

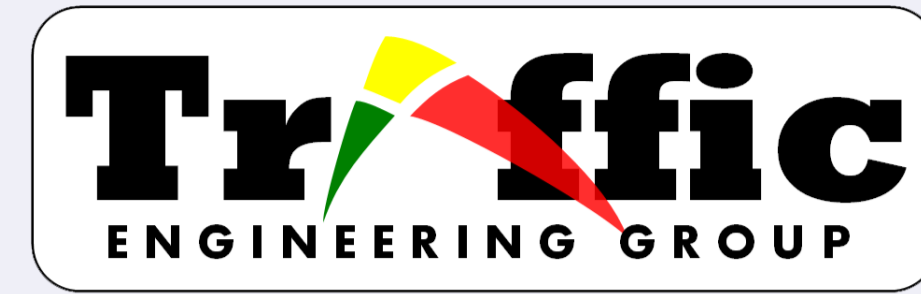
Modelling Motorway Gap Distribution for Evaluating Merging Opportunity of CAVs from Dedicated Lanes.

高速道路における専用車線からの協調型自動運転車合流機会の評価のためのギャップ分布モデリング

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<http://www.transport.iis.u-tokyo.ac.jp/>

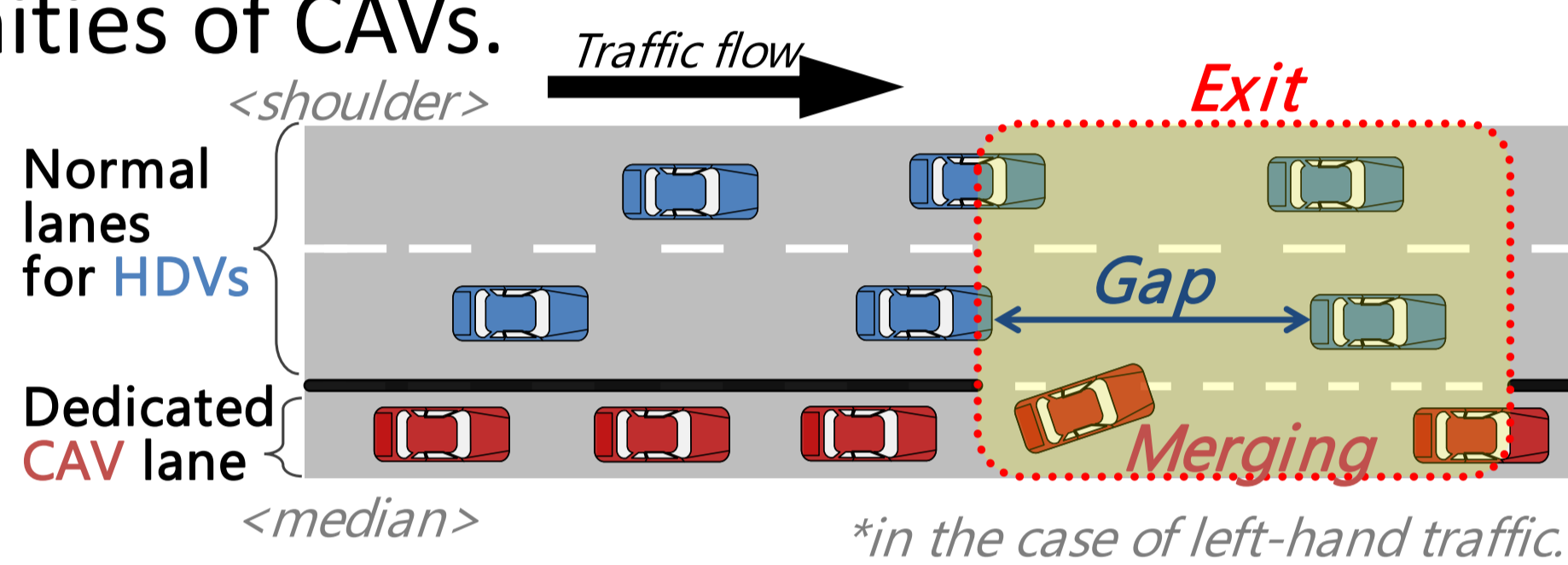
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1. Introduction

- A possible way to early introduce Connected-and-Automated-Vehicles (CAVs) is to provide dedicated CAV lanes.
- At an exit of dedicated lane, CAVs must merge into human driven vehicles (HDVs).

Objective: Utilize gap distributions of HDVs with different traffic conditions to evaluate the merging opportunities of CAVs.

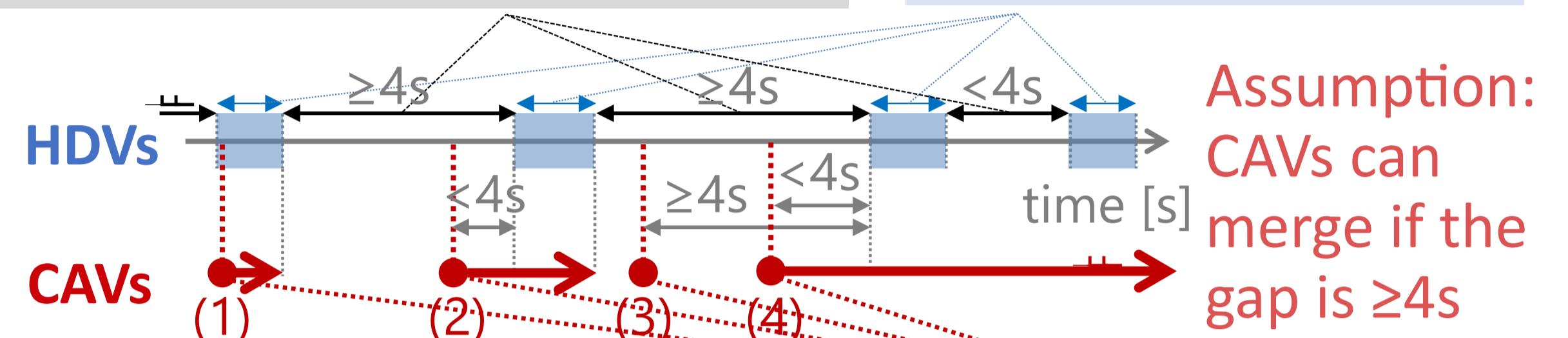


2. Methodology

Gap distribution

- Combined gamma model
 $f(t) = \varphi * g(t) + (1 - \varphi) * h(t)$

Occupancy Time distribution
- Gamma model

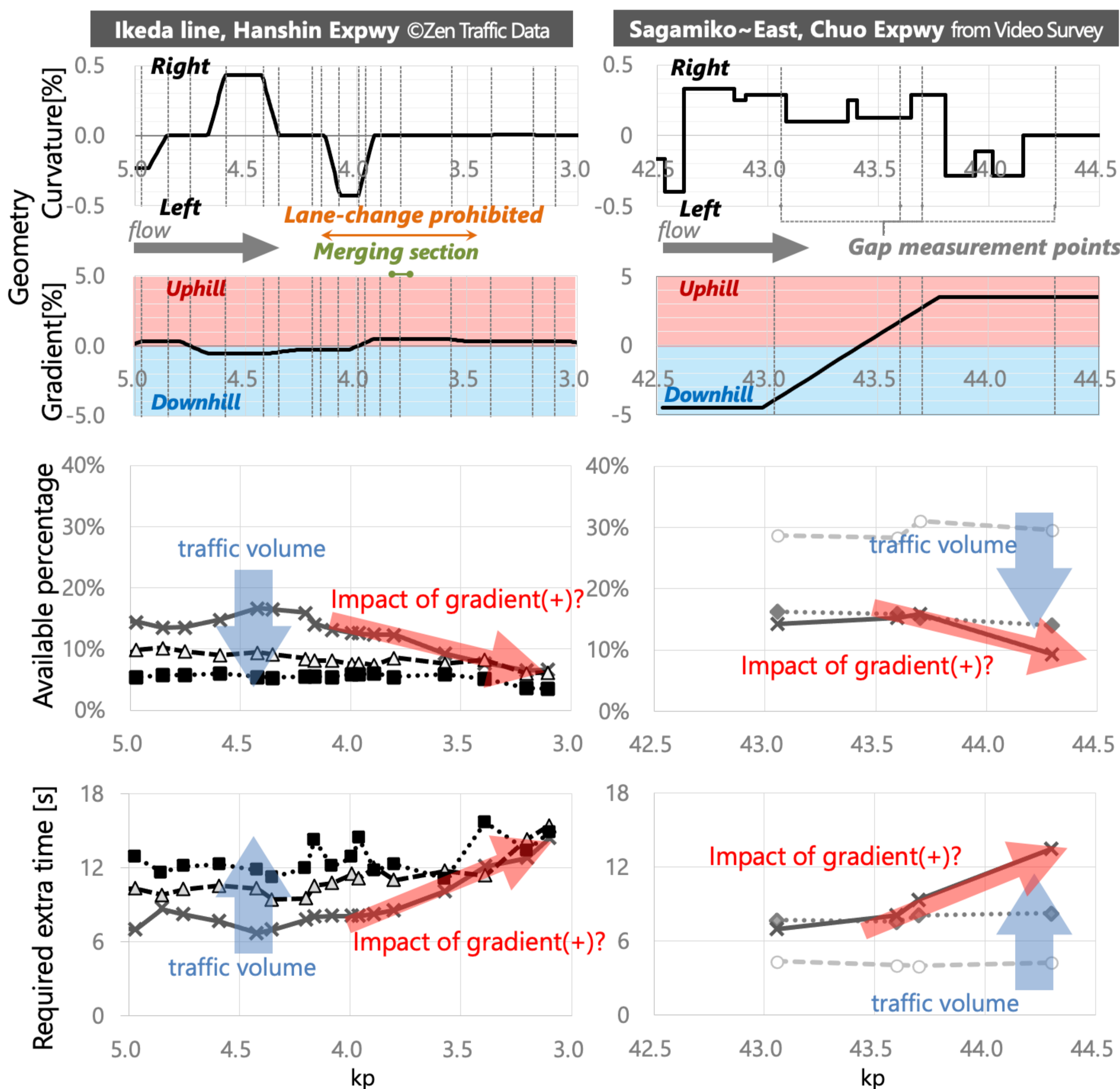


Available percentage
% of gaps longer than the critical gap (4 s)

Required Extra Time
Extra duration a CAV needs, to merge from dedicated CAV lane into HDVs' normal lane

Merging opportunity Evaluation (at a location)

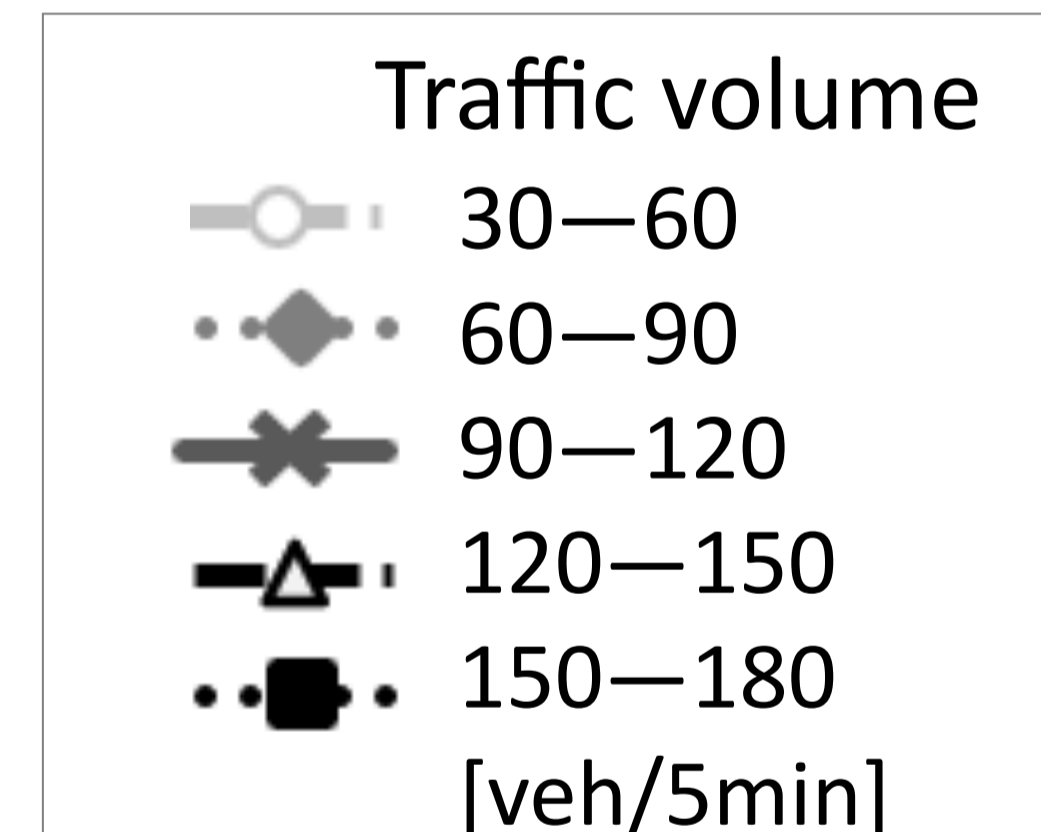
3. Results and Discussion



- Uncongested conditions only.

(Average 5min velocity is $\ge 60\text{km/h}$ on Hanshin Expwy; $\ge 80\text{km/h}$ on Chuo Expwy)

- Small vehicles only.



Higher traffic

- CAVs have difficulties to merge.
- Exit must be carefully designed & operated. (merging lane, V2I to monitor HDVs, etc.)

90—120veh/5min

- Exit should be avoided at long-stretch uphill due to less merging opportunities.

Lower traffic

- Merging opportunities are not much influenced by geometry.

4. Summary

- The impacts of a positive gradient on gap distributions seems to depend on the traffic volume conditions.
- Current conclusions are based on the limited samples, further validation must be done.