

# CircuitWerkes, Inc.

2805 NW 6<sup>th</sup> Street, Gainesville, FL 32609

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Exhibit EE-1: Engineering Statement in support of  
FCC FORM 349

APPLICATION FOR AUTHORITY TO CONSTRUCT OR MAKE CHANGES IN AN FM TRANSLATOR OR FM BOOSTER  
STATION

(For a New FM Translator)

This Exhibit supports minor modifications, to an existing construction permit for translator W223CJ by Circuitwerkes, Inc. (the Applicant) serving the community of West Palm Beach, FL. The facility ID is 158103.

This application changes the location, height and power. A change of the primary station is also made.

The predicted 60dBu contour of the proposed facility overlaps portions of the licensed 60dBu contour. The requested changes constitute a minor modification of the licensed facility.

The proposed facility is in compliance with 47 C.F.R. Section 1.1306 with regards to radio-frequency electromagnetic exposure in that the contribution to the rf environment is less than 5% of the maximum public exposure.

This application was prepared using FCC 3-arc-second terrain data.

This translator is a fill in for WSVU (facility ID 129188). Figure 3 shows that the W223CJ 1mV service contour is within the WSVU 2mV nighttime service contour. A waiver is requested to allow serving the night contour instead of the daytime contour.

Figure 1 is a color coded map showing the protected contours and interfering contours of all relevant FM facilities. No prohibited overlap exists between this proposed facility and any other facility on co-channel or a 1<sup>st</sup> adjacency. The 100dBu interfering contour overlaps 3<sup>rd</sup> adjacent WFEZ and 2<sup>nd</sup> adjacent WRLX. A "Living Way" waiver is requested and engineering data demonstrating that there is no interference to any occupied structure or major road is included.

Figure 2 demonstrates that there is overlap of the 60dBu contours between the original location and this proposal.

The proposal is sufficiently distant from all facilities mentioned in 73.1030(a), (b) & (c) so that notification under 73.1030 is not required.

Kyle Magrill, President/applicant

18 July 2017

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Figure 2: Minor Change Exhibit. Original 60dBu contour overlaps portions of the proposed 60dBu contour.

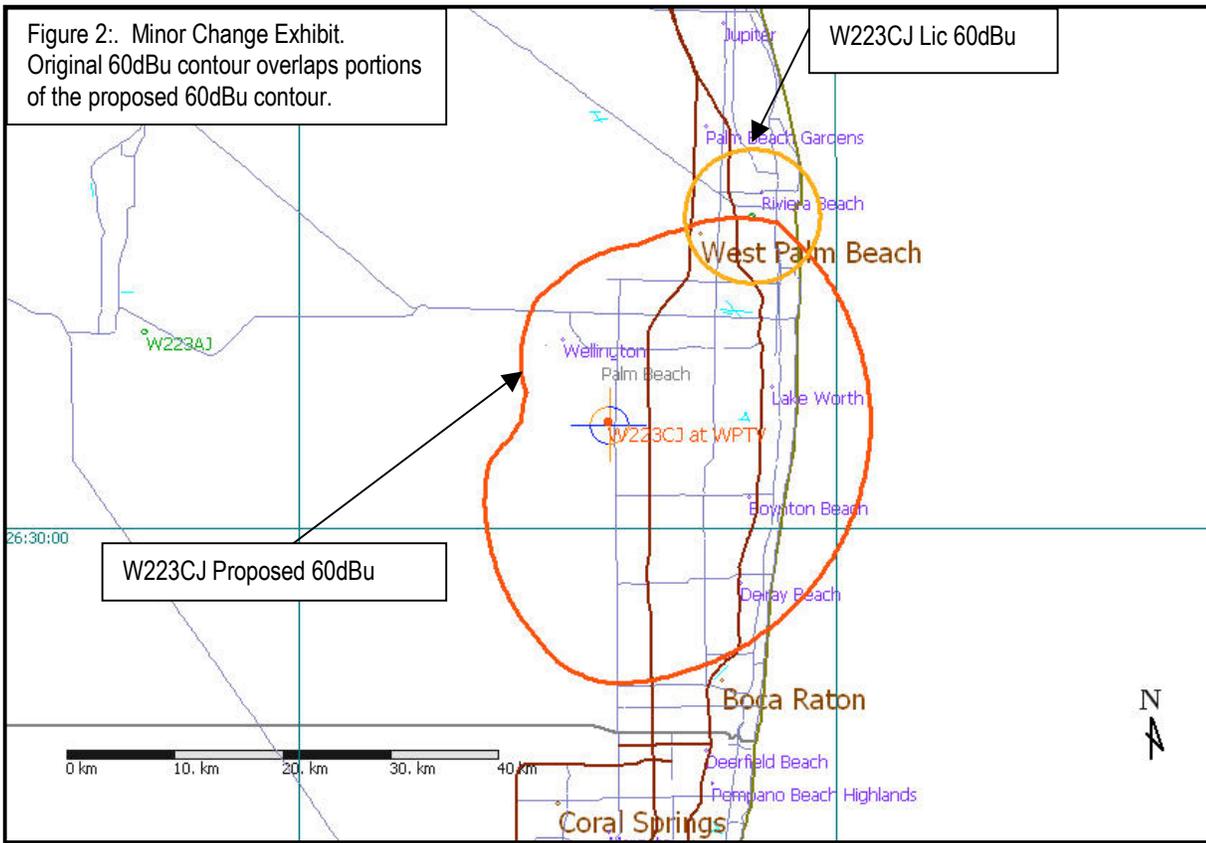
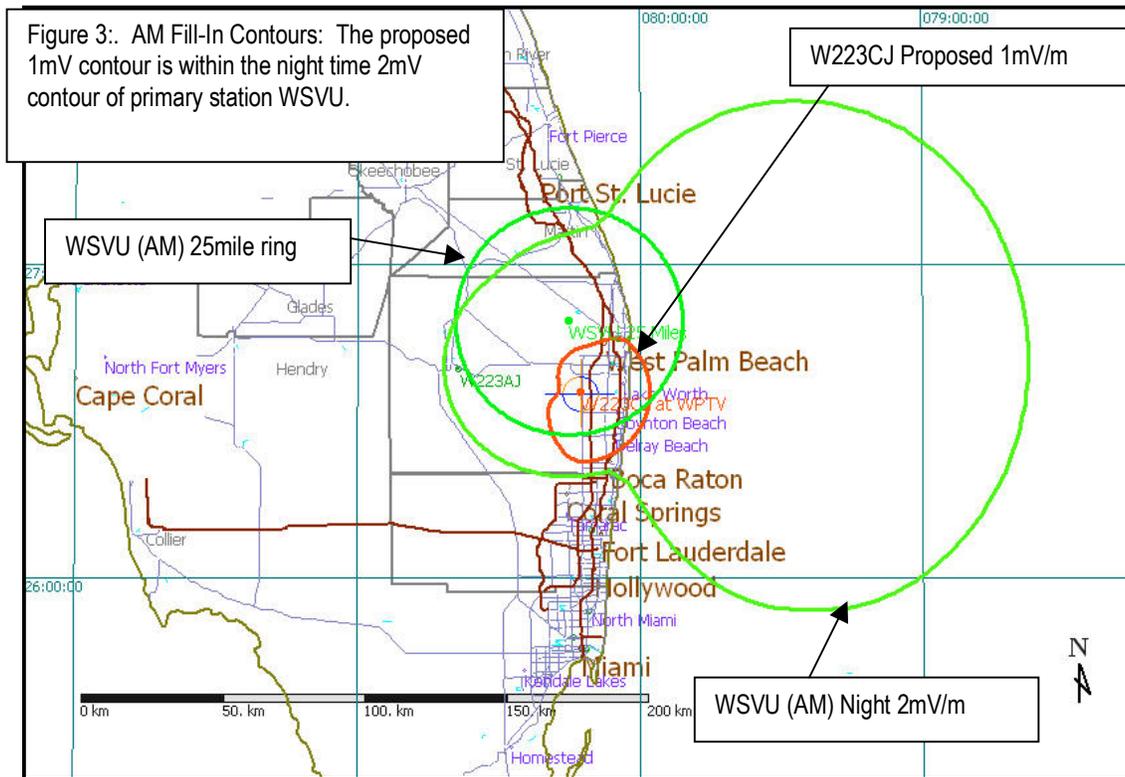


Figure 3: AM Fill-In Contours: The proposed 1mV contour is within the night time 2mV contour of primary station WSVU.

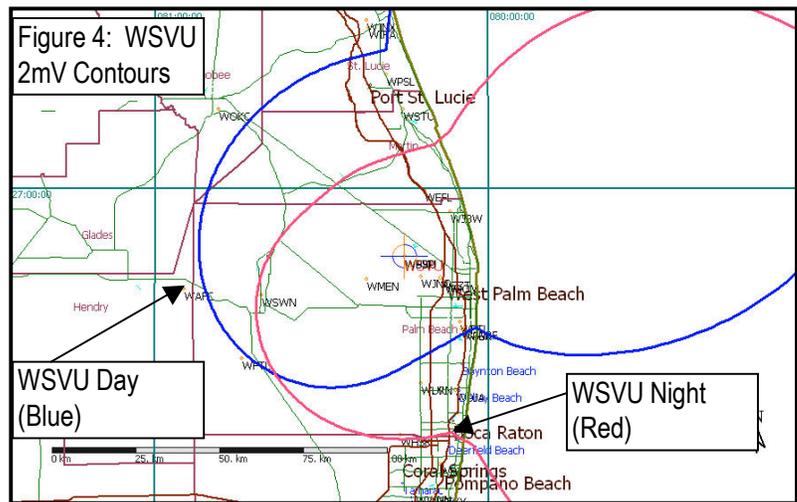


## Waiver of 47CFR74.1201(g) Requested

It is well established that rule waiver requests face a high hurdle. However, where there is a significant public interest, convenience or necessity that would, generally benefit the public, rules can be waived on a case by case basis. We are requesting that FM translator W223CJ be permitted to serve the nighttime 2mV contour of WSVU instead of the daytime service contour. We believe that this is an unusual case where a waiver of the rules clearly benefits the public, as discussed below.

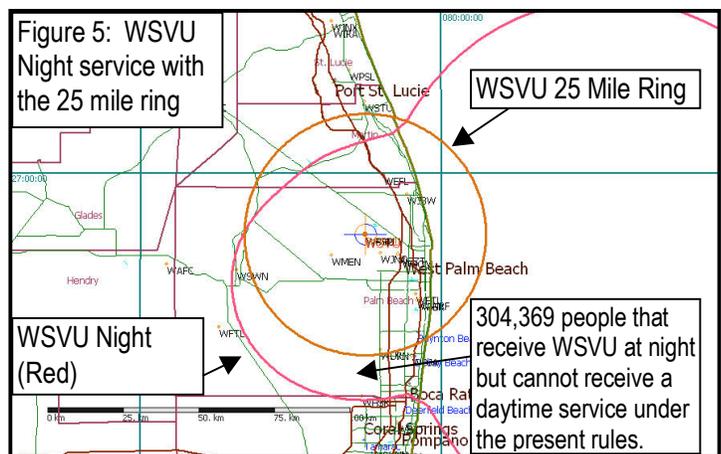
The Commission's rules currently allow FM translators to fill-in the daytime service area of AM stations, but does not specifically allow FM translators to fill in nighttime service areas nighttime service area. A serious problem with the currently written rule is that some AM stations cannot take advantage of certain necessary FM translator coverage. There are AM stations that serve different populations in the night vs the day. Most AM stations have bigger coverage areas in daytime operation than they do at night, but this is not the case for a handful of stations, like WSVU.

WSVU is an AM station serving the West Palm Beach market. Figure 4 shows WSVU's day and night coverage areas. WSVU covers a substantial segment of the market at night that is not covered during the daytime. Specifically, 526,373 people receive nighttime service from WSVU that do not receive service during the day. The current rules do not allow WSVU to serve this nighttime population with an FM translator, except for a limited number that are within 25 miles of the WSVU tower. So, a very substantial number of people that can listen to WSVU at night have no method of listening during the daytime service hours.



When we add the 25 mile ring, (Figure 5), we see that some of the affected nighttime population falls within the 25 mile ring, but most do not. Specifically, the 25 mile ring would include about 222,004 affected nighttime listeners that will be able to receive an FM signal from WSVU. However, 304,369 people would still be left without daytime service under the proposed new changes.

In adopting the original report and order, the Commission noted that many AM stations would benefit from FM translator coverage because they had poor nighttime coverage. It was reasoned that a translator could provide nighttime service for stations lacking an effective signal at night. Here we have a case for a station that lacks an effective signal in the day. If translators benefit the public and AM broadcasters by providing effective nighttime coverage, isn't WSVU also entitled to have effective coverage both day and night as well?



The wording of the rules seems to arbitrarily prefer the daytime audience over the nighttime audience. Unless the Commission has some reason as to why nighttime listeners should not be entitled to receive FM translator coverage, then a waiver of 74.1201(g) should be approved in this case.

### 'Living Way Waiver' Requested:

The 100dBu interfering contour of the proposed facility is within the protected contours of 2<sup>nd</sup> Adjacent WRLX and 3<sup>rd</sup> Adjacent WFEZ. WFEZ has the weaker signal of the two, so demonstrating that no interference occurs to WFEZ also proves no interference exists to WRLX. Based on FCC interference rules (+40dB threshold over a protected 60dBu contour) no second or third adjacent interference can be caused outside of a proposal's 100 dBu F(50,10) contour. In this case, the W223CJ proposed interfering contour is entirely contained within the WFEZ 61dBu contour. Within the area of possible interference, WFEZ's lowest predicted contour is 61dBu. This makes the worst case threshold of interference 101dBu (61 + 40 = 101), or higher. 101dBu is the signal level that cannot intersect any occupied buildings or significant roadways.



Figure 6 is a map showing the relevant contours.

**A directionalized, two-bay, half-wave spaced, antenna is proposed, such as a Shively model 6812.**

## Study 1:

### Terms and Methodology

Max ERP: The power specified in the application, expressed in kW.

Angle below the Horizon: The radiation angle below the antenna's horizontal plane.

Field at Angle: The field supplied by the antenna manufacturer for each Angle below the Horizon.

ERP at Angle: The ERP for an Angle given Max ERP & Field:

$$\text{ERP@Angle} = \text{Max ERP} * \text{Field}^2$$

Signal at Point: The predicted signal level assuming Free Space attenuation at a point:

$$\text{Signal} = 106.92 - (20 * \text{Log}(\text{Dist}(\text{km}))) + (10 *$$

$$\text{Log}(\text{ERP@Angle}(\text{kW})))$$

Distance to Point: The radiation path distance from the antenna to a point.

$$\text{DistToPoint} = \text{Antenna Rad Center in meters AGL} / (\text{Cos}(90^\circ - \text{Angle}^\circ)$$

Distance From Tower: The distance from the tower base to a point.

$$\text{DistToPoint} * \text{Sin}(90^\circ - \text{Angle}^\circ)$$

Interference Threshold = Protected station's predicted contour value at a point +40dBu

Over Threshold: The amount that the Proposal's signal exceeds the interference threshold.

$$\text{OverThresh} = \text{Signal} - \text{Interference Threshold value}$$

**A negative Over Threshold value indicates no interference at the point.**

Notes:

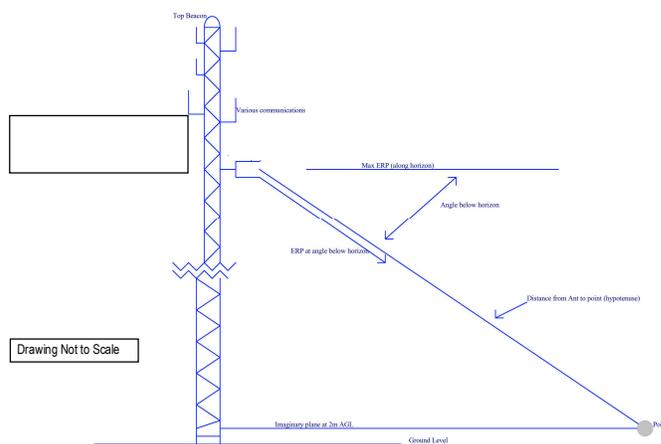
When finding a value for a point two meters above ground, then:  $\text{DistToPoint} = \text{Antenna Rad Center in meters above the plane, not ground} / (\text{Cos}(90^\circ - \text{Angle}^\circ)$ . Subtracting 2 meters from the antenna RC yields the desired result.

The application proposes 240W and must protect the WFEZ 61dBu contour, however the analysis was done at 250W which is more stringent than the requirement. Passing this analysis means that the proposal also passes the actual predicted conditions.

### Results:

Table A (below) shows the angle and distance to a point 2meters AGL from the proposed antenna. The field strength is calculated at each end point and compared to the worst case protected contour of WFEZ (61dBu). Using the manufacturer's field data for the specified antenna, the results show that, at no point on (or near) the ground, will the signal level from the proposed facility exceed the interference threshold of 101dBu. No elevated public roads nor occupied multi-story buildings extend into the zone of interference. The zone of interference does not approach the ground and does not extend to any adjacent property. It can be concluded that no interference is predicted to occur to WFEZ or to WRLX as a result of this proposal.

Exhibit EE-1, Study 1, W223CJ tower Diagram



**Table A D/U Analysis of Channel 223 for W223CJ vs WFEZ**

Ch223

Shively 6812B

2 bay 1/2 Wave

358m  
AGL

Threshold= 101.00

Maximum ERP (kW)	Angle below Horizon (degrees)	Field at Angle	ERP at Angle (kW)	Field at Point (dB(uV))	Distance to point (meters)	Distance from Tower (meters)	Over Threshold (dBuV)	Threshold AGL+2M	
0.250	0	1.000	0.250						
0.250	1	0.999	0.250	74.72	20341.03	20337.94	-26.28	101	355.000
0.250	2	0.998	0.249	80.73	10172.07	10165.87	-20.27	101.000	355.000
0.250	3	0.995	0.248	84.23	6783.10	6773.80	-16.77	101.000	355.000
0.250	4	0.992	0.246	86.70	5089.13	5076.74	-14.30	101.000	355.000
0.250	5	0.987	0.244	88.59	4073.17	4057.67	-12.41	101.000	355.000
0.250	6	0.981	0.241	90.11	3396.20	3377.60	-10.89	101.000	355.000
0.250	7	0.975	0.238	91.39	2912.96	2891.24	-9.61	101.000	355.000
0.250	8	0.967	0.234	92.47	2550.78	2525.96	-8.53	101.000	355.000
0.250	9	0.958	0.229	93.41	2269.32	2241.38	-7.59	101.000	355.000
0.250	10	0.949	0.225	94.23	2044.36	2013.31	-6.77	101.000	355.000
0.250	11	0.938	0.220	94.95	1860.50	1826.32	-6.05	101.000	355.000
0.250	12	0.927	0.215	95.59	1707.46	1670.14	-5.41	101.000	355.000
0.250	13	0.915	0.209	96.17	1578.12	1537.67	-4.83	101.000	355.000
0.250	14	0.902	0.203	96.67	1467.42	1423.83	-4.33	101.000	355.000
0.250	15	0.888	0.197	97.12	1371.61	1324.88	-3.88	101.000	355.000
0.250	16	0.847	0.179	97.26	1287.92	1238.03	-3.74	101.000	355.000
0.250	17	0.858	0.184	97.88	1214.21	1161.15	-3.12	101.000	355.000
0.250	18	0.843	0.178	98.21	1148.80	1092.58	-2.79	101.000	355.000
0.250	19	0.826	0.171	98.49	1090.40	1030.99	-2.51	101.000	355.000
0.250	20	0.809	0.164	98.73	1037.95	975.35	-2.27	101.000	355.000
0.250	21	0.791	0.156	98.94	990.60	924.81	-2.06	101.000	355.000
0.250	22	0.773	0.149	99.13	947.66	878.66	-1.87	101.000	355.000
0.250	23	0.754	0.142	99.28	908.55	836.33	-1.72	101.000	355.000
0.250	24	0.735	0.135	99.41	872.80	797.34	-1.59	101.000	355.000
0.250	25	0.716	0.128	99.51	840.00	761.30	-1.49	101.000	355.000
0.250	26	0.696	0.121	99.58	809.82	727.86	-1.42	101.000	355.000
0.250	27	0.676	0.114	99.63	781.95	696.73	-1.37	101.000	355.000
0.250	28	0.656	0.108	99.67	756.17	667.66	-1.33	101.000	355.000
0.250	29	0.636	0.101	99.68	732.25	640.44	-1.32	101.000	355.000
0.250	30	0.615	0.095	99.65	710.00	614.88	-1.35	101.000	355.000
0.250	31	0.594	0.088	99.61	689.27	590.82	-1.39	101.000	355.000
0.250	32	0.574	0.082	99.56	669.91	568.12	-1.44	101.000	355.000
0.250	33	0.553	0.076	99.47	651.81	546.65	-1.53	101.000	355.000
0.250	34	0.532	0.071	99.36	634.84	526.31	-1.64	101.000	355.000
0.250	35	0.512	0.066	99.25	618.92	506.99	-1.75	101.000	355.000
0.250	36	0.491	0.060	99.10	603.96	488.62	-1.90	101.000	355.000
0.250	37	0.471	0.055	98.94	589.88	471.10	-2.06	101.000	355.000
0.250	38	0.451	0.051	98.77	576.62	454.38	-2.23	101.000	355.000
0.250	39	0.431	0.046	98.56	564.10	438.39	-2.44	101.000	355.000
0.250	40	0.411	0.042	98.33	552.28	423.07	-2.67	101.000	355.000
0.250	41	0.391	0.038	98.08	541.11	408.38	-2.92	101.000	355.000
0.250	42	0.372	0.035	97.82	530.54	394.27	-3.18	101.000	355.000
0.250	43	0.353	0.031	97.53	520.53	380.69	-3.47	101.000	355.000
0.250	44	0.335	0.028	97.23	511.04	367.61	-3.77	101.000	355.000
0.250	45	0.317	0.025	96.91	502.05	355.00	-4.09	101.000	355.000

Shively 6812B

2 bay 1/2 Wave

335m

Threshold= 101.50

AGL

Maximum ERP	Angle below Horizon	Field at Angle	ERP at Angle	Field at Point	Distance to point	Distance from Tower	Over (dBuV)		
0.250	46	0.300	0.023	96.58	493.51	342.82	-4.42	101.000	355.000
0.250	47	0.282	0.020	96.18	485.40	331.04	-4.82	101.000	355.000
0.250	48	0.266	0.018	95.81	477.70	319.64	-5.19	101.000	355.000
0.250	49	0.249	0.016	95.37	470.38	308.60	-5.63	101.000	355.000
0.250	50	0.234	0.014	94.96	463.42	297.88	-6.04	101.000	355.000
0.250	51	0.219	0.012	94.51	456.80	287.47	-6.49	101.000	355.000
0.250	52	0.204	0.010	94.02	450.50	277.36	-6.98	101.000	355.000
0.250	53	0.190	0.009	93.52	444.51	267.51	-7.48	101.000	355.000
0.250	54	0.176	0.008	92.96	438.80	257.92	-8.04	101.000	355.000
0.250	55	0.163	0.007	92.41	433.37	248.57	-8.59	101.000	355.000
0.250	56	0.151	0.006	91.85	428.21	239.45	-9.15	101.000	355.000
0.250	57	0.139	0.005	91.23	423.29	230.54	-9.77	101.000	355.000
0.250	58	0.127	0.004	90.54	418.61	221.83	-10.46	101.000	355.000
0.250	59	0.116	0.003	89.85	414.15	213.31	-11.15	101.000	355.000
0.250	60	0.106	0.003	89.15	409.92	204.96	-11.85	101.000	355.000
0.250	61	0.096	0.002	88.38	405.89	196.78	-12.62	101.000	355.000
0.250	62	0.087	0.002	87.60	402.06	188.76	-13.40	101.000	355.000
0.250	63	0.079	0.002	86.84	398.43	180.88	-14.16	101.000	355.000
0.250	64	0.071	0.001	85.99	394.97	173.15	-15.01	101.000	355.000
0.250	65	0.063	0.001	85.03	391.70	165.54	-15.97	101.000	355.000
0.250	66	0.056	0.001	84.07	388.60	158.06	-16.93	101.000	355.000
0.250	67	0.050	0.001	83.15	385.66	150.69	-17.85	101.000	355.000
0.250	68	0.043	0.000	81.91	382.88	143.43	-19.09	101.000	355.000
0.250	69	0.038	0.000	80.89	380.26	136.27	-20.11	101.000	355.000
0.250	70	0.033	0.000	79.72	377.78	129.21	-21.28	101.000	355.000
0.250	71	0.028	0.000	78.35	375.46	122.24	-22.65	101.000	355.000
0.250	72	0.024	0.000	77.06	373.27	115.35	-23.94	101.000	355.000
0.250	73	0.020	0.000	75.53	371.22	108.53	-25.47	101.000	355.000
0.250	74	0.017	0.000	74.16	369.31	101.79	-26.84	101.000	355.000
0.250	75	0.014	0.000	72.52	367.52	95.12	-28.48	101.000	355.000
0.250	76	0.011	0.000	70.46	365.87	88.51	-30.54	101.000	355.000
0.250	77	0.009	0.000	68.75	364.34	81.96	-32.25	101.000	355.000
0.250	78	0.007	0.000	66.60	362.93	75.46	-34.40	101.000	355.000
0.250	79	0.005	0.000	63.71	361.64	69.01	-37.29	101.000	355.000
0.250	80	0.004	0.000	61.80	360.48	62.60	-39.20	101.000	355.000
0.250	81	0.003	0.000	59.33	359.43	56.23	-41.67	101.000	355.000
0.250	82	0.002	0.000	55.83	358.49	49.89	-45.17	101.000	355.000
0.250	83	0.001	0.000	49.83	357.67	43.59	-51.17	101.000	355.000
0.250	84	0.001	0.000	49.85	356.96	37.31	-51.15	101.000	355.000
0.250	85	0.000	0.000	29.86	356.36	31.06	-71.14	101.000	355.000
0.250	86	0.000	0.000	29.87	355.87	24.82	-71.13	101.000	355.000
0.250	87	0.000	0.000	29.88	355.49	18.60	-71.12	101.000	355.000
0.250	88	0.000	0.000	29.89	355.22	12.40	-71.11	101.000	355.000
0.250	89	0.000	0.000	29.89	355.05	6.20	-71.11	101.000	355.000

## Section VII Engineering Data:

Tech Box Data:

1. Channel: **223**

Primary Station: **FID:** 129188

**WSVU**  
**North Palm Beach, FL**  
**960 kHz**

2. Delivery Method: **Microwave**

3. Antenna Location Coordinates: (NAD27):

**26° 35' 20" N**

**80° 12' 44" W**

4. Antenna Structure Registration: **1220033**

5. Antenna Location Site Elevation Above Mean Sea Level: **5.5 meters**

6. Overall Tower Height Above Ground Level: **395 meters**

7. Height of Radiation Center Above Ground Level: **358 meters (V+H) AGL**

8. ERP:

**0.24 kW (H)**

**0.24 kW (V)**

9. Transmitting Antenna: **SHI 6812 or equiv, 2 bay, 1/2wave spaced, Directional**

10. Fill-in Translator: **Yes**

11. Interference: **Yes**

a)Section 74.1204, **Checked**. See EE-1, Figure 1.

b)Section 74.1205, **Not Checked**.

12. Unattended operation: **Yes**

13. Multiple Translators: **Yes**

14. NEPA: **Yes**. This proposal is excluded from environmental processing: "FM Model" was used to determine the rf exposure at 2 meters AGL. The maximum predicted rf near the base of the tower is less than 1uW/cm2 which is far less than 5% of the maximum public exposure level. The antenna will be mounted on an existing structure. No changes to structure, lighting, land or water are proposed. Applicant will cease radiating if workers are near the antenna.

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