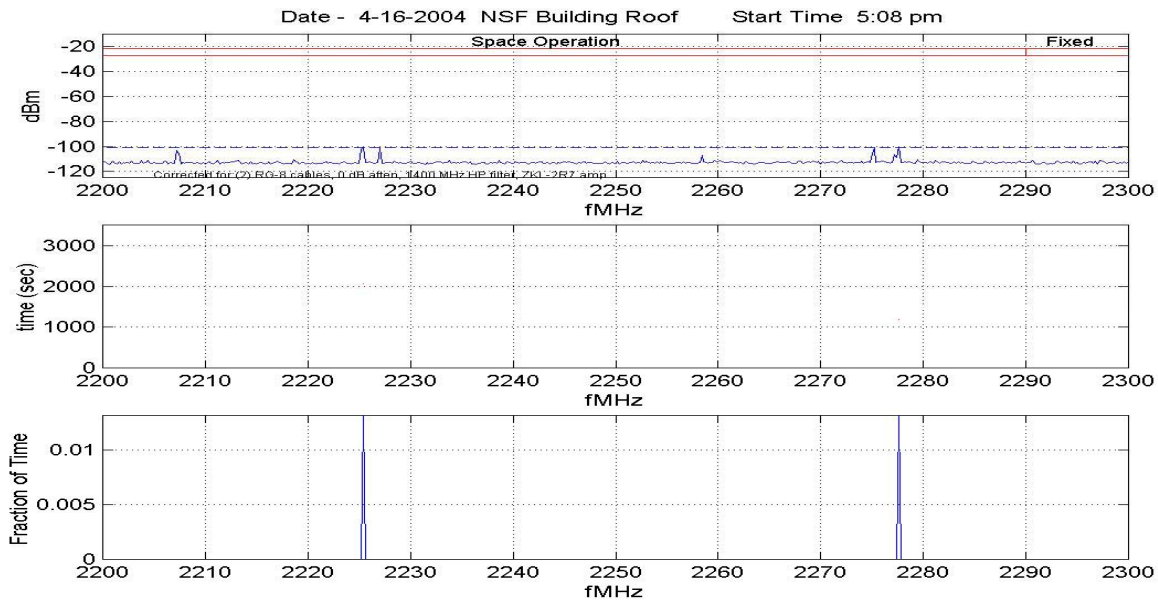


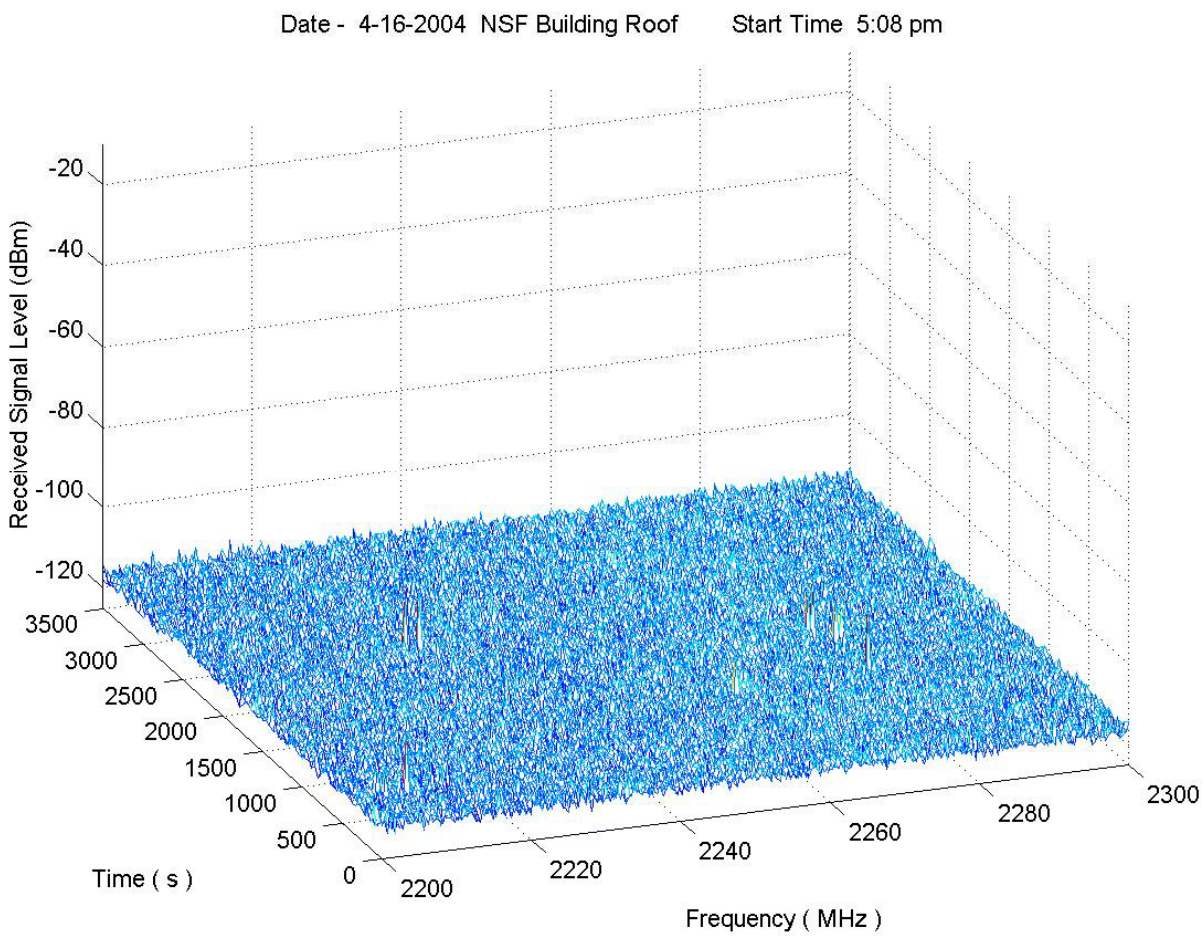
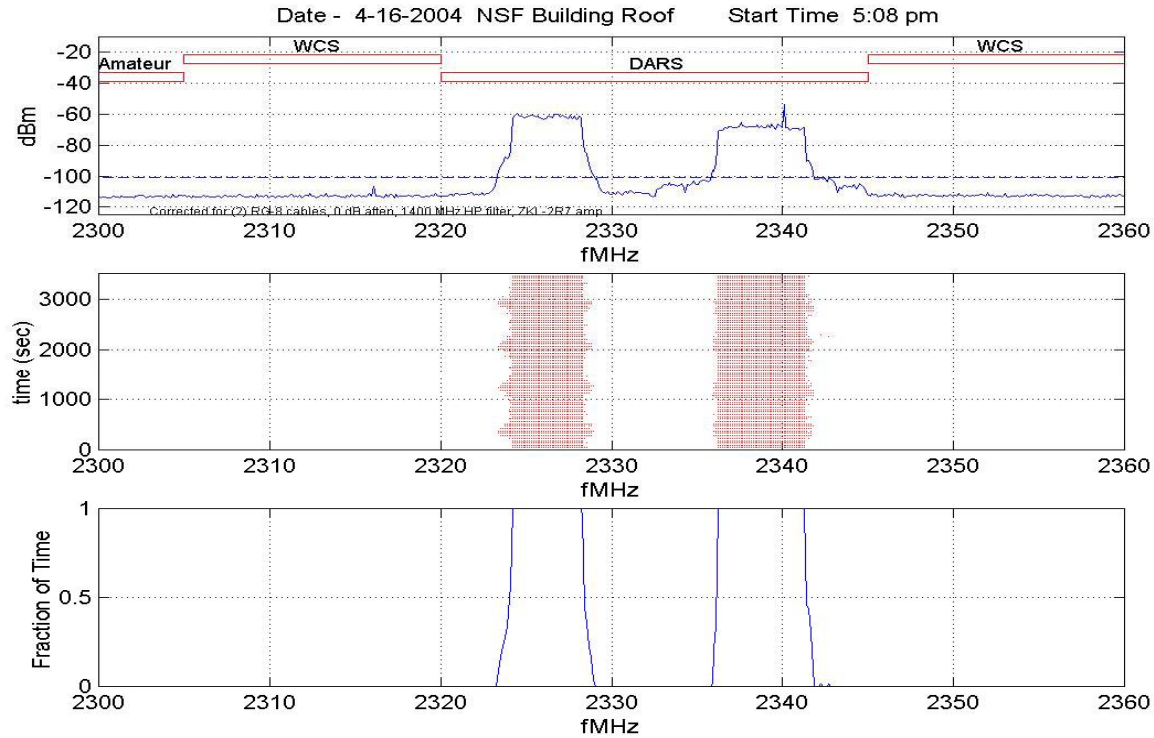


Figure 75: 2.2 GHz – 2.3 GHz (Antenna Rotating, NSF).



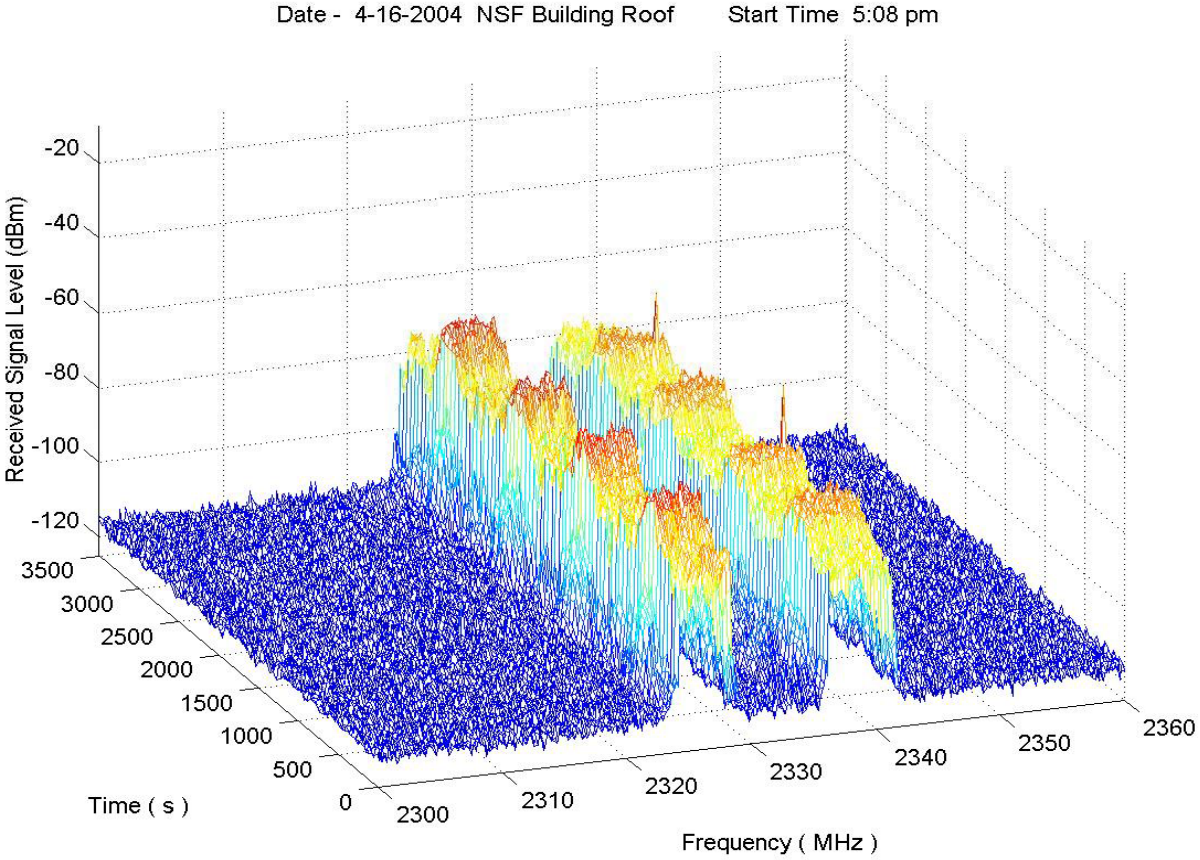
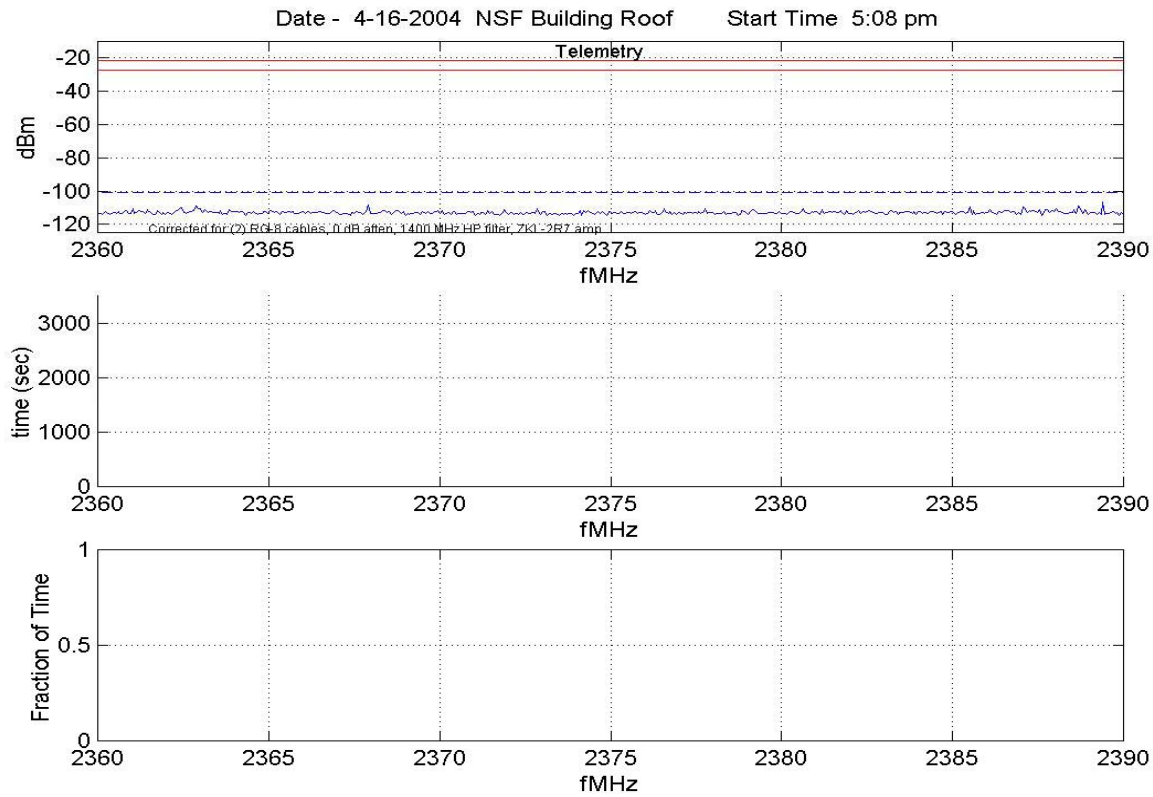


Figure 76: 2.3 GHz – 2.36 GHz (Antenna Rotating, NSF).



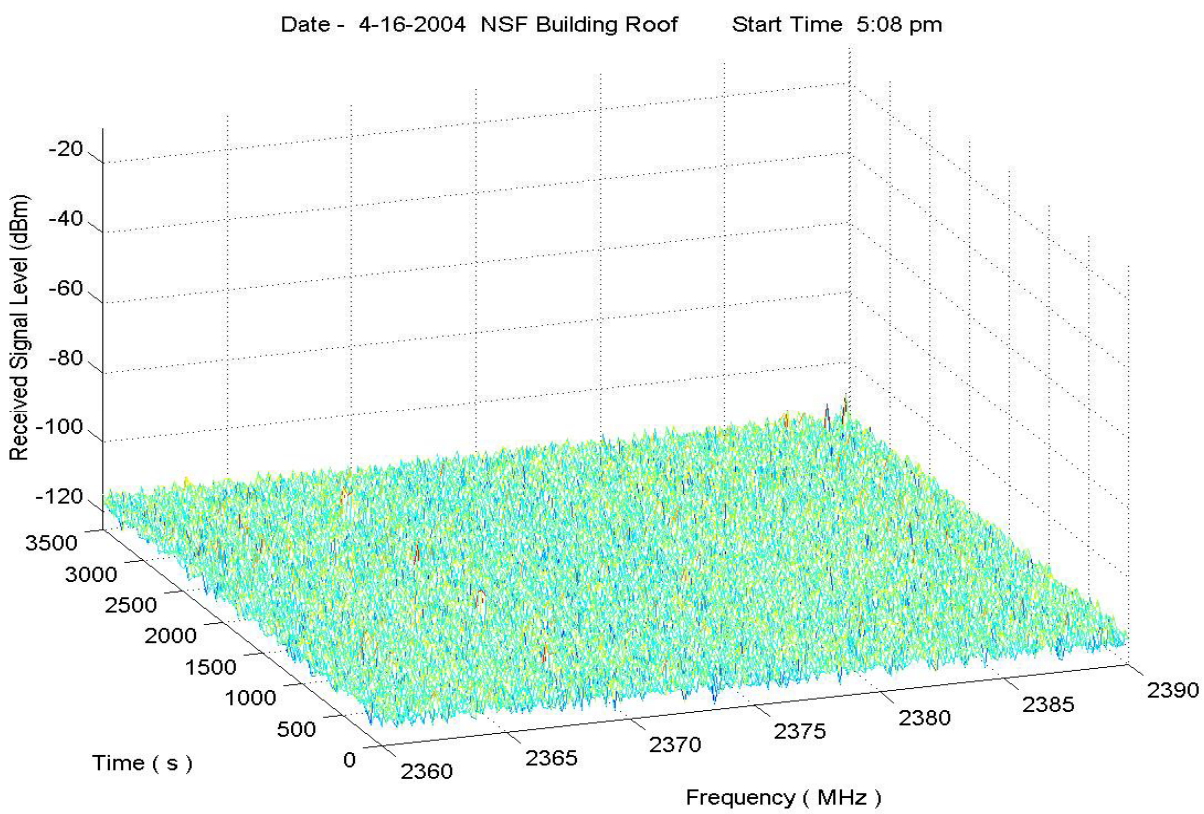


Figure 77: 2.36 GHz – 2.39 GHz (Antenna Rotating, NSF).

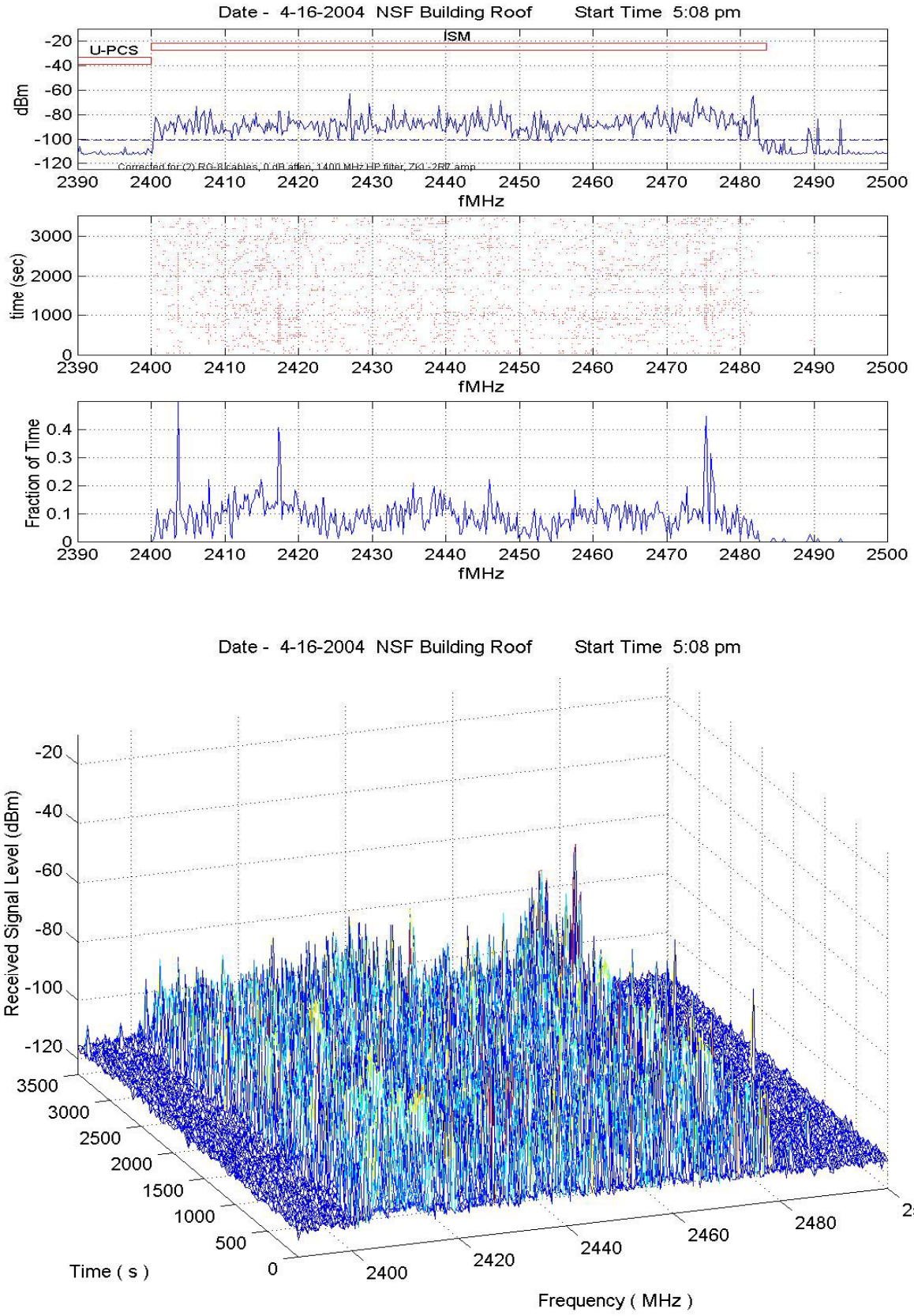


Figure 78: 2.39 GHz – 2.5 GHz (Antenna Rotating, NSF).

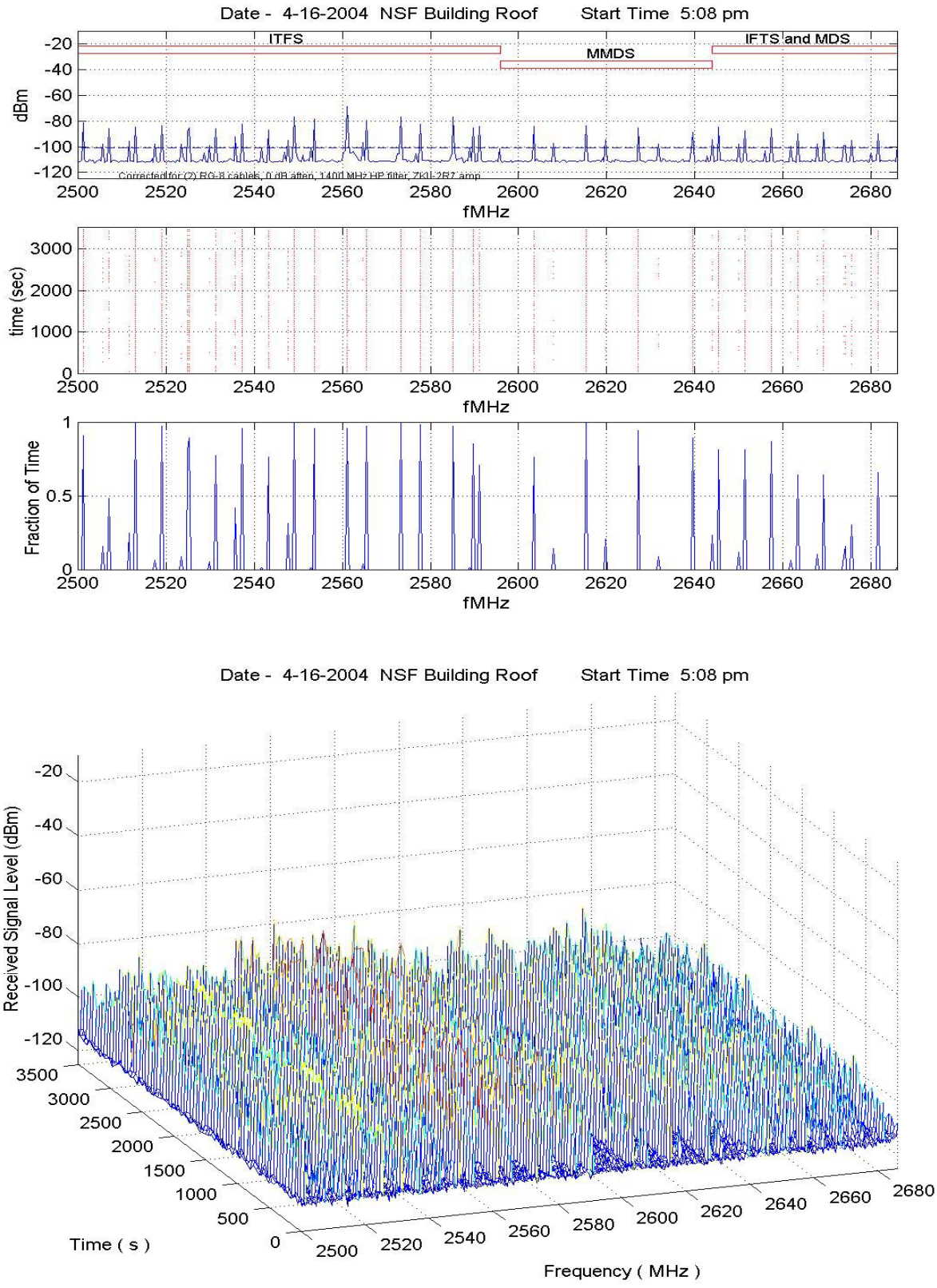
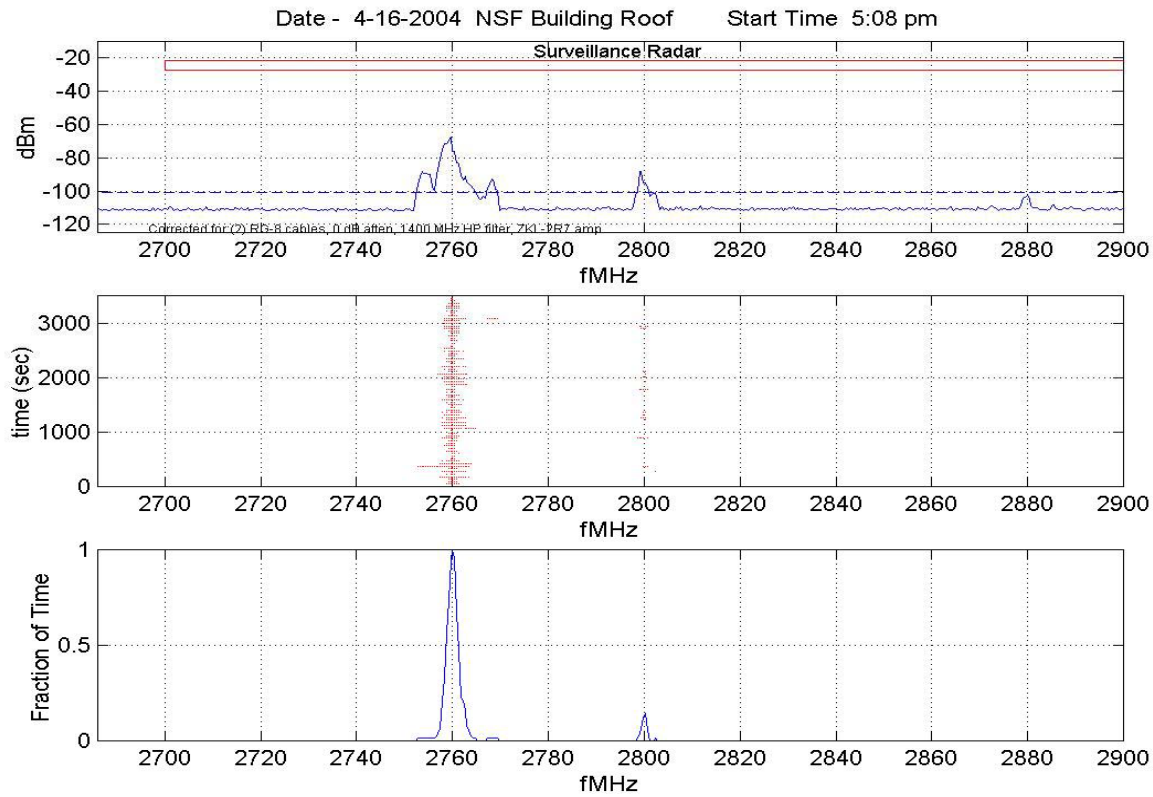


Figure 79: 2.5 GHz – 2.686 GHz (Antenna Rotating, NSF).



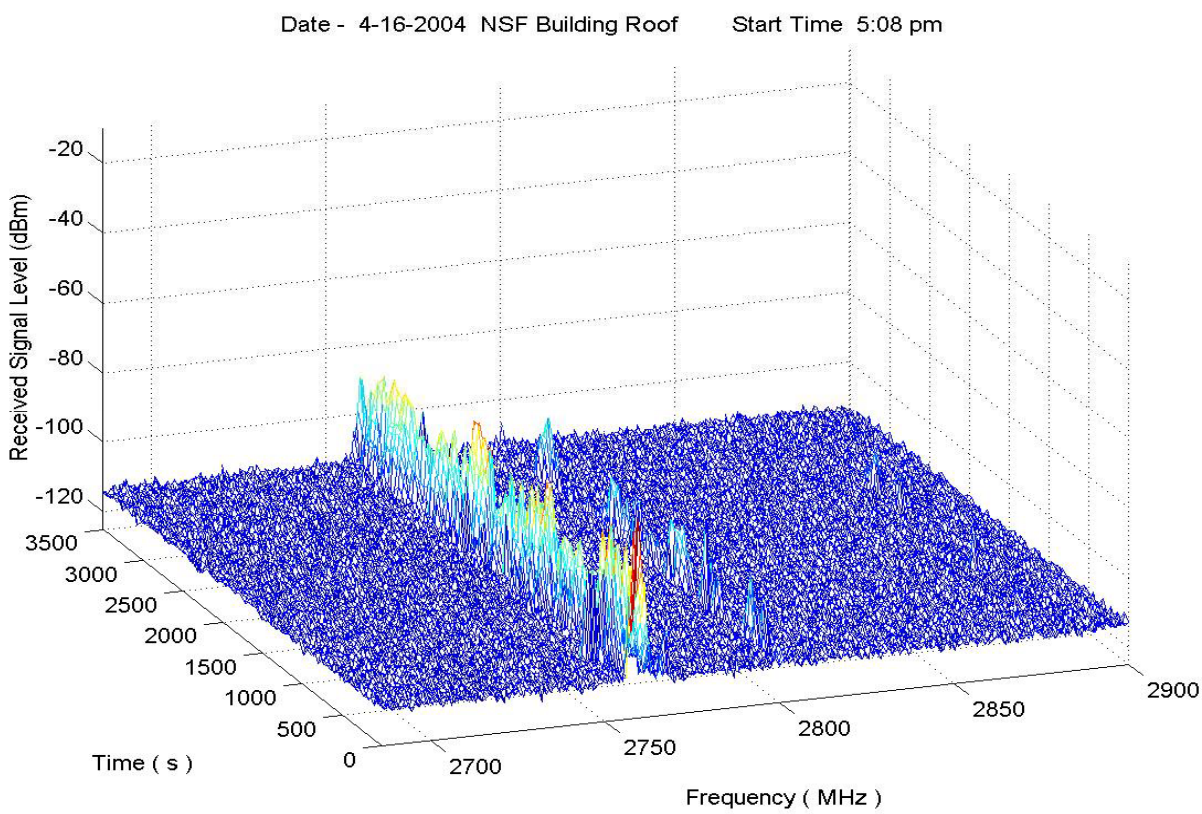


Figure 80: 2.686 GHz – 2.9 GHz (Antenna Rotating, NSF).

V. Appendix 1: Matlab Function Used to Calibrate the Data

The measured data was calibrated so that the plotted level is referenced to the antenna port. All cable, filter, and pre-amplifier losses/gains are calibrated out using the Matlab code below.

```
function [calib_dB]=calibrate4(fMHz,cable_type,atten,filter_type,amp_type);

%                   Create calibration file for measured spectrum data          McHenry  May 12 2002
%                   Added single RG 8 cable
%                   Added short jumper cable  Aug 2002
%                   Added new amplifier type  Dec 2002
%                   Added two new filter types  Jan 2003
%                   Added new filter type Apr 2004
%
%       fMHz                        frequency array in MHz
%       cable_type                  =1 for (1) RG-8 cables
%                                   =2 for (2) RG-8 cables
%                                   =3 for (3) RG-8 cables ( 1&2 added togther)
%                                   =4 for short (18") 'orange" cable
%       atten                       value of fixed attenuator in dB =0 for none, XX dB otherwise, XX > 0
%       filter_type                 =0 for none
%                                   =1 for 30-88 MHz bandpass
%                                   =2          for 225-450 MHz bandpass
%                                   =3          for 1400 MHz highpass
%                                   =4 for FM Bandstop (HLC-700)
%                                   =4 for FM bandstop "A"
%                                   =5 for FM bandstop "B"
%       ampl_type                   =0 for none
%                                   =1 for MC ZHL-2010
%                                   =2 for (3) MC ERA-5
%                                   =3 for MC ZKL-2R7
%
%       calib_dB                    additive correction in dB : measured (dBm) + calib_dB = power at antenna (dBm)
%                                   <0 for cable lossed, > 0 for amp gain
%

%       (1) RG-8 Cables
        fMHz_cable1=[0 290 580 870 1160 1450 1740 2030 2320 2620 3000];
        calib_cable1=[0 -1  -1.5   -2  -2   -2.5   -3   -3   -4  -4.5   -5];

%       (2) RG-8 Cables
        fMHz_cable2=[0 290 580 870 1160 1450 1740 2030 2320 2620 3000];
        calib_cable2=[0 -2  -3   -4  -4   -5   -6   -6   -8  -9   -10];

%       (3) RG-8 Cables
        fMHz_cable3=[0 290 580 870 1160 1450 1740 2030 2320 2620 3000];
        calib_cable3=[0 -3  -4.5   -6  -6   -7.5   -9   -9   -12  -13.5   -15];

%       Short (18") 'orange" cable
        fMHz_cable4=[0 100  3000];
        calib_cable4=[0 -0.2  -0.8];

%       MC ZHL-2010
        fMHz_amp1=[0 290 580 870 1160 1450 1740 2030 2320 2620 3000];
        calib_amp1=[22 22  22  22  22  20  18    -1  -17  -20   -20  -20];

%       (3) MC ERA-5
        fMHz_amp2=[0  290 580 870 1160 1450 1547 1643 1740 1837 1933 2030 2127 2223 2320 2620 3000];
        calib_amp2=[-20 -10 10 20  20   20    23  26    25   24   24   26  27   28    28   26   25];

%       (3) MC ZKL-2R7
        fMHz_amp3=[1   1000 2000 3000];
        calib_amp3=[22 22   22.5 22];

%       30-88 MHz Bandpass Filter
        fMHz_filter1=[0   20   25   30   35   40   75   80   85   88 90  3000];
        calib_filter1=[-30 -30  -3   -2  -1    -1   -1   -2   -2  -5 -30  -30];

%       225-450 MHz Bandpass Filter
```

```
fMHz_filter2=[0   166  200  225 250 275 300 325 350 375 400 425 450  475  500 525 550 3000];
calib_filter2=[-30 -30  -25  -10  -3  -2  -2  -2  -3  -3  -4  -4  -4  -20  -25 -30 -40  -30];

%       1400 MHz Highpass Filter
fMHz_filter3=[0   290 580 870 1160 1257 1353 1450 1547 1643 1740 1837 1933 2030 2127 2223 2320 2620 3000];
calib_filter3=[-60 -60 -60 -50 -20  -16  -3   -1    -1   -1   -1   -1   -1   -1   -1   -1   -1   -1];

%       FM Bandstop Filter(HLC-700)
fMHz_filter4=[0   60   70   80   90   96  100  105  110  120   130   140   150  1000];
calib_filter4=[0  -1    -5   -15 -30  -40  -45  -40  -10   -2   -1    -1    -.5   -0.5];

%       FM Bandstop "A" Filter  (spurious responses not shown 750-900 Hz and above 1000 MHz
fMHz_filter5=[0   60   70   80   90  94   96  102  110  120  130   140   150   200  3000];
calib_filter5=[0  0    -1   -2   -7  -20 -45  -45   -20  -4    -2   -1    -1    -.5   -1];

%       FM Bandstop "B" Filter  (spurious responses not shown above 1000 MHz)
fMHz_filter6=[0   60   70   80   90  95   97   100  108  110  115  120   130   140   150  3000];
calib_filter6=[0  0    -.5  -4  -18  -30   -40 -40  -40  -32  -10  -4    -2     -1   -.5  -1 ];

%       FM Bandstop "C" Filter
fMHz_filter7=[0   60   70   80 83 85  90  100  108  110  112  115  120   200 900  1200 1400 2600 3000];
calib_filter7=[0  0  -.5  -2  -5 -10 -35  -35  -35  -35  -10  -4  -2   -1  -1   -4  -6  -22 -16];

calib_dB=-abs(atten)*ones(1,length(fMHz));   %      Attenuation
if(cable_type == 1)
calib_dB=calib_dB + interp1(fMHz_cable1,calib_cable1,fMHz,'linear');
end;
if(cable_type == 2)
calib_dB=calib_dB + interp1(fMHz_cable2,calib_cable2,fMHz,'linear');
end;
if(cable_type == 3)
calib_dB=calib_dB + interp1(fMHz_cable3,calib_cable3,fMHz,'linear');
end;

if(amp_type == 1)
calib_dB=calib_dB + interp1(fMHz_amp1,calib_amp1,fMHz,'linear');
end;
if(amp_type == 2)
calib_dB=calib_dB + interp1(fMHz_amp2,calib_amp2,fMHz,'linear');
end;
if(amp_type == 3)
calib_dB=calib_dB + interp1(fMHz_amp3,calib_amp3,fMHz,'linear');
end;

if(filter_type == 1)
calib_dB=calib_dB + interp1(fMHz_filter1,calib_filter1,fMHz,'linear');
end;
if(filter_type == 2)
calib_dB=calib_dB + interp1(fMHz_filter2,calib_filter2,fMHz,'linear');
end;
if(filter_type == 3)
calib_dB=calib_dB + interp1(fMHz_filter3,calib_filter3,fMHz,'linear');
end;
if(filter_type == 4)
calib_dB=calib_dB + interp1(fMHz_filter4,calib_filter4,fMHz,'linear');
end;
if(filter_type == 5)
calib_dB=calib_dB + interp1(fMHz_filter5,calib_filter5,fMHz,'linear');
end;
if(filter_type == 6)
calib_dB=calib_dB + interp1(fMHz_filter6,calib_filter6,fMHz,'linear');
end;
if(filter_type == 7)
calib_dB=calib_dB + interp1(fMHz_filter7,calib_filter7,fMHz,'linear');
end;
```