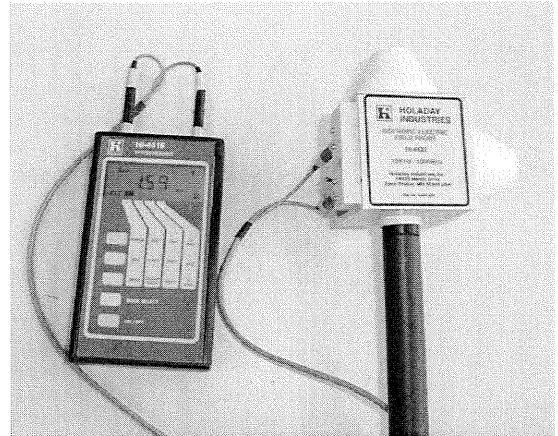


Safe working distance measurements, 3160 with mobile and fixed antenna installations

Equipment available :

Electric field sensor (Isotropic)
NATA traceable calibrated
Holaday HI-4422 Probe
HI-4416 Readout



Safe-working standards (occupational)

FCC 2.1091 :

1MHz – 3MHz : E = 614 V/m,
3MHz – 30MHz : E = (1842/f) V/m,

ICNIRP 1998 :

1MHz – 10MHz : E = (600/f) V/m,
10MHz – 30MHz : E = 60V/m,

Measurements for Mobile whip antenna installation:

1. The radiated V/m was measure at a distance of 1.5m from the antenna at a power level of 40 Watts CW to simulate continuous speech from the SSB Transceiver. This gives us a safety factor of 2 as the normally accepted RMS heating power of voice is about 10-20% of the peak power.
2. The field strength was measured in a 180 degree arc around the antenna and no significant change in reading was noted (<10%). This was tested at several frequencies with the same results.
3. The measurements in the car where made at the point of highest reading assuming a person was in that position. This was directly in line with the antenna and the middle of the rear window.

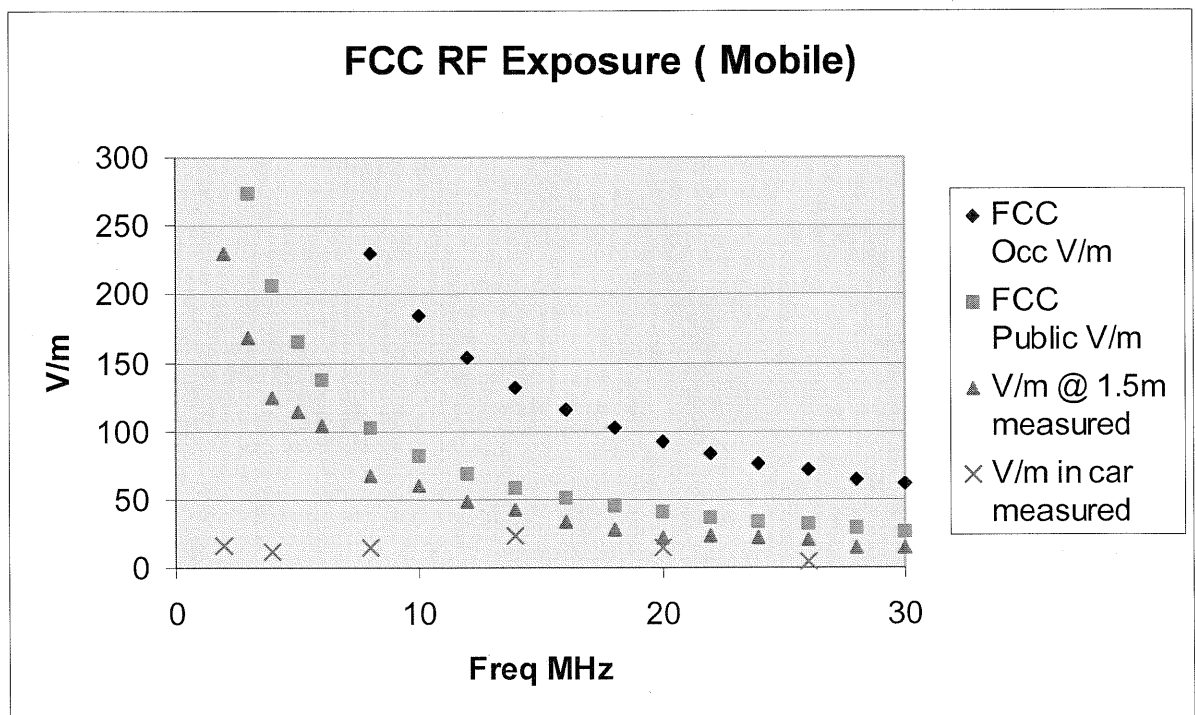
Measurements for Fixed (Base) antenna installation:

1. This was carried out on a “Semi Delta “ fixed broadband antenna mounted above a metal roof.
2. This was measured at the feed end of the antenna at a distance of 1m with a power of 40 Watts CW.

Results

Mobile whip antenna installation

Freq (MHz)	FCC Occ V/m Limit	FCC Public V/m Limit	V/m @ 1.5m Measured	V/m in car Measured
2	614	412	230	16
3	614	274	168	
4	460	206	124	12
5	368	165	114	
6	307	137	104	
8	230	103	68	14
10	184	82	60	
12	153	69	48	
14	132	59	42	24
16	115	51	34	
18	102	46	28	
20	92	41	22	14
22	83	37	24	
24	76	34	22	
26	71	32	20	4
28	65	29	14	
30	61	27	14	





Outside Vehicle @ 1.5m



Inside Vehicle at highest reading point

Results

Fixed antenna installation

Freq (MHz)	FCC Occ V/m Limit	FCC Public V/m Limit	V/m Fixed ant @ 1m Measured
2	614	412	18
3	614	274	
4	460	206	28
5	368	165	
6	307	137	30
8	230	103	26
10	184	82	26
12	153	69	
14	132	59	18
16	115	51	
18	102	46	28
20	92	41	
22	83	37	28
24	76	34	
26	71	32	14
28	65	29	
30	61	27	10

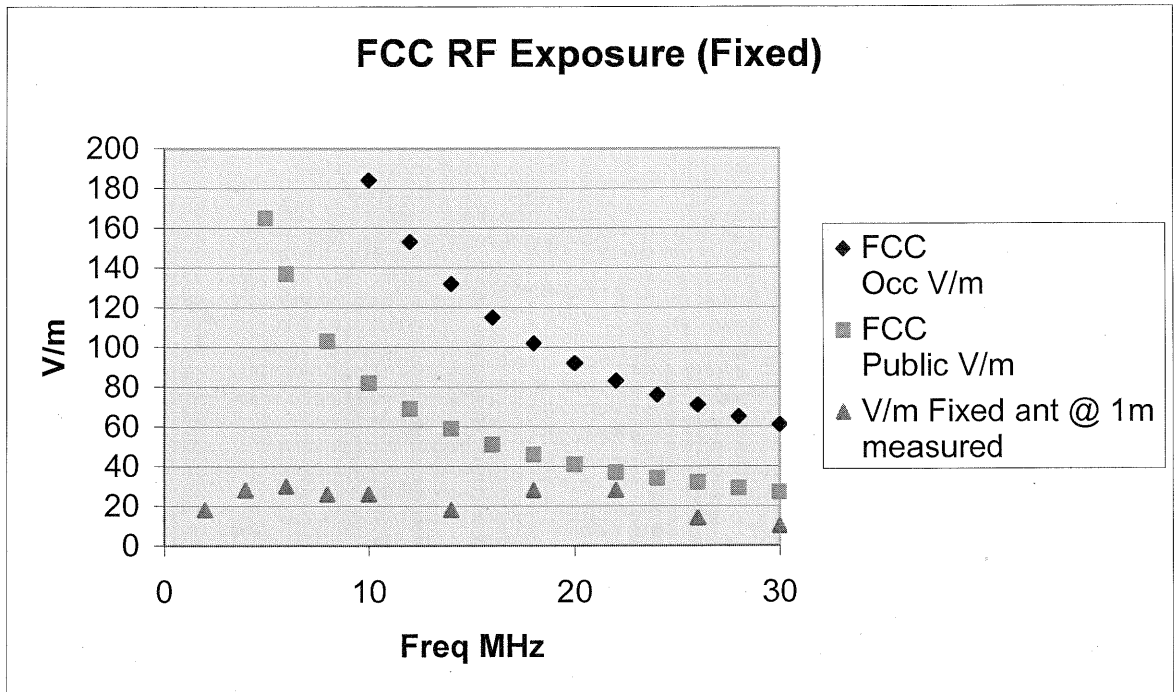


Photo of Semi-Delta fixed antenna (Feed end)

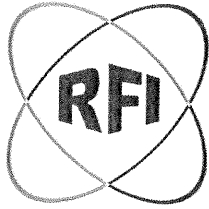
Conclusions

1. The requirements of FCC 2.1091 (occupational) are easily met at a distance of 1.5 metres from a typical Mobile antenna installation for all frequencies and possible average power levels from the 3160 Power Amplifier.
2. The requirements of FCC 2.1091 (occupational) are easily met at a distance of 2 metres from a typical Fixed antenna installation for all frequencies and possible average power levels from the 3160 Power Amplifier..
3. Average exposure levels are significantly less with typical usage of transceiver systems using the 3160 Power Amplifier.
4. From the measurements the requirements for General Population / Uncontrolled Exposure are also met at the distances we recommend.

A handwritten signature in black ink, appearing to read 'Neil Abraham'.

Neil Abraham
Engineering Design Manager

9th Feb 2009



rfi-ind.com.au

R.F.I. INDUSTRIES PTY. LIMITED

A.C.N. 005 273 950

ABN 66 005 273 950

52 to 54 Holloway Drive Bayswater, Victoria 3153, Australia

Telephone: (61) (3) 8739 6700

Facsimile: (61) (3) 8739 6799

Email: labs@rfi-ind.com.au

Web address: www.rfi-ind.com.au



Accreditation
No. 3540

TO:	Itacs Pty Ltd	FROM:	Hans Koch
ATTENTION:	Peter Karuga	DATE:	30 April 2008
FAX No.:	(08) 8346 8680	PAGES:	2
TELEPHONE:	(08) 8346 7072	REFERENCE:	TL5341 (HKQT150408)
EMAIL:	peter.karuga@itacslab.com		
SUBJECT:	Holiday HI-4422 repair		

REPAIR & VERIFICATION RECORD

MAKE: Holaday
MODEL: HI-4422 Probe (with companion HI-4416 Readout)
SER NO:

REPORTED FAULT: Battery not charging.

INVESTIGATION: Faulty battery pack confirmed.
In addition, electrolyte has leaked onto PCB's and corroded battery lead.

RECTIFICATION: Replaced NiCad battery pack and hard-wired in place with client approval (unrealistic price of new connector not justified).

Disassemble/reassemble probe (including component removal/replacement to gain cleaning access).

Thoroughly clean all visibly affected areas and clean all PCB's generally.

No damage to tracks or components apparent. Some surface track oxidation removed.

VERIFICATION: Unit and system passed self-test.

Carried out verification check in TEM cell against RFI Industries NATA traceable HI-4422/4416 system. Extremely close correlation of recorded field strengths. Details provided in Table 1 overleaf.

TABLE 1: Verification against identical HI-4422 NATA traceable probe.

RFI INDUSTRIES HI-4422			ITACS HI-4422		
FREQ (MHz)	RANGE	FIELD READING (V/m)	FREQ (MHz)	RANGE	FIELD READING (V/m)
10	1	2.00	10	1	1.96
21	2	26.8	21	2	26.5
100	3	34.5	100	3	34.4
64	4	58.6	64	4	58.5

Our NATA traceable probe has current ARPANSA calibration with an MU of ± 1.0 dB.

Probe correction factors for our probe are as detailed in Table 2 below (and whilst not applicable to the ITACS probe, can be considered generically typical of the HI-4422):

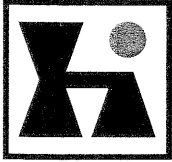
TABLE 2: Typical HI-4422 Probe Factor

FREQ (MHz)	PROBE FACTOR
0.1	0.92
1	1.03
10	1.00
30	0.99
100	0.96
200	0.98
900	1.05

Meter reading is multiplied by Probe Factor to obtain actual field strength.

Hans KOCH
 Technical Officer
 EMI/EMC Laboratories
 (03) 8739 6700





HOLIDAY INDUSTRIES, INC.

MEMBER OF THE BOWTHORPE GROUP
14825 MARTIN DRIVE • EDEN PRAIRIE, MN 55344
PHONE (612) 934-4920 • FAX: (612) 934-3604

CALIBRATION REPORT

Page 1 of 2

ELECTRIC FIELD SENSOR

MODEL	S/N
HI-4422	96046

ENVIRONMENT:

TEMP:	22 C
-------	------

PROBE:

Temp:	OK
Batt:	OK

#	FREQUENCY	APPLIED FIELD	INDICATED FIELD			MAX. DEV.	CHANNEL MATCH	
		V/M	RNG	Volts/Meter				
				X	Y	Z	db	%
1	10 KHz	90	100	86.2	87.4	86.4	-0.37	98.6%
2	30 KHz	90	100	92.0	92.8	91.8	0.27	98.9%
3	1.50 MHz	90	100	90.0	90.2	90.0	0.02	99.8%
4	3.0 MHz	90	100	90.8	91.2	91.0	0.12	99.6%
5	30 MHz	90	100	92.4	93.4	92.4	0.32	98.9%
6	150 MHz	90	100	93.0	93.4	92.8	0.32	99.4%
7	1.0 GHz	20	30	20.70	20.18	20.70	0.30	97.5%
8	30 KHz	9	10	9.04	-	-	0.04	-
9	30 KHz	28.4	30	28.50	-	-	0.03	-
10	30 KHz	90	100	92.00	-	-	0.19	-
11	30 KHz	284	300	284.60	-	-	0.02	-
12	3.0 MHz	9	10	9.12	-	-	0.12	-
13	3.0 MHz	28.4	30	28.52	-	-	0.04	-
14	3.0 MHz	90	100	91.00	-	-	0.10	-
15	3.0 MHz	284	300	285.40	-	-	0.04	-

1. Absolute Calibration 1430
2. Isotropic Response [400 MHz], (Pg 2)

The above sensor was calibrated to factory specifications. This calibration is traceable to US National Institute of Standards and Technology (NIST) through report number:

RF Probe, #812111

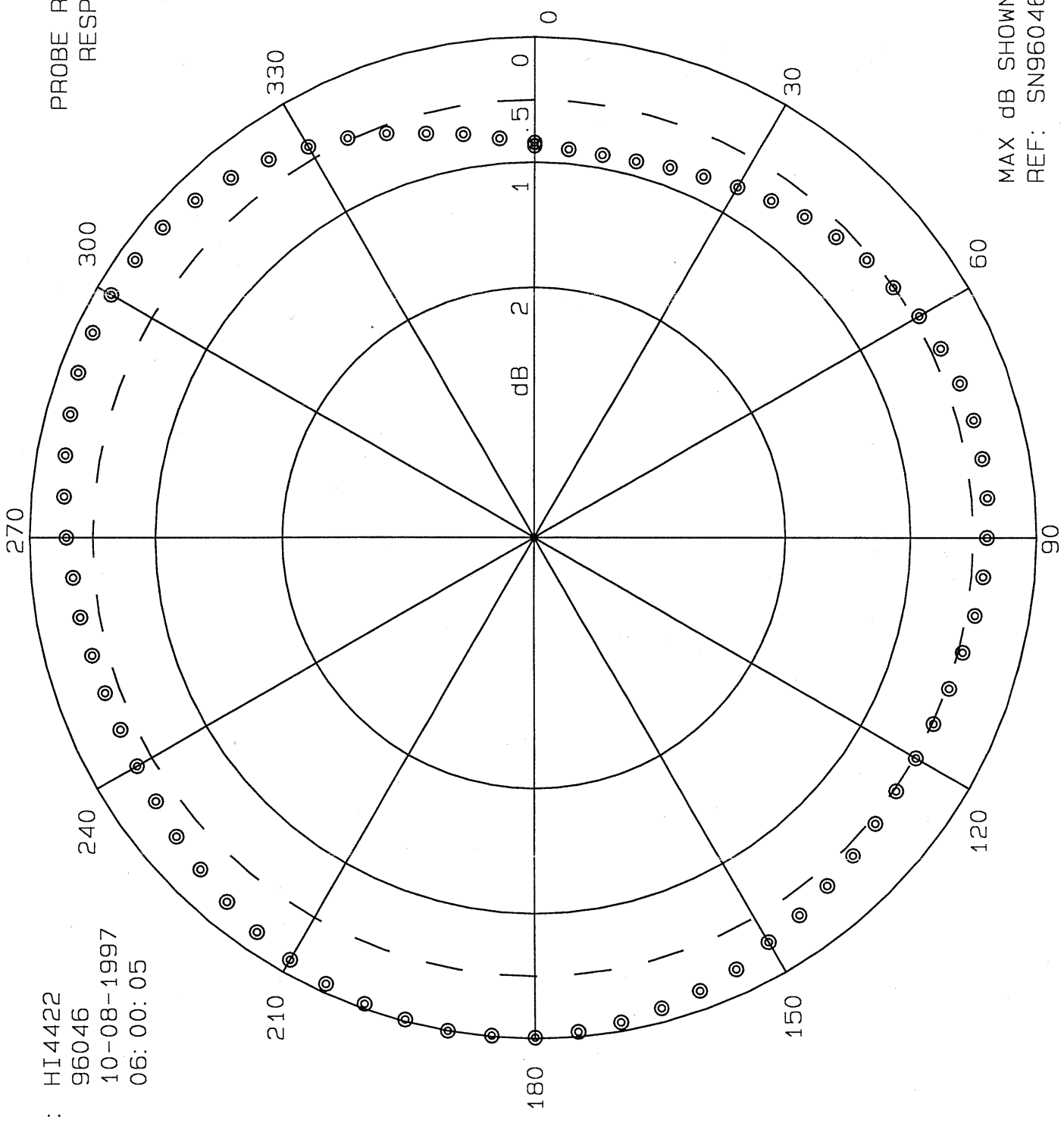
Recommended calibration interval: 1 year.

Calibration date: 8 Oct 97	By: <i>Kc</i>
----------------------------	---------------

Checked date: 20 Oct 97	By: <i>DT</i>
-------------------------	---------------

Model: HI4422
S/N: 96046
Date: 10-08-1997
Time: 06: 00: 05

PROBE ROTATIONAL
RESPONSE



MAX dB SHOWN -> -.9
REF: SN96046