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**Datasheet for the decision
of 22 November 2013**

Case Number: T 0544/12 - 3.3.09
Application Number: 00932308.0
Publication Number: 1449238
IPC: H01L21/00, C09K11/06,
H05B33/14, H01L51/50, H01L51/30
Language of the proceedings: EN

Title of invention:

VERY HIGH EFFICIENCY ORGANIC LIGHT EMITTING DEVICES BASED ON
ELECTROPHOSPHORESCENCE

Patent Proprietor:

THE TRUSTEES OF PRINCETON UNIVERSITY
THE UNIVERSITY OF SOUTHERN CALIFORNIA

Opponents:

Sumation Company Limited
Merck Patent GmbH
BASF SE

Headword:

Relevant legal provisions:

EPC Art. 83, 84, 123(2)

Keyword:

Transfer of opposition (yes)
Review of discretionary decision of the opposition division on
admissibility of documents
Admissibility of documents filed in appeal
Sufficiency of disclosure - (no)
Remittal to the department of first instance
Claims - clarity after amendment (yes)
Amendments - added subject-matter (no)

Decisions cited:

G 0004/88, G 0007/93, R 0009/10, T 0409/91, T 0435/91,
T 0670/95, T 0273/02, T 0261/03, T 1119/05, T 0063/06,
T 1063/06, T 0480/11

Catchword:

1. A definition of a group of compounds in a claim by both structural and functional features is generally acceptable under Article 83 EPC as long as the skilled person is able to identify, without undue burden, those compounds out of the host of compounds defined by the structural feature(s) in the claim which also fulfil the claimed functional requirement(s).

In the present case, claim 1 of all requests is nothing more than an invitation to perform a research programme to identify suitable iridium complexes (other than those specifically disclosed in the patent) by trial and error. This amounts to an undue burden, such that the invention underlying claim 1 is insufficiently disclosed (points 4.2 to 4.9 of the Reasons, T 435/91 and T 1063/06 followed).

2. As regards the discretionary decision of an opposition division not to admit a late-filed document, a bare assertion of lack of prima facie relevance is not by itself sufficient reasoning.

Without any sufficient reasons being given by the opposition division for not admitting a late-filed document, the board is not in a position to decide whether or not the opposition division has exercised its discretion in an appropriate way. In such a situation, it is first necessary for the board to put itself in the place of the opposition division and to decide whether or not it would have exercised such discretion in the same way as the opposition division did (points 2.2.4 and 2.2.5 of the Reasons).



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Case Number: T 0544/12 - 3.3.09

D E C I S I O N
of Technical Board of Appeal 3.3.09
of 22 November 2013

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Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
13 January 2012 concerning maintenance of the
European Patent No. 1449238 in amended form.**

Composition of the Board:

Chairman: W. Sieber
Members: M. O. Müller
K. Garnett

Summary of Facts and Submissions

- I. This decision concerns the appeals filed by all three opponents and the patent proprietor (The Trustees of Princeton University and The University of Southern California) against the decision of the opposition division that European patent No. 1 449 239 as amended met the requirements of the EPC.
- II. Sumation Company Limited (opponent I), Merck Patent GmbH (opponent II) and BASF AG (later renamed BASF SE, opponent III) each had requested revocation of the patent in its entirety on the grounds that the claimed subject-matter was neither novel nor inventive (Article 100(a) EPC) and that the patent did not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art (Article 100(b) EPC).
- III. By its letter of 25 October 2011, opponent I (Sumation Company Limited, hereinafter: "Sumation") filed a request for transfer of the opposition to Sumitomo Chemical Co., Ltd (hereinafter "Sumitomo") together with:
- T1: Letter of Agreement, dated 1 October 2011.
- IV. The further documents submitted during the opposition proceedings included:
- D1: Y. Ma et al, "Electroluminescence from triplet metal-ligand charge-transfer excited state of transition metal complexes", Synthetic Metals 94, 1998, pages 245 to 248;

- D4: "Inorganic Chemistry", G. L. Miessler et al, second edition, Prentice Hall Inc. 1998, pages 1 to 3 and 422 to 424;
- D5: "Chemistry of the Elements", N. N. Greenwood et al, Pergamon Press 1984, pages 345 to 349;
- D9: G. di Marco et al, "A Luminescent Iridium(III) Cyclometallated Complex Immobilized in a Polymeric Matrix as a Solid-State Oxygen Sensor", Adv. Mater., volume 8, number 7, 1996, pages 576 to 580;
- D10: A. J. Lees, "Luminescence Properties of Organometallic Complexes", Chemical Reviews, volume 87, number 4, 1987, pages 711 to 743;
- D16: WO 01/41512 A1;
- D25: M. A. Baldo et al, "Phosphorescent materials for application to organic light emitting devices", Pure Appl. Chem., volume 71, number 11, 1999, pages 2095 to 2106;
- D29: "Comprehensive Organometallic Chemistry III", D. M. P. Mingos et al (ed.), first edition, Elsevier 2007, pages 101 to 194;
- D37: T. Sajoto et al, "Blue and Near-UV Phosphorescence from Iridium Complexes with Cyclometalated Pyrazolyl or N-Heterocyclic Carbene Ligands", Inorganic Chemistry, volume 44, number 22, 2005, pages 7992 to 8003;

- D38: M. G. Colombo et al, "Facial Tris Cyclometalated Rh³⁺ and Ir³⁺ Complexes; Their Synthesis, Structure, and Optical Spectroscopic Properties", Inorg. Chem., volume 33, 1994, pages 545 to 550;
- D39: "Untersuchungen am Komplex Ir-1" of opponent II;
- D40: "Investigation of Some Photophysical Properties of Ir-1" of opponent III;
- D41: Expert opinion of Professor W. A. Herrmann of 16 September 2011;
- S1: C. Ghica et al, "Microstructural Characterization Of Polycrystalline Alq₃ Grown By Sublimation", Journal of Optoelectronics and Advances Materials, volume 7, number 6, 2005, pages 2997 to 3003;
- S3: A. Curionic et al, "Alq₃: ab initio calculations of its structural and electronic properties in neutral and charged states", Chemical Physics Letters 294, 1998, pages 263 to 271;
- S4: US 5,486,406;
- S7: JP 07-263145;
- S8: English translation of JP 07-263145; and
- S9: R. C. Kwong et al, "Organic Light-emitting Devices Based on Phosphorescent Hosts and Dyes, Adv. Mater., volume 12, number 15, 2000, pages 1134 to 1138.

V. The opposition division's decision, announced orally on 3 November 2011 and issued in writing on 13 January 2012, was based on a main request (patent as granted) and a first and second auxiliary request.

The only claims relevant for the present decision were claim 16 of the main request, claim 13 of the first auxiliary request and claim 1 of the second auxiliary request. Claim 16 of the main request read as follows:

"16. An organic light emitting device comprising a heterostructure containing an emissive layer that produces luminescent emission when a voltage is applied across the heterostructure, wherein the emissive layer includes a molecule that is a phosphorescent organometallic iridium compound or a phosphorescent organometallic osmium compound."

Claim 13 of the first auxiliary request corresponded to claim 16 of the main request with the osmium alternative being deleted. Claim 1 of the second auxiliary request corresponded to claim 13 of the first auxiliary request.

The opposition division essentially held as follows:

- a) Sumitomo was not the universal successor of Sumation (opponent I) and the submitted facts did not correspond to the situation in G 4/88 where a transfer of the opposition had been allowed. Therefore, Sumitomo had not acquired the status as opponent.
- b) S1, S3 and S4, S7 to S9 and D38 were late filed and not *prima facie* relevant.

- c) The main and first auxiliary requests were rejected for lack of novelty. Before dealing with the novelty of the main request, the opposition division decided that the invention underlying the main request was sufficiently disclosed. In this respect, the opposition division, accepting the proprietor's arguments, reasoned as follows:

The claims were not directed to organometallic iridium and osmium compounds in general, but only to those that were phosphorescent, and the term "phosphorescent" was well understood in the art as referring to triplet state emission. The prior art provided sufficient information about how to select phosphorescent iridium and osmium complexes and, even without the prior art, it was a matter of routine experimentation to find out whether a complex was phosphorescent or not. Complexes having completely quenched luminescence, as those of D16, produced no phosphorescence and therefore were not chosen for use in the layer of the claimed device. Similarly, the iridium complex Ir-1 of documents D39 and D40 showed no phosphorescence above 200°K, therefore it did not meet the selection criterion of the claims either. Consequently, D16, D39 and D40 did not prove any insufficiency of disclosure. As for the synthesis of the complexes, organometallic iridium and osmium complexes were known from the prior art and their synthesis was well documented. Lastly, the objection of lack of sufficient disclosure presupposed that there were serious doubts, substantiated by verifiable facts, that the skilled person was not able to readily perform the invention over the whole area claimed without undue burden and without needing inventive skill.

In the present case there were no such verifiable facts that could support serious doubts. On the contrary, D39 and D40 clearly showed that opponent II was able to reproduce the invention.

- d) The second auxiliary request satisfied the criteria of Articles 83 and 54 EPC. Furthermore, the subject-matter of the second auxiliary request was also inventive in view of D1 as the closest prior art.

VI. On 6 March 2012, opponent II filed an appeal and, on the same day, paid the prescribed fee. The statement of ground of appeal was filed on 9 May 2012 together with:

D42: Experimental data on Ir(ppy)₃.

VII. On 15 March 2012, opponent III filed an appeal and, on the same day, paid the prescribed fee. The statement of grounds of appeal was filed on 23 May 2012 together with copies of various documents already filed during the opposition proceedings, and the new documents:

D43: "Comparison of triplet energies of the Os-complex 1 mentioned in D1 and PBD"; and

D44: "Organic light emitting diodes with the Os complex (1) according to D1 as emitting material as well as with the emitting material according to EP'238B1 (current claim set)".

VIII. On 21 March 2012, opponent I filed an appeal in the name of Sumitomo and, on the same day, paid the prescribed fee.

Opponent I requested that the decision of the opposition division to reject the transfer of the opposition from Sumation to Sumitomo be set aside and the transfer be recorded. Apart from T1, the appeal contained in this respect:

T2: Declaration of Mr Hitoshi Miura, dated 15 March 2012;

T3: Partial Business Transfer Agreement, dated 26 March 2009; and

T4: Report on acquisition of securities concerning outward direct investment, dated 30 October 2007.

Auxiliarily, the appeal was filed in the name of Sumation.

IX. On 23 May 2012, opponent I filed its statement of grounds of appeal together with:

S10: Experimental data on the emission and electroluminescence properties of various organometallic iridium complexes,

and *inter alia* requested the reimbursement of the appeal fee.

X. On 9 March 2012, the proprietor filed an appeal and, on the same day, paid the prescribed fee. The statement setting out the grounds of appeal was filed on 11 May 2012 together with a first auxiliary request, the main request being maintenance of the patent as granted.

XI. As the opponents and the patent proprietor are each appellant(s) and respondent(s) in the present appeal

proceedings, for simplicity the board will continue to refer to them as the opponents and the proprietor.

XII. A response was filed by opponent II by letter of 11 June 2012 and by opponent I by letter of 20 December 2012.

XIII. The proprietor filed its response by letter of 18 December 2012 together with second to fifth auxiliary requests and:

D45: Expert declaration of Prof. M. Thompson, signed 14 December 2012;

D46: Expert declaration of M. S. Weaver, signed 12 May 2012;

D47: C. W. Tang et al, "Organic electroluminescent diodes", Appl. Phys. Lett. 51(12), 1987, pages 913 to 915;

D48: "Organic Electroluminescent Materials And Devices", S. Miyata and H. S. Nalwa (ed.), Amsterdam 1997, 32 pages;

D49: F. So et al, "Organic Electroluminescence Displays", International Journal of High Speed Electronics and Systems, volume 8, number 2, 1997, pages 247 to 263;

D50: A. A. Shoustikov et al, "Electroluminescence Color Tuning by Dye Doping in Organic Light-Emitting Diodes", IEEE Journal Of Selected Topics In Quantum Electronics, volume 4, number 1, 1998, pages 3 to 13; and

D51: J. Lee et al, "Effects of triplet energies and transporting properties of carrier transporting materials on blue phosphorescent organic light emitting devices", Applied Physics Letters 93, 2008, 3 pages.

XIV. On 21 March 2013, the board communicated its preliminary opinion to the parties. As regards sufficiency of disclosure, the board made the following observations:

Claim 1 defined the iridium compound in terms of its structure, namely the ligand type (organometallic) and the central atom (iridium) and, in terms of its function, namely as being an emissive phosphorescent molecule. The first question that needed to be discussed during the oral proceedings was whether every organometallic iridium compound was an emissive phosphorescent molecule. In this respect, in particular D16, D37, D39 and D40 were of relevance. In the event that the first question were to be answered in the negative, the second question to be discussed would be whether the skilled person, in view of the opposed patent and the common general knowledge, would know which organometallic iridium compounds were emissive phosphorescent molecules.

The board furthermore expressed the preliminary view that the status of Sumitomo as opponent could be acknowledged.

XV. By letter of 16 August 2013, third party observations were filed by Mr Passino and Mr Noranbrock from Lowe Hauptman & Ham, LLP, together with thirty documents.

XVI. With letter of 20 September 2013, opponent III submitted its reply to the board's preliminary opinion and the proprietor's letter of 18 December 2012 together with:

D52: EP 1 729 327 A1; and

D53: Letter of the examining division dated 5 August 2011 concerning EP 1 729 327 including the dependent claims on file at that stage of the proceedings.

XVII. A further letter was filed by opponent III by its letter of 2 October 2013 containing:

D54: "Applied Homogeneous Catalysis with Organometallic Compounds - A Comprehensive Handbook in Three Volumes", B. Cornils and W. A. Herrmann, volume 1, second edition, 2002, Preface to the First Edition, 8 pages.

XVIII. With its letter of 21 October 2013, opponent I filed:

S13: Statement of Professor G. Williams including exhibits 1 to 5; and

S14: Statement of Professor Sir R. Friend.

XIX. In its letter of 21 October 2013, the proprietor requested that the third party observations and the new documents cited therein be not admitted into the proceedings.

XX. In its letter of 11 November 2013, the proprietor filed

D55: Copies of the executed assignments of the priority application US 09/311126 of the opposed patent.

XXI. On 21 and 22 November 2013, oral proceedings were held before the board. At the beginning of the oral proceedings, the proprietor withdrew its main and first auxiliary requests. The new main, first and second auxiliary requests (former second to fourth auxiliary requests) were then discussed, after which the proprietor withdrew the former fifth auxiliary request. Furthermore, opponent I withdrew its request for the reimbursement of the appeal fee. As regards the admissibility of documents, the opponents requested that firstly, the opposition division's decision not to admit S1, S3, S4, S7 to S9 and D38 be set aside and the documents be admitted into the proceedings, secondly, that S10, S13, S14, D42 to D44, D52, D53 and D54 be admitted into the proceedings and thirdly, that D45 to D51 and D55 be not admitted into the proceedings. The proprietor requested that firstly, the opposition division's decision not to admit S1, S3, S4, S7 to S9 and D38 be maintained, secondly, that S10, S13, S14, D42 to D44, D52, D53 and D54 be not admitted into the proceedings and thirdly, that D45 to D51 and D55 be admitted into the proceedings.

XXII. Claim 1 of the new main request is identical to claim 1 held allowable by the opposition division and reads as follows:

"1. An organic light emitting device comprising a heterostructure containing an emissive layer that produces luminescent emission when a voltage is applied across the heterostructure, wherein the emissive layer includes a molecule that is a phosphorescent organometallic iridium compound".

Claim 1 of the first auxiliary request is identical to claim 1 of the main request except that the organometallic iridium compound has been defined to be "cyclometallated".

Claim 1 of the second auxiliary request differs from claim 1 of the first auxiliary request in that the iridium compound is further defined to have an aromatic ligand ("phosphorescent cyclometallated organometallic iridium compound with an aromatic ligand").

XXIII. So far as relevant to the present decision, the opponents' arguments can be summarized as follows:

a) Transfer of opposition

T1 and T3 provided evidence that the research and development and manufacturing operations of Sumation's macromolecular organic EL materials were transferred to Sumitomo as of 1 April 2009. When the business was transferred on this date, the opponent status of Sumation was transferred to Sumitomo as part of that business, as confirmed by T1. This transfer of opponent status fell clearly inside the situation encompassed by G 4/88 which permitted the transfer of opponent status as part of the opponent's business assets together with the assets in the interests of which the opposition was filed.

b) Admissibility of documents

The decision of the opposition division not to admit S1, S3 and S4 should be set aside and the documents should be admitted into the proceedings,

since, contrary to the opposition division's decision, these documents were *prima facie* relevant. More specifically, S1, S3 and S4 had been filed in order to show that the narrow definition used by the proprietor for the term "organometallic" was not applicable in the field of OLEDs and this question was of crucial importance for the present proceedings.

S10 and D42 to D44 should be admitted since they were filed in reaction to the opposition division's decision on inventive step in order to provide information on the layer structure in D1 and to prove that the problem to be solved in view of D1 was in fact not solved over the entire scope.

D45 and D46 were filed late and hence should not be admitted. D47 to D50 should not be admitted since they concerned fluorescent compounds and hence were not relevant. Furthermore D47, D48 and D50 did not constitute common general knowledge as these documents were not textbooks. Finally D51 should not be admitted since it was post-published and hence not relevant.

D53 should be admitted since it was an independent opinion as regards the definition of "organometallic" and thus was *prima facie* relevant.

D54, S13 and S14 should be admitted since they constituted a reaction to the proprietor's previous submissions on the definition of the term "organometallic".

c) Main request

i) The claimed subject-matter

The relevant technical field in the present case was the field of OLEDs. D25 and D29 showed that in this field, organometallic complexes included compounds without any metal-carbon bonds. More specifically, D25 referred to the compound "PtOEP" as an organometallic complex and in this compound, no platinum-carbon bonds were present. Furthermore, D29, equally in the field of OLEDs, referred to numerous emitter structures as "organometallic" even though these were devoid of any metal-carbon bonds. It was thus clear that the term "organometallic" in the field of OLEDs did not require the presence of metal-carbon bonds.

The proprietor's argument that D4 and, by way of reference thereto the patent, defined the term "organometallic" such that it required a metal-carbon bond, was not correct. Firstly, the opposed patent used the expression "for example" when referring to D4 and hence the definition in D4 was not the only definition applicable in the opposed patent. Secondly, there was in fact no clear definition for the term "organometallic" in D4. While some passages of D4 did define the term "organometallic" to require metal-carbon bonds, others did not. This reference to D4 in the patent did

therefore not induce the skilled person to deviate from its normal understanding of the term "organometallic". In this respect, the proprietor's reference to D41 was irrelevant, since the declarant of D41 was not a skilled person in the field of OLEDs. The same applied to D5, which did not represent the understanding of the person skilled in the art of OLEDs either.

ii) Sufficiency

Claim 1 contained the structural feature "organometallic iridium compound". There were myriads of conceivable organic ligands that formed complexes with iridium. This structural definition covered therefore an almost infinite number of complexes. The desired result of being phosphorescent was however not achieved by all these iridium complexes, as evidenced by compound "Ir-1" of D39 and D40, the L_2IrX complex of D16, and the $fac-Ir(ppz)_3$ complex of D37. The skilled person thus had to pick and choose within the almost infinite number of organometallic iridium complexes those compounds that were phosphorescent. The skilled person's common general knowledge would not enable him to do so without undue burden. More specifically, as set out in D16, only very few complexes had been identified which were capable of efficient room temperature phosphorescence, and the reasons why certain complexes were phosphorescent and others were not, were not at all clear. Furthermore, the opposed

patent itself did not contain any guidance as to how further phosphorescent iridium complexes, different from the specific structures disclosed in the patent, could be identified. The skilled person was thus forced to identify by trial and error those compounds amongst the almost infinite number of organometallic iridium complexes that were phosphorescent. This constituted an undue burden and hence the invention underlying claim 1 was insufficiently disclosed.

The proprietor's argument that the patent provided a unique concept by which the phosphorescent iridium compounds could be identified within the organometallic iridium compounds of claim 1 was not correct. More specifically, claim 1 did not reflect the proprietor's concept but extended to classes of iridium complexes that were entirely different from the structures made available by the proprietor's concept, such as ferrocene-like compounds or acetylacetonate complexes.

Likewise, the proprietor's argument that the opponents had not provided substantiated facts to put sufficiency of disclosure in doubt, was incorrect. More particularly, the opponents had provided facts substantiated by D16, D37, D39 and D40. This evidence had a much stronger weight than the only example in the patent ($\text{Ir}(\text{ppy})_3$).

The same applied to the argument that a chemist would have no problem to synthesise iridium complexes and it would be a routine task to check whether these were phosphorescent or not. In fact it was not a routine task to synthesise each and every iridium compound meeting the structural requirement of claim 1, purify all these compounds to the high degree of purity needed for OLEDs and then test each of these components with regard to their phosphorescence.

d) First auxiliary request

i) Remittal

The proprietor's request for remittal should not be allowed. The interpretation of the term "organometallic" had been a point of discussion between the parties from the very start of the present appeal proceedings and actually had already been discussed during the opposition proceedings. Furthermore, it had been the proprietor who had brought forward this argument during the discussion of sufficiency of disclosure. There was thus no need to remit the case for a further discussion of this point.

ii) Amendments - Articles 123(2) and 84 EPC

The introduction of the feature "cyclometallated" into claim 1 did not meet the requirements of Articles 123(2) or 84 EPC. As regards the requirements of

Article 84 EPC, it was not clear whether this term implied that the cyclometallated moiety had to be present in the organic ligand of the iridium compound and whether it was sufficient that one ligand was cyclometallated for the iridium compound to qualify as being cyclometallated.

iii) Sufficiency

Claim 1 still covered an almost infinite number of iridium complexes. The compounds tested in D16, D37, D39 and D40 were all cyclometallated but still did not show any phosphorescence. Hence, the skilled person still had to use trial and error to identify those iridium compounds that were phosphorescent.

The proprietor's argument that by way of the restriction to cyclometallated iridium compounds, claim 1 now reflected the concept provided by the opposed patent was not correct since claim 1 was still far from reflecting the concept referred to by the proprietor. More specifically, claim 1 still covered numerous classes of iridium compounds that were entirely different from those provided by this concept such as acetylacetonate complexes.

e) Second auxiliary request

i) Amendments - Articles 123(2) and 84 EPC

The requirements of Article 123(2) EPC were not met since the application as filed did not disclose a combination of the features "cyclometallated organometallic" and "with an aromatic ligand".

The incorporation of the feature "with an aromatic ligand" in claim 1 did not meet the requirements of Article 84 EPC since it was unclear whether the claim required the aromatic group of the aromatic ligand to be linked directly to the iridium atom or whether the claim also covered ligands where this was not the case, such as triphenylphosphine ligands. It was furthermore not clear whether this feature required the aromatic ligand to be bonded to the iridium atom via σ -bonds. Finally, it was not clear whether the claim required only one aromatic ligand to be present or whether complexes with more than one aromatic ligand were covered as well.

ii) Sufficiency

Even though claim 1 had been restricted to some extent, this claim still covered in terms of structure an almost infinite number of iridium compounds. The compounds of D16, D37, D39 and D40 were all cyclometallated and all contained two or more aromatic

ligands but nevertheless did not show any phosphorescence. Therefore, the skilled person had still to use trial and error to identify those iridium compounds of claim 1 that were phosphorescent.

The proprietor's argument that by way of the restriction to cyclometallated iridium compounds with aromatic ligands, claim 1 now reflected the concept provided by the opposed patent was not correct. Claim 1 still covered numerous classes of iridium compounds that were entirely different from those provided by this concept. Examples of compounds covered by claim 1 but not reflecting this concept were acetylacetonate complexes, or complexes wherein the aromatic group was linked to the iridium only indirectly via a polyalkylene group (the board in the course of this discussion observed that if one were to argue in the proprietor's favour that a concept was derivable from the patent, this might be a cyclic moiety comprising an iridium atom, an aromatic carbon atom and a nitrogen atom, the aromatic carbon atom and the nitrogen atom being bound by a σ -bond to the iridium atom).

XXIV. So far as relevant to the present decision, the proprietor's arguments can be summarized as follows:

a) Admissibility of documents

The Opposition division was right in not admitting S1, S3 and S4 since these documents had been filed

late and were not *prima facie* relevant. The broader definition of the term "organometallic" applied in these documents constituted a change of case at a very late stage, because a narrow definition of this term had been applied before the filing of these documents.

S10 should not be admitted since firstly, it had been filed very late and since, secondly, it showed that devices could be produced that were phosphorescent, such that it was not relevant to sufficiency of disclosure or inventive step. D42 to D44 should not be admitted since they could have been filed during the first instance proceedings and were not relevant.

D45, D47 and D48 should be admitted since they had been filed as a reaction to the opponents' insufficiency objection in order to show that it was part of common general knowledge to select appropriate OLED constituents to produce the OLEDs of claim 1.

D46 was a declaration about the uniqueness of the invention. This document should be admitted since it had been filed as a reaction to the opponents' insufficiency objection in order to justify the broadness of the claims. D49 to D51 were filed to prove that the opponents' experiments in S10, D42 and D44 were "designed to fail", and thus equally constituted a reaction to the opponents' grounds of appeal.

D53, S13 and S14 should not be admitted into the proceedings since these documents were filed after the summons and were not relevant.

b) Main request

i) The claimed subject-matter

The opponents' reference to the understanding of the person skilled in the art of OLEDs as regards the term "organometallic" was a secondary issue since the patent contained its own definition of the term "organometallic". More specifically, by way of reference to document D4, the patent defined the term "organometallic" such that it required a metal-carbon bond. This definition was supported by D5 and D41.

The feature "phosphorescent" in claim 1 implied the presence of phosphorescence at an operating temperature of an OLED device. Compounds exhibiting phosphorescence at temperatures at which nitrogen or carbon dioxide were liquid would thus not qualify as "phosphorescent" in the terms of claim 1.

ii) Sufficiency

The structures in the patent provided a unique concept by which phosphorescent iridium compounds could be identified. Moreover, the declaration D46 confirmed that the present invention was a technological breakthrough and thus justified a broad protection. The opponents had not provided substantiated facts to put sufficiency of disclosure in doubt. The opponents'

arguments based on D16, D37, D39 and D40 were in this respect not convincing since the iridium complexes of these documents were not phosphorescent and hence not covered by claim 1. These documents could therefore not prove that claim 1 covered non-workable embodiments. Furthermore, even if non-workable embodiments were covered by claim 1, this was not a problem since the jurisdiction of the boards tolerated some individual failures.

As regards the opponents' argument that the opposed patent provided evidence for the phosphorescence of only one single iridium complex, this was not convincing since one example in the patent was enough to prove sufficiency of disclosure.

Furthermore, it did not constitute an undue burden needed to carry out the invention underlying claim 1 since a chemist would have no problem to synthesise iridium complexes and it would be a routine task to check whether these were phosphorescent or not. This was proven by D29 which represented an overview of what had been done between the priority date of the patent and 2007 and which showed that the skilled person had been able to synthesize and test iridium complexes and thereby identify those that were phosphorescent. Finally, the skilled person could find in D9 and D10 iridium complexes that were phosphorescent.

c) First auxiliary request

i) Remittal

The case should be remitted to the opposition division for further prosecution on the basis of the first auxiliary request. Remittal was necessary since the case was now discussed on the basis of a completely new definition of the term "organometallic". More specifically, it could be assumed up to this point in time that the term "organometallic" required the presence of metal-carbon bonds, which was different from the board's understanding of the term.

ii) Amendments - Articles 123(2) and 84 EPC

Claim 1 met the requirements of Article 123(2) EPC. The combination of the features "organometallic" and "cyclometallated" was clearly and unambiguously derivable from page 5, lines 28 to 31 of the application as filed. As regards Article 84 EPC, claim 1 only indeed required that one or more rings containing an iridium atom were present. This related to the broadness of the claim, something that was however not objectionable under Article 84 EPC.

iii) Sufficiency

The invention underlying claim 1 was sufficiently disclosed. By way of the

restriction to cyclometallated iridium compounds, claim 1 now reflected the concept provided by the opposed patent to identify phosphorescent iridium compounds. More specifically, all iridium complexes specified in the opposed patent were cyclometallated and it was this characteristic that was now also present in claim 1.

d) Second auxiliary request

i) Amendments - Articles 123(2) and 84 EPC

The presence of aromatic ligands was disclosed on page 14, lines 7 to 8 of the application as filed and the feature "cyclometallated organometallic" was directly and unambiguously derivable from page 5, lines 28 to 31 of the application as filed.

As regards Article 84 EPC, claim 1 was indeed not restricted as regards the way the ligand and aromatic group therein were linked to the iridium atom but this related to the broadness of the claim only.

ii) Sufficiency

The invention underlying claim 1 was sufficiently disclosed. By way of the further restriction to cyclometallated iridium compounds with aromatic ligands, claim 1 now reflected the concept provided by the opposed patent to identify those

iridium compounds that were phosphorescent. In fact, the claim had now been restricted to the core of the invention.

XXV. The opponents requested that the decision under appeal be set aside and the patent be revoked.

Opponent I further requested that the decision of the opposition division to reject the transfer of the opposition from Sumation Company Limited to Sumitomo Chemical Co., Ltd be set aside and the transfer be registered.

XXVI. The proprietor requested that the decision under appeal be set aside and the patent be maintained on the basis of the claims of one of the second to fourth auxiliary requests filed by letter of 18 December 2012.

Reasons for the Decision

1. *Admissibility of the appeals*

1.1 Transfer of opposition

1.1.1 On 8 March 2007, Sumation Company Limited (hereinafter "Sumation") filed the present opposition. On 1 April 2009 the research and development and manufacturing operations of the macromolecular organic EL materials business of Sumation were transferred to Sumitomo Chemical Co., Ltd (hereinafter "Sumitomo") by virtue of a partial business transfer agreement dated 26 March 2009. On 25 October 2011, a request to record the transfer of the opponent status from Sumation to Sumitomo was filed at the EPO. A letter of agreement between Sumation and Sumitomo dated 1 October 2011 was filed as evidence T1 in support. On 28 October 2011,

the EPO indicated that the transfer of the opponent status to Sumitomo was being recorded. An EPO communication dated 4 November 2011 confirmed this. On 3 November 2011, oral proceedings were held before the opposition division, where it was decided not to acknowledge the transfer of the opposition to Sumitomo. On 21 March 2012, a notice of appeal was filed by Sumitomo, which was accompanied by further evidence T2, T3 and T4 in support of the transfer. Sumitomo requested that the decision of the opposition division to reject transfer of the opposition from Sumation to Sumitomo be set aside.

1.1.2 With regard to this request, the relevant issues are:

- (a) Whether the opposition was filed by Sumation in the interests of the "macromolecular organic EL materials business" of Sumation which was later transferred to Sumitomo;
- (b) Whether the parties to the partial business transfer agreement of 26 March 2009 also intended or agreed that the opposition should be transferred as part of this business;
- (c) Whether, and when, sufficient evidence of the intention to transfer opponent status was filed with the EPO, this determining the date when (if at all) the opponent status was actually transferred.

As to (a), this was not in dispute and there seems no reason to doubt that the opposition was filed by Sumation in the interests of the "macromolecular organic EL materials business" of this company.

As to (b), the board has some doubts, despite the statements in G 4/88, whether a transfer of the relevant business assets automatically and inevitably has the effect of transferring the opposition. However, this issue does not need to be addressed in the present case because the board can accept, in the absence of any evidence to the contrary, that it is implicit from the partial business transfer agreement of 26 March 2009 that the parties to that agreement intended and agreed that the status of opponent should be transferred (see T 261/03, point 2.2 of the Reasons)

As to (c), the issue is whether the evidence T1 filed on 25 October 2011 was such as to render it credible, on the balance of probabilities, and after evaluating the documents in a reasonable way and in the light of all the circumstances, that the alleged facts were true (T 261/03, point 3.5.5 of the Reasons). On the one hand, a mere assertion of transfer of status will not normally be enough to discharge the burden of proof (T 670/95, point 2); on the other the fact that another document might have been a more direct piece of evidence than the evidence in fact submitted does not necessarily mean that the proof actually offered is insufficient (T 273/02, point 2.6 of the Reasons).

The evidence T1 did not include the actual partial business transfer agreement of 26 March 2009 but only the agreement of 1 October 2011. This recited an agreement to transfer to Sumitomo the business assets of Sumation comprising the research and development and manufacturing operations of its macromolecular organic EL materials business, and that the two parties had concluded a partial business transfer agreement dated 26 March 2009 under which such business assets were in fact transferred as of 1 April 2009. The parties

further confirmed in the 21 October 2011 agreement (T1) that the status of Sumation as opponent in the present opposition was transferred as of 1 April 2009.

Overall, the board takes the view that on the balance of probabilities it is credible, given the evidence T1, that the alleged facts were true, even though the partial business transfer agreement of 26 March 2009 was not then filed.

1.1.3 In view of the above, the opposition division's decision that Sumation remains the opponent I has to be set aside and the transfer of the opposition to Sumitomo has to be acknowledged. Accordingly, the appeal in the name of Sumitomo is admissible.

1.2 No objections were raised against the admissibility of the appeals of the remaining parties and the board is satisfied that these appeals are admissible.

2. *Admissibility of documents*

2.1 During the oral proceedings, it was a matter of dispute whether *inter alia* S1, S3, S4, S10, D42 to D51, S13 (including exhibits 1 to 5), S14, D53 and D54 should be admitted into the proceedings. None of these documents is used in the reasoning of the present decision on the allowability of the proprietor's claim requests. Since, however, the admissibility of each of these documents has been challenged and a decision has been made in this respect by the board during the oral proceedings, the reasons for this decision are set out below.

2.2 S1, S3 and S4

2.2.1 The opposition division did not admit S1, S3 and S4 into the proceedings. The opponents requested that this decision be set aside and the documents be admitted into the proceedings.

2.2.2 S1, S3 and S4 were filed during the opposition proceedings with opponent I's letter of 30 September 2011, ie roughly one month prior to the oral proceedings before the opposition division. The board therefore agrees with the opposition division that these documents were indeed filed late. Pursuant to Article 114 EPC, the opposition division therefore had a discretion to admit these documents or to disregard them.

2.2.3 Such a discretionary decision should only be overruled in appeal if the discretion has been exercised according to the wrong principles, or without taking into account the right principles, or in an unreasonable way (G 7/93, OJ EPO 1994, 775, point 2.6 of the Reasons; T 1119/05, point 3.2 of the Reasons).

2.2.4 In the present case, the opposition division based its decision not to admit the late-filed documents S1, S3 and S4 on the sole ground that these documents were not *prima facie* relevant but without any further reasoning, ie, as to why they were not *prima facie* relevant. A bare assertion of lack of *prima facie* relevance is not in itself sufficient reasoning. Since the opposition division has thus not given sufficient reasons for not admitting the late-filed documents, the board is not in a position to decide whether or not the opposition

division has exercised its discretion in an appropriate way.

2.2.5 In such a situation, it is first necessary for the board to put itself in the place of the opposition division and to decide whether or not it would have exercised such discretion in the same way as the opposition division did (if the board comes to the conclusion that, in the position of the opposition division, it would not have exercised its discretion to admit these documents, the separate question will then arise whether the board should exercise its discretion to admit the documents as documents (late-)filed in the appeal proceedings).

2.2.6 Opponent I had filed documents S1, S3 and S4 in order to show that the narrow definition used by the proprietor for the term "organometallic" was not applicable in the field of OLEDs (see page 2 of the opponent's letter of 30 September 2013).

The question of how the term "organometallic" had to be interpreted was of crucial importance with regard to novelty during the opposition proceeding. Therefore, S1, S3 and S4 were in the board's view *prima facie* relevant and should therefore have been admitted. Accordingly, the board decided in the present appeal proceedings to overturn the decision of the opposition division and admit S1, S3 and S4 into the proceedings.

2.3 S10 and D42 to D44

2.3.1 S10 and D42 to D44 were submitted with the respective opponent's grounds of appeal. These documents were filed in reaction to the opposition division's decision on inventive step (last paragraph of point 7.2 of the

Reasons), in particular to counter the position that no proof had been provided that the technical problem in view of D1 had not been solved over the entire scope of claim 1.

The board therefore decided to admit documents S10 and D42 to D44 into the proceedings.

2.4 D45 to D51

2.4.1 These documents have been submitted by the proprietor in its response to the opponents' statements of grounds of appeal (letter of 18 December 2012).

2.4.2 The proprietor tried to prove with D45, D47 and D48 that the selection of constituents to produce the claimed OLEDs was part of the skilled person's common general knowledge. This constituted a reaction to the opponents' grounds of appeal in which it was argued that the invention was not sufficiently disclosed as regards the structure of the OLEDs.

D46 is an expert declaration about the uniqueness of the invention to justify the broadness of the claims in the light of the opponents' insufficiency objections. D49 to D51 were filed to prove that the opponents' experiments in S10, D42 and D44 were "designed to fail". These documents thus equally constitute a reaction to the opponents' grounds of appeal.

Therefore, the board decided to admit D45 to D51 into the proceedings.

2.5 D53 and D54

2.5.1 D53 and D54 were filed by opponent III with its letters of 20 September 2013 and 2 October 2013, respectively.

2.5.2 D53 is a communication of the examining division during the examination of the divisional application D52 of the opposed patent, concerning the question whether the osmium complexes disclosed in D1 are organometallic. Since no decision had been taken yet by the examining division at the time the communication was issued, this communication merely represents a provisional opinion. Such a provisional opinion has no *prima facie* relevance for the present appeal. Therefore the board decided not to admit D53 into the proceedings.

2.5.3 D54 was filed by opponent III by its letter of 2 October 2013. D54 represents a reaction to the view expressed in the declaration D41 and maintained by the proprietor in the present appeal proceedings that the term "organometallic" implied the presence of metal-carbon bonds. The board therefore decided to admit this document into the proceedings.

2.6 S13 and S14

The declarations S13 (including exhibits 1 to 5 referred to in S13) and S14 were filed by opponent I with its letter of 21 October 2013. In the same way as D54, these declarations were filed to address the proprietor's view on the interpretation of the term "organometallic". Therefore, the board decided to admit S13 (including its exhibits 1 to 5) and S14 into the proceedings.

2.7 Also the admissibility of S7 to S9, D38, D52 and D55 was a matter of dispute between the parties. Since however, further discussion would have been necessary as regards the relevance of these documents (none of which was used by any of the parties when discussing sufficiency of disclosure during the oral proceedings), the board did not take a decision on the admissibility of these documents.

Main request (former second auxiliary request)

3. *The claimed subject-matter*

3.1 Claim 1 refers to "[a]n organic light emitting device comprising a heterostructure containing an emissive layer that produces luminescent emission when a voltage is applied across the heterostructure, wherein the emissive layer includes a molecule that is a phosphorescent organometallic iridium compound." (emphasis added).

3.2 For the subsequent discussion of sufficiency of disclosure, the meanings of the terms "organometallic" and "phosphorescent" are important.

3.3 It was a matter of dispute between the parties what the term "organometallic" means. More specifically, and contrary to the opponents, the proprietor was of the opinion that a metal-carbon bond between a metal and an organic ligand had to be present to qualify a complex as organometallic.

3.3.1 The proprietor argued in this respect that the patent contained its own definition of the term "organometallic". More specifically, page 7, lines 23 to 24 of the patent defined this term by way of

reference to "Inorganic Chemistry", Gary L. Miessler and Donald A. Tarr, 2nd edition, Prentice-Hall, 1998 (D4 in the present proceedings):

"The term "organometallic" is as generally understood by one of ordinary skill, as given, for example, in "Inorganic Chemistry" (2nd edition) by Gary L. Miessler and Donald A. Tarr, Prentice-Hall (1998)."

According to the proprietor, D4 and, by way of reference thereto, the patent defined the term "organometallic" such that it required a metal-carbon bond.

3.3.2 The board does not find the proprietor's argument convincing.

Firstly, the opposed patent uses the expression "for example" when referring to D4 and this sheds doubt on whether the definition in D4 (if any) is the only definition applicable in the opposed patent.

Secondly, there is no clear definition of the term "organometallic" in D4 itself. On the one hand, various passages of D4 state that an organometallic compound must have a metal-carbon bond (see pages 1 and 422, in line with the proprietor's argument), on the other, D4 contains the following additional statement on page 424:

"Strictly speaking, the only compounds classified as organometallic are those that contain metal-carbon bonds, but in practice complexes containing several other ligands similar to CO in their bonding, such as NO and N₂, are frequently included."

In view of this statement of D4, it must rather be assumed that the term "organometallic" does not require the presence of a metal-carbon bond (in line with the opponents' argument).

Hence, the skilled person reading the patent would be in doubt whether the reference to D4 means that the term "organometallic" in the patent has to be read such that a metal-carbon bond is present.

- 3.3.3 Since thus the patent itself does not provide a clear definition of the term "organometallic, it must be examined how the skilled person in the relevant technical field at the priority date of the patent would have defined this term.

The relevant technical field in the present case is the field of organic light emitting devices ("OLEDs"). As regards the understanding of the skilled person in this field, D25 and D29 are of relevance.

D25 (published in the priority year of the opposed patent, namely 1999) is a scientific article in the field of OLEDs, which has been authored by three of the inventors of the opposed patent. This article refers to the compound "PtOEP" as an organometallic complex (first sentence in the third paragraph on page 2099), the structure of which is given in figure 5(c). In PtOEP, the platinum metal is exclusively bound to nitrogen atoms and no platinum-carbon bond is present.

D29 was published in 2007, and, as explained by the proprietor, represents an overview of what had been done between the priority date of the patent and 2007. This document is a copy of the sub-section entitled "OLED utilizing organometallic emitters" of the

textbook "Comprehensive Organometallic Chemistry III". This sub-section refers to tables 6 to 9 which "give the device structures and performance metrics for monochromatic OLEDs that utilize **organometallic** emitters" (emphasis added). Figures 38 to 42 in this sub-section show molecular structures of such emitters, whereby numerous of these structures are devoid of any metal-carbon bond. In an exemplary way, reference is made to the osmium, ruthenium and beryllium complexes in the first and second row of figure 42, none of which contains a metal-carbon bond.

It is thus clear, and in fact it was not disputed by the proprietor, that at the priority date of the opposed patent (and thereafter), the term "organometallic" in the field of OLEDs does not require the presence of metal-carbon bonds.

- 3.3.4 In this respect, the proprietor argued that the declaration D41 of Professor W. A. Herrmann proved that the skilled person would have considered the term "organometallic" to require the presence of metal-carbon bonds. However, while certainly being an expert in organometallic chemistry, Professor W. A. Herrmann is not an expert in the field of OLEDs. Therefore this declaration is irrelevant to the question of how the skilled person in the field of OLEDs would understand the term "organometallic".

The proprietor additionally referred to the text book D5, which defines organometallic compounds as including at least one close metal-carbon interaction (first sentence of the footnote on page 345). However, this book carries the title "Chemistry of the Elements" and hence does not represent the understanding of the person skilled in the art of OLEDs either.

3.3.5 For the above reasons, the term "organometallic" in claim 1 of the patent must be understood broadly as covering all iridium compounds that contain organic ligands, including those compounds not containing any metal-carbon bond.

3.4 As regards the feature "phosphorescent" in claim 1, the proprietor explained during the oral proceedings that claim 1 required phosphorescence at an operating temperature of an OLED. Thus according to the proprietor compounds exhibiting phosphorescence at temperatures at which nitrogen or carbon dioxide were liquid did not qualify as "phosphorescent" in the terms of claim 1. This definition was not disputed by the opponents and is applied when discussing sufficiency of disclosure below.

4. *Sufficiency of disclosure*

4.1 Claim 1 defines the iridium compound both structurally as being an organometallic iridium compound as well as functionally, namely that it must be phosphorescent, ie that it must be capable of showing phosphorescence at an operating temperature of an OLED (see point 3.4 above).

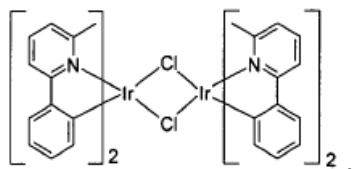
4.2 A definition of a group of compounds in a claim by both structural and functional features is generally acceptable under Article 83 EPC as long as the skilled person is able to identify, without undue burden, those compounds out of the host of compounds defined by the structural feature(s) in the claim which also fulfil the claimed functional requirement(s). Sufficiency of disclosure may for instance be acknowledged if all embodiments defined by the structural feature(s) of the

claim also meet the claimed functional requirement(s). If this is not the case, sufficiency may still be acknowledged if the common general knowledge at the priority date of the patent, or the patent itself, provided the skilled person with sufficient guidance on how to select those compounds out of the host of compounds defined by the structural feature(s) of the claim that also meet the claimed functional requirement(s) (T 435/91, point 2.2.1 of the Reasons and T 1063/06, point 5 of the Reasons).

4.3 In the present case, claim 1 contains the structural feature "organometallic iridium compound". This structural definition embraces any complex of iridium with an organic ligand (see point 3.3 above). Since there is an almost infinite number of conceivable organic ligands that form complexes with iridium, this structural definition covers an almost infinite and innumerable host of possible alternatives.

4.4 As shown by the opponents, in the present case the desired functional result of being phosphorescent is not achieved by all iridium compounds falling under the structural definition of claim 1.

4.4.1 In D39, opponent II describes the synthesis and properties of the compound "Ir-1"



The iridium complex Ir-1 contains the organic ligand phenylpyridine and thus meets the claimed structural definition of being an organometallic iridium complex.

It follows from D39 that an OLED containing this compound has an external quantum efficiency that is inferior to that of an OLED without this iridium compound. More specifically, in comparative experiment 2 without the iridium compound, the external quantum efficiency ("EQE") is 1.1%, which is higher than that obtained in experiments 1 and 2 with the iridium compound (0.05% and 0.2%).

The same iridium compound Ir-1 was tested in D40 by opponent III. It follows from D40 that at temperatures above 200°K, nearly no phosphorescent emission is observed for Ir-1.

Hence, even though the compound Ir-1 meets the structural definition in claim 1 of being an organometallic iridium complex, it does not meet the functional requirement in this claim of being phosphorescent.

4.4.2 D16 relates to the use of organometallic compounds of in particular iridium in emitting layers of OLEDs (page 1, lines 8 to 11). The following is stated on page 35, lines 20 to 22 of this document:

"The wrong choice of X ligands can also severally quench the emission from L_2IrX complexes. Both hexafluoro-acac and diphenyl-acac give either very weak emission o[r] no emission at all when used as the X ligand i[n] L_2IrX complexes. (emphasis added)"

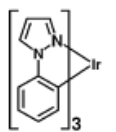
The acronym "acac" refers to acetylacetonate (see page 17, line 24 of D16). In an L_2IrX complex, in which X is hexafluoro-acac or diphenyl-acac, the iridium (Ir) is bound to the two oxygen atoms of the two carbonyl

groups of the acetylacetonate (see the formula of "acac" in figure 35 on page 156 of D29):



Hence, the L_2IrX complexes with the hexafluoro-acac and diphenyl-acac ligand of D16 meet the structural requirement of claim 1 of being an organometallic iridium complex. Nevertheless, as evidenced by the quoted passage of D16, they give either very weak or no emission at all.

- 4.4.3 D37 relates to certain phosphorescent iridium complexes (title) and states that "[n]o detectable emission from fac-Ir(ppz)₃ is observed in fluid or solid solutions at room temperature" (page 7995, left-hand column, lines 16 to 18). The compound fac-Ir(ppz)₃ has the following structure



This complex thus fulfils the structural requirement in claim 1 of being an organometallic iridium complex while it does not meet the functional requirement in this claim of being phosphorescent.

- 4.5 Thus, not all conceivable compounds falling under the structural definition in claim 1 (organometallic iridium compound) possess the claimed capability of being phosphorescent. It is thus up to the skilled person to identify within the almost infinite and innumerable host of alternatives covered by the structural definition of claim 1 those compounds that

are phosphorescent. As set out above (point 4.2), sufficiency of disclosure can therefore be acknowledged only if the skilled person is able to do so without undue burden, taking into account his common general knowledge at the priority date of the patent and the information available in the patent itself.

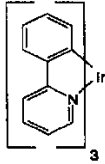
- 4.5.1 In this respect, document D16 is relevant. This document is an international patent application, the priority date of which is in the same year as that of the opposed patent and the list of inventors of which contains all inventors of the opposed patent. It is stated on page 35, lines 23 to 25 of D16 that the reasons why the organometallic hexafluoro-acac and diphenyl-acac ligands (see point 4.4.2. above) quench emission (and hence are not phosphorescent) are "not at all clear".

As further set out on page 3, lines 1 to 3 of D16, while many organic materials exhibit fluorescence, "only a very few have been identified which are also capable of efficient room temperature phosphorescence".

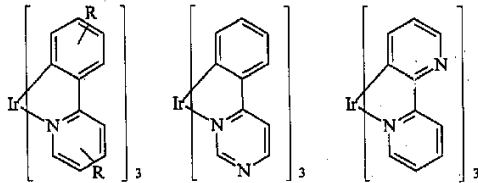
There is thus no reason to believe, and none was invoked by the proprietor, that the skilled person was able on the basis of his common general knowledge at the priority date of the opposed patent to identify those compounds out of the host of alternatives covered by the structural definition of claim 1 that are phosphorescent.

- 4.6 It remains to be examined whether, on the basis of the information contained in the opposed patent itself, the skilled person would have been enabled to identify those organometallic iridium compounds that are phosphorescent.

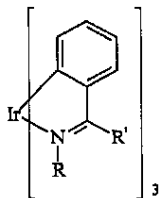
4.6.1 The only iridium compound used in the examples of the opposed patent is Ir(ppy)₃



In paragraph [0031] of the patent, it is furthermore stated that "[o]ne may have alkyl substituents or alteration of the atoms of the aromatic structure". This statement is illustrated by the following structures (with the R groups being alkyl or aryl, preferably in the 3,4,7 and/or 8 positions):



It is finally stated that other possible emitters can be illustrated by the following structure (R and R' being independently alkyl or aryl):



4.7 Hence, the opposed patent discloses five specific structures of phosphorescent iridium complexes. The opposed patent does however not contain any information as to how further phosphorescent iridium complexes, different from the above five structures (but covered by the structural definition of claim 1), could be

identified. The skilled person thus can only rely on trial and error to find out which further iridium complexes out of the almost infinite host of iridium complexes covered by the structural definition of claim 1 are phosphorescent.

- 4.8 The board acknowledges in this respect that a reasonable amount of trial and error may be acceptable. This presupposes, however, that sufficient information is available that leads the skilled person directly towards success through the evaluation of initial failures (T 480/11, point 3.4 of the Reasons). It is however exactly information about how initial failures can be transformed into success that is missing in the present case.

Claim 1 is therefore nothing more than an invitation to perform a research programme to identify suitable iridium complexes (other than those specifically disclosed in the patent) by trial and error. This amounts to an undue burden, such that the invention underlying claim 1 is insufficiently disclosed.

- 4.9 The proprietor argued in this respect that the five structures in the patent provided a unique concept by which phosphorescent iridium compounds could be identified within the host of iridium compounds covered by the structural definition of claim 1. The proprietor in this respect also referred to the expert declaration D46 of Mr M.S. Weaver, according to which the provision of OLEDs comprising organometallic iridium emitters was a technological breakthrough and thus justified a broad protection.

- 4.9.1 It is however more than doubtful to the board that it is possible to derive any general concept out of the

five specific structures (or any specific elements thereof) exemplified in the patent.

- 4.9.2 But even if, in the proprietor's favour, one accepted that the concept derivable from the five specific structures is a cyclic moiety comprising an iridium atom, an aromatic carbon atom and a nitrogen atom, the aromatic carbon atom and the nitrogen atom being bound by a σ -bond to the iridium atom (this cyclic moiety is present in all five structures), sufficiency of disclosure could still not be acknowledged.

More specifically, claim 1 extends to classes of iridium complexes that are entirely different from this concept, such as ferrocene-like compounds (in which the iridium atom is bound to the aromatic ligands via π - rather than σ -bonds) or acetylacetonate complexes (in which the iridium atom is not bound to any aromatic carbon atom or nitrogen atom at all). Hence, the granting of a patent monopoly on the basis of claim 1 would by far extend the technical contribution the patent makes over the state of the art. This would violate the general legal principle that the protection covered by a patent should correspond to the technical contribution to the art made by the disclosure of the invention described therein (T 435/91, point 2.2.1 of the Reasons).

- 4.9.3 The board is in this respect aware of the decision of the German Supreme Court (Bundesgerichtshof) X ZB 8/12 of 11 September 2013. In this decision, the court held that it is not objectionable as regards sufficiency of disclosure that a functional definition of a group of substances does not only cover known substances or those disclosed in the patent specification, but also those that will be made available in the future only,

or those the provision of which may require an inventive step ("Einer Umschreibung einer Gruppe von Stoffen nach ihrer Funktion in einem Verwendungsanspruch steht weder entgegen, dass eine solche Fassung des Patentanspruchs neben bekannten oder in der Patentschrift offenbarten Stoffen auch die Verwendung von Stoffen umfasst, die erst zukünftig bereitgestellt werden, noch dass die Bereitstellung erfinderische Tätigkeit erfordern kann").

The board does however not share this view. As set out in T 435/91 (point 2.2.1 of the Reasons), in order for a functional definition of a group of substances in a claim to meet the requirements of Article 83 EPC, the substances falling under this functional definition must all be available to the skilled person. This approach is based on the above-mentioned general legal principle that the protection covered by a patent should correspond to the technical contribution to the art made by the disclosure of the invention described therein. This legal principle means that the patent monopoly is not extended to subject-matter which, after reading the patent specification, would not be at the disposal of the skilled person, eg since an inventive step would still be required.

4.10 The proprietor submitted numerous further arguments which are not convincing for the following reasons:

4.10.1 Claim 1 covered only those organometallic iridium complexes that were phosphorescent. Hence the complexes in D16, D37, D39 and D40 were not covered by the claim, such that claim 1 did not embrace any non-workable embodiments.

This argument is in the board's view not relevant. The question that is decisive is not whether claim 1 covers non-workable embodiments but whether the identification of phosphorescent compounds out of the host of alternatives covered by the structural definition of the claim amounts to an undue burden.

4.10.2 The opponents had not provided substantiated facts to put sufficiency of disclosure in doubt.

First of all, this argument is not correct since the opponents have provided facts substantiated by the evidence D16, D37, D39 and D40.

Secondly, the probative force of the opponents' submissions is clearly sufficient. The board in this respect acknowledges that an initial presumption exists that a patent which has been granted is sufficiently disclosed and that therefore the burden of proof to rebut this assumption initially lies with the opponent(s). The weight of the submissions required for rebuttal depends, however, on the strength of the initial presumption of sufficiency of disclosure. A strong presumption requires more substantial submissions than a weak one (T 63/06, point 3.3.1 of the Reasons).

In the present case, the patent establishes phosphorescence in the case of only one iridium complex, namely $\text{Ir}(\text{ppy})_3$. No proof at all has been presented for the further complexes falling under the structural definition of claim 1 as regards their phosphorescence. The initial presumption that the invention underlying the opposed patent is sufficiently disclosed can therefore only be a weak one. In view of this, the probative force of the evidence D16, D37, D39

and D40 provided by the opponents is clearly sufficient to rebut this presumption.

- 4.10.3 One example in the patent was enough to prove sufficiency of disclosure.

This argument is at variance with the rationale developed in decisions T 409/91 (point 3.5 of the Reasons) and T 435/91 (points 2.2.1 and 2.2.2 of the Reasons), that sufficiency must be established over the entire scope of the claims and that it is thus not enough that there is (at least) one way to carry out the invention.

- 4.10.4 A chemist would have no problem to synthesise iridium complexes and it would be a routine task to check whether these were phosphorescent or not. This was proven by D29 which showed that the skilled person had been able to synthesize and test iridium complexes and thereby identify those that were phosphorescent.

The board's finding of an undue burden does not rest on the assumption that the synthesis of individual iridium complexes amounts to an undue burden. On the contrary, undue burden is considered to exist in view of the almost infinite number of complexes that fall under the structural definition given in claim 1, and the need to find out by trial and error which of those are phosphorescent.

- 4.10.5 The skilled person could find in D9 and D10 iridium complexes that were phosphorescent.

It is true that these documents disclose several organometallic phosphorescent iridium complexes. The skilled person might therefore indeed have been able to

identify these complexes when trying to find out which of the iridium compounds falling under the structural definition of claim 1 are phosphorescent. This does however not provide him with any assistance with regard to the question which of the almost infinite number of further complexes falling under the structural definition of claim 1 are phosphorescent.

- 4.11 The invention underlying claim 1 thus does not meet the requirements of Article 83 EPC. The main request is therefore not allowable.

In view of this, the further insufficiency objections raised by the opponents need not to be dealt with in the present decision.

First auxiliary request (former third auxiliary request)

5. *Remittal*

- 5.1 After the board had announced its opinion on the allowability of the main request, including its interpretation of the term "organometallic" (namely as not requiring the presence of metal-carbon bonds), the proprietor requested that the case be remitted to the opposition division for further prosecution on the basis of the first auxiliary request. The proprietor argued that remittal was necessary since the case was now discussed on the basis of a completely new definition of the term "organometallic". More specifically, the proprietor had assumed up to this point in time that the term "organometallic" required the presence of metal-carbon bonds, an assumption which was different from the board's understanding of the term.

- 5.2 As confirmed in eg R 9/10 (points 8 and 9 of the Reasons), there is no absolute right for a remittal of a case in order to be heard on a certain issue before both first and second instance. Such remittal is at the board's discretion.
- 5.2.1 In the present case, the issue for which the proprietor requested remittal (the interpretation of the term "organometallic") was a point of discussion between the parties from the very start of the present appeal proceedings. More specifically, opponent I discussed in its grounds of appeal (point 2.6) the meaning of the term "organometallic" and came to the conclusion that rather than the narrow definition applied by the proprietor during the opposition proceedings, a broader definition applied, namely that this term included complexes wherein the metal and the organic ligands were not bonded through direct metal-carbon bonds. Also later in the proceedings, this issue was pursued by opponents I and III. More specifically, in its letter of 21 October 2013, opponent I reiterated that the OLED literature did not require organometallic complexes to have any metal-carbon bonds. Similarly, opponent III explained in its letter dated 2 October 2013 that a broad definition of the term "organometallic" had to apply, such that complexes without metal-carbon bonds were included. In the same way as the opponents, the proprietor discussed this issue from the very start of the present appeal proceedings. For instance, in the paragraph bridging pages 11 and 12 of the grounds of appeal, the proprietor stated that organometallic compounds were defined as compounds containing direct metal-carbon bonds and that the molecules disclosed in figure 1 of D1 were not organometallic because they did not contain such a metal-carbon bond.

In fact, the issue whether the term "organometallic" required the presence of metal-carbon bonds was already a point of dispute during the opposition proceedings, where opponent III stated on pages 3 and 4 of its letter dated 18 August 2008:

"Dass der Ausdruck "organometallisch" in Zusammenhang mit organischen Leuchtdioden eher weit auszulegen ist, ergibt sich des Weiteren aus D2, einer Veröffentlichung von in EP'238 genannten Erfindern, worin organische Leuchtdioden offenbart sind, die als Emittermaterial PtOEP enthalten, das - wie die Patentinhaberin unter Ziffer VI.2 ihrer Eingabe vom 13. März 2008 erwähnt - keine Kohlenstoff-Metall-Bindungen aufweist." (translation by the board: "That the term "organometallic" in the context of organic light emitting diodes has to be interpreted rather broadly can be deduced furthermore from D2, a publication of inventors named in EP'238, where organic light emitting diodes are disclosed, which contain as emitting material PtOEP, which - as mentioned by the proprietor in point VI.2 of its submission dated 13 March 2008 - does not contain any carbon-metal bonds).

The interpretation of the term organometallic adopted by the board is thus not a completely new definition but, on the contrary, has been used by the opponents during the opposition proceedings and, in any case, has been extensively discussed since the outset of the present appeal proceedings.

- 5.2.2 Thus, the board did not see any reason to remit the case to the opposition division for a further discussion of this issue. Therefore, the board refused the proprietor's request for remittal.

6. *Admissibility of the first auxiliary request*

No objections were raised by the opponents and the board did not see any reasons not to admit this request. Accordingly the first auxiliary request was admitted into the proceedings.

7. *Sufficiency*

7.1 The claims of the first auxiliary request are identical to the claims of the main request except that the organometallic iridium compound in claim 1 has been defined to be "cyclometallated".

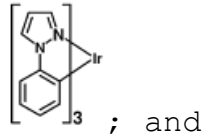
7.2 Even though claim 1 has been restricted to some extent by this amendment, the structural definition of the iridium compound in this claim still covers an almost infinite host of alternative compounds. More specifically, purely aliphatic as well as purely aromatic ligands are covered, neither of these groups being specified at all as regards their nature, number, location and type of binding (σ - or π -electron bonding).

7.3 The compounds tested in D16, D37, D39 and D40, namely:

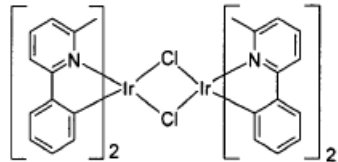
- the L_2IrX complex of D16 with X being hexafluoroacac and diphenyl-acac and with the iridium and acac forming the following structure:



- the fac-Ir(ppz)₃ complex of D37



- the "Ir-1" complex of D39 and D40



are all cyclometallated, but not phosphorescent (point 4.4 above).

Therefore, in the same way as for the main request, the iridium compounds covered by the structural definition in claim 1 of the first auxiliary request do not all meet the functional requirement of being phosphorescent. Hence, for the same reasons as given with regard to the main request, the skilled person has to identify by way of trial and error those iridium compounds that are phosphorescent out of the almost infinite host of alternatives covered by claim 1.

- 7.4 The proprietor argued that by way of the restriction to cyclometallated iridium compounds, claim 1 now reflected the concept provided by the five structures disclosed in the opposed patent (see point 4.9 above).

In the same way as for the main request, the board is however of the opinion that no such concept is derivable from the patent.

Furthermore, even if, in the proprietor's favour, the concept is considered to be a cyclic moiety comprising an iridium atom, an aromatic carbon atom and a nitrogen

atom, the aromatic carbon atom and the nitrogen atom being bound by a σ -bond to the iridium atom (point 4.9.2 above), sufficiency of disclosure could still not be acknowledged. More specifically, claim 1 is still far from reflecting this concept since, even though now being restricted to cyclometallated iridium compounds, it covers numerous classes of iridium compounds that are entirely different from this concept, such as the acetylacetonate complexes L_2IrX of D16 with X being hexafluoro-acac and diphenyl-acac (which are cyclometallated but do not have any cyclic moiety in which an aromatic carbon atom or nitrogen atom is linked to an iridium atom by a σ -bond). Hence, for the same reasons as given with regard to the main request, this argument of the proprietor must fail.

7.5 The invention underlying claim 1 of the first auxiliary request is thus insufficiently disclosed. The first auxiliary request is therefore not allowable.

Second auxiliary request (former fourth auxiliary request)

8. *Admissibility of the second auxiliary request*

No objections were raised by the opponents and the board did not see any reasons not to admit this request. Accordingly, the second auxiliary request was admitted into the proceedings.

9. *Sufficiency*

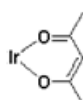
9.1 The claims of the second auxiliary request differ from those of the first auxiliary request in that in claim 1 the iridium compound is additionally defined to have an aromatic ligand ("phosphorescent cyclometallated

organometallic iridium compound with an aromatic ligand").

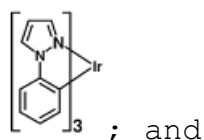
The nature and location of the aromatic ligand is not specified in claim 1. As regards this ligand, the claim thus covers any type of aromatic system (eg 5-, 6-, or 7-membered systems), any number of condensed or non-condensed aromatic rings, any type and number of heteroatoms in the aromatic system and any type of bonding between the iridium atom and the aromatic group(s) of the ligand (directly bonded via a σ -bond, indirectly bonded via σ -bonds, eg, by means of a polyalkylene bridging group or bonded via π -electron-bonding). Hence, even though claim 1 has been restricted to some extent by the introduction of the feature "cyclometallated" and "with an aromatic ligand", the structural definition of the iridium compound in this claim still covers an almost infinite host of alternative compounds.

9.2 The compounds tested in D16, D37 and D39, and D40, namely:

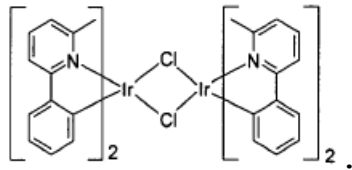
- the L_2IrX complex of D16 with X being diphenyl-acac, the iridium and the acac forming the following structure



- the fac- $Ir(ppz)_3$ complex of D37



- the "Ir-1" complex of D39 and D40



are all cyclometallated and all contain two or more aromatic ligands, but none of these complexes is phosphorescent (see point 4.4 above).

Therefore, in the same way as for the main and first auxiliary requests, the iridium compounds covered by the structural definition in claim 1 of the second auxiliary request do not all meet the functional requirement of being phosphorescent. Hence, for the same reasons as given above with regard to the main and first auxiliary requests, the skilled person has to identify by way of trial and error those iridium compounds that are phosphorescent out of the almost infinite host of alternatives covered by claim 1.

9.3 The proprietor argued that by way of the restriction to a cyclometallated iridium compound with an aromatic ligand, claim 1 now reflected the concept provided by the five structures in the opposed patent (see point 4.9 above).

In the same way as for the main and the first auxiliary request, the board is however of the opinion that no such concept is derivable from the patent.

And again, even if, in the proprietor's favour, the concept is considered to be a cyclic moiety comprising an iridium atom, an aromatic carbon atom and a nitrogen atom, the aromatic carbon atom and the nitrogen atom

being bound by a σ -bond to the iridium atom (point 4.9.2 above), sufficiency of disclosure could still not be acknowledged. More specifically, claim 1 in fact is still far from reflecting this concept since it still covers numerous classes of iridium compounds that are entirely different from those provided by this concept (if any) such as the acetylacetonate complex L_2IrX of D16 with X being diphenyl-acac or ligands with two aromatic rings, each bonded to the iridium via π -electron bonding. Hence, for the same reasons as given with regard to the main and first auxiliary requests, this argument of the proprietor must fail.

- 9.4 The invention underlying claim 1 of the second auxiliary request is therefore insufficiently disclosed. The second auxiliary request is thus not allowable.

The opponents' objections under Articles 84 and 123(2) EPC

10. The opponents raised objections under Articles 84 and 123(2) EPC against the amendments made in the auxiliary requests. During the oral proceedings, the board reached the conclusion that the requirements of these Articles were met by each of the auxiliary requests. Since, however, none of the auxiliary requests is allowable for the reasons given above (lack of sufficiency of disclosure), there is no need to address the allowability under Articles 84 and 123(2) EPC in the present written decision.

Third party observations

11. With letter of 16 August 2013, third party observations were filed.

As with any third-party observations filed during appeal, the board has the discretion to take these into consideration or to disregard them. In the present case, the third-party observations were filed late, namely only three and a half months before the oral proceedings. Furthermore, they essentially reiterate the submissions of the opponents. Finally, none of the parties relied on them. Consequently, they appear not to be of any *prima facie* relevance. The board therefore decided to disregard them.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.
3. The decision of the opposition division to reject transfer of the opposition from Sumation Company Limited to Sumitomo Chemical Co., Ltd is set aside and the transfer of the opposition to Sumitomo Chemical Co., Ltd is ordered to be registered.

The Registrar:

The Chairman:



M. Cañueto Carbajo

W. Sieber

Decision electronically authenticated