

PATENT APPLICATION
DOCKET # 1005-0019

WHAT IS CLAIMED IS:

1 1. A method in a cellular telecommunications
2 network of optimizing a handoff border between a present
3 cell and a neighbor cell, said method comprising the
4 steps of:
5 determining a current hysteresis value utilized to
6 ensure that a mobile station (MS) is receiving a stronger
7 signal from the neighbor cell than the present cell
8 before a handoff is performed from the present cell to
9 the neighbor cell, said stronger signal being stronger by
10 the hysteresis value;
11 collecting pairs of signal strength (SS)
12 measurements from a plurality of MSs operating near the
13 handoff border, each SS measurement pair including an SS
14 measurement from the present cell prior to a handoff and
15 an SS measurement from the neighbor cell following the
16 handoff;
17 calculating a midpoint SS by determining an average
18 SS measurement from the present cell, an average SS
19 measurement from the neighbor cell, and an overall
20 average of the average SS measurement from the present
21 cell and the average SS measurement from the neighbor
22 cell; and
23 optimizing the handoff border by subtracting from
24 the current hysteresis value, an amount approximately
25 equal to the difference between the midpoint SS and the
26 average SS measurement from the present cell.

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1 2. The method of optimizing a handoff border of
2 claim 1 further comprising repeating the steps of claim
3 1 utilizing SS measurements from a greater number of MSs.

1 3. A method in a cellular telecommunications
2 network of optimizing an outgoing hysteresis value
3 utilized for controlling handoff of a mobile station from
4 a present cell to a neighbor cell at a handoff border,
5 said method comprising the steps of:
6 determining a current outgoing hysteresis value;
7 collecting a plurality of signal strength (SS)
8 measurements taken by a plurality of mobile stations
9 operating near the handoff border, said SS measurements
10 including, for each mobile station, a first SS
11 measurement of a signal received by the mobile station
12 from a first base station serving the present cell prior
13 to a handoff, and a second SS measurement of a signal
14 received by the mobile station from a second base
15 station serving the neighbor cell following the handoff;
16 calculating an average SS on the present cell side
17 of the handoff border (CP);
18 calculating an average SS on the neighbor cell side
19 of the handoff border (CN);
20 calculating a midpoint SS between the present cell
21 and the neighbor cell by calculating an average of CP and
22 CN;

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23 calculating an expected signal strength on the
24 present cell side of the handoff border following the
25 handoff (EP) by subtracting a factor due to rounding
26 errors from the midpoint SS; and

27 calculating a recommended hysteresis value for
28 outgoing handoffs from the present cell to the neighbor
29 cell by subtracting from the current outgoing hysteresis
30 value, the difference between EP and CP.

1 4. The method of optimizing an outgoing hysteresis
2 value of claim 3 further comprising updating the outgoing
3 hysteresis value by repeating the steps of claim 1
4 utilizing the most recent SS measurements from MSs in the
5 present cell.

1 5. The method of optimizing an outgoing hysteresis
2 value of claim 3 further comprising fine tuning the
3 outgoing hysteresis value by repeating the steps of claim
4 1 utilizing SS measurements from all of the MSs operating
5 in the present cell.

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1 6. The method of optimizing an outgoing hysteresis
2 value of claim 3 further comprising the steps of:
3 determining whether the recommended hysteresis value
4 is less than or equal to a default hysteresis value; and
5 upon determining that the recommended hysteresis
6 value is less than or equal to the default hysteresis
7 value, utilizing the default hysteresis value to control
8 handoffs.

1 7. The method of optimizing an outgoing hysteresis
2 value of claim 3 further comprising the steps of:
3 determining whether the SS for the present cell is
4 below a predefined threshold for weak signal strength
5 while the SS for the neighbor cell is above a predefined
6 threshold for strong signal strength; and
7 adjusting the current hysteresis value based on the
8 calculated midpoint SS, upon determining that the SS for
9 the present cell is below the weak SS threshold and the
10 SS for the neighbor cell is above the strong SS
11 threshold.

1 8. The method of optimizing an outgoing hysteresis
2 value of claim 7 further comprising adjusting the current
3 hysteresis value based on the measured SS, upon
4 determining that either the SS for the present cell is
5 above the weak SS threshold or the SS for the neighbor
6 cell is below the strong SS threshold.

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1 9. A method in a cellular telecommunications
2 network of optimizing an incoming hysteresis value
3 utilized for controlling handoff of a mobile station from
4 a neighbor cell to a present cell at a handoff border,
5 said method comprising the steps of:

6 determining a current incoming hysteresis value;

7 collecting a plurality of signal strength (SS)
8 measurements taken by a plurality of mobile stations
9 operating near the handoff border, said SS measurements
10 including, for each mobile station, a first SS
11 measurement of a signal received by the mobile station
12 from a first base station serving the present cell prior
13 to a handoff, and a second SS measurement of a signal
14 received by the mobile station from a second base station
15 serving the neighbor cell following the handoff;

16 calculating an average SS on the present cell side
17 of the handoff border (CP);

18 calculating an average SS on the neighbor cell side
19 of the handoff border (CN);

20 calculating a midpoint SS between the present cell
21 and the neighbor cell by calculating an average of CP and
22 CN;

23 calculating an expected signal strength on the
24 neighbor cell side of the handoff border following the
25 handoff (EN) by adding a factor due to rounding errors,
26 and adding an MS output-power step-size factor to the
27 midpoint SS; and

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28 calculating a recommended hysteresis value for
29 incoming handoffs from the neighbor cell to the present
30 cell by subtracting from the current incoming hysteresis
31 value, the difference between EN and CN.

1 10. A method in a cellular telecommunications
2 network of optimizing outgoing and incoming hysteresis
3 values utilized for controlling when a mobile station is
4 handed off between a present cell and a neighbor cell at
5 a handoff border, said method comprising the steps of:
6 determining a current outgoing hysteresis value;
7 determining a current incoming hysteresis value;
8 collecting a plurality of signal strength (SS)
9 measurements taken by a plurality of mobile stations
10 operating near the handoff border, said SS measurements
11 including, for each mobile station, a first SS
12 measurement of a signal received by the mobile station
13 from a first base station serving the present cell prior
14 to a handoff, and a second SS measurement of a signal
15 received by the mobile station from a second base station
16 serving the neighbor cell following the handoff;
17 calculating an average SS on the present cell side
18 of the handoff border (CP);
19 calculating an average SS on the neighbor cell side
20 of the handoff border (CN);
21 calculating a midpoint SS between the present cell
22 and the neighbor cell by calculating an average of CP and
23 CN;

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24 calculating an expected signal strength on the
25 present cell side of the handoff border following the
26 handoff (EP) by subtracting a factor due to rounding
27 errors from the midpoint SS;
28 calculating an expected signal strength on the
29 neighbor cell side of the handoff border following the
30 handoff (EN) by adding the factor due to rounding errors,
31 and adding an MS output-power step-size factor, to the
32 midpoint SS;
33 calculating a recommended hysteresis value for
34 outgoing handoffs from the present cell to the neighbor
35 cell by subtracting from the current outgoing hysteresis
36 value, the difference between EP and CP; and
37 calculating a recommended hysteresis value for
38 incoming handoffs from the neighbor cell to the present
39 cell by subtracting from the current incoming hysteresis
40 value, the difference between EN and CN.