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# Datasheet for the decision of 22 May 2025

**Case Number:** T 0407/23 - 3.4.03

**Application Number:** 18192805.2

**Publication Number:** 3480806

**IPC:** G09G3/3225, G09G3/3275, G09G3/3291, G09G3/20

**Language of the proceedings:** EN

**Title of invention:**
DISPLAY DEVICE AND DRIVING METHOD THEREOF

**Applicant:**
Samsung Display Co., Ltd.

**Headword:**

**Relevant legal provisions:**
EPC Art. 52(1), 56, 123(2)

**Keyword:**
Amendments - added subject-matter (no)
Inventive step - (yes) - after amendment

**Decisions cited:**



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**Case Number: T 0407/23 - 3.4.03**

# D E C I S I O N
# of Technical Board of Appeal 3.4.03
# of 22 May 2025

| | |
|---|---|
| **Appellant:** (Applicant) | Samsung Display Co., Ltd.<br>1, Samsung-ro<br>Giheung-gu<br>Yongin-City<br>Gyeonggi-Do (KR) |
| **Representative:** | Marks & Clerk LLP<br>15 Fetter Lane<br>London EC4A 1BW (GB) |
| **Decision under appeal:** | **Decision of the Examining Division of the European Patent Office posted on 11 October 2022 refusing European patent application No. 18192805.2 pursuant to Article 97(2) EPC.** |

**Composition of the Board:**

| | |
|---|---|
| **Chairman** | T. Häusser |
| **Members:** | M. Stenger |
| | E. Mille |

## Summary of Facts and Submissions

I. The appeal concerns the decision of the examining division to refuse European application no. 18 192 805. In the contested decision, the examining division sets out that the subject-matter of the independent claims of the then main request and the then first and second auxiliary requests does not fulfil the requirements of Article 123(2) EPC and is not inventive in view of D1 under Article 56 EPC. The contested decision furthermore contains an obiter dictum relating to Article 84 EPC.

II. It is referred to the following documents

D1: US 2017/186375 A1
D2: US 2015/161941 A1
D3: US 2014/028649 A1
D4: US 2014/118409 A1

III. In the statement setting out the grounds for appeal, the appellant requested that the contested decision be cancelled and that the application be granted according to the main request or the first or second auxiliary requests underlying the decision under appeal and submitted in response to the first instance summons to oral proceedings (received by the EPO on 19 July 2022), or that the application at least be reverted to the examining division for further prosecution.

In reaction to the board's communication preparing the oral proceedings and to telephone conversations with the rapporteur, the appellant filed, with letters dated 20 February 2025, 29 April 2025 and 8 May 2025, sequentially modified versions of additional fourth and

fifth auxiliary requests as well as of an amended description. The final requests of the appellant were that these requests be considered in the following order:

1. fourth auxiliary request as filed on 8 May 2025
2. fifth auxiliary request as filed on 8 May 2025
3. main request submitted on 19 July 2022
4. first auxiliary request submitted on 19 July 2022
5. second auxiliary request submitted on 19 July 2022

With respect to the fourth and fifth auxiliary requests, the appellant requested that for these requests, the description be replaced by the description filed on 8 May 2025 marked "Revised description - May 2025".

IV. Since the highest ranking request of the appellant (fourth auxiliary request) could be granted, the oral proceedings scheduled for 20 May 2025 were cancelled.

V. Claim 1 of the fourth auxiliary request has the following wording (labelling **F1**, **F2**, ... added by the board in analogy to the labelling used in the contested decision; the board notes that the labelling of the board does not correspond in an identical manner to the one used by the examining division due to the double usage of the label **F6** in the latter; w.r.t. feature **F7** of claim 1 of the main request on which the contested decision is based, feature **F7'** is amended by an additional expression underlined by the board):

**F1** *A display device comprising:*
**F2** *a processor (9) configured to supply a control signal including a target maximum luminance (L_tar);*
**F3** *a first pixel (PXij)*

**F4** *including a first organic light emitting diode (OLED1);*

**F5** *an initialization voltage generator (12); and*

**F6** *a timing controller (11) including a first lookup table (LUT1) in which a plurality of first offset values (OFFSET1) respectively corresponding to a plurality of maximum luminances, a plurality of values of a first power voltage (ELVSS) respectively corresponding to the plurality of maximum luminances, and a plurality of values of a second power voltage (ELVDD) respectively corresponding to the plurality of maximum luminances are recorded, the timing controller (11) being configured to determine a value of the first initialization voltage (VINT1), based on a target maximum luminance (L_tar) and the first lookup table (LUT1), wherein the target maximum luminance (L_tar) is a luminance at a maximum gray scale to be displayed in the display device, wherein the first power voltage (ELVSS) is to be supplied to a cathode of the first organic light emitting diode (OLED1), wherein the plurality of maximum luminances include a reference maximum luminance (L-ref),*

**F7'** *wherein the timing controller (11) is configured to search for a first initialization voltage value corresponding to the target maximum luminance (L_tar), wherein the first initialization voltage value is obtained by adding a first offset value (OFFSET1) of the plurality of first offset values (OFFSET1), that corresponds to the target maximum luminance (L_tar), to a value of the first power voltage (ELVSS) of the plurality of values of the first power voltage (ELVSS), that corresponds to the target maximum luminance (L_tar), and to transfer the searched first initialization voltage value to the initialization voltage generator (12),*

**F8** *wherein the initialization voltage generator (12) is configured to generate a first initialization voltage (VINT1),*
**F9** *corresponding to the transferred first initialization voltage value, and to supply the first initialization voltage (VINT1) to an anode of the first organic light emitting diode (OLED1) to initialize a quantity of charges accumulated in the first organic light emitting diode,*
**F10** *wherein the first offset value (OFFSET1) at the reference maximum luminance (L_ref) is 0, wherein the first offset value (OFFSET1) corresponding to a first maximum luminance group that exceeds the reference maximum luminance (L_ref) among the plurality of maximum luminances is smaller than 0, wherein the first offset value (OFFSET1) corresponding to a second maximum luminance group that is less than the reference maximum luminance (L_ref) among the plurality of maximum luminances is larger than 0.*

VI. Claim 14 of the fourth auxiliary reads (labelling **M1**, **M2**, ... added by the board in analogy to the labelling used in the contested decision for claim 1; feature **M7'** is amended w.r.t. the corresponding feature **F7** of claim 1 of the main request by an additional expression underlined by the board):

**M1** *A method for driving a display device of claim 1, the method comprising:*
**M2** *supplying, by a processor (9), a control signal including a target maximum luminance (L_tar);*
**M6-c** *receiving, by a timing controller (11), information on a target maximum luminance (L_tar), wherein the target maximum luminance (L_tar) is a luminance at a maximum gray scale to be displayed in the display device;*

**M6-b** *determining, by the timing controller (11), a value of a first initialization voltage (VINT1) corresponding to the target maximum luminance (L_tar) with a first lookup table (LUT1) built therein;*
**M6-d** *supplying a first power voltage (ELVSS) to a cathode of a first organic light emitting diode (OLED1);*
**M5** *initializing, by an initialization voltage generator (12),*
**M11** *an amount of charges accumulated in*
**M4** *the first organic light emitting diode (OLED1)*
**M3** *of a first pixel (PXij)*
**M9** *by supplying the first initialization voltage (VINT1) to an anode of the first organic light emitting diode (OLED1);*
**M12** *allowing the first organic light emitting diode (OLED1) to emit light to correspond to a target gray scale having a luminance that is equal to or smaller than the target maximum luminance (L_tar),*
**M6-a** *wherein a plurality of first offset values respectively corresponding to a plurality of maximum luminances, a plurality of values of the first power voltage (ELVSS) respectively corresponding to the plurality of maximum luminances, and a plurality of values of a second power voltage (ELVDD) respectively corresponding to the plurality of maximum luminances are recorded in the first lookup table (LUT1);*
**M7'** *searching, by the timing controller (11), a first initialization voltage value corresponding to the target maximum luminance (L_tar), wherein the first initialization voltage value is obtained by adding a first offset value (OFFSET1) of the plurality of first offset values (OFFSET1), that corresponds to the target maximum luminance (L_tar), to a value of the first power voltage (ELVSS) of the plurality of values of the first power voltage (ELVSS), that corresponds to the*

*target maximum luminance (L_Tar); transferring, by the timing controller (11), the searched first initialization voltage value to the initialization voltage generator (12),*

**M8** *generating, by the initialization voltage generator (12), a first initialization voltage (VINT1),*

**M9** *corresponding to the transferred first initialization voltage value; and supplying, by the initialization voltage generator (12), the first initialization voltage (VINT1) to an anode of the first organic light emitting diode (OLED1) to initialize a quantity of charges accumulated in the first organic light emitting diode (OLED1),*

**M6-e** *wherein the plurality of maximum luminances include a reference maximum luminance (L_ref),*

**M10** *wherein the first offset value (OFFSET1) at the reference maximum luminance (L_ref) is 0,*
*wherein the first offset value (OFFSET1) corresponding to a first maximum luminance group that exceeds the reference maximum luminance (L_ref) among the plurality of maximum luminances is smaller than 0, and*
*wherein the first offset value (OFFSET1) corresponding to a second maximum luminance group that is less than the reference maximum luminance (L_ref) among the plurality of maximum luminances is larger than 0.*

All features **F1**, **F2**, ... of claim 1 of the fourth auxiliary request have a corresponding feature **M1**, **M2**, ... in claim 14 of the fourth auxiliary request.

VII. The appellant argued essentially that the claimed subject-matter did not extend beyond the application as filed and involved an inventive step.

## Reasons for the Decision

1. The appeal is admissible.

2. The invention

The invention is directed at an OLED display where the OLEDs can be precharged with an initialization voltage to avoid that under low luminance conditions OLEDs emit light with a delay with respect to other OLEDs, for instance in the form of a colour dragging phenomenon (see original paragraphs [7], [130] and [137]). At the same time, the invention aims at delaying degradation of OLEDs (paragraphs [80] and [135]).

3. Article 123(2) EPC in general

Independent device claim 1 of fourth auxiliary request is based on original claims 1, 2 and 4 to 6 as well as paragraphs [54], [60], [77], [78] and [102] as originally filed in combination with original Figure 6. Independent method claim 14 corresponds to claim 1 in its relevant parts as set out above (including features **F7'** and **M7'**).

Dependent claims 2 to 13 correspond to original claims 3 and 8 to 18.

4. Article 123(2) EPC w.r.t. features **F7/F7'/M7'**

4.1 The examining division set out that feature **F7** of the main request, namely

*wherein the timing controller (11) is configured to search for a first initialization voltage value corresponding to the target maximum luminance (L_tar) by adding a first offset value (OFFSET1) of the*

*plurality of first offset values (OFFSET1), that corresponds to the target maximum luminance (L_tar), to a value of the first power voltage (ELVSS) of the plurality of values of the first power voltage (ELVSS), that corresponds to the target maximum luminance (L_tar), and to transfer the searched first initialization voltage value to the initialization voltage generator (12),*

had no basis in the application as originally filed, because according to original paragraphs [77], [78] and [102], the timing controller only selected the OFFSET1 and ELVSS values according to the target luminance "but no adder is performed" and "no specific adder is defined" (sections 9.4 and 9.3.5 of the contested decision). Instead, the addition of the voltage was simply performed across the OLED via the electrical circuit of the OLED (section 9.3.5 of the contested decision).

This reasoning applied to claim 14 as well.

4.2 The appellant, referring to original paragraphs [0077] and [0078], essentially submits that the claims do not require an adder as such. What is required is a timing controller configured to search for a first initialization voltage value, which itself is obtained by adding a first offset value (OFFSET1) to a value of the first power voltage (ELVSS).

4.3 Modified feature **F7'** reads (expression added w.r.t. feature **F7** underlined by the board)

**F7'** *wherein the timing controller (11) is configured to search for a first initialization voltage value corresponding to the target maximum luminance (L_tar),*

*wherein the first initialization voltage value is obtained by adding a first offset value (OFFSET1) of the plurality of first offset values (OFFSET1), that corresponds to the target maximum luminance (L_tar), to a value of the first power voltage (ELVSS) of the plurality of values of the first power voltage (ELVSS), that corresponds to the target maximum luminance (L_tar), and to transfer the searched first initialization voltage value to the initialization voltage generator (12),*

4.3.1 By virtue of the expression added to feature **F7**, feature **F7'** does not require any more that the timing controller performs the adding of the OFFSET1 and ELVSS values.
Instead, feature **F7'** is in line with the rest of the application according to which the addition of the voltage is simply performed across the OLED via the electrical circuit of the OLED, as set out by the examining division. The objections of the examining division w.r.t. to the "adder" relating to Article 123(2) EPC are thus overcome by modified features **F7'**.

4.3.2 The board further notes that the specification in feature **F7'** that the value of the first power voltage (ELVSS) which is added to the first offset value (OFFSET1) is one

*of the plurality of values of the first power voltage (ELVSS), that corresponds to the target maximum luminance (L_tar)*

is not *verbatim* disclosed in the original application.

However, according to claim 2 as originally filed, the value of the first power voltage used in the addition (is a first power voltage)

*to be supplied to a cathode of the first organic light emitting diode.*

Since the first power voltage that is supplied to the cathode of the first OLED changes with and corresponds to the target maximum luminance (L_tar) as disclosed, for instance, in the table shown in original Figure 6, the specification mentioned above is directly and unambiguously disclosed in the application as filed.

4.4 In view of the above, the board comes to the conclusion that claim 1 of the fourth auxiliary request complies with the requirements of Article 123(2) EPC. The above remarks concerning feature **F7'** also apply to corresponding feature **M7'**. Thus, claim 14 also complies with the requirements of Article 123(2) EPC.

Hence, the fourth auxiliary request complies with the requirements of Article 123(2) EPC.

5. Article 84 EPC

The board further notes that the objection of the examining division w.r.t. Article 84 EPC in the obiter dictum (point 13 and its sub-points of the contested decision) is based on the issue underlying the objection w.r.t. Article 123(2) EPC set out above in section 4.1.
This issue was resolved by modified features **F7'** and **M7'**, as set out above w.r.t. to Article 123(2) EPC.

Hence, the objection of the examining division w.r.t. Article 84 EPC in the obiter dictum does not apply to the independent claims of the fourth auxiliary request.

6. Fourth auxiliary request, Article 56 EPC

6.1 D1, which is from the same applicant, discloses most of the features of independent claim 1 of the fourth auxiliary request (**F1** to **F5**, **F6**, **F8** and **F9**) and even aims at the same purpose (at least partly, see, e.g. paragraph [92] of D1: "so that light emission delay caused by the BCB operation may be reduced or minimized"). D1 represents therefore the closest prior art.

6.2 However, D1 is silent about how the initialization voltage offsets VINT_OFFSET in the lookup table shown in Figure 5 of D1 are obtained and does not disclose any relations between the values VINT_OFFSET and ELVSS in the look-up table.

That is, the subject-matter of claim 1 of the fourth auxiliary request differs from D1 by features **F10**, as also acknowledged by the examining division, and **F7**, which was discarded by the examining division as having been objected to before under Article 123(2) EPC (section 11.1.3 of the contested decision).

6.3 Feature **F10** reads:

*wherein the first offset value (OFFSET1) at the reference maximum luminance (L_ref) is 0,*
*wherein the first offset value (OFFSET1) corresponding to a first maximum luminance group that exceeds the reference maximum luminance (L_ref) among the plurality of maximum luminances is smaller than 0,*

*wherein the first offset value (OFFSET1) corresponding to a second maximum luminance group that is less than the reference maximum luminance (L_ref) among the plurality of maximum luminances is larger than 0.*

6.4 Effect of feature **F10** according to the examining division

The examining division set out that the process defined by feature **F10** (called feature **F9** in the contested decision) was entirely under the control of the software producer who would decide whether they would use a look-up table with relative data or absolute data. This selection was non-technical, made no technical contribution and would be given to the software producer for implementation. This did not involve an inventive step (see section 11.1.1 of the contested decision).

The board notes that populating a look-up table with OFFSET1 and ELVSS values that have to be added to obtain VINT1 as required by claim 1 of the main request (relative data) has a technical effect in that it contributes to determining voltages to be applied. However, it does not have an influence on the VINT1 values themselves when compared to a look-up table in which the VINT1 values are directly comprised (absolute data).
Thus, using a look-up table with relative data has the same technical effect as using one with absolute data as disclosed in the last column of the look-up table shown in Figure 5 of D1. The corresponding objective technical problem starting from D1 might then be formulated as how to find an alternative representation of the desired VINT1 values in the look-up table. The solution of this problem by using relative data (in the

sense of the claimed OFFSET1 values) does not justify the acknowledgement of an inventive step.

However, this argumentation relates to feature **F7** rather than to feature **F10**, contrary to what was set out by the examining division.

6.5 Effect of features **F7** and **F10** in combination

The examining division does not consider any combined effect of features **F7** and **F10**.

However, feature **F7**, which defines that the first initialization voltage value VINT1 is obtained by adding the OFFSET1 and the ELVSS values, and feature **F10** in combination have the effect that VINT1 is smaller than ELVSS for luminances higher than a certain threshold and higher than ELVSS for luminances below that threshold.

As submitted by the appellant (point 21 of the statement setting out the grounds of appeal), this results in the following technical effects achieved by the combination of features **F7'** and **F10**:

i) a reverse voltage effect in high luminance conditions,
ii) a sufficient driving effect in reference luminance conditions, and
iii) a precharge effect in low luminance conditions.

According to the application and in particular due to effect i), OLED degradation can be delayed (original paragraph [94]), as submitted by the appellant (statement setting out the grounds of appeal, point 21). The board sees no reason to doubt this.

6.6 Objective technical problem

In view of effects i) to iii), the objective technical problem may then be formulated as how to ensure effective driving of a display device to not only prevent a colour dragging phenomenon but to also ensure efficient OLED performance (i.e. delaying OLED degradation), as suggested by the appellant.

6.7 Inventive step

D1 does not mention degradation of OLEDs. Neither do D2 and D3. D4 mentions degradation of OLEDs (see paragraph [12]) and discloses the calculation of initialization voltages (see e.g. paragraph [16]). However, D4 does not disclose any relation between the initialization voltages and ELVSS, and thus no reverse voltage effect.

Hence, even by combining all available prior art documents, the skilled person would not arrive at the subject-matter of claim 1 of the main request. In particular, it would not incorporate features **F7'** and **F10** into the display device disclosed in D1 in an obvious manner.

Thus, the subject-matter of claim 1 of the main request is inventive (Articles 52(1) and 56 EPC) in view of the available prior art.

The same applies to the corresponding method claim 14, which comprises features **M7'** and **M10** corresponding to features **F7'** and **F10**.

## Order

## For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the examining division with the order to grant a patent in the following version:

   Claims: 1 to 14 of the fourth auxiliary request submitted with letter dated 8 May 2025;

   Description: pages 1 to 30 (paragraphs [1] to [143]) submitted with letter dated 8 May 2025 marked "REVISED DESCRIPTION - MAY 2025";

   Drawings: Figures 1 to 14 as originally filed.

The Registrar: The Chairman:

S. Sánchez Chiquero T. Häusser

Decision electronically authenticated