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**Datasheet for the decision
of 12 January 2007**

Case Number: T 0633/03 - 3.5.04

Application Number: 98200376.6

Publication Number: 0853427

IPC: H04N 3/15

Language of the proceedings: EN

Title of invention:
Imaging devices, systems and methods

Applicant:
Goldpower Limited

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 83, 84, 111(1)

Keyword:
"Disclosure - sufficiency (yes)"
"Claims - clarity (yes)"
"Claims - support by description (yes)"
"Decision re appeals - remittal (yes)"

Decisions cited:
-

Catchword:
-



Case Number: T 0633/03 - 3.5.04

D E C I S I O N
of the Technical Board of Appeal 3.5.04
of 12 January 2007

Appellant: Goldpower Limited
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 30 October 2002
refusing European application No. 98200376.6
pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: F. Edlinger
Members: A. Teale
J. Willems

Summary of Facts and Submissions

- I. The appeal is against the decision by the examining division to refuse European patent application No. 98 200 376.6.
- II. According to the appealed decision, the application failed to sufficiently disclose the discrimination circuitry for discarding charge from a radiation hit on the respective pixel detector corresponding to energy less than a predetermined value mentioned in the claims of the requests then on file, contrary to Article 83 EPC. The decision also pointed out that the sensor could be exposed to radiation having a mixture of different energies, or even a continuous spectrum. Implementing charge discrimination according to the radiation energy under these conditions would not be obvious to a person skilled in the art. The claims would, for instance, cover the case where the predetermined energy value corresponded to yellow radiation so that charges generated by red radiation were discarded whilst charges corresponding to green radiation were accumulated. It was "totally obscure" how the invention achieved this. For the same reasons, the independent claims were also found to lack clarity and support by the description, contrary to Article 84 EPC.
- III. In the statement of grounds the appellant filed a revised set of claims and provided explanations as to how a person skilled in the art could carry out the invention.

- IV. In an annex to a summons to oral proceedings the board expressed its preliminary opinion that, since the independent claims were not limited to the case where each readout signal corresponded to a single incident radiation event, doubt arose, Article 84 EPC, as to whether the claims were intended to cover the case where each readout signal corresponded to a plurality of radiation events. Concerning the embodiment of the description where pixel values were discarded prior to charge accumulation the board raised doubts as to sufficiency of disclosure, Article 83 EPC.
- V. In the oral proceedings held on 12 January 2007 the appellant filed an amended set of claims 1 to 13 and an amended description consisting of pages 1 to 4, 4a and 5 to 48. The appellant withdrew all previous requests filed in writing and requested that the decision under appeal be set aside and that the case be remitted to the first instance for further prosecution on the basis of the new amended request filed in the oral proceedings.
- VI. Claim 1 reads as follows:
- "An imaging system (10) comprising an imaging device (16) for imaging radiation (14), wherein:
- said imaging device (16) comprises at least one semiconductor substrate and comprises an array of pixel cells (18) formed from an array of pixel detectors (19) which generate charge in response to incident radiation and a corresponding array of pixel circuits (20);
- each of said pixel circuits (20) is associated with a respective pixel detector (19) for accumulating charge resulting from radiation incident on said pixel

detector, is individually addressable and comprises charge accumulation circuitry (50,350) capable of accumulating charge from successive radiation hits on said pixel detector; and

the imaging system (10) includes:

control electronics (24) enabling pixel circuits (20) associated with individual pixel cells (18) to be scanned for reading out signals providing values representative of charge from the pixel circuits of individual pixel cells at a selected readout speed, the selected readout speed being controllable such that individual ones of said readout signals may correspond to a single radiation hit;

at least one data reduction processor (DRP) operable, after said readout, to discard values representative of charge from a single radiation hit on a respective pixel detector corresponding to an energy less than a predetermined value; and

data storage for storing data corresponding to values not discarded by said at least one DRP, for each of a plurality of successive readouts."

Claims 2 to 12 are dependent on claim 1.

Claim 13 reads as follows:

"A method for imaging radiation using a semiconductor imaging device (16) comprising an array of pixel cells (18) formed from an array of pixel detectors (19) which generate charge in response to incident radiation (14) and a corresponding array of individually addressable pixel circuits (20) which include charge accumulation circuitry (50, 350) capable of accumulating charge from

successive radiation hits on a corresponding pixel detector, said method comprising:

- i) reading out signals providing values representative of charge from the pixel circuits of individual pixel cells at a selected readout speed, such that individual readout signals may correspond to a single radiation hit;
- ii) discarding values representative of charge from a single radiation hit on a respective pixel detector corresponding to an energy less than a predetermined value; and
- iii) storing data corresponding to values not discarded in step (ii), for each of a plurality of successive readouts."

VII. The appellant's arguments in the oral proceedings may be summarized as follows. The appellant declared that he did not wish to rely on the explanations given in the statement of grounds of appeal as to how a person skilled in the art would achieve the desired effect by discarding pixel values prior to charge accumulation. The invention provided a system and method for excluding radiation that had been scattered before hitting a pixel detector of an imaging device based on the fact that a radiation event resulting from scattering had a lower energy than would normally be expected for that imaging application. The patent application concerned both high intensity and low intensity imaging applications; see page 6, lines 23 to 32 of the description. In the low intensity imaging embodiments described in the context of the DRPs (data reduction processors) the readout speed could be optimised to match the radiation intensity. Under these circumstances read out values could represent the

charge and thus the energy from a single radiation hit. The charge accumulated in the capacitance of the pixel circuits was read out at appropriate intervals and compared in the one or more DRPs with a corresponding energy reference value and discarded if the comparison indicated that the radiation event - having an energy below the reference value - resulted from scattering. If however the read out values corresponded to an energy higher than the predetermined value then they were added to those already stored. While it was not possible to determine in each and every case that the charge value resulted from a single radiation hit, the imaging system was significantly improved by eliminating those radiation events attributable to scattering before processing.

VIII. At the end of the oral proceedings the board announced its decision.

Reasons for the Decision

1. The appeal is admissible.

2. The amendments

Editorial amendments aside, claim 1 has been amended - compared to claim 1 as originally filed - by adding features relating to the control electronics for scanning and reading out signals from the pixel circuits, the readout speed, at least one data reduction processor (DRP) and data storage for storing data not discarded by the at least one DRP.

Corresponding amendments have been made to claim 13 to

define the readout speed and setting out the storing of data not discarded in the second step. Claims 2 and 6 have been adapted to the new wording of claim 1.

These amendments have a basis in page 5, lines 28 to 37, page 37, line 11 to page 38, line 5, page 40, lines 15 to 22, page 42, lines 11 to 20 and page 43, lines 14 to 34 of the application as originally filed.

The description has been adapted to the amended claims at pages 4 and 4a. Embodiments have been deleted which do not fall within the present claims, in particular that mentioned in the appealed decision (reasons, section 1.1a) in which charge discrimination of incoming radiation hits occurs prior to accumulation on the pixel circuit.

The board finds that the claims satisfy the requirements of Article 123(2) EPC.

3. Sufficiency of disclosure, Article 83 EPC

The reasoning given in the appealed decision regarding Article 83 EPC is based in essence on the uncertainty as to how the invention measures the energy of single radiation hits. The board notes that the embodiment mentioned in the appealed decision (reasons, section 1.1a) in which charge discrimination of incoming radiation hits occurs prior to accumulation on the pixel circuit has now been deleted. Moreover the claims have now been directed to embodiments in which comparison of hit energy with a threshold occurs in a DRP after charge accumulation in the pixel circuits;

see the passages cited in point 2 above, which also apply to the present description.

Each radiation hit incident on a pixel detector causes a charge proportional to the hit energy to be accumulated in a pixel circuit; see page 39, line 33 to page 40, line 1 of the description. The accumulated charge is read out from each pixel circuit after a certain time. Since an unknown number of hits can occur between readouts, the accumulated charge read out is, to some extent, ambiguous as a measure of hit energy. However by selecting a readout speed appropriate to the radiation intensity the probability that more than one hit occurs per readout period can be optimized, meaning - in the board's understanding - reduced to an acceptable level. A data reduction processor (DRP) then compares the read out values representative of accumulated charge with a threshold. Values below the threshold are discarded as being attributable to scattering; the non-discarded values are used to form an image less affected by scattering. In terms of the example used by the examining division, an appropriate choice of readout speed would result in the majority of pixel detectors receiving at most one hit - be it red or green - in each readout period. In the board's view the fact that the system cannot eliminate the effects of all of the hits attributable to scattering would not prevent the skilled person from achieving the desired result of minimising the effect of scattered radiation; see, for instance, page 14, lines 4 to 14.

The board concludes that the application discloses the invention in a manner sufficiently clear and complete

for it to be carried out by a person skilled in the art, thus satisfying Article 83 EPC.

4. Clarity and support, Article 84 EPC

In the light of the amendments made to the application, the board is satisfied that the wording of the claims is now clear. Support for the claims is provided by the embodiments in which comparison of hit energy with a threshold occurs in a DRP after accumulation in the pixel circuits mentioned above in connection with sufficiency of disclosure.

Hence the board finds that the claims satisfy Article 84 EPC.

5. Remittal, Article 111(1) EPC

Since novelty and inventive step have not yet been considered by the first instance, the board exercises its discretion under Article 111(1) EPC to remit the case to the first instance according to the appellant's request.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance for further prosecution.

The Registrar:

The Chairman:

D. Sauter

F. Edlinger