Proposed NG-EPON wavelength planning decision flow

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January 2014

Purpose

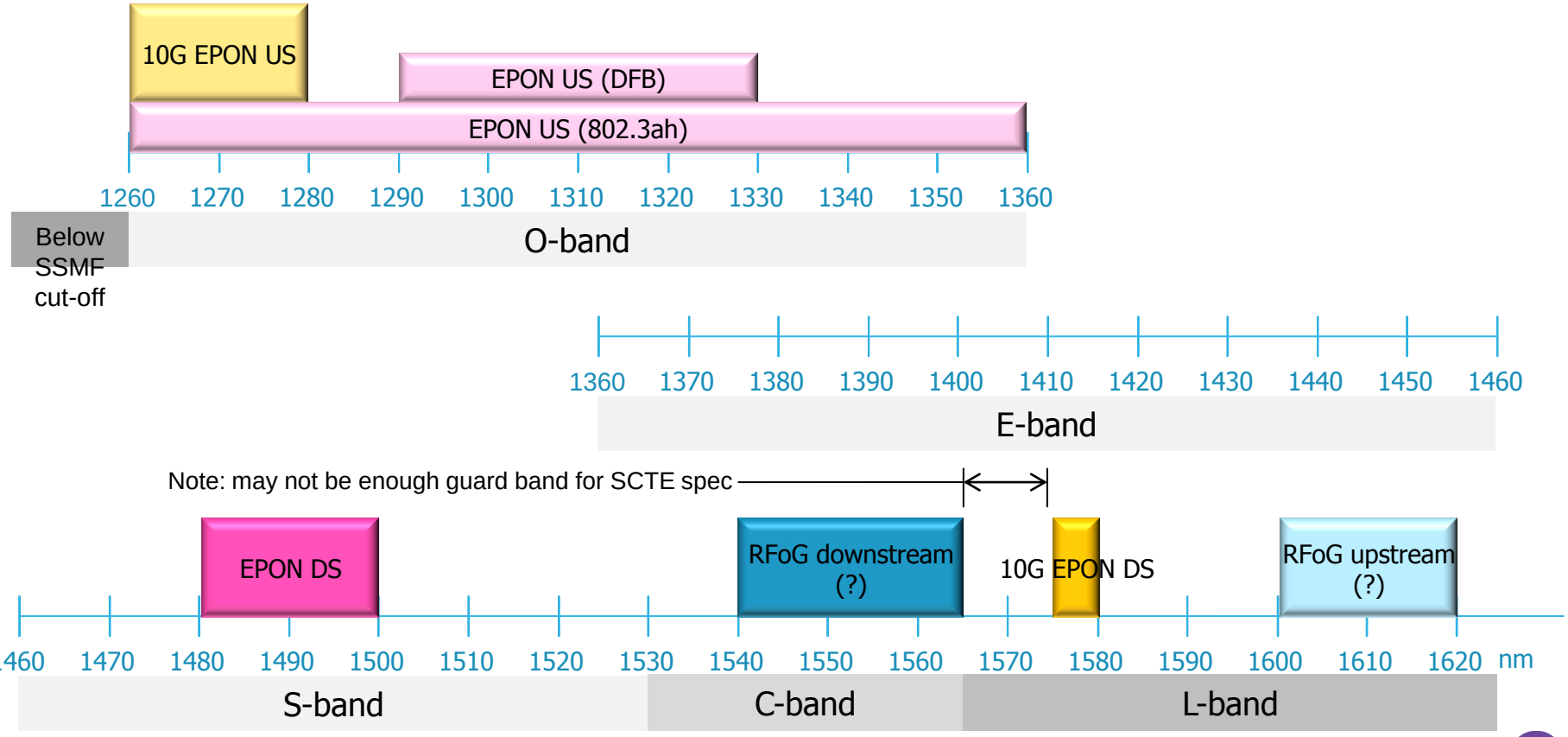
This presentation…

- does not advocate any particular wavelength plan for NG-EPON
- proposes a decision flow that can be used to determine a wavelength plan for NG-EPON
- is patterned after the decision flow used by FSAN to determine the NG-PON2 TWDM PON wavelength plan

- However some of the initial conditions for NG-EPON are different from NG-PON2
- Therefore IEEE may, or may not, determine a different wavelength plan for NGEPON

NG-EPON headline requirements (to be confirmed)

1. ≥25 Gb/s aggregate downstream, ≥10 Gb/s aggregate upstream
2. ≥ 20 km reach
3. Reuse of EPON and 1G EPON ODNs
4. Coexistence with EPON, 10G EPON, RFoG(?). Assume same filters as ITU-T PONs.



1. Re-use 10G EPON λs, upstream and downstream?

Re-use 10G EPON λs?

No

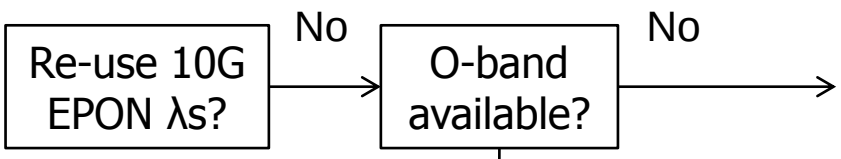
- May adversely affect the 10G EPON market
- Feasible alternatives may exist

Yes

- ≥25 Gb/s could be an optional speed (as 802.3ah specified both 100M and 1G speeds.)
- Few operators have deployed significant 10G EPON to co-exist with
- If NG-EPON = TDM PON, 25 Gb/s duobinary modulation can directly leverage 10G EPON ONU optics
- Preserves spectrum for future use

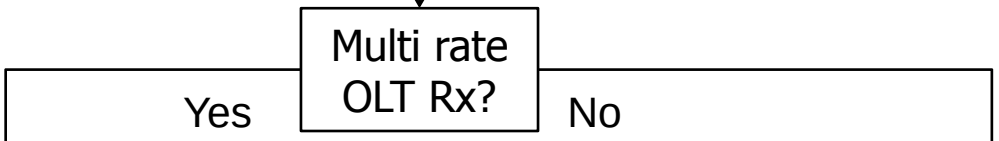
2. O-band available?

- Co-existence with 1260-1360 nm EPON is required, and multi-rate 1G/NG-EPON OLT receiver is not desired
- Lower fiber loss → longer reach is a priority (5.5 dB over 20 km)
- EDFAs are an important technology option



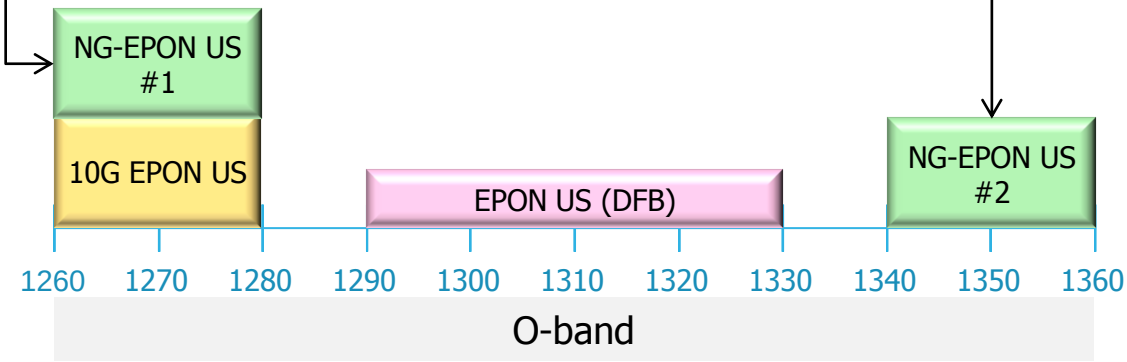
Yes

- Co-existence with 1260-1360 nm EPON is not required
- Low dispersion



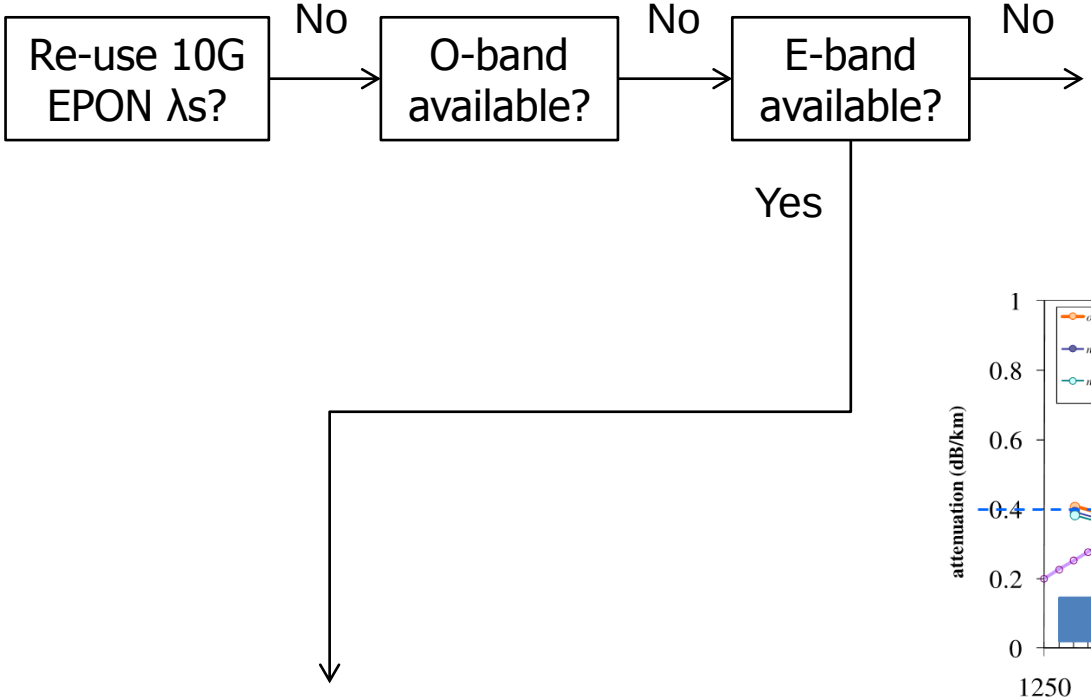
E.g.

- 25G/10G NG-EPON could share US MAC with 10G EPON
- >10G US NG-EPON and 10G EPON could share OLT MR Rx

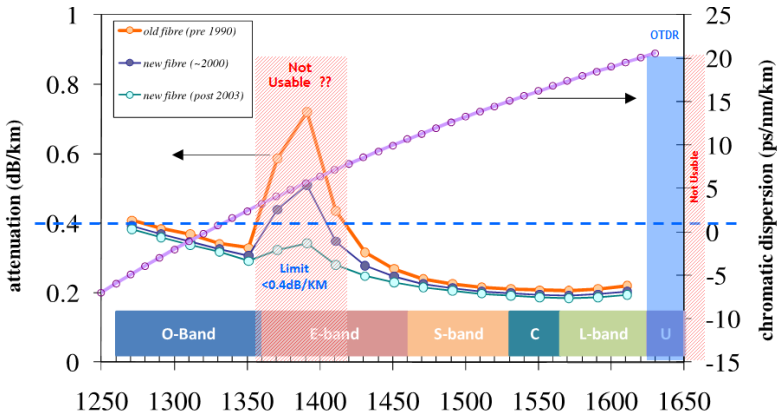


To determine downstream wavelengths, continue following the decision flow…

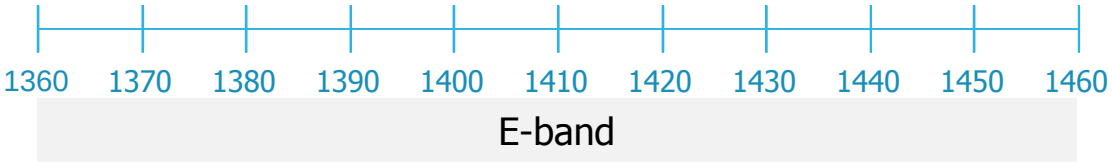
3. E-band available?



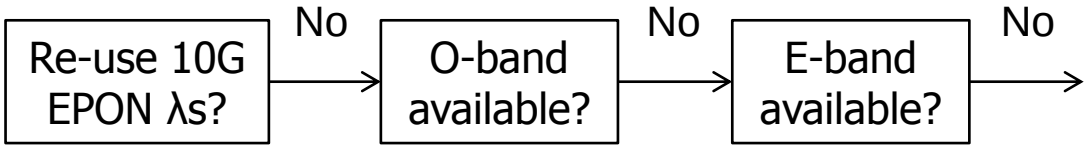
- The risk of high water peak fiber and unspecified power splitters is deemed to be high
- For downstream: ONUs in the field may need E-band blocking filter.



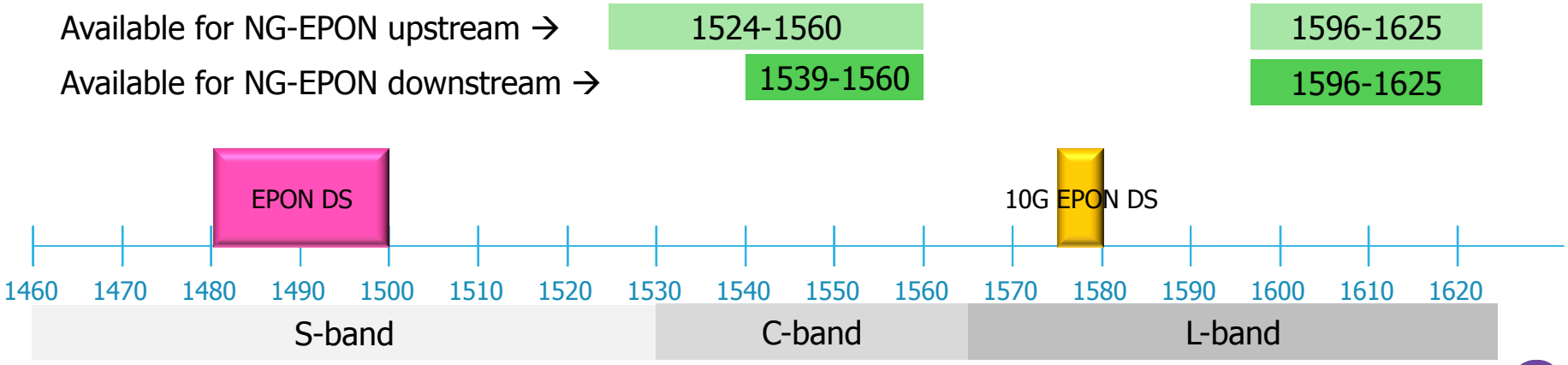
- Opens up 100 nm of spectrum



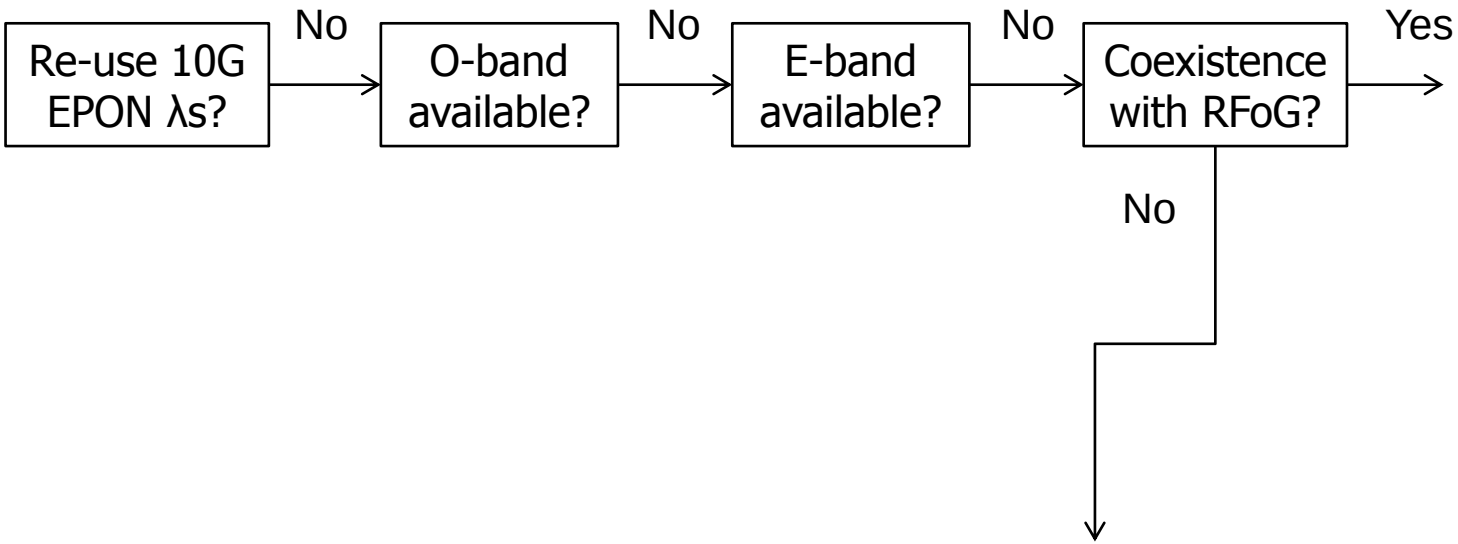
What is remaining at this point



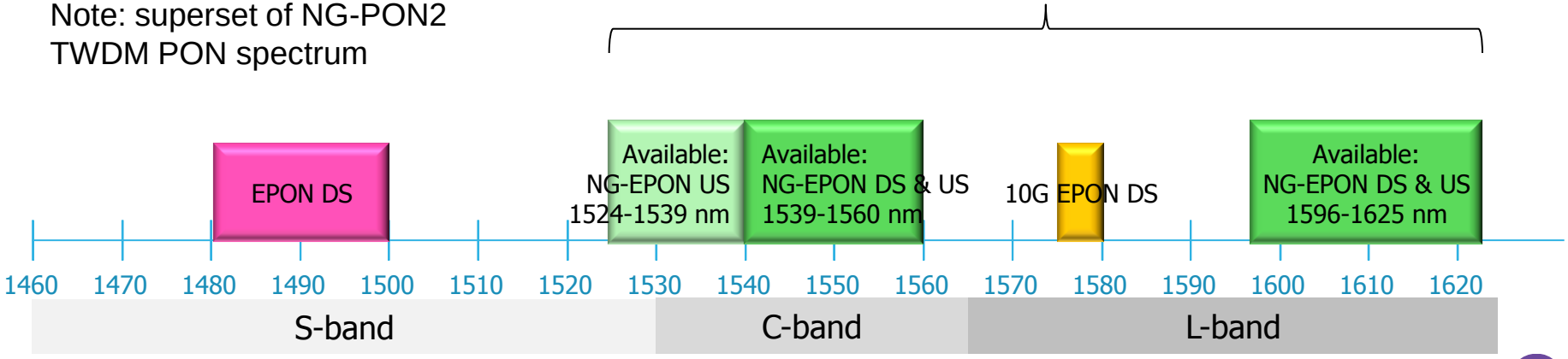
- S-, C-, and L-bands
- EPON and 10G EPON co-existence narrows the range to spectrum in the C and L+ bands
  - –Assuming the same filter characteristics as ITU-T PONs
  - –Refer to contribution ngepon_0115_harstead_02.pdf



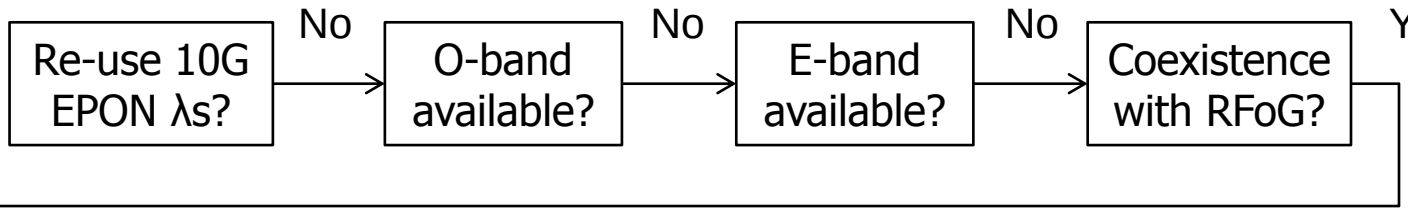
4. Coexistence with RFoG? No.



Note: superset of NG-PON2 TWDM PON spectrum

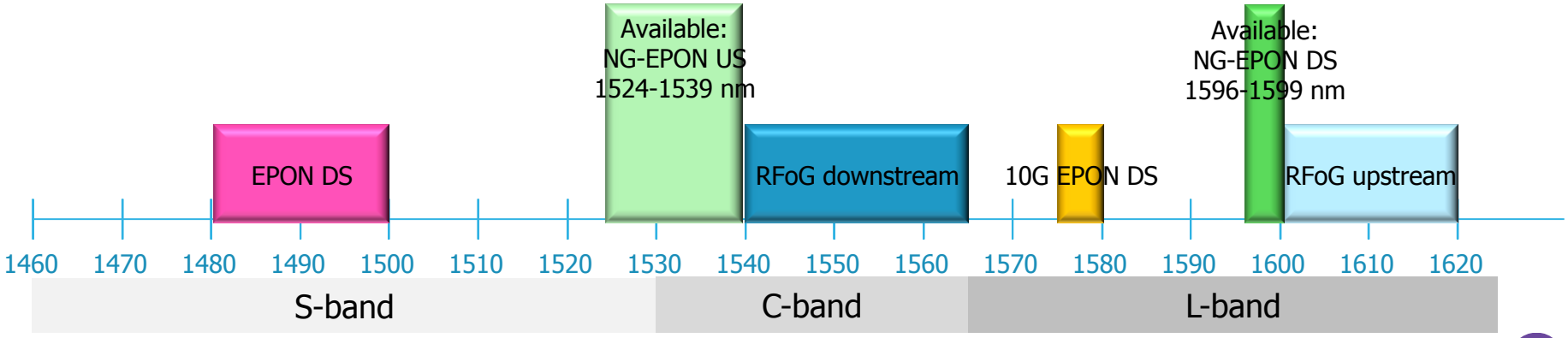


4. Coexistence with RFoG? Yes.



- To avoid overlap:
  - 1524-1539 nm upstream
  - 1596-1599 nm downstream

  } Note: subset of NG-PON2 TWDM PON spectrum
- Note: avoiding wavelength overlap is not the same thing as achieving co-existence. NEXT analysis is required

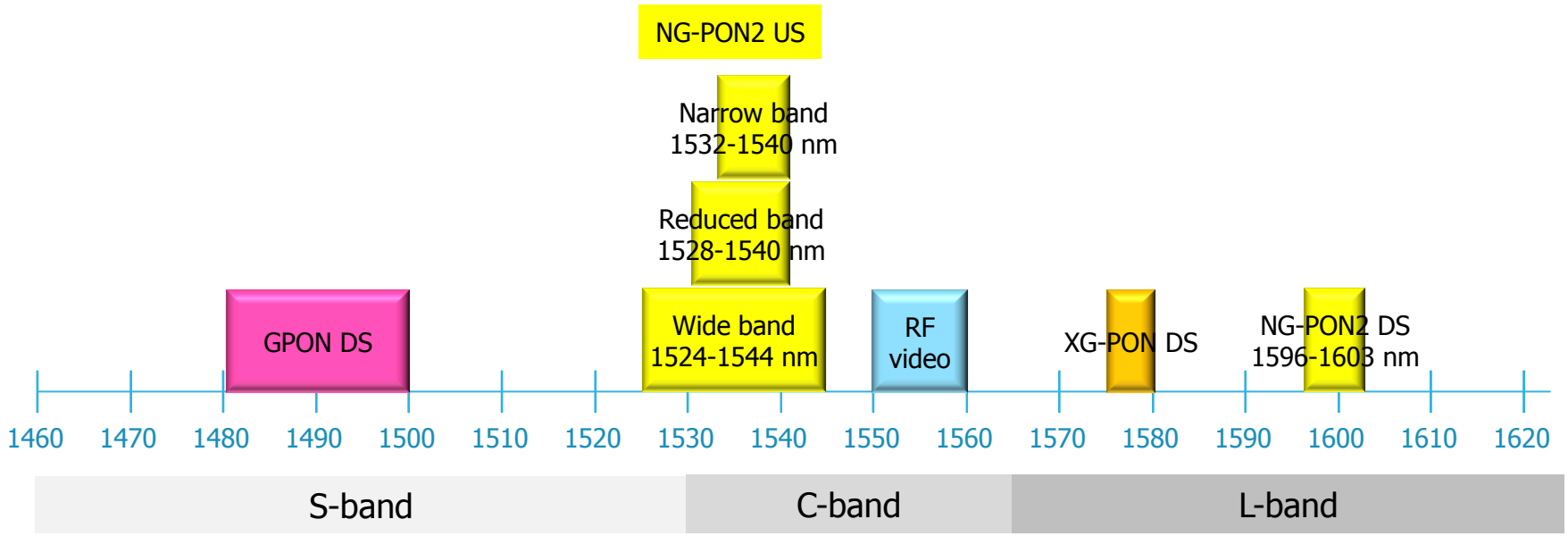


Summary

- This presentation sketches out an NG-EPON wavelength plan decision flow.
- For some scenarios, FEXT and/or NEXT analysis may be required.

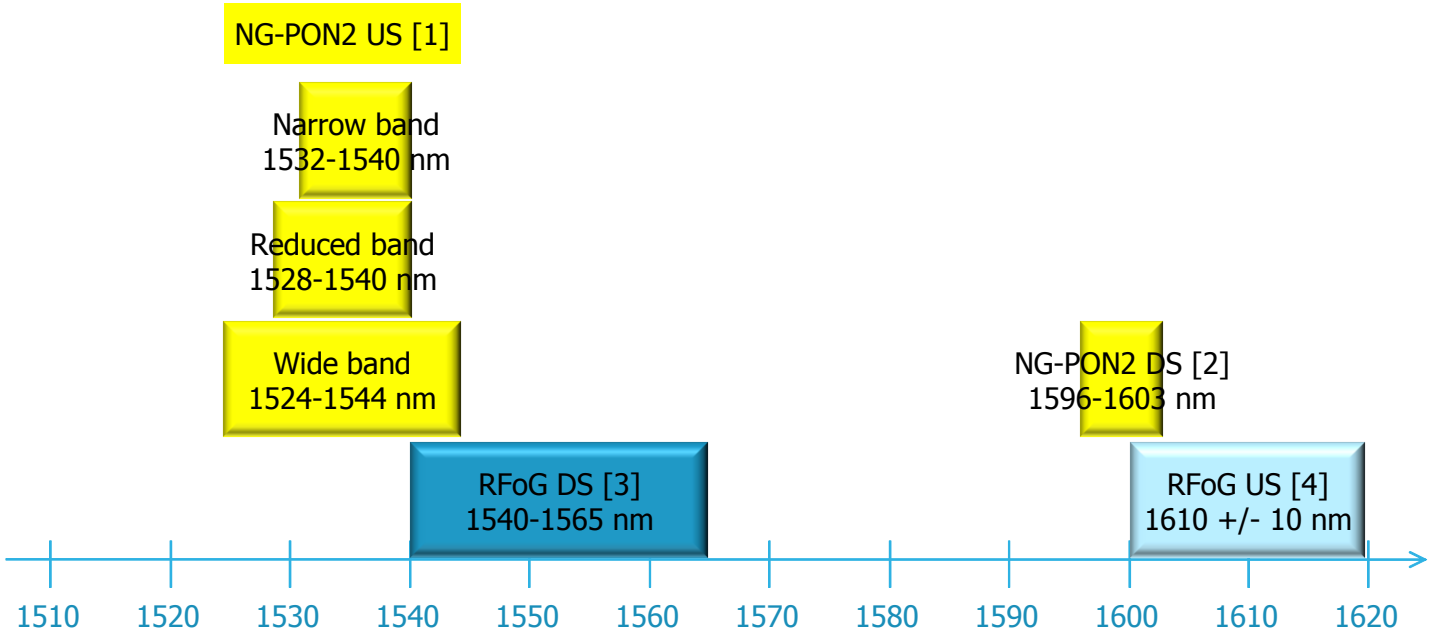
Backup

NG-PON2 TWDM PON final plan, ITU-T G.989.2



From ngepon_0115_harstead_02.pdf

RFoG and NG-PON2 wavelength overlaps



[1] ITU-T G.989.2 TWDM PON upstream

[2] ITU-T G.989.2 TWDM PON downstream

[3] SCTE 174 spec for R-ONU receiver wavelength range. (IEC CD60728-14 narrows the range to 1540-1560 nm). Both SCTE 174/ IEC CD60728-14 say “Blocking filters may… be required if an optical carrier at 1530 nm is used in the same fibre.” Therefore they already assume that receivers will have significant responsivity down to at least 1530 nm

[4] SCTE 174/ IEC CD60728-14 spec for R-ONU transmit wavelength range. This is the 1610 nm option “to allow the same PON to be used for RFoG and GPON or EPON applications.”

From ngepon_1114_harstead_04a.pdf