# ENGINEERING EXHIBIT

## Application for Minor Modification of Digital Low Power Television Station

prepared for

**Gray Television Licensee, LLC**
KYCW-LD Branson, MO
Facility ID 11135
Ch. 25 (digital) 15 kW

*Gray Television Licensee, LLC ("Gray")* is the licensee of digital Low Power Television station KYCW-LD, Channel 25, Branson MO, Facility ID 11135. KYCW-LD operates with 0.63 kW effective radiated power ("ERP"), directional (license pending, file #0000022105). *Gray* herein seeks a Construction Permit to authorize relocation of KYCW-LD and to specify changes in ERP, antenna height, and directional antenna pattern.

As proposed herein, KYCW-LD will be relocated to the tower structure associated with FCC Antenna Structure Registration number 1218324, 24.1 km (15.0 miles) from the present KYCW-LD site. The proposed KYCW-LD facility will employ a new antenna system to be side-mounted on the tower and no change to the overall structure height is proposed.

The proposed KYCW-LD facility will operate with a directional antenna at 15 kW ERP using a "full service" out of channel emission mask. A plot of the directional antenna's azimuthal pattern is supplied in Figure 1 Figure 2 depicts the coverage contour of the proposed facility as well as that of the licensed facility. The service area overlap demonstrates compliance with §73.3572 for a minor change.

Interference study per OET Bulletin 69[1] shows that the proposal complies with the FCC's interference protection requirements toward all digital television, television translator, LPTV,

[1]FCC Office of Engineering and Technology Bulletin number 69, *Longley-Rice Methodology for Evaluating TV Coverage and Interference*, February 6, 2004 ("OET-69"). The implementation of OET-69 for this study followed the guidelines of OET-69 as specified therein. The default cell size of 1 km was employed. Comparisons of various results of this computer program (run on a Sun Sparc processor) to the Commission's

and Class A stations. The results, summarized in Table 1, show that any new interference does not exceed the FCC's interference limits (0.5 percent to full power and Class A stations, and 2.0 percent to secondary stations) to any facility.

The nearest FCC monitoring station is 632 km distant at Grand Island, NE. This exceeds by a large margin the threshold minimum distance specified in §73.1030(c)(3) that would suggest consideration of the monitoring station. The site is not located within the areas requiring coordination with "quiet" zones specified in §73.1030(a) and (b). There are no authorized AM stations within 3 kilometers of the site. The site location is beyond the border areas requiring international coordination.

**Human Exposure to Radiofrequency Electromagnetic Field (Environmental)**

The proposed facility was evaluated for human exposure to RF energy using the procedures outlined in the FCC's OET Bulletin Number 65. Based on OET-65 equation (10) and the worst-case of 100 percent antenna relative field in downward elevations, the calculated power density attributable to the proposed facility at locations near the transmitter site at a height of two meters above ground level is 1.7 $\mu W/cm^2$, which is 0.5 percent of the general population / uncontrolled maximum permissible exposure limit. This is well below the five percent threshold limit described in §1.1307(b) regarding sites with multiple emitters, categorically excluding the applicant from responsibility for taking any corrective action in the areas where the proposal's contribution is less than five percent. When the antenna's elevation pattern is considered, the calculated RF exposure level will be even lower

The general public will not be exposed to RF levels attributable to the proposal in excess of the FCC's guidelines. RF exposure warning signs will continue to be posted. With respect to worker safety, the applicant will coordinate exposure procedures with all pertinent stations and will reduce power or cease operation as necessary to protect persons having access to the site, tower or antenna from RF electromagnetic field exposure in excess of FCC guidelines.

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implementation of OET-69 show excellent correlation.

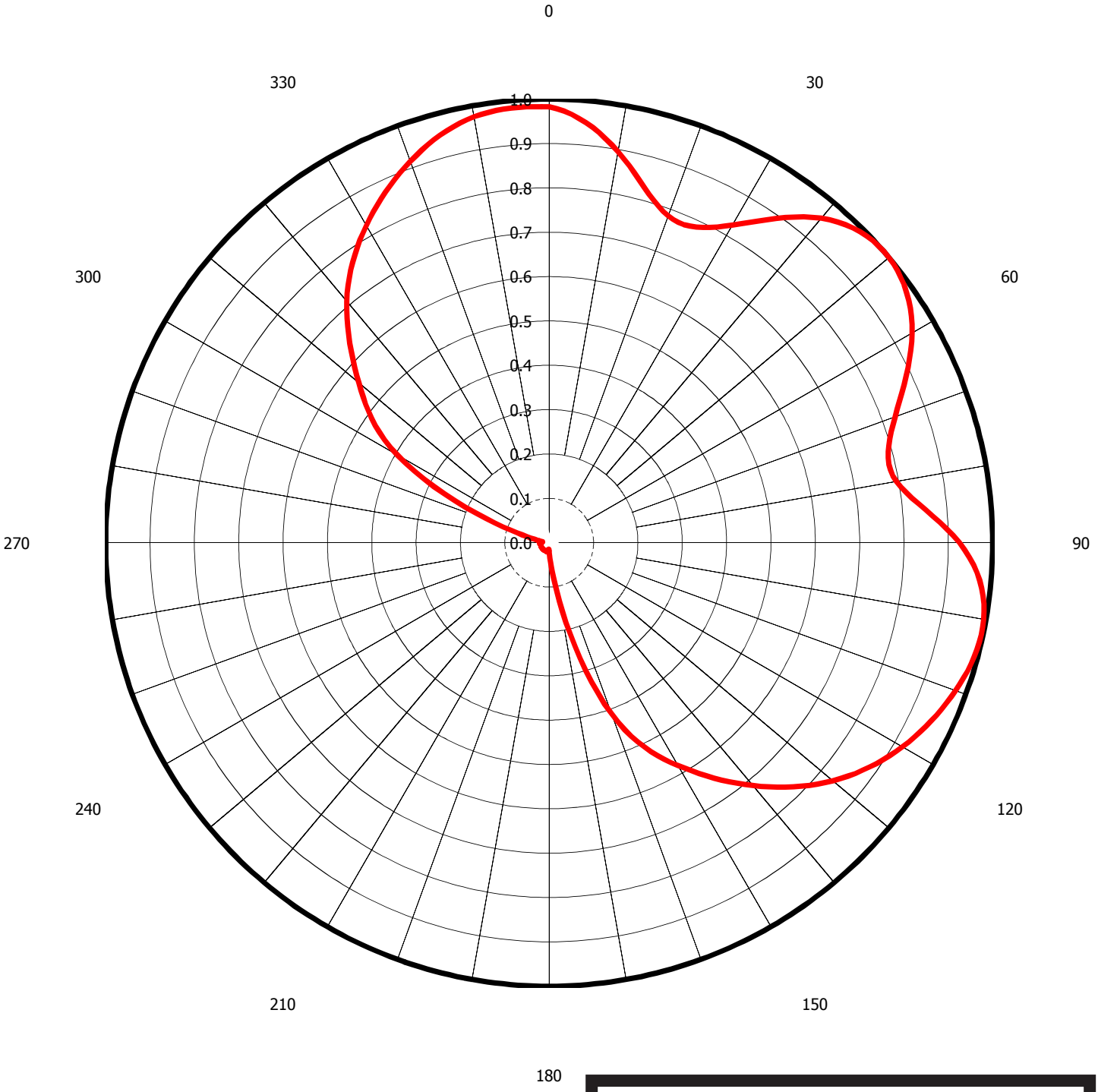
Environmental matters covered by this exhibit are limited to the evaluation of exposure to RF electromagnetic field. The proposed transmitting antenna will be installed on an existing antenna support structure which was constructed prior to March 16, 2001. No change in structure height is proposed.

List of Attachments

| | |
|---|---|
| Figure 1 | Antenna Azimuthal Pattern |
| Figure 2 | Coverage Contour Comparison |
| Table 1 | Interference Analysis Results Summary |
| Form 2100 | Engineering Data for FCC Form 2100 |

**Chesapeake RF Consultants, LLC**
Joseph M. Davis, P.E. February 27, 2017
207 Old Dominion Road Yorktown, VA 23692 703-650-9600

**Azimuth Pattern - Relative Field**
**(True North)**

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Digital Television and Radio

**Figure 1**
**Antenna Azimuthal Pattern**
**KYCW-LD Branson, MO**
**Facility ID 11135**
**Ch. 25 (digital) 15 kW**

prepared for
**Gray Television Licensee, LLC**

February, 2017

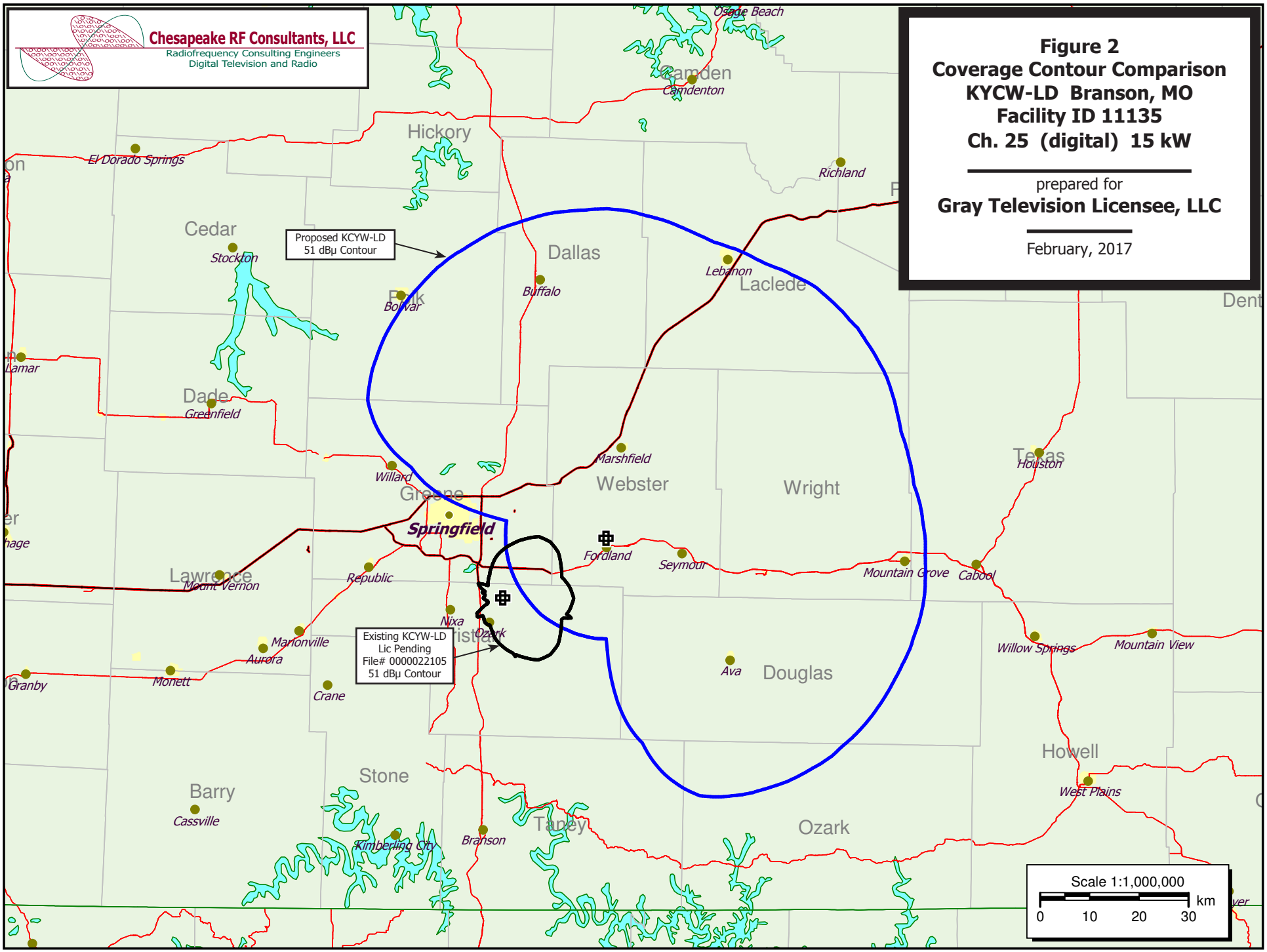
Chesapeake RF Consultants, LLC
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Figure 2
Coverage Contour Comparison
KYCW-LD Branson, MO
Facility ID 11135
Ch. 25 (digital) 15 kW
prepared for
Gray Television Licensee, LLC
February, 2017
Proposed KCYW-LD
51 dBµ Contour
Existing KCYW-LD
Lic Pending
File# 0000022105
51 dBµ Contour
Scale 1:1,000,000
km
0 10 20 30
Hickory
Cedar
Dallas
Laclede
Dade
Webster
Wright
Greene
Springfield
Lawrence
Barry
Stone
Taney
Douglas
Ozark
Howell
Texas
Camden
Osage Beach
Camdenton
El Dorado Springs
Richland
Stockton
Bolivar
Buffalo
Lebanon
Lamar
Greenfield
Willard
Marshfield
Houston
Fordland
Seymour
Mountain Grove
Cabool
Republic
Mount Vernon
Nixa
Ozark
Marionville
Aurora
Granby
Monett
Crane
Ava
Willow Springs
Mountain View
West Plains
Cassville
Kimberling City
Branson

Table 1

# Interference Analysis Results Summary

prepared for

## Gray Television Licensee, LLC

KYCW-LD Branson, MO

Chesapeake RF Consultants, LLC
Radiofrequency Consulting Engineers
Digital Television and Radio

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KYCW-LD  USERRECORD-01              BRANSON              MO US
Channel 25 ERP 15.    kW   HAAT  575. m  RCAMSL 01023 m FULL SERVICE MASK
Latitude 037-10-25  Longitude 0092-56-27
Dir Antenna Make usr  Model SCA_4DR-2HW     Beam tilt N  Ref Azimuth 50.
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The LMS application requires NAD-83 coordinates. FCC internal systems then convert to NAD-27 and port over to CDBS for processing. This interference analysis utilizes truncated NAD-27 coordinates to replicate FCC processing.

| | | | Dist | | | ---Population (2000 Census)---- | |
|---|---|---|---|---|---|---|---|
| Ch. | Call | City/State | (km) | Status | Application Ref. No. | Baseline | New Interference |
| 21 | K21JS | HARRISON AR | 106.4 | LIC | BLTTL-20111121DXG | --- | none |
| 24 | K24JY-D | COLUMBIA MO | 188.5 | CP MOD | BLANK-1277 | --- | none |
| 25 | KJNM-LD | FAYETTEVILLE AR | 159.2 | CP | BNPDTL-20100205AAL | --- | none |
| 25 | KJNM-LD | FAYETTEVILLE AR | 159.2 | CP MOD | BLANK-10834 | --- | none |
| 25 | W25EW-D | JACKSONVILLE IL | 396.3 | CP MOD | BLANK-13444 | --- | none |
| 25 | W25EW-D | JACKSONVILLE IL | 405.7 | CP MOD | BLANK-13744 | --- | none |
| 25 | W25EW-D | JACKSONVILLE IL | 372.6 | CP | BNPDTL-20101013ABP | --- | none |
| 25 | KCKS-LD | KANSAS CITY KS | 276.0 | LIC | BLANK-4587 | --- | none |
| 25 | K25NS-D | CAPE GIRARDEAU MO | 265.4 | CP | BNPDTL-20100907ABZ | --- | none |
| 25 | K25NR-D | COLUMBIA MO | 188.5 | CP MOD | BLANK-1278 | 199,910 | 0 (0.00%) |
| 25 | KOZJ | JOPLIN MO | 141.9 | LIC | BLEDT-20060620ABP | 403,223 | 1,882 (0.47%) |
| 25 | K25NG-D | ST. LOUIS MO | 287.5 | LIC | BLDTL-20130805ABR | --- | none |
| 25 | K25GJ | MUSKOGEE OK | 267.8 | LIC | BLTT-20051206ADA | --- | none |
| 25 | KGCT-CD | NOWATA OK | 245.4 | LIC | BLDTA-20091222AAA | --- | none |
| 25 | KUTU-CD | TULSA OK | 294.7 | LIC | BLDTA-20110506AAV | --- | none |
| 25 | K25MB-D | VIAN OK | 259.9 | CP | BNPDTL-20100504ALY | --- | none |
| 25 | WATN-TV | MEMPHIS TN | 353.5 | LIC | BLCDT-20050628AAP | --- | none |
| 26 | K26GS-D | HARRISON AR | 118.3 | LIC | BLDTL-20100517AFK | --- | none |
| 26 | K26KT-D | ELDON MO | 134.5 | CP | BNPDTL-20090825BVM | --- | none |
| 26 | KGKY-LD | JOPLIN MO | 156.8 | CP MOD | BMPDTL-20110726AEW | --- | none |

## Channel and Facility Information

| Section | Question | Response |
|---|---|---|
| **Proposed Community of License** | Facility ID | 11135 |
| | State | Missouri |
| | City | BRANSON |
| | LPD Channel | 25 |

## Antenna Location Data

| Section | Question | Response |
|---|---|---|
| **Antenna Structure Registration** | Do you have an FCC Antenna Structure Registration (ASR) Number? | Yes |
| | ASR Number | 1218324 |
| **Coordinates (NAD83)** | Latitude | 37° 10' 26.0" N+ |
| | Longitude | 092° 56' 28.1" W- |
| | Structure Type | TOWER-A free standing or guyed struct |
| | Overall Structure Height | 609.4 meters |
| | Support Structure Height | 574.6 meters |
| | Ground Elevation (AMSL) | 471.5 meters |
| **Antenna Data** | Height of Radiation Center Above Ground Level | 551 meters |
| | Height of Radiation Center Above Mean Sea Level | 1022.5 meters |
| | Effective Radiated Power | 15 kW |

## Antenna Technical Data

| Section | Question | Response |
|---|---|---|
| **Antenna Type** | Antenna Type | Directional Custom |
| | Do you have an Antenna ID? | No |
| | Antenna ID | |
| **Antenna Manufacturer and Model** | Manufacturer: | SCA |
| | Model | 4DR-8-2HW |
| | Rotation | 0 degrees |
| | Electrical Beam Tilt | Not Applicable |
| | Mechanical Beam Tilt | Not Applicable |
| | toward azimuth | |
| | Polarization | Horizontal |
| **Elevation Radiation Pattern** | Does the proposed antenna propose elevation radiation patterns that vary with azimuth for reasons other than the use of mechanical beam tilt? | No |
| | Uploaded file for elevation antenna (or radiation) pattern data | |
| | Out-of-Channel Emission Mask: | Full Service |

### Directional Antenna Relative Field Values (Pre-rotated Pattern)

| Degree | $V_A$ (Authorized Value) | Degree | $V_A$ (Authorized Value) | Degree | $V_A$ (Authorized Value) | Degree | $V_A$ (Authorized Value) |
|---|---|---|---|---|---|---|---|
| **0** | 0.983 | **90** | 0.925 | **180** | 0.020 | **270** | 0.020 |
| **10** | 0.895 | **100** | 0.995 | **190** | 0.020 | **280** | 0.020 |
| **20** | 0.784 | **110** | 0.975 | **200** | 0.020 | **290** | 0.130 |
| **30** | 0.827 | **120** | 0.920 | **210** | 0.020 | **300** | 0.395 |
| **40** | 0.955 | **130** | 0.835 | **220** | 0.020 | **310** | 0.560 |
| **50** | 1.0 | **140** | 0.715 | **230** | 0.020 | **320** | 0.710 |
| **60** | 0.945 | **150** | 0.580 | **240** | 0.020 | **330** | 0.825 |
| **70** | 0.830 | **160** | 0.410 | **250** | 0.020 | **340** | 0.915 |
| **80** | 0.795 | **170** | 0.135 | **260** | 0.020 | **350** | 0.975 |

### Additional Azimuths

| Degree | $V_A$ |
|---|---|