LTE IPR Analysis
Essentiality for OFDM/MIMO Standards

3Q. 2009

1. LTE IPR Analysis for OFDM/MIMO Standards

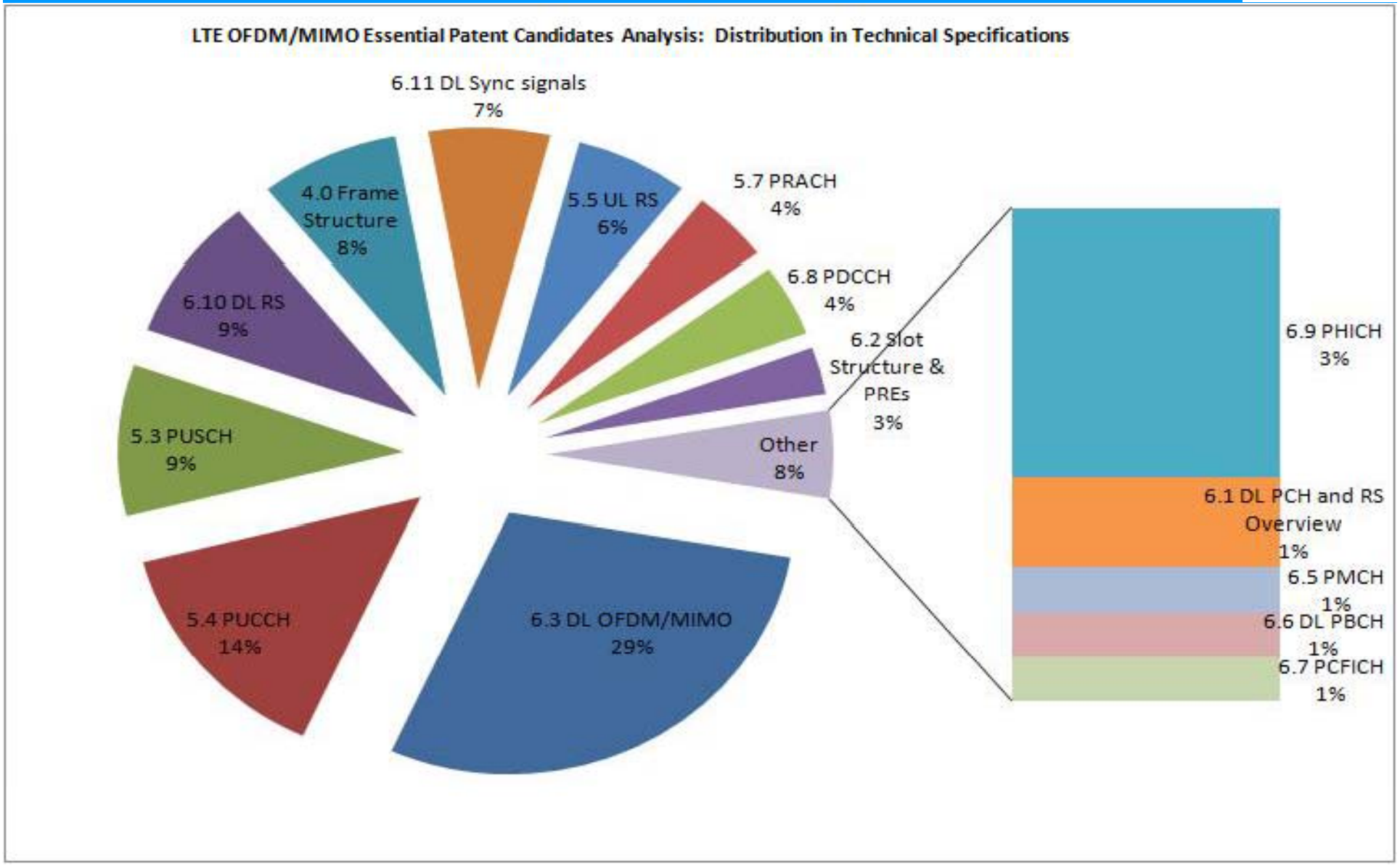
Total of 211 patents, issued and published in the United States before Sept. 1, 2009, are analyzed for LTE OFDM/MIMO innovations. The lists of patents declared essential to LTE appear at the ETSI IPR Online are used in the analysis except for Motorola's essential patent candidates. A keyword search is used for the identification of Motorola's essential patent candidates.

To evaluate the quality of the LTE patents for OFDM/MIMO standards, patent disclosures for each essential patent candidate are compared to the technical specifications for LTE OFDM/MIMO standards (TS36.211 V8.70).

Qualcomm, Samsung, LG, Nokia, Motorola, Nortel, Texas Instruments, InterDigital, Ericsson, ETRI, Nokia Siemens Networks, ETRI, Huawei, Sony, and NEC were the major LTE OFDM/MIMO IPR holders.

As for the most described field of technical specification, Down Link OFDM/MIMO (Section 6.3) was the top in the OFDM/MIMO essential patent candidates followed by PUCCH (Section 5.4) and PUSCH (Section 5.3). (Fig. 1.1)

Fig. 1.1 LTE OFDM/MIMO Essential Patent Candidates Analysis: Distribution in Technical Specifications



1. LTE IPR Analysis for OFDM/MIMO Standards -2

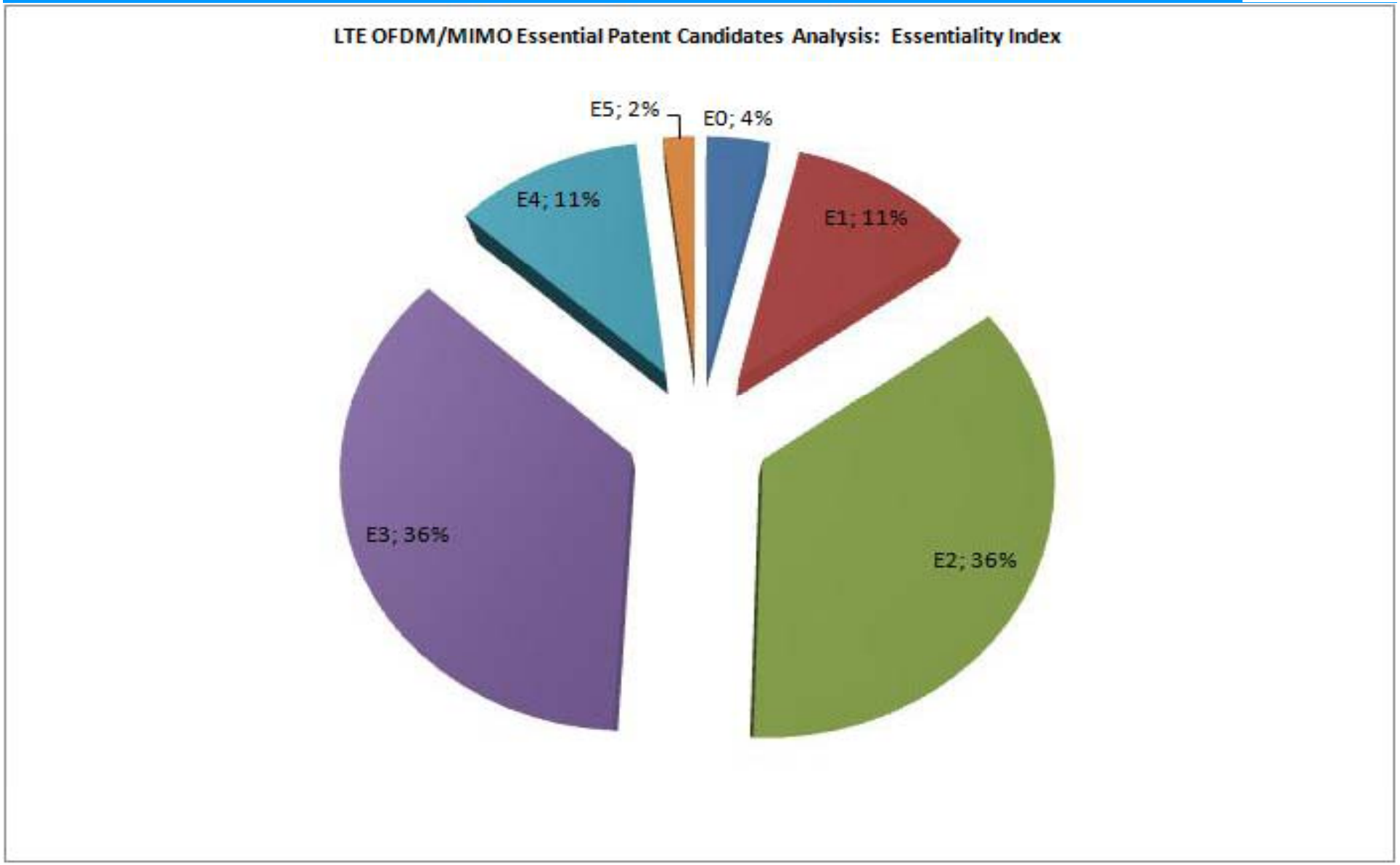
As a measure for the essentiality of the candidates, Essentiality Index (EI) is evaluated:

EI : Criteria
E0 : Patent disclosure is nothing to do with LTE technical specifications
E1 : Patent disclosure is weakly related to LTE technical specifications
E2 : Patent disclosure is partially related to LTE technical specifications, but required further analysis
E3 : Patent disclosure is partially related to LTE technical specifications
E4 : Patent disclosure is related to LTE technical specifications overall
E5 : Patent disclosure is strongly related to LTE technical specifications

51 % of the LTE OFDM/MIMO essential patent candidates are classified as E2, E1, and E0.

49% of the LTE OFDM/MIMO essential patent candidates are classified as high value of EI for the essentiality. (Fig. 1.2)

Fig. 1.2 LTE OFDM/MIMO Essential Patent Candidates Analysis: Essentiality Index



2. Qualcomm's Essential Patent Candidates

To evaluate the quality of Qualcomm's LTE IPR for OFDM/MIMO standards, patent disclosures for each essential patent candidate are compared to the technical specifications for LTE OFDM/MIMO standards (TS36.211 V8.70). Total of 57 patents issued and published in the United States before Aug. 1 2009 in the lists of patents declared essential to LTE appear at the ETSI IPR Online are used in the analysis.

As for the most described field of technical specification, Down Link OFDM/MIMO (Section 6.3) was the top in Qualcomm's OFDM/MIMO essential patent candidates. (Fig. 2.1)

More than half of the Qualcomm's OFDM/MIMO essential patent candidates are classified as E2, E1, and E0. Only 37 % (sixteen E3 and five E4) of the Qualcomm's OFDM/MIMO essential patent candidates are classified as high value of EI for the essentiality. (Fig. 2.2)

Fig. 2.1 Qualcomm's LTE OFDM/MIMO Essential Patent Candidates Analysis: Distribution in Technical Specifications

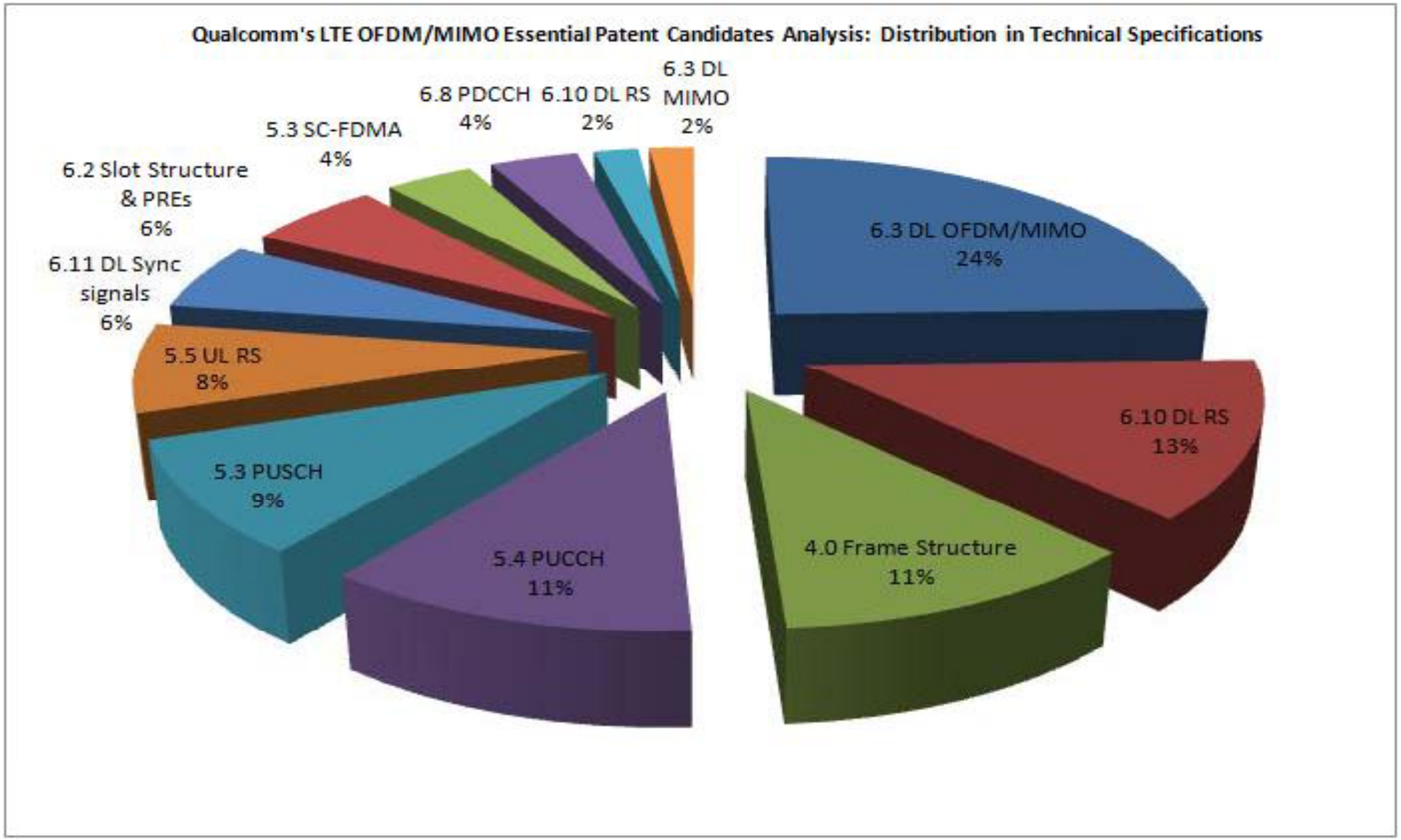
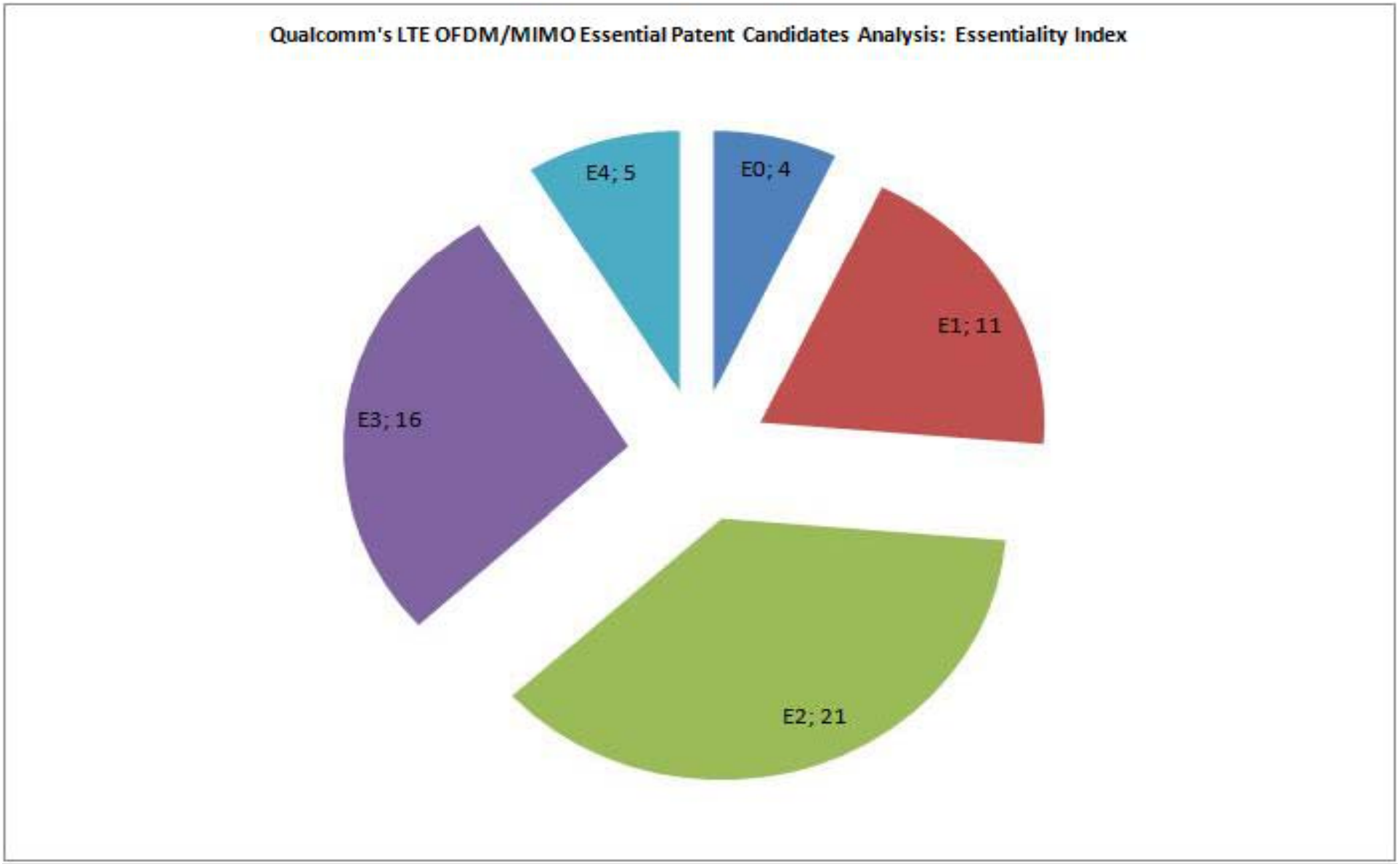


Fig. 2.2 Qualcomm's LTE OFDM/MIMO Essential Patent Candidates Analysis: Essentiality Index



3. Nortel’s Essential Patent Candidates

To evaluate the quality of Nortel's LTE IPR for OFDM/MIMO standards, patent disclosures for each essential patent candidate are compared to the technical specifications for LTE OFDM/MIMO standards (TS36.211 V8.70). Total of 28 patents issued and published in the United States before Aug. 1 2009 in the lists of patents declared essential to LTE appear at the ETSI IPR Online are used in the analysis.

As for the most described field of technical specification, Down Link OFDM/MIMO (Section 6.3) was the top in Nortel's OFDM/MIMO essential patent candidates. (Fig. 3.1)

More than half of the Nortel's OFDM/MIMO essential patent candidates are classified as E2. Only 30 % (seven E3 and one E4) of the Nortel's OFDM/MIMO essential patent candidates are classified as high value of EI for the essentiality. (Fig. 3.2)

Fig. 3.1 Nortel's LTE OFDM/MIMO Essential Patent Candidates Analysis: Distribution in Technical Specifications

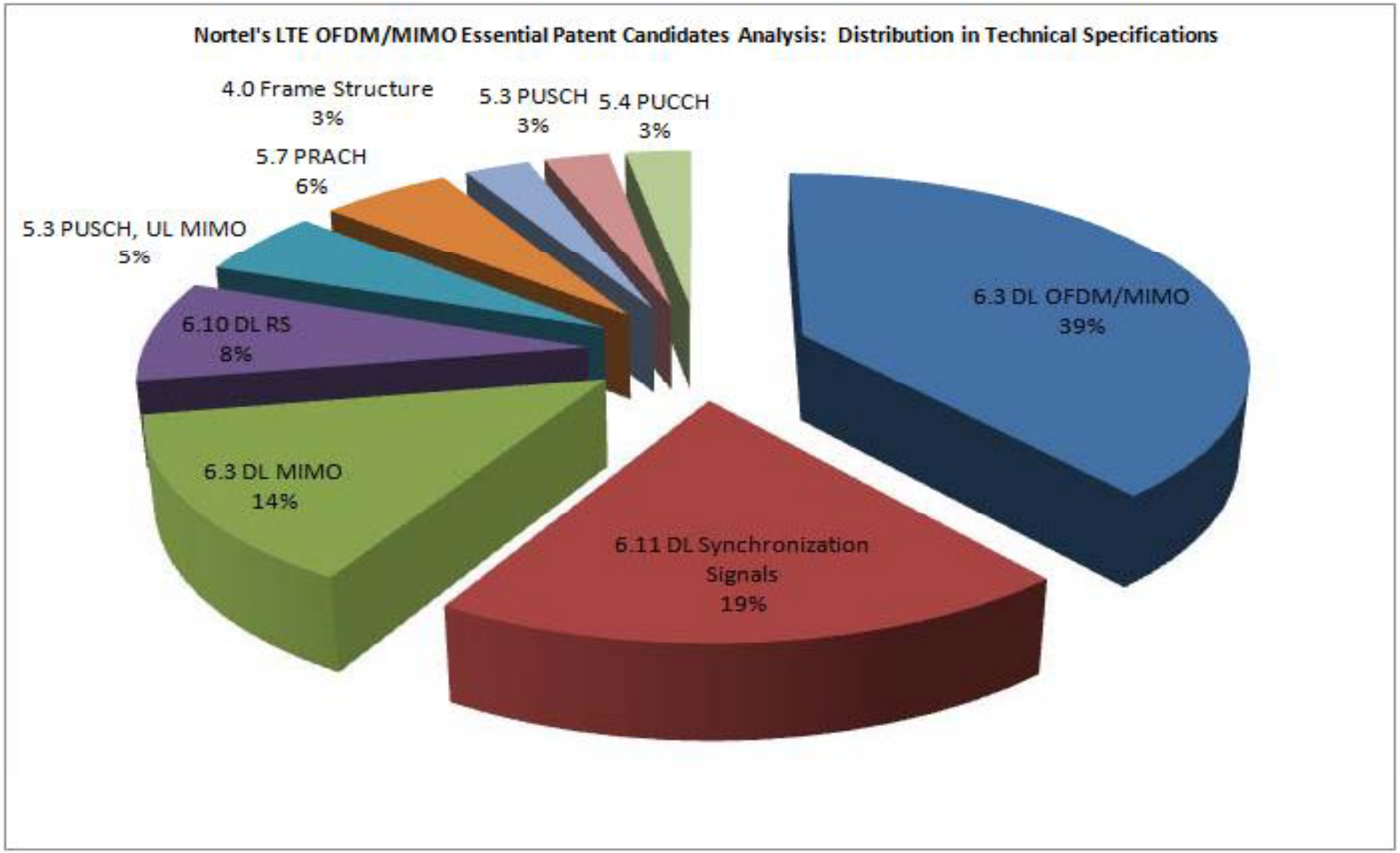
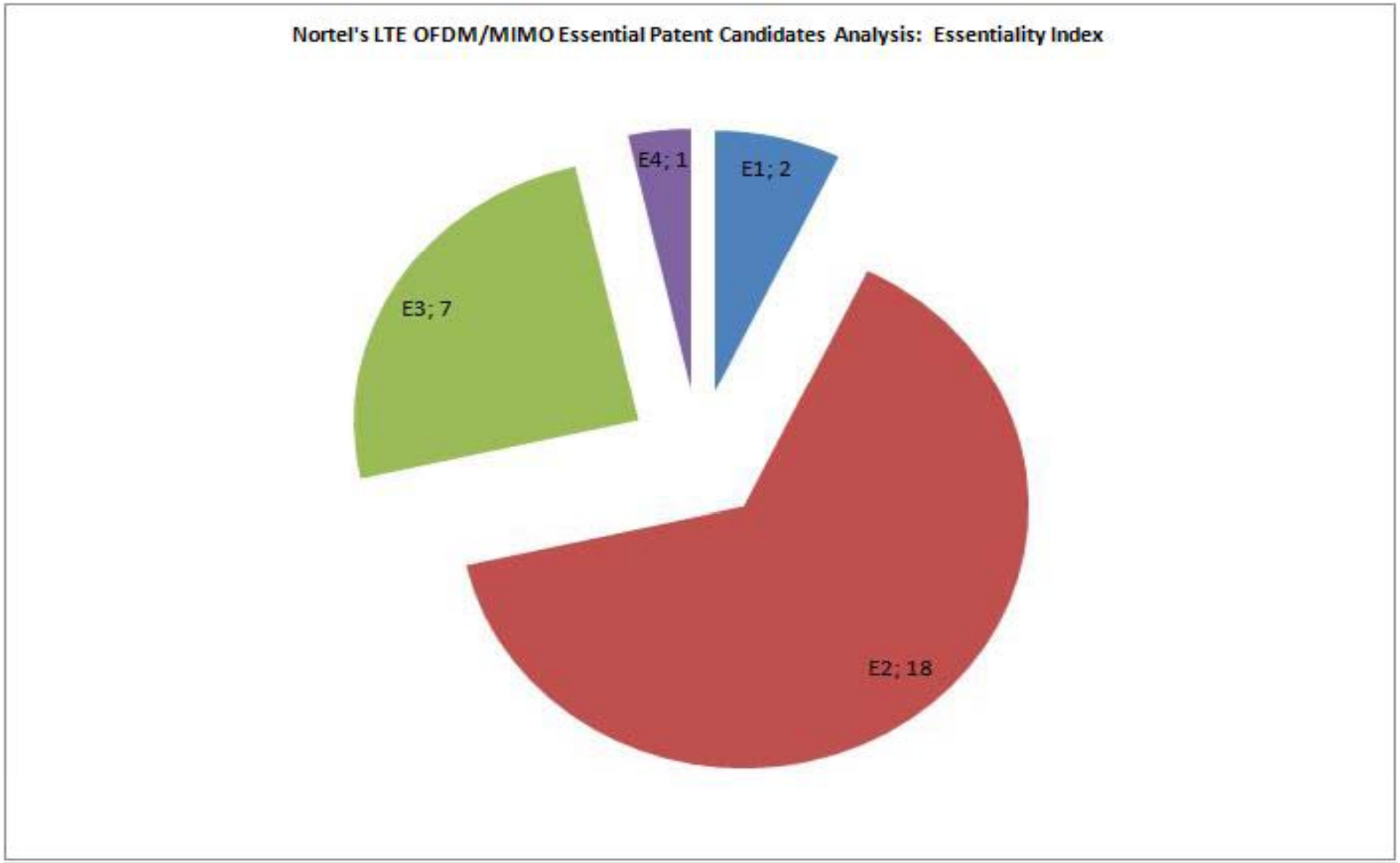


Fig. 3.2 Nortel's LTE OFDM/MIMO Essential Patent Candidates Analysis: Essentiality Index



4. InterDigital’s Essential Patent Candidates

To evaluate the quality of InterDigital's LTE IPR for OFDM/MIMO standards, patent disclosures for each essential patent candidate are compared to the technical specifications for LTE OFDM/MIMO standards (TS36.211 V8.70). Total of 14 patent applications published in the United States before Aug. 1 2009 in the lists of patents declared essential to LTE appear at the ETSI IPR Online are used in the analysis.

As for the most described field of technical specification, Physical Uplink Control Channel (PUCCH; Section 5.4) was the top in InterDigital's OFDM/MIMO essential patent candidates. (Fig. 4.1)

More than half of the InterDigital's OFDM/MIMO essential patent candidates are classified as E2, E1, and E0. Only 35 % (two E3 and three E4) of the InterDigital's OFDM/MIMO essential patent candidates are classified as high value of EI for the essentiality. (Fig. 4.2)

Fig. 4.1 InterDigital's LTE OFDM/MIMO Essential Patent Candidates Analysis: Distribution in Technical Specifications

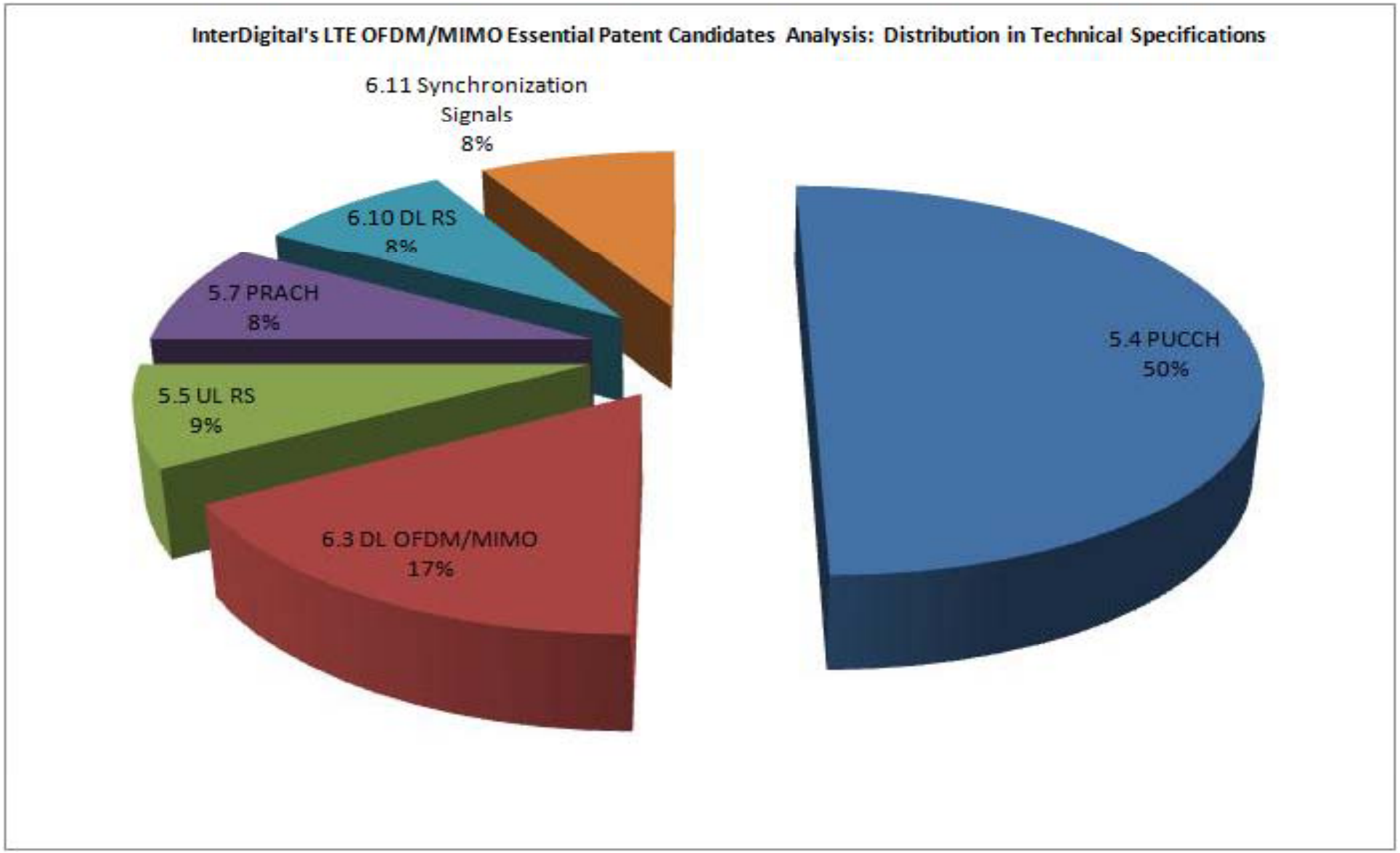
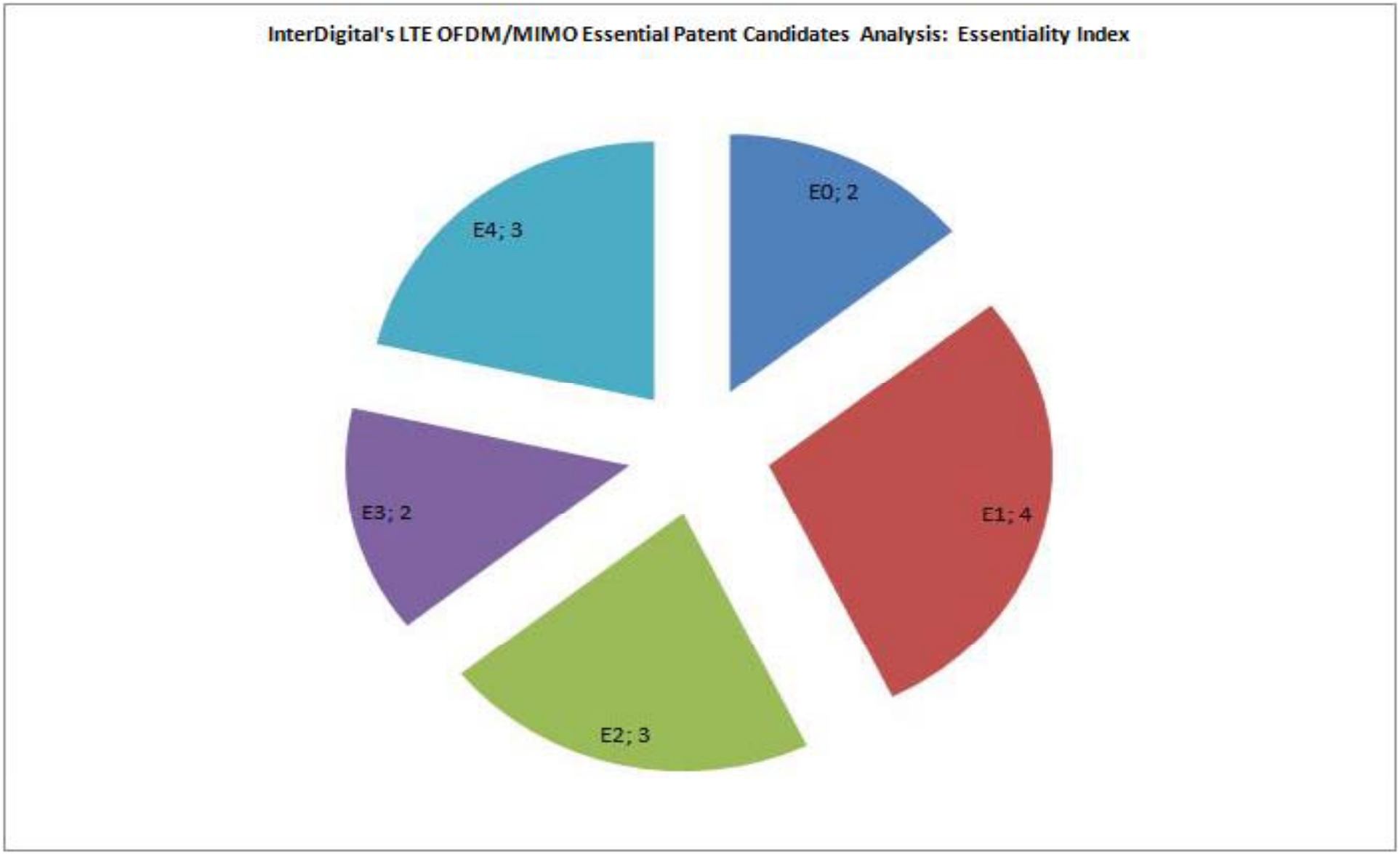


Fig. 4.2 InterDigital's LTE OFDM/MIMO Essential Patent Candidates Analysis: Essentiality Index



5. LG's Essential Patent Candidates

To evaluate the quality of LG's LTE IPR for OFDM/MIMO standards, patent disclosures for each essential patent candidate are compared to the technical specifications for LTE OFDM/MIMO standards (TS36.211 V8.70). Total of 16 patent applications published in the United States before Aug. 1 2009 in the lists of patents declared essential to LTE appear at the ETSI IPR Online are used in the analysis.

As for the most described field of technical specification, Physical Random Access Channel (PRACH; Section 5.7) was the top in LG's OFDM/MIMO essential patent candidates. (Fig. 5.1)

Only 18% of the LG's OFDM/MIMO essential patent candidates are classified as E2 and E0. Nearly 90 % (eight E3, three E4, and two E5) of the LG's OFDM/MIMO essential patent candidates are classified as high value of EI for the essentiality. (Fig. 5.2)

Fig. 5.1 LG's LTE OFDM/MIMO Essential Patent Candidates Analysis: Distribution in Technical Specifications

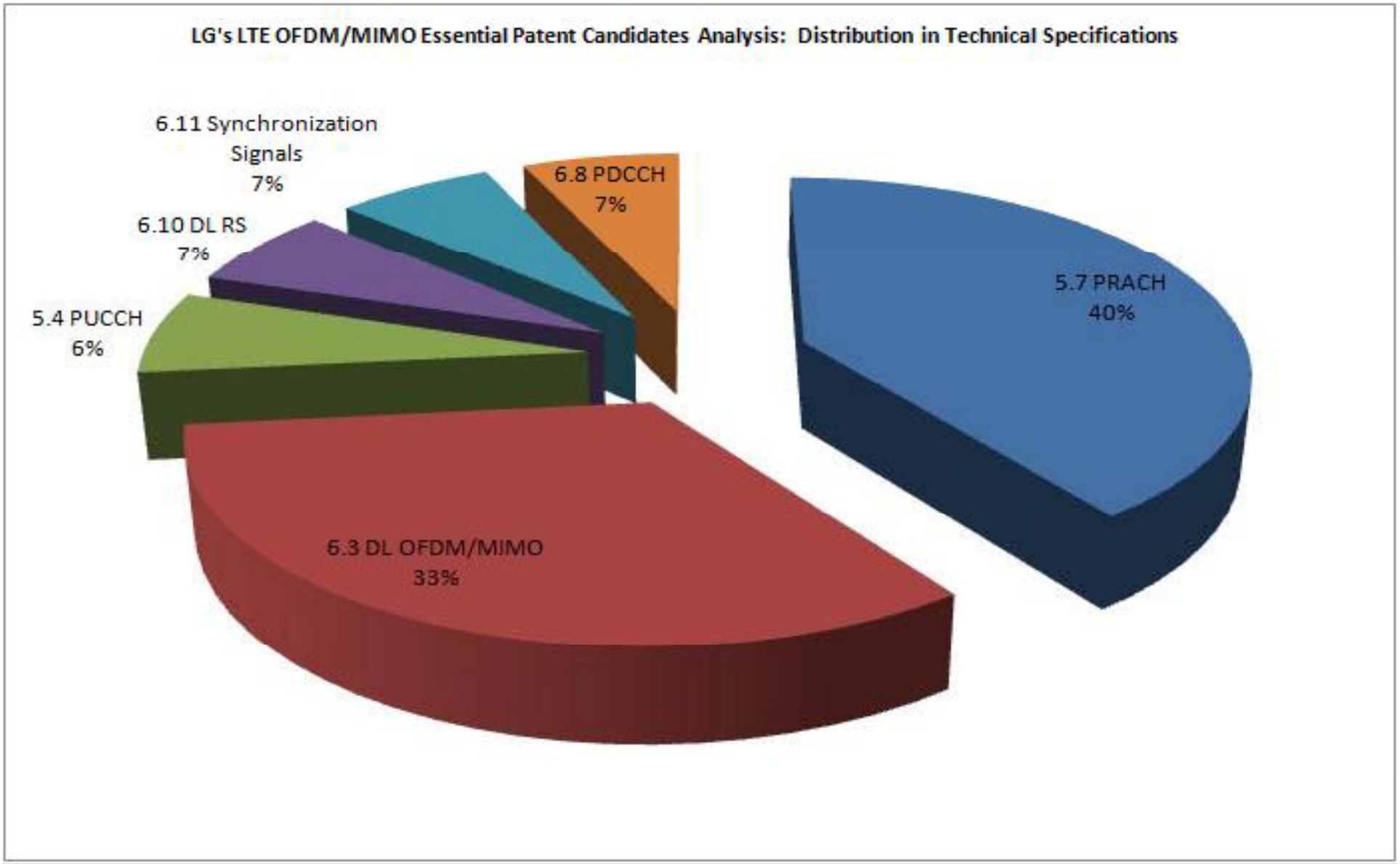
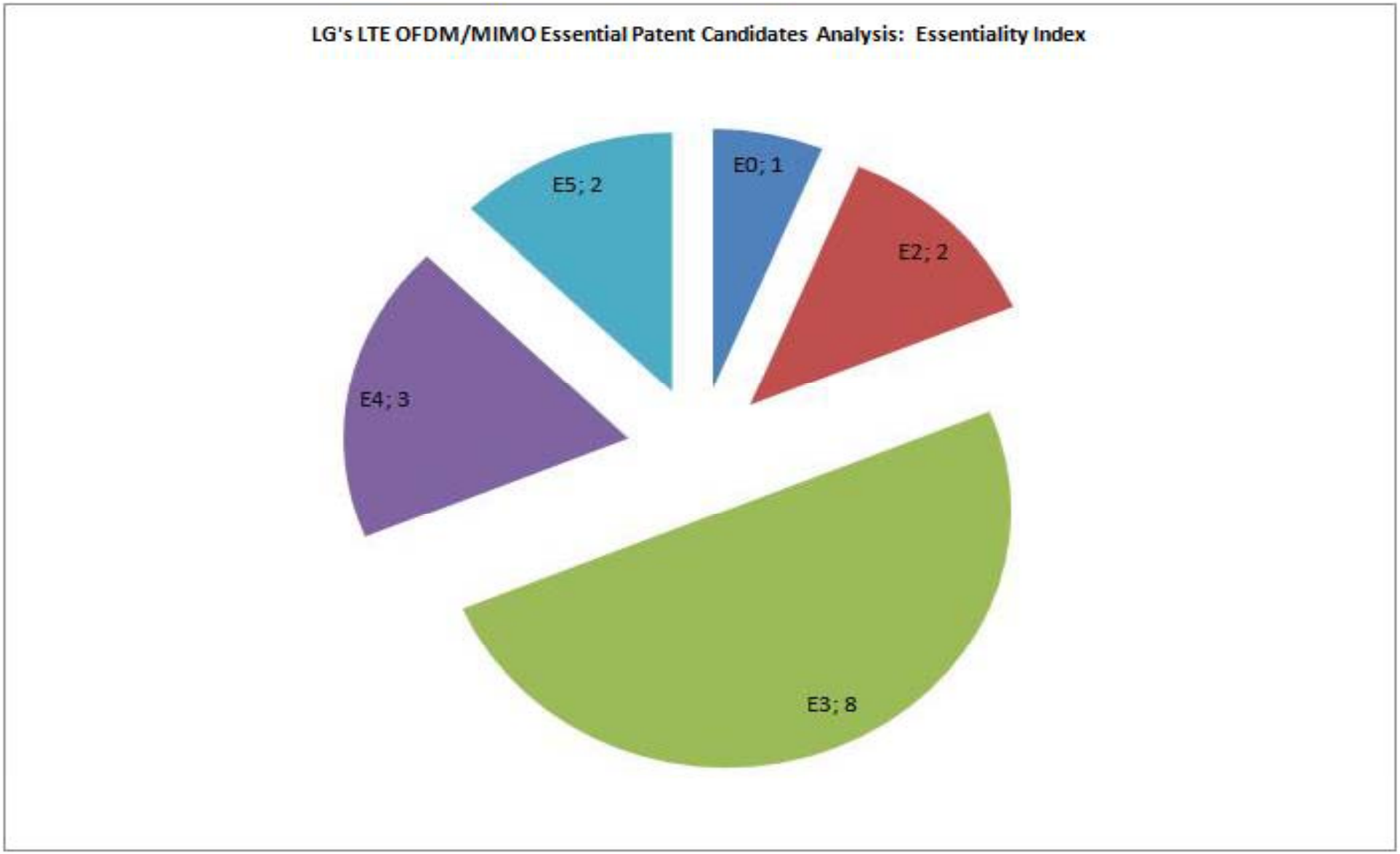


Fig. 5.2 LG's LTE OFDM/MIMO Essential Patent Candidates Analysis: Essentiality Index



6. Motorola’s Essential Patent Candidates

To evaluate the quality of Motorola's LTE IPR for OFDM/MIMO standards, patent disclosures for each essential patent candidate are compared to the technical specifications for LTE OFDM/MIMO standards (TS36.211 V8.70).

Total of 10 patent applications published in the United States before Aug. 1 2009, out of 103 essential patent candidates indentified by a keyword search, are used in the analysis.

As for the most described field of technical specification, Physical Uplink Control Channel (PUCCH; Section 5.4) was the top in Motorola's OFDM/MIMO essential patent candidates. (Fig. 6.1)

70 % (four E3 and three E4) of the Motorola's OFDM/MIMO essential patent candidates are classified as high value of EI for the essentiality. (Fig. 6.2)

Fig. 6.1 Motorola's LTE OFDM/MIMO Essential Patent Candidates Analysis: Distribution in Technical Specifications

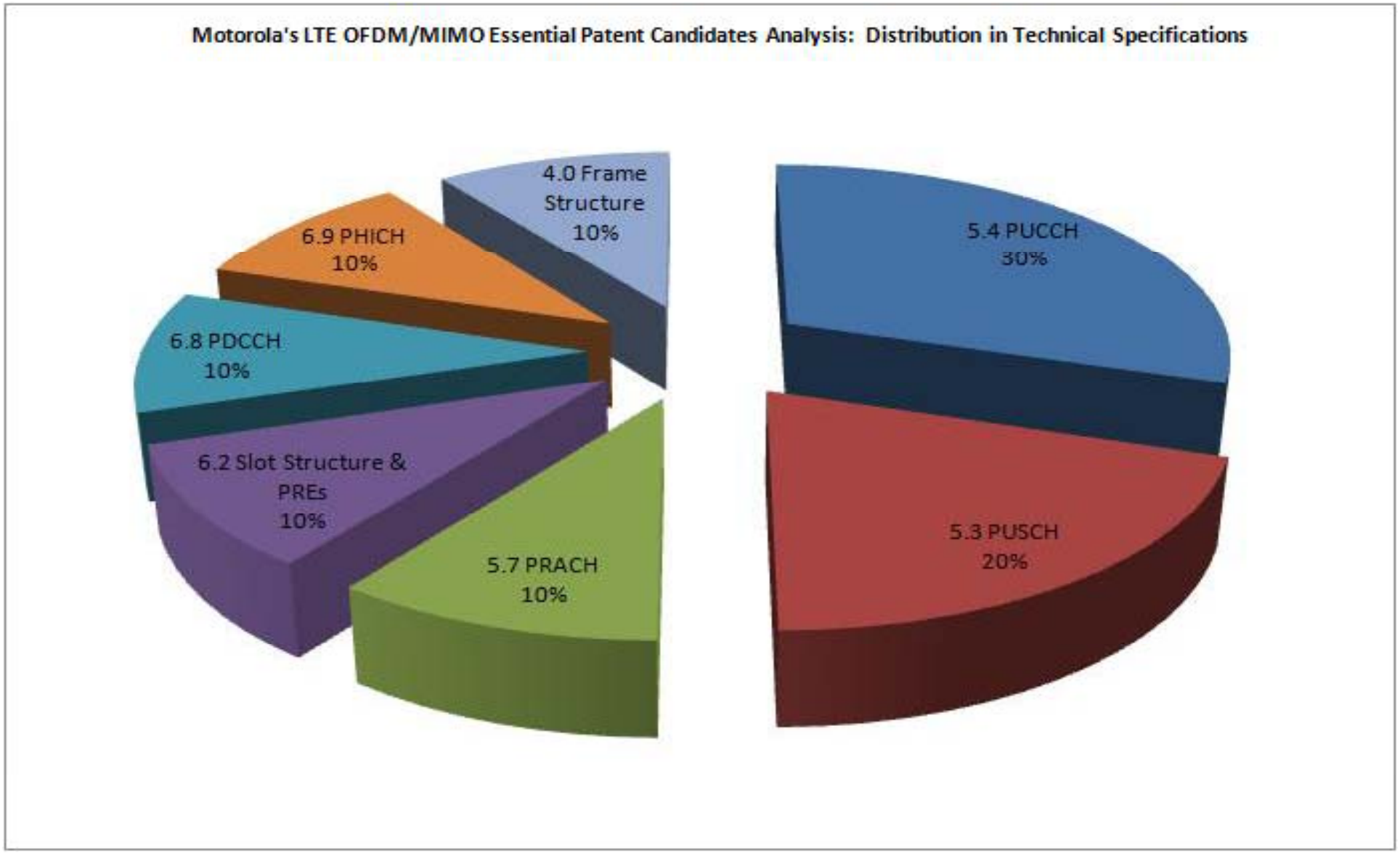
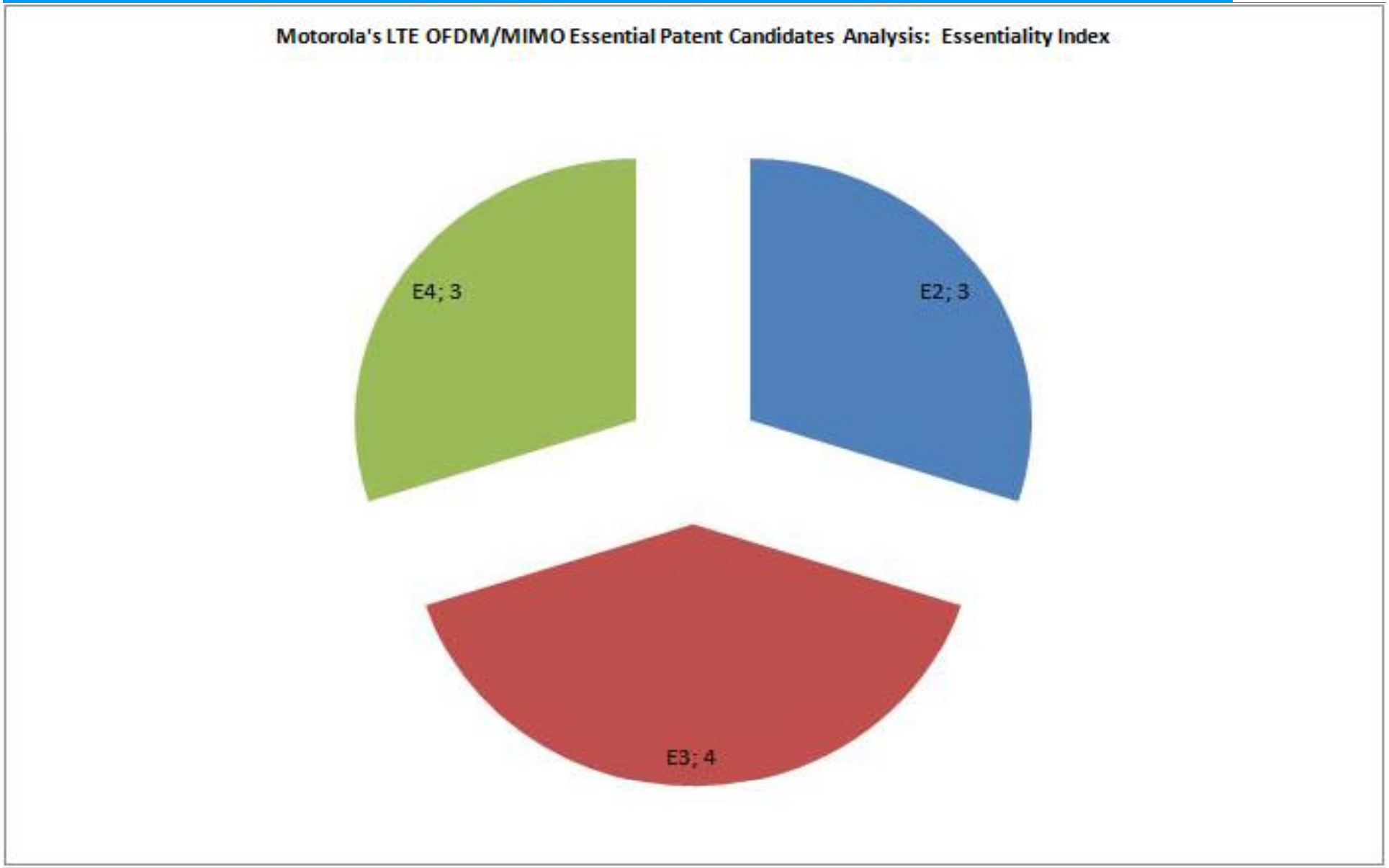


Fig. 6.2 Motorola's LTE OFDM/MIMO Essential Patent Candidates Analysis: Essentiality Index



7. Nokia’s Essential Patent Candidates

To evaluate the quality of Nokia's LTE IPR for OFDM/MIMO standards, patent disclosures for each essential patent candidate are compared to the technical specifications for LTE OFDM/MIMO standards (TS36.211 V8.70).

Total of 29 patents issued and published in the United States before Aug. 1 2009 in the lists of patents declared essential to LTE appear at the ETSI IPR Online are used in the analysis.

As for the most described field of technical specification, Down Link OFDM/MIMO (Section 6.3) was the top in Nokia's OFDM/MIMO essential patent candidates. (Fig. 7.1)

41 % of the Nokia's OFDM/MIMO essential patent candidates are classified as E2 and E1. 59 % (fifteen E3 and two E4) of the Nokia's OFDM/MIMO essential patent candidates are classified as high value of EI for the essentiality. (Fig. 7.2)

Fig. 7.1 Nokia's LTE OFDM/MIMO Essential Patent Candidates Analysis: Distribution in Technical Specifications

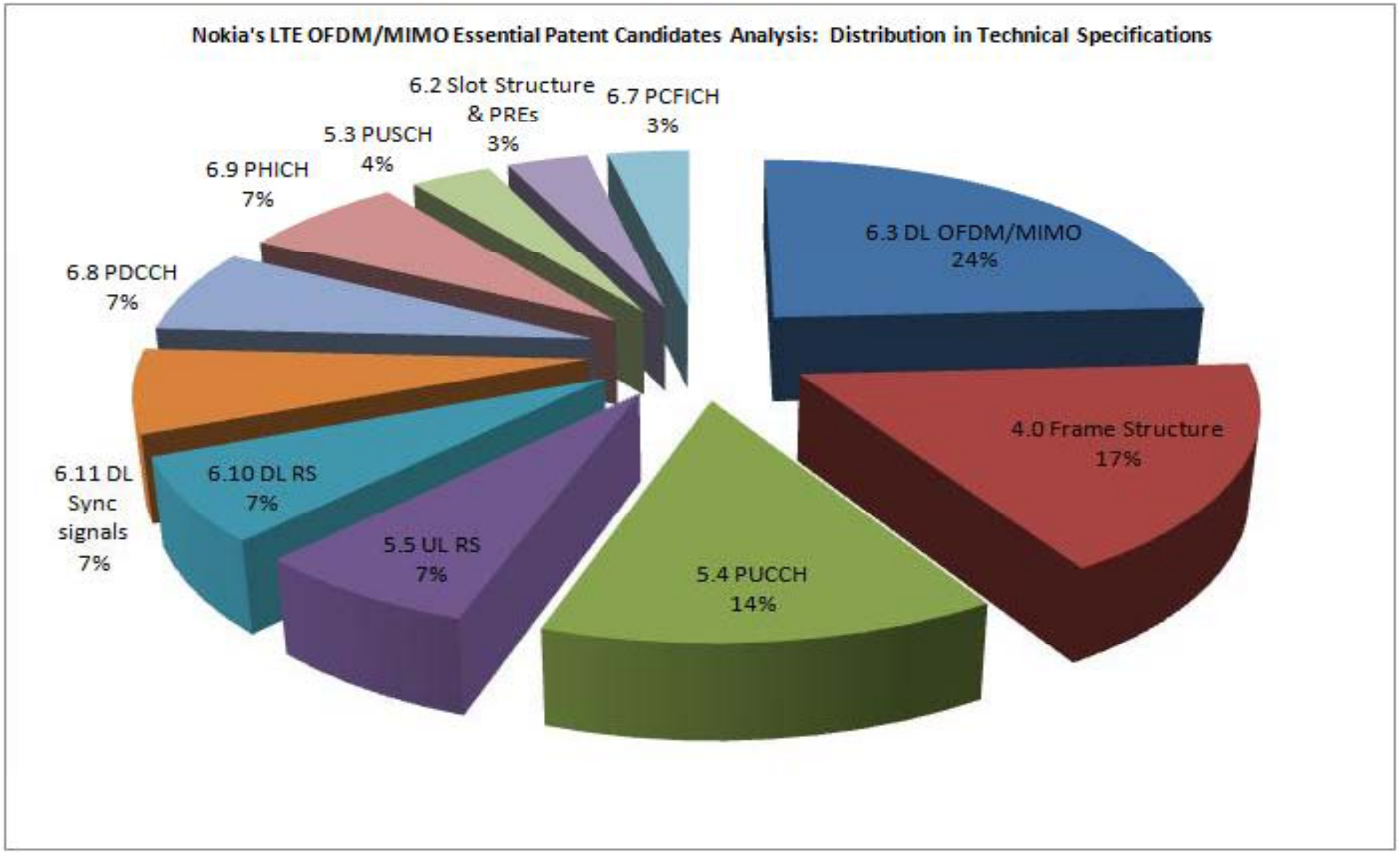
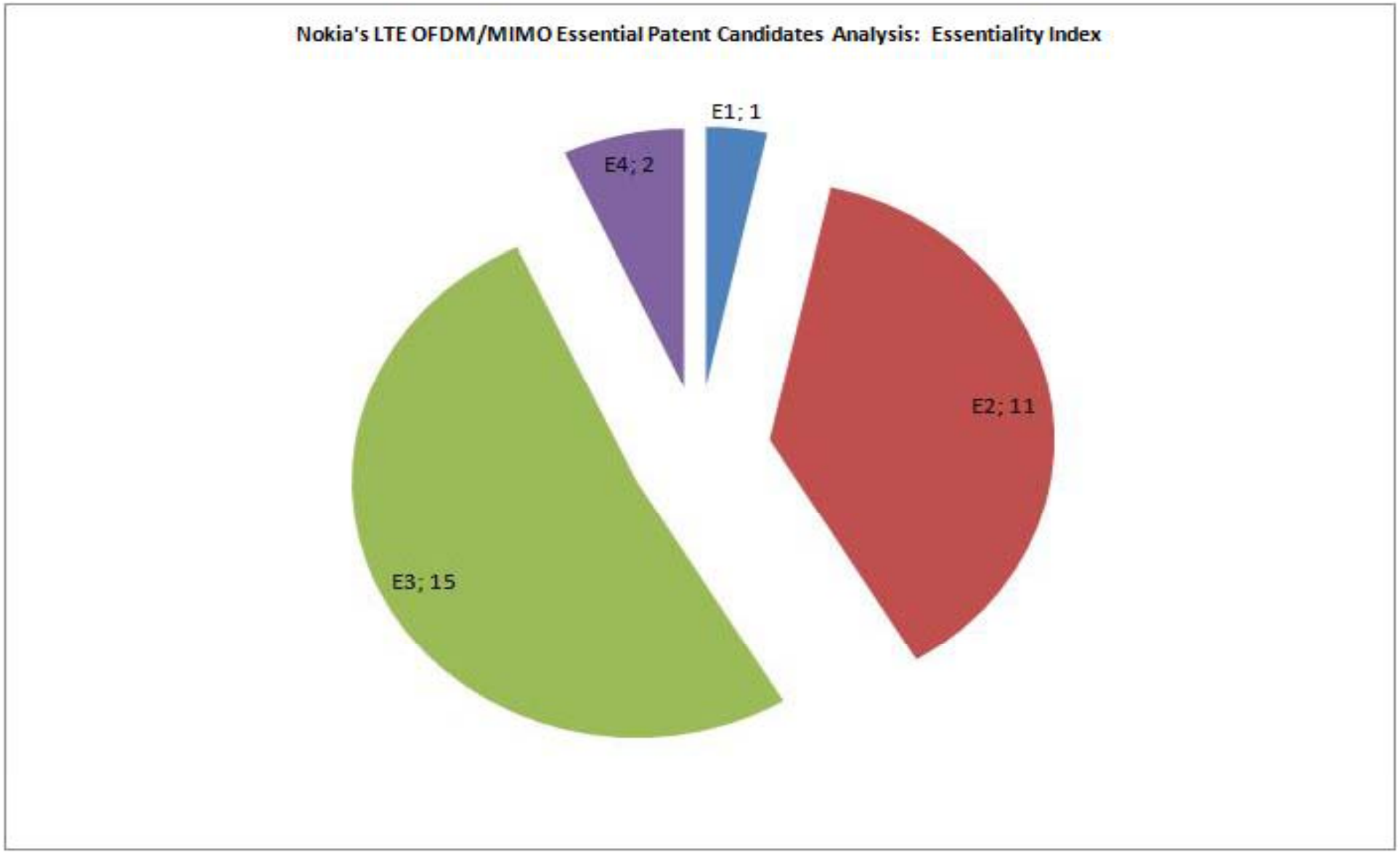


Fig. 7.2 Nokia's LTE OFDM/MIMO Essential Patent Candidates Analysis: Essentiality Index



8. Samsung’s Essential Patent Candidates

To evaluate the quality of Samsung's LTE IPR for OFDM/MIMO standards, patent disclosures for each essential patent candidate are compared to the technical specifications for LTE OFDM/MIMO standards (TS36.211 V8.70).

Total of 21 patent applications published in the United States before Aug. 1 2009 in the lists of patents declared essential to LTE appear at the ETSI IPR Online are used in the analysis.

As for the most described field of technical specification, Physical Uplink Control Channel (PUCCH; Section 5.4) was the top in Samsung's OFDM/MIMO essential patent candidates. (Fig. 8.1)

Only 23 % of the Samsung's OFDM/MIMO essential patent candidates are classified as E2 and E1. 77 % (ten E3, two E4, and two E5) of the Samsung's OFDM/MIMO essential patent candidates are classified as high value of EI for the essentiality. (Fig. 8.2)

Fig. 8.1 Samsung's LTE OFDM/MIMO Essential Patent Candidates Analysis: Distribution in Technical Specifications

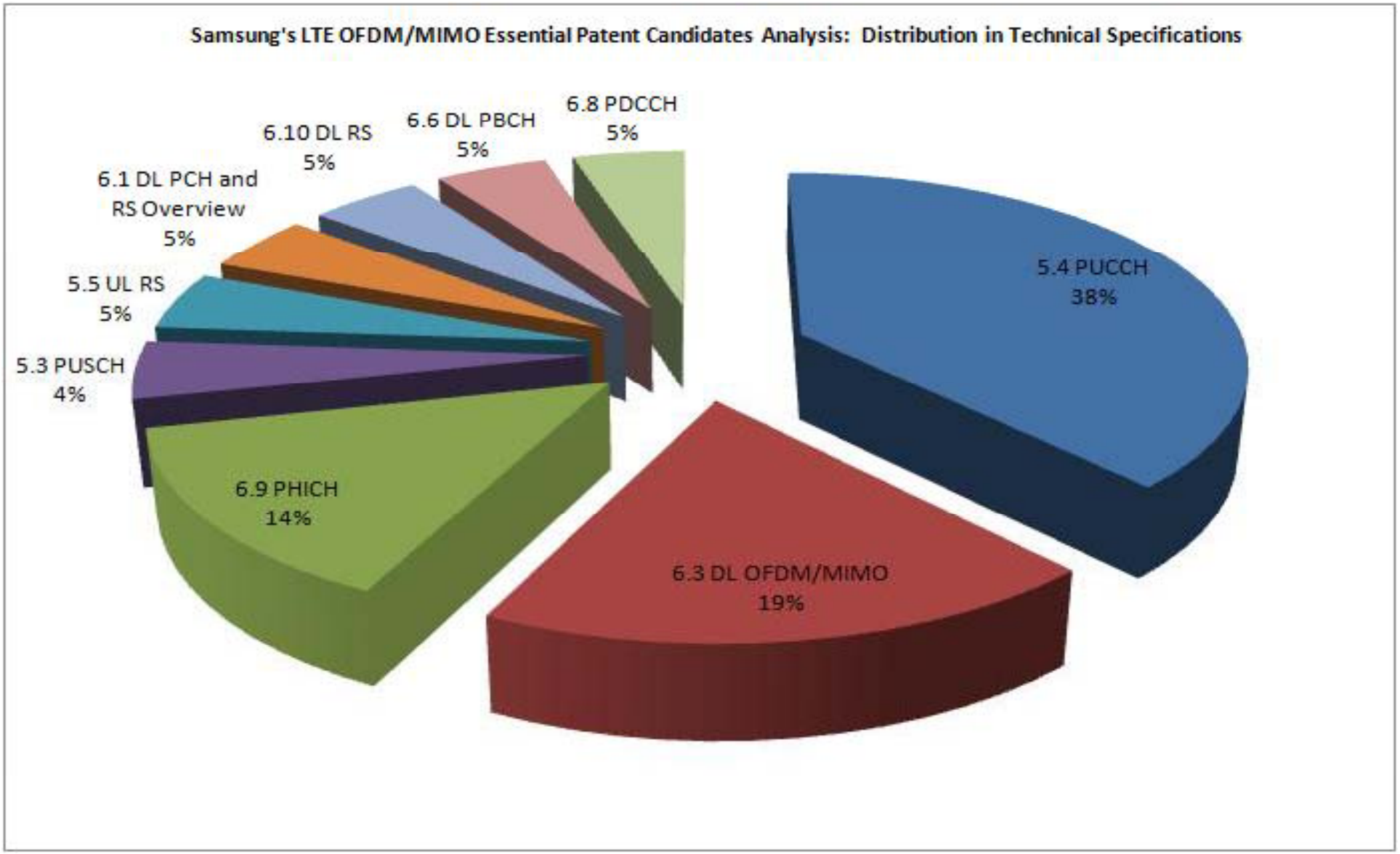
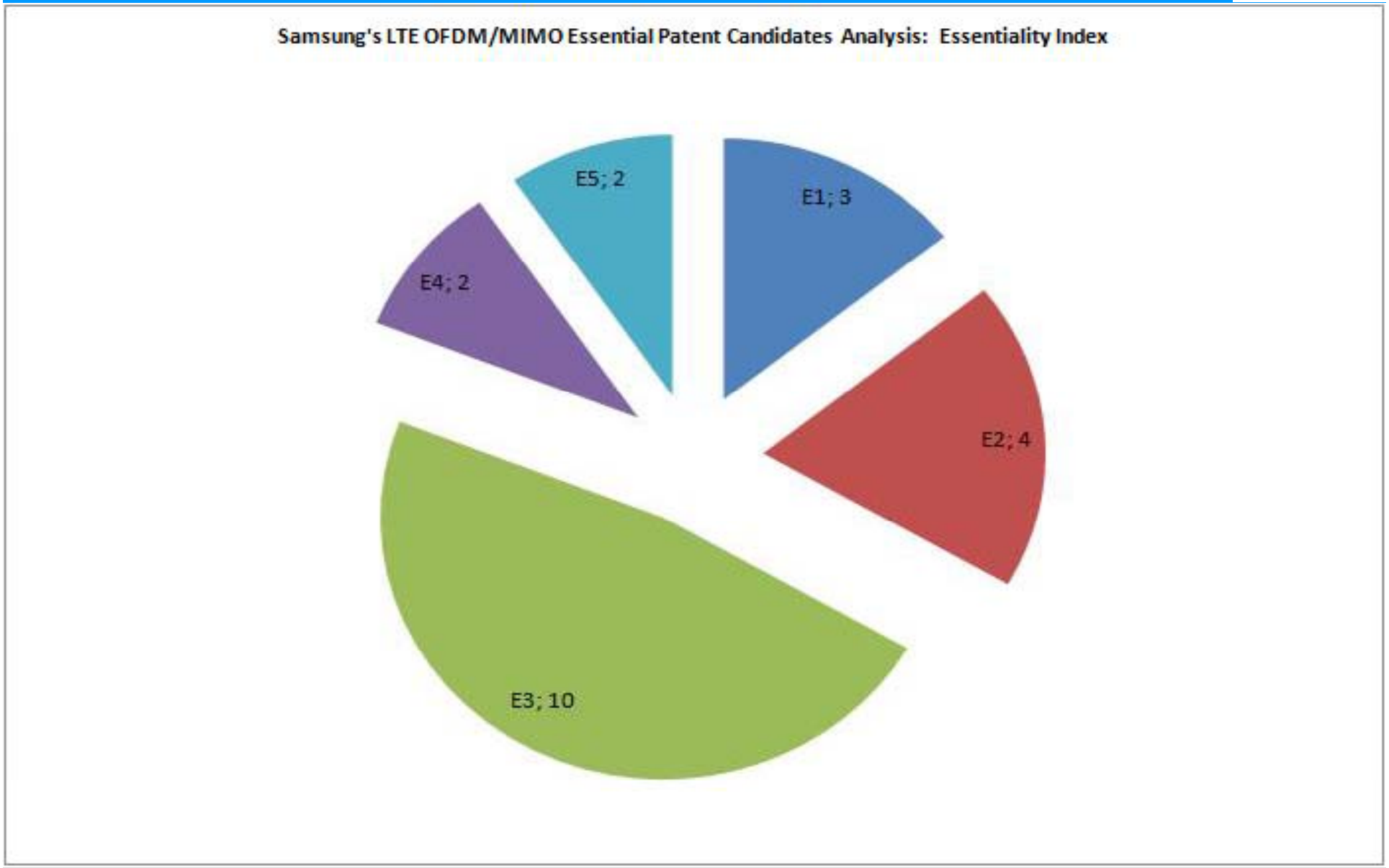


Fig. 8.2 Samsung's LTE OFDM/MIMO Essential Patent Candidates Analysis: Essentiality Index



9. Texas Instruments' Essential Patent Candidates

To evaluate the quality of TI's LTE IPR for OFDM/MIMO standards, patent disclosures for each essential patent candidate are compared to the technical specifications for LTE OFDM/MIMO standards (TS36.211 V8.70).

Total of 18 patents issued and published in the United States before Aug. 1 2009 in the lists of patents declared essential to LTE appear at the ETSI IPR Online are used in the analysis.

As for the most described field of technical specification, Down Link OFDM/MIMO (Section 6.3) was the top in TI's OFDM/MIMO essential patent candidates. (Fig. 9.1)

Only 33% of the TI's OFDM/MIMO essential patent candidates are classified as E2 and E1. 67 % (nine E3, three E4) of the TI's OFDM/MIMO essential patent candidates are classified as high value of EI for the essentiality. (Fig. 9.2)

Fig. 9.1 TI's LTE OFDM/MIMO Essential Patent Candidates Analysis: Distribution in Technical Specifications

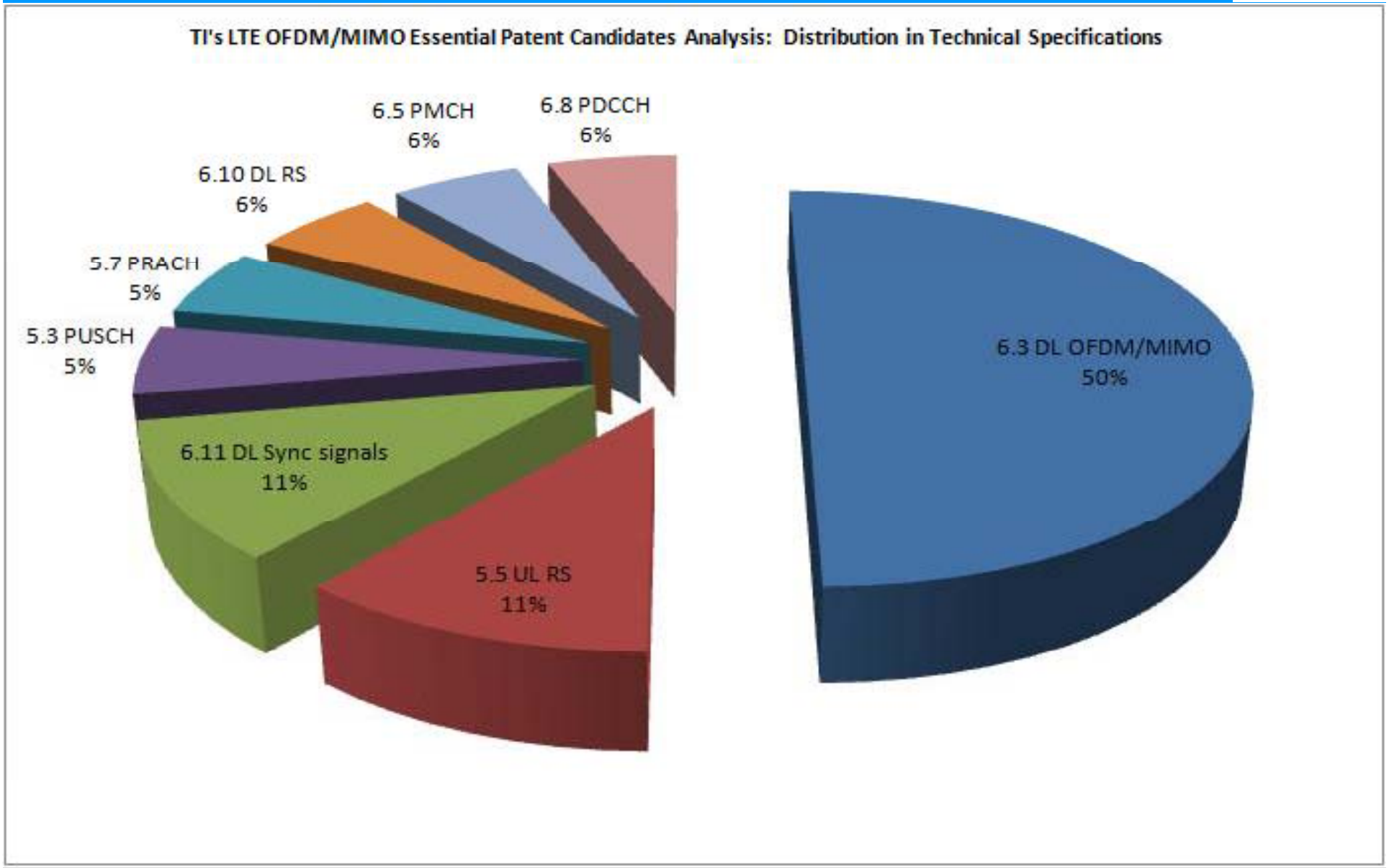
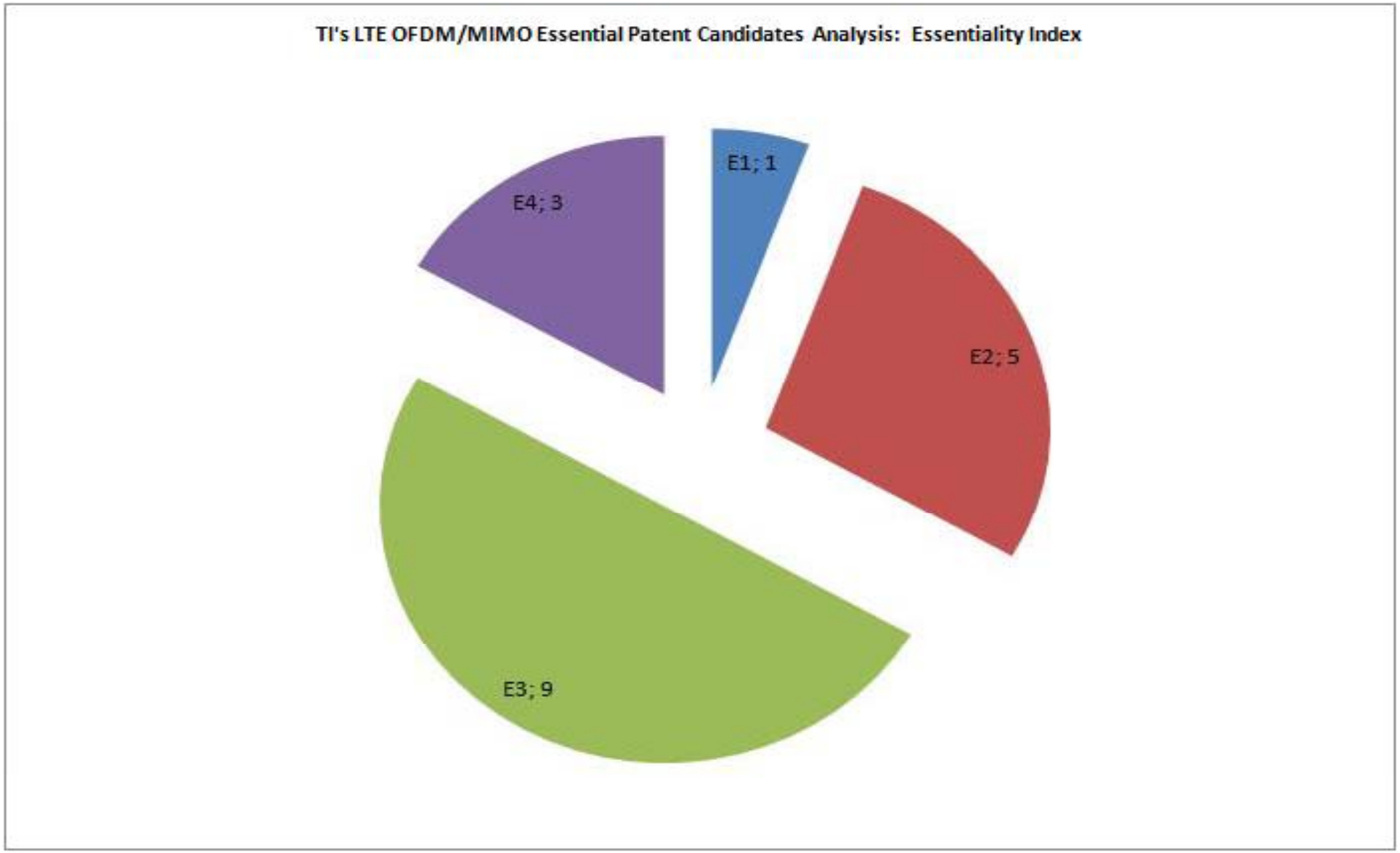


Fig. 9.2 TI's LTE OFDM/MIMO Essential Patent Candidates Analysis: Essentiality Index



Thank you!

If you have any questions
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