Экономия бензина

http://depositfiles.com/files/zsxl7kqoq

Tak.ru

Оплаченная Реклама:
- НТВ+ по доступной цене. Бесплатный тест!
- Бесплатные фильмы, музыка, программы
- Зобачев Жлобин
- Дипломные работы
- CARscope.ru: автомобильный журнал
- Наш Родной Малый Седяк
- PlayoD.
- группа континент
- Argentum
- Заработок и бонусы

Archives

понедельник, 28 сентября 2009 г.

3.5 Aggressive Frequency Reuse Technology

3.5.1 3 x 3 Frequency Reuse Pattern

The 3 x 3 frequency reuse pattern can be used in the areas with high traffic. That is, three base stations form a group, and each base station has three cells, so there are 9 cells, which form a frequency reuse cluster. However, the 9 cells use different frequencies. Compared with the 4 x 3 frequency reuse pattern, the intra-frequency reuse distance under the 3 x 3 frequency reuse pattern is small, so on-line interference is greater.

If the available bandwidth is 10MHz and the channel numbers are from 45 to 94, you can use normal 4 x 3 frequency reuse pattern on BCCH. In this case, the frequency ranges from 81 to 94, so 14 channel numbers are available. For TCH, you can use 3 x 3 frequency reuse pattern. In this case, the frequency ranges from 45 to 80, so 36 channel numbers are available.

For the frequency planning under 3 x 3 frequency reuse pattern, see Table:

Frequency planning under 3 x 3 frequency reuse pattern

Frequency group number	A1	B1	C1	A2	B2	C2	A3	B3	C3
Channel number of each frequency group	80	79	78	77	76	75	74	73	72
	71	70	69	68	67	66	65	64	63
	62	61	60	59	58	57	56	55	54
	53	52	51	50	49	48	47	46	45

If 3 x 3 reusing the 10MHz band, you can configure the maximum base station type as S5/5/5, and the frequency reuse degree is 10.

According to previous equations, because the number of base stations is 3 (N = 3), the intra-frequency interference attenuation factor is 3 (q = 3). In this case, the number of the intra-frequency interference sources is 2 at the first layer.

When the bandwidth is 10MHz, the base station type can be configured as S5/5/5 under 3 x 3 frequency reuse pattern. For 4 x 3 frequency reuse pattern, the maximum base station configuration type can only be configured as S4/4/4/. Therefore, network capacity under 3 x 3 frequency reuse pattern is greater than that under 4 x 3 frequency reuse pattern when the bandwidth is the same.

When the number of subscribers in a network is not great, you can use the 3 x 3 frequency reuse pattern to ease the pressure of network capacity. In actual conditions, however, because base stations are irregularly distributed, the antenna height is different, and the coverage area of each base station varies, the interference in the network will increase. In this case, if you intend to obtain better voice quality, you must take some anti-interference measures, such as using frequency hopping and DTX.

The characteristic of the 3 x 3 frequency reuse pattern are as follows:

- The adjustment for network structure is unnecessary.
- The frequencies can be easily grouped and the system capacity is great.
- Compared with 4 x 3 frequency reuse pattern, 3 x 3 frequency reuse pattern brings greater interference, but the overall interference can be controlled to a lower level.
- If frequency hopping is used, adequate bandwidth is needed.

3.5.2 2 x 6 Reuse Pattern

The 2 x 6 frequency reuse pattern is developed from the 4 x 3 frequency reuse pattern. Under the 4 x 3 frequency reuse pattern, you can add anther 2 cells to each base station, so 2 base stations (each base station has 6 60°-sectorized cells) has 12 cells, which form a frequency reuse cluster. In this case, a frequency reuse cluster contains 12 60°-sectorized cells, and this is defined as 2 x 6 frequency reuse pattern.

2 x 6 frequency reuse pattern.

2 x 6 frequency reuse pattern

Under the 2 x 6 frequency reuse pattern, .

Because each cell is 60°-directional cell under 2 x 6 frequency reuse pattern, the interference source of each cell is reduced to 1 at the first layer. In this case, the theoretical C/I can be expressed by the following equation:

Live

Hit

Постоянные читатели

In actual conditions, because base stations are irregularly distributed, the antenna height is different, and the effect from radio environment, the value of C/I cannot be as high as 15.6 dB.

If the available bandwidth is 10MHz, the channel numbers range from 45 to 94, you can also use 2 x 6 frequency reused pattern. Considering the characteristics of the 2 x 6 cellular structures, you can also use the 2 x 6 frequency reuse for BCCH. The frequencies are from 81 to 94, 14 channel numbers in total, and the others are TCH numbers.

For the frequency planning under 2 x 6 frequency reuse pattern, see Table:

Frequency planning under 2 x 6 frequency reuse pattern

Frequency group number	A1	B1	A2	B2	A3	B3	A4	B4	A5	B5	A6	B6
Channel number of each frequency group	94	93	92	91	90	89	88	87	86	85	84	83
	80	79	78	77	76	75	74	73	72	71	70	69
	68	67	66	65	64	63	62	61	60	59	58	57
	56	55	54	53	52	51	50	49	48	47	46	45

As listed in this table, when allocating frequency to the base station, you can select the frequency according to the regularity of {A1, A2, A3, A4, A4, A6} and {B1, B2, B3, B4, B5, B6}. Note that intra-frequency and neighbor frequency cannot be present within the same cell and adjacent cells.

Under the 2 x 6 frequency reuse pattern, you can enhance the system capacity by adding new cells to the base station. Compared with 4 x 3 frequency reuse pattern, the maximum base station type can be configured as S4/4/4/4/4/4 under 2 x 6 frequency reuse pattern, so the capacity of a single base station is twice that of the base station under the 4 x 3 frequency reuse pattern.

Under this frequency reuse pattern, however, the intra-frequency reuse distance is further shortened, which increases network interference greatly. In addition, as the number of cells increases, the requirements on the half-power angle and other antenna indexes are higher. Moreover, you must add antenna feeders to the system if using the 2 x 6 frequency reuse pattern, which brings great difficulty to project implementation. Therefore, the 2 x 6 frequency reuse pattern is seldom used.

For the 2 x 6 frequency reuse pattern, the frequency reuse degree is 12.5. And its characteristics are listed in the following:

- Through add more cells to each base station, you can enhance the capacity of the base station greatly.
- The antennas with smaller half-power angle and good performance are needed and the requirement on antenna and base station address is strict.
- The signals radiated by antennas are more concentrated, which is good for indoor coverage.
- The BSS system must support 6 sectors.
- More antennas are needed under the 2 x 6 frequency reuse pattern than that under 4 x 3 frequency reuse pattern, so you must adjust and optimize the planning for antenna system and frequencies.
- The times of handovers under the 2 x 6 frequency reuse pattern are more than that under the 4 x 3 frequency reuse pattern.
- The intra-frequency reuse distance is small, so the interference within the network is great. Therefore, you must take anti-frequency measures, such as using DTX and frequency hopping.

3.5.3 2 x 3 Frequency Reuse Pattern

Under 2 x 3 frequency reuse pattern, there are 2 base stations. Each one has 3 cells, so 6 cells form a frequency reuse cluster. The cells in the same cluster use the different frequencies, and the cells in different clusters use the same frequency group. This is defined as the 2 x 3 frequency reuse pattern.

2 x 3 frequency reuse pattern:

Under 2 x 3 frequency reuse pattern, each intra-frequency cell is interfered by 3 cells. Because the number of base stations in each frequency cluster is 2 (N = 2), the intra-frequency interference attenuation factor (q) can be expressed by the following equation:

For regularly-arranged cells, the theoretical carrier-to-interference ratio (C/I) can be expressed by the following equation:

Even if the cells are regularly arranged, however, the value of C/I cannot meet the requirement of the network. Therefore, you must take anti-frequency measures, such as frequency hopping, power control, and DTX

For 10MHz bandwidth, the available channel numbers are from 45 to 94. If the 14 channel numbers (81-94) are BCCH numbers, and the others are TCH numbers, the frequencies are planned according to 2 x 3 frequency reuse pattern.

Frequency planning under 2 x 3 frequency reuse pattern

Frequency group number	A1	B1	A2	B2	A3	B3
	80	79	78	77	76	75
	74	73	72	71	70	69

Channel number of each frequency group	68	67	66	65	64	63
	62	61	60	59	58	57
	56	55	54	53	52	51
	50	49	48	47	46	45

You can use looser 4 x 3 frequency reuse pattern and allocate 14 channel numbers for BCCH. If the bandwidth is 10MHz, you can configure the maximum base station type as S7/7/7 under the 2 x 3 frequency reuse pattern. In this case, the frequency reuse degree is 7.14.

The network capacity is great under the 2 x 3 frequency reuse pattern, but small intra-frequency reuse distance will cause great interference. In addition, the cell traffic cannot 100% reach the designated value. In actual conditions, therefore, you can use the looser 4 x 3 frequency reuse pattern for BCCH and the 2 x 3 frequency reuse pattern for TCH.

The characteristics of the 2 x 3 frequency reuse pattern are listed below:

- The network capacity is relatively great.
- The adjustment for the network structure is unnecessary.
- The network capacity can be expanded without wide frequency band.
- Small intra-frequency reuse distance will cause great interference, so you must take anti-interference measures to ensure network quality.
- Radio frequency (RF) hopping technology must be used to support the equipments.
- The antennas must be directed to the same direction as much as possible.

3.5.4 1 x 3 Frequency Reuse Pattern

1 x 3 frequency reuse pattern is also called fractional reuse. For 1 x 3 or 1 x 1 frequency reuse pattern, the reuse distance is quite small, so the interference in the network is quite great. Therefore, to avoid frequency collision, you must use RF hopping technology and set the parameters, including MA (mobile allocation), HSN (hopping sequence number), and MAIO (mobile allocation index offset). The ratio of number of the TRXs to that of the frequency hopping is FR LOAD (generally, it is smaller than 50%).

Under the 1 x 3 frequency reuse pattern, the interference in the network can also indicates the probability of the collision of intra-frequencies and neighbor frequencies. Emulation shows that probability of the collision is related to FR only.

According to 1 x 3 frequency reuse pattern, the 3 cells of a base station form a frequency reuse cluster. The same-directional cells of each base station use the same frequency group.

1 x 3 frequency reuse pattern.

For the 1 x 3 frequency reuse pattern, the number of base station is 1 (N = 1), so , and .

Because the value of C/I here is far lower than the protection value required by the system, you must take anti-interference measures, such as frequency hopping, power control, and DTX, to enhance the value of C/I.

If the available bandwidth is 10MHz, the available channel numbers are from 45 to 94. Because RF hopping must be used under 1 x 3 frequency reuse pattern, considering the importance of BCCH, you can use 4 x 3 frequency reuse pattern for BCCH and 1 x 3 frequency reuse pattern for TCH.

For BCCH, 14 channel numbers (81-94) are available; for TCH, 36 channel numbers (45-80) are available.

The channel numbers used for TCH are divided according to two ways. They are space grouping and sequence grouping. For the 1 x 3 frequency reuse spacing grouping, see Table:

1 X3 frequency reuse space grouping (a)

Frequency group number	Channel number	MAIO
A	80, 77, 74, 71, 68, 65, 62, 59, 56, 53, 50, 47	0, 2, 4,6, 8, 10
B	79, 76, 73, 70, 67, 64, 61, 58, 55, 52,49, 46	1, 3, 5, 7, 9, 11
C	78, 75, 72, 69, 66, 63, 60, 57, 54, 51, 48, 45	0, 2, 4, 6, 8, 10

For the 1 x 3 frequency reuse sequence grouping, see Table:

1 x 3 frequency reuse sequence grouping (a)

Frequency group number	Channel number	MAIO
A	80, 79, 78, 77, 76, 75, 74, 73,72, 71, 70, 69	0, 2, 4, 6, 8, 10
B	68, 67, 66, 65, 64, 63, 62, 61, 60, 59, 58, 57	0, 2, 4, 6, 8, 10
C	56, 55, 54, 53, 52, 51, 50, 49, 48, 47, 46, 45	0, 2, 4, 6, 8, 10

Because the ratio of the number of carriers to that of frequency hopping is required to be 1 to 2, if the bandwidth is 10MHz, you can configure the maximum base station type as

S7/7/7. In this case, the frequency reuse degree is 7.14.

The 3 cells of the same base station use the same HSN, and the cells of different base stations use different HSNs. To avoid the interference from neighbor frequencies, you can configure a proper MAIO for the cells of the same base station.

If the available bandwidth is 6MHz, the available channel numbers are from 96 to 124. In this case, you can use 4 x 3 frequency reuse pattern for BCCH (the available channel numbers are from 111 to 124, namely, 14 in total). For TCH, you can use 1 x 3 frequency reuse pattern (the available channel numbers are from 96 to 110, namely, 15 in total.

For the 1 x 3 frequency reuse space grouping when the bandwidth is 6MHz, see Table:

1 x 3 frequency reuse space grouping (b)

Frequency group number	Channel number	MAIO
A	96, 99, 102, 105, 108	0, 2, 4
B	97, 100, 103, 106, 109	1, 3
C	98, 101, 104, 107, 110	0, 2

When the bandwidth is 6MHz, you can configure the maximum base station type as S4/3/3 under 1 x 3 frequency reuse space grouping. In this case, the frequency reuse degree is 7.25/9.67/9.67, with 8.86 in average.

For the 1 x 3 frequency reuse sequence grouping, see Table:

1 x 3 frequency sequence grouping (b)

Frequency group number	Channel number	MAIO
A	96, 97, 98, 99, 100	0, 2
B	101, 102, 103, 104, 105	0, 2
C	106, 107, 108, 109, 110	0, 2

Because the ratio of the number of carriers to that of frequency hopping is required to be 1 to 2, if the bandwidth is 6MHz, you can configure the maximum base station type as S3/3/3. In this case, the frequency reuse degree is 9.67.

For TCH, both the space grouping and sequence grouping have drawbacks. Generally, for the urban areas where base stations are regularly and densely distributed, you should better use sequence grouping. For the areas where base stations are fragmentary and irregularly distributed, you should better use space grouping.

The characteristics of 1 x 3 frequency reuse pattern are listed below:

- The frequencies are more aggressively reused, so the network capacity is great.
- The network capacity under space grouping is a little greater than that under sequence grouping.
- When planning a network, you need to plan channel numbers for BCCH only.
- Re-planning for frequencies is unnecessary during network optimization.
- The efficiency for network planning is high.
- Wideband combiner must be used, but the cavity combiner with frequency selectivity is inapplicable.
- This frequency reuse pattern requires wideband repeater.
- The interference among intra-frequencies and neighbor frequencies increases as the frequency reuse distance decreases.
- RF hopping must be used, and the channel numbers participating frequency hopping is twice that of the number of carriers at least.
- In actual conditions, you cannot take anti-interference measures, such as RF hopping, DTX, and power control, for BCCH. Therefore, to ensure network quality, you can use the looser 4 x 3 frequency reuse pattern for BCCH only.

3.5.5 1 x 1 Frequency Reuse Pattern

One cell of one base station forms a frequency reuse cluster, and this is defined 1 x 2 frequency reuse pattern. Other cells and this cell use the same frequency group.

If the available bandwidth is 6MHz, the available channel numbers are from 96 to 124. Because RF hopping must be used under 1 x 1 frequency reuse pattern, considering the importance of BCCH, you can use 4 x 3 frequency reuse pattern for BCCH and 1 x 1 frequency reuse pattern for TCH.

If 4 x 3 frequency reuse pattern is used for BCCH, the available channel numbers are from 111 to 124, 14 in total. The channel numbers from 96 to 110 are used for TCH, 15 in total.

For the frequency planning under 1 x 1 frequency reuse pattern, see Table:

Frequency planning under 1 x 1 frequency reuse pattern.

Frequency group number	Channel number	MAIO
A	96,97,98,99,100,101,102,103,104,105,106,107,108,109,110	0,2,4
B	96,97,98,99,100,101,102,103,104,105,106,107,108,109,110	6,8

C	96,97,98,99,100,101,102,103,104,105,106,107,108,109,110	10,12

If the bandwidth is 6MHz, you can configure the maximum base station type as S4/3/3/ under 1 x 1 frequency reuse pattern. In this case, the frequency reuse degree is 7.25/9.67/9.67, so the average value is 8.86.

Therefore, the maximum base station configuration under 1 x 1 frequency reuse pattern is the same as that under 1 x 3 frequency reuse space grouping pattern, so is the network capacity.

3.5.6 A + B Frequency Reuse Pattern

The A + B frequency reuse pattern is developed from 1 x 3 frequency reuse pattern. When the bandwidth is narrow but the capacity is great, you can use this frequency reuse pattern. In this case, you must use RF hopping. Under the A + B frequency reuse pattern, the frequencies can be divided into three groups. They are {f1}, {f2}, and {f3}. For frequency planning, see Figure:

A + B frequency reuse pattern

According to A + B frequency reuse pattern, you can increase frequency diversity gain by increasing the number of channel numbers participating frequency hopping within the cell, because the increase of the frequency diversity gain can improve the carrier-to-interference ratio. To avoid interference among intra-frequencies and neighbor frequencies, you can configure a proper MAIO for the cells within the same base station. The probability of the collision of the intra-frequencies and neighbor frequencies will decrease as the number of channel numbers participating frequency hopping increases among cells of different base stations.

If the available bandwidth is 6MHz, the available channel numbers are 96 to 124. For A + B frequency reuse pattern, you must use RF hopping, but the BCCH does not participate in RF hopping. Therefore, in actual planning, to ensure good network quality, you can use looser 4 x 3 frequency reuse pattern for BCCH and A + B frequency reuse pattern for TCH.

If you use 4 x 3 frequency reuse for BCCH, the available channel numbers are 111 to 124, 14 in total, in which two channel numbers are standby ones. For TCH, the available channel numbers are 96 to 110, 15 in total.

For the frequency planning under A + B frequency reuse pattern, see Table:

Frequency planning under A + B frequency reuse pattern

Frequency group number	Channel number	MAIO
A	96, 97, 98, 99, 100, 101, 102, 103, 104, 105	0, 2, 4
B	101, 102, 103, 104, 105, 106, 107, 108, 109, 110	1, 3
C	96, 97, 98, 99, 100, 106, 107, 108, 109, 110	5, 7

When the bandwidth is 10MHz, you can configure the maximum base station type as S4/3/3 under A + B frequency reuse pattern. In this case, the frequency reuse degree is 7.25/9.67/9.67, so the average value is 8.86.

In actual conditions, the irregular distribution of base stations and antenna height may deteriorate the performance of parts of the network. Therefore, the A + B frequency reuse pattern are not recommended in large networks.

Автор: ourdot на 1:11

0 коммент.:

Отправить комментарий

Подпись комментария: Выбрать профиль...

Отправить комментарий Просмотр

Следующее Главная страница Предыдущее

Подписаться на: Комментарии к сообщению (Atom)