最后报告

ITU-D第1研究组

第23/1号课题

与人体电磁场暴露相关的战略和政策

2010-2014年第5研究期

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第 23/1 号课题

与人体电磁场暴露相关的战略和政策

ITU-D 研究组

作为电信发展局知识共享和能力建设议程的后盾，ITU-D 研究组支持各国实现其发展目标。通过推动为减贫和经济社会发展进行 ICT 知识的创建、共享和运用，ITU-D 研究组鼓励为成员国创作条件，利用知识更有效地实现其发展目标。

知识平台

ITU-D 研究组通过的输出成果和相关参考资料，被用于 193 个国际电联成员国的政策、战略、项目和特别举措的落实工作。这些活动还有助于巩固成员的知识共享基础。

信息交换和知识共享中枢

共同关心议题的共享是通过面对面会议、电子论坛和远程与会，在鼓励公开讨论和信息交流的气氛中实现的。

信息存储库

研究组成员根据收到的供审议的输入文件起草报告、导则、最佳做法和建议书。信息通过调查、文稿和案例研究采集，并通过内容管理和网络发布工具提供成员方便地使用。

第 1 研究组

2010-2014 年研究期，第 1 研究组受命研究有关有利环境、网络安全、ICT 应用和互联网相关问题领域的九个课题。工作重点是最有利于各国从电信/ICT 推动持续发展、创造就业、经济社会和文化发展中受益的国家电信政策和战略，同时考虑到发展中国家的优先问题。此项工作包括电信/ICT 的接入政策，特别是残疾人和有特殊需要的人们的无障碍获取，以及电信/ICT 的网络安全。此外，本组的工作还侧重于下一代网络的资费政策和资费模式、融合问题、宽带固定和移动业务的普遍接入、影响分析和成本与结算原则的应用，同时兼顾 ITU-T 和 ITU-R 部门开展的研究以及发展中国家的优先事宜。

本报告是由来自不同主管部门和组织的众多志愿人员编写的。文中提到了某些公司或产品，但这并不意味着它们得到了国际电联的认可或推崇。文中表述的仅为作者的意见，与国际电联无关。

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第 23/1 号课题

1 背景

1.1 在过去几年中，为满足城市和农村社区电信和信息技术（ICT）的需求，部署了不同来源的射频（RF）电磁场（EMF），这在过去几年发展非常迅速。通信技术部署的增加带来了竞争、流量增加、业务质量需求、网络覆盖以及新技术的引入。这一现象已经引起了公众关于长期暴露于通信设备发出的无线电信号可能带来的对人体健康的危害的关注。

1.2 国际电信联盟 2011 年统计数据库表明，在 2011 年移动蜂窝注册用户数达到了 60 亿。当用户达到 59 亿时，全球和发展中世界普及率分别为 87%和 79%[1]。随着移动业务的增长，预期全球移动电话用户数将继续增加，这意味着基站也将增加。

1.3 社会上对于电信设施无线电信号暴露可能造成的影响的担忧，也因为这些设施的建立并不总能征询民意而愈演愈烈。有证据显示射频暴露可能产生的有害效应是包容万象的，这一事实导致了很多结论，诸如在世界上一些国家被认为可能引发严重健康威胁。该报告的更高价值在于考察了某些国家如何防止射频暴露负面效应的出现。

1.4 移动电话从一些国家流向另一些国家导致了对此类设备的控制和监控变得很困难。也有一些关注认为移动电话的 SAR 是否兼容或符合规定很难监测，因为设计用以实现这些功能的设备很难购买到。对基站的辐射需要进行监测，而这也需要监控设备和使用这些设备的专家。

1.5 为赢得人们（消费者）的对无线电通信的持续发展需求至关重要的信任，国际电联电信标准化部门（ITU-T）第 5 研究组（SG5）和国际电联无线电通信部门（ITU-R）第 1 研究组（SG1）第 1C 工作组（WP1C）已经开展了关于非电离辐射测量的研究，以提供尤其是有关测量所使用的设备/工具和程序方面的信息。

1.6 国际电联电信发展部门（ITU-D）第 1 研究组（SG1）第 23/1 课题（Q23/1）对各国制定的不同规制和通信机制进行了研究，以便使人们更加了解知情，并为无线电通信系统的部署和运行提供了方便。

1.7 有关“与人体暴露于电磁场的相关战略和政策”的第 23/1 课题负责整理和分析各国制定的用于授权无线电通信设施安装的监管政策。这个课题的来源是因为人们认为长期暴露于无线电通信设备的发射环境下将会给人体带来伤害。

1.8 因为目前的研究没有最终显示会对人体产生任何伤害，有必要将这一信息告知消费者，以便促进通信设备的平稳部署。已有证据表明，在一些国家已经出现公共电信运营商拒绝陆地应用（用于网络部署）的情况。在一些例子里，人们将得病归罪于通信运营商，认为是暴露于设备的射频环境导致人生病。

[1] 2011 年的世界：ICT 的事实和数据，2011 年 10 月。

1.9 因此，国际电联有必要表明立场，拿出可供其成员国使用的指南，避免出现拒绝开展通信网络部署的情况，同时采取谨慎措施，避免因长期暴露于射频环境而带来的任何可能的危害。

1.10 在迪拜召开的 2012 年世界电信标准化全会（WTSA-12）做出了以下决议：

– 第 72 号决议“有关电磁场人体暴露的测量问题”

1.11 此外，在印度海得拉巴召开的 2010 年世界电信发展大会（WTDC-10）批准了以下文件：

– 第 62 号决议“有关人体暴露于电磁场的测量问题”

– 批准了有关“与人体暴露于电磁场相关的战略和政策”的第 23/1 号 ITU-D 课题。

1.12 在墨西哥瓜达拉哈拉召开的全权代表大会（PP-10）批准了第 176 号新决议“人体暴露电磁场及其测量”，并鼓励世界不同区域的成员国相互合作，分享专家资源，并在测量和培训方面提供帮助。

1.13 PP-10 第 176 号决议指示电信发展局（BDT）主任与电信标准化局（TSB）主任和无线电通信局（BR）主任合作：

– 鼓励成员国合作共享专家和资源；

– 组织召开区域性研讨会和讲习班。

2 本报告的范围和目的

本报告预期涵盖以下范围：

2.1 整理和分析与人体暴露于射频电磁场有关的监管政策，这些政策将在授权安装无线电通信站址时加以考虑或采用。

2.2 在无线电通信系统造成的射频电磁场方面，介绍用于提高人们认识程度的战略和方法以及向人们提供的信息。

2.3 基于各国在此方面的最佳实践做法，提出增强人们认识程度的方法的指导原则。

2.4 本报告目的在于帮助成员国确保满足人体射频暴露的标准，并回应有关人体暴露的感觉问题。

2.5 报告提供以下内容：

– 有关技术参数的信息（如射频暴露限值、最小距离、天线距屋顶的高度）；

– 技术评估以确定发射天线与相关射频暴露限值的兼容；

– 详细讨论如何处理与社区设施相邻的站址的选择问题；

– 设备与射频暴露限值的兼容性的监控；以及

– 射频暴露限值测量的指导原则。

3 与其他部门和组织的合作

3.1 在研究的全过程中，该课题一直与其他部门和组织进行协调，包括：ITU-T SG5、ITU-R SG1 WP1C 以及 WHO。

3.2 已经向 ITU-T SG5 和 ITU-R SG1 WP1C 发出了联络声明，要求它们提供技术发现的综述，并定期通报它们在 EMF 方面的工作进展。研究组提供了相关活动的具体信息，并表示应加强在 EMF 方面的更多合作，让所有研究组的专家都参与近来，以避免重复劳动。这对所有研究组的工作都有益。

3.3 为缩小标准化差距，ITU-T 在全球举办了能力建设活动，以帮助各国实施 ITU-T 标准。为提高 EMF 意识程度，也举办了一些讲习班，其中最近的一次于 2013 年 5 月 9 日在意大利都灵举办，还形成了行动呼吁[2]。

3.4 工作在“频谱监控”专题的 ITU-R SG1 WP 1C 批准了《频谱监测手册》2011 版，其中涉及电离辐射测量的有关内容。

3.5 ITU-R 第 6 研究组也出版了 BS.1698（2005）建议书“工作在任意发射频率的地面广播系统设施非电离辐射场强的评估方法”。该建议书提出了广播基站射频暴露的限值预测，以帮助制定有关保护人体不受潜在的有害效应影响的标准。

3.6 ITU-T SG5 向 ITU-D 通报了新出的建议书：

– 有关“人体暴露射频电磁场的测量、评估和监控的导则”的 K.91，

– 有关“电磁场强度监控”的 K.83，

– 有关“限制临近无线电通信基站对射频信号人体辐射影响的减弱技术”的建议书 K.70 (06/2007)，

– 有关人体暴露的 ITU-T 新课题 7/5。

3.7 世界卫生组织（WHO）的观点：

3.7.1 WHO 国际 EMF 项目设立于 1996 年。其目标主要内容是：审查有关 EMF 辐射对人体影响的文献，并鼓励国际可接受的协调一致的标准。WHO 在此课题方面的合作伙伴是：国际电联，国际劳工组织（ILO）、国际非电离保护委员会（ICNIRP）、联合国环境规划署（UNEP）以及其他组织。WHO 不开展或资助研究，而是通过召开科学研讨会和健康危险评估来对研究进行评估。

3.7.2 根据 WHO 的 2011 年第 193 号情况简报[3]，没有发现任何既有的有关移动应用的负面效应，有关移动应用长期效应的研究仍在继续之中。WHO 第 304 号情况简报显示，没有让人信服的科学证据表明来自基站和无线网络的射频信号会对健康产生负面影响。[4]

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[2] 电磁场问题讲习班，2013 年 5 月 9 日，意大利都灵，详细信息可见 http://www.itu.int/en/ITU-T/climatechange/emf-1305/Documents/Turin-Call-to-Action.pdf

[3] 世卫组织情况简报第 193 号，电磁场和公共卫生：移动电话，2011 年 6 月

[4] 世卫组织情况简报第 304 号，基站和无线技术，2006 年 5 月

4 适用于人体电磁场暴露的防护原则

4.1 当前公众的关切集中于长期暴露在不足以引起急剧生理反应的电磁场环境可能对身体健康造成的影响。一份提供给世界卫生组织（WHO）无线电频率政策国际利益攸关方讲习班（2013 年 6 月 5 日，法国巴黎）的背景报告草案[5]，确认了全世界实行电磁场暴露风险管理的五类政策（可能有重合）。经确认的政策类别有：

– 基于证据的做法

– 防护性的做法

– ALARA [6]原则

– 采取自愿的做法

– 信息和磋商

报告对世卫组织调查所收到的回复[7]进行分析后指出，85 个回复的国家中，有 77 个国家有固定设备的暴露限值。在这些有明确暴露限值的国家（77 个）中，大多数是采用 ICNIRP 限值（55 个），4 个国家称已在科学证据的基础上自行设定限值，两个国家采用 FCC[8] 限值，还有 16 个国家是按 ALARA（3 个）或防护性做法（13 个），采用低于国际导则的暴露限值。

世卫组织和其他很多组织开展了有关 EMF 的研究，以便就公众对电磁场潜在危害的关切做出科学、合理和客观的解答。世卫组织[9] 解释称：“防护原则是在高度缺乏科学证据的情况下所采取的风险管理政策，它反映出有必要在不经等待科学研究结果的情况下采取措施，预防可能存在的严重风险。”

4.2 在某些情况下，人们忽视对卫生或环境危害的早期警示，仅仅只是因为没有确实的科学证据证明有风险甚至高风险存在。这种态度导致人们在健康或环境危害发生或最起码威胁证据出现之前一直处于观望状态，而未能采取反制或防护措施。人类健康和环境事故的后果是人所共知的。防护原则不允许因为没有证明就否认威胁的存在，相反，要求我们从更有效保护的角度出发，通过逆向寻求确定可能的环境和健康影响的方法。

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5 2012 年世卫组织无线电频率电磁场风险管理政策调查的分析摘要。提交世卫组织无线电频率政策国际利益攸关方讲习班（2013 年 6 月 5 日，法国巴黎）供讨论的背景文件，2013 年 5 月。作者：Denis Zmirou-Navier、Amit Dhungel 和 Clémence Varret（公共卫生高等研究学院（EHESP）环境与职业卫生系，法国雷恩；洛林大学医学院，法国南锡）

6 ALARA 即可合理达到的最低水平

7 报告草案的免责声明称：“本报告草案中的信息是基于 2012 年开展的国际调查的回复，信息尚需核实。该资料的发行没有任何明确或隐含的担保。资料的解释和使用责任由读者自负。”

8 FCC 即美国联邦通信委员会

9 电磁场和公共卫生：防护政策（世卫组织背景资料，2000 年 3 月）可见：http://www.who.int/docstore/peh-emf/publications/facts_press/EMF-Precaution.htm

4.3 防护原则并非是科学不确定性的解决方案，相反是一种行动和知识之间的常规互动。和固定规则不一样，它提供参考点（摘要或具体实例）以供经常性的审查，需要对每个个体案例做出判断。在假设严重威胁发生之前加以考虑非常有必要，遮掩就可以提前防止威胁发生，并采取有效的和适当的措施来加以预防。其目的不是要在预防方面变得没有必要的小心，而是在早期阶段对威胁进行清点。

4.4 总而言之，有两种相反的态度：一种是积极寻找威胁的存在的确定性及其强度，另一种是视而不见。显然视而不见对于威胁管理而言是无益的，而对于防护和预防原则有一些通用的规则：威胁的确定，评估和定级。在危险的基本现象和存在都不具备确定性的时候，威胁是假想的。但是，即使这没有得到确认，也不意味着威胁就可以视为不太可能发生或直接可以忽视。即使是确定了存在威胁，其精确的可能性依然未知。因此，防护原则的范围从理论上而言，是可能无限制的。

4.5 防护原则的适用使得主管当局在面临当前或未来暴露导致缺乏科学知识的可能的、严重的、不可逆的伤害情况以及在不确定性盛行情况下采取的健康防护性措施成为合理行动。历史告诉我们，在出现了第一个警报信号之后马上采取防护原则，使得我们避免了与石棉、烟草 PCB、X 射线等相关的成本。为了科学完整性起见，决策机构应考虑到环境用药在寻找真正元凶时的偏差，这类偏差可能对人体健康和环境产生危害。

4.6 防护原则基于不同的证据等级（或证据力度）以证明可能的暴露级别的降低。证据等级取决于：采取行动或者不采取行动导致的成本的特性及其均衡；从所考虑的产品或物质能够获得的益处；可用性或替代性；等等。如果等待较高等级的因果关系的科学证据，或对相关机制的了解，将被证明是成本较高的，这些成本包括补偿性赔偿、健康看护、失业和科研团体威信的受损等。用于解释行动合理性的选定的证据级别不能决定任何具体措施或行动类别。它取决于诸如措施成本、资金、威胁来源（如自愿或强迫）等因素。各利益攸关方均应参与其中，以便帮助进行风险管理难题的评估，并选择用于减少暴露的行动的级别和类型。

4.7 1972 年斯德哥尔摩召开的联合国人类环境大会确立了环境领域的第一个权利和义务。其原则 1 规定：

– “任何人都享有拥有自由、平等、适合的生存条件的权利，能够生活在一个能够以尊严和幸福为生存质量的环境中，且其应有为现在和未来世代改善和保护环境的责任，”

– 在联合国系统内，防护原则第一次出现在 1992 年里约环境和发展宣言的原则 15：“当出现严重的不可逆的损害威胁时，缺乏科学确定性不能作为延迟采取有效措施防止环境恶化的理由”，以及在联合国环境框架公约（UNFCCC，1994）及其京都协议（1997）。

4.8 防护原则在以下文件中载明：

a) WTO 协定检疫和植物检疫应用（SPS 协定）（1994）中有关防护原则的第 5.7 条，其中清楚规定允许政府在缺乏足够科学证据的情况下对一个产品或流程的最终决定采取防护性做法。

b) 2000 年 1 月在蒙特利尔批准的生物安全协议。实际上，今天在生物安全协议中明确引入防护原则是更为广泛的推动将该原则载入法律框架的行动的一部分。

注：防护原则从来没有在WTO协定中明确载入。负责该组织成员之间争端解决的争端解决组织（DSB）总是拒绝就防护原则的真正范围做出任何决定，因为它认为该原则从来就不是通用的法律原则。如果可能存在潜在威胁，则DSB在出现危险情况可见证据的情况下完全基于该原则授权进行贸易限制。

5 一些国家监管政策分析

在起草这份报告时，对一些国家用于授权无线电通信基站建设的人体暴露电磁场监管政策进行了分析和整理。同时也讨论了有关向人们告知因无线电通信系统发出的电磁场的效应的战略和方法。

5.1 科特迪瓦

政策：管制机构和其他本地主管部门负责批准科特迪瓦的无线电安装的实施或修改。已经为防止社区敏感区域和易受伤害人群受到辐射影响采取了防护措施，其中敏感区域包括医院、学校、托儿所、活动区域等。这些防护措施不是清除通信天线，而是对天线模式做出特别关注，防止不必要辐射。在部署通信天线之前，做以下工作：

– 评估技术特性是否符合基于 ITU-T 建议书的监管要求。

– 对站点进行确认，以确保工作按照建筑许可进行。

– 进行技术分析，以便最终授权站点运行。

– 根据相关标准在国家层面上对站点进行每年一次的检测。

– 同时正在开展一项政策项目以监管射频暴露问题：

– 根据 ICNIRP 指南，确定科特迪瓦境内有关射频发射设施暴露的最低限值。

– 确定此类设施拥有者的义务。

信息提供和公众介入：在设立天线前进行公开磋商。使用广播业务向公众传递关于射频信号的信息。监管机构网站上有一个 FAQ 区域用于介绍非电离辐射和 SAR。测量结果将公布。

分析

其他成员国可以试用该政策。建议有关确定最小限值的项目参照有关限定射频源暴露的 ICNIRP 指南。

5.2 巴西

政策：巴西暴露限值遵循国际非电离辐射保护委员会（ICNIRP）指南。巴西联邦法律负责监控和确保无线电通信系统符合 WHO 推荐的电磁场强度。

巴西辐射电平测量；Anatel 负责评估在医院、诊所、学校、日间看护中心和老年之家半径 50 米范围内无线电通信站点许可发放 60 天内对站点的 EMP 暴露是否符合规定进行评估。

EMF 暴露验证有效期为最长 5 年。Anatel 负责在年度实施规划内根据法律以及社会和呼叫中心、网页和其他公共关系渠道等不同来源收集到的具体需求对已规划的站址进行测量。

大多数这些兼容评估与蜂窝基站收发信台（BTS）有关，其中一些这类评估是由于邻里投诉和关于 EMF 暴露的关注。

信息提供：Anatel 发布了一个提供总暴露率理论计算的软件，其中采用了自由空间传输模型和国家无线电通信站点数据库。Anatel 执行处的测量结果整合进入了该软件，这样在一些没有测量值的地点，也能提供计算值。

Anatel 网页也提供了巴西境内所有批准的移动电话的比吸收率（SAR）。巴西认为提供一份具有测量结果和理论计算的互动地图，将有助于确保向公众提供相关的准确信息。

分析

该政策遵循 WHO 和 ICNIRP 指南。关键区域如医院等已被考虑。收到投诉这一事实表明公众可能对 EMF 已有了解，因此发布基于软件的数据将是向公众提供信息的一种好的途径。

5.3 韩国

政策：采用了 ICNIRP 和 IEEE EMF 暴露限值。报道了对基站和广播发射机的 EMF 环境评估结果。所有辐射射频能量的设备将被要求进行 EMF 电平测量，这其中以下无线电设备除外：移动基站、急救站、位于公众极少进入的区域之内，如高山、小岛等，以及低功率站点，如那些无需许可的无线麦克风、无线控制器，以及无线寻呼机。

在公共区域附近架设的无线站点需要报告 EMF 电平的评定值，以便在开展正常运行前测试是否符合限值要求。

信息提供：从 2004 年起，每半年发布一次两种类型的新闻通讯，一种是 EMF 测量标准（来自 RRA），另一种是生物效应（来自 KIEES），暴露限值和政策。每两年发布一次包含 EMF 暴露信息的指导书和 CD。每年向专业认识发布一份专门期刊。自 1999 年起，每年举办一次或两次有关 EMF 和生物学关系的研讨会。

分析

韩国在 EMF 有关的研究项目方面非常积极。公众也通过新闻报纸、CD、研讨会和书籍等介入其中。它们也采用了 ICNIRP 和 IEEE 标准。

5.4 以色列

政策：采用了 ICNIRP 暴露限值。环境保护部负责控制与人体暴露基站电磁场有关的事项。ISR 监管框架基于以下：非电离辐射法，2006 年；以及非电离辐射规定，2009 年。按照非电离辐射法，防护原则是强制性的。以色列是第一个对发射基站实施年度测量的。每个市民都可以在网上看到所有的蜂窝基站：2013 年 7 月 10 日为 8591 个基站（见 xls 文件[10]）。该信息包括运营商的名录、确切地址、经纬度、批准和架设时间。

[10] http://www.sviva.gov.il/subjectsEnv/Radiation/Communication_Facilities/cellular/Documents/shidur_selulariim_peilim_1.xls

环境保护部噪声和辐射降低司于 2010 年实施了一个革新性的项目，允许辐射专员在其办公室里一年 365 天、每天 24 小时监控该国所有区域涉及 30 000 UMTS 部门的辐射。该项目从蜂窝运营商无线交换控制器的原始数据文件中提取相关信息。数据进行真实性验证、分析，并与限值进行比较。违反规定的将被标出。

此外，该系统也可以用于不间断监控如下参数：射频相对于分配频谱的使用率；服务质量参数，如掉话率、呼叫屏蔽、返回业务时间、区域类型覆盖率。

信息提供：以色列监控技术提供了高可用的数据，因其全部是电子的，且可以在该部的网站上获取、分析，并由该部网站公布，从而确保了对普通公众的完全透明。只要该系统显示出了一个违反规定的情况，它将自动发出报警，一方面是内部向该部发出，另一方面是向运营商发出；同时提供从活动开始到结束的全部记录。违反规定列表也在网页上显示。

分析

以色列已经实施了一个用户友好的更为有效和可靠的监控系统。

由于广播发射机和蜂窝基站对人们发出的过多射频辐射，且由于在科学上尚无明确的伤害效应，以色列建议首要考虑采用替代性的电缆、光纤和卫星通信，以取代固定无线、无线电视和无线互联网路由器。同样，运营商之间的无线基站共享应加以促进，以便降低基站的数量和人体对 EMF 场的暴露。

5.5 委内瑞拉

政策：CONATEL 于 2005 年 6 月 3 日发布了第 581 行政决定。该行政决定旨在为在 3 kHz 至 300 GHz 区间运营的固定无线电台产生的无线电暴露确定安全条件，即发射天线安装的技术要求，以及确定此类辐射是否符合现有法规的方法。

行政规定包括一系列有关工作在 3 kHz 至 300 GHz 固定无线电台的无线辐射安全条件的条款，以及 3 个附件。它适用于所有工作在 3 kHz 至 300 GHz 固定无线电台的运营商。

在暴露限值方面，行政决定要求固定无线电台运营商必须确保在任何可接入区域测得的由该无线电台发射的能量电平不得超过其在相关表格中根据委内瑞拉标准 COVEIN 2238 规定在行政决定覆盖的频率范围内登记的频率的最大暴露限值。

根据卫生部第 508 号决议的规定，设在医院、学校、疗养院、孤儿院以及运动场等建筑物内的无线电台，应为这些区域的人们考虑就电磁场暴露电平做出必要调整，要低于委内瑞拉 COVEIN 2238 标准规定限值的十倍。

信息提供：为确保国家法令的遵守，CONATEL 在全国范围对非电离无线电台进行监测，以便验证电信运营商的报告。然后，它向卫生部提交报告，后者可以据此裁定这些电台对人们健康的影响范围，并向那些感觉受到类电台的部署和运营影响的人提供适当的、完全和及时的回应。

此外，组织社区开展有关无线电台发出辐射及其对人们健康的影响的信息性讲座。讲座内容包括国家电信业务发展情况以及与居民区电磁场有关基本的监管、立法和惯例规则，唯一目的是为了促进居民融入国家电信发展和演进过程。

分析

该政策采用了 WHO 和 ICNIRP 指南的内容。此外，COVEIN 标准 2238 基本内容也采用了 ICNIRP 建议书的内容。

监管机构、运营商和具有相当资质的实体负责向公众提供有价值信息。

5.6 匈牙利

政策：在匈牙利，电磁场辐射方面的事务由专门机构负责，即国家公众健康服务机构下述的国家射频生物和射频卫生研究所（NRIRR）。其职责之一是负责无线电台的许可证发放并开展个别的测量。但是，因为能力和专家资源有限，匈牙利国家媒体和信息通信总局（NMIAH）与 NRIRR 以协议方式安装了一个国家 EMF 监测和信息网络。

测量项目是通过将 25 个测量工具在每两周移动至新的地点来实现的。测量地点选择的是在无线电设施附件的教育机构、托儿所和学校。根据个人的要求，也可以临时开展一些测试。

信息提供：测量结果通过网络公布。

分析

全国性的监控设施并将结果在网上公布，这回应了公众对电磁场健康威胁的关注，同时也提高了公众的认识程度。

5.7 乌兹别克斯坦

政策：乌兹别克斯坦有关人体暴露电磁场辐射问题的国家政策涉及两个法律，即：无线电频谱法和国家卫生监督法。无线电频谱法规定了人类健康优先考虑原则，以及在使用射频和高频率设备时必须考虑的环境条件。国家卫生监督法规定了确保人们卫生流行病学福利和辐射安全的社会关系，建立了拥有有利生存环境及其他权利的人权，并确保这些权利的实现。

负责重建或设计无线电设施的组织被要求遵守这些卫生准则和规则。负责对遵守这些要求或限值行为进行监督的是卫生部下属的国家卫生和流行病学机构。在设定无线电设施辐射出的 EMF 电平值时采用了计算和真实测量两类值。

信息提供：每个向周围环境传送电磁能量的无线电设施都必须拥有一份由其负责人及国家卫生监察官签发的卫生护照，并在该设施处保存。

5.8 贝宁

政策：贝宁国家监管机构（ATRPT）于 2012 年购买了包括设备在内的固定和移动监测站，用于对人体暴露 NIR 的辐射进行评估。该设备在一个固定点对电场强进行测量。ATRPT 在 2012 年也召开了一次全国性研讨会，用于讨论非电离辐射对人类健康的影响。

在研讨会上，提出了三个监管文件草案：

– 有关保护个人不受 0 至 300 GHz 电、磁和电磁场效应影响的法令草案；

– 有关无线电台安装条件的法令草案；

– 有关电信终端设备和无线电终端设备技术规范的法令草案；

制定的监管框架处理以下问题：

– 采用的暴露电平是由 INCIRP 为普通公众设定的。对于工人和普通公众没有做出去人。

– 重点放在防护原则上。对于学校和类似机构，托儿所、幼儿园和公园，其电场、磁场和电磁场的电平应不高于为普通公众设定的基线值的 25%。

– 此外，为防止运营商功率浮动，在运营商的天线距离学校、医院及其他敏感机构的中心不足 100 米情况下，禁止运营商将其天线主瓣指向学校、医院及其他敏感机构。

– 要求运营商在新的基站部署期间对暴露电平进行自我监测。

– 运营商必须在其设施外建设防护栏。

– 对于终端，最大比吸收率（SAR）为 2W/kg。

– ATRPT 负责监控对规则设定的暴露电平的遵守情况。

信息提供：开展了有关非电离辐射对人体健康影响的活动以提高公众对此问题的知情度。

5.9 印度

政策：印度电磁场案例研究（可见 1/278 号文件及本报告附件 10）包含了一些耐人寻味的有关移动电话使用的输入资料，资料显示，发展中国家的移动电话使用程度很高。这可能导致的一个结果是，许多呼叫中心的活动是通过移动电话，而不是之前的固定电话来处理。

与欧洲相比，印度和其他发展中国家的一些参数可能存在差异，具体有：

– 移动电话的使用数量；

– 运营商数量；

– 人口密度较高；

– 城市地区的无机增长；

– 隔离建筑的狭窄通道；

– 每个运营商平均持有的频谱较少；

– 辐射功率为平均每扇区 20 瓦；

– 天线高度较低；

– 覆盖条件较差，也导致手持设备在较高的功率水平运行；

– 基础设施的安装和维护由运营商外包给第三方；

– 基层和本地主管部门缺乏技术经验，不足以理解基于国际电联 K 系列建议书的排斥区域计算。对这一点的考虑还需要结合向 74.7 万个 BTS 普及监测要求的背景。

该案例研究还提及许多其他有关印度政策举措的输入资料，包括含有详细信息的网络参考链接。[11]

6 有关非电离电磁辐射以及部署无线网络和相关基础设施时人体暴露监管的国际电联中美洲项目

6.1 该项目旨在分析在中美洲由于社会对于电磁场辐射的担忧而造成的移动网络及其相关基础设施部署困难的问题，并考察这些国家对此问题的监管情况。类似的，该项目基于这些研究和评估开展，并提出解决方案，包括变动或政策发展；试验项目；在上述测量中介入社会通信；以及开发必需的通用工具，以便在部署无线网络时促进人们及其政治和民间团体的社会接纳。

特别的，对于后面的议题，萨尔瓦多开展了测量试验，这将在后文介绍。

6.2 由于社会上对于天线以及射频暴露可能造成的效应的担忧导致的无线电通信网络部署难已经成了一个不好解决的问题，这已成为国际电联、美洲间电信委员会（CITEL）以及中美洲电信技术委员会（COMTELCA）研究的优先课题。

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[11] a) 电磁场之旅，可见 http://www.dot.gov.in/access-services/journey-emf

b) 自 2012 年 9 月 1 日起生效的新 SAR 值，可查阅：
http://www.dot.gov.in/sites/default/files/Revision%20of%20SAR%20Limit%20mobile%20handsets.pdf

c) 自 2012 年 9 月 1 日起生效的修订暴露限值

d) 自 2013 年 8 月 1 日起生效的移动塔架安装修订建议导则，
http://www.dot.gov.in/sites/default/files/Advisory%20Guidelines%20For%20State%20Govts%20effective%20from%2001-08-13.pdf

e) 移动电话使用防护导则，
http://www.dot.gov.in/sites/default/files/Precautionary%20Guidelines%20for%20mobile%20Users.pdf

f) 移动通信手册——无线电波与安全，
http://www.dot.gov.in/sites/default/files/Mobile%20Communication-Radio%20Waves%20and%20Safety%2010th%20sept%2012%20final.pdf

g) TEC 移动电话测试程序，http://www.dot.gov.in/sites/default/files/SAR%20Testing.pdf

h) 对 BTS 天线电磁场暴露的测量，
http://www.dot.gov.in/sites/default/files/TEC%20Test%20Procedure%20EMFields%20From%20BTS%20Antennae.pdf

i) 电磁场投诉处理系统

j) 征集有关电磁场的研发提案的通知，http://www.dot.gov.in/sites/default/files/748%20circular.pdf

k) 如下所示，印度在 2013 年 5 月 9 日意大利都灵的国际电联电磁场讲习班上的介绍展示，也提供了一组新的输入资料，即关于电磁场政策概述与合规——印度政策概述的资料“移动塔架和手机的电磁场（EMF）辐射”，http://www.itu.int/en/ITU-T/climatechange/emf-1305/Documents/Presentations/s2part2p3-RKBhatnagar.pdf，以及印度在网络与设备电磁场合规方面的研究结果，
http://www.itu.int/en/ITU-T/climatechange/emf-1305/Documents/Presentations/s3p5-RKBhatnagar.pdf

6.3 该项目目的是要在中美洲研究、提出并实施一个项目，该项目涉及一个移动电话杆和基础设施的部署以及非电离辐射及健康保护等议题，根据的是若干决议，如国际电联 2010 年全权代表大会第 176 号决议（2010 年，瓜达拉哈拉）“电磁场对人体的辐射及测量”，第 72 号决议（WTSA，2008 年约翰内斯堡，2012 年迪拜）与人体暴露电磁场有关的测量，以及第 62 号决议（WTDC，2010 海得拉巴）。此外，该项目考虑向电信发展部门第 1 研究组以及 ITU-T 第 5 研究组拉丁美洲和加勒比区域组提供有关第 23/1 号课题方面获得的经验：“与人体暴露电磁场有关的战略和政策”。

6.4 该项目由国际电联发展局（BDT）负责实施，通过中美洲与古巴、墨西哥和多米尼加共和国区域办事处与美洲区域办事处紧密合作，并由外部专家以及参加该项目的国家帮助完成。

6.5 社会上对于电磁辐射的担忧是通过社区和电信业务用户组通过对部署天线的不情愿、担心对健康的可能伤害而表达出来的。中美洲国家曾在寻求获得解决办法，这其中包括制定一套通用工具，用来促进无线网络的部署，同时促进人们及其政治和民事组织的社会接纳程度。

6.6 萨尔瓦多、巴拿马和洪都拉斯加入了该项目，目的是要开展一项研究，以确定在其国内由于对电磁辐射的担忧而造成的无线网络及其相关基础设施的部署的当前情况，其最终目标是要促进天线及其相关基础设施的部署。

6.7 决定与可能与此话题相关的政府有关部门开会：电信监管机构、卫生部、环境部向市政府提供支持的国家办公室、都市区域以及主要城市的市政规划办公室、市长协会、运营公司。目的是一方面获取各方面的信息，不一定是关联的，同时也期望在涉及此事的国家政府各分支机构之间达成一致观点。

6.8 我们可能对三个具有以下特征的参与国家的两个进行以上问题的评估，而类似特征也存在于那些剩余的拉丁美洲国家和世界其他区域的国家。

政府在各个领域的政策缺乏一致性。国家政府各个分支机构之间缺乏整合以及共同的政策。在 NIR 及健康保护问题上缺乏一个社会沟通政策。市政规则的不遵守。在市层面上存在非授权的设施。人们对于设施存在拒绝情绪。参与环境组织。议题的政治化。担忧 NIR 可能造成的健康影响。社会报警开始出现。在相邻或本地区域对设施部署的拒绝有增加趋势。

6.9 这种冲突不是技术性的，也不是商业性的，从根本上说，这也不是一个与健康有关的问题，而是一个基于社会对危险的感知，继而出现了人们对辐射的惧怕，通过对市长和市政立法机构施加压力，从而在电信设施部署问题上产生这些监管障碍。

6.10 一些国家没有专门针对 NIR 的使用进行国家卫生立法，但是在一些情况下在电信部门有相关规章，而在其他情况下适用 COMTELCA 的规则。在所有情况下，我们就开展本地立法方面提出具体建议。

6.11 根据各国具体情况，并根据 WHO“建立有关电磁场威胁的对话”文件，我们为每个国家都提出了如何管理社会对于部署天线接受程度的建议，并提供了为实现该目标的随时间变化的可持续工作计划。

6.12 起草了有关天线安装好实践指南的草案，其内容从一份评论给出的有关移动电话操作和非电离辐射基本知识，到保护环境、降低视觉印象以及试图规划监管的安装方法，文物保护和辐射监控。同时预计还将纳入一些有关市级层面许可程序的指南，目的在于在不同城市的相同问题上取得一致性的方案。

6.13 开展试验的萨尔瓦多购买了以下设备：

– NIR 便携测量系统。

– 提供、校准、安装和管理两套用于电磁场的固定测量设备，及其具有必要应用的控制中心，基于 ITU-T K.83 建议书的规定，进行数据管理并发布到网上。

– 萨尔瓦多首都区域内一部分的辐射地图。

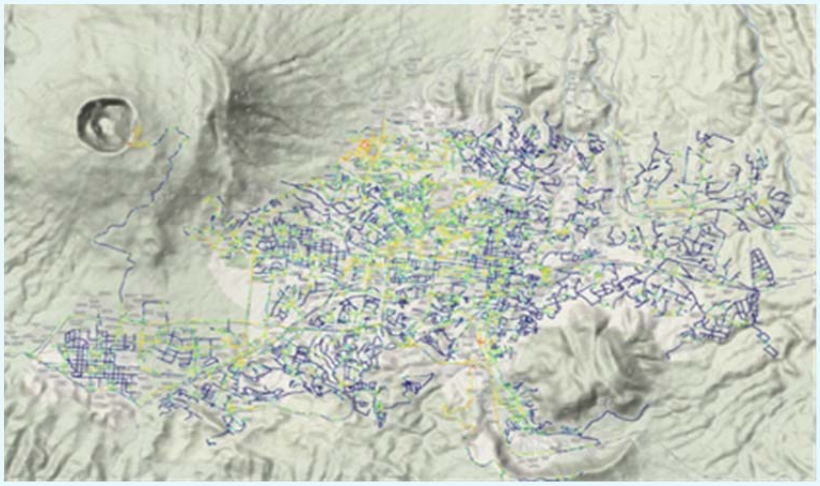
购买设备由国际电联通过招标方式进行，其中该波控公司（Wave Control）中标。

6.14 该工具未基于所要遵守的测量标准，因此它部取代执行部门开展的控制测量，并应被视为一个与公众进行社交沟通的附加工具，以减轻其对 NIR 可能对健康负面影响的担忧。目的是为了在街道级别和公众部门确定的敏感地点测量 NIR 电平。这些电平应以不间断方式进行监控。这将有助于以透明和可以理解的方式（网络、公告等）告诉公众，辐射电平远低于那些规则制定的值，目的是为了减轻公众的担忧。

6.15 通过在圣萨尔瓦多都市圈内的一个区域内的每个街道进行步行测量，获得了电磁场地图，从而能够在街道级别上对电磁场电平有个完整的总体印象。在频率范围 300 kHz 至 3 GHz（宽带）范围内，通过电磁场同向探头，对街道级别进行了测量。城市每个点的电平是通过动态方式与日期和 GPS 位置一次测量的。

6.16 这个过程是通过 SIGET 提供的一辆汽车和后勤人员实现的。电平测量单位为 V/m，因此在人体暴露射频电磁场限值方面可以与国际标准规定的电频进行直接比较。数据经采集和存储，加上日期和 GPS 方位，随后通过地理信息系统（GIS）传送，后者对数据进行可视化处理后以色彩代表值的方式显示在地图上。

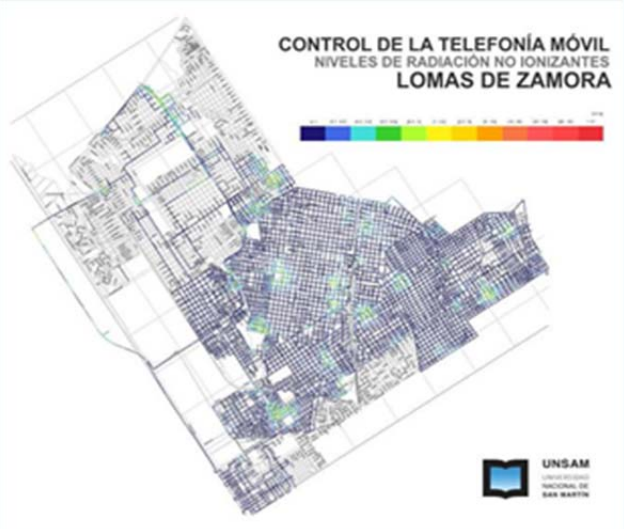
图1：圣萨尔瓦多NIR地图，在本报告期间尚未出版



6.17 在这个地图中，你可以看到 NIR 的层级，后者可以在一个尺度上从蓝色到红色进行比较，在红色之上已超出 WHO 规定的最大限值。

6.18 下图为一份阿根廷城市洛马斯德萨莫拉的类似地图，其中已经公布了有关 NIR 的级别高低：

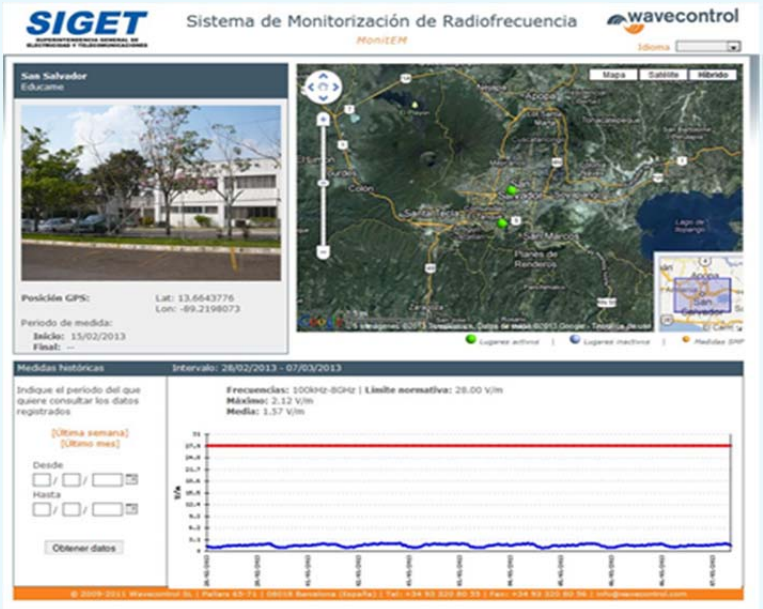
图2：连续监测系统 – “NIR的民众控制”



6.19 为实现不同邻里之间以及因对于 NIR 的恐惧而导致高度冲突的邻里之间的安宁，作为试验开展了一个小的连续性的监测项目。人们可以登录到 SIGET 网站，点击绿点将可以看到选定点的如下图所示的测量结果。程序系统将把带有频率信息的报告通过电子邮件送给关键人物，如相邻地区理事会主席、学校校长、邻里领导、与此有关的非政府协会等。

6.20 在准备本份报告时，SIGET 尚未公开发布有关信息，因此未纳入对应的链接。

图3：萨尔瓦多与国际电联联合开展的连续监测系统项目



6.21 对于萨尔瓦多案例，我们采用了一个宽带探头和一个窄带探头，其中包括在该国运营的蜂窝移动公司的频段。

6.22 美洲地区连续监测系统

除本项目外，美洲地区很多国家正在根据 ITU-T K.83 建议书的规定发展自身的连续监测系统。

阿根廷： 在扩展阶段

哥伦比亚： 已于近期安装（尚未公布）

厄瓜多尔： 已于近期安装（尚未公布）

巴西： 已于近期购买，尚未安装

欲了解本项目更多情况，请洽：Héctor Mario Carril，hectormario.carril@ties.itu.int 或国际电联洪都拉斯区域办事处 Miguel Alcaine，miguel.alcaine@itu.int。

7 为成员国提供的指导

7.1 建议成员国采用 ICNIRP 制定的 EMF 指导原则（获得世卫组织[12] 和国际电联[13] 支持），而不是自己发明其自身的门限值。WHO 通过其国际 EMF 项目已经制定了一份有关开发基于健康的 EMF 标准的框架，可以用这个框架来制定与国际标准不同的国家标准。[14] 世卫组织认识到一些国家可能选择采用其他射频暴露风险管理政策。

7.2 在国家层面，限值暴露 EMF 的规定可以范围两类，即自愿的和强制性的。

7.2.1 自愿条款包括导则、指示和建议，这些条款不具法律意义上的强制性，通常没有法律执行力，比如由 ICNIRP、IEEE 和其他组织制定的用于为各国政府机构提供指导的国际导则，它们只有当该国将其纳入其自身立法框架后才具备法律约束力。

7.2.2 强制、义务或法律约束性监管条款包括法律、法案、规章、条例、决定和法令，且需要一个立法框架。

7.2.3 WHO 的 EMF 项目认为，如果能促成将现有的国际标准变为法律范本，则将更有助于帮助感兴趣的国家将其纳入本国法律。此外，该法律范本[15]将使所有希望制定国内标准的国家也能够在此框架内开展工作。

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[12] 世卫组织，基于卫生的电磁场标准制定框架，2006 年，可查阅：http://www.who.int/peh-emf/standards/framework/en/index.html

[13] 国际电联，关于遵守人体电磁场暴露限值的指导原则，k.52，2004 年 12 月

[14] 世卫组织，基于卫生的电磁场标准制定框架。

[15] 世卫组织，电磁场保护的法律范本，2006 年，可查阅：http://www.who.int/entity/peh-emf/standards/emf_model/en/index.html

7.3 IEC、IEEE/ICES 以及 WHO EMF 项目的 CENELEC 制定了如何遵守暴露和辐射标准的测量标准。它们可以对由于设备安装或引入一个产品导致的 EMF 暴露的测量提供指导，如为了测量移动电话的 SAR 值而进行的假体测量。

7.3.1 根据国际电联《频谱监测手册》第 5.6 章所述，对电信设备最大 NIR 电平法规的执行由负责频谱管理的机构充分利用现有专家资源开展。提交本报告的各国经验文稿显示这一执行工作通常由负责发放许可的机构负责。

7.3.2 手册进一步建议按照以下步骤开展 NIR 测量：

– 相关于无线电执照的发放工作；

– 根据 NIR 控制和监控规划定期开展，或

– 在合适原因如公众或官方要求情况下开展。[16]

7.4 需测量的发射机包括：

– 广播和蜂窝基站；

– 业务无线电台；

– 手持机只检查提供商的技术规范，因为对手持机的测量将会很昂贵。

7.5 程序

7.5.1 应具备确保遵守强制性标准的程序。对于 EMF 暴露标准，通常会要求一个组织（可能是国家的，也可能是私人的）负责通过在工地或其他区域进行计算或测量来检查是否遵循了标准。设备对于暴露限值的遵循通常是由制造商核准的（SAR 测量）。

7.5.2 目前在实际情况中评估人体暴露的导则是基于现有 IEC/CENELEC 标准。因此，建议成员国遵守 IEC/CENELEC 标准。欧洲邮政电信行政大会（CEPT）的电子通信委员会（ECC）有关非电离电磁辐射（9 kHz – 300 GHz）的测量的建议书（02）04（修订于 2003 年布拉迪斯拉发，2007 年赫尔辛基），也可供参考。

7.5.3 国际电联监测手册第 5.6 章介绍了测量程序，其中解释了站址选择、设备定位、防护、使用的设备、不确定性和报告格式。

7.5.4 建议制定一些有关在任何国家或区域移动手机流通控制的指导原则，以避免出现不兼容或不遵守规定的设备。

7.5.5 建议和一致性监测一样，定期进行辐射测量。各国也应鼓励共址和基础设施共享，以便减少不必要的天线架设，并减少人体暴露和接收到有害效应。

[16] 国际电联《频谱监测手册》2011 版，见：http://www.itu.int/pub/R-HDB-23-2011

8 结论

8.1 发布公众可查阅的报告非常重要。这可以通过使用该国现有媒体渠道来实现。有必要对测量和计算得到的量进行比较。如果测量或计算所得的值高于 ICNIRP 电平，则应在报告中特别提及并应根据现行的规则采取适当的行动。

8.2 建议一个全面的测量报告也应包含以下信息：

– 测量的宗旨与目的；

– 日期、开始和停止时间；

– 地理坐标、高过地平的高度，以及测量地点的具体特征；

– 确定发射机的列表；

– 所用的测量设备，其序列号和校准状态；

– 测量的不确定性；

– 测量协议或标准；温度或天气条件包括湿度。[17]

8.3 此外，为提高报告的可理解度，以地图、图表和相片等图示方式来表达会有更好的效果。测量结果可以连同主发射机的位置或相对位置以及所在区域如学校、医院和房间来表述。[18]

8.4 在提高公众意识方面，有必要向公众提供 EMF 产品的信息来降低有关有害暴露的认识。公众可以了解有关进口 EMF 测量设备进入该国提供 SAR 的信息。在此方面，在相邻国家进行区域协调可以有助于控制这些设备的非法交易，从而只允许授权产品进入该国。

8.5 要注意的是在业务提供商安装的基站和个人使用的手持移动电话之间有不同之处。这些设备的控制是在不同层面上的（业务提供商和客户），这要求在业务提供商和客户之间加强协调和信息共享。因此建议每个手持机的 SAR 都要提供给公众[19]以便做出知情的选择。

9 指导原则

9.1 指导原则的范围

本导则预期涵盖以下范围：

9.1.1 与人体电磁场暴露相关的监管政策，这些政策将在授权安装无线电通信站址时加以考虑或采用。

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[17] 国际电联《频谱监测手册》第 5.6 章

[18] 国际电联《频谱监测手册》第 5.6 章

[19] http://www.sartick.com/

9.1.2 描述用于就无线电通信系统造成的电磁场的影响这一问题提高公众认识并向其传播相关信息的战略和方法。

9.2 导则的目标

9.2.1 本导则是为指导成员国建立有关人体电磁场暴露的认识。

导则提供以下内容：

– 技术参数方面的信息（如，辐射限值、距离、天线伸出屋顶的高度）；

– 证明塔式设施安全性的科学结果；

– 有关如何处理敏感地区（如学校和医院）的细节；

– 监测设施遵守辐射限值的情况；以及

– 测量辐射水平的程序。

9.3 导则制定原则

有关电磁场辐射和人体暴露的主要原则如下：

9.3.1 遵守有关电磁场限制的国际电联建议书；

9.3.2 遵守 ICNIRP 导则和拟议目标；

9.3.3 遵守世卫组织、劳工组织、ICNIRP 和联合国环境署的建议（书）；

9.3.4 必须向公众告知有关任何通信设备造成的电磁场的测量结果；

9.3.5 公布的报告应写明不应超过的辐射最低要求；以及

9.3.6 在医院、学校和人口密集地区一类的区域部署无线电通信设备时应格外注意。

9.4 电磁场辐射相关运营商的义务

在部署通信设备时，运营商应确保：

9.4.1 不超过辐射限值；

9.4.2 不超过距离限值；

9.4.3 安装和运行设备前都先进行测试；

9.4.4 测试须经监管部门批准；

9.4.5 就新设施向客户征求意见并通报信息；

9.4.6 向公众告知有关新设施及其设备发出的辐射方面的信息；

9.4.7 如可能，尽量避开学院、医院等敏感地区；以及

9.4.8 投入运行的无线电通信设备上应标有如“危险”字样的大型标识。

9.5 目标

根据导则确定的电磁场辐射目标暴露限值应基于：

9.5.1 ICNIRP、IEEE 和其它国际标准化机构制定的 EMF 国际指导原则（ICNIRP 的导则获世卫组织认可）；

9.5.2 国家一级的 EMF 暴露规定可以是自愿性的（像本导则一样），也可以是强制性文书（如果该国将其纳入本国法律）；

9.5.3 如果某些发射电磁场的设备尚无可遵循的国际发射标准，成员国应通过适当的国际组织大力推动相关标准的制定；以及

9.5.4 如有必要制定国家标准，应采用世卫组织通过国际 EMF 项目开发的基于卫生的 EMF 标准制定框架。如有必要，可采用基于卫生的 EMF 标准作为国家标准。

9.6 测量

9.6.1 世卫组织 EMF 项目建议采用说明如何确保符合暴露或发射标准的测量标准。

9.6.2 关于在实际情况中评估人体暴露的导则，将基于现有的 IEC/CENELEC 标准。

9.6.3 可以参照欧洲邮电管理局会议（CEPT）下的电子信息委员会（ECC）有关测量非电离电磁辐射（9 kHz – 300 GHz）的（02）04 建议书（布拉迪斯拉发 2003 年修订版和赫尔辛基 2007 年版）。

9.6.4 国际电联频谱管理手册第 5.6 章建议开展非电离辐射（NIR）测量工作时采取以下做法：

9.6.4.1 与颁发无线电许可证的工作相结合；

9.6.4.2 根据 NIR 控制和监测计划定期进行测量；或者

9.6.4.3 根据公众或官方要求等正当理由进行。

9.6.5 手册还简要介绍了测量程序，对选址、器械定位、防护措施、所用设备、不确定因素和报告形式做了说明。

9.7 监管机构发布测量结果

9.7.1 监管机构应公布由运营商提交、并由监管机构在报告期后进行定期核实的测量结果。报告期须由监管机构确定。

9.7.2 发布的通知应对测量工作、报告期和最低目标要求做出具体说明。

9.7.3 公布的参数应按照但不限于以下设备类别进行分类：

– 广播和蜂窝基站；

– 业余无线电台；以及

– 手持设备（由于很难测量手持设备的比吸收率，而且该测量不是各个国家都必须，因此仅以检查供应商的技术规范作为手持设备的测量结果可能十分昂贵。）

9.7.4 编制公众可获取的报告非常重要。此种报告可在该国可用的媒体上进行发布。

9.8 出版物的内容与格式

9.8.1 预计一份综合测量报告应包含以下信息：

– 测量结果；

– 测量的宗旨与目的；

– 日期和起止时间；

– 测量地点的地理坐标、地表以上高度和具体特征；

– 经确认的发射机的清单；

– 所使用的设备及其序号；以及

– 测量的不确定因素。

9.8.2 需对测量和计算的数值进行比较。如果测量或计算数值高于较低 ICNIRP 水平，应在报告中突出标明，并应根据现行规定采取适当措施。

9.8.3 此外，为提高报告的可理解度，要求采用地图、图表和照片等图示方式来表示结果。这样可以显示对主发射机的位置及其距离关切区域（如学校、医院和住宅区）的相对位置的测量结果。

9.9 检查与调查

9.9.1 监管机构应对运营商提交的测量相关事项进行检查或调查，以确保合规。对于 EMF 暴露标准，监管机构应获得能通过在工作地点及其他区域进行计算和测量来检查合规性的授权。对于发射标准，设备的合规性通常由制造商进行认证。

9.9.2 不符合标准要求的设备不允许投入运营。

9.9.3 提交虚假测量结果的运营商应予以销毁设备并在全国禁止运营。

9.9.4 有关电信设备非电离辐射水平最大限值的规定的执行，取决于可利用领域内现有专业经验的频谱管理主管部门。

9.10 对指导原则的修改

9.10.1 可在考虑本导则提出的主要原则的基础上，对本导则进行修改。

9.10.2 ICNIRP 如设定新目标，本导则可能会进行修改。

9.10.3 必须征求所有利益攸关方包括公众的意见。

9.10.4 在针对本国情况对本导则做出适当修改的一段时期之后，应落实修改后的导则。

9.10.5 对本导则进行审议。审议内容将涵盖：

- 既定目标；
- 测量设备；
- 出版物；
- 需测量的设备；以及
- 测量方法。

I. Annexes

Annex 1: **RF Exposure Units and Standards**

Annex 2: **ICNIRP 1998 Exposure Levels and IEEE Levels**

Annex 3: **Mandate of Question 23/1 (WTDC-10/139 (Rev.1))**

Annex 4: **WTSA-12 Resolution 72 on "Measurement concerns related to human exposure to electromagnetic fields"'**

Annex 5: **WTDC-10 Resolution 62 on "Measurement concerns related to human exposure to EMF".**

Annex 6: **Plenipotentiary Conference (PP-10) Resolution 176 on "Human exposure to and measurement of electromagnetic fields"**

Annex 7: **ITU Project in Central America Document**

Annex 8: **Q23/1 Workplan**

Annex 9: **Documents for Q23/1**

Annex 10: **A Case Study from India on EMF**

II. List of Contributions

III. References

Annex 1: RF Exposure Units and Standards

[1]Table 1 lists the reference units of the physical quantities used in this report.

Table 1: Physical quantities and units

Quantity	Symbol	Unit	Symbol
Frequency	f	Hertz	Hz
Electric field strength	E	Volt per metre	V/m
Power	P	Watts	W
Specific Absorption Rate	SAR	Watt per kilogram or milliWatt per gram	W/kg or mW/g
Power density or power flux density	S	Watt per square metre	W/m^2
		mWatt per square cm	mW/cm^2

Various institutions define the allowed limits permitted in specific regions: ICNIRP (1998, *Guidelines*); FCC- Federal Communications Commission (1997, *Bulletin 65*), developed by IEEE (Institute of Electrical and Electronic Engineers) 1991 C95.1 and adopted by ANSI (American National Standards Institute) (1992, ANSI/IEEE C95.1); IEEE 2006 standard (C95.1-2005), not adopted by FCC. ICNIRP (1998 p. 509 table 4 and p. 511 table 7) defines the exposure thresholds of the World Health Organisation (WHO) for EMF. The European Council EC 1999/519 (Annex III, tables 1 and 2) adopted its values. The following tables refer to the exposure limits for general public/ uncontrolled/ unperturbed environment (unlike the controlled/ occupational) for the cellular (UHF bands), where 'f' represents frequency in MHz, unless otherwise stated.

A distinction is made between the exposure levels from cellular base stations and handsets. The hazards from a base station's radiation refer to the field intensity and power density generated, whereas the hazards from handsets are considered by the SAR value. The reason for the two different approaches: the far-field standard (easily computable and measured) is used for the base station case, whereas the near-field standard (SAR and phantom-based measurements) is applied for the handset case. The standards and guidelines give the 'baseline limits' for power density and SAR.

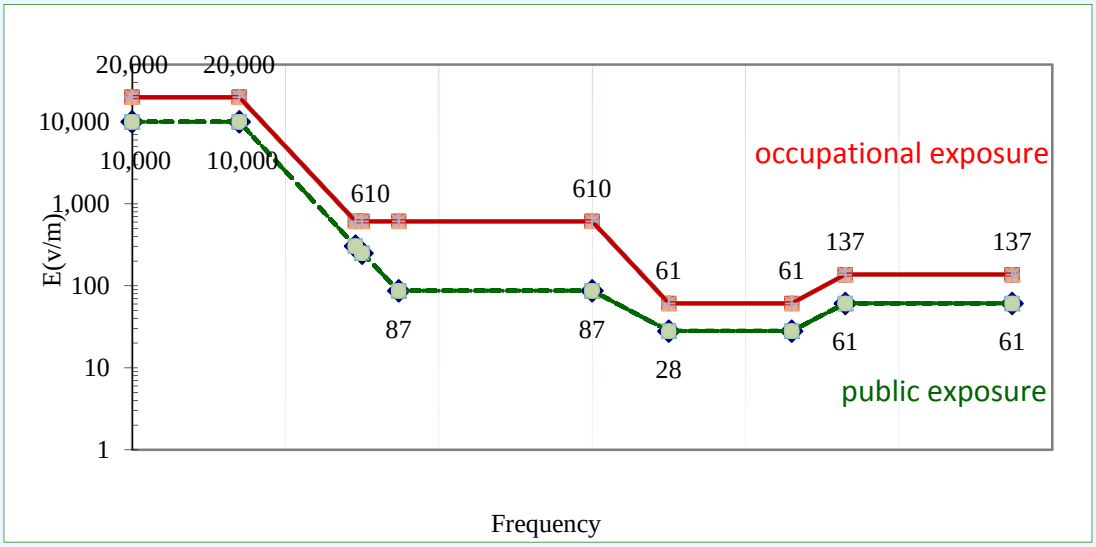
[1] See Mazar H. 2009a An Analysis of Regulatory Frameworks for Wireless Communications, Societal Concerns and Risk: the Case of Radio Frequency (RF) Allocation and Licensing

Annex 2: ICNIRP 1998 Exposure Levels and IEEE Levels

[1]Table 2: ICNIRP (1998:511) Reference levels for occupational and general public exposure

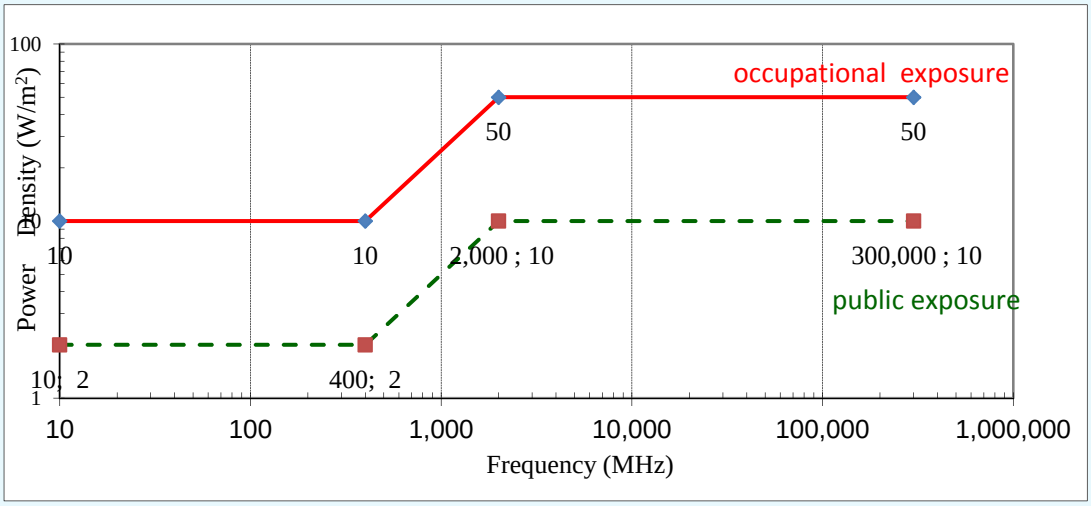
Frequency range	Electric field strength (V/m)		Equivalent plane wave power density S_{eq}(W/m^2)	
	general public	occupational	general public	Occupational
1-25 Hz	10,000	20,000		
0.025- 0.82 KHz	250/f(KHz)	500/f(KHz)		
0.82 -3 KHz	250/f(KHz)	610		
3-1000 KHz	87	610		
1-10 MHz	$87/f^{1/2}$ (MHz)	610/f (MHz)		
10-400 MHz	28	61	2	10
400-2000 MHz	$1.375f^{1/2}$ (MHz)	$3f^{1/2}$ (MHz)	f/200	f/40
2-300 GHz	61	137	10	50

Figure 1: ICNIRP field strength reference levels; see also Table 2



[1] See Mazar H. 2009a and a forthcoming John Wiley & Sons publication, 'Radio Spectrum Management: Policies, Regulations, Standards and Techniques', chapter 13 - Limitations to Radio Frequency Human Exposure.

Figure 2: ICNIRP power density reference levels; above 10MHz only; see Table 2



2.1 Exposure Levels: Cellular Base-Stations

The limits of ICNIRP (1998:511, table 7) and the European Community (EC 1999/519: Annex III, table 2) are identical. The ICNIRP levels have been endorsed by the Commission's Scientific Steering Committee. Table 2 specifies these exposure limits for frequencies of cellular base stations.

Table 3: ICNIRP and EC reference levels for exposure

Frequency range	Electric field strength (V/m)	Magnetic field strength (A/m)	Equivalent plane wave power density S_{eq}(W/m^2)	Magnetic Flux Density (μT), B
400-2000 MHz	$1.375f^{½}$	$0.0037f^{1/2}$	f/200	$0.0046\ f^{½}$
2-300 GHz	61	0.16	10	0.2

Table 3 specifies the US thresholds for cellular base stations.

Table 4 : FCC exposure limits (FCC 2001:67)

Frequency Range MHz	Electric Field (E) (V/m)	Magnetic Field H (A/m)	Power Density (S) (mW/cm^2)
30-300	27.5	0.073	0.2
300-1500	--	--	f/1500
1500-100,000	--	--	1

Table-4 depicts that the levels in power exposure limits of the US are 4/3 (=200/150) higher than ICNIRP and Europe.

The IEEE maximum permissible exposure 2005 updates are shown in Table 5.

Table 5: The 2005 IEEE permissible exposure (IEEE Std C95.1-2005:25, Table 9)

Frequency Range MHz	Electric Field (E) (V/m)	Magnetic Field H (A/m)	RMS power density (S) (W/m^2)
100-400	27.5	0.073	2
400-2000	--	--	f/200
2000-5000	--	--	10

The IEEE C95.1-2005 level for 400-2000 MHz (typical cellular RF bands) is identical (not to FCC nor ANSI levels) to the ICNIRP level (f/200 W/m^2); the units are also the same.

2.2 Exposures: Cellular Handsets

Specific energy Absorption Rate (SAR) is the time rate of energy absorption per gram of tissue from electromagnetic radiation; it is expressed in watts per kilogram (W/kg). Table 6 compares the rate absorption in ICNIRP, EC and FCC[2].

Table 6: Maximal power from handsets: Specific absorption rate, SAR (W/kg)

ICNIRP	European Community	FCC- USA
10 MHz–10 GHz; Localised SAR (Head and Trunk)		Portable Devices; General Population/ Uncontrolled
2.0; averaged over 10 g tissue		1.6; averaged over 1g tissue

In contrast to the thresholds of power density from cellular base stations, it is important to observe that the US is more risk averse than Europe in the allowed SAR from the cellular terminal. The ICNIRP threshold (adopted by EC) is 2.0 W/kg, while the US limits are 1.6 watts/kg[3] for the partial body. The IEEE (2006:79) has changed the peak spatial average SAR values from 1.6 W/kg for exposure of the public environment to 2 W/kg; moreover, the SAR is to be averaged over 10g tissue as in the ICNIRP and not for 1g as before. These changes were based on the scientific considerations and were also influenced by the desire to harmonize the basic restrictions with ICNIRP, where scientifically justified.

[2] ICNIRP1998:509 table 4; EC 1999/519, Annex III, Table 1; FCC 1997:75 (and FCC 2006 CFR 47 § 2.1093).

[3] Even the averaging is more stringent in the US, as the limit is averaged over one gram (FCC 2001:75), and not 10 grams as in ICNIRP 1998. Following changes in the IEEE C95.1-2005 standard, the US ANSI may adopt in the future the less stringent European level for SAR and averaging.

Annex 3: Mandate of Question 23/1 (WTDC-10/139 (Rev.1))*.

Question 23/1 – Strategies and policies concerning human exposure to electromagnetic fields

1. Statement of the situation

The deployment of different sources of electromagnetic fields to cater for the telecommunication and ICT needs of urban and rural communities has developed very rapidly over the past ten (10) years. This has been due to strong competition, ongoing traffic growth, quality of service requirements, network coverage extension and the introduction of new technologies. It has produced concern on the possible effects of prolonged exposure to emissions on people's health.

This concern on the part of populations is growing, aggravated by the feeling that they are not being kept informed of the process for deploying these installations; hence many complaints received by operators and government bodies responsible for radiocommunications/ICTs.

Thus, since the continued development of radiocommunications requires trust on the part of populations, the work carried out in ITU-R Study Group 1 Working Party 1C and ITU-T Study Group 5 under Resolution 72, on measurement concerns related to human exposure to electromagnetic fields, should be complemented by studies on the different regulatory and communication mechanisms developed by countries to increase the awareness of and information to populations and facilitate the deployment and operation of radiocommunication systems.

2. Question for study

The following subjects should be studied:

a) To compile and analyse the regulatory policies concerning human exposure to electromagnetic fields that are being considered or being undertaken for authorizing the installation of radiocommunication sites and Power Lines Telecommunications systems.

b) To describe the strategies or methods for raising the awareness of populations and information to populations regarding the effects of electromagnetic fields due to radiocommunication systems.

c) To propose guidelines and best practices on this matter.

3. Expected outcome

a) A report to the membership presenting guidelines to assist Member States in resolving similar problems faced by regulatory bodies.

b) The report will provide regulatory authorities with guidelines on methods for raising the awareness of populations along with best practices based on countries' experience in the matter.

4 Timeline

A provisional report is to be presented to the Study Group in 2012. It is proposed that the study be completed in 2013, at which date a final report containing guidelines will be submitted

* http://www.itu.int/ITU-D/study_groups/SGP_2010-2014/doc/rgq/2010/D10-RGQ23.1-en.pdf

Annex 4: WTSA-12* Resolution 72 on "Measurement concerns related to human exposure to electromagnetic fields"'

RESOLUTION 72 (REV. DUBAI, 2012)

Measurement concerns related to human exposure to electromagnetic fields

(Johannesburg, 2008; Dubai, 2012)

The World Telecommunication Standardization Assembly (Dubai, 2012),

considering

a) the importance of telecommunications and information and communication technologies (ICT) for political, economic, social and cultural progress;

b) that a significant part of the infrastructure needed to help bridge the digital divide between developed and developing countries[1] involves various wireless technologies;

c) that there is a need to inform the public of the potential effects of exposure to electromagnetic fields (EMF);

d) that an enormous amount of research has been carried out regarding wireless systems and health, and many independent expert committees have reviewed this research;

e) that the International Commission on Non-Ionizing Radiation Protection (ICNIRP), the International Electrotechnical Commission (IEC) and the Institute of Electrical and Electronics Engineers (IEEE) are three among a number of pre-eminent international bodies in establishing measurement methodologies for assessing human exposure to EMF, and they already cooperate with many standards bodies and industry forums;

f) that the World Health Organization (WHO) has issued fact sheets regarding EMF issues, including mobile terminals, base stations and wireless networks, referencing ICNIRP standards;

g) Resolution 176 (Guadalajara, 2010) of the Plenipotentiary Conference, on human exposure to and measurement of electromagnetic fields;

h) Resolution 62 (Hyderabad, 2010) of the World Telecommunication Development Conference, on measurement concerns related to human exposure to electromagnetic fields,

recognizing

a) the work done within ITU Radiocommunication Sector (ITU-R) study groups on radiowave propagation, electromagnetic compatibility (EMC) and related aspects, including measurement methods;

b) the work done within Study Group 5 of the ITU Telecommunication Standardization Sector (ITU-T) on techniques for taking radio-frequency (RF) measurements;

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* http://www.itu.int/pub/T-RES-T.72-2012

1 These include the least developed countries, small island developing states, landlocked developing countries and countries with economies in transition.

c) that Study Group 5, in establishing measurement methodologies for assessing human exposure to RF energy, already cooperates with many participating standards organizations (PSOs),

recognizing further

a) that some publications about EMF effects on health create doubt among the population, in particular in developing countries;

b) that, in the absence of regulation, people, in particular in developing countries, become more and more doubtful and are increasingly opposing the deployment of radio installations in their neighbourhoods;

c) that the cost of the equipment used for assessing human exposure to RF energy is very high, and that the equipment is more likely to be affordable only in developed countries;

d) that implementing such measurement is essential for many regulatory authorities, in particular in developing countries, in order to monitor the limits for human exposure to RF energy, and that they are called upon to ensure those limits are met in order to license different services,

noting

the similar activities carried out by other national, regional and international standards development organizations (SDOs),

resolves

to invite ITU-T, in particular Study Group 5, to expand and continue its work and support in this domain, including but not limited to:

i) disseminating information related to this topic through organizing workshops and seminars for regulators, operators and any interested stakeholders from developing countries;

ii) continuing to cooperate and collaborate with other organizations working on this topic and to leverage their work, in particular with a view to assisting the developing countries in the establishment of standards and in monitoring compliance with these standards, especially on telecommunication terminals;

iii) cooperating on these issues with ITU-R Study Groups 1 and 6, and with Study Group 1 of the ITU Telecommunication Development Sector (ITU-D) in the framework of Question 23/1;

iv) strengthening coordination with WHO so that any fact sheet relating to human exposure to electromagnetic fields is circulated to Member States as soon as it is issued,

instructs the Director of the Telecommunication Standardization Bureau, in close collaboration with the Directors of the other two Bureaux, and within the available financial resources

1 to support the development of reports identifying the needs of developing countries on the issue of assessing human exposure to EMF, and submit the reports as soon as possible to ITU-T Study Group 5 for its consideration and action in accordance with its mandate;

2 to hold workshops in developing countries with presentations and training on the use of equipment employed in assessing human exposure to RF energy;

3 to support developing countries while they establish their regional centres equipped with test benches for monitoring conformance of telecommunication terminal equipment and human exposure to electromagnetic waves using, among other things, the modalities listed in Resolutions 44 (Rev. Dubai, 2012) and 76 (Rev. Dubai, 2012) of this assembly, in the context of the development of the regional test centres and of Resolution 177 (Guadalajara, 2010) of the Plenipotentiary Conference,

invites Member States and Sector Members

to contribute actively to the work of Study Group 5 in providing relevant and timely information in order to assist developing countries in providing information and addressing measurement concerns related to RF exposure and electromagnetic fields,

further invites Member States

to adopt suitable measures in order to ensure compliance with relevant international recommendations to protect health against the adverse effect of EMF.

Annex 5: WTDC-10* Resolution 62 on "Measurement concerns related to human exposure to EMF"

RESOLUTION 62 (HYDERABAD, 2010)

Measurement concerns related to human exposure to electromagnetic fields

The World Telecommunication Development Conference (Hyderabad, 2010),

recalling

Resolution 72 (Johannesburg, 2008) of the World Telecommunication Standardization Assembly, on measurement concerns related to human exposure to electromagnetic fields (EMF), which calls for close cooperation with the Directors of the other two Bureaux – Telecommunication Development Bureau (BDT) and Radiocommunication Bureau (BR) – to implement the resolution in view of its importance to developing countries,

considering

a) that there is a pressing need for information on the potential effects of human exposure to EMF in order to protect humans from such effects;

b) that there are a number of eminent international bodies involved in establishing measurement methodologies for assessing human exposure to EMF, and these already cooperate with many telecommunication standards bodies, including the ITU Telecommunication Standardization Sector (ITU-T),

recognizing

a) that some publications and information about EMF effects on health create doubt among the population, in particular in developing countries[1], causing these countries to address questions to ITU-T and, currently, to the ITU Telecommunication Development Sector (ITU-D);

b) that, in the absence of regulation, people, particularly in developing countries, become more and more doubtful and are increasingly opposing the deployment of radio installations in their neighbourhoods;

c) that the cost of the equipment used for assessing human exposure to EMF is very high and difficult for many developing countries to afford;

d) that implementing such measurement is essential for many regulatory authorities in developing countries, in order to monitor the limits for human exposure to radio-frequency energy, and that they are called upon to ensure those limits are met in order to license different services,

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* http://www.itu.int/ITU-D/conferences/wtdc/2010/pdf/WTDC10_DraftPreliminaryReport.pdf

1 These include the least developed countries, small island developing states, landlocked developing countries and countries with economies in transition.

resolves to instruct the Director of the Telecommunication Development Bureau

in response to the needs of the developing countries and consistent with the substance of Resolution 72 (Johannesburg, 2008), and in close cooperation with the Director of BR and Director of the Telecommunication Standardization Bureau (TSB):

1 to give the necessary priority to this subject and, within the available resources, allocate the necessary funds for expediting execution of this resolution;

2 to ensure that Programme 1 determines the requirements of developing countries and their regulatory authorities (at regional level) in relation to this resolution, contributes to studies on this subject, takes an active part in the work of the relevant ITU Radiocommunication Sector (ITU-R) and ITU-T study groups, and submits written contributions on the results of its work in this regard, plus any proposals it deems necessary, to ITU-D Study Group 2,

instructs Study Group 1

within the framework of their Questions, to cooperate with ITU-T Study Group 5 and ITU-R Study Groups 1, 5 and 6, in order to achieve the following goals:

- prepare an annual report on the progress of work in this area in respect of their Questions;
- contribute to the organization of any seminars on this subject;
- contribute to preparation of the Guide on the use of ITU-T publications on achieving electromagnetic compatibility and safety, and publications relating to measurement methodologies, the need for measurements to be performed by a "Qualified Radio Engineer" and the criteria for a "Qualified Radio Engineer", and system specifications.

Annex 6: Plenipotentiary Conference (PP-10)* Resolution 176 on "Human exposure to and measurement of electromagnetic fields".

RESOLUTION 176 (GUADALAJARA, 2010)

Human exposure to and measurement of electromagnetic fields

The Plenipotentiary Conference of the International Telecommunication Union (Guadalajara, 2010),

recalling

a) Resolution 72 (Johannesburg, 2008) of the World Telecommunication Standardization Assembly, on measurement concerns related to human exposure to electromagnetic fields (EMF);

b) Resolution 62 (Hyderabad, 2010) of the World Telecommunication Development Conference, on measurement concerns related to human exposure to EMF;

c) relevant resolutions and recommendations of the ITU Radiocommunication Sector (ITU-R) and ITU Telecommunication Standardization Sector (ITU-T);

d) that there is ongoing work in the three Sectors relating to human exposure to electromagnetic fields, and that liaison and collaboration between the Sectors and with other expert organizations are important, in order to avoid duplication of effort,

considering

a) that the World Health Organization (WHO) and the International Commission on Non-Ionizing Radiation Protection (ICNIRP) have the specialized health expertise and competence to assess the impact of radio waves on the human body;

b) that ITU has expertise in calculating and measuring the field strength and power density of radio signals;

c) the high cost of equipment used for measuring and assessing human exposure to EMF;

d) that the considerable development in radio spectrum use has resulted in multiple sources of EMF emissions within any given geographic area;

e) the urgent need for regulatory bodies in many developing countries to obtain information on EMF measurement methodologies in regard to human exposure to radio-frequency energy, in order to establish national regulations to protect their citizens;

f) that guidelines on limits of exposure to EMF have been established by ICNIRP[1], the Institute of Electrical and Electronics Engineers (IEEE)[2] and the International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) and that many administrations have adopted national regulations based on these guidelines,

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* http://www.itu.int/pub/S-CONF-ACTF-2010/en

[1] Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300 GHz) – http://www.icnirp.de/documents/emfgdl.pdf.

[2] IEEE Std C95.1™-2005, IEEE standard for safety levels with respect to human exposure to radio frequency electromagnetic fields, 3 kHz to 300 GHz.

resolves to instruct the Directors of the three Bureaux

to collect and disseminate information concerning exposure to EMF, including on EMF measurement methodologies, in order to assist national administrations, particularly in developing countries, to develop appropriate national regulations,

instructs the Director of the Telecommunication Development Bureau, in collaboration with the Director of the Radiocommunication Bureau and the Director of the Telecommunication Standardization Bureau

1 to ascertain the requirement for, and as appropriate conduct, regional seminars and workshops in order to identify the needs of developing countries and to build human capacity in regard to measurement of EMF related to human exposure to these fields;

2 to encourage Member States in the various regions to cooperate in sharing expertise and resources and identify a focal point or regional cooperation mechanism, including if required a regional centre, so as to assist all Member States in the region in measurement and training,

instructs the Secretary-General, in consultation with the Directors of the three Bureaux

1 to prepare a report on the implementation of this resolution for submission to the ITU Council at each annual session;

2 to provide a report to the next plenipotentiary conference on measures taken to implement this resolution.

Annex 7: ITU Project in Central America Document*

* http://www.itu.int/md/D10-RGQ23.1-INF-0004/

Annex 8: Q23/1 Work Plan

Work Programme 2010-2014

DATE	ACTIVITY / EXPECTED RESULTS	PERSON RESPONSIBLE
September 2010	- Determination of the working method and of the means to carry out the work	BDT, Rapporteur's Group
October 2010 – February 2011	- Compilation and analysis of envisaged or adopted regulatory policies on human exposure to electromagnetic fields authorizing the installation of radiocommunication sites and telecommunication systems over electric power lines - Description of strategies or methods for raising awareness and informing people about the effects of electromagnetic fields caused by radio systems - Guidelines and best practices	BDT, Rapporteur's Group
March/April 2011	Rapporteur's Group meeting: - Consideration of contributions received - Consideration of relevant documents of others Sectors (ITU-T, ITU-R) - Call for contributions from: • World Health Organization • International Commission on Non-Ionizing Radiation Protection (ICNIRP) • Institute of Electrical and Electronic Engineers (IEEE)	BDT, Rapporteur's Group
September 2011	Rapporteur's Group meeting: - Consideration of contributions received - Consideration of relevant documents of other Sectors and programmes - Call for new contributions - Draft guidelines for compliance with relevant international recommendations aimed at protecting health against the harmful effects of electromagnetic fields	BDT, Rapporteur's Group
March/April 2012	Rapporteur's Group meeting - Consideration of contributions received - Consideration of relevant documents of other ITU Sectors and international organizations working on this issue - Finalization of guidelines - Development of plan of the draft report - Call for new contributions - Dissemination of information on this topic at workshops and seminars organized for regulators, operators and the public	BDT, Rapporteur and Vice-Rapporteurs
September 2012	Rapporteur's Group meeting: - Preparation of draft report - Consideration of contributions received - Call for new contributions	BDT, Rapporteur's Group
March/April 2013	Rapporteur's Group meeting: - Consideration and adoption of draft report - Consideration of contributions received - Consideration of relevant documents of other Sectors and programmes	BDT, Rapporteur's Group

DATE	ACTIVITY / EXPECTED RESULTS	PERSON RESPONSIBLE
September 2013	Rapporteur's Group meeting: - Seminar - Presentation of draft report - Consideration of contributions received - Consideration of relevant documents of other Sectors and programmes	BDT, Rapporteur's Group

Annex 9: Documents for Q23/1*

* http://www.itu.int/ITU-D/CDS/sg/rgqlist.asp?lg=1&sp=2010&rgq=D10-RGQ23.1&stg=1

Annex 10: A case study from India on EMF

This contribution is shared among the members for information and also for comments. ITU is also requested to consider and take appropriate action as per the findings of this contribution. Formation of a Focus Group cutting across ITU-T, ITU-R, ITU-D may be necessary to study the various aspects considering the importance of the issue.

The deployment of different sources of electromagnetic fields to cater for the telecommunication and ICT needs of urban and rural communities has developed very rapidly over the past decade in India. This has been due to strong competition, presence of multiple operators (10 to 12 in each service area) on-going traffic growth, quality of service requirements, network coverage and introduction of new technologies. Indian Territory has been divided into 22 Licensing Service Areas for provision of mobile services in the country. Growing number of towers nearing more residential premises has produced increasing concern on the possible adverse effects of EMF exposure on people's health. In India the issue has been raised by the public as well as by media. Accordingly, India adopted a policy on the EMF radiation covering Base Transmitting Station (BTS) and Mobile Handsets standard in the year 2008.

1. Statement of the situation

1.1 The deployment of different sources of electromagnetic fields to cater for the telecommunication and ICT needs of urban and rural communities has developed very rapidly over the past decade in India. This has been due to strong competition, presence of multiple operators (10 to 12 in each Service area) on-going traffic growth, quality of service requirements, network coverage and introduction of new technologies. Indian Territory has been divided into 22 Licensing Service Areas for provision of mobile services in the country. Licensed Service Area wise subscriber base for landline and mobile customer is enclosed as **Annex 10A**.

1.2 Growing number of towers nearing more residential premises has produced increasing concern on the possible adverse effects of EMF exposure on people's health. In India the issue has been raised by the public as well as by media. Accordingly, India adopted a policy on the EMF radiation covering Base Transmitting Station (BTS) and Mobile Handsets standard in the year 2008. Licensed Service Area wise details of BTS installed in the country is enclosed as **Annex 10B**.

2. Steps taken by Government of India

2.1 In its Fact Sheet No. 304 of 2006, WHO recommended that *'National authorities should adopt international standards to protect their citizens against adverse levels of RF fields. They should restrict access to areas where exposure limits may be exceeded.'* WHO has referred to the International Exposure Guidelines developed by International Commission on Non-Ionizing Radiation Protection (ICNIRP).

2.2 Based on the recommendation of WHO, India adopted ICNIRP norms, in the year 2008, for basic restrictions & reference level for limiting electro-magnetic field exposure from Base Stations as well as for mobile handsets and necessary provisions were made in the Unified Access Service Licence (Mobile Telephone Service operators' license) on 4th November, 2008. As per the provisions,

"Licensee shall conduct audit and provide self certificates annually as per procedure prescribed by Telecommunication Engineering Centre (TEC) / or any other agency authorized by Licensor from time to time for conforming to limits / levels for antennae (Base Station Emissions) for general public exposure as prescribed by International Commission on Non-Ionizing Radiation Protection (ICNIRP) from time to time".

The ICNIRP limits/levels are reproduced as detailed below:

Frequency Range	E-Field Strength (Volt/Meter (V/m))	H-Field Strength (Amp/Meter (A/m))	Power Density (Watt/Sq.Meter (W/Sq.m))
400MHz to 2000MHz	$1.375f^{½}$	$0.0037f^{½}$	f/200
2GHz to 300GHz	61	0.16	10

(f = frequency in MHz)

2.3 Department of Telecommunications (DoT), Government of India further issued instructions on 8th April, 2010 to all the mobile operators regarding implementation of radiation norms on Electro Magnetic Field (EMF) exposure by Base Transceiver Stations (BTSs) by submitting the self certification for each and every BTS. The instructions, inter-alia, include the following:

(i) All Base Station Transceivers (BTSs) must be self certified as meeting the radiation norms. Self certification is submitted to respective Telecom Enforcement Resource & Monitoring (TERM) Cells of DoT by the telecom service providers.

(ii) All new BTS sites start radiating only after self certificate has been submitted to relevant TERM Cells.

(iii) The TERM Cell tests upto 10 per cent of BTS sites randomly at its discretion. Additionally, BTS sites against which there are public complaints are also be tested by TERM Cell.

(iv) If a site fails to meet the Electro Magnetic Radiation criterion, there is a provision of penalty of Rs.5 lakh (about US$10,000) per BTS per service provider. Service providers must meet the criterion within one month of the report of TERM Cell in such cases, after which site will be shut down.

2.4 In year 2008, Department of Telecommunications had adopted International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines for mobile handsets also. ICNIRP prescribed the following values for Specific Absorption Rate (SAR) for mobile handset:

For Frequency Range 10 MHz to 10 GHz	Whole body average SAR (W/Kg)	Localised SAR head & trunk (W/Kg)	Localised SAR limbs (W/Kg)
General Public Exposure	0.08	2	4

2.5 For the mobile handsets, DoT, in the year 2008, had issued instructions to the indigenous manufacturers to conform to ICNIRP prescribed Specific Absorption Rate (SAR) limit of 2 W/kg (averaged over 10 gm tissue) in the frequency range of 10 MHz to 10 GHz.

3. Inter-Ministerial Committee

3.1 Subsequently, based on public concern and media reports, Government of India set up an Inter-Ministerial Committee (IMC) on 24.08.2010 consisting of representatives from DoT, Indian Council of Medical Research (Ministry of Health), Department of Biotechnology and Ministry of Environment and Forest to examine the effect of EMF Radiation from mobile base stations and mobile phones.

3.2 Inter-Ministerial Committee (IMC) in its report submitted in the year 2011 examined the environmental and health related concerns and indicated that most of the laboratory studies were unable to find a direct link between exposure to radio frequency radiation and health; and the scientific studies as yet have not been able to confirm a cause and effect relationship between radio frequency radiation and health. The effect of emission from cell phone towers is not known yet with certainty. The inter-ministerial committee (IMC) examined 90 international and national studies/reference papers, related with the EMF radiation, before finalizing its recommendations.

3.3 However, as a precautionary measure, IMC recommended for lowering of the BTS RF exposure limits to 1/10th of the ICNIRP limit and adoption of Specific Absorption Rate (SAR) level for mobile handsets limits to 1.6 Watt/Kg (averaged over 1 gm of tissue) in place 2.0 Watt/Kg in India.

3.4 The recommendations of the Inter Ministerial Committee were accepted by the Government of India. Accordingly, in respect of BTS, norms for exposure limit for the Radio Frequency Field (Base Station Emissions) were reduced to 1/10th of the limits prescribed by ICNIRP with effect from 1st September 2012. The revised limits/levels for India for BTS Emission is as below:

Frequency Range	E-Field Strength (Volt/Meter (V/m))	H-Field Strength (Amp/Meter (A/m))	Power Density (Watt/Sq.Meter (W/Sq.m))
400MHz to 2000MHz	$0.434f^{½}$	$0.0011f^{½}$	f/2000
2GHz to 300GHz	19.29	0.05	1

(f = frequency in MHz)

3.5 In respect of Mobile Handsets, the following directions were issued regarding Specific Absorption Rate (SAR) level:

(i) SAR level for mobile handsets shall be limited to 1.6 Watt/Kg, average over a mass of 1 gram of human tissue.

(ii) All the new design of mobile handsets shall comply with the SAR level of 1.6 Watt/Kg averaged over a mass of 1 gram tissue with effect from 1st September, 2012. However, the mobile handsets with existing designs, which are compliant with 2.0 Watt/Kg averaged over a mass of 10 gram tissue, may continue to co-exist up to 31st August 2013.

(iii) From 1st September 2013, only the mobile handsets with revised SAR value of 1.6 Watt/Kg are permitted to be manufactured or imported in India for domestic market.

3.6 DoT has also set-up a laboratory in the Telecommunication Engineering Centre (TEC), for testing of SAR value of mobile handsets imported/manufactured in India.

4. Further, following steps have also been taken by Department of Telecommunications for the awareness of the general public in respect of EMF Radiation:

4.1 General awareness programmes / seminars regarding the steps taken for safety of public health from mobile tower radiation are being conducted by the Associations of Mobile Service Providers in various major cities.

4.2 A 'Precautionary Guidelines for Mobile User' advising to take certain precautions while using/purchasing the mobile handsets has been placed on DoT website.

4.3 An informative guide on 'Mobile Communications-Radio Waves and Safety' has been issued and the same is also available on DoT website. The document covers a basic introduction to radio waves, various terminologies, Do's & Don'ts related to mobile phone usage, clarification of various myths regarding deployment, use of Radio waves / Safety Standards and frequently asked questions relating to Mobile phones & Human health. The document shall help in facilitating the right inputs and creating an environment where everyone can use the radio wave safely.

4.4 Advertisements for ensuring safety from radiations of Mobile Towers & handsets has been issued by DoT which has been published in National &Regional Newspapers.

4.5 A Complaint Handling System for Electro Magnetic Field (EMF) Radiation from Mobile Towers has also been launched by DoT in October 2012 in Mumbai. The online facility is available on DoT website http://www.dot.gov.in/ through a link "Public Grievance – EMF Radiation".

4.6 Guidelines for State Government / Local Bodies for issue of clearance for installation of mobile towers at various locations in the licensed service area are under finalization. Similarly, various parameters to be checked by TERM Cell units to monitor the Radiation levels are also under finalization.

4.7 Various steps being taken by the Government of India regarding EMF related issues are available on DoT website http://www.dot.gov.in under the caption "Journey to EMF".

4.8 Surprise test checks of BTS sites are also carried out by DoT to verify the compliance to revised norms. During surprise check by DoT's TERM Cell Unit more than 100 BTS sites in many parts of the country including Mumbai were found radiating at much higher level than prescribed between the period September 2012 to March 2013.

5. Further Indian Initiatives on Scientific Assessment

5.1 Government of India, Department of Science & Technology (DST) has constituted a committee on 01.10.2012 under the Chairmanship of Former Director General of Indian Council for Medical Research (ICMR), having members from Indian Institute of Technology (IIT) Chennai, Indian Institute of Toxicology Research, Lucknow, Department of Telecom, Ministry of Environment & Forest, ICMR and Department of Science & Technology to examine the possible harmful effects from Cell towers on the population living in the vicinity and for developing the frame of reference for calling out Request For Proposals (RFP) for scientific assessment of health hazards and adverse impact on ecology.

5.2 The Committee has invited R&D proposals in June 2013 on the possible impact of EMF radiation exposure from mobile towers and handsets on life (humans, living organism, flora & fauna and environment) and related initiatives. Eligible Scientist / Organizations – public or private, individually or in collaboration have been requested for submission of their proposal on or before 14th August 2013.

6. Submissions

6.1 In a latest development, an Indian Delegation from DoT, Government of India had visited Geneva from 19 to 22 Feb. 2013 to discuss EMF Radiation related health issues with WHO Secretariat and Technical standards with ITU.

6.2 WHO officials suggested that lowering of the EMF radiation limit alone may not be adequate to achieve the desired results, though a strong regulation on siting of BTS Tower antennae could be more important. Few countries have imposed restrictions specifying the horizontal distance in regards to the installation of base station Antenna from sensitive locations in the urban planning itself.

6.3 Indian scenario with more than 10 mobile operators in each service area along with high population density is quite different from Europe

6.4 Officials from International Agency on Cancer Research (IARC) at Lyon, France indicated that in Europe Mobile Towers are not considered as a threat as Antennas are at higher levels /heights and fairly distant apart.

6.5 However, the conditions in India and other developing countries are totally different from those in Europe in terms of:

– mobile phone usages,
– number of operators,
– higher levels of population density,
– in-organic growth in urban areas,
– narrow lanes separating buildings,

- lower body mass index,
- lower fat content,
- lesser spectrum per operator,
- radiated power being 20 Watt per sector,
- higher levels of RF exposure on account of multiple operators having BTSs on same tower, and
- Antennas mounted at lower heights etc.
- Poor coverage conditions also lead handsets to operate at higher levels of power
- Outsourcing of infrastructure installation & maintenance to third parties by operators
- Inadequate technical expertise at field level and local authorities to understand exclusion zone calculations based on ITU K series recommendations. This also needs to be seen in the background of monitoring requirements extending to 0.747 million BTSs as in Annexure II.

Some of the typical Wall mounted BTS installation photographs are enclosed in the **Annex** from city of Mumbai, India**.**

6.6 During discussions on Indian scenario, IARC felt that their present research that is addressing only Mobile Handsets may have to be reassessed to include Mobile Towers also.

6.7 A research project focusing on measurements of exposure levels from base stations in densely populated areas and areas covered by many base stations, level of usage, and measurements of emissions from regular and counterfeit mobile phones, was considered to be of great scientific interest by IARC. Based on the suggestions from IARC, Mobile Handset usage study was taken up by licensor in India.

6.8 DoT obtained the latest version of ITU's EMF estimator Software and organized an ITU Workshop on 21st & 22nd May 2013 at Delhi. The Workshop has facilitated Indian Telecom Service Providers for better evaluation on the human exposure to electromagnetic field from multiple sources of communication installation, and for taking steps to reduce the radiation levels in the areas around transmitting stations.

6.9 Minutes of Usage/ Hours of Mobile Hand Usage by Indian Service Providers has been collected from Indian Mobile Operators across various Licensing Service Areas, based on IARC suggestion as in Para 6.7 above. The detailed data is enclosed as **Annex 10C**. There are 22 Licensed Service Areas and on an average, there are 10 Mobile Operators in each Licensed Area.

6.10 Typical Results show that on an average more than 100,000 Mobile users of one operator in one licensed service area have about 2 hours of mobile usage per day. Taking on an average 10 operators in all the 22 service area in India, at least 20 million mobile users have mobile usage of 2 or more hours per day.

6.11 In Europe, the tariff for mobile service is higher than fixed telephone service and the Tele-density for both Mobile & Fixed Lines phones is comparable to the level of 100+ in Europe and that explains lower levels of usage of mobile.

6.12 Whereas, in developing countries the tariff for Mobile & Fixed telephone is almost same and tele-density for mobile telephones are generally above 90% whereas it is less than 10% for Fixed telephones.

6.13 The usage in Indian study is many folds higher than Inter Phone Study inputs that are referenced in IARC's Monograph 102 on EMF published on 24/4/2013 which on Page 421 (Chapter 6 on Conclusions) states "Radiofrequency Electromagnetic fields are possibly carcinogenic to humans (Group 2B)."

6.14 IARC and WHO need to go further from IARC Monographs' 102 findings with focus on latest available inputs from developing world outside Europe. Inputs from Indian Case Study as above, is an example.

6.15 ITU needs to have a relook at all EMF related initiatives through Study Groups. Possibly a new ITU Focus Group on 'EMF Radiation & Health Issues' cutting across ITU-T, ITU-R and ITU-D needs to be constituted.

6.16 Though ITU Recommendations on EMF calculations including exclusion zone distance calculations and EMF Estimator Software are available, but further up-gradation of the software is required. India has already written to Secretary General (ITU) & Director TSB (ITU) with a request to make it more user friendly and a special feature incorporating acceptance of Excel data based BTS data inputs by EMF Estimator software and avoiding manual keying of all the data. Further, linkages with 3D maps have also been requested.

6.17 An ITU Handbook on EMF Radiation should also be taken up by ITU-D under Q 23/1 or proposed Focus Group. It can include ITU's generic guidelines on EMF including safe distances to be maintained for populated location directly falling within the main radiated lobe coverage based on typical shared sites radiating at say 20 Watts/ sector along with other safe usage instructions. The Handbook should also include "How to minimize exposures to EMF Radiations from Mobile Towers and handsets", Do's& Don't related to mobile phone usage, clarifications on various myths regarding deployment, use of Radio waves / Safety Standards and frequently asked questions relating to Mobile phones & Human health. The Handbook shall help in facilitating the right inputs for world telecom community and create an environment where everyone can use the radio wave safely.

Annex 10A: Wireless / Landline subscribers as on 31st March 2013 service area wise in India

Sl No.	License Service Area	Number of Wireless Subscriber	Number of Landline Subscriber
1	Andhra Pradesh	64363622	2239363
2	Assam	14387664	194395
3	Bihar	60301859	394129
4	Delhi	40426200	2962600
5	Gujarat	51693364	1792030
6	Haryana	19543589	560474
7	Himachal Pradesh	7015343	280669
8	Jammu & Kashmir	6844607	196811
9	Karnataka	52914789	2443394
10	Kerala	30692668	3064818
11	Kolkata	21260064	1144255
12	Madhya Pradesh	52164292	1120350
13	Maharashtra	68400365	2466496
14	Mumbai	30372793	2985057
15	North East	8960542	189884
16	Orissa	24601935	374427
17	Punjab	29462871	1320185
18	Rajasthan	48601130	1011041
19	Tamil Nadu (incl. Chennai)	72412392	3109695
20	Uttar Pradesh (East)	73824150	1048303
21	Uttar Pradesh (West)	48399485	767118
22	West Bengal	41159859	548248
	Total	**867803583**	**30213742**

Total number of subscriber : 898,017,325

Percentage of Mobile (Wireless) subscriber : 96.6 %

Percentage of Landline (Wire-line) subscriber: 3.4 %

Annex 10B: Number of base stations (service area wise) in India as on 31st May 2013

Sl No.	Service Area	Number of BTS
1	Andhra Pradesh	60285
2	ASSAM	14152
3	Bihar	44283
4	Delhi	30900
5	Gujarat	45950
6	Haryana	17604
7	Himachal Pradesh	7021
8	Jammu & Kashmir	11115
9	Karnataka	54307
10	KERALA	32658
11	Kolkata	19609
12	MAHARASHTRA	64354
13	Madhya Pradesh	46423
14	MUMBAI	25535
15	North East	8634
16	Orissa	20795
17	Punjab	26959
18	RAJASTHAN	35560
19.1	Tamil Nadu excluding Chennai	45484
19.2	Chennai	21835
20	Uttar Pradesh (East)	45176
21	Uttar Pradesh (West)	37883
22	West Bengal	30080
	Total	**746602**

Annex 10C

Licensing Area	Top 100 Subsribers Average	Top 500 Subsribers Average	Top 1000 Subsribers Average	Top 5,000 Subsribers Average	Top 10,000 Subsribers Average	Top 50,000 Subsribers Average	Top 100,000 Subsribers Average
LA1	8.42	6.55	5.90	4.58	4.08	3.03	2.61
LA2	9.57	7.16	6.23	4.36	3.67	2.32	1.83
LA3	7.83	6.33	5.74	4.46	3.97	2.92	2.50
LA4	9.62	6.71	5.84	4.27	3.72	2.62	2.20
LA5	9.12	6.82	6.02	4.50	3.94	2.82	2.40
LA6	11.30	7.97	6.81	4.67	3.97	2.65	2.17
LA7	7.36	5.50	4.83	3.47	2.94	1.84	1.44
LA8	6.19	4.90	4.39	3.25	2.80	1.81	1.43
LA9	7.97	6.19	5.55	4.18	3.64	2.46	1.98
LA10	8.98	6.70	5.95	4.52	4.00	2.93	2.52
LA11	8.03	5.85	5.11	3.70	3.18	2.13	1.72
LA12	8.80	6.53	5.77	4.31	3.76	2.59	2.12
LA13	10.94	7.79	6.73	4.90	4.25	2.92	2.42
LA14	13.93	9.87	8.45	5.76	4.84	3.08	2.45
LA15	8.23	5.93	5.27	3.95	3.44	2.39	1.98
LA16	7.03	5.18	4.61	3.45	3.00	2.01	1.62
LA17	6.62	5.42	4.93	3.86	3.41	2.44	2.05
LA18	10.46	7.50	6.55	4.81	4.18	2.91	2.42
LA19	9.08	6.73	5.90	4.37	3.83	2.71	2.28
LA20	10.94	7.50	6.46	4.69	4.10	2.93	2.49
LA21	9.20	6.96	6.24	4.87	4.33	3.18	2.71
LA22	8.98	6.36	5.57	4.15	3.61	2.45	1.99
LA23	8.20	6.27	5.60	4.24	3.71	2.59	2.14

GSM SERVICE PROVIDER "B" WITH DATA for 22 LICENSING AREAS HANDSET USAGE IN HOURS/ DAY							MOBILE
Licensing Area	Top 100 Subsribers Average	Top 500 Subsribers Average	Top 1000 Subsribers Average	Top 5,000 Subsribers Average	Top 10,000 Subsribers Average	Top 50,000 Subsribers Average	Top 100,000 Subsribers Average
LA1	9.72	6.46	5.43	3.62	2.98	1.77	1.36
LA2	11.66	8.61	7.42	5.08	4.25	2.57	1.95
LA3	10.86	8.00	7.08	5.24	4.51	2.92	2.31
LA5	12.86	8.82	7.48	5.11	4.29	2.64	2.01
LA6	13.42	8.43	6.92	4.40	3.58	2.07	1.57
LA7	8.58	5.66	4.76	3.03	2.40	1.17	0.78
LA8	10.04	7.23	6.25	4.37	3.66	2.16	1.57
LA9	13.34	9.89	8.40	5.52	4.51	2.46	1.65
LA10	8.73	6.13	5.25	3.55	2.92	1.68	1.25
LA11	7.81	5.04	4.20	2.62	2.05	0.94	0.59
LA12	12.66	8.04	6.66	4.37	3.61	2.16	1.62
LA13	14.96	10.84	9.14	6.23	5.32	3.59	2.93
LA14	12.41	7.72	6.45	4.26	3.51	2.05	1.52
LA15	14.92	7.75	6.12	3.82	3.12	1.84	1.40
LA16	10.92	7.93	6.73	4.40	3.55	1.87	1.29
LA17	11.09	7.95	6.89	4.80	4.03	2.45	1.86
LA18	8.89	6.39	5.45	3.67	3.03	1.71	1.22
LA19	13.00	7.88	6.40	4.20	3.48	2.07	1.55
LA20	8.08	5.77	5.01	3.54	2.99	1.87	1.46
LA21	11.31	8.05	6.97	4.90	4.14	2.51	1.88
LA22	10.35	7.31	6.27	4.27	3.52	1.96	1.40
LA23	11.08	7.96	6.80	4.67	3.95	2.56	2.04
Average	11.21	7.63	6.46	4.35	3.61	2.14	1.60

CDMA SERVICE PROVIDER "C" WITH DATA for 22 LICENSING AREAS USAGE IN HOURS/ DAY							MOBILE HANDSET
Licensing Area	Top 100 Subsribers Average	Top 500 Subsribers Average	Top 1000 Subsribers Average	Top 5,000 Subsribers Average	Top 10,000 Subsribers Average	Top 50,000 Subsribers Average	Top 100,000 Subsribers Average
LA1	7.57	5.41	4.95	3.93	3.25	1.92	1.48
LA3	9.25	6.99	6.17	4.55	3.91	2.53	2.00
LA4	8.57	5.98	5.19	3.52	2.87	1.62	1.17
LA5	5.40	3.85	3.24	2.12	1.71	0.90	0.59
LA6	9.93	8.13	6.84	4.85	4.04	2.31	1.74
LA7	8.37	5.50	4.70	3.15	2.60	1.54	1.16
LA8	4.35	3.00	2.50	1.50	1.11	0.39	0.20
LA10	0.06	0.01	0.01	0.00	0.00	0.00	0.00
LA11	4.60	3.41	2.95	2.00	1.64	0.90	0.63
LA12	6.54	4.82	4.35	2.96	2.37	1.31	0.95
LA13	8.68	6.14	5.41	4.17	3.43	1.91	1.42
LA14	9.67	6.93	6.04	4.48	3.82	2.36	1.81
LA15	8.65	5.95	5.21	3.75	3.14	1.96	1.54
LA17	5.46	3.98	3.41	2.27	1.82	0.92	0.59
LA18	6.85	4.52	3.75	2.36	1.88	0.91	0.57
LA19	9.42	7.36	6.15	4.48	3.75	1.84	1.26
LA20	5.37	3.90	3.37	2.33	1.95	1.16	0.85
LA21	10.12	7.15	6.18	4.43	3.76	2.36	1.82
LA22	8.49	6.17	5.45	3.88	3.21	1.83	1.34
LA23	7.73	5.54	4.74	3.12	2.53	1.33	0.93
Average	7.25	5.24	4.53	3.19	2.64	1.50	1.10

GSM SERVICE PROVIDER "D" WITH DATA for 18 LICENSING AREAS HANDSET USAGE IN HOURS/ DAY							MOBILE
Licensing Area	Top 100 Subsribers Average	Top 500 Subsribers Average	Top 1000 Subsribers Average	Top 5,000 Subsribers Average	Top 10,000 Subsribers Average	Top 50,000 Subsribers Average	Top 100,000 Subsribers Average
LA1	9.26	6.72	5.61	3.54	2.83	1.54	1.13
LA2	9.69	7.46	6.55	4.64	3.89	2.36	1.81
LA3	10.50	8.16	7.23	5.36	4.59	2.90	2.20
LA4	7.70	5.24	4.48	3.15	2.69	1.78	1.44
LA5	12.20	9.13	7.88	5.29	4.38	2.56	1.90
LA8	7.81	5.71	4.88	3.16	2.46	1.09	0.70
LA9	12.59	9.56	8.40	6.09	5.22	3.34	2.56
LA10	8.05	5.72	4.94	3.38	2.81	1.68	1.26
LA11	9.81	7.08	6.04	4.08	3.38	1.97	1.46
LA13	8.72	5.74	4.66	2.86	2.27	1.20	0.86
LA15	7.64	5.47	4.69	3.14	2.59	1.50	1.12
LA16	8.48	5.98	5.11	3.44	2.84	1.72	1.33
LA17	10.06	7.60	6.65	4.73	3.98	2.36	1.75
LA18	6.57	4.11	3.28	1.76	1.29	0.56	0.35
LA19	8.91	6.87	6.03	4.15	3.43	1.98	1.48
LA20	9.04	6.45	5.63	4.16	3.65	2.62	2.22
LA21	10.93	8.29	7.29	5.30	4.53	2.86	2.19
LA22	9.72	6.98	6.02	4.23	3.58	2.22	1.68
Average	9.32	6.79	5.85	4.03	3.36	2.01	1.52

GSM SERVICE PROVIDER "E" WITH DATA for 6 LICENSING AREAS HANDSET USAGE IN HOURS/ DAY							MOBILE
Licensing Area	Top 100	Top 500	Top 1000	Top 5,000	Top 10,000	Top 50,000	Top 100,000
	Subsribers Average	Subsribers Average	Subsribers Average	Subsribers Average	Subsribers Average	Subsribers Average	Subsribers Average
LA1	9.95	7.13	6.19	4.34	3.68	2.40	1.92
LA3	11.65	9.20	8.25	6.20	5.41	3.67	2.94
LA6	13.90	10.85	9.38	6.35	5.31	3.34	2.63
LA13	11.77	8.84	7.57	5.20	4.39	2.83	2.26
LA21	12.21	9.69	8.71	6.66	5.88	4.21	3.52
LA22	12.18	9.52	8.50	6.43	5.63	3.91	3.20
Average	11.94	9.21	8.10	5.86	5.05	3.39	2.75

GSM SERVICE PROVIDER "F" WITH DATA for 3 LICENSING AREAS : HANDSET USAGE IN HOURS/ DAY							MOBILE
Licensing Area	Top 100	Top 500	Top 1000	Top 5,000	Top 10,000	Top 50,000	Top 100,000
	Subsribers Average	Subsribers Average	Subsribers Average	Subsribers Average	Subsribers Average	Subsribers Average	Subsribers Average
LA6	9.14	5.83	4.71	2.72	2.05	0.92	0.61
LA7	10.55	7.56	6.46	4.22	3.36	1.61	1.05
LA14	11.17	8.45	7.27	4.90	4.01	2.17	1.46
Average	10.29	7.28	6.15	3.94	3.14	1.57	1.04

SERVICE PROVIDER "A to F" WITH DATA for 94 LICENSING AREAS IN HOURS/ DAY							MOBILE HANDSET USAGE
Licensing Area	Top 100*94	Top 500*94	Top 1000*94	Top 5,000*94	Top 10,000*94	Top 50,000*94	Top 100,000*94
	Subsribers Average	Subsribers Average	Subsribers Average	Subsribers Average	Subsribers Average	Subsribers Average	Subsribers Average
Average Hours/ Day for Service Provider	9.44	6.79	5.86	4.11	3.46	2.15	1.67
Subscribers	9,400	47,000	94,000	470,000	940,000	4,700,000	9,400,000
Mobile Handset Usage in Hours / Month	292.74	210.49	181.78	127.47	107.39	66.73	51.81
Mobile Handset Usage in Hours / Year	3,512.88	2,525.88	2,181.34	1,529.65	1,288.66	800.78	621.74

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II. List of Contributions

1. Côte d'Ivoire www.itu.int/md/D10-SG01-INF-0034/
2. Brazil www.itu.int/md/D10-SG01-C-0088/
3. Republic of Korea www.itu.int/md/D10-SG01-C-0181/
4. Israël www.itu.int/md/D10-SG01-C-0135/
5. Venezuel www.itu.int/md/D10-SG01-C-0082/
6. Hungary www.itu.int/md/D10-RGQ23.1-C-0015/
7. Uzbekistan www.itu.int/md/D10-SG01-INF-0018/
8. Benin www.itu.int/md/D10-SG01-C-0228/
9. India www.itu.int/md/D10-SG01-C-0278/

III. References

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