

Summary and Update of the Australian Centre for Radiofrequency Bioeffects Research (ACRBR) Human Neurophysiology Research

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ACRBR Background

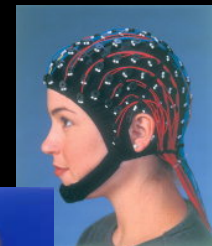
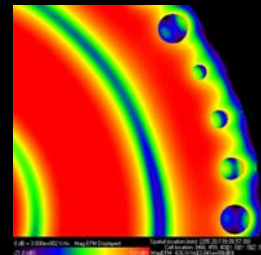
- Established in 2004 by the National Health and Medical Research Council (NHMRC)
- Centre members:
 - Swinburne University
 - Monash University
 - RMIT
 - Telstra Research Laboratories
 - IMVS
- To conduct research on possible health-related consequences of using low-level RF devices

ACRBR Aims

- Promote & conduct research in the area of biological effects of RF electromagnetic radiation
- Increase research capacity through educational programs and additional funding
- Provide community and government consultation on RF bioeffects

ACRBR Research

- Currently (and previously) engaged in a number of research programs assessing the effects of second and third generation radio technologies (and related electromagnetic fields) on humans
- Main Research focuses
 - Human Neurophysiology
 - Dosimetry
 - Epidemiology
 - Molecular
 - In vitro & In vivo



Human Neurophysiology Research

- The effects of RF EMF on
 - Sleep
 - Sleep EEG
 - The awake EEG
 - Cognition



Previous Sleep Results

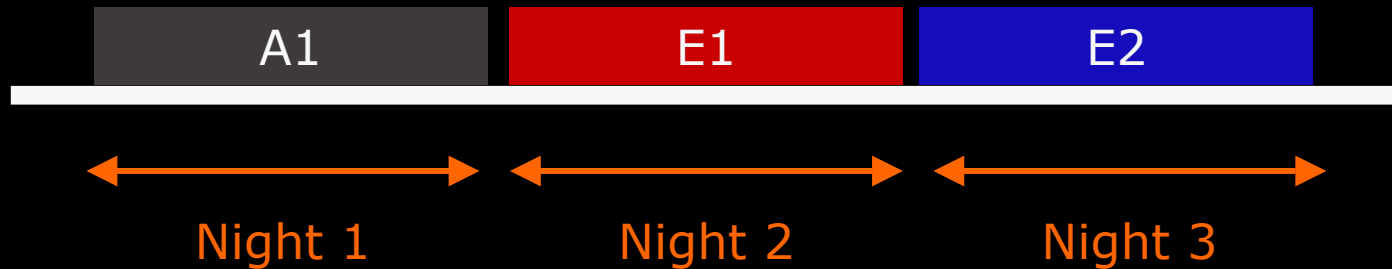
- Loughran et al (2005), NeuroReport
 - ↓ REM latency (~ 17 mins)
 - No change in other conventional sleep parameters (e.g., total sleep, sleep onset, arousals, etc)
 - ↑ EEG power density in the 11.5–12.25 Hz frequency range (partial $\eta^2 = 0.105$)
- Further results
 - No significant EEG changes in subsequent NREM periods
 - Some trend level enhancements in EEG spectral power in the 2nd and 4th NREM periods (6 - 8 Hz, 2 - 3 Hz 2nd NREM)
 - No significant EEG changes during REM sleep

Ongoing Sleep Research

- Replication of Loughran et al (2005)
- Aims
 - Test whether the change in REM latency can be replicated/address statistical uncertainty
 - Test whether the changes in EEG can be replicated
 - Investigate further the possibility of individual differences in response to mobile phone emissions

Study Design

- N = 30 (participants from original study)
- Design



- Exposure
 - Right hemisphere
 - Nokia 6110 (peak spatial SAR = 0.19 W/Kg, averaged over 1g)

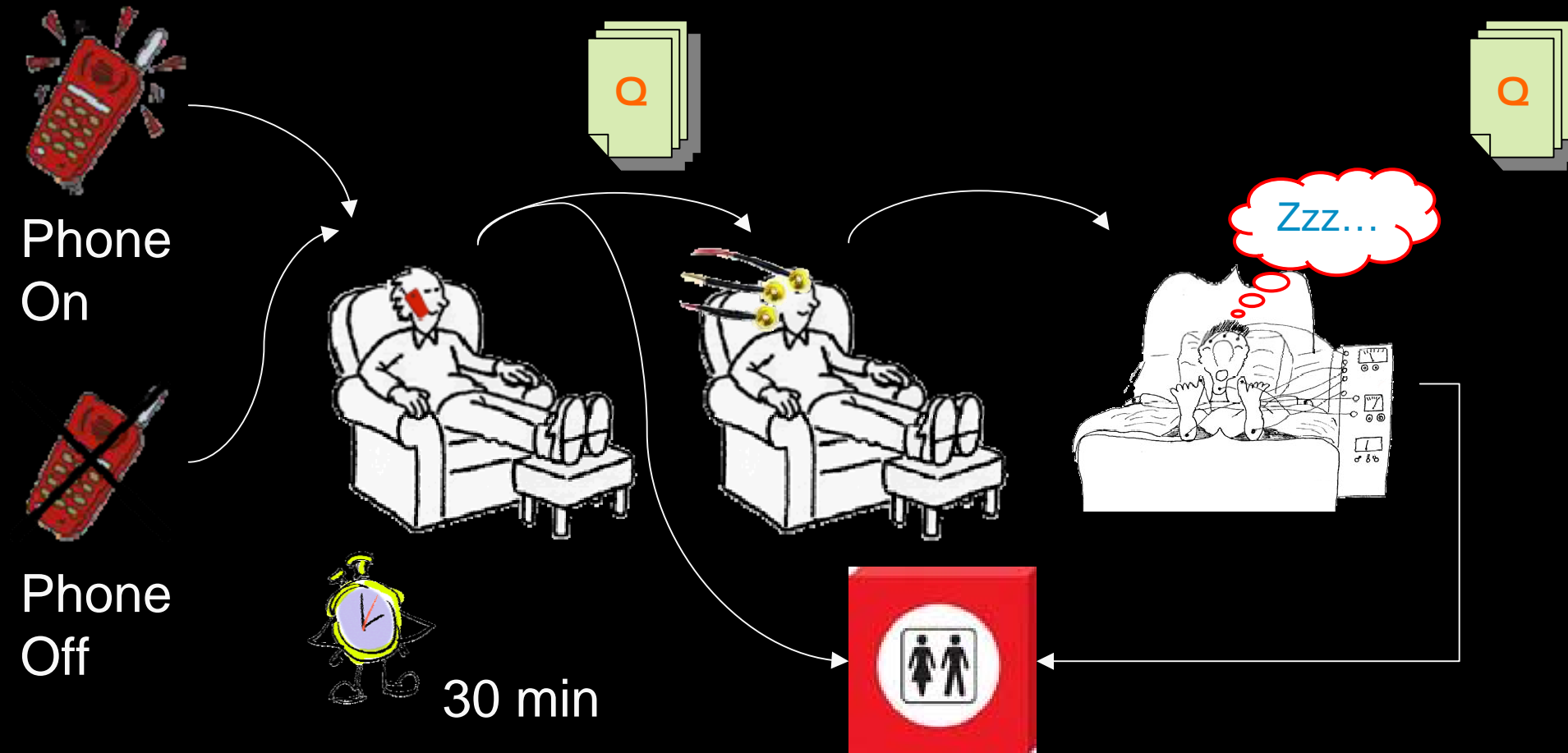
Study Design

Condition

Exposure

Set-Up

Measurement



Current Progress

- Recruited and completed 20 participants for follow-up
- First results expected December 2007
- Exploratory results expected early 2008

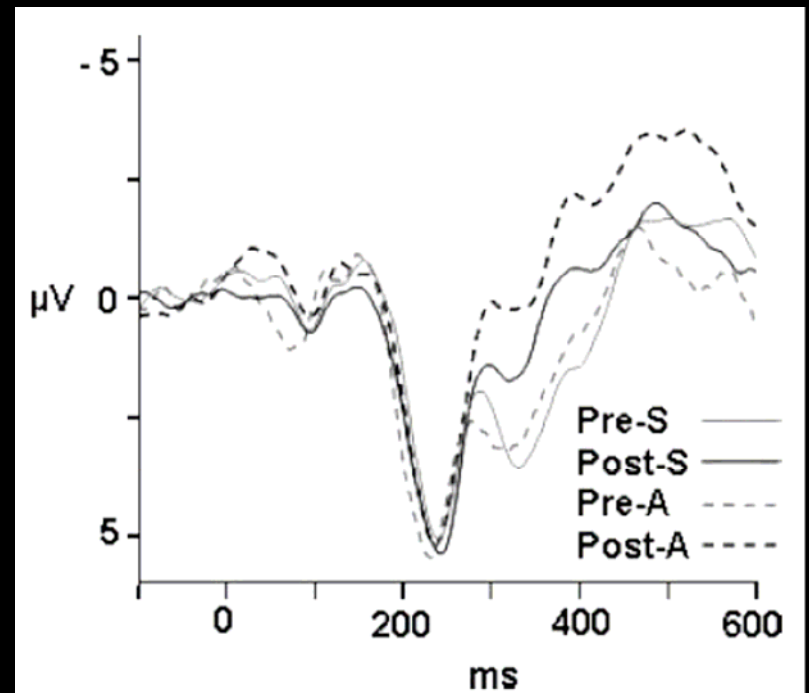


Summary of Sleep Research

- Our findings to date similar to other laboratories
- Changes in EEG appear to be transient
- There does not appear to be an effect on the EEG during REM sleep
- Changes in the sleep EEG do not appear to affect overall sleep quality

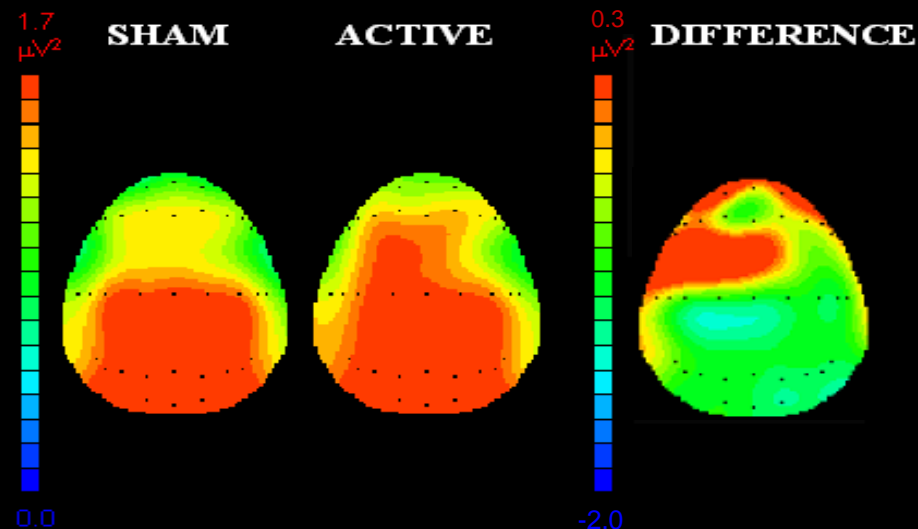
Summary of Previous Cognitive Research

- Hamblin et al (2004): Active exposure
 - ↑ RT (53ms)
 - Accuracy NS
 - ↓ N100 amplitude
 - ↓ N100 latency
 - ↑ P300 latency
- Hamblin et al (2006)
 - N100, P100, P300 (No change)
 - RT – No change



Summary of Previous Cognitive EEG Research

- Croft et al (2007)
 - ↑ resting EEG activity
 - Alpha frequency range (8 – 12 Hz)
 - During exposure
 - More pronounced ipsilateral to exposure (particularly at posterior sites)



Ongoing Cognitive Research

- Sensitivity of different age groups to radiofrequency bioeffects
 - Aims:
 - To test the effect of RF on several measures as a function of age-group
 - Resting EEG
 - ERP
 - Cognition
 - Heart Rate
 - Subjective symptoms
 - Galvanic skin response

Ongoing Cognitive Research

- Sensitivity of different age groups to radiofrequency bioeffects
 - Methods:
 - Participants tested under three conditions: 2G, 3G, and sham.
 - Participants complete a single auditory oddball task, the difficulty of which is chosen through baseline testing
 - Additional tasks - visual “n-back” working memory tasks, and resting tasks
 - Exposure:
 - 60 Minutes
 - 2G – Nokia 6110 (900 MHz)
 - 3G – Signal generator (1900 MHz)
 - Results:
 - Expected early 2008

Ongoing Cognitive Research

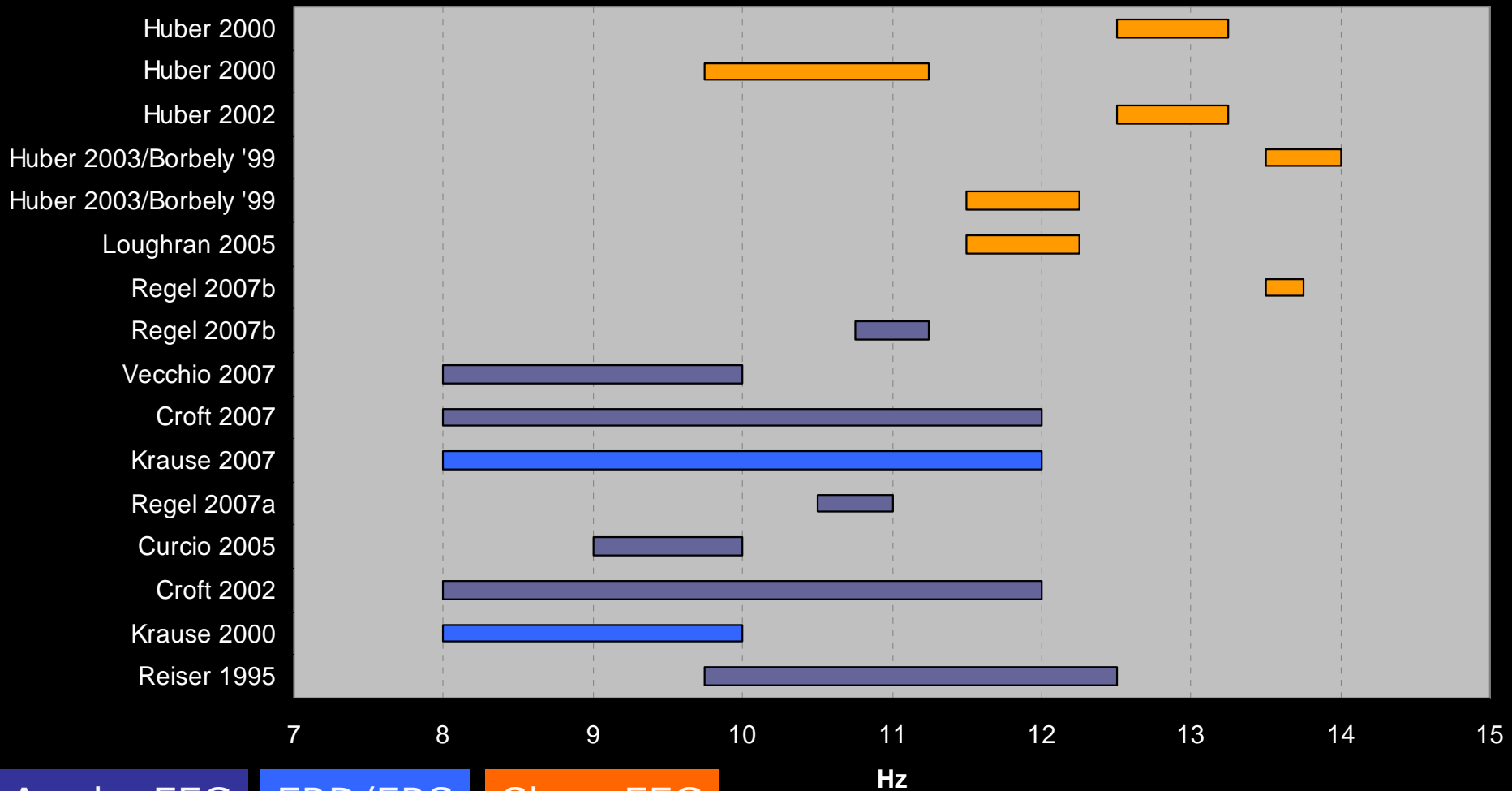
- The effect of caffeine vs. RF on neural function in human volunteers
 - Aims:
 - designed as a positive control for the parallel study investigating the effects of 3G and 2G technologies
 - Methods:
 - As per previous study
 - Results:
 - Expected December 2007

Consistency of Effects

- Recent, larger studies suggest that there is no effect of RF EMF on cognition (e.g. RT)
- More consistent is the effect on the EEG in the 8 – 12 Hz frequency range
 - ↑ resting EEG activity (alpha)
 - ↑ EEG power density during NREM sleep



Significant EEG Enhancements



Awake EEG

ERD/ERS

Sleep EEG

Hz

Why the Variation?

- Differences in exposure parameters
- Differences in study design
 - Cognitive tasks
 - Sleep measurement
- Magnitude of effect
 - Sample size
- Statistics
 - Multiple comparisons

Future Perspectives

- Mechanisms?
- Functional Significance?
- Age-related differences?
- Individual differences?
- Long-term effects/consequences?
- New technologies?

Acknowledgements

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