

Federal Patent Court

4 Ni 42/23 (EP)

(reference number)

Judicial reference pursuant to Section 83 (1) PatG

After preliminary deliberation, the Senate, having examined the parties' submissions to date, is of the opinion that the following aspects will be of particular importance for the decision (Section 83 (1) sentence 1 PatG):

According to the Senate's current assessment, the nullity action with which the plaintiff is challenging the patent in dispute in the scope of claims 1 and 10 has no prospect of success. The ground for invalidity of lack of patentability is unlikely to apply.

I. Preliminary remark

1. The parties should intensify their considerations regarding a settlement of the legal dispute prior to the oral hearing. They are requested to examine whether, in view of the assessment of the factual and legal situation set out below, an **amicable settlement of** the legal dispute by means of solutions that also make sense from an economic point of view is an option for them. If they consider a settlement to be possible, they are requested to inform the Senate of this in good time before the hearing date.

If the parties do not reach an agreement before the hearing, the Senate will address the issue of a settlement of the legal dispute at the hearing and attempt to work towards an amicable agreement. This would

It is advisable for the parties to send a person who is not only technically but also commercially competent to the hearing or to authorize their legal representatives to conclude a settlement. The parties should be reachable by telephone on the day of the hearing.

2. The parties are requested to provide information on the **status of the infringement proceedings** before the Regional Court of Munich I under file number 21 O 8191/23.

3. The parties are ordered to comment on the final **amount in dispute** to be determined - also taking into account the aforementioned parallel infringement proceedings before the Regional Court of Munich I under file number 21 O 8191/23.

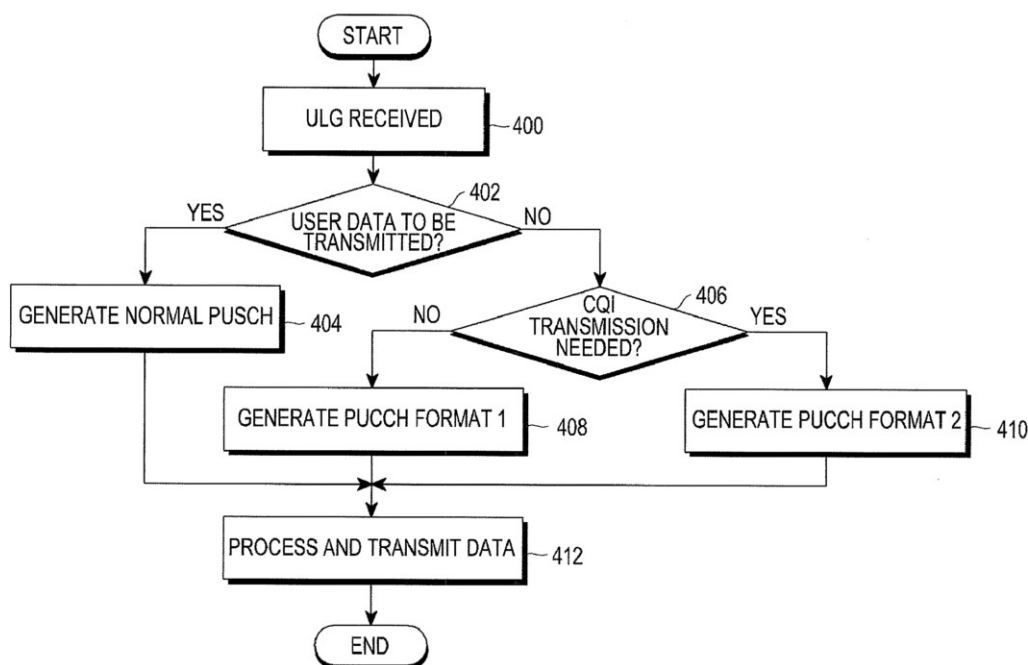
4. This notice will also be sent to the Munich I Regional Court under file number 21 O 8191/23.

II. The patent in suit, the task, the skilled person and the interpretation

1. The present invention relates to wireless communication networks, in particular to a method and an apparatus for improving transmission using a configured resource according to the general term of independent claims 1 and 10, respectively. Such a method and such an apparatus are known from US 2011/0205991 A1 (patent in suit, para. 0001).

1.1 According to the teaching of US 2011/0205991 A1, the user equipment (UE) of an LTE system (*Long Term Evolution*; a 4G mobile radio system) sends control information to the base station via the PUCCH (*Physical Uplink Control Channel*) after receiving a *scheduling grant* for the PUSCH (*Physical Uplink Shared Channel*) data channel and if it has no (user) data to send in the uplink via the PUSCH. This control information contains status information that indicates to the base station that the user device has no (user) data to send.

has to send. US 2011/0205991 A1 thus improves the previously common procedure, according to which the user device always sends a MAC PDU (*Medium Access Control Packet Data Unit*), possibly padded with zeros, to the base station if no (user) data is available (US 2011/0205991 A1, para. 0028, 0042), which in particular reduces the energy consumption of the user device (US 2011/0205991 A1, para. 0008 - 0010, 0028, 0043). When transmitting the status information via the PUCCH control channel, a distinction is also made as to whether additional control information, such as CQI (*Channel Quality Information*), must be transmitted (*PUCCH format 1*) or not (*PUCCH format 2*), whereby the control information is transmitted via the PUCCH control channel in any case:



US 2011/0205991 A1, Fig. 4

1.2 According to the information in the patent in suit, the E-UTRAN system (*Evolved Universal Terrestrial Radio Access Network*; the air interface of the 4G LTE mobile radio system) can provide a high data throughput in order to realize voice over IP and multimedia services. A new radio technology for the next generation (e.g. 5G) is being discussed by the 3GPP standardization organization, with amendments to the current 3GPP standard being submitted and reviewed in order to further develop and finalize the 3GPP standard (patent in suit, paras. 0002, 0003).

2. The present invention relates to a method of a subscriber device and a subscriber device for improved transmission using a configured resource in a wireless communication system (para. 0004).

3. The Senate considers the specialist to be an engineer in communications or information technology with a university Master's degree or diploma. He has several years of professional experience in the development of mobile radio systems. The expert is familiar with the status of ongoing standardization efforts in this field and is aware of the contributions discussed in the standardization processes.

4. The patent in suit as granted comprises ten claims.

The plaintiff requests that the patent in suit be declared invalid to the extent of claims 1 and 10. The defendant defends the patent in suit to the extent granted.

The further explanations are based on the following classification of features of the granted patent claim 1 (procedural claim), which corresponds to the classification of the parties:

Claim 1:

1 A method of a User Equipment, in the following also referred to as UE, comprising:

Method of a subscriber equipment, hereinafter also referred to as UE, comprising:

1.1 an uplink grant is available for the UE in a Transmission Time Interval, in the following also referred to as TTI,

an uplink authorization is available for the UE in a transmission period, hereinafter also referred to as TTI,

1.2 wherein the UE does not have data available for transmission (3005; 3105);

where the UE has no data available for transmission (3005; 3105);
 characterized by
characterized by

- 1.3 the UE determines whether to skip the uplink grant in the TTI according to whether a physical control information needs to be transmitted in the TTI or not (3010; 3110, 3115).

the UE determines whether the uplink authorization in the TTI is to be skipped, depending on whether or not physical control information must be transmitted in the TTI (3010; 3110; 3115).

The secondary, dependent claim 10 (device claim) reads with a feature structure.

Claim 10:

- 10 A User Equipment (300), in the following also referred to as UE,
 10.1 wherein an uplink grant is available for the UE in a Transmission Time Interval, in the following also referred to as TTI,
whereby an uplink authorization is available for the UE in a transmission time period, hereinafter also referred to as TTI,
 10.2 and the UE does not have data available for transmission comprising:
and the UE has no data available for transmission:
 10.4 a control circuit (306);
a control circuit (306);
 10.4.1 a processor (308) installed in the control circuit (306); and
a processor disposed in the control circuit (306); and
 10.4.2 a memory (310) installed in the control circuit (306) and operatively coupled to the processor (308);

a memory (310) arranged in the control circuit (306) and operatively connected to the processor (308); characterized in that
characterized in that

- 10.5 the processor (308) is configured to execute a program code (312) stored in the memory (310) to perform the method steps as defined in any of the preceding claims.

the processor (308) is arranged to execute a program code (312) stored in the memory (310) to perform the procedural steps as defined in one of the preceding claims.

5. Interpretation

In the opinion of the Senate, the skilled person understands the patent in suit as follows:

5.1 As already explained above, the patent in dispute deals with the further development of the 4G mobile radio system LTE and its radio interface E- UTRA(N).

Only a very small part of the patent in suit deals directly with the subject-matter of the contested patent claims 1 and 10 as granted, namely in particular paragraphs 0182 (*Scenario 3*), 0198, and 0242 to 0251. A larger part of the patent in suit describes methods and devices which obviously do not fall within the scope of the contested patent claims, which applies in particular to Figures 23 to 29.

The vast majority of the patent in suit describes in great detail the E-UTRAN specifications in force at the time of priority and often quotes from them verbatim.

a) Thus, the patent in suit (para. 0007) initially mentions, in addition to US 2011/0205991 A1 discussed above, some of the prior art relating to the

3GPP E-UTRA specifications applicable at the time of priority of the patent in suit, from which it then quotes in the course of the description:

- 3GPP TS 36.212 V13.0.0 (2015-12): *E-UTRA; Multiplexing and channel coding (Release 13)*
- 3GPP TS 36.213 V12.5.0 (2015-03): *E-UTRA; Physical layer procedures (Release 12)*
- 3GPP TS 36.321 V12.5.0 (2015-03): *E-UTRA; Medium Access Control (MAC) protocol specification (Release 12)*
- 3GPP TS 36.331 V12.5.0 (2015-03): *E-UTRA; Radio Resource Control (RRC); Protocol specification (Release 12)*

These specifications are therefore assumed to be known and familiar and the Senate reserves the right to refer to these specifications at any time in the course of the invalidity proceedings, as they form part of the specialized knowledge of the skilled person defined above.

b) In addition to the 3GPP specifications, the patent in suit (paras. 0025 to 0029) mentions two 3GPP discussion papers dealing with the **reduction of latency** in E-UTRA:

- RP-150465; Ericsson, Huawei: *New SI proposal: Study on Latency reduction techniques for LTE*; 3GPP TSG RAN Meeting #67, Shanghai, China, March 9 - 12, 2015, 8 pages.
- RP-150310; Ericsson: *Study on latency reduction techniques for LTE; Motivation for new proposed SI*; Copyright 2014, 16 pages.

Contribution RP-150465, for example, emphasizes that the latency time for packet data is not only important for the perceived responsiveness of the system, but also has a direct influence on its throughput (data rate). In addition, large latency times in combination with high data rates require large buffers in the UE and in the base station (RP-150465, p. 3, ch. 3, para. 4).

As possible solutions, the two 3GPP discussion papers mention **protocol improvements** and a **shortening of the transmission time intervals TTI** (*Transmission Time Interval*) (RP-150465, p. 4, ch. 4, para. 3; RP-150310, p. 6), which the patent specification in dispute does not take into account.

in its paragraphs 0025 to 0029. According to paragraph 0029 of the patent in suit, a candidate with the following features for fast uplink access solutions was presented in RP-150310:

- Pre-authorization -> fast uplink access, but with limited throughput; resources can be allocated with (modified) **SPS** (**Semi-Persistent Scheduling**).
- Omitting the requirement to send (useless) padding data when there is no data in the buffer -> saves battery resources during inactivity and has a good throughput-per-watt ratio.
- Switch to dynamic scheduling when entering the active phase -> optimizes throughput if there is a lot of data in the send buffer.

c) Furthermore, the patent in suit cites in paragraph 0007 a technical *report* (TR) of the 3GPP organization, which deals with techniques for **reducing latency times** for E-UTRA:

- 3GPP **TR 36.881** V0.6.0 (2016-02): *Study on latency reduction techniques for LTE (Release 13)*. Pages 1 to 92.

This technical report, which refers inter alia to the above-mentioned contribution RP-150465 (p. 6, Chapter 2), is designated as document **D1** in the present invalidity proceedings.

D1 states typical latency times of 17 ms (with a *scheduling request period* of 10 ms) or 12.5 ms (*scheduling request period*: 1 ms) for the uplink of an E-UTRAN system (D1, p. 13, Table 5.2.1-1).

In paragraphs 0030 to 0041, the patent in suit reproduces verbatim chapters 8.1 (*Semi-Persistent Scheduling*), 8.2 (*UL Grant reception*) and 8.2.1 (*Configured SPS activation and deactivation*) of **D1**, the superordinate chapter 8 of which is entitled "*Solutions for latency reduction*". According to the current specifications, a *user equipment* (UE) sends a MAC PDU (*Medium Access Control Packet Data Unit*), which contains a MAC CE (*Control Element*) to fill up a BSR (*Buffer Status Report*) and optionally fill-up bits in response to an assigned dynamic or

configured UL authorization, even if no data is available for transmission in the UE buffer and no other regular MAC CE needs to be sent.

It is advantageous to allow UEs to skip (most) dynamic and configured uplink authorizations when no data is available for transmission. In the case of frequent UL authorizations, skipping UL authorizations could reduce UL interference and improve UE battery efficiency. The UE continues to transmit one or more regular MAC CE(s), if available. The base station can enable the skipping of UL authorizations through dedicated RRC signaling.

In addition, section 8.2.1 of **D1** discusses the advantages and disadvantages of an ACK signal from the UE, or a non-existent ACK signal, on an uplink authorization transmitted on the PDCCH by the base station (patent in suit, paras. 0034 - 0041).

d) Paragraphs 0042 to 0051 of the patent in suit reproduce chapters 5.10 (*Semi-Persistent Scheduling*), 5.10.1 (*Downlink*) and 5.10.2 (*Uplink*) of the specification 3GPP TS 36.321 V12.5.0 (*E-UTRAN, Medium Access Control (MAC) protocol specification*), which deal with **semi-persistent scheduling** and whose superordinate chapter 5 is entitled "*MAC procedures*".

Paragraphs 0052 to 0078 of the specification of the patent in suit reproduce the chapters 5.4.1 (*UL Grant reception*), 5.4.2 (*HARQ operation*), 5.4.2.1 (*HARQ entity*) and 5.4.2.2 (*HARQ process*) (superordinate chapter 5.4 "*UL-SCH data transfer*") of the specification 3GPP TS 36.321 V12.5.0.

e) In paragraphs 0079 to 0081 of the specification of the patent in suit, part of chapter 6.3.2 (*Radio Resource Control Information Elements*) of the 3GPP TS specification 36.331 V12.5.0 (*Radio Resource Control (RRC)*), namely with regard to the **SPS-Config** information element (p. 283 - 285; SPS = *Semi-Persistent Scheduling*). The superordinate chapters of the RRC specification are "*6 Protocol data units, formats and parameters*" and "*6.3 RRC Information Elements*".

f) Paragraph 0082 of the patent in suit states that although some UEs can transmit simultaneously on the data channel PUSCH (*Physical Uplink Shared Channel*) and the control channel PUCCH (*Physical Uplink Control Channel*), the base station only configures this feature of the UEs if poor channel conditions do not result in the maximum transmission power of a UE being exceeded. In addition, the UE can decide which channel it uses to transmit UCI (*Uplink Control Information*), depending on whether PUSCH and PUCCH are configured simultaneously or not.

In paragraphs 0083 to 0085, the patent in suitably provides extracts from the 3GPP TS 36.213 V12.5.0 (*Physical layer procedures*) specification, namely Chapter 10.1 (*UE procedure for determining physical uplink control channel assignment*). If the UE is configured for simultaneous transmission, different control information is transmitted via different channels, e.g. HARQ-ACK and SR (Scheduling Request) via the PUCCH and CSI (Channel State Information) via the PUSCH (Para. 0085).

g) Paragraph 0086 of the patent in suit states that UEs can transmit HARQ-ACK (*Hybrid Automatic Repeat Request Acknowledgement*) or HARQ-NACK signals several times via the PUCCH alone, i.e. in particular without using the PUSCH, in poor channel conditions.

In paragraphs 0087 to 0089, the patent in suit provides excerpts from the specification 3GPP TS 36.213 V12.5.0, namely excerpts from the chapter 10.2 (*Uplink HARQ-ACK timing*) (p. 212, para. 1, 2; p. 213, para. 5).

h) In paragraph 0090 of the patent in suit it is stated that the specification 3GPP TS 36.212 V13.0.0 (*Multiplexing and channel coding*) describes how the physical layer processes a transport block from the MAC layer and how uplink control information is multiplexed. To this end, the patent in suit cites in its paragraphs 0091 to 0167 the chapters 5.2 (*Uplink transport channels and control information*), 5.2.1 (*Random access channel*), 5.2.2 (*Uplink shared channel*), 5.2.2.1 (*Transport block CRC attachment*), 5.2.2.2 (*Code block segmentation and code block CRC attachment*), 5.2.2.3 (*Channel coding of UL-SCH*), 5.2.2.4 (*Rate matching*),

5.2.2.5 (*Code block concatenation*), 5.2.2.6 (*Channel coding of control information*), 5.2.2.7 (*Data and Control multiplexing*) and 5.2.2.8 (*Channel interleaver*) of TS 36.212.

In paragraphs 0168 to 0176, the patent in suit reproduces chapters 5.2.4 (*Uplink control information on PUSCH without UL-SCH data*), 5.2.4.1 (*Channel coding of control information*), 5.2.4.2 (*Control information mapping*) and 5.2.4.3 (*Channel inter-leaver*) of TS 36.212.

i) In paragraphs 0177 to 0181, the patent in suit again deals with **semi-persistent authorizations** of uplink transmitter resources and the **reduction of latency times** and again refers to the specifications TS 36.321 and TS 36.213 as well as to the already mentioned discussion paper **RP-150310**. It is also mentioned that **UEs can be allowed to refrain from sending unnecessary reply messages in the uplink in order to save energy** (paragraph 0180).

Paragraph 0181 gives examples of what the patent in suit understands by physical control information, namely:

- CQI (Channel Quality Indicator)
- PMI (Precoding Matrix Index)
- RI (Rank Indicator)
- HARQ feedback

j) As far as can be seen, the patent in suit deals with the disadvantages **of the prior art** from paragraph 0182 onwards and outlines **three scenarios** in this respect:

Scenario 1

If physical control information has to be transmitted in a TTI and if a UE is not able to transmit simultaneously on PUCCH and PUSCH and the UE has (payload) data available for transmission, the UE multiplexes the physical control information with the payload data according to the prior art and transmits them together on the PUSCH. However, if an added

If the UL resource allocated to the PUSCH is small (e.g. a pre-allocated configured uplink resource that is assumed to be small), multiplexing the physical control information in the PUSCH may jeopardize the data transmission as the coding rate of the data may be worse than normal and the data transmission is likely to fail. Furthermore, since the network or base station may not know whether the UE is transmitting the physical control information on the PUCCH or the PUSCH, which may depend on whether the UE has data available for transmission or not, the complexity of decoding the UE transmission is increased.

Scenario 2

If physical control information has to be transmitted in a TTI, and if a UE has data available for transmission and simultaneous transmission on PUCCH and PUSCH is enabled, but the UE is not able to perform both transmissions on a control channel (e.g. PUCCH) and a data channel (e.g. PUSCH) with sufficient power, the UE prioritizes the PUCCH transmission over the PUSCH transmission according to the procedure known from the prior art. However, the data on the PUSCH could then not be transmitted in this TTI, or less power is used on the PUSCH, so that the PUSCH transmission (of the user data) is likely to fail.

Scenario 3

If a UE **has no (user) data available for transmission in a TTI**, the UE **skips the configured UL assignment or the dynamic uplink assignment (for the PUSCH) in this TTI**. If the UE has to transmit UCI (*Uplink Control Information*) in the TTI, **the UE transmits the UCI on the PUCCH**. However, if more than one UCI needs to be transmitted in a TTI, **the PUCCH may not be a good candidate for transmitting the UCI as it has limited capacity and the UE may have to delete some UCI**. In addition, the available resources on the PUCCH are limited and therefore the transmission of the UCI on the PUCCH may not be very robust.

In paragraphs 0184 to 0186, the patent in suit makes a number of assumptions which are obviously essential to the invention. For example, a UE may not use a configured uplink allocation if no data is available for transmission. In addition, the UE may not transmit any padding bits using the configured uplink allocation. The period of the configured uplink allocation may be less than a specified value, in particular less than 10 ms or 10 TTIs. The period of the configured uplink assignment can be 1 ms or 1 TTI, 2 ms or 2 TTIs or 5 ms or 5 TTIs. The TTI length could be 1 ms, 0.5 ms or several OFDM (or SC-FDMA) symbols, e.g. 1, 2, 3, 4, 5 or 6 symbols.

The method, apparently essential to the invention, may be used in the event that the HARQ-ACK retry is not configured. In addition, "*a user equipment has data available for transmission*" may have the meaning that the UE **has UL data in the buffer**, or that the UE **has a regular MAC control to transmit**, or that the UE has UL data in the buffer and a regular MAC control to transmit.

The configured uplink assignment can be assigned in advance. The configured uplink assignment can be assigned to a UE if no data is available for transmission. The configured uplink assignment can be assigned to the UE before it transmits a *scheduling request* or a buffer status report.

k) To solve the problems described in *scenario 1*, the information for physical control is transmitted on the control channel,

- if a configured uplink assignment is available,
- if information has to be transmitted for physical control in a TTI,
- if a UE is not able to carry out a transmission on a control channel and a data channel simultaneously and
- if the UE has data available for transmission.

In addition, the UE does not use the configured uplink assignment for transmission on the data channel, as shown in FIG. 18 and FIG. 19 (scenario 1 in each case):

Configured Resource is Available	Scenario 1	Scenario 2
PHY control info needs to be transmitted in a TTI	yes	yes
Data available for Tx	yes	yes
Simultaneous Tx on PUCCH and PUSCH	no	Yes but power is not enough to transmit on both
→ Prior Art	Transmit on PUSCH	Transmit on PUCCH
→ Idea	Transmit on PUCCH	Transmit on PUSCH

FIG. 18

When physical control information needs to be transmitted in a TTI:	Simultaneous transmission on PUCCH and PUSCH is enabled	Simultaneous transmission on PUCCH and PUSCH is disabled
The UE has data	Transmit on PUCCH	Transmit on PUSCH
The UE has no data	Transmit on PUCCH	Transmit on PUCCH

FIG. 19

The skilled person recognizes that the scenarios shown in Figure 18 do not fall under claim 1 of the patent in suit because (user) data is available for transmission in each case (Data available for Tx: yes/yes).

According to paragraph 0188, a second solution of scenario 1 is that the information for physical control is (even then) transmitted on the control channel,

- if a configured uplink assignment is available,
- if information has to be transmitted for physical control in a TTI,
- if a HARQ-ACK repetition is not configured,
- if the UE is not able to perform a transmission on the control channel and a data channel simultaneously, and
- if the UE has data available for transmission.

In addition, the physical control information would (also) be transmitted on the control channel if a HARQ-ACK repetition is configured under the same conditions as above.

In addition, the UE does not use the configured uplink assignment for transmission on the data channel.

According to paragraph 0189, a third solution of scenario 1 is to determine on which channel information for physical control in a TTI is to be transmitted on a data channel in the TTI according to an uplink authorization. Preferably, this means determining whether the physical control information is to be transmitted on the data channel or on a control channel. In addition, the determination can be different for different types of uplink control information, such as HARQ-ACK, CQI/PMI/RI or SR (Scheduling Request).

Preferably, the determination of the channel on which physical control information is to be transmitted is made according to a type of uplink authorization, e.g. whether it is a periodically available uplink authorization or an uplink authorization for a specific TTI. In the latter case, the physical control information can be transmitted on a control channel, in the former case on a data channel (para. 0190).

Preferably, the determination of the channel on which information is to be transmitted for physical control is based on the purpose of the uplink authorization. An example of the purpose is whether the uplink authorization serves to reduce latency or not. The purpose of the uplink authorization can be known by means of an indication, a configuration, a periodicity of the uplink authorization or an identifier for addressing the uplink authorization. For example, if the uplink authorization is addressed by an RNTI (*Radio Network Temporary Identifier*), the UE transmits information for physical control on a control channel. If the uplink authorization is addressed by another RNTI, the UE transmits the physical control information on a data channel (para. 0191).

Preferably, the determination on which channel information is to be transmitted for physical control is based on the available resource of the uplink authorization, the available resource being an uplink authorization for a TTI length (para. 0192).

Alternatively, the available resource of the uplink authorization is a number of PRBs (*Physical Resource Blocks*) of the uplink authorization or a TTI length of the uplink authorization and a number of PRBs. In one example, the UE transmits the physical control information on a control channel when the available resource of the uplink authorization is less than a certain value and on a data channel when the available resource of the uplink authorization is greater than a certain value, wherein the certain value is fixed or configured for a UE or is derived according to the payload size or the amount of physical control information. Alternatively, the specific value is derived according to a type of physical control information, e.g. HARQ-ACK / CQI / PMI / RI / SR. Alternatively, the specific value is derived according to an MCS (*Modulation and Coding Scheme*) of the uplink authorization. In addition, the specific value is set in such a way that the code rate of the information for physical control is guaranteed if it is transmitted on the data channel (para. 0193).

If the behavior of a UE is consistent regardless of whether the UE has data available or not (e.g. if physical control information is transmitted on a control channel, as shown in Figure 19), network deco- dition can be simplified because the network does not need to assume different UE behaviors (para. 0194).

I) To solve the problems described in **scenario 2, the information for physical control is transmitted on the data channel** (para. 0195),

- if a configured uplink authorization is available,
- if information has to be transmitted for physical control in a TTI,
- if the UE has data available for transmission, and

- when simultaneous transmission on a control channel and a data channel is enabled, but the UE is unable to perform both transmissions on the control channel and the data channel with sufficient power, where the case of insufficient power may be due to the sum of the calculated power for the data channel and the calculated power for the control channel exceeding the maximum power of the UE.

In scenario 2, the UE **multiplexes** the physical control information with data on the data channel. The UE uses the configured uplink authorization to transmit data on the data channel.

In addition, if a configured uplink assignment is available **and no data is available for transmission**, the UE does not use the configured uplink grant for transmission on the data channel (e.g. "transmit padding") **if no physical control information needs to be transmitted in a TTI**, as shown in Figures 18 and 20:

When physical control information needs to be transmitted in a TTI :	Simultaneous transmission on PUCCH and PUSCH is enabled	Simultaneous transmission on PUCCH and PUSCH is disabled
The UE has data	Transmit on PUCCH	Transmit on PUCCH.
The UE has no data	Transmit on PUCCH	Transmit on PUCCH

FIG. 20

The skilled person is likely to understand claim 1 of the patent in suit - in particular taking into account the subject-matter of dependent claim 2, which must fall within the subject-matter of claim 1 - as meaning that the scenarios shown in the last line of Figure 20 are not in accordance with the patent in suit, since the information for physical control is not transmitted in the PUSCH but in the PUCCH, contrary to what is required by claim 2. In addition, the skilled person is aware that no uplink authorization is granted for a transmission on the PUCCH - contrary to what is stated in claim 1.

If a UE transmits physical control information on a data channel instead of a control channel, more power can be used for a data channel transmission and the data channel transmission is more likely to be successful. On the other hand, if more than one piece of physical control information needs to be transmitted in a TTI, some of the physical control information may not be transmitted due to the control channel configuration if the UE prioritizes the control channel transmission. By transmitting the physical control information on the data channel, all physical control information could be transmitted (para. 0197).

m) To solve the problems described in **scenario 3, the information for physical control is transmitted on the data channel (instead of via the control channel as known from the prior art)** (para. 0198),

- if an uplink authorization (configured or dynamically granted for a TTI) is available,
- if the UE has **no data** available for transmission, and
- if the information for physical control must be transmitted in a TTI.

In contrast, the uplink authorization (configured or dynamically authorized for a TTI) is skipped if no information for physical control needs to be transmitted in a TTI.

The skilled person will recognize that the statements made in paragraph 0198 concerning scenario 3 correspond to the features of granted claims 1 and 2 of the patent in suit.

n) Paragraphs 0199 to 0204 of the patent in suit contain explanations and embodiments of the solution of scenario 3.

The physical control information can be CQI, PMI, RI and/or HARQ feed back. The UE may not be able to recognize the data channel and the control channel.

simultaneously (e.g. due to the UE capability or power limitation). The data channel could be the PUSCH. The control channel could be the PUCCH (para. 0204).

o) The methods according to Figs. 23, 24 and 25 are obviously **not** in accordance with the claim, since they assume that the UE has (user) data available for transmission and that the physical control information is transmitted via the control channel (Figs. 23, 24) or is transmitted with the user data in the multiplex via the data channel (Fig. 25; para. 0211, 0212 (sentence 1), 0220).

p) **Claims 1 and 2 of the patent in suit, on the other hand, correspond to the methods shown in Figures 30 and 31 (paragraphs 0242 to 0251):**

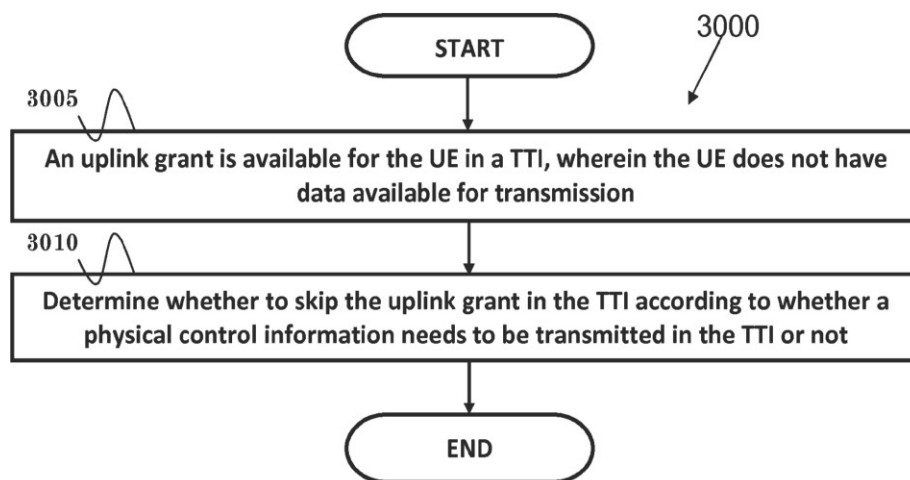


FIG. 30

Patent in suit, Fig. 30, corresponds to claim 1

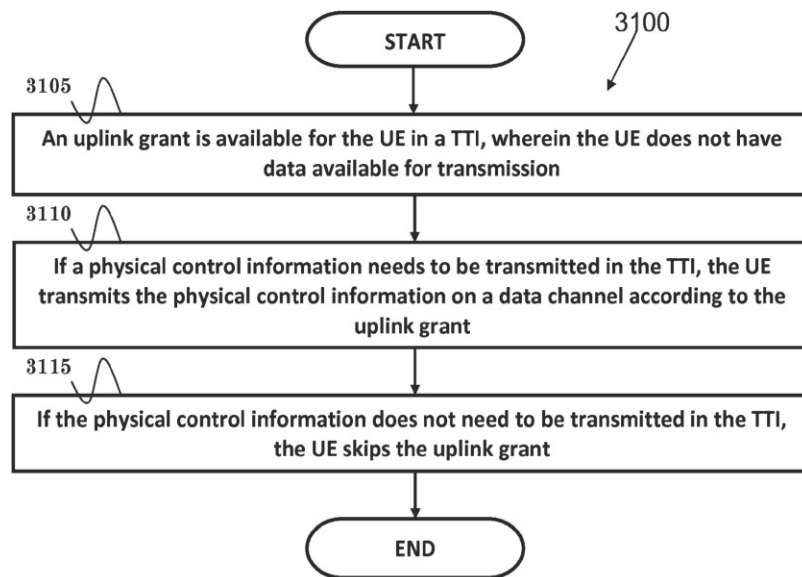
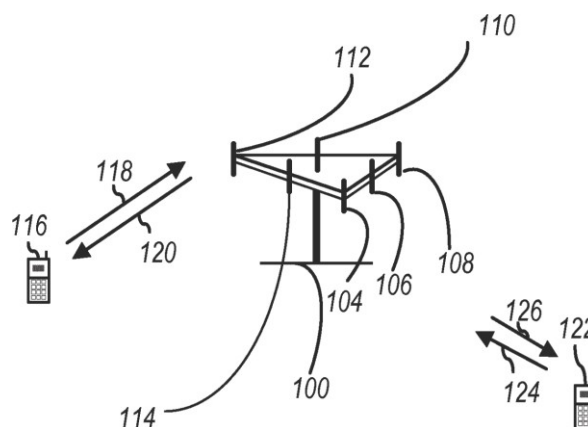


FIG. 31

Patent in suit, Fig. 31, corresponds to claim 2

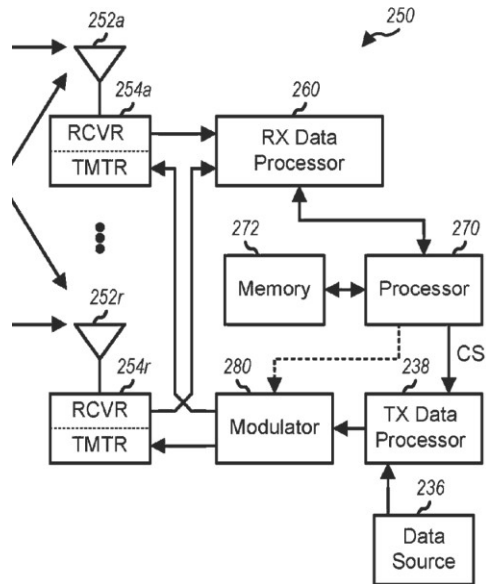
5.2 The method of a user device referred to as **UE** (*user equipment*) according to **claim 1** is not limited to a specific communication system. Claim 1 therefore covers not only mobile radio systems of different generations, but also, for example, wired communication systems.

The skilled person reads into claim 1 that there is a communication partner of the UE which, although not necessarily, is typically a base station of a mobile radio system to which the UE transmits user data and/or information for control in the uplink, as is sketched in the following superimposed Figure 1 of the specification in dispute (two UEs 116, 122; one base station 100):



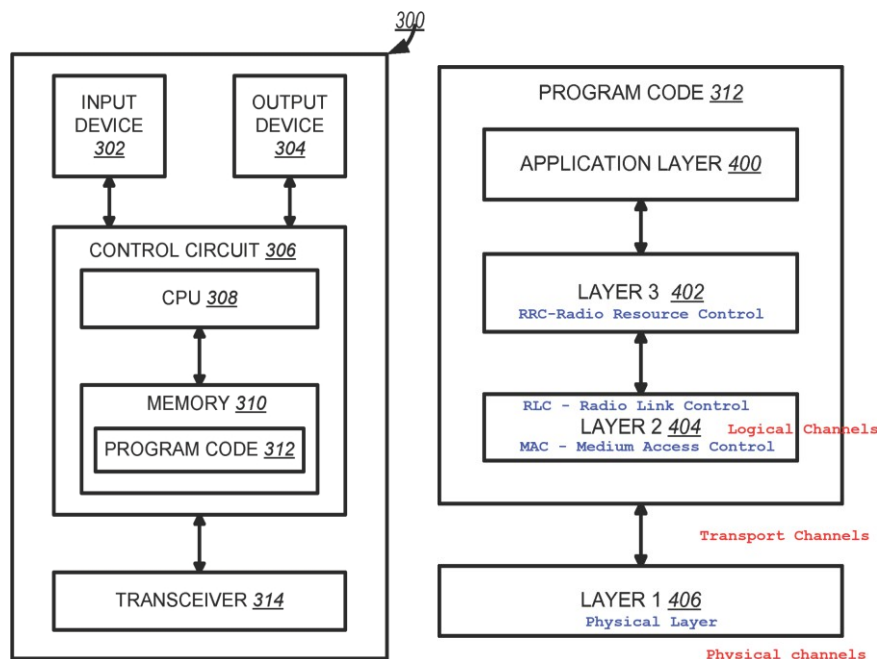
Patent in suit, Fig. 1

The following excerpt from Figure 2 of the patent in suit shows the typical structure of a MIMO UE (*Multiple Input Multiple Output* = several transmit/receive antennas with corresponding transceivers):



Patent in suit, excerpt from Fig. 2

Figures 3 and 4 below also show the typical structure of a UE (Fig. 3) and the structure of its program code with various layers according to the familiar ISO layer model (Fig. 4):



Patent in suit, Fig. 3 and Fig. 4 (with comments by the Senate)

5.3 According to **feature 1.1**, the UE has an authorization to transmit in the uplink to its communication partner, e.g. a base station. This uplink grant is valid for at least one transmission time interval TTI, which does not exclude that it is a transmission grant for several, e.g. periodically arranged, transmission time intervals TTI. The dependent claims 4 (*wherein the uplink grant is a configured uplink grant that is periodically available*) and 5 (*wherein the uplink grant is a dynamic grant specific for the TTI*) take up both variants.

According to the non-limiting embodiments, a TTI can have a length of 1 ms, 0.5 ms or 1, 2, 3, 4, 5 or 6 SC-FDMA symbols, which in the LTE system corresponds to a length of 66.67 μ s, 133.33 μ s for a symbol length of 66.67 μ s, 0.2 ms, 0.27 ms, 0.33 ms or 0.4 ms.

Feature 1.1 is not limited to the fact that the uplink authorization already applies to the next TTI that is in principle suitable for transmission. It could also apply to a TTI further in the future (next but one, next but one, ...). In any case, feature 1.3 refers to the TTI introduced in feature 1.1, i.e. the UE's decision to skip the uplink authorization or not (i.e. to use it) refers to the TTI mentioned in feature 1.1.

The uplink authorization according to **feature 1.1** is the permission for the UE to transmit user data, because the person skilled in the art is aware that in communication systems control information may regularly be transmitted on certain predefined resources, i.e. without prior explicit resource allocation, while the transmission of (regularly larger amounts of) user data is only permitted after the allocation of corresponding resources. This restriction to user data is also **reflected** in **features 1.2 and 1.3**, as they describe a situation in which no (user) data is available for transmission (feature 1.2), but information for physical control may have to be transmitted (feature 1.3).

According to the information in paragraphs 0030, 0032 and 0185 and in claim 9, the "data" mentioned in **feature 1.2** can be not only user data, but also **"regulatory MAC control elements"** (MAC CE, Medium Access Control Element), cf.

- Para. 0030: *Detailed result of the study can be found in 3GPP TR 36.881 V0.6.0 as quoted below, which confirmed that it would be beneficial to skip the config- ured grant if there is no data or regular MAC (Medium Access Control) CE (Con- trol Element) to be sent*
- Para. 0032: *In current specifications, the UE sends a MAC PDU containing a MAC CE for padding BSR and optionally padding bits in response to an allo- cated UL dynamic or configured grant even if no data is available for transmis- sion in the UE buffer and no other regular MAC CE is needed to be sent. It is beneficial to allow UEs to skip (most) dynamic and configured uplink grants if no data is available for transmission. With frequent UL grants, allowing skipping UL grants may decrease UL interference and improve UE battery efficiency. The UE will continue to send one or more regular MAC CE(s)' if any. The eNB may enable skipping UL grants by RRC dedicated signaling.*
- Para. 0185: *Furthermore, throughout the application, a UE has data available for transmission may mean the UE has UL data in the buffer. The UE has data available for transmission may mean the UE has regular MAC control element for transmission. Throughout the application, the UE has data available for transmission may mean the UE has UL data in the buffer and regular MAC con- trol element for transmission.*
- Claim 9: *wherein the UE having data available for transmission means the UE has UL data in the buffer and/or regular MAC control element for transmission.*

For example, experts are aware from the LTE system that regular MAC CEs are part of the MAC PDUs, see 3GPP TS 36.321 V12.5.0, section 6.1.2 MAC PDU:

- *A MAC PDU consists of a MAC header, zero or more MAC Service Data Units (MAC SDU), zero, or more MAC control elements, and optionally padding; as described in Figure 6.1.2-3.*

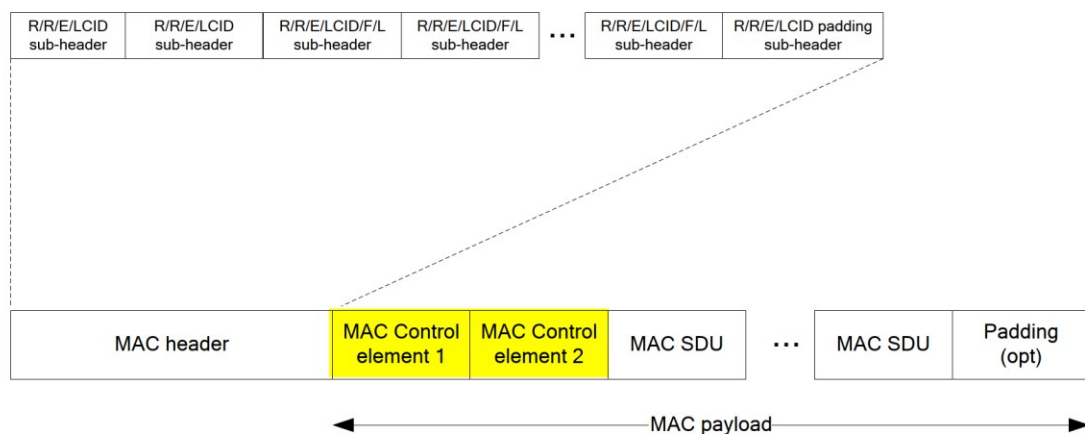


Figure 6.1.2-3: Example of MAC PDU consisting of MAC header, MAC control elements, MAC SDUs and padding

He also knows which MAC CEs exist and what functions they have (3GPP TS 36.321 V12.5.0, chapter 6.1.3 *MAC Control Elements* with subchapters), e.g.

- 6.1.3.1 *Buffer Status Report MAC Control Element*
- 6.1.3.2 *C-RNTI MAC Control Element*
- 6.1.3.3 *DRX Command MAC Control Element*
- 6.1.3.6 *Power Headroom Report MAC Control Element*

Although these MAC CEs do not represent user data, but control information of the MAC layer, they are - in contrast to **feature 1.3** - **not** information for physical control.

Claim 1 makes no statement as to which physical channel or channels the uplink authorization referred to in **feature 1.1** applies to. Only in dependent claim 2, which, at least in this respect, does not already have a restrictive effect on claim 1, can the person skilled in the art infer that the uplink authorization is intended to apply to a (physical) **data channel**, whereby this is designed as a PUSCH (*Physical Uplink Shared Channel*) in accordance with claim 3.

Thus, claim 1 also comprises a variant according to which an uplink authorization exists for a physical channel on which both (user) data and any type of control information, including that mentioned in feature 1.3, can or may be transmitted.

5.4 According to **feature 1.2**, the UE has **no data** available for transmission, which the person skilled in the art, as explained above, understands to mean that the UE **does not** have to transmit **any payload data, regular MAC CEs or other information not used for physical control**, at least not in one of the next transmission time intervals.

According to the information in the patent in suit, which is not restrictive in this respect, "data available for transmission" means that such (useful) data is available in a buffer memory of the UE, cf.

- Para. 0185: *Furthermore, throughout the application, a UE has data available for transmission may mean the UE has UL data in the buffer. The UE has data available for transmission may mean the UE has regular MAC control element for transmission. Throughout the application, the UE has data available for transmission may mean the UE has UL data in the buffer and regular MAC control element for transmission.*

5.5 Feature 1.3 must be considered in conjunction with the conditions set out in features 1.1 and 1.2. Only if the conditions mentioned there are fulfilled, i.e. if an uplink authorization for a TTI is available (feature 1.1) and no "data" is pending for transmission (feature 1.2), does the case distinction mentioned in **feature 1.3** take place. If the UE has to transmit information for physical control, the transmission authorization for the TTI mentioned in feature 1.1 is not discarded but used to transmit this control information; if, on the other hand, the UE does not have to transmit any information for physical control, no uplink transmission takes place in the TTI.

In the applicant's view, the actions resulting from the case differentiation, sending the information for physical control in the TTI or not sending this information, which are only explicitly stated in claim 2, cannot already be read in claim 1. The Senate currently shares this view of the applicant only in part. It is true that sub-claims regularly do not lead to a

correspondingly limited understanding of the associated independent claim or claims.

Here, however, the case is different. The person skilled in the art understands claim 1 with regard to the consequences (skipping or not skipping the uplink authorization in the sense of not sending or sending the information for physical control) of the case differentiation (is information for physical control available or not) already in the sense of claim 2.

Nevertheless, claim 2 is not a nullum, but a limitation compared to claim 1, because only claim 2 and claim 6 indicate that the non-skipping of the uplink authorization, i.e. the transmission of the information for physical control **takes place via a (pure) data channel** (claim 2) or the skipping of the uplink authorization leads to a non-transmission on a/the (referring back to claim 2) data channel.

By the *physical control information* referred to in **feature 1.3**, the skilled person understands layer 1 specific control information. According to the embodiments of the patent in dispute, which are not restrictive in this respect, the physical control information is, for example, the variables commonly used in E-UTRA (claim 9; paragraphs 0182, 0189):

- CQI (*Channel Quality Indicator*)
- PMI (*Precoding Matrix Indicator*)
- RI (*Rank Indicator*)
- HARQ feedback (*Hybrid Automatic Repeat Request*)
- SR (*Scheduling Request*)

III. On the ground for invalidity of lack of patentability

According to the Senate's current assessment, the subject-matter of the granted independent patent claims 1 and 10 is likely to be **new** compared to the cited prior art and is also based on an **inventive step**.

Due to the substantive correspondence of the essentially identical corresponding patent claims 1 and 10, only the patentability of the method according to claim 1 is analyzed in detail below and the transferability of the assessment to the device claim 10 is assumed.

1. State of the art

In support of the alleged lack of patentability, the plaintiff refers to the following documents, which were undisputedly published before the priority date of the patent in suit, the

April 1, 2016, which is why the question of the effective priority claim of the patent in dispute is currently irrelevant:

D13GPP TR 36.881 V0.6.0 (2016-02). Technical Report. 3rd Generation Partnership Project; Technical Specification Group Radio Access Net- work; Evolved Universal Terrestrial Radio Access (E-UTRA); Study on latency reduction techniques for LTE (Release 13). Pages 1 to 92, published on 07.03.2016 (cf. <https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=2901>)

D2ASUSTeK : The Impact of Latency Reduction on UL SPS. R2-154534, 3GPP TSG-RAN2 Meeting #91bis, Malmo, Sweden, September 5 - 9, 2015. 3 pages

D3HTC : Uplink latency reduction with prescheduling. R1-160765, 3GPP TSG RAN WG1 Meeting #84, St Julian's, Malta, 15th - 19th February 2016. 2 pages

D4DAHLMAN, E., et. al: 4G: LTE/LTE-Advanced for Mobile Broadband. Second Edition. Elsevier. Copyright 2014. ISBN: 978-0-12-419985-9. S. 128 - 130, 144, 161 - 163, 198 - 200, 207, 227, 285, 326, 332, 333, 337

D5Samsung : Summary of Email Discussions on UCI Coding. R1-155446, 3GPP TSG RAN WG1 #82bis, Malmo, Sweden, October 5 -9, 2015. 6 pages

D6LG Electronics: Discussion on remaining issues on PUSCH design for eMTC. R1-156842, 3GPP TSG RAN WG1 Meeting #83,

Anaheim,

USA, 15th - 22th November 2015. 4 pages

The defendant has filed the following document, which is a more recent edition (according to the information available to the Senate, published at the earliest in July 2016, i.e. before the filing date but after the priority date of the patent in suit) of D4 filed by the plaintiff:

PI_1 DAHLMAN, E., et. al.: 4G, LTE-Advanced Pro and The Road for 5G. Third Edition. Elsevier. Copyright 2016. ISBN: 978-0-12-804575-6. pp. 58 - 60, 68 - 71, 214

2. Document **D2** (R2-154534 of the 91bis meeting of the 3GPP TSG RAN **WG2**, which is responsible for **layers 2 and 3**) should **not**, in the current opinion of the Senate, conflict with the legal validity of the patent in dispute.

2.1 For this meeting, the discussion paper *The Impact of Latency Reduction on UL SPS* was submitted by ASUSTeK for agenda item *7.10.1 L2 enhancements to reduce latency*.

In addition to the PLC period shortened to 1, 2 or 5 ms (p. 1, *Proposal 1: The newly introduced UL PLC periodicity should be less than 6 ms. It could be 1, 2, 5 ms.*), four alternatives (*Option 1, 2, 3, 4*) are shown as to how the configured uplink authorizations can be skipped in the case of a configured and activated UL PLC and when there is no data to be sent, in particular with regard to the task of supplying the base station with the information that a UE has received the UL PLC activation message from the base station in a resource-saving manner. According to options 1 and 3, after activation of the UL PLC by the base station by means of the *PDCCH Activating UL PLC* signal, either only one MAC PDU is sent as acknowledgement of receipt and then all uplink authorizations are skipped (*option 1: Skip all except for the first transmission*) or all uplink authorizations are skipped, but a positive acknowledgement message ACK is sent (*option 3: Skip all but send a positive acknowledgement*):

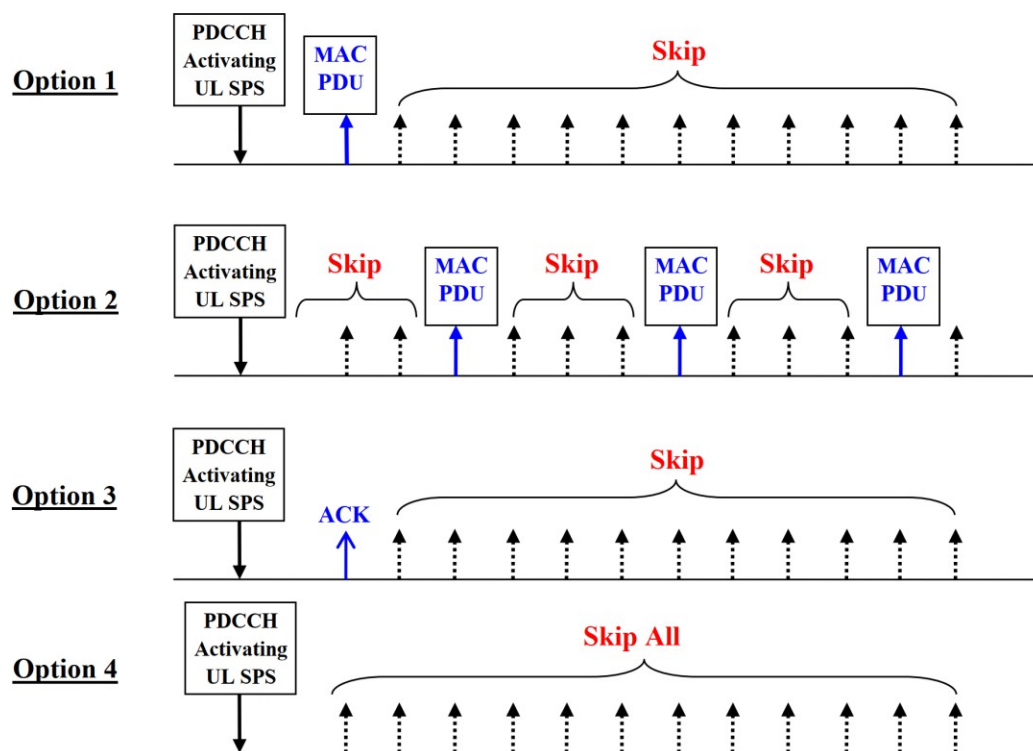


Figure 2

2.2 Expressed in the words of claim 1 of the patent in suit, this means that the **D2** is aware of the following:

- 1 A method of a User Equipment, in the following also referred to as UE, comprising:

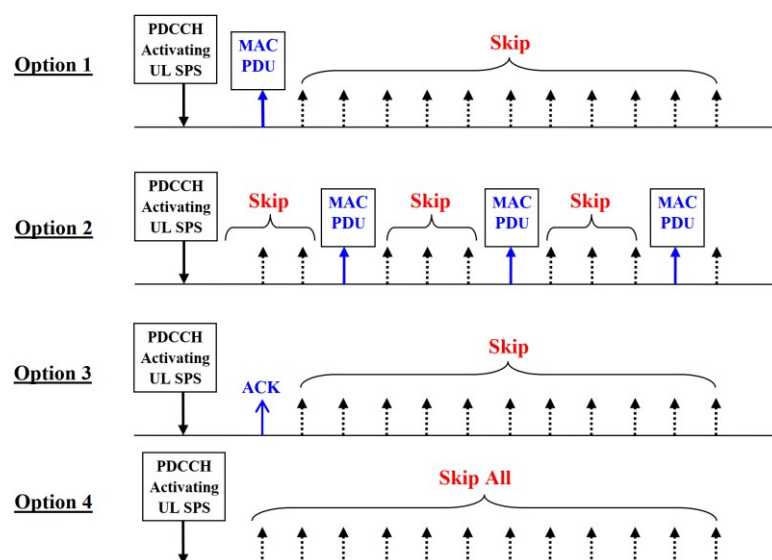
Page 1, 1 Introduction ... Agreements: 1 It is beneficial to allow UEs to skip (most) dynamic and configured uplink transmissions if no data is available for transmission

Page 3, Text proposal of TR 36.881 ... 8.2 UL Grant reception ... There are several ways for UE to skip configured UL grants and avoid missing detection of activating UL SPS like only sending the first transmission using the configured grant or sending an ACK for detection of activating UL SPS.

- 1.1 an uplink grant is available for the UE in a Transmission Time Interval, in the following also referred to as TTI,

According to Figure 2 of D2, the base station configures and activates a UL PLC, i.e. a semi-persistent UL authorization, by means of

of the signal *PDCCH Activating UL SPS*. After receiving this activation message, the UE may, at least for a certain period of time, transmit in the uplink at certain, periodically arranged intervals (according to proposal 1 (*Proposal 1*) of D2, e.g. every 1, 2 or 5 ms) in the uplink, as indicated in Figure 2 of D2 by the upward-pointing arrows (black, dashed and with closed arrowhead: these uplink authorizations are not used; blue, solid and with closed arrowhead: these uplink authorizations are used to send a MAC PDU):



However, the person skilled in the art **cannot** directly and clearly see from Figure 2 of D2 whether the ACK signal is actually transmitted in option 3 using the uplink authorization for the PUSCH (as in option 1 for transmitting a MAC PDU) or whether the ACK signal is transmitted on a different channel, independent of the uplink authorization for the PUSCH, e.g. on the PUCCH control channel. The latter view is probably supported by the fact that the arrow for ACK is drawn differently to the other blue arrows (thinner and with an open tip) and, in particular, that D2 for option 3 states that all uplink authorizations are **skipped** (*Skip all but send a positive acknowledgement*).

1.2 wherein the UE does not have data available for transmission

Page 2, Paragraph 1: *Skipping UL grants ... Assumed that UL SPS is configured and activated, if there is no data available for transmission, UE could skip most transmissions. The following options show how the UE skip the configured grants even if there is no data available for transmission. The illustration of these options is shown in Figure 2*

1.3^{Nicht} ~~the UE determines whether to skip the uplink grant in the TTI according to whether a physical control information needs to be transmitted in the TTI or not.~~

From the "Skipping UL grants" section of D2, in particular Figure 2, the skilled person understands that, according to option 3, the UE, in response to the message received from the base station "PDCCH Activating UL SPS" first sends the confirmation signal ACK, whereby, as already explained, the skilled person **cannot** see from D2 whether an uplink authorization for the PUSCH is used for this or whether the transmission takes place on another channel, in particular on the control channel PUCCH, and thus the uplink authorization available for this TTI is also skipped (*option 3: skip all*).

Moreover, the person skilled in the art **cannot directly and unambiguously infer** from D2 **that the ACK signal is an information for physical control, i.e. a layer 1 message**. Rather, the person skilled in the art understands that it is information from a higher layer that indicates to the base station that its *PDCCH Activating UL SPS* message has been correctly received by the UE.

In this context, it should be noted that **D2** is a contribution that was prepared for a meeting of the 3GPP **TSG-RAN2** working group, i.e. the working group that - in contrast to the RAN1 working group - does not deal with Layer 1, i.e. not with the *physical layer*, but with Layers 2 and 3.

Consequently, with option 3, the **decision** required by feature 1.3 as to whether or not the transmission authorization for the TTI specified in feature 1.1 is rejected, depending on whether or not information for physical control must be transmitted in the TTI, **does not take place** in the UE.

Thus, the subject-matter of claim 1 as granted is new compared to the method known from **D2**.

2.3 According to the defendant, D2 shows two disjunctive proposals. The Senate cannot currently agree with this view. On the contrary, the skilled person is likely to infer from D2 that in the meeting preceding D2 both measures (shortening the SPS interval to a minimum of one TTI, i.e. to 1 ms, as well as to 1 ms, as well as the possibility of the UE rejecting most uplink authorizations, regardless of whether it is a (one-off) dynamic authorization or a semi-persistent authorization, i.e. a sequence of periodic authorizations) were adopted (D2, Chapter 1, Para. 1: *In the last meeting, we have the following agreements*). Accordingly, D2 also proposes both amendments for the 3GPP TR 36.881 technical report (D2, p. 3, Ch. 8.1, last sentence and Ch. 8.2, last sentence); both measures should therefore be implemented.

Apart from that, however, as explained in the above comparison of features, **D2** does not show the procedure according to feature 1.3 in the patent in suit.

3. Document **D3** (R1-160765 of the 84th meeting of the 3GPP TSG RAN **WG1** working group) should, in the current opinion of the Senate, **not** conflict with the legal validity of the patent in suit.

3.1 The discussion paper *Uplink latency reduction with prescheduling* from HTC was submitted for the aforementioned meeting under agenda item 7.3.4.4.

In addition to shortening the transmission time interval to 0.5 ms or to just one OFDM symbol (0.067 ms), this also discusses the possibility of "*prescheduling*", i.e. assigning an uplink authorization to the UE without the UE having previously made a corresponding resource *request* (*scheduling request*). As in other prior art documents, **SPS** (*semi-persistent scheduling*) is also mentioned. As was already known at the time, D3 mentions the disadvantages of prescheduling, in particular the UE's responses to the SPS's uplink requests, which consist only of padding bits or only of the BSR (*Buffer Status Report*) and would therefore cost the UE a lot of energy, especially with short SPS periods (1 ms).

D3 then goes on to mention the solution approach known at the time of allowing the UEs to skip the actually required responses to the UL authorizations received if no user data is to be sent.

As was also known at the time (see D2, p. 3, 8.2 *UL Grant reception ... avoid missing detection of activating UL SPS*), the D3 explains that this omission of the UE responses leads to difficulties for the base stations. In particular, the base stations would have to perform complex calculations as part of the resulting "blind decoding" and - this is the actual finding of D3 - cannot perform UL HARQ (*Hybrid Automatic Repeat Request*).

To solve this problem, D3 proposes examining various approaches:

- *Auxiliary signal* NDI (*New Data Indicator*), which is sent by the UE together with user data via the PUSCH in order to distinguish an initial transmission of data from a repeated data transmission,
- *Auxiliary signal* RV (*Redundancy Version*) Index sent by the UE together with user data via the PUSCH to indicate how many repetitions of data are involved, or
- new, *full-fledged* uplink control channel for the transmission of HARQ information in parallel to the (payload) data transmission of the UE taking place on the PUSCH; contrary to the applicant's view, the new control channel is not transmitted on the PUSCH (as according to the information provided).

in the D3, PDCCH and PDSCH can be sent together in the downlink, but not as a single channel).

All three proposed solutions mentioned in D3 thus provide for the transmission of additional HARQ control information in parallel with the transmission of user data; contrary to the combination of features 1.2 and 1.3 of the patent in dispute, they thus deal with a situation **in which user data is available for transmission in the UE** and is also transmitted using an uplink authorization.

3.2 Expressed in the words of claim 1 of the patent in suit, it thus follows from the **D3** is aware of the following:

- 1 A method of a User Equipment, in the following also referred to as UE, comprising:

Page 2, 3 Conclusions ... Proposal 1: Consider transmit an autonomous control signal by the UE along with PUSCH for latency reduction with UL transmission skipping.

- 1.1 an uplink grant is available for the UE in a Transmission Time Interval, in the following also referred to as TTI,

P. 1, Chapter 2, Para. 2: In addition to directly shortening the TTI, it has been noted that another major factor which contributes to the UL transmission latency is the time for the UE to wait for a scheduling request (SR) opportunity, transmit the SR, and then finally receive the UL grant

Paragraph spanning pages 1 and 2: The idea is to allow the UE to skip an UL transmission when an UL grant is received or an SPS transmission opportunity occurs in the case that it has no data to transmit.

Against the background of his specialist knowledge, in particular of the LTE mobile radio system, the skilled person reads that the one-off dynamic uplink *grant* (*UL grant*) or the multiple, periodic uplink grant (*SPS transmission opportunity*) naturally also apply to the next TTI - although this is not even required by memo 1.2, as explained for the interpretation.

1.2^{Nicht} ~~wherein the UE does not have data available for transmission~~

Although D3 shows in the paragraph spanning pages 1 and 2 that it assumes the situation in which the UE does not have to send user data (*The idea is to allow the UE to skip an UL transmission when an UL grant is received or an SPS transmission opportunity occurs in the case that it has no data to transmit.*), its proposed solutions, as explained in the introduction, all deal with the transmission of additional control information in the event that user data is available for transmission.

1.3^{Nicht} ~~the UE determines whether to skip the uplink grant in the TTI according to whether a physical control information needs to be transmitted in the TTI or not.~~

According to the proposed solutions in D3, the UE sends control signals in response to the uplink authorization received from the base station only when it actually has user data to transmit. If this is not the case, the uplink authorization is skipped. In this respect, D3 does not show the procedure in accordance with features 1.2 and 1.3, according to which, in the event that no data is available for transmission (feature 1.2), the non-skipping or skipping of the uplink authorization depends on whether information on physical control is available or not (feature 1.3).

Thus, the subject-matter of claim 1 as granted is new compared to the method known from **D3**.

3.3 According to the applicant, the information that the UE transmits via the new fully-fledged control channel, contrary to the auxiliary signals NDI or RV, is not data-associated, so that it can be transmitted even if the UE has no data available for transmission in accordance with feature 1.2 (reply of 06.05.24, p. 17, para. 3). The Senate cannot currently agree with this assumption, but considers it to be speculative, also in the absence of any evidence.

The Senate also considers the plaintiff's assertion that the autonomy of the new tax channel includes independence from any data transmissions to be speculation - also due to a lack of further evidence (Reply, p. 18, penultimate paragraph).

4. Document **D6** (R1-156842 of the 83rd meeting of the 3GPP TSG RAN **WG1** working group) should, in the Senate's current view, **not** conflict with the legal validity of the patent in suit.

4.1 For this meeting, the discussion paper *Discussion on remaining issues on PUSCH design for eMTC* was submitted by LG Electronics under agenda item 6.2.1.5.

The expert is aware that eMTC stands for *enhanced Machine Type Communication*, an LTE variant introduced with Release 13 to support the *Internet of Things (IoT)*, which focuses on low energy consumption and low complexity of the end devices. According to its title, D6 would like to discuss remaining questions regarding the PUSCH design for the eMTC LTE *variant*.

In its chapter 2 *PUCCH/PUSCH simultaneous transmission*, D6 states at the beginning that [in principle] it is not expected that a simultaneous PUCCH/PUSCH transmission is configured for LC/CE UEs. However, with regard to a [nevertheless occurring] simultaneous PUCCH/PUSCH transmission, it is expected that the base station should avoid collisions, as otherwise the UE would have to abort a transmission. There are several cases in which collisions can occur, and D6 provides instructions (last column *Handling*) for various collision cases in the table spanning pages 1 and 2. The first column of the table (*On-going transmission*) initially indicates which control information (e.g. *CSI (Channel State Information)*, *HARQ-ACK*) or user data (*PUSCH via UL grant*) is currently being transmitted via which physical channel (e.g. *HARQ- ACK on PUCCH*). In some cases, the first column also indicates whether an uplink grant is used for transmission via the PUSCH. For example, in the third case (fourth row of the table) it is indicated that control information is transmitted via

are transmitted to PUSCH (*Aperiodic CSI reporting via PUSCH*) and an uplink authorization for PUSCH is used for this purpose (*UL grant PUSCH*).

If the UE now wishes to transmit further data or control information, the second table column (*New transmission*) specifies what is to be transmitted (e.g. HARQ-ACK on PUCCH or by means of which authorization, e.g. *SPS PUSCH* or *UL grant*). In the aforementioned fourth table row (third case), the second column contains the entry *SPS PUSCH*, i.e. user data is now to be transmitted via a semi-persistent uplink grant. As this would lead to a collision with the ongoing transmission of aperiodic CSI control information via the dynamically granted (one-off) uplink authorization (*UL grant PUSCH*), the recommended action in D6 (last column of the table) in this case is "*SPS is dropped/skipped*", i.e. the semi-persistent uplink authorization is not used.

4.2 Expressed in the words of claim 1 of the patent in suit, the **D6**

The following is thus known:

- 1 A method of a User Equipment, in the following also referred to as UE, comprising:

Page 1, 2 *PUCCH/PUSCH simultaneous transmission ... In terms of simultaneous PUCCH/PUSCH, it is expected that eNB should avoid collision as UE needs to drop one transmission.*

- 1.1 an uplink grant is available for the UE in a Transmission Time Interval, in the following also referred to as TTI,

Table covering pages 1 and 2:

On-going transmission	New transmission	Handling
Aperiodic CSI reporting via PUSCH, UL grant PUSCH	SPS PUSCH	SPS is dropped/skipped

Against the background of his specialist knowledge, in particular of the LTE mobile radio system, the person skilled in the art reads that the multiple, periodic uplink authorization (*New transmission ... SPS PUSCH*)

naturally also applies to the next TTI - although feature 1.2, as explained in the interpretation, does not even require this.

1.2 ^{Nicht} ~~wherein the UE does not have data available for transmission~~

The plaintiff refers to the third case already shown for feature 1.1 and bridging pages 1 and 2 in the table (fourth row), in which a UE currently (*on-going transmission*) transmits information for physical control via the PUSCH (*Aperiodic CSI reporting via PUSCH*) and uses a (one-time) dynamically granted uplink authorization (*UL grant PUSCH*) and in addition a UL data transmission via PLC via the PUSCH (*PLC PUSCH*) is pending, so that there would be a collision between control information and user data. As a solution to this impending collision on the PUSCH, D6 proposes for this case (*Handling column*) to skip the uplink authorization granted via PLC (*PLC is dropped/skipped*). **This means that data to be transmitted is available in the UE for this case.** The plaintiff's assertion to the contrary that in this case only a MAC CE could be available for transmission, i.e. no user data, does not apply because, as explained for interpretation, the patent in suit defines the case in which no data is available for transmission as a situation in which neither user data nor a MAC CE is available for transmission.

1.3 ^{Nicht} ~~the UE determines whether to skip the uplink grant in the TTI according to whether a physical control information needs to be transmitted in the TTI or not.~~

According to the solution proposed by D3, an uplink authorization (SPS *PUSCH*) issued by SPS for the transmission of data on the PUSCH is skipped if information on physical control (*Aperiodic CSI reporting via PUSCH*) has to be transmitted via the PUSCH at the same time, which would fulfil the pure wording of feature 1.3, but not in combination with feature 1.2, because the relevant table line of D6,

as explained above, concerns precisely the case **in which data is to be transferred**.

Thus, the subject-matter of claim 1 as granted is new compared to the method known from D6.

5. According to the current opinion of the Senate, the combination of documents **D1** and **D5** should **not** conflict with the legal validity of the patent in suit.

5.1 Document **D1** (3GPP TR 36.881 V0.6.0) has already been discussed in the chapter on interpretation. In particular, the technical report D1 in its chapter 8 *Solutions for latency reduction* shows the use of periodic uplink authorizations for a certain period of time (*semi-persistent scheduling*), whereby the UEs are allowed to skip some of the uplink authorizations. The UEs may then still send regular MAC CEs (p. 15, section 8.2).

The subject-matter of claim 1 of the patent in suit is probably **not** known from D1.

Expressed in the words of claim 1 of the patent in suit, the following is known from D1:

- 1 A method of a User Equipment, in the following also referred to as UE, comprising:

Page 15, 8.2 *UL Grant Reception ... It is beneficial to allow UEs to skip (most) dynamic and configured uplink grants if no data is available for transmission.*

- 1.1 an uplink grant is available for the UE in a Transmission Time Interval, in the following also referred to as TTI,

Page 15, 8.1 *Semi-Persistent Scheduling ... Supporting a PLC periodicity of 1 TTI is beneficial as this may reduce the latency of initial UL transmissions.*

- 1.2 wherein the UE does not have data available for transmission

Page 15, 8.2 UL Grant Reception ... *It is beneficial to allow UEs to skip (most) dynamic and configured uplink grants if no data is avail- able for transmission.*

1.3^{teils} the UE determines whether to skip the uplink grant in the TTI according to ~~whether a physical control information needs to be transmitted in the TTI or not.~~

According to the technical doctrine of D3, the uplink authorization is skipped if neither user data nor regular MAC CEs are available for transmission:

P. 15, 8.2 UL Grant Reception ... *In current specifications, the UE sends a MAC PDU containing a MAC CE for padding BSR and optionally padding bits in response to an allocated UL dynamic or con- figured grant even if no data is available for transmission in the UE buffer and no other regular MAC CE is needed to be sent.*
It is ben- eficial to allow UEs to skip (most) dynamic and configured uplink grants if no data is available for transmission. With frequent UL grants, allowing skipping UL grants may decrease UL interference and improve UE battery efficiency. The UE will continue to send one or more regular MAC CE(s), if any.
The eNB may enable skipping UL grants by RRC dedicated signaling.

Thus, the subject-matter of claim 1 as granted is new compared to the method known from D1.

5.2 Document **D5** (R1-155446 of the 82nd meeting of the 3GPP TSG RAN **WG1** working group) should, in the current opinion of the Senate, **not** conflict with the legal validity of the patent in suit.

For the aforementioned meeting, the discussion paper *Summary of Email Discussions on UCI Coding* was submitted by Samsung for agenda item 7.2.2.1.2.

According to its title, D5 deals with the coding of control information in the uplink, the UCI (*Uplink Control Information*).

In particular, D5 states in detail which company holds which view on the question of whether the different variants of the UCI should be coded together or separately (*joint coding (JC) versus separate coding (SC)*). The plaintiff's view that it is a matter of joint coding of UCI and data (action for annulment, p. 38, lines 28 - 30) can therefore obviously not be correct. The section "*Issue 3*", which covers pages 5 and 6 of D5, deals with the question of how multiplexing, the allocation of resource elements RE and the regulation of transmission power for the UCI types with common and separate coding are to be carried out if UCI and user data are to be transmitted together.

In any case, D5 specifies two variants via which uplink channels the UCI can be transmitted, namely via the *PUCCH* or via a *UCI-only PUSCH* (p. 1, *Observation 2*), possibly also a third, namely via a *PUSCH-based PUCCH* (p. 1, *Observation 3*). The *UCI-only PUSCH* is likely to be an exclusive transmission of control information via the *PUSCH*, i.e. without simultaneous user data transmission (D5, p. 5, third table row (Intel), para. 2: *For UCI on PUSCH without UL-SCH, separate coding scheme and Rel-12 PC formula for CSI-only PUSCH can be reused*). Apart from the main topic of D5, i.e. coding, the skilled person cannot find any further details on this type of transmission of control information in D5.

Expressed in the words of claim 1 of the patent in suit, the following is known from D5:

- 1 A method of a User Equipment, in the following also referred to as UE, comprising:

Page 4, *Issue 2: Multiplexing, RE allocation, and UE transmission power for the UCI types with joint coding and with separate coding for transmission on:*

a) *New PUSCH-based PUCCH*

b) *UCI-only PUSCH*

a. *Should UCI transmission in PUSCH-based PUCCH have same or different attributes than in UCI-only PUSCH?*

- 1.1 ~~an uplink grant is available for the UE in a Transmission Time Interval, in the following also referred to as TTI,~~

The expert cannot find any information on the subject of uplink authorizations in D5.

- 1.2^{teils} ~~wherein the UE does not have data available for transmission~~
D5 refers to the case where no user data but control information is to be transmitted in the uplink, cf.

P. 3, second row of table (Ericsson), para. 2: UCI on PUSCH with and without UL-SCH data.

p. 5, second row of table (Huawei, HiSilicon), para. 2: For UCI on PUSCH without UL-SCH

P. 5, third and fourth table row (Intel; DOCOMO), para. 2 in each case: For UCI on PUSCH without UL-SCH,

but not in connection with the existence or non-existence of an uplink permit.

- 1.3^{Nothing} ~~the UE determines whether to skip the uplink grant in the TTI according to whether a physical control information needs to be transmitted in the TTI or not.~~

D5 is silent on the subject of uplink authorizations; in this respect, the expert can also infer nothing from it as to whether and under what circumstances an uplink authorization can or should be skipped.

Thus, the subject-matter of claim 1 as granted is new compared to the method known from D5.

5.3 The subject matter of claim 1 is not obvious to a person skilled in the art from the combination of documents D1 and D5.

As explained in section 5.1, document D1 does not indicate that the need to transmit physical control information would have an impact on the use or non-use of uplink authorizations (remainder of

Feature 1.3). Since document D5 does not deal with uplink authorizations, it cannot provide the specialist with any reason to do so.

It is also currently not apparent to the Senate what reason the skilled person would have, based on the D1, to include information on physical control in the decision to use a granted uplink authorization for the PUSCH or not. This is because such information can be transmitted via the PUCCH. The fact that there could be disadvantages associated with the transmission of control information via the PUCCH, or that the transmission of control information via the PUSCH could offer advantages over transmission via the PUCCH in some situations, is obviously a finding that only the patent in suit provides.

IV. The parties are given the opportunity pursuant to Section 83 (2) sentence 1 PatG,

until September 28, 2024

to comment conclusively on this reference by making relevant applications or supplementing their submissions and also in other respects.

The respective opposing party is given a further period of time to respond to the submissions in this opinion

until November 28, 2024.

The parties are **instructed** to **serve** their respective **pleadings from lawyer to lawyer**.

Instruction pursuant to Section 83 (4) sentence 1 no. 3 PatG

The Senate may reject a party's means of attack and defense or an amendment to the action or a defense of the defendant with an amended version of the patent, which are only submitted after the above-mentioned preclusion period has expired, and decide without further investigation if the consideration of the patent is not possible.

new submission would necessitate an adjournment of the already scheduled date for the oral hearing and the party concerned does not sufficiently excuse the delay (Section 83 (4) PatG).

Munich, July 22, 2024

4th Nullity Senate (RinBPatG
Werner)

Completed

Schweiger, judicial employee
as clerk of the registry