

Considerations on Optical 400GbE DMT

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Supporters

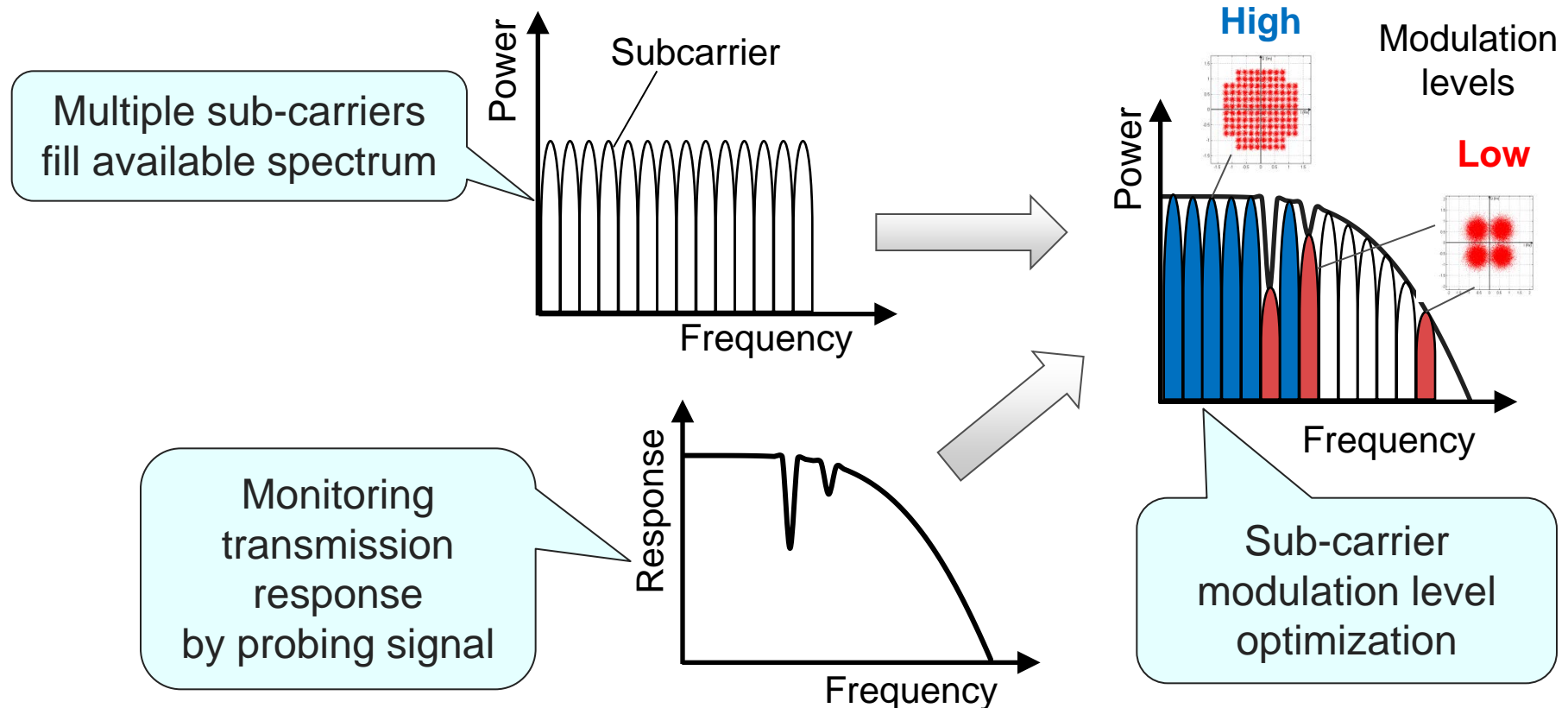
- Hideki Isono Fujitsu Optical Components
- Daniel Stevens Fujitsu Semiconductor Europe
- Matt Pope Semtech
- Craig Hornbuckle Semtech
- Song Shang Semtech
- Francois Tremblay Semtech

Background

- Several contributions in the last meeting mentioned that the long reach applications such as 10km and 40km is strongly preferred for first target of 400GbE.
- In this presentation, we discuss the advanced modulation for its solution.
 - Transceiver configuration for optical 400GbE DMT
 - Transceiver target considering CMOS process technology roadmap
 - The CMOS technology will be an important factor for power consumption in the advanced modulation.

Discrete Multi-tone (DMT) Technology

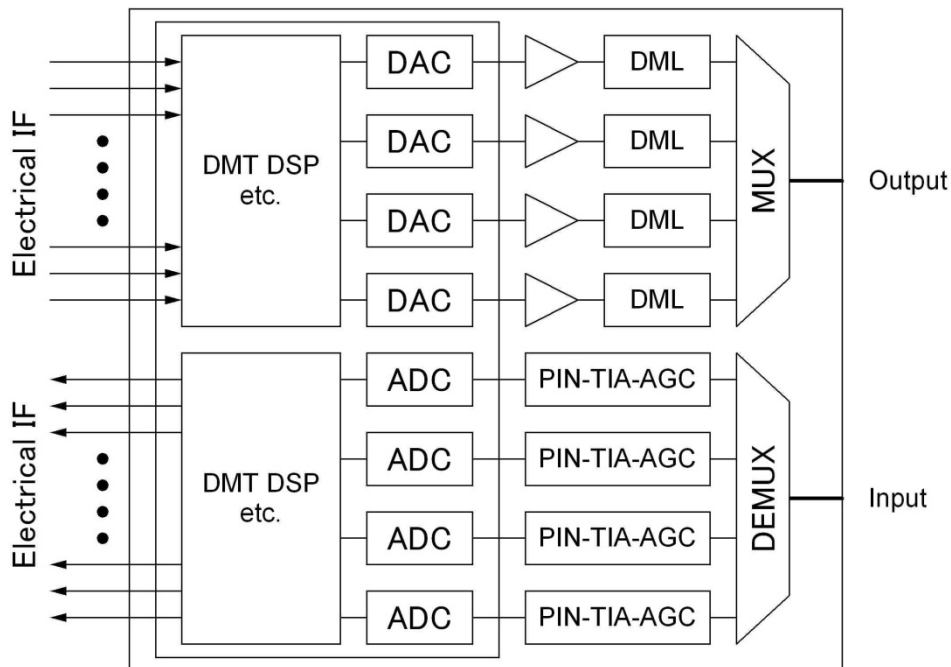
- Widely used in xDSL systems (ADSL, HDSL....)
 - High spectral efficiency and cost effectiveness
- Adaptive bit and power allocation for each subcarrier depending on transmission characteristics
 - Optimization from SNRs of the transmitted probing signal



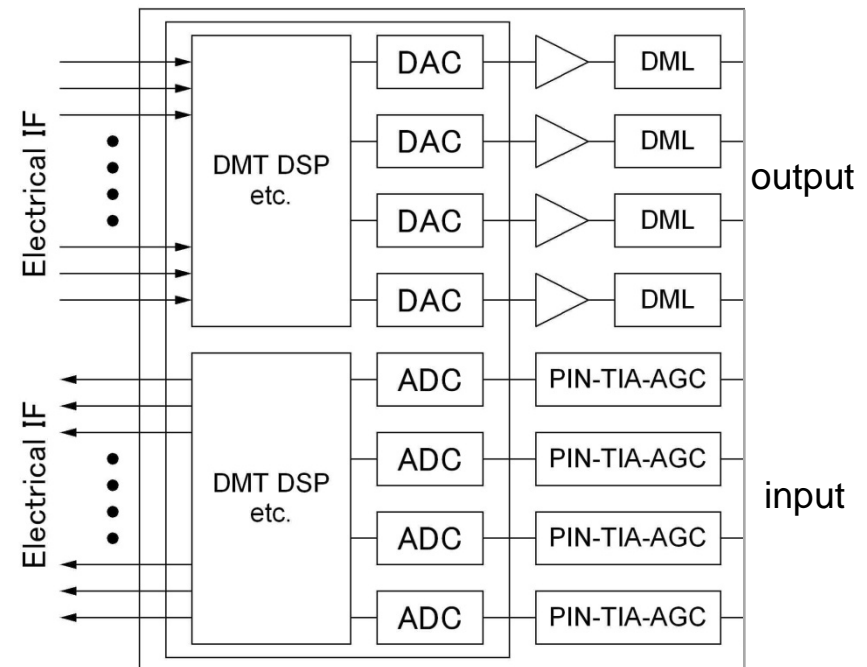
Configuration for Optical 400GbE DMT

- DMT can achieve 400GbE transceiver with only 4 channel as below because DMT can use any optical devices for 100GbE transceiver.
 - Reduction of size and cost because of reduction the number of optical devices
- Serial optical link by using DMT with WDM is the good candidate considering the long reach applications such as 10km and 40km preferred as the first target for 400GbE.

➤ Serial optical link (WDM)

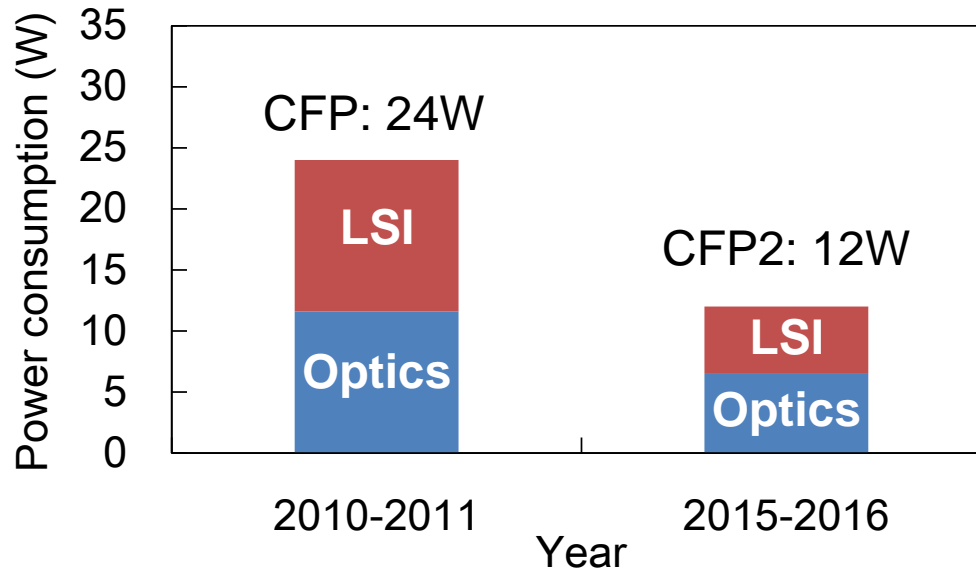


➤ Parallel optical link



Target Transceiver for Optical 400GbE DMT

- CFP and CFP2 transceiver will be preferred for target transceiver for the long reach application.
- We estimate the availability of optical 400GbE DMT transceiver from the point of view of power consumption.
- Target power consumption

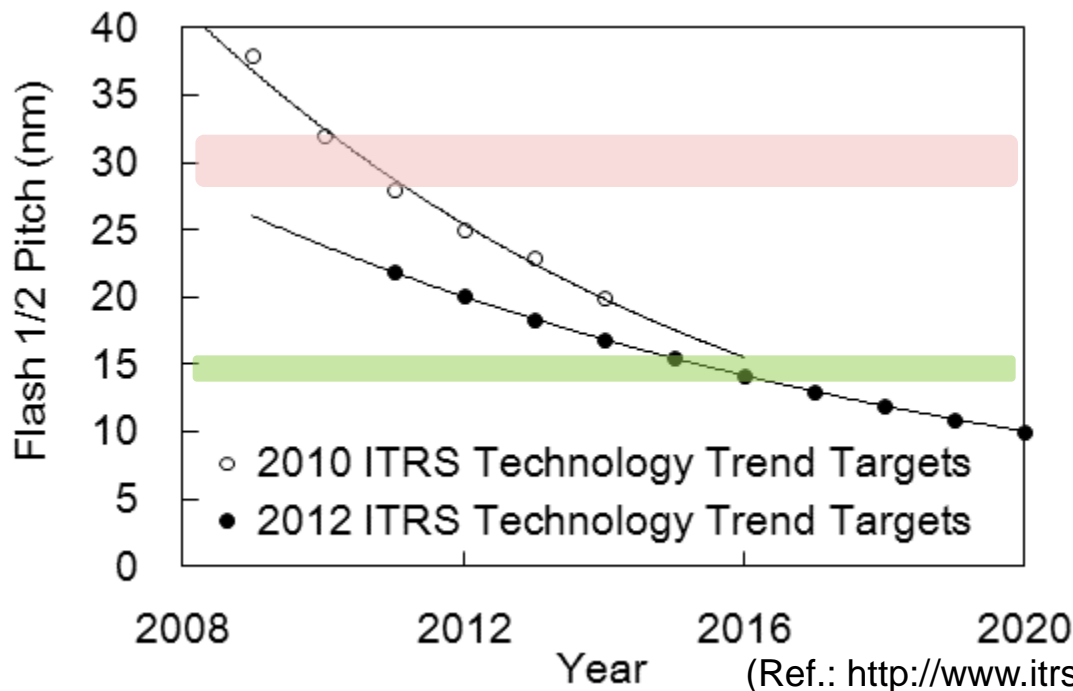


- Reduction of power consumption
 - LSI: Progress of CMOS process technology
 - Optics: Differential driving and reduction of driving voltage and bias current due to the characteristic enhancement of DAC and ADC

Target for Optical 400GbE Transceiver Roadmap

- The progress of CMOS technology is accelerated.
- We show available time of CFP and CFP2 for Optical 400GbE DMT transceiver from the point of view of CMOS process technology.
- Overview of CMOS International Technology Roadmap for Semiconductors(ITRS)

2011 ITWG Table Timing:	2007		2010		2013		2016		2019		2021	
2011 ITRS Flash Poly :	54nm	45nm	2009	32nm	22nm	2012	15nm	2015	11nm	2018	11nm	
2011 ITRS DRAM M1 :	68nm		45nm			32nm		22nm			16nm	
MPU/hpASIC "Node":	"45nm"		"32nm"		"22/20nm"		"16/14nm"		"11/10nm"		"8/7nm"	
2011 ITRS MPU/hpASIC M1 :	76nm	65nm	54nm	45nm	38nm	32nm	27nm		19nm			13nm



Target Module	LSI process	
	Technology	Available time
CFP	32nm-28nm	2010-2011
CFP2	16nm-14nm (+2gen.)	2015-2016

Summary

- Transceiver configuration is shown for optical 400GbE DMT with WDM
 - Reduction of size and cost because of reduction the number of optical devices
- Progress of CMOS technology leads to reduction of power consumption and cost for 400GbE transceiver.
 - Roadmap towards the transceiver of CFP and CFP2

Thank you