NOKIA

Measurement Results of 25G NRZ & EDB in C and O-band

Vincent Houtsma & Dora van Veen

Optical Access Research, Nokia Bell Labs, Murray Hill, NJ

October, 2016

So far mostly O-band receiver sensitivity results have been shown

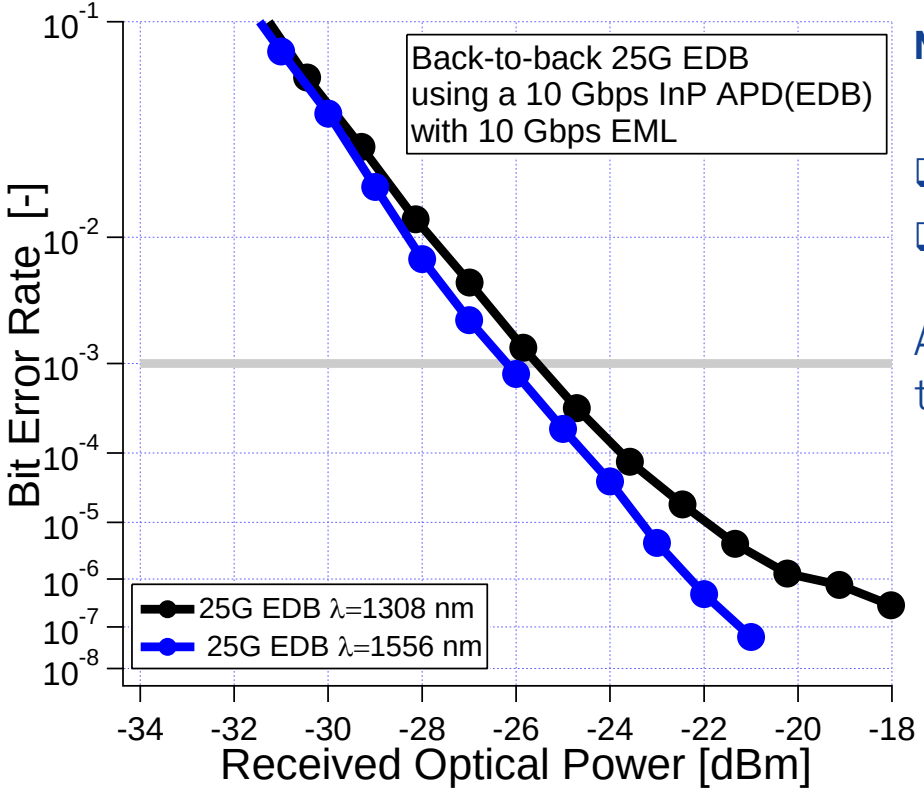
The wavelength plan however is still under discussion in 802.3ca and C-band operation is still an option for the DS

We therefore evaluated the relative back-to-back receiver performance between O-band and C-band for two different type of receivers :

- ❑ 25G Ge/Si APD using conventional NRZ detection
- ❑ 10G InP APD using EDB detection

λ=1308 nm and λ=1556 nm were used as O and C band wavelengths

Measured BER for 25G EDB(10G InP APD) using 10G EML



Measured Receiver Sensitivity at BER=10^{-3}

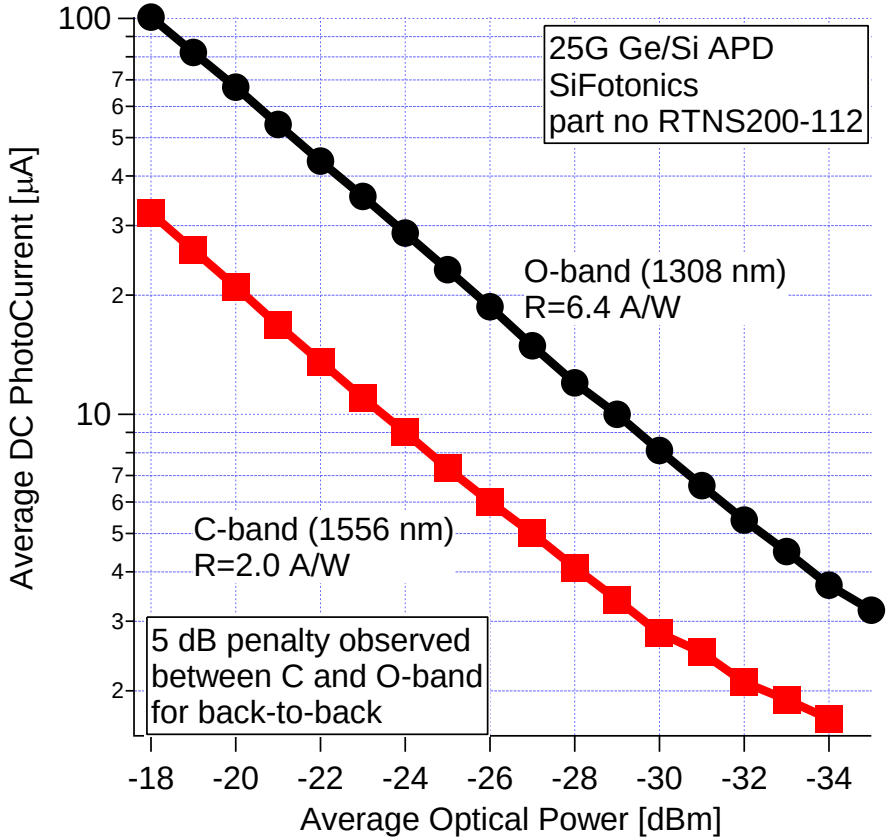
- **25G EDB = -26.2 dBm (C-band)**
- **25G EDB = -25.5 dBm (O-band)**

An **improvement** of 0.7 dB is observed by going to C-band compared to O-band operation

Vincent Houtsma, Dora van Veen & Ed Harstead "Unified Evolution-Ready 25 Gbps NG-PON Architecture", in Proc. ECOC 2016, paper Th.2.P2.SC7.72 Dusseldorf, Germany (2016).

NOKIA

DC Responsivity of 25G Ge/Si APD measured in C and O-band



Measured DC Responsivity

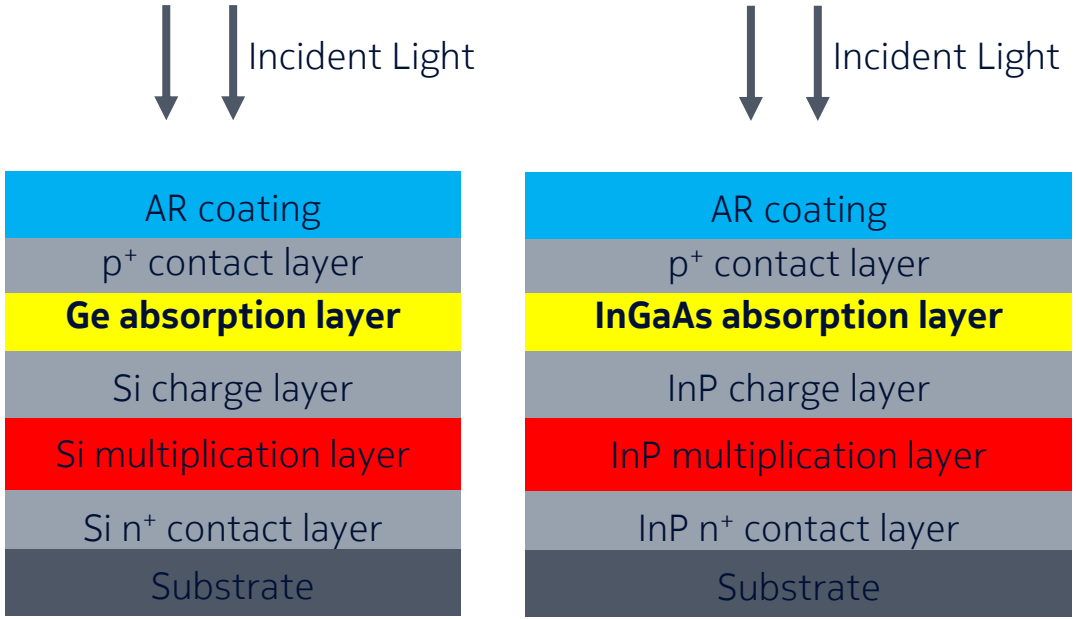
- ❑ **25G NRZ = 2.0 A/W (C-band)**
- ❑ **25G NRZ = 6.4 A/W (O-band)**

A **penalty** of 5 dB is observed by going to C-band compared to O-band operation

NOKIA

Differences between Ge/Si and InP APDs

Basic principle of APDs : Light gets absorbed in the absorption layer and the carriers get multiplied in the multiplication layer

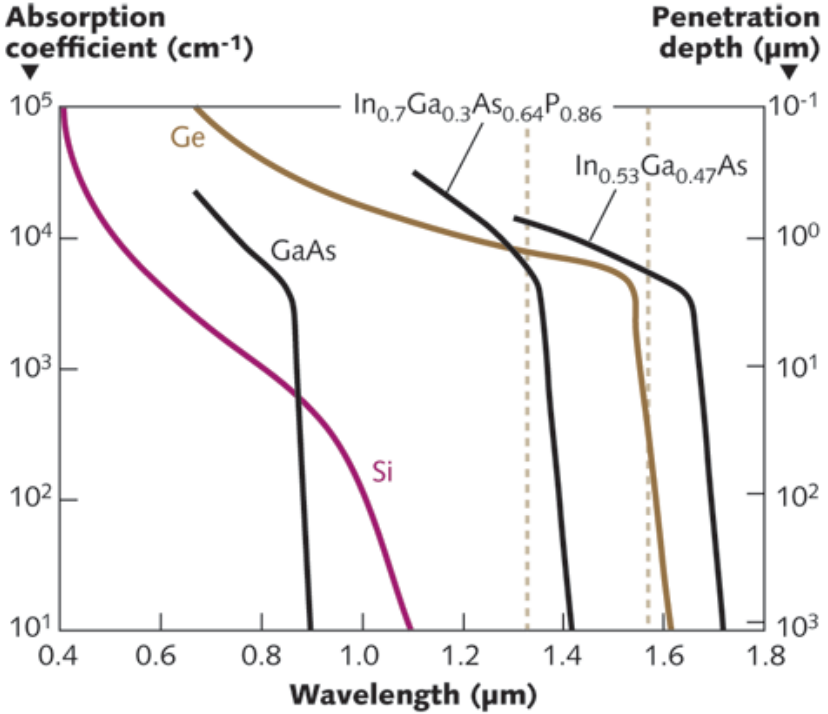


Schematic cross-section of both Ge/Si and InP APDs

- **For Ge/Si APDs absorption layer is based on Ge**
- **For InP APDs absorption layer is based on InGaAs**

NOKIA

Reason for difference in penalty between C and O-band for 25G Ge/Si APD and 10G InP APD



(From LaserFocusWorld *Courtesy of A*STAR*)

- Absorption coefficient of Ge suggests reduced responsivity in C-band for Ge/Si APD might be related to the *direct* bandgap of Ge which has cut off wavelength of about 1550 nm
- Conventional 10 Gbps InP APDs based on InGaAs absorption layer have cut off wavelength of 1680 nm
- Also absorption layer thickness is thinner for 25G vs 10G APDs (for speed reasons)
- 25G APDs based on InP might have smaller penalty as observed for Ge/Si APDs since it still used InGaAs as the absorption layer (t.b.c.)

NOKIA


NOKIA