Link Tuner

This chapter describes the Link Tuner optical application for Cisco NCS 1010.

- Overview of Link Tuner, on page 1

Overview of Link Tuner

Link tuner computes the target Power Spectral Densities (PSD) for APC by calculating the optimal PSDs for a span. Power Spectral Density represents power per 12.5 GHz of spectrum. Link tuner is enabled if automatic link bring up is enabled.. Link tuner is span-specific and computes the target PSDs for channels entering the span. Link tuner uses the following parameters to compute the target PSD:

- Fiber-type
- Span loss measurement
- Spectral density
- Connector losses
- Span length
- Raman gain (only on Raman spans)

The link tuner application finds the target PSD for the best performance for channels entering a span. You have to manually configure drop-psd. The drop-psd is the target PSD for OLT drop ports.

Link tuner monitors the span loss and total noise in the link. When link tuner detects changes in the span loss, span length, or connector loss, link tuner recomputes the target PSDs. However, it applies the new target PSDs only if it detects a change of 0.1 dB or more in the total noise value.

Link tuner computes the target PSDs and total noise whenever a link goes down and comes back up. All traffic impacting actions trigger link tuner.

Restriction From Cisco IOS XR Release 7.9.1, NCS 1010 supports C+L band networks. In Cisco IOS XR Release 7.9.1, Link tuner support is not available for C+L band networks. In Cisco IOS XR Release 7.9.1, Link tuner is available only for C band only networks. If you are deploying a C+L band configuration for your network, you can obtain the PSD profiles (Single Band and Dual band) from Cisco Optical Network Planner.

The following table describes the different link tuner status.

Status	Description
Operational	Link tuner is active and operational.
Blocked	Link tuner is active but unable to compute ta
Disabled	Link tuner is disabled.

To view link tuner status and PSD computation information, use **show olc link-tuner** command.

The following sample is an output of **show olc link-tuner** command.

```
RP/0/RP0/CPU0:ios#show olc link-tuner
Controller          : Ots0/0/0/0
Link Tuner Status   : OPERATIONAL
Last PSD computation: 2022-05-06 10:59:51
------------------------------------------------------------------------
Setpoint            : Computed PSD
                      (dBm/12.5 GHz)
--------------------------s---------------------------------------------
01                     -5.7
02                     -5.6
03                     -5.6
04                     -5.5
05                     -5.5
06                     -5.4
07                     -5.4
08                     -5.3
09                     -5.3
10                     -5.2
11                     -5.2
12                     -5.1
13                     -5.1
14                     -5.0
15                     -5.0
16                     -4.9
17                     -4.9
18                     -4.8
19                     -4.8
20                     -4.7
21                     -4.7
22                     -4.6
23                     -4.6
24                     -4.5
25                     -4.4
26                     -4.4
27                     -4.3
28                     -4.3
29                     -4.2
30                     -4.2
31                     -4.1
32                     -4.1
33                     -4.0
```

Note When an NCS 1020 network is not fully up and the complete topology is not discovered, **show olc link tuner** shows the default psd value (-4.1dB) as link-tuner is blocked due to partial topology. APC uses Configured value to perform power correction. Link tuner performs the psd computation after the topology is fully discovered. When all nodes are up and the partial topology state changes, APC uses link tuner computed psd values. The **show olc link tuner** command shows the link tuner computed values.

To view link tuner status, PSD computation information, and computed total noise, use **show olc link-tuner detail** command.

The following sample is an output of **show olc link-tuner detail** command.

```
RP/0/RP0/CPU0:ios#show olc link-tuner detail
Controller          : Ots0/0/0/0
Link Tuner Status   : OPERATIONAL
Last PSD computation: 2022-05-06 10:59:51
Computed Total Noise: -35.4 dB
------------------------------------------------------------------------
Setpoint            : Computed PSD
                       (dBm/12.5 GHz)
------------------------------------------------------------------------
01                     -5.7
02                     -5.6
03                     -5.6
04                     -5.5
05                     -5.5
06                     -5.4
07                     -5.4
08                     -5.3
09                     -5.3
10                     -5.2
11                     -5.2
12                     -5.1
13                     -5.1
14                     -5.0
15                     -5.0
16                     -4.9
17                     -4.9
18                     -4.8
19                     -4.8
20                     -4.7
21                     -4.7
22                     -4.6
23                     -4.6
24                     -4.5
25                     -4.4
26                     -4.4
27                     -4.3
28                     -4.3
29                     -4.2
30                     -4.2
31                     -4.1
32                     -4.1
33                     -4.0
```

You can view the target PSDs configured for all setpoints using the **show olc apc-local target-psd-profile** command. The output shows the source of the PSD configuration also. The target PSD source can be Link Tuner or Configuration.

The following sample is an output of **show olc apc-local target-psd-profile** command.

```
RP/0/RP0/CPU0:ios#show olc apc-local target-psd-profile
Mon Jun 20 06:40:32.779 UTC
Controller          : Ots0/0/0/0
Target PSD source   : Link Tuner
--------------------------------------------------------------------------------
Setpoint               Frequency                       Target PSD
                         (THz)                       (dBm/12.5 GHz)
--------------------------------------------------------------------------------
01                    191.337494                          -6.3
02                    191.488495                          -6.3
03                    191.639496                          -6.2
04                    191.790497                          -6.2
05                    191.941498                          -6.2
06                    192.092499                          -6.1
07                    192.243500                          -6.1
08                    192.394501                          -6.1
09                    192.545502                          -6.0
10                    192.696503                          -6.0
11                    192.847504                          -5.9
12                    192.998505                          -5.9
13                    193.149506                          -5.8
14                    193.300507                          -5.8
15                    193.451508                          -5.8
16                    193.602493                          -5.7
17                    193.753494                          -5.7
18                    193.904495                          -5.7
19                    194.055496                          -5.6
20                    194.206497                          -5.6
21                    194.357498                          -5.5
22                    194.508499                          -5.5
23                    194.659500                          -5.5
24                    194.810501                          -5.4
25                    194.961502                          -5.4
26                    195.112503                          -5.3
27                    195.263504                          -5.3
28                    195.414505                          -5.3
29                    195.565506                          -5.2
30                    195.716507                          -5.2
31                    195.867493                          -5.1
32                    196.018494                          -5.1
33                    196.169495                          -5.1
```

Configure Link Tuner

The following configurations are available for the link tuner:

Enable Link Tuner

You can enable link tuner for a controller. Use the following commands to enable link tuner.

configure

optical-line-control

controller ots *Rack/Slot/Instance/Port*

link-tuner enable

commit

end

The following is a sample configuration that enables link tuner.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#optical-line-control
RP/0/RP0/CPU0:ios(config-olc)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-olc-ots)#link-tuner enable
RP/0/RP0/CPU0:ios(config-olc-ots)#commit
RP/0/RP0/CPU0:ios(config-olc-ots)#end
```

Disable Link Tuner

You can disable link tuner for a controller. Use the following commands to disable link tuner.

configure

optical-line-control

controller ots *Rack/Slot/Instance/Port*

link-tuner disable

commit

end

The following is a sample configuration that disables link tuner.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#optical-line-control
RP/0/RP0/CPU0:ios(config-olc)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-olc-ots)#link-tuner disable
RP/0/RP0/CPU0:ios(config-olc-ots)#commit
RP/0/RP0/CPU0:ios(config-olc-ots)#end
```

Configure Link Parameters

Configure fiber-type, spectrum density, connector losses, and span length for accurate link tuning.

To configure fiber type, use **fiber-type** command. SMF is the default fiber-type.

You can configure the following fiber types using **fiber-type** command:

- E-LEAF
- FREE-LIGHT
- METRO-CORE
- SMF
- SMF-28E
- TERA-LIGHT
- TW-RS
- TW-Reach
- TW-minus
- TW-plus

- ULL-SMF28

To configure spectrum density, use **link-tuner spectrum-density** command. You can configure a spectrum density as a percentage value in the range of 1-100. The default spectrum density is 81.

To configure connector loss, use the **connector-loss** command. You can configure Tx and Rx connector loss in the range 0–20 dB. The default connector loss is:

- 0.25 dB for ports without Raman module
- 0.3 dB for ports with Raman module

To configure span length, use the **span-length** command. You can configure span length in the range of 0.1 to 200 km as multiples of 0.1 km. In the absence of span length configuration, link tuner computes span length using span loss.

The following example is a sample configuration that configures the link tuner parameters.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#optical-line-control
RP/0/RP0/CPU0:ios(config-olc)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-olc-ots)#fiber-type SMF
RP/0/RP0/CPU0:ios(config-olc-ots)#link-tuner spectrum-density 80
RP/0/RP0/CPU0:ios(config-olc-ots)#connector-loss rx 1
RP/0/RP0/CPU0:ios(config-olc-ots)#connector-loss tx 1
RP/0/RP0/CPU0:ios(config-olc-ots)#span-length 100
RP/0/RP0/CPU0:ios(config-olc-ots)#commit
RP/0/RP0/CPU0:ios(config-olc-ots)#end
```