



ONS15800 Amplifiers: Pump Laser Reliability Management

Contents

- 1 Scope And Purpose 3**
- 2 Document outline 3**
- 3 The laser issue description and management proposal 4**
 - 3.1 Pump laser behavior to failure 4
 - 3.2 Management in four steps 5
- 4 Procedures for the laser issue management..... 6**
 - 4.1 How to identify the ONS15800 optical amplifiers possibly affected by the reliability issue 6
 - 4.2 How to identify optical amplifiers already in a degrade process 6
 - 4.3 How to customize the alarms of the optical amplifiers..... 6
 - 4.4 How to identify the optical amplifiers to be replaced..... 7

1 Scope And Purpose

The scope of this document is limited to the units and P/N mentioned in section 3 below.

The purpose of this document is to provide guidelines for managing a reliability issue for the some of ONS15800 optical amplifiers as detailed below.

2 Document outline

This document will provide:

1. A short description of the issue and management proposal.
2. Instructions for identifying the ONS15800 optical amplifiers possibly affected by the reliability issue.
3. Instruction for identifying the optical amplifiers, which need to be replaced.
4. Instruction for customizing the alarms of the affected optical amplifiers.

3 The laser issue description and management proposal

An issue has been identified on pump lasers that will decrease the reliability of a number of ONS15800/1 optical amplifiers.

The list of optical amplifiers possibly affected by the pump laser reliability issue is provided below.

Card name	Part Number (all versions)
RBA	800-09740
RBA-10G	800-10204
RBA-10G-E	800-14497
TPA-B	800-09744
BBA	800-09746
BBA-10G	800-10206

Considering the estimated failure rate per year and the behavior to failure, detailed later, a management by attrition is recommended.

3.1 Pump laser behavior to failure

The failure mode of the lasers shows a well know behavior:

1. First the laser slowly degrades.
At this stage the laser, which is regulated by a power control loop, will show an increasing laser current.
The laser power is not affected and the same for the optical amplifier performances.
This phase takes a different period to complete according to the optical amplifier power class, provided by the following table:

Amplifier Power Class	Time for completing the slow degrade phase
Low Class	175 days
Mid Class	75 days
High Class	50 days

2. Then the laser quickly fails.
At this stage the laser power will start degrading and the optical amplifier performances are affected.
The effect on BBA, which is equipped with just one laser, is obviously catastrophic.
The effect on other amplifiers, once that one pump laser fails, is an improper pumping of the Erbium Doped fiber.
The output power will very likely decrease by 3 dB.
The gain tilt will increase (longer wavelength will show higher gain).

The noise figure is impacted slightly on RBA and RBA-10G while is heavily impacted on TPA-B and BBA-10G when laser 1 fails.

3.2 Management in four steps

According to the scenario presented above four steps are proposed for managing a network:

1. Identify the optical amplifiers in the network that are possibly affected by the issue (manufactured between May 2000 and May 2002).
2. Of the affected amplifiers, identify the optical amplifiers already in a degrade process and arrange for prompt replacement.
Identification of amplifiers already in degrade can continue after alarm threshold change described in step 3.
3. Customize the alarm threshold of the remaining affected amplifiers so that the beginning of the slow degrade phase (as described in 3.1) can be detected earlier with an alarm notification by the amplifier.
4. Identify the optical amplifiers as they produce an alarm, note the time before failure and replace.

4 Procedures for the laser issue management

4.1 *How to identify the ONS15800 optical amplifiers possibly affected by the reliability issue*

The possibly affected optical amplifiers have been manufactured starting the 19th week of 2000 (May) and ending the 18th (included) week of 2002 (May).

In order to state the manufacturing date the serial number has to be used:

The serial number second and third figures provide the manufacturing year, while the fourth and fifth figures provide the week number.

E.g.:

Amplifier with S/N **19903**124

Has been manufactured during the week 03 in 1999.

4.2 *How to identify optical amplifiers already in a degrade process*

In order to identify the optical amplifiers that already have initiated the slowly degrade phase, described in 3.1, the following approach is suggested.

The amplifier laser current has to be monitored looking for laser current that are increasing.

It is possible to identify a degrading amplifier after two scans of the laser current.

Three scans of the network amplifier laser currents are recommended, with a month period between them.

Starting from the second reading an increase in the laser current greater than 3 mA identifies a laser that has initiated the degrade phase.

Arrange for prompt replacement of these amplifiers.

4.3 *How to customize the alarms of the optical amplifiers*

The laser current degrade threshold has to be set to the operating value increased by 5%.

In case the 5% delta for the alarm threshold is lower than 3 mA, the threshold has to be set 3 mA higher than the current operating value.

*NOTE: Where the TLI interface is available, the “**thresh.exe**” tool is provided to adjust the laser current threshold for early detection of the lasers entering the degrade process. The tool will adjust the laser threshold as described in the steps above.*

NOTE: The laser current operating value depends on the amplifier power class.

Every time the amplifier power class is changed the laser current threshold should be customized again.

Once the laser current threshold has been customized increasing the amplifier power class will result in generating an alarm, which will be cleared with a new setting of the laser current threshold.

4.4 How to identify the optical amplifiers to be replaced

Once the optical amplifier alarms have been customized according to what described in 4.2, the optical amplifier will arise an alarm as soon as the lasers have initiated the slowly degrade phase described in 3.1.

Starting from the moment the alarm has been generated following time period are available for replacement of the amplifier.

Amplifier Power Class	Time before failure
Low Class	140 days
Mid Class	60 days
High Class	40 days