

COST 296 Action: **Mitigation of Ionospheric Effects on Radio Systems (MIERS)**

Approved Minutes of the 2nd Management Committee Meeting
30, 31 May and 1 June 2005

Abdus Salam International Centre for Theoretical Physics, Trieste, Italy

1. **Welcome**

The participants were welcomed by Lili Cander (COST 296 Chairperson) who thanked everyone for coming and Sandro Radicella, the local organiser, for his hospitality in hosting the meeting.

2. **Approval of the Agenda**

The Draft Agenda for the meeting was approved without any amendments, see ANNEX I

3. **Adoption of the Minutes of the first MC meeting**

The minutes of the First MC meeting held at the COST Office in Brussels 4 February 2005 were approved without any amendments.

4. **Official status of the COST 296 Action**

The Chairperson LC began the proceedings by asking all the participants to introduce themselves and was delighted to see some new first time attendees, from China, Finland, Russia and USA at a COST 296 meeting. See list ANNEX II

Following this LC proceeded to explain the current status of the signatures to the Action, some participating countries still to sign the MoU.

There were several applications from non-COST countries Institutes to join COST296, University of Lowell, USA; St Petersburg University, Russia; IZMIRAN, Russia; Polar Research Institute of China, China and China Research Institute of Radiowave Propagation, China; these were all accepted by vote to join this Action. The Geomagnetic Laboratory, Natural Resources from Canada has sent an expression of interest and was accepted by vote.

5. **COST296 Budget till 30 June 2005**

LC reported the status of the COST 296 Budget and that owing to the amount of budget allocated for this short period, February to 30 June 2005 there would have to be some adjustments to the reimbursements for this meeting.

6. **COST296 Budget 1 July 2005 to 30 June 2006**

LC presented the budget for the next financial year 1 July 2005 to 30 June 2006 (ANNEX III). This was given approval by the MC members and would be sent to Brussels along with a request for a larger budget taking into account the number of countries that will sign MoU during this financial period.

7. **Short Term Scientific Missions (STSMs)**

LC reported that there was no funding for STSMs for the period 4 February to 30 June 2005. There will however be some funding for STSMs in the next F/Y 1 July 2005 to 30 June 2006. Members were asked to set up a task group to discuss nominations and first proposals to be presented later in the meeting.

8. **Collaboration between COST296 and COST724 Actions**

JL Chairman of the COST724 Action gave an introductory talk on different opportunities for collaboration between COST296 and COST724 Actions. Among others it is planned to hold an ICTP school on Space Weather to be held in mid 2006.

9. **The 2nd European Space Weather Week (joint Workshop with COST724, ESA and E-STAR)**

It has been decided to have the next MC meeting during the 2nd European Space Weather Week (SWW) being held in Noordwijk, Netherlands, 14–18 November 2005. This will include a joint Workshop with COST724 Action. Further details will be announced on the COST296 and COST724 WWW sites.

10. **Receipt and adoption of the progress reports of Working Group Leaders**

WG 1: Ionospheric monitoring and modelling (ANNEX IV)

WG 2: Advanced terrestrial systems (ANNEX V)

WG 3: Space based systems (ANNEX VI)

11. **Contributions of the COST 296 Action to the ITU-R SG3**

It has been decided to have the COST296 Seminar on ITU-R SG3L issues from 4 to 5 July 2005 at Graz University with the following participants: L. W. Barclay and A. M. Casimiro (Co-Leaders of WP 2.3), P. Lassudrie-Duchesne, S. Radicella, B. Arbesser-Rastburg, S. S. Kouris, B. Zolesi, Lj. R. Cander and R. Leitinger. With the following Agenda:

- 1) Review the current status of ITU-R SG3L documents;
- 2) Identify the areas where COST296 can really contribute;
- 3) Propose required work to be carried out in particular work packages;
- 4) Organize the active participation of European researchers at the ITU-R SG3L.

12. **COST296 first Annual Progress Report for TIST meeting**

The TIST annual Chairpersons meeting is to be held in Switzerland 28 June to 1 July when LC will present the first COST296 Annual Progress Report.

13. **COST296 website and logo**

COST 296 web site is up and running and managed at RAL. It was decided to that the competition for the COST 296 would be carried forward to the next MC meeting being held in November when a decision will be made.

14. **Next meetings of the COST296 Action**

It has been decided to have the third MC meeting during the 2nd European Space Weather Week (SWW) being held in Noordwijk, Netherlands, 14–18 November 2005.

15. **Special issues of the international journals related to the COST271/296 actions activities**

In preparation are:

- Special issue of Annals of Geophysics that collects the contributions presented at the Solar-Terrestrial Sciences session ST17 on “Effects of the Ionosphere on Terrestrial and Earth-Space Communications”, held during the European Geophysical Society, American Geophysical Union and European Union of Geosciences Joint Assembly (Nice, France, 6 – 11 April, 2003);
- Special issue of Journal of Atmospheric and Solar-Terrestrial Physics that collects the oral contributions presented at the Solar-Terrestrial Sciences session ST14 on “Space weather and RF communications: monitoring and modelling”, held during the 1st General Assembly of the European Geosciences Union (Nice, France, 25 – 30 April, 2004);
- Special issue of Bulgarian Geophysical Journal that collects the poster contributions presented at the Solar-Terrestrial Sciences session ST14 on “Space weather and RF communications: monitoring and modelling”, held during the 1st General Assembly of the European Geosciences Union (Nice, France, 25 – 30 April, 2004);

16. **International meetings relevant to the COST296 Action**

- 1) URSI/COSPAR INTERNATIONAL REFERENCE IONOSPHERE WORKSHOP - New satellite and ground data for IRI, and comparison with regional models, to be held at the Ebre Observatory, Roquetes, Spain from June 27 to July 1, 2005;
- 2) URSI General Assembly - New Delhi - 23-29 October 2005.

17. **Other documents for consideration**

There were no other documents for consideration.

18. **Any other business**

There was no Any other business.

ANNEX I

COST 296 Action MC meeting 30, 31 May and 1 June 2005

Approved Agenda

1. Welcome
2. Approval of the Agenda
3. Adoption of the Minutes of the first MC meeting
4. Official status of the COST29 Action
5. COST296 Budget till 30 June 2005
6. COST296 Budget till 30 June 2006
7. Short Term Scientific Missions (STSMs)
8. Collaboration between COST296 and COST724 actions
9. The 2nd European Space Weather Week (joint Workshop with COST274, ESA and E-STAR)
10. Receipt and adoption of the progress reports of Working Group Leaders

WG 1: Ionospheric monitoring and modelling

WG 2: Advanced terrestrial systems

WG 3: Space based systems

11. Contributions of the COST296 Action to the ITU- R SG 3
12. COST296 first annual report for TIST meeting
13. COST296 website and logo
14. Next meetings of the COST296 Action
15. Special issues of the international journals related to the COST271/296 actions activities
16. International meetings relevant for the COST296 Action
17. Other documents for consideration
18. Any other business

ANNEX II

COST 296 Action MC meeting 30, 31 May and 1 June 2005

List of Attendees

| | |
|------------------|--|
| J Andujar | (JA) Universidad de Huelva. Huelva, Spain |
| M Aquino | (MA) University of Nottingham, UK |
| Y Beniguel | (YB) IEEA, France (NR) |
| P Benzce | (PB) Hungarian Academy of Sciences, Sopron, Hungary |
| A Bourdillon | (AB) University Rennes 1, France (Co-Leader WG-2, NR) |
| J Boška | (JBO) Academy of Sciences of Czech Republic, Prague, Czech Republic (NR) |
| J Bremer | (JB) Leibniz-Institute of Atmospheric Physics, Kühlungsborn, Germany (NR) |
| Lj R Cander | (LC) Rutherford Appleton Laboratory, Chilton, Didcot, UK (Chairperson, NR) |
| A Casimiro | (AC) University of Algarve, Faro, Portugal (NR) |
| I Galkin | (IG) University of Massachusetts Lowell, USA (IR) |
| N Jakowski | (NJ) DLR/DFD, Neustrelitz, Germany (Co-Leader WG-3, NR) |
| S S Kouris | (SK) Aristotelian University of Thessaloniki, Thessaloniki, Greece (NR) |
| J Laštovička | (JL) Academy of Sciences of Czech Republic, Prague, Czech Republic (Co-Leader WG-1, NR) |
| R Leitinger | (RL) Karl-Franzens-Universität, Graz, Austria (Co-Leader WG-1, NR) |
| J Lilensten | (JLI) CNRS, France (Chairperson COST 724) |
| A Mikhailov | (AM) IZMIRAN, Russian Academy of Sciences, Troitsk, Russia |
| G Miro | (GM) Abdus Salam ICTP, Trieste, Italy |
| B A de la Morena | (BM) INTA, El Arenosillo, Spain (NR) |
| B Nava | (BM) Abdus Salam ICTP, Trieste, Italy |
| H Nebdi | (HN) Royal Meteorological Institute, Brussels, Belgium |
| L Perrone | (LP) Istituto Nazionale di Geofisica e Vulcanologia, Rome, Italy |
| M Pietrella | (MP) Istituto Nazionale di Geofisica e Vulcanologia, Rome, Italy |
| R Pirjola | (RP) Finnish Meteorological Institute, Helsinki, Finland (NR) |
| S M Radicella | (SR) Abdus Salam ICTP, Trieste, Italy |
| V Romano | (VR) Istituto Nazionale di Geofisica e Vulcanologia, Rome, Italy |
| H Rothkaehl | (HR) Space Research Centre, Warsaw, Poland (NR) |
| L Ruiyuan | (LR) Polar Research Institute of China, Shanghai, China (IR) |
| R Stamper | (RS) Rutherford Appleton Laboratory, Chilton, Didcot, UK |
| I Stanislawska | (IS) Space Research Centre, Warsaw, Poland (Co-Leader WG-1, NR) |
| H Strangeways | (HR) University of Leeds, Leeds, UK |
| I Tsagouri | (IT) National Observatory of Athens, Greece |
| E Tulunay | (ET) The Middle East Technical University, Ankara, Turkey + TUBITAK-Marmara Research Center, Kocaeli, Turkey (Co-Leader WG-2, NR) |
| Y Tulunay | (YT) Istanbul Technical University, Istanbul, Turkey (NR) |
| A Vernon | (AV) Rutherford Appleton Laboratory, Chilton, Didcot, UK (COST296 Secretary) |
| R Warnant | (RW) Royal Observatory of Belgium, Brussels, Belgium (NR) |
| M Warrington | (MW) University of Leicester, Leicester, UK (NR) |
| N Zernov | (NZ) St Petersburg University, St Petersburg, Russia |
| B Zolesi | (BZ) Istituto Nazionale di Geofisica e Vulcanologia, Rome, Italy (Vice-Chairman, NR) |
| NR: | National Representative |
| IR: | Institute Representative |

ANNEX III

COST ACTION 296

BUDGET FOR THE PERIOD JULY 1ST 2005 TO JUNE 30TH 2006

| | | |
|--------------|--|---------------|
| (1) | SECRETARIAT | 7500€ |
| (2) | WORKSHOP and 3 rd MC MEETINGS | 30000€ |
| (3) | 4 th MC MEETINGS | 20000€ |
| (4) | SHORT-TERM SCIENTIFIC MISSIONS | 9000€ |
| (5) | SEMINAR | 6000€ |
| TOTAL | | 72500€ |

PUBLICATIONS SEPARATE BUDGET

ANNEX IV

Working Group 1 – Ionospheric Monitoring and Modelling

Leaders : J. Laštovička (CZ) and I. Stanislawska (P)

WP1.1 Near Earth space plasma monitoring

Leaders: R. Stamper (UK) and D. Altadill (ES)

WP1.2 Data ingestion and assimilation in ionospheric models

Leaders: D. Buresova (CZ) and B. Nava (I)

WP1.3 Near Earth space plasma modelling and forecasting

Leaders: I. Kutiev (Bu) and H. Strangeways (UK)

WP1.4 Climate of the upper atmosphere

Leaders: J. Bremer (G) and E. Turunen (F)

WP1.1 Near Earth Space Plasma Monitoring

WP1.1 will promote the development of comprehensive and accessible collections of high-quality near Earth plasma monitoring data by:

1. Developing monitoring techniques and parameters describing the state of the ionospheric plasma, to include ground-based and space based techniques.
2. Maintaining and extending the flow of real-time and retrospective ionospheric monitoring data to databases.
3. Validating the quality and consistency of monitoring data, particularly that collected in real time.
4. Supporting and developing Internet sites and protocols for disseminating data products.
5. Organising observation campaigns to generate more detailed data coverage, in space and-or time.

Participants:

| | |
|--------------------------|---------|
| D. Altadill | 1, 2, 5 |
| M. Angling | 2 |
| A. Belehaki | 2 |
| P. Bencze | 2, 4 |
| J. Boska | 1, 2, 3 |
| D. Buresova | 2, 3, 4 |
| L. Cander | 1, 2 |
| I. Galkin | 1, 3, 4 |
| T. Gulyaeva | 1 |
| N. Jakowski | 1, 2 |
| ? C. Juren (Sweden) | 2 |
| D. Kouba | 2 |
| Ionospheric team of INGV | |
| N. Melida | 2 |
| B.A. de la Morena | 2 |
| H. Nebdi | 2 |
| M. Pezzopane | 1 |

| | |
|-----------------|------------|
| V. Romano | 2 |
| H. Rothkaehl | 1 |
| P. Sauli | 1, 2, 3 |
| C. Scotto | 1 |
| R. Stamper | 1, 3, 4, 5 |
| I. Stanislawska | 2, 3, 4 |
| I. Tsagouri | 2, 3 |
| E. Turunen | 2 |
| Wu Jian | 2, 3 |

WP1.2 Data ingestion and assimilation in ionospheric models

Terms of Reference of the WP 1.2:

1. Determine additional data products for inclusion in the COST271 Action Space Weather Database to improve support for ionospheric modeling; promote the generation of such products including manually corrected ionospheric parameters and N(h) profiles covering the entire European region.
2. Promote and coordinate the creation of a suitable set of very high quality experimental data (like TEC and ionospheric parameters) for model validation and data ingestion studies.
3. Promote and coordinate the creation of a set of “synthetic” data (produced with a model) for assessment of retrieval techniques.
4. Select and validate appropriate models and data ingestion and assimilation techniques.
5. Improve/develop real-time or near-real-time electron density reconstruction techniques.
6. Identify criteria to be used to validate the data ingestion and assimilation techniques.
7. Carry out specific studies on the use of the selected data ingestion techniques in order to improve the models formulation (structure) and applicability under different degrees of disturbance of the ionosphere.

Participants:

| | |
|--------------------|---|
| M. Angling | topics 4, 6, 7 |
| D. Buresova | topics 1, 2, 3, 5 |
| L. Cander | topics 1, 2 |
| L. Ciralo | topics 1, 2 |
| P. Coisson | topics 4, 5, 6, 7 |
| I. Galkin | topics 1, 2, 5 |
| R. Leitinger | topics 3, 7 |
| N. Melida | topics 1, 2 |
| G. Miró | topics 1, 2, 4, 7 |
| B. A. de la Morena | topics 1, 2 |
| B. Nava | topics 4, 5, 6, 7 |
| H. Nebdi | topic 1 (manually corrected ionospheric parameters) |
| S. M. Radicella | topics 1, 4, 6 |
| H. Rothkaehl | topics 1, 5 |
| T. Sindelarova | topics 1, 3, 5 |
| I. Stanislawska | topics 1, 5 |
| S. Stankov | topics 4, 6 |

WP1.3 Near-Earth space plasma modelling and forecasting

1. List the available forecasting models and classify them by lead-time: warning, nowcasting and forecasting
2. Develop common rules for error estimates and testing procedures
3. Develop techniques for real-time forecasting (data adjustment)
4. Improve the existing and develop new space plasma models
5. Unify geomagnetic drivers for forecasting models (Dst, Kp, ap ...)
6. Prediction of geomagnetic indices
7. Forecasting of foF2 and TEC
8. Modelling and predicting different scale ionospheric perturbations
9. Tomographic imaging for model validation
10. Channel modelling by neurofuzzy and other novel techniques
11. Modelling of irregularities for propagation predictions and from propagation data

| Participant(s) | Institution/group | Topics of Interest |
|---|--|----------------------------------|
| Ivan Kutiev | | 1,2,3,4,5,6,7 |
| Hal Strangeways | University of Leeds | 8,9,10,11 |
| Lili Cander Bruno Zolesi | RAL INGV | 1, 2, 3, 7, 8, 11 |
| Eleri Pryse, Helen Middleton, Len Kersley | University of Aberystwyth | 9 |
| Paul Cannon, Matt Angling and Neil Rodgers | QinetiQ, Malvern | 3,7,11 |
| Rene Warnant | Royal Observatory of Belgium | TEC modelling and forecasting |
| Stanimir Stankov & colleagues | Deutsches Zentrum für Luft- und Raumfahrt, , German Aerospace Centre | 7, 8 |
| Stamatis Kouris, Th. Xenos, D. Fotiadis, Kostas Polimeris | | 7, 10 |
| Loredana Perrone Marco Pietrella | Istituto Nazionale di Geofisica and Vulcanologia , Rome | 7 |
| Dr Hamid Nebdi | Royal Meteorological Institute of Belgium | 6,7,8 |
| José Manuel Andújar Diego Marín. | University of Huelva | 7, 8,10 |
| Benito A. De la Morena. Nicolás Mérida. | Station El Arenosillo, INTA | 7, 8,10 |

Y. + E. Tulunay 7, 10

H. Rothkaehl 4, 8

A. Mikhailov 7

I. Stanislavska 1, 2, 3, 7

Liu Ruiyuan 1, 2, 3, 7

Wu Jian 1,2, 3, 7

WP1.4 Climate of the upper atmosphere

Terms of reference:

1. Derivation of long-term trends in different ionospheric/atmospheric parameters and different height regions to get hints about their origin (greenhouse effect, geomagnetic influence or other sources).
2. Detection of signatures of different atmospheric waves (e. g. gravity, planetary and infrasonic waves), the investigation of their propagation through the atmosphere/ionosphere, and the search for possible predictability of their effects on the ionosphere.
3. Investigation of ionospheric variability at high latitudes (influence of precipitating high energetic particles on the ionised and neutral part of the atmosphere) as well as at middle latitudes.
4. Incoherent radar observations and model calculations for investigations of the coupling between the ionized and neutral part of the atmosphere for quiet and disturbed conditions.
5. Space weather impacts on the midlatitude ionosphere.

Participants:

| | |
|-------------------|------------|
| L. Alfonsi | 1, 3 |
| D. Altadill | 2 |
| D. Buresova | 2, 5 |
| P. Bencze | 1 |
| J. Boska | 2, 5 |
| J. Bremer | 1, 3 |
| J. Chum | 2 |
| G. De Franceschi | 1, 3 |
| L. Cander | 3 |
| D. Fotiadis | 3 |
| C. Jacobi | 2 |
| D. Kouba | 2 |
| S. Kouris | 3 |
| J. Lastovicka | 1, 2, 5 |
| A. Mikhailov | 1, 4 |
| B.A. de la Morena | 2 |
| L. Perrone | 3 |
| K. Polimeris | 3 |
| V. Romano | 5 |
| H. Rothkaehl | 5 |
| P. Sauli | 1, 2, 3, 4 |
| T. Sindelarova | 2, 5 |
| I. Stanislawska | 5 |
| E. Turunen | 3, 4 |
| Th. Ulich | 1 |
| Wu Jian | 3, 5 |
| Th. Xenos | 3 |
| B. Zolesi | 3 |

ANNEX V

Working Group 2 – Advanced Terrestrial Systems

Leaders : Prof A. Bourdillon and Prof E. Tulunay

- [Work Package 2.1](#) Radar and radiolocation (Leaders: Dr C. Bianchi and Dr E. M. Warrington)
- [Work Package 2.2](#) HF/MF communications (Leaders: Dr J. M. Andujar and Dr P. Lassudrie-Duchesne)
- [Work Package 2.3](#) Spectrum management (Leaders: Prof L. W. Barclay and Prof A. M. Casimiro)

WORK PACKAGE 2.1 : RADAR AND RADIOLOCATION

Leaders: Dr C. Bianchi and [Dr E.M. Warrington](#)

This work package is part of [WorkingGroup2](#). This page contains two sub-sections:

- [Terms of Reference](#)
- [Participants](#)

Terms of Reference

The following are proposed as the terms of reference for this work package:

1. Hot clutter modeling for surface wave radar. Existing hot clutter models will be evaluated and a new model may be proposed. Models will be validated with measurements from a basic surface wave set-up. An experimental set-up will be designed and implemented
2. Frequency management of ground-wave and sky-wave radars
3. Angle of arrival measurements for sky-wave signals
4. Propagation effects that influence radar and radiolocation systems
5. The effects of environmental noise on HF radar systems

Participants

| Surname | Forename | Country | Confirmed? | Activity |
|------------|----------|---------|------------|----------------------------|
| Tulunay | Yurdanur | Turkey | Y | Surface wave radar clutter |
| Tulunay | Ersin | Turkey | Y | Surface wave radar clutter |
| Bahadirlar | Yildirim | Turkey | Y | Surface wave radar clutter |

| | | | | |
|-------------|-----------|--------|---|--|
| Türker | Senalp | Turkey | Y | Surface wave radar clutter |
| Warrington | Mike | UK | Y | Various |
| Le Bouter | Guy | France | Y | Improving angle of arrival measurements for sky-wave signals |
| Lemur | Dominique | France | Y | Improving angle of arrival measurements for sky-wave signals |
| Oger | Martial | France | Y | Improving angle of arrival measurements for sky-wave signals |
| Bertel | Louis | France | Y | Improving angle of arrival measurements for sky-wave signals |
| Marie | François | France | Y | Improving angle of arrival measurements for sky-wave signals |
| Strangeways | Hal | UK | Y | Improving angle of arrival measurements for sky-wave signals |
| Benito | Eulalia | Spain | Y | Performing inversion of HF radar backscatter ionograms |
| Saillant | Stéphane | France | Y | Performing inversion of HF radar backscatter ionograms |
| Bourdillon | Alain | France | Y | Performing inversion of HF radar backscatter ionograms |
| Bianchi | Cesidio | Italy | Y | Propagation effects |
| Jangal | Florent | France | Y | modelling of clutter in surface wave radar |
| Angling | Matthew | UK | Y | Tools based on assimilative ionospheric model |
| Strangeways | Hal | UK | Y | Improving angle of arrival measurements for sky- |

| | | | | |
|---------|-----|----|---|---|
| | | | | wave signals |
| Barclay | Les | UK | Y | Frequency management and effects of environmental noise |

WORK PACKAGE 2.2 : HF/MF COMMUNICATIONS

Leaders: Prof J. M. Andujar and Dr P. Lassudrie-Duchesne

This work package is part of [WorkingGroup2](#). This page contains two sub-sections:

- [Terms of Reference](#)
- [Participants](#)

Terms of Reference

The following are proposed as the terms of reference for this work package:

1. Digital radio systems – predictions, methods of estimating reliability: experimental studies concerning channel reliability by using existing experimental set-up complied with ITU standards will be conducted in cooperation with University of Leicester UK
2. Wideband propagation modelling and development of a hardware simulator
3. High data transfer rate system of radio communications through the ionospheric channel
4. Effects of gravity, planetary and infrasonic wave effects on propagation
5. Extension of existing wideband HF simulators to the MF band

Participants

| Surname | Forename | Country | Confirmed? | Activity |
|------------|----------|---------|------------|--------------------------------|
| Tulunay | Yurdanur | Turkey | Y | |
| Tulunay | Ersin | Turkey | Y | |
| Bahadirlar | Yildirim | Turkey | Y | |
| Türker | Senalp | Turkey | Y | |
| Erhel | Yvon | France | Y | increasing the tranfer rate of |

| | | | | |
|-------------|-----------|---------|---|--|
| | | | | radio communications through the ionospheric channel |
| Lemur | Dominique | France | Y | increasing the transfer rate of radio communications through the ionospheric channel |
| Oger | Martial | France | Y | increasing the transfer rate of radio communications through the ionospheric channel |
| Bertel | Louis | France | Y | increasing the transfer rate of radio communications through the ionospheric channel |
| Clency | Perrine | France | Y | increasing the transfer rate of radio communications through the ionospheric channel |
| Le Roux | Yvon | France | Y | |
| Warrington | Mike | UK | Y | increasing the transfer rate of radio communications through the ionospheric channel |
| Salous | Sana | UK | Y | increasing the transfer rate of radio communications through the ionospheric channel |
| Angling | Matthew | UK | Y | Tools based on assimilative ionospheric model |
| Sauli | Petra | Czechia | Y | studying gravity wave effects on propagation |
| Buresova | Dalia | Czechia | Y | studying effects of infrasonic waves |
| Sindelarova | T. | Czechia | Y | studying effects of infrasonic waves |
| Lastovicka | Jan | Czechia | Y | studying effects of infrasonic and gravity waves |
| Boska | Josef | Czechia | Y | studying effects of gravity waves |
| Kouba | D. | Czechia | Y | studying effects of gravity waves |
| Strangeways | Hal | UK | Y | development of a HF hardware simulator and extension to the |

| | | | | |
|-----------------|-------------|--------|---|--|
| | | | | MF band |
| Barclay | Les | UK | Y | HF predictions for digital systems |
| Andujar | Jose Manuel | Spain | Y | Digital radio systems – predictions, methods of estimating reliability. Wideband propagation modelling and development of a hardware simulator |
| Marin | Diego | Spain | Y | Digital radio systems – predictions, methods of estimating reliability. Wideband propagation modelling and development of a hardware simulator |
| A. de la Morena | Benito | Spain | Y | Digital radio systems – predictions, methods of estimating reliability. Wideband propagation modelling and development of a hardware simulator |
| Melida | Nicolas | Spain | Y | Digital radio systems – predictions, methods of estimating reliability. Wideband propagation modelling and development of a hardware simulator |
| Zernov | Nikolay | Russia | Y | The extension of the HF channel software simulator to the case of strong scintillation of the electron density of the ionosphere |
| Gherm | Vadim | Russia | Y | The extension of the HF channel software simulator to the case of strong scintillation of the electron density of the ionosphere |

WORK PACKAGE 2.3 : SPECTRUM MANAGEMENT

Leaders: Prof L. W. Barclay and Prof A. M. Casimiro

This work package is part of [WorkingGroup2](#). This page contains two sub-sections:

- [Terms of Reference](#)
- [Participants](#)

Terms of Reference

The following are proposed as the terms of reference for this work package:

1. Use of GPS to improve HF communications management
2. Adaptive waveform management;
3. Effects of infrasound on radio propagation
4. Occupancy determination of HF band for the East Mediterranean conducted using calibrated HF spectrum measurements and HF receiver array
5. Supporting research and application in antenna systems to increase their efficiency and mitigate the propagation errors
6. Developing new techniques to analyse the radiation path in the propagation channel

In doing so, W.P.-2.3 will collaborate with the COST 284 Action: "Innovative Antennas for Emerging Terrestrial & Space Based Applications"

Participants

| Surname | Forename | Country | Confirmed? ▲ | Activity |
|----------------|-----------------|----------------|---------------------|-----------------|
| Tulunay | Yurdanur | Turkey | Y | |
| Tulunay | Ersin | Turkey | Y | |
| Bahadirlar | Yildirim | Turkey | Y | |
| Türker | Senalp | Turkey | Y | |
| Cander | Lili | UK | Y | |
| Barclay | Les | UK | Y | |
| Bianchi | Cesidio | Italy | Y | |
| Casimiro | António | Portugal | Y | |
| Azevedo | Amândio | | | |

ANNEX VI

Working Group 3 – Spaced-based Systems