PRAIRIE WINDS BROADCASTING, INC.
Radio Station KGIM - Aberdeen, SD
1420 kHz, 1 kW-D, 0.21 kW-N, U

ENGINEERING STATEMENT

This engineering statement, together with the attached figures, has been prepared on behalf of Prairie Winds Broadcasting, Inc., licensee of AM radio station KGIM, Aberdeen, SD, in support of a request for license to cover construction permit BP-20230227AAE.

A non-directional proof of performance has been completed and confirms the radiation pattern is essentially omnidirectional. Since commonly-owned station KSDN (930 kHz) is on the same site as KGIM, appropriate traps and filters have been installed and adjusted and an attached report by engineer Ronald Schacht shows absence of interaction and intermodulation, and/or generation of spurious radiation products. Mr. Schacht also made new antenna impedance measurements and hence new antenna currents are 1.2 ampere daytime and 0.55 ampere nighttime.

ANTENNA SYSTEM

The KGIM tower is 81.2 m above base insulators and is 138° at 1420 kHz and produces a notified inverse field of 335 mV/m with 1 kW input. The overall height of this tower is 82.3 meters. The KGIM antenna is registered under number 1042352.

The ground system beneath this tower consists of 120 equally spaced buried copper radials 80.8 meters in length, except where shortened to a transverse copper strap or property boundaries, along with a 12.2 meter square copper screen.

The NAD-27 coordinates of this tower are: N 45° 25' 27" and W 98° 31' 07".

EQUIPMENT EMPLOYED FOR IMPEDANCE MEASUREMENTS

The test equipment used to measure the KGIM antenna impedance included:

1. General Radio 1606A RF Bridge #813
2. General Radio 1211D #2826 & Potomac Instruments FIM-41 #1990
   along with a frequency counter.

This data was then tabulated and plotted as shown in Figure 1.

The antenna resistance at 1420 kHz was found to be 700.0 ohms with a reactive component of +j479 ohms.

NEW POWER DETERMINATION

Operating power is determined by the formula: $P = I^2R$, where P is the antenna input power in watts, I is the antenna current in amperes and R is the antenna resistance in ohms. Substituting the new value of antenna resistance in the formula, the antenna current for 1000 watt daytime operation is 1.20 amperes (rounded from1.1952) and for 210 watt nighttime operation is 0.55 ampere.

January 17, 2024

William E. Suzman
Consulting Radio Engineer

ENGINEERING DATA IN SUPPORT OF CO-LOCATING THE KSDN AND THE KGIM TRANSMITTERS AT THE KSDN SITE

In a brief history, KSDN,Aberdeen, South Dakota was licensed for 5kw DA with a five tower array arranged in a cloverleaf pattern with 3 towers used in the day and 3 used at night. At one point in time, the southeast tower was replaced with a much taller tower to support several fm antennas. Over the years with the addition of antennas on this particular tower, the directional pattern became unstable so it was determined that a simple solution would be to reduce KSDN to 1kw non DA day and 500 watts non DA at night. To accomplish this, the center tower, which was also used as the non directional radiator for non DA field measurements was set up as the radiator for KSDN at the non DA power. The remaining towers were anti resonated. KGIM, a station operated by the same corporation had a single non DA antenna a few miles away on 1420 kHz. During a severe storm in April, the KGIM tower fell putting the station off the air. In order to get KGIM operating, the KGIM transmitter was moved to the KSDN site and it was decided to use another one of the abandoned KSDN towers, the southwest tower. A new antenna tuning unit was constructed for the antenna and the appropriate series and parallel resonant traps were incorporated in both the new 1420 antenna tuner and the existing 930 KSDN tuner. These traps were constructed to isolate the transmitters from energy received from the other radiator. After the installation of the traps both 930 and 1420 transmitters were found to operate satisfactorily with no measurable power being reflected. During this reconstruction, the unused northwest and northeast tower were dismantled, leaving only three towers standing, those being the center tower fed by the 930 KSDN transmitter, the southwest tower, fed by the KGIM transmitter and the tall southeast tower supporting the FM antennas which was antiresonated.

To assure compliance with the Commission rules concerning spurious emissions and intermod products between the two carriers, a series of measurements were made at 2 locations. The first location chosen was 1.13km WNW of the transmitter site on the first gravel road north of the transmitter site. The area is clear of power lines although there is a cattle fence along the road comprised of a series of wires on wooden poles. The second location measured was also WNW at .8km from the site at a stone quarry. This area is completely isolated with no power, telecommunications or fences. The equipment used to make the measurements as follows:

Anritsu MS2712E.ser 10950163 Spectrum Analyzer
Chris Scott LP-3 ser 21 Shielded loop antenna mounted on 5 foot tripod
Potomac FIM41 ser 1990 Field Intensity meter

First, at both locations, the Spectrum analyzer was adjusted to a wide display to show both 930 kHz and 1420 kHz on the same display. Other than another local station at 1380 and another at 980 no other carriers were visible. After this, the analyzer was set up to check specific frequencies in the following combination:

Station A=KSDN 930
Station B=KGIM 1420

A+B or 2350 kHz
B-A or 490 kHz
2A+B or 3280 kHz
2B+A or 3770 kHz
2A-B or 440 kHz
2B-A or 1910 kHz

At location 1 , 1.13 km from the transmitter site measurements were made at 9:15 am cdt on 6/28/2022. Using the Anritsu and the loop antenna, the carrier of 930 was set to a reference level of -10 dbm. with the loop oriented for maximum signal. The analyzer was set to each of the frequencies listed and nothing was observed that was above the noise floor of -100 dbm at any of the frequencies. The Anritsu was then set to the carrier of 1420 and the antenna adjusted for maximum signal. It also produced a signal of -10 dbm as expected since both transmitters are operating at 1 kilowatt. Again, all of the frequencies mentioned above were scanned and nothing was observed. Next, the same was done using the Potomac FIM41 field meter. The meter was set to 930 which produced 240 mv/m. All of the mentioned frequencies, with the exception of 440 kHz and 490 kHz which are out of the range of the FIM41, were measured. There was nothing observed on any frequency except 1910 kHz (2B-A) where the 930 audio was heard at a level or -95 db below the 930 main carrier. Also at 1860, the second harmonic of 930, the 930 audio was heard also at a level of -95 db. below the main 930 carrier. Also a signal was observed at 3770 (2B+A) where again 930 audio was heard at -88 db below the 930 carrier. Next, the 1420 carrier was measured and found to be 235 mv/m. For all practical purposes the intermod products were the same exceeding the requirement of -80db. After realizing there was wire cattle fence along the road, it was decided to find another location so a point .8 km from the transmitter site in the quarry was chosen to remeasure. At this point again, the Anritsu was set up with the loop antenna.The Anritsu spectrum analyzer indicated -8 dbm on both the 930 and the 1420 carriers. Besides the local carriers at 1380 and 980 no other signals were noticed in the vicinity of 930 or 1420. All of the intermod frequencies were observed with noting visible above the noise floor which was -100 dbm. Again, the Potomac FIM 41 was used to make the same set of measurements. The carriers of both 930 and 1420 were measured and found to be 320 mv/m. Again, all of the intermod frequencies with the exception of 440 kHz and 490 kHz were measured (out of range). No signals were noted with the following exceptions.

A signal of -95 db was noted at 1910 (2B-A) with 920 audio. Also at 3770 a signal of -90 db was noted with the 930 audio present and garbled. Also the second harmonic of 930 (1860) was noted at -94 db. The difference between the Anritsu and the field meter can be due to either the lack of sensitivity of the Anritsu, its higher noise floor or a mix taking place in the front end of the field meter due to the proximity from the transmitters and the fact that the field meter attenuator was totally out of the circuit to locate the signals. In either case the 5 db difference between the meter and the Anritsu is a moot point as both instruments are well above the required 80 db attenuation.

The second set of measurements at the quarry were made at 10:20am CDT on 6/28/2022. Measurements were made by Ron Schacht and the station Chief Engineer ,Don Brintnall. All measurements contained are correct to the limits of the equipment used.

Tabular Data:

FREQUENCY	SITE 1 (1.13KM)	SITE 2 (.8KM)
930+1420	BETTER THAN -100 DB	BETTER THAN -100 DB
1860+1420	BETTER THAN -100 DB	BETTER THAN -100 DB
2480+930	-88 DB	-90 DB

1860-1420	*BETTER THAN -100 DB	BETTER THAN -100 DB
1420-930	*BETTER THAN -100 DB	BETTER THAN -100 DB
2840-930	-95 DB	-95 DB

* Measurements taken only on Anritsu spectrum analyzer, in the noise as the Potomac FIM 41 does not tune to these frequencies.

Ron Schacht

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