**Mathematics support**

**5.5.1 the performance VS the distribution of bandwidth for each hop**

Mathematics support: We utilize 10MHZ for two hops, when bandwidth is uniform distribution, then the performance of this system is the best.

(1)

: signal to noise power.

: receiving power.

: summary of interference power.

: noise power.

(2)

: path loss.

: amplititude.

: distance.

Empirically, the relation between the average received power and the distance is determined by the expression where is called the path loss exponent.

**5.5.2 Hata model:**

(3)

: path loss in areas.

: height of base station antenna.

: distance between the base station and mobile stations.

Shannon limit:

(4)

: capacity.

: bandwidth.

From equation (3),

(5)

(6)

: capacity.

: the packet size.

: number of users.

From equation (1), we control the size of interference so that the interference power source is minimal with a distance of to the receiver. Therefore, the interference power will be smaller than and we denote it as , and we set (7). We place equation (1) into (5), and get

（8）

in order to fulfil the equality in equation (8),

(9)

Therefore, the value of of the receivers with the fulfil the requirement is within a range.

(10)

In case of two hops: (11), and if

resource is reused for the second hop: (11).

(12)

because of (13),

(13)

Therefore, a maximal coverage can be calculated as:

Maximize

(14)

s.t. and .

To differentiate the objective function w.r.t

(15)

If , then only if , so

(16)

For conclusion, that is why the performance of the uniform distribution is the best.

**5.5.3 the performance VS times of hop**

Mathematics support.2 why the performance of two hops in V2V communication is better than the performance of utilizing just one hop in V2V communication. Because the difference between two -hops and one-hop communication is concerned about the distance that is .

From equation (12) and equation (16), then get

= (17)

we assume , then get

=(18)

(19)

(20)

because is the MCS efficiency, according to the practical programming, we have applied CQI=11. So , .

For conclusion, under this condition, when the time of hopping is smaller than 3. so the performance is always better than just utilizing one hop.