

**Brief Biography:** Mr. Guidash received a BS in Electrical Engineering from the University of Delaware in 1981, and an MS in Electrical Engineering from Rochester Institute of Technology in 1991. Michael joined Kodak in 1981 as a Product Engineer for photometer ASIC's for Kodak film cameras. In 1986, he transferred to the Kodak Research Laboratories and CCD wafer fabrication facility. From 1986 – 1989, he developed 2um and 1um CMOS processes, and a 30V 4um BiCMOS process. These processes were used for gate arrays for many Kodak products, and output drivers for all of Kodak's copiers. From 1989 – 1996, Mr. Guidash managed the Smart Sensor Group which developed BiCMOS-CCD processes to provide fully integrated CCD systems on a chip. From 1993 – 1996, he also served as product and yield enhancement engineer for Kodak's high volume CCD's. In 1996 Michael helped form and led the CMOS Image Sensor (CIS) group. From 1996 to 2009, he managed the R&D and product development of CIS programs. Kodak closed the CIS business in August of 2009. From August of 2009 through April of 2012, Mr. Guidash worked as intellectual property technologist and coordinator. This included technical coordination of CIS patent applications and office actions, electronic components patent applications and office actions, and technical support for IP sales and licensing teams. Mr. Guidash left Kodak in May of 2012 to start a technology consulting company in the field of CIS. From 2012 to present, Mr. Guidash has continued development and innovation in CIS pixel and process technology, including pMOS pixels, Multi-bit binary pixels, low noise and high speed sensor readout design, and BSI processes. He has authored or co-authored 18 papers/presentations in the fields of integrated circuits and image sensors. He has 78 issued and many active patent applications in the field of image sensors.

### **Career Highlights:**

- **Chief Technologist and Innovator:** Initiated and led development efforts in CIS at Kodak in pixel and process design. Inventor of many key patents in the field of CMOS Image sensors including Pinned Photodiode Pixels, Camera-on-a-Chip architecture, and shared amplifier pixel architectures. Continued to innovate and invent to drive CIS cost reduction, features and performance. Applies strategic thinking to align business goals with short and long term technology and product plans. Known as a creative thinker and innovator, providing vision and leadership to bring ideas and concepts to the marketplace.
- **Technology Development Management:** Provided vision, roadmap and direction for a broad set of elements in circuit design, pixel architecture, process integration, and sensor/camera systems. Possesses technical and interpersonal skills to assemble, manage and motivate diverse cross-functional teams, that efficiently and successfully deliver to schedule.
- **Product Development:** Provided technical voice to market attack and business plans. Guided ideas and concepts from invention phase through R&D and through commercialization.
- **Technical Due Diligence:** Provided technical guidance and analysis for development partner selection, technology and resource acquisitions, and litigations.
- **Partner Management:** Negotiated, coordinated and directed 3<sup>rd</sup> party technology providers and external development partners, including foundries. Directed integration of CIS processes into 6 foundries.
- **Technical Skills:** CCD and CIS operation, design, device integration and fabrication technologies. Image sensor and ASIC yield enhancement; yield team management; rigorous and methodical problem solver, efficiently finding root causes and solutions for yield crises and problems.
- **Patents & Publications:** 78 issued US patents; 19 publications.

### **Professional Experience:**

#### **R.M. Guidash Consulting LLC: President, (May 2012 - Present)**

Technical consulting services for CMOS Image Sensors (CIS):

- Process, pixels, circuits, sensor architectures, systems and IP. General and customized tutorials and advisement. Short and long term projects and problem solving.
- Technologist for development in CIS design and process technology, including pMOS pixels, multi-bit binary pixels, low noise and high speed sensor readout design, and BSI device structures.

**Eastman Kodak: Scientist and IP Specialist; Office of the CTO, (2010 - April 2012)**

Post closure of Kodak CIS Business - Patent generation; patent app. management; technical support for patent attorneys; technical support for IP sales and licensing teams.

- Continued patent generation for digital capture; technical support for pending patent applications; technical support for IP sales & licensing teams; Key member of team that sold CIS patents.

**Eastman Kodak: Chief Technologist & Manager – CIS R&D; Image Sensor Division, (2001 - 2009)**

Managed group of ~25 people in R&D of CIS technology elements, including pixel and process development, chip level architectures, analog readout architectures, and camera/module systems.

- Developed/demonstrated new technologies including Kodak panchromatic CFA patterns and processing, pMOS hole detector pixel, 3D hybrid stacked devices, and low read noise analog circuits. Designed and demonstrated 3D hybrid stacked BSI 1.4um pixel sensor in 2007-2008.
- Led team to file over 100 patent applications. Filed patent applications on and led development of 1<sup>st</sup> 3D hybrid stacked BSI CIS architecture. This led to demonstration of very high performance, low dark current BSI prototype sensors with pixel sizes ranging from 0.9um to 5.0um.
- Initiated and led a cross-functional camera R&D team directed at CIS and other Kodak technologies for novel co-optimized cameras and camera sub-systems.
- Provided technical guidance and analysis for selection and initiation of foundry and R&D partners.
- Managed directed technical interface with external partners in design, process and pixel development (IBM, TSMC, Ziptronix and others).

**Eastman Kodak: Chief Technologist & Mgr. - CIS R&D/Prod. Dev; Image Sensor Division, ('95 - '01)**

Managed and directed group of 10-15 people in all elements of CIS R&D and product development.

- Pioneered and championed CIS initiatives at Kodak.
- Inventor and co-inventor of many key patents in the field of CMOS Image sensors including Pinned Photodiode Pixels, Camera-on-a-Chip architecture, and shared amplifier pixel architectures.
- Led the development teams to key achievements; World's 1<sup>st</sup> pinned photodiode CIS, Megapixel CIS device, and Shared amplifier CIS pixel product.
- Led transfer of world's first 1/2" optical format 1.3 megapixel CMOS image sensor into mass production, providing successful delivery to several compact digital camera products.
- Managed and directed technical interface with external partners in design, process and pixel development, (JPL, Photobit, Motorola, Intel, Tower Semiconductor).
- Initiated and directed a cross-functional team including resources from Motorola and other Kodak organizations to develop a small, low cost image module for cell phone applications. This effort won the 1997 Team Achievement Award at Kodak through development of a CIS cell phone module.

**Eastman Kodak: Development Engineer – Smart Sensors; Image Sensor Division, (1989 – 1995)**

- Led product delivery and technology development of all ASIC and smart sensor products. Performed all device modeling, device and process integration.
- Developed and demonstrated Interline CCD integrated with 2um CMOS on the same chip
- Led team to design and demonstrate world's 1<sup>st</sup> pinned PD Active Pixel CMOS Sensor, and linear CCD image sensor with on-chip timing and control.
- Led/coordinated world's 1<sup>st</sup> commercial megapixel CCD yield enhancement team at commercialization ramp up of DC40 digital camera. Brought yield from 0% to 60% in ~3 months assisting on-time launch of DC40 camera.
- Led/coordinated CCD yield enhancement team at commercialization ramp up of world's 1<sup>st</sup> USB peripheral, Kodak TCAM1. Brought yield from 0% to 50% in ~3 months.
- Led & directed CCD dark current and point defect reduction team.

**Eastman Kodak: Product Engineer; Integrated Circuits Fabrication, Elmgrove Plant, (1984 – 1988)**

Product Engineer for all Kodak Copier Output Driver IC's, DISC camera IC's, and Instant Camera IC's. Delivering ~6M devices per year. Responsible for all aspects of IC test, delivery, yield and cost.

- Developed software for device and statistical yield modeling
- Led and delivered on development of Smart Integrated Chemically Sensitive Field Effect Transistors for Kodak Harrow.
- Awarded Special Opportunity Graduate Program to get MSEE degree. (RIT)

**Eastman Kodak: Product Engineer; Integrated Circuits Fabrication, Elmgrove Plant, (1981 -1983)**

- Product Engineer for all Kodak Instant Camera IC's: brought yield of 5 new devices from 0% to 45% in ~4 months. Reached final yields of ~85%. Responsible for all aspects of IC test, packaging, delivery, customer interface and failure analysis, yield and cost.

**Education:**

M.S. (Electrical Engineering), Rochester Institute of Technology, 1991

B.S. (Electrical Engineering), University of Delaware, 1981

**Publications and Presentations:**

**1** L. D'Luna, W. Cook, M. Guidash, G. Brown, T. Tredwell, J. Fischer, T. Tarn; "An 8x8 discrete cosine transform chip with pixel rate clocks" IEEE ASIC Seminar; Sept. 1990

**2** G. Ting, R.M. Guidash, P. Lee, C. Anagnostopoulos; "A Low Cost Smart-Power BiCMOS Driver Chip for Medium Power Applications"; IEEE ASIC Conference Proceedings; p. 466-469 [1994]

**3** L. D'Luna, K. Parulski, D. Maslyn, M. Hadley, T. Kenney, R. Hibbard, M. Guidash, P. Lee, C. Anagnostopoulos; "A digital video signal post-processor for color image sensors"; IEEE ASIC Conference [1994]

**4** P. Lee, R. Gee, M. Guidash, T. Lee, E. Fossum; "An active pixel sensor fabricated using CMOS/CCD process technology; 1995 IEEE Workshop on CCD's and Advanced Image Sensors.

**5** M. Guidash, P. Lee, J. Andrus, A. Ciccarelli, H. Erhardt, J. Fischer, E. Meizenzahl; "A modular, high performance, 2um CCD-BiCMOS process technology for application-specific image sensors and image sensor systems on a chip; Proc. SPIE Vol. 2415, p. 256-264, April 1995

**6** M. Guidash, P. Lee, J. Andrus, A. Ciccarelli, H. Erhardt, J. Fischer, E. Meizenzahl; "A modular, high performance, 2um CCD-BiCMOS process technology for application-specific image sensors and image sensor systems on a chip; CCD & Advanced Image Sensor Workshop, 1995

**7** M. Guidash, T. Lee, P. Lee, et. al., "A 0.6um CMOS pinned photodiode color imager technology"; IEDM Tech. Digest 1997 p. 927-929

**8** M. Guidash, K. Parulski, "Digital Capture – not all pixels are created equal", Industrial and Applied Physics Symposium, Rochester NY, October 2001

**9** M. Guidash, et. Al., "A High-Performance, 6  $\mu$ m 1.3 Megapixel, Pinned Photodiode CMOS Image Sensor"; SPIE Opto Northeast Conference; September 2001

**10** M. Guidash, M. Mattern; "High-performance CMOS image sensor design, a combination of disciplines", New York Microelectronics Design Conference, Rochester NY, Sept 2003

**Publications and Presentations (continued):**

**11** J. Zhang, S. Cooper, A. LaPietra, M. Mattern, M. Guidash, E. Friedman; “A low power thyristor-based CMOS programmable delay element. ISCAS (1) 2004; p. 769-772

**12** D. McGrath, H. Fujita, M. Guidash, T. Kenney & W. Xu; “Shared pixels for CMOS imaging arrays”, CCD & Advanced Image Sensor Workshop, Kurizawa, Japan, 2005

**13** F. Chu, M. Guidash, J. Compton, S. Coppola, W. Hintz; “Improving low-light CMOS performance with four-transistor four-shared architecture and charge domain binning; SPIE proceedings Vol 6069; pp. 25-33; 2006

**14** R. Michael Guidash, John T. Compton, R. Daniel McGrath, Edward T. Nelson, Christopher Parks, Joseph R. Summa, “A 1.4 um pixel front-side-illuminated image sensor for mobile phones”, IEEE International Image Sensor Workshop, Trondheim Norway, June 2009

**15** Thomas Vogelsang, Michael Guidash, Song Xue, “Overcoming the Full Well Capacity Limit: High Dynamic Range Imaging Using Multi-Bit Temporal Oversampling and Conditional Reset”, IEEE International Image Sensor Workshop, Park City Utah, June 2013

**16** Thomas Vogelsang, David G. Stork and Michael Guidash, “A Hardware Validated Unified Model of Multi-Bit Temporally and Spatially Oversampled Image Sensors with Conditional Reset”, SPIE Journal of Electronic Imaging 23(1), 013021 (Jan-Feb 2014).

**17** Michael Guidash and Thomas Vogelsang, “Non-Destructive Threshold Assessment of a Pinned Photodiode Pixel with Correlated Double Sampling”, 18<sup>TH</sup> IEEE International Symposium on Consumer Electronics, June 22-25, 2014.

**18** Thomas Vogelsang, Michael Guidash, Jay Endsley and Craig Smith, “A 2MP Oversampling Image Sensor with 2.75μs Row Time and Conditional Threshold Comparison”, IEEE International Image Sensor Workshop, Vaals Netherlands, June 2015

**19** Michael Guidash, Thomas Vogelsang, Jay Endsley and Jia-Ju Ma “CMOS Image Sensor Source Follower Read Noise Reduction to Enable Single Photon Counting”, To be published in 2016; Sensors Magazine

**US Patents: (78 issued)**

8,665,340	8,587,681	8,558,292	8,378,398	8,339,494	8,253,214	8,194,178
8,178,938	8,164,682	8,158,453	8,101,450	8,076,749	8,049,256	8,018,016
7,973,876	7,969,469	7,859,581	7,858,915	7,830,435	7,705,900	7,675,097
7,674,648	7,443,431	7,361,877	7,342,213	7,238,926	7,092,017	6,730,899
6,730,897	6,721,008	6,714,239	6,710,804	6,680,498	6,657,665	6,624,850
6,587,146	6,552,323	6,504,195	6,486,504	6,466,266	6,423,994	6,365,926
6,352,869	6,323,476	6,307,195	6,297,070	6,259,124	6,218,692	6,218,656
6,184,928	6,160,281	6,127,697	6,107,655	6,100,556	6,100,551	6,069,377
6,051,447	6,027,955	5,986,257	5,949,061	5,904,493	5,903,021	5,881,184
5,872,371	5,841,159	5,625,210	5,621,230	5,591,997	5,387,536	5,338,946
8,730,362	8,736,728	8,829,637	8,836,784	8,946,612	8,957,981	9,001,251
9,070,611						

**Expert Consultant Cases:**

(italic text indicates client; listed as Plaintiff vs. Defendant(s) or Petitioner vs. Patent Owner)

1. Cal-Tech vs. *ST Microelectronics*; Infringement Analysis; October 2012
2. Imperium Holdings vs. *Motorola Mobility, Kyocera, Sony Mobile*; Civil Action No. 4:11-cv-00163-RC-ALM; February 2013 – Infringement analysis and Report
3. Cal-Tech vs. *Omnivision Technologies*; Validity Analysis; December 2013
4. HSM LLC vs. *ST Microelectronics et. al.*; Infringement and Validity Analysis; Validity Report; April-October 2014
5. Fujian Newland Computer Co. Ltd. vs. *Hand Held Products Inc.*; Case IPR2013-00595; August 2014
6. *Kyocera* vs. e-Watch; IPR US7,643,168; Validity Analysis and Declaration; December 2014
7. Collabo Innovations-WiLAN vs. *Aptina, ON Semi*; Infringement and Validity Analysis; Validity Declaration; April-October 2015

**Expert Consultant Depositions:**

1. Imperium Holdings vs. *Motorola Mobility, Kyocera, Sony Mobile*; Civil Action No. 4:11-cv-00163-RC-ALM; February 2013
2. Fujian Newland Computer Co. Ltd. vs. *Hand Held Products Inc.* ; Case IPR2013-00595; August 2014