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**Technical Statement
Request for Special Temporary Authorization
KDTS-LD, Channel 14, San Francisco, CA
Word of God Fellowship, Inc.
Construction Permit in File Number 0000115857
Facility ID 167032**

Introduction

Station KDTS-LD (“KDTS”) was granted a Construction Permit to move to Channel 14 after its displacement in the aftermath of the Post-Incentive Auction Spectrum Repack. The Construction Permit is in File Number 0000115857, for Facility ID 167032, at Sutro Tower in San Francisco, CA. Its principle operating parameters are 15 kW ERP, using a wide cardioid directional antenna with its axis of symmetry at a bearing of 90 degrees True and at a radiation center height of 249.1 m above ground level and 503.3 m above mean sea level.

In the KDTS-LD Channel 14 Construction Permit, there is a Special Condition that reads as follows:

During equipment tests the permittee shall take adequate measures to identify and eliminate objectionable interference that may be caused to existing land mobile radio facilities in the 460 – 470 MHz band authorized prior to the date this construction permit is issued. Documentation that objectionable interference will not be caused to existing land mobile radio facilities shall be submitted along with the application for license (FCC Form 347). Program test authority will not be granted without this showing. Operation will not begin until the Commission specifically grants the program test authority. Further, the Commission reserves the right to require television translator and low power television stations to go off the air until interference problems are resolved. See subsections 74.703 (e) and (f) of the Commission’s Rules.

To meet the provisions of the Special Condition, significant steps have been taken in terms of identifying Land Mobile Radio (LMR) operations that could potentially receive interference from KDTS operating on Channel 14, establishing communications with LMR licensees whose facilities had the potential for receiving such interference, notifying the licensees of extensive testing to be conducted, and seeking their cooperation in that testing. As a consequence of that outreach and testing, two LMR operations

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were identified that were impacted to one extent or another when KDTS was transmitting on Channel 14 – both of them located on Sutro Tower and sharing an LMR master receiving antenna and distribution system owned and provided by Sutro Tower, Inc. Despite a week of testing for three hours per day, with the transmitter on for one minute and off for one minute throughout the test period, after notifying approximately 400 LMR licensees every day of testing, no other LMR operations were identified as being impacted by KDTS operation at full power.

Steps Taken

There are three potential causes for interference from broadcast transmissions to LMR reception:

(1) Emissions from the broadcast transmission system in the LMR band, (2) Intermodulation or desensitization occurring in the front end of the LMR receiving system, and (3) passive intermodulation (PIM) on the path from the transmitter to the receiver. The KDTS Channel 14 facility has been constructed with all of the system components necessary to reduce out-of-channel emissions to minuscule levels – so low, in fact, that they are very difficult to measure at the system output without extraordinary efforts. Measuring the raw transmitter output 6-MHz spectrum and the transmitter output (“mask”) filter separately, combining their responses, and expressing the emitted power outside Channel 14 relative to the power within the channel shows that the highest power delivered to the antenna in any 30 kHz bandwidth¹ in the 460 – 470 MHz range is on the order of 0.83 nW, i.e., 0.83×10^{-9} W or –60.8 dBm. The free-space path loss from the KDTS transmitting antenna to the LMR receiving antenna (separated by about 177 feet, 54 m) is roughly 60.5 dB. Thus, the maximum signal level reaching the LMR receiving antenna in the 460 – 470 MHz band would be –113.2 dBm, if the main beams of the two antennas were aligned and operating in their far fields, which they are not. Measurements of antenna coupling, which incorporate the effects of both free-space path loss and antenna patterns, even in the near-field case, demonstrate a loss between antennas of 117 dB. Thus, the maximum out-of-band power from the KDTS transmitter that is predicted to reach the input of the LMR master received signal distribution system is –177.8 dBm, or roughly 1.7 ZW (i.e., 1.7×10^{-21} W). Since the noise floor of the LMR receiving system input is in the region of –129 dBm (based on the Boltzmann constant, temperature, and bandwidth), the highest possible levels reaching the input of the master receiving antenna RF distribution system are nearly 50 dB below that level, effectively ruling out the potential for direct impact on-channel to the distribution system. That leaves two possible mechanisms that could cause interference to LMR reception through the RF distribution system: issues generated in the front end of the receiving system itself, and PIM generated on the tower or in the environment.

After the initial week of testing, additional tests were conducted with the two LMR operations located on Sutro Tower – one belonging to each of two licensees. Because of differences in their technical configurations, one operation did not experience the impact as interference with its operations while the other operation did. Both systems experienced a change in the noise floor apparently generated within the LMR master received signal distribution system. In the case of one system – owned by RFC

¹ 30 kHz is the measurement bandwidth specified in §73.687(e)(4)(ii) of the FCC rules with respect to protection of Land Mobile Radio reception from television broadcast signals.

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Communications, Inc., – the reception threshold of the receiver, at which signals that it received began to be used along with signals from other sites in its network, was set well above the distribution system noise floor, requiring relatively strong received signals before they would be used. As a consequence, even when the distribution system noise floor level increased when the KDTS transmitter was turned on, the noise floor did not exceed the reception threshold set on the receiver, and the noise floor change had no effect on system operation. In the case of the other LMR system – owned by Fisher Wireless Communications, Inc. – the reception threshold of the receiver was set very close to the distribution system noise floor, so that signals would be used even at very weak received signal levels. The result was that the second system was much more sensitive to changes in the noise floor, experiencing as a form of interference such changes when the KDTS transmitter was turned on.

Given the differences in operation of the two LMR systems, the focus of efforts to mitigate the impact of operation of the KDTS Channel 14 transmitter has been the Fisher Wireless receiver at Sutro Tower. A number of different changes and adjustments to the LMR master received signal distribution system were applied with varying results. For example, different low-noise amplifiers (LNAs) were tried, yielding some performance improvement but not enough to completely overcome the problem. The receiving antenna was moved gradually along the edge of the tower to locate nulls in the signal strength of the Channel 14 transmitter, but none were sufficiently deep as to eliminate the impact on reception. A variety of unused or rusty components on the tower were removed or replaced to try to identify possible sources of Passive InterModulation (PIM), and a probe antenna was used to attempt to identify possible sources of PIM. Neither PIM location approach worked. The result is that the source of increase in the noise floor coming from the LMR master received signal distribution system appears to be within that system itself. Consequently, an effort currently is underway to design, construct, and install a replacement for the entire filter and amplifier system, starting with the antenna, using low-PIM components and the latest amplifier technology. It will not be known with certainty whether the system replacement will fully solve the interference problem until the replacement system is tested *in situ*.

Given the time that will be required to complete installation of the replacement LMR signal distribution system, tests were undertaken jointly with the LMR system operators to determine whether a KDTS ERP level could be found at which the LMR systems could operate without disruption of their services while KDTS began broadcast operations. Technicians from both LMR operators participated in joint testing with KDTS on November 17, 2020. The conclusion reached by the technician from RFC Wireless was that, because of the way its operation is configured, full-power operation by KDTS was acceptable since there was no disruption to its operations even at that power level. The conclusion reached by the technicians from Fisher Wireless was that reduction of the KDTS ERP to half power (i.e., 7.5 kW ERP) was sufficient to allow Fisher to operate without disruption.

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After identifying about 400 LMR licensees with the potential to receive interference from KDTS, that number was reduced to two with a week-long initial testing program. Further testing with those two showed that only one had a significant impact on its operations. Cooperative testing specifically with that one licensee allowed that entity to determine that its operations could continue with KDTS-LD

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operating at half power. The specific licensee is Fisher Wireless Communications, Inc., and its president, Dana B. Fisher, has been kind enough to confirm by e-mail that it finds operation by KDTS at half power to be acceptable to it for the number of months it will take to design, construct, and install a replacement for the RF filter and amplifier subsystem of the Sutro Tower LMR received signal distribution system. The design of the replacement subsystem will be based on a design used successfully in another market with a significantly more powerful Channel 14 operation. Work on the replacement is in the design stage currently.

For all the reasons stated and explained herein, it now is in the public interest for the FCC to grant Special Temporary Authorization to KDTS-LD for the station's move to Channel 14, with operation at 7.5 kW ERP (i.e., half the power level authorized in its construction permit) to permit it to begin program delivery to the public while it continues its efforts to meet the terms of the Special Condition contained in its Construction Permit. Concurrent with beginning operation on Channel 14, KDTS-LD will terminate its program operations on its current Channel 8 facility. The two sharee stations – KQTA-LD, Facility ID 0000054596, and KMMC-LD, Facility ID 0000053901 – that will be sharing the Channel 14 operation already have terminated transmission on their previous channels due to earlier displacement of their operations, and they will resume operation on Channel 14. The deviation from FCC rules and procedures sought is permitting KDTS-LD, KQTA-LD, and KMMC-LD to begin program transmission with modified technical parameters after completing many, but prior to completing all, of the requirements of the Special Condition in the KDTS construction permit. Such a grant of STA is hereby respectfully requested.