



# Wireless Communications: Co-Existence between Israel and its Neighbors

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# Preamble

- ❖ Allocation of wireless services around the world
- ❖ Co-existence is problematic at overlapping RF and out of band
- ❖ FM broadcasting at 88-108 MHz, coexistence is crucial mainly with Jordan and Lebanon
- ❖ TV (analog and digital) interferes up-link cellular (Jordan, Cyprus) at the 806-862 MHz RF band
- ❖ No significant interference (except un-intentional roaming with Jordan and PSE) at the GSM family European frequencies: GSM900M / GSM1800 / UMTS2000M bands

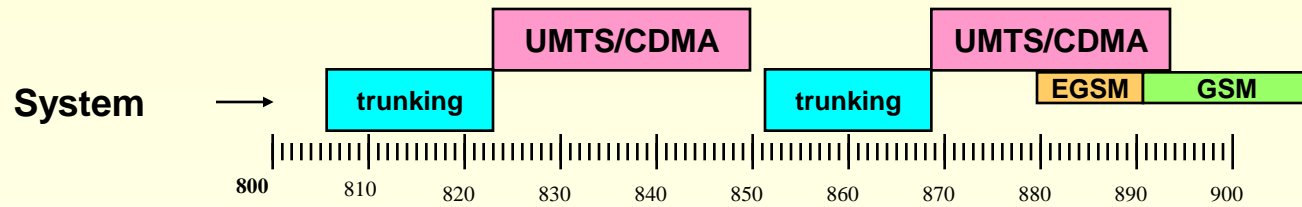
# ITU Regions

<http://www.moc.gov.il/new/documents/frequencies/MazarThesisOct08.pdf> p. 68

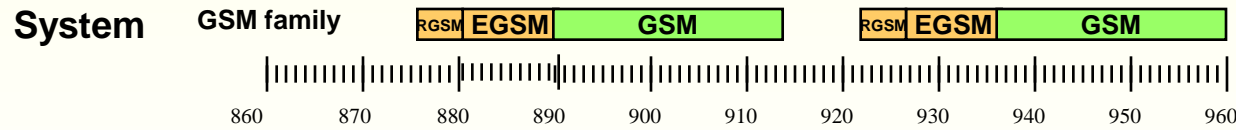
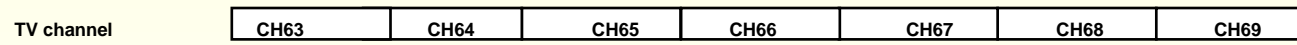


# 800/900 MHz Cellular, Trunking & TV allocations

17 May 2010

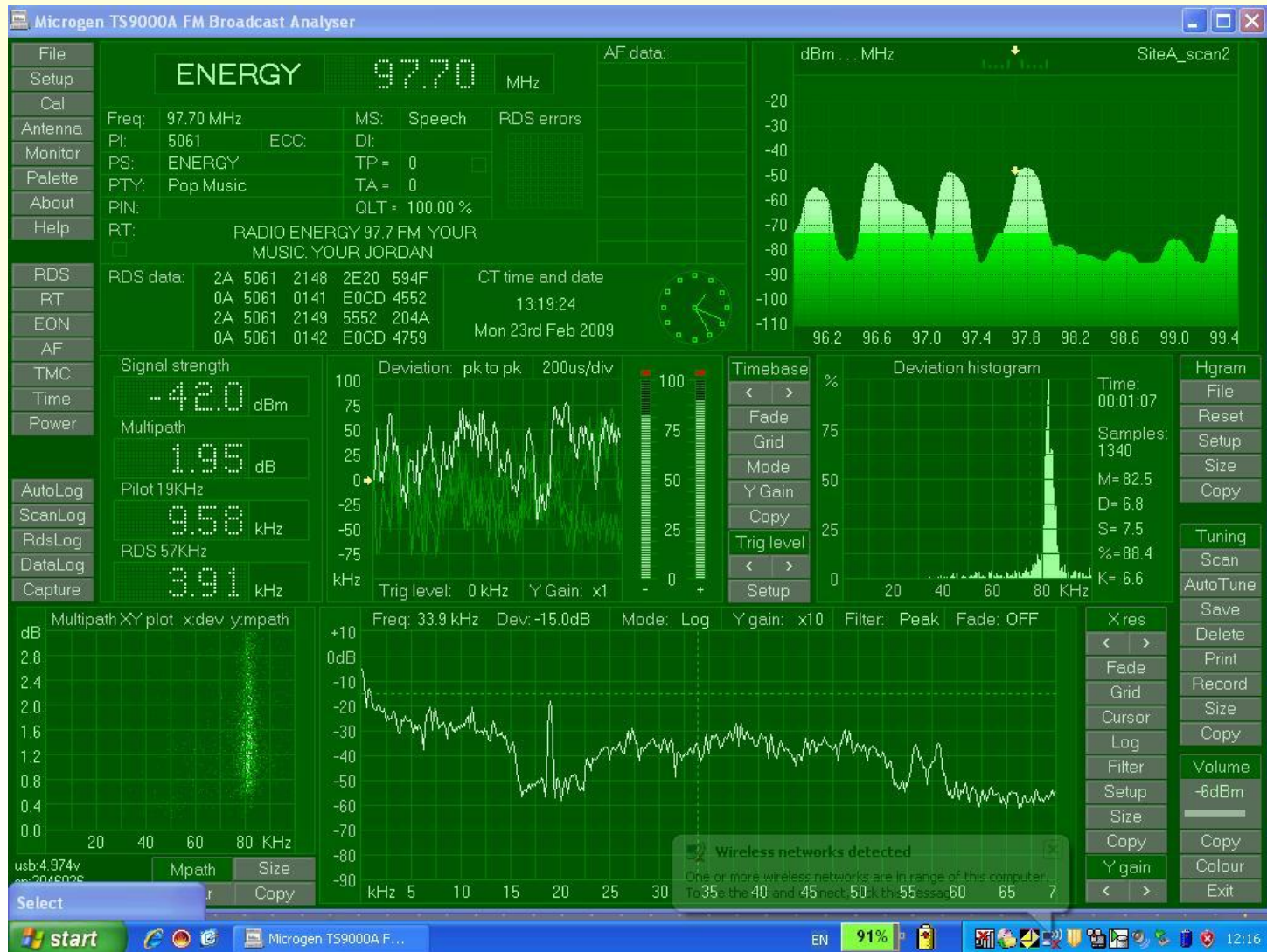


European



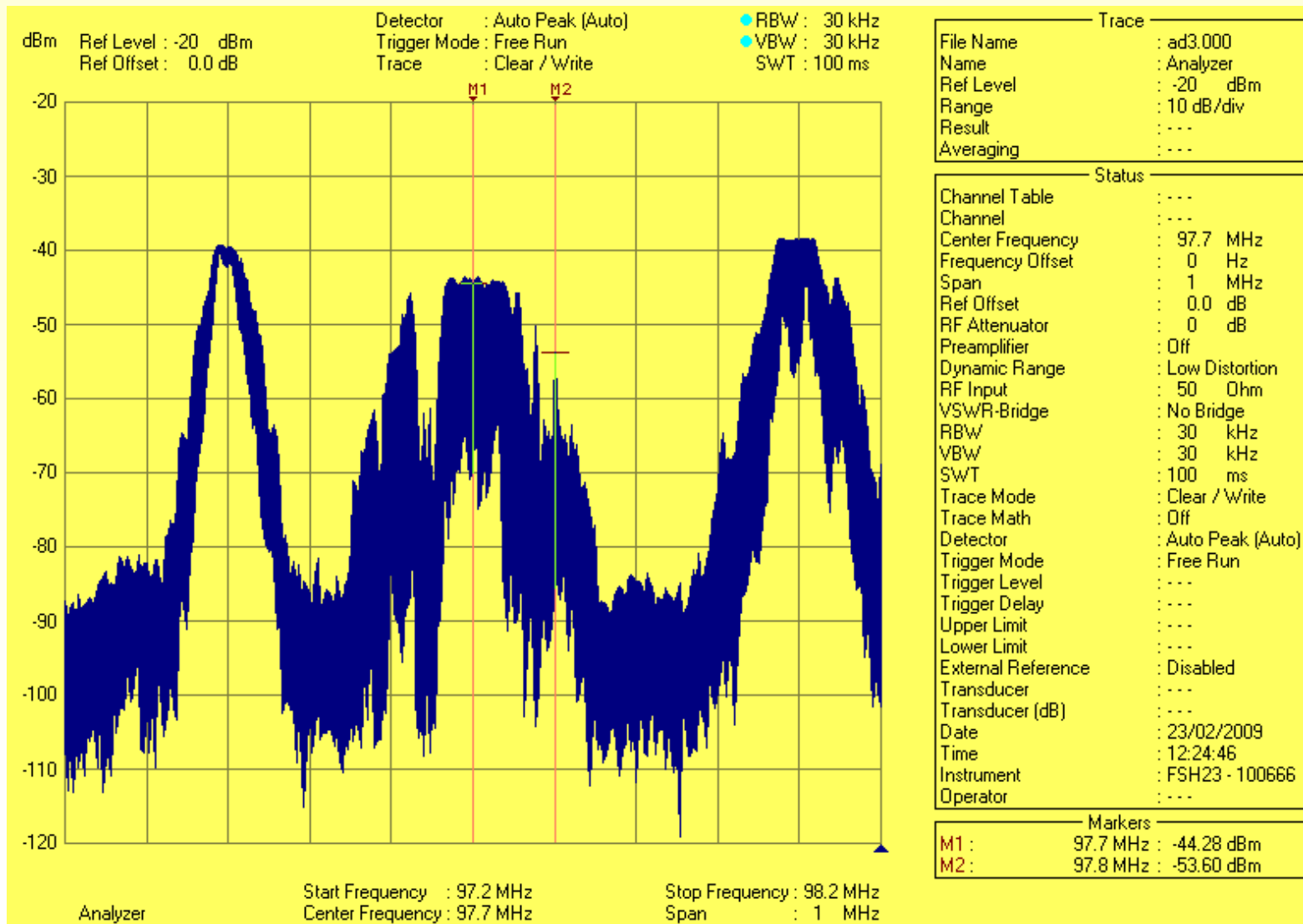
# Jordan: Amman Radio Energy 97.7 MHz interfering 97.8 MHz

*Measured by Microgen TS9000A analyser*

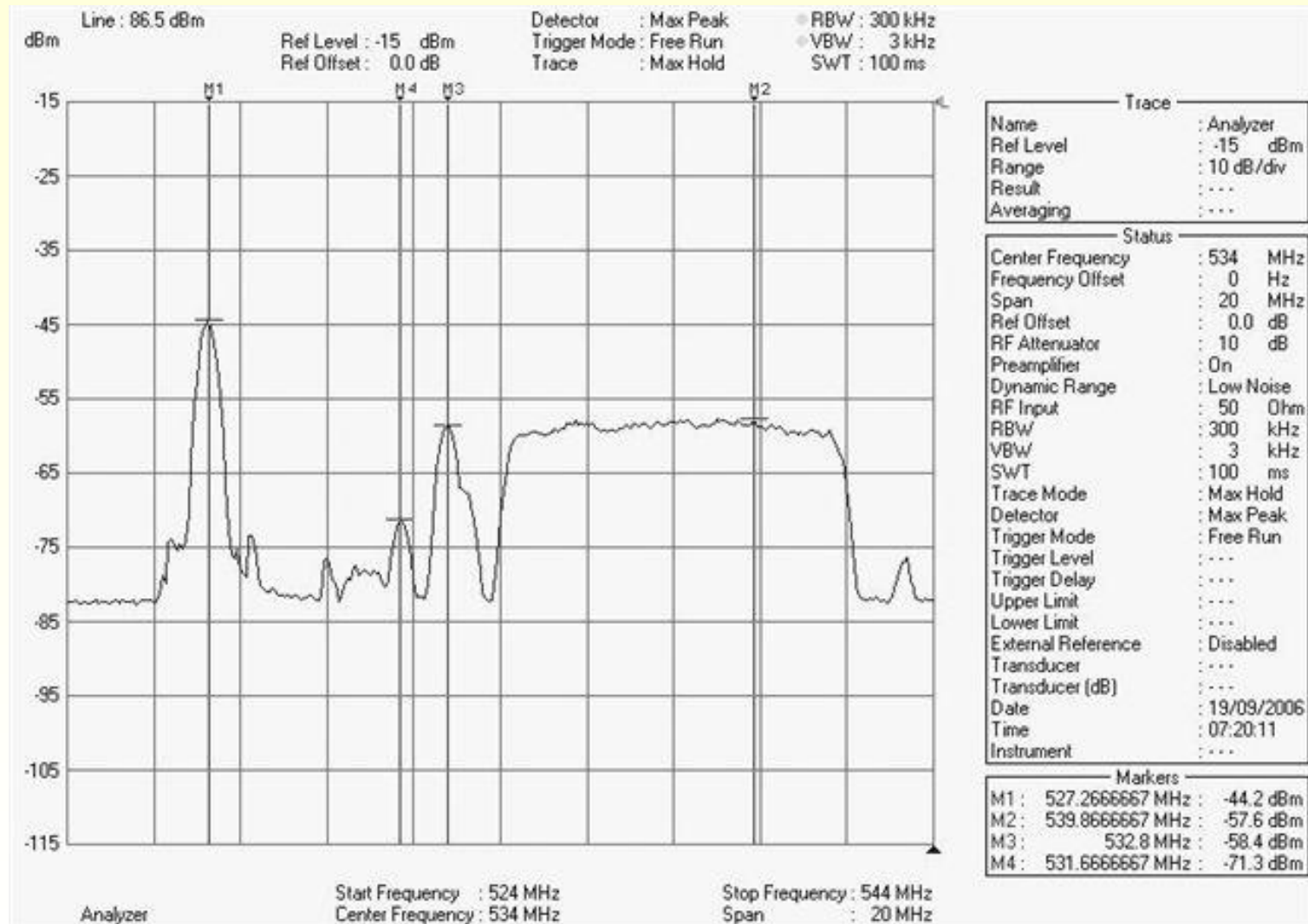


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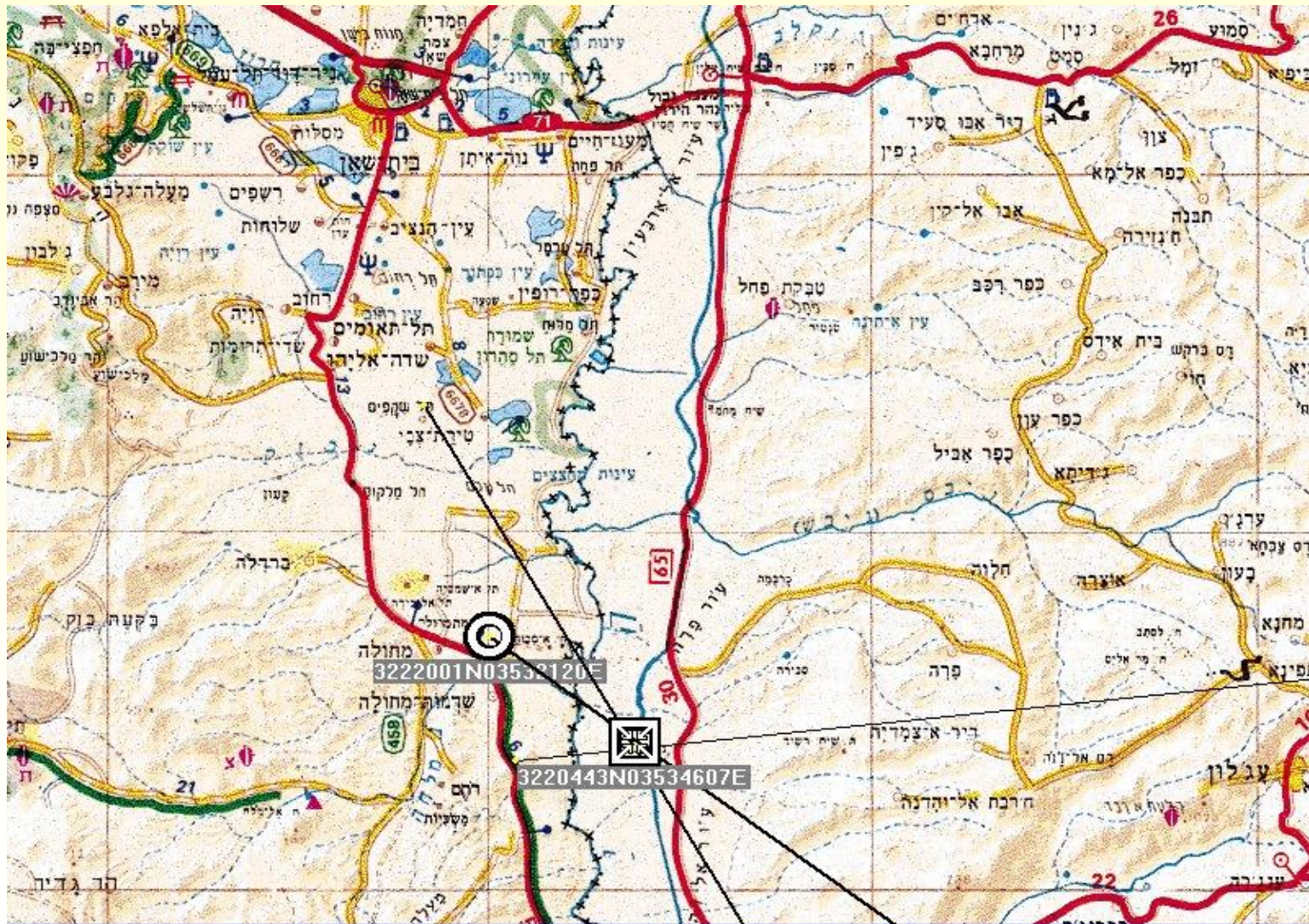
*Measured by handheld R&S Spectrum Analyser FSH23, 23 Feb 2009*



TV Analog ch. 28 (526-534) adjacent to Digital ch. 29 (534-542)  
 19/09/06; measured by author; M1-video, M4-synch, M3-sound



# Jordan: Triangulation, showing TV Channel 66 (video) interfering CDMA





## Protection of land mobile systems from terrestrial digital video broadcasting systems in the VHF and UHF ITU-R M.1767

$$\text{Power Sensitivity } P_s = KTB_{lms} F I/N \quad (1)$$

- For full overlap  $B_{video}$  (e.g. 8 MHz) into  $B_{lms}$  (e.g. 5 MHz), the interference video power threshold level at the LMS station receiver input,  $P_r$  is determined from the following equation:

$$P_r = KTB_{lms} F I/N B_v / B_{lms} = KTF I/N B_v \quad (2)$$

$F$ : noise figure of the LMS base station or mobile station receivers (dB)

$I/N$ : criterion of interference to LMS receiver system noise ratio (dB)

$B_{video}$ : digital broadcast bandwidth (MHz)

$B_{lms}$ : Land Mobile bandwidth (MHz)

- In the typical case of full inclusion of the LMS receiver bandwidth  $B_v$  in the interferer bandwidth  $B_i$ , the threshold interfering power is **independent of the LMS receiver bandwidth**

## Recommends 2 at ITU-R Rec. [ITU-R M.1767](#)

$$\text{Field strength (dB}(\mu\text{V/m))} = -37 + F + I/N - G + L + 10 \times \log (B_i) + P_o + 20 \times \log f - K \quad (2)$$

$G$ : LMS antenna gain (dBi) for the base station and the mobile station

$L$ : cable feeder loss of the LMS receiver (dB)

$B_i$ : digital broadcast bandwidth (MHz)

$P_o$ : noise increase due to man-made noise and other interference power level (not from DAB and DVB systems) (dB)

$f$ : centre frequency of the interfering broadcasting signal (MHz)

$K$ : overlap correction factor from the Tables in Annex 4, if applicable.

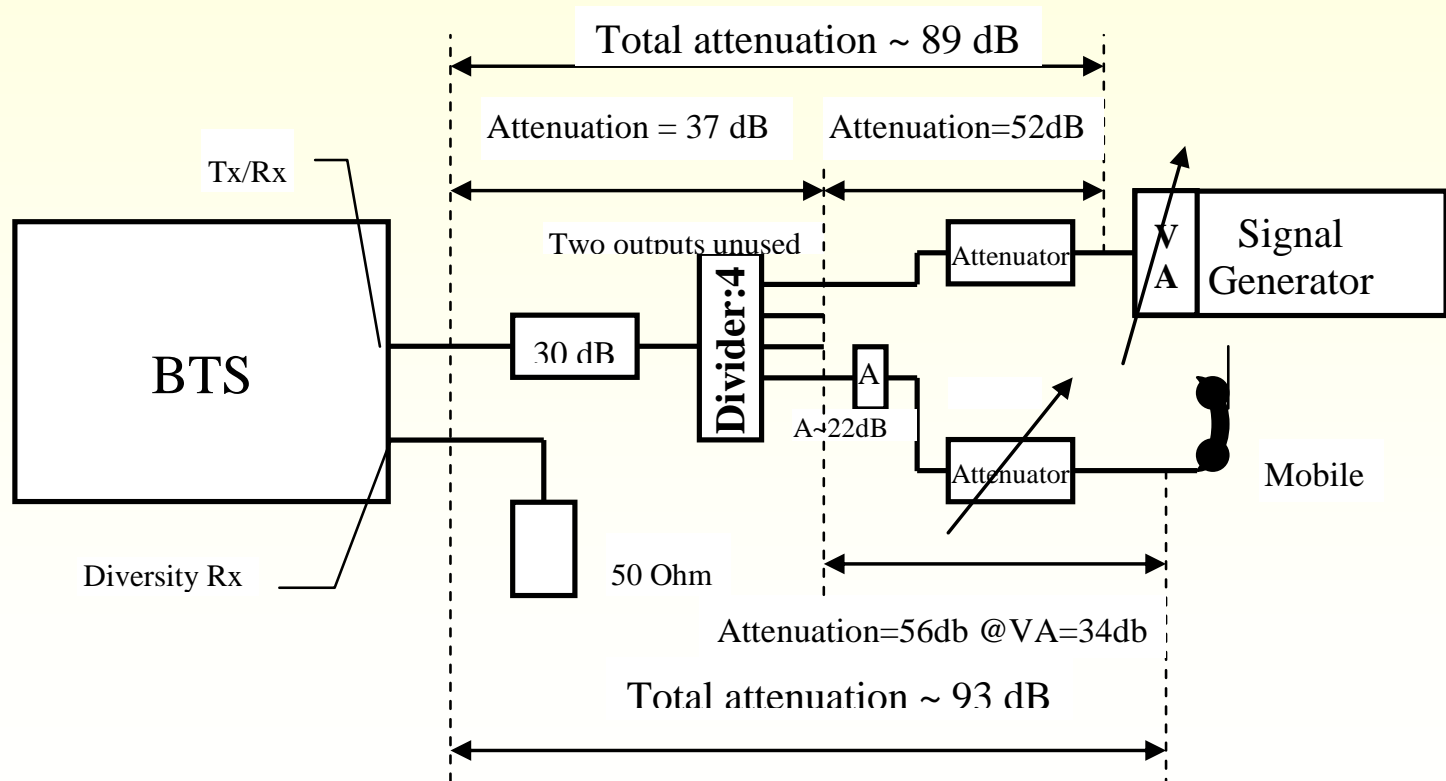
- Using the relationship (numbers, not in dB) between field strength,  $E$ , and power,  $P_r$ , in free space is given by:

$$P_r = \frac{E^2 G \lambda^2}{Z_0 4\pi} = \frac{E^2 G c^2}{480\pi^2 f^2}$$

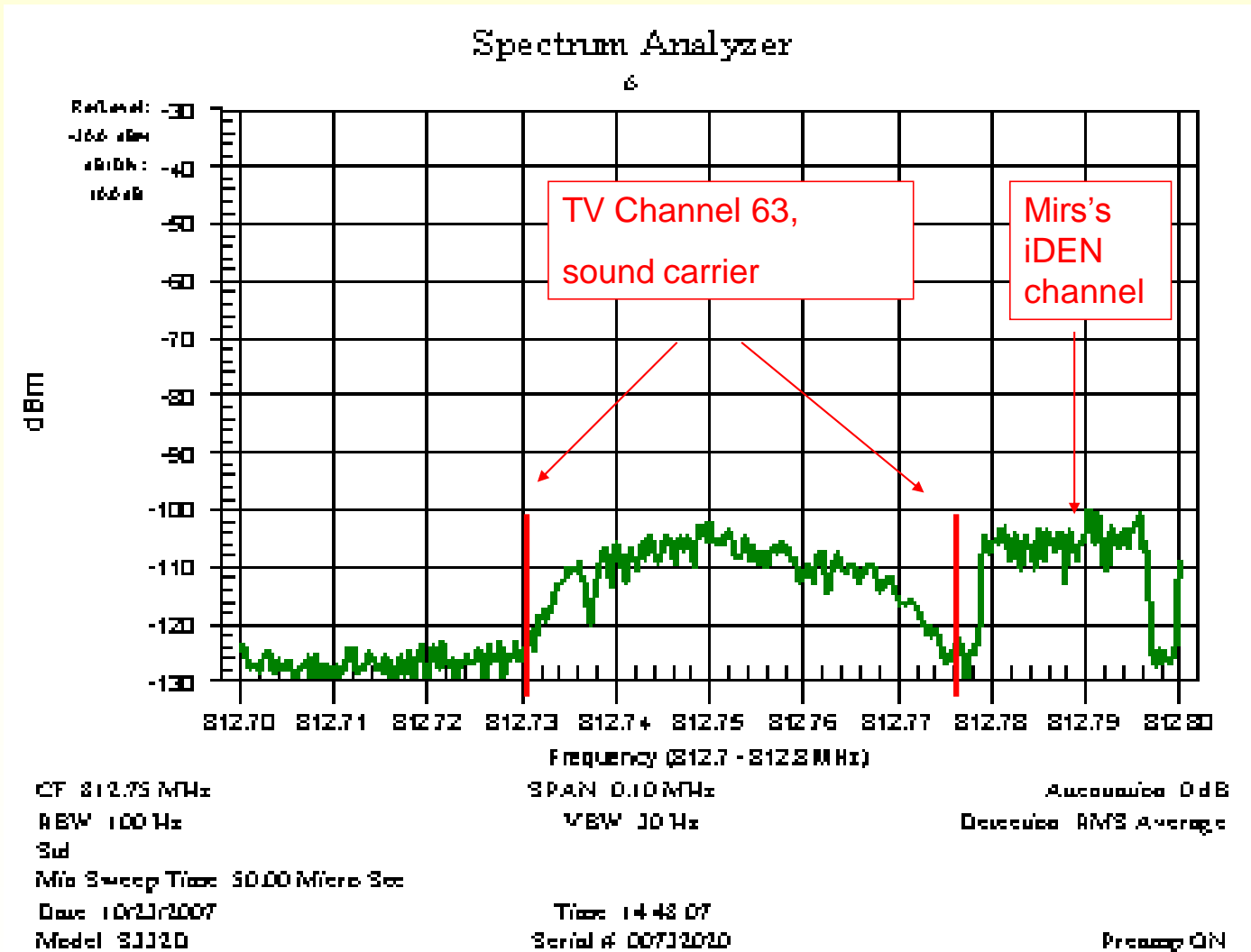
- See also ITU-R Recommendation [F.1670-1 \(02/06\)](#) Protection of fixed wireless systems from terrestrial digital video and sound broadcasting systems in shared VHF and UHF bands

# DBV-T + CDMA Interference Experiment, 22 Jan 03

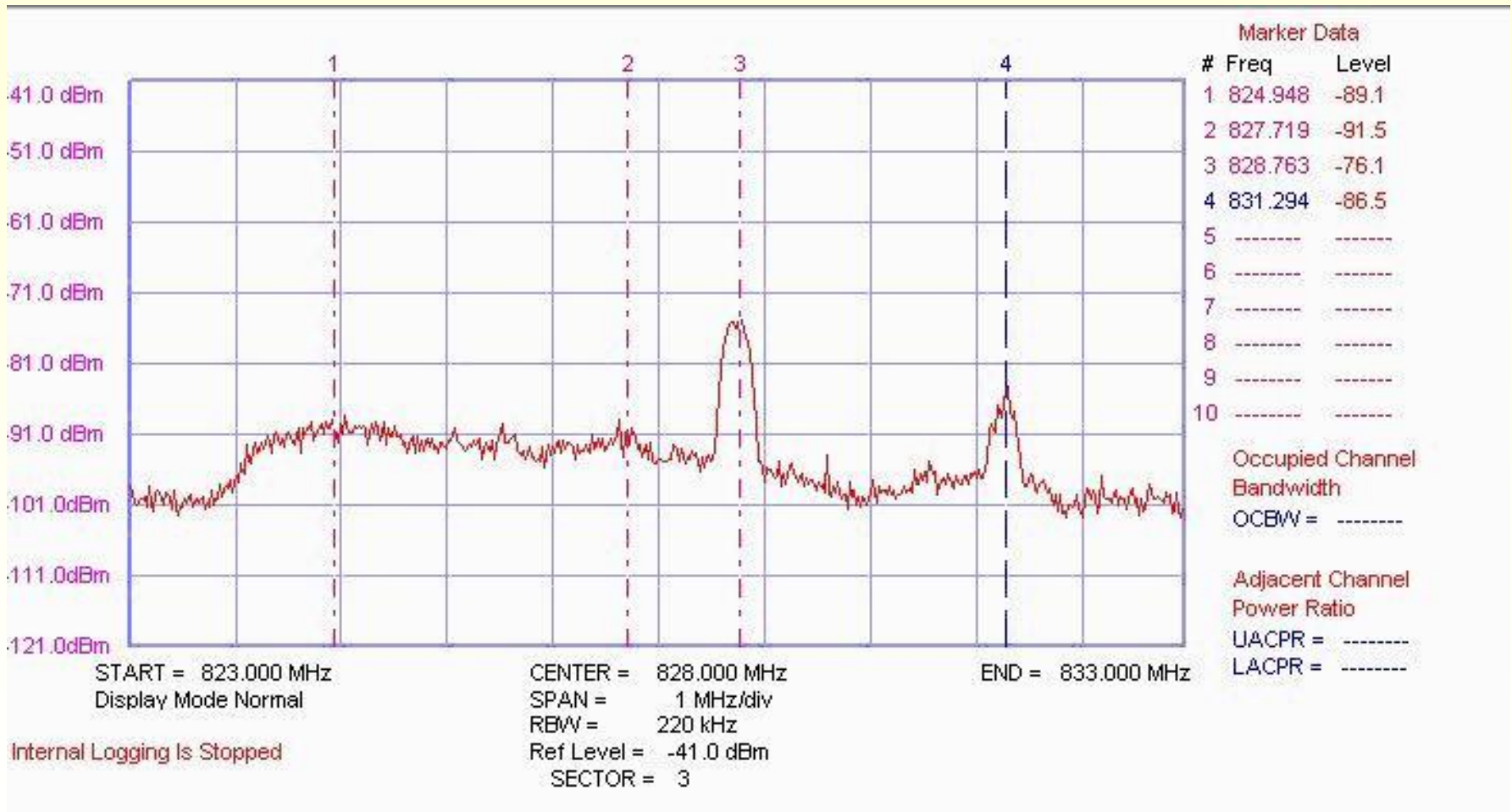
CDMA carrier 832.86 to 834.12 MHz; Mobile unit: Startac, mobile output power was set at  $-34\text{dBm}$ ;  
Simulated interference: FM maximal deviation  $\pm 4\text{MHz}$  Frequency bandwidth 830 to 838MHz .



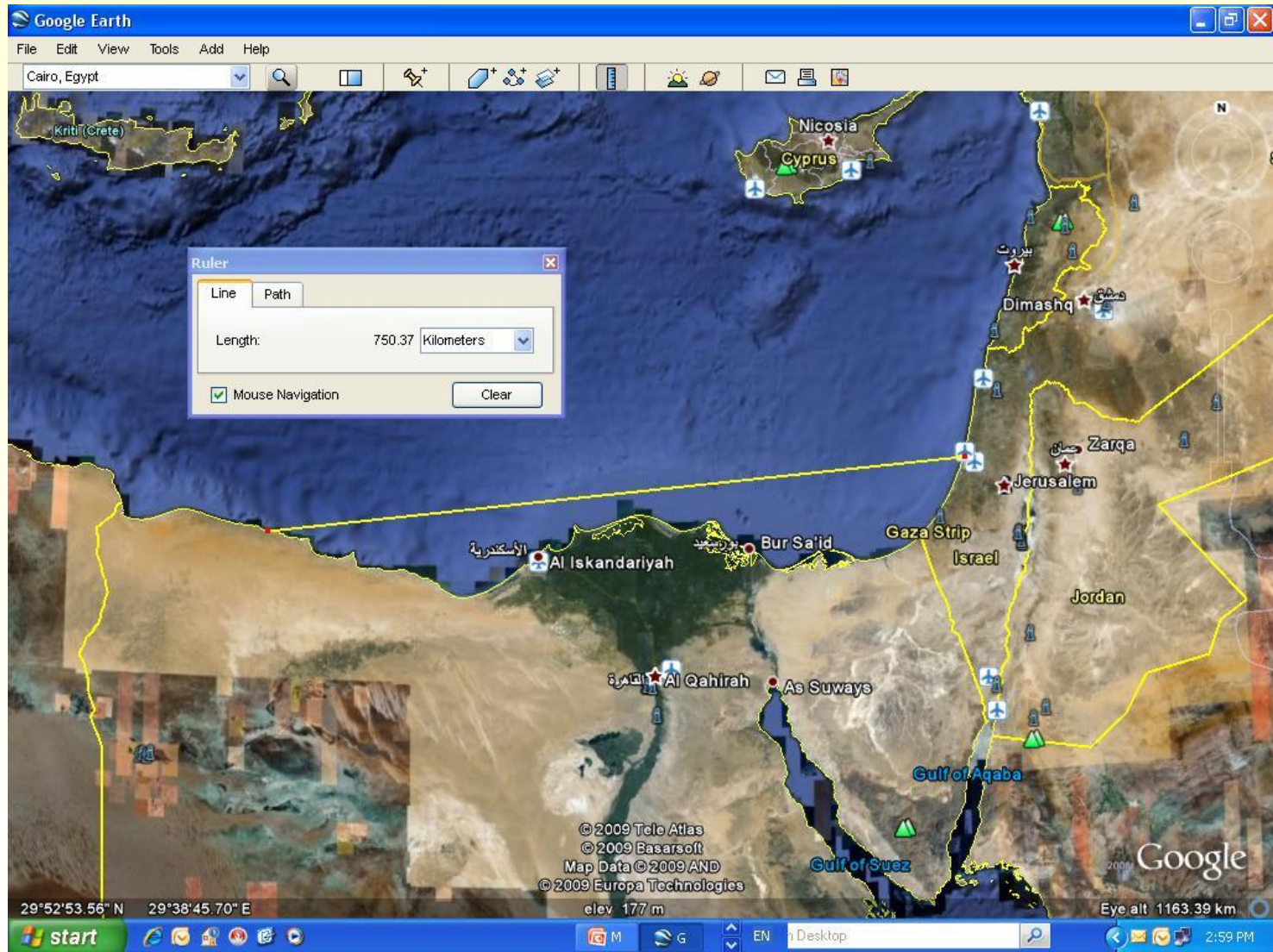
# Measured interference from Cyprus, Feb 2009



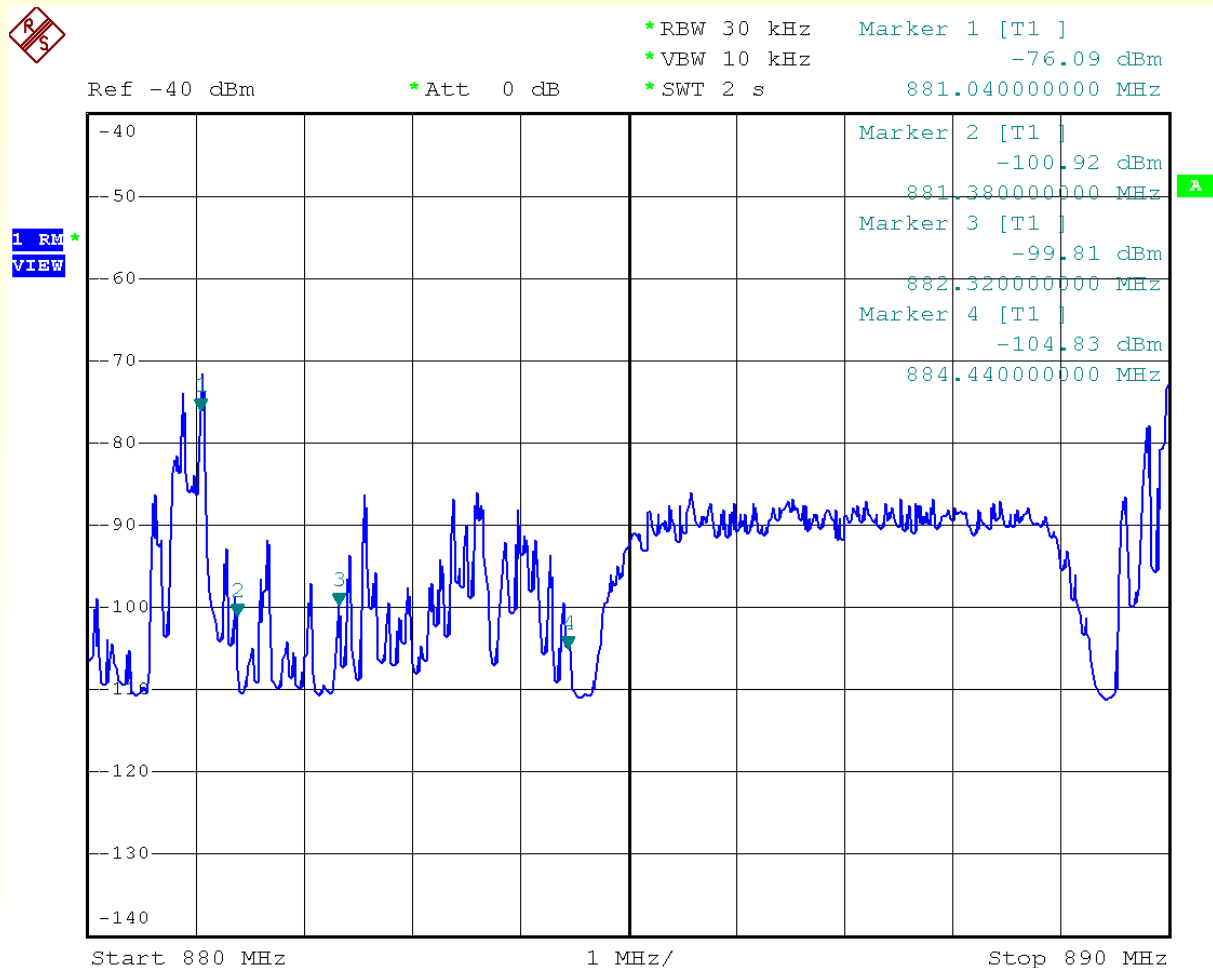
# Measured interference from Cyprus, ch. 65, Feb 2009



# Interference to Egypt, Matrouh

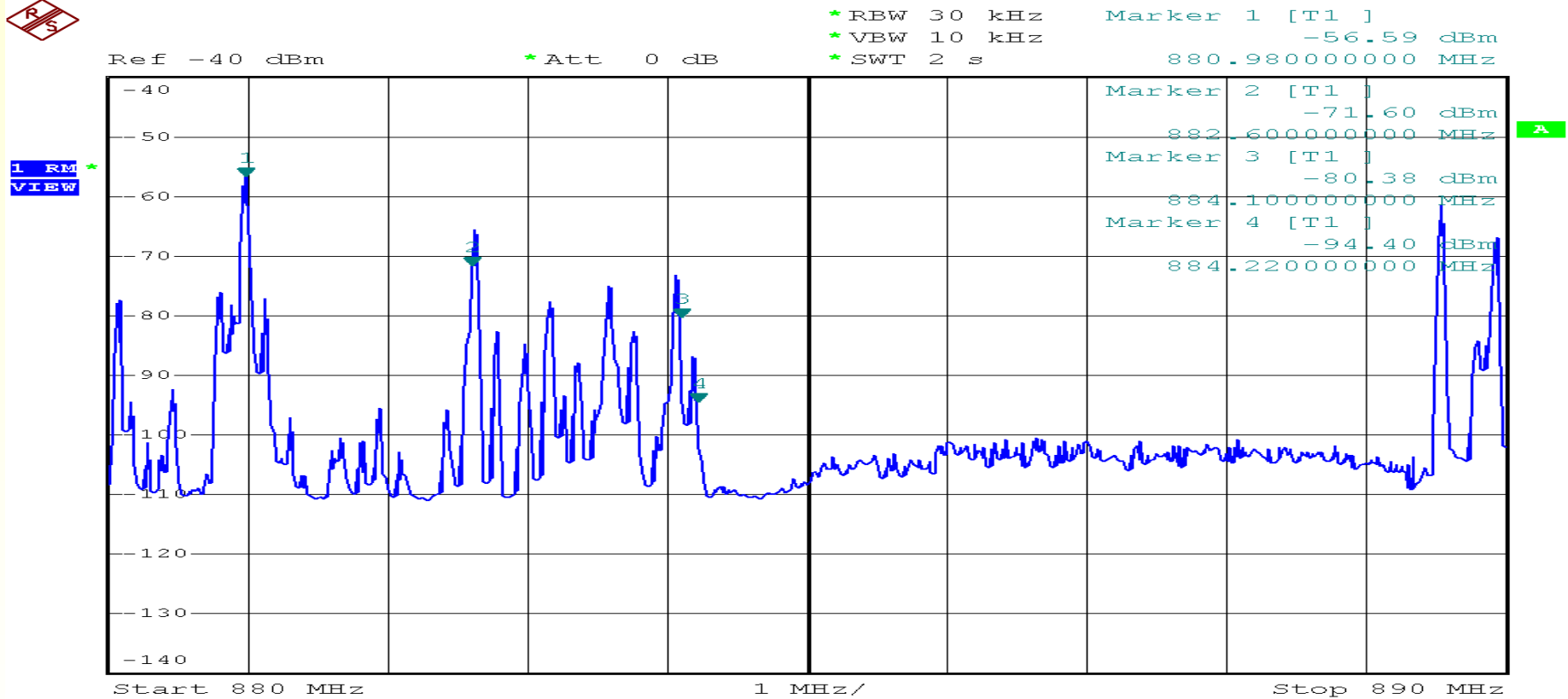


# Egypt, Alarish, Sector E (880-890 MHz), 27 Oct 09



Date: 27.OCT.2009 14:16:44

# Egypt Rafah 1 Sector H (880-890 MHz), 17 Feb 10



Date: 17.FEB.2010 10:47:00



# Summary; how to reduce the RFI in our region

- ❖ Follow the RF allocation of ITU Region 1
- ❖ Follow the ITU allotments and notifications
- ❖ Technical cooperation: careful assignment, mitigation techniques (power control, use topography and artificial obstacles)
- ❖ Advancing 'operator to operator' collaboration

Thanks