C-band Wavelength Plan for 10G EPON Downstream

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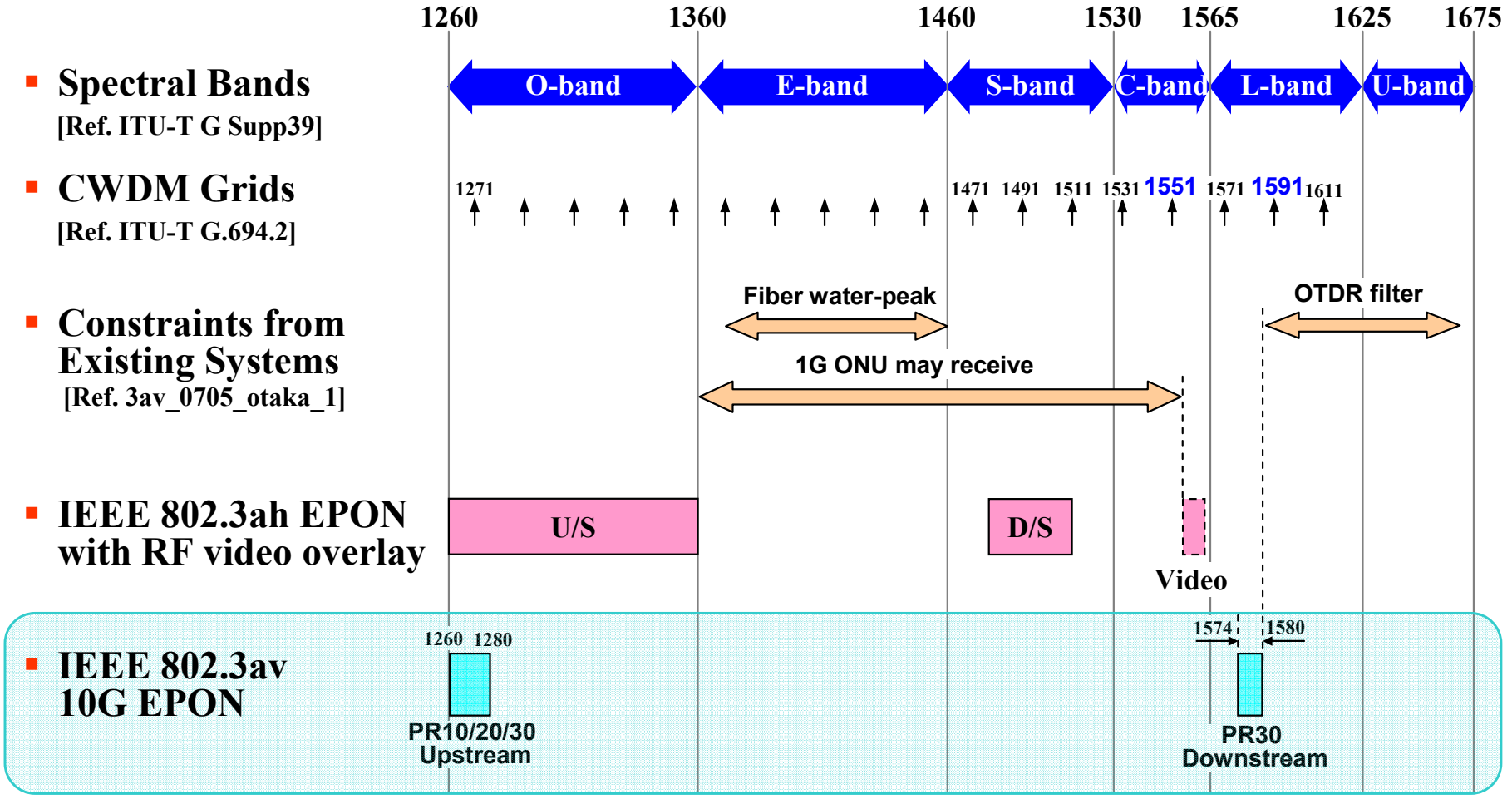
10G EPON Wavelength Plan

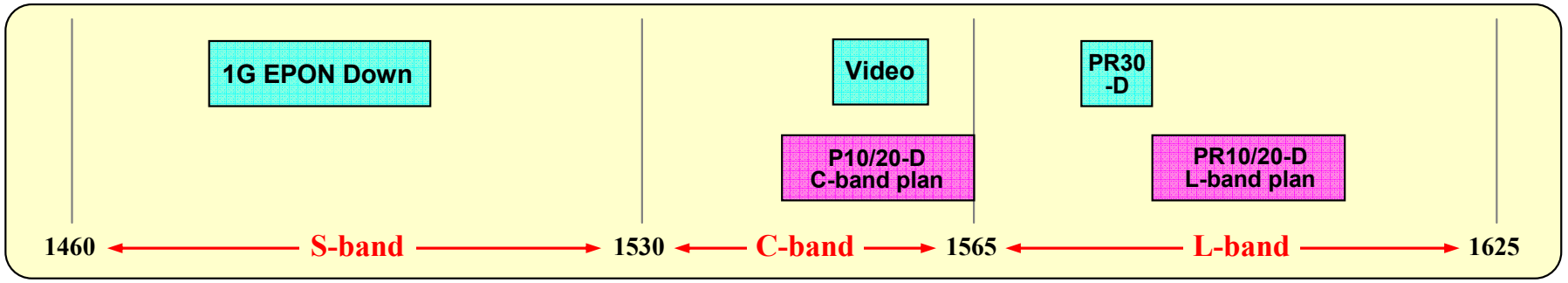
- Upstream wavelength is 1260nm ~ 1280nm
- PR30 Downstream wavelength is selected to 1574nm ~ 1580nm for coexistence with RF video overlay and OTDR monitoring signal
- PR10/20 Downstream wavelength is not decided yet



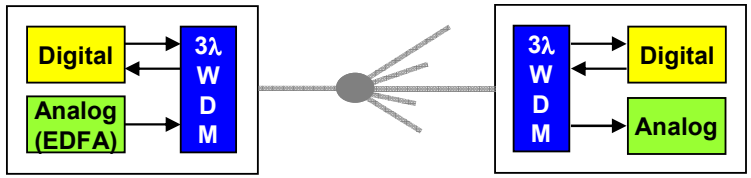
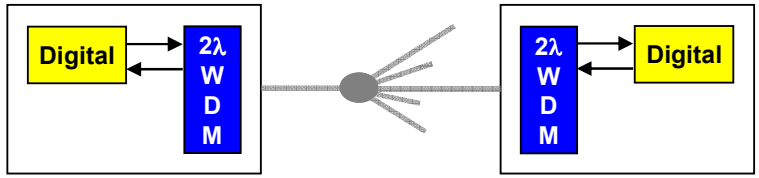
PR10/20 Downstream Wavelength

Downstream Wavelength Plan	PR10/20 Candidates		PR30
	L-band plan [1)]	C-band plan [2)]	
Center Wavelength	**1590nm**	**1550nm**	**1577 nm**
Band	1580 ~ 1600nm (20nm bandwidth)	1545 ~ 1565nm (20nm bandwidth)	1574 ~ 1580nm (6nm bandwidth)
Availability of EML	Maybe 1~2 years after standard	Now	Maybe 1~2 years after standard
Coexistence	• 1G EPON • RF Video overlay	• 1G EPON • OTDR monitoring	• 1G EPON • RF Video overlay • OTDR monitoring
Remarks	• Coexist with RF video overlay	• DWDM/CWDM grid • EML/SOA/EDFA available	

Note 1) Option C in 3av_0709_effenberger_1.pdf, 2) 3av_0709_lee_1.pdf



Options for Video over PON

Video-overlay Option	IP video Option
• Allocation of additional wavelength ✓ 1550nm ~ 1560nm • Similar to CATV delivery method ✓ Exploit the existing cable infrastructure ✓ Re-use of STB at home • Fundamentally one-way system ✓ No return channel via overlay wavelength • Limited bandwidth for unicasted VoD service • Costly triplexer at ONT 	• IP based in-band video service ✓ Data and video use the same IP transport mechanism • Highly interactive • Real converged network • Only low-cost diplexer  • IP STB needs to be newly deployed
• 2 operators have deployed this option in a FTTx infrastructure	• More than 2 Telco operators are willing to use this method.

- ❑ Video-overlay option is initial solution, especially for 1G EPON
- ❑ IP video option is long-term solution

IP video over 10G EPON

- Long-term solution for video
  - Video-overlay option is attractive at initial state due to the reuse of the cable infrastructure and the extended bandwidth for video delivery in 1G EPON
  - However, IP video option offers competitive advantages against video-overlay option in terms of high interactivity and service personalization
  - While, video-overlay option does not support RF return path for interactive service and does not support sufficient bandwidth for personalized on-demand service

- Do we need RF overlay in coexistence with 10G EPON?
  - CATV provides equivalently around 5Gb/s bandwidth [3)]
  - 10G EPON provides more bandwidth for IP video delivery than CATV

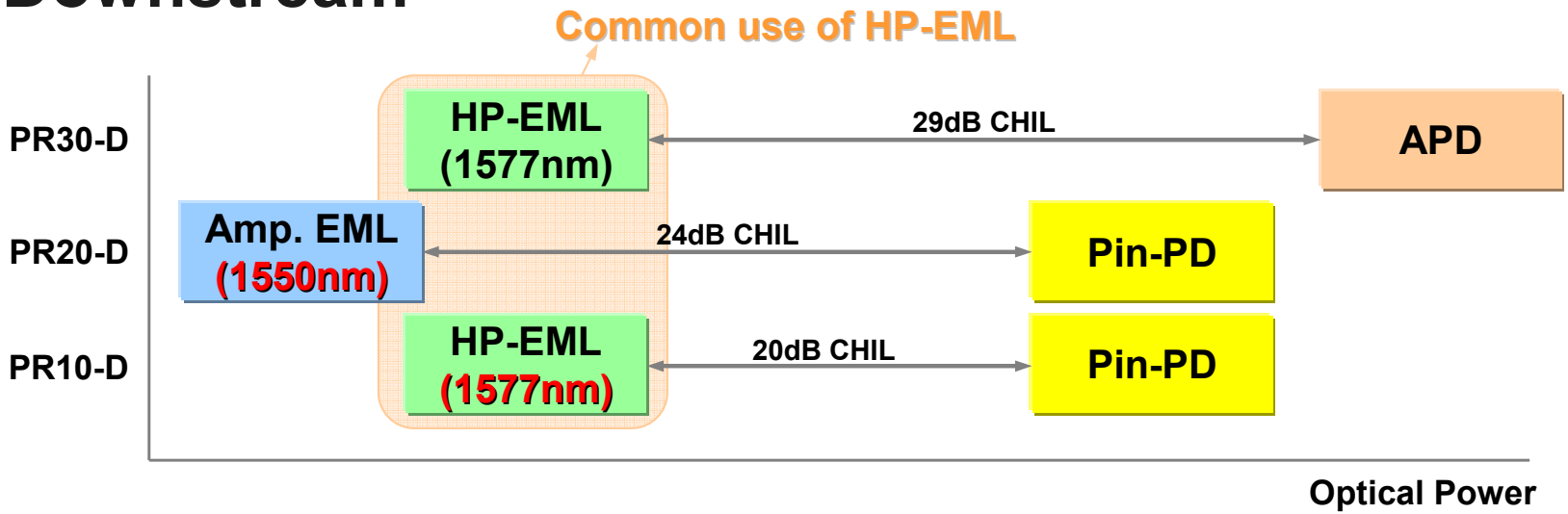
Note 3) source: yoon_1_0706.pdf

Proposal (1)

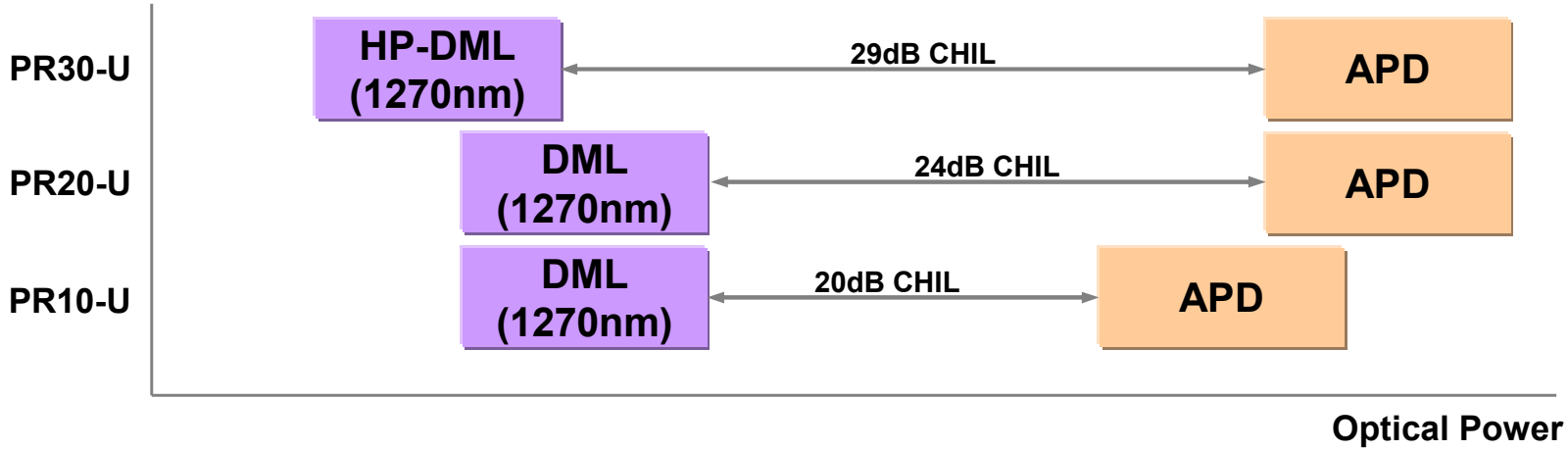
PMD	PR20-D	PR10-D
Wavelength plan	**C-band: 1550nm (1545 ~ 1565nm)**	**1577nm (1574 ~ 1580nm)**
Component features	• High output power (maximum +9~+10 dBm) • Coexistence with RF video overlay is limited due to SRS effect from high power data signal	• Use of high power EML as PR30-D
Remarks	• IP video delivery without WDM overlay • Use of existing CWDM/ DWDM source without waiting for new EML • Future upgrade to high split ratio (> 64)	• Reuse of PR30-D source • Possibly 20nm bandwidth when uncooled EML is required

Proposal (2)

❑ Downstream

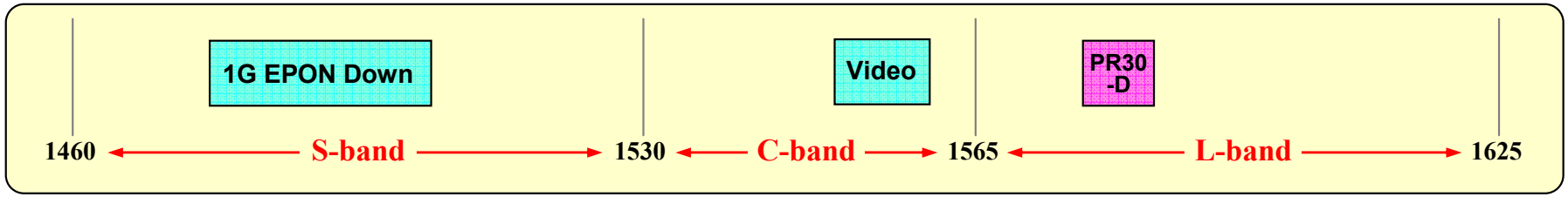


❑ Upstream

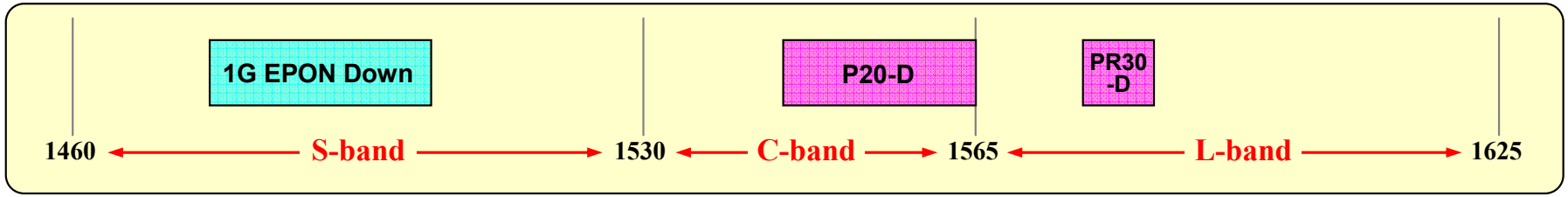


Wavelength Plan for 10G EPON Downstream

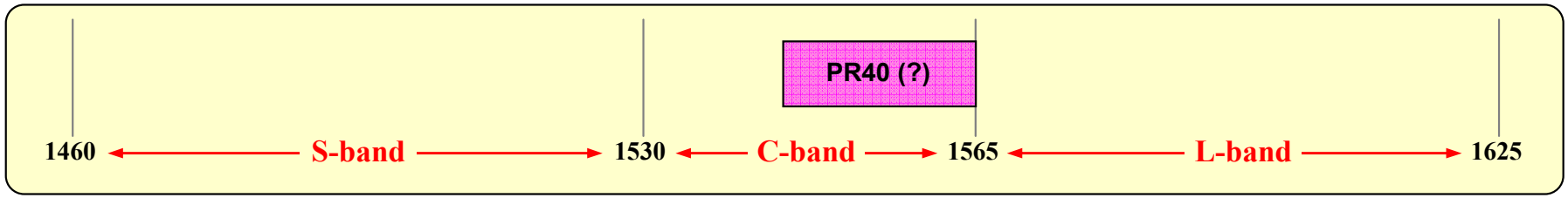
- Coexistence with 1G EPON + RF video overlay: 1577nm



- Greenfield & Coexistence with only 1G EPON: 1577nm or 1550nm



- Future Upgrade (> 64 split ratio): 1550nm
  - No coexistence due to the gap of power budget between the existing and the required



Conclusions

- 1550nm EML is widely available
  - Availability of 1550nm EML makes it easy to initial deployment of 10G EPON
- Will 10G EPON require video overlay option?
  - Upcoming video service requires interactivity and personalization based on IP transport mechanism
  - 10G EPON is able to provide enough bandwidth for IP video delivery, which is different from 1G EPON case
  - Especially for PR20-D, analogue RF video signal may degrade from SRS effect caused by amplified data signal
- For coexistence with the existing network,
  - We have already prepared a solution for coexistence with 1G EPON + RF video overlay; 1577nm for PR30-D
  - Coexistence with only 1G EPON is possible with 1550nm wavelength plan of 10G EPON downstream

C-band wavelength plan is valid for PR20-D of 10G EPON