

**Ministry Environmental Protection**  
**NOISE AND RADIATION ABATEMENT DEPARTMENT**

☒ 5 Kanfei Nesharim P.O.Box 34033 Jerusalem 95464 ☎ +972 2 6495869 ☎ +972 2 6495870  
[stelian@sviva.gov.il](mailto:stelian@sviva.gov.il) [www.sviva.gov.il](http://www.sviva.gov.il)

**National Activity Report – 2011**

*Stelian Ghelberg*

**Continuous Monitoring of Cellular Radiation by  
 Collecting Information Directly from the Radio Switch  
 Networks of the Cellular Carriers Nationwide**

An innovative program implemented in 2010 in Israel enables the Radiation Commissioner to monitor all +25,000 UMTS sectors around the country from his desk and receive all radiation related data from every antenna, everywhere in the country, 1500 time every second, 365 days a year!

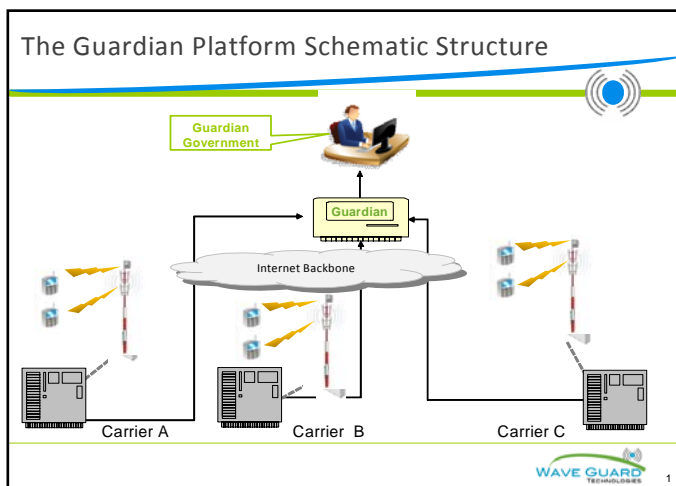
The new program for Continuous Monitoring of Cellular Radiation (CMCR) is a ground-breaking program that elevates the level of enforcement by the department to a complete new era. This program has significant relevance in each of the following WHO report categories:

- New policies and legislations regarding NIR exposure
- Areas of public concern and national responses
- New public information activities

Below is a summary of the program characteristics, benefits, implementation challenges, key results and conclusions.

**Overview of Program**

In 2010 the Department of Noise and Radiation in the Israeli Ministry of Environmental Protection implemented a new program for monitoring non-ionizing radiation from cellular antennas. The program combines an innovative state-of-the-art technology for continuous measurement of cellular radiation with a set of processes and procedures



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to enable a truly comprehensive monitoring of cellular radiation on a nationwide scale.

At the heart of the program is an innovative technology we licensed, which makes possible continuous monitoring of all radiation related parameters throughout the cellular network. A cellular network is designed in such a way that each and every one of the antennas in the network is connected to the radio switches, which are the core management center of the network. The antennas receive commands from the main network computer and report back on their performance and activities. This way the central system effectively manages the network and consequently has complete data of the activity in its network.

The new technology we use connects to the radio switches of each of the cellular carriers in the country. The software receives prescribed copies of specifically requested log files that the radio switches produce during their regular operations. Once authenticated and confirmed for their originality, the software analyzes the files, extracts the specific pieces of data required to calculate the radiation emitted from every device in the network and presents that information in an easy to consume set of reports. Then, the system compares this data with data from the operational permits provided by the commissioner's office for each antenna and flag violations.

The innovation here is in the ability to rely on factual data from the radio switches themselves to produce the radiation reading instead of relying on external measurement from the field that requires backward calculations to understand the radiation that a specific device emits.

### **Key Benefits of Technology:**

1. **Undisputed Data Accuracy:** since the data comes directly from the radio switches of the cellular carriers it is indisputable in its accuracy. This benefit is of a great importance for effective enforcement of the law and regulations since debates over data accuracy have previously prevented such effectiveness.
2. **Nationwide Coverage:** since the system connects to the radio switches, it covers the entire network the radio switch manages and effectively via a single connection (per carrier) covers every emitting device throughout the entire country.
3. **Complete Data:** since we get the data per emitting device, we are able to monitor the system at the device level rather than the previous site level monitoring. This is important since it gives us much more actionable data to enforce the radiation limits. For example, we now know which specific device on a pole with many devices violates its permit. Furthermore, we can point to the route cause of the violation: a change in the physical configuration, a change in power supply, an added amplifier, etc.
4. **Continuous Monitoring:** since the radio switches produce the data 1500 times per second, we gain effectively continuous monitoring of the network. This feature is of extreme importance since we can for the

first time monitor patterns in the radiation of antennas, which previously, relying on one-off manual tests we were not able to. For example, we can identify increased radiation near schools when the pupils leave the school to go home.

5. **High Availability of Data:** since the data is all electronic and digital, it is highly available for us to view at any point in time and makes it very easy to analyze towards research activity.
6. **Automation and Control:** whenever the system identifies a violation it operates a set of management and control modules that enable automation of alerts, both internally and to and from the carriers and maintains a clear log of activities and correspondences regarding the violation from its inception to closure. We plan to make the list of violations available on our site for the public to consume.
7. **Low Cost:** Since the system is a software one, its costs is substantially lower than any alternative means (labor-based monitoring teams sent to the field to measure individual antennas at a specific time, or hardware-based probes mounted on base stations to monitor an individual sector).

## Implementing the system

The technical implementation of the system was relatively straight forward and simple; it took less than a week to make all the technical aspects working. We had to overcome a number of concerns and obstacles raised by the cellular carriers. Today we can safely conclude that the mass majority of the carriers' claims were based on fear of the commercial implications of the information the system will enable the commissioner more than the legal or technical aspects. The results of the system show unequivocally, that the internal measurement and control systems the carriers have in place are insufficient to prevent violations of permits and there is an acute need for a dedicated system for that purpose within their operations.

That said, some of the claims were valid and required us for some action. For example, despite the fact that we requested only network data, one of the carriers alerted us to the fact that the way they collect the data includes significant amount of customer-specific data together with the antenna level data. This may present privacy concerns to customers. To combat the risk, we requested our software vendor to produce a filter which we have provided the carriers. The filter was checked by the carrier, implemented on the carriers' side and stripped the file they send us from all customer specific data and left it with only antenna-level data.

In general, we found the existing legal foundation more than adequate to support our needs for the new program and hence did not require us for any legal change. The legal construct is a combination of a number of legal components including:

- a) [The Non-Ionizing Radiation Law, 2006](#),
- b) [The Non-Ionizing Radiation Regulations, 2009](#),
- c) The Operating Contracts between the government and each of the carriers, and

d) The specific Operational Permit issued by the Radiation Commissioner for each antenna.

The above law, regulations, contract and permits all specify the obligation by the carriers to not only obey the law that states a limit for radiation from each antenna, but also to provide the commissioner with the information he needs to monitor the actual radiation and enforce the law.

Prior to the implementation of this new program, we followed ICNIRP and WHO guidelines and recommendations and required the carriers to conduct the following activities as they relate to limiting radiation from the antennas:

- a) Apply for a specific construction and operational permits for every new radiation source (cellular site) and every change to an existing source.
- b) Conduct a radiation test before planning a new site, before and after the activation of a new site and after every change to an existing site
- c) Conduct at least one annual radiation test for every site, and
- d) Report the results of each of the above tests to the commissioner.

To enable a smooth implementation of the system, we had to augment some of our internal procedures as well as amend the operational permits given to the carriers for each antenna. We made changes to the conditions in the antenna permits. Since we are the ones issuing the permits, we have full legal authority over their conditions and were able to make the changes quickly and easily, avoiding the complex and lengthy process to amend laws.

The key changes we implemented in our Operational Permits included the requirements from the carriers to:

- a) Provide the commissioner with the entire set of parameters that generate and determine the radiation of the emitting device
- b) Provide the above information continuously and in real time
- c) Provide the above information electronically using a software system we specified and provided the carriers
- d) Avoid any disruption of the operation of the above software
- e) Avoid any manipulation of the data the above software requires

### **Key Findings of System**

The system became operational on September 1<sup>st</sup>, 2010 and instantly provided information on the 25,321 antennas in Israel which operates in 3G. The system detected a total of more than 900 hours in which the maximum permitted transmitting power across roughly 2,000 antennas was exceeded. Other types of violations, like those caused by changes to Elevation Tilt, Feeder Loss, Power Pattern, Frequency Ranges used and others are also available and monitored by us.

Violations were detected at all the 3 carriers which operate 3G antennas in Israel and some 8% of the total number of 3G sectors violated its specific permit for at least 1 second in the first 4 months of operation. At the same time, the system detected close to 20 sites which operated without a valid permit.

Based on the continuous monitoring data, we reached out to the carriers with specific requests to examine the information with their own resources and respond back to us with suggested actions to rectify the situation. With respect to the sites which operated without permits and have worked with the carriers to either shut down the sites or produce the appropriate permits for them.

With respect to the violations of permits the carriers were not able to provide substantive information to counter the information from the system and only vaguely stated their internal systems did not find any such violations. Nevertheless, the information from the system enabled us to effectively work with the carriers to eliminate the violations.

As a result, the number of violations has decreased substantially since the system was put in place and stands today on a small fraction of what we witnessed only 4 months ago.

## **Summary and Conclusions**

This system proved itself to be extremely effective and efficient in collecting complete and continuous information regarding radiation levels from each antenna throughout the country. It enables us actionable information to work in a timely manner with the carriers to significantly minimize violations from the radiation permits. The mere essence of the carriers' acknowledgment of the level of data the commissioner has in real time regarding each and every one of their antennas is a major contributor to the enforcing power of the commissioner.

Based on the success of the system we have been working on the following:

- a) Extend the coverage of the program from the current 3G antennas and enable it to the other technologies in use in Israel, namely GSM, CDMA and IDEN today and 4G in the near future. We expect that expansion to materialize in Q1-2011.
- b) To take advantage of the new capabilities, we have further amended our processes and now provide permits and monitor the radiation from each individual transmission device and not as before at the site level.
- c) Publish the information regarding violations on our website for the entire public to consume. This will be done both in a tabular format and in conjunction with our GIS map.
- d) Support additional means to disseminate the information to specific segments of the populations, for example educational organizations.

To my knowledge, this program is first of its kind in the world and is unique in its ability to provide complete and near-real-time information on every radiating device throughout the entire cellular network nationwide and enable actionable information to ensure effective monitoring and protect the public.

Considering the effectiveness of this new and innovative program, we strongly recommend every radiation commissioner to evaluate implementing such a

system in their countries. Further, we recommend WHO – EMF Project to diligently study the new technology towards potentially setting it as the recommended standard for cellular radiation measurement method.