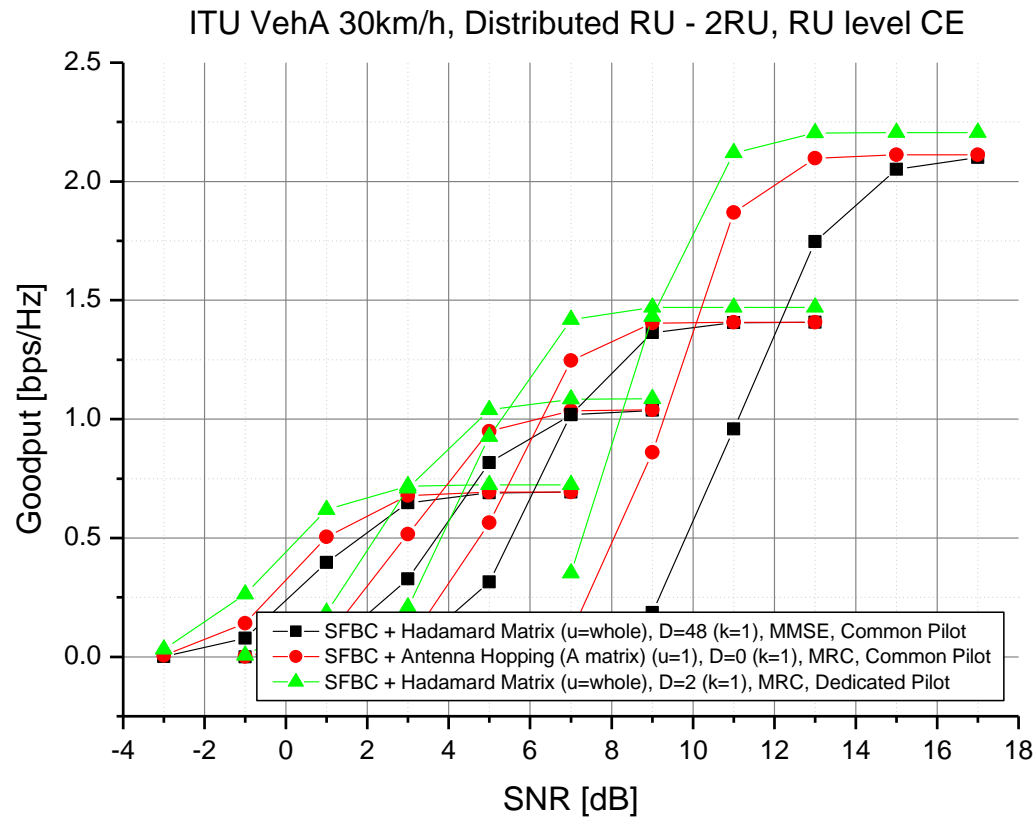
- If  $k = 1$ , then it is same as physical subcarrier index

- If  $u = 18$ , then it is same granularity as PRU

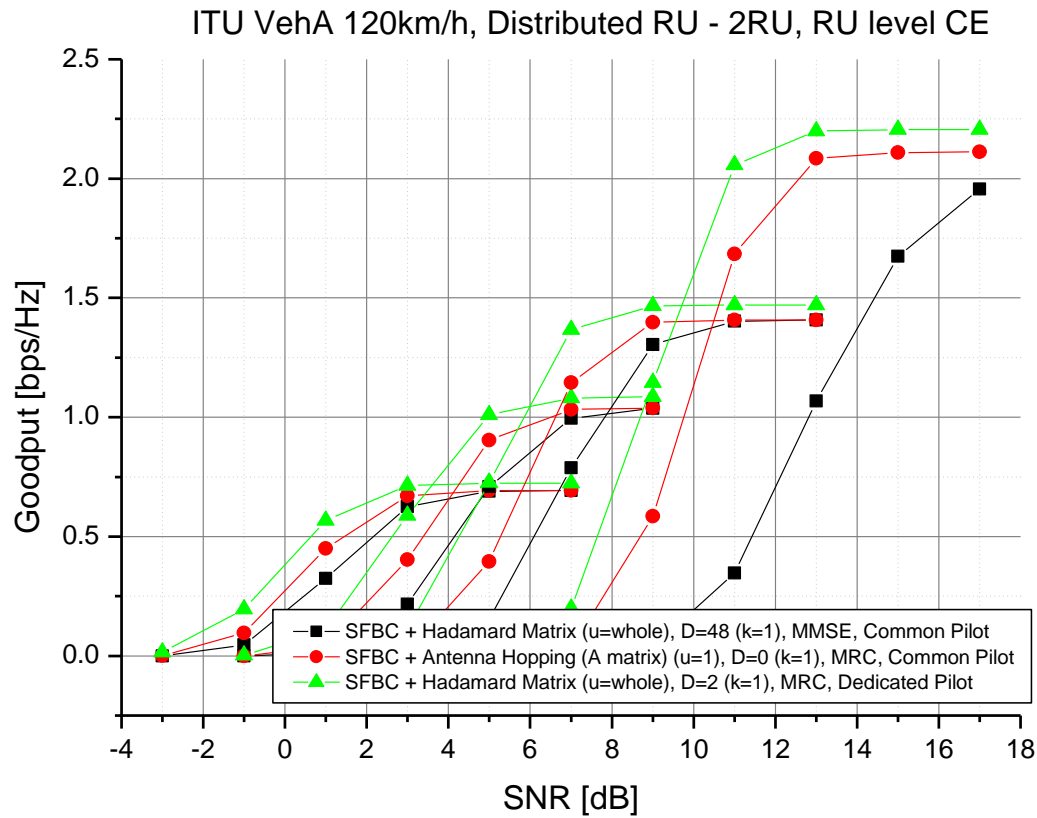
# Simulation assumptions

- ITU VehA 30km/h and 120km/h
- MRC or MMSE receiver and MLD receiver
- QPSK  $\frac{1}{2}$  , QPSK  $\frac{3}{4}$  , 16QAM  $\frac{1}{2}$  , 16QAM  $\frac{3}{4}$  with Turbo code (Difficult to simulate with current version of CTC)
- 2D MMSE channel estimator with 1 RU granularity
- 2 subcarrier level permutation (SFBC support)
- Assume whole band is available for distributed permutation
- Zero Correlated Channel
- For common pilot, we use 14.8% pilot overhead pilot pattern
- For dedicated pilot, we use 11.1% pilot overhead pilot pattern

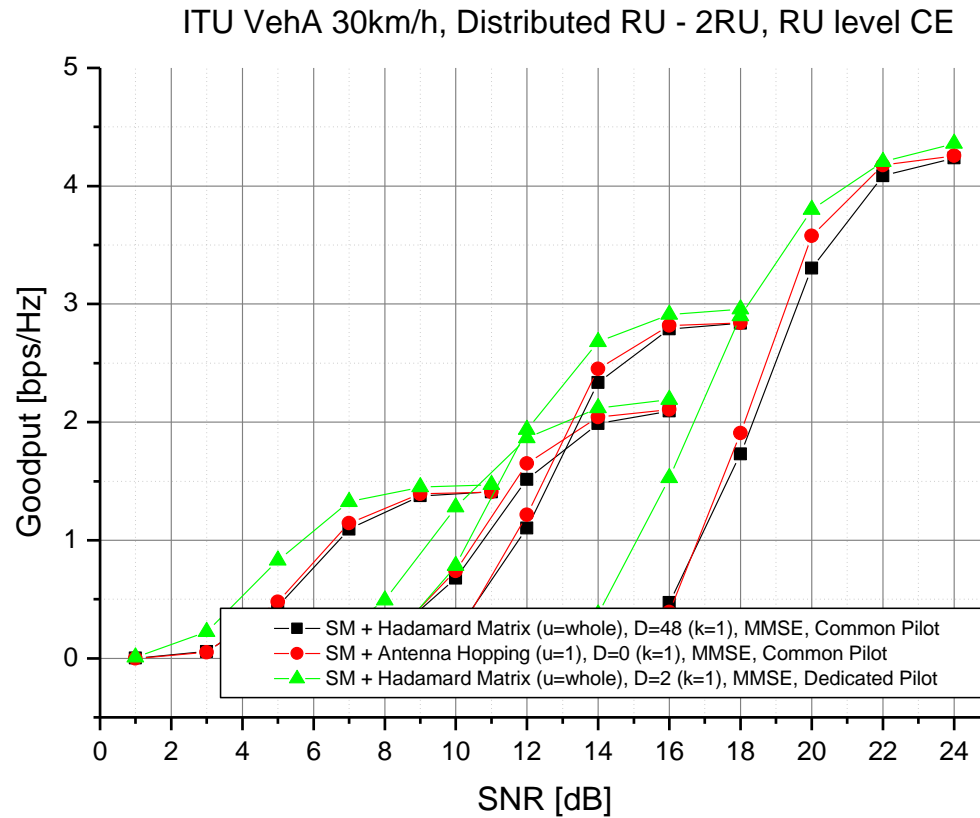
# Rate 1 Comparison : ITU VehA 30km/h



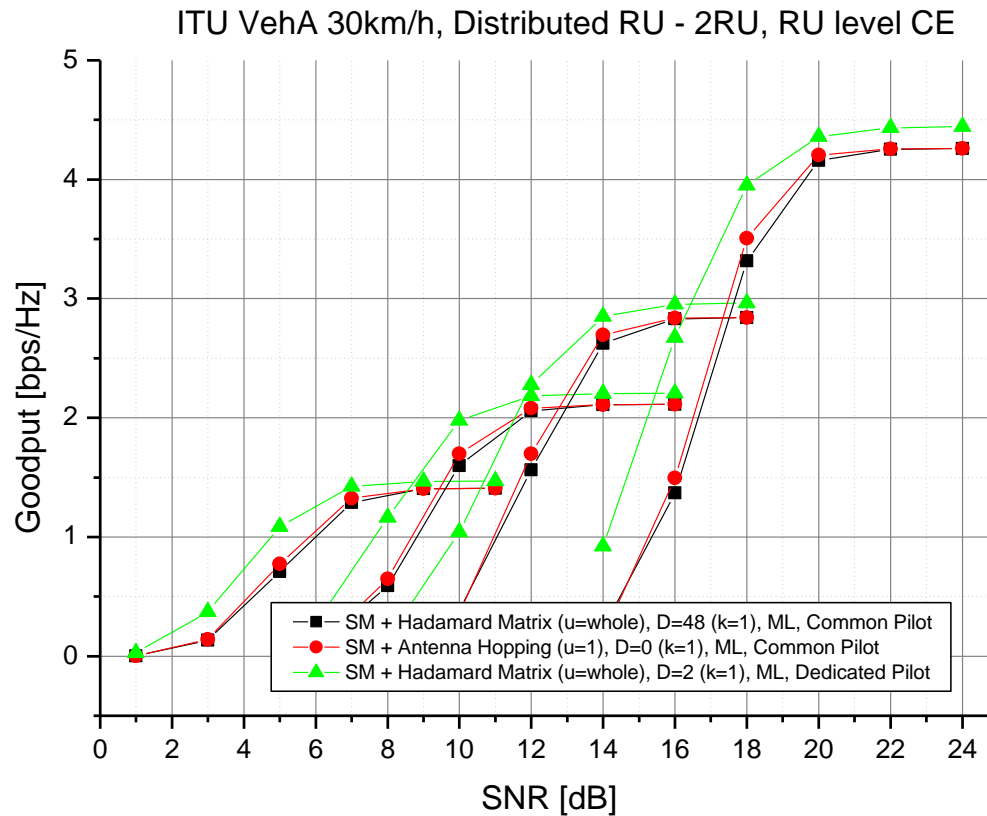
# Rate 1 Comparison : ITU VehA 120km/h



# Rate 2 Comparison : ITU VehA 30km/h, MMSE receiver

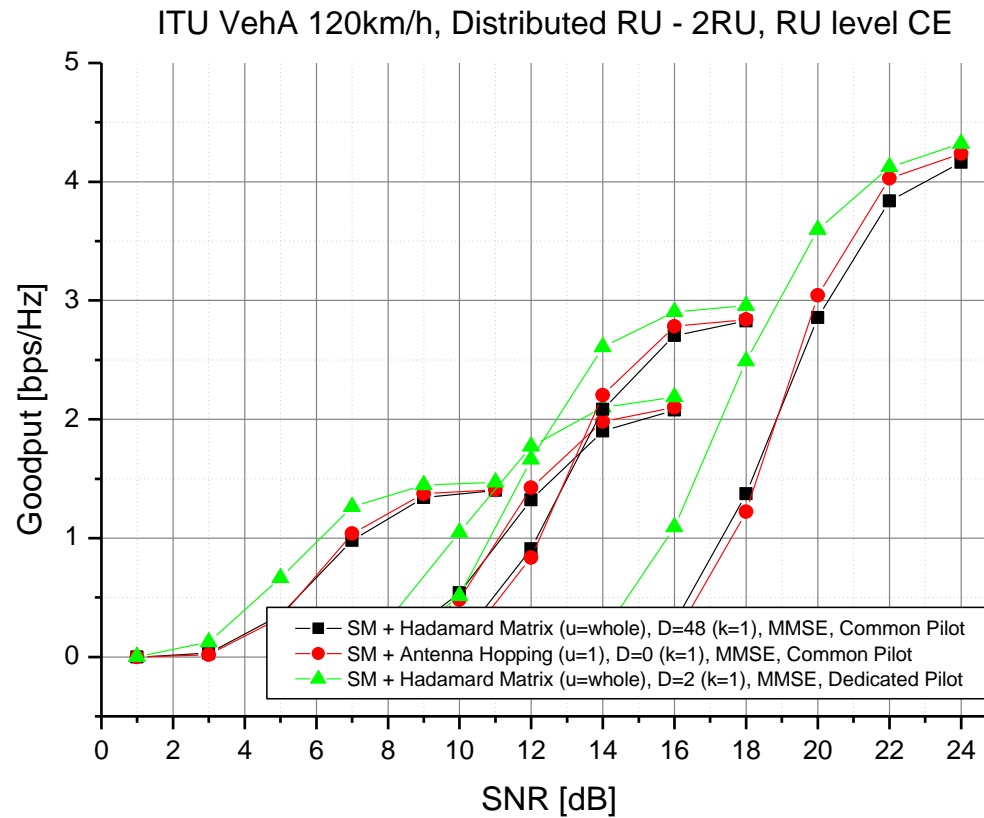


# Rate 2 Comparison : ITU VehA 30km/h, ML receiver



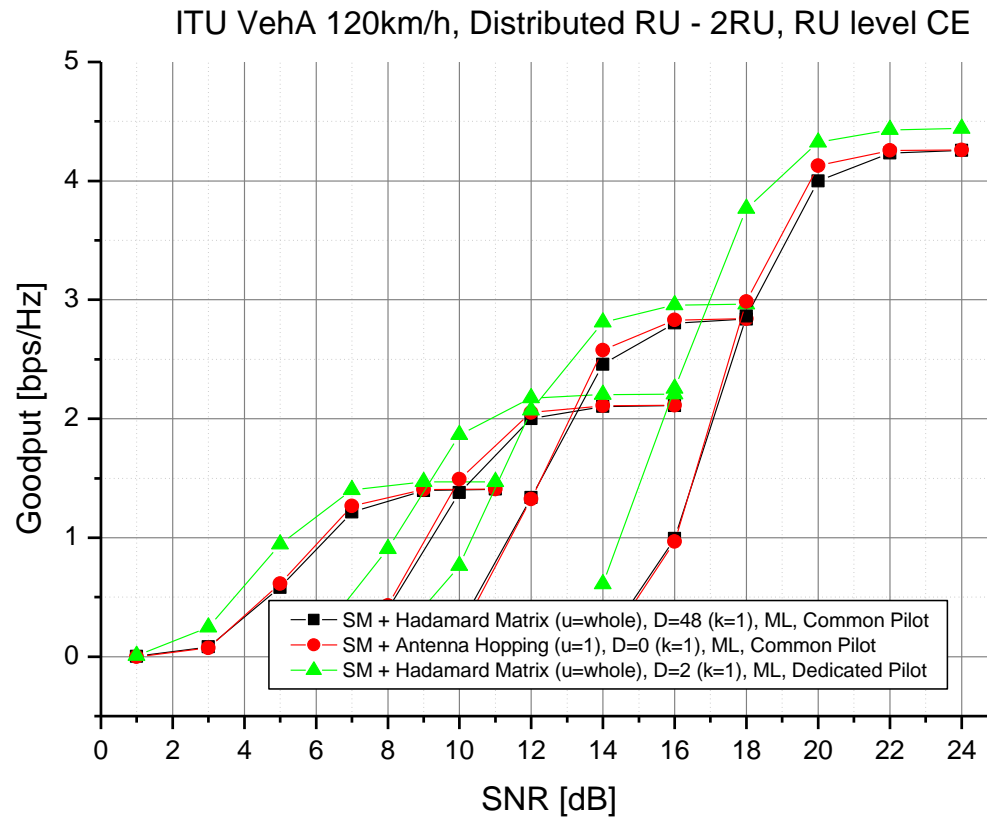
# Rate 2 Comparison : ITU VehA

## 120km/h, MMSE receiver





# Rate 2 Comparison : ITU VehA 120km/h, ML receiver



# Suggestions

- Precoded pilot can get pilot overhead reduction gain
- For 8Tx OL-SU-MIMO system, 8Tx common pilot introduces too much overhead
- For multiplexing different rank preferred MS, make two DRUs, one for 2Tx pilot zone and one for 4Tx pilot zone
  - How to multiplexing these two DRUs are FFS (FDM or TDM)

# Remedy

- *Line 38, page 4, Add the following text;*
  - Demodulate pilot is precoded. For closed-loop SU-MIMO, the number of pilot is same as number of streams. For MU-MIMO, the number of pilot is same as number of MS. For open-loop SU-MIMO in localized permutation zone, the number of pilot is same as number of streams. For open-loop SU-MIMO in distributed permutation zone, the number of pilot is either two or four depending on MS multiplexing.