Internal distribution code:
(A) [-] Publication in OJ
(B) [-] To Chairmen and Members
(C) [-] To Chairmen
(D) [X] No distribution

**Datasheet for the decision
of 27 May 2020**

Case Number: T 1059/18 - 3.5.03

Application Number: 12800854.7

Publication Number: 2717625

IPC: H04W36/04, H04W36/32,
H04W36/00, H04W48/12,
H04W48/20, H04W24/02, H04W84/04

Language of the proceedings: EN

Title of invention:
Method and device for cell changing in heterogeneous network

Applicant:
Huawei Technologies Co., Ltd.

Headword:
Cell changing in heterogeneous networks/HUAWEI

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - main request (yes)

Case Number: **T 1059/18 - 3.5.03**

D E C I S I O N
of Technical Board of Appeal 3.5.03
of 27 May 2020

Appellant: (Applicant)	Huawei Technologies Co., Ltd. Huawei Administration Building Bantian Longgang District Shenzhen, Guangdong 518129 (CN)
Representative:	Isarpatent Patent- und Rechtsanwälte Behnisch Barth Charles Hassa Peckmann & Partner mbB Friedrichstrasse 31 80801 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 7 December 2017 refusing European patent application No. 12800854.7 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chair	K. Bengi-Akyürek
Members:	J. Eraso Helguera
	R. Romandini

Summary of Facts and Submissions

I.   The appeal was lodged by the applicant against the
        decision of the examining division refusing the present
        European patent application for lack of inventive step
        with respect to the claims of a main request.

II.   In its decision, the examining division referred *inter
        alia* to the following prior-art documents:

   D1:   Nokia: "HCS measurement rules & high mobility",
             Tdoc RAN WG2 R2-041433, 3GPP TSG-RAN-WG2
             Meeting #43, Prague, CZ, 16th-20th August 2004;

   D4:   WO 2011/013967 A2;

   D6:   Huawei: "Email report on "Home-(e)NB mobility,
             remaining issues", R2-086778, 3GPP TSG-RAN2
             Meeting #64, Prague, CZ, 10th-14th November 2008;

   D13: GB 2 358 550 A.

III.   The appellant requested that the decision under appeal
        be set aside and that a patent be granted on the basis
        of the claims of the main request underlying the
        decision, or, in the alternative, on the basis of the
        claims of either of a first and a second auxiliary
        request, both filed with the statement of grounds of
        appeal.

IV.   Claim 1 of the **main request** reads:

        "A method for cell changing of a user equipment in a
        heterogeneous network, comprising:

determining (101), by the user equipment, a movement state of the user equipment;

determining (102), by the user equipment, a frequency priority order according to the determined movement state, wherein: when the movement state is a high movement state in which the number of cell changes in a specified time exceeds a first threshold, a priority of a frequency used by a cell with a wide coverage in the heterogeneous network is higher than a priority of a frequency used by a cell with a small coverage, and, when the movement state is a low movement state in which the number of cell changes in a specified time is lower than a second threshold, a priority of a frequency used by a cell with a wide coverage in the heterogeneous network is lower than a priority of a frequency used by a cell with a small coverage;

performing (103), by the user equipment, a frequency measurement according to the determined frequency priority order and the determined movement state; and

performing (104), by the user equipment, a cell change according to the determined frequency priority order and a result of the frequency measurement,

wherein the performing (103) the frequency measurement according to the determined frequency priority order and the determined movement state comprises:

when the movement state is the high movement state in which the number of cell changes in the specified time exceeds the first threshold,

if signal strength or signal quality of a current serving cell is greater than a first demarcation, measuring at least one high-priority frequency in the heterogeneous network at intervals of a first specified time; and

if the signal strength or the signal quality of the current serving cell is less than the first demarcation, measuring all frequencies in the heterogeneous network at intervals of the first specified time;

and

when the movement state is the low movement state in which the number of cell changes in the specified time is lower than the second threshold,

if signal strength or signal quality of a current serving cell is greater than a first demarcation,

measuring at least one high-priority frequency in the heterogeneous network at intervals of a first specified time;

if no cell is found at the at least one high-priority frequency in a second specified time, measuring the at least one high-priority frequency at intervals of a third specified time, wherein the third specified time is greater than the first specified time;

after at least one cell is found at the at least one high-priority frequency, measuring the at least one high-priority frequency at intervals of the first specified time; and

if the signal strength or the signal quality of the current serving cell is less than the first demarcation, measuring all frequencies in the heterogeneous network at intervals of the first specified time, and

wherein performing (104) the cell change, comprises: selecting, by the user equipment, a scaling factor corresponding to the current movement state of the user equipment according to a movement state of a user equipment, and scaling a relevant hysteresis used for cell reselection or handover, , [*sic*] and then performing, by the user equipment, the cell change

according to the frequency priority order, the result
of the frequency measurement and the scaled relevant
hysteresis,

wherein the user equipment in the heterogeneous
network uses two sets of scaling factors to scale the
hysteresis, respectively, and the two sets of scaling
factors correspond to the size of a target cell and the
movement state of the user equipment, respectively, and

wherein a first scaling factor among the first set
of scaling factors is determined according to the size
of the target cell for cell changing, and a second
scaling factor among the second set of scaling factors
is determined according to the movement state."

Independent claim 4 of the **main request** reads:

"A user equipment, comprising:
a first determining unit (10), configured to
determine a movement state of the user equipment;
a second determining unit (11), configured to
determine a frequency priority order according to the
movement state determined by the first determining
unit (10), wherein: when the movement state is a high
movement state in which the number of cell changes in a
specified time exceeds a first threshold, a priority of
a frequency used by a cell with a wide coverage in the
heterogeneous network is higher than a priority of a
frequency used by a cell with a small coverage, and,
when the movement state is a low movement state in
which the number of cell changes in a specified time is
lower than a second threshold, a priority of a
frequency used by a cell with a wide coverage in the
heterogeneous network is lower than a priority of a
frequency used by a cell with a small coverage;
a measuring unit (12), configured to perform a
frequency measurement according to the frequency

priority order determined by the second determining
unit (11) and the determined movement state determined
by the first determining unit (10); and

a processing unit (13), configured to perform a cell
change according to the frequency priority order
determined by the second determining unit (11) and a
result of the frequency measurement performed by the
measuring unit (12),

wherein the measuring unit (12) is specifically
configured to:

when the movement state is the high movement state
in which the number of cell changes in the specified
time exceeds the first threshold,

if signal strength or signal quality of a current
serving cell is greater than a first demarcation,
measure at least one high-priority frequency in the
heterogeneous network at intervals of a first specified
time; and

if the signal strength or the signal quality of the
current serving cell is less than the first
demarcation, measure all frequencies in the
heterogeneous network at intervals of the first
specified time;

and

when the movement state is the low movement state in
which the number of cell changes in the specified time
is lower than the second threshold,

if signal strength or signal quality of a current
serving cell is greater than a first demarcation,

measure at least one high-priority frequency in the
heterogeneous network at intervals of a first specified
time; and

if no cell is found at the at least one high-
priority frequency in a second specified time, measure
the at least one high-priority frequency at intervals

of a third specified time, wherein the third specified
time is greater than the first specified time;

measure the at least one high-priority frequency at
intervals of the first specified time after at least
one cell is found at the at least one high-priority
frequency; and

if the signal strength or the signal quality of the
current serving cell is less than the first
demarcation, measure all frequencies in the
heterogeneous network at intervals of the first
specified time, and

wherein the processing unit (13) includes:

a receiving module (135) configured to receive a
hysteresis used for cell changing from a current
serving cell, where the hysteresis is obtained by the
serving cell according to a size of a target cell for
cell changing;

a determining module (136) configured to determine a
scaling factor according to the determined movement
state;

a scaling module (137) configured to scale the
received hysteresis according to the determined scaling
factor; and

a processing module (138) configured to perform the
cell change according to the frequency priority order,
the result of the frequency measurement and the scaled
hysteresis,

wherein the user equipment in the heterogeneous
network uses two sets of scaling factors to scale the
hysteresis, respectively, and the two sets of scaling
factors correspond to the size of the target cell and
the movement state of the user equipment, respectively
and

wherein a first scaling factor among the first set
of scaling factors is determined according to the size
of the target cell for cell changing, and a second

scaling factor among the second set of scaling factors
is determined according to the movement state."

Reasons for the Decision

1.   MAIN REQUEST

1.1   Inventive step (Article 56 EPC)

1.1.1   The board concurs with the decision under appeal and
        with the appellant that the subject-matter of claim 1
        of the main request differs from **D1** at least in that
        (board's emphasis):

        (a) performing the frequency measurement according to
            the determined frequency priority order and the
            determined movement state <u>further</u> comprises:

            when the movement state is the low movement state
            in which the number of cell changes in the
            specified time is lower than the second threshold,

               if signal strength or signal quality of a current
               serving cell is greater than a first demarcation,

                    if no cell is found at the at least one
                    high-priority frequency in a second
                    specified time, measuring the at least one
                    high-priority frequency at intervals of a
                    third specified time, wherein the third
                    specified time is greater than the first
                    specified time;
                    after at least one cell is found at the at
                    least one high-priority frequency,
                    measuring the at least one high-priority

frequency at intervals of the first
specified time,

and in that:

(b) performing the cell change, <u>further</u> comprises:

selecting, by the user equipment, a scaling factor
corresponding to the current movement state of the
user equipment according to a movement state of a
user equipment, and scaling a relevant hysteresis
used for cell reselection or handover, and then
performing, by the user equipment, the cell change
according to the frequency priority order, the
result of the frequency measurement and the <u>scaled</u>
relevant hysteresis,

wherein the user equipment in the heterogeneous
network uses two sets of scaling factors to scale
the hysteresis, respectively, and the two sets of
scaling factors correspond to the size of a target
cell and the movement state of the user equipment,
respectively, and

wherein a first scaling factor among the first set
of scaling factors is determined according to the
size of the target cell for cell changing, and a
second scaling factor among the second set of
scaling factors is determined according to the
movement state.

1.1.2   According to paragraph [0046] of the present
application as published, the technical effect achieved
by feature (a) is that it reduces the number of
measurements carried out when the user equipment is in

a low movement state and stays in gaps between small
cells for a long time.

On the basis of the application, the objective
technical problem associated with feature (a) may be
defined as "how to prevent wasting much battery energy
of the user equipment when performing frequency
measurements."

1.1.3   According to paragraphs [0053] and [0054] of the
        application as published, the technical effect achieved
        by feature (b) is that it adapts the hysteresis to the
        size of the cell and the movement state of the user
        equipment, avoiding thereby early reselection or
        handover and thus ping-pong effects.

        The objective technical problem associated with
        feature (b) may therefore be framed as "how to avoid
        early or late cell changes of the user equipment in the
        heterogeneous network of D1."

1.1.4   Hence, the board holds that the two distinguishing
        features are associated with distinct partial objective
        problems; therefore, they may be assessed
        independently. For the reasons set out below, the board
        finds that distinguishing feature (a) alone justifies
        the acknowledgement of inventive step.

1.1.5   The examining division considered in point 19.5.2 of
        the appealed decision that the person skilled in the
        art starting out from **D1** would introduce feature (a) by
        combining the teachings of **D1** and **D13** in a
        straightforward manner.

1.1.6   The board disagrees. **D13** seeks to optimise the mobile
        terminal's battery life by considering two aspects: the

differences in signal quality among neighbouring cells
(see page 2, point 1) and the rate of change in
propagation conditions of those signals (see page 3,
point 2). In accordance with the first aspect, the
first technique of D13 proposes classifying the
neighbouring cells according to a quality parameter
signal (i.e. signal quality and/or strength) and
monitoring the signals in different groups at different
rates. As to the second aspect, the second technique of
D13 suggests adjusting the monitoring rate depending
upon the change over time in the quality parameter of
the proximate signals. Both techniques may be used
separately or in combination.

D13 does not specifically relate to heterogeneous
networks but to cellular networks in general and TETRA
in particular. Assuming *arguendo* that the skilled
person starting out from D1 considered applying the
teachings of D13 in order to prevent wasting much
battery energy of the user equipment upon frequency
measurements within the meaning of feature (a) would
still require the skilled person to:

(i)   purposively choose at least the first
       technique of D13 from the two techniques
       available and apply it at least to the
       specific situation of D1 in which the
       movement state is the low movement state
       and the signal strength or signal quality
       of a current serving cell is greater than a
       demarcation,

(ii)   at least in this situation, set a threshold
       so low that, as soon as at least one cell
       is found again at a high-priority
       frequency, it is moved to the "foreground
       group" according to D13.

With respect to step (i) and account taken that the
teachings of D13 should be applied to the specific
situation of D1 in which the movement state is the low
movement state, the second technique would appear to be
the straightforward choice since it is explicitly
presented in D13 as suited to "static conditions" (see
page 3, point 2). However, this technique does not
require the definition of intervals of a first, second
and third specified time, as required by feature (a),
because the monitoring rate is obtained from a time
derivative of the quality parameters of the proximate
cells.

If the skilled person nevertheless applied the first
technique of D13 to D1, as argued by the examining
division, following in particular the teachings of D13,
page 8, lines 19-23, the board notes that, if a
measured cell belonging to the foreground group and
being monitored at a relatively high rate was not found
in the corresponding monitoring period (and considering
a second specified time equal to the first specified
time), the quality parameter would be below the
threshold and the cell would be moved to the
"background group" and measured at a relatively low
rate. After a cell was found at a high-priority
frequency, the cells with a measured quality parameter
being above the threshold would be moved to the
"foreground group", while the rest of the cells would
remain in the "background group". The examining
division considered in point 19.5.2, third paragraph,
of the impugned decision that "claim 1 discloses the
lowest threshold possible (signal detection threshold).
Such a choice cannot be considered to be inventive as
it is regarded to be a common and obvious choice for
the person skilled in the art."

The board disagrees. As explained in paragraph [0050] of the application as published, "[i]f no cell is found in the second specified time, it indicates that the user equipment may stay in a gap between the small cells at this time, and probably no cell will be found even if the user equipment performs the frequency measurement continually at intervals of the first specified time ...". Hence, the specific threshold "cell at a high-priority frequency found/not found" of distinguishing feature (a), chosen in the present application to reduce the measurement rate when the movement state corresponds to the low movement state and the signal strength or signal quality of a current serving cell is greater than a demarcation, is not arbitrary but purposively set to detect and tackle the specific situation of a static terminal situated in a gap between small cells in a heterogeneous network. Neither of D1 and D13 hint at using this specific combination of features or even addressing this particular situation. Thus, the person skilled in the field of 3GPP-based mobile networks would not arrive at this combination without the use of hindsight.

1.1.7   Prior-art documents **D4** and **D6** were cited by the examining division in relation to distinguishing feature (b). Neither of those documents discloses or hints at the introduction of distinguishing feature (a) into the system of D1.

1.1.8   At least for this reason, the subject-matter of claim 1 of the main request involves an inventive step in view of **D1** and its combination with **D13, D4** or **D6** and the skilled person's common general knowledge.

1.1.9   The same reasoning applies *mutatis mutandis* to the
         subject-matter of the further independent claim 4.

1.2   In view of the above, the board decides that a patent
         is to be granted on the basis of the claims of the
         present main request.

         The main request being allowable, the auxiliary
         requests on file need not be considered further.

Order

For these reasons it is decided that:

1.   The decision under appeal is set aside.

2.   The case is remitted to the examining division with the
         order to grant a patent on the basis of claims 1 to 6
         of the main request as filed on 4 October 2017 and with
         a description and drawings to be adapted accordingly.

The Registrar: The Chair:

B. Brückner   K. Bengi-Akyürek

Decision electronically authenticated