The Impact of Future 6G Phones on Weather Satellite Ground Stations in the 7 GHz Band

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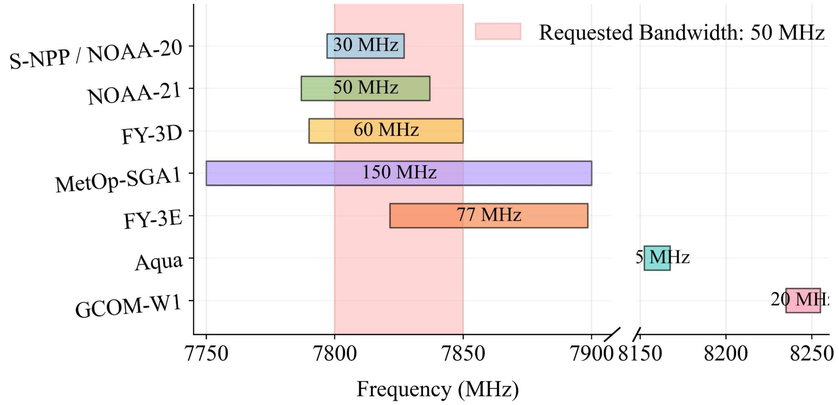
I. BACKGROUND

The 7.125–8.4 GHz frequency band has been identified as candidate band for future mobile communications including 6G cellular networks.

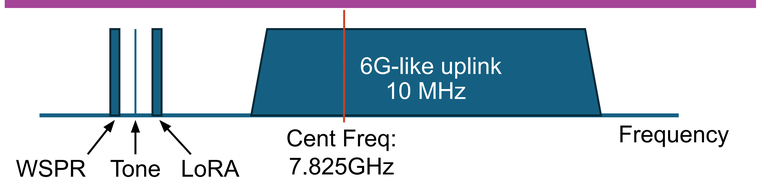


The requested bandwidth overlaps with several weather satellite transmission frequencies

This can result in interference when the satellite downlinks information to the ground station

We measure the potential impact of this interference using a special license to transmit in 7800-7850 MHz band

II. EXPERIMENT SETUP



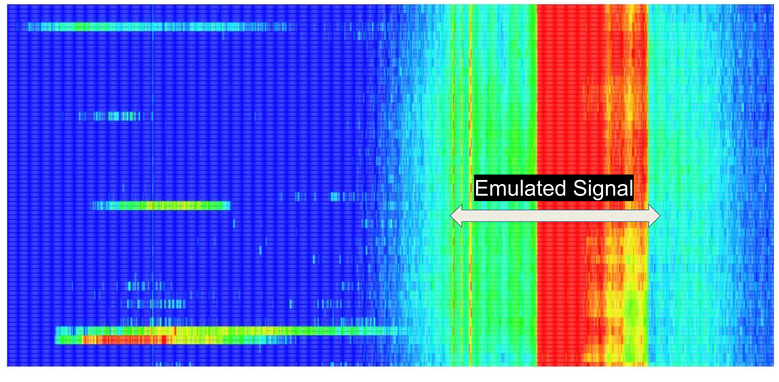
We transmit an emulated signal with 15 MHz bandwidth at 7.825GHz using the SpectrumX Mobile Experiment Platform (MEP) [1]. The transmit location was UW-Madison's Computer Science Building.

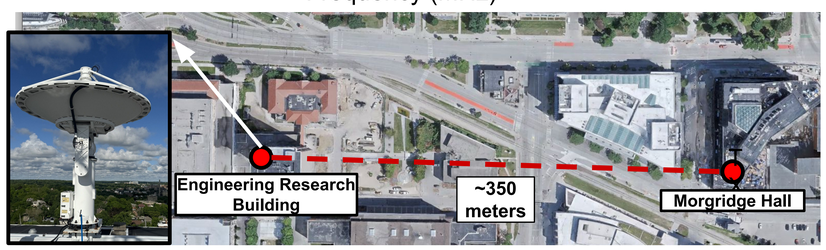
There were two types of receive nodes:

1. The Direct Broadcast ERB Antenna, a 2.4m Tracking Dish monitoring the X-Band
2. Two Receive MEPs:
   a. Co-located with Transmitter (RF)
   b. 10th floor of Engineering Research Building (IF; downconverted signal from antenna)

III. MEASUREMENTS

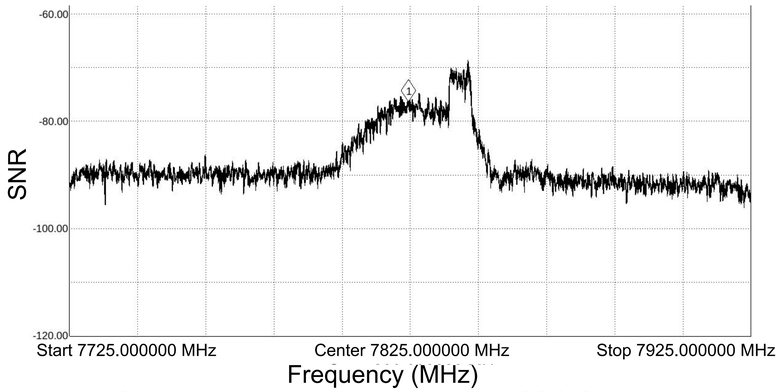
During each satellite pass, the emulated signal was continuously transmitted from a building located ~350 meters (line of sight distance) east of the ERB weather satellite dish. Since the dish tracked satellites across the sky, its beam direction changed throughout the pass and was not always pointed toward the transmitter. The nearby MEP consistently observed the transmitted signal, while the ground station dish primarily detected interference when its beam was not directed away from the transmitter. Experiments were repeated across 14 LEO satellite passes.



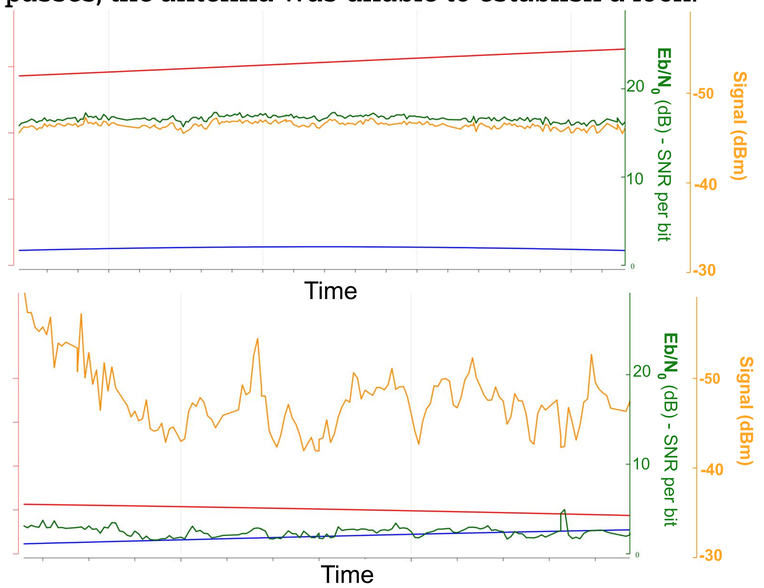


IV. RESULTS

We observed a stronger signal when the antenna was pointing towards the transmitter, but no impact at certain angles. Additionally, our emulated signal interfered with satellite downlinks, directly overlapping the satellite transmission and presenting with significantly more power.



Ground station systems encountered higher error rates and lower SNR per bit while transmitting. In some passes, the antenna was unable to establish a lock.



ACKNOWLEDGEMENTS

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REFERENCES

[1] N. Rainville et al., "The SpectrumX Mobile Experiment Platform," 2026 IEEE Radio and Wireless Symposium (RWS), Hollywood, CA, USA, 2026, pp. 37-40, doi: 10.1109/RWS64705.2026.11408768