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Datasheet for the decision of 16 December 2022

Case Number: T 0561/21 - 3.5.03

Application Number: 14839485.1

Publication Number: 3041304

IPC: H04W72/04, H04L5/00, H04W72/12, H04L1/18

Language of the proceedings: EN

Title of invention:
Transmission methods and apparatuses in TDD-FDD combined system

Patent Proprietor:
SISVEL International S.A.

Opponents:
Bock, Dr. Wolfgang
Ford-Werk GmbH (until 31 May 2022)

Headword:
Omitted DAI bits/SISVEL

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - obvious combination of known features

Decisions cited:
T 0967/97, T 0694/15, T 0816/16, T 0261/19, T 1112/19

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Case Number: T 0561/21 - 3.5.03

D E C I S I O N
of Technical Board of Appeal 3.5.03
of 16 December 2022

Appellant: (Opponent)	Bock, Dr. Wolfgang Stuntzstrasse 33 81677 München (DE)
Representative:	Samson & Partner Patentanwälte mbB Widenmayerstraße 6 80538 München (DE)
Respondent: (Patent Proprietor)	SISVEL International S.A. 6 Avenue Marie Thérèse 2132 Luxembourg (LU)
Representative:	Metroconsult Srl Via Sestriere, 100 10060 None (TO) (IT)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 1 March 2021 concerning maintenance of the European Patent No. 3041304 in amended form.**

Composition of the Board:

Chair	K. Bengi-Akyürek
Members:	J. Eraso Helguera
	F. Bostedt

Summary of Facts and Submissions

I. This case concerns the appeal filed by the opponent (appellant) against the interlocutory decision of the opposition division to maintain the opposed patent in accordance with a "main request" filed during opposition proceedings.

II. The appealed decision mentioned *inter alia* the following prior-art documents:

D2: WO 2012/124996 A2,

D3: US 2012/0257752 A1.

Where appropriate, reference will be made to the paragraphs of:

D2a: US 2014/0003303 A1,

also mentioned in the appealed decision, as the English translation of the corresponding paragraphs of **D2**.

III. A notice of intervention was filed by Ford-Werke GmbH (intervener) and was subsequently withdrawn. The board also considered the arguments and evidence appearing in that notice of intervention.

IV. The notice of intervention mentioned *inter alia* the following prior-art document:

D16: Y. Li, Q. Mu, L. Liu, L. Chen, M. Peng and W. Wang: "Control Channel Design for Carrier Aggregation between LTE FDD and LTE TDD Systems", 2012 IEEE 75th Vehicular Technology Conference.

V. Oral proceedings before the board were held on 16 December 2022.

- The appellant requested that the decision under appeal be set aside and that the patent be revoked.

- The proprietor (respondent) requested that the patent be maintained on the basis of the claims of a **main (and sole) request** filed with the written reply to the notice of intervention.

At the end of the oral proceedings, the board's decision was announced.

VI. Claim 1 of the **main request** reads as follows:

"Transmission method used in User Equipment, UE, (300) for a Time Division Duplex, TDD, - Frequency Division Duplex, FDD, joint operation system, wherein different uplink reference frame configurations are provided for the TDD, wherein formats of a Downlink Control Information, DCI, are defined and at least one of said formats comprises two bits, said two bits being defined as Uplink Index, ULI, to indicate the index of the uplink subframe scheduled by the DCI and wherein said two bits are provided for Downlink Assignment Index, DAI, in TDD frame configurations different from #0 instead of being used as ULI, to indicate the amount of Physical Downlink Shared Channel (PDSCH) represented by the uplink ACK/NACK corresponding to the DCI, comprising:

Step A: receiving a first DCI on the subframe n on a first carrier, wherein the first carrier is an FDD downlink carrier, n is an integer, and the first DCI is the uplink-scheduling DCI; and

Step B: transmitting the uplink data on Physical Uplink Shared Channel, PUSCH, of a second carrier in the subframe n+k according to the scheduling of the first DCI, wherein the second carrier is a TDD carrier, k is the uplink scheduling delay of the uplink reference frame configuration of the second carrier on the subframe n;

characterised in that for frame configuration #{0, 1, 2, 3, 4, 5, 6}, the first DCI comprises said two bits only when the uplink reference frame configuration is configuration #0."

Reasons for the Decision

1. The patent

1.1 The opposed patent concerns the LTE TDD-FDD joint operation scheme, according to which a User Equipment (UE) may access Time Division Duplex (TDD) and Frequency Division Duplex (FDD) network simultaneously to obtain higher communication rates or better communication experience. The carrier aggregation scheme is performed between TDD and FDD carriers. When an FDD carrier is adopted as "scheduling Component Carrier (CC)" and a TDD carrier is adopted as "scheduled CC", the timing of the cross-carrier scheduling requires a special design. The scheduling timing includes *uplink and downlink scheduling timing*. The *uplink scheduling timing* includes the timing relationship among the various steps: the base station transmits uplink-scheduling Downlink Control Information (DCI), the UE transmits data on Physical Uplink Shared Channel (PUSCH) according to the DCI, the base station transmits ACK/NACK messages on Physical HARQ Indicator Channel (PHICH), and the UE transmits

data on PUSCH according to the ACK/NACK messages. The *downlink scheduling timing* includes the timing relationship of the following steps: the base station transmits the downlink-scheduling DCI and data, and the UE reports uplink ACK/NACK messages (cf. paragraphs [0007] and [0008] of the patent).

1.2 However, according to the patent, many conflicts typically exist between the payload size of TDD uplink-scheduling DCI and FDD downlink-scheduling DCI. If it is resolved by adding padding bits there would be more redundant bits (cf. paragraph [0009] of the patent).

1.3 The patent recognises that the uplink-scheduling DCI of TDD has additionally two Uplink Index/Downlink Assignment Index (ULI/DAI) bits compared with the DCI of FDD having the same format (cf. paragraph [0016] of the patent). The essence of the claimed invention is that, for the cross-carrier scheduling, when the FDD carrier is a *scheduling* CC and the TDD carrier is a *scheduled* CC, downlink scheduling complies with FDD timing. ACK/NACK associating with the PDSCH of at most one subframe can be reported on Uplink PUSCH. Therefore, DAI bits in DCI are not required (cf. paragraph [0018] of the patent). When the uplink reference frame configuration of SCC is #1 to #6, i.e. the formats using the two ULI/DAI bits as DAI bits, the uplink-scheduling DCI does not include the two ULI/DAI bits. According to the patent, this reduces the overhead of DCI redundancy, and increases the DCI coverage. At the same time, it maintains the compatibility with the existing system at upmost (cf. paragraph [0034] of the patent).

2. MAIN (AND SOLE) REQUEST

2.1 Claim 1 - inventive step starting from D2 (Article 56 EPC)

2.1.1 The respondent submitted that, in order to evaluate the inventive step of the patent, a single starting point should have been considered. Both the respondent and the opposition division considered that document **D3** should be identified as closest prior art.

2.1.2 The appellant replied that both inventive-step objections starting from **D2/D2a** and D3 were discussed in (a) the decision under appeal, (b) the statement of grounds of appeal, and (c) the respondent's written reply to the appeal.

2.1.3 The board adheres to the view that, if inventive step is to be denied, the choice of the starting point for the assessment of inventive step requires no specific justification since the claimed subject-matter must be inventive over any state of the art according to Article 56 EPC (see e.g. T 1112/19, Reasons 2.1.3 citing: T 967/97, Catchword II, also cited in the Guidelines for Examination; T 694/15, Reasons 13; T 816/16, Reasons 3.7.1; T 261/19, Reasons 2.5). Besides, D2 also concerns LTE TDD-FDD joint operation. Thus, document **D2** is indeed a promising springboard towards the claimed invention.

2.1.4 Using the wording of claim 1, document **D2** discloses (board's outline based on the one used in the appealed decision):

(i) Transmission method used in UE for a TDD-FDD joint operation system (Figs. 14(b) and 16),

(i'a) wherein different uplink reference frame configurations are provided for the TDD (paragraph [34]: "Table 1"),

(i'b) wherein formats of a DCI are defined and at least one of said formats comprises two bits (paragraph [51]: "Format 0", see also D2a, paragraph [0047]), said two bits being defined as ULI to indicate the index of the uplink subframe scheduled by the DCI (paragraph [95]: MSB and LSB of the UL index; see also D2a, paragraph [0085]),

(i'c) wherein said two bits are provided for DAI, in TDD frame configurations different from #0 instead of being used as ULI, to indicate the amount of PDSCH represented by the uplink ACK/NACK corresponding to the DCI (cf. paragraph [75]: Table 4, paragraph [74]: "DASI" defined in "LTE(-A)"; see D2a, paragraph [0069]; *DASI as defined in LTE-A implies the use in DCI Format 0 of the same MSB and LSB as DAI bits for frame configurations #1 to #6*), comprising:

(ii) Step A: receiving a first DCI on the subframe *n* on a first carrier, wherein the first carrier is an FDD downlink carrier, *n* is an integer, and the first DCI is the uplink-scheduling DCI (cf. Fig. 14(b): "PCC UL grant" in "SF #5", Fig. 16: "G3", "G4", "G1", "G2" in SF #3, #4, #8 and #9, respectively);

(iii) Step B: transmitting the uplink data on PUSCH of a second carrier in the subframe *n+k* according to the scheduling of the first DCI, wherein the second carrier is a TDD carrier, *k* is the uplink scheduling delay of the uplink reference frame configuration of the second carrier on the subframe *n* (Fig. 14(b): "SCC PUSCH" in "SF #12",

k being "7 SFs", Fig. 16: "U3", "U4", "U1", "U2" in SF #7, #8, #12 and #13, *k* being 4).

2.1.5 In agreement with the parties, the board thus considers that the subject-matter of claim 1 differs from D2 in that:

(iv) for frame configuration #{0, 1, 2, 3, 4, 5, 6}, the first DCI comprises said two bits only when the uplink reference frame configuration is configuration #0.

2.1.6 The technical effect associated with this distinguishing feature is that it reduces the overhead of DCI redundancy and increases the DCI coverage (cf. paragraph [0034] of the patent and point 1.3 above). Accordingly, the objective technical problem can be framed as "how to reduce the transmission overhead and to improve cell coverage in the system of D2".

The subject-matter of claim 1 does not involve an inventive step starting from D2 for the following reasons:

2.1.7 Document **D2** does not disclose any particular modification to the use of the DAI bits beyond what is implied by the reference to the 3GPP LTE-A standard. The skilled person seeking to reduce the transmission overhead and to improve cell coverage in D2 would have come across **D16**, which explicitly recognises, in section II.C, item 2, the following as a *second* problem in carrier aggregation between FDD and TDD carriers:

> "On the other hand, when an FDD CC is configured as the PCC, ..., since PUCCH is present on FDD UL PCC in each subframe, it's not required to feed back

ACK/NACK signals of multiple subframes in one UL subframe; therefore, the 2-bit downlink assignment index (DAI) field in TDD DCI is no longer needed."

2.1.8 In section IV.B, item 1, D16 proposes the following *first* solution to the *second* problem indicated above:

"*1) Omit the 3 bits in TDD DCI:* In the case of CA between FDD and TDD carriers, there could be two configurations for TDD DCI: 1) if a TDD CC is configured as the PCC, the TDD DCI format will remain the same as in conventional LTE TDD specification; that is, the HPN field is 4 bits in length and the 2-bit DAI field is used; 2) if an FDD CC is configured as the PCC, the redundant 3 bits will be omitted to reduce the overhead.

As the energy per information bit in DCI can be increased when the 3 redundant bits are omitted, PDCCH reliability will be improved, which can translate into better cell coverage."

2.1.9 In view of the above teachings, the skilled person seeking to improve the cell coverage in D2 would have followed the explicit prompt of D16, omitting from the first DCI the 2-bit DAI field when an FDD CC is configured as a PCC and a TDD as SCC. For an uplink-scheduling DCI using "Format 0", the skilled person would have been aware that such omission can only take place when the TDD SCC uses frame configuration #{1, 2, 3, 4, 5, 6}, because in TDD there is no DAI field in "DCI Format 0" for configuration #0. Rather, those two bits are supposed to be used as ULI bits and serve a very different purpose. D16 provides no indication to omit the two ULI bits from a "DCI Format 0" when the TDD SCC uses configuration #0. Hence, the straightforward combination of D2 and D16

would have led to the introduction of **feature (iv)** into the system of D2, i.e. the subject-matter of claim 1, without the involvement of any inventive skills.

2.1.10 The respondent submitted the following arguments:

(a) In D16, it was not explicitly described that downlink scheduling complied with FDD and uplink scheduling complied with TDD. The skilled person would not have obtained any hint from D16 to choose the *first* solution in place of the *second* solution. Moreover, the first solution did not specify that the two DAI bits of the TDD DCI should be kept for TDD configuration #0 and used as ULI to indicate the uplink frame to be scheduled.

(b) The objective problem formulated by the board was incorrect. The technical effect of the distinguishing feature according to the patent was that "it reduces the transmission overhead and improve cell coverage in the system of D2 by maintaining at the same time the highest compatibility with the existing (LTE) systems". Neither D2 nor D16 was ever concerned with "backward compatibility". In D16, the redundancy of the HPN and DAI bits were treated as one. The skilled person confronted with the technical problem to reduce the overhead of DCI redundancy and increasing the DCI coverage by maintaining the compatibility with the existing system at upmost, would not have considered this a convenient and straightforward solution. "Backward compatibility" was not assured by such solution because this was not guaranteed by the only solution proposed by D16 to omit the three DCI bits (i.e. the two DAI bits and one of the four "original" HPN bits). In

particular, it seemed that the omission of one HPN bit would have applied to any UL frame configuration of the joint FDD-TDD CA system in case of FDD PCC, while, according to the invention, the omission of the DAI bits applied only to UL frame configuration #0. Thus, D16 not only did not address any backward compatibility issue but, on the contrary, created an issue in these respects or at least give uncertainties about the real compatibility of the technical solution to solve the objective technical problem.

2.1.11 These arguments are not persuasive, for the following reasons:

(a) On the one hand, the claimed method merely requires receiving a first uplink-scheduling DCI on a first FDD DL carrier ("step A") and transmitting the uplink data on PUSCH of a second TDD carrier ("step B"). These features are however already known from D2, as agreed by the parties. Claim 1 does not mention how the PDSCH is scheduled. On the other hand, the first solution to the second problem proposed in D16 explicitly suggests that the three bits in TDD DCI are omitted "if an FDD CC is configured as the PCC" and "in the case of CA between FDD and TDD carrier". Document D2 fulfils both conditions. The two solutions to the second problem mentioned in section IV.B of D16 are presented as equally valid alternatives that the skilled person would have considered and selected in accordance with the given circumstances. As explicitly stated in that section, the choice hinges upon an apparent trade-off between the improved PDCCH reliability and the better cell coverage offered by the *first* solution versus the

reduced complexity of blind decoding and blind decoding attempts offered by the *second* solution. Therefore, starting from D2, the skilled person seeking to solve the objective technical problem defined in point 2.1.6 above would have naturally chosen the first solution proposed in D16.

(b) The respondent interprets **feature (iv)** as excluding the omission of other bits, in particular, one bit in the HPN field as proposed by D16. The board disagrees with this feature construction. Feature (iv) merely defines *when* the two bits defined in feature (i'b) are to be comprised in the first DCI ("only when the uplink reference frame configuration is configuration #0"). However, this feature does not concern *other* fields. Nor does the description, which does not even mention the HPN field. Furthermore, it is immaterial whether or not D16 ensures "backward compatibility" - whatever the definition - while supporting TDD-FDD joint operation. According to the respondent, this effect requires *keeping the HPN field unvaried*. Since claim 1 does not include this limitation, it cannot credibly attain the alleged "backward compatibility" either. Finally, in LTE-A, not all the DCI formats including DAI bits additionally comprise an HPN field. For instance, "DCI Format 0" comprises DAI bits for configurations #1 to #6, but no HPN field. For this specific DCI format, following the hint given by D16 would only lead to the omission of the DAI bits for frame configurations #1 to #6.

2.2 In conclusion, the main request is not allowable under Article 56 EPC.

3. Since there is no allowable claim request on file, the patent must be revoked.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chair:

B. Brückner K. Bengi-Akyürek

Decision electronically authenticated