

**Approved Minutes of the kick-off meeting**  
**COST Action 296**  
**Mitigation of Ionospheric Effects on Radio Systems (MIERS)**  
**04<sup>th</sup> February 2005**  
**COST Office,**  
**Brussels**

**1. Welcome**

The participants of the inaugural meeting of COST Action 296 were welcomed by Dr. Ferreira, TIST Science Officer for the Action. (Annex 1)

The first part of the meeting was chaired by Dr. Ferreira, including the election of an acting chairperson for the Action, which was carried out under agenda item 7.

**2. Approval of agenda**

The draft agenda for the kick-off meeting was adopted without any amendments.

**3. Presentation of the delegations**

The delegates presented themselves in a “tour de table”. (Annex 1)

**4. General information on COST mechanism and the Annual Grant Scheme**

Dr. Ferreira gave a brief orientation on the COST mechanism presenting the general framework created to promote the scientific and technical co-operation in Europe. Relevant information can be found on the COST-website at <http://cost.cordis.lu>.

The participants were informed about COST and the current situation in general and the COST Actions in the field of Telecommunication.

The Scientific Officer informed the delegates about the principles and procedures related to the COST Actions and about the possibilities of getting activities funded from the COST budget. Dr. Ferreira informed about the reimbursement rules and regulations as well as the process. The following relevant documents can be found at the official Web-site of COST:

- Rules and procedures for implementing COST Actions
- Financing of COST activities from the COST budget
- Information Guide for the implementation of the scheme for Short Term Scientific Missions in the COST Framework

## **5. Status of the Cost Action**

Draft MoU : 328/04

Entry into force : 20/01/2005

Beginning of the Action: 04/02/2005

End of Action: 03/02/2009

Total number of Signatories at date: 7

## **6. Agreement on the internal rules of procedure for the Management Committee of the COST Action**

The Rules of Procedure for Management Committees (Annex 2) was discussed and approved.

## **7. Election of the Chair and Vice-Chair of the Management Committee**

Dr. Cander & Dr. Zolesi were unanimously elected Chair and Acting Vice Chair for the Management Committee of the COST Action.

Dr. Ferreira passed the Presidency of the meeting to Dr. Cander.

## **8. Election of the Grant-Holder**

CCLRC, Rutherford Appleton Laboratory, Chilton, Didcot, UK was unanimously elected as Grant-Holder for COST Action 296. The Action's Secretary will be Mrs. Vernon.

## **9. Working plan for the implementation of the Memorandum of Understanding**

Dr Cander gave a brief presentation on the implementation of the COST296 and a lively discussion followed. Details can be found in the attached ANNEX III. The MC approved the COST296 organizational structure as in ANNEX IV.

The Workplan for the period 5 February to 30 June 2005 has been approved by the MC as follows:

- To define terms of reference for each WP in the Action and associated team members;
- To introduce participants from non-COST countries and organisations in the Action;
- To set up the COST296 website;
- To select the COST296 logo;
- To prepare the joint Workshop with COST724 Action before the end of 2005;
- To establish collaboration with other relevant COST Actions.

## **10. Place and Date of next meeting**

- One day WG Leaders meeting during the EGU 2005 General Assembly, Vienna, Austria on 27 April 2005
- 2<sup>nd</sup> MC meeting at the Abdus Salam International Centre for Theoretical Physics, Trieste, Italy, 30, 31 May and 1 June 2005.

## **11. Miscellaneous**

The MC approved the presentation on 'Highlights from COST-271 and the future with COST-296' to be given by Dr Warrington at IES2005, USA and the presentation on 'Evaluation and mitigation of ionospheric effects on radio systems: EU COST271 and 296 Actions' to be given by Professor Bourdillon at ECPS 2005, France on behalf of the COST 296 community. The MC also encouraged MC members to present talks on COST296 at the other national and international conferences as Dr Stanislawska during the SWW in Boulder, USA, Dr Zolesi during IRI in Ebro, Spain and URSI in New Delhi, India.

## **12. Closing**

Dr. Cander concluded the meeting by thanking the participants and the TIST team.

## ANNEX I

### Participants Kick-off Meeting, Brussels, Belgium 04 February 2005

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<i>Nr</i>	<i>Family Name</i>	<i>First Name</i>	
1.	ALTADILL	D	ES
2.	BELEHAKI	ANNA	GR
3.	BENCZE	PAL	HU
4.	BENIGUEL	YANNICK	FR
5.	BOURDILLON	ALAIN	FR
6.	CANDER	LJ. R.	UK
7.	CASIMIRO	ANTONIO	PT
8.	DAMBOLDT	THOMAS	DE
9.	FERREIRA	AFONSO	COST
10.	HAMID	NEBDI	BE
11.	JAKOWSKI	NORBERT	DE
12.	JODOGNE	JEAN-CLAUDE	BE
13.	KOURIS	STAMATIOS	GR
14.	KRANKOWSKI	A	PL

15.	KUTIEV	IVAN	BG
16.	LEITINGER	REINHART	AT
17.	LILENSTEN	JEAN	COST 724 (Ch)
18.	PIRJOLA	RISTO	FI
19.	RADICELLA	SANDRO	IT
20.	RIEDLER	WILLIBALD	AT
21.	ROSSEEL	CHRISTIEN	COST
22.	ROTHKAEHL	HANNA	PL
23.	SATORI	GABRIELLA	HU
24.	STANISLAWSKA	IWONA	PL
25.	TULUNAY	ERSIN	TR
26.	TULUNAY	YURDANUR	TR
27.	TURUNEN	ESA	FI
28.	VERNON	ANGELA	UK
29.	WARNANT	RENE	BE
30.	WARRINGTON	EM	UK
31.	WERNIK	A	PL

**RULES AND PROCEDURE**  
for the Management Committee of the Action  
**COST 296**

**Mitigation of Ionospheric Effects on Radio Systems (MIERS)**

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Article 1

The Management Committee for COST Action 296 (hereinafter the "MC") has been set up in accordance with the provision of Chapter 8 in the document *COST 400/01* "Rules and Procedures for Implementing COST Actions" (hereinafter the "R & P"). The MC shall consist of no more than two representatives for each Signatory and no more than one representative for each non-COST institution admitted to participate in the Action (hereinafter the "members of the MC").

The members of the MC shall be appointed for the duration of the Action. The secretariat of the MC (hereinafter the "Secretariat") and the COST Office shall be notified of any amendments to such appointments.

Article 2

The main responsibilities of the MC are defined in particular in Chapter 8 of the R & P with some additional provisions in Chapters 9, 10 and 11.

Article 3

Each Signatory shall have one vote in the MC. If a member representing a Signatory is unable to attend, this power is delegated to an officially appointed deputy. Members representing non-COST institutions have the right to express their views but not to vote.

Article 4

The members of the MC may appoint experts or advisors to accompany them. Attendance at the meeting shall be strictly limited to members and their appointed experts or advisors as well as to specialists invited in connection with specific items on the Agenda.

The names of the experts, advisors or specialists shall be communicated to the Secretariat before each meeting.



Subject to the approval of the MC, any member may also invite representatives of international organisations or experts from non-signatory States to participate as observers in some of its activities in accordance with requirements.

#### Article 5

The MC may decide that some of its discussions or certain Minutes of meetings and other documents be considered confidential. Documents are not considered confidential unless this is clearly stated on the front page.

The information supplied by the members of the MC shall not be published without their agreement.

#### Article 6

If in the course of this Action results are obtained or expected, which could give rise to intellectual (industrial or non industrial) property rights, the MC shall take the necessary steps, be it by written agreement among the participants or otherwise, in order to protect these rights, with respect to the principles set out in the brochure "Industrial property rights in the context of COST" and in Chapter 11 of the R & P.

#### Article 7

The MC shall appoint from among its members representing Signatories, by a simple majority vote, a Chairperson, a Vice-Chairperson, and a Grant Holder and a Secretariat. These appointments remain valid until the MC decides to organise new elections.

If the Chairperson is unable to attend, his/her place shall be taken by the Vice-Chairperson.

In the event of the premature termination of the appointment of the Chairperson or Vice-Chairperson, they shall be replaced for the remainder of the term of office in question, again by a simple majority vote.

#### Article 8

Meetings of the MC shall be officially held only if at least two-thirds of the Signatories are represented.

The decisions of the MC shall be taken by a simple majority of the Signatories present and voting. If appropriate, a secret ballot may be carried out and the votes shall be counted by the Secretariat. In the event of a tie, the procedure may be repeated.

#### Article 9

The MC shall be convened by the Chairperson as often as required for the performance of its tasks, at least twice a year.

It may also be convened at the request of members representing at least three Signatories.

#### Article 10

Correspondence shall be dealt with by the Secretariat, which shall be responsible for all contact with the Chairperson, Vice-Chairperson and members of the MC.

The Secretariat will receive copies of all correspondence.

Documents to be distributed by the Secretariat at the meetings should be sent at least three weeks before, for their duplication. For last minute documents to be distributed during meeting sessions, a sufficient number of copies should be brought, in order to avoid duplication on the spot. Whenever possible, documents should be duplicated and mailed by the authors directly to the participants and the Secretariat.

The Secretariat will maintain master copies of all documents.

#### Article 11

Meetings shall be held where the MC considers it advisable to meet at the invitation of an institution in a signatory State.

#### Article 12

The working language of the MC is mainly English. Documents from the Secretariat will be issued in that language.

### Article 13

The traveling expenses incurred by and allowances due to a maximum of two members and for normally two meetings per year of the MC will be borne by the COST budget for representatives of a Signatory eligible for reimbursement. Details of the reimbursement are covered by the valid document “COST-OFFICE Rules for reimbursement of expenses for experts eligible for reimbursement”

### Article 14

These rules of procedure may be amended by the MC following a valid vote as long as the changes do not contravene the “Rules and Procedures for implementing COST Actions” or adversely affect the functioning of the Action. Proposals for the amendment of these rules shall be circulated one month prior to their discussion to the members of the MC and to the COST-Office.

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*ANNEX III*

**COST ACTION 296**



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## ***Mitigation of Ionospheric Effects on Radio Systems (MIERS)***

*Ljiljana R. Cander, Rutherford Appleton Laboratory, UK  
Bruno Zolesi, Istituto Nazionale di Geofisica e  
Vulcanologia, Italy*

**4 February 2005, COST office, Bruxelles**

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*Mitigation of Ionospheric Effects on  
Radio Systems (MIERS)*



***The main objective is to:***

***Develop an increased knowledge of the effects imposed by the ionosphere on practical radio systems, and for the development and implementation of techniques to mitigate the deleterious effects of the ionosphere on such systems.***

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## *Mitigation of Ionospheric Effects on Radio Systems (MIERS)*



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### **Other objectives of the Action are to:**

- Support and enhance the existing European facilities for historical and real-time ionospheric data collection accessible to all;*
  - Exchange information on methods and algorithms to mitigate the effects of ionospheric perturbations and variations on advanced terrestrial and space-based communication services by creating an effective computing infrastructure;*
  - Develop an integrated approach to ionospheric modelling;*
  - Create the mechanism needed to ingest measured parameters into models, extend and develop suitable mitigation models and define the protocols needed to link models together;*
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## *Mitigation of Ionospheric Effects on Radio Systems (MIERS)*



- Make applicable results available to the ITU-R and to promote the research aspects to funding agencies such as ESA, ESF and the EU;*
  - Elaborate inputs for the preparation of the future European Space Programme (ESP);*
  - Strengthen the existing areas of expertise by stimulating closer cooperation between scientists and users;*
  - Focus the scope of all the previous COST ionospheric related studies to the mitigation of ionospheric effects on specific radio systems.*
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## *Mitigation of Ionospheric Effects on Radio Systems (MIERS)*



***The main benefit from the research and development to be undertaken within the Action will be added-value products applicable to current and new generations of radio systems operating in, or affected by, the near-Earth plasma environment.***

***Other benefits of the MIERS are as follows:***

- Continuation of the ionospheric and other relevant data collection and dissemination for now-casting, forecasting and mitigation purposes;*
  - Dissemination and correlation of results, ideas and information among existing participants as well as others who may wish to participate in the future;*
  - Significant increase in performance of operational and future radio systems thus providing a valuable support to European research centres, industry and users.*
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## *Mitigation of Ionospheric Effects on Radio Systems (MIERS)*



*Space weather aspects of the **MIERS** Action present important technological problems for telecommunications.*

*They are complementary to ongoing studies from the COST 724 Action on “Developing the Scientific Basis for Monitoring, Modelling and Predicting Space Weather”. The objectives of COST 724 are to develop within a European framework the science underpinning space weather applications, as well as explore methods for providing a comprehensive range of space weather services to a variety of users, based on modelling and monitoring of the Sun-Earth system.*

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*Mitigation of Ionospheric Effects on  
Radio Systems (MIERS)*



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*The COST296 Action is structured in three  
Working Groups:*

*WG 1 - Ionospheric monitoring and modelling*

*WG 2 - Advanced terrestrial systems*

*WG 3 - Space-based systems*

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## *Mitigation of Ionospheric Effects on Radio Systems (MIERS)*



### **WG 1 - Ionospheric monitoring and modelling**

- ***Near-Earth space plasma monitoring by vertical incidence and oblique sounding networks and GNSS techniques (retrospective and real-time);***
  - ***Data ingestion and assimilation into ionospheric models, including data collection and processing, and the adaptation of models to enable data ingestion and assimilation;***
  - ***Near-Earth space plasma modelling and forecasting including mitigation of ionospheric perturbations, tomographic imaging for model validation and channel modelling techniques;***
  - ***Climate of the upper atmosphere including long-term ionospheric trends, gravity and planetary wave effects on propagation and ionospheric space weather.***
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## *Mitigation of Ionospheric Effects on Radio Systems (MIERS)*



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### ***WP1.1 - Near-Earth space plasma monitoring***

- Monitoring near-Earth space by vertical incidence and oblique sounding networks and GNSS technique
- Ionospheric data networking
- TEC model assisted techniques and measurements from the global network

### ***WP1.2 - Data ingestion and assimilation in ionospheric models***

- Data collection and processing
- Model adaptation for data ingestion and assimilation

### ***WP1.3 - Near-Earth space plasma modelling and forecasting***

- Real-time near-Earth space plasma modelling
- Modelling and forecasting of ionospheric perturbations
- Tomographic imaging for model validation
- Channel modelling by neurofuzzy techniques

### ***WP1.4 - Climate of the upper atmosphere***

- Long-term ionospheric trends
  - Gravity and planetary wave effects on propagation and infrasonic waves
  - Ionospheric space weather
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## *Mitigation of Ionospheric Effects on Radio Systems (MIERS)*



### **WG 2 - Advanced terrestrial systems**

- ***Radar and radiolocation, including ionospheric effects on surface-wave radar and radiolocation systems, frequency management of ground-wave and sky-wave radars and angle of arrival measurements for sky-wave signals;***
  - ***HF/MF communications including digital radio systems, wideband propagation modelling and development of a hardware simulator, increased capacity of HF links through MIMO techniques (experimental measurements and simulation) and extension of existing wideband HF simulators to the MF band;***
  - ***Spectrum management, including the use of GPS to improve HF communications management, adaptive waveform management and the effects of infrasound on radio propagation.***
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## *Mitigation of Ionospheric Effects on Radio Systems (MIERS)*



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### ***WP2.1- Radar and radiolocation***

- Ionospheric effects on surface-wave radar
- Frequency management of ground-wave and sky-wave radars
- Angle of arrival measurements for sky-wave signals

### ***WP2.2 - HF/MF communications***

- Digital radio systems – predictions, methods of estimating reliability
- Wideband propagation modelling and development of a hardware simulator
- Increased capacity of HF links through MIMO techniques
- Gravity and planetary wave effects on propagation
- Extension of existing wideband HF simulators to the MF band

### ***WP2.3 - Spectrum management***

- Use of GPS to improve HF communications management
  - Adaptive waveform management
  - Effects of infrasound on radio propagation
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## *Mitigation of Ionospheric Effects on Radio Systems (MIERS)*



### **WG 3 – Space-based systems**

- Ionospheric effects on space-based remote sensing systems, gravity wave effects on GNSS, space plasma media and security implications;***
  - Mitigation techniques with emphasis on ionospheric structures, their physical nature and impact on GNSS signals, improved accuracy of GNSS by better ionospheric correction and errors due to ionospheric perturbations;***
  - Scintillation monitoring and modelling with emphasis on scintillation effects, their physical nature and impact on ionospheric radio systems (GNSS signals in particular), high-latitude and equatorial scintillation effects (experimental work and modelling).***
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## *Mitigation of Ionospheric Effects on Radio Systems (MIERS)*



### ***WP3.1 - Space plasma effects***

- Ionospheric medium and large scale structures and their impact on GNSS signals
- Gravity wave effects on GNSS signals
- Ionospheric disturbances effects on GNSS signals

### ***WP3.2 – Special mitigation techniques***

- Ionospheric effects on space based remote sensing (observation) systems
- Improved accuracy of GNSS by better ionospheric correction
- Space plasma media and safety in space implications

### ***WP3.3 - Scintillation monitoring and modelling***

- Scintillation effects, their physical nature and impact on ionospheric radio systems
  - High latitude scintillation effects – experimental work and modelling
  - Equatorial latitude scintillation effects – experimental work and modelling
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## *Mitigation of Ionospheric Effects on Radio Systems (MIERS)*



***The following COST member countries have been actively involved in the preparation of the Action and are all willing to participate in the Action:***

***Austria, Belgium, Bulgaria, The Czech Republic, Finland, France, Germany, Greece, Hungary, Italy, Poland, Portugal, Spain, Sweden, Turkey and the UK.***

***The following institutions from non-COST member countries have been involved in the preparation of the Action and are willing to participate in the Action: University of Massachusetts Lowell, USA; St Petersburg State University, St Petersburg, Russia; and IZMIRAN, Moscow, Russia.***

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# ANNEX IV

## **COST 296 Action: Organizational structure**

### **Mitigation of Ionospheric Effects on Radio Systems (MIERS)**

#### **Working Group 1 - Ionospheric monitoring and modelling**

Leaders : J. Laštovicka and I. Stanislawska

##### WP1.1 Near Earth space plasma monitoring

Leaders: D. Altadill and R. Stamper

##### WP1.2 Data ingestion and assimilation in ionospheric models

Leaders: D. Buresova and B. Nava

##### WP1.3 Near Earth space plasma modelling and forecasting

Leaders: I. Kutiev and H. Strangeways

##### WP1.4 Climate of the upper atmosphere

Leaders: J. Bremer and E. Turunen

#### **Working Group 2 - Advanced terrestrial systems**

Leaders: A. Bourdillon and E. Tulunay

##### WP2.1 Radar and radiolocation

Leaders: C. Bianchi and E.M. Warrington

##### WP2.2 HF/MF communications

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

##### WP2.3 Spectrum management

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

#### **Working Group 3 – Space-based systems**

Leaders: N. Jakowski and R. Leitinger

##### WP3.1 Space plasma effects

Leaders: S. Radicella and P. Sauli

##### WP3.2 Special mitigation techniques

Leaders: U. Foelsche and R. Warnant

##### WP3.3 Scintillation monitoring and modelling

Leaders: Y. Beniguel and V. Romano