

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AT&T SERVICES INC., T-MOBILE USA, INC., CELLCO PARTNERSHIP
D/B/A VERIZON WIRELESS, ERICSSON INC., AND NOKIA OF AMERICA
CORPORATION,
Petitioners

v.

INNOVATIVE SONIC LIMITED AND CELERITY IP, LLC.
Patent Owner.

Case IPR2024-1145
U.S. Patent No. 9,560,559

**DECLARATON OF CHRISTOPHER HANSEN, PH.D IN SUPPORT OF
PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 9,560,559**

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I, Christopher Hansen, Ph.D., declare as follows.

I. INTRODUCTION

1. I have been retained by Petitioners AT&T Services Inc., T-Mobile USA, Inc., Cellco Partnership d/b/a Verizon Wireless, Verizon Communications, Inc., Ericsson, Inc., and Nokia of America Corporation as an independent expert consultant in this proceeding before the United States patent and Trademark Office (“PTO”) against Innovative Sonic Ltd. (“Patent Owner”) regarding U.S. patent No. 9,560,559 (“the ’559 Patent”) (Ex-1001). I have been asked to consider whether certain references disclose or suggest the features recited in claims 1–3 and 7–11 (“the Challenged Claims”) of the ’559 Patent. My opinions are set forth below.

2. I am being compensated at a rate of \$500 per hour for my work in this proceeding plus reimbursement of direct expenses. My compensation is in no way contingent on the nature of my findings, the presentation of my findings in testimony, or the outcome of this or any other proceeding. I have no other interest in this proceeding.

II. BACKGROUND AND QUALIFICATIONS

3. My educational background, career history, publications, and other relevant qualifications provided here are only a summary.

4. Based on my education, research, and work experience, I am knowledgeable about the subject matter of the '559 Patent and the related prior art.

5. I received a B.S. in electrical engineering from Rensselaer Polytechnic Institute in 1987. I received an M.S. in electrical engineering from University of Massachusetts, Amherst in 1989. I received a Ph.D. in electrical engineering from the University of California, Los Angeles in 1997. My Ph.D. research was in the area of wireless communications.

6. I have over 25 years of experience working with wireless communications and IEEE standards and over 15 years of experience working in 802.11 WLAN chipsets and cellular base-station systems development.

7. A copy of my curriculum vitae listing my full employment history is included as Exhibit 1004. I will briefly summarize aspects of my experience below.

8. From 1989 through 1992, my work focused on radio frequency (RF) and microwave systems and circuit development for radar systems and cellular (mobile) radio. This work included my experience at AT&T Bell Laboratories with the development of the world's first commercial micro-cell and feed-forward amplifiers used in commercial cellular wireless base station equipment, the precursors to modern 3GPP systems.

9. From 1997 through 1999, I was employed by two Silicon Valley startup companies developing advanced digital communications technology for

asymmetrical digital subscriber line (ADSL) and high bit-rate digital subscriber line (HDSL2) systems.

10. From 2000 through 2012, I was employed at Broadcom Corporation, where I served as system engineer for the IEEE 802.11a/b/g wireless local area network chipsets including analysis of radio and baseband DSP architectures for the physical layer design, and then project manager and lead system engineer for the IEEE 802.11n proposal to the IEEE at Broadcom. My responsibilities focused on technology developments and contributions to a number of the IEEE 802.11 standards, and in particular the IEEE 802.11n standard which incorporated a MIMO-OFDM physical layer and enhanced MAC layer for higher throughput wireless networks. My work covered many topics including preamble design, advanced channel coding, channel estimation, and multiple antenna beamforming.

11. At Broadcom, I made significant technical contributions to multiple integrated circuit products, including the first commercially successful IEEE 802.11g chipsets. My contributions included signal processing algorithm development, digital hardware development, radio and system design, and software development. I participated in the design of the first commercially successful single chip CMOS wireless LAN, the first commercially successful MIMO wireless integrated circuit, early CMOS mmwave technology, channel coding, and multiple

antenna beamforming research. I also developed technology for LTE baseband chipsets, including new techniques for digital pre-distortion.

12. I led standards participation efforts and made key contributions to multiple wireless standards that have been deployed in billions of products, including IEEE 802.11n and Bluetooth v3.0. I made contributions to the IEEE for 802.11n both directly and through participation in the WWiSE Special Interest Group (SIG) and its proposal to the IEEE. My contributions encompassed preamble design, channel coding, beamforming, backward compatibility, and many other topics. My work at Broadcom resulted in more than one hundred issued patents in which I am a named inventor. A list of my patents is listed in my CV.

13. From June 2012 through July 2013, I was employed at Apple Inc., where I served as senior wireless system architect for analysis of the IEEE.11 wireless networks for iOS products.

14. From August 2013 to present, I have worked as a self-employed consultant while serving out my leadership role at the IEEE.

15. I am currently President of Covariant Corporation, which is a consulting firm that provides expertise on wireless communications, IEEE 802.11 standards and commercial product development.

16. I am named inventor on more than 125 issued patents, including many standard essential patents for the IEEE 802.11 standards.

17. Over the past 30 years, I have worked on numerous projects and developed many technical skills. These include physical layer (PHY) algorithm development for both wireless and wireline communication systems, signal processing algorithm evaluation, channel code (convolutional and LDPC) analysis, embedded software development, RF circuit and system design, and technical standards development. I have extensive knowledge of the theory and practice of IEEE 802.11 wireless networks at both the PHY and MAC layers as well as practical standards and product development experience with Bluetooth and 3GPP (LTE/NR) technologies. I write software code in Matlab, C, C++, and Python and hardware code in Verilog and VHDL. I actively maintain my skills through my consulting projects and standard participation activities.

18. My experience with cellular technology is extensive. It began with my work at Bell Laboratories on microcell and base station designs. These systems employed both legacy analog technology as well as the first TDMA and CDMA systems which pre-date the modern 3GPP standards. First deployed world-wide in 1991, they helped launch the modern wireless era.

19. I continued working on cellular technology as a graduate student at UCLA where I researched advanced wireless communication techniques including channel probing, and distributed power control. At Broadcom I researched baseband signal processing techniques for cellular chipsets and at Apple I investigated co-

existence between cellular/LTE and W-Fi technologies. In my more recent consulting work, I have reviewed numerous 3GPP standards and investigated new wireless technology related to cellular systems.

III. MATERIALS REVIEWED

20. The opinions contained in this declaration are based on the documents I reviewed, my professional judgment, as well as my education, experience, and knowledge regarding signal processing, communications, and coding.

21. In forming my opinions expressed in this declaration, I reviewed the following materials and information:

Ex. Number	Title
1001	U.S. Patent No. 9,560,559 to Kuo et al. (“the ’559 Patent”)
1002	File History of U.S. Patent No. 9,560,559
1005	U.S. Patent No. 9,479,973 (“Centonza”)
1006	U.S. Provisional Patent Application No. 61/678,722 (“Centonza Provisional”)
1007	World Intellectual Property Pub. App. No. WO2012064265A1 (“Siomina”)
1008	3GPP TS 36.331 V11.2.0 (2012-12)
1009	3GPP TS 36.331 V11.0.0 (2012-06)
1010	3GPP TR 36.932 V12.0.0 (2012-12)
1011	U.S. Pat. App. Pub. No. 20120315908A1
1012	U.S. Pat. App. Pub. No. 20120088516A1
1013	U.S. Pat. App. Pub. No. 20150017993A1
1014	Declaration of Craig Bishop
1015	3GPP TS 36.331 V8.1.0 (2008-03)

22. I also reviewed any other materials I refer to in this declaration in support of my opinions.

23. My opinions contained in this declaration are based on the documents I reviewed and my knowledge and professional judgment. My opinions have also been guided by my understanding of how a person of ordinary skill in the art would have understood the state of the art, the prior art, and the claims and the specification of the '559 Patent at the time of the alleged invention.

24. I understand that Patent Owner has asserted that the priority date of the '883 patent is at least as early as February 8, 2013, which I understand is the filing date of Provisional Application No. 61/762,414. I understand that it is Patent Owner's burden to prove that the Challenged Claims are entitled to that February 8, 2013 date and, absent such proof, the Challenged Claims are entitled to the filing date on the face of the '559 Patent (which is January 29, 2014). Given that Patent Owner has not proved priority to an earlier filing date, I assume the operative priority date is January 29, 2014. I have assumed, however, that the time of the alleged invention of the '559 Patent is around February, 2013, based on Patent Owner's assertion. My opinions in this matter are the same whether the date of the alleged invention is February 8, 2013, January 29, 2014, or a date in between.

25. My opinions reflect how one of ordinary skill in the art (which I describe below) would have understood the '559 Patent, the prior art to the patent, and the state of the art at the times of the alleged invention as I was asked to consider, noted above.

26. Based on my experience and expertise, it is my opinion that the prior art discloses and/or suggests all the features recited the Challenged Claims of the '559 Patent, as I discuss in detail below.

IV. PERSON OF ORDINARY SKILL IN THE ART

27. Based on my knowledge and experience, I understand what a person of ordinary skill in the art would have known at the times of the alleged invention. My opinions herein are, where appropriate, based on my understandings as to a person of ordinary skill in the art at those times.

28. In my opinion, based on the materials and information I have reviewed, and based on my experience in the technical areas relevant to the '559 Patent, as of the earliest claimed priority date, a person of ordinary skill in the art at the time of the alleged invention of the '559 Patent ("POSITA"), which for purposes of this proceeding is on or around February 8, 2013, would have had a B.S. in Electrical Engineering or a related field with at least three years of experience designing, developing, and/or testing telecommunication systems. A POSITA would also have familiarity with the wireless standards and well-known protocols for accessing wireless networks, including the relevant 3GPP standards. More education may supplement practical experience or *vice versa*. I apply this understanding in my analysis herein.

29. All of my opinions in this declaration are from the perspective of one of ordinary skill in the art, during the relevant timeframe, which I discussed above as being around February 8, 2013 to January 29, 2014. During this timeframe, I possessed at least the qualifications of a person of ordinary skill in the art, as defined above.

V. THE '559 PATENT

A. Technical Background

30. The '559 Patent relates to “small cell enhancements” in cellular networks that utilize dual connectivity. Ex-1001 at (54). More specifically, the patent purports to enhance a small cell by providing the cell with the measurement-gap configuration for a user equipment (“UE”), such as a smartphone.

31. Next-generation cellular systems (such as LTE) utilize a network that includes base stations (referred to as “eNBs”) and a core network that contains components like a Mobility Management Entity (“MME”) and a Serving Gateway (“SGW”), as shown below. *Id.*, 1:31–40, 2:18–30 (describing E-UTRAN); Ex-1006, 9 (Fig. 1).

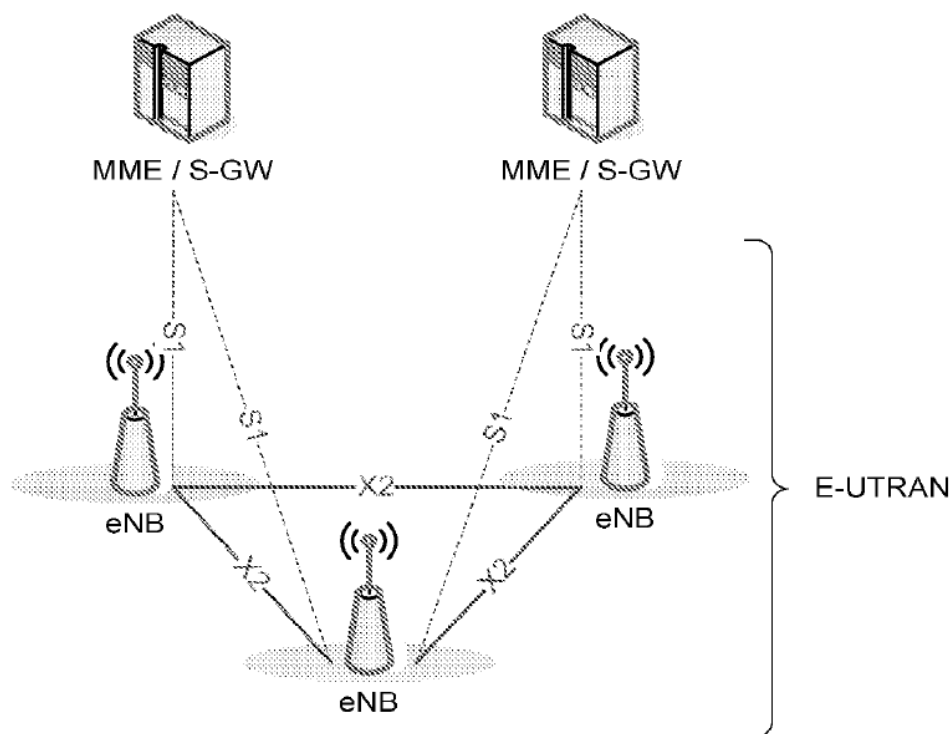


Figure 1: Overall E-UTRAN Architecture
Ex-1006, 9.

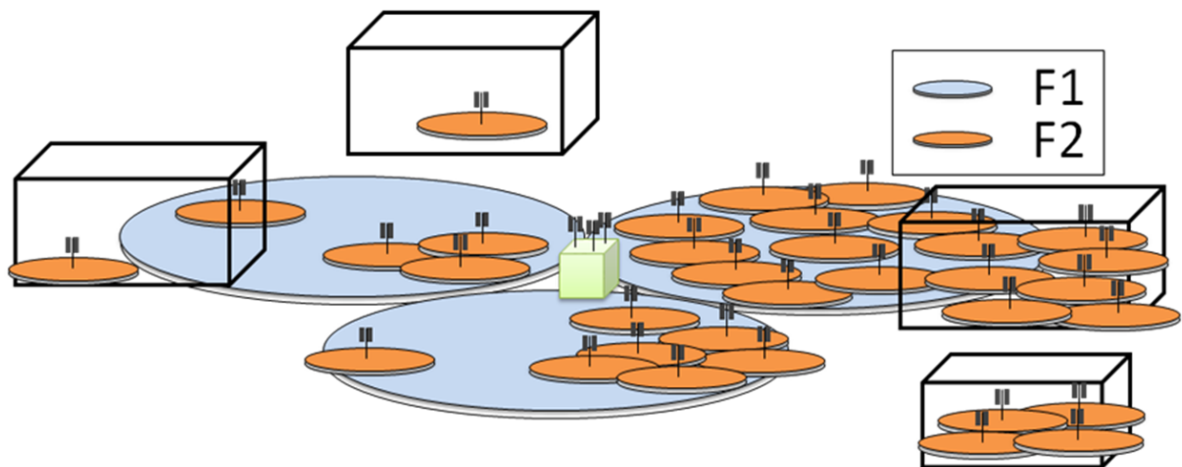
32. The eNBs can communicate over an X2 interface, and each eNB can communicate through core network devices (e.g., the MME and SGW) over an S1 interface. The eNBs provide cellular service to a UE.

33. In general, dual connectivity in the context of the '559 Patent refers to the ability to two eNBs to serve a UE.¹ Dual connectivity pre-dates the '559 Patent,

¹ The Patent Owner equated dual connectivity with the ability to have two base stations serve a UE. *See, e.g.,* Ex-1002, 37 (“dual connectivity (i.e., a UE is served by two base stations at the same time”).

which the Patent Owner admitted in the patent specification. Ex-1001, 4:62–6:29 (describing 3GPP requirements, studies, and proposals relating to dual connectivity).

34. For example, the '559 Patent incorporates the version 12.0.0 of Technical Report (“TR”) 36.932, which describes a scenario that can provide dual connectivity. Ex-1001, 2:18–30; *id.*, 5:4–40 (describing TR 36.932-based study “for the feasible scenario of dual connectivity”).



NOTE 1: F1 and F2 are the carrier frequency for macro layer and local-node layer, respectively

Figure 6.1-1: Deployment scenarios of small cell with/without macro coverage

Ex-1010, 7.

35. The image above shows a number of eNBs, such as a macro eNB (in green) and pico eNBs (the antennas within each of the orange circles). A UE (not depicted) is associated with “cells” that are controlled by the eNBs, *e.g.*, a macro cell and a pico cell. The macro eNB controls a macro cell layer (the layer represented in blue). The pico eNBs control a local-node layer (represented in orange). Utilizing dual connectivity, the macro eNB would serve the UE through a macro cell

and a pico eNB would serve the UE through a local cell. TR 36.932 explains that the deployment scenarios include when “the UE is in coverage of both the macro cell and the small cell simultaneously,” Ex-1010, 7, which is a deployment that can facilitate dual connectivity, as the ’559 Patent recognizes. Ex-1001, 5:4–40.

36. As with dual connectivity, the ’559 Patent specification admits that determining and providing measurement-gap configurations also predates the ’559 Patent. Ex-1001, 6:41–49. In general, a measurement gap refers to the time in which a UE cannot communicate (in either the uplink or downlink direction) because the UE is taking measurements. Ex-1001, 6:46–49 (explaining that a UE “cannot transmit or receive any signal . . . during the measurement gaps”); Ex-1006, 19 (“Measurement gaps define time periods when no uplink or downlink transmissions will be scheduled, so that the UE may perform the measurements[.]”).

37. The purpose of setting a measurement-gap configuration is so an eNB serving the UE can more efficiently schedule its communication with the UE to avoid the measurement gap, *e.g.*, sending data to the UE that will arrive at the UE when the UE is not taking measurements or scheduling the receipt of data from UE during those times the UE is not taking measurements (*i.e.*, outside the measurement gap).

38. Providing measurement-gap configurations, including measurement-gap patterns, has existed in the cellular standards since at least 2008 within version

8.1.0 of the Radio Resource Control protocol specification (3GPP TS 36.331) via the MeasurementConfiguration element within the RRCConnectionReconfiguration message, which is the command from an eNB to a UE to “establish or modify an RRC [Radio Resource Control] connection.” Ex-1015, 57, 98, 102–103.

RRCConnectionReconfiguration message

```
-- ASN1START
RRCConnectionReconfiguration ::= SEQUENCE {
    rrc-TransactionIdentifier      RRC-TransactionIdentifier,
    criticalExtensions             CHOICE {
        c1                       CHOICE {
            rrcConnectionReconfiguration-r8      RRCConnectionReconfiguration-r8-IEs,
            spare7 NULL,
            spare6 NULL, spare5 NULL, spare4 NULL,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensions          SEQUENCE {}
    }
}

RRCConnectionReconfiguration-r8-IEs ::= SEQUENCE {
    measurementConfiguration      MeasurementConfiguration      OPTIONAL, -- Need OP
    mobilityControlInformation MobilityControlInformation      OPTIONAL, -- Need OP
    nas-DedicatedInformation       NAS-DedicatedInformation      OPTIONAL, -- Need OP
    radioResourceConfiguration    RadioResourceConfiguration    OPTIONAL, -- Need OP
    securityConfiguration          SecurityConfiguration          OPTIONAL, -- Cond Handover
    ue-RelatedInformation          UE-RelatedInformation          OPTIONAL, -- Need OP
    ...
}
-- ASN1STOP
```

Ex-1015, 57.

MeasurementConfiguration information element

```
-- ASN1START
MeasurementConfiguration ::=          SEQUENCE {
    -- Measurement identities
    measIdToRemoveList                MeasIdToRemoveList        OPTIONAL, -- Need OP
    measIdToAddModifyList              MeasIdToAddModifyList      OPTIONAL, -- Need OP
    -- Measurement objects
    measObjectToRemoveList              MeasObjectToRemoveList    OPTIONAL, -- Need OP
    measObjectToAddModifyList           MeasObjectToAddModifyList OPTIONAL, -- Need OP

    -- Reporting configurations
    reportConfigToRemoveList            ReportConfigToRemoveList  OPTIONAL, -- Need OP
    reportConfigToAddModifyList          ReportConfigToAddModifyList OPTIONAL, -- Need OP
    -- Other parameters
    quantityConfig QuantityConfig                OPTIONAL, -- Need OC
    measGapConfig                      MeasGapConfig              OPTIONAL, -- Need OC
    s-Measure                          INTEGER (0)               OPTIONAL, -- Need OC; FFS
    cdma2000-SystemTimeInfo             CDMA2000-SystemTimeInfo    OPTIONAL, -- Need OC
    mbsfn-NeighbourCellConfig           SEQUENCE {}                OPTIONAL -- 2-bit field FFS
}

MeasIdToRemoveList ::=                SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {
    measId                             MeasId
}

MeasIdToAddModifyList ::=              SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {
    measId                             MeasId,
    measObjectId                       MeasObjectId,
    reportConfigId                     ReportConfigId
}

MeasObjectToRemoveList ::=             SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {
    measObjectId                       MeasObjectId
}

MeasObjectToAddModifyList ::=          SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {
    measObjectId                       MeasObjectId,
    measObject                         CHOICE {
        measObjectEUTRA                MeasObjectEUTRA,
        measObjectUTRA                 MeasObjectUTRA,
        measObjectGERAN                 MeasObjectGERAN,
        measObjectCDMA2000              MeasObjectCDMA2000
    }
}

ReportConfigToRemoveList ::=           SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {
    reportConfigId                     ReportConfigId
}

ReportConfigToAddModifyList ::=        SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {
    reportConfigId                     ReportConfigId,
    reportConfig                       CHOICE {
        reportConfigEUTRA               ReportConfigEUTRA,
        reportConfigInterRAT            ReportConfigInterRAT,
        reportConfigPeriodical          ReportConfigPeriodical
    }
}
-- ASN1STOP
```

Ex-1015, 102–103.

– *MeasGapConfig*

The IE *MeasGapConfig* specifies the measurement gap configuration and controls activation/ deactivation of measurement gaps.

***MeasGapConfig* information element**

```
-- ASN1START
MeasGapConfig ::=
    gapPattern                SEQUENCE {
                                INTEGER (0)                                OPTIONAL, -- Need OC
                                -- value range FFS
    gapActivation              CHOICE {
        activate                SEQUENCE {
            startSFN              INTEGER, -- FFS
            startSubframeNumber    INTEGER -- FFS
        },
        deactivate                NULL
    }
}
-- ASN1STOP
```

Ex-1015, 98.

39. The '559 Patent incorporates by reference version 11.2.0 of the RRC protocol specification (specifically, December 2012 version of TS 36.331). Ex-1001, 2:18–30. The Patent explains that TS 36.331 teaches sending measurement-gap configurations. *Id.*, 6:41–49. TS 36.331 describes including the measurement-gap configuration within the RRCConnectionReconfiguration message from an eNB to a UE (similar to the version 8.1.0 above). TS 36.331 also discloses a message exchanged between eNBs to share a UE's measurement-gap configuration to prepare for a handover (HandoverPreparationInformation). Ex-1008, 140–142, 245–46, 294–95, 296–97. The HandoverPreparationInformation message was included in TS 36.331 before Version 11.2.0, including as explained below for version 11.0.0.

40. The HandoverPreparationInformation message includes the measurement-gap configuration through the AS-Config field (which itself contains

the MeasConfig field, which itself contains the MeasGapConfig field). Ex-1008, 245–247, 294–295, 296–297.

HandoverPreparationInformation message

```
-- ASN1START
HandoverPreparationInformation ::= SEQUENCE {
    criticalExtensions      CHOICE {
        c1                  CHOICE{
            handoverPreparationInformation-r8  HandoverPreparationInformation-r8-IEs,
            spare7 NULL,
            spare6 NULL, spare5 NULL, spare4 NULL,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture      SEQUENCE {}
    }
}

HandoverPreparationInformation-r8-IEs ::= SEQUENCE {
    ue-RadioAccessCapabilityInfo  UE-CapabilityRAT-ContainerList,
    as-Config                      AS-Config                      OPTIONAL,      -- Cond HO
    rrm-Config                     RRM-Config                     OPTIONAL,
    as-Context                     AS-Context                     OPTIONAL,      -- Cond HO
    nonCriticalExtension            HandoverPreparationInformation-v920-IEs  OPTIONAL
}

HandoverPreparationInformation-v920-IEs ::= SEQUENCE {
    ue-ConfigRelease-r9           ENUMERATED {
        rel9, rel10, rel11, spare5, spare4, spare3,
        spare2, spare1, ...}      OPTIONAL,      -- Cond HO2
    nonCriticalExtension            HandoverPreparationInformation-v9d0-IEs  OPTIONAL
}

HandoverPreparationInformation-v9d0-IEs ::= SEQUENCE {
    lateNonCriticalExtension       OCTET STRING                  OPTIONAL,
    nonCriticalExtension            HandoverPreparationInformation-v11x0-IEs  OPTIONAL
}

HandoverPreparationInformation-v11x0-IEs ::= SEQUENCE {
    as-Context-v11x0              AS-Context-v11x0              OPTIONAL,      -- Cond HO2
    nonCriticalExtension            SEQUENCE {}                  OPTIONAL
}

-- ASN1STOP
```

Ex-1008, 294–295.

AS-Config information element

```
-- ASN1START
AS-Config ::= SEQUENCE {
    sourceMeasConfig MeasConfig,
    sourceRadioResourceConfig RadioResourceConfigDedicated,
    sourceSecurityAlgorithmConfig SecurityAlgorithmConfig,
    sourceUE-Identity C-RNTI,
    sourceMasterInformationBlock MasterInformationBlock,
    sourceSystemInformationBlockType1 SystemInformationBlockType1(WITH COMPONENTS
        {..., nonCriticalExtension ABSENT}),
    sourceSystemInformationBlockType2 SystemInformationBlockType2,
    antennaInfoCommon AntennaInfoCommon,
    sourceDL-CarrierFreq ARFCN-ValueEUTRA,
    ...,
    [[ sourceSystemInformationBlockType1Ext OCTET STRING (CONTAINING
        SystemInformationBlockType1-v890-IEs) OPTIONAL,
        sourceOtherConfig-r9 OtherConfig-r9
    ]],
    [[ sourceSCellConfigList-r10 SCellToAddModList-r10 OPTIONAL
    ]]
}
-- ASN1STOP
```

Ex-1008, 296.

MeasConfig information element

```
-- ASN1START
MeasConfig ::= SEQUENCE {
    -- Measurement objects
    measObjectToRemoveList MeasObjectToRemoveList OPTIONAL, -- Need ON
    measObjectToAddModList MeasObjectToAddModList OPTIONAL, -- Need ON
    -- Reporting configurations
    reportConfigToRemoveList ReportConfigToRemoveList OPTIONAL, -- Need ON
    reportConfigToAddModList ReportConfigToAddModList OPTIONAL, -- Need ON
    -- Measurement identities
    measIdToRemoveList MeasIdToRemoveList OPTIONAL, -- Need ON
    measIdToAddModList MeasIdToAddModList OPTIONAL, -- Need ON
    -- Other parameters
    quantityConfig QuantityConfig OPTIONAL, -- Need ON
    measGapConfig MeasGapConfig OPTIONAL, -- Need ON
    S-Measure RSRP-Range OPTIONAL, -- Need ON
    preRegistrationInfoHRPD PreRegistrationInfoHRPD OPTIONAL, -- Need OP
    speedStatePars CHOICE {
        release NULL,
        setup SEQUENCE {
            mobilityStateParameters MobilityStateParameters,
            timeToTrigger-SF SpeedStateScaleFactors
        }
    } OPTIONAL, -- Need ON
    ...
}

MeasIdToRemoveList ::= SEQUENCE (SIZE (1..maxMeasId)) OF MeasId
MeasObjectToRemoveList ::= SEQUENCE (SIZE (1..maxObjectId)) OF MeasObjectId
ReportConfigToRemoveList ::= SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigId
-- ASN1STOP
```

Ex-1008, 245–246.

41. The AS-Config element (which contains the measurement-gap configuration) contains “information about RRC configuration information in the source eNB which can be utilized by target eNB to determine the need to change the RRC configuration during the handover preparation phase.” Ex-1008, 296.

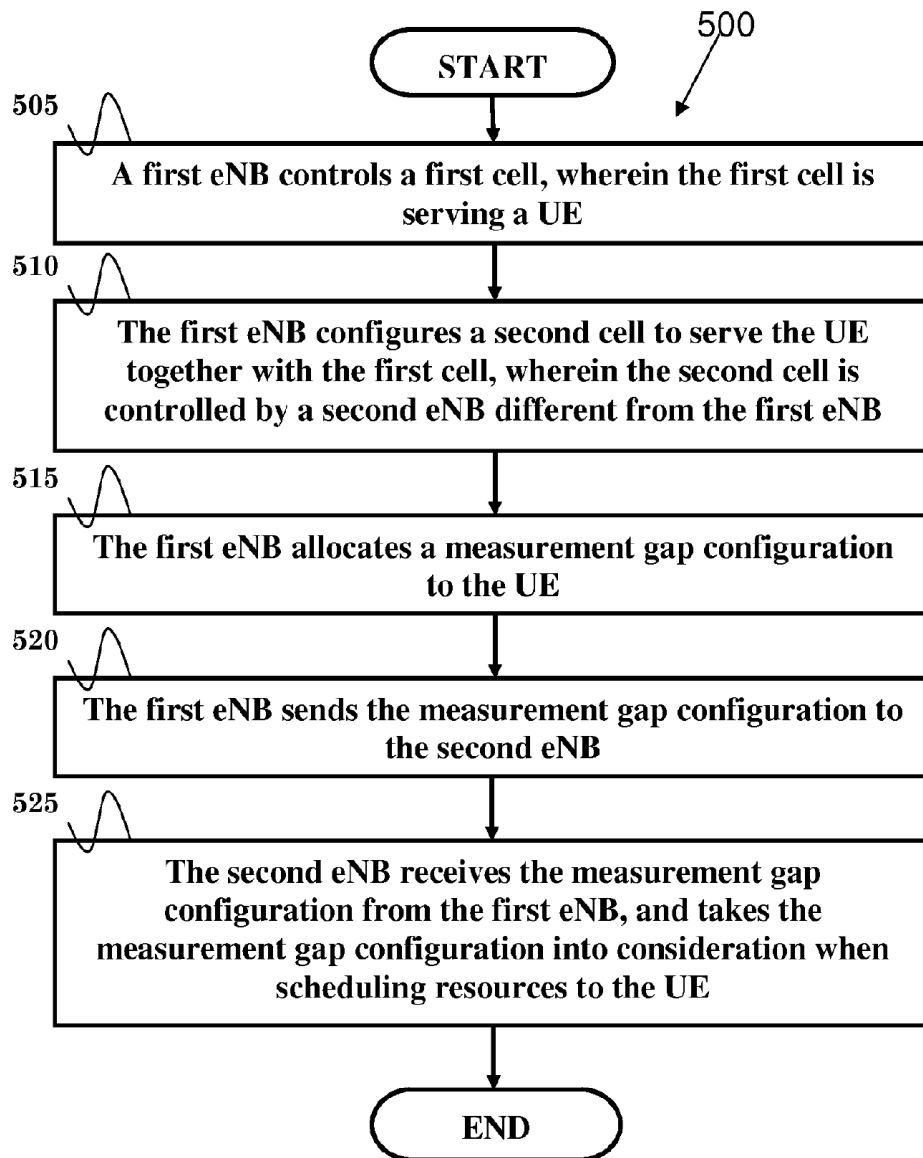
– *AS-Config*

The *AS-Config* IE contains information about RRC configuration information in the source eNB which can be utilized by target eNB to determine the need to change the RRC configuration during the handover preparation phase. The information can also be used after the handover is successfully performed or during the RRC connection re-establishment.

Ex-1008, 296.

B. Overview of the '559 Patent

42. The '559 Patent generally combines the concepts of dual connectivity and sending a measurement-gap configuration from one eNB to another. The Patent describes a five-step process to in which a first eNB ultimately provides a measurement gap configuration to a second eNB.



Ex-1001, Fig. 5.

43. Claim 1 recites the steps from Figure 5 as follows (Ex-1001, claim 1):

1. A method for supporting dual connectivity in a wireless communication system, wherein separate eNBs (evolved Node B) are used to support dual connectivity, comprising:

a first eNB controls a first cell, wherein the first cell is serving a UE

(User Equipment); and;

the first eNB configures a second cell to serve the UE together with the first cell, wherein the second cell is controlled by a second eNB;

the first eNB allocates a measurement gap configuration to the UE; and

the first eNB sends the measurement gap configuration to the second eNB so that the second eNB could take measurement gaps into consideration when scheduling resources to the UE.²

² I understand that Petitioners reserve the right to challenge the validity of the '559 Patent claims, including under Section 112, on the basis of written description, enablement, and definiteness. I do not opine on any of those issues in this declaration.

C. Overview of the Prosecution History

44. During prosecution, the Examiner focused on three references that the Examiner found rendered the pending claims obvious: Li,³ Ji,⁴ and Ishii.⁵ Ex-1002, 13, 34–38, 46–50. The Patent Owner did not dispute that dual connectivity sending measurement-gap configurations from one base station to another existed before the '559 Patent. As explained above, the patent itself admits that these concepts pre-date the '559 Patent.

45. The Patent Owner argued, to obtain allowance of the claims, that the references failed to show that the eNB receiving a measurement gap configuration “is a serving base station” and that the UE is served by both the first and second eNB “at the same time.” Ex-1002, 35, 37 (emphases in original). Patent Owner admitted that Ishii “addresses dual connectivity (i.e., a UE is served by two base stations at the same time),” but it asserted it was improper to combine Ishii with Ji because Ji teaches that the UE “is served by a single base station.” *Id.*, 37. The Examiner then allowed the claims based on Patent Owner’s arguments. *Id.*, 13.

³ U.S. Pat. App. Pub. No. 20120315908A1 (Ex-1011).

⁴ U.S. Pat. App. Pub. No. 20120088516A1 (Ex-1012).

⁵ U.S. Pat. App. Pub. No. 20150017993A1 (Ex-1013).

46. Centonza and Siomina were not before the Patent Office during prosecution. Ex-1006, (56). I understand that they thus were not considered by the Examiner or cited as basis for rejecting the pending claims. In my opinion, as I describe below, the Challenged Claims are not patentable in view of Centonza or Siomina.

D. Level of Ordinary Skill in the Art

47. In my opinion, as of the earliest claimed priority date, a person of ordinary skill in the art at the time of the alleged invention of the '559 Patent ("POSITA") would have had a B.S. in Electrical Engineering or a related field with at least three years of experience designing, developing, and/or testing telecommunication systems. A POSITA would also have familiarity with the wireless standards and well-known protocols for accessing wireless networks. More education may supplement practical experience or *vice versa*.

VI. CLAIM CONSTRUCTION

48. I understand that claim terms are typically given their ordinary and customary meanings, as would have been understood by a person of ordinary skill in the art at the time of the alleged invention. In considering the meaning of the claims, however, I understand that one must consider the language of the claims, the specification, and the prosecution history of record. I have been asked to consider the claim terms under their plain meanings and thus I have considered the claims,

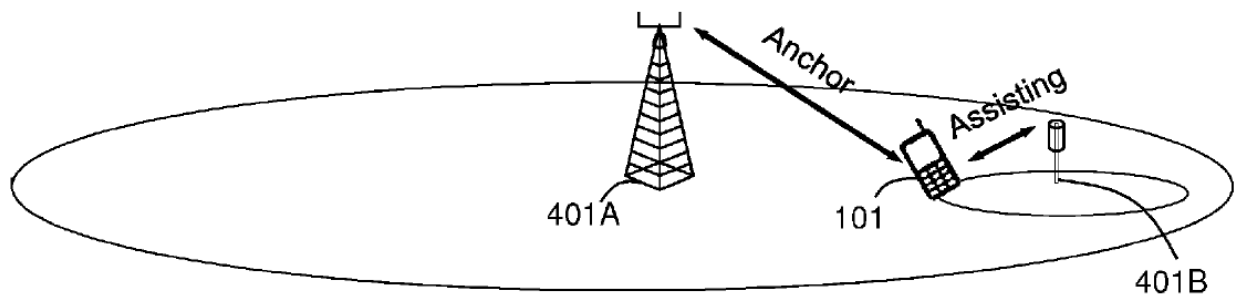
specification and prosecution history for the '559 Patent in doing so in support of my opinions discussed herein. In addition, the prior art discussed in this Declaration, in my opinion, discloses all limitations under both the plain meaning as well as any plausible construction.

VII. OVERVIEW OF PRIOR ART

49. I now provide an overview of the prior art.

A. Centonza

50. Centonza discloses a process for managing dual connectivity using a partial handover technique. It discloses that the two eNBs (*e.g.*, a macro eNB that controls a macro cell and a pico eNB that controls a pico cell) serve a UE at the same time (*e.g.*, shown with the Anchor and Assisting flow). Ex-1005, Fig. 1, 5:31–33.



Ex-1005, Fig. 1.

51. To manage dual connectivity, Centonza teaches communications between eNBs and between an eNB and the UE (including providing RRC protocol information). Centonza also teaches communicating the measurement-gap configuration. Ex-1005, 10:63–11:44; Ex-1006, 18–19, 89–90, 138–139, 205–206.

B. 3GPP TS 36.331

52. The '559 Patent references TS 36.331 (specifically version 11.2.0 of the specification). Ex-1001, 2:18–30. Centonza also discloses that 3GPP TS 36.331 describes the details of the RRC protocol (the version dated at the time of the Centonza Provisional was version 11.0.0). Ex-1005, 7:24–26; Ex-1006, 11. Centonza's Handover Request message similarly includes an "RRC Context" information element, which refers to the RRC Handover Preparation Information message in sub-clause 10.2.2 of TS 36.331. Ex-1005, 17:6–35; Ex-1006, 150.

Table 1: Example of enhanced HANDOVER REQUEST message

IE/Group Name	Presence	Range	Semantics description	Criticality	Assigned Criticality
>RRC Context	M		Comprises the RRC Handover Preparation Information message as defined in subclause 10.2.2 of TS 36.331 [9].	–	–

Ex-1006, 150 (cropped).

53. The Handover Preparation Information message includes a field (MeasGapConfig) that "specifies the measurement gap configuration and controls setup/ release of measurement gaps." Ex-1008, 245–47, 294–95, 296–97. The image below is from version 11.2.0 of TS 36.331.

– *MeasGapConfig*

The IE *MeasGapConfig* specifies the measurement gap configuration and controls setup/ release of measurement gaps.

***MeasGapConfig* information element**

```
-- ASN1START
MeasGapConfig ::=
    CHOICE {
        release
        setup
        gapOffset
            CHOICE {
                gp0
                gp1
                ...
            }
    }
-- ASN1STOP
```

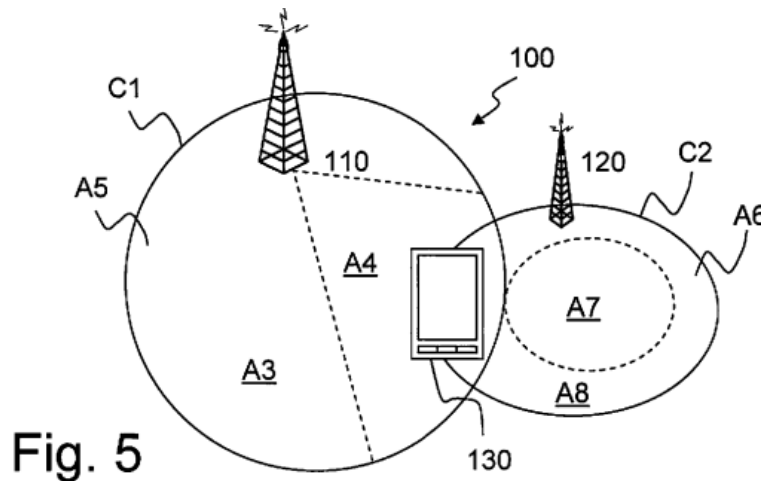
Ex-1008, 246.

54. This disclosure of a Handover Preparation Information message that includes the *MeasGapConfig* field is included in both version 11.2.0 of TS 36.331 (which is incorporated by reference in the '559 Patent) as well as version 11.0 (the version that existed as of Centonza's priority date). Ex-1009, 216–217, 259–260, 262. In my opinion, there is no material difference between versions 11.2.0 and 11.0.0 of TS 36.331 as it relates to the prior art disclosures I rely upon in this declaration. As I explain below when discussing TS 36.331, both versions contain the same disclosure relevant to my analysis in this declaration (*e.g.*, the Handover Preparation Information message and its communication of measurement-gap configuration from the Source eNB to the Target eNB).

C. Siomina

55. Siomina discloses a heterogeneous network similar to Centonza (*e.g.*, a network containing both macro eNBs with macro cells and pico eNBs with pico

cells). For example, Siomina discloses a macro eNB (110) that controls a first cell (C1) and a pico eNB (120) that controls a second cell (C2). Ex-1007, Figs 3 and 5; *id.* 9:23–11:11, 17:13–18:14.



Ex-1007, Fig. 5.

56. The UE served by each cell is labeled 130 in the above Figure.

57. Siomina also discloses that the macro eNB sends transmission and measurement patterns to the pico eNB, which can include measurement-gap patterns. Ex-1007, Figs. 6a and 7, 19:12–29, 24:5–16. The eNBs take the transmitted patterns into account with scheduling resources to the UE. *Id.*, Figs. 4 and 6a; *id.*, 3:29–35, 5:18–36, 6:5–9, 13:20–30, 19:12–29, 31:22–32:27.

VIII. THE PRIOR ART DISCLOSES AND/OR SUGGESTS THE RECITED FEATURES OF THE CHALLENGED CLAIMS

58. In my opinion, the prior art references I discuss in this declaration disclose and/or suggest each of the recited features of the Challenged Claims. This

section contains my opinions regarding the prior art as it relates to the Challenged Claims.

A. Ground 1: Centonza Anticipates the Challenged Claims

59. In my opinion, Centonza discloses each of the elements of each of the Challenged Claims for the reasons I explain below.

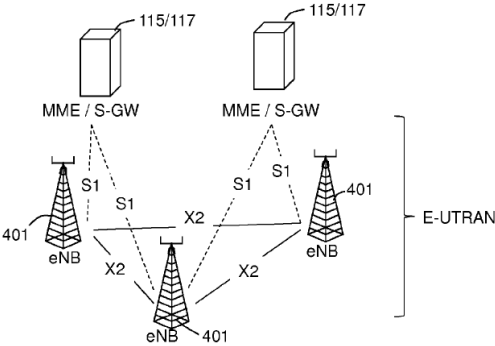
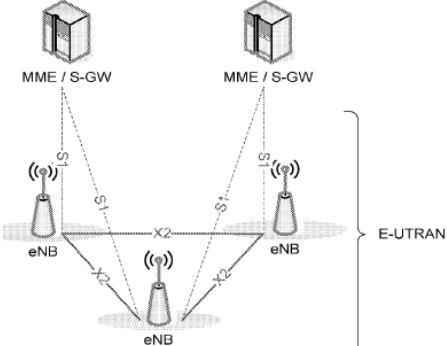
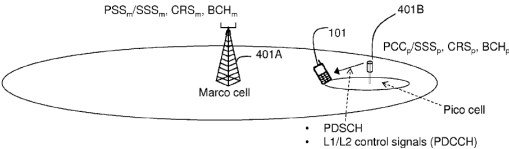
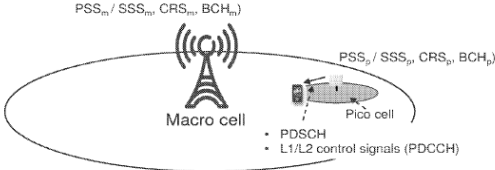
1) Centonza is Prior Art

60. In my opinion, Centonza is prior art to the '559 Patent claims. Centonza was filed on July 15, 2013, before the '559 Patent's January 29, 2014 filing date, and published on July 24, 2014. Centonza claims priority to an August 2, 2012 provisional application (Provisional Application No. 61/678,772 or the "Centonza Provisional"), which was filed on August 2, 2021. In my opinion, the Centonza Provisional discloses the subject matter of the Challenged Claims. It also my opinion that the Centonza Provisional supports the claims of Centonza. It is thus my understanding that Centonza is prior art to the '559 Patent claims.

61. The Centonza Provisional discloses the subject matter of the Challenged Claims, as shown below, and provides Section 112 support for Centonza and its claims. Centonza and the Centonza Provisional contain virtually identical disclosures, including the specific disclosure related to measurement gap configuration. Ex-1005, Figs. 1–19; Ex-1006, 9–34 (Figs. 1–17), 61–62 (Figs. 18–19); Ex-1005, 10:63–11:44; Ex-1006, 18–19, 89–90, 138–139, 205–206.

62. The text of Centonza and the Centonza Provisional are very similar, with regard to the subject matter of the Challenged Claims and the elements of each Challenged Claim. I have provided parallel citations to Centonza and the Centonza Provisional for each claim element of the Challenged Claims. The Centonza Provisional contains, in four papers, approximately 200 pages of description of the inventions disclosed (and later claimed) in Centonza. The Centonza Provisional describes the functionalities at a source base station and target base station for providing a handover of a sub-set of bearers associated with a user equipment. That includes detailing the circuitry and operations to determine a need for a handover procedure, to select a subset of bearers associated with the user equipment, to send and receive a handover request for the sub-set of bearers, to analyze rules to select the subset of bearers (*e.g.*, non-guaranteed bit rate bearers, guaranteed bit rate bearers) based on a number of parameters, including bit-rate thresholds and Quality of Service (“QoS”) class identifier.

63. In addition, Centonza’s figures and message structure teachings are found in the Centonza Provisional, including the teachings that, in my opinion, disclose each element of the Challenged Claims. Below are some examples.

Centonza	Centonza Provisional
 FIGURE 2 (Ex-1005, Fig. 2)	 Figure 1: Overall E-UTRAN Architecture (Ex-1006, 9 (Fig. 1))
 FIGURE 9 (Ex-1005, Fig. 9)⁶	 Figure 8: Heterogeneous deployment where the pico node corresponds to a cell of its own (a "pico cell"). The indices "p" and "m" indicate common signals/channels for the pico and macro cell respectively. (Ex-1006, 15 (Fig. 8))⁷

⁶ See, e.g., Ex-1005, Figs. 8, 9, 10, 11, and 12.

⁷ See, e.g., Ex-1006, 15–17 (Figs. 7, 8, 9, 10, and 11).

Centonza	Centonza Provisional																																																																																																								
FIGURE 19 (Ex-1005, Fig. 19) (Flow Diagram for Target eNB)	Figure 19 – flow diagram of example operations of a target base station (Ex-1006, 62 (Fig. 19)) (Flow Diagram for Target eNB)⁸																																																																																																								
TABLE 1 X2 HANDOVER REQUEST message <table data-bbox="251 808 747 1438"><thead><tr><th data-bbox="251 808 568 861">IE/Group Name</th><th data-bbox="568 808 747 861">Presence</th></tr></thead><tbody><tr><td>Message Type</td><td>M</td></tr><tr><td>Old eNB UE X2AP ID</td><td>M</td></tr><tr><td>Cause</td><td>M</td></tr><tr><td>Target Cell ID</td><td>M</td></tr><tr><td>GUMMEI</td><td>M</td></tr><tr><td>UE Context Information</td><td></td></tr><tr><td>>MME UE S1AP ID</td><td>M</td></tr><tr><td>>UE Security Capabilities</td><td>M</td></tr><tr><td>>AS Security Information</td><td>M</td></tr><tr><td>>UE Aggregate Maximum Bit Rate</td><td>M</td></tr><tr><td>>Subscriber Profile ID for RAT/Frequency priority</td><td>O</td></tr><tr><td>>E-RABs To Be Setup List</td><td></td></tr><tr><td>>>E-RABs To Be Setup Item</td><td></td></tr><tr><td>>>>E-RAB ID</td><td>M</td></tr><tr><td>>>>E-RAB Level QoS Parameters</td><td>M</td></tr><tr><td>>>>DL Forwarding</td><td>O</td></tr><tr><td>>>>UL GTP Tunnel Endpoint</td><td>M</td></tr><tr><td>>RRC Context</td><td>M</td></tr><tr><td>>Handover Restriction List</td><td>O</td></tr><tr><td>>Location Reporting Information</td><td>O</td></tr><tr><td>>Management Based MDT Allowed</td><td>O</td></tr><tr><td>UE History Information</td><td>M</td></tr><tr><td>Trace Activation</td><td>O</td></tr><tr><td>SRVCC Operation Possible</td><td>O</td></tr><tr><td>CSG Membership Status</td><td>O</td></tr></tbody></table> (Ex-1005, 17:5–35) (X2 HANDOVER REQUEST)	IE/Group Name	Presence	Message Type	M	Old eNB UE X2AP ID	M	Cause	M	Target Cell ID	M	GUMMEI	M	UE Context Information		>MME UE S1AP ID	M	>UE Security Capabilities	M	>AS Security Information	M	>UE Aggregate Maximum Bit Rate	M	>Subscriber Profile ID for RAT/Frequency priority	O	>E-RABs To Be Setup List		>>E-RABs To Be Setup Item		>>>E-RAB ID	M	>>>E-RAB Level QoS Parameters	M	>>>DL Forwarding	O	>>>UL GTP Tunnel Endpoint	M	>RRC Context	M	>Handover Restriction List	O	>Location Reporting Information	O	>Management Based MDT Allowed	O	UE History Information	M	Trace Activation	O	SRVCC Operation Possible	O	CSG Membership Status	O	Table 1: X2 HANDOVER REQUEST message <table data-bbox="868 819 1364 1396"><thead><tr><th data-bbox="868 819 1201 840">IE/Group Name</th><th data-bbox="1201 819 1364 840">Presence</th></tr></thead><tbody><tr><td>Message Type</td><td>M</td></tr><tr><td>Old eNB UE X2AP ID</td><td>M</td></tr><tr><td>Cause</td><td>M</td></tr><tr><td>Target Cell ID</td><td>M</td></tr><tr><td>GUMMEI</td><td>M</td></tr><tr><td>UE Context Information</td><td></td></tr><tr><td>>MME UE S1AP ID</td><td>M</td></tr><tr><td>>UE Security Capabilities</td><td>M</td></tr><tr><td>>AS Security Information</td><td>M</td></tr><tr><td>>UE Aggregate Maximum Bit Rate</td><td>M</td></tr><tr><td>>Subscriber Profile ID for RAT/Frequency priority</td><td>O</td></tr><tr><td>>E-RABs To Be Setup List</td><td></td></tr><tr><td>>>E-RABs To Be Setup Item</td><td></td></tr><tr><td>>>>E-RAB ID</td><td>M</td></tr><tr><td>>>>E-RAB Level QoS Parameters</td><td>M</td></tr><tr><td>>>>DL Forwarding</td><td>O</td></tr><tr><td>>>>UL GTP Tunnel Endpoint</td><td>M</td></tr><tr><td>>RRC Context</td><td>M</td></tr><tr><td>>Handover Restriction List</td><td>O</td></tr><tr><td>>Location Reporting Information</td><td>O</td></tr><tr><td>>Management Based MDT Allowed</td><td>O</td></tr><tr><td>UE History Information</td><td>M</td></tr><tr><td>Trace Activation</td><td>O</td></tr><tr><td>SRVCC Operation Possible</td><td>O</td></tr><tr><td>CSG Membership Status</td><td>O</td></tr></tbody></table> (Ex-1006, 50) (X2 HANDOVER REQUEST)	IE/Group Name	Presence	Message Type	M	Old eNB UE X2AP ID	M	Cause	M	Target Cell ID	M	GUMMEI	M	UE Context Information		>MME UE S1AP ID	M	>UE Security Capabilities	M	>AS Security Information	M	>UE Aggregate Maximum Bit Rate	M	>Subscriber Profile ID for RAT/Frequency priority	O	>E-RABs To Be Setup List		>>E-RABs To Be Setup Item		>>>E-RAB ID	M	>>>E-RAB Level QoS Parameters	M	>>>DL Forwarding	O	>>>UL GTP Tunnel Endpoint	M	>RRC Context	M	>Handover Restriction List	O	>Location Reporting Information	O	>Management Based MDT Allowed	O	UE History Information	M	Trace Activation	O	SRVCC Operation Possible	O	CSG Membership Status	O
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⁸ See, e.g., Ex-1006, 34 (Fig. 19).

Centonza

TABLE 8

X2 HANDOVER REQUEST ACKNOWLEDGE message

Presence	
IE/Group Name	
Message Type	M
Old eNB UE X2AP ID	M
New eNB UE X2AP ID	M
E-RABs Admitted List	
> E-RABs Admitted Item	
>> E-RAB ID	M
>> UL GTP Tunnel Endpoint	O
>> DL GTP Tunnel Endpoint	O
E-RABs Not Admitted List	O
Target eNB To Source	M
eNB Transparent Container	
Criticality Diagnostics	O

(Ex-1005, 22:2–18)
(X2 HANDOVER REQUEST)

Centonza Provisional

Table 8: X2 HANDOVER REQUEST ACKNOWLEDGE message

IE/Group Name	Presence
Message Type	M
Old eNB UE X2AP ID	M
New eNB UE X2AP ID	M
E-RABs Admitted List	
> E-RABs Admitted Item	
>> E-RAB ID	M
>> UL GTP Tunnel Endpoint	O
>> DL GTP Tunnel Endpoint	O
E-RABs Not Admitted List	O
Target eNB To Source eNB	M
Transparent Container	
Criticality Diagnostics	O

(Ex-1006, 55)
(X2 HANDOVER REQUEST
ACKNOWLEDGE)

TABLE 1a

PATH SWITCH REQUEST message

IE/Group Name	Presence	Range	Semantics description	Criticality	Assigned Criticality
Message Type	M			YES	reject
eNB UE S1AP ID	M			YES	reject
E-RAB To Be Switched in Downlink List		1		YES	reject
>E-RABs Switched in Downlink Item		1 to <maxnoof E-RABs>		EACH	reject
>>E-RAB ID	M			—	
>>Transport layer address	M			—	
>>GTP-TEID	M		To deliver DL PDUs	—	

TABLE 1a-continued

PATH SWITCH REQUEST message

IE/Group Name	Presence	Range	Semantics description	Criticality	Assigned Criticality
Source MME UE S1AP ID	M			YES	reject
E-UTRAN CGI	M			YES	ignore
TAI	M			YES	ignore
UE Security Capabilities	M			YES	ignore
CSG Id	O			YES	ignore
Cell Access Mode	O			YES	ignore
Source MME GUMMEI	O			YES	ignore
Selective Handover Indicator	O	ENUMERATED (true, ...)	This IE indicates to MME that the handover is selective. IT helps MME to decide whether to maintain bearers not listed in the E-RABs To Be Switched In Downlink List	YES	ignore

(Ex-1005, 18:48–19:23)
(PATH SWITCH REQUEST)

IE/Group Name	Presence	Range	Semantics description	Criticality	Assigned Criticality
Message Type	M			YES	reject
eNB UE S1AP ID	M			YES	reject
E-RAB To Be Switched in Downlink List		1		YES	reject
>E-RABs Switched in Downlink Item		1 to <maxnoof E-RABs>		EACH	reject
>>E-RAB ID	M			—	
>>Transport layer address	M			—	
>>GTP-TEID	M		To deliver DL PDUs	—	
Source MME UE S1AP ID	M			YES	reject
E-UTRAN CGI	M			YES	ignore
TAI	M			YES	ignore
UE Security Capabilities	M			YES	ignore
CSG Id	O			YES	ignore
Cell Access Mode	O			YES	ignore
Source MME GUMMEI	O			YES	ignore
Selective Handover Indicator	O	ENUMERATED (true, ...)	This IE indicates to MME that the handover is selective. IT helps MME to decide whether to maintain bearers not listed in the E-RABs To Be Switched in Downlink List	YES	ignore

(Ex-1006, 52)
(PATH SWITCH REQUEST)

Measurement gaps define time periods when no uplink or downlink transmissions will be scheduled, so that the user equipment may perform the measurements, for example, inter-

Measurement gaps define time periods when no uplink or downlink transmissions will be scheduled, so that the UE may perform the measurements (e.g. inter-frequency measurements

<u>Centonza</u>	<u>Centonza Provisional</u>
frequency measurements where the user equipment has only one Tx/Rx unit and supports only one frequency at a time. The measurement gaps configuration are common for all gap-assisted measurements. (Ex-1005, 11:37–44)	where the UE has only one Tx/Rx unit and supports only one frequency at a time). The measurement gaps are common for all gap-assisted measurements (Ex-1006, 19)

64. I have been asked, however, to consider if the disclosure of the Centonza Provisional provides written description support for at least one issued claim of Centonza.

65. The chart below maps Centonza’s claim 25 to corresponding support in the Centonza Provisional.

<u>Centonza</u>	<u>Centonza Provisional</u>
25. A method, in a target base station in a wireless communications network, for providing a handover for a sub-set of bearers associated with a wireless terminal being served by a source base station, said sub-set of bearers being less than or equal to all bearers associated with the wireless terminal, the method comprising:	The application utilizes a wireless communication network, which includes a source base station and a target base station. Ex-1006, 58–62. It discloses, in a target base station, providing a handover for a sub-set of bearers associated with a wireless terminal being served by a source base station, said sub-set of bearers being less than or equal to all bearers associated with the wireless terminal. <i>Id.</i> , 61–62 (showing handover of a “sub-set of bearers” and depicting “example operations which may be taken by the target base station ... in the providing a handover of at least a sub-

Centonza	Centonza Provisional
	set of bearers associated with a user equipment.”); <i>id.</i>, 47 (describing “a selective handover of only a subset of the UE bearers”); <i>id.</i>, 73–78 (describing embodiments where the target base station receives a selective handover request); <i>id.</i>, 73 (“41. A method, in a target base station, for providing a handover of at least a sub-set of bearers associated with a user equipment, the method comprising:”).
receiving, from the source based station, a handover request for the sub-set of bearers, wherein a least one bearer of the wireless terminal is to remain connected to the source base station	The application discloses, receiving, from the source based station, a handover request for the sub-set of bearers, wherein a least one bearer of the wireless terminal is to remain connected to the source base station. Ex-1006, 62 (showing the target base station “[r]eceive[s], from the source base station, a handover request for a sub-set of bearers”); <i>id.</i>, 73 (“receiving (50), from a source base station, a handover request for the sub-set of bearers associated with the user equipment”); <i>id.</i>, 106 (explaining that “at least one bearer (which is not associated with the identified sub-set) remains connected to the base station” as part of handover procedure); <i>id.</i>, 112 (explaining that at least one bearer “remains connected to the base station”).
analyzing an admissibility of the sub-set of bearers with respect to the handover procedure	The application discloses analyzing an admissibility of the sub-set of bearers with respect to the handover procedure. Ex-1006, 62 (showing the target base

Centonza	Centonza Provisional
	station “[a]nalyze[s] a possibility of admitting the sub-set of bearers”); <i>id.</i> , 73 (“analyzing (52) suitability of possibility of admitting the sub-set of bearers comprises in the handover request”).
sending, to the source base station, a handover acknowledgement message comprising a result of the analyzed admissibility; and	The application discloses sending, to the source base station, a handover acknowledgement message comprising a result of the analyzed admissibility. Ex-1006, 61–62 (showing the target base station “send[s], to the source base station, a handover acknowledgement message”); <i>id.</i> , 74 (“sending (64), to the source base station, a handover request acknowledgement comprising a result of analyzing”).
receiving, from the source base station, at least one subsequent handover request, wherein each subsequent handover request is treated as a handover request for only a sub-set of bearers associated with the wireless terminal.	The application discloses receiving, from the source base station, at least one subsequent handover request, wherein each subsequent handover request is treated as a handover request for only a sub-set of bearers associated with the wireless terminal. Ex-1006, 50 (“In case the target eNB receives multiple selective handover requests concerning the same UE from the same source eNB, it shouldn’t be interpreted as an error, but rather as a request to selectively hand over even more bearers of the UE towards the target.”); <i>id.</i> , 74 (same); <i>id.</i> , 62 (showing target base station “[r]eceive[s], from the source base station, a handover request for a sub-set of bearers”); <i>id.</i> , 112

Centonza	Centonza Provisional
	(explaining that at least one bearer “remains connected to the base station”).

66. For the reasons above, in my opinion, the Centonza Provisional supports Centonza.

2) Claim 1

- a) [Ipre]: A method for supporting dual connectivity in a wireless communication system, wherein separate eNBs (evolved Node B) are used to support dual connectivity, comprising:*

67. I have not been asked to determine if any aspects of the preamble limit the scope of the claims. To the extent the preamble is limiting, however, Centonza discloses the preamble in my opinion.

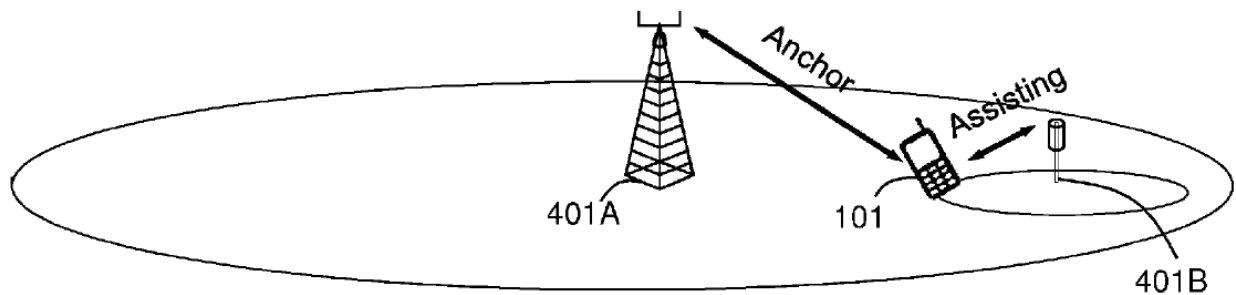
68. Centonza discloses supporting dual connectivity in a wireless communications system (*e.g.*, dual connectivity in cellular networks) in which two separate eNBs are used to support dual connectivity (*e.g.*, an eNB controlling a macro cell and an eNB controlling a pico cell). Ex-1005, Fig. 9, 12; Ex-1006, 16 (Fig. 8), 17 (Fig.11).

69. Centonza discloses that the two eNBs are separate and that each eNB has its own cell (*e.g.*, one eNB controls a macro cell and another eNB controls a pico cell). Ex-1005, 9:34–41, 16:57–62; Ex-1006, 15–16; *see also id.*, 26 (disclosing “dual connectivity”); Ex-1005, 10:34–40 (disclosing “dual connectivity”).

70. Centonza also discloses that the two eNBs serve the UE at the same time. Centonza depicts, for example, a “heterogeneous deployment with simultaneous anchor and assisting flows to a wireless terminal.” Ex-1005, Fig. 1, 5:31–33 (emphasis added).⁹

⁹ Patent Owner stated during prosecution that “dual connectivity” means that “a UE is served by two base stations at the same time.” Ex-1002, 37 (emphasis added). Centonza, in my opinion, includes multiple disclosures of dual connectivity as defined by Patent Owner. *See, e.g.*, Ex-1005, 10:28–43 (“When both connections are active, the anchor flow may be used either for control signaling while the assisting flow is used for data. However, it will still be possible to send data also via the anchor flow.”); Ex-1006 (same); Ex-1005, 9:21–10:43 (describing a heterogeneous network in which a macro node and pico node transmit data and common signals and channels associated with a cell); Ex-1006, 15–16 (same); Ex-1005, 1:47–52 (explaining that Centonza addresses the challenges from “serving a user equipment (UE) from more than one eNB simultaneously”); Ex-1006, 8 (same); Ex-1005, 10:11–27 (describing an embodiment in which “[i]n essence identical copies of the signals and channels necessary for a legacy terminal are transmitted simultaneously from the macro 401A and pico 401B nodes”); Ex-1006, 17 (same);

71. Figure 1 of Centonza, depicted below, also shows an example of dual connectivity, with a macro eNB (with a corresponding macro cell), labeled 401A, and a pico eNB (with a corresponding pico cell), labeled 401B.



Ex-1005, Fig. 1.

72. Centonza discloses that the base stations are eNBs. *See, e.g.,* Ex-1005, 1:53–57 (“FIG. 1 provides an example of a heterogeneous network where a mobile terminal 101 uses multiple flows, e.g. an anchor flow from the macro base station (or ‘anchor eNB’) 401A and a assisting flow from a pico base station (or a ‘assisting eNB’) 401B.”).

id., 145 (“Namely, the handover procedures involves the handing over of a subset of UE bearers to a target cell while some other UE bearers are kept active in the source cell, enabling bearer traffic transmission to the same UE from at least two different cells.”).

73. Centonza also shows that a UE is served by two cells (*e.g.*, cell A and cell B) at the same time (*e.g.*, during the t3-t2 interval). Ex-1005, 19:25–21:54; Ex-1006, 52–54.

TABLE 5

User equipment history, selective handovers implicitly indicated via time-stamping.			
Cell ID	Cell Type	Time UE started connection in a cell	Time UE stayed in a cell
A	Type 1	t1	t4-t1
B	Type 2	t2	t3-t2

Ex-1005, 21:1–12

74. The above table shows that a UE is connected to Cell A (such a macro cell) starting at t1. At time t2, there is a partial handover of radio bearers from Cell A to Cell B and, between time t2 and t3, the UE is served by both Cell A and Cell B. Then, at time t3, the radio bearers are handed back over from Cell B to Cell A, resulting in only Cell A serving the UE between time t3 and t4. This teaches an explicit example in which an eNB that controls a first cell (*e.g.*, the Source eNB controlling a macro cell “A”) serves a UE at the same time as a second cell (*e.g.*, a pico cell “B”) that is controlled by a different eNB (*e.g.*, the Target eNB).

75. For these reasons, Centonza discloses the preamble in my opinion.

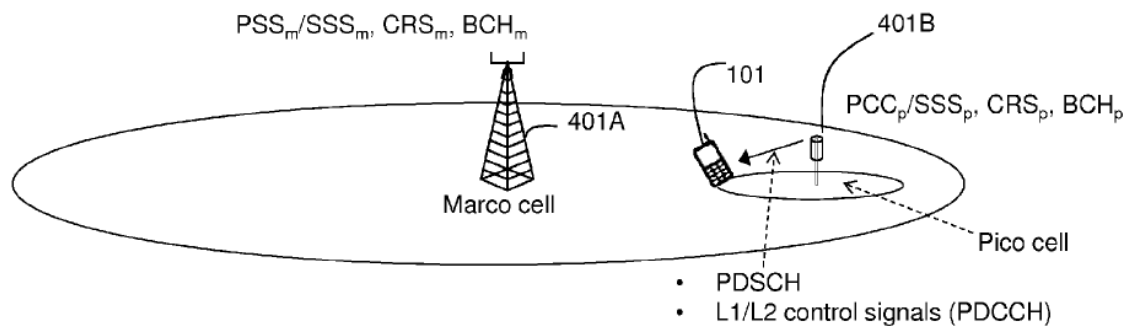
b) [1b]: a first eNB controls a first cell, wherein the first cell is serving a UE (User Equipment); and

76. In my opinion, Centonza discloses this limitation. Centonza discloses that the first eNB (*e.g.*, a Source eNB) controls a first cell (*e.g.*, a macro cell) that is serving a UE, such as a mobile device. Centonza discloses macro cells and pico cells (an anchor cell and a booster/assisting cell), including a “Primary serving cell” (a PCell) and a “secondary cell” (an SCell). Ex-1005, Figs. 8–12, 12:10–27; Ex-1006, 14–18, 20, 144.

77. The Source eNB controls a first cell (such as a PCell macro cell), reflected in Centonza explaining that a node (such an eNB) corresponds to a cell. Ex-1005, 5:46–48 (explaining that the “pico node corresponds to a cell of its own”); *id.*, 9:34–41 (teaching that macro nodes “may correspond to currently deployed macro cells” and that a pico node “may correspond to a cell of its own”); *id.*, 16:14–19 (referring to a “target eNB cell”); *id.*, 16:49–56 (discussing whether a cell “reside[s]” on a node); Ex-1006, 15, 16, 87 (describing node that “corresponds to a cell of its own”).

78. Centonza also discloses that the first cell (such a PCell macro cell) is serving a UE. Ex-1005, 3:4–62 (describing a “wireless terminal being served by a source base station”); *id.*, 12:10–27 (describing a “Primary serving cell, PCell”); Ex-

1006, 19–22 (describing a “Primary serving cell (PCell)”). Centonza discloses, for example, a macro cell (part of 401A) serving a wireless terminal (101). *See, e.g.*, Ex-1005, Fig. 9, 12; Ex-1006, 16 (Fig. 8), 17 (Fig.11); *see also* Ex-1005, Fig. 1 (showing anchor and assisting flow through macro node and pico node).



Ex-1005, Fig. 9.

79. This disclosure shows, in my opinion, that Centonza meets this claim element.

c) [1c]: the first eNB configures a second cell to serve the UE together with the first cell, wherein the second cell is controlled by a second eNB;

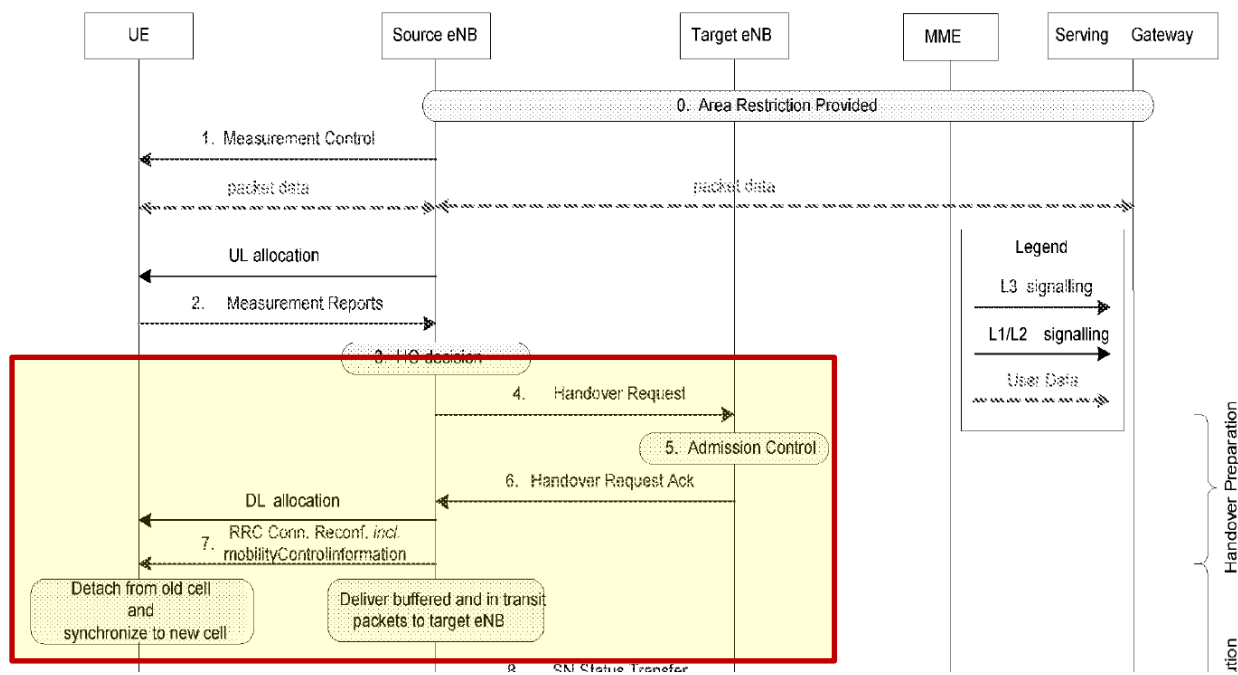
80. Centonza, in my opinion, discloses this limitation. Centonza teaches that the first eNB (*e.g.*, the Source eNB) configures a second cell (*e.g.*, a pico SCell) to serve the UE together with the first cell (*e.g.*, the macro PCell).

81. Centonza teaches dual connectivity via a partial handover of bearers from one eNB (*e.g.*, the Source eNB) to another eNB (*e.g.*, the Target eNB). Centonza teaches that the Source eNB configures a second cell as part of the partial handover process. Ex-1006, 45 (Fig. 14); Ex-1005, Fig. 15.

82. The steps highlighted below (steps 4 through 7) show, in my opinion, how Centonza teaches that the Source eNB configures a second cell (which is controlled by the Target eNB) to serve the UE together with the first cell. Ex-1006, 45 (Fig. 14); Ex-1005, Fig. 15.

83. These steps result in the Source eNB sending the UE an RRC message (the RRCConnectionReconfiguration message), shown in step 7 below. The '559 Patent discloses sending this type of RRC message to configure a second cell to a UE. Ex-1001, 6:55–58 (“[T]he second cell could be configured to the UE via a Radio Resource Control (RRC) message (such as a RRC Connection Reconfiguration message) from the first eNB.”).

84. Centonza’s figure, reproduced below, shows the series of steps.



85. Per above, the Source eNB sends a Handover Request to the Target eNB (step 4). That request includes a target cell identifier (the “Target Cell ID”) for an SCell that the Source eNB configures to serve together with the PCell via a list of the sub-set of radio bearers (called E-RABs¹⁰) to handover in an “E-RABs To Be Setup List.” Ex-1006, 50; Ex-1005, 17:5–18:24.

¹⁰ Centonza teaches that an “E-RAB” refers to an “E-UTRAN Radio Access Bearer,” typically a data radio access bearer. Ex-1006, 47 (“[U]nless otherwise specified, by bearer it is meant a data radio bearer.”); *id.*, 11, 47, 49, 51; Ex-1005, 4:13, 16:36–40, 17:5–18:24, 21:56–65, 27:56–58, 30:27–30.

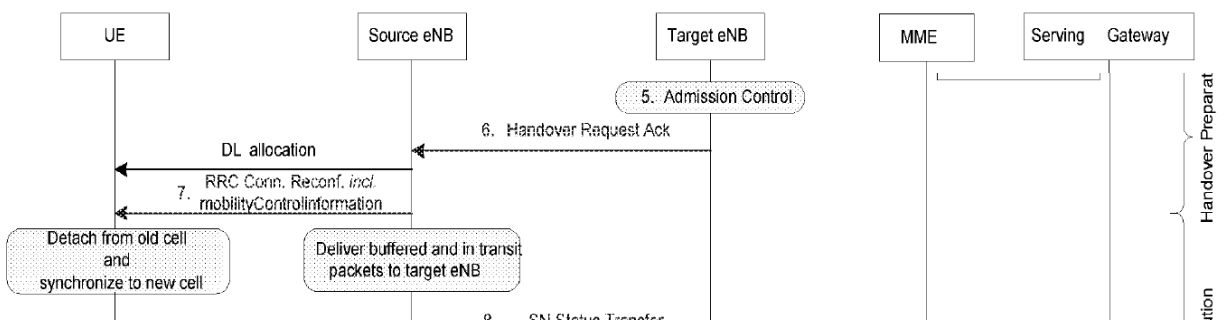
X2 HANDOVER REQUEST message	
	Presence
IE/Group Name	
Message Type	M
Old eNB UE X2AP ID	M
Cause	M
Target Cell ID	M
GUMMEI	M
UE Context Information	
>MME UE S1AP ID	M
>UE Security Capabilities	M
>AS Security Information	M
>UE Aggregate Maximum Bit Rate	M
>Subscriber Profile ID for	O
RAT/Frequency priority	
>E-RABs To Be Setup List	
>>E-RABs To Be Setup Item	
>>>E-RAB ID	M
>>>E-RAB Level QoS Parameters	M
>>>DL Forwarding	O
>>>UL GTP Tunnel Endpoint	M
>RRC Context	M
>Handover Restriction List	O
>Location Reporting Information	O
>Management Based MDT Allowed	O
UE History Information	M
Trace Activation	O
SRVCC Operation Possible	O
CSG Membership Status	O

Ex-1005, 17:5–18:24 (annotated).

86. The Handover Request configures an SCell of the UE (the Target Cell) via handing over a subset of bearers (in the E-RABs To Be Setup List) towards the SCell. Ex-1006, 62 (Fig. 19); *id.*, 48, 66, 70 (disclosing handover “towards the pico node or cell”); *id.*, 52–54 (teaching selective handover from a UE from Anchor Cell

A to Assisting Cell B); Ex-1005, 19:25–21:54 (same); *id.*, Fig. 19. As I explain above in connection with the preamble element ([1pre]), Centonza discloses that, after the partial handover, the first cell (*e.g.*, a macro cell, such as cell A, controlled by a Source eNB) serves the UE together and at the same time as the second cell (*e.g.*, a pico cell, such as cell B, controlled by a Target eNB).

87. The Target eNB, after determining if it can admit the handed-over bearers (step 5), “[s]ends, to the source base station [the first eNB], a handover acknowledgement message” (step 6). Ex-1005, Fig. 19; Ex-1006, 62 (Fig. 19); Ex-1006, 54 (describing admissions control); *id.*, 54–55, 93 (describing HANDOVER REQUEST ACKNOWLEDGE); Ex-1005, 21:55–23:31 (same); Ex-1006, 45 (Fig. 14); Ex-1005, Fig. 15. This is shown in the cropped image from Figure 14.



Ex-1006, 45 (Fig. 14) (cropped).

88. The Handover Request Acknowledge contains an E-RABs Admitted List and an E-RABs Not Admitted List, which informs the Source eNB of the E-RABs the Target eNB will accept and reject for the Target Cell. Ex-1006, 55; Ex-1005, 22:1–8.

X2 HANDOVER REQUEST ACKNOWLEDGE message	
	Presence
IE/Group Name	
Message Type	M
Old eNB UE X2AP ID	M
New eNB UE X2AP ID	M
E-RABs Admitted List	
> E-RABs Admitted Item	
>> E-RAB ID	M
>> UL GTP Tunnel Endpoint	O
>> DL GTP Tunnel Endpoint	O
E-RABs Not Admitted List	O
Target eNB to Source	M
eNB Transparent Container	
Criticality Diagnostics	O

89. The Source eNB receives these lists and changes the data path of radio bearers based on the lists. Specifically, “the source eNB decides to keep those bearers [on the Not Admitted List] with itself and hand over only the ones listed in the E-RABs Admitted List.” Ex-1006, 55; Ex-1005, 22:19–25.

90. The Source eNB then sends the downlink (“DL”) allocation and a RRC Connection Reconfiguration message to the UE (step 7). For the handed over bearers, this message detaches the bearers from the old cell (e.g., the PCell) and synchronizes to the new cell (e.g., the SCell, which was the Target Cell). Ex-1006, 94 (“After receiving the *RRCCConnectionReconfiguration* message comprising the *mobilityControlInfo*, UE performs synchronisation to target eNB and accesses the target cell via RACH. . . . When the UE has successfully accessed the target cell, the

UE sends the *RRCCConnectionReconfigurationComplete* message to the target to confirm that the handover succeeded.”); *id.*, 99 (explaining that, upon receipt of the *RRCCConnectionReconfiguration*, the UE “[s]tart[s] synchronizing to the downlink of the target cell”). This is the same message that the ’559 Patent discloses as an example configuration. Ex-1001, 6:55–58.

91. Centonza’s process, as I explained above for the preamble element of claim ([1pre]), configures the second cell (the SCell that is the target cell) to serve together with the first cell (the PCell), including as reflected in the mobility/history information tables for Cell A and Cell B I discuss above

92. After the partial handover of bearers, Centonza discloses that the PCell continues to serve the UE through the E-RABs that were not handed over (*e.g.*, those E-RABs that were not listed in the Handover Request or those in the E-RABs Not Admitted List in the Handover Acknowledge). Ex-1006, 55; Ex-1005, 22:19–25. The second cell (the SCell that is the target cell) serves the UE through the E-RABs that were handed over (*e.g.*, the E-RABs that were admitted). Ex-1006, 55; Ex-1005, 22:19–25. The SCell and PCell in Centonza, including after the partial handover, serve the UE together, as I described above in the preamble for claim 1. Ex-1005, Fig. 1, 5:31–33 (disclosing “simultaneous anchor and assisting flows to a wireless terminal”); Ex-1006, 145 (“Namely, the handover procedures involves the handing over of a subset of UE bearers to a target cell while some other UE bearers

are kept active in the source cell, enabling bearer traffic transmission to the same UE from at least two different cells.”); *see also id.*, 112 (explaining that even an empty bearer list still allows for “the possibility of transmitting future mobility signaling from both the serving and target cell”).

93. Centonza also discloses that the second eNB (the Target eNB) controls the second cell (the SCell). As I explained in connection with the preamble element, Centonza discloses that the second eNB (the Target eNB) controls the second cell (the SCell that is the target cell). Ex-1005, Fig. 9, 5:46–48 (depicting a deployment in which “the pico node corresponds to a cell of its own”); *id.*, 9:39–41 (“A pico node of a heterogeneous deployment may correspond to a cell of its own (a ‘pico cell’)[.]”); Ex-1005, Figs. 8–12, 12:10–27; Ex-1006, 15; *id.*, 16 (Fig. 8); 14–18, 20, 144.

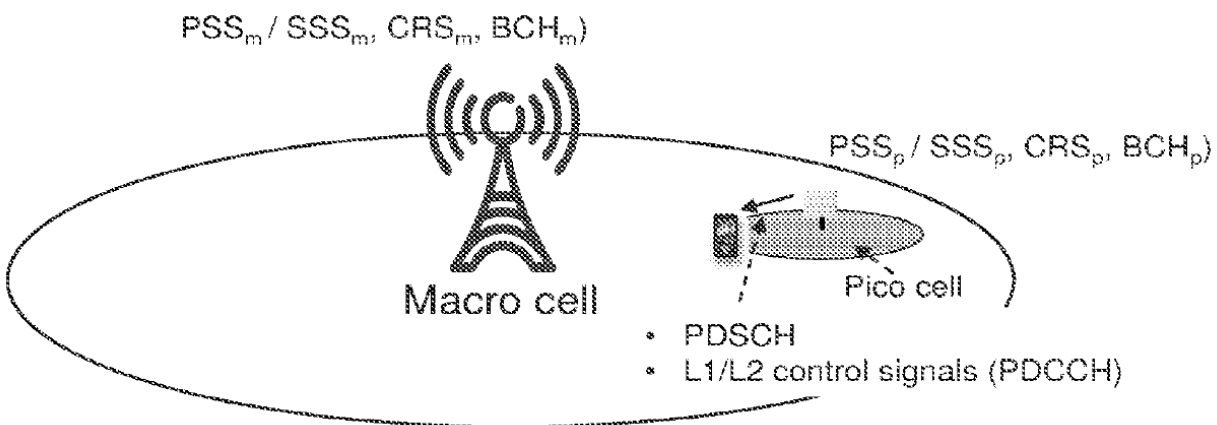


Figure 8: Heterogeneous deployment where the pico node corresponds to a cell of its own (a “pico cell”). The indices “p” and “m” indicate common signals/channels for the pico and macro cell respectively.

Ex-1006, 16 (Fig. 8).

94. As shown above, the Target eNB controls an SCell (e.g., a pico node that corresponds to a pico cell of its own).

95. For these reasons, in my opinion, Centonza discloses this claim limitation.

d) [1d]: the first eNB allocates a measurement gap configuration to the UE; and

96. Centonza discloses this limitation in my opinion. Centonza discloses that the first eNB (the Source eNB) allocates a measurement-gap configuration to the UE. Centonza teaches that, in connection with the reference's selective handover procedure, the Source eNB allocates a measurement-gap configuration to the UE and then communicates that configuration to the Target eNB as part of the Handover Request. The Source eNB also allocates a measurement-gap configuration for the UE as part of configuring the UE through an RRC message, such as the RRCConnectionReconfiguration message.

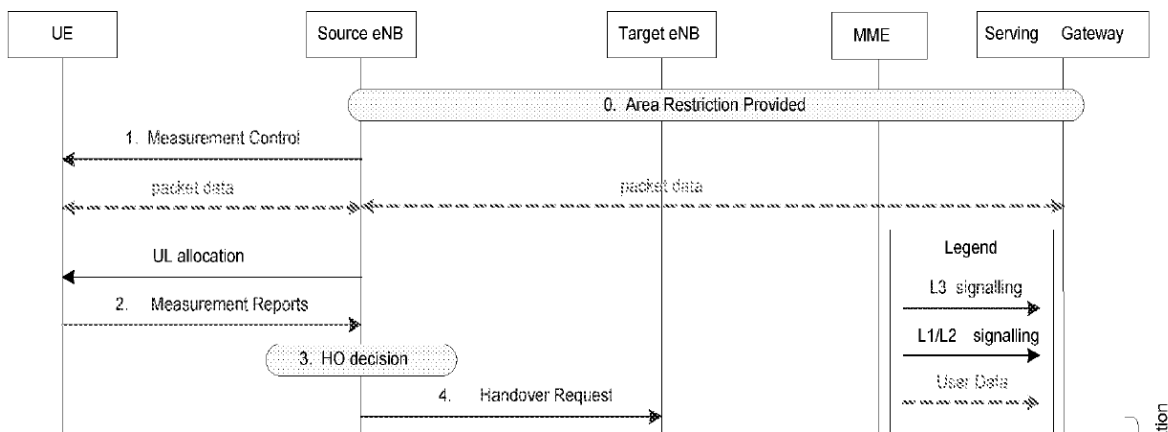
97. Centonza explains that one configuration an eNB can signal is a measurement gap configuration as part of providing the "measurement configuration applicable for a user equipment in RRC_CONNECTED by means of dedicated signaling, for example, using the RRCConnectionReconfiguration message" specified in TS 36.331.

Various measurement configurations may be signaled to the user equipment. . . . Yet another example

configuration is measurement gaps. Measurement gaps define time periods when no uplink or downlink transmissions will be scheduled, so that the user equipment may perform the measurements, for example, inter-frequency measurements where the user equipment has only one TX/RX unit and supports only one frequency at a time. The measurement gaps configuration are common for all gap-assisted measurements.

Ex-1005, 9:65–11:44; Ex-1006, 18–19, 89–90, 138–139, 205–206.

98. Centonza discloses that first eNB (*e.g.*, the Source eNB) receives measurement reports from the UE (step 2 below). Ex-1006, 45 (Fig. 14); Ex-1005, Fig. 15.



Ex-1006, 45 (Fig. 14) (cropped).

99. To provide those reports, the Source eNB first configures the UE to take measurements and provide measurement reports (such as in step 1,

“Measurement Control” above). Centonza explains that UEs are configured to report measurements via the RRCConnectionReconfiguration message.¹¹

UEs can be configured to report measurements, mainly for the sake of supporting mobility. As specified in 3GPP TS 36.331, the E-UTRAN provides the measurement configuration applicable for a UE in RRC_CONNECTED by means of dedicated signaling, i.e. using the RRCConnectionReconfiguration message.

Ex-1005, 9:65–11:44; Ex-1006, 18–19, 89–90, 138–139, 205–206.

100. This process allocates a measurement-gap configuration to the UE because the RRCConnectionReconfiguration message in TS 36.331 contains the MeasGapConfig information element (as I describe above) which “specifies the measurement gap configuration and controls setup/ release of measurement gaps.” Ex-1009, 217; Ex-1008, 246 (same); Ex-1015, 98 (explaining that the MeasGapConfig element “specifies the measurement gap configuration and controls activation/ deactivation of measurement gaps”).

¹¹ The purpose of the RRCConnectionReconfiguration message includes “to setup/ modify/ release measurements.” Ex-1009, 46; Ex-1008, 49 (same); Ex-1015, 57 (explaining that message conveys information for measurement configuration).

101. Thus, before a Handover Request (step 4 above), the Source eNB has allocated a measurement-gap configuration for the UE. Again, the eNB can signal to the measurement-gap configuration to the UE when it configures the UE via the RRCConnectionReconfiguration message. Ex-1005, 10:63–11:44; Ex-1006, 18–19, 89–90, 138–139, 205–206; *see also* Ex-1008, 140–141, 245–246 (showing MeasGapConfig within RRCConnectionReconfiguration message); Ex-1009, 128–129, 216–217 (same). This teaching reflects that the Source eNB allocates a measurement-gap configuration for a UE when it configures the UE.

102. Centonza’s allocation of a measurement-gap configuration for the UE is further shown in the Handover Request message that the Source eNB sends the Target eNB. Ex-1005, 17:6–35; Ex-1006, 150. The Handover Request message includes an RRC Context Information Element, which Centonza explains is “the RRC Handover Preparation Information message as defined in subclause 10.2.2 of TS 36.331.” *Id.*

Table 1: Example of enhanced HANDOVER REQUEST message

IE/Group Name	Presence	Range	Semantics description	Criticality	Assigned Criticality
>RRC Context	M		Comprises the RRC Handover Preparation Information message as defined in subclause 10.2.2 of TS 36.331 [9].	–	–

Ex-1006, 150 (cropped).

103. In this section and others,¹² Centonza specifically identifies with detailed particularity the RRC messaging protocol in TS 36.331 and clearly identifies where that material is found, namely the information about the two messages of interest that contain the measurement-gap configuration for a UE: the RRCConnectionReconfigurationRequest message and the HandoverPreparationInformation message.

104. TS 36.311 (both the version available at the time of the Centonza Provisional and the version incorporated into the '559 Patent) would have been well known to those of ordinary skill in the art before February 8, 2013. Those of skill in the art of wireless networks, specifically next-generation cellular networks such as 4G/LTE, would have been aware of the RRC protocol and the RRC protocol specification that is TS 36.331 before 2013.

¹² Centonza further points to TS 36.311 as providing “[t]he details of the RRC protocol functionalities and procedures.” Ex-1005, 7:24–26; Ex-1006, 11; *see also* Ex-1005, 10:65-11:3 (“As specified in 3GPP TS 36.331, the E-UTRAN provides the measurement configuration applicable for a user equipment in RRC_CONNECTED by means of dedicated signaling, for example, using the RRCConnectionReconfiguration message.”); Ex-1006, 18 (same).

105. Both version 11.2.0 and version 11.0.0 of TS 36.331 disclose that the Handover Preparation Information includes the MeasGapConfig information element, which “specifies the measurement gap configuration and controls setup /release of measurement gaps.” Ex-1009, 217; Ex-1008, 246–247.

– **MeasGapConfig**

The IE *MeasGapConfig* specifies the measurement gap configuration and controls setup/ release of measurement gaps.

MeasGapConfig information element

```
-- ASN1START
MeasGapConfig ::=
    CHOICE {
        release
        setup
            gapOffset
                gp0
                gp1
                ...
            }
    }
-- ASN1STOP
```

MeasGapConfig field descriptions

gapOffset

Value *gapOffset* of *gp0* corresponds to gap offset of Gap Pattern Id “0” with MGRP = 40ms, *gapOffset* of *gp1* corresponds to gap offset of Gap Pattern Id “1” with MGRP = 80ms. Also used to specify the measurement gap pattern to be applied, as defined in TS 36.133 [16].

Ex-1009, 217.

106. The Handover Preparation Information message includes the MeasGapConfig element within the AS-Config field. Ex-1009, 260; Ex-1008, 295. The AS-Config field contains information “about RRC configuration information in the source eNB which can be utilized by target eNB to determine the need to change the RRC configuration during the handover preparation phase.” Ex-1009, 261; Ex-1008, 298. That field includes the “measurement configuration in the source cell,” (sourceMeasConfig), Ex-1009, 262; Ex-1008, 297, which includes the

MeasGapConfig element, Ex-1009, 216; Ex-1008, 245–246. Thus, Centonza discloses that the RRC Context information element includes the measurement-gap configuration that the Source eNB allocated for a UE.

107. This disclosure further reinforces that the Source eNB allocated the measurement-gap configuration for the UE. The Source eNB then sends this configuration to the Target eNB as part of the Handover Request.

- e) *[1e]: the first eNB sends the measurement gap configuration to the second eNB so that the second eNB could take measurement gaps into consideration when scheduling resources to the UE.*

108. In my opinion, Centonza discloses this limitation. Centonza discloses that, within the Handover Request, the first eNB (the Source eNB) sends the measurement gap configuration (*e.g.*, the MeasGapConfig field within the RRC Context element) to the second eNB (the Target eNB), as discussed above in element [1d]. *Id.*; Ex-1006, 61–62 (Figs. 18 and 19) (“Send, to a target base station, a handover request....Receive, from the source base station, a handover request....”); Ex-1005, 3:12–16 (“sending, to a target base station, a handover request”); *id.*, 3:37–41 (“receiving, from the source base station, a handover request”); *id.*, Figs. 18 and 19 (“Send, to a target base station, a handover request....Receive, from the source base station, a handover request....”).

109. The purpose of the “send[ing]” is this step is “so that the second eNB could take measurement gaps into consideration when scheduling resources to the UE.” This language provides the intended result of the sending. To the extent this language limits the scope of the claims, Centonza meets this language in my opinion.

110. Centonza discloses that the first eNB sends the measurement-gap configuration to the second eNB to allow the second eNB to schedule resources around the measurement gaps. Centonza explains that “[m]easurement gaps define time periods when no uplink or downlink transmissions will be scheduled, so that the user equipment may perform the measurements[.]” Ex-1005, 11:37–44; Ex-1006, 19, 90, 139, 206; *see also* Ex-1009, 74 (defining measurement gap as “[p]eriods that the UE may use to perform measurements, i.e. no (UL, DL) transmissions are scheduled”); Ex-1008, 80 (same).

111. This disclosure shows that the Source eNB transmits the measurement-gap configuration to ensure that communications to and from a UE (such as communications between a UE and an eNB) are scheduled around the measurement gap, *i.e.*, are not scheduled during the time periods “when no uplink or downlink transmissions will be scheduled.” Ex-1005, 11:37–44; Ex-1006, 19, 90, 139, 206. Centonza further teaches that control signaling that “provides downlink and uplink scheduling information.” Ex-1005, 9:60–63; Ex-1006, 15, 87, 136; *see also id.*, 94, 209 (teaching that, after the RRC configuration is received, “the target eNB can

begin sending data to the UE and the UE can send data to the target based on the scheduling grants it is receiving”); *id.*, 99 (explaining that the UE can issue a “request for an UL grant using a scheduling request”).

112. TS 36.331 similarly explains that the Source eNB provides the MeasGapConfig information (as part of the AS-Config element) to the Target eNB so the Target eNB can “to determine the need to change the RRC configuration” (e.g., the measurement-gap configuration) “during the handover preparation phase.” Ex-1009, 261; Ex-1008, 296 (same). TS 36.331 further teaches that the measurement-gap configuration is used to schedule resources to and from a UE, including communications from an eNB (such as the Target eNB). Ex-1008, 53, 73 (explaining applying measurement configuration that require the UE to know the system frame number of the target PCell, such as the measurement gap); Ex-1009, 50, 67 (same); Ex-1008, 80 (“**Measurement gaps:** Periods that the UE may use to perform measurements, i.e. no (UL, DL) transmissions are scheduled.”); Ex-1009, 74 (same).

113. These disclosures mean that, based on the received measurement-gap configuration, the Target eNB follows the current measurement-gap configuration when it schedules resources or reconfigures the UE. In either case, Centonza teaches that the natural result flowing from the Source eNB sending the measurement-gap configuration to the Target eNB is that the Target eNB will take the measurement

gap into considering when scheduling resources to the UE. Centonza thus teaches providing the measurement gap configuration to the Target eNB so the Target eNB can schedule resources to a UE to avoid the periods when the UE cannot transmit or receive data because it is taking measurements.

3) Claim 2

a) [Preamble]: The method of claim 1, wherein

114. In my opinion, Centonza discloses all of the elements of claim 1 for the reasons I explain above.

b) [2b]: the measurement gap configuration indicates a measurement gap pattern to be applied in the UE for performing measurements.

115. In my opinion, Centonza discloses this claim limitation. Centonza explains that the measurement gap configuration indicates a measurement gap pattern to be applied in the UE for performing measurements, as I explain above in element [1e]. Centonza explains that “[m]easurement gaps define time periods when no uplink or downlink transmissions will be scheduled, so that the user equipment may perform the measurements[.]” Ex-1005, 11:37–44; Ex-1006, 19, 90, 139, 206. This discloses a measurement-gap pattern to be applied in the UE for performing measurements.

116. As I discuss in connection with element [1d], the measurement-gap configuration (e.g., within MeasGapConfig) is included within the Handover

Request (via RRC Context) and the RRCConnectionReconfigurationRequest message. The MeasGapConfig field includes the gapOffset field, which is used to “specify the measurement gap pattern to be applied[.]” Ex-1009, 217; Ex-1008, 247 (same).

<i>MeasGapConfig</i> field descriptions
gapOffset Value <i>gapOffset</i> of <i>gp0</i> corresponds to gap offset of Gap Pattern Id “0” with MGRP = 40ms, <i>gapOffset</i> of <i>gp1</i> corresponds to gap offset of Gap Pattern Id “1” with MGRP = 80ms. Also used to specify the measurement gap pattern to be applied, as defined in TS 36.133 [16].

Ex-1009, 217.

117. Thus, in my opinion, Centonza discloses this claim element.

4) Claim 3

a) [Preamble]: The method of claim 1, wherein

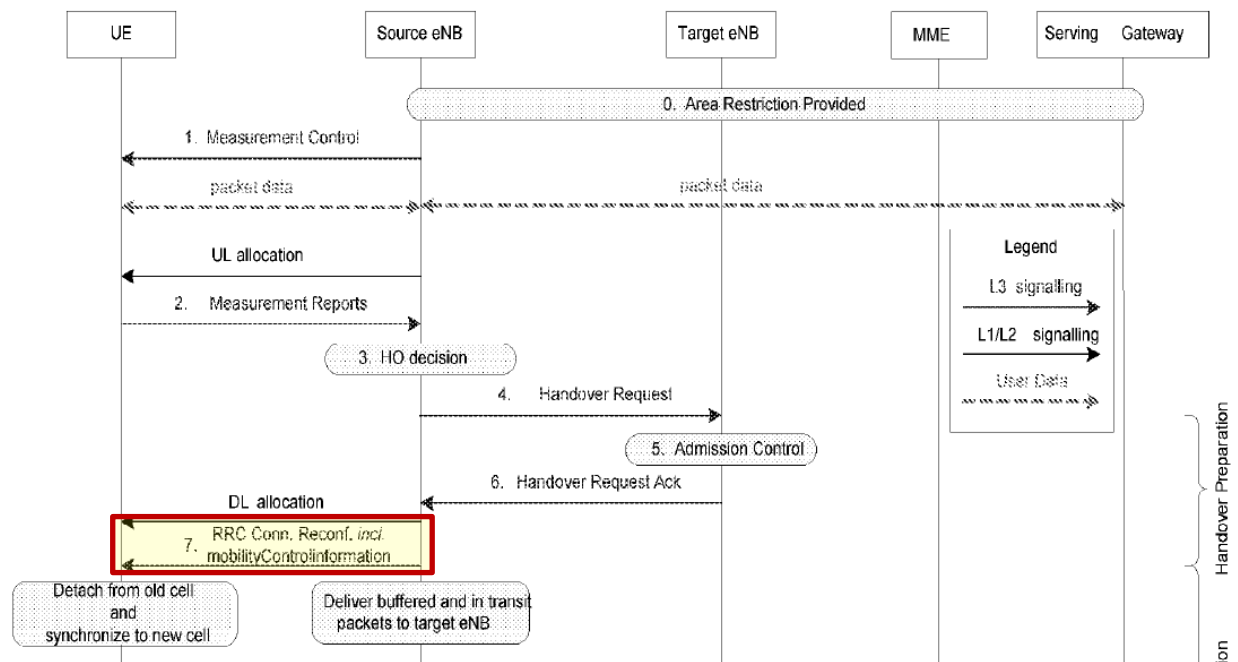
118. In my opinion, Centonza discloses all of the elements of claim 1 for the reasons I explain above.

b) [3b]: the second cell is configured to the UE via a Radio Resource Control (RRC) message (such as a RRC Connection Reconfiguration message) from the first eNB.

119. In my opinion, Centonza discloses this claim limitation. The reference teaches that the second cell (*e.g.*, the pico cell) is configured to the UE via a Radio Resource Control (RRC) message (such as a RRC Connection Reconfiguration message) from the first eNB (*e.g.*, the Source eNB).

120. Centonza shows that the Source eNB configures the SCell to the UE through a RRC Connection Reconfiguration message, as shown below in step 7. Ex-

1006, 46 (Fig. 14); Ex-1005, Fig. 15; *id.*, 10:63–11:3 (“[T]he E-UTRAN provides the measurement configuration applicable for a user equipment in RRC_CONNECTED by means of a dedicated signaling, for example, using the RRCConnectionReconfiguration message.”); Ex-1006, 18, 89 (same); *id.*, 92 (“The measurement configurations are sent to the UE by using the *measConfig* Information Element (IE) that is comprised in the *RRCConnectionReconfiguration* message.”); *id.*, 93 (explaining that main components of the *RRCConnectionReconfiguration* message including “[a]n optional measurement configuration (*measConfig* IE) to be used in the target cell”).



Ex-1006, 46 (Fig. 14) (cropped and annotated).

121. As shown above, after receiving the RRC message, the second cell is configured to the UE, evidenced in the “Detach from old cell and synchronize to

new cell” action in the Figure above. This shows that the RRC message configures the second cell (here the target cell, such as an SCell) to the UE. This disclosure matches the example RRC-based configuration disclosed in the ’559 Patent. Ex-1001, 6:55–58.

122. Centonza thus discloses this claim element in my opinion.

5) Claim 7

a) [Preamble]: A method for supporting dual connectivity in a wireless communication system, wherein separate eNBs (evolved Node B) are used to support dual connectivity and a UE (User Equipment) is served by a first cell controlled by a first eNB, comprising:

123. Centonza discloses this claim element in my opinion. This limitation is a combination of two elements above, elements [1pre] and [1b]. Centonza discloses “[a] method for supporting dual connectivity in a wireless communication system, wherein separate eNBs (evolved Node B) are used to support dual connectivity” for the reasons I explain in connection with in element [1pre]. Section VIII (A)(2)(a).

124. Centonza similarly discloses “a UE (User Equipment) is served by a first cell controlled by a first eNB” as I describe above for the parallel limitation in [1b] (“a first eNB controls a first cell, wherein the first cell is serving a UE (User Equipment)”). Section VIII(A)(2)(b).

125. Centonza discloses this limitation in my opinion for these reasons.

- b) *[7b]: a second eNB controls a second cell, wherein the second cell is configured by the first eNB to serve the UE together with the first cell; and*

126. Centonza discloses this limitation in my opinion for these reasons. This limitation matches element [1c], which recites “the first eNB configures a second cell to serve the UE together with the first cell, wherein the second cell is controlled by a second eNB.” As I explain above in connection with element [1c], Centonza discloses this limitation for the same reasons as element [1c]. Section VIII(A)(2)(c).

- c) *[7c]: the second eNB receives a measurement gap configuration from the first eNB so that the second eNB could take measurement gaps into consideration when scheduling resources to the UE, wherein the measurement gap configuration was allocated by the first eNB to the UE.*

127. Centonza discloses this element in my opinion. This limitation is a combination of two claim elements in claim 1, elements [1d] and [1e]. The “wherein the measurement gap configuration was allocated by the first eNB to the UE” parallels element [1d], which recites “the first eNB allocates a measurement gap configuration to the UE.” As I explain in connection with element [1d], Centonza discloses this limitation in my opinion. Section VIII(A)(2)(d). The “second eNB receives a measurement gap configuration from the first eNB” portion of this limitation mirrors the “the first eNB sends the measurement gap configuration to the second eNB” from element [1e]. For the same reasons I discuss above for element

[1e], Centonza discloses that the second eNB (the Target eNB) receives from the first eNB (the Source eNB) measurement-gap information (*e.g.*, via the MeasGapConfig field within the RRC Context element of the Handover Request). Section VIII(A)(2)(e). Finally, the “second eNB could take measurement gaps into consideration when scheduling resources to the UE” portion of this limitation matches the same limitation in element [1e]. In my opinion, as I discuss above in connection with element [1e], Centonza discloses this limitation. Section VIII(A)(2)(e).

6) Claim 8

a) [Preamble]: The method of claim 7, further comprises:

128. In my opinion, Centonza discloses each of the elements in claim 7 for the reasons above.

b) [8b]: the second eNB takes the measurement gap configuration into consideration when scheduling resources to the UE.

129. In my opinion, Centonza discloses this claim limitation. As I discuss in connection with elements [1e] and [7c], the second eNB (the Target eNB) receives the MeasGapConfig field within the RRC Context element of the Handover Request in order to schedule resources to the UE. Sections VIII(A)(2)(e) and VIII(A)(5)(c).

7) Claim 9

a) [Preamble]: The method of claim 8, wherein

130. In my opinion, Centonza discloses each of the elements in claim 8 for the reasons above.

b) [9b]: the resources contain downlink assignments and/or uplink grants.

131. In my opinion, Centonza discloses this claim limitation. As I explain in connection with elements [1e], [7c], and [8b], the second eNB (the Target eNB) receives the MeasGapConfig field within the RRC Context element of the Handover Request in order to schedule resources to the UE. Sections VIII(A)(2)(e), VIII(A)(5)(c), and VIII(A)(6)(b). That includes the uplink grants and downlink assignments, as the UE cannot transmit data in the uplink and downlink directions during the measurement gap period. *Id.*

8) Claim 10

a) [Preamble]: The method of claim 7, wherein

132. In my opinion, Centonza discloses each element of claim 7 for the reasons above.

b) [10b]: the measurement gap configuration indicates a measurement gap pattern to be applied in the UE for performing measurements.

133. In my opinion, Centonza discloses this claim element. This limitation is the same as element [2b], and Centonza discloses that element as I explain above.

Section VIII(A)(3)(b). For the same reasons as element [2b], Centonza discloses this limitation. *Id.*

9) Claim 11

a) [Preamble]: The method of claim 7

134. In my opinion, Centonza discloses each element of claim 7 for the reasons above.

b) [11b]: wherein the second cell is configured to the UE via a Radio Resource Control (RRC) message (such as a RRC Connection Reconfiguration message) from the first eNB.

135. In my opinion, Centonza discloses this claim element. This limitation is the same as element [3b] and, for the same reasons that I discuss in connection with element [3b], Centonza discloses this claim element. Section VIII(A)(4)(b).

B. Ground 2: Centonza Combined With TS 36.331 Version 11.2.0 Renders Obvious the Challenged Claims

136. In my opinion, as I explain above, Centonza discloses each element of the Challenged Claims. It is also my opinion, to the extent Centonza does not disclose each claim element on its own, Centonza combined with TS 36.311 renders the Challenged Claims obvious for the reasons below.

1) Centonza and TS 36.331 Version 11.2.0 Are Prior Art

137. In my opinion, Centonza is prior art for the reasons I explain in connection with Ground #1, as I understand the legal requirements to be prior art. Section VIII(A)(1).

138. In my opinion, TS 36.331 is also prior art as I understand the legal requirements to be prior art. The '559 Patent admits that Version 11.2.0 of TS 36.331 predates the '559 Patent because it incorporates by reference Version 11.2.0 of TS 36.331. Ex-1001, 2:18–30, 6:41–49.

139. The version of TS 36.331 I discuss above in connection with Ground #1 (version 11.0.0) has the same relevant disclosure as version 11.2.0. I cite both versions of TS 36.331 above in connection with Ground #1.

140. I also understand that that version 11.0.0 of TS 36.331 was publicly available at or near the time of its June 2012 publication date (such as on the 3GPP website). Ex-1014, ¶¶ 53–58. I further understand that version 11.2.0 of TS 36.331 was publicly available at or near the time of its December 2012 publication date. *Id.*, ¶¶ 59–64.

2) Motivation to Combine Centonza and TS 36.331 Version 11.2.0

141. To the extent Centonza does not incorporate TS 36.331 by reference, in my opinion, a POSITA would have been motivated to combine Centonza with TS

36.331 version 11.2.0 to arrive at the Challenged Claims. Centonza cites to TS 36.331 for the RRC protocol, including the messages related to providing user equipment measurements (such as measurement-gap configurations) and states that the Handover Request includes the RRC context. Ex-1005, Fig. 5, 7:14–26, 10:64–11:3, 12:47–60, 16:66–17:4; Ex-1006, 11, 18, 146, 150, 152, 165, 166. Centonza’s teaching would have motivated a POSITA to combine Centonza with TS 36.331, given Centonza’s discussion of the RRC protocol, its incorporation of the RRC protocol into Centonza’s system, and Centonza’s multiple citations to the RRC protocol specification in TS 36.331 as it relates to Centonza’s messages.

142. Centonza and TS 36.331 are in the same field. Both references relate to next-generation cellular networks, specifically building on E-UTRAN that existed in 2012 (*e.g.*, 4G/LTE networks). TS 36.331 is a standardized protocol specification for RRC used in E-UTRAN, specifically a protocol “for the radio interface between UE and E-UTRAN[.]” Ex-1008, 14; Ex-1009, 14 (same). Centonza likewise relates to improvements to E-UTRAN (including 4G/LTE), including using the RRC protocol. Ex-1005, 1:35–53, 2:24–36, 15:13–18 (explaining that Centonza improves upon “[t]he current legacy handover mechanisms” and describing “the use of an LTE based system as an example”); *see also id.*, Figs. 2, 4, 5, 6:20–35, 6:61–7:47 (describing the Radio Protocol Architecture of E-UTRAN and explaining that “[t]he

details of the RRC protocol functionalities and procedures may be found in 3GPP TS 36.331”); Ex-1006, 8, 11, 82 (similar).

143. A POSITA would have also had a reasonable expectation of success from combining Centonza and TS 36.311. Centonza discloses the architecture to transmit messages through the RRC protocol, and discloses that its Handover Request includes the RRC Context for selective handover (the RRC Handover Preparation Information message). Ex-1005, Figs. 4, 5, 6:61–7:46, 16:63–17:35; Ex-1006, 10–12, 49–50, 148, 150, 152. A POSITA thus would have understood that Centonza could implement the RRC protocol as described in TS 36.331 and the combination would be successful. This is especially the case because the RRC protocol standardized in TS 36.331 was well-established by 2013, including transmitting the MeasGapConfig element (which has existed in the RRC protocol specification since at least 2008). Ex-1015, 98; Ex-1014, Ex-1014, ¶¶ 47–52 (describing publication of TS 36.331 specification in March 2008).

3) Independent Claims

144. In my opinion, Centonza renders obvious claims 1 and 7 of the ’559 Patent. As I explain above in Sections VIII(A), in my opinion, Centonza (including as disclosed in TS 36.331 that is referenced in Centonza) discloses each element of these claims. To the extent Centonza (without the incorporated portions of TS 36.311 that I cite above) does not disclose any of the claim elements, it is my opinion

that the combination of Centonza and TS 36.311 discloses each element as detailed in Ground #1. The combination of Centonza and TS 36.331, as I explain above in Ground #1, discloses each element of the Challenged Claims.

145. In addition, to the extent the combination of Centonza and TS 36.311 does not disclose the purpose (elements [1e] and [7c]) of sending the measurement-gap configuration to the Target eNB, it is my opinion that a POSITA would have found it obvious to modify the system such that the Target eNB takes the measurement-gap configuration into consideration when scheduling resources to the UE. Per Centonza, the measurement-gap configuration tells the Target eNB when the UE cannot communicate in the uplink and downlink directions. The entire purpose of transmitting this information, in my opinion, is so the Target eNB can ensure it is not attempting to communicate with the UE during the measurement-gap period. It thus would have been obvious to a POSITA to modify Centonza and TS 36.331 to expressly take into consideration the measurement gaps when scheduling resources to the UE. A POSITA would have been motivated to make this change, in my opinion, to take advantage of the measurement-gap configuration provided to the Target eNB and maximize the efficiency of communications with the UE.

146. A POSITA would also have had a reasonable expectation of success in the combination of Centonza and TS 36.331. The system would work better because the Target eNB would avoid transmitting data to the UE during the measurement

gaps (as it would know that the UE would be unable to receive those transmissions) and would avoid scheduling grants in the uplink direction during the measurement-gap period because the UE cannot transmit data during those periods. Again, the purpose of providing the measurement-gap configuration is so the UE and eNBs can communicate outside the measurement-gap periods. By making sure that the communication is outside the measurement-gap period, the system will have less data loss and increased data throughput as a result. A POSITA would have been motivated to increase the efficiency of the system for these reasons and would have had a reasonable expectation that the combination of Centonza and TS 36.331 would be successful.

4) Dependent Claims

147. For the dependent claims of the Challenged Claims, it is my opinion that Centonza combined with TS 36.331 renders obvious those claims (claims 2, 3, 8–11). As I discuss above in Sections VIII(A) in connection with Ground #1, it is my opinion that Centonza (including the portions of TS 36.331 that I discuss) discloses each element of these claims. To the extent Centonza (without the incorporated portions of TS 36.311 that I cite above) does not disclose any of the claim elements, it is my opinion that the combination of Centonza and TS 36.311 discloses each element as detailed in Ground #1.

148. In addition, to the extent the combination of Centonza and TS 36.311 does not disclose the Target eNB “tak[ing] the measurement gap configuration into consideration when scheduling resources to the UE” (element [8b]) a POSITA would have found it obvious to modify the system for the same reasons I discuss above in connection with claims 1 and 7 (and specifically elements [1e] and [7c]): the purpose of providing the measurement-gap configuration is for an eNB to schedule resources around the measurement-gap period.

149. Similarly, to the extent the combination of Centonza and TS 36.311 does not explicitly disclose the scheduled resources include downlink assignments and/or uplink grants (as in element [9b]), in my opinion a POSITA would have found it obvious to modify the system to schedule downlink assignments and uplink grants based on the measurement-gap configurations. A POSITA would have found such a change obvious for the reasons above in connection with scheduling resources to the UE. During the measurement gaps, a UE cannot communicate in either the uplink or downlink directions. It thus would have been obvious to a POSITA to modify Centonza and TS 36.331 to expressly take into consideration the measurement gaps when scheduling uplink grants and downlink assignments. A POSITA would have been motivated to make this change to take advantage of the measurement-gap configuration provided the Target eNB and maximize the throughput during periods of uplink and downlink transmissions (and minimize the

amount of transmissions during the measurement gaps, which would require retransmission of the data).

150. A POSITA, in my opinion, would have had a reasonable expectation of success for the same reasons as above, including given that Centonza expressly cites to TS 36.331 and the use of the RRC protocol and protocol information elements, and that Centonza teaches uplink and downlink transmissions and control signaling that provides uplink and downlink scheduling. Ex-1005, 9:60–92; Ex-1006, 15, 87, 136; *see also id.*, 94, 209 (teaching that, after the RRC configuration is received, “the target eNB can begin sending data to the UE and the UE can send data to the target based on the scheduling grants it is receiving”); *id.*, 99 (explaining that the UE can issue a “request for an UL grant using a scheduling request”). This disclosure shows that expressly including scheduling uplink grants and downlink assignments around the measurement gaps would have been successful.

C. Ground 3: Centonza Combined With Siomina Renders Obvious the Challenged Claims

1) Centonza and Siomina Are Prior Art

151. In my opinion, Centonza is prior art to the '559 Patent for the reasons above in Ground #1. Section VIII(A)(1). In my opinion, Siomina is also prior art to the '559 Patent, as I understand the requirements for a reference to be prior art. Siomina is a World Intellectual Property Organization (“WIPO”) application that

claims priority to a November 2010 provisional application, was filed in November 2011, and was published in May 2012, Ex-1007, (10), (22), (30), each of which occurred before the earliest priority date of the '559 Patent. It is thus prior art to the '559 Patent as I understand the legal requirements for prior art.

2) Motivation to Combine Centonza and Siomina

152. In my opinion, a POSITA would have been motivated to combine Centonza and Siomina to arrive at the Challenged Claims. Centonza and Siomina are in the same field, as both relate to improving heterogeneous network deployments in 4G/LTE networks. Ex-1005, Fig. 1, 1:35–62, 2:24–36; Ex-1006, 8, 14–16; Ex-1007, 1:24–2:30. Centonza, as I discuss above, also teaches obtaining measurement-gap information and, via an RRC message, transmitting that information to the Target eNB in a heterogeneous network that enables dual connectivity. Section VIII(A). Thus, in my opinion, a POSITA looking at Centonza would have been motivated to look for a more-detailed disclosure relating to transmitting measurement-gap configuration information between two eNBs in a heterogeneous network to manage communications with a UE.

153. Siomina, in my opinion, would have been one of the disclosures a POSITA would have been motivated to combine with Centonza before the priority date of the '559 Patent. Siomina, also assigned to Telefonaktiebolaget LM Ericsson, provides additional details on transmitting patterns between two eNBs, including

measurement-gap configurations, and scheduling resources based on those patterns. *Id.*; *E.g.*, Ex-1007, 3:29–35 (discussing how a pico cell “can prioritize scheduling of transmissions”).

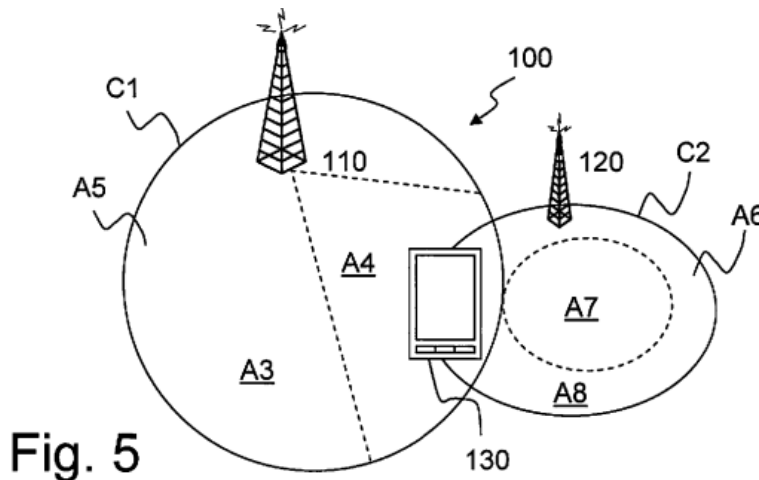
154. A POSITA, in my opinion, would also have a reasonable expectation of success in combining Centonza and Siomina. Both references disclose the same type of heterogeneous network in LTE/4G systems (*e.g.*, macro eNBs and pico eNBs), using the same standardized X2 interface to send messages between eNBs, the same standardized RRC protocol, and the same measurement-gap concepts. *Id.*; Ex-1005, 6:20–35, 6:61–7:47, 11:37–44; Ex-1006, 8–9, 10–12, 18–19, 21; Ex-1007, 2:19–30, 5:4–6:15, 10:16–19, 33:21–22. The two references complement each other and would have been a natural fit for a POSITA to combine, given that they are in the same field, both relate to improvements to heterogeneous networks (such as those providing dual connectivity), and both relate to providing measurement-gap configuration information to an eNB for it to use. A POSITA thus would have understood that the combined system, employing many of the same standards, would work for the purposes described in both references.

3) **Claim 1**

- a) *[Preamble]: A method for supporting dual connectivity in a wireless communication system, wherein separate eNBs (evolved Node B) are used to support dual connectivity, comprising:*

155. To the extent the preamble is limiting, the combination of Centonza and Siomina render obvious the preamble in my opinion. As I discuss above, Centonza discloses the preamble. Section VIII(A)(2)(a).

156. To the extent Centonza does not disclose the preamble, Siomina discloses the preamble because it shows a macro eNB (the first eNB) that controls a first cell (C1) and a pico eNB (a second eNB) that controls a second cell (C2). Ex-1007, Figs 3, 5; *id.* 9:23–11:11, 17:13–18:14.



Ex-1007, Fig. 5.

157. Siomina discloses, as shown above, that the two eNBs are separate and show a heterogeneous deployment in a wireless communication system. While

Siomina does not expressly disclose the term “dual connectivity,” a POSITA in my opinion would have understood, before February 2013, that heterogeneous networks (such as networks that contain macro eNBs and pico eNBs) like Siomina were typically used to support dual connectivity.

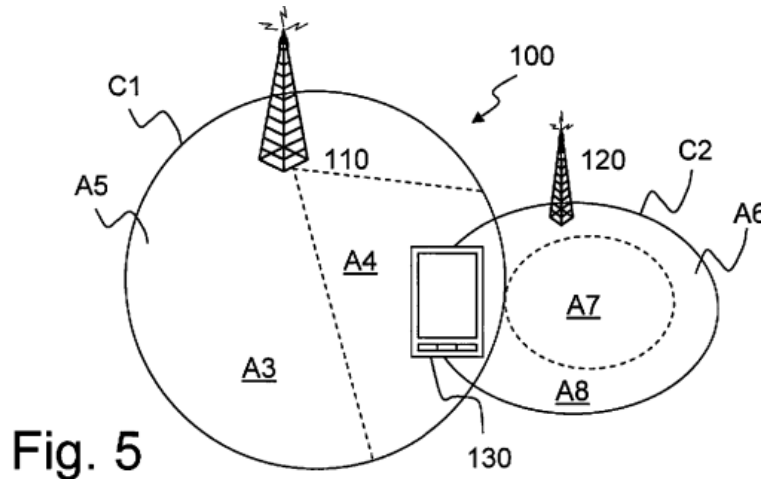
158. In my opinion, a POSITA would have reached this understanding, at least in part, by looking at Centonza. Centonza expressly discloses a heterogeneous network in which a UE “uses multiple flows, e.g. an anchor flow from the macro base station (or ‘anchor eNB’) **401A** and a[n] assisting flow from a pico base station (or a[n] ‘assisting eNB’) **401B**.”). Ex-1005, 1:53–62; *id.*, Fig. 1, 5:31–33 (“FIG. 1 is an illustrative example of a heterogeneous deployment with simultaneous anchor and assisting flows to a wireless terminal[.]”) (emphasis added).

159. Patent Owner, as reproduced above, stated during prosecution that “dual connectivity” refers to “a UE is served by two base stations at the same time,” Ex-1002, 37, which is the type of system that Centonza expressly discloses as I explain above.

b) [1b]: a first eNB controls a first cell, wherein the first cell is serving a UE (User Equipment); and

160. In my opinion, the combination of Centonza and Siomina renders obvious this limitation. Centonza discloses element [1b] in my opinion, as I explain above in connection with Ground #1. Section VIII(A)(2)(b). To the extent Centonza

does not disclose this element, in my opinion Siomina discloses that a first eNB (*e.g.*, a macro eNB) controls a first cell (*e.g.*, C1) that a serving a UE (*e.g.*, UE 130). Ex-1007, Figs 3, 5; *id.* 9:23–11:11, 17:13–18:14.



Ex-1007, Fig. 5.

161. The above figure shows a first eNB (specifically, the macro eNB 110) that controls a first cell (cell C1), which is serving a UE (specifically, the UE 130).

- c) [1c]: the first eNB configures a second cell to serve the UE together with the first cell, wherein the second cell is controlled by a second eNB;*

162. In my opinion, the combination of Centonza and Siomina renders obvious this limitation. Centonza discloses element [1c] in my opinion, as I explain above. Section VIII(A)(2)(c). To the extent Centonza does not disclose this element, it is my opinion that Siomina also discloses that the first eNB (*e.g.*, the macro eNB) configures a second cell (*e.g.*, C2) to serve the UE (*e.g.*, UE 130) together with the first cell (*e.g.*, C1), wherein the second cell (*e.g.*, C2) is controlled

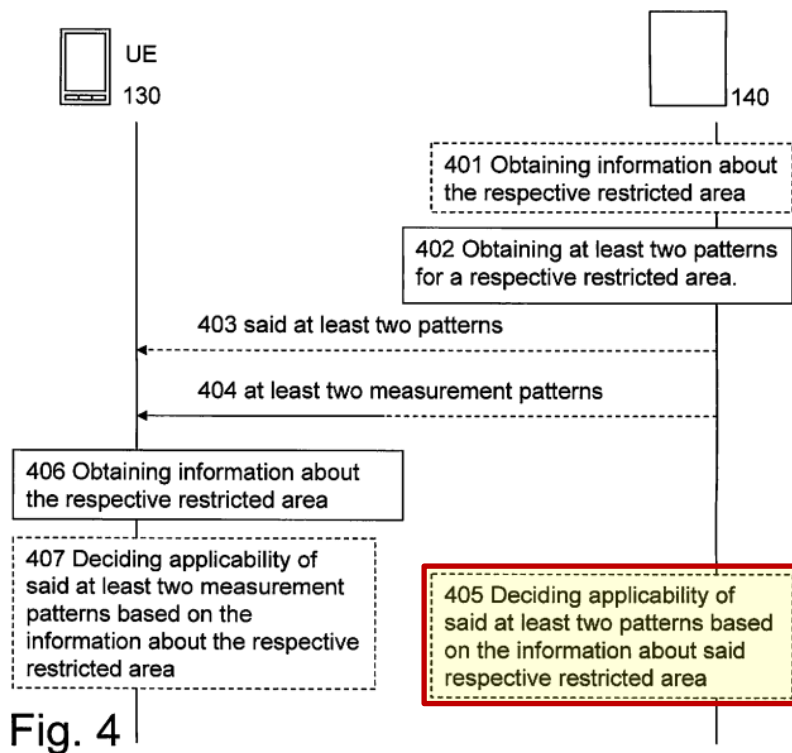
by a second eNB (*e.g.*, the pico eNB). Ex-1007, Figs. 6a, 7, 7:11–35, 12:13–13:30, 18:8–20:5, 22:22–24:21. It discloses that the macro eNB configures cell C2 at the pico eNB through transmitting the patterns to be used in cell C2 at the pico base station.

163. As I explain above, to the extent Siomina does not disclose dual connectivity (*e.g.*, “a second cell to serve the UE together with the first cell”), it is my opinion that a POSITA would have understood that Siomina’s heterogeneous network typically would be used for dual connectivity. A POSITA would have reached this conclusion in view of Centonza’s express disclosure of using a heterogeneous network to provide dual connectivity in which a first and second cell serve a UE together (*e.g.*, the primary and secondary cells in Centonza).

d) [1d]: the first eNB allocates a measurement gap configuration to the UE; and

164. The combination of Centonza and Siomina renders obvious this limitation in my opinion. Centonza discloses element [1d] for the reasons I explain above. Section VIII(A)(2)(d). To the extent Centonza does not disclose this limitation, it is my opinion that Siomina discloses that a first eNB allocates a

measurement-gap configuration to the UE (e.g., configuring a pattern¹³). Ex-1007, Figs. 4, 7, 11:14–17:10, 22:22–24:21.



Ex-1007, Fig. 4.

165. As shown above, for example, Siomina teaches that the network node 140 (such as the macro base station 110¹⁴) decides which configuration (a pattern)

¹³ The '559 Patent teaches that “[i]n one embodiment, the measurement gap configuration could indicate a measurement gap pattern to be applied in the UE for performing measurements.” Ex-1001, 6:59–64.

¹⁴ Siomina discloses that network node 140 may be “a macro eNodeB, pico eNodeB, micro eNodeB, home eNodeB, relay node, or the like.” Ex-1007, 9:29–33.

shall be applied to a UE (step 405). Ex-1007, Fig. 7 (“705 Deciding applicability of said at least two patterns based on the information about said respective restricted area”); *id.*, 24:18–21 (describing step 705 as “performed in a similar manner as action 405”); *id.*, 13:20–30 (“[T]he network node 140 determines which of the at least two patterns shall be applied when the user equipment 130 is located in the respective restricted area.”); *id.* (“The network node 140 may further decide applicability of the at least two patterns based on available measurements relating to the user equipment such as position, current pre-coding, bandwidth used, etc.”); *id.*, 10:16–19 (“The first pattern may be intended for measurement gaps and the second pattern may be intended for measurements without measurement gaps.”).

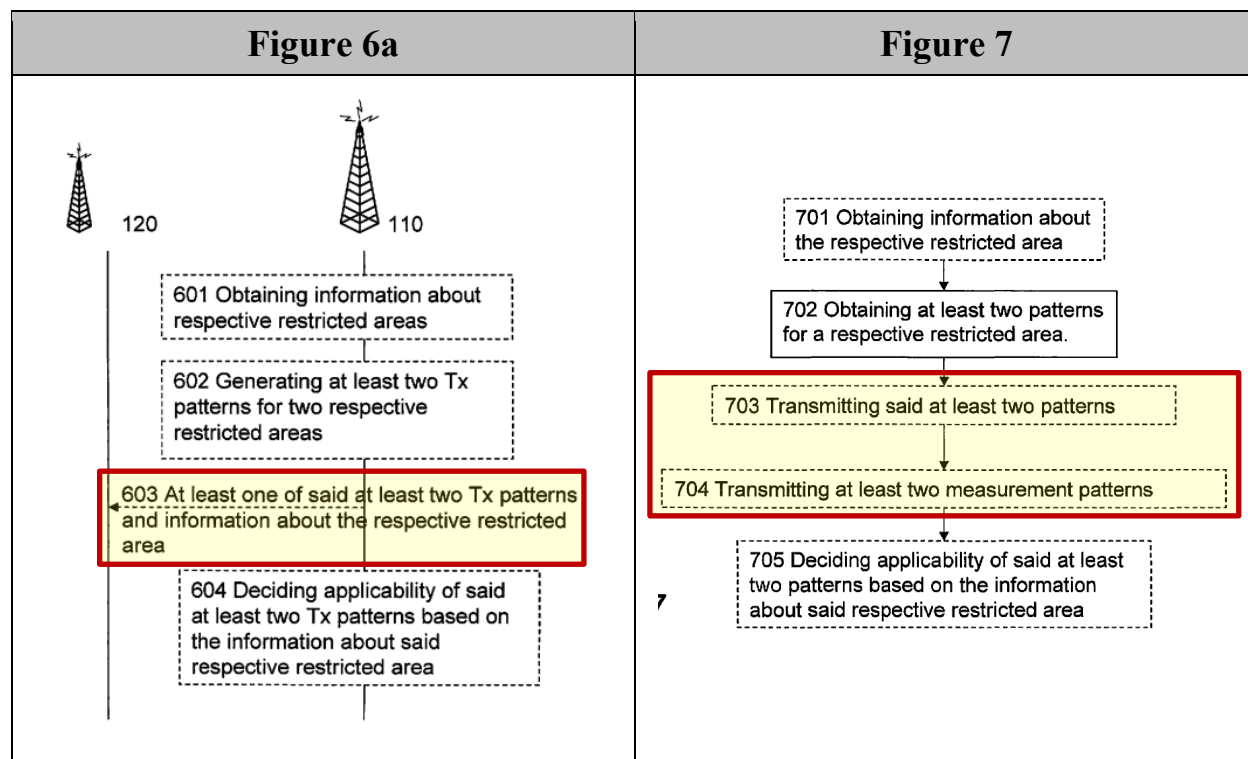
166. This disclosure shows that the first eNB (*e.g.*, the macro eNB) allocates a measurement-gap configuration to a UE.

- e) *[1e]: the first eNB sends the measurement gap configuration to the second eNB so that the second eNB could take measurement gaps into consideration when scheduling resources to the UE.*

167. The combination of Centonza and Siomina renders obvious this limitation in my opinion. Centonza discloses element [1e] for the reasons I discuss above. Section VIII(A)(2)(e). To the extent Centonza does not disclose this limitation, in my opinion Siomina also discloses that a first eNB (*e.g.*, macro base station) sends the measurement gap configuration (the pattern) to the second eNB

(e.g., pico base station) so that the second eNB could take measurement gaps into consideration when scheduling resources to the UE (e.g., UE 130). Ex-1007, Figs. 4, 6a, 7, 11:14–17:10, 18:17–20:5, 22:21–24:21.

168. Siomina discloses that the macro eNB sends the patterns to the pico eNB. In connection with Figures 6a and 7, for example, Siomina teaches that the macro eNB sends at least two patterns for the pico eNB in step 603 (in Figure 6a) and steps 703 and 704 (in Figure 7). Ex-1007, Figs. 6a and 7; *id.*, 19:12–29 (describing step 603); *id.*, 24:5–16 (describing steps 703 and 704).



Ex-1007, Figs. 6a and 7.

169. Siomina discloses that the second eNB (the pico eNB) receives the configuration (the pattern) and takes the pattern into consideration when it schedules

resources to the UE, such as scheduling transmission activity to the UE. Ex-1007, Figs. 4, 6a; *id.*, 3:29–35 (discussing how a pico cell “can prioritize scheduling of transmissions”); *id.*, 5:18–36 (explaining that “the resources that can be used for measurements are indicated by patterns, such as an ABS [Almost Blank Subframe] pattern”); *id.*, 6:5–9 (“When determining the measurement pattern, the different ABS patterns will need to be taken into account.”); *id.*, 13:20–30 (disclosing that a network node, which may be a pico eNB, “determines which of the at least two patterns shall be applied when the user equipment 130 is located in the respective restricted area”); *id.*, 19:12–29 (“[T]he pico radio base station 120 may determine its own ABS pattern while taking the second ABS pattern into account.”); *id.*, 31:22–32:27 (explaining that, in general, “a transmission activity pattern is a configuration of a transmission activity scheduled for a node over a certain period of time”).

4) Claim 2

a) [Preamble]: The method of claim 1, wherein

170. In my opinion, the combination of Centonza and Siomina renders obvious claim 1 for the reasons I discuss above.

b) [2b]: the measurement gap configuration indicates a measurement gap pattern to be applied in the UE for performing measurements.

171. In my opinion, the combination of Centonza and Siomina renders obvious this limitation. Centonza discloses element [2b] in my opinion for the

reasons I explain in connection with Ground #1. Section VIII(A)(3)(b). To the extent Centonza does not disclose this element, in my opinion Siomina discloses that the measurement-gap configuration indicates a measurement gap pattern to be applied to the UE for performing measurements (*e.g.*, the patterns identified above) for the reasons I discuss above for elements [1d] and [1e]. Sections VIII(A)(2)(d) and VIII(A)(2)(e).

5) Claim 3

a) [Preamble]: The method of claim 1, wherein

172. In my opinion, the combination of Centonza and Siomina renders obvious claim 1 for the reasons I discuss above.

a) [3b]: the second cell is configured to the UE via a Radio Resource Control (RRC) message (such as a RRC Connection Reconfiguration message) from the first eNB.

173. In my opinion, the combination of Centonza and Siomina renders obvious this limitation. Centonza discloses element [3b] in my opinion for the reasons above. Section VIII(A)(3)(b). To the extent Centonza does not disclose this limitation, in my opinion, Siomina discloses that the first eNB configures the second cell to the UE via RRC signaling to UEs to configure cells. Ex-1007, 5:18–36, 32:8–33:29, 37:14–40:24 (discussing use of RRC signaling and transmitting patterns over RRC).

174. To the extent Siomina does not disclose this limitation, in my opinion, a POSITA would have found it obvious to use RRC signaling from the first eNB to the UE to configure the second cell, including as disclosed in Centonza. Both references disclose RRC signaling (which has been part of cellular standards before the '559 Patent) between an eNB and a UE, and configuring a cell to a UE via a RRC Connection Reconfiguration message was known in the art (as the '559 Patent admits through incorporating the RRC Protocol Specification). Ex-1001, 2:18–30 (incorporating TS 36.331); Ex-1008, 49–56 (describing RRC connection reconfiguration); Ex-1009, 46–52 (same).

6) Claim 7

- a) *[Preamble]: A method for supporting dual connectivity in a wireless communication system, wherein separate eNBs (evolved Node B) are used to support dual connectivity and a UE (User Equipment) is served by a first cell controlled by a first eNB, comprising:*

175. In my opinion, to the extent the preamble is a limitation, the combination of Centonza and Siomina renders obvious the preamble of claim 7. This limitation is a combination of elements [1pre] and [1b] above. As I explain above, the combination of Centonza and Siomina renders obvious “[a] method for supporting dual connectivity in a wireless communication system, wherein separate eNBs (evolved Node B) are used to support dual connectivity” for the reasons in element [1pre]. Section VIII(C)(2)(a). The combination of Centonza and Siomina

similarly renders obvious this limitation “a UE (User Equipment) is served by a first cell controlled by a first eNB” as described above for the parallel limitation in element [1b] (“a first eNB controls a first cell, wherein the first cell is serving a UE (User Equipment)”). Section VIII(C)(2)(b).

- b) [7b]: a second eNB controls a second cell, wherein the second cell is configured by the first eNB to serve the UE together with the first cell; and*

176. In my opinion, the combination of Centonza and Siomina renders obvious this limitation. This limitation is a parallel limitation to element [1c], which recites “the first eNB configures a second cell to serve the UE together with the first cell, wherein the second cell is controlled by a second eNB.” As discussed in my analysis of element [1c], the combination of Siomina and Centonza renders obvious this limitation. Section VIII(C)(2)(c).

- c) [7c]: the second eNB receives a measurement gap configuration from the first eNB so that the second eNB could take measurement gaps into consideration when scheduling resources to the UE, wherein the measurement gap configuration was allocated by the first eNB to the UE.*

177. In my opinion, the combination of Centonza and Siomina renders obvious this limitation. This limitation is a combination of elements [1d] and [1e] above. The “wherein the measurement gap configuration was allocated by the first eNB to the UE” parallels [1d], which recites “the first eNB allocates a measurement

gap configuration to the UE.” As my analysis for element [1d] shows, the combination of Siomina and Centonza renders obvious this limitation. Section VIII(C)(2)(d). The “second eNB receives a measurement gap configuration from the first eNB” portion of this limitation mirrors the “the first eNB sends the measurement gap configuration to the second eNB” from element [1e]. For the same reasons that I explain in my analysis of element [1e], the second eNB (the Target eNB) receives from the first eNB (the Source eNB) measurement-gap information (e.g., via the MeasGapConfig field within the RRC Context element of the Handover Request in Centonza and the patterns disclosed in Siomina). Section VIII(C)(2)(e). Finally, the “second eNB could take measurement gaps into consideration when scheduling resources to the UE” portion of this limitation matches the same limitation in [1e]. For the same reasons that I explain above in my analysis of element [1e], the combination of Siomina and Centonza discloses this limitation. Section VIII(C)(2)(e).

7) Claim 8

a) [Preamble]: The method of claim 7, further comprises:

178. In my opinion, the combination of Centonza and Siomina renders obvious claim 7 for the reasons I discuss above.

- b) [8b]: the second eNB takes the measurement gap configuration into consideration when scheduling resources to the UE.*

179. In my opinion, the combination of Siomina and Centonza renders obvious this claim limitation. As I explain above in connection with element [1e], the second eNB receives the MeasGapConfig field (in Centonza) or the transmitted patterns (in Siomina) in order to schedule resources to the UE. Section VIII(C)(2)(e).

180. To the extent the combination of Siomina and Centonza do not teach this element, a POSITA would have found it obvious in my opinion to modify the system for the reasons above, including for Ground #2. Section VIII(C)(6). The purpose of receiving the measurement-gap configuration is so the eNB can schedule resources to the UE around the measurement gaps, *i.e.*, to avoiding transmitting data with the UE when it is taking measurements and cannot transmit or receive data. It thus would have been obvious to a POSITA in my opinion to have the second eNB use the measurement-gap configuration for the UE for that purpose, including to make the system more efficient and increase throughput. This motivation, in addition to the reasons I identify above relating to Centonza in Ground #2, would also have been found in Siomina, which discusses that an eNB “can prioritize scheduling of transmissions.” *See, e.g.*, Ex-1007, 3:29–35. A POSITA, in my

opinion, would have expected this combination to be successful for the reasons above. Section VIII(C)(6).

8) Claim 9

a) [Preamble]: The method of claim 8, wherein

181. In my opinion, the combination of Centonza and Siomina renders obvious claim 8 for the reasons I discuss above.

b) [9b]: the resources contain downlink assignments and/or uplink grants.

182. In my opinion, the combination of Siomina and Centonza renders obvious this claim limitation. As discussed in my analysis in connection with elements [1e], [7c], and [8b], the second eNB receives the MeasGapConfig field (in Centonza) or the transmitted patterns (in Siomina) in order to schedule resources to the UE. Sections VIII(C)(2)(e), VIII(C)(5)(c), and VIII(C)(6)(b). Those resources include the uplink and downlink grants, as the UE cannot transmit data in the uplink and downlink directions during the measurement gap period. To the extent the combination of Siomina and Centonza do not teach this element, it would have been obvious to modify the system for the reasons above, including in element [8b] and Ground #2. Section VIII(B)(7).

9) Claim 10

a) [Preamble]: The method of claim 7, wherein

183. In my opinion, the combination of Centonza and Siomina renders obvious claim 7 for the reasons I discuss above.

b) [10b]: the measurement gap configuration indicates a measurement gap pattern to be applied in the UE for performing measurements.

184. In my opinion, the combination of Centonza and Siomina renders obvious this claim element. This limitation is the same as [2b]. For the same reasons I discuss above for element [2b], the combination of Siomina and Centonza renders obvious this limitation. Section VIII(C)(2)(b).

10) Claim 11

a) [Preamble]: The method of claim 7

185. In my opinion, the combination of Centonza and Siomina renders obvious claim 7 for the reasons I discuss above.

b) [11b]: wherein the second cell is configured to the UE via a Radio Resource Control (RRC) message (such as a RRC Connection Reconfiguration message) from the first eNB.

186. In my opinion, the combination of Centonza and Siomina renders obvious claim this claim limitation. This limitation is the same as [3b]. For the same reasons I explain above for element [3b], the combination of Siomina and Centonza renders obvious this limitation. Section VIII(C)(3)(b).

D. Ground 4: Centonza and Siomina Combined With TS 36.331 Version 11.2.0 Renders Obvious the Challenged Claims

187. In my opinion, similar to Ground #2, to the extent Centonza does not incorporate TS 36.331, in my opinion Centonza combined with Siomina and TS 36.331 version 11.2.0 renders the claims obvious. Each of these references qualify as prior art under Section 102, as I have opined in Grounds #1, #2, and #3.

188. In addition, for the same reasons above, it is my opinion that a POSITA would have been motivated to combine Centonza, Siomina, and TS 36.311 and would have had a reasonable expectation that the combination would be successful. Sections VIII(B) and VIII(C). Both Centonza and Siomina operate according to the 4G/LTE standards, including utilizing the RRC protocol defined in TS 36.331, as I have explained above for the other grounds. Both Centonza and Siomina refer to the RRC protocol, which would have motivated, in my opinion, a POSITA to look to TS 36.331 for how the RRC protocol was implemented and could be implemented in the combined system of Centonza and Siomina. The combination of Centonza, Siomina, and TS 36.331 discloses each of the claim elements of the Challenged Claims for the reasons I have explained in this declaration for Grounds #1, #2, and #3.

IX. SECONDARY CONSIDERATIONS

189. I am unaware of any evidence of secondary considerations that would support a finding of non-obviousness. The asserted prior art cited herein demonstrates, in my opinion, that there is no evidence of failure by others and that the features recited in the Challenged Claims were readily available in the prior art. Should Patent Owner raise issues relating to secondary considerations, I reserve my right to respond to that evidence and allegations.

X. CONCLUSION

190. I declare that all statements made herein of my knowledge are true, and that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Dated: July 17, 2024

By: 

Christopher Hansen, Ph.D.