



ICES

ATTACHMENT 9



International Liaison Report

Piscataway, New Jersey

30 August 2006

Michael R. Murphy, PhD

Air Force Research Laboratory



Outline



- **Recent International EMF Meetings**
 - Focus on BEMS 2006
- **Upcoming EMF Meetings**
 - Focus on Directed Energy Professional Society
- **Liaisons**
 - ICNIRP, WHO, BEMS/EBEA, URSI, EMBS
- **Additional Presentations**



Recent EMF Meetings

- 24th Meeting of the Society for Physical Regulation in Biology and Medicine, 11-13 Jan 2006, Cancun, Mexico, www.SPRBM.org
- BEMS Workshop and Board Meeting, 3-4 Feb 2006, Phoenix, AZ <http://www.bioelectromagnetics.org/>
 - “Exploring the Boundaries of EMF Intervention Techniques”
- Emerging EMF-technologies, Potential Sensitive Groups and Health, 20-21 April 2006, Graz, Austria
<http://www.kht.tugraz.at/conference2006.html>





Recent EMF Meetings



- **International Conference on Electromagnetic Fields, Health and Environment, 27-29 April 2006, Madeira Island, Portugal**
www.apdee.org/ehe06/
- **BEMS Annual Meeting, 11-15 June, Cancun, Mexico,** <http://www.bioelectromagnetics.org/>





News from BEMS: Cancun 2006 (1)



- On the whole, a very good meeting
 - 340 registrants
 - Made \$\$ for the society
 - Excellent venue
- Highpoint: C-K Chou receives D'Arsonval Award
- Lowpoint: Blank Expressions on the “Precautionary Principle”
 - + Cindy Sage & Michael Kundi
- Adjacent Meetings
 - ICES SC4 and 34
 - Air Force Workshop – BBB
 - Non-Lethal Interventions III





News from BEMS: Cancun 2006 (2)



- Reemerging focus area: Medical application of RF
 - New focus on very short, high intensity pulses
 - Sparked by merger with ElectroMed
- Emerging interest area – “Non-Lethal Interventions”
 - Primary oriented toward electrical stimulation
- New Officers;
 - President Elect: Eva Czerska, FDA
 - Treasurer: Vijayalxmi
 - Board-Bio: J. L. Carson (oncology)
 - Board-Bio: Joachim Schuz (epi)
 - Board – Eng: Dariusz Leszczynski
 - Board – At Large: Nam Kim (EE)
 - Journal Editor: James Lin





Upcoming EMF Meetings



- **International Conference of the IEEE EMBS, Aug 31-Sept 3, 2006, New York City, USA.**
<http://embc2006.njit.edu/announcement.php>
- **Bioelectrochemistry Gordon Research Conference, 3 – 8 Sept 2006, Aussois, France**
rnuccite@odu.edu
- **Workshop on Proposed Mechanisms for the Interaction of RF-Signals with Living Matter, 11-13 September 2006, Rostock, Germany**
- **Int. Seminar on Electromagnetic Fields and Special Workshop on Interlaboratory Comparison," 13-15 Sept 2006, Ljubljana, Slovenia / Zagreb, Croatia.**
<http://www.cost281.org/>





Upcoming EMF Meetings



- **International Conference on High-Intensity Physical Factors in Medicine, Biology, Agriculture and Ecology,** 9-11 October 2006
Sarov, Nizhny Novgorod Region, Russia
- **4th International Workshop on Biological Effects of Electromagnetic Fields**
16-20 October 2005, Crete, Greece
<http://imm.demokritos.gr/bioeffects/>





Upcoming EMF Meetings



- **Ninth Annual Directed Energy Symposium,**
30 October 30 – 3 November 2006. Albuquerque, New Mexico
<http://deps.org>
- **Society for Physical Regulation in Biology and Medicine**
25th annual Scientific Conference, 10-13 January 2007,
Honolulu, Hawaii
<http://www.stanford.edu/group/sprbm/conference.html>
- **European BioElectromagnetics Association (EBEA) Congress.**
10-13 April 2007,
University of Bordeaux, France
<http://www.ebea.org>
- **The Bioelectromagnetics Society 29th Annual Meeting**
10-15 June 2007, Kanazawa, Japan
<http://www.bioelectromagnetics.org>



BEMS – Future Plans (1)



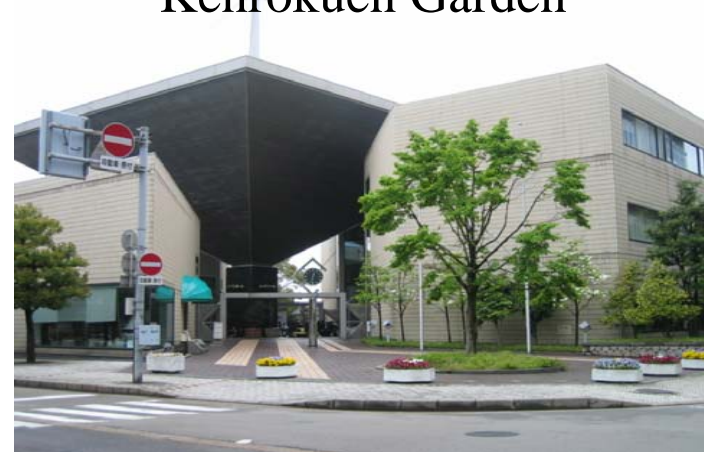
Kanazawa, Japan 10-15 June 2007
Technical Program Chair: Richard Nuccitelli.



Kanazawa Castle



Kenrokuen Garden



Kenrokuen Garden

Meeting venue



BEMS – Future Plans (2)



- **2008: United States**
 - San Diego, CA ?
 - Tacoma, WA ?
- **2009: Europe**
 - World Congress with EBEA
 - Slovenia? Prague?



**Chihuly Glass,
Tacoma**



**Lake Bled,
Slovenia**

**Tycho Brahe,
Prague**





Ninth Annual DE Symposium

30 Oct – 3 Nov, Albuquerque



SYMPOSIUM ORGANIZING COMMITTEE

Chair of the Symposium
Dr William Baker, AFRL

Co-Chair of the Symposium
Dr Michael Lavan, SMDC

Program Committee

Dr Gene Bednarz, Chair, AFRL
Dr Jack Agee, AFOSR
Mr Charles Gilman, SAIC
Dr Roy Hamil, AFRL
Dr Tom Hussey, AFRL
Ms Susan Levine, JNLWD
Dr Guillermo Loubriel, SNL
Dr Sheldon Meth, DARPA
Dr Mike Murphy, AFRL
Mr Mark Neice, JTO
Dr Charles Oberly, AFRL
Ms Birtha Otey, SMDC
Dr Robert Peterkin, SAIC
Mr Quentin Saulter, ONR
Dr Edl Schamiloglu, UNM
Dr Vern Schlie, AFRL
Mr Mike Sheehan, AFRL
Dr Don Shiffler, AFRL
Dr Don Sullivan, ATK
Mr John Tatum, ARL
Mr Ed Utt, 46th TW

Registration

Ms Cynnamon Spain, DEPS

Short Courses

Ms Donna Storment, DEPS

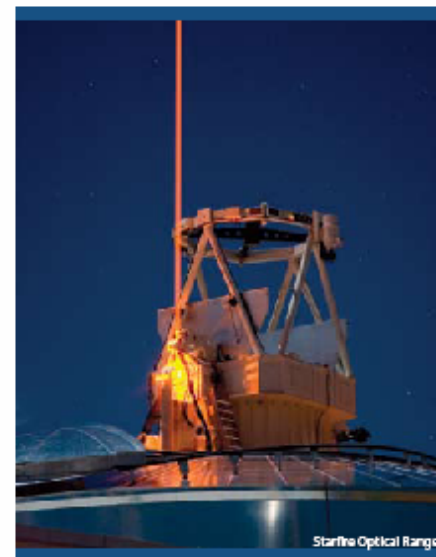
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PERMIT NO. 2066

Directed Energy Professional Society
P.O. Box 9874
Albuquerque, NM 87119-9874

Tel: 505-998-4910
Fax: 505-998-4917
www.deps.org



Call for Papers



Starfire Optical Range

NINTH ANNUAL DIRECTED ENERGY SYMPOSIUM



SPONSORED BY
**DIRECTED ENERGY
PROFESSIONAL SOCIETY**

CO-SPONSORED BY
AIR FORCE RESEARCH LABORATORY
DIRECTED ENERGY DIRECTORATE

30 October - 3 November 2006

**Hyatt Regency Hotel
Albuquerque, New Mexico**

Deadline for Abstracts: 15 June 2006



DIRECTED ENERGY PROFESSIONAL SOCIETY



- **Founded 1999 to be the premier organization for fostering R&D of Directed Energy (DE) technology for military and civil applications**
- **Publishes**
 - DE Symposium Proceedings
 - DEPS Monthly Update
 - Journal of Directed Energy
- **Organizes Multiple Events & Conferences**
 - <http://www.deps.org>





What is Directed Energy



In Everybody's Definition

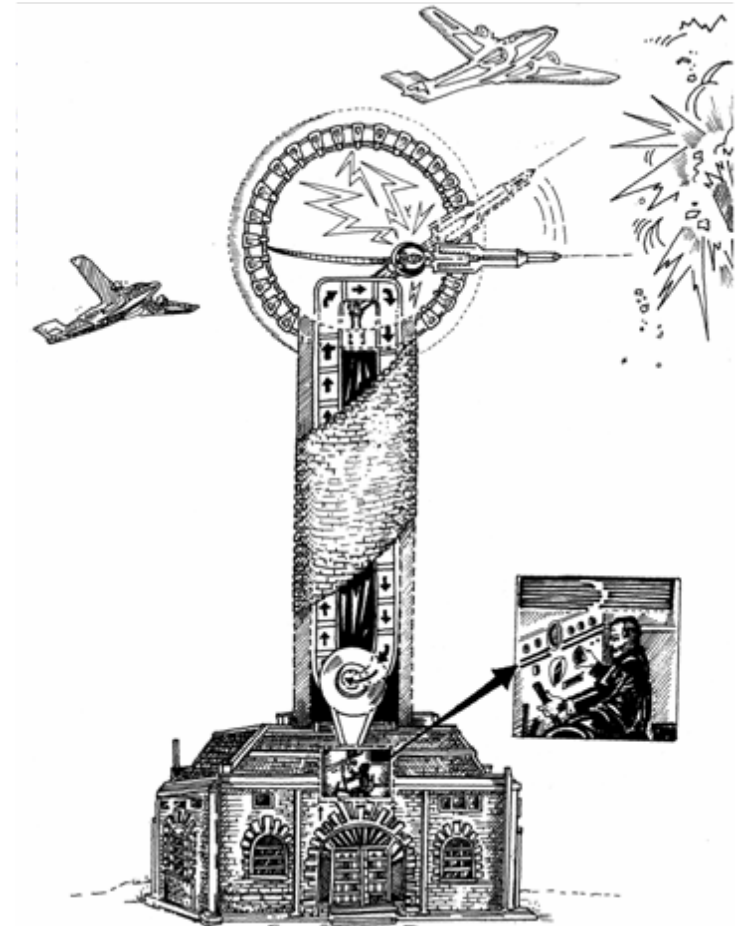
- High Power Microwaves
- Lasers
- Charged Particle Beams

Included by Some

- Electrical current (Tasers)
- High Power Acoustics

Directed Energy Weapons

- Speed of light
- Precise, selective
- Deep magazine
- Lethal or non-lethal
- Anti -materiel or -personnel



Tesla's Concept for a Charged Particle Beam Weapon - 1938



Directed Energy Conferences



- **Directed Energy Professional Society (DEPS)**
 - DE Test & Evaluation Conference 2006 1-3 August (5)
 - Directed Energy Modeling and Simulation Conference (4)
 - DE Systems Symposium 26-30 march 2007
 - High Power Microwave (2)
 - Specialized Laser Conferences
 - DE Education Workshops (6)
 - DE Test & Evaluation Conference 2006
1-3 August (5)
 - Ninth Annual DE Symposium,
30 Oct – 3 Nov, Albuquerque
- **Commercial Conference Organizers**
 - NGIA - 3rd Annual DE Warfare Conference, 15-17 Jan 2007,
Washington DC
 - SMi Conf. - DE Weapons II: 7-8 June 2004. London





Ninth Annual DE Symposium

30 Oct – 3 Nov, Albuquerque



TOPICS

Proposed Focus Session topics currently include:

Directed Energy Safety

Materials Development for Directed Energy

Solid State Laser Developments

Novel Concepts in Directed Energy

Modeling and Simulation for Directed Energy

Power Systems for Directed Energy

Electromagnetic Launchers

Directed Energy Bioeffects

Narrowband and Wideband HPM Sources

Next Generation Millimeter Wave Sources

Test and Evaluation Activities for Directed Energy

Power Conditioning and Thermal Management for DE

Laser Directed Energy Threats

RF Directed Energy Threats

Non-Lethal Directed Energy Applications

Ultrashort Pulse Laser Propagation

Directed Energy Effects and Susceptibility – RF

Directed Energy Effects and Susceptibility – Laser

Directed Energy Protection and Hardening

Compact, Militarily Useful High Energy Lasers

Directed Energy Wargaming Activities and Results

Operational Effectiveness of Directed Energy



Directed Energy Weapons

Legend – Science Fiction - Concept



Archimedes' Mirror – 212 BC



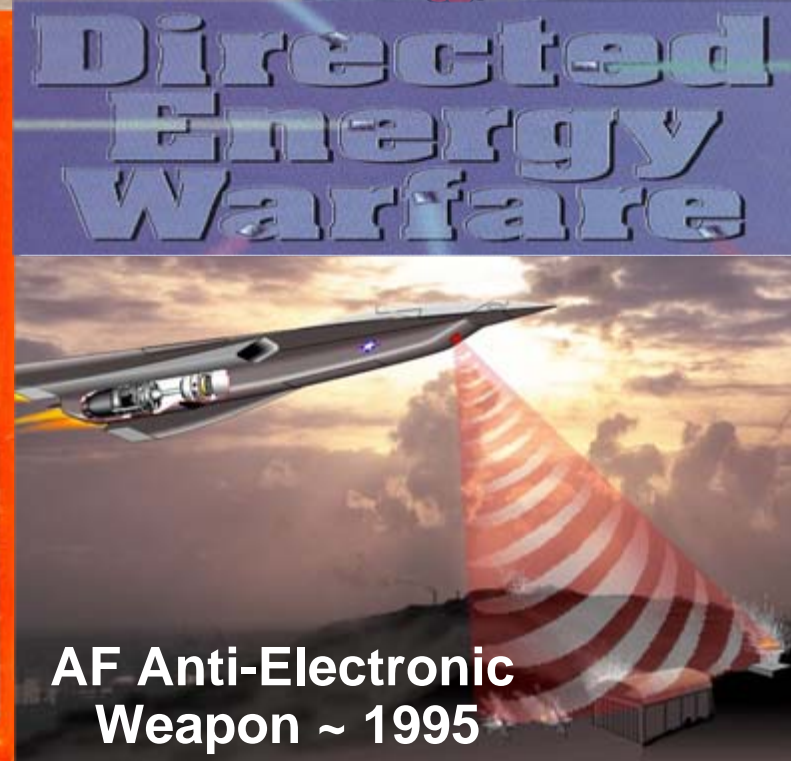
Photon Torpedo ~ Star
Date 1317



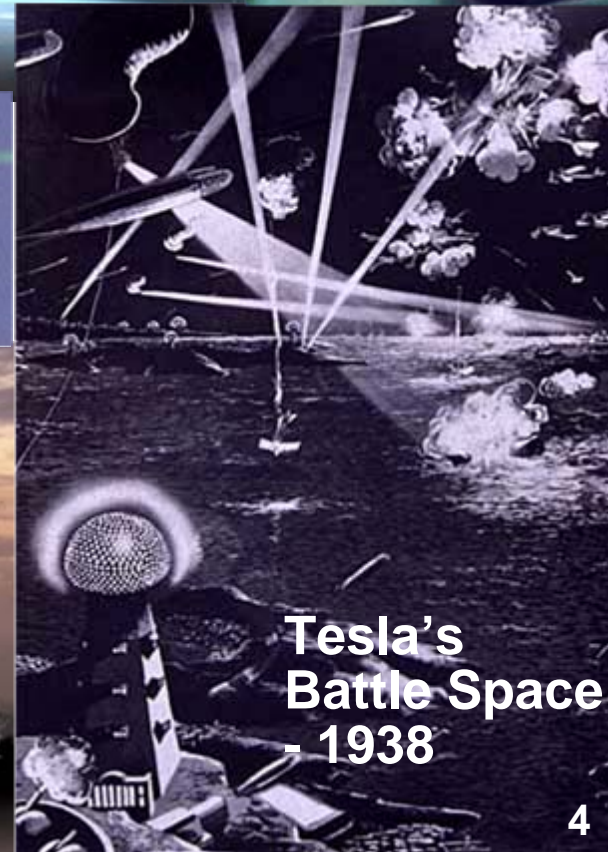
Phaser



Radio Gun - 1923



AF Anti-Electronic
Weapon ~ 1995



Tesla's
Battle Space
- 1938



Military Use of Directed Energy: Bioeffects Enabling the Future



Imagination



Health and Safety

B
i
o
e
f
f
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s

protection
novel emissions

human testing
risk analysis

Effectiveness



ATL

Reality



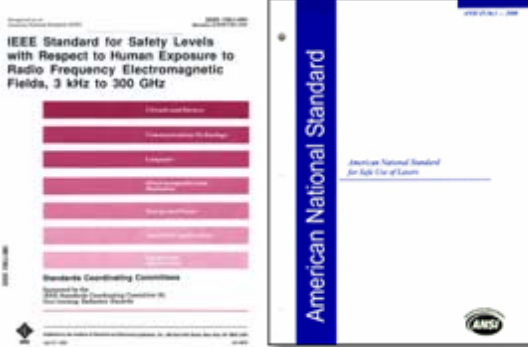
ADS



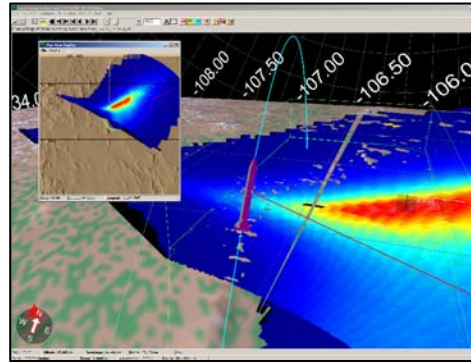
Directed Energy Bioeffects The Great Enabler



Exposure Standards



Optimal Safe T&E



Threat Assessment



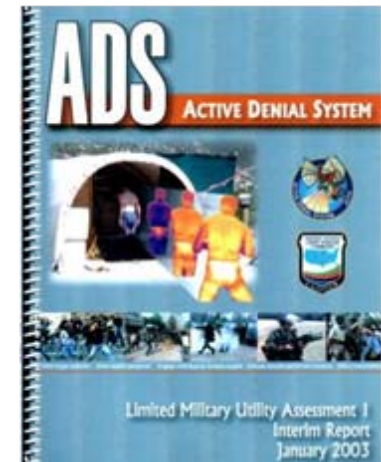
Protection



Weapons Design



Informed Policy & Legal Decisions





An exposure limit is NOT like the edge of a cliff, with immediate danger when it is exceeded.

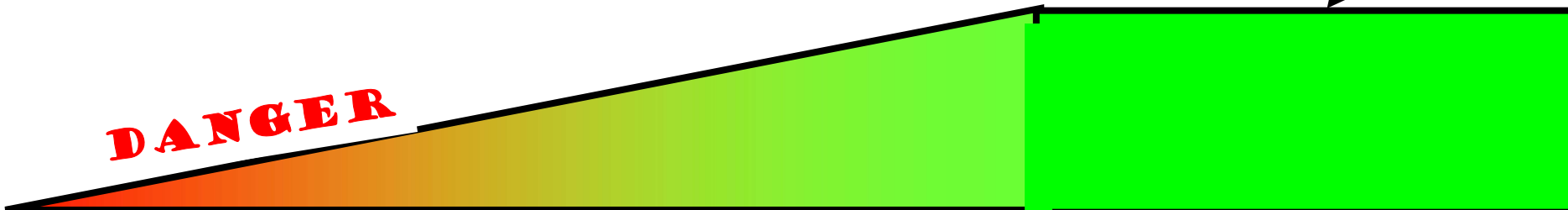


Limit value? No!

Limit values are conservatively set some distance from the start of a slope, down which the possibility of danger gradually increases.

Limit Value!

DANGER





Liaison: ICNIRP



**IEEE
Liaison**

**ICNIRP Meeting
April 2006
Chicago
Art Thansandote**





Liaison URSI – Commission K



- **General Assembly of the Union of Radio Science International (URSI)**

- New Delhi 22-29 Oct 2005

- Com. K “Electromagnetics in Biology & Medicine” 88 talks & 55 posters

- About 1/3 the attendance at BEMS

- IEEE ICES Safety Standards for Exposure to Electromagnetic Energy,” M. R. Murphy

- Next URSI GA will be 9-16 August 2008, Chicago, Ill





Liaison WHO



- (a) There is no such condition as EMF hypersensitivity.
- (b) Emissions from cell towers (base stations) are safe
- (c) IARC reviewing RF and cancer
- (d) WHO completing report on other RF health effects

**Mike Repacholi retires.
Replaced by Dr. Emilie
van Deventer.**





Liaison NATO STANAG 2345



- 3rd revision since the 1993 Rome meeting
- 1994 revision based on IEEE/USDOD controlled limits
 - Now a mixture of ICNIRP/IEEE/USDOD
- B. Jon Klauenberg named Custodian in 2005
- Recent review/revision meetings
 - London (Sept 05), Brooks (Jan 06), Germany (April 06)
- Current peak e-field limit is 200kV/M;
 - Might go higher in new revision
- 40 mA contact current (ICNIRP)
 - Increases risks in operational context
- Working draft for circulation –13 Sept 2006
 - NATO RADHAZ meeting in Brussels



Further Information: B.Jon.Klauenberg@Brooks.AF.mil

Liaison: EMBS



Developing Safety Standards for Electromagnetic Fields (EMF) The IEEE International Committee on Electromagnetic Safety

Michael R. Murphy, Air Force Research Laboratory, and Ron C. Peterson, RC Peterson Associates

BACKGROUND

There are extensive benefits derived from the use of EMF, but this use is accompanied by increased exposure to low-level emissions & the possibility of accidental high-level exposures. Health & safety standards for EMF are needed to:

- Protect people from the potential hazards of EMF
- Provide a base for safe exploitation of EMF-based technology

IEEE and US Navy Developed the First US National Standard for RF

USAS (later renamed ANSI/IEEE C95.1)
C95.1-1966

Sponsors

U.S. Department of the Navy
Institute of Electrical and Electronics Engineers

Approved November 9, 1966
United States of America Standards Institute



10 MHz - 100GHz

10 mW/cm²

0.1-hour (6 minute)
averaging time introduced

1.2 pages long

While EMF standards are stable for a time, they are "living documents" that are revised as science progresses. One of the most significant bodies that sets, reviews, and revises health and safety standards for EMF is the IEEE International Committee on Electromagnetic Safety (ICES).



ICES TODAY

- ICES operates under the strict rules of the IEEE Standards Association Standards Board
- ICES Reorganized in 2005 to include:
 - Human Exposure Standards
 - Product Standards
 - Environmental Standards
- ICES Participants Composition
 - 150 members from 25 countries
 - Medicine, physiology, physics, engineering, public policy
 - Government, academia, industry, consultants, general public



ICES
Safety Standards
for
Electromagnetic Fields

ICES Organization - 2005



RFR STANDARD: C95.1

- Incorporated frequency dependence - 1982
- Dosimetry introduced - 1982
- Concept of SAR used as basis - 1982
- Expanded frequency range (3kHz - 300 GHz) - 1991
- Two-tier (controlled & uncontrolled) - 1991
- Relaxation for partial-body exposures - 1991
- Induced body current limits for shocks/burns - 1999
- Match high freq RF limits with infrared limits - 1991
- Thorough review/revision - 2005 (187 pages long)
- Increased harmonization with ICNIRP - 2005

ELF STANDARD: C95.6

Set in 2002 for 0 - 3kHz range to avoid:

- Aversive or painful stimulation of sensory neurons;
- Muscle excitation that might lead to injuries while performing potentially hazardous activities;
- Excitation of neurons or direct alteration of synaptic activity within the brain;
- Cardiac excitation possibly causing fibrillation;
- Magneto-hydrodynamic effects.

MORE ABOUT ICES

How ICES Develops EMF Standards

- Peer-reviewed, replicated scientific publications
- Consensus among all "stakeholders"
- Balloted by Subcommittee & Technical Committees
 - 75 % participation and 75% support required
 - Negative ballots/comments are addressed and circulated to all members for reconsideration
 - Usually, 4 ballots with 90% or higher support

- Proceedings EMBC 2006

- Take a Brochure

- <http://grouper.ieee.org/groups/scc28/>

- Chair: r.c.petersen@ieee.org

- Membership: sajohnston@btclick.com

- Internat. Liaison: michael.murphy@brooks.af.mil



Additional Presentations



European RF Conference Updates

Sheila Johnston

IEC TC106 Activities

Ron Petersen

Initial Research for TeraHertz Safety Standards

Jill McQuade

Noel Montgomery