Photonics News

De Core Newsletter 12.13

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==>Insights :

1. Can AMOLED be the next game changer?

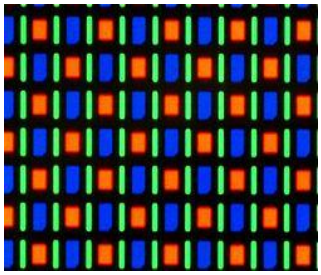

Fig: Magnified AMOLED screen on Nexus one smart phone (using RGBG system)

- AMOLED also known as Active Matrix Organic Light Emitting Diode is a latest technology, gearing up to match up the competition with other rivals such as Super LCD, Clear Black, OLED and others. An article by Silicon India featured Super AMOLED and AMOLED at 4th and 5th position respectively.

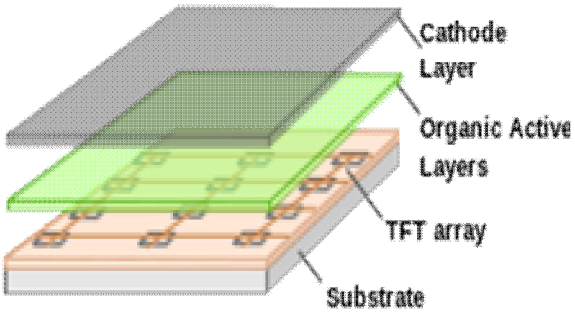

Fig: Schematic of an active-matrix OLED display

- AMOLED display consists of an active matrix of OLED (Organic LED) pixels that generate luminescence (light) on the supply of electrical signal. This matrix of OLED is integrated onto thin film transistor (TFT) array and it functions as a series of switches to control the influx of current into individual pixels according to the requirement.

- Moreover a report on "Display Materials and Components Report - AMOLED Light-Emitting Material - 2014" from IHS Inc. concluded that AMOLED's forecast to rise by nearly 27 percent from $350 million this year to $445 in 2014.

Ref:
1. http://www.siliconindia.com/gadget/news/10-Display-Types-That-Light-Up-Smartphone-Screens-nid-158105.html
2. http://www.ciol.com/ciol/features/204456/market-amoled-light-emitting-materials-set-surge-2014

==> Physics:

1. Molecules were for matter, now for light too?

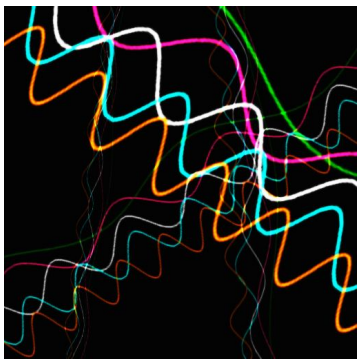

Fig: Photon waves

- Researchers from Massachusetts Institute of Technology have been able to create strong interaction between photons by sending them through a gas of rubidium atoms in an atmosphere of temperature just few degrees above absolute zero. This phenomenon is also known as quantum mechanical entanglement. A know how is this field would revolutionize the field of communication introducing quantum computers and processing information using photons.

- Imagine the life with computers working with the speed of light (~3e8 m/s), in comparison with speed of electrons (~1e6 m/s), increase at an order of 100! It's like a bicycle (1m/s) vs. Formula One car (100m/s). Hope the quantum guys don't take a nap like the hare did in Hare & Tortoise story.

Ref:
1.http://physicsworld.com/cws/article/news/2013/sep/26/physicists-create-molecules-of-light
2. http://en.wikipedia.org/wiki/Quantum_entanglement

==> Business:

1. B2G spurs LED growth story in India:

Fig: Street light

- B2G also known as Business to Government where the products are bought by Government to improve the facilities in cities. Tier I cities roar in such developments, but Tier II cities are also catching up the speed by applying energy efficient LED products.

- The market is dominated by Street lighting product. The second largest sector being commercial followed by industrial and automotive segments.

Ref: http://www.itnewsonline.com/showbwstory.php?storyid=10612

==> So how does it work?

Quantum Dots:

1. What are quantum dots?

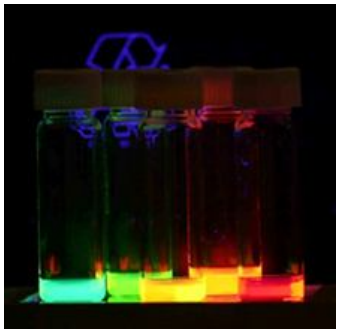

Fig: Colloidal quantum dots irradiated with an UV light.

Quantum dots are tiny nano-crystals that glow when applied with external source of energy such as ultraviolet, visible and others in the EM spectrum. The number of atoms included in the quantum dot determines its size and the size of quantum dot determines the colour of the light emitted.

2. Applications of quantum dots?

Quantum dots are used in making inexpensive, industrial quality white light (by mixing red, blue and green quantum dots), third generation solar cells with efficiency of 60%. Quantum dots can even be injected into liquid mixtures, fabrics and polymers, while in the field of biomedical; it is used to illuminate a specific area during operation (eg. during cancer operation).

3. What are its drawbacks?

a) Quantum dots can have surface defects, which results in blinking of QD's and deteriorates the quantum yield of the dots.

b) Quantum dots when placed into live cells exhibit aggregation which can interfere with the surrounding cell function. Also a dilemma exists in trying to get QDs inside cells without killing the cells in the delivering process. The toxicity of quantum dots to cells is a major issue.

c) Manufacturing of blue emitting QDs is a difficult process.

d) The extended lifetime of QD may be a hindrance to certain applications that require QDs to biodegrade immediately after the experiment has been performed.

Though the future of Quantum dots are looks bright with appropriate amount of research going into it.

Ref:

1. http://www.azonano.com/article.aspx?ArticleID=1814
2. http://www.nanocotechnologies.com/content/CommercialApplications.aspx
3. www.ion.chem.usu.edu/~tapaskar/James-Quantum-Dots-Seminar.ppt
4. http://bme240.eng.uci.edu/students/07s/yokabe/disadvantages.htm

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