

also create strong magnetic fields that can warp the filament and grid structures of very high power valves. Some form of manual or automatic 'stepped' switch-on is highly desirable, temporarily inserting a suitable resistor in the primary of the mains transformer.

ELECTRONICS & THE ENVIRONMENT

MOST OF US like to think of our hobby as reasonably benign in respect of environmental pollution. Admittedly not everyone approves of the visual appearance of masts and towers - but then some of us still use trees to support our antennas. EMC of course is a problem, but is usually curable and seldom damages the environment. Health hazards from biological effects of RF radiation, other than known thermal effects, are still largely unproven, despite public agitation and many years of investigation. One needs to take note of the toxicity of cadmium, beryllium, mercury, etc, the need to provide good ventilation when using some cored-solder fluxes which can induce asthmatic problems, the possible effects of strong RF on heart pacers, etc. However, before we seem to be unduly smug, it is worth remembering that the production of semiconductors involves extremely dangerous toxic waste. A few years ago Silicon Valley was described as the most polluted area on Earth - though the position is said to have been improved since.

I was reminded of the continued concerns by an article 'The Environment' by Tekla S Perry in the 'Technology 2000' round-up in *IEEE Spectrum*, (January 2000, pp81-85) with its introduction "Research into making today's increasingly pervasive electronic products more environmentally safe is being spurred by concerns at both the global level - environmental contamination that will last for generations - and the personal level - the health of an individual." This illuminating survey covers such questions as reducing the high lead content in printed-circuit boards; achieving more energy efficiency to fight global warming; the continuing health concerns raised on the use of cellular phones; the effects of low-frequency (50 and 60Hz) electromagnetic fields, which seemed to go into remission, only to resurge; and the elimination of the use of chlorofluorocarbons (CFCs) a family of chemicals that damages the ozone layer.

Printed circuit boards manufactured in their millions contain components which have lead-based surface finishes and are attached with lead solder paste and lead-based wave solder. The electronics industry uses and discards a huge amount of lead annually (some 7700 metric tons for solder applications). Although this is less than the lead used for car batteries, most lead batteries are recycled, seldom the case with the lead in PCBs. When taken out of service, most PCBs in personal computers go

into waste dumps, along with leaded circuit boards in obsolete video games, portable tape players, broken VCRs, etc. "Lead, like cadmium and mercury, is toxic. In humans it affects the nervous system, blood circulation and kidneys. Placed in landfills or incinerated, it can leach into the groundwater, where it can get into the food chain. In recent years lead has been legislated out of, or restricted, in most uses in the USA and in many developed countries. No longer is lead found in paint, pipe solder or in petrol in many areas, but its use in electronics manufacture has not yet been restricted."

The growing mountains of computer junk is seen as a key environmental concern. In Europe, the European Commission has recently circulated the third draft of a directive on 'Waste Electrical and Electronic Equipment', which addresses the use of cadmium, mercury and some other toxic metals, along with lead. It currently schedules a phasing-out of the use of all these substances, exempting batteries and PCBs, by 1 January 2004, although this draft may be modified in an anticipated fourth draft.

Tekla Perry shows that some major companies, including Sony and Matsushita, are planning to eliminate lead solder from domestic products this year. Similarly, some firms in the USA are attempting to clean-up the large quantities of polluted water resulting from electronics manufacture. Possible alternatives to lead solder include tin, copper and silver in various combinations. It seems likely that tin/copper will be used for wave soldering, with tin/silver/copper used for solder paste. These alloys have higher melting temperatures than the current tin/lead solders, 220°C. Tin/silver/copper melts at about 240°C and tin/copper at a rather higher temperature.

IEEE Spectrum notes that efforts are being made to promote the use of energy-efficient products, including computers and peripherals, fluorescent light bulbs, with TV set-top boxes and telephone equipment soon to be targeted. But some of these energy-saving projects may be countered by the increased use of computers resulting from the popularity of the Internet.

Possible health hazards resulting from the proximity to the user's brain of cell phones

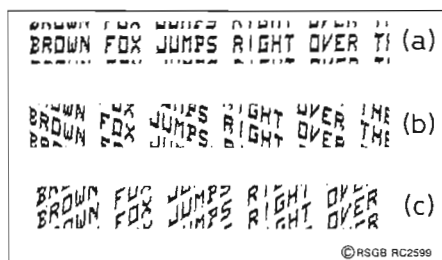


Fig 3: Appearance of Hellschreiber transmissions on a mechanical machine. (a) Transmitter and receiver running at approximately the same speed. (b) Receiver running slowly. (c) Receiver running fast. (Source: G5XB's 1981 article)

(800 to 2500MHz) continue to be investigated, with results beginning to be reported from industry sponsored research, although not often proving reproducible, and in some cases contradictory. But clearly this is a topic that has still a long way to run. As James C Lin, professor of bioengineering and electrical engineering at the University of Illinois puts it: "Given the results published so far, I personally feel that the implications of cellular telephone effects are not horrendous. But cellular telephones are a recent phenomenon. For the first time in history, we are putting a microwave source right next to the head of millions and millions of people. So we need to get a consistent and dependable set of answers, and that will take time."

Unfortunately the public does not always distinguish between the closeness of the hand-held cell phone and the far more distant tower-mounted cellular base station antennas, and this can be readily translated into opposition to any clearly identifiable amateur transmitting antennas.

RESURGENCE OF HELLSCHREIBER?

THE FIRST PRINTING radio-telegraph machine that I ever saw in action was in 1942-43 at Hanslope Park. This was a mechanical Hellschreiber, a system developed in 1929 by Rudolf Hell and which in the thirties came into use for press, diplomatic and military traffic. In WW2 a transportable Feldfernsehreiber was used in conjunction with a conventional HF field transmitter for German military traffic. Transmissions were relatively broadband and could be readily identified by their characteristic throbbing sound (regarded as an unpleasant form of QRM by those struggling to receive weak Morse signals on or near the same frequency!). After the war, a few Hellschreibers remained in use, mainly in China, and a few amateurs acquired mechanical Feldfernsehreiber or Hellschreiber machines and used them on the 3.5 MHz band - notably several Dutch amateurs and, in the UK, the late Stan Cook, G5XB, who had monitored German Hellschreiber traffic for Bletchley Park at Beaconsfield (later transferred to the BBC). G5XB wrote-up the mechanical Hellschreiber system in detail in *Radio Communication*, April 1981, pp 320-323, from which Fig 3 is taken. After Stan went Silent Key, Bob ('Noz') King, G3ASE, acquired his Hellschreiber and continues to restore and experiment with it. [Incidentally, G3ASE (QTHR), is organizing another reunion for former RSS Voluntary Interceptors / SCU3 Operators, etc, or their friends or relatives, or anyone seriously interested in the wartime RSS and Box 25, at Bletchley Park on Sunday, May 14].

It might have been thought that in this day and age, this 70-year-old system - which is little faster than manual Morse and in which

