

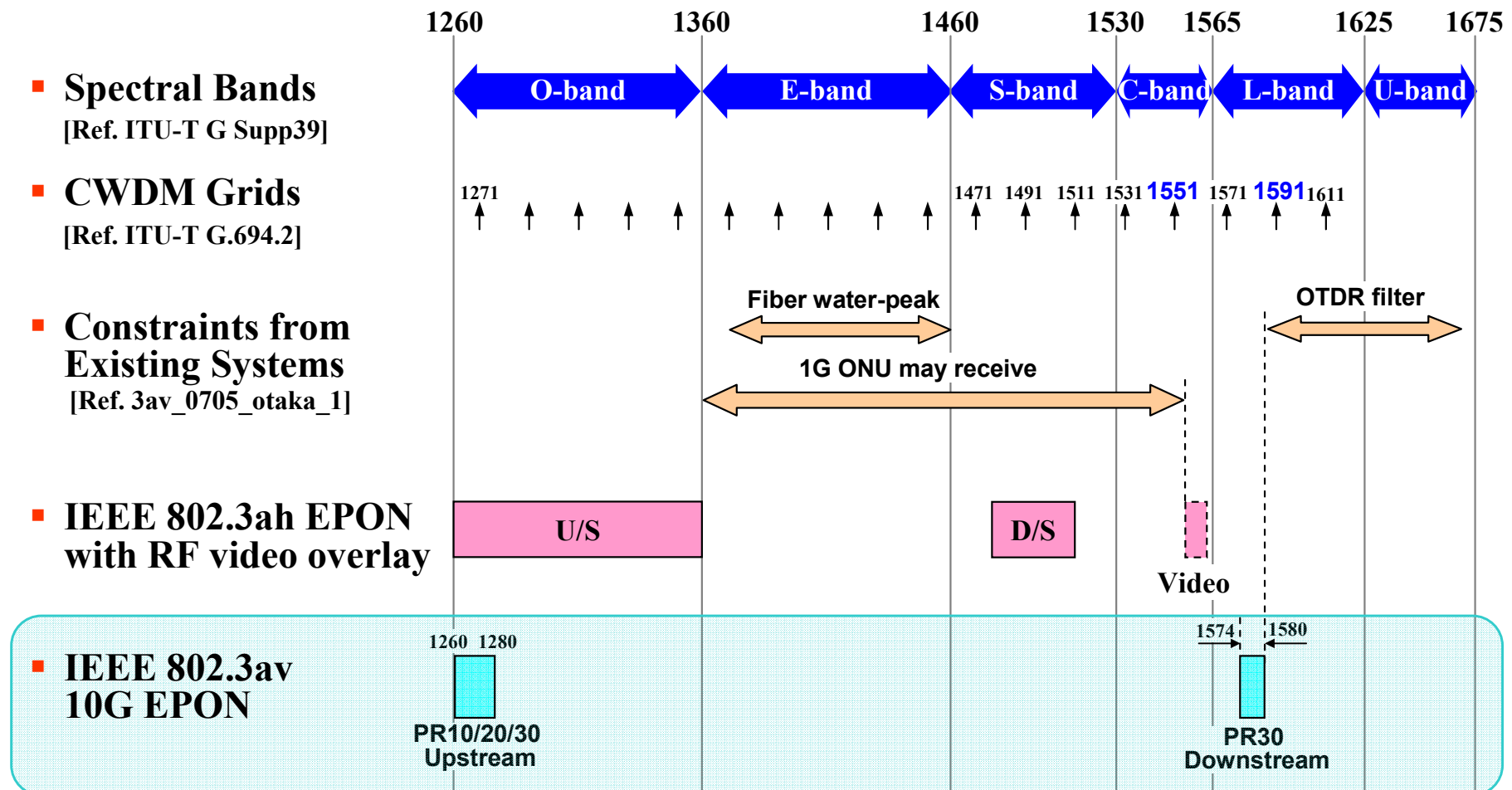
C-band Wavelength Plan for 10G EPON Downstream

Dongsoo Lee, <d-soolee@etri.re.kr>

**IEEE 802.3av 10Gb/s EPON TF
Atlanta, Georgia USA - November 2007**

10G EPON Wavelength Plan

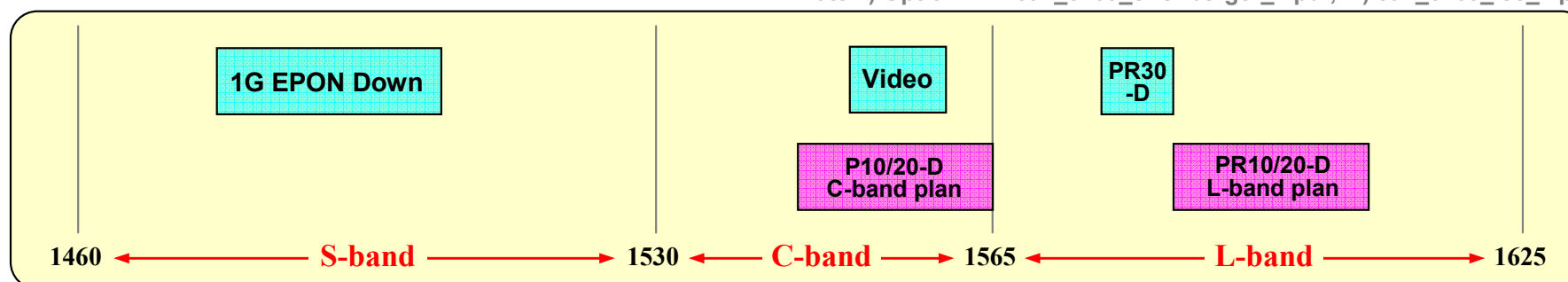
- ❑ Upstream wavelength is 1260nm ~ 1280nm
- ❑ PR30 Downstream wavelength is selected to 1574nm ~ 1580nm for coexistence with RF video overlay and OTDR monitoring signal
- ❑ PR10/20 Downstream wavelength is not decided yet



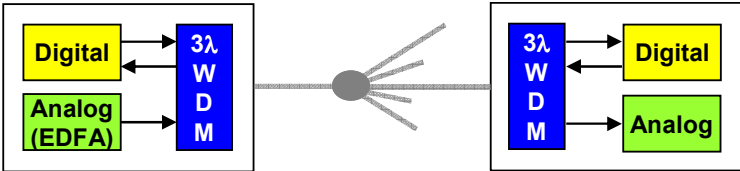
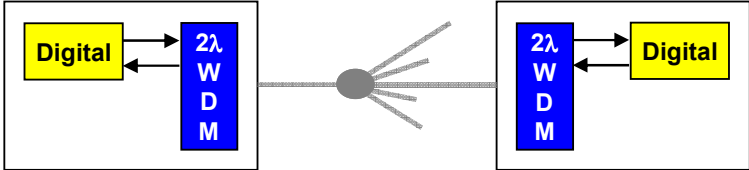
PR10/20 Downstream Wavelength

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	At the time of standard
Coexistence	<ul style="list-style-type: none"> 1G EPON RF Video overlay 	<ul style="list-style-type: none"> 1G EPON OTDR monitoring 	<ul style="list-style-type: none"> 1G EPON RF Video overlay OTDR monitoring
Remarks	<ul style="list-style-type: none"> DWDM/CWDM grid Coexist with RF video overlay Common ONT Rx 	<ul style="list-style-type: none"> DWDM/CWDM grid EML/SOA/EDFA available 	

Note 1) Option C in 3av_0709_effenberg_1.pdf, 2) 3av_0709_lee_1.pdf



Options for Video over PON

Video-overlay Option	IP video Option
<ul style="list-style-type: none"> • Allocation of additional wavelength <ul style="list-style-type: none"> ✓ 1550nm ~ 1560nm • Similar to CATV delivery method <ul style="list-style-type: none"> ✓ Exploit the existing cable infrastructure ✓ Re-use of STB at home • Fundamentally one-way system <ul style="list-style-type: none"> ✓ No return channel via overlay wavelength • Limited bandwidth for unicasted VoD service • Costly triplexer at ONT 	<ul style="list-style-type: none"> • IP based in-band video service <ul style="list-style-type: none"> ✓ Data and video use the same IP transport mechanism • Highly interactive • Real converged network • Only low-cost diplexer  <ul style="list-style-type: none"> • IP STB needs to be newly deployed
<ul style="list-style-type: none"> • 2 operators have deployed this option in a FTTx infrastructure 	<ul style="list-style-type: none"> • 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

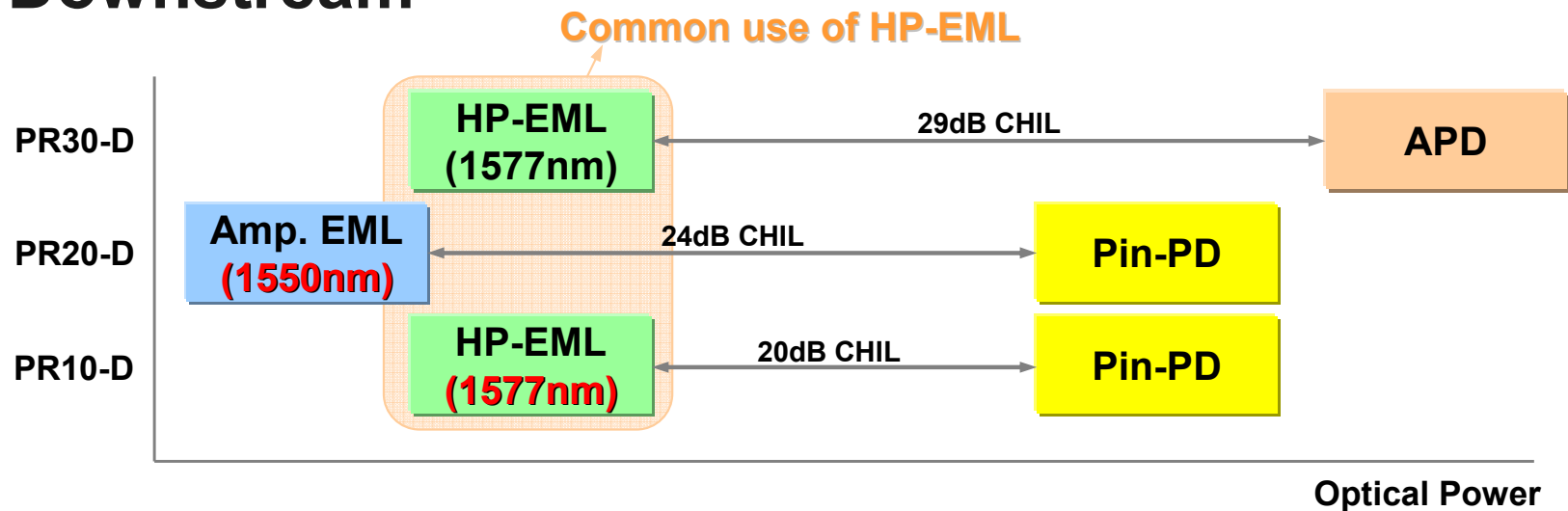
Note 3) source: yoon_1_0706.pdf

Proposal (1)

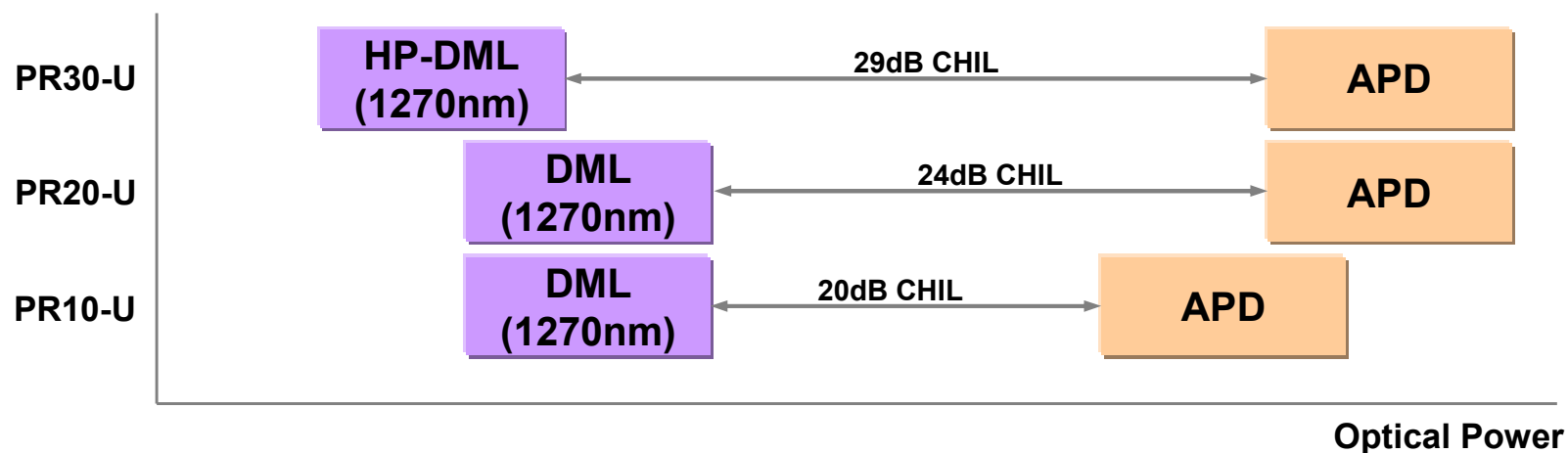
PMD	PR20-D	PR10-D
Wavelength plan	C-band: 1550nm (1545 ~ 1565nm)	1577nm (1574 ~ 1580nm)
Component features	<ul style="list-style-type: none"> • High output power (maximum +9~+10 dBm) • Coexistence with RF video overlay is limited due to SRS effect from high power data signal 	<ul style="list-style-type: none"> • Use of high power EML as PR30-D
Remarks	<ul style="list-style-type: none"> • IP video delivery without WDM overlay • Use of existing CWDM/DWDM source without waiting for new EML • Future upgrade to high split ratio (> 64) 	<ul style="list-style-type: none"> • Reuse of PR30-D source • Possibly 20nm bandwidth when uncooled EML is required

Proposal (2)

Downstream

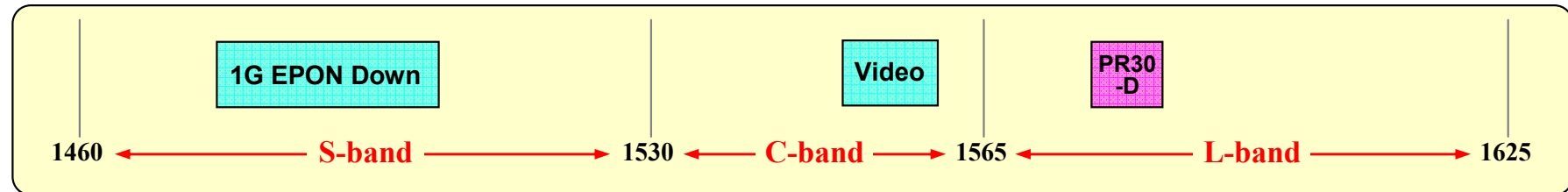


Upstream

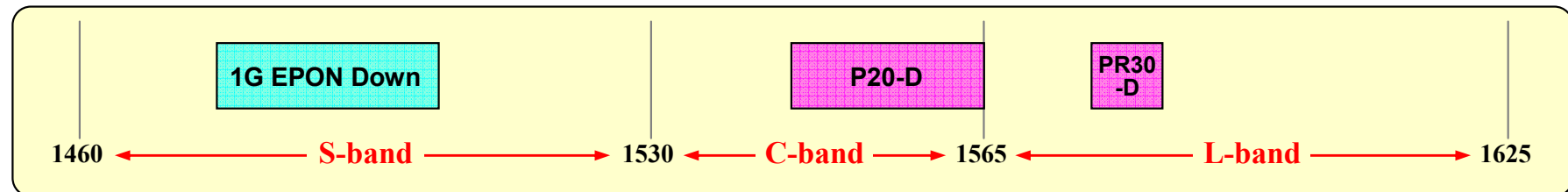


Wavelength Plan for 10G EPON Downstream

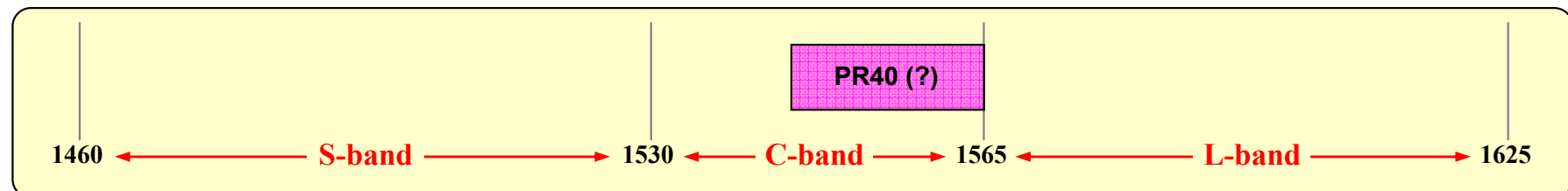
- ❑ Coexistence with 1G EPON + RF video overlay: 1577nm



- ❑ 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