LETTERS TO THE EDITOR

RECEIVING DISHES FOR SATELLITE BROADCASTING

I suggest that there is a serious misconception about satellite broadcasting systems being propagated by "headlines" and news items like your July 1978 item "Will the dish antenna replace the chimney pot?"

It is informative to drive or walk down a street and see how few homes have a direct-sight line to a broadcasting satellite. A direct sight-line is essential to reception. Antennas will have to be outside, unless very efficient radomes are provided for inside antennas. Trees in leaf effectively block the satellite signals in the 12 GHz band.

I do not doubt that broadcast satellites will be developed and in use within a few years but I seriously doubt that there will be many homes able to receive these broadcasts on their own antennas. Most reception is likely to be community antennas of various kinds, i.e. antennas that serve a group of buildings or a whole community, probably in the form of cable television distribution systems.

We have some experience with terrestrial broadcasting services at 2150MHz (the MDS service in the United States). Even at this lower frequency we require absolutely clear sight-line and find that in many communities such sight-lines are not available for a large proportion of homes.

I. Switzer
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Our report dealt with a talk given by Dr G. J. Phillips, so we have asked Dr Phillips to comment on the letter:

The question raised by Mr Switzer is an interesting one. I would first, however, say that there is no misconception in the proposals for broadcasting by satellites in the 12GHz microwave band. There has been very wide international agreement on the principle that the transmitted power should be sufficient to permit individual reception where practicable. It was assumed that the majority of people will have at least some part of their premises or adjoining ground in line-of-sight from the satellite. The chance is very much greater with an elevation of some 25 degrees than with the terrestrial case Mr Switzer mentions. Of course, it will be more practical in a large number of cases to have local cable distribution systems. apart from some cases where they are essential because direct reception is not possible.

However, we can all find our own answer to the line-of-sight problem very simply. On October 12th at 3 p.m. BST the sun was at a position in the sky that represents the satellite position assigned for UK services. It is near enough in the right place on any afternoon at this time from 6th to 18th. We can see which part of our premises or garden are in shadow, and whether or not there is any position left in sunlight that would be a practical one for a 3-foot dish. Incidentally, I agree that trees are a major problem, and we have to anticipate the next few years of growth of potential offenders.

What is sometimes forgotten is that terrestrial broadcasting and cable systems share a basic difficulty; extending coverage to remote areas of low population is expensive with either of these methods. Satellite broadcasting gives an opportunity for those prepared and able to install a simple system to receive the service, in whatever part of the country they live. In some ways it comes close to the ideal of broadcasting than anything hitherto. But it still allows a cable system to be used when it can be installed and proves to be cheaper or where our observations of the sun in October show you need it!

G. J. Phillips
BBC Research Department
Tadworth, Surrey

MICROCOMPUTERS AND MICROPROCESSORS

New developments will probably always bring with them problems of description. A current area of difficulty seems to be the word 'microcomputer'. Indeed, in a recent vocabulary of microprocessor terminology[1], a microcomputer is said to be:

"1. Synonymous with microprocessor.
2. Computing system which usually consists of a microprocessor unit memories and i/o circuits mounted on a p.c. board, and sells for about 500 dollars, comparable to a minicomputer but smaller in size, slower and less powerful."

Many readers will probably agree with definition number 2, i.e. a microcomputer is a microprocessor-based system. However, definition 1 seems dubious.

When the manufacturers recently started putting a microcprocessor, memories and i/o onto a *single chip* they had to use a new description to differentiate it from a microprocessor, as the following examples show:

Intel 8048 Single component 8-bit microcomputer
Intel 8022 Single chip microcomputer
Motorola 6801 Microcomputer unit (MCU)
T.I. TMS 1000 One-chip microcomputer
Rockwell PPS4/1 Single circuit microcomputer
AMI 9940 Single chip microcomputer
Mostek 3870 Single chip microcomputer

I should have explained this in more detail in my recent article "Trends in microprocessors" in the September issue as this may have prevented your editorial staff from changing the word 'microcomputer' to 'microprocessor' in a number of places, in an attempt to be consistent with their current beliefs on terminology. The section on page 68 headed 'Single chip microprocessors' should have been headed 'single chip microcomputers' and the word 'microcomputers' used throughout this as appropriate. Also 'microcomputers' should have been used in the section headed 'two chip expandable systems' on page 69 (lines 17 and 24). Similarly, Figure 4 and Figure 5 should have referred to microcomputers rather than microprocessors.

It is also interesting to look at the manufacturers' descriptions of single board microcomputers:

Intel SBC Micromputers
Packaged microcomputer systems
O.e.m. computers
Motorola Microcomputers
(Micromodules)
Zilog Z80 MCB microcomputer board
TI TM 990 Series microcomputer modules
DEC LSI-11/2 microcomputer

The current state therefore seems to be clear; a microcomputer contains a microprocessor, memory and i/o, and you will need more information from the text to determine whether it does this in a box, on a board or in a chip. (Thinks: will we have single-chip minicomputers (sic) one day?)

I should also point out some other minor misprints in the article. On Figure 7, the words 'minimum system,' 'address buffer', 'data buffer', 'control' and 'interrupt' are incorrectly sprinkled around the diagram, and on page 70, the Z8000 address range in expanded mode should have read 8 Mbyte.

David A. Russell
Computer Technology Ltd
Hemel Hempstead
Herts

Reference

1. B. Becciolini "MPU Vocabulary" Motorola Publication, 1977.

RELATIVITY AND TIME SIGNALS

A great deal of present knowledge and understanding is directly opposed to what was earlier thought to be the case and the first chaps to come up with these new-fangled notions, e.g. a round Earth, have always had an unwelcoming reception. However, it does not seem likely that Dr Essen ("Relativity and time signals", October issue) will fall into this distinguished band for his concepts of Relativity, despite his pre-eminent work on establishing time standards at a single location or between stationary locations. In fact he seems to be clinging to older (Newtonian) ways of thought on this subject.

In the preamble to the article he is quoted as saying that "no one has attempted to refute my arguments." This is not the case. At a lecture he gave on this topic some four or five years ago at this institution, several of the audience (from Fellows of the Royal Society downwards) put powerful and cogent arguments at variance with his own, but unhappily Dr. Essen seemed barely to hear them, let alone try to grasp what was being said.

A principal difficulty most of us have in attempting to comprehend Relativistic theory is that it systematically encompasses a proposition which is totally at variance with everyday experience — that is, that the velocity of light is the same for all observers. As far as I am aware, this proposition has not

been falsified and is in accord with all relevant observations so far made.

Why is this such a difficult idea to handle? Imagine you let off a firework with a bang and a flash; the acoustic and optical wavefronts spread out spherically from you at the speed of sound and the speed of light respectively. Suppose someone is hurrying towards the pyrotechnic display; he sees the acoustic wave approaching him more quickly (than it left you), since (?) he is moving towards this sound wavefront — but, astoundingly, the optical wavefront *still* approaches him at the velocity of light, the self same speed it was receding from you.

Most people find this stunning, not to say distressing, too, but it is wholly in accord with all observations so far made. This is so "unreasonable" that attempts to use everyday language to discuss such situations are usually doomed to the errors and paradoxes which Dr Essen eloquently portrays. It seems that only the strict unbending formality of a mathematical language can cope with discussing effects which are so at variance with everyday experience.

Simultaneity is one such obvious and self-evident everyday idea which is a 'casualty' when constrained to be in accord with the constancy of the speed of light for all uniformly moving observers, who now see the same event happening at different times depending on their speed.

Dr Essen is worried by where the 'missing' ticks go in his clock thought-experiment. Because a sentence can be grammatically and syntactically correct, it still does not imply that any meaning can necessarily be ascribed to it – the classic example of Russell's, "Monday is square" or "Is Monday square?", demonstrates this beautifully. It is not that Dr Essen's ticks are 'missing'. Relativistically, each observer sees his own clock functioning normally and sees the other chap's clock running more slowly. The observers are thus equivalent; that is, they each get identical results for the same observation (watching the other chap move off) and this seems very satisfactory. The ticks only appear to be missing if one takes the old Newtonian concept of time (and simultaneity) as being something absolutely established everywhere 'at once' throughout all space. 'Missing' ticks would be very strange, as Dr Essen perhaps unwittingly emphasises, and good grounds for preferring all of Relativity theory rather than what seems to be his partly Newtonian viewpoint.

A dazzingly clear exposition on simultaneity and other such matters is given by Einstein himself in the paperback by Methuen called *Relativity (The Special and the General Theory)*, translated by Lawson. In the early parts of this book there is no algebra to 'confuse', just beautiful thought experiments using railway trains (!) etc. and brilliant careful exposition.

D. Griffiths
Physics Department
Imperial College
London SW7

Dr Essen replies:
I remember the meeting at the Imperial College to which Dr Griffiths refers and if my recollection is correct my talk was given a courteous hearing and friendly reception apart from a few gasps of disbelief which were firmly suppressed by the chairman. The discussion was a disappointment to me, however, since it consisted largely of a reiteration of some of the arguments I had been trying to demolish. It could be that I was too polite or too slow witted to deal adequately with this part of the discussion.

In my article I only dealt with one specific point – the error in Einstein's thought-experiment, but Dr Griffiths' criticism ranges over a much wider area, including the velocity of light and simultaneity. For a discussion of these I would refer the reader and Dr Griffiths to the references given at the end of the article. He advances the view that relativity effects can only be dealt with by "the strict unbending formality of a mathematical language" but I suggest that, on the contrary, an error in a thought-experiment can be explained only by the stricter formality of experimental technique. Although Dr Griffiths calls it my experiment I hasten to disclaim ownership as I am strongly opposed to the use of such devices. However, if they are used they should be conducted with the correct technique and I have shown that if Einstein's experiment is carried out correctly it does not give the paradoxical result obtained by Einstein. I would have thought that relativitists would be grateful to have this paradox explained and removed from the theory.

Dr Griffiths states that each observer sees the other chap's clock running more slowly than his own and I agree that this is a simple way of expressing Einstein's first prediction. My expressions (1) and (2) are a more precise way of saying the same thing. It could be called an apparent effect since it is the result of a measurement made at a distance and is symmetrical for the two observers. If he considers in detail how the comparison is made as I have explained in my article he will be forced to the conclusion that ticks must be lost or at least that they are not received and recorded on the clock dials. Dr Griffiths suggests that I am worried by this loss, but I merely state that it is inexplicable. It was Einstein who was worried and he stated later that it was absurd. He thereby implicitly abandoned his first set of assumptions and the results obtained from them.

If Dr Griffiths wishes to make a serious criticism of my article he must show where my analysis of the thought-experiment is wrong.

L. Essen
Great Bookham, Surrey

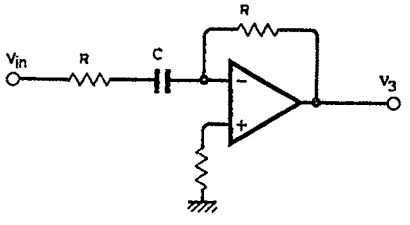
Editor's Note. We have received many more letters on this subject and hope to publish a selection of them in future issues.

HIGH FREQUENCY DIFFERENTIATOR

In Mr S. Cussons's "High frequency differentiator", Circuit Ideas, August issue, the proposed circuit is, of course, not a true differentiator, having the transfer function

$$\frac{sRC}{1 + sRC}$$

instead of the true differentiator's sRC. Mr



Cussons's circuit approximates the true differentiator at low frequencies, $f << 1/2\pi RC$, i.e. $f << 807$kHz, not the claimed 5MHz, with the component values shown. It will run out of loop gain at 5MHz anyway, the second stage will have only × 1.67 typically left.

Rules of nature cannot be altered: a true differentiator has to have gain proportional to frequency with all the associated noise and stability problems.

Incidentally, an identical (except polarity) transfer function can be obtained in a simpler circuit, shown here, with less output offset.

Andrew E. Romer
Bognor Regis
Sussex

DISCUSSION OF WARC 79 PROPOSALS

It is not true that the United States of America is the only country which encourages public discussion of WARC proposals. Here in Canada the government gives every opportunity for industry and members of the public to read the current draft proposals, comment on them, and participate in the revision.

The process here is not quite the same as in the US, but it achieves the same objectives. It is true that much of the detailed discussion which leads to draft proposals goes on within government, but the group which does this work welcomes submissions from anyone, and there is plenty of evidence that such submissions are given active consideration.

When draft proposals are ready the text is publicised through several channels, including news releases in the printed press. Comments are invited, and all responses (excepting only those for which the authors have specifically requested confidentiality — and these are few) are available for inspection at regional centres of the Department of Communications throughout the country. The third draft of Canada's proposed position at the WARC 79 is now being prepared.

It is normal procedure for the DOC to call a meeting of interested parties each time a new draft revision is published, for explanation and discussion.

In parallel with this activity, industry participates in many studies relating to domestic sub-allocations of present and proposed ITU frequency allocations. Our government in fact indulges in quite a lot of pushing and prodding to excite more interest and comment from both industry and the public at large.

I should mention that the Canadian Radio Technical Planning Board is not a government body. We are the working interface representing all users of the radio spectrum and suppliers of radio equipment. Our normal emphasis is on the review of type approval specifications for radio and tv equipment, and standard radio systems plans for efficient use of the spectrum within Canada (this kind of thing also being done here in the knowledge and with the participation of all those in industry and the public who care about such things).

I just felt that credit should be given where credit is due; our government does its best to encourage participation.

Bob Eldridge
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