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**Datasheet for the decision  
of 30 January 2009**

**Case Number:** T 0899/07 - 3.5.03

**Application Number:** 95305696.7

**Publication Number:** 0703678

**IPC:** H04B 10/08

**Language of the proceedings:** EN

**Title of invention:**

Performance monitoring and fault location in optical transmission systems

**Applicant:**

AT&T Corp.

**Opponent:**

-

**Headword:**

Monitoring optical amplifiers/AT&T

**Relevant legal provisions:**

EPC Art. 56

**Relevant legal provisions (EPC 1973):**

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**Keyword:**

"Inventive step - yes (after amendment)"

**Decisions cited:**

-

**Catchword:**

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Case Number: T 0899/07 - 3.5.03

**D E C I S I O N**  
of the Technical Board of Appeal 3.5.03  
of 30 January 2009

**Appellant:** AT&T Corp.  
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**Representative:** Sarup, David Alexander  
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**Decision under appeal:** Decision of the Examining Division of the  
European Patent Office posted 14 December 2006  
refusing European application No. 95305696.7  
pursuant to Article 97(1) EPC 1973.

**Composition of the Board:**

**Chairman:** A. S. Clelland  
**Members:** B. Noll  
R. Menapace

## Summary of Facts and Submissions

- I. This appeal is against the decision of the examining division posted on 14 December 2006 to refuse European application no. 95305696.7.
- II. The following documents were referred to in the decision:
- D1: EP-A-0 554 126, and  
D2: PATENT ABSTRACTS OF JAPAN vol. 018, no. 230 (E-1542), & JP-A-06 021897.
- III. The reasons given for the refusal were that the subject-matter of claims 1 and 8 lacked novelty with regard to the disclosure of D1 and also lacked an inventive step with regard to the disclosure of D1, D2 having been cited as providing background information.
- IV. The applicant filed an appeal against this decision and requested that the decision be set aside and that a patent be granted.
- V. In the course of the oral proceedings on 30 January 2009 before the board the appellant submitted a new set of claims 1 to 11 and requested that a patent be granted on the basis of these claims.

Claim 1 of this request reads as follows:

"Apparatus for monitoring the performance of an optical amplifier (100) amplifying a wavelength division multiplexed signal having a plurality of multiplexed channels, there being a signal of a specific tone modulated upon each of the plurality of multiplexed

channels, the apparatus comprising:

- a tone detector (310) for detecting levels of said tones; wherein the tone detector (310) includes a plurality of bandpass filters (360) respectively tuned to the tone frequencies, each bandpass filter (360) being connected to a peak detector (380) for detecting a power level of the respective one of the specific tones
- an output level detector (380) for detecting an output level of the optical amplifier (100)
- means for determining for each of the multiplexed channels a performance parameter, which is an indication of the signal to noise ratio of the respective channel, by comparing the power level of each of the specific tones to the power level of the amplifier;
- and means for transmitting said performance parameters to a remote maintenance location."

Claim 2 relates to a method having steps corresponding to the apparatus features of claim 1.

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

## **Reasons for the Decision**

### 1. *Amendments of claims (Article 123(2) EPC)*

Claim 1 includes subject-matter of original claims 1 and 3 to 6 and various passages from the description (reference is made to the published application), in particular page 4, lines 10 to 13 (relation between

tones and optical channels), page 5, lines 3 to 9 (tone detector) and page 6, lines 9 to 11 (transmitting the performance parameters to a remote maintenance station). The subject-matter of claim 2 corresponds to that of claim 1 in terms of method steps. Claims 3 to 11 correspond to original claims 9 to 12 and 19 to 23. The board is therefore satisfied that the claims meet the requirements of Article 123(2) EPC.

2. *The prior art*

Document D1 discloses a monitoring system for an optical amplifier embedded in a transmission system transmitting a single wavelength optical signal. The signal-to-noise ratio (SNR) of the optical signal is measured in the optical amplifier to localize a fault while the system is in operation (column 1, lines 11 to 20). Various examples for measuring the SNR are discussed with regard to figures 2 to 4 and 6 to 12. In the example described with reference to figure 2 the optical signal is amplitude modulated in the transmitter with a predetermined modulation frequency, i.e. a single tone, so that the tone appears as an electrical signal after optical-electrical conversion. The tone signal level and the total signal power are measured using a bandpass filter 6-1 followed by an envelope detector 7-1 and a low-pass filter 5-1. From these parameters the SNR is calculated in a monitor and control block 8-1.

D2 discloses a power control for an optical amplifier in a WDM transmission system. Each channel is modulated with a respective tone in the transmitter. In order to ensure that the monitoring signal does not depend on

any pattern of the WDM signal a broadband filter 22 (figure 2) extracts the control signal from each optical transmission signal.

3. *Novelty (Article 54(1) (2) EPC) of claim 1*

Figure 2 of D1 shows separate monitoring systems 40 and 50 for the respective up and down transmission systems, each monitoring system including a single bandpass filter (6-1 or 6-2) and monitoring a separate optical amplifier (1-1 or 1-2). It is in the board's view not appropriate to consider the D1 filters 6-1 and 6-2 as a "plurality of band pass filters" since filters 6-1 and 6-2 are associated with different monitoring systems whereas the plurality of filters according to claim 1 is comprised in one and the same monitoring system. Thus, the board concludes that the subject-matter of claim 1 is novel with regard to D1.

Novelty with regard to D2 was not at issue in the decision under appeal, and the board is satisfied that D2 is not relevant as regards the novelty of claim 1.

4. *Inventive step (Article 56 EPC) of claim 1*

The apparatus according to claim 1 differs from the system shown in figure 2 of D1 in the provision of a plurality of bandpass filters, tuned to the respective frequencies of the tones modulated upon the plurality of channels, the provision of means for determining a performance parameter for each of the multiplexed channels, and the provision of means for transmitting the performance parameters to a remote maintenance station.

The skilled person, faced with the problem of monitoring an optical amplifier for a WDM signal can in the board's view be expected to follow the teaching of D1 and measure the SNR for each channel in the WDM signal.

While the SNR for a single wavelength optical signal can be conveniently measured in the system of figure 2 of D1 by comparing the signal component to the total optical power, the SNR cannot be measured in the same way for a channel in a WDM signal as the levels of all channels contribute to the total power, so that the result of the comparison for one channel will depend on the level of the other channels. For this reason a person skilled in the art would not consider the apparatus in figure 2 of D1 appropriate for measuring the SNR of each channel in a WDM signal and thus not appropriate for monitoring the performance of an optical amplifier for WDM signals.

Document D2 does not offer a solution to the above-mentioned problem. The board's understanding of paragraph [20] of this document is that for monitoring purposes two or more tones are extracted together using a broadband filter 22. In the board's opinion this teaching leads the skilled person towards monitoring the sum of levels of plural or all channels and thus leads away from monitoring each channel individually.

On the other hand, as discussed in the application at page 5, lines 21 to 22, a change in the performance of an optical amplifier is reflected in the change of the ratio of the tone levels to the total power, from which

the application concludes that for the purpose of monitoring it is advantageous to compare the level of each channel with the total power, rather than to measure the SNR for each channel. The board cannot find this teaching in the prior art at its disposal and accordingly concludes that it is only with the benefit of hindsight that a person skilled in the art would determine a performance parameter as specified in the third feature of claim 1 for monitoring the performance of an optical amplifier amplifying a WDM signal.

From the above it follows that a person skilled in the art would not, without the benefit of hindsight, arrive at the apparatus of claim 1 when considering the teaching of D1 on its own or in combination with D2. The board therefore concludes that the subject-matter of claim 1 is not rendered obvious by the disclosure of D1 and D2 either considered separately or together.

The above applies, *mutatis mutandis*, to independent claim 2 which relates to a method having method steps corresponding to the structural features of claim 1.

5. Since the amended claims overcome the grounds for refusal given in the impugned decision the board considers it appropriate to remit the case pursuant to Article 111(1) EPC to the department of first instance for further prosecution.



**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 on the basis of claims 1 to 11 as filed in the oral proceedings before the board.

The Registrar:

The Chairman:

D. Magliano

A. S. Clelland