Optical Fiber Communications

Chapter 4

Optical Sources - LED

Light Emitting Diode (LED)

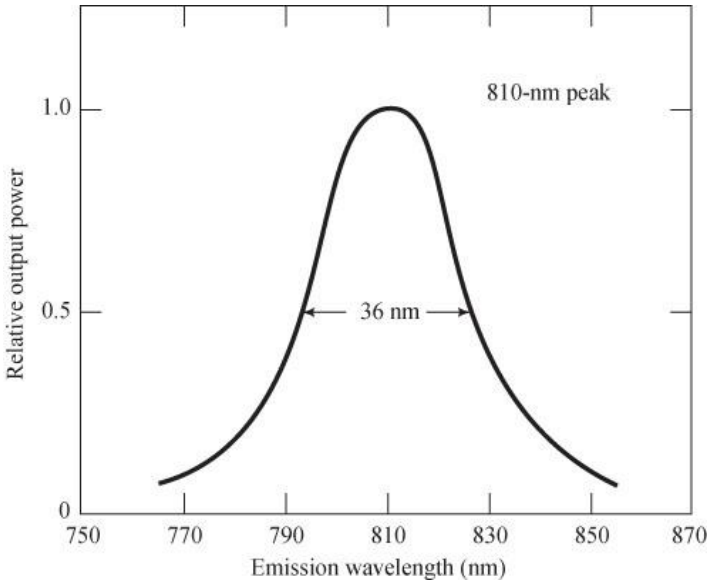
LED Communication Systems

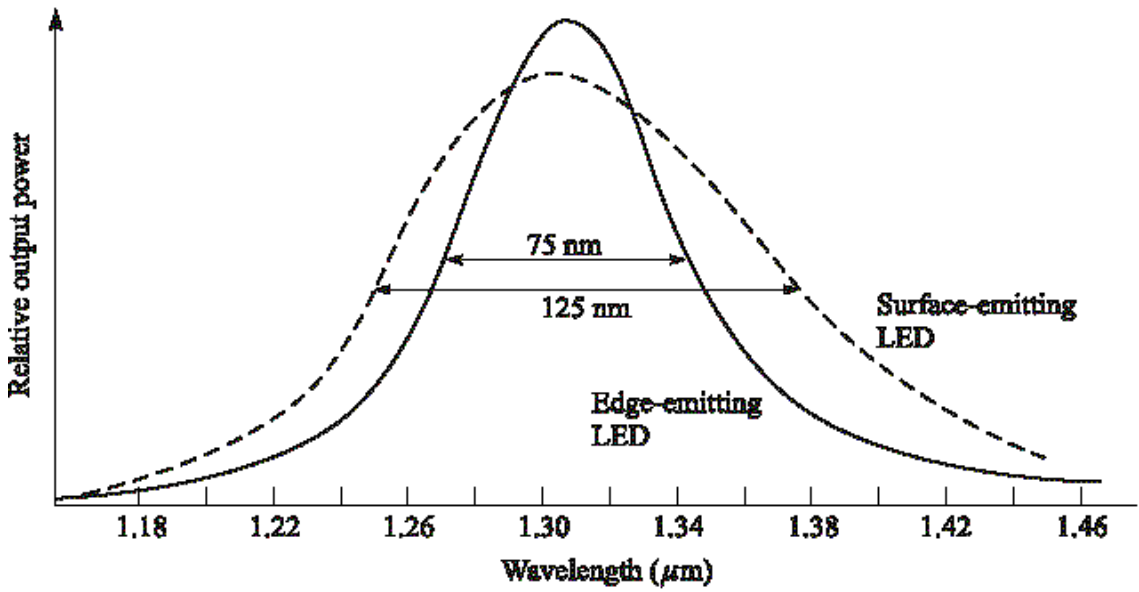
- Type 1 : Fiber Based System
- Type 2 : Optical Wireless System (Indoor App)

Fiber Based LED Comm. Sys.

Table 4.2 *Typical characteristics of surface- and edge-emitting LEDs*

LED type	*Material*	*Wavelength (nm)*	*Operating current (mA)*	*Fiber-coupled power (μW)*	*Nominal FWHM (nm)*
SLED	GaAlAs	850	110	40	35
ELED	InGaAsP	1310	100	15	80
SLED	InGaAsP	1310	110	30	150





Fiber Based LED Comm. Sys.

→ Fiber Dispersion Perspective *ace- and edge-emitting LEDs*

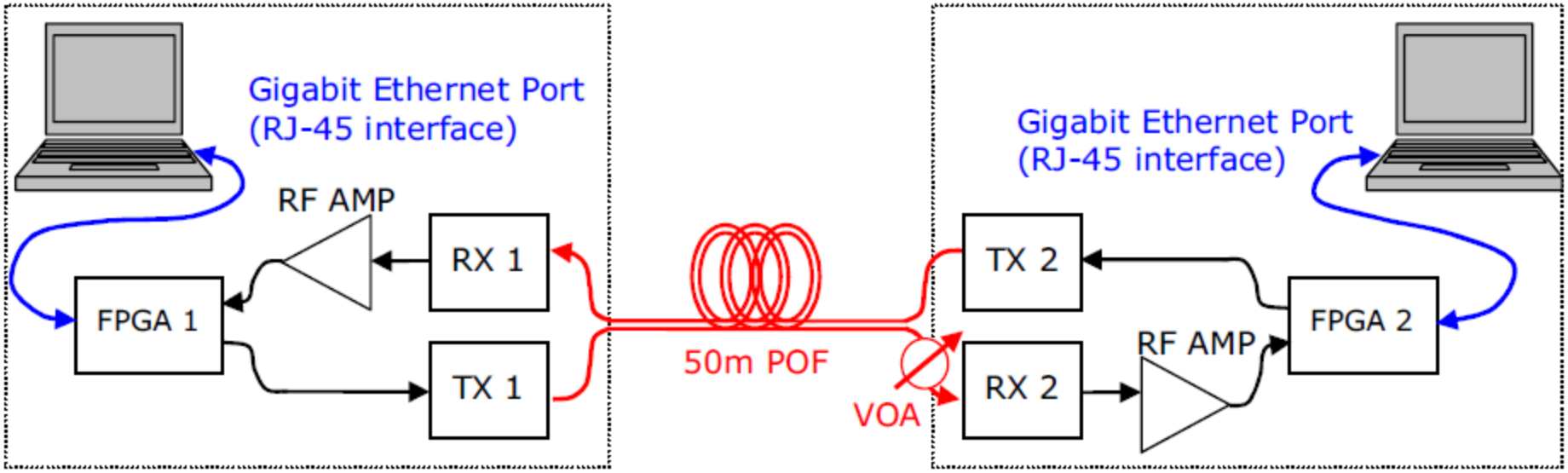
LED type	*Material*	*Wavelength (nm)*	Atten. [dB/km]	Disp. [ps/nm-km]	*Fiber-coupled power (μW)*	*Nominal FWHM (nm)*
SLED	GaAlAs	850	3.5	High	40	35
ELED	InGaAsP	1310	0.5	2.8	15	80
SLED	InGaAsP	1310	0.5	2.8	30	150

→ Calculate Max. Transmission Distances?
(Dispersion Limited? Power Limited?)

Current **Fiber** Based LED Comm. Sys. Trends

- Fiber Based System

  "First Demonstration of Real-Time LED-based Gigabit Ethernet Transmission on 50m of A4a.2 Si-POF with Significant System Margin,"
  European Conference and Exhibition on Optical Communication (ECOC), **Sep 2010**



→ 1Mbps upto 1Gbps

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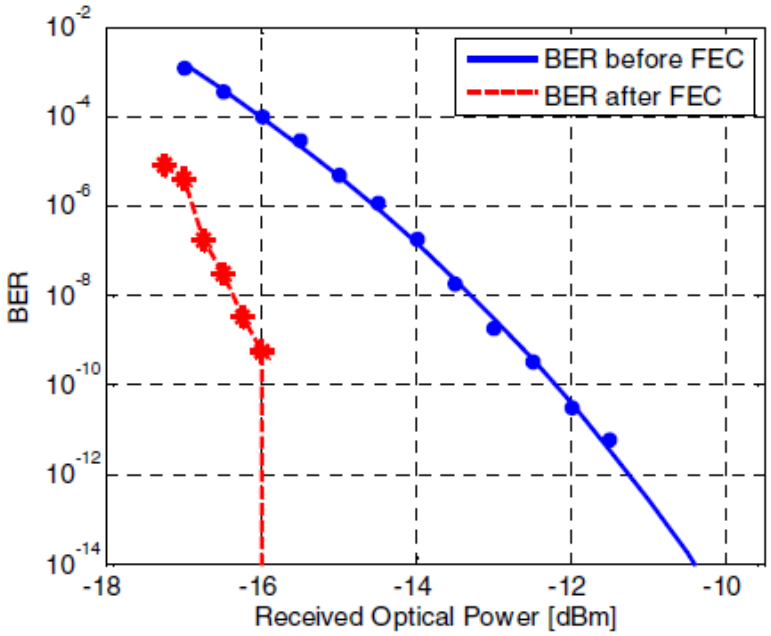

Fig. 2: BER measurement before and after FEC as a function of the received optical power.

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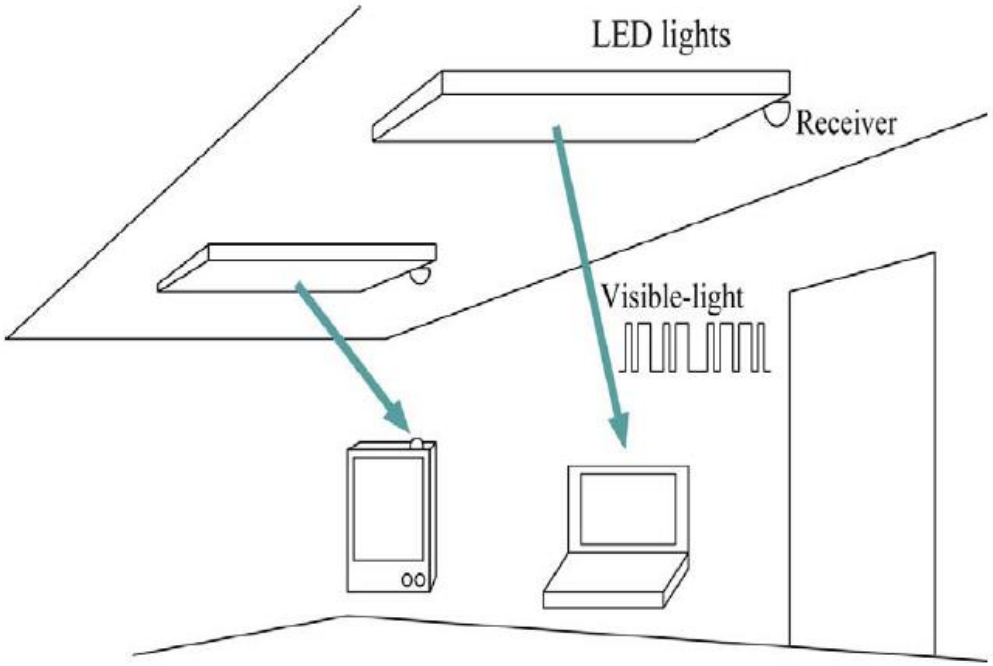
→ Plastic Optical Fiber

Current **Wireless** Based LED Comm. Sys. Trends

- Optical Wireless System (Indoor Comm.)

  "10m/500Mbps WDM visible light communication systems,"
  Optics Express, Vol.20, No.9, **Apr 2012**



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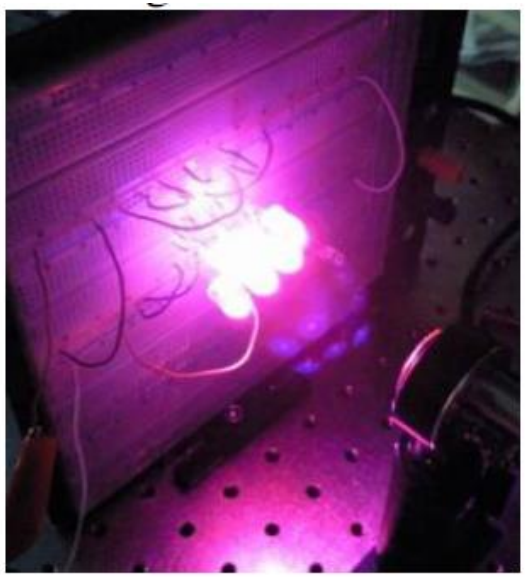

Fig. 9. Red + Blue Signal

Fig. 10. Green + Blue Signal

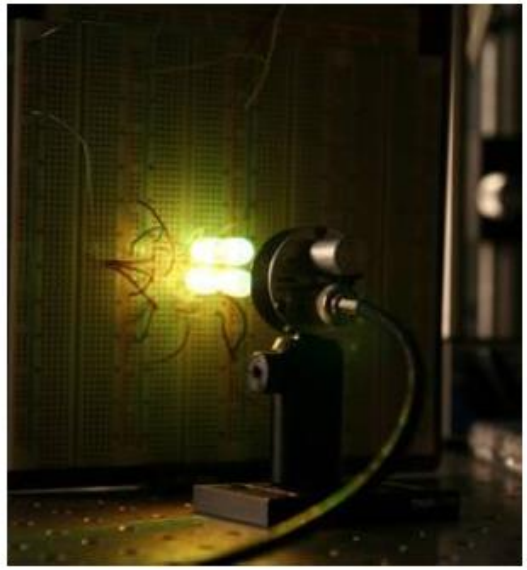

Fig. 11. Red + Gredn Signal

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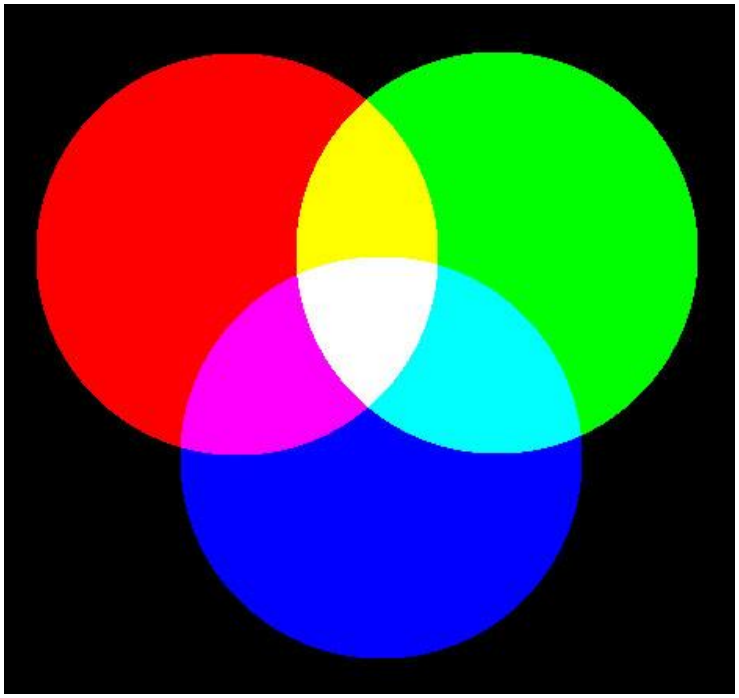
  Optics Express, Vol.20, No.9, **Apr 2012**



→ color mixing

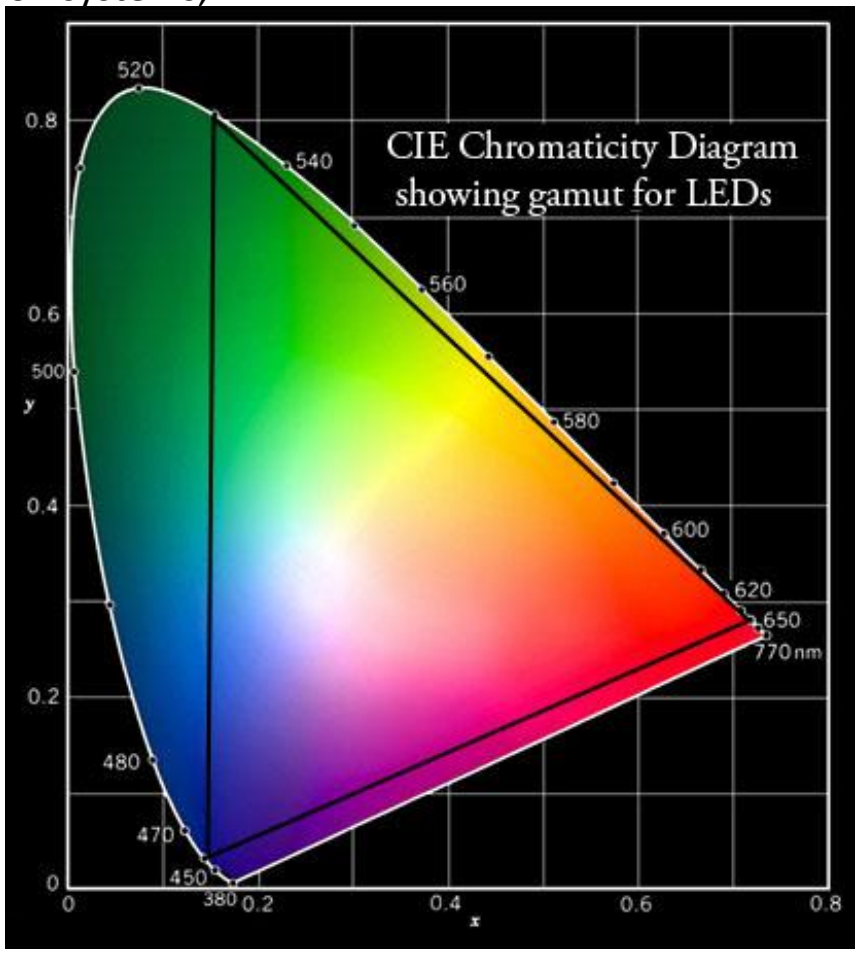


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Fig. 21 Picture of the prototype (overall view)

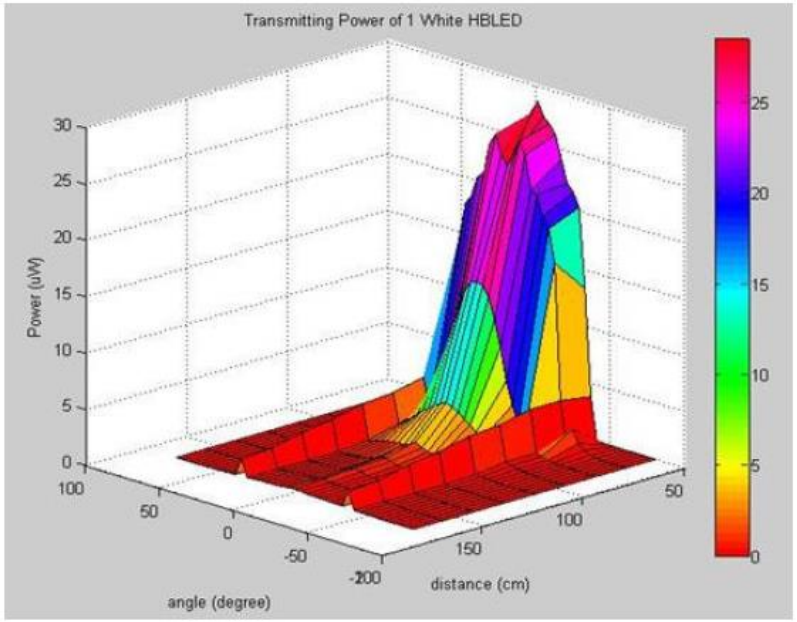

Fig. 15 Power Distribution of 1 HBLED @ I= 0.35A

LED TV

- LCD TV
  - Backlit CCFL (Compact Cathode Fluorescent Lamp)
  - LC pixels to control RGB
  - Has limited color rendition
- LED TV
  - Backlit LED
  - LC pixels to control RGB
  - Wider range of colors
  - Use less power