**DORDT UNIVERSITY**

**ENGINEERING DEPT.\_\_\_\_\_\_\_\_\_\_**Comm Systems**\_ NAME\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**COURSE\_\_\_**EGR 363\_\_\_\_\_\_\_\_\_\_**SUBJECT\_\_**PS#**\_\_\_\_ PAGE\_\_\_\_ OF\_\_\_\_ DATE\_\_\_\_\_\_\_\_\_\_**

**3-A** *An investigation of TV channel allocations and image frequency sensitivities.*

a.) Use <https://www.fcc.gov/media/television/tv-query> to find the latitude and longitude of Sioux Center, IA. To do this, scroll down the page and click the link to Reference Coordinates for Communities. Then set the state to IA, enter Sioux Center, and enter an optional radius of 161 km (100 mi). Then submit the query. These latitude and longitude coordinates are used by the FCC in considering the market area coverage of various radio and TV stations. (Geolocation information alone can be found from many Web services. For example, shift-clicking on any blank area in a Google map will pop up the geolocation of that spot. Note that there are two systems of units for this: degrees, minutes, seconds vs. decimal degrees. Google reports in decimal degrees. In some cases, clicking on geolocation numbers will toggle the display to the other units. The FCC works with degrees, minutes, seconds. If you enter the latitude and longitude manually on the FCC site you may omit letters N and W. They will be assumed since all U.S. locations are so located.)

b.) In the search results from step (a), click on the TV link.

c.) In the list of TV stations that results from step (b), find KSIN–DT–LIC (The currently licensed digital transmitter for station KSIN in Sioux City.) What is the effective radiated power (ERP) and height above average terrain (HAAT) for this station’s antenna? Repeat for KMEG–DT–LIC

KSIN ERP\_\_\_\_\_\_ kW KSIN HAAT\_\_\_\_\_\_\_m KMEG ERP\_\_\_\_\_\_\_ kW KMEG HAAT\_\_\_\_\_\_m

d.) Digital TV stations are assigned a certain “radio-frequency channel number” (RF channel) by the FCC and must broadcast on that channel. They are also allowed to broadcast a digital code that identifies their channel number. This broadcast code is called their “virtual channel number.” The FCC does *not require* *that the virtual channel number match the assigned RF channel* number. KSIN–DT–LIC happens to transmit a code for virtual channel 27 (Actually 27.1, 27.2 and 27.3 etc. since a digital TV station can broadcast more than one program at a time should it choose to do so.) Thus, to viewers, KSIN appears to be “Channel 27.” What RF channel is assigned to KSIN–DT–LIC? (The first “Channel” column in the FCC list.) Repeat for KMEG–DT–LIC. KMEG reports a virtual channel number of “14” to viewers.

KSIN RF Channel from FCC data\_\_\_\_\_\_\_\_ KMEG RF Channel from FCC data\_\_\_\_\_\_\_\_

Note: The RF channel is the actual channel that a digital television station may transmit on. It only reports a “virtual channel number” to viewers for marketing reasons. The old analog KSIN TV station transmitted on RF channel 27—nothing virtual about that. Practically all analog TV transmitters around North America were turned off between February and June of 2009. During the transition to digital, stations did not want to have to teach their viewers new channel numbers, thus virtual channel numbers were invented. Digital television receivers must “scan for channels.” This fills up a lookup table. When the viewer asks to watch (virtual) channel 14 for example, the TV set looks at address 14 in the table to find the actual assigned RF channel for that station, then tunes in to the RF channel. Most viewers are completely unaware of this translation process.

e.) Use Wikipedia to look up “Pan-American television frequencies.” What is the ATSC carrier frequency (ATSC pilot) for KSIN–DT–LIC? Also, how wide is the channel allocation they have (in MHz, upper edge minus lower edge).

KSIN ATSC pilot \_\_\_\_\_\_\_\_ MHz Channel bandwidth\_\_\_\_\_\_\_\_\_\_MHz

f.) Based on the video (ATSC pilot) carrier frequency’s location within the assigned frequency band, is this DSB-SC, VSB, or SSB modulation? (Digital TV transmitters no longer use “video” or “audio” carriers, just ignore those columns. Also note that an SSB signal would have no need for *any* spectrum on the unused side of the carrier.

ATSC digital TV transmission uses \_\_\_\_\_\_\_\_\_ modulation

g.) What is the image frequency for KSIN–DT–LIC? The intermediate frequency for (analog and digital) TV receivers is 45.75 MHz. The local oscillator runs at a frequency greater than the (ATSC pilot) carrier frequency. What RF channel number corresponds best with this image frequency? Return to the FCC list of TV stations. Is anything assigned on the image frequency? If so, report the station nearest to Sioux Center. Who owns the assignment(s) on the image channel and how does this compare with the ownership of KSIN–DT–LIC? Why does this situation work?

Image freq. of KSIN?\_\_\_\_\_\_\_\_\_MHz Ch. No?\_\_\_\_\_

Anything assigned in KSIN’s image freq?\_\_\_\_\_\_\_\_\_\_\_ If assigned, ownership?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

If no assignment, why? Notice practically every RF channel is assigned to something. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_