ELEKTROMAGNETISCHE VELDEN: GEMAK OF GEVAAR

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ARBO UNIE
RIVM
RIVM

OVER HET ONDERZOEK

The MANSION Study:

Ecologische Moment Assessment van Elektro- magnetische velden en Idiopathische milieu intolerantie.

Doel:

Bepalen of *real-time* manifestatie van symptomen in IMI-EMV kan worden verklaard door stemming, perceptie van- en daadwerkelijke blootstelling aan EMV.

Rijksinstituut voor Volksgezondheid en Milieu
Ministerie van Volksgezondheid, Welzijn en Sport

ZonMw

ACHTERGROND

Ideopatische Milieu Intolerantie als gevolg van Electro Magnetische Velden (IMI-EMV) of Electrohypersensitivteit (EHS)

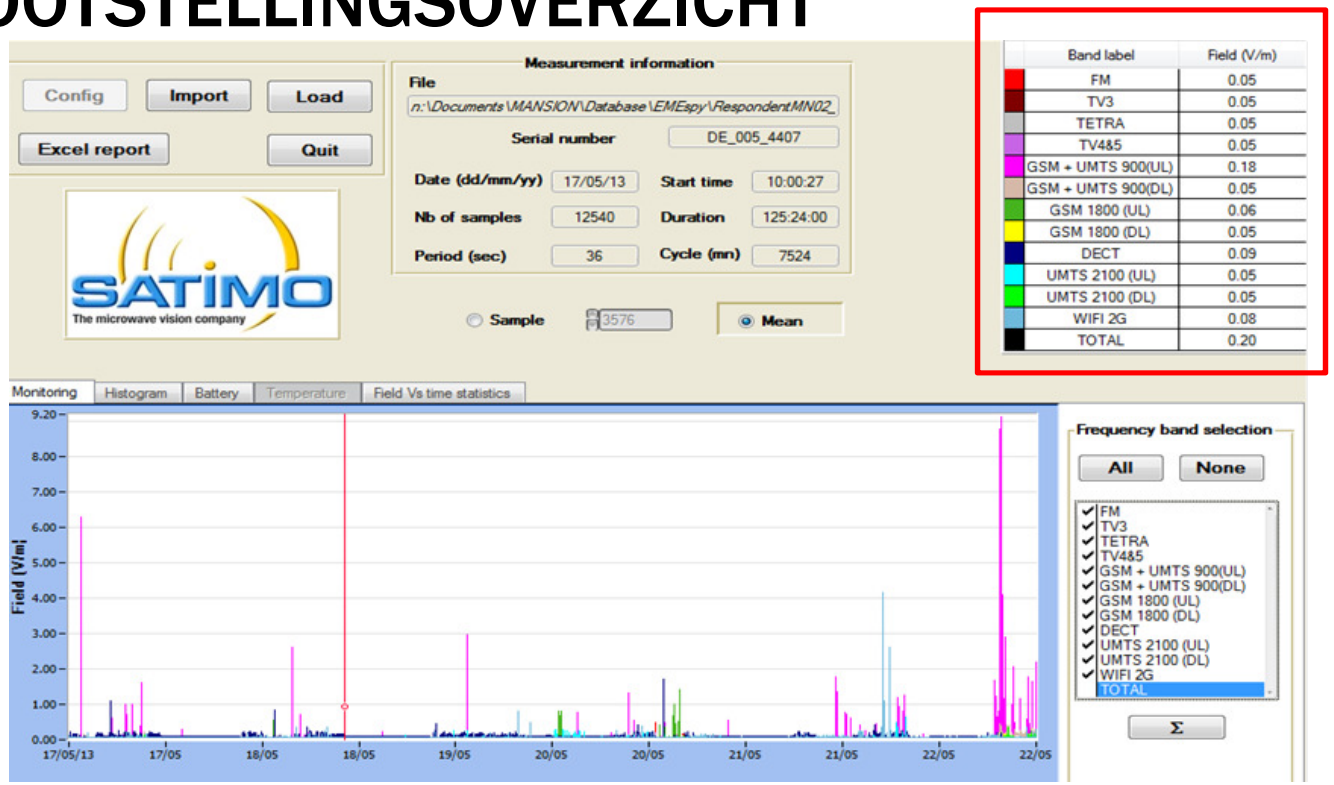
- Prevalentie 1.5-5%
- Non-specifieke fysieke symptomen
- Attributie, nocebo?

MEETOPSTELLING

- Meetset met RF-exposimeter, GPS en E-dagboek.
- Meetset werd 5 dagen gedragen, ook tijdens het werk.

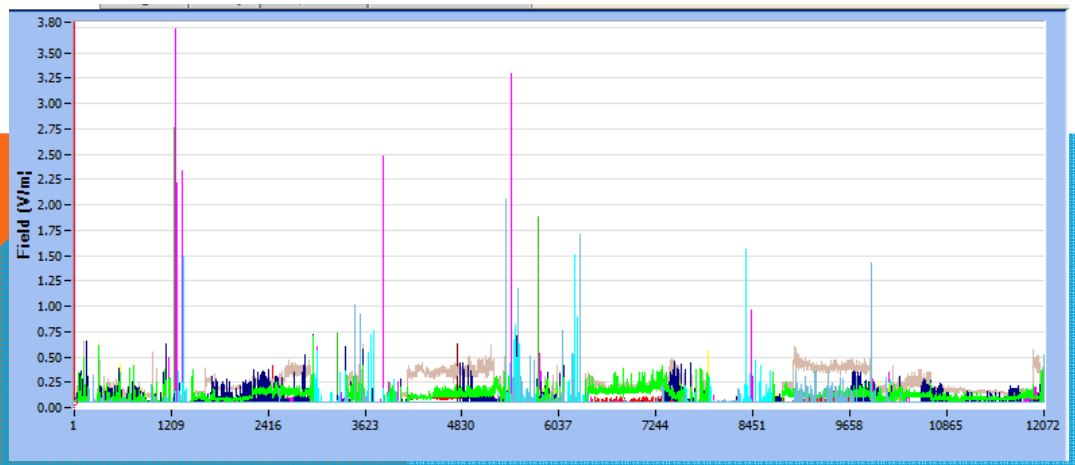
BLOOTSTELLINGSOVERZICHT

Dorp

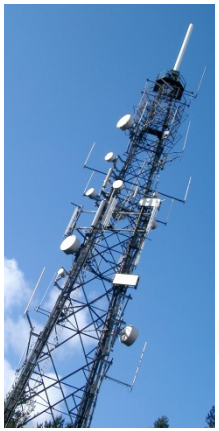


Band label	Field (V/m)
FM	0.05
TV3	0.05
TETRA	0.05
TV4&5	0.05
GSM + UMTS 900(UL)	0.18
GSM + UMTS 900(DL)	0.05
GSM 1800 (UL)	0.06
GSM 1800 (DL)	0.05
DECT	0.09
UMTS 2100 (UL)	0.05
UMTS 2100 (DL)	0.05
WIFI 2G	0.08
TOTAL	0.20

Stad



WAT IS WAT?



UL = Up Link DL = Down Link	Band label	Field (V/m)
88 - 108 MHz	FM	0.05
174 - 223 MHz	TV3	0.05
380 - 400 MHz	TETRA	0.05
470 - 830 MHz	TV4&5	0.05
880 - 915 MHz	GSM + UMTS 900(UL)	0.16
925 - 960 MHz	GSM + UMTS 900(DL)	0.05
1710 - 1785 MHz	GSM 1800 (UL)	0.07
1805 - 1880 MHz	GSM 1800 (DL)	0.05
1880 - 1900 MHz	DECT	0.16
1920 - 1980 MHz	UMTS 2100 (UL)	0.05
2110 - 2170 MHz	UMTS 2100 (DL)	0.05
2400 - 2500 MHz	WIFI 2G	1.26
	TOTAL	1.28

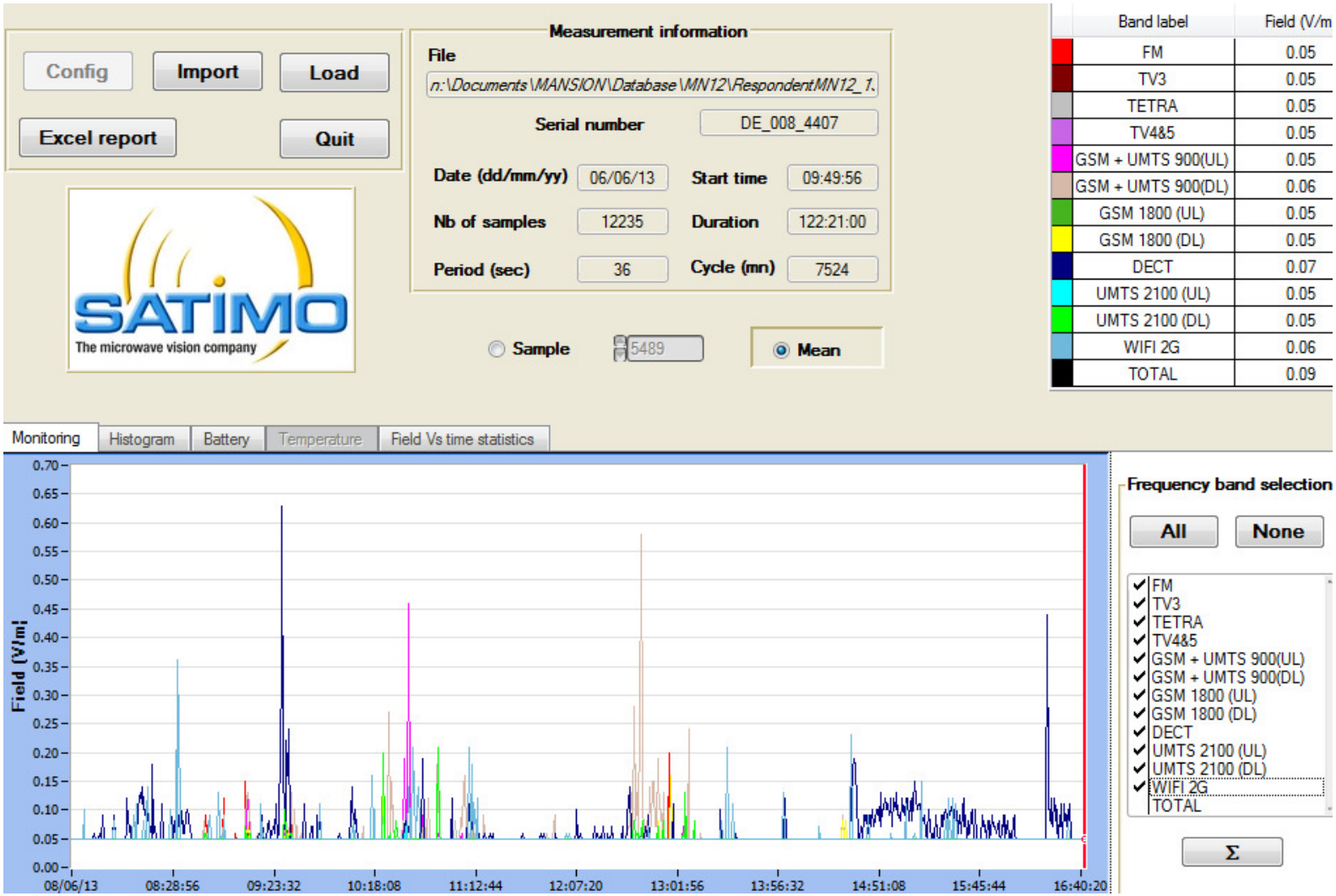
WAT MAG?

Table 12 Action values (RMS values).

frequency range	electric field strength, *E*	magnetic field strength, *H*	magnetic flux density, *B*	equivalent power density for plane waves, S_{eq}
	V/m	A/m	μT	W/m^2
0 - 1 Hz	-	1.63×10^5	2×10^5	-
1 - 8 Hz	20 000	$1.63 \times 10^5 / f^2$	$2 \times 10^5 / f^2$	-
8 - 25 Hz	20 000	$2 \times 10^4 / f$	$2.5 \times 10^4 / f$	-
0.025 – 0.82 kHz	$500/f$	$20/f$	$25/f$	-
0.82 - 65 kHz	610	24.4	30.7	-
65 -100 kHz	610	$1\,600/f$	$2\,000/f$	-
0.1 - 1 MHz	610	$1.6/f$	$2/f$	-
1 - 10 MHz	$610/f$	$1.6/f$	$2/f$	-
10 - 400 MHz	61	0.16	0.2	10
400 – 2 000 MHz	$3\sqrt{f}$	$0.008\sqrt{f}$	$0.01\sqrt{f}$	$f/40$
2 - 300 GHz	137	0.36	0.45	50

WAT MAG?

Frequentie	Algemeen publiek	Werknemers
10-400 MHz	28 V/m	61 V/m
900 MHz (gsm)	41 V/m	90 V/m
1800 MHz (gsm)	58 V/m	127 V/m
2000 MHz (UMTS) en hoger	61 V/m	137 V/m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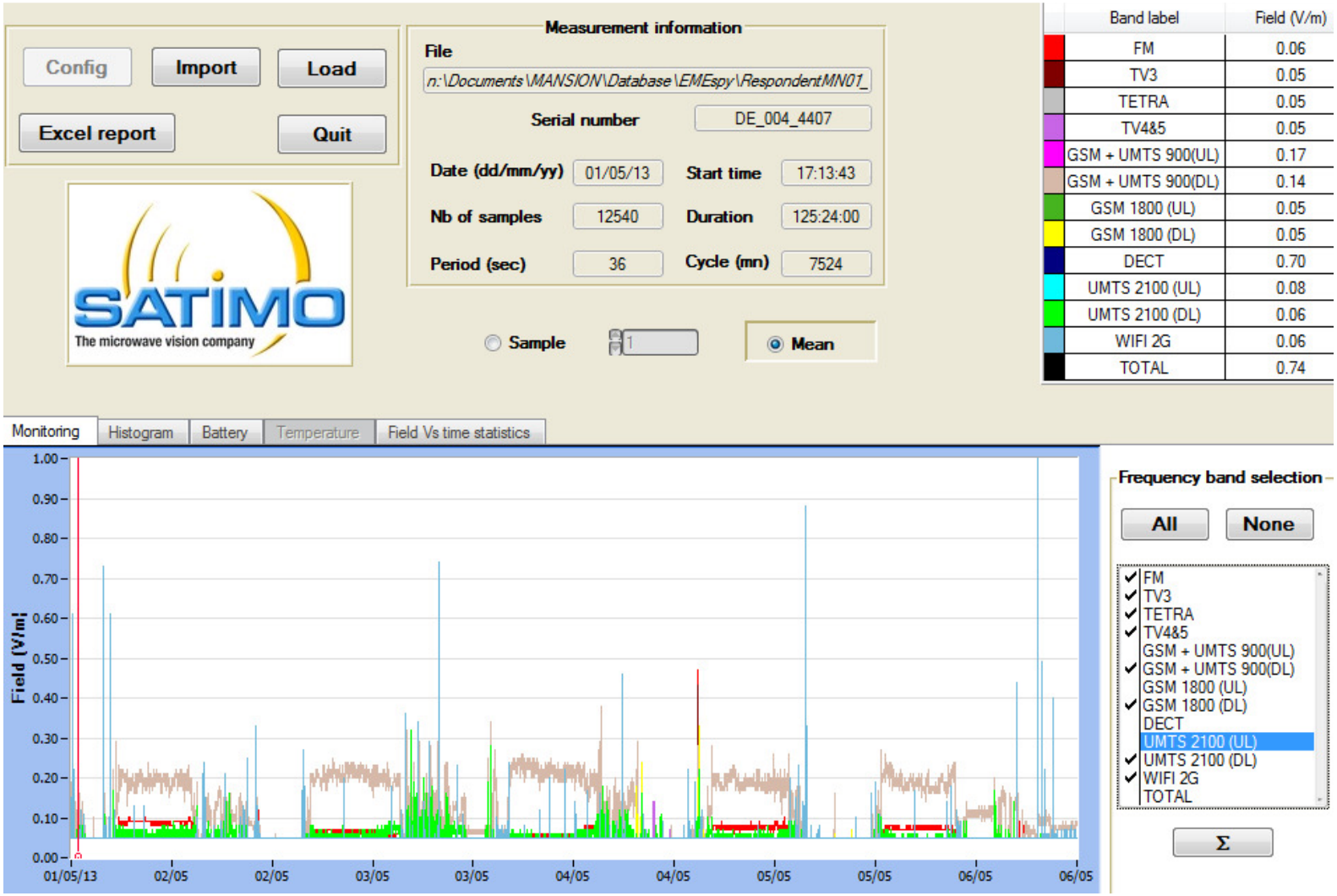
Load
Excel report
Quit
SATIMO
The microwave vision company
Measurement information
File
n:\Documents\MANSION\Database\MN12\RespondentMN12_1.
Serial number
DE_008_4407
Date (dd/mm/yy)
06/06/13
Start time
09:49:56
Nb of samples
12235
Duration
122:21:00
Period (sec)
36
Cycle (mn)
7524
Sample
5489
Mean
Band label
Field (V/m
FM 0.05
TV3 0.05
TETRA 0.05
TV4&5 0.05
GSM + UMTS 900(UL) 0.05
GSM + UMTS 900(DL) 0.06
GSM 1800 (UL) 0.05
GSM 1800 (DL) 0.05
DECT 0.07
UMTS 2100 (UL) 0.05
UMTS 2100 (DL) 0.05
WIFI 2G 0.06
TOTAL 0.09
Monitoring
Histogram
Battery
Temperature
Field Vs time statistics
Field (V/m)
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
08/06/13
08:28:56
09:23:32
10:18:08
11:12:44
12:07:20
13:01:56
13:56:32
14:51:08
15:45:44
16:40:20
Frequency band selection
All
None
FM
TV3
TETRA
TV4&5
GSM + UMTS 900(UL)
GSM + UMTS 900(DL)
GSM 1800 (UL)
GSM 1800 (DL)
DECT
UMTS 2100 (UL)
UMTS 2100 (DL)
WIFI 2G
TOTAL
Σ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The microwave vision company
Measurement information
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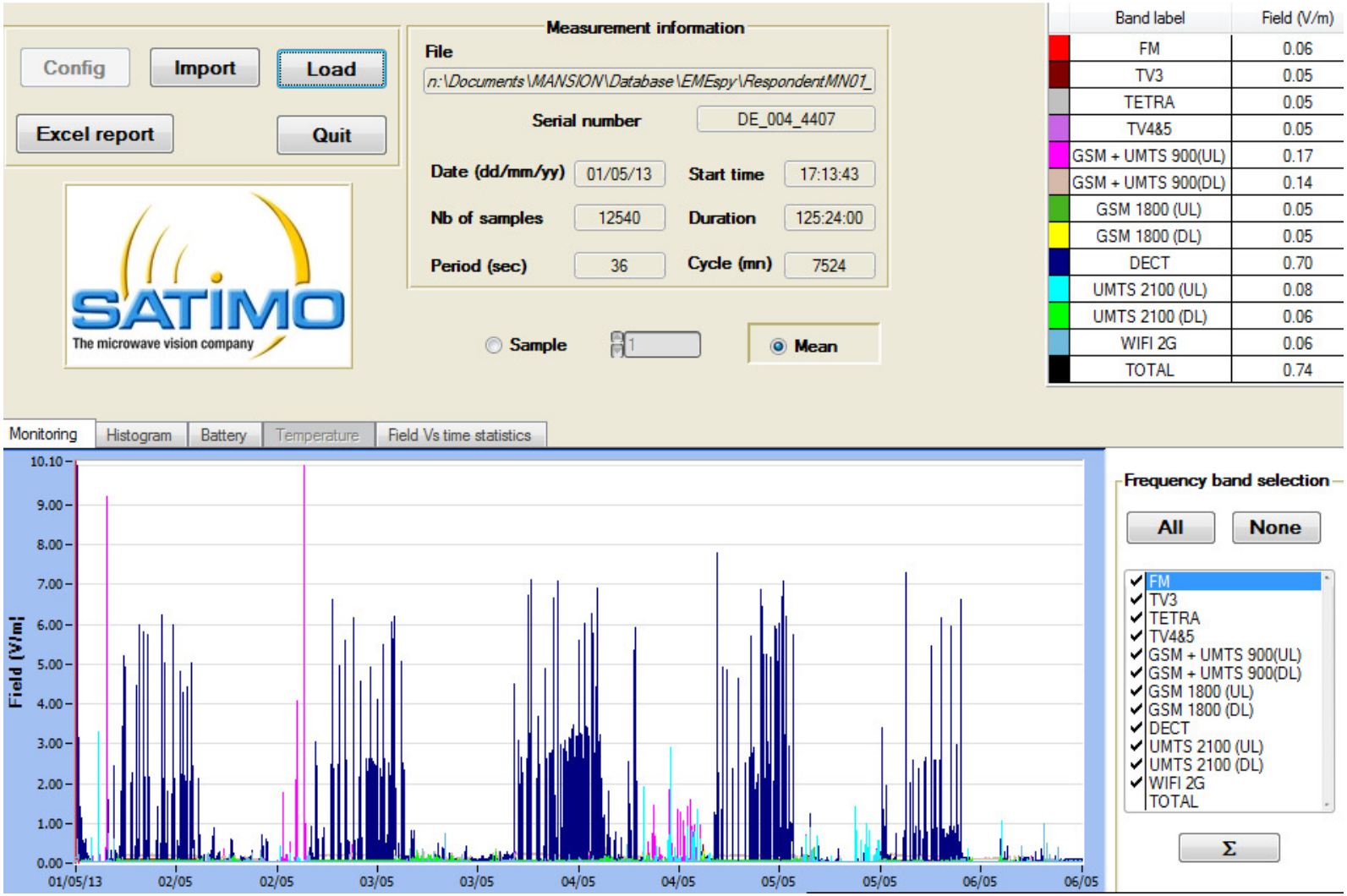
Serial number
DE_004_4407
Date (dd/mm/yy)
01/05/13
Start time
17:13:43
Nb of samples
12540
Duration
125:24:00
Period (sec)
36
Cycle (mn)
7524
Sample
1
Mean
Band label
Field (V/m)
FM 0.06
TV3 0.05
TETRA 0.05
TV4&5 0.05
GSM + UMTS 900(UL) 0.17
GSM + UMTS 900(DL) 0.14
GSM 1800 (UL) 0.05
GSM 1800 (DL) 0.05
DECT 0.70
UMTS 2100 (UL) 0.08
UMTS 2100 (DL) 0.06
WIFI 2G 0.06
TOTAL 0.74
Monitoring
Histogram
Battery
Temperature
Field Vs time statistics
Field (V/m)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
01/05/13
02/05
02/05
03/05
03/05
04/05
04/05
05/05
05/05
06/05
06/05
Frequency band selection
All
None
FM
TV3
TETRA
TV4&5
GSM + UMTS 900(UL)
GSM + UMTS 900(DL)
GSM 1800 (UL)
GSM 1800 (DL)
DECT
UMTS 2100 (UL)
UMTS 2100 (DL)
WIFI 2G
TOTAL
Σ


Config
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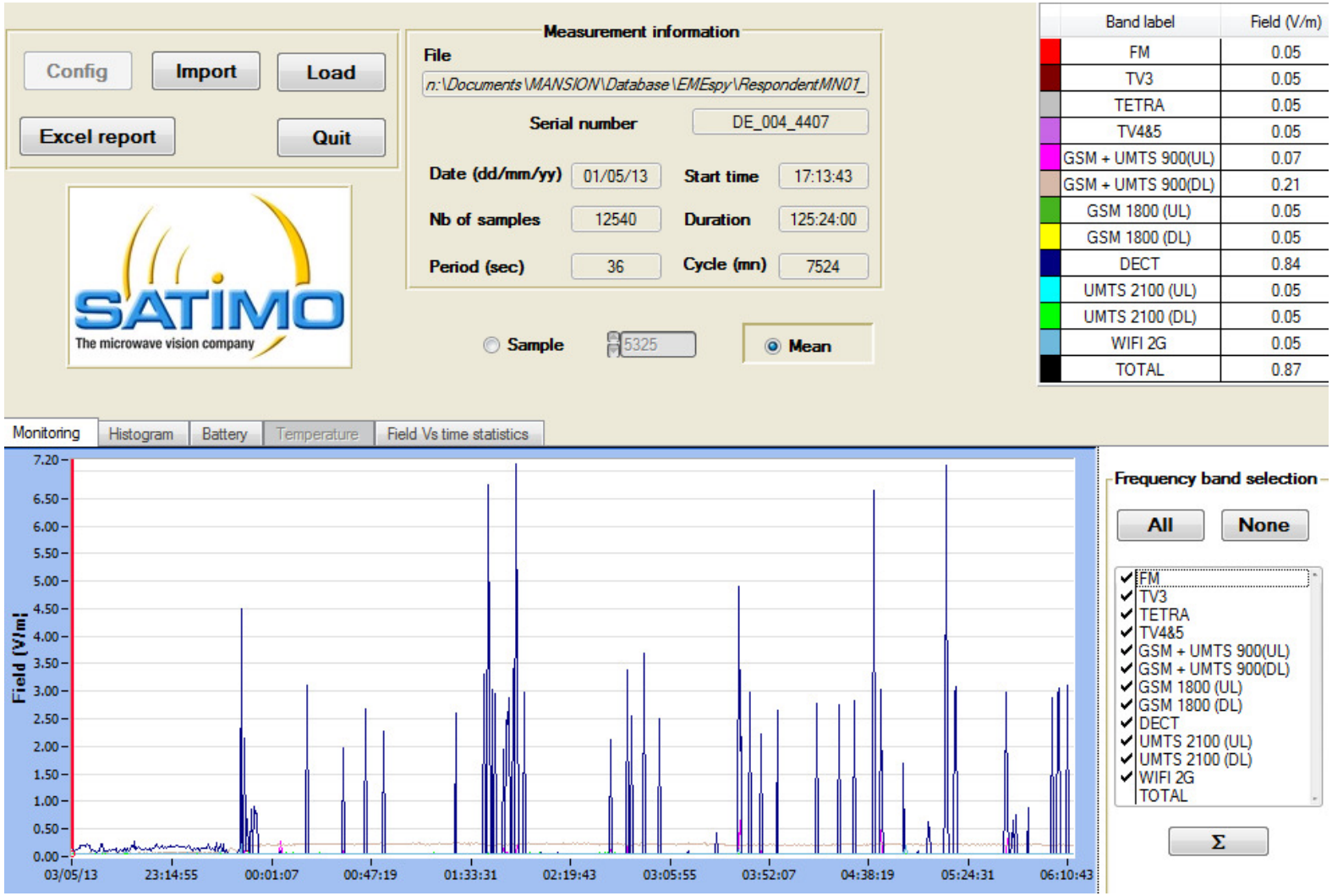
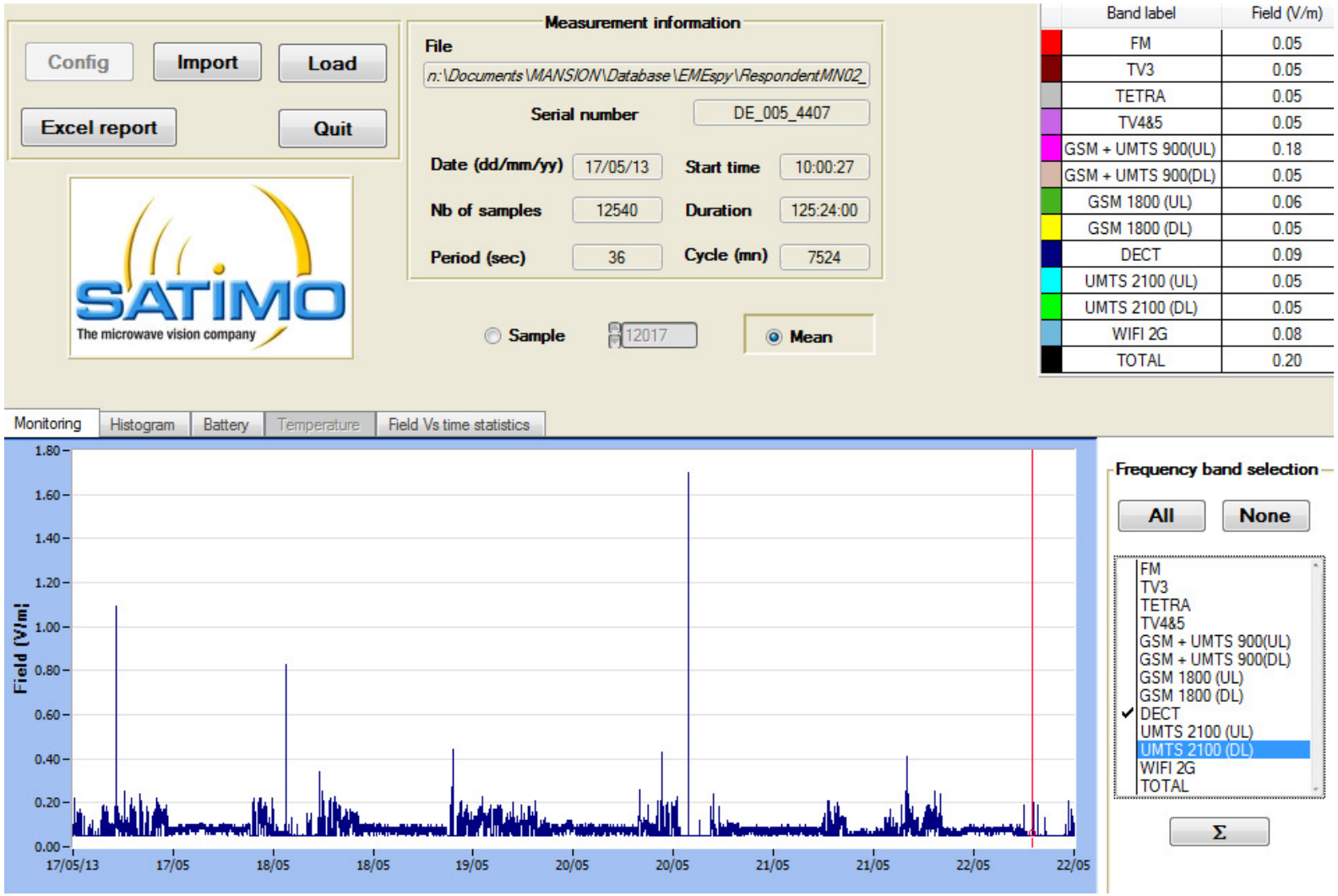
Excel report
Quit
SATIMO
The microwave vision company
Measurement information
File
n:\Documents\MANSION\Database\EMEspy\RespondentMN01_
Serial number
DE_004_4407
Date (dd/mm/yy)
01/05/13
Start time
17:13:43
Nb of samples
12540
Duration
125:24:00
Period (sec)
36
Cycle (mn)
7524
Sample
1
Mean
Band label
Field (V/m)
FM 0.06
TV3 0.05
TETRA 0.05
TV4&5 0.05
GSM + UMTS 900(UL) 0.17
GSM + UMTS 900(DL) 0.14
GSM 1800 (UL) 0.05
GSM 1800 (DL) 0.05
DECT 0.70
UMTS 2100 (UL) 0.08
UMTS 2100 (DL) 0.06
WIFI 2G 0.06
TOTAL 0.74
Monitoring
Histogram
Battery
Temperature
Field Vs time statistics
Field (V/m)
10.10
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
01/05/13
02/05
02/05
03/05
03/05
04/05
04/05
05/05
05/05
06/05
06/05
Frequency band selection
All
None
FM
TV3
TETRA
TV4&5
GSM + UMTS 900(UL)
GSM + UMTS 900(DL)
GSM 1800 (UL)
GSM 1800 (DL)
DECT
UMTS 2100 (UL)
UMTS 2100 (DL)
WIFI 2G
TOTAL
Σ



Band label	Field (V/m)
FM	0.05
TV3	0.05
TETRA	0.05
TV4&5	0.05
GSM + UMTS 900(UL)	0.07
GSM + UMTS 900(DL)	0.21
GSM 1800 (UL)	0.05
GSM 1800 (DL)	0.05
DECT	0.84
UMTS 2100 (UL)	0.05
UMTS 2100 (DL)	0.05
WIFI 2G	0.05
TOTAL	0.87

Algemene bevolking is ‘veilig’. Maar hoe zit het met de beroepsbevolking?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SATIMO
The microwave vision company
Measurement information
File
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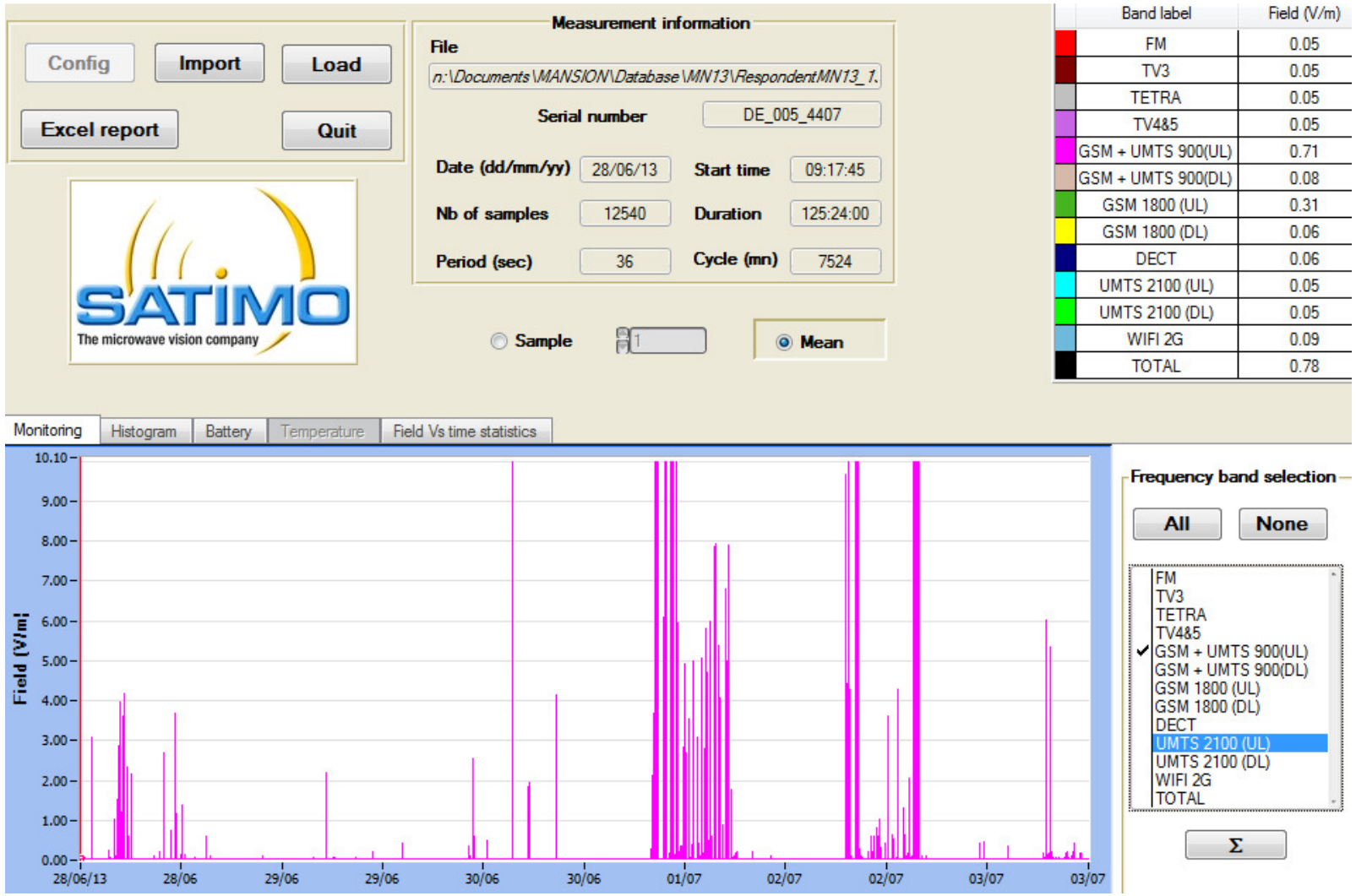
Serial number
DE_005_4407
Date (dd/mm/yy)
17/05/13
Start time
10:00:27
Nb of samples
12540
Duration
125:24:00
Period (sec)
36
Cycle (mn)
7524
Sample
12017
Mean
Band label
Field (V/m)
FM 0.05
TV3 0.05
TETRA 0.05
TV4&5 0.05
GSM + UMTS 900(UL) 0.18
GSM + UMTS 900(DL) 0.05
GSM 1800 (UL) 0.06
GSM 1800 (DL) 0.05
DECT 0.09
UMTS 2100 (UL) 0.05
UMTS 2100 (DL) 0.05
WIFI 2G 0.08
TOTAL 0.20
Monitoring
Histogram
Battery
Temperature
Field Vs time statistics
Field (V/m)
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
17/05/13
17/05
18/05
18/05
19/05
20/05
20/05
21/05
21/05
22/05
22/05
Frequency band selection
All
None
FM
TV3
TETRA
TV4&5
GSM + UMTS 900(UL)
GSM + UMTS 900(DL)
GSM 1800 (UL)
GSM 1800 (DL)
DECT
UMTS 2100 (UL)
UMTS 2100 (DL)
WIFI 2G
TOTAL
Σ


Config
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Load
Excel report
Quit
SATIMO
The microwave vision company
Measurement information
File
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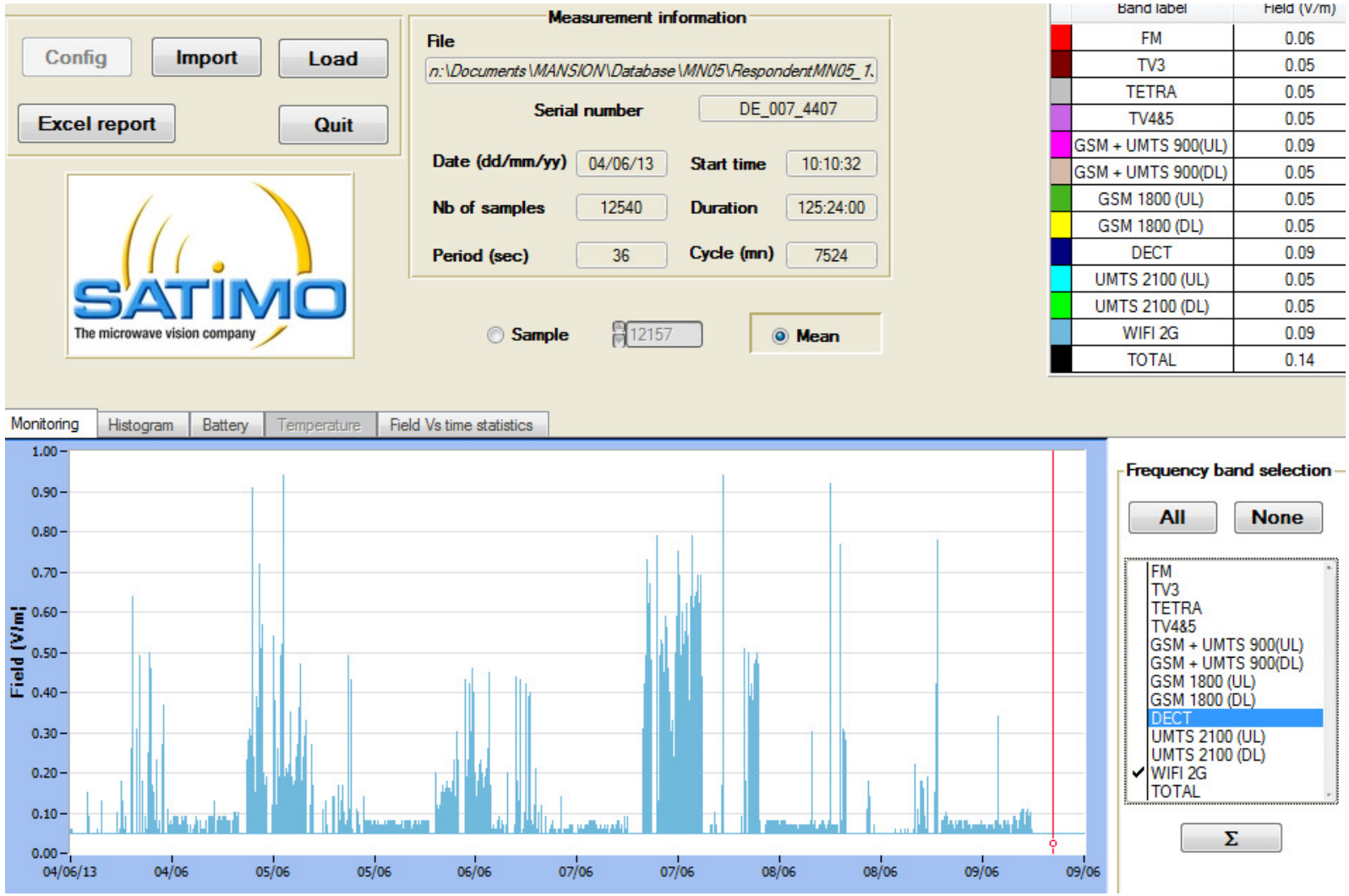
Serial number
DE_005_4407
Date (dd/mm/yy)
28/06/13
Start time
09:17:45
Nb of samples
12540
Duration
125:24:00
Period (sec)
36
Cycle (mn)
7524
Sample
1
Mean
Band label
Field (V/m)
FM 0.05
TV3 0.05
TETRA 0.05
TV4&5 0.05
GSM + UMTS 900(UL) 0.71
GSM + UMTS 900(DL) 0.08
GSM 1800 (UL) 0.31
GSM 1800 (DL) 0.06
DECT 0.06
UMTS 2100 (UL) 0.05
UMTS 2100 (DL) 0.05
WIFI 2G 0.09
TOTAL 0.78
Monitoring
Histogram
Battery
Temperature
Field Vs time statistics
Field (V/m)
10.10
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
28/06/13
28/06
29/06
29/06
30/06
30/06
01/07
02/07
02/07
03/07
03/07
Frequency band selection
All
None
FM
TV3
TETRA
TV4&5
GSM + UMTS 900(UL)
GSM + UMTS 900(DL)
GSM 1800 (UL)
GSM 1800 (DL)
DECT
UMTS 2100 (UL)
UMTS 2100 (DL)
WIFI 2G
TOTAL
Σ


Config
Import
Load
Excel report
Quit
SATIMO
The microwave vision company
Measurement information
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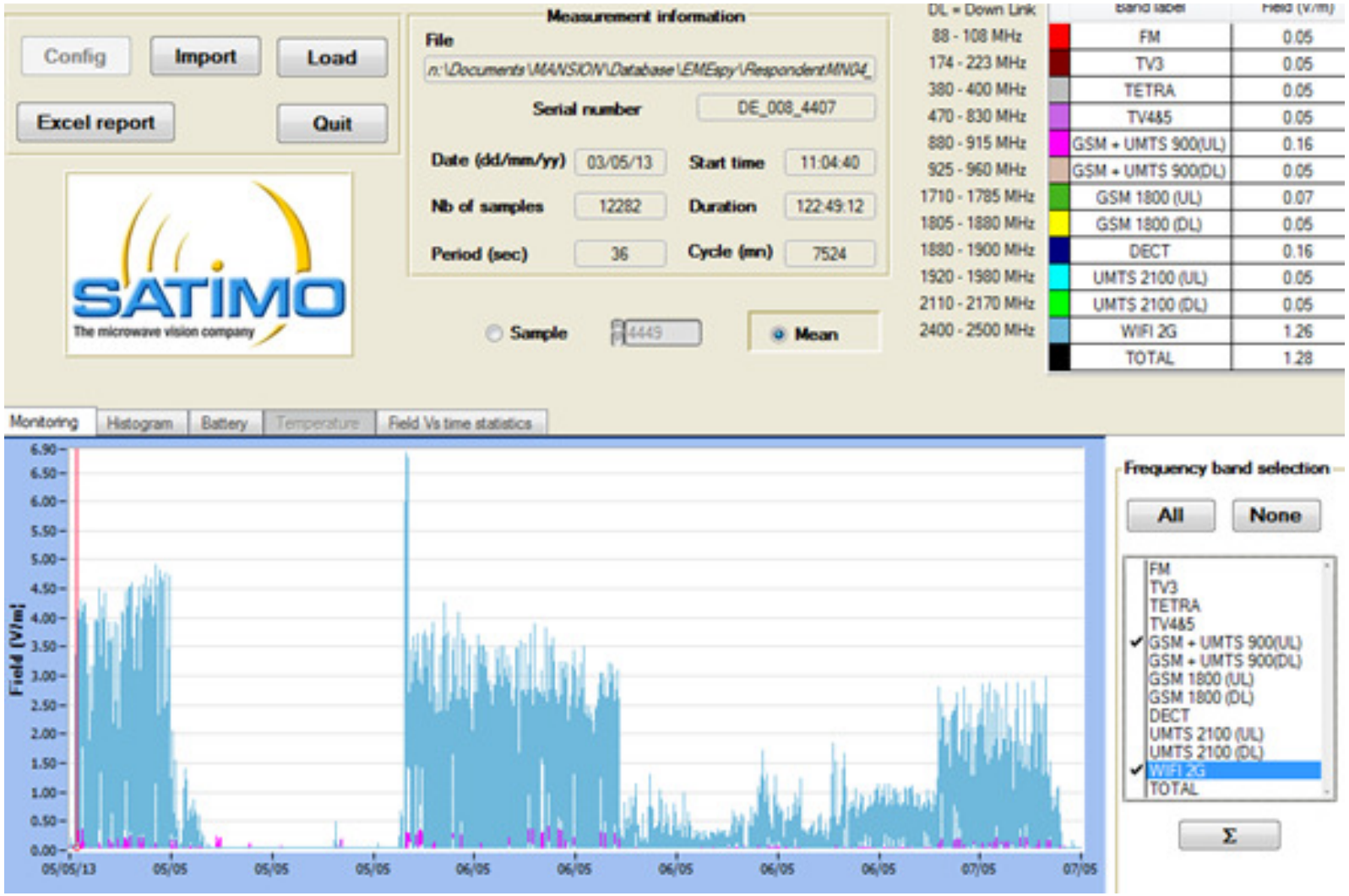
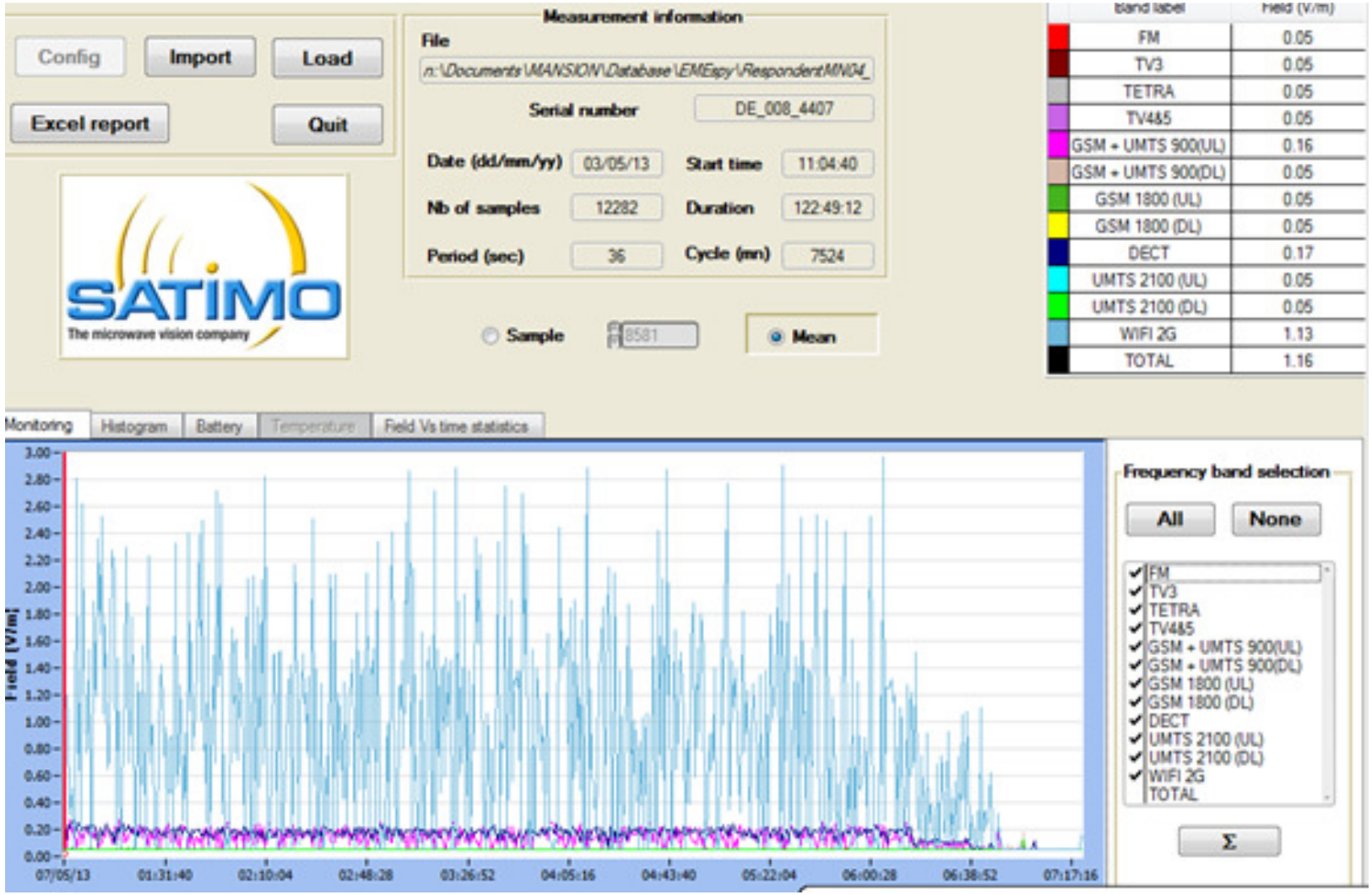
Serial number
DE_007_4407
Date (dd/mm/yy)
04/06/13
Start time
10:10:32
Nb of samples
12540
Duration
125:24:00
Period (sec)
36
Cycle (mn)
7524
Sample
12157
Mean
Band label
Field (V/m)
FM 0.06
TV3 0.05
TETRA 0.05
TV4&5 0.05
GSM + UMTS 900(UL) 0.09
GSM + UMTS 900(DL) 0.05
GSM 1800 (UL) 0.05
GSM 1800 (DL) 0.05
DECT 0.09
UMTS 2100 (UL) 0.05
UMTS 2100 (DL) 0.05
WIFI 2G 0.09
TOTAL 0.14
Monitoring
Histogram
Battery
Temperature
Field Vs time statistics
Field (V/m)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
04/06/13
04/06
05/06
05/06
06/06
07/06
07/06
08/06
08/06
09/06
09/06
Frequency band selection
All
None
FM
TV3
TETRA
TV4&5
GSM + UMTS 900(UL)
GSM + UMTS 900(DL)
GSM 1800 (UL)
GSM 1800 (DL)
DECT
UMTS 2100 (UL)
UMTS 2100 (DL)
WIFI 2G
TOTAL
Σ


Config
Import
Load
Excel report
Quit
SATIMO
The microwave vision company
Measurement information
File
n:\Documents\MANSION\Database\EMEspy\RespondentMN04_
Serial number
DE_008_4407
Date (dd/mm/yy)
03/05/13
Start time
11:04:40
Nb of samples
12282
Duration
122:49:12
Period (sec)
36
Cycle (mn)
7524
Sample
4449
Mean
DL = Down Link
Band label
Field (V/m)
88 - 108 MHz
FM
0.05
174 - 223 MHz
TV3
0.05
380 - 400 MHz
TETRA
0.05
470 - 830 MHz
TV4&5
0.05
880 - 915 MHz
GSM + UMTS 900(UL)
0.16
925 - 960 MHz
GSM + UMTS 900(DL)
0.05
1710 - 1785 MHz
GSM 1800 (UL)
0.07
1805 - 1880 MHz
GSM 1800 (DL)
0.05
1880 - 1900 MHz
DECT
0.16
1920 - 1980 MHz
UMTS 2100 (UL)
0.05
2110 - 2170 MHz
UMTS 2100 (DL)
0.05
2400 - 2500 MHz
WIFI 2G
1.26
TOTAL
1.28
Monitoring
Histogram
Battery
Temperature
Field Vs time statistics
Field (V/m)
6.90
6.50
6.00
5.50
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
05/05/13
05/05
05/05
05/05
06/05
06/05
06/05
06/05
06/05
07/05
07/05
Frequency band selection
All
None
FM
TV3
TETRA
TV4&5
GSM + UMTS 900(UL)
GSM + UMTS 900(DL)
GSM 1800 (UL)
GSM 1800 (DL)
DECT
UMTS 2100 (UL)
UMTS 2100 (DL)
WIFI 2G
TOTAL
Σ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Excel report
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SATIMO
The microwave vision company
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Serial number
DE_008_4407
Date (dd/mm/yy)
03/05/13
Start time
11:04:40
Nb of samples
12282
Duration
122:49:12
Period (sec)
36
Cycle (mn)
7524
Sample
8581
Mean
Band label
Field (V/m)
FM 0.05
TV3 0.05
TETRA 0.05
TV4&5 0.05
GSM + UMTS 900(UL) 0.16
GSM + UMTS 900(DL) 0.05
GSM 1800 (UL) 0.05
GSM 1800 (DL) 0.05
DECT 0.17
UMTS 2100 (UL) 0.05
UMTS 2100 (DL) 0.05
WIFI 2G 1.13
TOTAL 1.16
Monitoring
Histogram
Battery
Temperature
Field Vs time statistics
Field [V/m]
07/05/13
01:31:40
02:10:04
02:48:28
03:26:52
04:05:16
04:43:40
05:22:04
06:00:28
06:38:52
07:17:16
Frequency band selection
All
None
FM
TV3
TETRA
TV4&5
GSM + UMTS 900(UL)
GSM + UMTS 900(DL)
GSM 1800 (UL)
GSM 1800 (DL)
DECT
UMTS 2100 (UL)
UMTS 2100 (DL)
WIFI 2G
TOTAL
Σ

ARBEIDSSECTOREN

- Type I (Groen), onder anderen:
  - Kantoren
  - Licht materiaal (NEN 60745, 61029 en 60335)
  - Transport
  - Draadloze communicatie

ARBEIDSSECTOREN

- Type II (Geel), onder anderen:
  - Seal/Verlijm installaties
  - Booglassen
  - MRI scannen
  - Kleine radiozenders (op dak)

ARBEIDSSECTOREN

- Type III (Rood), onder andere:
  - Installatie en onderhoud zendmasten
  - Electrochemische processen
  - Inductie verhitting/lassen etc.
  - MRI (interventie)

INDUSTRIËLE OMGEVING

- Zware elektrische machines produceren in de regel sterke elektrische en magnetische velden.
- Werkgever moet volgens AH-strategie werknemers beschermen waar nodig.
- Naast wettelijke regelingen, zijn er ook eenvoudige maatregelen te treffen om de blootstelling te verminderen.

SIMPELE TIPS BLOOTSTELLINGSVERMINDERING

- Speaker/handsfree bellen
- Zorg voor goed bereik
- Gebruik WIFI als het er is (i.p.v. UMTS/DECT)
- Mijd draadloze verbindingen (ook speelgoed etc.)
- Elektrische dekens vermijden/uitschakelen

METEN VAN TOEPASSING AH-PRAKTIJK?

- Dure apparatuur/meting
- In industrie wordt vaak met specifieke frequentie gewerkt
- Indicatief is het mogelijk
- Handig voor Risicocommunicatie
  - Er is altijd straling
  - Men voelt zich gehoord
  - Nocebo/attributie v.s. handvaten geven

CONTACTEN

Voor geaccrediteerde instellingen zie www.rva.nl/search/ ‘zoeken in de inhoud van scopes’ met de term ‘elektromagnetische’

Nr	Naam	Adres	Postcode	Plaats	Scopes NL	Scopes EN	
C001	DEKRA Certification B.V.	Postbus 5185	6802 ED	ARNHEM			
C002	Kiwa Nederland B.V.	Postbus 70	2280 AB	RIJSWIJK ZH			Vrijwillig geschorst, Deel van de scope
C440	TÜV Rheinland Nederland B.V.	Postbus 541	7300 AM	APELDOORN			
C447	D.A.R.E!! Consultancy	Vijzelmolenlaan 7	3447 GX	WOERDEN			
K038	Nationaal Lucht- en Ruimtevaartlaboratorium - EMG Kalibratie Laboratorium (ASAQ)	Voorsterweg 31	8316 PR	MARKNESSE			
L220	Nationaal Lucht- en Ruimtevaartlaboratorium - EMC Test Laboratorium (ASAQ)	Voorsterweg 31	8316 PR	MARKNESSE			

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LEESVOER

Omgaan met EMV

http://www.kennisplatform.nl/actueel/14-02-21/Omgaan_met_elektromagnetische_velden.aspx

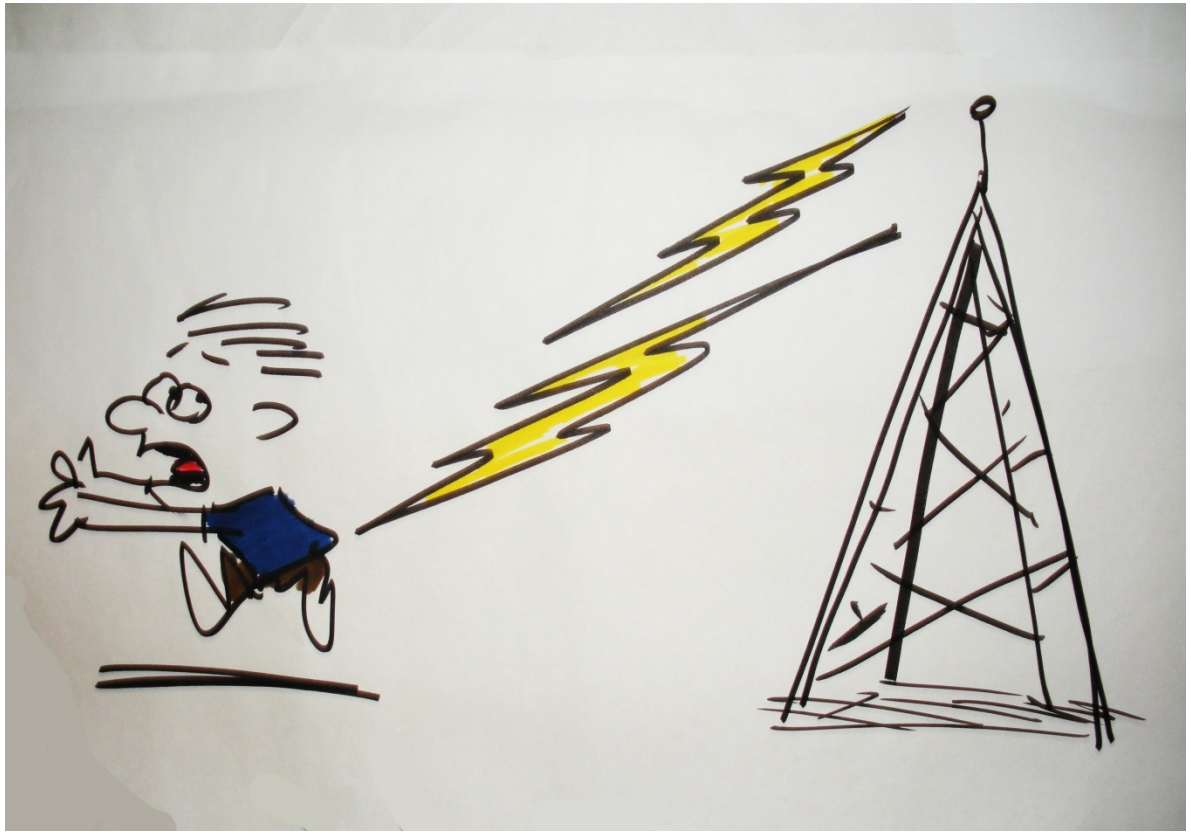
Electromagnetic fields in the working environment

http://www.rivm.nl/bibliotheek/rapporten/610015001.pdf

EU Richtlijnen

Http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:179:0001:0021:NL:PDF

VRAGEN?



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