UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TESLA, INC.,

Petitioner,

v.

INTELLECTUAL VENTURES II LLC

Patent Owner.

Case No. IPR2025-00343
U.S. Patent No. 10,292,138

PATENT OWNER'S RESPONSE

TABLE OF CONTENTS

PATENT OWNER'S EXHIBIT LIST iv
I. INTRODUCTION 1
II. THE SPECIFICATION AND CLAIMS OF THE '138 PATENT 3
A. Overview Of Allocation Process Disclosed In The '138 Patent 6
B. Tier-Based Weighted Fair Queueing 7
C. System Disclosed for Implementing the Allocation Process 8
D. Limiting The Total Number of Queues Served 10
E. Iterative Allocation Process 11
1. Step 605 - Determine Normalized Queue Weightings (W'q) 12
2. Step 610 - Determine Queue Allocations ($RAAU_q$) 14
3. Step 615 - Determine If Max Number Of Queues Is Exceeded 15
4. Step 620 - Determine New Queue Allocations ($RAAU_q$') 15
5. Step 625 - Order Queues Based On $RAAU_q$' Values 17
6. Step 628 - Select Max Queues From Ordered List 18
7. Steps 630 and 635 - Determine N_q' Values 18
8. Step 640 - Determine New Normalized Queue Weightings (W''_q) 19
9. Step 645 - Determine Recalculated Queue Allocations ($RAAU''_q$) 20
10. Steps 650-655: Adjust Recalculated Queue Allocations ($RAAU''_q$) If They Sum To More Than FreeRAAU 21
11. Steps 660-670: Determine If Resource Allocated To A Queue Is Less Than That Required For A Cell Edge State And Adjust If Necessary 22
12. Step 675: Update $Running_RAAU_Delta_q$ Values For Queues 23
III. THE CHALLENGED CLAIMS 26
IV. MATERIALS RELIED ON IN THE PETITION 29
A. Eckert 30
1. Eckert's Description Of The Problem 30

a. The Control Header For HS-DSCH Is Very Simple Because Data From Just One Queue Is Transmitted In Each Transmission Time Interval....30
b. The Problem: How To Reduce The Signaling In The Control Header Of Each MAC-e Protocol Data Unit Containing Data From Multiple Queues....31
2. Eckert's Proposed Solution....33
a. Use The Mobile Radio Terminal's Selection Of One Of A Set Of Predefined Transport Formats To Convery To The Receiver The Queues From Which The Transmitted Data Originated As Well As The Amount Of Data Being Transmitted From Each Queue....33
b. Use Of Weightings That Specify Numerical Proportions For Mapping Data From Queues To Transport Channels....36
c. Eckert's System Links The Weights To The Transport Formats....39
B. Lohr-1....39
1. TFC Selection That Identifies Data To Be Transmitted According To The Absolute Priorities Of Logical Channels....40
2. Scheduling Modes....41
C. Bucknell....42
D. Hans....44
E. Lohr-2....44
F. Declaration of Zhi Ding....44
V. GROUND 1 FAILS TO CARRY ITS BURDEN TO DEMONSTRATE THAT CLAIM 1 WOULD HAVE BEEN OBVIOUS....45
A. The Petition Has Failed To Demonstrate That A UE In Eckert Or Lohr-1 Receives A Single Allocation of Uplink Resources....46
1. The Petition Has Failed To Demonstrate That Eckert Discloses A Single Allocation Of Uplink Resources....46

2. The Petition Has Failed To Demonstrate That Eckert Combined With Lohr-1 Discloses A Single Allocation Of Uplink Resources 48

a. The Petition Has Failed To Demonstrate That The Rate Controlled Mode In Lohr-1 Comprises A Single Allocation Of Uplink Resources 49

b. The Petition Has Failed To Demonstrate That The Time And Rate Controlled Mode In Lohr-1 Comprises A Single Allocation Of Uplink Resources 50

c. A POSITA Motivated To Reduce Control Signaling Overhead Would Not Have Selected The Time And Rate Controlled Mode In Lohr-1 52

B. The Petition Has Failed To Demonstrate That It Would Have Been Obvious To Modify Eckert Based On Bucknell....54

1. The Petition's Proposed Modification Of Eckert Based On Bucknell Would Render Eckert *Inoperable* For Its Primary Purpose Of Reducing Signaling Overhead....54

2. Neither Of The Petition's Reasons For Modifying Eckert Based On Bucknell Withstands Scrutiny....59

VI. GROUND 1 FAILS TO DEMONSTRATE THAT CLAIMS 2-4 AND 8-11 ARE UNPATENTABLE 63

VII. GROUND 2 FAILS TO DEMONSTRATE THE UNPATENTABILITY OF DEPENDENT CLAIMS 5 AND 12 63

VIII. GROUND 3 FAILS TO DEMONSTRATE THE UNPATENTABILITY OF DEPENDENT CLAIMS 6 AND 13 64

IX. CONCLUSION....64

PATENT OWNER'S EXHIBIT LIST

Ex. 2001	Petitioner's Answer to Complaint and Counterclaim, dated June 20, 2024, in *Intellectual Ventures II LLC v. Tesla, Inc*., C.A. 1:24-cv-00884-ADA (W.D. Tex.)
Ex. 2002	Docket from District Court Litigation, *Intellectual Ventures II LLC v. Tesla, Inc*., C.A. 1:24-cv-00884-ADA (W.D. Tex.)
Ex. 2003	Scheduling Order from District Court Litigation, *Intellectual Ventures II LLC v. Tesla, Inc*., C.A. 1:24-cv-00884-ADA (W.D. Tex.)
Ex. 2004	Defendant's Second Supplemental Preliminary Invalidity Contentions, dated January 9, 2025, in District Court Litigation, *Intellectual Ventures II LLC v. Tesla, Inc*., C.A. 1:24-cv-00884-ADA (W.D. Tex.)
Ex. 2005	Webpage for Judge Albright http://www.txwd.uscourts.gov/for-attorneys/judge-albright-courtroom-faq/
Ex. 2006	Defendant's Final Invalidity Contentions, dated May 22, 2025, in District Court Litigation, *Intellectual Ventures II LLC v. Tesla, Inc*., C.A. 1:24-cv-00884-ADA (W.D. Tex.)
Ex. 2007	Expert Declaration of Dr. Gary R. Lomp
Ex. 2008	CV of Dr. Gary R. Lomp

I. INTRODUCTION

The Petition challenges claims 1-6 and 8-13 ("Challenged Claims") of U.S. Patent No. 10,292,138 ("'138 Patent," Ex. 1001) under three grounds. The Board should find that the Petition has failed to carry its burden of demonstrating by a preponderance of the evidence that the Challenged Claims are unpatentable.

First, the Challenged Claims require that the UE receive "*a single allocation of uplink resources*" from the network. In the '138 Patent, the "single allocation" corresponds to a *finite quantum of physical resources* that can be shared out, such as the resources defined by a combination of spreading codes and timeslots. Ex. 1001, 9:39-43 and 11:7-10. The Petition fails to demonstrate that either Eckert alone, or Eckert in combination with Lohr-1, meets this limitation. Petitioner's position that this limitation is met by Eckert is based on a truncated, out-of-context quotation from the '138 Patent which the Petition uses to erroneously contend that the *entirety* of a transport channel (e.g., including *infinite time frames and spreading codes*) is the same as a "a *single allocation of uplink resources*." The other reference relied on for this limitation, i.e., Lohr-1, explicitly states that "*uplink resources are not explicitly reserved for a UE*." Ex. 1007, 18:15-20 (emphasis added). The Petition provides no explanation how a system where uplink resources are not explicitly reserved for a UE suggests providing the UE with "a single allocation of uplink resources."

Second, the Petition's proposed motivation for modifying Eckert in view of Lohr-1 and Bucknell does not withstand scrutiny. Eckert recognized that when transmitting data from multiple queues to a receiver, a potentially "enormous volume of additional signaling data in the control data header" could be required to convey the specifics of the queue(s) from which the data transmitted originated, as well as the amount of data from each such queue being transmitted. Ex. 1005, [0024]-[0027]. Eckert's goal was to *reduce* the amount of additional *signaling data* that a UE operating in the E-DCH framework needed to be transmitted in order to inform the network of the makeup of the transmitted data. *Id*., [0040]. Eckert's solution used "*weighting values*" to proportionally map data from queues to the transport channels based on weights, and then *tied* a set of predefined transport format combinations from which the mobile station selects to the *weightings*. *Id*., [0062]-[0063], [0109] and [0254]-[0258]. This linkage allowed Eckert to *reduce* signaling overhead by using a *single* index value (corresponding to the selected transport format) to signal to the receiver the makeup of the transmitted data. *Id*., [0051]-[0052], [0081] and [0235]-[0236].

The Petition's obviousness argument posits that a POSITA would toss aside Eckert's weighting methodology (thereby defeating Eckert's explicit goal of reducing signaling overhead by linking the weights to selectable pre-defined transport formats), and substitute in its place Bucknell's priority-only based

allocation method. The proposed substitution would destroy Eckert's capability to use a *single* index value (corresponding to the selected transport format) to signal the makeup of the data being transmitted, and, in Eckert's words, require an "enormous volume of additional signaling data in the control data header" to convey the specifics of the queue(s) from which the data transmitted originated, as well as the amount of data from each such queue being transmitted. Ironically, the Petition's purported motivation for the proposed combination was to *reduce signaling overhead*. In fact, the proposed combination would *vastly increase signaling overhead* and, in the process, render Eckert inoperable for its intended purpose.

For at least these reasons, as well as additional reasons set forth below, the Board should enter a Final Written Decision finding that the Petition failed to carry its burden of demonstrating that the Challenged Claims are unpatentable.

II. THE SPECIFICATION AND CLAIMS OF THE '138 PATENT

The '138 Patent is directed to a system and method for allocating uplink transmission resources among multiple data flows in a wireless communication environment, where each data flow is mapped to a respective radio bearer. These radio bearers are associated with queues (or buffers) at the User Equipment (UE) that store data awaiting transmission. Ex. 2007, ¶24.

At the time of the '138 Patent, conventional resource allocation methods used for dividing resources in a wireless communication environment used a simple

absolute priority scheme, i.e., a method in which data is processed in ascending order based on the priority of each queue. Unlike conventional resource allocation techniques, the '138 Patent added weighting logic into the algorithm for dividing resources among data in multiple queues. As explained in the '138 Patent:

> In one embodiment of the present invention, the apparatus further comprises weighting logic operably coupled to the signal processor and the prioritization logic and arranged to provide a set of weight values for each service across a plurality of users such that the prioritization logic allocates bandwidth resource to individual radio bearers according to a set of weight values.
>
> The provision of *weighting logic* operably coupled to the signal processor and the prioritization logic *allows a proportion of the resource to be allocated to particular radio bearers* (e.g. services). This is in contrast to the *conventional prioritization scheme* provided by 3GPP, which uses a simple *absolute priority scheme*.
>
> In one embodiment of the present invention, the apparatus further comprises a transmitter transmitting the set of weight values to the wireless communication unit. This feature provides the advantage that the UE can then properly prioritize traffic *whilst receiving a single physical allocation* from the network and *not have to use the simple absolute priority system* defined in 3GPP. Ex. 1001, 4:17-35 (emphasis added).

Thus, one purpose of the weighting logic disclosed in the '138 Patent was to create a resource allocation algorithm that allocated a *proportion* of a *single physical allocation* from the network to data from each of the queues. The weighting logic differentiated the algorithm disclosed in the '138 Patent from conventional schemes that used only the relative priority of each queue for resource allocation.

In the disclosed allocation algorithm, each of the data flows has a Quality of Service (QoS) profile (referred to as an S_{tier} parameter) and is associated with a radio bearer instance. The disclosed allocation process is iterative, and distributes proportions of a *single allocation of uplink resources* (e.g., codes and timeslots) — referred to as Resource Allocation Assignment Units (RAAUs) — in a manner that is fair over time across radio bearers with similar characteristics. As explained in the '138 Patent:

> ... This *single physical allocation* of radio resources provided to a UE is *shared* amongst a number of services, in proportion to their respective QoS requirements, for example *in proportion to the signaled weight values* (S_{tier}). Ex. 1001, 9:39-43 (emphasis added).

See also, Id., 11:7-10 (equating the "quantum of physical resources" that can be shared out with a combination of spreading codes and timeslots).

The allocation algorithm disclosed in the '138 Patent limits the distribution of resources to only a subset of queues in order to address signaling problems that may occur when a queue (or radio bearer) is allocated a very small proportion of the overall resources. In the disclosed system, the S_{tier} parameters, which reflect the relative QoS priorities of the radio bearers, are communicated from the network to the UE. In each transmission cycle, the allocation algorithm determines different weights (referred to as W'_q and W''_q) for each queue based on both the S_{tier} values and current fill level of the queues. In each transmission cycle, these weights are

used to determine resource allocations (referred to a $RAAU_q$, $RAAU'_q$ and $RAAU''_q$) for the queues. The algorithm tracks the underallocation or overallocation of resources to each queue over time with a parameter termed $running_RAAU_delta_q$, which reflects, *inter alia*, the difference between the amount of resources that would have been allocated to the queue had transmission not been limited to only a subset of the queues, and the actual resource allocation for each queue when transmission is limited to only a subset of the queues. The $running_RAAU_delta_q$ parameter allows the algorithm to achieve fairness over time across radio bearers with similar characteristics. Ex. 2007, ¶28.

The following sections explain this allocation process in detail, beginning with an overview of the high-level architecture and progressing through each step of the algorithm as shown in Figure 6 of the '138 Patent. A working example involving four queues is used throughout to illustrate the iterative calculations and resource adjustments that take place.

A. Overview Of Allocation Process Disclosed In The '138 Patent

In the disclosed embodiment, buffers hold data until physical resources (each of which is referred to as a "RAAU") become available to transmit the data. Ex. 1001, 11:7-8 ("RAAU represents a quantum of physical resources."). The allocation algorithm allocates a total amount of resources (referred to as "FreeRAAU") among the data flows using an iterative process. *Id*., 11:9-10 ("FreeRAAU is the number of

free RAAU that the resource allocator (RA) can share out.") The disclosed allocation process services the queues in a statistically fair fashion. In simple terms, the algorithm keeps track of whether each queue has been overallocated or underallocated resources in the past by defining a quantity termed "*running_RAAU_delta,*" which serves as a numerical measure of service excess or deficiency previously provided to each queue. *Id*., 10:43-45 and 11:32-38. The algorithm uses the *running_RAAU_delta* parameter to manage the allocation process among the queues in a fair manner. *Id*. For example, the process allocates a share of available resources in each transmission interval in a manner that, for example, maintains equality of performance (over time) across users having the same QoS profile. *Id*., 8:44-46, 9:4-11 and 9:39-42; Ex. 2007, ¶30.

B. Tier-Based Weighted Fair Queueing

The allocation process disclosed in the '138 Patent provides "QoS prioritization" across radio bearers by associating a queue weight (referred to as an S_{tier} value) with each radio bearer (or RB). As explained in the '138 Patent:

> The structure of this architecture means that it is possible to provide QoS prioritization across multiple users. Hence, for example, in a scenario where there are two users, one may have hyper-text transfer protocol (HTTP) traffic and this may be mapped to RB1, and a second user may employ file transfer protocol (FTP) traffic, which may be mapped to RB2. The S_{tier} associated with RB 1 ($S_{tier\ 1}$) is higher than that for RB2 ($S_{tier\ 2}$). ...

> It is noteworthy that there is no restriction on the values associated with each *queue weight value (S_{tier})*. Therefore, in accordance with embodiments of the present invention, it may be possible to, say, set the relative weight for service 1 for SLA-2 to be higher than a number of services on SLA-1, which may nominally be a higher-priority SLA.
>
> In accordance with one embodiment of the present invention, a mechanism to provide prioritization of services across multiple users in an uplink direction is described. In this regard, *weight values are signaled to the UE*. If there are multiple QoS requirements within a single 3GPP PDP context, *a single physical allocation of radio resources may be made to the UE*. ... This single physical allocation of radio resources provided to a UE is *shared amongst a number of services, in proportion to their respective QoS requirements, for example in proportion to the signaled weight values (S_{tier})*. *Id*., 9:4-43 (emphasis added).

Thus, as discussed more fully below, in one embodiment of the allocation process disclosed in the '138 Patent, *queue weight values* associated with the QoS requirements of each of the queues are *transmitted to a UE* (user equipment) from a Universal Mobile Telecommunication System Radio Access Network (UTRAN) in the form of S_{tier} values, and a single physical allocation of resources provided to the UE is *shared amongst the queues based on these weight values*. Ex. 2007, ¶32.

C. System Disclosed for Implementing the Allocation Process

FIG. 5 of the '138 Patent, reproduced below, illustrates a communication system for implementing the disclosed allocation process in the context of uplink scheduling. *Id*., 5:48-50. The system includes User Equipment (UE) 505 and a Universal Mobile Telecommunication System Radio Access Network (UTRAN)

540. UE 505 receives a single PDP context 510 (packet-data connection) and "splits the single PDP context 510 into separate services on individual radio bearers in divider logic 515." *Id.*, 10:5-8. The UE then transmits "a message 535 indicating separate buffer occupancy for each of the radio bearers to a UTRAN scheduler 545." *Id.*, 10:8-10.

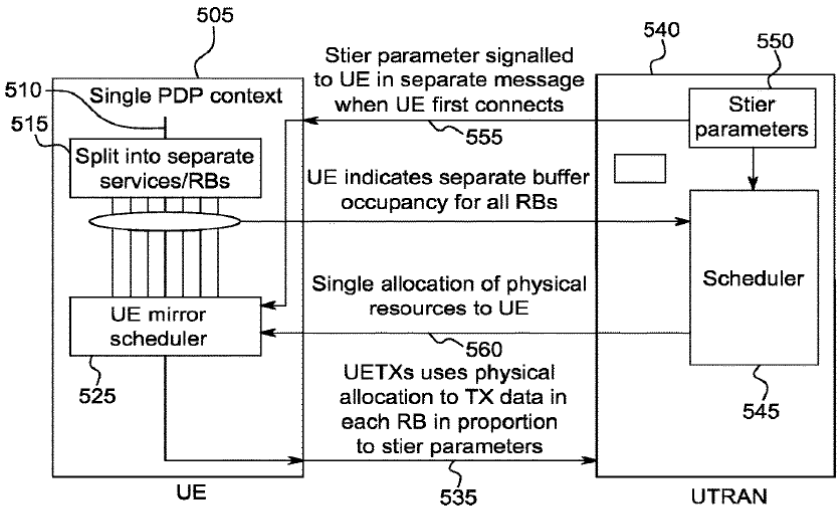


FIG. 5

"The separate services on individual radio bearers are input to a UE mirror scheduler 525." *Id.*, 10:11-12. The UE mirror scheduler 525 receives the S_{tier} parameters 550 (discussed above) from the UTRAN 540, which are also input to the UTRAN scheduler 545. *Id.*, 10:13-16. The UTRAN scheduler 545 provides "a single allocation of a physical resource to the UE mirror scheduler 525 within message 560." *Id.*, 10:17-18. "The UE mirror scheduler 525 then informs the UTRAN 540 on its use of the physical allocation, "in order to transmit data in each radio bearer

in proportion to the informed S_{tier} parameters 550." *Id.*, 10:19-22. "Thus, within the UE 505, the S_{tier} values are known, together with the total allocation of resources for the UE 505. … [T]he overall resources allocated by the network are now split up" based on the relative weighting values. *Id.*, 10:23-28.

D. Limiting The Total Number of Queues Served

One aspect of the allocation process disclosed in the '138 Patent involves limiting the total number of queues serviced to a subset of all queues. This aspect was intended to address signaling problems that may occur when a queue (or radio bearer) is allocated a very small proportion of the overall resources. As explained in the '138 Patent:

> … it may be the case that very small proportions of the overall resources are allocated to each RB. This may create signalling problems, as the mechanism may result in a large number of individual users being allocated some resource at any one time and each user will require a separate allocation message. Therefore, in an enhanced embodiment of the present invention, *a mechanism to implement additional functionality to limit a total number of queues served, e.g. to be allocated resource allocation units, is described. Thus, this algorithm limits a number queues that can be allocated resource at any one instance, for example to an operator specified value*. The algorithm may also ensure that the ratio of allocated resource is maintained, over the long term, to the ratios specified by the S_{tier} values. *Id.*, 10:32-45 (emphasis added).

In the disclosed embodiment, "max_number_queues_serviced" is the parameter used to limit the total number of queues serviced at any time to a subset of all queues:

> Referring now to FIG. 6, an algorithm 600 employing embodiments of the present invention is illustrated. The algorithm describes one mechanism to limit a number of queues served at a single instant of time. *The algorithm may be run when a number of active users (i.e. those users known to have a buffer occupancy greater than zero in any queue) is greater than a known fixed parameter, for example 'max_number_queues_serviced*' … *Id*., 10:48-54 (emphasis added).

The 'max_number_queues_serviced' value necessarily corresponds to a subset of all queues, because it is used when the number of active users "is greater than" the 'max_number_queues_serviced' value.

E. Iterative Allocation Process

The iterative allocation process of '138 Patent is depicted in Fig. 6 (below):

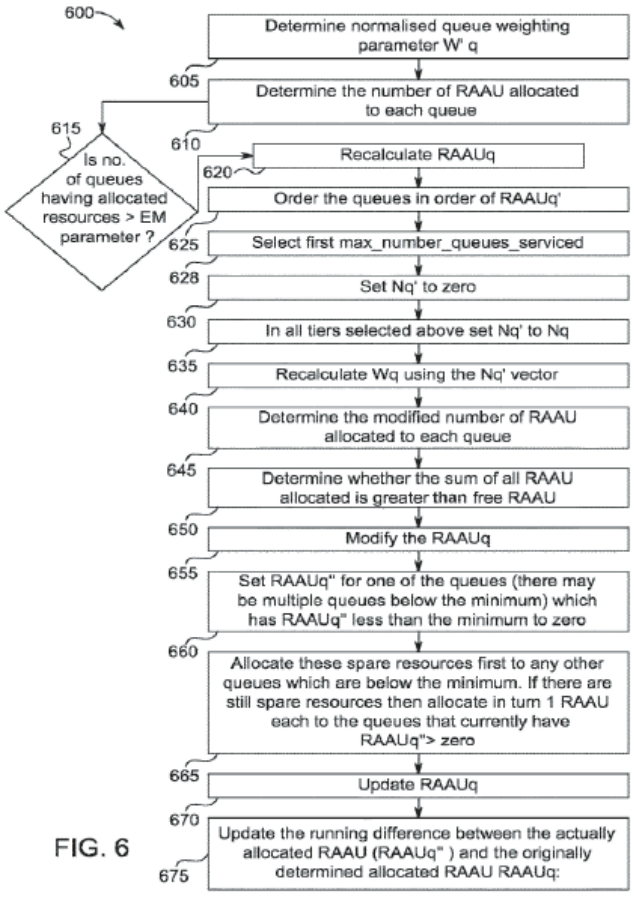


FIG. 6

Set forth below is a step-by-step explanation of the allocation process shown in Figure 6. In order to better illustrate how the allocation process operates, an exemplary illustration involving the allocation of resources among four queues (q1, q2, q3, and q4) is discussed and carried forward for each step in the allocation process. Ex. 2007, ¶39. For illustration purposes only, the following starting parameters are used for the exemplary illustration:

FreeRAAU = 40
max_num_queues_serviced = 3
cell edge minimum = 7

Queue Number	q1	q2	q3	q4
S_{tier} value for queue (S_q)	0.3	0.3	0.2	0.2
running_RAAU_delta for queue	0	0	0	0
Initial fill level for each queue (Nq)	110	100	55	50

1. Step 605 - Determine Normalized Queue Weightings (W'q)

The process begins at step 605 by determining a normalized weighting (W'_q) of the allocated resources" for each of the queues based on Equation [6] set forth below. *Id.*, 10:57-67.

$$W'_q = \frac{S_q N_q}{\sum_q S_q N_q}$$

In Equation [6], S_q corresponds to the S_{tier} parameter for the queue denoted by the subscript "q" in S_q. As noted above, the S_{tier} parameter for each queue (S_q) is provided to the UE from the UTRAN. *Id.*, 10:13-16. Also in Equation [6], N_q is the number of entries in the queue denoted by the subscript "q" in N_q. In the illustrated example, the N_q values for the four queues (q1, q2, q3 and q4) correspond to N_1, N_2, N_3 and N_4 and were chosen as 110, 100, 55 and 50, respectively. Ex. 2007, ¶40.

As is evident from Equation [6] and the illustration of the implementation of Equation [6] below, the normalized weighting (W'_q) for <u>*each*</u> queue is based on the S_{tier} values of <u>*all*</u> queues, which have been provided to the UE from the UTRAN, as well as the fill levels (N_q) of <u>*all*</u> queues. *Id.*, 10:13-16. Ex. 2007, ¶41.

Applying the exemplary starting values set forth above to Equation [6] results in the following normalized weightings (W'_q) for the queues. The denominator sum is:

$$\sum_q S_q N_q = (0.3 * 110) + (0.3 * 100) + (0.2 * 55) + (0.2 * 50)$$
$$= 33 + 30 + 11 + 10$$
$$= 84$$

Applying this value for the denominator results in the following normalized weightings (W'_q) (rounded to five decimal places) for each of the four queues:

$$W_1' = \frac{33}{84} = 0.39286$$

$$W_2' = \frac{30}{84} = 0.35714$$

$$W_3' = \frac{11}{84} = 0.13095$$

$$W_4' = \frac{10}{84} = 0.11905$$

Ex. 2007, ¶42.

2. Step 610 - Determine Queue Allocations ($RAAU_q$)

Next, in step 610, the process determines a number of resource allocation units (RAAU) allocated to each queue using Equation [7] set forth below. *Id.*, 11:1-10.

$$RAAU_q = (FreeRAAU) * W_q'$$

In Equation [7], $RAAU_q$ corresponds to a number of resource allocation units (or RAAU) allocated to the queue denoted by the subscript "q" in $RAAU_q$. Continuing with the illustration, application to Equation [7] of the normalized weightings (W'_q) for the queues determined in Step 605 above and the starting value of FreeRAAU=40 chosen for the illustration results in the following $RAAU_q$ values for queues q1, q2, q3 and q4:

$$RAAU_1 = (40)(0.39286) = 15.714$$

$$RAAU_2 = (40)(0.35714) = 14.286$$

$$RAAU_3 = (40)(0.13095) = 5.2380$$

$$RAAU_4 = (40)(0.11905) = 4.7620$$

Ex. 2007, ¶43.

3. Step 615 - Determine If Max Number Of Queues Is Exceeded

Next, in step 615, the allocation process determines whether "the number of queues that have resources allocated is greater than" the max_number_queues_serviced threshold. *Id*., 11:11-17. Continuing with the illustrative example, each of the four queues (q1, q2, q3 and q4) had resources allocated to it, e.g., each of the four queues had a positive value of $RAAU_q$ as determined in Step 610. In this illustrative example, the value for max_num_queues_serviced = 3 was chosen. As a result, the number of queues having resources allocated (4 queues) exceeds the max_num_queues_serviced value (3 queues) in the example. Ex. 2007, ¶44.

4. Step 620 - Determine New Queue Allocations ($RAAU_q$')

"If the number of queues that have resources allocated is greater than" the "parameter max_number_queues_serviced, the process moves to step 620," where the algorithm "re-calculates $RAAU_q$ as follows" using Equation [8] set forth below. *Id*., 11:17-25:

$$RAAU'_q = RAAU_q + running_RAAU_delta_q$$

In Equation [8], $running_RAAU_delta_q$ corresponds to "the running difference between the number of RAAU" allocated in Step 610 to the queue denoted by the subscript "q" in $running_RAAU_delta_q$ "without the limitation of the number of queues serviced" and the number of RAAU allocated to such queue "with the limitation" of the number of queues serviced. *Id*., 11:27-31. As explained in the '138 Patent, "this algorithm is iterative and *running_RAAU_delta* is determined from the previous iteration of the algorithm." *Id*., 11:32-34. Hence, while $running_RAAU_delta_q$ may be zero "in the first iteration, on the second iteration the limitation of the number of queues in the previous iteration" will result in non-zero values of $running_RAAU_delta_q$ because there are some queues that do not receive the number of RAAU that were originally determined in Step 610. *Id*., 11:34-38; Ex. 2007, ¶45.

Consistent with the embodiment disclosed in the '138 Patent, in the illustrative example, each of the four queues (q1, q2, q3, and q4) begins with its value of $running_RAAU_delta_q$ set to zero. Thus, in the illustrative example. the first application of Equation [8] results in the following $RAAU_q$' values:

$$RAAU_1' = RAAU_1 + 0 = 15.714$$

$$RAAU_3' = RAAU_3 + 0 = 5.238$$

$$RAAU_2' = RAAU_2 + 0 = 14.286$$

$$RAAU_4' = RAAU_4 + 0 = 4.762$$

While in the illustrative example, each of the four queues (q1, q2, q3, and q4) begins with its value of *running_RAAU_delta*$_q$ equal to zero, as demonstrated below, the limitation of the number of queues serviced results in non-zero values of *running_RAAU_delta*$_q$ going forward. As explained more fully below in connection with Step 675, as a result of the limitation on the number of queues serviced, some queues receive a greater number of RAAU than were originally determined in Step 610 and other queues receive a lesser number of RAAU than were originally determined in Step 610. These differences result in non-zero values of *running_RAAU_delta*$_q$ going forward. *See*, Section II(E)(12), *infra*; Ex. 2007, ¶47.

5. Step 625 - Order Queues Based On *RAAU*$_q$*'* Values

"In step 625, the queues are then ordered in order of *RAAUq*', beginning with the highest queue." *Id*., 11:39-40. Continuing with the illustrative example, each of the four queues (q1, q2, q3 and q4), the four queues are ranked as follows based on their respective *RAAU*$_q$*'* values from highest to lowest:

Rank	Queue	*RAAUq'*
1	q1	15.714
2	q2	14.286
3	q3	5.238
4	q4	4.762

Ex. 2007, ¶48.

6. Step 628 - Select Max Queues From Ordered List

In step 628, "[t]he first max_number queues_serviced queues are then selected." *Id.*, 11:40-42. In the illustrative example, the value for max_num_queues_serviced = 3 was chosen. Therefore, the top three ranked queues (i.e., q1, q2 and q3) are chosen, as represented by the red box below:

Rank	Queue	*RAAUq'*
1	q1	15.714
2	q2	14.286
3	q3	5.238
4	q4	4.762

In step 628, a *subset* of all queues (equal to the max_number_queues_serviced) is selected from the top of the ordering. Ex. 2007, ¶50.

7. Steps 630 and 635 - Determine N_q' Values

Next, the allocation process determines a new N_q value (N_q') for each queue. As noted above in connection with Step 605, N_q represented the number of entries in each queue. *Id.*, 10:65-66. "In all queues not selected in step 628, the N_q' value is set to zero as shown in step 630. In all of the tiers that were selected in step 628, N_q' is set to N_q, as shown in step 635." *Id.*, 11:43-45. Continuing with the illustrative

example, the N_q and N_q' value for each queue is set forth in the table below:

Queue	N_q (from Step 605)	Queue Selected in Step 628?	N_q' Set In Steps 630 and 635
q1	1100	YES	110
q2	1000	YES	100
q3	1000	YES	55
q4	1000	NO	0

Ex. 2007, ¶51.

8. Step 640 - Determine New Normalized Queue Weightings (W''_q)

In step 640, the normalized queue weighting for each queue is "recalculated using the N_q' vector determined in step 635" based on Equation [10] reproduced below. The '138 Patent refers to the recalculated normalized weighting for each queue as W''_q. *Id.*, 11:46-55.

$$W_q'' = \frac{S_q N_q'}{\sum_q S_q N_q'}$$

As is evident from Equation [10] and the illustration of the implementation of Equation [10] below, the normalized weighting (W''_q) for each selected queue is based on the S_{tier} values of all selected queues, which have been provided to the UE from the UTRAN, as well as the fill levels represented by the N_q' values of all selected queues. *Id.*, 10:13-16; Ex. 2007, ¶53.

Applying the exemplary starting S_{tier} values and the recalculated N_q' values for the selected queues to Equation [10] results in the following recalculated normalized weightings (W''_q) for the queues. The denominator sum is:

$$\sum_q S_q N'_q = (0.3 * 110) + (0.3 * 100) + (0.2 * 55) + (0.2 * 0)$$
$$= 33 + 30 + 11$$
$$= 74$$

Applying this value for the denominator results in the following recalculated normalized weightings (W''_q) for each of the four queues:

$$W''_1 = \frac{33}{74} = 0.4459 \qquad W''_3 = \frac{11}{74} = .1486$$

$$W''_2 = \frac{30}{74} = 0.4054 \qquad W''_4 = \frac{0}{74} = 0.000$$

9. Step 645 - Determine Recalculated Queue Allocations ($RAAU''_q$)

Next, the recalculated normalized weightings (W'_q) for each queue determined in Step 640 are used to recalculate the allocation for each queue based on Equation 11 reproduced below. The '138 Patent refers to this recalculated allocation for each queue as $RAAU_q''$. *Id.*, 11:56-60.

$$RAAU''_q = round\left[(FreeRAAU)W''_q\right]$$

In Equation [11], the round (...) function "rounds to the nearest integer." *Id.*, 11:61. Continuing with the illustrative example, application of the FreeRAAU value

(chosen to be equal to 200) and the recalculated normalized weightings (W'_q) (from Step 640) to Equation [11] results in the following recalculated allocation ($RAAU''_q$) for each queue rounded to the nearest integer:

$$RAAU''_1 = (40)(0.4459) = 17.84 \rightarrow 18$$

$$RAAU''_2 = (40)(0.4054) = 16.22 \rightarrow 16$$

$$RAAU''_3 = (40)(0.1486) = 5.944 \rightarrow 6$$

$$RAAU''_4 = (40)(0.0000) = 0 \rightarrow 0$$

Ex. 2007, ¶56.

10. Steps 650-655: Adjust Recalculated Queue Allocations ($RAAU''_q$) If They Sum To More Than FreeRAAU

In Step 650, the sum of all RAAU allocated in Step 645 (i.e., the sum of all $RAAU''_q$) is determined. If the sum allocated "is greater than freeRAAU (which is possible following the rounding operation in step 645) then the $RAAU_q$" may be modified in Step 655. *Id.*, 11:62-66. In the illustrative example, the sum of all RAAU allocated in Step 645 equals the sum of 18 + 16 + 6, or 40 -- which is no greater than freeRAAU (which in this example equals 40). Accordingly, no adjustment is needed in Step 655. Ex. 2007, ¶57.

11. Steps 660-670: Determine If Resource Allocated To A Queue Is Less Than That Required For A Cell Edge State And Adjust If Necessary

As explained in the '138 Patent, "[i]t is possible that the volume of resource allocated to the queue may be less than that required given the cell edge state that the UE is in. For example, if the UE is in cell edge '2' then four RAAU will be needed as a minimum." *Id.*, 12:1-4. If the amount of RAAU allocated "is less than the minimum required RAAU, given the cell edge state for any q, then $RAAU_q$" may be set for one of the queues that has $RAAU_q$" less than the minimum to zero, as shown in step 660. .. In this scenario, any spare resources are allocated first to any other queues that are below the minimum, as shown in step 665. If there are still spare resources, then any spare resources are allocated ... to the queues that currently have $RAAU_q$" greater than zero." *Id.*, 12:5-16. In a case where such spare resources are reallocated, the $RAAU_q$" values are updated in step 670. *Id.*, 12:17; Ex. 2007, ¶58.

In the illustrative example, the volume of resources allocated to q3 (in Step 645) is 6, which is less than the cell edge state minimum of 7 in the illustrative example. Thus, in Step 665, $RAAU_q$" for q3 is set to zero, and the volume of resources previously allocated to q3 (which was 6) is reallocated to the queues that currently have $RAAU_q$" greater than zero (which are q1 and q2 in the illustrative example.) Accordingly, in Step 665, half of the 6 RAAU from q3 (or 3 RAAU) are

reallocated to q1 and the other half of the 6 RAAU from q3 (or 3 RAAU) are reallocated to q2. The $RAAU_q$" values are then updated in Step 670 to be as follows:

$$RAAU_1'' = 18 + 3 = 21 \qquad RAAU_3'' = 0$$

$$RAAU_2'' = 16 + 3 = 19 \qquad RAAU_4'' = 0$$

Ex. 2007, ¶59.

12. Step 675: Update *Running_RAAU_Delta*$_q$ Values For Queues

In Step 675, for each of the queues, the running difference between the actually allocated RAAU ($RAAU_q$") from Step 645 above and the originally allocated RAAU ($RAAU_q$) from Step 610 above (rounded to the nearest integer) is then updated using Equation [12] reproduced below (with colored annotations). *Id.*, 12:18-24.

$$running_RAAU_delta_q = running_RAAU_delta_q + \left(RAAU_q - RAAU_q''\right)$$

In the annotated version of Equation [12] above, the value in red font corresponds to the previous value of $running_RAAU_delta_q$ (immediately before the current update in Step 675), and the value in blue font corresponds to the updated value of $running_RAAU_delta_q$ determined in Step 675. Ex. 2007, ¶60.

Continuing with the illustrative example, as explained in connection with Step 620 above, the value of $running_RAAU_delta_q$ may be zero in the first iteration. *Id.*, 11:34-38. Applying a previous value of $running_RAAU_delta_q$ equal to zero for each queue to the formula of Equation [12] yields the following updated values of $running_RAAU_delta_q$.

$$\begin{aligned} running_RAAU_delta_1 &= running_RAAU_delta_1 + (RAAU_1 - RAAU_1'') \\ &= 0 + (16 - 21) \\ &= -5 \end{aligned}$$

$$\begin{aligned} running_RAAU_delta_2 &= running_RAAU_delta_2 + (RAAU_2 - RAAU_2'') \\ &= 0 + (14 - 19) \\ &= -5 \end{aligned}$$

$$\begin{aligned} running_RAAU_delta_3 &= running_RAAU_delta_3 + (RAAU_3 - RAAU_3'') \\ &= 0 + (5 - 0) \\ &= 5 \end{aligned}$$

$$\begin{aligned} running_RAAU_delta_4 &= running_RAAU_delta_4 + (RAAU_4 - RAAU_4'') \\ &= 0 + (5 - 0) \\ &= 5 \end{aligned}$$

As reflected in the results of Step 675, the limitation on the number of queues serviced results in q1 and q2 receiving a *greater* number of RAAU in Step 645 than were originally determined in Step 610 (q1 and q2 were "*overallocated*"), and q3 and q4 receiving a *lesser* number of RAAU in Step 645 than were originally determined in Step 610 (q3 and q4 were "*underallocated*." These differences result in q1 and q2 having *negative* values of $running_RAAU_delta_q$ the next time Step 620

is performed, and q3 and q4 having <u>positive</u> values of *running_RAAU_delta*$_q$ the next time Step 620 is performed. The value of *running_RAAU_delta*$_q$ for each queue thus tracks whether each queue has been overallocated or underallocated resources in the past, and serves as a numerical measure of service excess or deficiency previously provided to each queue. *Id*., 10:43-45 and 11:32-38. By applying the current *running_RAAU_delta*$_q$ value each time the allocation algorithm determines *RAAU'*$_q$ in Step 620, and then updating each *running_RAAU_delta*$_q$ each time Step 675 is performed, the allocation process disclosed in the '138 Patent achieves a fair allocation amongst the queues in a manner that, for example, approaches equality of performance over time of queues having the same QoS profile. *Id*., 8:44-46, 9:4-11 and 9:39-42. Ex. 2007, ¶62.

In summary, the allocation algorithm uses queue weightings (S_{tier} or S_q) values and the fill levels of the queue (N_q) to compute normalized queue weightings (*W'*$_q$ and *W"*$_q$), that are used to determine a series of resource allocations (*RAAU*$_q$, *RAAU'*$_q$ and *RAAU''*$_q$) for the queues, each of which reflects an amount of the available resource (*FreeRAAU*) each queue should receive. The algorithm uses the *running_RAAU_delta*$_q$ to track whether resources have been overallocated or underallocated to each queue over time based on the running difference between the amount of resources that would have been allocated to each queue had transmission

not been limited to only a subset of the queues ($RAAU_q$), and the actual resource allocation for each queue ($RAAU"_q$). Ex. 2007, ¶63.

As discussed more fully below, the prior art relied on the Petition bears *no resemblance* to the allocation algorithm disclosed in the '138 Patent. Ex. 2007, ¶64.

III. THE CHALLENGED CLAIMS

Claim 1 is exemplary and recites:

A user equipment (UE) comprising:
a processor communicatively coupled to a transmitter and circuitry configured to receive; and
the processor is configured to:
cause the circuitry to receive parameters associated with a plurality of radio bearers,
determine a plurality of buffer occupancies, wherein each of the plurality of buffer occupancies is associated with one or more radio bearers of the plurality of radio bearers,
cause the transmitter to transmit a message including the plurality of buffer occupancies to a network,
cause the circuitry to receive a single allocation of uplink resources,
select data from the plurality of radio bearers for transmission using the single allocation of uplink resources, wherein the selection of the data occurs using a first iteration and a second iteration,
wherein in the first iteration, the selection of the data is selected from a subset of the plurality of radio bearers based on the received parameters,
wherein in the second iteration, the selection of the data is based on buffered data for respective radio bearers, and
cause the transmitter to transmit a signal including the selected data.[1]

[1] Independent claim 8 (also challenged in the Petition) contains substantially the same limitations as claim 1.

Walking through the steps of claim 1, the claim recites that the UE receive parameters associated with a plurality of radio bearers. The S_{tier} parameters (or S_q) provided to the UE from the UTRAN (one such parameter for each of the queues) discussed in connection with Step 605 above are examples of parameters that are received by the UE and associated with a plurality of radio bearers. Ex. 1001, 10:13-16; *see*, Section II(E)(1), *supra*; Ex. 2007, ¶66.

Claim 1 then recites that the UE determines "a plurality of buffer occupancies, wherein each of the plurality of buffer occupancies is associated with one or more radio bearers of the plurality of radio bearers" and transmits a message "including the plurality of buffer occupancies to a network." Next, the claim recites that the UE receives "*a single allocation of uplink resources*" from the network. In the '138 Patent, the "single allocation" corresponds to a finite "*quantum of physical resources*" that can be shared out, such as the resources defined by a combination of spreading codes and timeslots. Ex. 1001, 9:39-43 and 11:7-10; Ex. 2007, ¶67.

Next, claim 1 recites selecting "data from the plurality of radio bearers for transmission *using the single allocation* of uplink resources." In the examples disclosed in the '138 Patent, this selection involves the sharing of the single allocation among data from different queues in proportion to the signaled weight values for the queues. *Id*., 9:39-43. Claim 1 then recites that "wherein the selection of the data occurs using a first iteration and a second iteration." Ex. 2007, ¶68.

The "first iteration" requires the selection of data "from a *subset* of the plurality of radio bearers *based on the received parameters*." In the disclosed embodiment, the queues chosen in Step 628 correspond to "a *subset* of the plurality of radio bearers," and the recalculated normalized queue weightings (W''_q) for the queues in the subset (determined in Step 640) result in subsequent data selection based on a plurality of the S_{tier} (or S_q) parameters ("received parameters"). *See*, Sections II(E)(6)-(8), *supra*; Ex. 2007, ¶69. This aspect of the disclosed embodiment is illustrated by Equation [10], reproduced again below:

$$W_q'' = \frac{S_q N_q'}{\sum_q S_q N_q'}$$

As is evident from this equation, the W''_q value for each selected queue is based on a *plurality* of S_{tier} values (a plurality of "received parameters"). Ex. 1001, 10:13-16. Since each of recalculated normalized queue weightings (W''_q) is based on a plurality of "received parameters," the recalculated queue allocations ($RAAU''_q$) determined in Step 645 using W''_q are similarly "based on the received parameters." *See*, Section II(E)(9), *supra*; Ex. 2007, ¶70.

The "second iteration" requires the selection of data "based on buffered data for respective radio bearers." An example of "the second iteration" is illustrated in the specification where, after the $RAAU''_q$ values are determined in Step 645, the algorithm performs a further reallocation (a "second iteration") in Steps 655-670

when the volume of resources allocated to queue(s) is less than that required for a given cell edge state. Ex. 1001, 12:1-4; *see also*, Section II(E)(11), *supra*. More specifically, in Step 660, $RAAU_q$" is set to zero for queues below the minimum required given the cell edge state, and resources are reallocated to other queues having a $RAAU_q$" value greater than zero. Ex. 1001, 12:5-16; *see also*, Section II(E)(11), *supra*. This reallocation to queues with $RAAU_q$" greater than zero is "based on buffered data for respective radio bearers," because $RAAU_q$" is based on W''_q (which was calculated using Equation [10]) and therefore based on, *inter alia*, the <u>*respective levels of buffered data in each selected queue*</u> as represented by the N_q' values of the selected queues) Ex. 1001, 10:13-16; *see*, Section II(E)(8), *supra*. Since the $RAAU''_q$ allocations themselves are "based on buffered data for respective radio bearers," the use of the $RAAU''_q$ values in Step 660 to reallocate resources to queues having $RAAU_q$" greater than zero (an example of "the second iteration") is also "based on buffered data for respective radio bearers." Ex. 2007, ¶71.

IV. MATERIALS RELIED ON IN THE PETITION

Ground 1 alleges that claims 1-4 and 8-11 are obvious over Eckert (Ex. 1005) in view of Lohr-1 and Bucknell. Ground 2 alleges that dependent claims 5 and 12 are obvious over Eckert in view of Bucknell, Lohr-1, and Hans. Ground 3 alleges that dependent claims 6 and 13 are obvious over Eckert in view of Bucknell, Lohr-1 and Lohr-2. Each of the relied on references is discussed next.

A. Eckert

All three Grounds rely on Eckert as the primary reference. Patent Owner's discussion of Eckert begins with Eckert's description of the background art and the problem that Eckert sought to address. Next, Patent Owner describes examples of Eckert's proposed solution.

1. Eckert's Description Of The Problem

a. The Control Header For HS-DSCH Is Very Simple Because Data From Just One Queue Is Transmitted In Each Transmission Time Interval

The Background of Eckert contained a description of the "High Speed Downlink Packet Access (HSDPA) ... for the packet data transmission via the shared transport channel High Speed Downlink Shared Channel (HS-DSCH)" set forth in the "UMTS communication standard release 5 for the downlink." Ex. 1005, [0018]. Eckert explained that "[i]n comparable fashion to the enhanced uplink medium access control protocol, the fundamental characteristics of the HSDPA method ... are performed in the medium access control subprotocol layer MAC-hs (Medium Access Control High Speed)." *Id*.; Ex. 2007, ¶74.

Eckert explained that "[t]he MAC-hs subprotocol layer receives the data which are to be processed in the downlink transmission direction ... which correspond to the MAC-hs service data units (SDU)." *Id*., [0019]. A "MAC-hs protocol data unit comprises an MAC-hs header field (header) and one or more

MAC-hs SDUs." *Id*., [0020]. However, "as described in 3GPP TS 25.321, Technical Specification ... *all the MAC-hs SDUs* in a transmission time interval belong to the *same priority queue*, i.e. in each transmission time interval only MAC-hs SDUs having the same priority are transmitted on an HS-DSCH transport channel." *Id*., [0020]. Since "in each data transmission time interval the data from *just one priority queue* are transmitted via the HS-DSCH, ... the control data header of an MAC-hs protocol data unit has a *very simple structure* and it is necessary to transmit only the information regarding the priority queue from which the data to be transmitted originate." *Id*., [0022] (emphasis added); Ex. 2007, ¶75.

b. The Problem: How To Reduce The Signaling In The Control Header Of Each MAC-e Protocol Data Unit Containing Data From Multiple Queues

The Background in Eckert also discussed the then recent introduction by the 3rd Generation Partnership Project (3GPP) of "a new dedicated transport channel called Enhanced Dedicated Channel (E-DCH)" in order to improve "the packet data transmission via dedicated transport channels in the uplink." Ex. 1005, [0012]. In connection with the E-DCH, the NodeB (base station) provides the mobile radio terminal "*a set of defined transport formats* for the E-DCH transport channel" and the mobile radio terminal *selects an appropriate transport format* from the defined set for uplink transmissions. *Id*., [0014] (emphasis added); Ex. 2007, ¶76.

In contrast to the HS-DSCH, in the E-DCH framework "data from *various priority queues*, are transmitted in an MAC-e protocol data unit within a data transmission time interval." *Id*., [0023] (emphasis added). Eckert next identified a problem: how should a device transmitting data from multiple queues signal to the receiver the specifics of the queue(s) from which the data transmitted in the MAC-e protocol data unit originated, as well as the amount of data from each such queue being transmitted. As Eckert explained:

> One possible solution to signaling the association of an MAC-e SDU, i.e. an MAC-d PDU, for example, with a respective priority queue and with a respective MAC-d data stream would be to add to each MAC-e SDU *a control data header with an identification of the respective MAC-d flow (flow-ID, FID) and then to add a control data header with an identification of the respective priority queue (queue ID, QID) to every single data packet from a priority queue before transmission*, so as then to be able to split the data at the receiver again as appropriate in the data link layer.
>
> However, this would be *disadvantageous* on account of the *enormous volume of additional signalling data in the control data header (large overhead) which is required*. ...
>
> On the basis of the prior art, it is thus merely possible to signal the total size of an MAC-e protocol data unit *but not how the data of an MAC-e protocol data unit need to be made up, i.e. from which priority queues how many and using what packet size* it is necessary to transmit data in an MAC-e protocol data unit. *Id*., [0024]-[0027] (emphasis added).

Having identified the problem of how to signal the makeup of the transmitted data to the receiver without incurring an "*enormous volume of additional signaling*

data," Eckert begins the Detailed Description by stating that the invention was directed toward *reducing signalling* complexity:

> The invention is based on the problem of mapping data from at least one logical channel onto at least one transport channel in a data link layer protocol unit in simple fashion with *reduced signalling complexity* in comparison with known procedures. *Id*., [0040] (emphasis added).

Thus, Eckert's goal was to *reduce* the amount of additional *signalling data* that a UE operating in the E-DCH framework needed to send to the network in order to inform the network the makeup of the transmitted data. Ex. 2007, ¶¶78-79.

2. Eckert's Proposed Solution

a. Use The Mobile Radio Terminal's Selection Of One Of A Set Of Predefined Transport Formats To Convery To The Receiver The Queues From Which The Transmitted Data Originated As Well As The Amount Of Data Being Transmitted From Each Queue

In Eckert's solution, the mobile radio device *selects a transport format* for transmission of data on the uplink from a set of transport formats *predefined* by the base station. *Id*., [0042], [0109], [0201] and [0206]. Each transport format in the defined set includes *predefined* data amount(s) from *predefined* queue(s). *Id*., [0014], [0028], [0042], [0069], [0102], [0154], [0194] and [0204], The mobile radio terminal signals to the makeup of the transmitted data to the base station by signaling a *selected transport format* to the base station. Ex. 2007, ¶80.

> The information regarding how many data packets are transmitted in an MAC-e protocol data unit 607 from which MAC- d flow 301, 302 is indicated in the respectively *selected transport format* and is described in the table shown above, for example. *Id*., [0234] (emphasis added).

See also, id., [0044]-[0045]. Eckert discloses the following exemplary table of predefined transports. Each row of the table corresponds to a predefined transport format, and indicates how much data from each priority queue (PQ) is being transmitted in that transport format.

	PQ #1		PQ #2		PQ #3	
TF	# of TBs	TB size (bit)	# of TBs	TB size (bit)	# of TBs	TB size (bit)
#1	0	100	0	100	0	100
#2	1	100	0	100	0	100
#3	0	100	1	100	0	100
#4	0	100	0	100	1	100
. . .	. . .	. . .	. . .	. . .	. . .	. . .
#10	2	200	2	100	0	100
#11	3	200	2	100	1	100
#12	2	300	1	200	2	100
. . .	. . .	. . .	. . .	. . .	. . .	. . .
# n	5	300	3	300	1	300

Id., [0204]. In the above table, "a first column (TF) indicates the number of the respective transport format," "a second column (PQ#1/# of TBs) indicates a number of data packets in the first priority queue" admissible with "the respective transport

format," "a third column (PQ#1/TB size (bit)) indicates the size of the transport block in bits in which the data packets in the first priority queue" are "intended to be inserted into the MAC-e protocol data unit," a fourth column (PQ#2/# of TBs) indicates a number of data packets in the second priority queue" admissible with "the respective transport format," "a fifth column (PQ#2/TB size (bit)) indicates the size of the transport block in bits in which the data packets in the second priority queue" are "intended to be inserted into the MAC-e protocol data unit," "a sixth column (PQ#3/# of TBs) indicates a number of data packets in the third priority queue" admissible with "the respective transport format," and "a seventh column (PQ#3/TB size (bit)) indicates the size of the transport block in bits in which the data packets in the third priority queue" are "intended to be inserted into the MAC-e protocol data unit." *Id*., [0205]-[0212].

In Eckert, the table predefining the transport formats is stored "both on the terminal and on the network, which means that *just one index for the respective table row* needs to be written to the control range of the MAC-e protocol data unit 607, which additionally achieves *significant savings in terms of bits required* in the control data range 608, i.e. *in the header field* of the MAC-e protocol data unit 607, and *still permits explicit coding and decoding* of the data on the basis of the MAC-e protocol, i.e. particularly splitting of the multiplexed data over the respective priority queues 306 and the MAC-d flows at the receiver, particularly in the mobile radio

base Station 109." *Id*., [0235]-[0236]; *see also,* [0051]-[0052] ("Signalling this information in the transport formats allows or achieves *very simple signalling* of this information, preferably on the network, for a mobile radio device") and [0081] ("In this way, *very simple and efficient signalling* of the assignment of the respective data to the data link layer protocol buffer storages and/or data link layer data streams is made possible without the need to indicate this assignment information to every single protocol data unit"). Ex. 2007, ¶82.

b. Use Of Weightings That Specify Numerical Proportions For Mapping Data From Queues To Transport Channels

In order to simplify the mapping of data onto transport channels, Eckert disclosed the use of "*weighting values*," which Eckert defined differently than the "*priority*" of each queue. As Eckert explained:

> Within the context of this description, the *priority* associated with a priority queue is to be understood to mean the *relative or absolute significance* of the data buffer-storaged in the respective priority queue's buffer storage.
>
> A *weighting* value within the context of this description is to be understood to mean an indication of a *data transmission bandwidth* which is to be respectively *allocated*, in other words reserved, for reading the data storaged in the respective data link layer protocol buffer storage. *Id*., [0062]-[0063] (emphasis added).

By way of example, Eckert discloses an exemplary embodiment where there are four priority queues A, B, C, D, where each queue is assigned the following weights:

> for the first priority queue A *50%* of the total available data transmission bandwidth,
>
> for the second priority queue B *30%* of the total available data transmission bandwidth,
>
> for the third priority queue C *15%* of the total available data transmission bandwidth, and
>
> for the fourth priority queue D *5%* of the total available data transmission bandwidth. *Id*., [0254]-[0258] (emphasis added).

The weighting scheme disclosed in Eckert supports a *proportional* mapping of data from queues to the transport channels based on weights, a result that is not possible using only a priority ranking of each queue. For example, assuming queues A, B, C, and D had absolute priorities of 1, 2, 3 and 4, respectively, if the *only* information available for mapping data from queues to the transport channels was the *priority* of each queue (without also weights), it would *not be possible* to define a *proportional* mapping method where 50%, 30%, 15% and 5% of the total available transmission bandwidth was respectively allocated to each of queues A, B, C and D. Put another way, if the only information available for mapping data from queues to the transport channels was the priority of each queue, the schemes for mapping the data from the queues would be strictly constrained to mapping schemes based on

priority alone. This distinction sets Eckert apart from Lohr-1 and Bucknell (both are discussed later) which, in contrast to Eckert, use only the *priority* of queues (without also weights) to map data from the queues to the available resources. Ex. 2007, ¶85.

A "fundamental aspect" of Eckert's weighting scheme "may be seen in the application of the inherently known *weighted fair queueing* principle, which involves the data streams being assigned to the individual queues, with *each queue being assigned a weighting* which represents a defined percentage of the total transmission bandwidth." *Id*., [0131] (emphasis added).

Significantly, while in some embodiments, Eckert sends the weights from the mobile radio network to the mobile terminal, Eckert also includes embodiments where the weightings "are *not explicitly signalled*." *Id*., [0107], [0115] and [0118] (emphasis added). Instead, "weighting values can be *assigned* to the priority queues" *a priori* on the basis of, e.g., the four known traffic classes provided in UMTS, i.e., "conversational, streaming, interactive, background." *Id*., [0118]- [0121]. By way of example, Eckert discloses that "streaming data are weighted with 40%, conversational data are weighted with 30%, interactive data are weighted with 20% and background data are weighted with 10%." *Id*.; Ex. 2007, ¶87.

c. Eckert's System Links The Weights To The Transport Formats

In Eckert, *the set of transport format combinations* from which the mobile station selects a transport format for each uplink transmission are *tied* to the *weightings* used to proportionally allocate the total available transmission bandwidth among the queues. Id., [0109] ("the weighting values ... preferably being linked to the respective transport formats"). Thus, when the mobile station proportionally allocates the total available transmission bandwidth among the queues in accordance with the weights, the process results in a combination of data from the queues which *corresponds to one of the transport formats available for the mobile terminal to select*. The linkage between the weighting values and the available transport formats is what allows Eckert to use a *single* index value (corresponding to the selected transport format) transmitted in the header of the MAC-e protocol data unit to signal to the receiver the queue(s) from which the data transmitted originated, as well as the amount of data from each such queue being transmitted. *Id*., [0051]-[0052], [0081] and [0235]-[0236]; Ex. 2007, ¶88.

B. Lohr-1

Lohr-1 discloses the use of Radio Resource Control (RRC) messaging between a radio network and user equipment to establish and configure a transport format combination set (TFCS). Ex. 1007, 3:21-23. In Lohr-1, "[t]he user

equipment *autonomously* chooses among the allocated transport format combinations based on its own status e.g. available power and buffer status." *Id*., 3:23-26 (emphasis added).

1. TFC Selection That Identifies Data To Be Transmitted According To The Absolute Priorities Of Logical Channels

Lohr-1 discloses an E-DCH MAC architecture where "[t]here are M different data flows (MAC-d) carrying data packets to be transmitted from user equipment to Node B," where "[t]he data packets can be stored in different Priority Queues. *Id*., 5:30-6:1. When the user equipment (UE) wants to send data on the uplink, the "user equipment has to send a request message to the Node B. ... With a grant message sent in the downlink from the Node B to the UE, *the Node B assigns the UE*" the transport format combination set (TFCS). *Id*., 7:2-9 (emphasis added). "*The UE selects a suitable TFC* from the 'Node B controlled TFC subset' ... Any TFC in the 'Node B controlled TFC subset' might be selected by the UE, provided there is sufficient power margin, sufficient data available and TFC is not in the blocked state." *Id*., 8, 29-32; Ex. 2007, ¶90.

Lohr-1 discloses that "the UE-RRC creates a new RLC entity associated with" a "new radio bearer." *Id*., 14:7-8. "At radio bearer setup/reconfiguration each involved logical channel is assigned a MAC Logical channel Priority (MLP) in the range of 1 to 8. An MLP of 1 denotes the highest degree of priority." *Id*., 14:13-16.

The UE performs selection of the transport format combination [TFC] (from the transport format combination set [TFCS]) "in accordance with the priorities indicated by RRC (MLPs)." *Id*., 17:13-14. Lohr-1 follows an "absolute priority" scheme in which "the MAC may select a TFC from the TFCS, which maximizes the transmission of higher priority data." *Id*., 17:14-15. "During selection, the logical channels may be processed in ascending order of their priority values (MLP), in descending order of their degree of priority." *Id*., 17:27-18:13; Ex. 2007, ¶91.

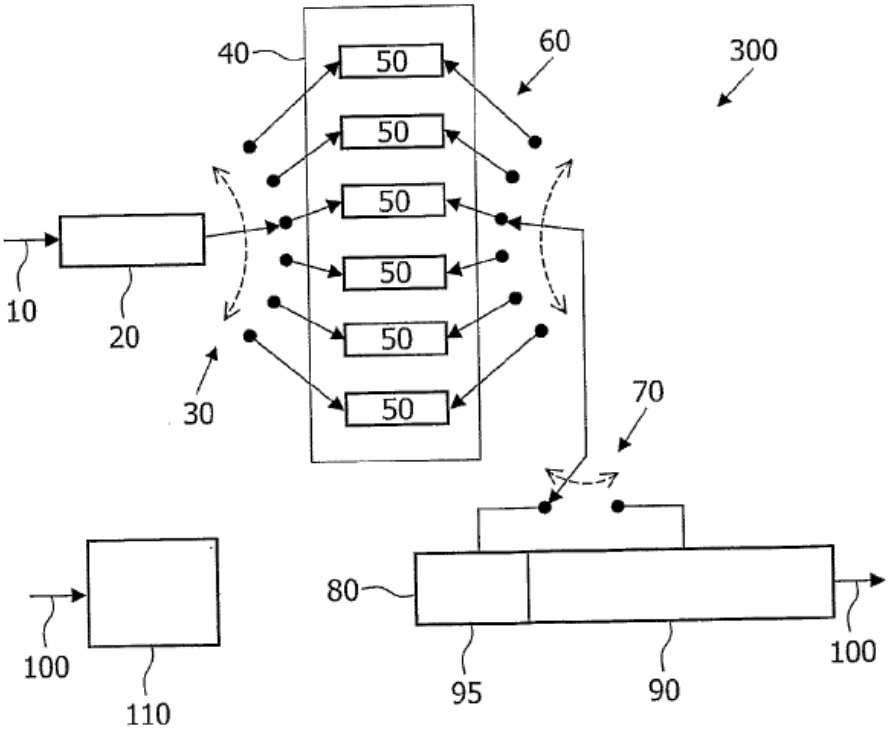
2. Scheduling Modes

Lohr-1 disclosed two scheduling modes: (i) a rate controlled mode, and (ii) a time and rate controlled mode. *Id*., 18:14-15. "In the rate controlled mode, UEs are allowed to transmit *autonomously up to a maximum data rate*, signaled by Node B. ... Since Node B scheduler has no control on the transmission timing of UEs in the rate controlled mode, *uplink resources are not explicitly reserved for a UE*." *Id*., 18:15-20 (emphasis added). "In the time and rate controlled scheduling mode, *Node B additionally controls the time* when UEs are allowed to transmit." *Id*., 18:21-22 (emphasis added). "Node B controlled time and rate scheduling provides a more precise RoT control compared to the rate-only controlled scheduling as already mentioned before. However this more precise control of the interference at this Node B is obtained *at the cost of more signaling overhead and scheduling delay*

(scheduling request and scheduling assignment messages) compared to rate control scheduling." *Id*., 10:25-29 (emphasis added); Ex. 2007, ¶92.

C. Bucknell

Figure 2 of Bucknell discloses "an apparatus for multiplexing" data as shown below:



In the multiplexing apparatus of Figure 2, "an input 10 for receiving data packets" is coupled to "an input buffer 20, such as a random access memory, for storing the received data packets." Ex. 1006, [0020]. A bank 40 includes of "a plurality of queue stores 50 for containing queues." *Id.* "The input buffer 20 is coupled to the bank 40 by a first routing means 30 ... for routing each data packet from the input buffer 20 to one of the queue stores 50 according to a priority assigned to each data

packet." *Id*. An output buffer 80 stores "the data packets prior to transmission on an output 100." *Id*.

"The output buffer 80 comprises a first portion 90 and a second portion 95." *Id*. "Data packets are selected for transfer from the queue stores 50 to the output buffer 80 by means of a second routing means 60 ... and are transferred into the first portion 90 or the second portion 95 by means of a switch 70." *Id*.

The Petition relies on Examples 1-4 and 9 in Bucknell "of how the data packets may be selected from the queues in the queue stores 50 to populate the group of data packets assembled in the first portion 90 and second portion 95 of the output buffer 80." *Id*., [0025]. These examples provide as follows:

> 1) Strict priority based selection: In this case each MAC-d flow is assigned a priority. Then for the first selection, data packets are taken from the queue having the highest priority until the resource available for the first portion 90 is filled. If this queue becomes empty, data packets are taken from the queue with the next highest priority and so on. For the second portion 95 the same procedure is carried out, but for a subset of the queues. ....
>
> 2) Fair selection for the second portion: In this case the second portion 95 is populated by taking one data packet in turn from each of the subset of queues, excluding the highest priority queue. To maximize fairness, especially when a large number of queues are present, the last selected queue may be remembered for use in subsequent multiplexing operations.
>
> 3) As a variation on 2), if the resource available for the first portion 90 is not fully used, then the unused resource can be made available for the second portion 95.

> 4) As a further variation on 2), the second portion 95 can be populated before the first portion 90. This may allow some flexibility in regard to which queues make use of which of the portions. ...
>
> 9) One or both selections for the first and second portions 90, 95 can be modified to take into account the length of queue, for example by preferentially selecting from queues exceeding a certain length.

Ex. 1006, [0026]-[0028]. Bucknell does not disclose how the transmitting device signals the receiver with the makeup of the queue(s) from which the data transmitted originated, and the amount of data from each such queue being transmitted. Nor does Bucknell suggest that any of its data selection schemes are linked with predefined transport formats, or explain how its scheme could be implemented in the context of a transmitter that selects a predefined transport format from a predefined set of transport formats in order to transmit uplink data. Ex. 2007, ¶97.

D. Hans

"Hans is directed to a conventional set of protocol layers in a UMTS system." Pet., 63, *citing*, Ex. 1008.

E. Lohr-2

"Lohr-2 relates to a UMTS system that employs data transmitted in the E-DCH channel." Pet., 73, *citing*, Ex. 1009.

F. Declaration of Zhi Ding

The expert declaration from Zhi Ding submitted with the Petition (Ex. 1003) is not prior art, but is being improperly used by the Petition to fill gaps in the prior

art. The expert declaration should be afforded little, if any, evidentiary weight.

Moreover, large portions of the declaration simply mirror the Petition with only minimal, insubstantial differences. For example, paragraphs 29-35, 40, 44-60, 63, 65, 67-110, 112-114, 116-131, 133-143, 145 and 147-190 of the declaration essentially parrot the Petition word-for-word.[2] The few variations between the Petition and the expert declaration are largely superficial—for example, in instances where the Petition provides a citation to a reference, the declaration further includes by way of parenthetical a direct quotation from the reference corresponding to that citation. Such rote repetition is entitled to little evidentiary weight. As explained in *Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 9 at 15–17 (PTAB Aug. 24, 2022) (precedential); *Facebook, Inc. v. Windy City Innovations, LLC*, 973 F.3d 1321, 1340–41 (Fed. Cir. 2020).

V. GROUND 1 FAILS TO CARRY ITS BURDEN TO DEMONSTRATE THAT CLAIM 1 WOULD HAVE BEEN OBVIOUS

Ground 1 relies on Eckert as the primary reference and alleges that claims 1-4 and 8-11 are obvious over Eckert in view of Lohr-1 and Bucknell. As explained next, the Petition has failed to even map all of the elements of claim 1 to these

[2] The only portions of the expert declaration that do not parrot the Petition nearly verbatim include information such as the expert's background, the materials he considered, and boilerplate describing application legal standards. (Ex. 1003, ¶¶ 1-18 (background of expert and materials considered) and ¶¶ 19, 22-28 (legal standards)).

references. Moreover, the rationale set forth in the Petition fails to demonstrate that a POSITA would have been motivated to modify Eckert based on Lohr-1 and Bucknell in the manner alleged.

A. The Petition Has Failed To Demonstrate That A UE In Eckert Or Lohr-1 Receives A Single Allocation of Uplink Resources

Claim 1 requires that the UE receive "*a single allocation of uplink resources*" from the network. In the '138 Patent, the "single allocation" corresponds to a *finite quantum of physical resources* that can be shared out, such as the resources defined by a combination of spreading codes and timeslots. Ex. 1001, 9:39-43 and 11:7-10; Ex. 2007, ¶101. The Petition alleges that this element is met by Eckert alone or, in the alternative, Eckert in combination with Lohr-1.

1. The Petition Has Failed To Demonstrate That Eckert Discloses A Single Allocation Of Uplink Resources

The Petition initially alleges that "Eckert discloses or renders obvious" the requirement that the UE receive "a single allocation of uplink resources" (referred to as Element [1.6] in the Petition). Petition, 34-35. More specifically, the Petition alleges that Eckert's "allocated *E-DCH channel* ... is an example of a single allocation of uplink resources." *Id*. This mapping is premised on the Petitioner's erroneous allegation that, in the context of the '138 Patent, an entire *transport channel* (e.g., the E-DCH) is an example of "a single allocation of uplink resources." *Id*., at 35. More specifically, the Petition alleges:

> The '138 patent confirms that a transport channel is an example of "*a single allocation of [] radio resources*." Ex.1001, 9:36-43 ("In this manner, **a single PDP context implies a single CCTrCh. This single physical allocation of radio resources** provided to a UE…"). The abbreviation CCTrCh was understood in the art to refer to a transport channel known as the Coded Composite Transport Channel. Ex.1003, ¶88 (citing Ex.1011, [0021]). Petition, 35 (emphasis in original).

The cited passage from the '138 Patent (9:36-43) does *not* equate a transport channel with a single allocation of uplink resources. Petitioner's argument is based on an out-of-context, truncated quotation of the subject passage from the '138 Patent. The subject passage actually states:

> If there are multiple QoS requirements within a single 3GPP PDP context, *a single physical allocation of radio resources may be made to the UE*. In this manner, a single PDP context implies a single CCTrCh. *This single physical allocation of radio resources provided to a UE is shared amongst a number of services*, in proportion to their respective QoS requirements, for example in proportion to the signalled weight values (S_{tier}). Ex. 1001, 9:36-43 (emphasis added).

This passage is not equating a CCTrCh (a Coded Composite Transport Channel) with a single allocation of uplink resources as the Petition suggests. Rather, the reference to "*This* single physical allocation of radio resources" in the *third* sentence of the passage is referring back to "*a* single physical allocation of radio resources" in the *first* sentence of the passage -- rather than a CCTrCh as suggested by the out-of-context quote included in the Petition. The '138 Patent does *not* describe a method where the *entirety* of a CCTrCH (e.g., including *infinite time*

frames and spreading codes) "is shared among a number of services ... in proportion to the signalled weight values." Rather, the '138 Patent discloses that a "single allocation" corresponds to a *finite quantum of physical resources* that can be shared out, such as the resources defined by a combination of spreading codes and timeslots. Ex. 1001, 9:39-43 and 11:7-10. In fact, if the single allocation of resources could comprise infinite resources (i.e., use of a transport channel for an infinite number of time slots), the algorithm set forth in Figure 6 of the '138 Patent would be inoperable because the fractions used to implement the algorithm would have infinity in their denominators. Ex. 2007, ¶104.

Simply put, the Petition's mapping of Eckert's E-DCH channel as a whole (e.g., including every possible time frame and spreading code) to the "a single allocation of uplink resources" must be rejected because it is based on the erroneous proposition that the specification of the '138 Patent equates an entire transport channel to "a single allocation of uplink resources," and because allowing it would render the entirety of the math required by the '138 Patent to return an undefined value, thereby functionally disabling the system. Ex. 2007, ¶105.

2. The Petition Has Failed To Demonstrate That Eckert Combined With Lohr-1 Discloses A Single Allocation Of Uplink Resources

In the alternative, the Petition initially alleges that "Eckert combined with Lohr-1 also renders obvious ... a single allocation of uplink resources at an even more granular level than a transport channel." Petition, 35.

As mentioned above, Lohr-1 disclosed two scheduling modes to be used for E-DCH -- (i) a rate controlled mode, and (ii) a time and rate controlled mode. *Id*., 18:14-15. Neither suffices to meet the claim element. Ex. 2007, ¶107. Each of Lohr-1's modes are examined next.

a. The Petition Has Failed To Demonstrate That The Rate Controlled Mode In Lohr-1 Comprises A Single Allocation Of Uplink Resources

Lohr-1 discloses that, "[i]n the rate controlled mode, UEs are allowed to transmit *autonomously up to a maximum data rate*, signaled by Node B. ... Since Node B scheduler has no control on the transmission timing of UEs in the rate controlled mode, *uplink resources are not explicitly reserved for a UE*." *Id*., 18:15-20 (emphasis added); *see also*, 9:12-15 ("[i]n Node B controlled rate scheduling all uplink transmissions may occur in parallel ... Hence, transmissions from different user equipments may overlap in time. With Rate scheduling a Node B can only restrict the uplink TFCS but *does not have any control of the time* when UEs are transmitting data on the E-DCH"). Given the express statement in Lohr-1 that "uplink resources are *not* explicitly *reserved* for a UE," it is clear that the "rate controlled mode" fails to disclose "*a single allocation of uplink resources*" provided

to the UE from the network, as claimed. The Petition fails to address this aspect of the "rate controlled mode" disclosed in Lohr-1, or provide any explanation how a system where uplink resources are not explicitly reserved for a UE suggests providing to the UE with "a single allocation of uplink resources." Ex. 2007, ¶108.

b. The Petition Has Failed To Demonstrate That The Time And Rate Controlled Mode In Lohr-1 Comprises A Single Allocation Of Uplink Resources

Lohr-1 also discloses a "time and rate controlled scheduling mode" where "*Node B additionally controls the time* when UEs are allowed to transmit." *Id*., 18:21-22 (emphasis added). However, even in that mode, "[t]he user equipment is allowed to *autonomously* choose among the allocated *transport format combinations* based on its own status e.g. available power and buffer status." *Id*., 3:23-26 (emphasis added); *see also*, 7:5-8 ("With a grant message sent in the downlink from the Node B to the UE, the Node B assigns the UE the TFCS with maximum data rate and the time interval, the UE is allowed to send"), Lohr-1 provides the following disclosure with respect to its transport format combination (TFC) selection process:

> Node B controlled scheduling is one of the technical features for E-DCH which is foreseen to enable more efficient use of the uplink power resource in order to provide a higher cell throughput in the uplink and to increase the coverage. The term "Node B controlled scheduling" denotes *the possibility for the Node B to control*, within the limits set by the RNC, *the set of TFCs from which the UE may choose a suitable TFC*. The set of TFCs from which the UE may choose *autonomously* a TFC is in the following referred to as "Node B controlled TFC subset".

> The "Node B controlled TFC subset" is a subset of the TFCS configured by RNC as seen in Fig. 8. The UE selects a suitable TFC from the "Node B controlled TFC subset" ... *Any TFC in the "Node B controlled TFC subset" might be selected by the UE*, provided there is sufficient power margin, sufficient data available and TFC is not in the blocked state. Two fundamental approaches to scheduling UE transmission for the E-DCH exist. The scheduling schemes can all be viewed as *management of the TFC selection in the UE* and mainly differs in how the Node B can influence this process and the associated signaling requirements. Ex. 1007, 8:22-9:3 (emphasis added).

As example of a transport format combination set from which the UE may autonomously select was show in Eckert and is reproduced again below:

	PQ #1		PQ #2		PQ #3	
TF	# of TBs	TB size (bit)	# of TBs	TB size (bit)	# of TBs	TB size (bit)
#1	0	100	0	100	0	100
#2	1	100	0	100	0	100
#3	0	100	1	100	0	100
#4	0	100	0	100	1	100
. . .	. . .	. . .	. . .	. . .	. . .	. . .
#10	2	200	2	100	0	100
#11	3	200	2	100	1	100
#12	2	300	1	200	2	100
. . .	. . .	. . .	. . .	. . .	. . .	. . .
# n	5	300	3	300	1	300

Ex. 1005, [0204]. As illustrated in the table, the individual transport formats (TFs) in the set correspond to vastly *different* quantities of transmitted data. For example, TF#2 transmits *100 bits of data* (1 transport block of 100 bits from PQ#1 and no data

from PQ#2 or PQ#3); while TF# n transmits *2700 bits of data* (5 transport blocks of 300 bits from PQ#1, 3 transport blocks of 300 bits from PQ#2, and 1 transport block of 300 bits from PQ#3). Thus, the set of transport formats provided to the UE comprise *multiple* data quantities from which the UE autonomously selects. The Petition fails to explain how providing the UE with *multiple data quantity options* for transmitting data equates to providing the UE with "*a single allocation of uplink resources*" from the network, as claimed. Ex. 2007, ¶110.

Thus, for the above reasons, the Petition has failed to demonstrate that either of the two scheduling modes in Lohr-1 (i.e., (i) a rate controlled mode, and (ii) a time and rate controlled mode) satisfy the requirement in claim 1 that that the UE be provided with "*a single allocation of uplink resources*" from the network. Ex. 2007, ¶111.

c. A POSITA Motivated To Reduce Control Signaling Overhead Would Not Have Selected The Time And Rate Controlled Mode In Lohr-1

Assuming for the purposes of argument that the Petition had somehow demonstrated that the allocation of a transmission time interval in the "time and rate" mode of Lohr-1 was equivalent to providing the UE with "a single allocation of uplink resources" (to be clear, for the reasons discussed in V(A)(2)(b) above, the Petition has failed to make this showing), it is clear that a POSITA interested in *reducing* control signaling overhead (Eckert's explicit goal) would *not* have

implemented the "time and rate" controlled scheduling mode of Lohr-1 in the context of Eckert. Lohr-1 explains that, while "Node B controlled time and rate scheduling provides a more precise RoT control compared to the rate-only controlled scheduling ... this more precise control of the interference at this Node B is obtained *at the cost of more signaling overhead and scheduling delay* (scheduling request and scheduling assignment messages) compared to rate control scheduling." Ex. 1007, 10:25-29 (emphasis added); Ex. 2007, ¶112.

When it comes to modifying Eckert based on Bucknell, the Petition posits that a POSITA would have been motivated to modify Eckert's system in order "to *reduce* control signaling overhead." Petition, 49 and 52. However, if a POSITA putting the references in Ground 1 together was motivated "to *reduce* control signaling overhead," the POSITA would *not* have been drawn to use the "time and rate" scheduling mode from Lohr-1 because that scheduling mode comes "*at the cost of more signaling overhead and scheduling delay*." Ex. 1007, 10:25-29. In this regard, the proposed rationale for combining Eckert, Lohr-1, and Bucknell must be rejected as internally inconsistent. More specifically, the Petition has failed to provide a rational underpinning for the proposition that a POSITA who was allegedly motivated to modify Eckert's system in order "to *reduce* control signaling overhead" would *simultaneously* select a scheduling mode from Lohr-1 that is explicitly taught to *increase* control signaling overhead. Ex. 2007, ¶113.

B. The Petition Has Failed To Demonstrate That It Would Have Been Obvious To Modify Eckert Based On Bucknell

As explained next, the Petition's proposed modifications of Eckert (the primary reference) based on Bucknell would eviscerate the stated purpose of Eckert. In addition, the Petition's proposed reasons why a POSITA would have been motivated to modify Eckert based on Bucknell do not withstand scrutiny.

1. The Petition's Proposed Modification Of Eckert Based On Bucknell Would Render Eckert *Inoperable* For Its Primary Purpose Of Reducing Signaling Overhead

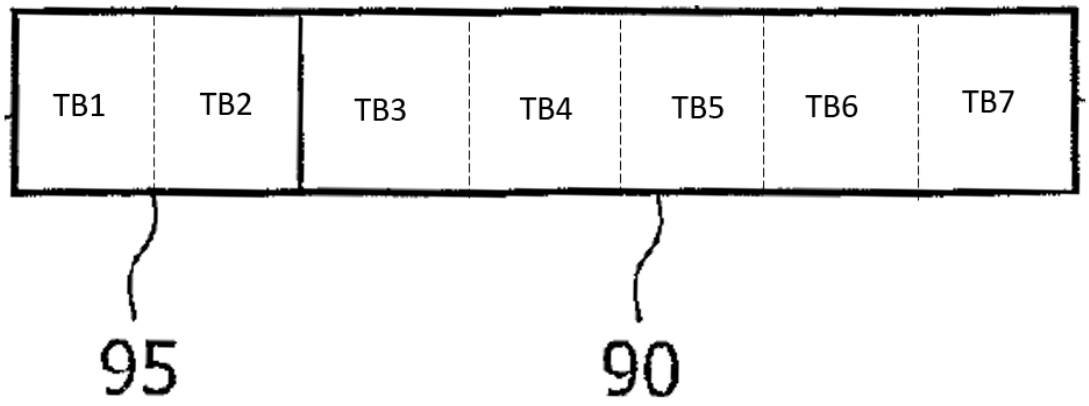
The Petition proposes eliminating from Eckert, the weightings used in Eckert for proportionally mapping data from queues to the transport channels, and substituting in place thereof several of the priority-based allocation algorithms disclosed in Bucknell. Petition, 51-52. However, doing away with Eckert's weightings would have rendered Eckert inoperable for its intended purpose, i.e., *reducing* signaling overhead by using a *single* index value (corresponding to the selected transport format) transmitted in the header to signal the makeup of the transmitted data to the receiver. Ex. 1005, [0051]-[0052], [0081] and [0235]-[0236]; Ex. 2007, ¶115.

Eckert recognized that, when transmitting data from multiple queues, signaling the makeup of the transmitted data to a receiver has the potential to add an "enormous volume of additional signaling data in the control data header." Ex. 1005,

[0024]-[0027]. Eckert's goal was to *reduce* the amount of additional *signaling data* that a UE operating in the E-DCH framework needed to send to the network in order to inform the network the specifics of the queue(s) from which the transmitted data originated, as well as the amount of data from each such queue being transmitted. *Id*., [0040]; Ex. 2007, ¶116.

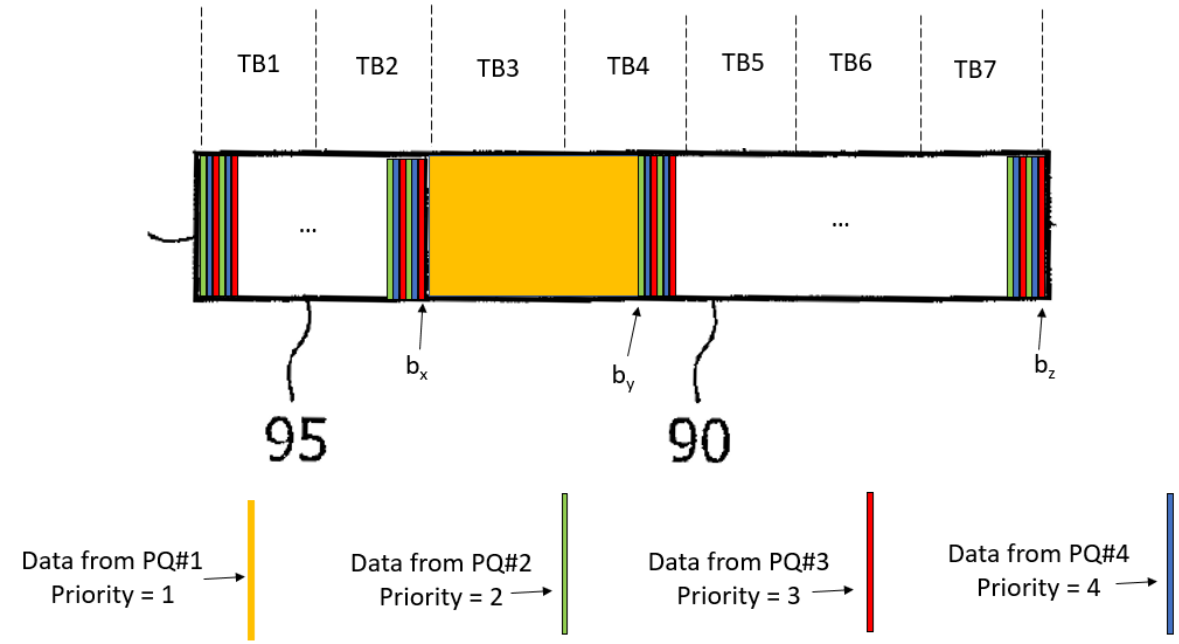
In order to reduce the signalling overhead, Eckert proposed a solution based on the use of "*weighting values*" for *proportionally* mapping data from queues to the transport channels based on weights. *Id*., [0062]-[0063] and [0254]-[0258]. Eckert then *tied* the set of transport format combinations from which the mobile station selects a transport format to the *weightings* used to proportionally allocate the total available transmission bandwidth among the queues. *Id*., [0109]. Thus, in Eckert, when the mobile station proportionally allocates the total available transmission bandwidth among the queues in accordance with the weights, the process results in a combination of data from the queues which *corresponds to one of the transport formats available for the mobile terminal to select*. The linkage between the weighting values and the available transport formats is what allows Eckert to *reduce* signaling overhead by using a *single* index value (corresponding to the selected transport format) transmitted in the header to signal the makeup of the transmitted data to the receiver. *Id*., [0051]-[0052], [0081] and [0235]-[0236]; Ex. 2007, ¶117.

Removing the weightings from Eckert as proposed in the Petition would eliminate Eckert's linkage between the proportional queue allocations and the predefined set of transport format combinations provided by the base station to the UE. The Petition does not allege that a network could set up predefined transport format combinations linked to any of the priority-based allocation algorithms disclosed in Bucknell, because doing so would be impractical. Ex. 2007, ¶118. For example, consider a scenario (illustrated below) where Bucknell's "second portion 95" is mapped to two transport blocks (TB1 and TB2) and Bucknell's "first portion 90" is mapped to five transport blocks (TB3-TB7).



Next, consider the case illustrated below under Bucknell's Examples 1-3 involving four priority queues (PQ#1, PQ#2, PQ#3, PQ#4) in descending order of priority, i.e., PQ#1 is assigned the highest priority and PQ#4 is assigned the lowest priority. In this case, Bucknell's "first portion 90" is partially filled using data packets from the highest-priority queue (PQ#1 - shown in orange) but there is insufficient data in the

highest-priority queue (PQ#1) to fully fill the first portion 90 and so the first portion 90 is filled only up to the bit position labelled b_y. In the diagram below, the bit position labelled b_x denotes where the first bit in the first portion 90 is placed, and b_z denotes where the last bit of data from PQ#1 would have been positioned had there been sufficient data from PQ#1 to fully fill the first portion 90.



Ex. 2007, ¶119. In this scenario, under Bucknell's Examples 1-3, the remaining space in the first portion 90 (from bit positions b_y to b_z) is used for the "second portion 95" and thus, the space between bit positions b_y to b_z and the space originally allocated to the "second portion" is filled "by taking one packet in turn" from each of PQ#2, PQ#3 and PQ#4. Ex. 1006, [0025]-[0028]. Next, as shown in the table below, consider how much information about the arrangement resulting from this

scenario would need to be signalled from the transmitter to the receiver in the control header:

Transport Block #1	Signaling Information Required In Control Header
TB1-TB2	Starting with PQ #2, interleaved data from PQ#2, PQ#3 and PQ#4
TB3	Data from PQ #1
TB4	Data from PQ#1 up to position b_y, followed by interleaved data from PQ#2, PQ#3 and PQ#4 starting with PQ #2
TB5-TB7	Starting with next queue in the rotation after the queue associated with the last position in TB4, interleaved data from PQ#2, PQ#3 and PQ#4

As is clear from this example, the quantity of signaling data when transmitting data populated into the "first portion 90" and the "second portion 95" using Bucknell's Examples 1-3 would be "enormous," especially compared to Eckert's solution which conveyed the makeup of the data being transmitted with a *single* index value (corresponding to the selected transport format). Ex. 1005, [0051]-[0052], [0081] and [0235]-[0236]. It is also apparent that, given the myriad of possible ways that the first and second portions could be filled with data from the different queues using Examples 1-3 of Bucknell, it would be impractical to link a defined set of predefined transport format combinations to all of the possible allocation outcomes that could be produced. Ex. 2007, ¶121.

Without the linkage in Eckert between the proportional queue allocations

(associated with the weights) and the predefined set of transport format combinations, the UE will lose the ability to use a *single* index value (corresponding to the selected transport format) transmitted in the header to signal to the receiver the queue(s) from which the data transmitted originated, as well as the amount of data from each such queue being transmitted. *Id*., [0051]-[0052], [0081] and [0235]-[0236]. At that point, Eckert would cease to function for its intended purpose of *reducing* the amount of additional *signaling data* that a UE operating in the E-DCH framework needs to send to the network. Instead, the modified system will suffer from the very problem that Eckert first identified, namely, the need for an "enormous volume of additional signaling data in the control data header" to convey the specifics of the queue(s) from which the data transmitted originated, as well as the amount of data from each such queue being transmitted. Ex. 1005, [0024]-[0027]; Ex. 2007, ¶122.

2. Neither Of The Petition's Reasons For Modifying Eckert Based On Bucknell Withstands Scrutiny

The Petition offers two reasons why a POSITA would be motivated to do away with Eckert's weightings, neither of which withstands scrutiny. According to the Petition:

> A POSITA would have been motivated to modify Eckert's method of selecting data from MAC-d priority queues for transmission with Bucknell's method of selecting data from MAC-d priority queues for two reasons: (1) *to reduce control signaling overhead* and (2) *to reduce*

> *complexity compared to Eckert's method*. Petition, 48-49 (emphasis added).
>
> * * *
>
> .. Bucknell discloses a number of ways to fill two portions of a MAC-e PDU, *see* Ex.1006, [0025]-[0031], *as alternatives to Eckert's queue weighting for selecting packets from queue*s, that a POSITA would have found advantageous and looked to for the following reasons. First, Bucknell's alternatives *do not require sending weighting values from a base station to a UE, as is done in Eckert, ... thus beneficially achieving reducing control signaling overhead* compared to Eckert's techniques. Second, Bucknell's methods *reduce complexity compared to Eckert's use of queue weights by avoiding the use of calculations that involve selecting data from queues in proportion to weighting values*. Petition, 51-52 (emphasis added).

Thus, the Petition's first reason why a POSITA would be motivated to do away with Eckert's weightings is to reduce the signaling overhead associated with transmitting the weighting values from the base station to the UE. This rational fails because Eckert includes embodiments where the weightings "are *not explicitly signalled*." *Id*., [0107], [0115] and [0118] (emphasis added). Instead, "weighting values can be *assigned* to the priority queues" on the basis of, e.g., the four known traffic classes provided in UMTS, i.e., "conversational, streaming, interactive, background." *Id*., [0118]- [0121]. By way of example, Eckert discloses that "streaming data are weighted with 40%, conversational data are weighted with 30%, interactive data are weighted with 20% and background data are weighted with 10%." *Id*. Since Eckert itself discloses a way to implement Eckert's system without

explicitly signaling the weights from the base station to the UE, it is illogical that a POSITA would have been motivated to cast aside Eckert's weighting methodology to reduce the signalling overhead associated with transmitting the weighting values. Ex. 2007, ¶124.

Moreover, even if Eckert required the weightings to be transmitted from the base station to the UE *at set-up time*, the bandwidth required to transmit the weights pales in comparison to the additional signaling overhead that would be required in the control header for *every data transmission* if Eckert's weighting methodology were tossed aside in favor of any of the examples from Bucknell relied on in the Petition. As explained above in Section V(B)(1), the quantity of signaling data when transmitting data populated into the "first portion 90" and the "second portion 95" using Bucknell's Examples 1-3 would be enormous compared to Eckert's solution which conveyed the makeup of the data being transmitted by using a *single* index value (corresponding to the selected transport format). The additional signaling overhead required in the control header of each transmission assembled with Bucknell's examples would be orders of magnitude larger than the bandwidth required to transmit Eckert's weightings from the base station to the UE at set-up time. Ex. 2007, ¶125.

The Petition's second reason why a POSITA would be motivated to do away with Eckert's weightings is to "reduce complexity ... by avoiding the use of

calculations that involve selecting data from queues in proportion to weighting values." Petition, 52. This purported motivation presumably involves eliminating a simple multiplication operation where a weight value (e.g., 40%) is multiplied by the available bandwidth in Eckert, and is flawed on multiple levels. First, there is no need for the UE in Eckert to do any "calculations" to determine the amount of data associated with each weighting value because, in Eckert, the results of such calculations are already "baked into" the pre-defined transport formats provided by the base station to the UE. *See*, Eckert at [0204]. Second, the fraction of a clock cycle of processing required to multiply an available bandwidth quantity by an allocation percentage is so trivial that it would not motivate a POSITA to do away with the benefits of Eckert's weighting methodology, i.e., the ability to reduce signaling overhead by using a single index value (corresponding to the selected transport format) transmitted in the header to signal to the makeup of the transmitted data to the receiver. It defies credulity that a POSITA would toss aside the intended purpose of Eckert, or at the very least, engage in a substantial redesign of Eckert to substitute a priority based allocation methodology for Eckert's weighting-based system, in order to save a fraction of a clock cycle. Ex. 2007, ¶126.

In summary, the Petition's purported reasons why a POSITA would be motivated to do away with Eckert's weightings are unpersuasive and fail to demonstrate by a preponderance of the evidence that a POSITA would have been

motivated to cast aside Eckert's weightings in favor of a priority-based allocation scheme from Bucknell. Ex. 2007, ¶127.

VI. GROUND 1 FAILS TO DEMONSTRATE THAT CLAIMS 2-4 AND 8-11 ARE UNPATENTABLE

For the reasons set forth in Section V, *supra*, the Petition has failed to demonstrate that independent claim 1 is unpatentable over Eckert in view of Lohr-1 and Bucknell. Independent claim 8 is substantially the same as independent claim 1, and the Petition's mappings for independent claim 8 are substantially the same as those of claim 1. Thus, the Petition has failed to demonstrate the unpatentability of claim 8 under Ground 1 for the same reasons that the Petition failed to demonstrate the unpatentability of independent claim 1 in Ground 1.

In addition to independent claims 1 and 8, Ground 1 also challenges dependent claims 2-4 and 9-11. With respect to these dependent claims, Ground 1 relies on the same mappings for the independent claims discussed above. Accordingly, the Petition has failed to demonstrate the unpatentability of dependent claims 2-4 and 9-11 in Ground 1.

VII. GROUND 2 FAILS TO DEMONSTRATE THE UNPATENTABILITY OF DEPENDENT CLAIMS 5 AND 12

With respect to dependent claims 5 and 12, Ground 2 relies on the same deficient mappings discussed above in connection with Ground 1. Accordingly, the

Petition has failed to demonstrate the unpatentability of dependent claims 5 and 12 in Ground 2.

VIII. GROUND 3 FAILS TO DEMONSTRATE THE UNPATENTABILITY OF DEPENDENT CLAIMS 6 AND 13

With respect to dependent claims 6 and 13, Ground 3 relies on the same deficient mappings discussed above in connection with Ground 1. Accordingly, the Petition has failed to demonstrate the unpatentability of dependent claims 6 and 13 in Ground 3.

IX. CONCLUSION

Patent Owner respectfully requests that the Board enter a Final Written Decision finding that the Petitioner has failed to carry its burden of demonstrating by a preponderance of the evidence that any of the Challenged Claims are unpatentable.

Respectfully submitted,

Dated: November 19, 2025

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CERTIFICATE OF COMPLIANCE WITH WORD COUNT

Pursuant to 37 C.F.R. § 42.24(d), I certify that this Response complies with the type-volume limits of 37 C.F.R. § 42.24(b)(1) because it contains 13,934 words, excluding the parts of this Patent Owner's Response that are exempted by 37 C.F.R. § 42.24(a), according to the word processing system used to prepare this Patent Owner's Response.

Respectfully submitted,

Dated: November 19, 2025

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CERTIFICATE OF SERVICE

The undersigned certifies that pursuant to 37 C.F.R. § 42.6(e), a copy of the foregoing **PATENT OWNER'S RESPONSE** was served via email (as consented to by counsel) on November 19, 2025 to lead and backup counsel of record for Petitioners as follows:

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