

**Dirk Hartogs, Ph.D.**  
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## **SUMMARY**

For modulation/digital communications/wireless/DSP/ECC/OFDM (orthogonal frequency division multiplex, see for example DSL) technology and architecture, litigation support, creation, and acquisition of intellectual property. Testifying expert in Federal Court, regulatory bodies, and foreign courts.

Dr Hartogs has been involved in communications technologies, including cellular, wireless, networking, modulation and radio propagation, and digital signal processing and statistics in both engineering and litigation support roles for over 20 years. Ten of Dr. Hartogs twelve U.S. patents are communications based (the other two are coding/data storage), as are seven of his previously disclosed litigation support engagements. His PhD dissertation extended several communication concepts to multiple-access. He is named as an inventor in additional (unissued) patent applications for ecommerce architectures.

Four of his communications patents form the early basis of Orthogonal Frequency Division Multiplex. The OFDM technology he developed in the 1980s for modulation is now incorporated in wireless, DSL technologies, all current 802.11 methods, and most digital radio/television structures. His basic patents ('034, '706, '816, and '227) are each directly referenced by hundreds of subsequent OFDM, communication, and modem patents spanning a period of twenty years. His expertise extends to related concept and system areas (see below).

## **PROFESSIONAL EXPERIENCE**

**1996 to Present**      **Eager & Eager llc dba**  
**1985 to 1990**        **californiatechnologyexperts.com**

Technologist supporting major intellectual property disputes, arising from patent, standards groups, and trade secret issues both in the United States and abroad.

Technologies (both concepts and standards) include:

802.11 wireless

Cellular

GPS  
ISDN  
Networks  
LAN/WAN  
Digital Signal Processing  
Compression  
Digital TV  
Spread Spectrum

Modulation  
DSL  
Packet Systems  
Telephony  
OFDM  
Error Correction  
Embedded Processing

Efforts include all levels of signal processing, modulation, communications, control, and networking.

Direct technical contributions also include extremely fast track IP creation, evaluation, and management as an individual system concept and algorithm contributor, as a senior member and manager of development teams, and as liaison to outside regulatory groups, such as PUC, ITC, standards bodies, and USPTO. Concept development for complex signal processing and communications products and design of associated systems for commercial and defense consulting clients.

**1990 to 1996**                      **Canon Research**  
**Director Systems Architecture/WAN Technology**

Directed the digital telecommunications development efforts for Canon Research, a multi-national quasi start-up. Responsible for the analysis, architecture, and implementation of emerging technologies, including ISDN and telecommunications networking. Embedded processing. Multiple patents.

Managed engineering teams, challenging PhDs at multiple levels in research, including technical reports, patents, and conference presentations. Negotiated key technology development contracts. Participated in technical sessions, conferences, and as a board member of California ISDN Users Group and before California Public Utilities Commission.

**1983 to 1985**                      **Telebit Corporation**  
**Director of Development**

Supervised, directly or indirectly, fifteen development engineers in exceptional software and hardware modem (two embedded processors) development team. Led a rapid and successful digital signal processing effort (over fifty thousand lines of code on Texas Instruments 320 DSP) that resulted in numerous Product of the Year awards. Initially contributed as an individual developer of the unique modem technology allowing a start-up (three people in a back room) to become a market leader against established competitors in less than two years. Key individual OFDM patents issued (four patents, each cited over 100 times by later modem, wireless, and DSL patents).

**1981 to 1983**                    **Litton Applied Technology**  
**Staff to Vice President, Engineering**

Responsible for the direction of the independent research effort supporting development of integrated computer/receiver platforms for the Defense Department. Overall effort involved ten simultaneous and distinct projects. Also participated in marketing programs for new product technologies.

**1979 to 1980**                    **Spatial Incorporated**  
**Vice President**

Responsible for engineering and manufacturing management of this start up company, which released best of class products based on complex ultra linear amplifier technology. Relocated the organization from L.A. to Northern California.

**1975 to 1979**                    **Probe Systems**  
**Senior Engineering Specialist**

Responsible for technical impact and management of defense programs (including ARPA) requiring both innovative signal processing techniques (SIGINT, ELINT) and timely completion. Analyzed sophisticated communications methods and developed effective DSP techniques for complex radio signals, including spread spectrum and low probability of intercept. (Employed by Probe part-time while pursuing Ph.D., below)

**EDUCATION**

Ph.D. Electrical Engineering (Communication Theory), Stanford University  
M.S., Electrical Engineering (Statistics minor), Stanford University  
A.B., Mathematics and Physics (With Honors) Dartmouth College

**DISCLOSED LITIGATION SUPPORT EXPERIENCE**

Dr Hartogs was a testifying/disclosed expert in 10 closed matters. He gave trial testimony and/or depositions in half. He provided expert reports including claim constructions in possibly all. He has also provided rapid expert opinion to support value determination of acquired patent packages. Technologies rather broadly include digital signal processing, communication methods, and ecommerce. He has related experience in many undisclosed cases over the last ten years, including several in focusing on cellular and GPS, as well as licensing/litigation alternatives of patents by major corporations. Further work involves the related technologies listed above.

References are available on request. Additional pro bono work involves conflicts which arise between technology and the Fourth Amendment.

### **PATENTS**

Twelve US communications patents, including the OFDM basis patents leading to modulation methods used by many wireless providers. (i.e both Wi-Fi and cellular) (See “Hughes-Hartogs” at [www.uspto.gov](http://www.uspto.gov) patent database). Numerous related foreign patents.

### **PROFESSIONAL AFFILIATIONS & AWARDS**

Life Member, IEEE

Former Board Member, California Broadband Users Group (CALBUG)

Former Board Member, California ISDN Users Group (CIUG)