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**Datasheet for the decision  
of 4 September 2014**

**Case Number:** T 0543/11 - 3.5.05

**Application Number:** 03742400.9

**Publication Number:** 1540909

**IPC:** H04L23/02, H04L27/10,  
H04L27/22, H03M13/03

**Language of the proceedings:** EN

**Title of invention:**

IMPROVING HIERARCHICAL 8PSK PERFORMANCE

**Applicant:**

The Directv Group, Inc.

**Headword:**

Hierarchical 8PSK demodulation

**Relevant legal provisions:**

EPC Art. 83

**Keyword:**

Sufficiency of disclosure - (yes)

Remittal to the department of first instance - (yes)

**Decisions cited:**

**Catchword:**



**Beschwerdekammern  
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Case Number: T 0543/11 - 3.5.05

**D E C I S I O N**  
**of Technical Board of Appeal 3.5.05**  
**of 4 September 2014**

**Appellant:** The Directv Group, Inc.  
(Applicant) 2250 E. Imperial Highway  
El Segundo, CA 90245 (US)

**Representative:** Jackson, Richard Eric  
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**Decision under appeal:** **Decision of the Examining Division of the  
European Patent Office posted on 27 August 2010  
refusing European patent application  
No. 03742400.9 pursuant to Article 97(2) EPC.**

**Composition of the Board:**

**Chair** A. Ritzka  
**Members:** P. Cretaine  
D. Prietzel-Funk

## **Summary of Facts and Submissions**

- I. This appeal is against the decision of the examining division announced in oral proceedings held on 23 July 2010, with reasons dispatched on 27 August 2010, refusing European patent application No. 03 742 400.9 for insufficiency of disclosure (Article 83 EPC). The argumentation of the examining division was that the demodulator 402 in Figure 4 was not described in a manner sufficiently clear for the skilled person to be able to implement the claimed method, even taking into account the common general knowledge as exemplified by pages 725 to 764 of the book of E. Lee et al.: "Digital Communications".
- II. Notice of appeal was received on 3 November 2010. The appeal fee was paid on the same day. A statement setting out the grounds of appeal was received on 6 January 2011. The appellant requested that the decision under appeal be set aside.
- III. A summons to oral proceedings scheduled for 4 September 2014 was issued on 1 April 2014. In an annex accompanying the summons the board gave its preliminary opinion that the application did not meet the requirements of Article 83 EPC.
- IV. By letter dated 4 August 2014 the appellant provided further arguments supporting its request.
- V. Oral proceedings were held as scheduled on 4 September 2014. During them, the appellant presented further arguments. It requested that the decision under appeal be set aside and that a patent be granted on the basis of claims 1 to 8 of the request submitted with the letter dated 23 June 2010.

VI. Claim 1 of the sole request reads as follows:

"1. A method for demodulating and decoding a hierarchically modulated composite signal (202) having a first signal modulated at a first modulation at a first hierarchical level and a second signal modulated at a second modulation at a second hierarchical level, comprising the steps of:  
demodulating and decoding the hierarchically modulated composite signal (202) with a first demodulator (204) to produce first symbols (212) from the first modulation at the first hierarchical level;  
error-correct decoding the first symbols to produce error-corrected first symbols (212);  
re-encoding the error-corrected first symbols (212), characterised by:  
demodulating the hierarchically modulated signal (202) with a second demodulator using the re-encoded first symbols (212) to produce second symbols (404);  
subtracting (214) the re-encoded error-corrected first symbols (212) from the second symbols (404) to obtain the second signal modulated at the second modulation at the second hierarchical level; and  
demodulating and decoding the second signal modulated at the second modulation at the second hierarchical level with a third demodulator to produce second symbols (222) from the demodulated second signal."

The request comprises a further independent claim (claim 6) directed to a corresponding system.

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

## Reasons for the Decision

1. The appeal is admissible.
2. Insufficiency of disclosure - Article 83 EPC
  - 2.1 The decision under appeal was based on the sole objection that the application did not meet the requirements of Article 83 EPC, because the demodulator 402 was not described in a manner sufficiently clear for the person skilled in the art to be able to implement the claimed method and system.

The signal demodulator illustrated in block 402 of Figure 4 receives as inputs the hierarchically modulated composite signal 202 and the quasi-error-free (QEF) re-encoded HP symbols. According to paragraph [0038] of the published application, the re-encoded HP symbols enable the demodulator 402 to demodulate the composite signal 202 with improved carrier/tracking recovery. For the implementation of demodulator 402 of Figure 4, and also of the demodulators represented in blocs 204 and 216, the description refers (see paragraph [0039]) in particular to the book by E. Lee et al. entitled "Digital Communications", pages 725 to 736 (carrier recovery) and 737 to 764 (timing recovery).

- 2.2 Lee describes in pages 728 to 732 a decision-directed carrier recovery scheme which the appellant is relying on for illustrating the common general knowledge. In particular, Figure 16.2 of Lee relates to a carrier recovery loop used in implementing a demodulator that tries to compensate the phase error  $\varepsilon_k$  of a carrier demodulated signal  $q_k$ . The system should prevent demodulation with a wrong frequency which would lead to

a rotation of the received constellation and, in the case of a PSK modulation, to the crossing of boundaries between quadrants resulting in the false determination of phase-modulated symbols (see Figure 16.1). This is achieved by continuously improving the signal  $q_k$  by taking into account the phase error  $\varepsilon_k = \Theta_k - \Phi_k$  with respect to decisions  $\hat{A}_k$  which are made on the signal  $q_k$ ,  $\Theta_k$  being the frequency offset and phase jitter and  $\Phi_k$  being the receiver estimate of the carrier phase (see expression (16.8)). The carrier recovery loop of Figure 16.2 receives as input the signal to be demodulated and outputs the decision signal  $\hat{A}_k$ .

- 2.3 The board agrees with the appellant that the skilled person, intending to implement the demodulators 204 and 402 based on the essential technical principles of Figure 16.2 of Lee, will consider that the composite input signal in Figure 4 of the application is equivalent to the signal input from the left-hand side into the phase detector in Figure 16.2 of Lee.
- 2.4 The description states with respect to Figure 4 (see in particular paragraph [0030]) that the signal 206 is a phase-modulated signal whose phase information is representative of HP data values (see Figure 1B: determining the location of the phase of the received composite signal in one of the four quadrants enables the detection of one of the HP symbols AB). These HP symbols are then decoded in the HP Symbol Decode bloc 208 and error-corrected in the HP FEC Decode bloc 210 to provide HP data 212. The HP data values signal, also referred to as HP symbol stream 304, is re-encoded in the HP Re-Encode bloc 302 to provide an improved, i.e. error-corrected, version of the phase-modulated signal 206. The skilled person, who according to paragraph [0039] employs a typical demodulator as described in

Lee to implement demodulator 204, realises immediately that the carrier has to be removed from the input composite signal to provide a phase-modulated signal, equivalent to the signal  $q_k$  in Lee, and that this phase-modulated signal is then decided upon to provide the phase-modulated output signal 206, equivalent to the signal  $\hat{A}_k$  in Figure 16.2 of Lee. The signal corresponding to the decision signal  $\hat{A}_k$  in Lee that the skilled person will use for implementing carrier recovery in the demodulator 204 is thus the phase-modulated signal 206. The skilled person is thus able to implement the demodulator 204 based only on the technical content of the present application and his common general knowledge, as exemplified by the above-mentioned disclosure of Lee. The board further notes that the Article 83 EPC objection underlying the decision under appeal was related to the implementation not of demodulator 204 but of demodulator 402. However, the skilled person will realise, as explained below, that demodulator 402 can be implemented starting from the same conventional structure as modulator 204, based on Figure 16.2 of Lee.

- 2.5 The skilled person learns from the description in paragraph [0029] that the aim of the present application is to avoid degradations in the carrier recovery loop due to errors in the uncoded symbol decisions used in predicting the tracking error at each symbol time. The skilled person also realises from paragraph [0038] that this aim is achieved by having the HP-data 212 provided to the demodulator 402 to demodulate the input signal 202/406. From paragraph [0040], the skilled person grasps that the demodulator 402 is provided with re-encoded HP symbols without symbol decision errors. The skilled person will, in the board's view, thus implement the

demodulator 402 such that the improved phase-modulated signal issued from the HP-Re-Encode block 302 is used as the decision signal in the carrier recovery loop of the demodulator 402, i.e. as a signal corresponding to the decision signal  $\hat{A}_k$  in Figure 16.2 of Lee. The board therefore judges that the skilled person is able to implement the demodulator 402 based only on the technical content of the present application and his common general knowledge, as exemplified by the above-mentioned disclosure of Lee.

2.6 The application therefore meets the requirements of Article 83 EPC.

3. Remittal

The question of compliance with Article 52(1) EPC, in particular as regards inventive step, was not discussed during the oral proceedings before the department of first instance. Although the decision under appeal mentioned (see part III: "Further remarks") the opinion of the examining division in that respect, the board decided not to address this question during the oral proceedings. Remittal to the department of first instance for further prosecution (Article 111(1) EPC) is judged to be the most appropriate course of action under the given circumstances, in order not to deprive the appellant of the possibility of having all other outstanding matters decided by two instances.



## Order

### For these reasons it is decided that:

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

The Registrar:

The Chair:



K. Götz-Wein

A. Ritzka

Decision electronically authenticated