

APPENDIX B

EXPLANATION OF METHODOLOGY

SUMMARY OF MEASUREMENTS

EXPLANATION OF METHODOLOGY

see Appendix C

NII Band Worksheet

This Spreadsheet titled the "N2-X Worksheet" was designed primarily to quickly collect data and provide information for all aspects of the Radio's performance. From operation in the field to how it compares with the limits specified by Regulatory Agencies worldwide. With all the possible equipment configurations and variations with respect to a specific application in the field. It was necessary to generate a tool that compiles all the information required to support modifications and design changes necessary to deliver superior performance for which it was designed. This tool should enable the "Factory Tuned Selection" process to operate smoothly. This is a SAMPLE of how the data was extrapolated the actual submittal data is located in the appendices to follow. Hopefully, it will be clear as to how the selections were determined for acceptance and Certification...

After the frequency range for the desired band has imported for the 1 MHz steps, The "Raw Readings" data is placed into the center column. The third column titled "POWER OUT", converts the reading in to milliwatts and the SUM is then calculated in the bottom cell. Representative of the Peak Power Total in milliwatts.

The 26 dB bandwidth measurement is then entered in the upper right side above this table as well as the gain (dBi) for the particular antenna you wish to evaluate against the limits.

The program will allow you to take in consideration any Loss. When the loss has been calculated insert the number here and that number will be subtracted when working out the Total measurement in dB milliwatts. All measurements were taken with a 5 ft. coaxial cable with measured loss of 2.6 dB.

This is where the Peak Transmit Power (PTP) LIMIT is calculated. That LIMIT is then transferred down to the SUMMARY tables below (section 2).

N2X 5.3 GHz NII Radio

Date: 07/2/09
 File Name: 5.3GHzCT01
 Tested By: Russch
 BW: 1 MHz
 VSWR: 30 kHz
 Span: 1 MHz

CHANNEL 1 = 5.2608 GHz

26 dB BW(dBHz) = 12.63
 PTP Limit = 22.01
 Antenna gain (dBi) = 17.5
 Ant. gain - 60dB(dBi) = 11.5
 PTP Limit - Ant. Gain(dBi) = 10.51

FREQUENCY (MHz)	Analyzer Reading (dBm)	POWER OUT (mW)
5.2508	36.83	0.800
5.2518	39.37	0.800
5.2528	34.62	0.800
5.2538	39.33	0.801
5.2548	19.60	0.813
5.2558	6.33	0.147
5.2568	-1.62	0.689
5.2578	6.33	1.879
5.2588	1.33	1.358
5.2598	1.60	1.259
5.2608	2.50	1.778
5.2618	1.44	1.393
5.2628	6.83	1.211
5.2638	6.17	0.562
5.2648	2.50	0.562
5.2658	3.33	0.117
5.2668	29.83	0.808
5.2678	32.60	0.801
5.2688	36.67	0.800
5.2698	49.83	0.800
5.2708	38.60	0.800
		0.00
		10.58

Insertion Loss (dB) = Correction Factor = 2.600

SUMMARY MODEL: 63 DFPS-5-52

FLAT PANEL	Measurement	Limits	DELTA
Power (mW)	1.15	22.00	-20.85
Power (dBm)	-1.99	-0.10	-1.89
ERP (dBm)	26.11	27.00	-0.89

Notes: The above measurements made at the highest Output Power setting w/ lowest antenna gain.
 Please refer to Chart PTP-1.8 for test results for other Antenna configurations.

(-) below LIMIT
 (+) above LIMIT

Two things needs to be entered here. The 26 dB Bandwidth in MHz and the gain for the specific Antenna being investigated. It will make the adjustments to the actual calculated value, if required.

Peak Power Measurement was taken with a Peak Power Meter for reference only.

Antenna Summary

With the table above, after the "raw data" has been entered in the middle column for each of the Power settings. Based on the entered 26 dB bandwidth measurement and the power level, the program will do the calculations for that particular power output and the antenna gain, and then stores the results in the far right column titled "DELTA". This is actually a "measurement versus limit" or specification. The tables have already been configured for the applicable antenna gain in dB. The program calculates the difference and posts the data accordingly.

The data is traceable by color as well, if a colored copy can be made available or via a colored computer monitor.

SSP2-52A High Power Setting
 DFPS-5-52 Low Power Setting
 DFPS-1-52 Low/Medium Setting
 DFPS-2-52 High/Medium Setting

SUMMARY MODEL: SSP2-52A

PARABOLIC	Measurement	Limits	DELTA
Power (mW)	10.58	22.01	-11.44
Power (dBm)	7.64	-0.99	7.73
ERP (dBm)	29.74	27.00	2.74

SUMMARY MODEL: DFPS-5-52

FLAT PANEL	Measurement	Limits	DELTA
Power (mW)	5.45	22.00	-16.55
Power (dBm)	4.76	-0.10	4.87
ERP (dBm)	32.86	27.00	5.86

SUMMARY MODEL: DFPS1-52

FLAT PANEL	Measurement	Limits	DELTA
Power (mW)	2.65	21.98	-19.33
Power (dBm)	1.63	-0.12	1.75
ERP (dBm)	29.73	27.00	2.73

SUMMARY MODEL: DFPS 2-52

FLAT PANEL	Measurement	Limits	DELTA
Power (mW)	1.15	22.00	-20.85
Power (dBm)	-1.99	-0.10	-1.89
ERP (dBm)	26.11	27.00	-0.89

The last column on the right hand side of the Antenna Summary (sec. 2) titled "DELTA" takes the measurement and compares the reading to the referenced specification. The values are in reference to limits. This data is transferred and stored in the next in the section where it is placed in the allocated table based on the power setting which the measurement was recorded.

DATA COLLECTION

CHANNEL REFERENCE TABLES

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SWITCH SET Summary

20 dB Bandwidth measurement is recorded and entered in both tables, the "NI Worksheet" and the "SWITCH SET Summary" require that this be entered manually. This is how the "subset tables" get set up with the appropriate tracking to the allocated cells for the transfer of information.

After the "Raw Readings" are have been inserted in the "NI worksheet" and has made the conversion to a value, in milliwatts, at the bottom of that column, place that value in the applicable cell based on the power level and the Switch setting.

Parabolic Antenna SSP2-52A				
5.3 GHz				
CHANNEL 1 Reference Table				
POWER SWITCH SET	SW 1	SW 2	SW 3	SW 4
20 dB Bandwidth	12.83	12.98	12.54	12.58
PTP Limit	22.91	22.90	21.98	22.00
Antenna gain (dB)	28.1	28.1	28.1	28.1
Ant. gain - Solid dB	22.1	22.1	22.1	22.1
PTP Limit - Ant. gain (dB)	-0.09	-0.10	-0.12	-0.10
ADDRESS SET	II	OO	OI	IO
Protal (mW)	10.58	5.45	2.85	1.15
Peak Power (dBm)	14.50	12.20	9.20	8.30

RESULTS VERSUS LIMITS - Single Antenna

POWER SWITCH SET	SW 1	SW 2	SW 3	SW 4
Protal (mW)	-11.44	-16.55	-19.33	-20.85
Protal (dBm)	7.73	4.87	1.75	-1.89
Protal (dBm)	2.74	5.86	2.73	-0.89

Basically, this set of calculated measurements is what is sent to the Final Data Table located in Section 6 of this document. Initially when this method was originated it was not clear as to what we were going to want to be looking at as far as the Final Data is concerned. This "test matrix" covers most of everything with the exception to the plots which are located in Appendix D.

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Channel Data Storage

This is basically the holding area for all the Channel measurements versus frequency. Up until now, we have been referring to the data and the steps in which to input the data for a single channel. You need to move to the next channel until all the channels of interest have been entered. Then the independent channel data is stored in this table.

Storage

Compiled Results

4 ANTENNAS @ 4 POWER LEVELS

Data ready for final Data Sheet

Parabolic	SSP2-52A	SW 1	SW 2	SW 3	SW 4
28.1 dBi	Protal (mW)	-11.44	-16.55	-19.33	-20.85
	Protal (dBm)	7.73	4.87	1.75	-1.89
	ERP (dBm)	2.74	5.86	2.73	-0.89
Flat Panel	DFFD2-52	SW 1	SW 2	SW 3	SW 4
27.5 dBi	Protal (mW)	-11.42	-16.55	-19.33	-20.85
	Protal (dBm)	7.73	4.87	1.75	-1.89
	ERP (dBm)	8.14	5.26	2.13	-1.49
Flat Panel	DFFD1-52	SW 1	SW 2	SW 3	SW 4
23.0 dBi	Protal (mW)	-11.42	-16.55	-19.33	-20.85
	Protal (dBm)	2.82	-0.23	-3.36	-2.49
	ERP (dBm)	3.84	0.76	-2.37	-1.49
Flat Panel	DFFS-5-52	SW 1	SW 2	SW 3	SW 4
17.5 dBi	Protal (mW)	-11.42	-16.55	-19.33	-20.85
	Protal (dBm)	-2.87	-6.73	-8.85	-12.49
	ERP (dBm)	-1.86	-4.74	-6.87	-10.89

DATA GETS COMBINED WITH OTHER CHANNELS TESTED

REVIEW FINAL RESULTS IN THE FOLLOWING TABLE

The results are sent on their way to a spreadsheet which displays all the results where it can be seen easily the areas of concern, with reference to specifications, and those issues can be addressed at that time.

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The Calculations Used

...time to MOVE ON TO ANOTHER CHANNEL

REFERENCE CALCULATIONS		Antenna Type(s)			
LIMITS		Manufacturer	DESCRIPTION	MODEL	GAIN (dB)
PTP Limit	$11 \text{ dBm} + 10 \log(26 \text{ dB BW})$	Gabriel Electronics	2" Parabolic Dish	SSD2-52	28.1
Protal (mW)	$10 \log(\text{Analyzer Reading})/10$				LOW
Protal (mW)	$\text{Sum}(\text{Protal mW})$		2" Flat Panel	DFFD2-52	27.5
Protal (dBm)	$10 \log(\text{Protal mW})$				MID
ERP (dBm)	$\text{Protal (dBm)} + \text{Ant. Gain - 60 dBm}$		1" Flat Panel	DFFS1-52	23.0
			3" Flat Panel	DFFS3-52	17.5
					HIGH

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FINAL CALCULATED MEASUREMENTS

PTP TABLE 1

FINANCIAL RESULTS	-19.33
	1.75
	2.73

PENDING RESULTS	20.85
	1.81
	0.83

The table is divided into three sections. The first section displays the three (3) channels investigated for the submitted format. The format of the data is configured identically to the data in the previous tables. In order to encompass the entire data package for all the channels, it is displayed from the highest power setting to the lowest, where as *SWT* is the highest and *SWL* being the lowest output power for Channels 1, 5 and 8. The antennas were configured in a similar fashion with the highest gain antennas at the top of each of the sections representing 1 of the 3 channels. The data has been compiled so that each antenna has its own table. Formatting the results in a "tabular specific" type of arrangement. A different format than what was previously displayed but heigh to see the correlation between the various power levels and the different antenna gain[s].

Refer to **Appendix C** and **D** for the final results and the selection of the antennas, specifically being submitted for certification at this time.

WIRELESS, INC.

N2-X

5.3 GHz CHANNEL 1

Parabolic

SSP2-52A

SW 1

SW 2

SW 3

SW 4

DATA

Power (mW)

-11.44

-16.55

-19.33

-20.85

VERSUS

Power (dBm)

7.73

4.87

1.75

-1.89

LIMIT

EIRP (dBm)

-7.95

5.95

2.73

-0.89

28.1 dB

Flat Panel

DFFD2-52

SW 1

SW 2

SW 3

SW 4

DATA

Power (mW)

-11.43

-16.55

-19.33

-20.85

VERSUS

Power (dBm)

7.13

4.27

1.15

-2.49

LIMIT

EIRP (dBm)

8.14

5.26

2.13

-1.49

27.5 dB

Flat Panel

DFFD1-52

SW 1

SW 2

SW 3

SW 4

DATA

Power (mW)

-11.43

-16.55

-19.33

-20.85

VERSUS

Power (dBm)

2.63

-2.23

-3.35

-4.49

LIMIT

EIRP (dBm)

2.64

0.76

-2.37

-1.49

23.0 dB

Flat Panel

DFFS5-52

SW 1

SW 2

SW 3

SW 4

DATA

Power (mW)

-11.43

-16.55

-19.33

-20.85

VERSUS

Power (dBm)

-3.87

-6.73

-8.85

-12.49

LIMIT

EIRP (dBm)

-1.98

-4.74

-22.37

-28.89

17.5 dB

() Below LIMIT

() Above LIMIT

5.3 GHz CHANNEL 5

N2-X

Parabolic

SSP2-52A

SW 1

SW 2

SW 3

SW 4

RESULTS

Power (mW)

-10.41

-15.80

-19.20

-20.87

VERSUS

Power (dBm)

8.11

5.41

2.01

-1.78

LIMIT

EIRP (dBm)

2.15

6.47

3.09

-0.71

28.1 dB

Flat Panel

DFFD2-52

SW 1

SW 2

SW 3

SW 4

RESULTS

Power (mW)

-10.42

-15.80

-19.20

-20.87

VERSUS

Power (dBm)

7.50

4.81

1.61

-2.38

LIMIT

EIRP (dBm)

8.56

5.87

2.49

-1.21

27.5 dB

Flat Panel

DFFD1-52

SW 1

SW 2

SW 3

SW 4

RESULTS

Power (mW)

-10.42

-15.80

-19.20

-20.87

VERSUS

Power (dBm)

3.00

0.21

-2.55

-2.38

LIMIT

EIRP (dBm)

4.06

1.37

-2.01

-1.21

23.0 dB

Flat Panel

DFFS5-52

SW 1

SW 2

SW 3

SW 4

RESULTS

Power (mW)

-10.42

-15.80

-19.20

-20.87

VERSUS

Power (dBm)

-2.59

-5.19

-8.50

-12.38

LIMIT

EIRP (dBm)

-1.44

-4.13

-25.01

-28.81

17.5 dB

() Below LIMIT

() Above LIMIT

On the Final Data submittal, the column on the right will specify which antennas are to be considered for Certification and for what power levels we would like the Grant to include.

5.3 GHz CHANNEL 8

N2-X

Parabolic

SSP2-52A

SW 1

SW 2

SW 3

SW 4

RESULTS

Power (mW)

-12.00

-16.13

-19.54

-21.30

VERSUS

Power (dBm)

7.28

5.03

1.54

-2.23

LIMIT

EIRP (dBm)

2.66

6.53

3.00

-0.74

28.1 dB

Flat Panel

DFFD2-52

SW 1

SW 2

SW 3

SW 4

RESULTS

Power (mW)

-11.99

-16.13

-19.54

-21.30

VERSUS

Power (dBm)

6.68

4.45

0.34

-2.83

LIMIT

EIRP (dBm)

8.07

5.93

2.40

-1.34

27.5 dB

Flat Panel

DFFD1-52

SW 1

SW 2

SW 3

SW 4

RESULTS

Power (mW)

-11.99

-16.13

-19.54

-21.30

VERSUS

Power (dBm)

2.18

-0.05

-3.56

-2.83

LIMIT

EIRP (dBm)

2.57

1.43

-2.10

-1.34

23.0 dB

Flat Panel

DFFS5-52

SW 1

SW 2

SW 3

SW 4

RESULTS

Power (mW)

-11.99

-16.13

-19.54

-21.30

VERSUS

Power (dBm)

-3.32

-5.55

-8.06

-12.83

LIMIT

EIRP (dBm)

-1.93

-4.07

-25.10

-28.84

17.5 dB

() Below LIMIT

() Above LIMIT

This is just a **SAMPLE** of the table for "proof of concept" purposes only.

On the Final Data submitted, the column on the right will specify which antennas are to be considered for Certification and for what power levels we would like the Grant to include.

5.3 "RAW" Data

5.3 GHz Date: 8/5/99

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6.38 (2H)

8/23/98

6.3 GHz

842.799

CFR 100

DATE	CUSTOMER	DESCRIPTION
10/1/01	ABC COMPANY	1000000
10/2/01	DEF COMPANY	2000000
10/3/01	GHI COMPANY	3000000
10/4/01	JKL COMPANY	4000000
10/5/01	MNO COMPANY	5000000
10/6/01	PQR COMPANY	6000000
10/7/01	STU COMPANY	7000000
10/8/01	VWX COMPANY	8000000
10/9/01	YZA COMPANY	9000000
10/10/01	BCD COMPANY	10000000
10/11/01	EFG COMPANY	11000000
10/12/01	HIJ COMPANY	12000000
10/13/01	KLM COMPANY	13000000
10/14/01	NOP COMPANY	14000000
10/15/01	QRS COMPANY	15000000
10/16/01	TUV COMPANY	16000000
10/17/01	WXY COMPANY	17000000
10/18/01	ZAB COMPANY	18000000
10/19/01	BCD COMPANY	19000000
10/20/01	EFG COMPANY	20000000
10/21/01	HIJ COMPANY	21000000
10/22/01	KLM COMPANY	22000000
10/23/01	NOP COMPANY	23000000
10/24/01	QRS COMPANY	24000000
10/25/01	TUV COMPANY	25000000
10/26/01	WXY COMPANY	26000000
10/27/01	ZAB COMPANY	27000000
10/28/01	BCD COMPANY	28000000
10/29/01	EFG COMPANY	29000000
10/30/01	HIJ COMPANY	30000000
10/31/01	KLM COMPANY	31000000
11/1/01	NOP COMPANY	32000000
11/2/01	QRS COMPANY	33000000
11/3/01	TUV COMPANY	34000000
11/4/01	WXY COMPANY	35000000
11/5/01	ZAB COMPANY	36000000
11/6/01	BCD COMPANY	37000000
11/7/01	EFG COMPANY	38000000
11/8/01	HIJ COMPANY	39000000
11/9/01	KLM COMPANY	40000000
11/10/01	NOP COMPANY	41000000
11/11/01	QRS COMPANY	42000000
11/12/01	TUV COMPANY	43000000
11/13/01	WXY COMPANY	44000000
11/14/01	ZAB COMPANY	45000000
11/15/01	BCD COMPANY	46000000
11/16/01	EFG COMPANY	47000000
11/17/01	HIJ COMPANY	48000000
11/18/01	KLM COMPANY	49000000
11/19/01	NOP COMPANY	50000000
11/20/01	QRS COMPANY	51000000
11/21/01	TUV COMPANY	52000000
11/22/01	WXY COMPANY	53000000
11/23/01	ZAB COMPANY	54000000
11/24/01	BCD COMPANY	55000000
11/25/01	EFG COMPANY	56000000
11/26/01	HIJ COMPANY	57000000
11/27/01	KLM COMPANY	58000000
11/28/01	NOP COMPANY	59000000
11/29/01	QRS COMPANY	60000000
11/30/01	TUV COMPANY	61000000
12/1/01	WXY COMPANY	62000000
12/2/01	ZAB COMPANY	63000000
12/3/01	BCD COMPANY	64000000
12/4/01	EFG COMPANY	65000000
12/5/01	HIJ COMPANY	66000000
12/6/01	KLM COMPANY	67000000
12/7/01	NOP COMPANY	68000000
12/8/01	QRS COMPANY	69000000
12/9/01	TUV COMPANY	70000000
12/10/01	WXY COMPANY	71000000
12/11/01	ZAB COMPANY	72000000
12/12/01	BCD COMPANY	73000000
12/13/01	EFG COMPANY	74000000
12/14/01	HIJ COMPANY	75000000
12/15/01	KLM COMPANY	76000000
12/16/01	NOP COMPANY	77000000
12/17/01	QRS COMPANY	78000000
12/18/01	TUV COMPANY	79000000
12/19/01	WXY COMPANY	80000000
12/20/01	ZAB COMPANY	81000000
12/21/01	BCD COMPANY	82000000
12/22/01	EFG COMPANY	83000000
12/23/01	HIJ COMPANY	84000000
12/24/01	KLM COMPANY	85000000
12/25/01	NOP COMPANY	86000000
12/26/01	QRS COMPANY	87000000
12/27/01	TUV COMPANY	88000000
12/28/01	WXY COMPANY	89000000
12/29/01	ZAB COMPANY	90000000
12/30/01	BCD COMPANY	91000000
12/31/01	EFG COMPANY	92000000
1/1/02	HIJ COMPANY	93000000
1/2/02	KLM COMPANY	94000000
1/3/02	N	

Comments:

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