On the Duality of Wireless and Optical Communications (a life story)

The table below summarizes the duality between wireless communications and fiber-optic communications. One can clearly observe that a ten years gap exists in adopting the advances made in wireless DSP to the realm of fiber.

Wireless	Optical
Racotek – In the early 90's I architected and commercialized a mobile data-overlay on voice systems. This coherent communication technology I invented was called **DP-QPSK with digital signal processing**.	*CeLight* -In the early 2000's I founded CeLight which developed the fundamental coherent technology for fiber optic long distance combinations. This coherent communication technology I invented is called **DP-QPSK with digital signal processing.** CeLight holds the key patents in this domain.
NextNet - In 1997 I founded NextNet which the developed **vector-oriented OFDM** based communications. We also were the first company to deploy such system in Mexico City. This became later on the WiMax worldwide standard. The company was sold to ClearWire which deployed WiMax all over in the US	*CeLight* – 2007 and on CeLight is developing a 1Terabit architecture based on **vector oriented OFDM and Optical Comb.** Our prediction is this technology will become the standard for the next generation of Optical Communications.

I was blessed in observing this phenomena and thus responsible for the WiMax invention as well as the Coherent DP-QPSK current 100G in fiber-optic. Furthermore, I invented at CeLight a last mile optical system that is based on scattered light that can serve wireless backhaul, replace FTTH ...all without digging.

To give you a feeling of the innovation associated with my inventions at CeLight with the CeLight team please observe the following section. You have an open invitation to visit CeLight and get exposed and inspired with our innovations.

Isaac Shpantzer's Patent Portfolio
April 19, 2011

GRANTED PATENTS (28)

	Number	Title	Topics disclosed
1	*6,671,425* *Application* #10/173,581 Filed 6/18/2002	Method and system for acoustically tuning a light source	Tuneable laser; frequency hopping
2	*7,076,169*	System and method for	Optical frequency division

	Number	Title	Topics disclosed
	20020186435 PCT/US02/06395 *Application #10/087,022* Filed 2/28/2002	orthogonal frequency division multiplexed optical communication	multiplexed communications
3	*7,167,651* *20020145787* *Application 09/962,243* Filed 9/26/2001	System and method for code division multiplexed optical communication	Optical CDMA in fiber
4	*7,224,906* *20030058504* PCT/US02/06330 *Application #10/084,057* Filed 2/28/2002	Method and system for mitigating nonlinear transmission impairments in fiber-optic communications systems	Optimal pulse shape for long haul fiber communications
5	*7,277,178* *20050105099* *Application #10/947,640* Filed 1/13/ 2005	Coherent photothermal interferometric spectroscopy system and method for chemical sensing	Chemical sensing using coherent detection of an optical signal
6	*7,327,913* *20040096143* PCT/US2004/031489 Application 10/669,130 Filed 9/22/2003	Coherent optical detector and coherent communication system and method	Free-space coherent communications
7	*7,266,307* *20030147116* PCT/US03/02639 AU2003209427 *Application #10/215,036* Filed 8/9/2002	Method and apparatus for pulse generation and adaptive pulse generation for optical communications	Adaptive pulse shaping; Autocorrelator
8	*7,272,271* *20040028418* PCT/US2003/121230 AU2003278698 EP1518142 *Application 10/613,772* Filed 7/2/2003	Electro-optical integrated chip for arbitrary quadrature modulation of optical signals	Integrated PSK modulator
9	*7,242,481* *20050185191* *Application #11/055,547* Filed 2/9/2005	Laser vibrometry with coherent detection	Vibration measurement using coherent detection of an optical signal
10	*7,315,697* *20020196509* Application #10/173,579 Filed 6/18/2002	Light source for generating an output signal having spaced apart frequencies	Comb generator with engineered PPLN
11	*7,397,979* *20070110362* #11/610,964 Filed 12/14/ 2006, CN	Coherent optical detector and coherent communication system and method	Optical Hybrid structure and calibration
12	*7,418,209* *20040146269* #10/462,834 Filed 6/17/2003	System and method for multi-dimensional encoding	Frequency/ Amplitude/ Phase/ Polarization hopping comm. system
13	*7,391,969* *20070140705* #11/616,417;	Method and apparatus for pulse generation and adaptive pulse generation for optical	Adaptive pulse shaping; Pulse formation using three spectral component

	Number	Title	Topics disclosed
	Filed 12/27/ 2006	communications	
14	*7,426,035* *20070115475* Application AE #11/561,966 Filed 11/21/ 2006	System and method for chemical sensing using trace gas detection	"Canine" detection
15	*7,483,600* *20070140613* 11/672,372 Filed 2/7/2007	Integrated coherent optical detector	Hybrid-photodetector alignment
16	7,470,905 11/947,058 Filed 11/29/2007	High Z material detection system and method	Muon detection with measuring time-of-flight
17	7,502,118 *20070127030* Application AE #11/677,185 Filed 2/21/2007	High sensitivity photothermal interferometric spectroscopy system and method for chemical sensing	Adaptive optics system plus multimode fiber used in the detection system
18	7,512,338 20080175600 #11/503,456 Filed 8/11/ 2006	Method and apparatus for pulse generation and adaptive pulse generation for optical communications	Autocorrelator (optical sampler)
19	*7,652,254* *20070102648* Appl.AE #11/626,920 Filed 1/25/2007 Prov. 60/883,420 @ 1/4/2007;	Method and system for nuclear substance revealing using muon detection	Nuclear material detection
20	*7,715,720* *20070274733* 11/695,920 Filed 4/3/2007	Coherent optical detector and coherent communication system and method	Hybrid as a time-domain filter, ISI mitigation
21	2,587,460 Canadian patent application PCT/US2005/033740 WO2007001379	Coherent photothermal interferometric spectroscopy system and method for chemical sensing	Chemical sensing using coherent detection of an optical signal
22	7,693,428 20090190929 12/418,060 Filed 4/3/2009	Optical orthogonal frequency division multiplexed communications with nonlinearity compensation	OFDM with nonlinearity compensation
23	7,801,395 20090142051 11/938,655 11/12/2007	Coherent optical detector and coherent communication system and method	Hybrid calibration
24	7,840,144 20080025728 11/867,351 10/4/2007 Prov. 60/850,085 filed 10/06/2006	Coherent optical transceiver and coherent communication system and method for satellite communications	Vibration compensation in coherent communications
25	7,897,925 20090224157 12/272,780 Filed 11/17/2008 Prov. 61/013,791 from 12/14/2007	System and method for high Z material detection	Muon detection with velocity measurement
26	20100028024 12/028,121	Secure optical communications system and	Multidimensional encoding continuation, general case

	Number	Title	Topics disclosed
	Filed 2/8/2008	method with coherent detection	
27	20090185811 12/389,803 Filed 2/20/2009	Space diversity optical receiver and system and method using the same	Beam Combiner with phase and coupling rate adjustment
28	20090269083 12/392,559 Filed 2/25/2009	Space diversity receiver for optical communications	NLOS with beam combining

FILED PATENTS (17)

	Number	Title	Topics disclosed
1	*20070133918* 11/679,376 prov. 60/777,610 Filed 2/27/2007	Quadrature Modulator with feedback control and optical communications system using the same	Feedback loop for QPSK modulator
2	#05858159.6 Eu patent application PCT/US2005/033740 WO2007001379	Coherent photothermal interferometric spectroscopy system and method for chemical sensing	Chemical sensing using coherent detection of an optical signal
3	20080159758 12/045,765 Filed 3/11/2008	Optical orthogonal frequency division multiplexed communications with coherent detection	Polarization recovery in OFDM
4	20080310847 12/137,352 Filed 6/11/2008	Optical orthogonal frequency division multiplexed communications over the horizon	OFDM non-line of sight communications
5	20090220246 12/331,164 Filed 12/9/2008 Prov. 61/090,404 from 8/20/2008	An optical receiver and a free-space optical communications using the same	Beam Combiner with phase adjustment
6	20090236528 12/361,664 Filed 1/29/2009	Chemical sensing system and method	Chemical sensing with the beam combiner and Solid residue testing
7	20090169221 12/371,249 Filed 2/13/2009	Optical receiver using beam combining and system using the same	NLOS with beam combining with multiple photodetectors
8	20090185810 12/413,161 Filed 3/27/2009	Single chip two-polarization quadrature synthesizer, analyzer and optical communications system using the same	Two-polarization integrated transmitter and receiver
9	20090295576 12/539,484 Filed 08/12/2009	Inspection system and method	High Z material detection in combination with chemical sensing
10	20100065745 12/618,303 Filed 11/13/2009	Detection of high z materials using reference database	Reference database
11	20100290734 12/629,579 Filed 12/2/2009	Optical sensor for detecting and localizing events	Including underwater applications
12	12/635, 848 Filed 12/11/2009	Chemical sensing with coherent detection of optical signal	Chemical sensing with pulsed LO

	Number	Title	
13	20100135656 12/696,957 Filed 1/29/2010	Optical orthogonal frequency division multiplexed communications with nonlinearity compensation	OFDM with phase compensation
14	20100290054 12/711,476 Filed 2/24/2010	Chemical sensing with noise pre-compensation	Chemical sensing with a LO beam carrying a phase shift to compensate the noise
15	20100310256 12/856,852 Filed 8/16/2010	Parallel optical receiver for optical systems	Multiple parallel analog-to-digital converte
16	12/969,045 Filed 12/15/2010	Optical communications with polarization dependent loss compensation	Polarization scrambler and rotator
17	13/070,719 Filed 3/24/2011	Secure orthogonal frequency multiplexed optical communications	Different format for subcarrier data modulation

Trademarks

	Number	Title
1	3,375,679 Jan. 29, 2008	CeLight