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**Signaling extensions for Media Channel sub-carriers configuration in  
Spectrum Switched Optical Networks (SSON) in Lambda Switch Capable (LSC)  
Optical Line Systems.**

[draft-ggalimbe-ccamp-flexigrid-carrier-label-00](#)

## Abstract

This memo defines the signaling extensions for managing Spectrum Switched Optical Network (SSON) parameters shared between the Client and the Network and inside the Network. This document extends the GMPLS Lambda label format in accordance and extending the parameters defined in ITU-T Recommendation G.694.1.[[ITU.G694.1](#)] and its extensions.

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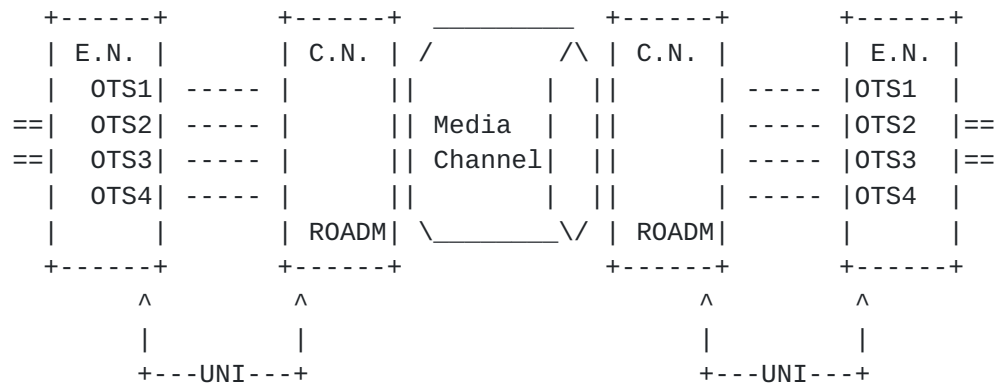
## [1.](#) Introduction

Generalised Multiprotocol Label Switched (GMPLS) is widely used in Wavelength Switched Optical Network (WSO) to support the optical circuits set-up through the signalling between Core Nodes and Edge Nodes. This extension addresses the use cases described by [[RFC7698](#)] Ch.3.3 and supports the information, needed by Spectrum Switched Optical Network (SSO), to signal a Media Channel and the associated carriers set request. The new set of parameters is related to the Media Channel and the carrier routed with it and keep the backward compatibility with the WSO signalling. In particular this memo wants do address the use cases where the SSO LSP (the Media Channel in [RFC7698](#)) carries multiple carrier (OTSi) containing same Payload. The set of the carriers can be seen as single Logical circuit. This memo can be considered as the extension of [[RFC7699](#)] The contents and



the parameters reflect the experimental activity on IP over SSON recently done.

Figure 1 shows how the multiple carrier are mapped into a Media Channel. A set of parameters must be shared on the UNI to allow the GMPLS to do the proper routing and Spectrum Assignment and decide the carrier position.



E.N. = Edge Node - UNI Client

C.N. = Core Node - UNI Network

ROADM = Lambda/Spectrum switch

Media Channel = the optical circuit

OTSi = Carriers belonging to the same Network Media Channel (or Super Channel)

UNI = Signalling interface

from Fig. 5.1/G.698.2

Figure 1: Multi carrier LSP

## 2. Client interface parameters

The Edge Node interface can have one or multiple carriers (OTSi). All the carrier have the same characteristics and are provisionable in terms of:

Number of subcarriers:

This parameter indicates the number of subcarriers available for the super-channel in case the Transceiver can support multiple carrier circuits.

Central frequency (see G.694.1 Table 1):



This parameter indicates the Central frequency value that Ss and Rs will be set to work (in THz). See the details in [Section 6](#)/ G.694.1 or based on "n" and "k" values in case of multicarrier transceivers.

Central frequency granularity:

This parameter indicates the Central frequency granularity supported by the transceiver, this value is combined with K and n value to calculate the central frequency on the carrier or sub-carriers.

Minimum channel spacing:

This is the minimum nominal difference in frequency (in GHz) between two adjacent channels (or carriers) depending on the Transceiver characteristics.

Bit rate / Baud rate of optical tributary signals:

Optical tributary signal bit (for NRZ signals) rate or Symbol (for Multiple bit per symbol) rate .

FEC Coding:

This parameter indicate what Forward Error Correction (FEC) code is used at Ss and Rs (R/W) (not mentioned in G.698). .

Wavelength Range (see G.694.1): [\[ITU.G694.1\]](#)

This parameter indicate minimum and maximum wavelength spectrum in a definite wavelength Band (L, C and S).

Modulation format:

This parameter indicates the list of supported Modulation Formats and the provisioned Modulation Format..

Inter carrier skew:

This parameter indicates, in case of multi-carrier transceivers the maximum skew between the sub-carriers supported by the transceiver.

Laser Output power:

This parameter provisions the Transceiver Output power, it can be either a setting and measured value.

### **3. Use Cases**

The use cases are described in [draft-kdkgall-ccamp-dwdm-if-mng-ctrl-fwk](#) and [\[RFC7698\]](#)









#### **4.2. Extension to LSP set-up reservation**

Once the GMPLS has calculated the Media Channel path, the Spectrum Allocation, the Sub-carrier number and frequency, the modulation format, the FEC and the Transmit power, sends back to the E.N. the path set-up confirmation providing the values of the calculated parameters:

Media Channel:

(Grid, C.S., Identifier and n).

Number of subcarriers:

This parameter indicates the number of subcarriers available for the super-channel in case the Transceiver can support multiple carrier Circuits.

Central frequency (see G.694.1 Table 1):

Grid, Identifiers, central frequency and granularity.

Central frequency granularity:

This parameter indicates the Central frequency granularity supported by the transceiver, this value is combined with K and n value to calculate the central frequency on the carrier or sub-carriers.

Minimum channel spacing:

This is the minimum nominal difference in frequency (in GHz) between two adjacent channels (or carriers) depending on the Transceiver characteristics.

Bit rate / Baud rate of optical tributary signals:

Optical tributary signal bit (for NRZ signals) rate or Symbol (for Multiple bit per symbol) rate.

FEC Coding:

This parameter indicate what Forward Error Correction (FEC) code is used at Ss and Rs (R/W) (not mentioned in G.698). .

Modulation format:

This parameter indicates the list of supported Modulation Formats and the provisioned Modulation Format.

Inter carrier skew:

This parameter indicates, in case of multi-carrier transceivers the maximum skew between the sub-carriers supported by the transceiver.

Laser Output power:



This parameter provisions the Transceiver Output power, it can be either a setting and measured value.

Circuit Path, RRO, etc:

All these info are defined in [\[RFC4208\]](#).

Path Error:

e.g. no path exist, all the path error defined in [\[RFC4208\]](#).

Figure 3: The format of this sub-object (Type = TBA, Length = TBA) is as follows:

```

      0               1               2               3
      0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|S|I|           Modulation ID           |           FEC           |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|           baud rate (Symbol Rate)           |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|Grid | C.S. | M.C. Identifier |           n           |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

      0               1               2               3
      0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| Grid| carrier Identifier           |           j           |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|           k           |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|           sub-carrier power           |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

Sub-Transponder Mod Format:

- S: standardized format;
- I: input / output (1 / 0)
- Modulation IDs: BPSK (1), DC DP BPSK, QPSK, DP QPSK, 8QAM, 16QAM, 64QAM, etc.
- FEC .....
- Symbol Rate: IEEE float in bauds/s
- Number of Carriers in the Media channel
- Bits/symbol
- Sub-carrier Power
- Media channel Grid

```

+-----+-----+
|  Grid  | Value |
+-----+-----+
|ITU-T Flex| 3    |
+-----+-----+

```



- C.S.
- n Media channel central frequency
- Sub carrier identifier field: sub-carrier identifier inside the mediachannel
- J field: granularity of the channel spacing, can be a multiple of 0.01GHz. - default value is 0.1GHz.
- K field: positive or negative integer (including 0) to multiply by J and identify the S.C. Position inside the Media Channel, J can be set at default value = 0.1GHz.

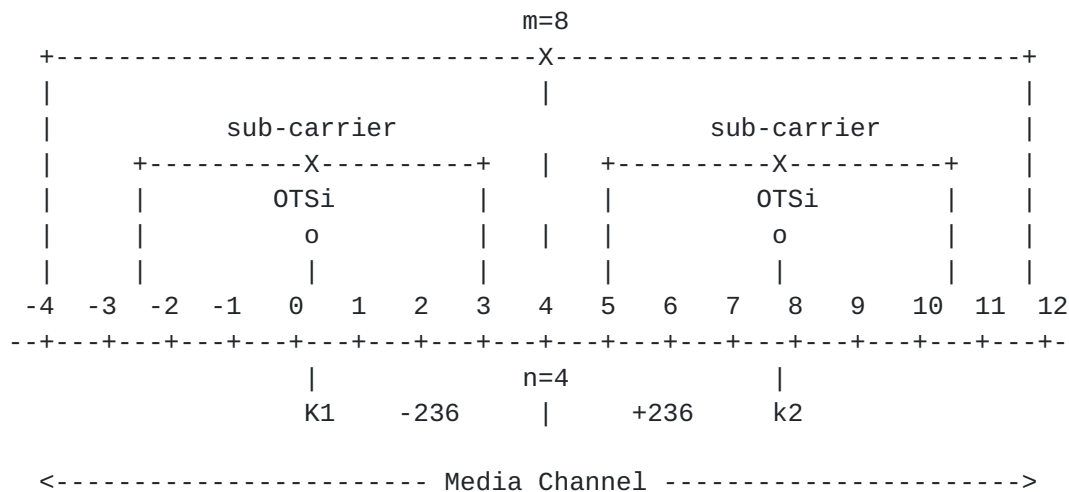


Figure 3: OCh\_General

#### 4.3. RSVP Protocol Extensions considerations

The additional information described in the draft, is related to the Media Channel supported traffic. It could be encoded as specific extensions of the SENDER\_TSPEC/FLOW\_SPEC object for Flexi-Grid networks (see [[RFC7792](#)])

#### 5. Security Considerations

GMPLS message security uses IPsec, as described in xxxx. This document only defines new UNI objects that are carried in existing UNI messages, similar to the UNI objects in xxx. This document does not introduce new security considerations.



## **6. IANA Considerations**

T.B.D.

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