Committee on Energy and Commerce
U.S. House of Representatives
Witness Disclosure Requirement - "Truth in Testimony"
Required by House Rule XI, Clause 2(g)

1.	**Your Name:** *Preston Marshall*		
2.	**Are you testifying on behalf of the Federal, or a State or local government entity?**	Yes	No X
3.	**Are you testifying on behalf of an entity that is not a government entity?**	Yes	No X

4. **Other than yourself, please list which entity or entities you are representing:**

   None

5. **Please list any Federal grants or contracts (including subgrants or subcontracts) that <u>you or the entity you represent have received</u> on or after October 1, 2009:**

   As Principle Investigator at USC, DARPA CBMEN Program MSI, Dept of State Collecting Relevant Content, and Distribution of such Content to large populations over Underdeveloped or Under-Attack Communication Infrastructure

6. **If your answer to the question in item 3 in this form is "yes," please describe your position or representational capacity with the entity or entities you are representing:**

7.	**If your answer to the question in item 3 is "yes," do any of the entities disclosed in item 4 have parent organizations, subsidiaries, or partnerships that you are not representing in your testimony?**	Yes	No

8. **If the answer to the question in item 3 is "yes," please list any Federal grants or contracts (including subgrants or subcontracts) that were received by the entities listed under the question in item 4 on or after October 1, 2009, that exceed 10 percent of the revenue of the entities in the year received, including the source and amount of each grant or contract to be listed:**

9. **Please attach your curriculum vitae to your completed disclosure form.**

Signature: ███████████████ Date: *10 Sept 2012*

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Dr. Preston F. Marshall

Deputy Director, Information Sciences Institute
Computational Systems and Technology
Research Professor, Ming Hsieh Department of Electrical Engineering
Viterbi School of Engineering
University of Southern California

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Education: Ph.D, Electrical Engineering   Trinity College, Dublin, Ireland
M.S., Information Science   Lehigh University, Bethlehem, PA
B.S., Electrical Engineering   Lehigh University, Bethlehem, PA

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Professional Background

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Extensive experience in systems engineering of large-scale systems projects, including cross disciplinary analysis, problem formulation, and system allocation. Specific concentration in adaptive wireless communications and networking, and spectrum related technology and policy. Demonstrated ability to develop and position innovative technology, and transition it to effective application.

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Professional Experience

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Currently: *Deputy Director*, Information Sciences Institute (ISI), and Research Professor in Electrical Engineering at the Viterbi School of Engineering at the University of Southern California (USC). Responsible for research and financial management of 75 researcher technology groups focusing on system level technology challenges in High Performance Computer (HPCC) system design, quantum annealing computation, signal processing architectures and implementation, implantable neurological electronics, grid and cloud computing, cyber-physical system trust, and interactions of human behavior and decision theory. Personal research interest is evolving networking concepts, wireless, cognitive radio and networking technologies, spectrum policies, and information theory based approaches to computation and network analysis.

Established wireless research program at USC/ISI. Led efforts achieving over 13 million dollars of sponsored research efforts, including major research grants in the area of network solutions of interference and jamming through advanced decision-making concepts, content persistence and distribution in wireless networks, basic research into fundamental problems of network scaling and density, and extension of self-forming network principles to energy management systems.

Ongoing participation in the technical and policy community in technology and wireless related topics with both Governmental and non-Governmental organizations, including the White House Office of Scientific and Technology Policy (OSTP), Federal Communications Commission, the National Science Foundation (NSF)/National Telecommunications and Information Agency (NTIA) Wireless Spectrum Research & Development Senior Steering Group (WSRD-SSG), Department of Commerce Institute for Telecommunication Sciences, Rapporteur for the Aspen Institute *Communications and Society Program* roundtables on spectrum, and New America Foundation Open Internet program.

Previously: *Program Manager* at Defense Advanced Research Projects Agency (DARPA) Advanced Technology Office, and member of the US Government Senior Executive Service. Responsible for program concept development, formulation, obtaining agency sponsorship, selection of research performers, and providing technical, programmatic and financial direction of 380 million dollars of research funding and acquisition program execution.

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Successfully advocated for new technologies with senior leadership within Department of Defense, external regulatory organizations, federal agencies, congressional membership, key commercial enterprises, and international standards bodies. Developed strategies for transitioning technologies, including standards processes, industrial readiness, user acceptance, and availability of funding.

Led DARPA research into low cost, adaptive wireless and networking technology, cognitive radio, dynamic spectrum, and content-based networking, and computational policy-based systems. Recognized by wireless and networking community as a prime proponent of, and contributor to these technologies through dozens of keynote and invited speeches, professional papers, and journal interviews. This included not only the technology aspects of these thrusts, but advocacy of regulatory acceptance of these technologies, such as dynamic spectrum sharing, through interaction with US and international agencies, such as the FCC, NTIA, National Academies, UN International Telecommunications Union and World Radio Conference, and other national regulators. In recognition of contributions to the field, Awarded Software Defined Radio Forum Industry Achievement Award for 2007. Two programs were personally selected by Secretary of Defense for immediate transition to deployment based on their targeting urgent needs, affordability and technical base maturity. Accomplishments at DARPA include:

- Achieved ten new program starts by: identifying novel technology opportunities, identifying and recruiting potential stakeholder sponsors, sources of technology development and developing compelling business and technical arguments for significant organizational investment.

- Achieved unprecedented transition of four programs to operational use or acquisition through identification of unmet technology needs, aggressive positioning of program in relation to existing capabilities, identification of program advocates within Armed Service organizations, and effective promotion of technology programs throughout the DoD leadership structure.

- Developed first complete and operational dynamic spectrum radios that demonstrated viability of spectrum white space sharing, and created sufficient performance evidence of effectiveness to enable initial regulatory and user acceptance (XG Program).

- Transitioned Delay Tolerant Networking (DTN) research into DARPA, and enhanced technology to include distributed caching, content storage, advertisement, and discovery and security services to provide a new conceptual framework for Infrastructureless personal and localized information services.

- Developed Wireless Network after Next (WNaN program to create the first purpose-built Cognitive Radio, targeting an under 500 dollar device that will revolutionize networking by integrating content management, networking and wireless services into a low cost device that can provide information services without dependence on external infrastructure, such as Internet servers and routing and spectrum administration.

- Structured Analog Logic program to initiative development of analog-based, probabilistic computing devices, and Bayesian representation of processing, in order to tolerate processing errors, and perform logic at transistor speeds; tens of times faster and smaller than equivalent digital circuits.

- Successfully transitioned, or positioned for product transition, five technology programs by focusing technology development on meeting recognized and urgent user needs, including remote sensing, adaptive spectrum, communications monitoring, and network services.

Director of Communications, Engineering, and Analysis for Coleman Research Corporation. Developed and led forty person teams providing analysis, technology, and design in the area of strategic systems engineering, spectrum management, communications technology development, communications for command and control, and Intelligence programs. Provided senior support to the Missile Defense Agency (MDA), Deputy for Systems Engineering and Integration. Technical lead for engineering efforts in support of DARPA, Defense Spectrum Office (DSO), Defense Decision Support Center (DSC), and MDA on efforts including systems and communications engineering, and acquisition.

Consultant, specialized in Command and Control, and Communications systems. Clients included military, commercial, and educational institution research programs, and span the range of corporate networking, private RF communications networks, Internet technology development, DARPA programs in High Performance and Parallel Computing, early web-based technologies, and assured reliability communications for Ballistic Missile Defense.

General Manager, Vanguard Research, Inc. Responsible for developing, managing, and leading programs in Battle Management/C3, communications, and software architectures. Oversaw forty person engineering and analysis team, and technically contributed to programs in systems engineering, integration and acquisition of complex hardware and software missile defense systems; analysis of alternative standards and access methods; application of end-to-end encryption technologies; studies on the use of Laser communications, and prototyping of distributed computing and networking architectures.

Vice President of Aeroflex Systems. Responsible for all technical effort across company, and Profit/Loss responsibility for 6 million of annual revenues. Provided technical leadership for 120 man program in airborne self-defense Electronic Warfare avionics and development of avionic evaluation software and hardware.

Vice President of Essex Corporation. Responsible for technical design and development of real-time submarine process control operating systems, applications, and networks.

Assistant to Director of Lehigh University Center for Information Science. As a member of the Research Faculty, responsible for supervising research activities of multi-disciplinary research center, included automated bibliographic systems, retrieval and equation answering systems, chemical structures database analysis, and artificial intelligence-based search systems.

Principal Investigator

Dept. of State/ AID	2012–2015	Collecting Relevant Content, and Distribution of such Content to large populations over Underdeveloped or Under-Attack Communication Infrastructure
DARPA	2012–2014	Content-Based Mobile Networks
DARPA	2011–2013	Communications in the Extreme
Office of Naval Reseach	2010–2011	Radiation Effects on Electronics in Aligned Carbon Nanotube Technology
DARPA	2009–2010	Rapidly-formed Electrical Grids for Extreme Scenarios
Dept. of Energy	2010–2012	Building Level Energy Management System
DDR&E	2009–2010	Impact of Dynamic Spectrum Access on Network Scaling Bounds

Employment History

USC ISI	2009-Present	Institute Deputy Director, Division Director, Research Professor of Electrical Engineering
DARPA	2002–2009	Program Manager, and Senior Executive Service, Strategic Technology Office
Coleman Research Corporation	1997-2002	Director
Consultant	1995–1997	Scope: RF Communications and High Performance Computing
Vanguard Research, Inc.	1985–1995	General Manager and Corporate Director
Aeroflex Systems	1980–1985	Vice President for Technical Operations, and Director, Software Engineering
Essex Corporation	1975–1980	Vice President, Information Sciences Division
Lehigh University	1974–1975	Assistant to the Director, Center for Information Science

Awards

Department of Defense, Secretary of Defense Superior Service Award, 2009.

2008 Software Defined Radio Forum (SDRF) Industry Achievement Award.

Patent

P. F. Marshall and M. Chaskin, "Space Launch Vehicle and Method," U.S. Patent 5,678,784; describing the use of a non-rigid airfoil to minimize the total energy required to launch and recover payloads to low earth orbit, Oct. 21, 1997.

Professional Activities

Member, USC Viterbi School of Engineering Research Committee, 2012 – Present

Chair of the Executive Committee for the IEEE International Symposium on New Frontiers in Dynamic Spectrum Access Networks (2009 - Present).

Conference Track Chair (Middleware and Applications) for IEEE 2011 Military Communications Conference (MILCOM).

Guest Editor for IEEE Communications Special section on Dynamic Spectrum (March 2011), and IEEE COMSOC Journal on Selected Areas in Communications, Issue on Adaptive, Spectrum Agile and Cognitive Wireless Networks (April 2007).

Member of the National Science Foundation (NSF)/NITRD, Wireless Spectrum R&D Senior Steering Group.

Technology Program Chair for First, Second, and Third IEEE International Symposium on New Frontiers in Dynamic Spectrum Access Networks (DYSPAN 2005, 2007, and 2008).

Books

P. F. Marshall, *Scaling, Density, and Decision-Making in Cognitive Wireless Networks.* Cambridge University Press, To Be Released in Sept 2012.

——, *The Reallocation Imperative: A New Vision for Spectrum Policy.* The Aspen Institute, Communications and Communications Society Program, 2012.

——, *Quantitative Analysis of Cognitive Radio and Network Performance.* ARTech, Norwood, MA, 2010.

Book Chapters

M. Cummings and P. F. Marshall, "TV White Space privacy and security," in *TV White Space Spectrum Technologies: Regulations, Standards, and Applications*, R. A. Saeed and S. J. Shellhammer, Eds. CRC Press, 2011, ch. 23.

P. F. Marshall, "Evolving communications architectures: More local is more green," in *Green IT: Technologies and Application*, KSEA, Ed. Springer-Verlag, Aug., 2011, ch. 1.

——, "Spectrum Awareness and Access Considerations," in *Cognitive Radio Technology*, 2nd ed., B. Fette, Ed. Academic Press, 2009, ch. 5.

——, "Spectrum Awareness," in *Practical Electronics Handbook*, 1st ed. Elsevier, 2008, ch. 3.

——, "Spectrum Awareness," in *Cognitive Radio Technology*, 1st ed., B. Fette, Ed. Academic Press, 2007, ch. 5.

Selected Recent Refereed Publications and Conferences

——, "The Maturation of Dynamic Spectrum Access from a Future Technology, to an Essential Solution to Immediate Challenges (Editorial)," *IEEE Communications Magazine*, March 2011.

——, "Research towards a cognitive network Eco-System," in *The 2010 Military Communications Conference, Networking Protocols and Performance Track (MILCOM 2010-NPP)*, San Jose, California, USA, November 2010.

——, "Dynamic Spectrum Access as a Mechanism for Transition to Interference Tolerant Systems," in *IEEE 4th International Symposium on New Frontiers in Dynamic Spectrum Access Networks*, Singapore, April 2010.

P. F. Marshall and P. J. Kolodzy, "A Potential Alliance for World-Wide Dynamic Spectrum Access," in *IEEE 4th International Symposium on New Frontiers in Dynamic Spectrum Access Networks*, Singapore, April 2010.

P. F. Marshall, "Extending the Reach of Cognitive Radio," *Proceedings of the IEEE*, vol. 97, no. 4, pp. 612–625, April 2009.

——, "Cognitive Radio as a Mechanism to Manage Front-end Linearity and Dynamic Range," *IEEE Communications Magazine*, vol. 47, no. 3, pp. 81–87, Mar. 2009.

——, "A Generalized Method for Quantification of Cognitive Radio Benefits within Wireless Systems," Ph.D. dissertation, Trinity College, Dublin, IE, Oct. 2009.

——, "Progress towards affordable, dense and content focused tactical edge networks," in *IEEE Military Communications Conference (MILCOM)*, Nov. 2008, pp. 1–7.

M. Cummings, S. Li, B. Fette, M. Kokar, B. Fette, B. Lyles, P. F. Marshall, and D. Hillman, "Activities of SDR Forum MLM Working Group on a language for advanced communication systems applications," in *Software Defined Radio Technical Conference*, Washington, D. C., 2008.

P. F. Marshall, "Recent progress in moving cognitive radio and services to deployment," in *Proceedings of the 2008 International Symposium on a World of Wireless, Mobile and Multimedia Networks*. San Diego, CA: IEEE Computer Society, 2008, pp. 1–8.

——, "From self-forming mobile networks to self-forming content networks," in *Association of Computing Machinery Mobile Communications Conference (MOBICOM) 2008*. San Francisco, CA: Keynote, Sept. 2008.

M. Kokar, D. Hillman, S. Li, B. Fette, P. F. Marshall, M. Cummings, T. Martin, and J. Strassner, "Towards a unified policy language for future communication networks: A process," in *3rd IEEE Symposium on New Frontiers in Dynamic Spectrum Access Networks*, Oct. 14–17 2008, pp. 1–10.

P. F. Marshall, "Dynamic Spectrum Management of Front-end Linearity and Dynamic Range," in *3rd IEEE Symposium on New Frontiers in Dynamic Spectrum Access Networks*, Oct. 14-17, 2008, pp. 1–12.

——, "Closed-Form Analysis of Spectrum Characteristics for Cognitive Radio Performance Analysis," in *3rd IEEE Symposium on New Frontiers in Dynamic Spectrum Access Networks*, Oct. 14-17, 2008, pp. 1–12.

C. Cordeiro, B. Daneshrad, J. B. Evans, N. Mandayam, and P. F. Marshall, "Adaptive, spectrum agile and cognitive wireless networks (editorial)," *IEEE Journal on Selected Areas in Communications*, vol. 25, no. 3, April 2007.

P. F. Marshall, "DARPA Progress in Spectrally Adaptive Radio Development," in *Software Defined Radio Forum Technical Conference*, 2006.

——, "Adaptation and Integration across the Layers of Self Organizing Wireless Networks to Achieve Performance and Scalability," in *IEEE Military Communications Conference (MILCOM)*, Washington, DC, 2006.

——, "XG communications program information briefing," in *Semantic Web Applications for National Security (SWANS) Conference*, April 2005.

——, "Sensor networking: Radio and networking technology for sensor applications (invited paper)," in *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*, ser. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 5796, May 2005, pp. 235–245.

D. Honey and P. F. Marshall, "Microwave photonics: What are the technology tipping points for military system applications?" in *IEEE International Topical Meeting on Microwave Photonics*, Oct. 2004, p. 181.

P. F. Marshall, "Future Implicatitions of IPv6: Accessorizing IPv6," in *US IPv6 Summit 2003*, Dec. 8-11 2003.

——, "Spectrum management protocols in the Defense Advanced Research Projects Agency Next Generation Communications program," in *Software Defeined Radio Annual Technical Conference*, 2002.