

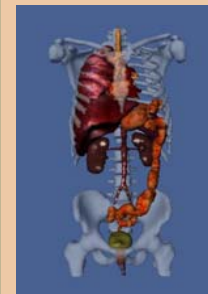
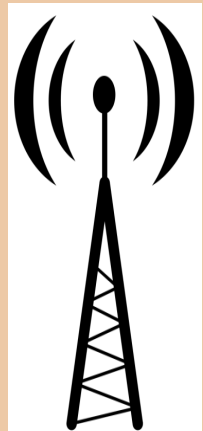
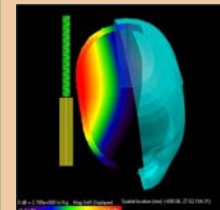
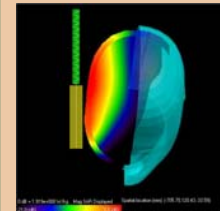
ICES TC95 SC4 Literature Surveillance Report

WG Members

Joe Morrissey
Dariusz Leszczynski
Sheila Johnston
Joe Elder

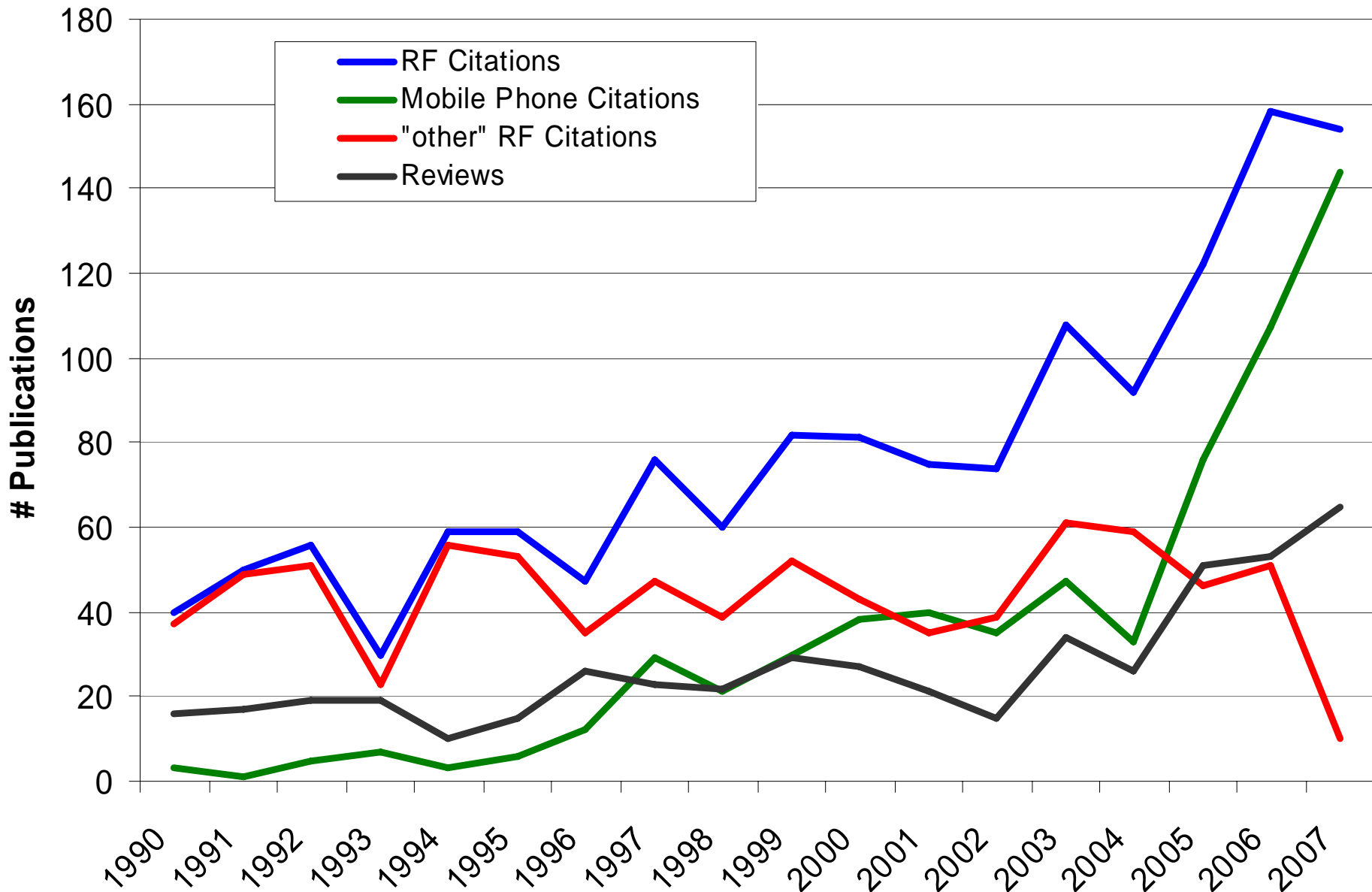
Literature Database

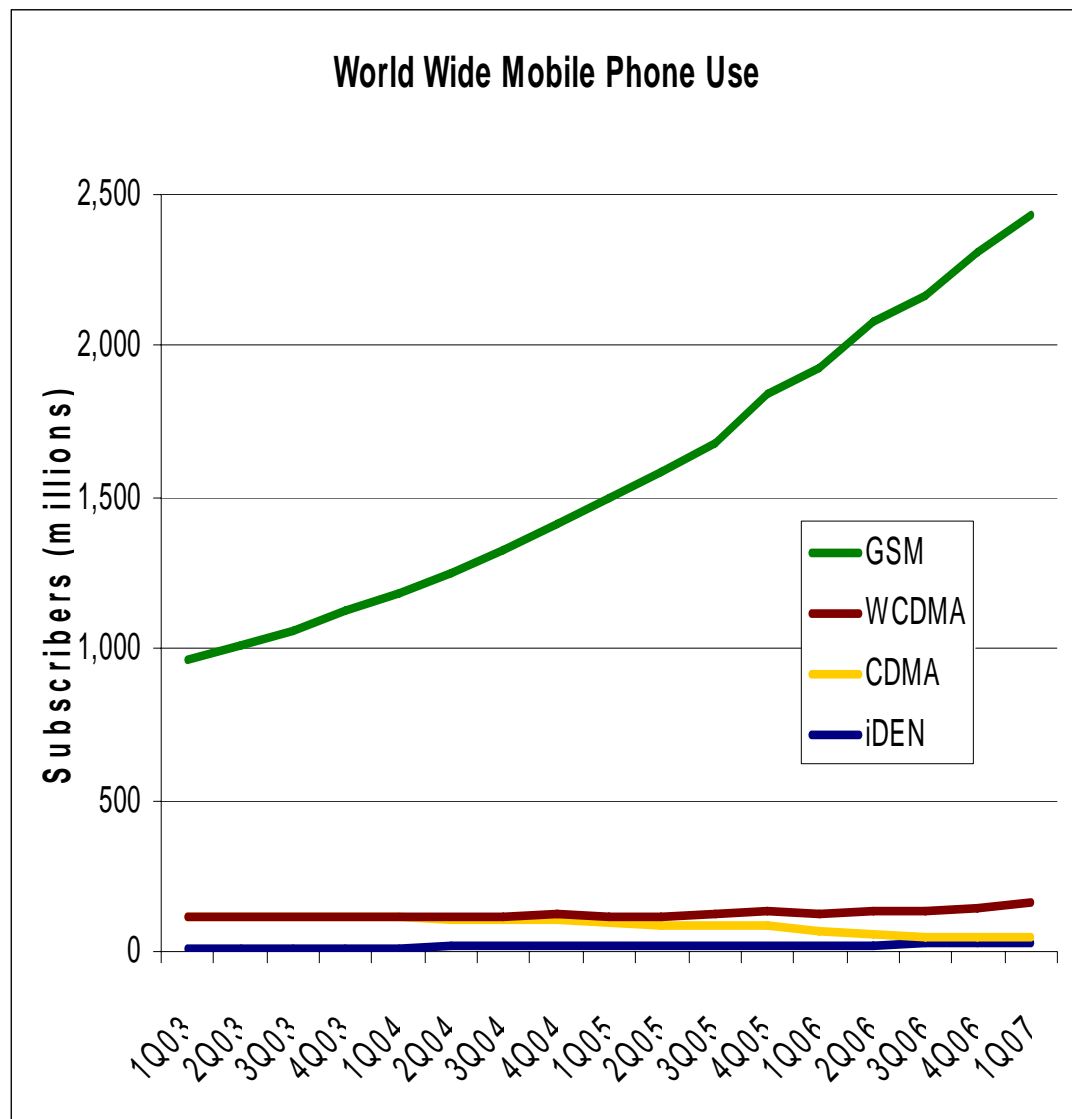
Total Citations: **3087** (2964 at last meeting)
Reviews: **842** (776 at last meeting)
Mobile Phone studies: **968**





Peer Reviewed RF Bioeffects Publications

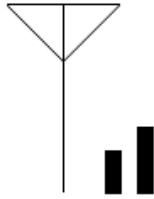




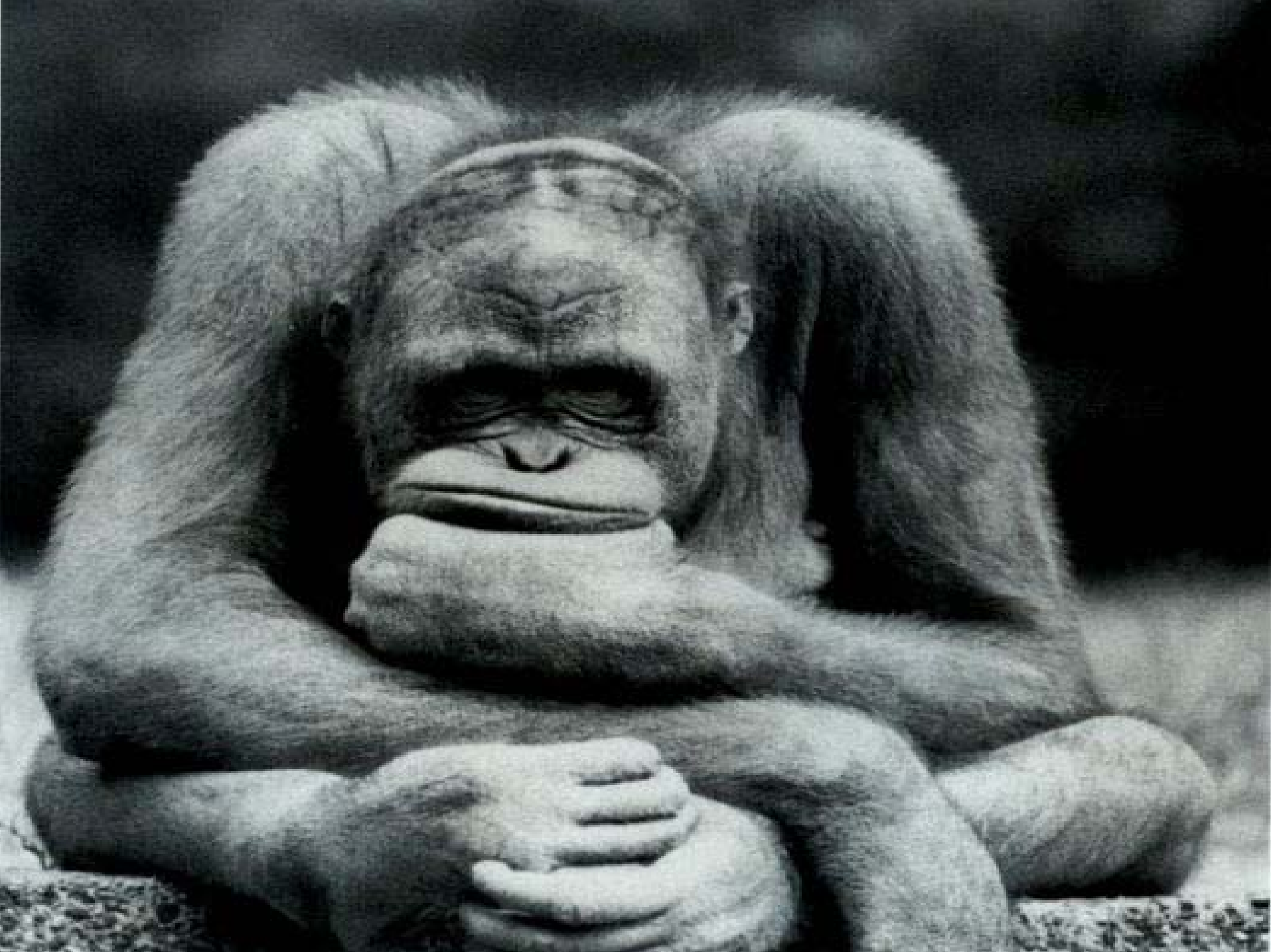
Top 10 growth countries

GSM net additions in Q1 2007:

China	18,040,914
India	13,728,036
Pakistan	7,662,993
Indonesia	5,394,269
Iran	5,135,330
Brazil	3,877,141
Argentina	3,809,765
Nigeria	3,321,118
Thailand	3,255,817
Russian Federation	3,215,204



Product	Frequency (MHz)	Power (W)	Field strength @ 1 m (V/m)
Paging transmitters	49	250	110 [i]
Mobile radios	138-470	25	35 ^a
Hand-held transceivers	27, 49, 138-470	5	15 ^a
Police/ambulance	138-900	10-100	22-70 ^a
Commercial BW and Public Safety (mobile)	698-806	1-2	
Wireless LANs	912, 2400, 5GHz	0.1 -0.25	2.2 - 3.1
Wireless personal digital assistants	896-940	2	10
Radio modems	896-901	10	22
Cellular telephones[ii]	800-900	0.6	5.4
Personal communications satellite telephones	1610-1626.5	1	7
Licensed PCS equipment	1850-1910	1	7
BWA (3G / IMT, WiMAX mobile)	2.5 -2.689	1-2	
BWA (Fixed))	3650-3700	1-25	
Public Safety	4940-4990	2	
CISPR 11, CISPR 22 [iii]	25-1000	0.04 · 10 ⁻⁶	0.0014 [iv]





Expert Reviews (2000-2007)

- U.K. Independent Expert Group on Mobile Phones (IEGMP) (2000) www.iegmp.org.uk
- World Health Organization (2000) http://www.who.int/docstore/peh-emf/publications/facts_press/efact/efs193.html
- Japanese Ministry (MPHPT) (2001) http://www.soumu.go.jp/joho_tsusin/eng/Releases/NewsLetter/Vol11/Vol11_23.pdf
- Singapore Health Sciences Authority (2002) <http://www.hsa.gov.sg/docs/fullversion.pdf>
- Australian Radiation Protection Nuclear Safety Agency (2003) http://www.arpansa.gov.au/pubs/eme_comitee/fact1.pdf
- French Environ Health Safety (2003)
http://afsse.fr/upload/bibliotheque/994597576240248663335826568793/statement_mobile_phones_2003.pdf
- U.S. FDA (2003) <http://www.fda.gov/cellphones/qa.html#31>
- U.K. NRPB (2004) http://www.hpa.org.uk/radiation/publications/documents_of_nrbp/abstracts/absd15-3.htm
- World Health Organization (2004) <http://www.who.int/peh-emf/about/WhatisEMF/en/index1.html>
- Health Council of the Netherlands (2004) *Bioelectromagnetics* 25:142-144
- U.S. HHS CDC (2005) http://www.cdc.gov/nceh/radiation/factsheets/cellphone_facts.pdf
- German Research Centre Jülich, Programme (MUT) (2005) <http://www.fz-juelich.de/portal/index.php?index=721&jahr=2005&cmd=show&mid=288>
- Swedish State Radiation Protection Authority (SSI) (2006) http://www.ssi.se/ssi_rapporter/pdf/ssi_rapp_2007_4.pdf
- Australian Communications and Media Authority (2006) http://emr.acma.gov.au/mobile_phone_health.pdf
- Health Canada (2006) http://www.hc-sc.gc.ca/iyh-vsv/prod/cell_e.html
- U.S. FCC (2006) <http://ftp.fcc.gov/cgb/consumerfacts/mobilephone.html>
- European Cancer Prevention Organization (2005) <http://www.ecpo.org/>
- UK Inst Eng Technol (2006) <http://www.theiet.org/publicaffairs/bepag/postat02final.pdf>
- New Zealand Ministry of Health (2007) <http://www.nrl.moh.govt.nz/faq/cellphonesandcellsites.asp>
- Hong Kong, Office of the Telecomm Authority (2007) <http://www.ofta.gov.hk/en/freq-spec/radiation.pdf>
- Health Council of the Netherlands (2007) <http://www.healthcouncil.nl/pdf/Press%20release%20200706%20site.pdf>
- Ireland Expert Group (2007) <http://www.dcmnr.gov.ie/NR/rdonlyres/9E29937F-1A27-4A16-A8C3-F403A623300C/0/ElectromagneticReport.pdf>
- ICNIRP(2007) <http://www.icnirp.de/Joint/VecchiaAbstract.pdf>
- European Commission Scientific Committee (2007) http://ec.europa.eu/health/ph_risk/committees/04_scenihhr/docs/scenihhr_o_007.pdf
- States of Jersey (2007) http://www.scrutiny.gov.je/view_doc.asp?panelid=0&reviewid=0&target=Reports&doc=documents/reports/S-260-48911-3052007.htm
- Japan (2007) http://www.soumu.go.jp/joho_tsusin/eng/Releases/NewsLetter/Vol18/Vol18_06/Vol18_06.html
- World Health Organization (2007) <http://www.who.int/peh-emf/about/WhatisEMF/en/index1.html>; http://www.who.int/peh-emf/meetings/ottawa_june05/en/index4.html; <http://www.who.int/mediacentre/factsheets/fs304/en/index.html>

Conclusions (paraphrased): **“no evidence that chronic RF exposure at levels below IEEE C95.1 or ICNIRP limits is harmful to human health”** and **“more research needed”**

Table 1 – Summary of published results from national INTERPHONE analyses of mobile phone use

Country	Age range	Diagnosis years	Number of cases and controls	OR and 95% CI Ever regular use # cases	OR and 95% CI Start of use 10 years or more in the past # cases	OR and 95% CI Ipsilateral use, start of use 10+ years in past # cases	OR and 95% CI Contralateral use, start of use 10+ years in past # cases
Glioma							
Denmark (Christensen et al, 2005)	20-69	2000-2002	Low-grade 81 155 High-grade 171 330	Low-grade 1.08 (0.58, 2.00) 47 High-grade 0.58 (0.37, 0.90) 59	Low-grade 1.64 (0.44, 6.12) 6 High-grade 0.48 (0.19, 1.26) 8	NA	NA
France (Hours et al, 2007)	30-59	2001-2003	96 96	1.15 (0.65, 2.05) 59	46 months+ 1.96 (0.74, 5.20) 21	NA	NA
Germany (Schuz et al, 2006)	30-69	2000-2003	366 1,494	0.98 (0.74, 1.29) 138	2.20 (0.94, 5.11) 12	NA	NA
Norway (Klaeboe et al 2007)	19-69	2001-2002	289 358	0.6 (0.4, 0.9) 161	6+ years 0.8 (0.5, 1.2) 70	6+ years 1.3 (0.8, 2.1) 39	6+ years 0.8 (0.5, 1.4) 32
Sweden (Lonn et al, 2005)	20-69	2000-2002	371 674	0.8 (0.6, 1.0) 214	0.9 (0.5, 1.5) 25	1.6 (0.8, 3.4) 15	1.3 (0.5, 3.9) 5
UK (Hepworth et al, 2006)	18-69	2000-2004	966 1,716	0.94 (0.78, 1.13) 508	0.90 (0.63, 1.28) 66	NA	NA
Nordic combined (Lahkola et al, 2007)		2000-2004	1,522 3,301	0.78 (0.68, 0.91) 867	0.95 (0.74, 1.23) 143	1.39 (1.01, 1.92) 77	0.98 (0.71, 1.37) 67
Meningioma							
Denmark (Christensen et al, 2005)	20-69	2000-2002	175 316	0.83 (0.54, 1.28) 67	1.02 (0.32, 3.24) 6	NA	NA
France (Hours et al, 2007)	30-59	2001-2003	145 145	0.74 (0.43, 1.28) 71	46 months+ 0.73 (0.28, 1.91) 15	NA	NA
Germany (Schuz et al, 2006)	30-69	2000-2003	381 762	0.84 (0.62, 1.13) 104	1.09 (0.35, 3.37) 5	NA	NA
Norway (Klaeboe et al 2007)	19-69	2001-2002	207 358	0.8 (0.5, 1.1) 98	6+ years 1.0 (0.6, 1.8) 36	6+ years 1.1 (0.6, 2.3) 17	6+ years 1.2 (0.6, 2.3) 18
Sweden (Lonn et al, 2005)	20-69	2000-2002	273 674	0.7 (0.5, 0.9) 118	0.9 (0.4, 1.9) 8	1.3 (0.5, 3.9) 5	0.5 (0.1, 1.7) 3
Acoustic neurinoma							
Denmark (Christensen et al, 2004)	20-69	2000-2002	106 212	0.90 (0.51, 1.57) 45	0.22 (0.04, 1.11) 2	NA	NA
France (Hours et al, 2007)	30-59	2001-2003	109 214	0.92 (0.53, 1.59) 58	46 months+ 0.66 (0.28, 1.57) 14	NA	NA
Germany (Schlehofer et al, 2007)	30-69	2000-2003	97 194	0.67 (0.38, 1.19) 29	NA 0	NA	NA
Japan (Takebayashi et al, 2006)	30-69	2000-2004	101 339	0.73 (0.43, 1.23) 51	8+ years 0.79 (0.24, 2.65) 4	NA	NA
Norway (Klaeboe et al 2007)	19-69	2001-2002	45 358	0.5 (0.2, 1.0) 22	6+ years 0.5 (0.2, 1.4) 8	6+ years 0.9 (0.3, 2.8) 5	6+ years 0.8 (0.2, 2.5) 4
Sweden (Lonn et al, 2004)	20-69	1999-2002	148 604	1.0 (0.6, 1.5) 89	1.9 (0.9, 4.1) 14	3.9 (1.6, 9.5) 12	0.8 (0.2, 2.9) 4
Nordic combined (Schoemaker et al, 2005)		1999-2004	678 3,553	0.9 (0.7, 1.1) 360	1.0 (0.7, 1.5) 47	1.3 (0.8, 2.0) 31 1.8 (1.1-3.1)* 23	1.0 (0.6, 1.7) 20 0.9 (0.5, 1.8)* 12
Parotid gland tumours							
Sweden and Denmark (Lonn et al, 2006)	20-69	2000-2002	Benign 112 321 Malignant 60 681	Benign 0.9 (0.5, 1.5) 77 Malignant 0.7 (0.4, 1.3) 25	Benign 1.4 (0.5, 3.9) 7 Malignant 0.4 (0.1, 2.6) 2	Benign 2.6 (0.9, 7.9) 6 Malignant 0.7 (0.1, 5.7) 1	Benign 0.3 (0.0, 2.3) 1 Malignant NA 0

Recent Epidemiologic Data

- **Individual INTERPHONE studies**
 - 3 report significant effects for ipsilateral 10+ yrs
 - 6 report no effect or non-significant trends
 - 5 ongoing
 - small individual study numbers
 - incomplete individual exposure assessment
- **Schoemaker Br J Cancer (2005); Lahkola Int J Cancer (2007)**
 - pooled INTERPHONE analysis: UK + Scandanavia
 - ipsilateral +10yr AN OR = 1.8; 95% CI 1.0-3.3
 - ipsilateral +10 yr glioma OR = 1.39, 95% CI 1.01-1.92
- **Hardell et al. Occup Environ Med (2007)**
 - meta-analysis: 2 cohort + 16 case control studies
 - ipsilateral +10 yrs AN OR = 2.4, 95% CI = 1.1-5.3 and
 - ipsilateral +10 yrs glioma OR = 2.0, 95% CI = 1.2-3.4

- **Kan et al. J Neurooncol (2007)**
 - **Meta analysis: 9 case control studies**

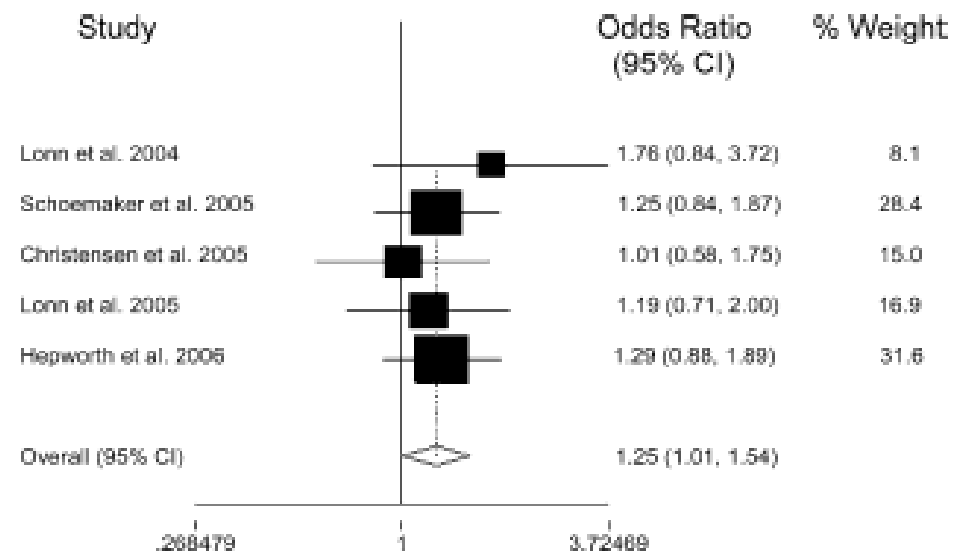


Fig. 3 Pooled odds ratio of brain tumor development associated with cellular phone use of 10 or more years

RADIO FREQUENCY EXPOSURE IN MOBILE PHONE USERS: IMPLICATIONS FOR EXPOSURE ASSESSMENT IN EPIDEMIOLOGICAL STUDIES

Joseph J. Morrissey*

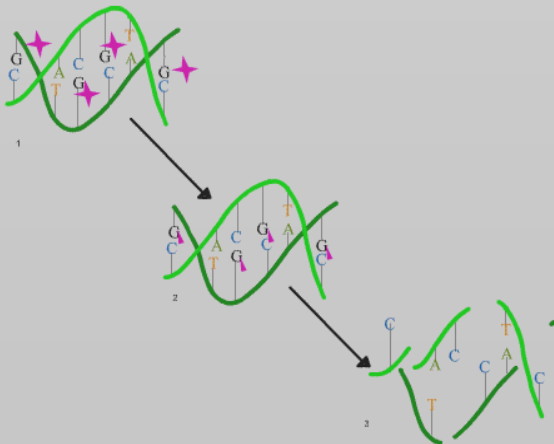
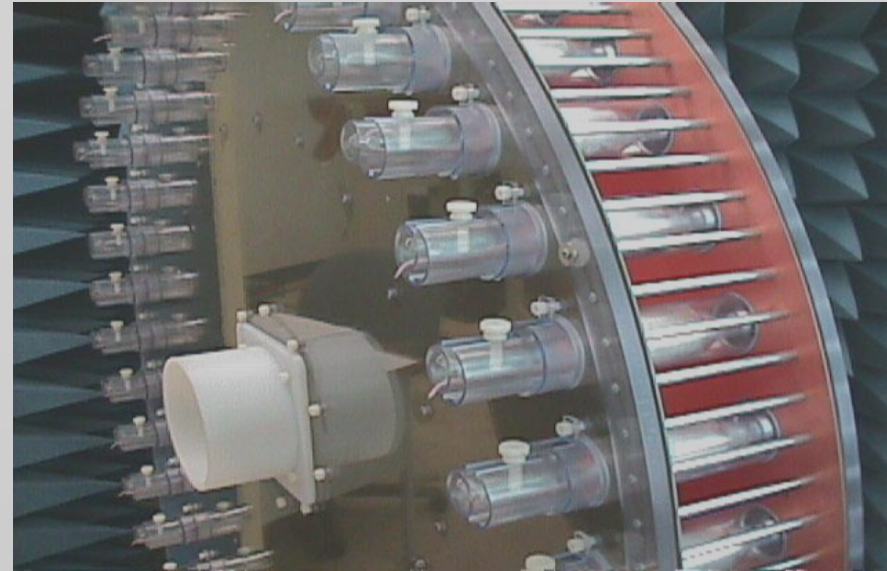
Motorola Florida Corporate Research Laboratory, 8000 West Sunrise Blvd,
Ft Lauderdale, FL 33322, USA

Received September 29 2006, amended Month 00 2006, accepted November 27 2006

The majority of epidemiological studies investigating correlations between long-term low-level radiofrequency (RF) exposure from mobile phones and health endpoints have followed a case-control design, requiring reconstruction of individual RF exposure. To date, these have employed 'time of use' as an exposure surrogate from questionnaire information or billing records. The present study demonstrates such an approach may not account for variability in mobile phone transmit power, which can be roughly correlated with RF exposure. This variability exists (a) during a single call, (b) between separate calls, (c) between averaged values from individuals within a local study group and (d) between average values from groups in different geographical locations. The present data also suggest an age-related influence on talk time, as well as significant inaccuracy (45–60%) in recalling 'time of use'. Evolving technology and changing use behaviours may add additional complexities. Collectively, these data suggest efforts to identify dose response and statistical correlations between mobile phone use and subtle health endpoints may be significantly challenged.

Animal studies

- Over 40 animal cancer studies
- Exposure levels often ~ 4 W/kg
- Co-exposure with several cancer initiators and/or promoters



Mechanistic studies

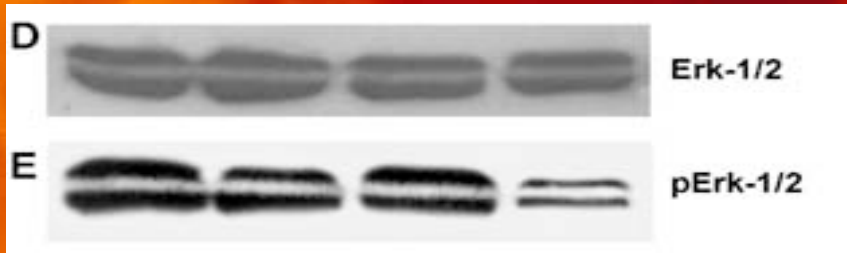
- Several papers in the literature
- fGf workshop (Rostock Germany 2006)
- Only realistic mechanism is thermal

In Vitro Studies

Long term exposure

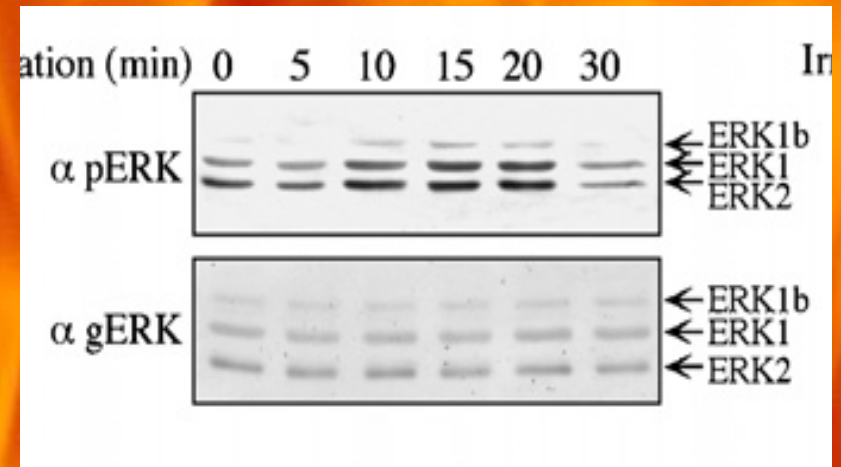
Caraglia et al (2004) - 1950 MHz exposure to KB (human skin) cells for 1-3 hours at 3.6 W/kg

0hr 1hr 2hr 3hr

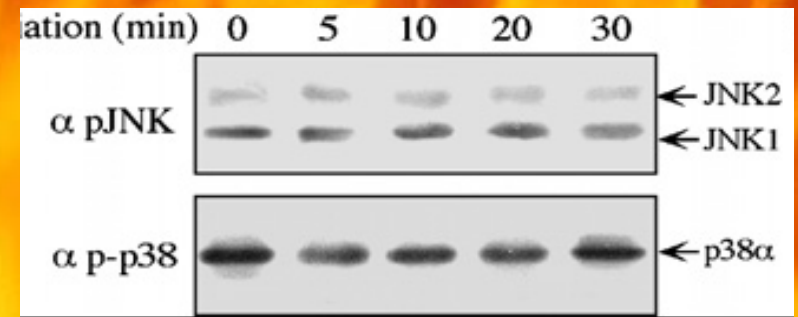
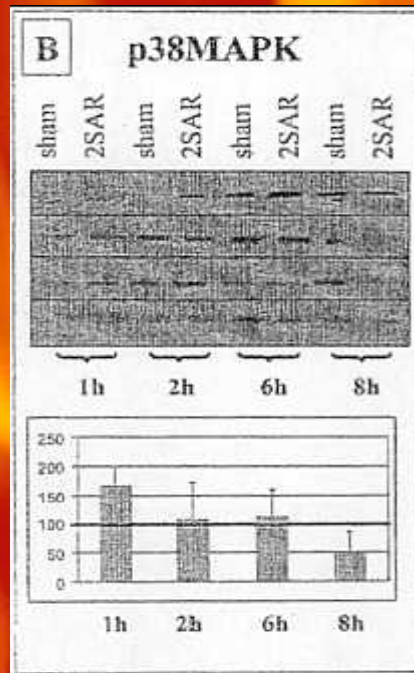


Short term exposure

Friedman et al (2007) - 875 MHz exposure to Rat1 & HeLa cells at 0.07 mW/cm²



Leszczynski et al (2002) - 900 MHz (GSM) exposure to EA.hy926 (human epithelial) cells for 1 hour at 2 W/kg



Social Sciences

EU / EMF-NET Workshop in Stresa Italy, May 2007

- Several studies report pervasiveness and growing dependence upon mobile phones in society
- Perception of risk from EMFs often predetermined
 - Researchers
 - General public
- Precautionary measures may not be beneficial
- Geographical and age differences in level of concern
 - base stations vs. mobile phone handsets
 - RF exposure vs. driving
- Children have a high rate of mobile phone use
- Concern may have a psychosomatic element

Sleep and EEG Studies

FGF Workshop in Stuttgart Germany, November 2007

- Studies report mixed effects on EEG / sleep
 - Effects are often small in magnitude
 - Not consistent in direction and repeatability
 - Definition of “alpha” EEG spectrum inconsistent
 - Recordings taken before, during, or after sleep
 - Significant inter- and intra- individual variation
- Possibility of artifacts may be substantial
 - RF may couple with EEG leads
 - Many parameters highly sensitive
- Connection with Human Health not clear

We agreed to the following approach:

- Step 1: Literature Capture – ongoing through current database
- Step 2: Selection - ongoing / we agreed to all peer-reviewed citations
- Step 3: Division – ongoing - specialty areas for review per existing database subcategories
- Step 4: Critical Evaluation
- Step 5: Synoptic Review

New Directions



Local Tissue Temperature Limits

- Whole body basic restriction taken from animal behavioral data (4 W/kg work stoppage)
 - occupational = 10x safety factor (0.4 W/kg)
 - general public = extra 5x safety factor (0.08 W/kg)
- Local limits (IEEE C95.1, 1995) applied 20x peak / average ratio to WBA value (= 1.6 W/kg)
- Current standard (IEEE C95.1, 2006) considers
 - upward revision of peak/average SAR (Bernardi 2003)
 - harmonizing with ICNIRP
 - 2 W/kg (per 10 grams, 6 minute avg) is conservative
- Limited information on tissue temperature thresholds for local adverse effects



