

ECE 430

LAB 5

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```
64 bytes from 10.10.10.1: icmp_seq=28 ttl=64 time=101 ms
64 bytes from 10.10.10.1: icmp_seq=29 ttl=64 time=99.1 ms
64 bytes from 10.10.10.1: icmp_seq=30 ttl=64 time=96.8 ms
64 bytes from 10.10.10.1: icmp_seq=31 ttl=64 time=88.2 ms
64 bytes from 10.10.10.1: icmp_seq=32 ttl=64 time=85.9 ms
64 bytes from 10.10.10.1: icmp_seq=33 ttl=64 time=83.9 ms
64 bytes from 10.10.10.1: icmp_seq=34 ttl=64 time=81.0 ms
64 bytes from 10.10.10.1: icmp_seq=35 ttl=64 time=79.9 ms
64 bytes from 10.10.10.1: icmp_seq=36 ttl=64 time=78.0 ms
64 bytes from 10.10.10.1: icmp_seq=37 ttl=64 time=302 ms
64 bytes from 10.10.10.1: icmp_seq=38 ttl=64 time=301 ms
64 bytes from 10.10.10.1: icmp_seq=39 ttl=64 time=298 ms
64 bytes from 10.10.10.1: icmp_seq=40 ttl=64 time=296 ms
64 bytes from 10.10.10.1: icmp_seq=41 ttl=64 time=294 ms
64 bytes from 10.10.10.1: icmp_seq=42 ttl=64 time=292 ms
64 bytes from 10.10.10.1: icmp_seq=43 ttl=64 time=290 ms
64 bytes from 10.10.10.1: icmp_seq=44 ttl=64 time=288 ms
64 bytes from 10.10.10.1: icmp_seq=45 ttl=64 time=286 ms
64 bytes from 10.10.10.1: icmp_seq=46 ttl=64 time=284 ms
64 bytes from 10.10.10.1: icmp_seq=47 ttl=64 time=276 ms
64 bytes from 10.10.10.1: icmp_seq=48 ttl=64 time=274 ms
64 bytes from 10.10.10.1: icmp_seq=49 ttl=64 time=272 ms
64 bytes from 10.10.10.1: icmp_seq=50 ttl=64 time=270 ms
64 bytes from 10.10.10.1: icmp_seq=51 ttl=64 time=268 ms
64 bytes from 10.10.10.1: icmp_seq=52 ttl=64 time=266 ms
64 bytes from 10.10.10.1: icmp_seq=53 ttl=64 time=264 ms
64 bytes from 10.10.10.1: icmp_seq=54 ttl=64 time=262 ms
64 bytes from 10.10.10.1: icmp_seq=55 ttl=64 time=260 ms
64 bytes from 10.10.10.1: icmp_seq=56 ttl=64 time=258 ms
64 bytes from 10.10.10.1: icmp_seq=57 ttl=64 time=251 ms
64 bytes from 10.10.10.1: icmp_seq=58 ttl=64 time=248 ms
64 bytes from 10.10.10.1: icmp_seq=59 ttl=64 time=246 ms
64 bytes from 10.10.10.1: icmp_seq=60 ttl=64 time=244 ms
64 bytes from 10.10.10.1: icmp_seq=61 ttl=64 time=167 ms
64 bytes from 10.10.10.1: icmp_seq=62 ttl=64 time=165 ms
64 bytes from 10.10.10.1: icmp_seq=63 ttl=64 time=163 ms
64 bytes from 10.10.10.1: icmp_seq=64 ttl=64 time=161 ms
64 bytes from 10.10.10.1: icmp_seq=65 ttl=64 time=153 ms
64 bytes from 10.10.10.1: icmp_seq=66 ttl=64 time=151 ms
64 bytes from 10.10.10.1: icmp_seq=67 ttl=64 time=149 ms
64 bytes from 10.10.10.1: icmp_seq=68 ttl=64 time=147 ms
64 bytes from 10.10.10.1: icmp_seq=69 ttl=64 time=145 ms
64 bytes from 10.10.10.1: icmp_seq=70 ttl=64 time=143 ms
64 bytes from 10.10.10.1: icmp_seq=71 ttl=64 time=140 ms
64 bytes from 10.10.10.1: icmp_seq=72 ttl=64 time=138 ms
^C
--- 10.10.10.1 ping statistics ---
72 packets transmitted, 72 received, 0% packet loss, time 71073ms
rtt min/avg/max/mdev = 77.975/205.639/302.095/64.091 ms
ild27@grid04:~$
```

Figure 1: showing ping working on transmitter

```

...ssh -XCi ~/.ssh/id_rsa lld27@dwsgrid.ece.drexel.edu ...XCi ~/.ssh/id_rsa lld27@dwsgrid.ece.drexel.edu ...Ci ~/.ssh/id_rsa lld27@dwsgrid.ece.drexel.edu ...+
64 bytes from 10.10.10.1: icmp_seq=48 ttl=64 time=274 ms
64 bytes from 10.10.10.1: icmp_seq=49 ttl=64 time=272 ms
64 bytes from 10.10.10.1: icmp_seq=50 ttl=64 time=270 ms
64 bytes from 10.10.10.1: icmp_seq=51 ttl=64 time=268 ms
64 bytes from 10.10.10.1: icmp_seq=52 ttl=64 time=266 ms
64 bytes from 10.10.10.1: icmp_seq=53 ttl=64 time=264 ms
64 bytes from 10.10.10.1: icmp_seq=54 ttl=64 time=262 ms
64 bytes from 10.10.10.1: icmp_seq=55 ttl=64 time=260 ms
64 bytes from 10.10.10.1: icmp_seq=56 ttl=64 time=258 ms
64 bytes from 10.10.10.1: icmp_seq=57 ttl=64 time=251 ms
64 bytes from 10.10.10.1: icmp_seq=58 ttl=64 time=248 ms
64 bytes from 10.10.10.1: icmp_seq=59 ttl=64 time=246 ms
64 bytes from 10.10.10.1: icmp_seq=60 ttl=64 time=244 ms
64 bytes from 10.10.10.1: icmp_seq=61 ttl=64 time=242 ms
64 bytes from 10.10.10.1: icmp_seq=62 ttl=64 time=240 ms
64 bytes from 10.10.10.1: icmp_seq=63 ttl=64 time=238 ms
64 bytes from 10.10.10.1: icmp_seq=64 ttl=64 time=236 ms
64 bytes from 10.10.10.1: icmp_seq=65 ttl=64 time=234 ms
64 bytes from 10.10.10.1: icmp_seq=66 ttl=64 time=232 ms
64 bytes from 10.10.10.1: icmp_seq=67 ttl=64 time=230 ms
64 bytes from 10.10.10.1: icmp_seq=68 ttl=64 time=228 ms
64 bytes from 10.10.10.1: icmp_seq=69 ttl=64 time=226 ms
64 bytes from 10.10.10.1: icmp_seq=70 ttl=64 time=224 ms
64 bytes from 10.10.10.1: icmp_seq=71 ttl=64 time=222 ms
64 bytes from 10.10.10.1: icmp_seq=72 ttl=64 time=220 ms
^C
--- 10.10.10.1 ping statistics ---
72 packets transmitted, 72 received, 0% packet loss, time 71073ms
rtt min/avg/max/mdev = 77.975/205.639/302.095/64.091 ms
lld27@grid04:~$ iperf -c 10.10.1.1 -u -i 1 -b 200K -t 10
Client connecting to 10.10.10.1, UDP port 5001
Sending 1470 byte datagrams, IP target: 58800.00 us (kalman adjust)
UDP buffer size: 47.7 MByte (default)
[ 3] local 10.10.10.2 port 41098 connected with 10.10.10.1 port 5001
[ ID] Interval Transfer Bandwidth
[ 3] 0.0- 1.0 sec 27.3 KBytes 223 Kbits/sec
[ 3] 1.0- 2.0 sec 24.4 KBytes 200 Kbits/sec
[ 3] 2.0- 3.0 sec 24.4 KBytes 200 Kbits/sec
[ 3] 3.0- 4.0 sec 24.4 KBytes 200 Kbits/sec
[ 3] 4.0- 5.0 sec 24.4 KBytes 200 Kbits/sec
[ 3] 5.0- 6.0 sec 24.4 KBytes 200 Kbits/sec
[ 3] 6.0- 7.0 sec 24.4 KBytes 200 Kbits/sec
[ 3] 7.0- 8.0 sec 24.4 KBytes 200 Kbits/sec
[ 3] 8.0- 9.0 sec 24.4 KBytes 200 Kbits/sec
[ 3] WARNING: did not receive ack of last datagram after 10 tries.
[ 3] 0.0-10.1 sec 245 KBytes 200 Kbits/sec
[ 3] Sent 171 datagrams
read failed: Connection refused
lld27@grid04:~$ 

```

Figure 2: showing iperf reporting that it is receiving data on the Rx node

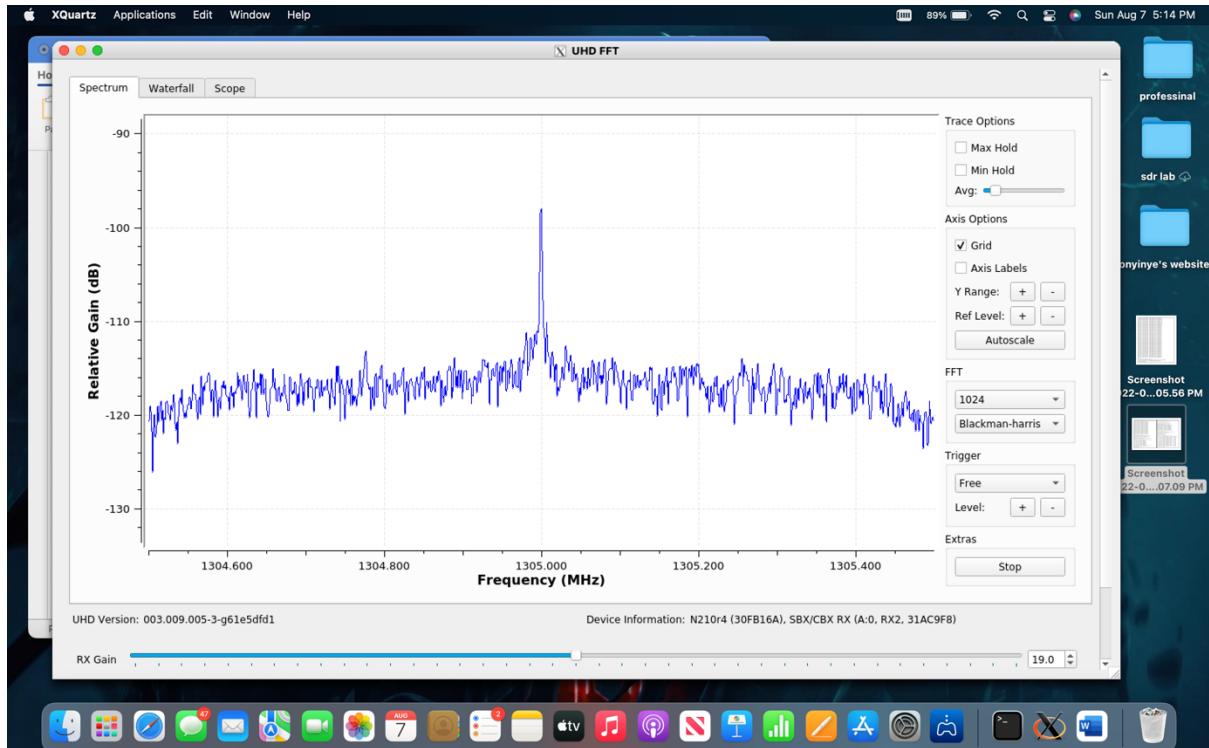


Figure 3: uhd_fft showing node traffic

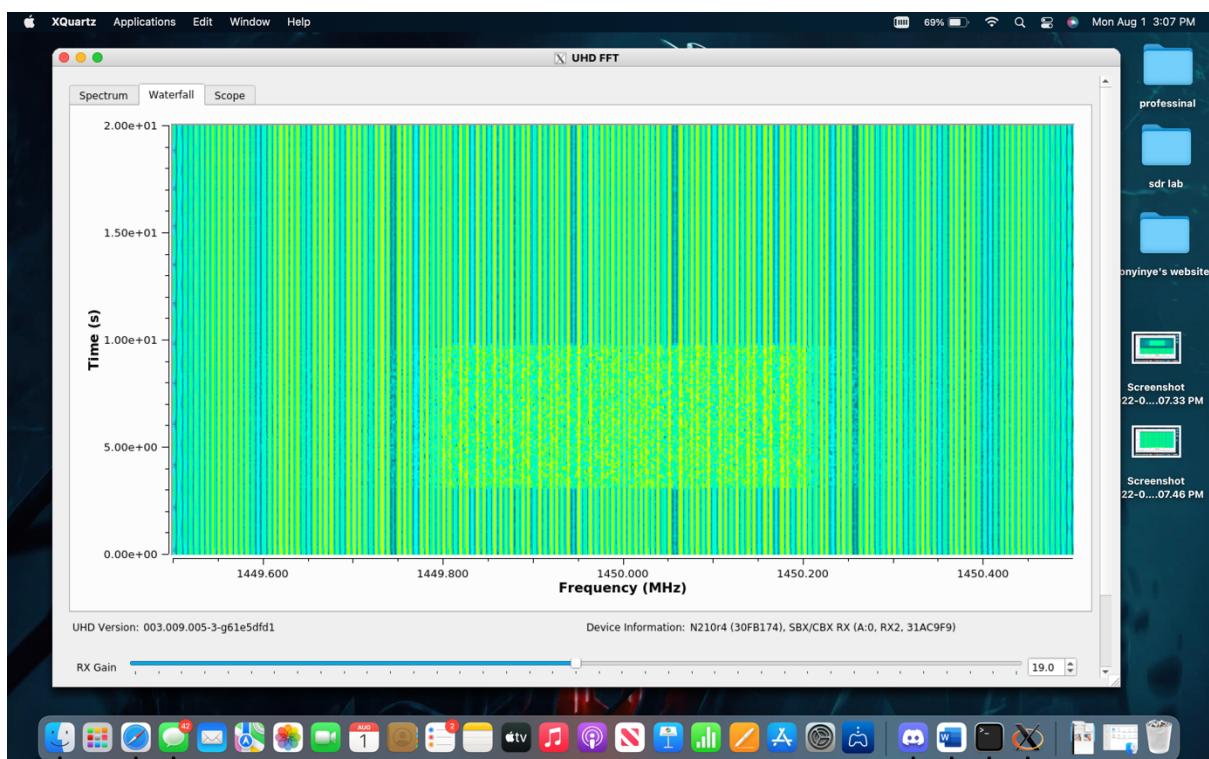
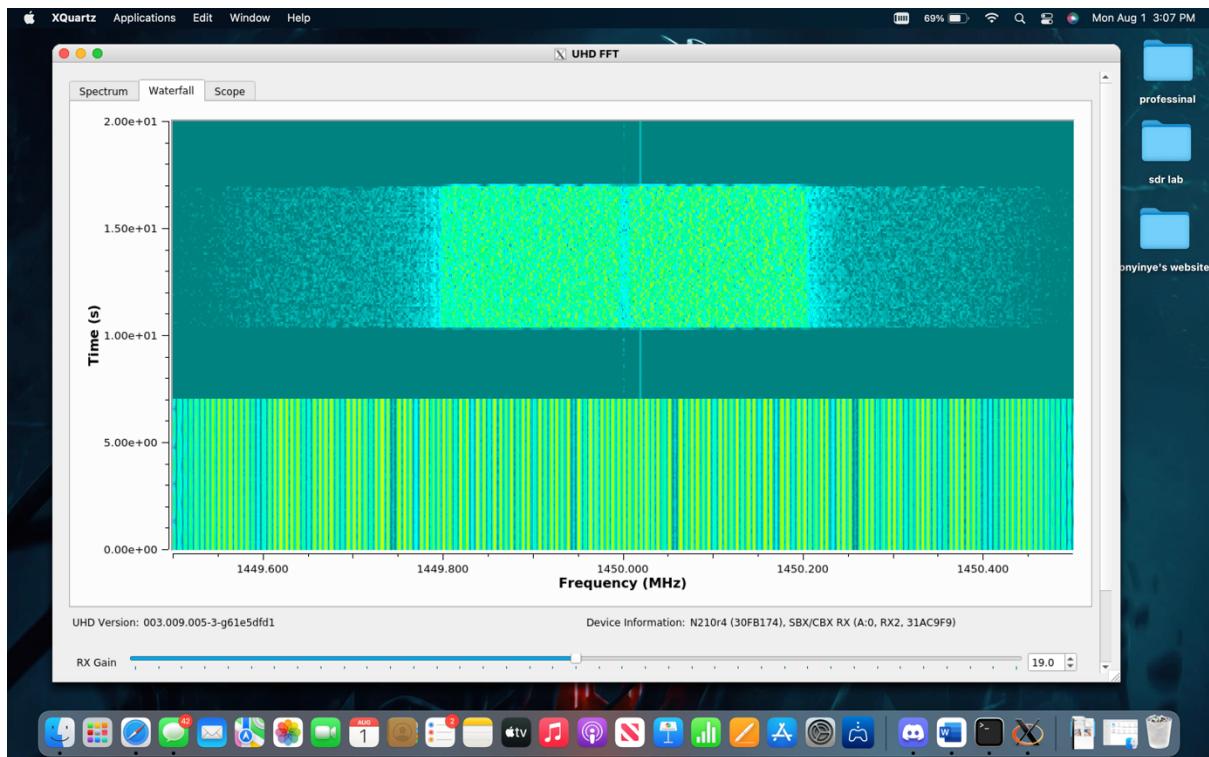


Figure 4 (a & b): a) transmission before jammer b) continuous jammer affecting transmission

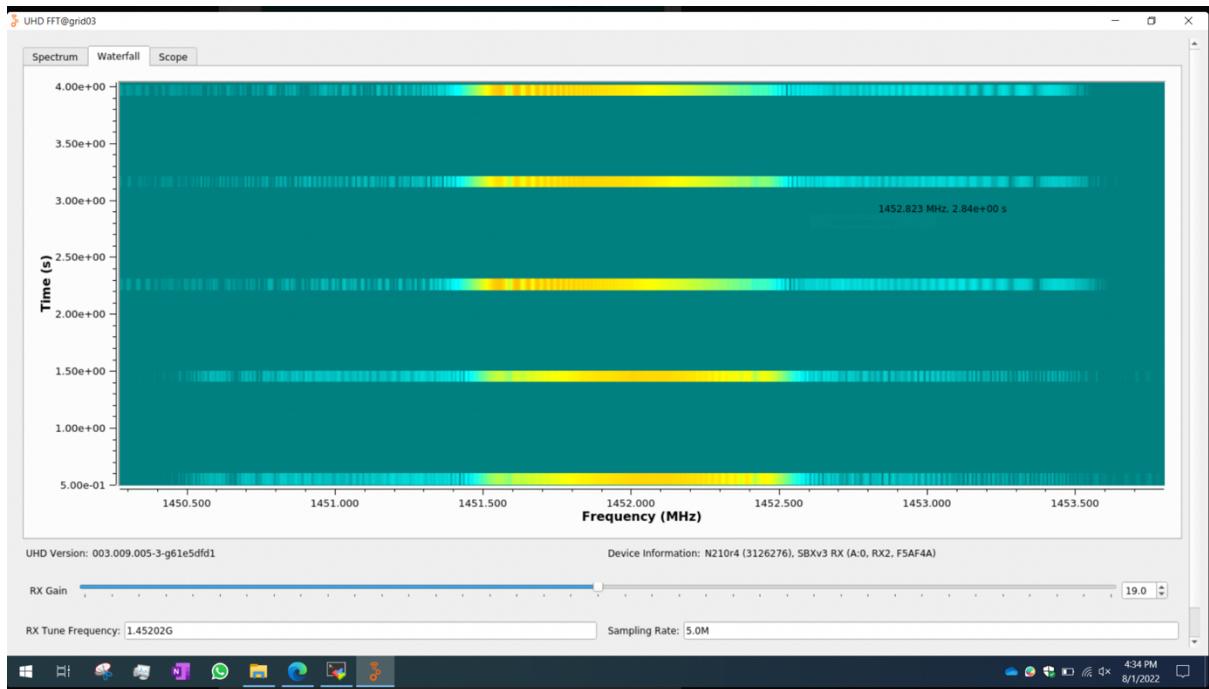


Figure 5: Jamming signal on for 0.1 seconds and off for 0.9 seconds

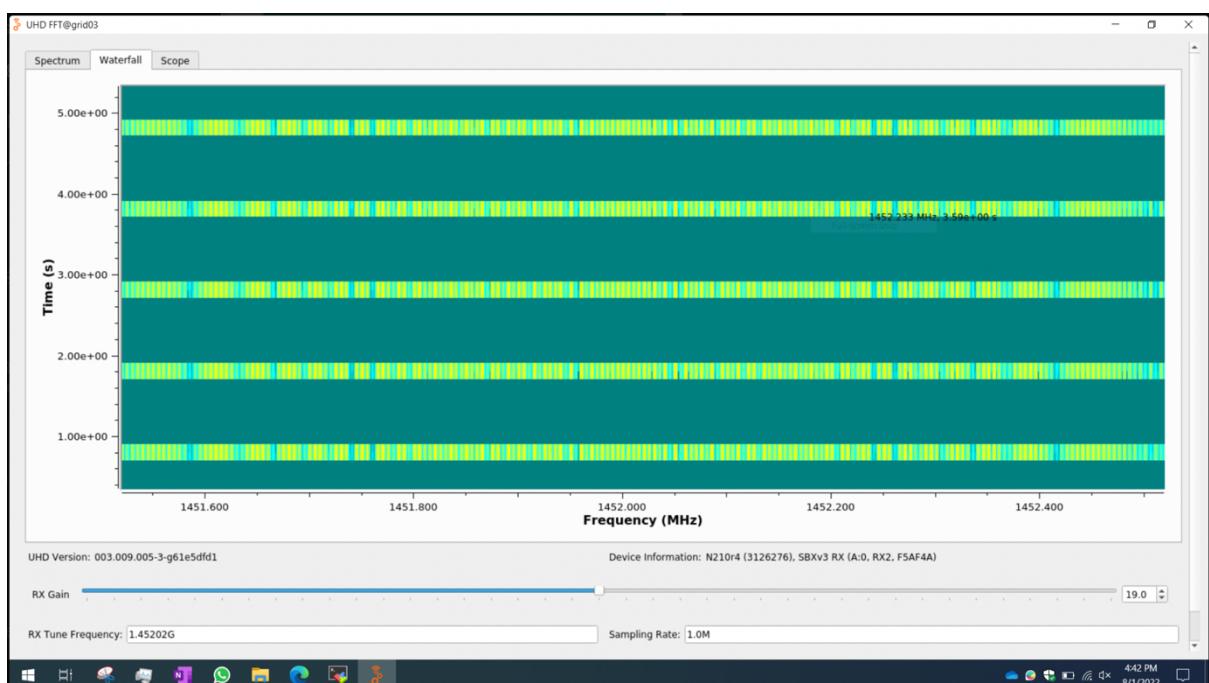


Figure 6: Jamming signal on for 0.2 seconds and off for 0.8 seconds

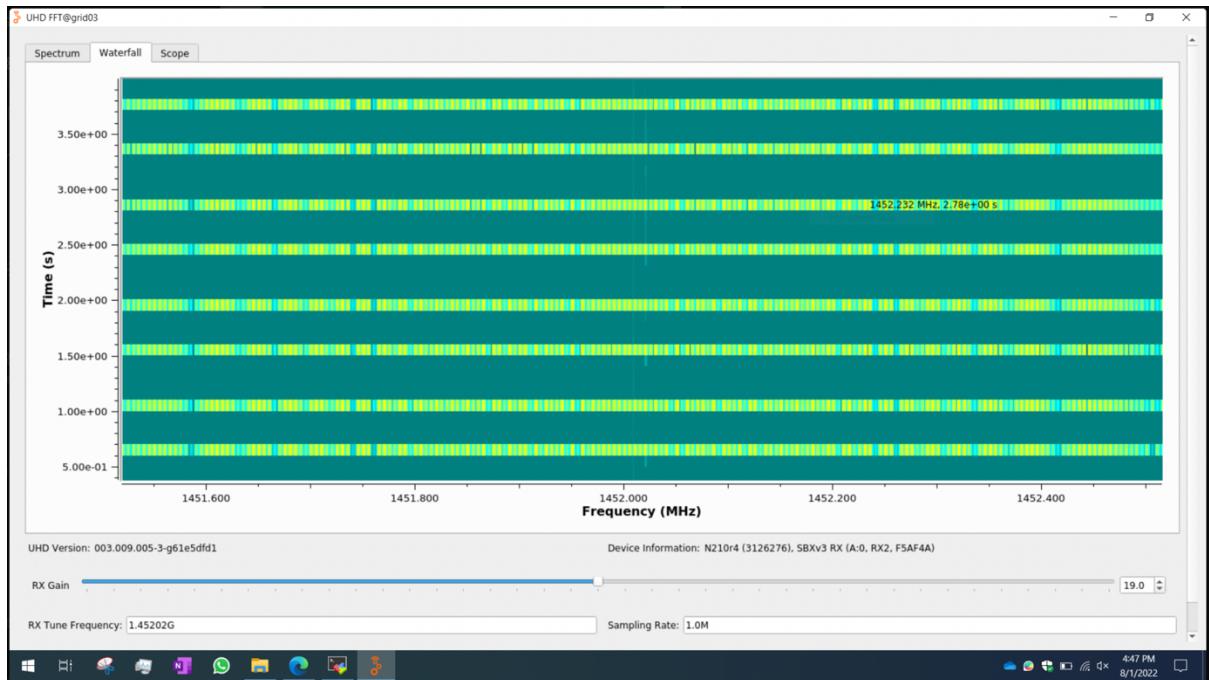


Figure 7: Jamming signal on for 0.1 seconds every 0.5 seconds

Figure 7 displays the most effective jammer settings as this prevents transmission more frequently, causing more data loss than in figure 5&6.