5 PROPAGATION RESEARCH BY AMATEURS

5.1 INTRODUCTION

Amateurs have always contributed to radio science, both in the technical field, e.g. with the development of new transmitting and receiving methods, and in the field of propagation research by showing the limits of distance and the variety of propagation phenomena that can be used over an ever increasing range of frequencies.

Regarding propagation, amateur contributions during the first years of radio in the 'world below 200 metres' are, of course, well-known, as are, for instance, the pioneering efforts of the "amateur" Grote Reber in the field of radio-astronomy. Those were the early days, but also in more recent times amateurs have made considerable contributions in the field of scientific investigations. To mention a few examples:

a) in the fifties several research institutes in Western Europe carried out tropo-scatter research in close co-operation with an extensive network of amateur observer stations;

b) fundamental work was and is done by amateurs in the definition and study of the TE (Trans-Equatorial) propagation mode of VHF radio-waves;

c) during the IGY (International Geophysical Year), amateurs supported various propagation research projects initiated by the Max Planck Institute in Darmstadt as well as by other scientific institutes.

The important facts which enable amateurs to make valuable contributions to propagation research are:

1) world-wide there are almost no regions which are not covered by amateurs. If effectively organised, amateurs constitute an extensive network of observation points that an official research institute could hardly afford to set up;

2) amateurs are enthusiastic in the disciplines they pursue, are often on the bands for extended periods of time - pushing the various propagation modes to their limits! - , and, in many cases, are in possession of high-performance, individually-calibrated pieces of transmitting/receiving equipment.

IARU Region I fully recognizes the importance of this type of work in the Amateur Service, and at the IARU Region 1 Conference in Warsaw (1975) the following general recommendation was adopted:

> Groups of amateurs shall be organised to carry out scientific observations regarding all forms of radio propagation, including
> 1) ionospheric
> 2) tropospheric
> 3) space.
>
> These groups are recommended to co-operate closely with RSGB, DARC, REF and any other societies which have a proper organisation for handling scientific data and co-operating with scientific institutes.
>
> It is also recommended that the results of such observations be published in the journals of member societies and/or scientific journals.

Currently, in the international field, amateurs are involved in long-term studies of tropospheric and auroral propagation modes, long range ionospheric high MUF studies and the study of the characteristics of moonbounce and meteor-scatter techniques.

On a national scale amateurs co-operate in the development of repeater systems for mobile station use, together with studies of terrain and inner city problems associated with operating mobile stations. Furthermore, studies are carried out on the effects of micro (local) climate on space communications and, in particular, on microwave band communications during adverse weather conditions like e.g. heavy rain, which can enhance signals considerably.

The above is certainly not an exhaustive summary; on the contrary, the list of scientific activities in which amateurs participate is expanding all the time.

5.2 COORDINATION OF AMATEUR PARTICIPATION IN PROPAGATION RESEARCH

As set out in the introduction (section IVa), IARU as well as IARU Region 1 have always recognized the importance of scientific work carried out by amateurs, and IARU Region 1 are officially supporting various activities of member societies in the field of propagation research.
Currently the RSGB, via their RSGB Propagation Studies Committee, and the SARL are the member society which co-ordinate the amateur participation in propagation research.

1. Sporadic-E investigations

At the IARU region 1 Conference in Warsaw (1975) REF proposed to start on two projects:

i) a study of long distance VHF propagation with the aid of beacons to be set up in the southern part of Europe

ii) a study of sporadic-E activity over the North Atlantic area, particularly on the amateur bands 28 MHz and 50 MHz.

Both projects were accepted at the final Plenary Meeting of this Conference, and the work of supervising these projects was entrusted to Serge Canivenc, F8SH, who was nominated as IARU Region 1 Coordinator for sporadic-E investigations.

The following recommendations concerning the above projects were adopted at the IARU Region 1 Conference at Warsaw (1975):

> Sporadic-E investigations: that the proposal to establish beacon stations in southern Europe, as described in document WA58 (with the exception that the radiated power should preferably be limited to 50 W) be adopted. Proposals for beacons should be submitted through member societies to the IARU Region 1 Sporadic-E Coordinator Mr. Serge Canivenc, F8SH. In respect of beacon frequency allocations RSGB should be consulted [3].

Transatlantic Sporadic-E investigations: that the proposals set out in document WA59 be adopted in order to promote an investigation of Sporadic-E propagation in the North Atlantic area. It is also recommended that Region 2 be invited by Region 1 to encourage their member societies to set up, for the purpose of the investigation, beacon stations in the 50 Mhz band, e.g.in Canada and in the U.S.A. Region 1 societies should then establish an observation network in consultation with Mr. Serge Canivenc, F8SH, the IARU Region 1 Sporadic-E Coordinator. Region 2 is invited to join the programme and to publicise the contents of document WA59.

On the basis of the above recommendations, F8SH extended his activities and started a programme for the investigation of VHF wave propagation via Field Aligned Irregularities (FAI). This phenomenon was discovered by amateurs in southern Europe in the 70's. They noticed that stations contacted during sporadic-E openings were often on a quite different bearing from the one corresponding to the normal great-circle path.
F8SH fulfilled the function of IARU Region 1 Sporadic-E Coordinator till July 1988 when he suddenly passed away. His excellent work, his many publications and his highly appreciated representation of the Amateur Service in the CCIR Interim Working Party 6/8 dealing with anomalous VHF ionospheric propagation will be remembered with gratitude.
He was succeeded by **Jim Bacon, G3YLA** (address in section If)
who will continue and further develop the work started by F8SH.

2. Auroral propagation

[3] see section IX which deals with the coordination of the allocation of beacon frequencies.

At the IARU Region I Conference in Warsaw (1975) the RSGB, via their Propagation Studies Committee, proposed to standardize auroral reporting by amateurs throughout Region I, so that the greatest use can be made of these reports for scientific studies.

At the final Plenary Meeting of the Conference this proposal was adopted, and Charlie Newton, G2FKZ, was nominated as IARU Region 1 Coordinator for Auroral Studies.

The following recommendation relating to the auroral project was adopted at the IARU Region 1 Conference in Warsaw (1975):

> VHF Auroral Propagation: that the proposals set out in document WA32 (regarding the standardisation of auroral reporting) be adopted by member societies and that member societies publicise the reporting forms contained therein.

In 1993 G2FKZ resigned, and the IARU Region 1 Conference in De Haan (September 1993) nominated as his successor **Vaino Lehtoranta, OH2LX** (address in section If)

3. Tropospheric propagation studies

At the IARU Region 1 Conference in Warsaw (1975), on the proposal of the RSGB Propagation Studies Committee IARU Region 1 nominated as Tropospheric Propagation Studies Coordinator
Mr. R.G.Flavell, G3LTP. He resigned from this post at the conference in Tel Aviv 1996.
At the moment a successor is sought for. He will have to look into progation effects on the microwaves (such as Arainscatter@)

4. Information exchange programme

The RSGB Propagation Studies Committee hold the official solar and ionospheric data back to the IGY, the International Geophysical Year (1967), and any information can be supplied upon application to RSGB Headquarters .

Tape/slides lecture material on auroral propagation is also available via the Hon. Secretrary of IARU Region I

5. Co-operation with CCIR study groups and publications

Co-operation has been established with the CCIR propagation study groups 5 for tropospheric propagation, and 6 for ionospheric propagation.

Five IARU Region 1 propagation reports were submitted to CCIR study groups via F8SH, the former IARU Region 1 Sporadic-E Studies Coordinator, and, where appropriate, the attention of CCIR study groups has been and is drawn to the results of amateur investigations/observations which could be used fruitfully in their studies.

Some scientific publications which have used amateur data are

Tropo	I.E.R.E. Conference Proceedings 40 (1978)	pp 265-280
	I.E.E. Conference Publication 169 (1978) Pt 2	pp 182-186
	I.E.E. Conference Publication 195 (1981) Pt 2	pp 163-167
	I.E.E. Conference Publication 219 (1983) Pt 2	pp 14- 18
	I.E.E. Conference Publication 248 (1985)	pp 498-501
Aurora	I.E.E. Conference Publication 219 (1983) Pt 2	pp 259-262
T.E.P.	I.E.E. Conference Publication 219 (1983) Pt 2	pp 325-328

6. Action/support required from IARU Region 1 member societies

IARU Region 1 consider it of the utmost importance that member societies stimulate and encourage the participation of amateurs in scientific and propagation studies. To this end wide publicity should be given to the projects already in progress, and possibilities for new projects and/or extensions of existing projects should be investigated.

In all this work close co-operation with the existing Coordinators and/or coordinating institutes is strongly recommended. As already indicated, for publications member societies can obtain information at the addresses given above.
This type of work can open a whole new field of extremely interesting activities for amateurs! To mention a few examples:

a) Now that in some European Region 1 countries the 50 MHz band has been opened for amateur use, every effort should be made to increase the number of beacons and observation stations on this band, where many propagation modes can be studied, including modes such as back-scatter meteor trails, and, at suitable solar times, high M.U.F. propagation. As this band is not yet universally available for the Amateur Service, listening stations can play an important role here!

b) VHF Managers/Contest Committees etc. should be aware of the possibility of using contest logs for the derivation of data useful for scientific studies. These logs often contain a wealth of data covering a wide geographical area, providing detailed information, particularly on tropospheric propagation, that could not be obtained in any other way. This is an excellent illustration of the main strength of the Amateur Service: the mass of observation stations!

Reporting forms (log sheets), used in the various projects and showing the data that preferably should be gathered by the participants, as well as the necessary information and instructions are obtainable from the addresses given above.

Some reporting forms already in use are appended to this section, together with some examples of information sheets accompanying these reporting forms.

7. Cooperation with the DUBUS magazine

In order to facilitate the flow of information from amateurs to the coordinators a cooperation with DUBUS has been arranged in 1995 whereby the relvant DUBUS editors will share the information received with the IARU Region 1 coordinators.

VIII. Propagation database

At the IARU Region 1 Conference 1999 in Lillehammer the offer of Michael Kastelic, OE1MCU, was accepted to create a easily accessable database for the collection and distribution of amateur reports.

Appendix Sample reporting forms and information sheets (nov 96)