ENGINEERING STATEMENT

IN SUPPORT OF

REQUEST FOR EXPERIMENTAL AUTHORIZATION

FOR

ATSC 3.0 OPERATION

BOARD OF TRUSTEES, MICHIGAN STATE UNIVERSITY

WKAR-TV

EAST LANSING, MI

Background

The Board of Trustees, Michigan State University (MSU), the licensee of WKAR, East Lansing, MI (Facility ID: 6104), was granted Special Temporary Authority to operate an experimental facility on a vacant channel in its market in June 2018 to evaluate the new ATSC 3.0 standard. Over the last five years, MSU has used the facility to test the various options (components/modes/techniques) in the ATSC 3.0 standard to gain a better understanding of how ATSC 3.0 compares to the current ATSC 1.0 broadcast standard and how ATSC 3.0 could be used for broadcast services in the future. Now that the five-year period for its experimental facility is coming to an end (in June 2023), MSU is seeking Special Temporary Authority for a new experimental facility to move to the next phase of its research into the many facets of the ATSC 3.0 standard.

Channel/Antenna System/Tower

The previous experimental facility had most recently operated on Ch. 35. MSU intends to (initially) operate the new facility from the WKAR tower on Ch. 35 as well with the following parameters:

Ch. 35 STA Operation

Coordinates:	42° 42' 06.9" N (NAD83)
	84° 24' 47.8" W
ERP:	5.5 kW (DA)
RCAMSL:	411.5m

The facility will continue utilizing the existing directional ERI I230ECW-8-23 side-mounted broadband antenna (azimuth and elevation pattern data attached hereto). The antenna is elliptically polarized, but the vertically polarized radiation does not exceed the horizontally polarized component in any azimuth.

Interference check studies were run using the FCC TVStudy software (Version 2.2.5) for the proposed experimental facility parameters. The summary results of the initial interference study showed that the proposed facility is predicted to cause interference to the WLMB (Toledo, OH) construction permit facility (LMS File No. 0000185769), filed by WLMB as part of its channel change from Ch. 5 to Ch. 35. While interference to this facility is prohibited by the proposed experimental facility, the new WLMB Ch. 35 facility is not yet operational. Therefore, the proposed experimental facility on Ch. 35 will not cause any actual interference to the WLMB Ch. 35 facility.

The summary results of a revised interference check study with both the WLMB Ch. 35 allotment facility and construction permit facility removed from consideration

(summary results attached hereto) show that the proposed facility is not predicted to cause more than 0.5% new interference to any other surrounding co-channel or adjacent channel facilities or more than 2% new interference to any LPTV facilities.

MSU is seeking authorization to operate the proposed experimental facility on Ch. 35 until (at the latest) the time when the WLMB Ch. 35 facility becomes operational. MSU will coordinate with the licensee of WLMB to ensure that the experimental facility is either turned off or switched to a new channel before WLMB begins broadcasting on Ch. 35. MSU has identified Ch. 27 as an alternative channel; however, the experimental facility is already configured for operation on Ch. 35 and MSU would like to continue operating the facility while it works with the appropriate vendors to schedule the work necessary to change from Ch. 35 to Ch. 27.

The proposed facility will comply with all FCC out-of-band emission requirements for full-service DTV stations through the use of a mask filter.

Future Operation on Ch. 27

As mentioned above, MSU plans to transition the experimental facility from Ch. 35 to Ch. 27 before WLMB begins broadcasting on Ch. 35. MSU expects the future Ch. 27 STA facility to have the following parameters:

Future Ch. 27 STA Operation

Coordinates:	42° 42’ 06.9” N (NAD83)
	84° 24’ 47.8” W
ERP:	4.7 kW (DA)
RCAMSL:	411.5m

An interference study was conducted of the future Ch. 27 facility parameters using the FCC TVStudy software (Version 2.2.5) with the default parameters. The results of the study (copy attached hereto) show that potential interference from the proposed facility is not predicted to exceed 0.49% to any full-service DTV or Class A stations or 1.99% to any low power stations as required by the Commission's Rules.

Prior to changing from Ch. 35 to Ch. 27, MSU will apply for a new experimental STA and make a good faith effort to identify and notify local healthcare facilities within the predicted service area of its proposed operation on Ch. 27.

Environmental/RFR

This report addresses only the conditions specified in 47CFR1.1307 that deal with Radio Frequency Radiation. Any other non-RFR conditions that might require the preparation of an EA are beyond the scope of this report; since the structure is existing and registered, such conditions should not be an issue requiring further consideration.

The location of the proposed post-incentive auction facility is assumed to currently be "in compliance" with FCC guidelines for human exposure to RFR (as defined in OET-65). The worst case ground level RFR contributed to the site by this proposal in public areas is calculated to be 0.000508 mW/cm^2, which is less than 5% of the MPE for public exposure (0.399333mW/cm^2) at Ch. 35 (596-602 MHz). Per Section 1.1307(b) of the FCC Rules, the proposed operation would be categorically excluded from taking corrective action in areas with levels above the MPE limit where the contribution to the RFR from the proposed facility is less than 5%.

MSU agrees to comply with the Commission's requirements regarding power adjustments or cessation of operation as may be necessary to ensure a compliant environment for worker access. Workers will be trained on RFR issues and encouraged to wear personal RFR monitors when on the structure. The tower base is enclosed by a locked security fence and appropriate signage warning of potential RFR hazards is posted.

Certification

I hereby certify that the foregoing report or statement was prepared by me but may include work performed by others under my supervision or direction. The statements of fact contained therein are believed to be true and correct based on personal knowledge, information, and belief unless otherwise stated; with respect to facts not known of my own personal knowledge, I believe them to be true and correct based on their origin from sources known to me to be generally reliable and accurate. I have prepared this document with due care and in accordance with applicable standards of professional practice.

Benjamin Pidek, P.E.
May 21, 2023

Attached:
TVStudy Interference Check Report for Proposed STA Facility on Ch. 35
TVStudy Interference Check Report for Proposed Future STA Facility on Ch. 27
Antenna Azimuth and Elevation Pattern Plots and Tabulations for Ch. 35

TVStudy TV Interference Check Report for Proposed WKAR-TV STA Facility on Ch. 35

```
Study created: 2023.05.18 21:50:20

Study build station data: LMS TV 2023-05-16

    Proposal: WKAR-TV D35 DT STA EAST LANSING, MI
 File number: BLANK0000096961
 Facility ID: 6104
Station data: LMS TV 2023-05-16
   Record ID: 25076f916f32ec91016f3451f2ad153a
     Country: U.S.
        Zone: I

Individual records excluded:
0000185769    WLMB D35 DT CP TOLEDO, OH BLANK0000185769
17076         WLMB D35 DT BL TOLEDO, OH DTVBL17076

Stations potentially affected by proposal:

IX   Call      Chan       Svc Status  City, State              File Number            Distance
No   DDWFHD-LP N27z       TX  APP     ANN ARBOR, MI            BLTT20000925AAY         72.4 km
No   WISE-TV   D34        DT  LIC     FORT WAYNE, IN           BLANK0000064330        188.9
No   WCMV      D34        DT  LIC     CADILLAC, MI             BLANK0000087365        233.4
No   WKBD-TV   D34        DT  LIC     DETROIT, MI              BLANK0000074932         93.3
No   WOOD-TV   D34        LD  LIC     GRAND RAPIDS, MI         BLANK0000069365        148.9
No   W24DL-D   D34        LD  CP      SAGINAW, MI              BLANK0000198178        104.9
No   W24DL-D   D34        LD  APP     SAGINAW, MI              BLANK0000203509        104.9
No   WGBO-DT   D35        DT  LIC     JOLIET, IL               BLANK0000124507        278.5
No   WPBY-LD   D35        LD  LIC     LAFAYETTE, IN            BLANK0000058858        326.2
No   WBND-LD   D35        LD  LIC     SOUTH BEND, IN           BLANK0000086891        189.5
No   WTWO      D35        DT  LIC     TERRE HAUTE, IN          BLANK0000086897        458.5
Yes  WUDL-LD   D35        LD  LIC     DETROIT, MI              BLANK0000090277        105.4
Yes  WOLP-CD   D35        DC  LIC     GRAND RAPIDS, MI         BLANK0000141794         89.6
No   W35DQ-D   D35        LD  LIC     MIDLAND, MI              BLANK0000074730         75.4
No   WPBN-TV   D35        DT  LIC     TRAVERSE CITY, MI        BLANK0000087956        233.4
No   WVIZ      D35        DT  LIC     Cleveland, OH            BLANK0000082429        268.2
No   WPTD      D35        DT  LIC     DAYTON, OH               BLANK0000204180        331.6
No   WNHO-LD   D35-       LD  LIC     Defiance, OH             BLANK0000086381        157.0
No   WTAP-TV   D35        DT  LIC     PARKERSBURG, WV          BLANK0000105709        442.5
No   WODP-LD   D36        LD  LIC     FORT WAYNE, IN           BLANK0000198707        188.2
No   WHME-TV   D36        DT  LIC     SOUTH BEND, IN           BLANK0000087036        189.4
No   W36FA-D   D36        LD  LIC     HESPERIA, MI             BLANK0000067768        162.4
No   WUHO-LD   N36+       TX  LIC     KALAMAZOO, MI            BLTTL20060103ABT       112.1
Yes  WAQP      D36        DT  LIC     SAGINAW, MI              BLANK0000096188         64.7
No   WQHS-DT   D36        DT  LIC     CLEVELAND, OH            BLANK0000079885        267.6
No   WMNT-CD   D36        DC  LIC     TOLEDO, OH               BLANK0000067041        137.4

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

    Channel: D35
   Latitude:  42 42  6.90 N (NAD83)
  Longitude:  84 24 47.80 W
Height AMSL: 411.5 m
       HAAT: 144.0 m
   Peak ERP: 5.50 kW
    Antenna: ERI-I230ECW-2-23 (ID 1003205) 230.0 deg
```

Elev Pattrn: Generic
  Elec Tilt: 1.00

40.8 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	0.067 kW	154.7 m	31.3 km
45.0	0.254	140.1	37.3
90.0	0.045	143.1	28.5
135.0	2.89	134.6	49.2
180.0	4.66	140.0	51.9
225.0	4.50	142.0	51.9
270.0	4.86	149.1	52.7
315.0	3.65	151.1	51.5

**Proposal is within coordination distance of Canadian border
Distance to Canadian border: 117.2 km

Distance to Mexican border: 2086.5 km

Conditions at FCC monitoring station: Allegan MI
Bearing: 265.7 degrees   Distance: 126.5 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:
Bearing: 267.8 degrees   Distance: 1752.8 km

Study cell size: 2.00 km
Profile point spacing: 1.00 km

Maximum new IX to full-service and Class A: 0.50%
Maximum new IX to LPTV: 2.00%

---- Below is IX received by proposal BLANK0000096961 ----

Proposal receives 5.93% interference from scenario 1
No IX check failures found.

TVStudy TV Interference Check Report for Proposed Future WKAR-TV STA Facility on Ch. 27

```
Study created: 2023.05.18 21:06:28

Study build station data: LMS TV 2023-05-16

    Proposal: WKAR-TV D27 DT STA EAST LANSING, MI
 File number: WKAR_C27_ESTA_051823
 Facility ID: 6104
Station data: User record
   Record ID: 349
     Country: U.S.
        Zone: I
```

Stations potentially affected by proposal:

IX	Call	Chan	Svc	Status	City, State	File Number	Distance
No	W26DH-D	D26	LD	LIC	AUBURN, IN	BLDTL20091005ABQ	161.0 km
No	WCMU-TV	D26	DT	LIC	MOUNT PLEASANT, MI	BLEDT20130710ABN	133.4
No	WUPW	D26	DT	LIC	TOLEDO, OH	BLANK0000108708	141.0
No	W27EL-D	D27+	LD	LIC	CHAMPAIGN, IL	BLANK0000120591	429.5
No	WILC-CD	D27	DC	LIC	SUGAR GROVE, IL	BLANK0000151822	278.5
No	WTTV	D27	DT	LIC	BLOOMINGTON, IN	BLANK0000086972	394.0
No	WSOT-LD	D27	LD	LIC	MARION, IN	BLDTL20111212AGP	248.7
No	WNDU-TV	D27	DT	LIC	SOUTH BEND, IN	BLANK0000116736	191.9
No	DDWFHD-LP	N27z	TX	APP	ANN ARBOR, MI	BLTT20000925AAY	72.4
No	W27DQ-D	D27	LD	LIC	ELMHURST, MI	BLANK0000201427	315.0
Yes	W48CL	D27+	LD	CP	GRAND RAPIDS, MI	BLANK0000195649	113.6
No	W27ET-D	D27	LD	LIC	MAPLE VALLEY, MI	BLANK0000198207	156.1
Yes	WADL	D27	DT	LIC	MOUNT CLEMENS, MI	BLANK0000111708	125.9
No	W27DU-D	D27	LD	LIC	TRAVERSE CITY, MI	BLANK0000201475	250.5
No	WDYC-LD	D27	LD	LIC	CINCINNATI, OH	BLANK0000212247	397.9
No	WOCV-CD	D27	DC	LIC	CLEVELAND, OH	BLANK0000202416	267.9
No	WTTE	D27	DT	LIC	COLUMBUS, OH	BLANK0000129745	328.5
No	WPNM-LD	D27z	LD	LIC	LIEPSIC, OH	BLANK0000090626	179.0
No	W27DG-D	D27	LD	LIC	MILLERSBURG, OH	BLANK0000168187	332.6
No	WQLN	D27	DT	LIC	ERIE, PA	BLANK0000083708	364.4
No	WTAE-TV	D27	DT	LIC	PITTSBURGH, PA	BLANK0000112576	468.7
No	WTAE-TV	D27	DT	CP	PITTSBURGH, PA	BLANK0000127499	468.7
No	WVTV	D27	DT	LIC	MILWAUKEE, WI	BLANK0000121792	287.7
No	WMYS-LD	D28	LD	LIC	SOUTH BEND, IN	BLANK0000086895	189.5
No	WSYM-TV	D28	DT	LIC	LANSING, MI	BLANK0000177429	32.5
No	WSYM-TV	D28	DT	CP	LANSING, MI	BLANK0000181141	32.5
No	WBWM-LD	D28	LD	LIC	MT PLEASANT, MI	BLANK0000152432	104.2
No	WBWM-LD	D28	LD	CP	MT PLEASANT, MI	BLANK0000163180	105.3
No	WLPC-LD	D28	LD	LIC	Redford, MI	BLANK0000112211	119.4

```
No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

    Channel: D27
   Latitude:  42 42  6.90 N (NAD83)
  Longitude:  84 24 47.80 W
Height AMSL: 411.5 m
       HAAT: 144.0 m
   Peak ERP: 4.70 kW
    Antenna: ERI-I230ECW-2-23 230.0 deg
Elev Pattrn: Generic
  Elec Tilt: 1.00
```

40.0 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	0.023 kW	154.7 m	26.8 km
45.0	0.217	140.1	37.3
90.0	0.038	143.1	28.6
135.0	2.75	134.6	49.8
180.0	3.89	140.0	51.8
225.0	4.07	142.0	52.2
270.0	4.15	149.1	52.8
315.0	3.28	151.1	51.8

**Proposal is within coordination distance of Canadian border
Distance to Canadian border: 117.2 km

Distance to Mexican border: 2086.5 km

Conditions at FCC monitoring station: Allegan MI
Bearing: 265.7 degrees Distance: 126.5 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:
Bearing: 267.8 degrees Distance: 1752.8 km

Study cell size: 2.00 km
Profile point spacing: 1.00 km

Maximum new IX to full-service and Class A: 0.50%
Maximum new IX to LPTV: 2.00%

---- Below is IX received by proposal WKAR_C27_ESTA_051823 ----

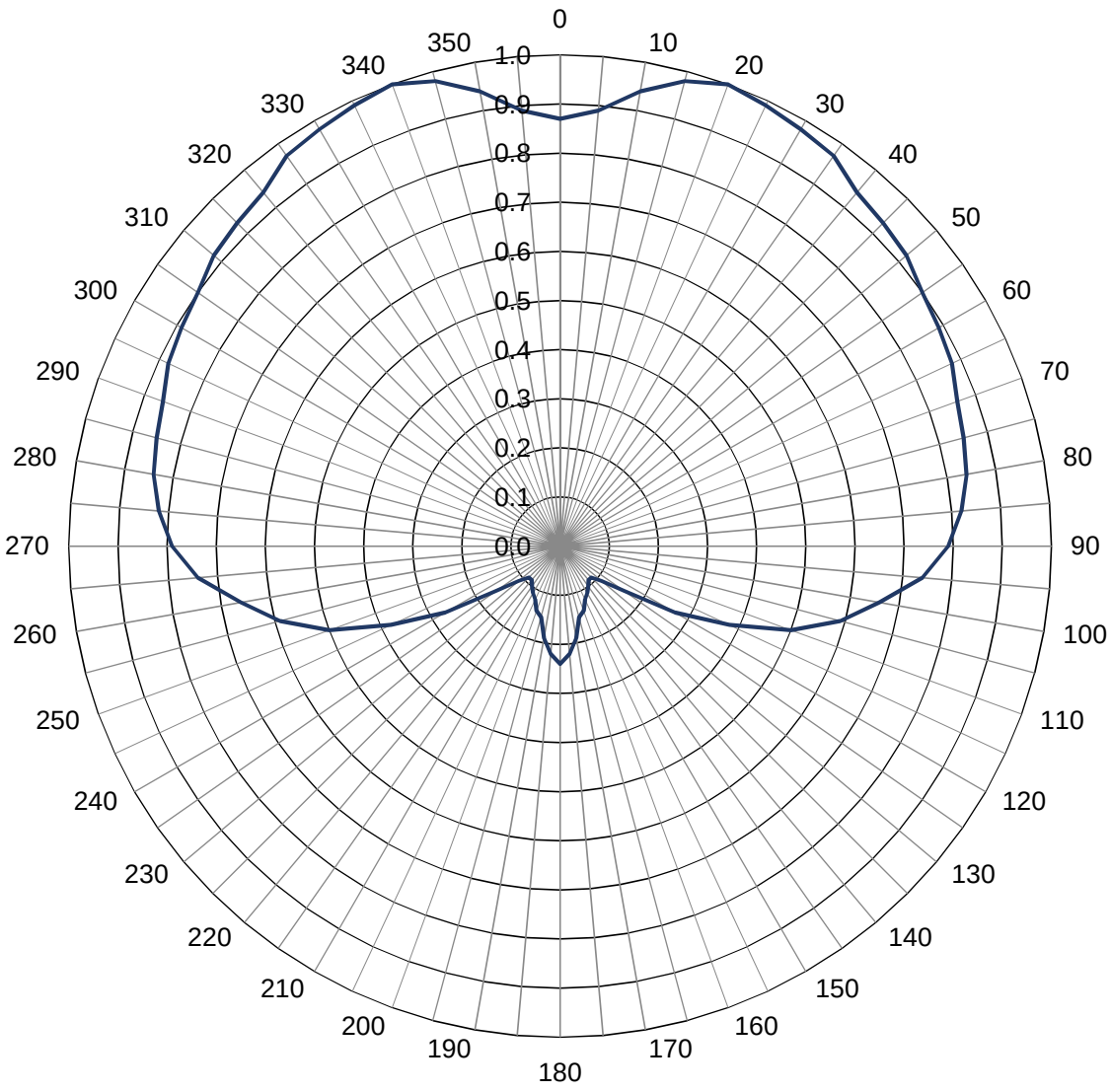
Proposal receives 19.08% interference from scenario 1
Proposal receives 20.90% interference from scenario 2
No IX check failures found.

Azimuth Pattern

Type:	i230WC-H-35	**Polarization:**	Horizontal
Directivity:	2.07 numeric (3.15 dB)	**Frequency:**	35 (ATSC)
Peak(s) at:		**Location:**	East Lansing, MI

NOTE: Pattern shape and directivity may vary with channel and mounting

Relative Field



Tabulated Data for Azimuth Pattern

Type: i230WC-H-35

Angle	Field	dB
0	0.870	-1.21
2	0.880	-1.11
4	0.890	-1.01
6	0.900	-0.92
8	0.920	-0.72
10	0.940	-0.54
12	0.960	-0.35
14	0.970	-0.26
16	0.980	-0.18
18	0.990	-0.09
20	1.000	0.00
22	1.000	0.00
24	0.990	-0.09
26	0.990	-0.09
28	0.990	-0.09
30	0.980	-0.18
32	0.980	-0.18
34	0.970	-0.26
36	0.960	-0.35
38	0.960	-0.35
40	0.940	-0.54
42	0.940	-0.54
44	0.930	-0.63
46	0.930	-0.63
48	0.920	-0.72
50	0.920	-0.72
52	0.910	-0.82
54	0.900	-0.92
56	0.900	-0.92
58	0.890	-1.01
60	0.890	-1.01
62	0.890	-1.01
64	0.880	-1.11
66	0.880	-1.11
68	0.870	-1.21
70	0.860	-1.31
72	0.860	-1.31
74	0.850	-1.41
76	0.850	-1.41
78	0.850	-1.41
80	0.840	-1.51
82	0.840	-1.51
84	0.830	-1.62
86	0.820	-1.72
88	0.810	-1.83
90	0.790	-2.05

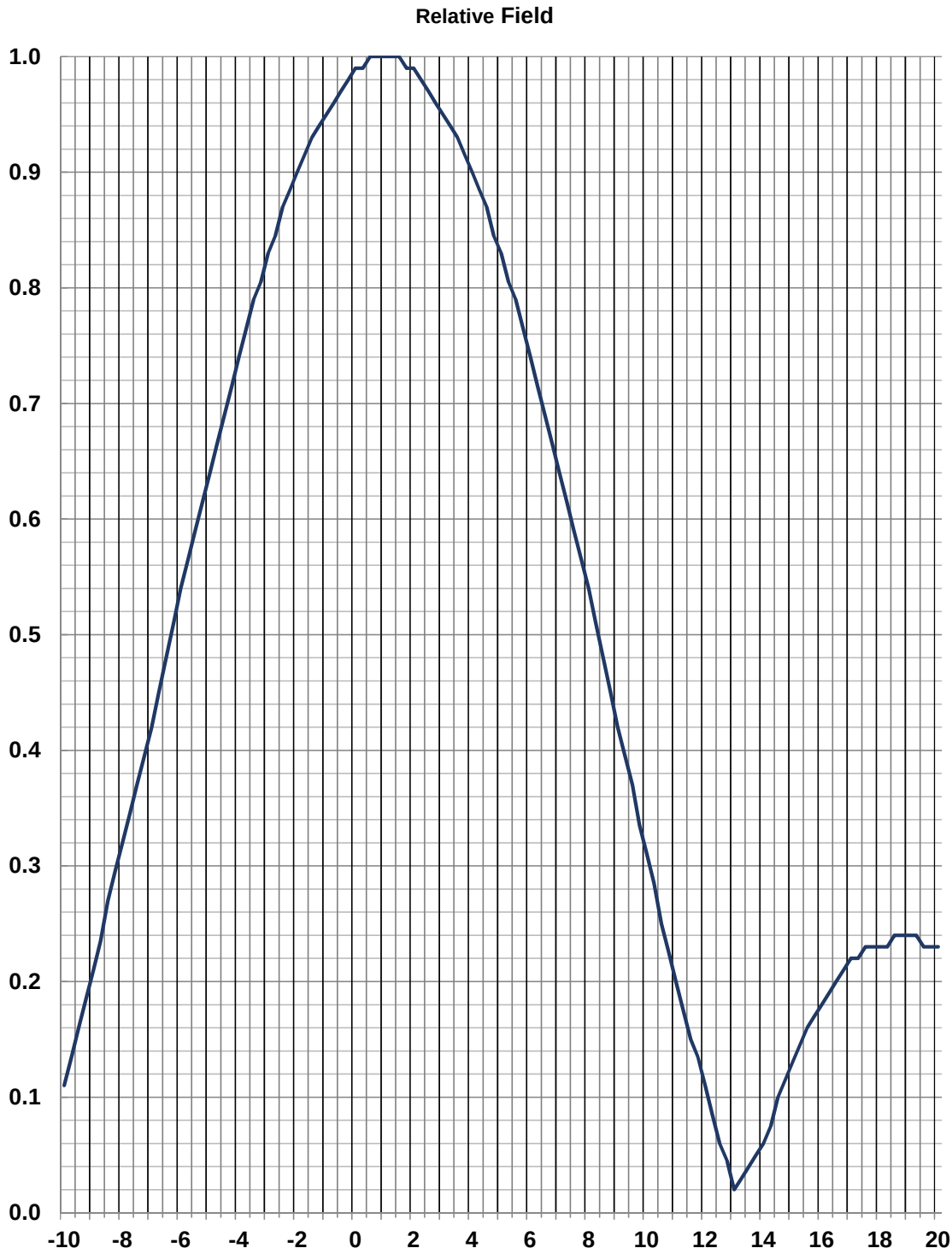
Angle	Field	dB
92	0.770	-2.27
94	0.750	-2.50
96	0.720	-2.85
98	0.690	-3.22
100	0.660	-3.61
102	0.630	-4.01
104	0.600	-4.44
106	0.580	-4.73
108	0.540	-5.35
110	0.500	-6.02
112	0.460	-6.74
114	0.400	-7.96
116	0.360	-8.87
118	0.320	-9.90
120	0.270	#####
122	0.230	#####
124	0.180	#####
126	0.150	#####
128	0.140	#####
130	0.110	#####
132	0.100	#####
134	0.090	#####
136	0.090	#####
138	0.080	#####
140	0.090	#####
142	0.090	#####
144	0.090	#####
146	0.100	#####
148	0.110	#####
150	0.110	#####
152	0.100	#####
154	0.110	#####
156	0.120	#####
158	0.130	#####
160	0.140	#####
162	0.150	#####
164	0.150	#####
166	0.160	#####
168	0.180	#####
170	0.190	#####
172	0.210	#####
174	0.220	#####
176	0.230	#####
178	0.230	#####
180	0.240	#####
182	0.230	#####

Angle	Field	dB
184	0.230	#####
186	0.220	#####
188	0.210	#####
190	0.190	#####
192	0.180	#####
194	0.160	#####
196	0.150	#####
198	0.150	#####
200	0.140	#####
202	0.130	#####
204	0.120	#####
206	0.110	#####
208	0.100	#####
210	0.110	#####
212	0.110	#####
214	0.100	#####
216	0.090	#####
218	0.090	#####
220	0.090	#####
222	0.080	#####
224	0.090	#####
226	0.090	#####
228	0.100	#####
230	0.110	#####
232	0.140	#####
234	0.150	#####
236	0.180	#####
238	0.230	#####
240	0.270	#####
242	0.320	-9.90
244	0.360	-8.87
246	0.400	-7.96
248	0.460	-6.74
250	0.500	-6.02
252	0.540	-5.35
254	0.580	-4.73
256	0.600	-4.44
258	0.630	-4.01
260	0.660	-3.61
262	0.690	-3.22
264	0.720	-2.85
266	0.750	-2.50
268	0.770	-2.27
270	0.790	-2.05
272	0.810	-1.83
274	0.820	-1.72

Angle	Field	dB
276	0.830	-1.62
278	0.840	-1.51
280	0.840	-1.51
282	0.850	-1.41
284	0.850	-1.41
286	0.850	-1.41
288	0.860	-1.31
290	0.860	-1.31
292	0.870	-1.21
294	0.880	-1.11
296	0.880	-1.11
298	0.890	-1.01
300	0.890	-1.01
302	0.890	-1.01
304	0.900	-0.92
306	0.900	-0.92
308	0.910	-0.82
310	0.920	-0.72
312	0.920	-0.72
314	0.930	-0.63
316	0.930	-0.63
318	0.940	-0.54
320	0.940	-0.54
322	0.960	-0.35
324	0.960	-0.35
326	0.970	-0.26
328	0.980	-0.18
330	0.980	-0.18
332	0.990	-0.09
334	0.990	-0.09
336	0.990	-0.09
338	1.000	0.00
340	1.000	0.00
342	0.990	-0.09
344	0.980	-0.18
346	0.970	-0.26
348	0.960	-0.35
350	0.940	-0.54
352	0.920	-0.72
354	0.900	-0.92
356	0.890	-1.01
358	0.880	-1.11
360	0.870	-1.21

Elevation Pattern

Type:	i230WC-08-35		**Polarization:**	Horizontal
Directivity:			**Frequency:**	35 (ATSC)
Main Lobe:	5.57 numeric	(7.46 dB)	**Location:**	East Lansing, MI
Horizontal:	5.46 numeric	(7.37 dB)	**Beam Tilt:**	1.00 degrees



Tabulated Data for Elevation Pattern

Type: i230WC-08-35

-5 to 10 degrees in 0.25 degree increments.
10 to 90 degrees in 0.50 degree increments.

Angle	Field	dB	Angle	Field	dB	Angle	Field	dB	Angle	Field	dB	Angle	Field	dB
-5.00	0.640	-3.88	6.25	0.715	-2.91	25.00	0.150	#####	47.50	0.110	#####	70.00	0.040	#####
-4.75	0.665	-3.54	6.50	0.690	-3.22	25.50	0.140	#####	48.00	0.110	#####	70.50	0.040	#####
-4.50	0.690	-3.22	6.75	0.665	-3.54	26.00	0.140	#####	48.50	0.110	#####	71.00	0.040	#####
-4.25	0.715	-2.91	7.00	0.640	-3.88	26.50	0.130	#####	49.00	0.120	#####	71.50	0.040	#####
-4.00	0.740	-2.62	7.25	0.615	-4.22	27.00	0.120	#####	49.50	0.120	#####	72.00	0.040	#####
-3.75	0.765	-2.33	7.50	0.590	-4.58	27.50	0.110	#####	50.00	0.120	#####	72.50	0.040	#####
-3.50	0.790	-2.05	7.75	0.565	-4.96	28.00	0.110	#####	50.50	0.120	#####	73.00	0.040	#####
-3.25	0.805	-1.88	8.00	0.540	-5.35	28.50	0.100	#####	51.00	0.120	#####	73.50	0.040	#####
-3.00	0.830	-1.62	8.25	0.510	-5.85	29.00	0.100	#####	51.50	0.120	#####	74.00	0.040	#####
-2.75	0.845	-1.46	8.50	0.480	-6.38	29.50	0.090	#####	52.00	0.110	#####	74.50	0.040	#####
-2.50	0.870	-1.21	8.75	0.450	-6.94	30.00	0.090	#####	52.50	0.110	#####	75.00	0.030	#####
-2.25	0.885	-1.06	9.00	0.420	-7.54	30.50	0.090	#####	53.00	0.110	#####	75.50	0.030	#####
-2.00	0.900	-0.92	9.25	0.395	-8.07	31.00	0.090	#####	53.50	0.110	#####	76.00	0.030	#####
-1.75	0.915	-0.77	9.50	0.370	-8.64	31.50	0.090	#####	54.00	0.100	#####	76.50	0.030	#####
-1.50	0.930	-0.63	9.75	0.335	-9.50	32.00	0.090	#####	54.50	0.100	#####	77.00	0.030	#####
-1.25	0.940	-0.54	10.00	0.310	#####	32.50	0.100	#####	55.00	0.090	#####	77.50	0.030	#####
-1.00	0.950	-0.45	10.50	0.250	#####	33.00	0.100	#####	55.50	0.090	#####	78.00	0.030	#####
-0.75	0.960	-0.35	11.00	0.200	#####	33.50	0.100	#####	56.00	0.090	#####	78.50	0.030	#####
-0.50	0.970	-0.26	11.50	0.150	#####	34.00	0.100	#####	56.50	0.090	#####	79.00	0.030	#####
-0.25	0.980	-0.18	12.00	0.110	#####	34.50	0.090	#####	57.00	0.080	#####	79.50	0.030	#####
0.00	0.990	-0.09	12.50	0.060	#####	35.00	0.090	#####	57.50	0.080	#####	80.00	0.030	#####
0.25	0.990	-0.09	13.00	0.020	#####	35.50	0.080	#####	58.00	0.070	#####	80.50	0.030	#####
0.50	1.000	0.00	13.50	0.040	#####	36.00	0.080	#####	58.50	0.070	#####	81.00	0.030	#####
0.75	1.000	0.00	14.00	0.060	#####	36.50	0.070	#####	59.00	0.070	#####	81.50	0.030	#####
1.00	1.000	0.00	14.50	0.100	#####	37.00	0.070	#####	59.50	0.070	#####	82.00	0.030	#####
1.25	1.000	0.00	15.00	0.130	#####	37.50	0.060	#####	60.00	0.060	#####	82.50	0.030	#####
1.50	1.000	0.00	15.50	0.160	#####	38.00	0.050	#####	60.50	0.060	#####	83.00	0.030	#####
1.75	0.990	-0.09	16.00	0.180	#####	38.50	0.040	#####	61.00	0.060	#####	83.50	0.020	#####
2.00	0.990	-0.09	16.50	0.200	#####	39.00	0.030	#####	61.50	0.060	#####	84.00	0.020	#####
2.25	0.980	-0.18	17.00	0.220	#####	39.50	0.020	#####	62.00	0.050	#####	84.50	0.020	#####
2.50	0.970	-0.26	17.50	0.230	#####	40.00	0.010	#####	62.50	0.050	#####	85.00	0.020	#####
2.75	0.960	-0.35	18.00	0.230	#####	40.50	0.010	#####	63.00	0.050	#####	85.50	0.020	#####
3.00	0.950	-0.45	18.50	0.240	#####	41.00	0.020	#####	63.50	0.050	#####	86.00	0.020	#####
3.25	0.940	-0.54	19.00	0.240	#####	41.50	0.030	#####	64.00	0.050	#####	86.50	0.020	#####
3.50	0.930	-0.63	19.50	0.230	#####	42.00	0.040	#####	64.50	0.050	#####	87.00	0.020	#####
3.75	0.915	-0.77	20.00	0.230	#####	42.50	0.050	#####	65.00	0.050	#####	87.50	0.020	#####
4.00	0.900	-0.92	20.50	0.220	#####	43.00	0.060	#####	65.50	0.050	#####	88.00	0.020	#####
4.25	0.885	-1.06	21.00	0.210	#####	43.50	0.060	#####	66.00	0.040	#####	88.50	0.020	#####
4.50	0.870	-1.21	21.50	0.200	#####	44.00	0.070	#####	66.50	0.040	#####	89.00	0.020	#####
4.75	0.845	-1.46	22.00	0.200	#####	44.50	0.080	#####	67.00	0.040	#####	89.50	0.020	#####
5.00	0.830	-1.62	22.50	0.190	#####	45.00	0.090	#####	67.50	0.040	#####	90.00	0.020	#####
5.25	0.805	-1.88	23.00	0.180	#####	45.50	0.090	#####	68.00	0.040	#####			
5.50	0.790	-2.05	23.50	0.170	#####	46.00	0.100	#####	68.50	0.040	#####			
5.75	0.765	-2.33	24.00	0.160	#####	46.50	0.100	#####	69.00	0.040	#####			
6.00	0.740	-2.62	24.50	0.150	#####	47.00	0.110	#####	69.50	0.040	#####			