



# Model OT-1000-HH

## 1GHz SuperMod Optical Transmitter, DWDM



## ADVANCED OPERATING MANUAL

The features mentioned in this *Advanced OT-1000-HH Manual* can be accessed only with the optional OT-NEC-A, Network Element Controller.

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## CONTROLLING THE OT-1000-HH VIA NEC

The RS-485 interface is used to manage the OT-1000-HH, such as reading data and changing settings. It is recommended to connect this interface to a network element controller like:

The Olson network element controller OT-NEC-A allows supervising and controlling the function of the transmitter and other equipment connected to the RS485 master interface, using the integrated Ethernet webserver (HTTP) interface.

In order to enable the communication with a NEC, the RS485 slave port of the OT-1000-HH has to be connected with the RS485 master port of the OT-NEC-A as shown in the figure below. In general, this is accomplished by the sub-rack bus wiring. The NEC Ethernet interface has to be connected to a PC either directly via a crossed Ethernet cable or via a LAN. It is important to set the IP address of the NEC in order to be compatible with the available LAN IP addresses. The IP address can be changed using the push-buttons and the LCD (please refer to NEC operating manual). In the example below the IP address has been set to be 172.23.41.65.

Starting from OT-NEC-A application software release 1.12 or higher, a picture as shown below will appear on the web screen when a web browser communicates with the NEC:

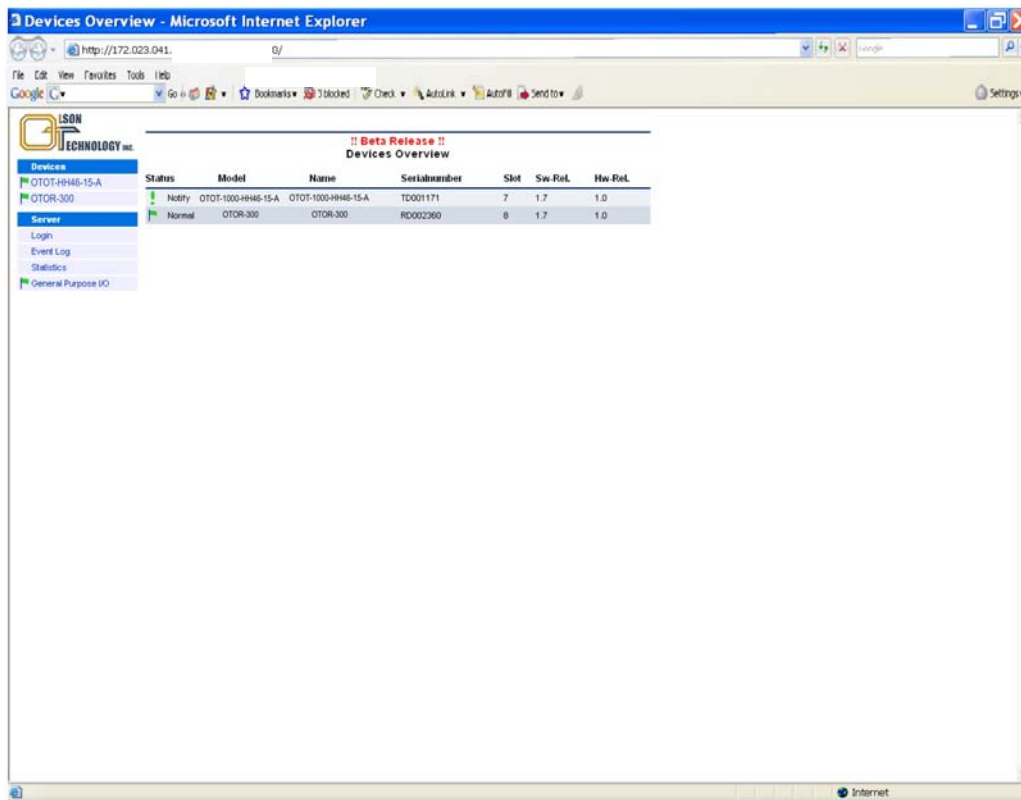


Figure 1 — Display of Web Browser (Microsoft Internet Explorer)

In “Devices” all devices are shown which are connected to and recognized by the NEC. In the devices-column user, defined aliasnames for the OT-1000-HH are shown. In the “Devices” overview window the states, models, alias name, serial number, software and hardware releases are shown. By performing a mouse-click on one of the devices in the devices column, a device specific menu will open as shown below.

For details on operating the OT-1000-HH via a NEC, please refer to the NEC operating manual.

## STATUS MENU

The picture below shows the status menu of the OT-1000-HH.

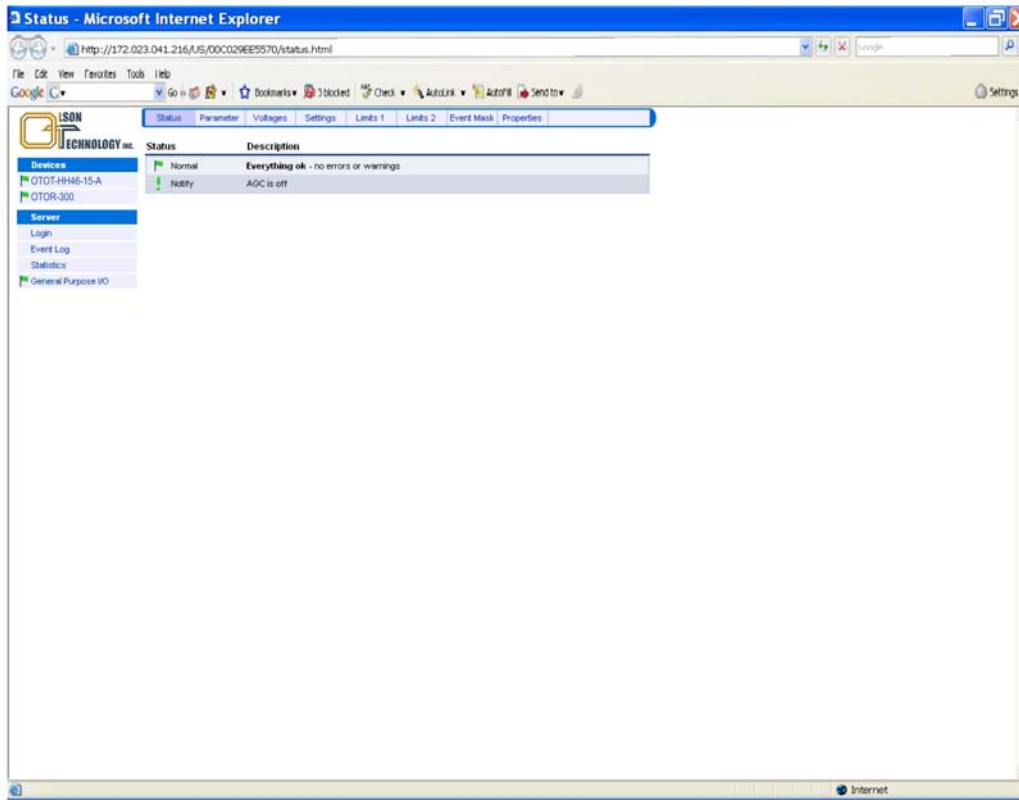


Figure 2 — Status Menu

The actual status of the transmitter is shown using a mark and a description. There are several marks, filled or unfilled, used to show all events.

- A green flag indicates that the transmitter is working properly.
- An orange (yellow) flag shows a warning. A certain parameter is out of the nominal range. The unit should be checked and the problem resolved as soon as possible.
- Red flags indicate urgent alarms. An immediate action is required to fix the failure.
- An exclamation mark provides a message about a certain mode of operation or change

## PARAMETER MENU

The parameters menu displays the most important operation values of the transmitter:

- RF input power (root-mean-square value)
- Optical modulation index (total root-mean-square value)
- RF Gain
- Optical output power
- Thermo electric cooler TEC current
- Laser bias current
- Laser temperature (offset to 25°C)
- Transmitter module temperature

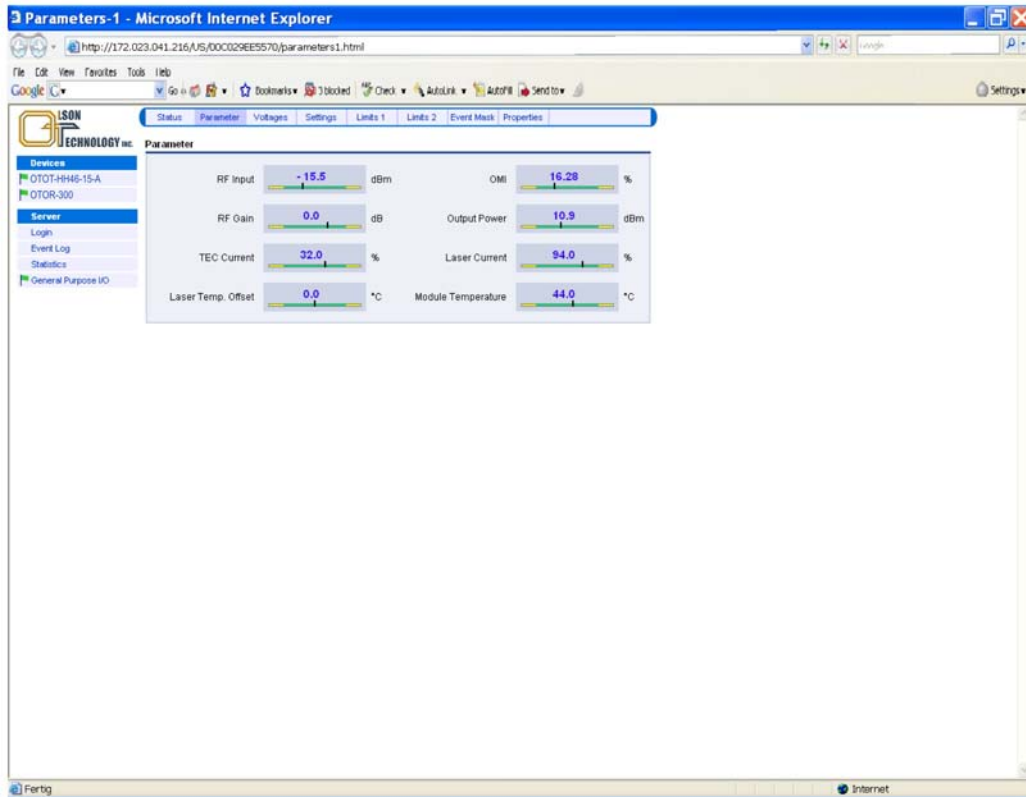


Figure 3 —Parameter Menu

For a proper operation, the black vertical bars should meet the green fields.

Note: The scaling of the green and yellow fields might be different in order to obtain a good reading, especially of the green field.

## VOLTAGES MENU

The voltages menu displays all internal supply voltages like shown below:

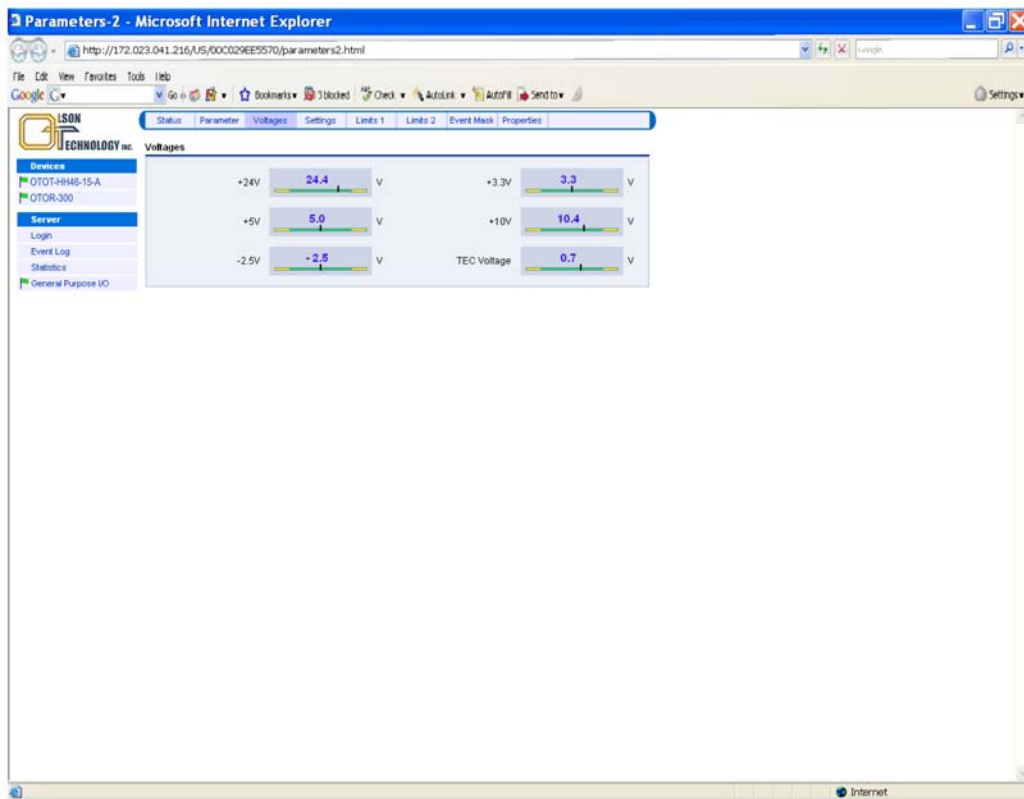


Figure 4 — Voltages Menu

For a proper operation, the black vertical bars should meet the green fields.

Note: The thresholds for alarms are not user adjustable but by factory setting only.

## SETTINGS MENU

This menu allows changing some basic transmitter adjustments.

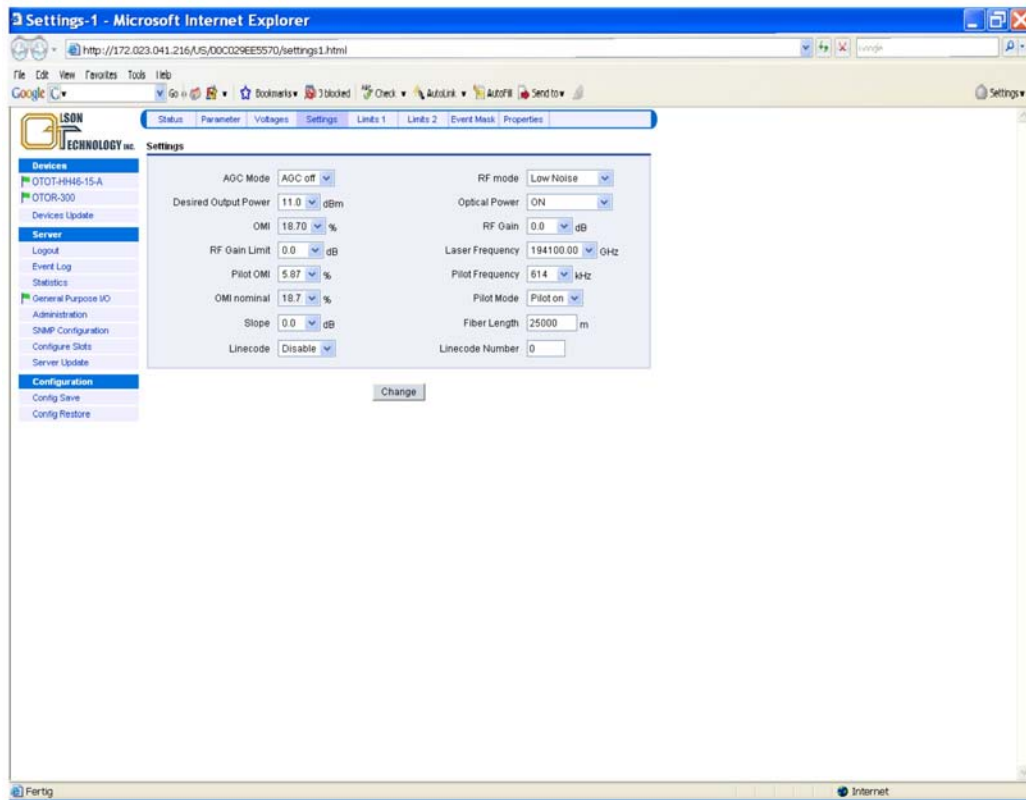


Figure 5 — Settings Menu



## Adjusting the Optical Output Power

The picture below shows, how to change the optical output power.

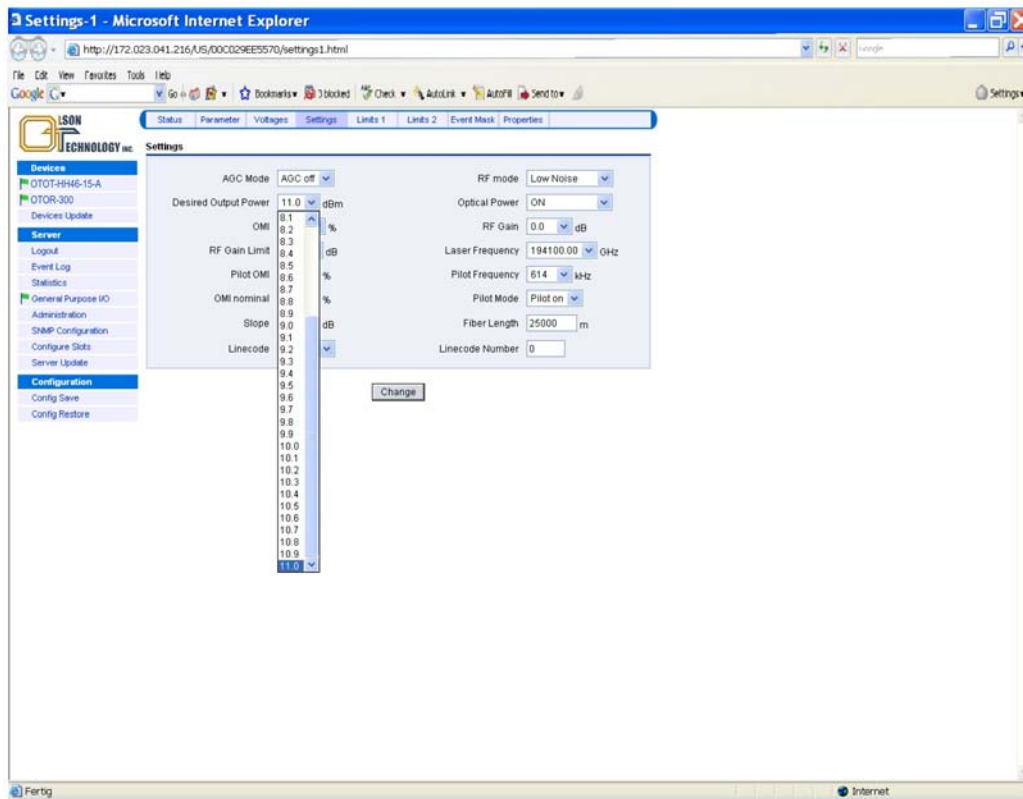


Figure 6 — Changing the Optical Output Power

## Switching Optical Output Power On/Off

The OT-1000-HH allows putting the transmitter into standby mode. In the standby mode, the optical output power is switched off by reducing the laser bias current. In order to enable a fast return back into normal operation (optical output power switched on) the laser temperature control continues to work during standby mode.

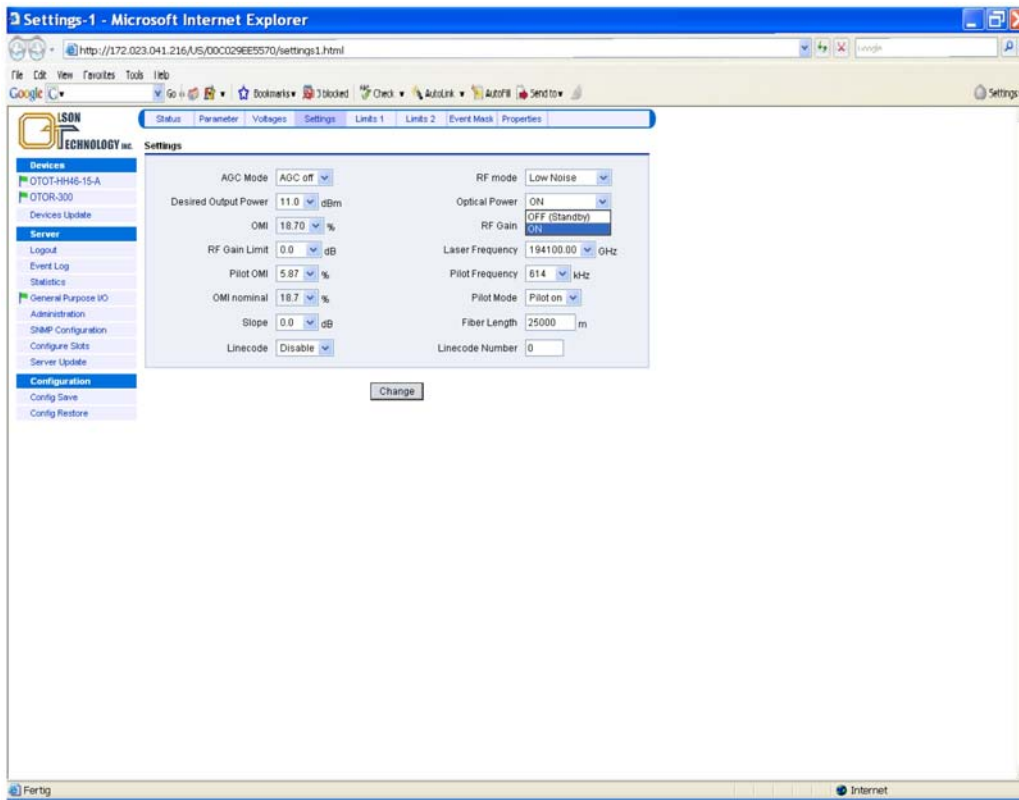


Figure 7 — Switching Optical Output Power On/Off

## Changing the ITU Frequency

The picture below shows, how to change the ITU frequency (optical wavelength) of the transmitter in steps of 50GHz up to  $\pm 1$ GHz.

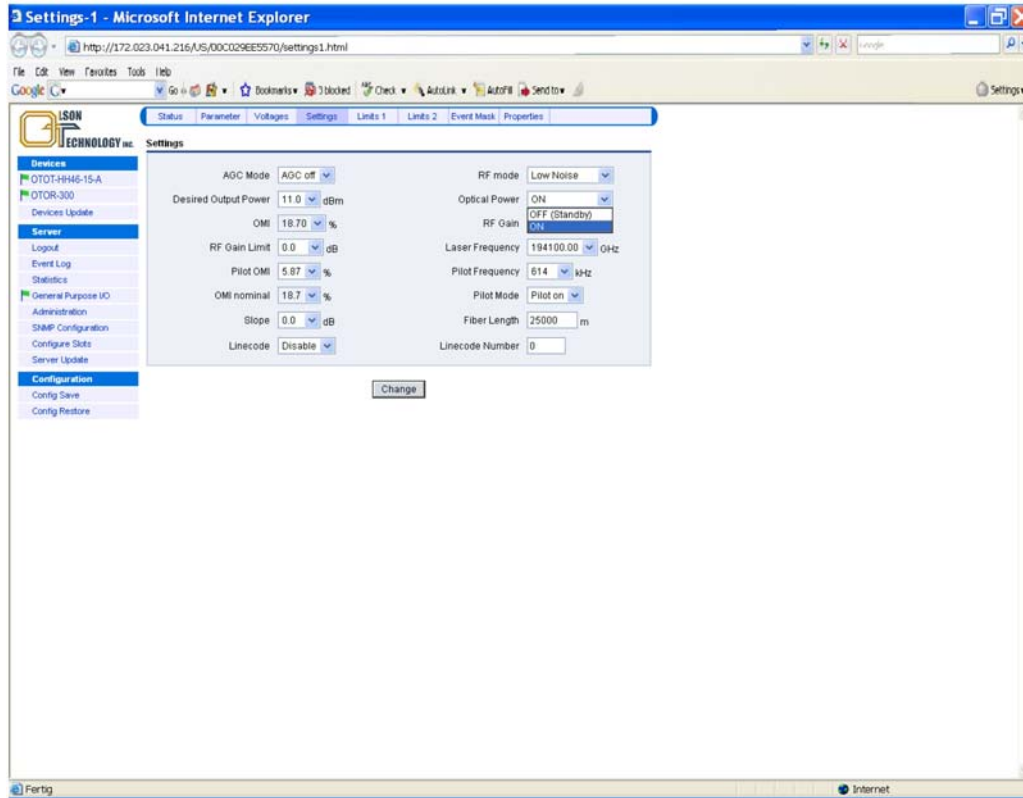


Figure 8 — Changing the ITU Frequency

## Selecting the AGC Mode

The transmitter can be operated in AGC-Off (manual) as well as in AGC-On (automatic) mode.

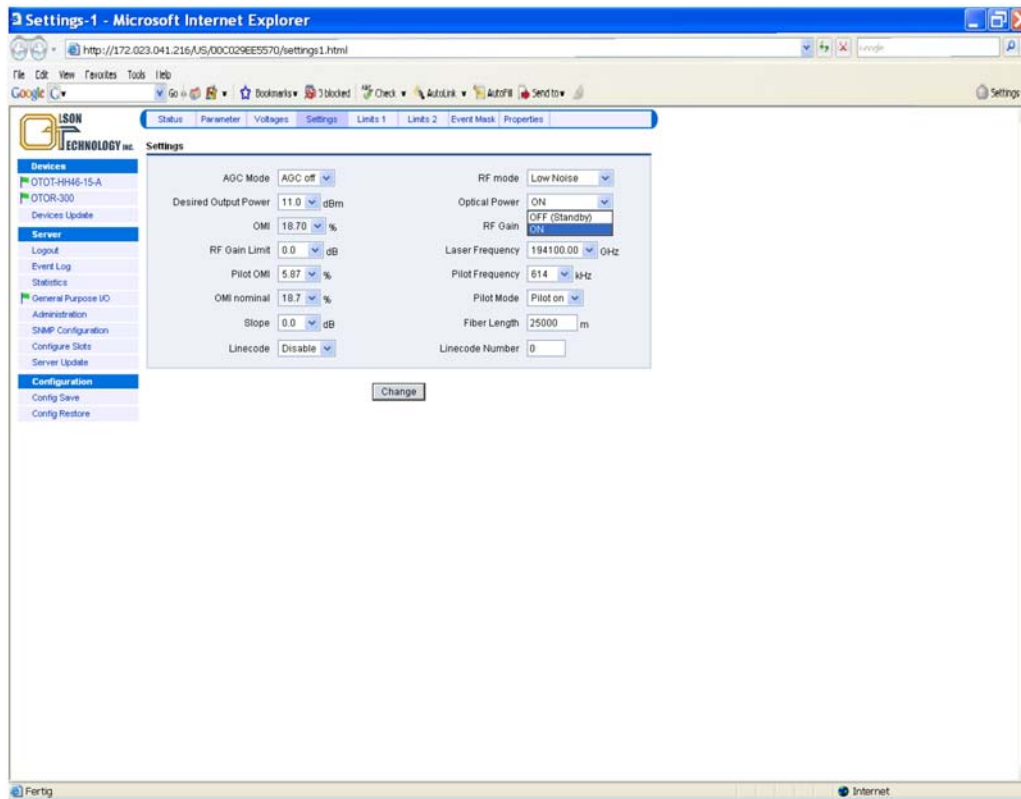


Figure 9 — Selecting the AGC Mode

## Setting the RF Gain (AGC-Off Mode only)

The picture below shows how to adjust the RF gain, in order to optimize the transmission performance in terms of CNR, CSO, CTB and BER.

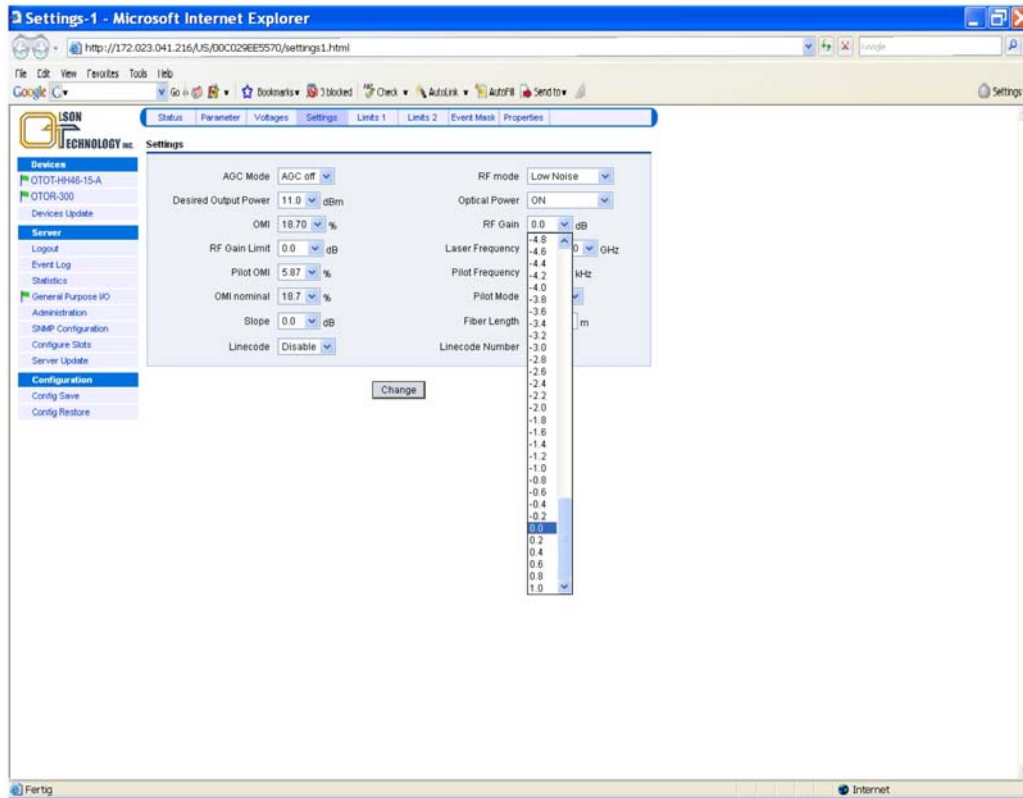


Figure 10 — Setting the RF Gain

Certain combinations of optical output power and OMI maximum RF Gain settings can be physically unreachable. In this case the web page marks the RF Gain setting “value out of range” as can be seen in the figure below.



Figure 11 — Setting the RF Gain: Value out of Range

Notes:

- 1) The RF gain setting is only relevant in AGC-Off mode.
- 2) The setting range for RF gain might change slightly from device to device due to production tolerances.
- 3) Changing RF gain alters the input sensitivity of the OT-1000-HH in AGC-Off mode; 0dB is the nominal RF gain. Setting the RF gain to e.g. +2dB improves the input sensitivity of the OT-1000-HH from 20dBmV to 18dBmV.

## Setting the RF Mode

There are three different RF modes as shown in the picture below:

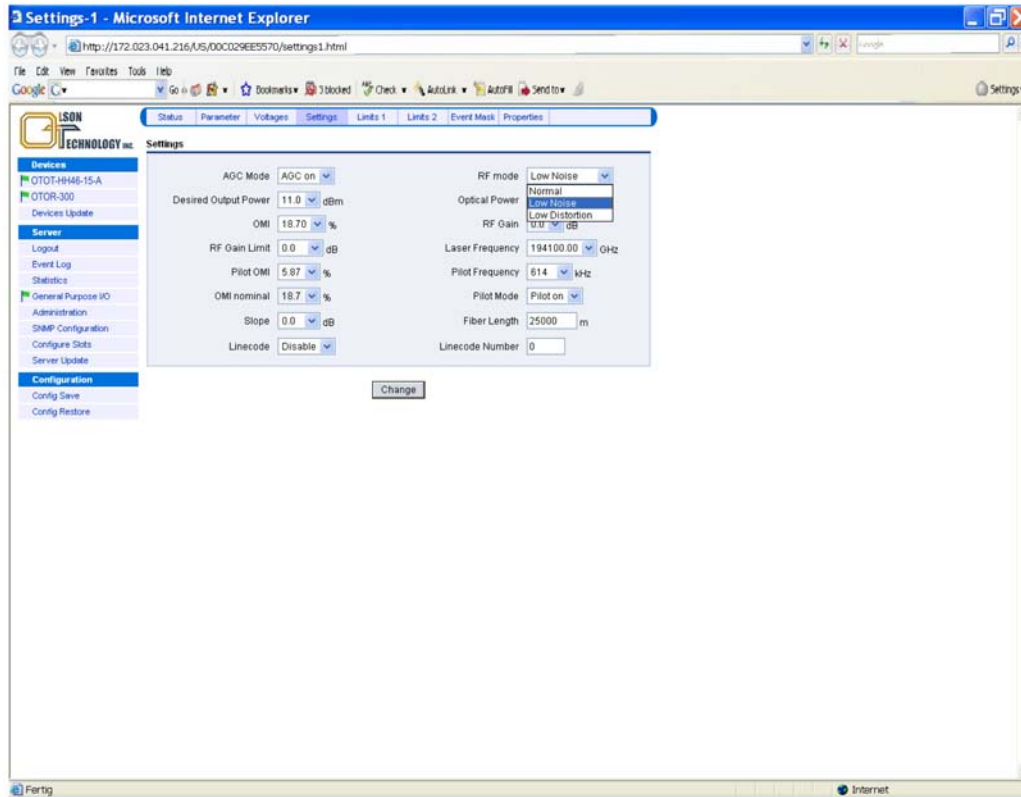


Figure 12 — Setting the RF Mode

1) Normal

This is the default RF mode to obtain all specifications as given in “Technical Specifications.” It is the recommended mode of operation; for very special applications, however, there are two further modes of operation available:

2) Low noise

By selecting this mode the transmitter’s noise performance is improved by increasing the gain of the input RF amplifier stage and decreasing the gain of the output RF amplifier stage. In this mode, the intermodulation performance will suffer slightly.

3) Low distortion

By selecting this mode, the optimum intermodulation performance will be obtained by slightly degrading the noise performance.

## Setting the RF Gain Slope

The OT-1000-HH enables the change the slope of the RF gain of its internal RF amplifier stages. The slope equalizer follows a RF cable compensating or RF cable simulating characteristics.

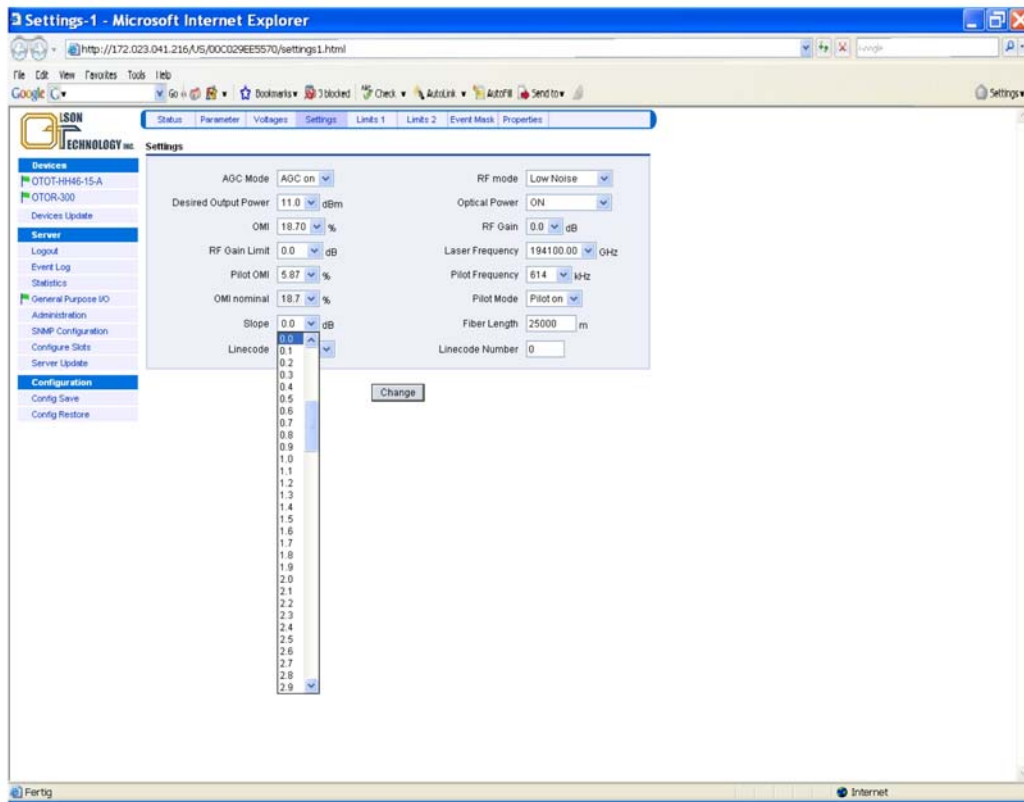


Figure 13 — Setting the RF Gain Slope

## Setting the OMI of the Pilot Tone

The OT-1000-HH provides a pilot tone that can be used with return path receivers. This pilot tone enables a pilot tone controlled automatic level control (ALC) of the return path receiver. The picture below shows how to set the pilot tone OMI. The nominal OMI (0dB setting) is 5%.

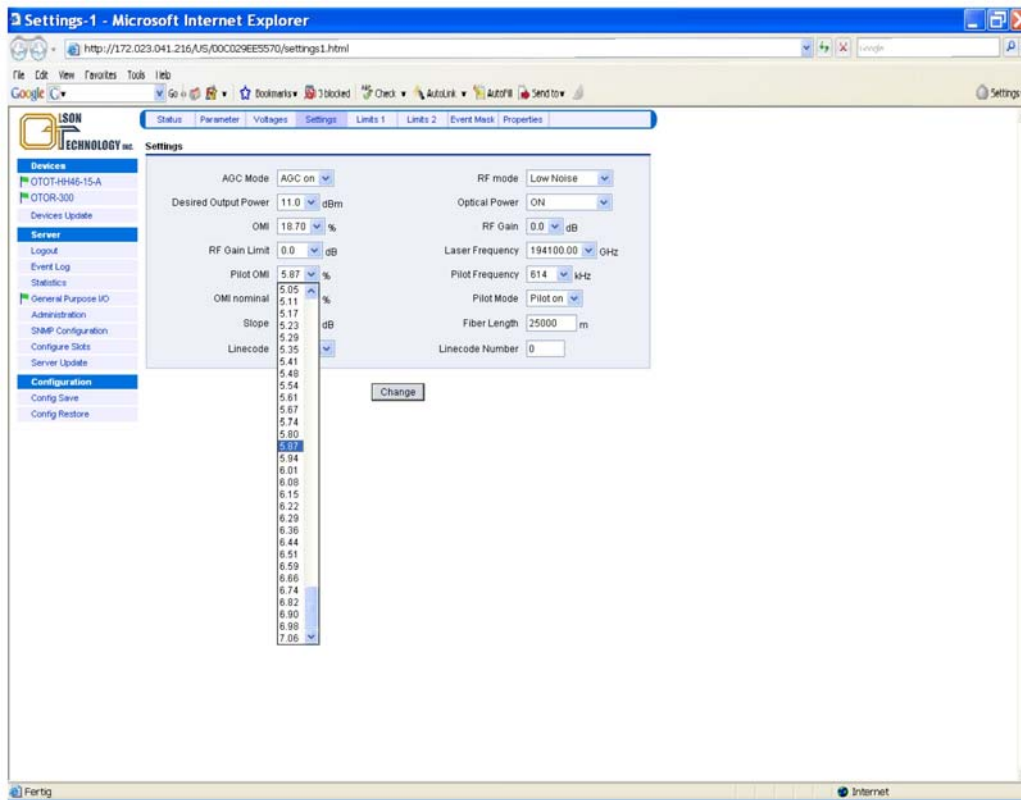


Figure 14 — Setting the OMI of the Pilot Tone

Note: Changing the pilot tone OMI immediately changes the output level of a return path receiver with turned-on pilot tone controlled ALC.



## Setting the Pilot Tone Frequency

The frequency of the pilot tone of the OT-1000-HH can be changed, if required. This pilot tone enables a pilot tone controlled automatic level control (ALC) of the return path receiver. For special applications the pilot tone frequency might be changed to 307kHz or 1229kHz.

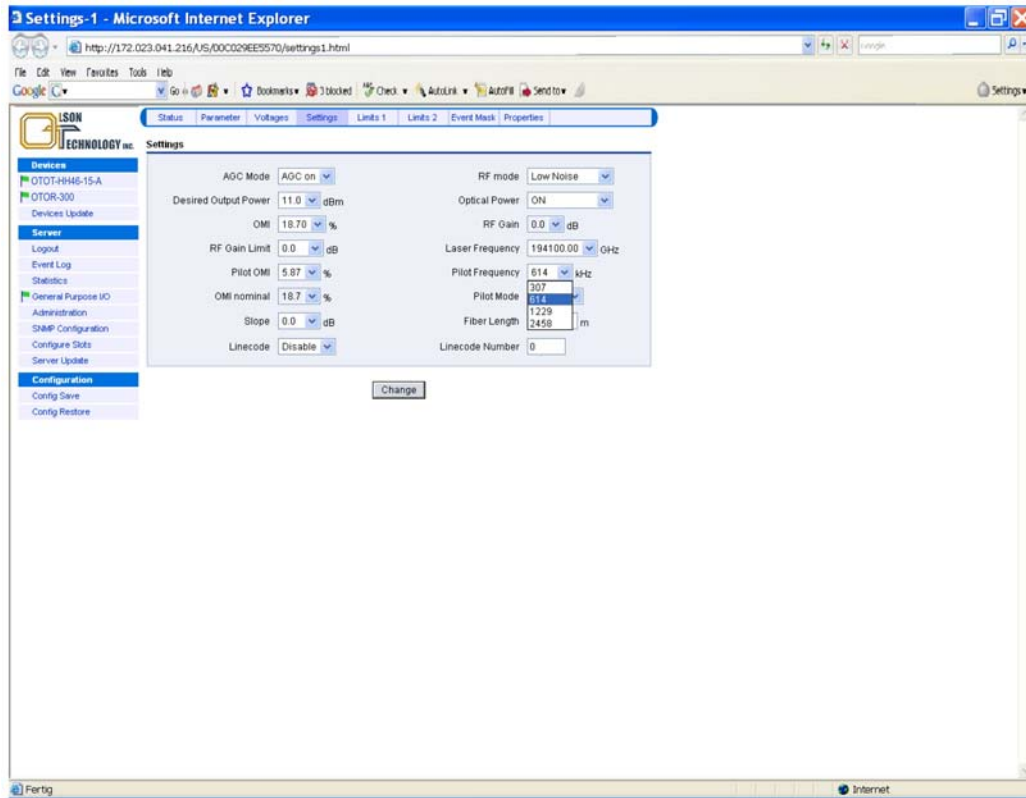


Figure 15 — Setting the Pilot Tone Frequency

## Setting $OMI_{totrms}$ (AGC-On Mode only)

The picture below shows, how to adjust the total root-mean-square OMI in order to optimize the transmission performance in terms of CNR, CSO, CTB and BER.

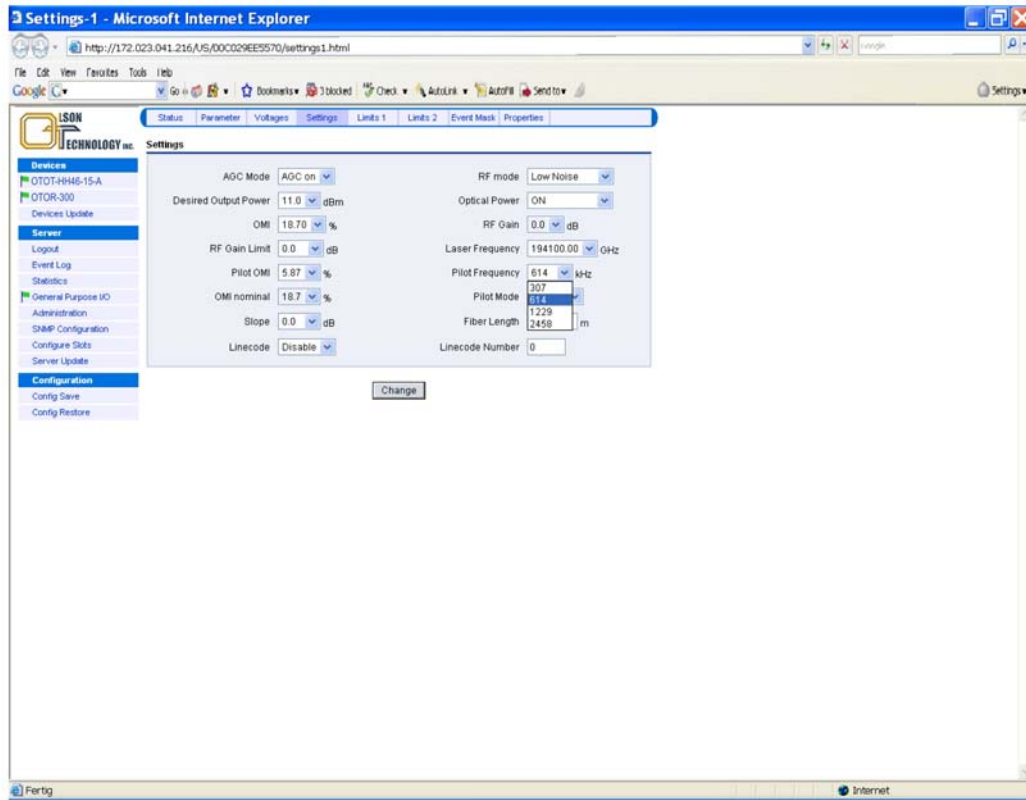


Figure 16 — Setting of  $OMI_{totrms}$

The display in % (absolute) and dB (relative) enable an easy comparison with calculation results as described earlier.

Notes:

- 1)  $OMI$  nominal refers to a factory setting and cannot be changed by the user.
- 2)  $OMI_{totrms}$  setting is only relevant in AGC-On mode.
- 3) The setting range for  $OMI_{totrms}$  might change slightly from device to device due to production tolerances.

## Line Coding

The transmitter is capable to transmit a line code for easy link identification and verification purposes. Linecode transmission may be turned on or off.

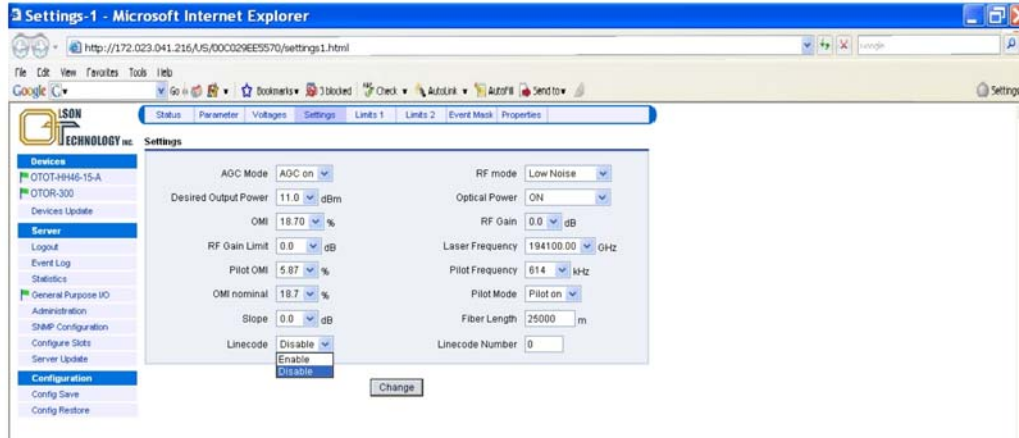


Figure 17 — Turning Line Coding On/Off

If the line code feature is enabled (linecode turned on), a line code between 0 and 999 may be entered in the “Linecode Number” field.



Figure 18 — Setting the Linecode Number

Note:

The OT-1000-HH uses PM (phase modulation) standard on the pilot tone to transmit the line code information. Optionally, a plug-in module can be offered, which is compatible with the AM modulation as required from return path receivers.

## Setting the RF Gain Limit (AGC-On Mode only)

The picture below shows how to adjust the maximum RF gain in AGC-On mode.

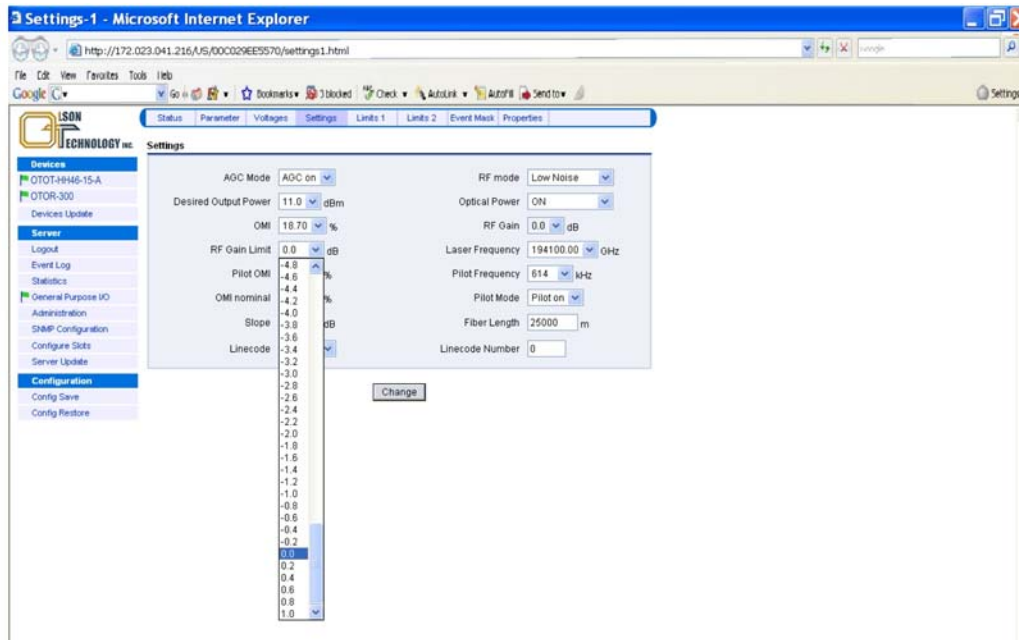


Figure 19 — Setting Maximum RF Gain

The RF gain (maximum) limit is useful, if a certain OMI per channel should not be exceeded. This typically is required if the RF load is going to be increased later. At the beginning with weaker RF load (lower number of TV carriers) the AGC tries to compensate the weaker RF load with an increased gain. If the difference between the initial channel load and the final channel load is e.g. 6dB, the AGC will start at the initial channel load at a 6dB higher OMI than with the final channel load. As a consequence, a fiber node and all subsequent RF amplifiers have to handle this 6dB OMI-change too. With the RF gain limit function the change in OMI can be limited.

Certain combinations of optical output power and OMI maximum RF Gain settings can be physically unreachable. In this case the web page marks the RF Gain limit setting “value out of range” as can be seen in the figure below.



Figure 20 — Setting Maximum RF Gain: Value out of range

## LIMITS MENUS

The two limits menus of the OT-1000-HH determine, what deviations from the nominal values of some of the operating conditions of the transmitter lead to either warning or alarm messages. In order to avoid inadequate changes, some settings are factory settings only.

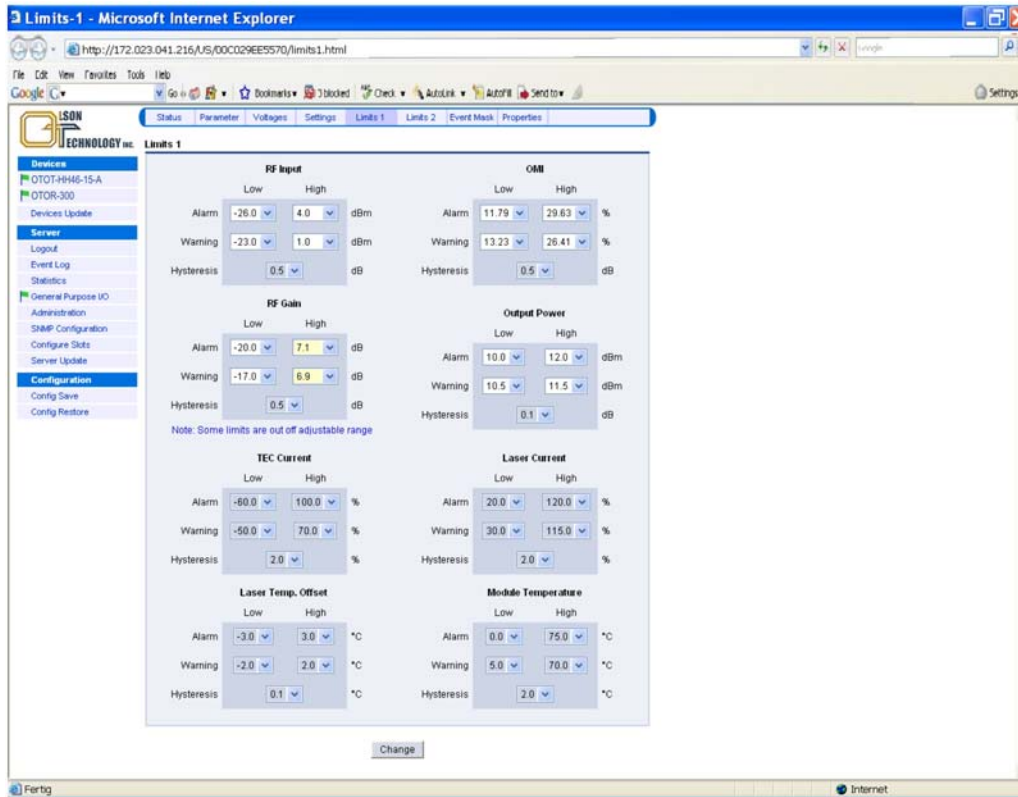


Figure 21 — Limits 1 Menu

After successful log-in, the warning and alarm thresholds for the RF RMS input level, OMI total RMS, RF gain and optical output power can be set by the customer (OT-1000-HH application software release 2.0 and later).

It is recommended to be very careful in setting the alarm thresholds in order to avoid meaningless alarms, e.g. due to temperature changes etc. For the output power, a warning a range of at least  $\pm 1$  dB is recommended.

### Notes:

The settings range for the alarms thresholds for RF input, RF gain and  $OMI_{totrms}$  might change slightly from device to device due to production tolerances.

All settings of the limits II menu (not displayed)) are factory settings only. The user cannot modify them.

## EVENT MASK MENU

The OT-1000-HH allows setting an I/O port mask, if a NEC with application software 1.9 or later is used. This feature allows suppressing warnings and alarms, if they are undesired in certain configurations.

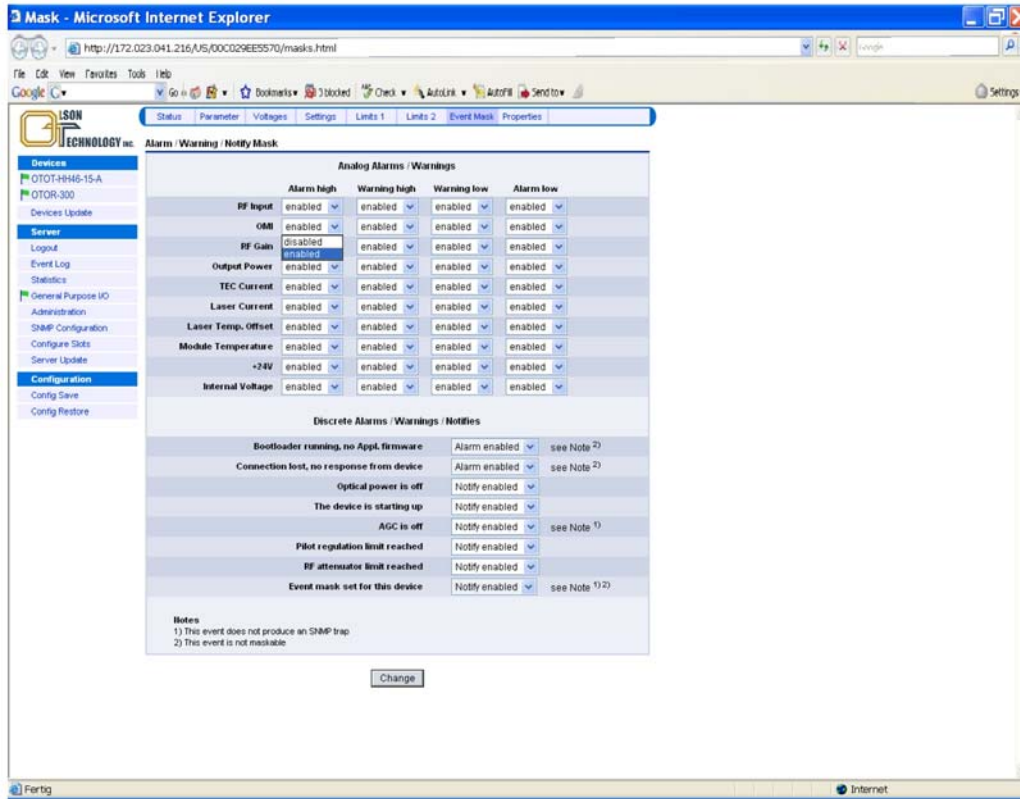


Figure 22 — Setting the Event Mask

All warnings and alarms can be enabled / disabled as requested from the operator. However, in the status screen of the web browser display a notify message is created in order to inform about applying an alarm / warning mask.

## PROPERTIES MENU

The properties menu of the OT-1000-HH gives an overview of the appearance of the transmitter such as hardware model, hardware release, serial number and the software releases. Optionally an aliasname and some user data may be edited. The aliasname occurs in the “Devices” tree of all web browser displays as well as in the LCD.

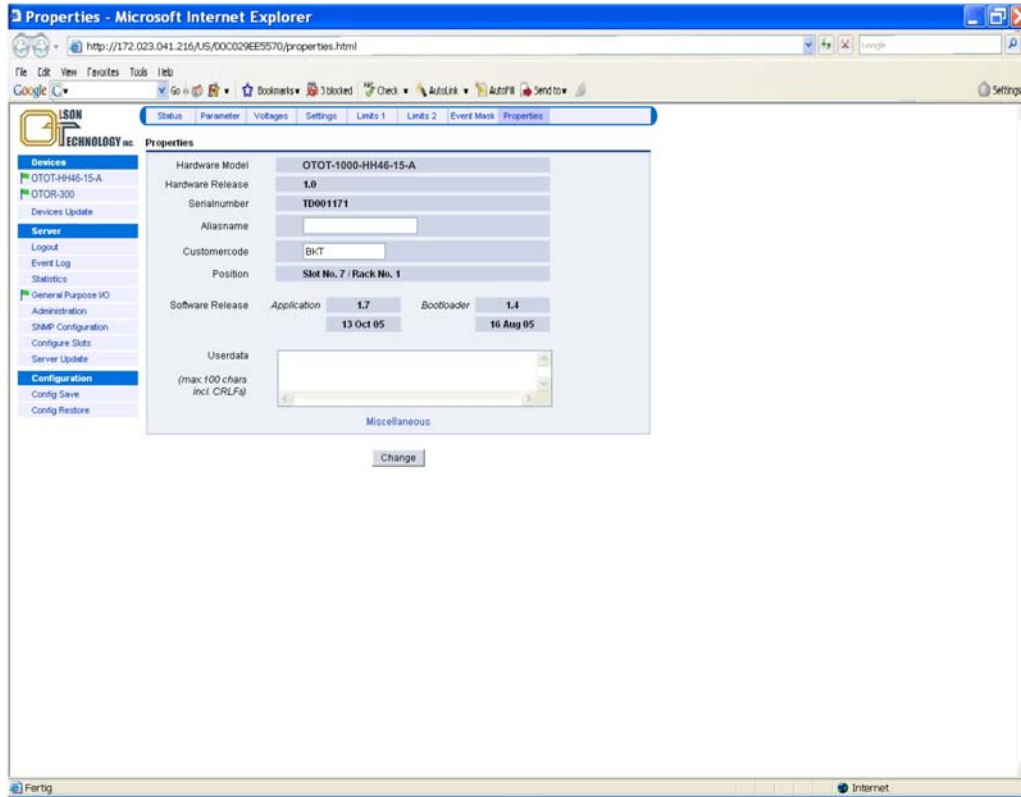


Figure 23 — Properties Menu of OT-1000-HH

The miscellaneous button can be used to request either a

- Reset to factory settings and cold start or
- Reset of the transmitter (= cold start).

Note: Be very careful in executing these reset commands since they force cold start situation, where the transmitter might need about 30 seconds to get back to full performance properties.



## SOFTWARE UPDATE

The devices update menu allows uploading new application software to all devices, which are connected to the OT-NEC-A (server). The picture below shows the devices update screen.

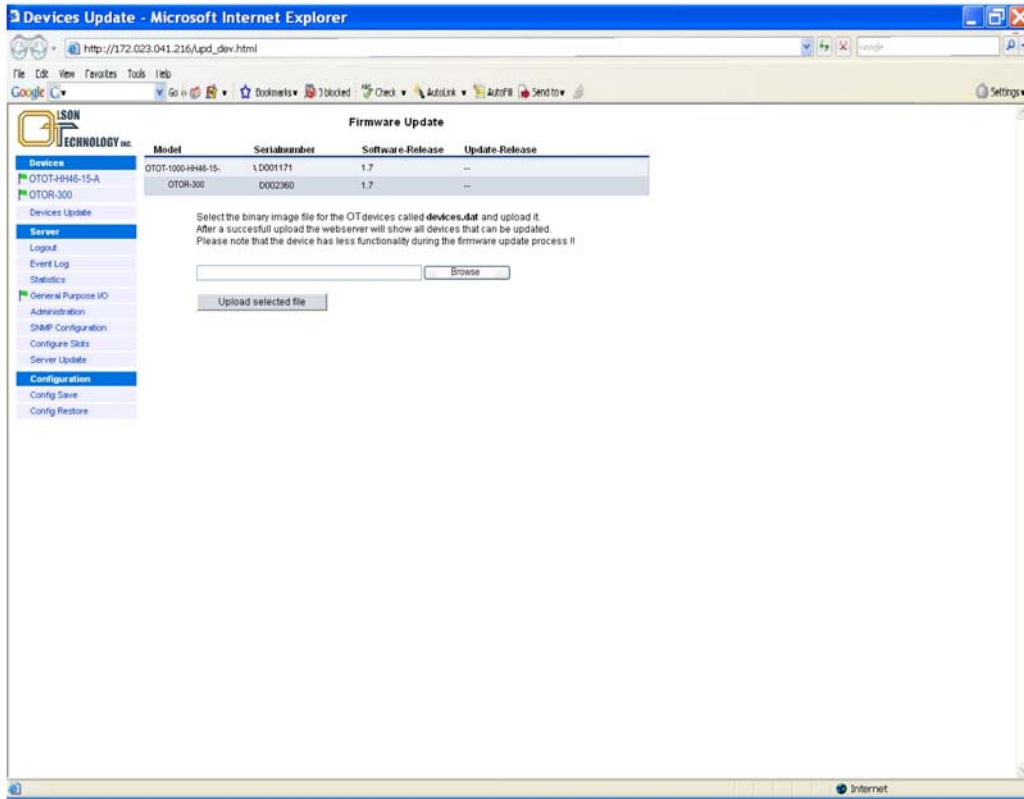


Figure 24 — Devices Update Screen

The Model OT-1000-HH is shown, together with the serial number of all devices and the current application software release of these devices. If a “devices.dat” file is selected by using the Windows™ file selection feature, the available update-release numbers will be shown in the rightmost column. By selecting the OT-1000-HH to be updated, the software update can be started by clicking on the upload selected file button. After a successful update, the new upgraded software release number will be shown for the updated transmitter.

## ORDERING INFORMATION

Part Number	Description	Notes
10-HHxx-yy-A	<i>LaserLite</i> Tx, 5-10MHz, DWDM, 75 Ohms, SC/APC, AC Power	1) The “xx” in the part number indicates the ITU channel See Olson Technology System Solution, “DWDM ITU Wavelengths” for channels. 2) The “yy” in the part number indicates the optical output power in dBm. Range is +3 to +15dBm.
10-HHxx-yy-D	<i>LaserLite</i> Tx, 5-10MHz, DWDM, 75 Ohms, SC/APC, DC Power	1) The “xx” in the part number indicates the ITU channel See Olson Technology System Solution, “DWDM ITU Wavelengths” for channels. 2) The “yy” in the part number indicates the optical output power in dBm. Range is +3 to +15dBm.