Why Use LCoS in a Wavelength Selective Switch?

Posted by Rafik Ward June 12, 2009

Located in the heart of Sydney, Finisar Australia is the home of Finisar's Wavelength Selective Switch (WSS) product line. In this blog post, Dr. Simon Poole, one of the founders of Finisar Australia, outlines the interesting technology choices leading up to the development of the Finisar WSS and some of the thought processes and decisions made along the way.

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When we first started working on Wavelength Selective Switches (WSS) back in 2003, the critical decision was on which technology platform should we base our WSS? At the time, there was no such thing as a WSS so we could start with a clean sheet of paper and look around to see what had been happening in related product lines. We looked firstly at what had been achieved in the Wavelength Blocker space, where liquid crystal technology seemed to be the 'weapon of choice' and also at optical cross-connects, where companies like Network Photonics, OMM, Xros and many others had pioneered the use of MEMS switching elements. A third alternative we considered, but rejected, were the use of planar technology (PLCs) as we could see that this was limited to degree-2 ROADMs.

Whilst we were investigating the various existing technology options, we also came across a technology called Liquid Crystal on Silicon (LCoS) which was, at the time, being developed by a large number of companies including Intel, Philips, and Panasonic for projection television applications. It was our CTO, Dr. Steve Frisken, who made the intuitive leap that we could maybe use this as the basis for a WSS.

The huge advantage of LCoS, as opposed to the other technology platforms, was that it had a large number of pixels (typically 2 million) and we could create the switching 'image' using industry-standard computer display drivers – indeed much of the early product development was done using the DVI output from a standard PC. In addition, the fact that we had so many pixels to play with meant that we could envisage a whole range of additional functionality that couldn't be achieved with the other technologies we were considering.

At this point in our thinking, we were about to make a 'bet your company' decision (we were, at the time, a very small company called Engana) so we spent much time comparing the various options and in drawing up tables, similar to that below, in an attempt to analyse the various options we had. In all the analyses we came back to the same basic conclusion, that LCoS offered more flexibility at a competitive cost, but had the obvious problem that it was unproven in telecom applications. The table below provides a comparison of potential WSS technologies in late 2003.

CHARACTERISTIC	MEMS	Liquid Crystal	LCoS
Reconfigurable Channel Plan	No	No	Yes
Consumer-based (low cost) Technology	No	No	Yes
Moving parts	Yes	None	None
Closed loop power control	Required	Not required	Not required
Technological Maturity	Medium	High	Low
Proven in telecom systems	Yes	Yes	No

This analysis process made it clear that the opportunities for enhancing WSS functionality through the use of LCoS technology were the key to unlocking the potential of future reconfigurable networks and so we decided to jump on a bandwagon of one and go with the LCoS technology option.

Five years later, we are now able to offer many of these advanced functionalities through our WaveShaper™ Programmable Optical Processors as well as our WSS product line .

We have such a plethora of capabilities that it is still sometimes unclear what will be required for next generation reconfigurable networks. Some of the capabilities we can offer within our LCoS

platform, all of which are settable per-channel 'on the fly' include:

• Optical "Drop-and Continue" for optical broadcast networks;
• Mixed Channel Plan – mix-and-match of 50- and 100-GHz channels;
• Channel Bandwidth Control – e.g. for ASE noise minimization on dropped channels;
• Channel Dispersion Control – providing adjustable 2nd (and higher) order CD compensation; and
• Channel Shape Control – control of the channel filter shape.

What other capabilities would you like to see in a programmable WSS?

Please comment here or contact me at simon.poole@finisar.com.

Dr. Simon Poole is the Director of New Business Ventures of Finisar Australia
Dr. Steve Frisken is the CTO of Finisar Australia

LCoS technology, Optics, WSS products | Rafik Ward | 12:23 pm

5 Comments

By shemale, November 17, 2010 @ 7:31 am

Interesting.

By guiming chen, May 21, 2013 @ 5:56 am

Dear Dr. Simon Poole,

Thank you to share the history why Finisar chose LCoS to make WSS, but I am not sure if the LCoS for WSS is same as that for projection television or not, if different, why, only because wavelength is different ? thanks

By Simon Poole, June 6, 2013 @ 1:33 am

Dear Guiming Chen

Thank you for your question. As I explained in the article, our LCoS platform is derived from the technology developed for projection TV. As you point out, the difference in wavelength range does require modifications to the design of the LCoS cell – in particular the thickness of the Liquid Crystal layer will generally need to be grater to obtain the necessary performance at 1.55µm compared to the shorter wavelength visible range required for TV applications.

Simon Poole

By Lional Rajasekera, July 15, 2013 @ 12:02 am

Hi Simon

Congrtulations and all the best to you.

Looks like you are winning all the awards.

Regards

Lional R

By Simon Poole, July 18, 2013 @ 1:06 am

Thanks, Lional

The awards are really appreciated and are built on the hard work and dedication of the teams I've been fortunate enough to work with over the years.

All the best

Simon

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