



Ambient Levels of Radio Frequency Emissions in the Kingdom of Bahrain:

Results of measurements made between
April and June 2009

A Report issued by the
Telecommunications Regulatory Authority

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30th June 2009

Purpose:

To present the results of RF field strength measurements taken in Bahrain during the second quarter of 2009.

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1 Executive Summary

- 1.1 This report is the second in a series of reports which will be issued by TRA as part of its ongoing campaign to measure the ambient level of Radio Frequency (RF) field strengths in the Kingdom of Bahrain.
- 1.2 The previous report provided a detailed background to the issue as well as the results for measurements taken during the 1st Quarter of 2009. This report provides the results of further measurements and can therefore be considered to be an extension of the first report.
- 1.3 In the first report TRA stated that a Ministerial Order to establish limits for RF exposure in the Kingdom would be published imminently. It can now be reported that the Order was published in April 2009.
- 1.4 During the period April to June 2009 measurements of RF field strengths were made at 15 locations throughout the Kingdom of Bahrain. The detailed results of these measurements are recorded in section 4 of this report.
- 1.5 The key findings of the measurements are:
 - a. The RF field strengths measured are all significantly below the ICNIRP guideline.
 - b. The highest signal levels measured were in the broadcast & GSM bands and were 1.2% & 0.85% of the ICNIRP level respectively.
 - c. The highest total exposure measured across all bands is 14.52% of the ICNIRP level. This was measured at the CIO where the major contributors are radio and television broadcasting stations.
- 1.6 Further measurements will be made to continue to develop a detailed picture of RF signal levels throughout the Kingdom of Bahrain.

2 Introduction

- 2.1 This report is the second in a series of reports which will be issued by TRA as part of its ongoing campaign to measure the ambient level of Radio Frequency (RF) field strengths in the Kingdom of Bahrain.
- 2.2 The previous report provided a detailed background to the issue as well as the result for measurements taken during the 1st Quarter of 2009. This report can therefore be considered to be an extension of the first report.
- 2.3 The first report stated that a Ministerial Order to establish limits for RF exposure in the Kingdom would be published imminently. It can now be reported that the Order was published in April 2009.
- 2.4 During the period April to June 2009 measurements of RF field strengths were made at 15 locations throughout the Kingdom of Bahrain. The detailed results of these measurements are recorded in section 4 of this report.

3 Scope

3.1 This report presents the results of measurements made between April and June 2009 at the following locations:

Location	General Area	Specific Location
1	Bahrain International Airport	Metrological centre, near radar
2	Hidd	Block 101, Educational Centre for Children
3	Sanabis	Block 412
4	Arad	Block 244
5	Duraz	Block 540
6	Demistan	Block 1019
7	Janabeya	Block 575
8	Nabih Saleh Island	Block 381
9	Riffa	Block 929
10	Bugowa	Block 455
11	Hamala	Montessori Pre-school
12	Hamala	British School
13	Isa Town	CIO car park
14	Manama	15 th Floor, World Trade Centre
15	Hajiyat	Block 939

Table 1: locations of measurement

4 Results

4.1 Insite Box

Figures 1 to 12 below present the results of measurements taken using the Insite Box measurement system. The results are in the form of charts which show the minimum, maximum and average field strengths measured, per band, as a fraction of the ICNIRP level.

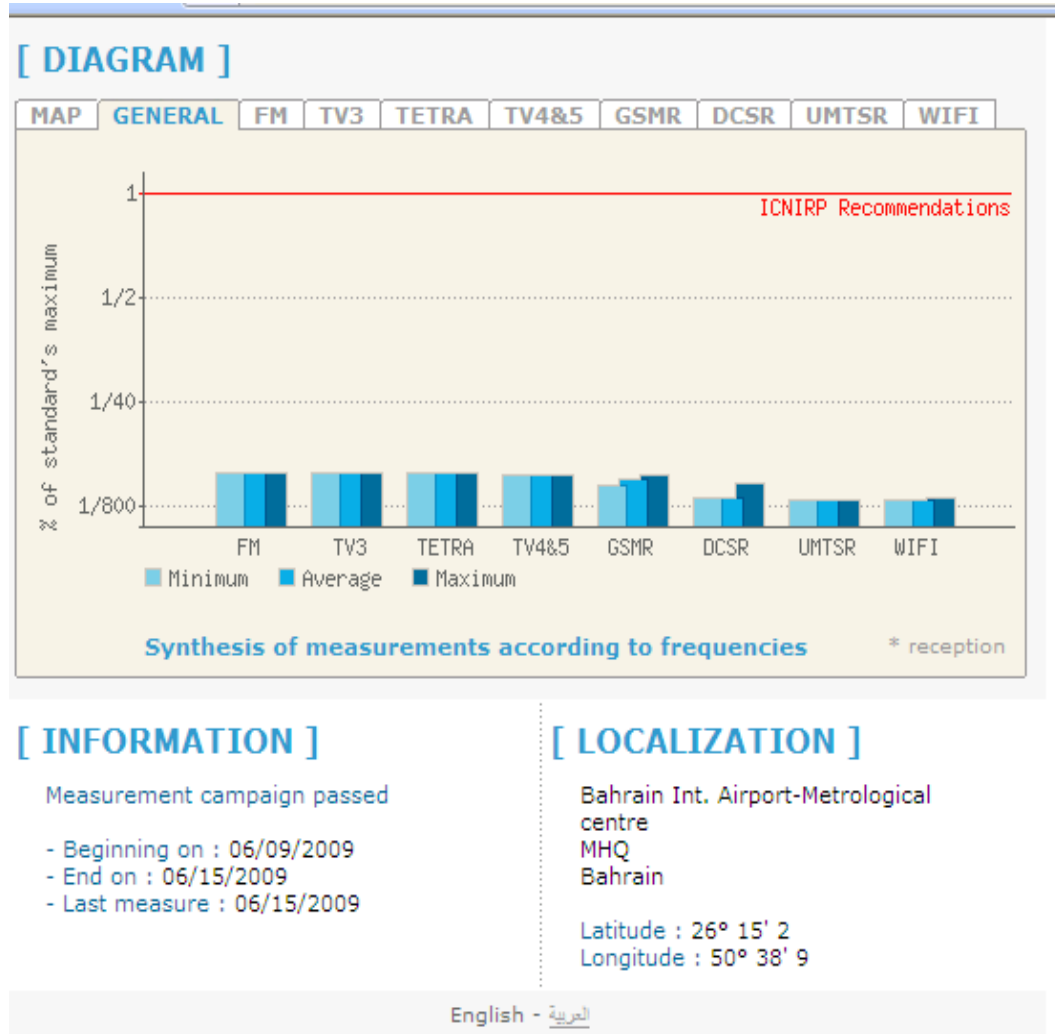


Figure 1: Result for the International Airport

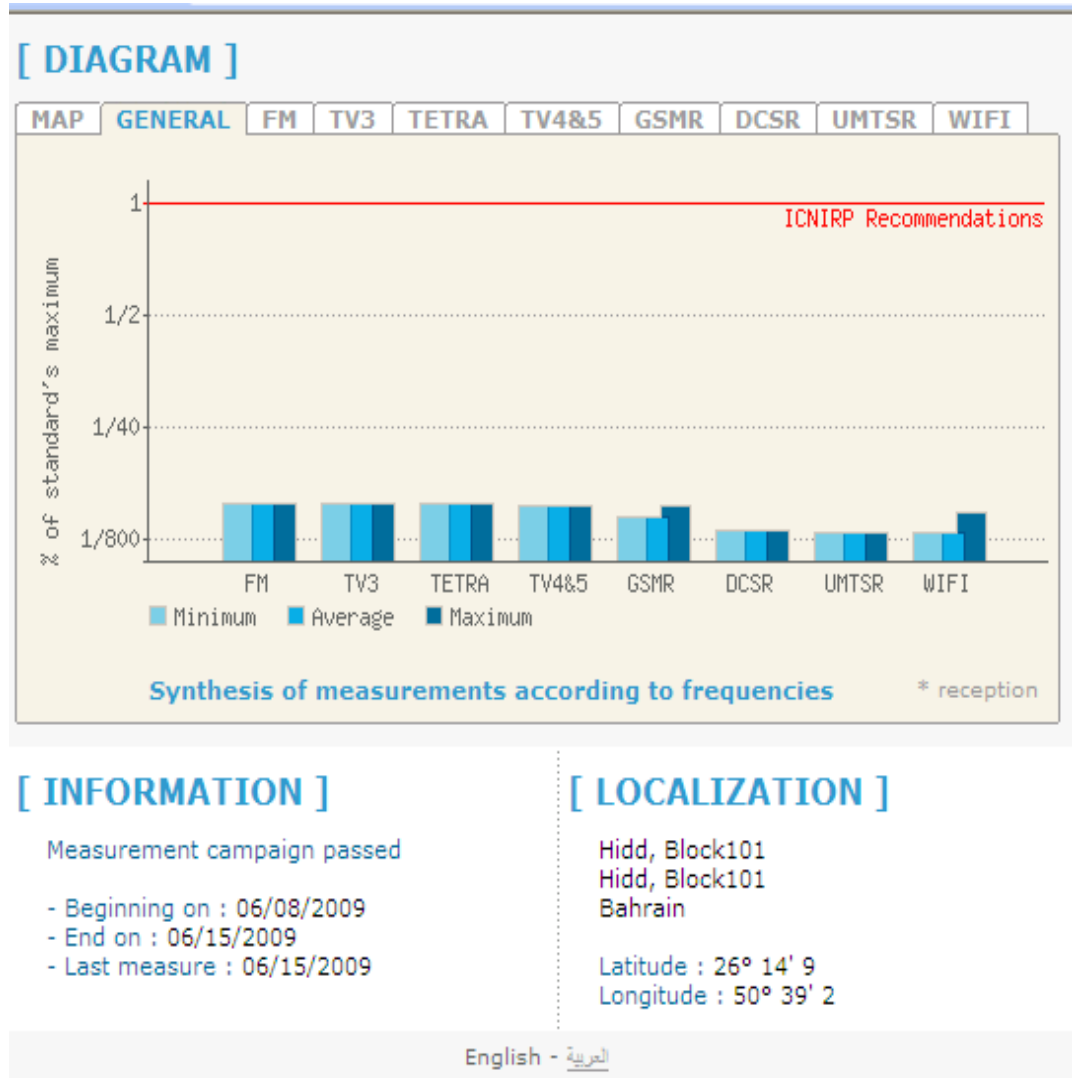


Figure 2: Results of Hidd, Educational Service Centre for Children

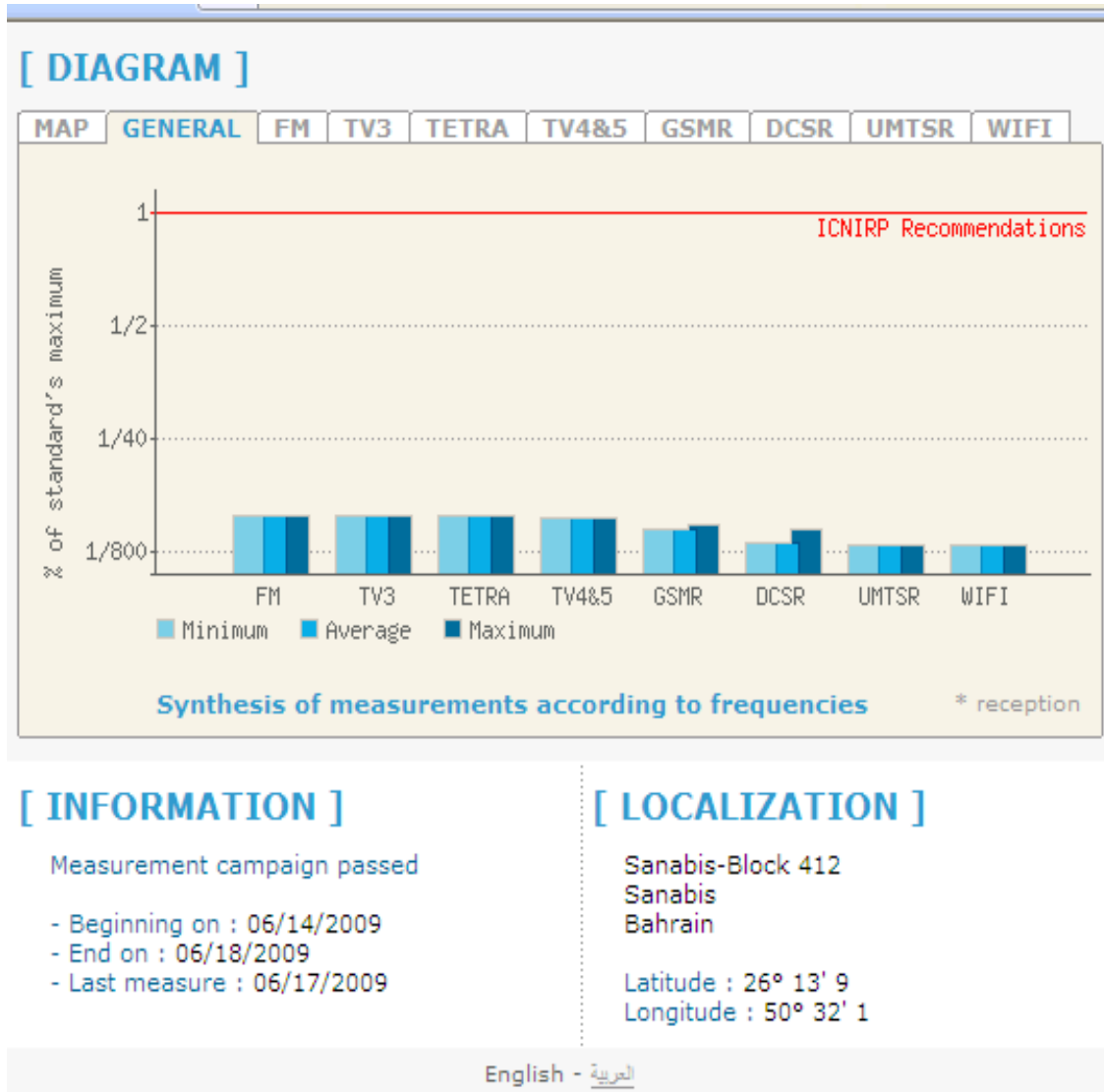


Figure 3: Result of Sanabis area

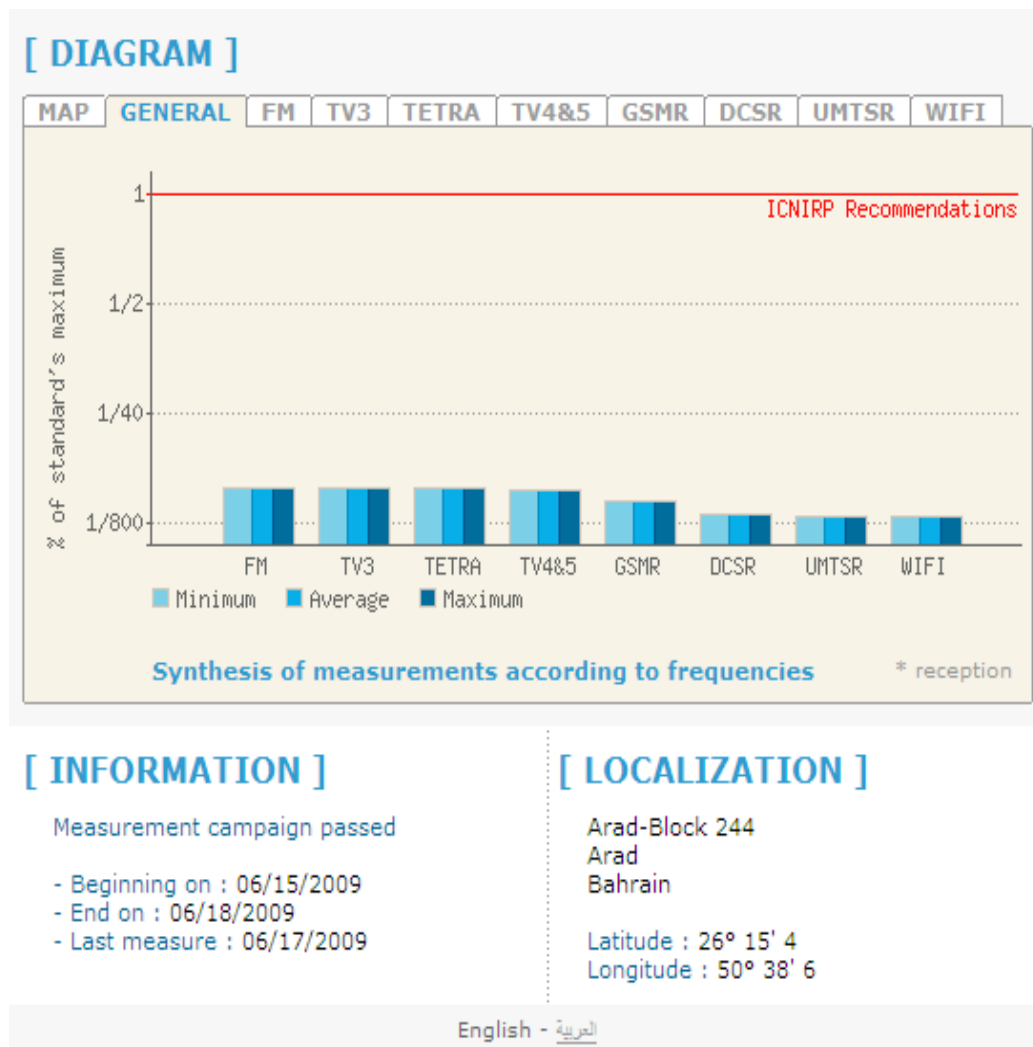


Figure 4: Result of Arad area

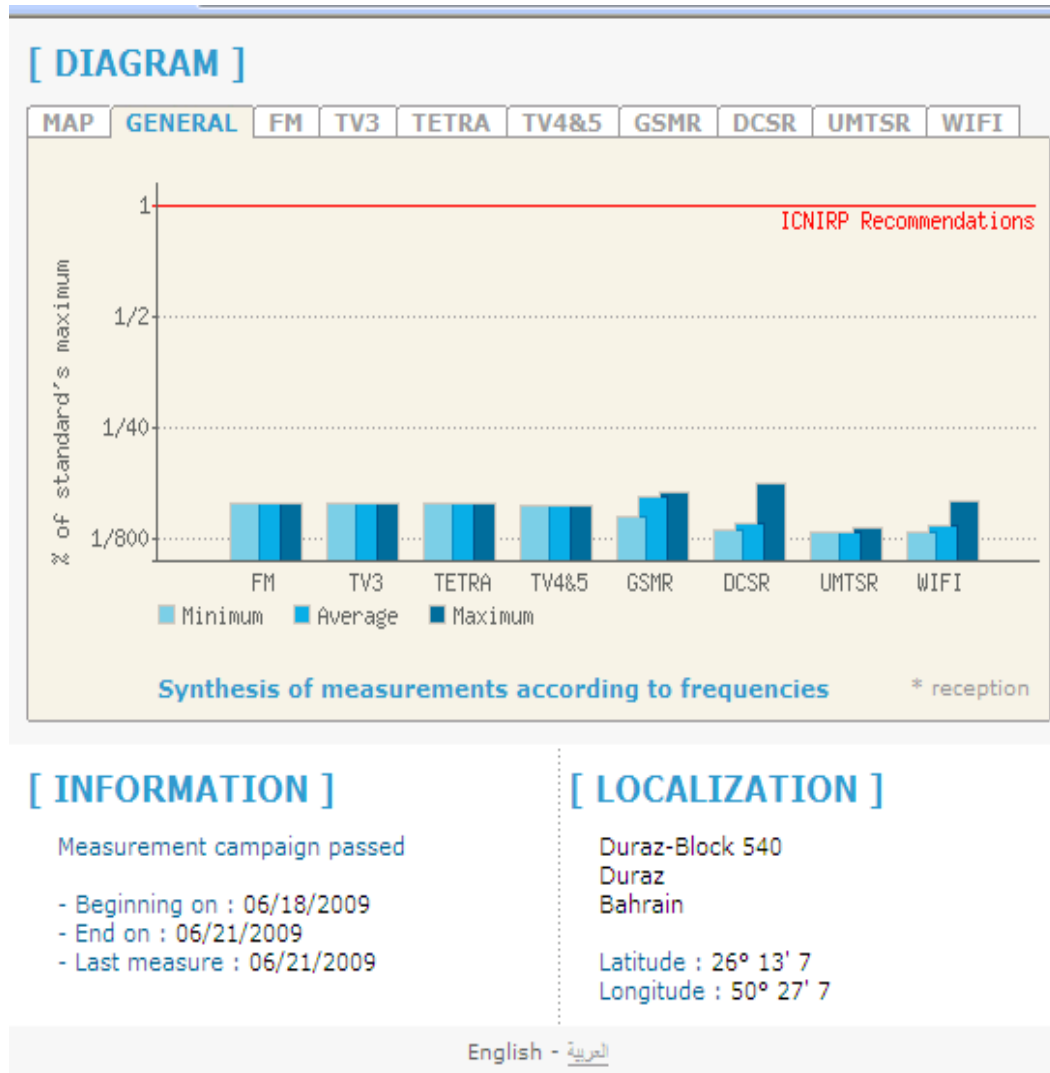


Figure 5: Result of Duraz area

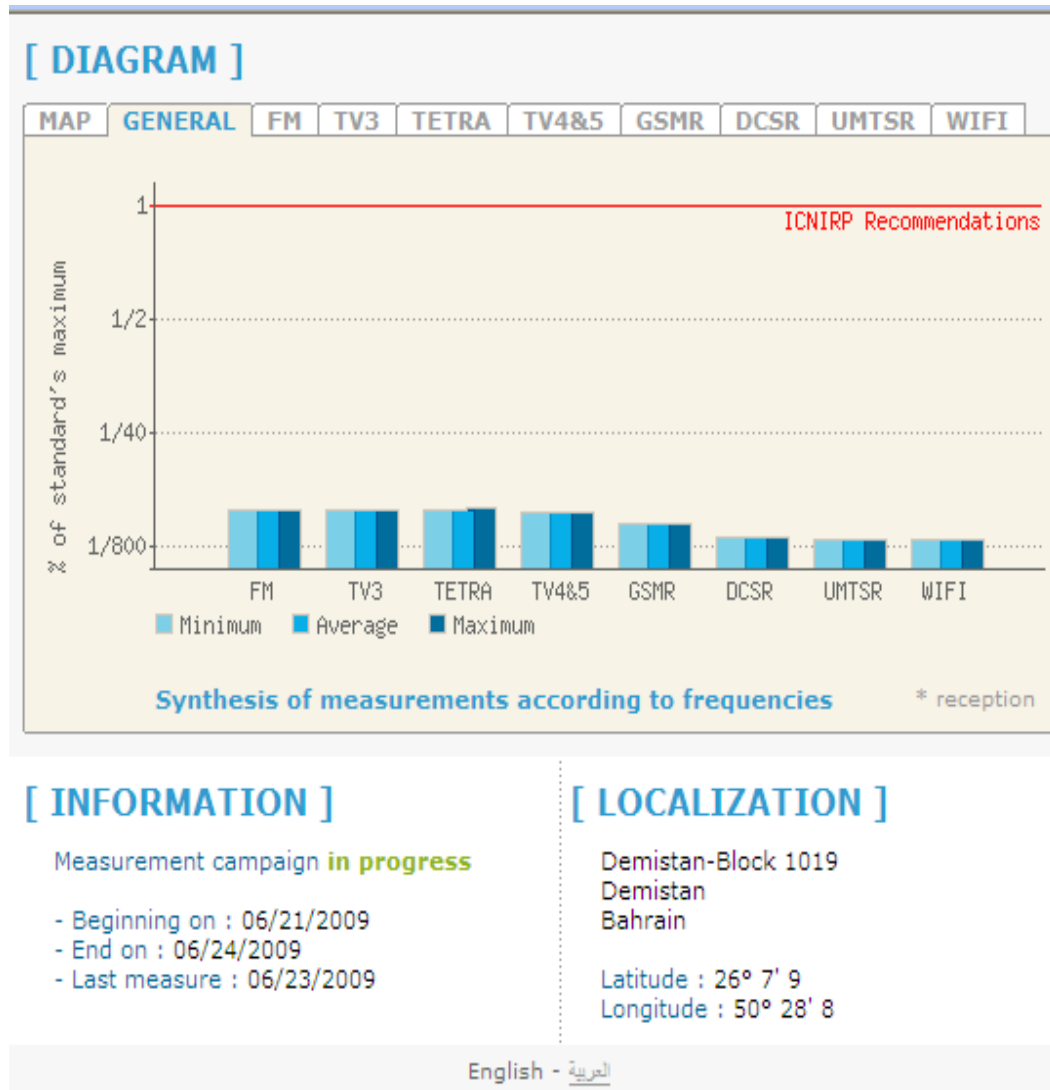


Figure 6: Result of Demistan Area

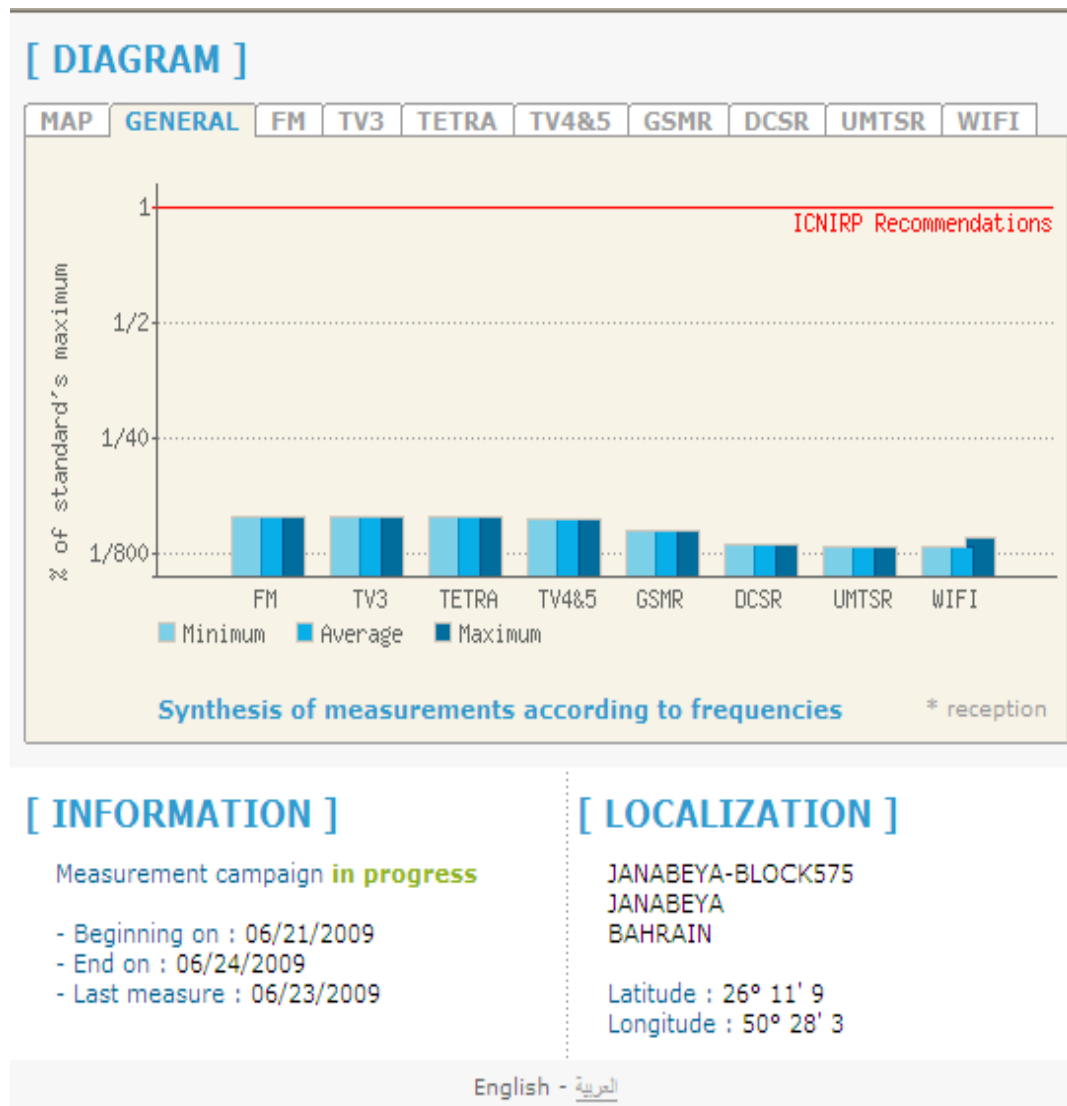


Figure 7: Result of Janabeya

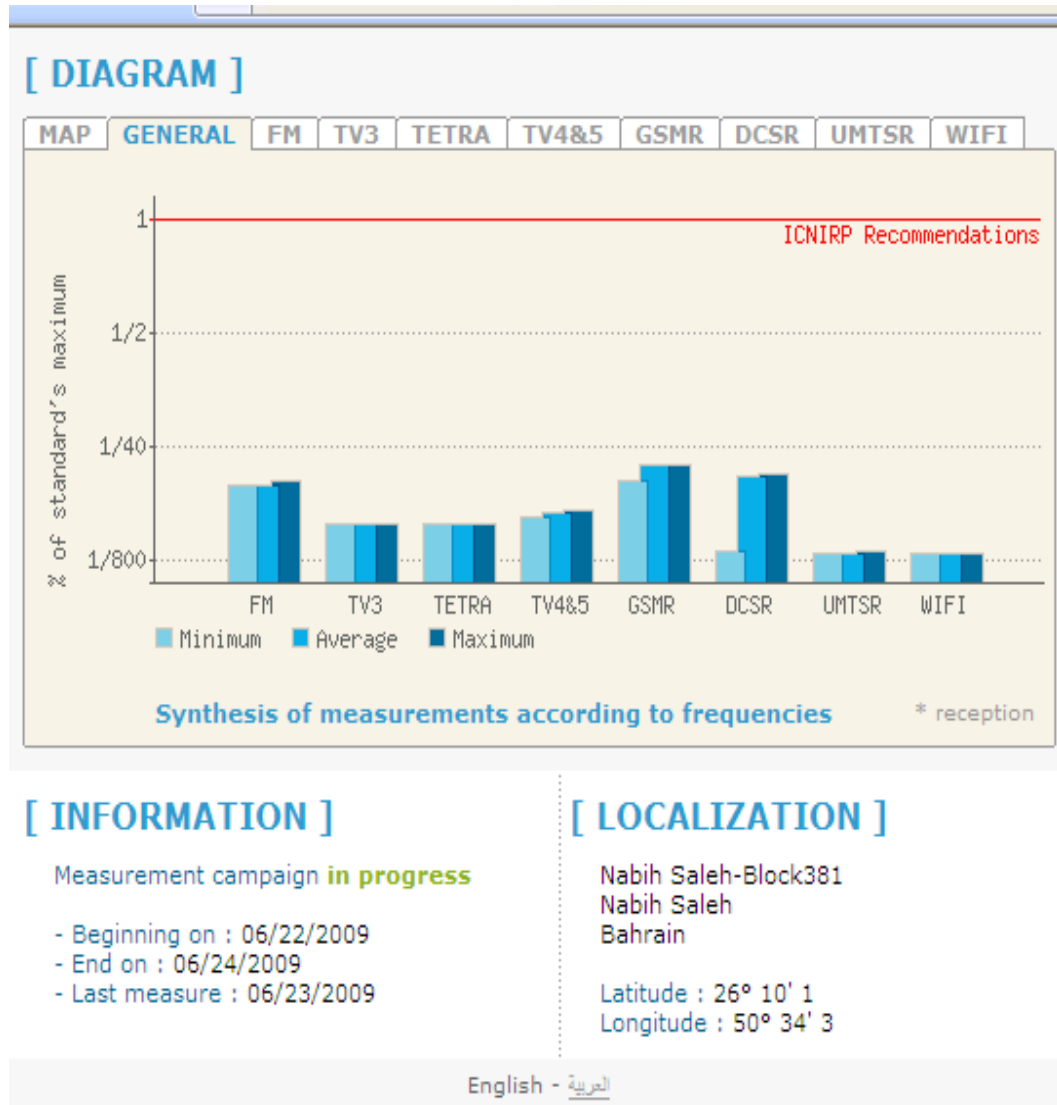


Figure 8: Nabih Saleh Island

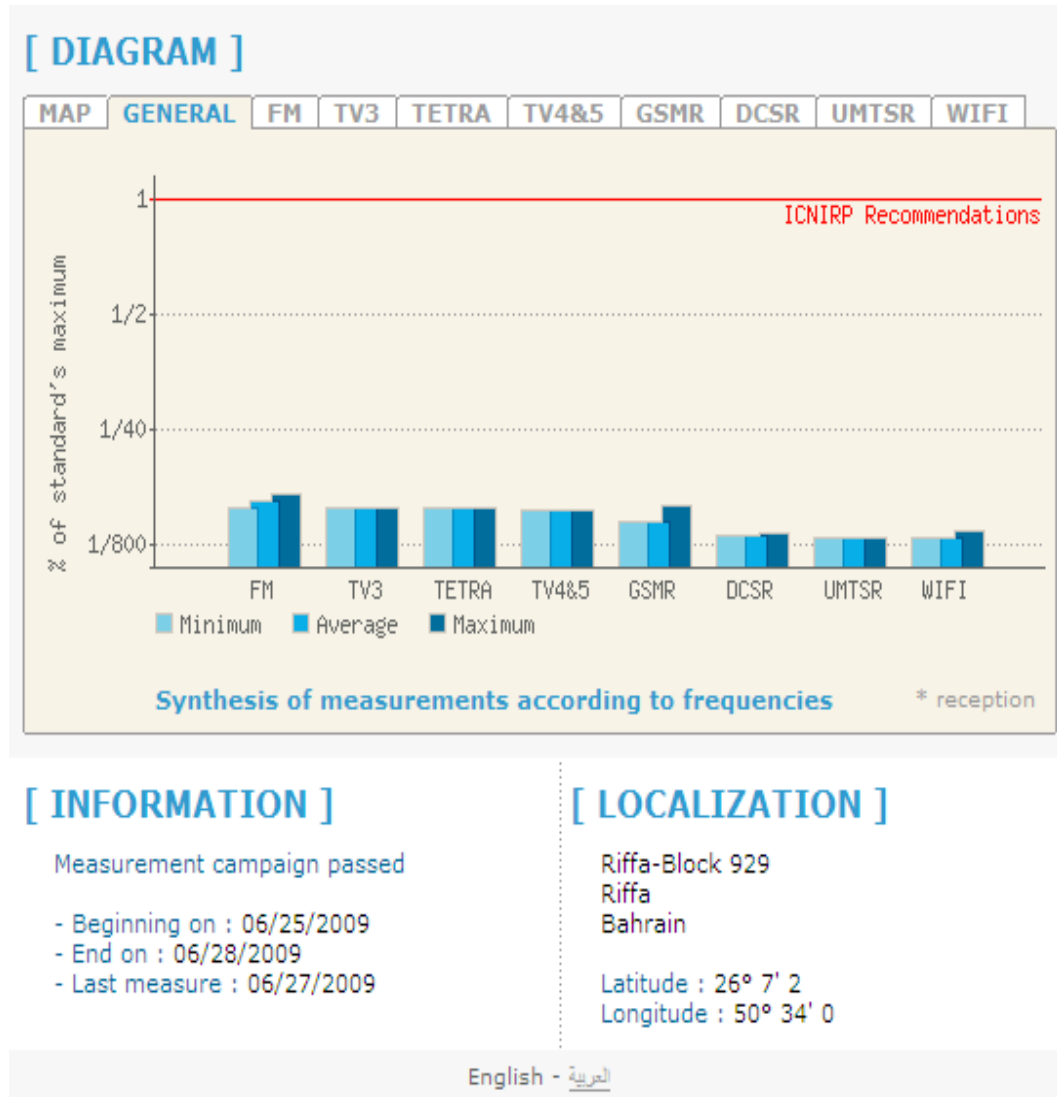


Figure 9: Result of Riffa area

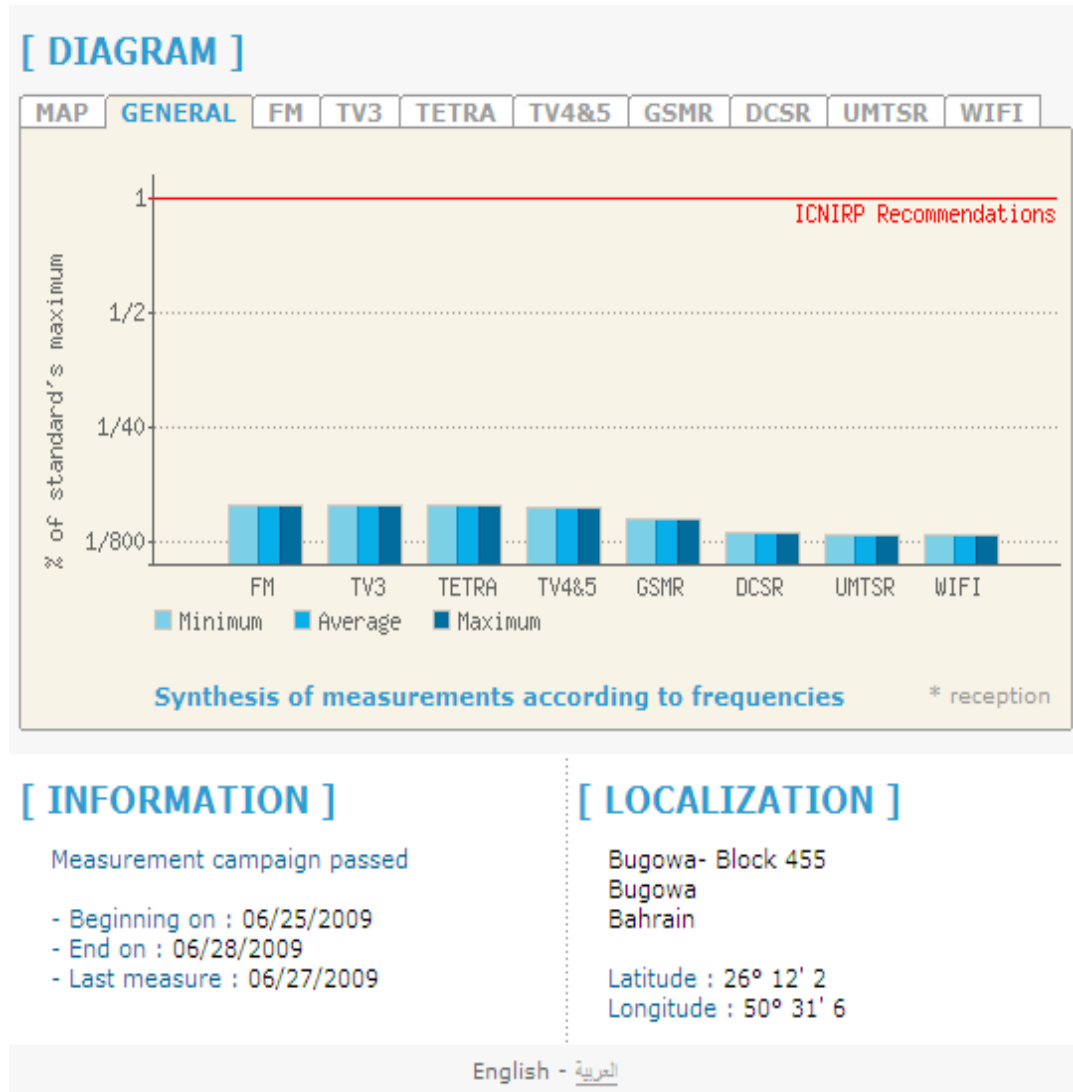


Figure 10: Result of Bugowa area

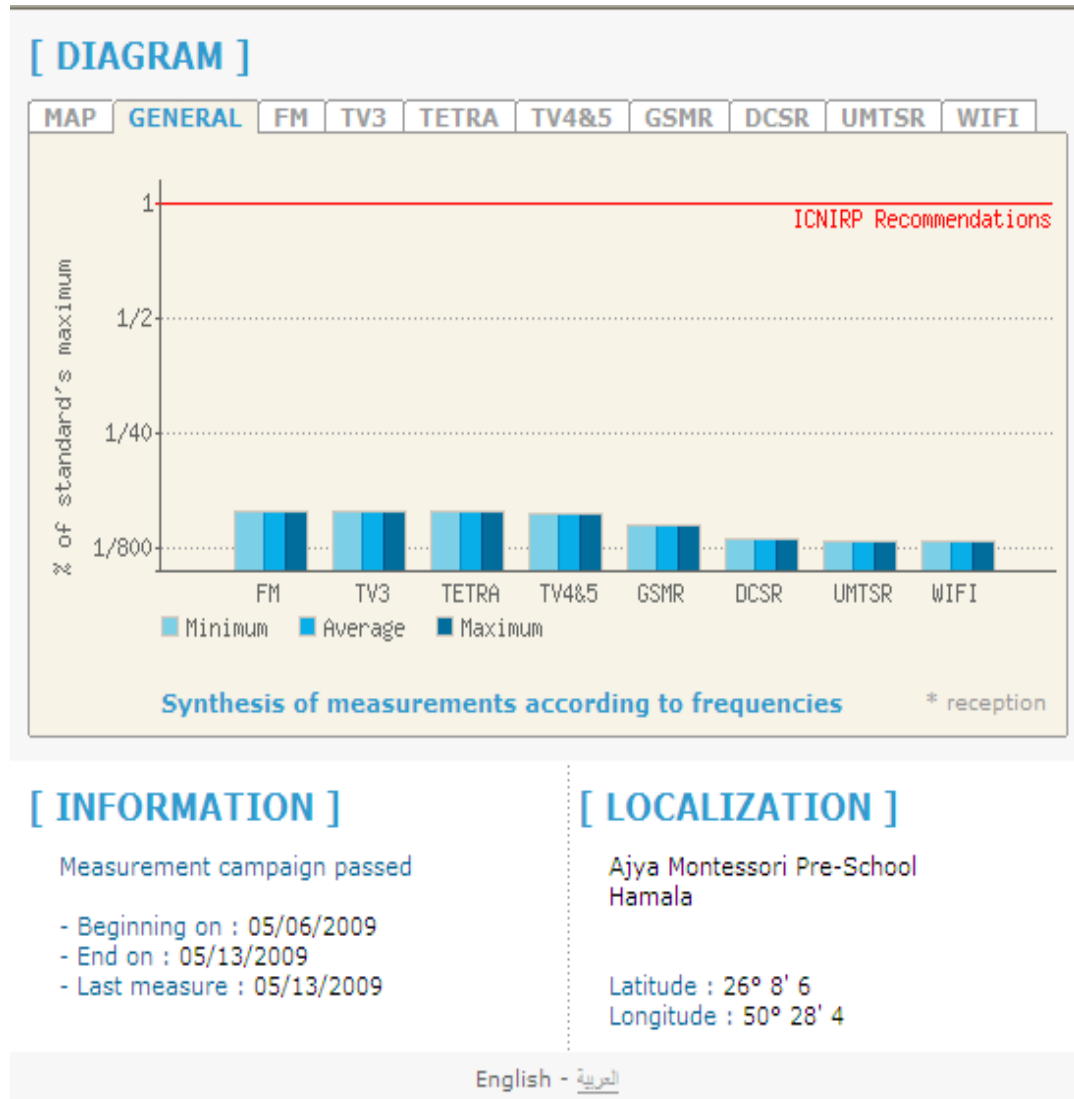
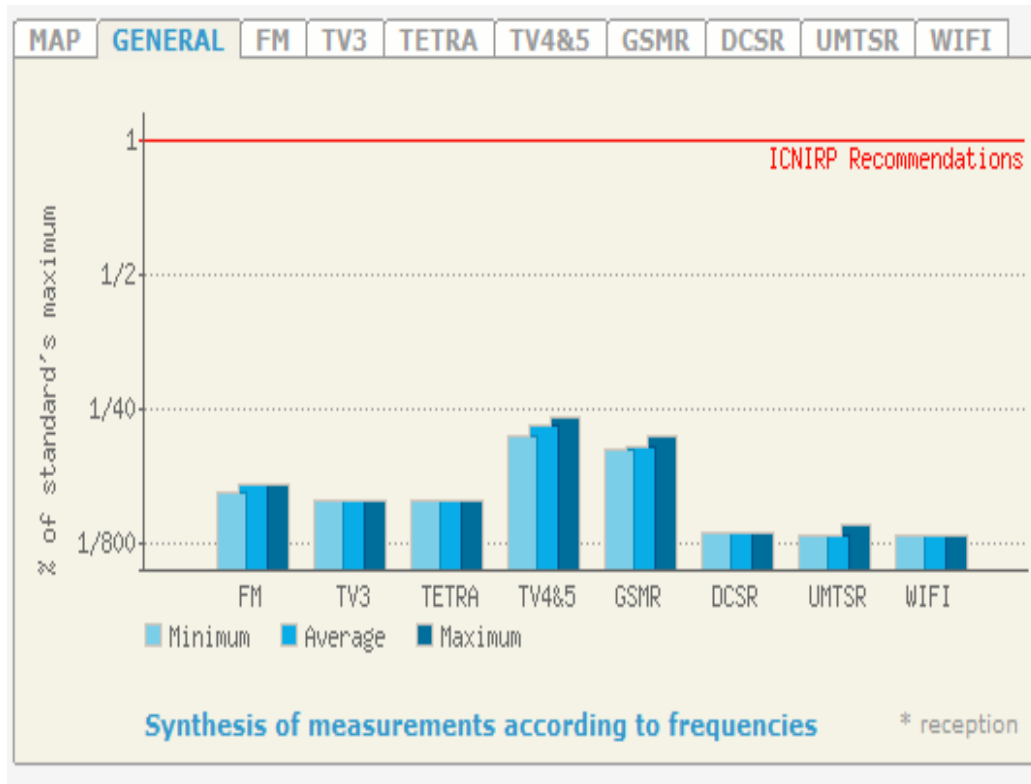


Figure 11: Result of Montessori School



[INFORMATION]

Measurement campaign **in progress**

- Beginning on : 04/29/2009
- End on : 05/06/2009
- Last measure : 05/04/2009

[LOCALIZATION]

British School
Hamala
Kingdom of Bahrain

Latitude : 26° 9'
Longitude : 50° 28'

Figure 12: Result of British School in Hamala

4.2 Insite free

4.3 As the Insite Box measurement system is not capable of measuring WiMax frequencies, additional measurements using the Insite Free equipment were also performed at the Janabiya, Montessori School & Hajiyat. The table below presents the measured level of WiMax signals as a % of the ICNIRP limit:

Location / site name	% of ICNIRP for WiMax band	Specific location
Hamela	0.0732%	Montessori School playground
Janabiya	0.320%	Block 575 Near Wimax station
Hajiyat	0.083%	Block 939 Near Wimax station

Table 2: WiMax measurements with Insite free

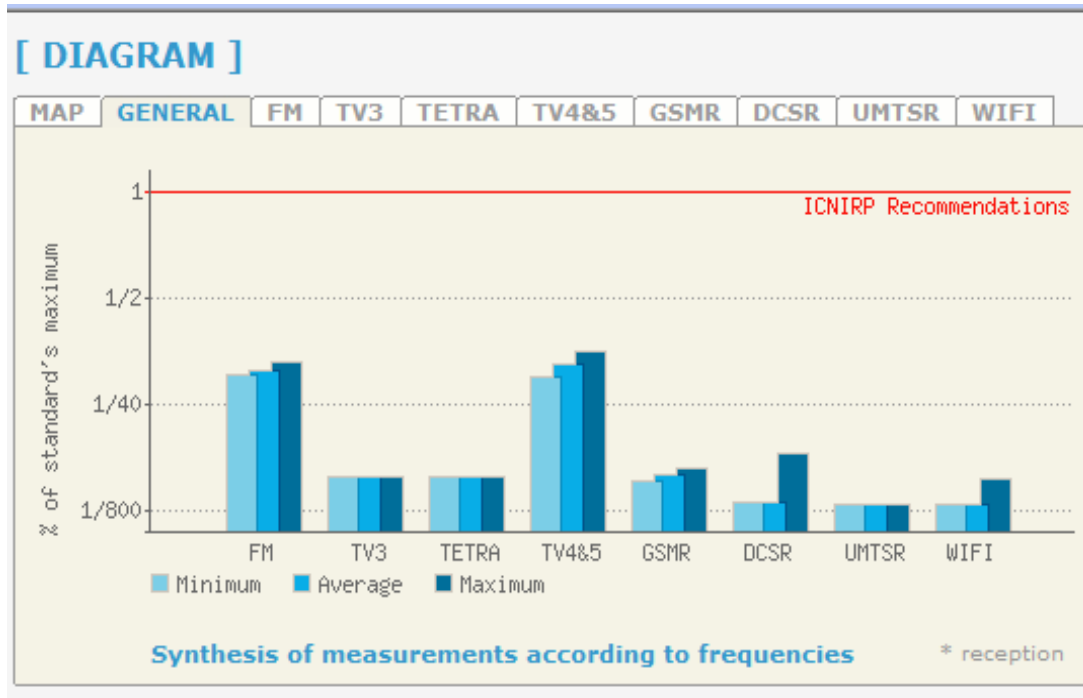
4.4 In addition, the Insite Free equipment is capable of determining the total exposure across all bands. The following table shows the total exposure over all bands as a % of the ICNIRP level for a selection of sites:

Location / site name	Total % exposure limit	Remarks
Isa Town	14.52%	Near CIO car park
Manama	0.15%	WTC 15th floor
Riffa (Hajiyat)	0.15%	Near Wimax station

Table 3: Measurement of total exposure across all bands

5 Conclusion

- 5.1 No measurements at any site exceeded the ICNIRP guidelines.
- 5.2 The highest signal levels measured (at sites not previously measured) were in the broadcast & GSM bands and were 1.2% & 0.85% of the ICNIRP level respectively as shown in Figs. 8 & 12 for Nabih Saleh Island & British School in Hamala.
- 5.3 These signals are slightly higher than the levels normally observed in these bands, however they represent just a very small fraction of the ICNIRP level.
- 5.4 The report for the first quarter recorded higher than average measurements for the CIO. The measurements were taken inside the building and TRA stated in the first quarter report that it would return to the site to measure the total exposure level outside the building. The results presented in Table 3 show the total of exposure across all bands to be 14.52% of the ICNIRP level. The primary contributors to this figure are the broadcasting stations located in Isa Town. Please refer to table 3 above and also the chart below which is reproduced from the report for the first quarter.



[INFORMATION]

Measurement campaign passed

- Beginning on : 03/08/2009
- End on : 03/23/2009
- Last measure : 03/20/2009

[LOCALIZATION]

Central Informatics Organisation
Isa Town
Kingdom of Bahrain

Latitude : 26° 9' 9
Longitude : 50° 33' 4

6 Next steps:

- 6.1 TRA will continue with the measurement campaign to map RF signal levels throughout the Kingdom of Bahrain including the Southern part of the Island.
- 6.2 As the signal levels in some bands are higher than is normally observed, follow-up measurements will be made at the British School and Nabih Salah Island using the Insite Free to determine the total exposure across all bands.
- 6.3 TRA is investigating the possibility of having the software associated with the Insite Box device modified so that it is capable of determining the total exposure level across all bands within its measurement range (this will exclude the WiMax band as WiMax frequencies are outside the range of the hardware used in the device). The aim is to have the total exposure level for a site plotted on the bar charts as well as the levels for each band.
- 6.4 As the Insite Box will not be able to measure the contribution from WiMax transmissions, TRA will always carry out supplementary measurements using the Insite Free system for any site which is close to a WiMax base station (i.e. where the WiMax signal is likely to make a measureable contribution to the total exposure measurement).