

TECHNICAL ARRANGEMENT

on

BEIJING ELECTROMAGNETIC RADIATION MONITORING NETWORK PROJECT

between

**THE BEIJING MUNICIPAL ENVIRONMENTAL PROTECTION BUREAU
OF THE PEOPLE REPUBLIC OF CHINA**

(Beijing EPB)

and

**DEPARTMENT OF SUSTAINABLE DEVELOPMENT, ENVIRONMENTAL
DAMAGE AND EUROPEAN UNION AND INTERNATIONAL AFFAIRS,
THE MINISTRY FOR THE ENVIRONMENT, LAND AND SEA
OF THE REPUBLIC OF ITALY**

(IMELS)

(Hereinafter referred to as the Signatories)

Recalling the Sino-Italian Collaboration Program for Environmental Protection, started in 2002, between the Italian Ministry for the Environment, Land and Sea and the People's Government of Beijing Municipality, mainly the "Green Olympics Commitment" project, which strongly contributes to improve environmental quality in Beijing.

Taking into account the "Agreement IMELS-Beijing Municipality for the Establishment of a Sino-Italian Environmental Cooperation for Sustainable Beijing Fund (SIEC-SUB)" signed on the 14th of May 2005, between the Signatories, to financially contribute for projects' implementation by the Signatories.

Recalling the Memorandum of Understanding on Radiation Environment Management Cooperation between Agenzia Regionale per la Protezione Ambientale del Piemonte ("ARPA Piemonte") and Beijing EPB, signed on the 17th September 2014 and valid for three years.

Considering the successful cooperation activity developed under that MoU, through which the two parties have had preliminary understanding on the aspects of electromagnetic radiation monitoring and evaluation, electromagnetic radiation publicity and complaint response measures, radioactivity monitoring and laboratory analysis, and disposal of radioactive wastes, and achieved initial and satisfactory results in cooperation.

Based on the Memorandum of Understanding signed by the Signatories on June 16th, 2017, to strengthen the cooperation in the area of environmental radiation, pollution prevention and control.

It is hereby agreed as follows

Art. 1 – General Provisions

The Steering Committee between the Signatories, held in Beijing on the 19th December 2017, has established the project “Beijing Electromagnetic Radiation Monitoring Network”, to support the above mentioned cooperation activity on electromagnetic radiation monitoring in Beijing, hereinafter referred to as “the Project”, to be developed between 2018 and 2020.

Art. 2 – Objectives and Activities

The objectives and activities of the Project are detailed in the Annex 1 of the present Technical Arrangement containing the Terms of Reference of the project, which will be implemented accordingly.

Flexibility is given to the Signatories for future changes in the working plan. The Signatories shall jointly agree upon modifications.

Art. 3 – Cooperation Method

Beijing EPB will be responsible for project management, in coordination with IMELS and its Project Management Office in Beijing.

In order to guarantee continuity with the previous cooperation on electromagnetic radiation management, IMELS confirms ARPA Piemonte as Italian technical implementation entity, entrusted to be responsible of the development of the activities of the Project and of the achievement of its objectives. Beijing EPB entrusts Beijing Municipal Radiation Safety Technology Center for the implementation of the project.

Art. 4 – Financial Resources

The Signatories will all make necessary financial contribution for a successful implementation of the Project. The share of IMELS contribution and Beijing Municipality contributions on the Project total investment would be around 50% and 50% respectively.

The Project total budget is 407,302 Euro. The contributions from IMELS and Beijing EPB are listed here below:

IMELS will contribute with 204.600 Euro, accounting for around 50% of total budget. The above mentioned amount has been the residue funds of SIEC-SUB. The

contribution of IMELS regarding the activities under this Technical Arrangement will be borne without any financial responsibility by Italian Central Government.
Beijing EPB will be responsible for the rest budget.
Financial sources allocation will be implemented according to the Annex 2 (Budget Breakdown) to this Technical Arrangement.

Art. 5 – Accounts and auditing

Final accounts, directly comparable to the budget, shall be submitted to the Steering Committee between IMELS and BJEPPB along the final report.
The accounts shall be endorsed by a chartered or registered accountant and the person responsible for the projects of BJEPPB, who, by their endorsement, confirm that the accounts are presented in accordance to the agreement. Notwithstanding, IMELS reserves the right to demand their party auditing.

Art. 6 – Law in force

This arrangement will be implemented in conformity with international law principles, international Conventions and Protocols signed by the Signatories, national legislation of China and Italy, as well as, as for Italy, with any other obligations arising from the membership of the Italian Republic in the European Union.

Art. 7 – Settlement of Disputes

Any dispute arising from the interpretation and implementation of this Technical Arrangement shall be settled through consultation among the Signatories.

Art. 8 – Duration

This Technical Arrangement shall enter into force on the date of Signature and it will remain effective for three years, in accordance with the provision of article 1 of the present Technical Arrangement, unless one of the Signatories notifies the other in writing, at least three (3) months in advance, of its intention to terminate it.

The Technical Arrangement may be extended by written agreement between the Signatories at least three (3) months in advance.

The following annexes are integral part of this Technical Arrangement:

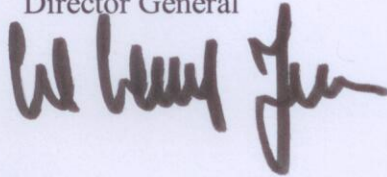
- Annex 1 – Terms of Reference
- Annex 2 – Budget Breakdown

Signed for acknowledgement and acceptance on March 23rd, 2018 in Beijing in English and Chinese, each version being equally authentic. In case of divergence in interpretation, English will prevail..

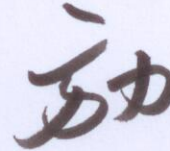
For the Department for Sustainable
Development, Environmental Damage and
European Union and International Affairs
Ministry for Environment, Land and Sea
of The Republic of Italy

Francesco La Camera

Director General



For the the Beijing Municipal Environmental
Protection Bureau
of the People Republic of China



Fang Li

Director General

Annex 1 Terms of Reference

I. Background

In September 2014, Beijing Municipal Environmental Protection Bureau (Beijing EPB) signed the first-phase Memorandum of Understanding on Joint Administration of Environmental Radiation valid for three years with the Radiation Department of Piedmont Regional Environmental Protection Bureau (Piedmont EPB). Through technical exchange for over two years, the two parties have had preliminary understanding with each other on the aspects of electromagnetic radiation monitoring and evaluation, electromagnetic radiation publicity and complaint response measures, radioactivity monitoring and laboratory analysis, and disposal of radioactive wastes, and achieved initial and satisfactory results in cooperation.

Through a series of lectures by Italian experts, we learn that the electromagnetic radiation laws and regulations and systems of international organization, EU and Italia are comprehensive advanced; and the predictive ability of electromagnetic radiation level model around electromagnetic radiation sources, application of anechoic electromagnetic compatibility microwave chambers, and field monitoring on electromagnetic radiation of the Radiation Department of Piedmont EPB have reached international advanced level.

In recent years, with the rising of environmental awareness and environmental understanding among the public, the society and local governments are more concerned about the influence of electromagnetic radiation from mobile communication basic stations, high voltage transmission lines and large broadcast & television launch stations, and therefore propose higher requirements on the sector of environmental administration and monitoring. In this context, it is urgent to improve monitoring criterion, technologies and methods, control quality in a timely and effective manner, and strengthen result evaluation in details. At present, a primary task is to study and establish a planning scheme for Beijing electromagnetic radiation monitoring network through study and investigation.

Given these, the two parties anticipate to carry out the second-phase cooperation based on the sound cooperation and great results of the first phase to deepen mutual exchange and cooperation in the electromagnetic radiation monitoring field.

II. Objectives

The Beijing electromagnetic radiation monitoring project involves monitoring methods and monitoring objects, as detailed below:

- (1) Monitoring methods: manual and automatic;
- (2) Monitoring categories: electromagnetic radiation environment quality and electromagnetic radiation sources. The latter can be divided into broadcast & television launch stations, mobile communication base stations, high voltage transmission engineering and radar and satellite earth stations.

Currently, the Beijing electromagnetic radiation monitoring network (hereinafter referred to as the “network”) covers most of the contents above, but in the aspects of monitoring methods, distribution of monitoring points, monitoring technologies and modes and needs, it still cannot match Italian and other EU countries and needs improvement based on study and investigation. Apart from the above mentioned monitoring methods and monitoring categories, we expect to conduct investigations on under-developing drive-test monitoring programs of some European countries and spatial continuous regional environmental EMF monitoring, as the supplements approaches for existing Beijing EMF monitoring network. We hope to achieve the following goals through the cooperation with Italia:

1. Learn About the Laws and Regulation and Standard Systems of Electromagnetic Radiation Monitoring of EU and Italia

Currently, China has not systematic and up-to-dated laws and regulations and standard system for monitoring environmental electromagnetic radiation level. Except for the monitoring methods of AC power transmission and transformation projects and mobile communication base stations, there is yet no environmental monitoring standard against other radiation sources like broadcast & television stations and radars. The only reference to environmental electromagnetic radiation monitoring is *Guide to Radiation Environment Protection and Administration – Methods and Standards of Evaluating Electromagnetic Radiation Influence on Environment* (HJ/10.3-1996) formulated 20 years ago, which needs to be improved to cater to current requirements. It is known international organizations, EU and its members have built systematic and up-to-dated monitoring methods and standard systems and continuously launch new monitoring methods, such as *Making RF Electromagnetic Radiation Map* of ITU for evaluating electromagnetic radiation exposure levels to public, and the Italian monitoring methods and standards for large-power electromagnetic radiation sources like radars. All of these can be referred during deployment of electromagnetic radiation monitoring points and planning of the network.

2. Application of Italian Monitoring Technologies

In the project of investigating surrounding electromagnetic radiation level of large broadcast & television launch facilities, the Chinese side not only use domestic laws and regulations for monitoring, but also go to Arpa Piemonte to learn the portable prototype narrowband monitoring system developed by Arduino of Italia, and build the electromagnetic radiation model of broadcast & television launch facilities based on the prototype open-source electronic platform of Arduino under the guide of Italian experts in Beijing. In addition, they perform application test, aiming at improving the electromagnetic radiation monitoring methods for large electromagnetic radiation sources and offering more sophisticated technical support for decision-making of environmental administration.

3. Improve the Automatic Monitoring Method

3.1 Narrow band automatic monitoring

Nowadays, daily monitoring and evaluation on domestic electromagnetic radiation sources and surrounding environment mainly rely on the manual mode. Although Beijing has five electromagnetic radiation sources and five broadband-based automatic electromagnetic radiation monitoring stations, there are not sufficient typical monitoring points. Moreover, both manual monitoring and automatic monitoring on mobile base stations are mainly based on broadband, lack of wide application of manual and automatic frequency-selective monitoring. As a result, we cannot understand the spectrum composition of each point and the electromagnetic radiation level of each frequency band. Till now, we have not any attempts on frequency-selective automatic monitoring, while EU and Italia have widely used it to base stations and broadcast & television stations and drawn rich experience from this course. Through learning and exchange, we can apply this method to the project of investigating surrounding electromagnetic radiation level of broadcast & television launch facilities and environmental electromagnetic radiation monitoring, and take it as an effective supplement to broadband-based automatic monitoring to comprehensively represent and depict the structure of electromagnetic radiation spectrogram and the contribution rate of each frequency band so as to locate main radiation sources.

3.2 Drive-test monitoring method

Manual and automatic methods are fixed-point monitoring methods, which are unfavorable in spatial representative. While, the greatest advantage of drive-test monitoring is to collect quantity of data in short time with high efficiency, which are effective supplement methods for manual and automatic methods and beneficial for spatial continuous monitoring of regional environment, moreover suitable for regional exposure level evaluation to public.

4. Capacity Building

4.1 Capacity Building of Chinese Technical Personnel

Learn the functions, parameters and application of the Italian prediction software to proficiently operate the software and set up prediction model; and grasp the electromagnetic radiation monitoring technologies and methods for radar stations.

(1) Prediction Software

The EIA report on domestic various new electromagnetic radiation source projects requires that predictions should be offered with technical parameters. Currently, predictions are deducted mainly by using formulas, and the parameter settings of the formulas are too simple to meet actual requirements. Although some electromagnetic radiation prediction software is available, it simplifies the complex prediction process into once reflection so that the predictions are greatly different from measured values. Arpa Piemonte has worked with different electromagnetic radiation prediction softwares for mobile base stations, AC power transmission and transformation engineering and broadcast & television launch facilities, also developing a free-space, far-field software. Through comparison among the different propagation models available in Arpa Piemonte, and experimental validation, it is possible to quantify and reduce the errors in calculations in complex environments. This plays an important role in verification, acceptance, monitoring and publicity of environmental evaluation technologies. Through learning these prediction software, we can have a profound

understanding of transmission paths of electromagnetic wave, distribution of electromagnetic radiation, and accuracy of monitoring data.

(2) Monitoring Methods for the Environmental Electromagnetic Radiation of Radar Stations

Currently, the EPM *Controlling Limits for Electromagnetic Environment* (GB8702-2014) stipulates the limit values of electromagnetic radiation of pulse signals but does not offer related monitoring methods, while in this regard Italia has established specific technical standards. We can take the opportunity of training by Italian experts in Beijing to accumulate and explore the methods of different instrument to monitor electromagnetic radiation level of pulse signals.

(3) Monitor Surrounding RF Foot Sense Current of Broadcast & Television Launch Facilities

This monitoring method enables us to know the RF current of human body and the current flowing through legs to the ground.

4.2 Capacity Building of Italian Personnel

Italian personnel will study related issues, theories and result evaluation methods of high-voltage DC monitoring in Beijing and conduct technical exchange on site.

5. Scheme of Beijing Electromagnetic Radiation Monitoring Network

We will investigate the manual and automatic electromagnetic radiation monitoring networks of EU members to learn about the information about network scale, point distribution, selection of automatic stations, optimization and combination of manual and automatic monitoring methods, and number of automatic monitoring stations, so as to deliver concrete suggestions for Beijing electromagnetic radiation monitoring project in the aspects of quality monitoring of electromagnetic radiation environment, point distribution in electromagnetic radiation source monitoring, combination of manual and automatic monitoring, integration of broadband-based and frequency-selective automatic monitoring, utilization of automatic monitoring data, and the shortest duration of each automatic monitoring station. As well will carry out investigations on practicability and application prospects of drive-test monitoring method.

In conclusion, we will establish the scheme of point distribution, and monitoring methods and modes of this project by learning the laws and regulations and standard systems of electromagnetic radiation fields adopted by international organizations, EU and Italia; the methods of Italia and EU for monitoring and evaluating surrounding and environmental electromagnetic radiation level of radiation sources; and the cutting-edge technologies of Italia.

III. Project Implementation

(I) Investigation of Materials

1. On Laws and Regulations, and Standard System

(1) Respectively sum up the laws and regulations and standard systems of electromagnetic radiation field formulated by international organizations (WHO and ITU), EU and Italia; collect, sort out and integrate the monitoring and evaluation methods of various electromagnetic radiation sources, with focus on broadcast & television launch sources, radars, mobile communication base stations and power transmission and transformation engineering; and deliver applicable laws and regulations and standard systems of electronic edition in English.

(2) Survey the application and progress of (ITU-T K113) *Making RF Electromagnetic Radiation Map* in various countries, as well as applications of drive-test monitoring methods in monitoring network.

(3) Investigate the status quo of Italian and EU automatic and manual electromagnetic radiation monitoring networks.

(4) Study the evaluation methods and cases of regional electromagnetic radiation exposure levels to public in EU and Italy.

(5) Investigate the status quo of environmental ionizing radiation monitoring, including selection of monitoring sites and measurement items, as well as conclusions and suggestions in EU and in Italy

(6) Survey the development of ionizing radiation levels to public, such as approaches, technical route, executing units, conclusions and suggestions.

2. On-going Electromagnetic Radiation Investigation Projects

Sort out and integrate the electromagnetic radiation investigation projects of EU and Italia, focusing on broadcast & television launch stations, mobile communication base stations and power transmission and transformation engineering; and collect the information about project contents, monitoring methods, point distribution, monitoring instrument, quality control, uncertainty evaluation and results assessment, applications of drive-test monitoring, etc.

3. Hold a thematic seminar

Hold a thematic seminar in Beijing, for which we will invite relevant well-known experts in this field to conduct exchange and study centering on ionizing and nonionizing radiation monitoring and evaluation, including the laws and regulations and standard systems, monitoring and investigation experience, monitoring instrument, evaluation methods, prediction based on model, quality guarantee, data analysis, etc.

Tasks 1 and 2 above shall be taken by the Italian side, with staged reports yielded; and Task 3 shall by the Chinese side.

(II) Purchase and Application of Frequency-selective Automatic Monitoring Equipment

1. Investigate the models and constitution of equipment, power supply system, monitoring principle, environmental suitability, data transmission mode and reliability, main technical parameters (range of test frequencies, dynamic scope of measured values, measuring precision, number of preset frequency bands, etc.), and the functions of auxiliary client-end software of Italian NARDA; and understand the requirements in follow-up upgrade and expansion.
2. Complete purchase, installation, onsite training and pilot run of equipment pursuant to the purchasing procedure.
3. Use the equipment after being commissioned for field monitoring.

The tasks above shall be mainly completed by the Chinese side by using frequency-selective automatic monitoring equipment on site.

(III) Applications of Various Monitoring Methods Used in Evaluation and Measurement of Regional Electromagnetic Radiation Level

Monitor and evaluate the electromagnetic radiation level of the areas around the CCTV tower or other designated region.

1. Deploy monitoring points in targeted areas to perform manual monitoring, broadband-based & frequency-selective automatic monitoring and drive-test monitoring, and compare the results of these monitoring modes.
2. Sum up the advantages and disadvantages of these electromagnetic radiation monitoring modes and complement them with each other to provide technical basis for point distribution used in follow-up manual and automatic electromagnetic radiation source monitoring systems.

Tasks 1 above shall be taken by the Chinese side; and Task 2 shall by the Italian side.

(IV) Planning Suggestion on Beijing Electromagnetic Radiation Monitoring Network

1. Carry out typical research on the network.
2. The Italian side shall investigate the laws and regulations and standard systems of electromagnetic radiation and the status quo of electromagnetic radiation monitoring networks of EU members to provide suggestions on the construction of Beijing electromagnetic radiation monitoring network in manual and automatic modes for Chinese side accordingly.

Task 1 above shall be taken by the Chinese side; and task 2 shall by the Italian side under the assist of China, with a staged report yielded.

(V) Short-term Work

Italia: The Chinese side will go to Italia to participate in 10-day research on the aspects of prediction model, instrument calibration, method of monitoring electromagnetic radiation of radars, and surrounding RF foot sense current of broadcast & television launch facilities.

(VI) Training

1. Beijing: the Italian side shall provide 8-day training for the Chinese side in Beijing on the aspects of construction and experiment of prediction model as well as the monitoring methods of electromagnetic radiation of radars.
2. Beijing: the Italian shall accept 3-day training in Beijing on the aspects of high-voltage DC monitoring and data analysis and evaluation.

(VII) Technical Exchange

1. Italia: the Chinese side will go to Italian to discuss the risks of AC electromagnetic radiation exposed, complaint response process and staged results of management and cooperation items;
2. Italia: the Chinese side will go to Italian to discuss the methods of AC monitoring data analysis and verification, strategies and measures of electromagnetic radiation administration, and regional EMF evaluation, and combine the final results of the project and the previous results to explore the following cooperation field.

IV. Yields of the Project

Integrate all investigation results of this project in a timely manner and prepare and submit the report of *China-Italia Cooperation – Planning Scheme of Beijing Electromagnetic Radiation Monitoring Network*.

V. Project Schedule

Goals and Implementing Plan of Different Stages		
Year	Month	Tasks
2018	May	The Chinese side will go to Italia to open the start by deciding detailed working contents for three years and specific time and expected results of each stage of the project.
	May to December	(1) Investigate, purchase and try out automatic frequency-selective monitoring equipment. (2) Investigate the laws and regulations of electromagnetic radiation of international organizations, EU and Italia and the results of completed electromagnetic radiation projects. (3) Investigate the application and progress of (ITU-T K113) Making RF Electromagnetic Radiation Map in various countries, as well as applications of drive-test monitoring methods in monitoring network and achievements of done programs. (4) Comparisons and conclusions of measurement results with various monitoring methods
	September	Italian experts will go to Beijing to (1) instruct the Chinese side to build electromagnetic radiation monitoring system based on the prototype open-source electronic platform of Arduino to monitor surrounding electromagnetic radiation level of the CCTV Tower and conduct a test for the model; (2) introduce the methods of monitoring radar radiation.
	Nov. to Dec.	Carry out typical research on the network.
	December	Staged summary
2019	February to April	Chinese technical personnel will work in the laboratory of Italian Arpa Piemonte for 10 days.
	April	The Chinese working team will go to Italian to exchange staged results, discuss countermeasures against AC electromagnetic radiation complaints, and study monitoring methods and technologies on site.
	May	Italian experts will go to Beijing to (1) attend the electromagnetic radiation thematic seminar; (2) Italian experts will accept the training of high-voltage DC monitoring in Beijing.
	May to July	The Italian side will investigate the status quo of electromagnetic radiation monitoring networks of EU countries and propose scheme and suggestions accordingly.
	August to December	Collect, sort up and evaluate related data and materials to prepare the staged technical report and scheme report.
2020	January to May	Italian experts will go to Beijing to discuss the planning scheme of the network.
	May to June	A Chinese delegation will go to Italian to exchange the method for AC monitoring data analysis and verification and the strategies and measures of electromagnetic radiation administration; and combine the final results of the project and the previous results to discuss the following cooperation field.
	June to October	Finish the final project report.

Annex 2 Budget Breakdown

No.	Items	Categories	Fund by Italian Side	Fund by Chinese Side	Total
			Unit: 10 thousand Euro		
1	One set of frequency-selective automatic electromagnetic radiation monitoring equipment	Original equipment cost	4.46	0	4.46
2	Investigation and preparation of project reports	Technical consulting fees	5.0	0	5.0
3	Training	Expert consultation fees	2.0	0	2.0
4	Investigation on electromagnetic radiation level of large radiation facilities or their surrounding environment	Technical consulting fees	0	13.51	13.51
5	Data collection and quality assurance of EMF continuous monitoring stations	Technical consulting fees	0	6.7602	6.7602
6	Traveling	Domestic traveling expenses	0	0	0
7		European traveling expenses	5.0	0	5.0
9	Expert consultation fees	Expert consultation fees	0.5	0	0.5
10	Others	Translation fees	1.5	0	1.5
11	Management	Management cost	2.0	0	2.0
Total			20.46	20.2702	40.7302

Note: Exchange rate between Euro and RMB: 7.4:1.

北京市人民政府组成部门北京市环境保护局
与意大利环境、领土与海洋部
可持续发展、环境损害和欧盟与国际事务司
北京电磁辐射监测网络项目技术协议

以下简称双方

鉴于

2002年以来，北京市人民政府与意大利环境、领土与海洋部（以下简称“意大利环境部”）开展的中意北京环保合作，为北京市履行“绿色奥运”承诺和改善环境质量提供了有力支持。

2005年5月14日，双方签署协议设立了“中意北京可持续发展环境合作”基金（简称“合作基金”），为双方合作项目的开展提供资金支持。

2014年9月17日，北京市环境保护局（以下简称“北京市环保局”）与意大利皮埃蒙特大区环保局签署辐射环境管理合作谅解备忘录，有效期三年。

双方在上述谅解备忘录的框架下开展了成功的合作，对电磁辐射监测和评价、公众宣传与投诉应对措施、放射性监测与实验室分析、放射性废物的处置都达成了初步的共识，取得了令人满意的初期合作成果。

2017年6月16日，双方签订合作谅解备忘录，同意加强在环境辐射管理、污染防治等方面的合作。

双方同意

第一条 总则

2017年12月19日，双方在北京召开的指导委员会会议上确定拟于2018-2020年开展“北京电磁辐射监测网络项目”（以下简称“项目”），以支持北京电磁辐射监测工作。

第二条 目标和内容

项目目标和内容详见本协议附件1-项目技术条款，签署生效后与协议正文具有同等效力。

本协议的工作计划，可经双方协商一致后进行修订。

第三条 合作方式

北京市环保局将与意大利环境部及其北京项目管理办公室密切协作，负责项目的管理工作。

为保证与之前电磁辐射管理合作项目的连续性，意大利环境部确认由皮埃蒙特大区环保局作为意方项目承担单位，负责项目活动的开展和项目目标的实现。北京市环保局委托北京市辐射安全技术中心具体实施该项目。

第四条 资金来源

双方均应为本项目的成功开展提供必要的资金支持。意大利环境部和北京市将分别为本项目提供50%的资金支持。

项目总预算为407,302欧元。意大利环境部和北京市环保局的资金支持金额分列如下：

- 意大利环境部将提供 204,600 欧元的资金支持, 约占总预算 50%, 由合作基金账户结余资金中划拨。意大利环境部无需再申请中央财政资金用于支持本项目。

- 剩余部分的资金将由北京方面提供。

资金分配将根据本协议附件 2 (预算明细表) 来进行。

第五条 账目和审计

对应项目预算的总账目, 应与项目总报告一起, 提交由意大利环境部和北京市环保局共同组成的项目执行委员会审查。

项目财务报表应由授权/注册会计师和北京市环保局的项目管理人员共同背书, 确认相关账目已经按照协议提交。同时, 意大利环境部保留要求意方审计的权利。

第六条 适用法律

本协议的实施应符合目前通行的国际法规、国际公约、双边协议、双方国内法律以及意大利作为欧盟成员国的责任和义务。

第七条 争端解决

因本技术协议的解释和实施而起的任何争议, 将由双方通过协商解决。

第八条 有效期

本协议自双方签字之日起生效，有效期为三年。如需提前终止，其中一方应至少提前三个月书面通知另一方。

如需延期，双方应至少提前三个月以书面协议形式确认。

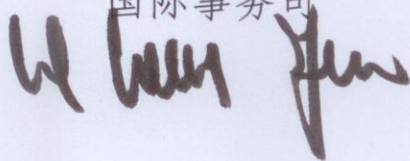
下列附件是本协议不可缺少的构成部分：

- 附件 1 项目技术条款
- 附件 2 预算明细表

本协议经双方协商一致，于 2018 年 3 月 23 日在北京以中文、英文两种语言签署，一式两份，具有同等效力。如有争议，以英文版本为准。

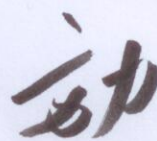
意大利环境、领土与海洋部
可持续发展、环境损害和欧盟与

国际事务司



弗朗西斯科·拉·卡梅拉
司长

北京市人民政府组成部门
北京市环境保护局



方力
局长

附件 1 项目技术条款

一、项目背景

2014年9月，北京市环保局与皮埃蒙特大区环保局辐射部签署了第一期的“辐射环境管理”合作备忘录，执行周期为3年。经过2年多的技术交流与互访，双方在电磁辐射监测与评价、公众宣传与投诉应对措施、放射性监测与实验室分析及放射性废物处置管理等方面有了初步的接触与了解，达到项目合作的最初目标，取得了满意的成果。

通过意方专家多次讲座，了解到国际组织、欧盟及意大利的电磁辐射法规、标准体系全面、完善，而且皮埃蒙特大区环保局辐射部在电磁辐射源周围电磁辐射水平模型预测能力、电磁兼容微波暗室的建造与应用、电磁辐射现场监测等方面均达到了国际先进水平。

近年来，随着公众环保意识和知识水平的提升，社会和地方政府越来越关注移动通信基站、高压输变电路及大型广播电视发射台站等的电磁辐射影响，对环保管理和监测部门提出了越来越高的要求。在此背景下，监测规范的完整、监测技术的提升、监测方式的完善、质量控制的及时有效、结果评价的详尽等是我们亟待改善的方面；在学习调研基础上，研究制定北京市电磁辐射监测网络的规划方案。

综上所述，在第一期良好合作及成果基础上，双方希望继续开展第二期合作项目，深入进行电磁辐射监测领域的交流与合作。

二、项目目标

北京市电磁辐射监测分类包括监测方式、监测类别等，其中

(1) 监测方式：分为手工监测和自动监测；

(2) 监测类别：分为电磁辐射环境质量监测和电磁辐射源监督性监测。电磁辐射源监督性监测根据源的类别细分为广电发射台站监测、移动通信基站监测、高压交流输变电工程监测、雷达及卫星地球站监测等。

目前北京市电磁辐射监测网络涵盖了以上大部分内容，但在监测方法、监测布点、监测技术、监测方式等方面与意大利等欧盟国家尚有一些差距，需要在学习调研基础上进一步改进、完善北京市电磁辐射监测网络系统。

除上述我们已有的监测方式和监测类别外，通过项目实施调研欧盟部分国家正在开展的车载巡测监测方式，及除环境监测和污染源监测外的空间连续区域环境监测，作为北京市电磁监测网络在监测方式和监测类别方面的补充。希望通过中意的合作项目达到以下目标：

1. 梳理了解欧盟、意大利等电磁辐射监测法规体系

目前国内环保领域的电磁辐射法规标准体系尚不系统、不全面，电磁辐射源除交流输变电工程和移动通信基站有相应的监测方法外，其他辐射源如广播电视、雷达等均无专门的环保监测规范，环境电磁辐射水平监测等只能参照《辐射环境保护管理导则-电磁辐射环境影响评价方法与标准》(HJ/10.3-1996)，因方法制定于20年前，有需要改进的地方，因此参考性有限。据了解，国际组织、欧盟及其成员国已构建了系统、完善的监测方法和标准体系，并不断推出新的监测方法，如ITU的《制作射频电磁辐射地图》用于电磁辐射公众曝露水平评价、意大利颁布的雷达等大功率电磁辐射源监测方法规范等，为北京市电磁辐射监测布点监测及监测网络规划提供借鉴。

2. 意方监测技术应用

在大型广播电视发射设施周边电磁辐射水平调查项目中，除按照国内法规进行监测外，中方人员赴 Arpa Piemonte 学习意大利 Arduino 技术公司开发的便携式窄带监测系统原型软件，在意方专家到京时指导建立基于 Arduino 开源电子原型平台的广播电视发射设施电磁辐射预测模型，并进行应用测试，以完善今后大型电磁辐射源电磁辐射水平调查的监测方法，为管理决策提供更精细的技术支持。

3. 完善电磁辐射监测方式

3.1 选频自动监测

目前国内电磁辐射源及环境的日常监测及评价依据以手工监测为主，北京市虽布设了 5 个电磁辐射源、5 个环境电磁宽带自动监测站，但点位少，代表性不强；此外，无论是移动基站手工监测还是自动站监测，目前均以宽带为主，缺少选频的手工和自动监测的广泛应用，无法掌握各监测点位的频谱构成及各频段电磁辐射水平的贡献情况，尤其是选频自动监测更是监测手段的空白。而欧盟及意大利选频自动监测已广泛应用到基站、广播电视等的监测中，具有丰富经验。通过学习交流，可以将此方法应用到大型广播电视发射设施周边电磁辐射水平调查项目及环境电磁辐射监测中，作为宽带自动监测有效的补充手段，以便于全面表征、详细描述电磁辐射频谱图结构、各频段贡献率，从而确定主要辐射源。

3.2 车载巡测监测

手工监测和自动监测均为定点监测，空间代表性差。而车载巡测监测最大优势是能短时间内获取大量空间数据，效率高，是手工和自动监测的有效补充手段，利于空间连续的区域环境监测，适用于区域的公众曝露水平评价。

4. 人员能力建设

4.1 中方技术人员能力建设

通过对意方预测软件功能、参数、应用等的学习了解，掌握软件的操作，进行模型预测；雷达站电磁辐射监测技术方法的学习等。

(1) 预测软件

国内在各类电磁辐射源新建项目环评报告中要求根据技术参数提供预测结果，目前主要方式是通过一些公式进行推导，预测公式的各项参数设定较简单；虽然也有一些电磁辐射预测软件，但通常只涉及一次反射，简化了实际的复杂环境，预测结果往往与实测值差别较大。意大利 Arpa 已开发了移动基站、交流输变电工程及广播电视发射设施等电磁辐射预测软件，模拟各类复杂环境下的电磁辐射水平，预测值与实测值误差非常小，已在环评技术审核、验收监测、公众宣传等方面发挥了重要作用。学习掌握这些预测软件，可深刻理解电磁波传播途径、电磁辐射水平的分布、监测数据的准确性等。

(2) 雷达站周围电磁辐射水平监测方法

目前环保部在《电磁控制限值》(GB8702-2014)中规定了脉冲信号电磁辐射限值标准，但未给出相关监测方法，而意大利已建立了相关技术规范。在意方专家在京期间对中方技术人员进行相关培训，不断积累、摸索不同仪器进行雷达脉冲信号电磁辐射水平的监测方法。

(3) 广播电视发射设施周边射频足部感应电流监测

通过监测可以了解感应到人体中的射频电流及通过腿部注入地面的电流。

4.2 意方人员能力建设

到京学习高压直流监测相关问题，理论知识、结果评估等，并至监测现场进行技术交流。

5. 北京市电磁辐射监测网络方案

调研借鉴欧盟成员国电磁辐射自动监测与手工监测网络的规模、点位布设、自动站站址选择、手工与自动监测方式的优化组合及自动站站点数量等，在北京市电磁辐射环境质量监测、电磁辐射源监督性监测中点位布设、手工与自动监测的结合、两种自动监测的整合、自动监测数据的作用、每个站点自动监测的最短时长等方面提出具体建议。调研车载巡测监测的实用性和应用前景。

综上，本项目的实施通过对国际组织、欧盟及意大利电磁辐射领域相关法律法规、标准体系进行梳理，借鉴意大利及欧盟在电磁辐射源周围及环境电磁辐射监测与评价方法的实践，学习意方先进技术等基础上，制定北京市电磁辐射监测网络点位布设、监测方法、监测方式等方案。

三、项目实施方案

1. 资料调研

1.1 法规标准体系调研

(1) 分别梳理电磁辐射领域国际（WHO、ITU等）欧盟、意大利三个层面的电磁辐射法律、法规和标准体系，重点对广播电视发射天线、雷达、移动通信基站、输变电工程等各类电磁辐射源的监测方法和评价方法进行收集、整理和汇总，并提供法规、标准的英文电子版；

(2) 调研 ITU-T 中 K113《制作射频电磁辐射地图》在各国中的应用和开展进度情况，巡测监测在监测网络中的应用；

(3) 调研意大利及欧盟电磁辐射自动监测与手工监测网络系统情况;

(4) 欧美国家关于区域电磁辐射公众曝露水平评价的方法、案例等;

(5) 欧美国家关于国民剂量项目的开展情况、方法技术路线、实施单位及结论与建议;

(6) 欧美国家关于电离辐射环境质量监测情况, 点位布设, 监测项目选取, 结论与建议

1.2 已开展的电磁辐射项目调查调研

梳理、汇总欧盟、意大利开展的电磁辐射调查项目, 重点为广播电视、移动通信基站、输变电工程项目, 汇总项目内容、监测方法、监测布点、监测仪器、质量控制、不确定度评价、结果评价、巡测监测的应用等内容;

1.3 举办讲座

在京召开专家讲座, 围绕电磁/电离辐射监测与评价, 邀请国内外该领域知名专家从法规标准体系、监测与调查项目、监测仪器、评价方法、模型预测、数据分析等多维度进行交流、学习;

上述任务 3.1.1、3.1.2 由意方负责完成, 并提交阶段报告; 任务 3.1.3 由中方组织。

2. 选频自动监测设备采购与应用

(1) 调研意大利 NARDA 公司的设备型号、设备构成、供电系统、监测原理、环境适应性、数据传输方式及可靠性、主要技术参数(测试频率范围、测值动态范围、测量精度、预定频段数量等)、配套客户端软件功能等, 并了解日后升级、扩容的要求;

(2) 按采购程序完成设备采购、安装、现场培训、试运行;

(3) 调试后用于现场监测

上述工作主要中方完成, 提供现场监测用的选频自动监测设备。

3. 各种监测方式在区域电磁辐射水平监测评价中的应用

对中央电视发射塔或其他选定区域周围进行电磁辐射水平监测与评价。

(1) 在调查区域布点进行手工监测和宽带、选频自动监测, 巡测监测, 并比较监测结果;

(2) 总结手工监测、宽带和选频自动监测及巡测监测在电磁辐射监测中的优势与劣势及各种监测方式的融合、补充, 为之后电磁辐射监测网络规划提供技术基础。

上述任务(1)由中方完成; 任务(2)由意方负责完成。

4. 北京电磁辐射监测网络规划建议

(1) 北京市电磁辐射环境自动监测网络代表性研究;

(2) 意方在调研法规、标准及欧盟各国电磁辐射监测网络现状等基础上, 为北京市电磁辐射监测网络(手工和自动)建设提出建议等。

上述任务(1)由中方完成; 任务(2)由意方负责完成, 并提交阶段报告, 中方配合。

5. 短期工作

意大利: 中方赴意大利参与预测模型、雷达电磁辐射监测方法、广播电视发射设施周围射频足部感应电流监测等方面的工作。时长10天。

6. 培训

(1) 北京：意方赴京培训中方预测模型建立与试验、雷达电磁辐射监测方法等。时长：8天；

(2) 北京：意方赴京接受高压直流监测、数据分析、评价等培训。时长：3天。

7. 技术交流

(1) 意大利：中方赴意大利交流电磁辐射暴露产生的风险、投诉应对的流程和管理及合作项目的阶段成果；

(2) 意大利：中方赴意大利交流监测数据分析、检验方法、区域评价方法及电磁辐射管理策略和措施，并总结合作项目最终成果，基于前期的成果讨论下一步合作领域。

四、项目产出及成果

及时汇总本项目各项调研成果，编写并提交《中意合作—北京市电磁辐射监测网络规划方案》报告。

五、项目实施进度

项目阶段目标与实施计划		
年	月	实施内容
2018 年	5月	中方赴意大利启动项目，细化三年工作内容，确定各阶段时间节点和阶段成果
	5-12月	(1) 调研、采购选频自动监测设备，试运行 (2) 调研国际组织、欧盟及意大利法规标准体系 (3) 调研 ITU-T 中 K113 在各国中的应用和开展情况，巡测监测在监测网络中的应用及已完成的电磁辐射类项目成果 (4) 各种监测方式在区域电磁辐射水平监测结果比较及

		总结建议
	9月	意方专家赴京 (1) 指导中方在进行中央广播电视发射塔周围电磁辐射水平监测中建立基于 Arduino 开源电子原型平台的广播电视发射设施电磁辐射预测模型, 并进行应用测试; (2) 培训雷达电磁辐射监测方法。
	11-12月	北京市电磁辐射环境自动监测网络代表性研究;
	12月	阶段总结
2019年	2-4月	中方技术人员 赴意大利 Arpa Piemonte 实验室工作 10 天
	4月	中方工作组 赴意大利 交流阶段成果成效, 交流电磁投诉应对措施; 进行现场监测方法和技术的学习
	5月	意方专家赴京 (1) 参加在京召开辐射专题讲座 (2) 接受高压直流监测培训
	5-7月	意方调研欧盟国家电磁辐射监测网络现状, 提出方案建议。
	8-12月	数据及资料汇总、处理、评价等, 编写阶段技术报告和方案报告
	2020年	1-5月
5-6月		中方团组 赴意 交流监测数据分析与检验方法及电磁辐射管理策略和措施, 并总结合作项目最终成果, 基于前期的成果讨论下一步合作领域
6-10月		完成项目总报告

附件 2 预算明细表

序号	预算内容	预算类别	意方资助	北京投入	总投入
			单位: 万欧元	单位: 万欧元	单位: 万欧元
1	电磁辐射选频自动设备 1 套	设备购置费	4.46	0	4.46
2	项目报告调研及编制	技术咨询费	5.0	0	5.0
3	培训费	专家咨询费	2.0	0	2.0
4	大型辐射设施电磁辐射水平调查或电磁环境调查	技术咨询费	0	13.51	13.51
5	电磁辐射监测质量保证和数据收集	技术咨询费	0	6.7602	6.7602
6	差旅费	国内差旅费	0	0	0
7		欧洲差旅费	5.0	0	5.0
8	专家咨询费	专家咨询费	0.5	0	0.5
9	其他工作费	翻译费	1.5	0	1.5
10	管理费	管理费	2.0	0	2.0
合计			20.46	20.2702	40.7302

注: 欧元与人民币汇率按 7.4:1 折算