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```
import radarClass
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close all
clear all
close all

% moon = imread('TooHigh.png');
% imshow(moon);
```

constants

```
c = physconst("lightspeed");
km = 10^3;
us = 10^-6;
k = physconst("Boltzman");
To = 290;
F = 1.25;
G = 10;
```

dragon defintions

```
dragon.lengthRange = [10 30];
dragon.RCSRange = [1 20];
dragon.speedRange = [0  500];
dragon.averageSpeed = 200;
dragon.maxAltitude = 15*km;

bewilderbeast.RCS = 1000;
bewilderbeast.maxSpeed = 100;
```

set paramters, create radar objects

```
dewds1 = radarClass("dewds1");
dewds2 = radarClass("dewds2");
```

```
radar =

  radarClass with properties:

                type: "dewds2"
             storage: []
              dopMax: []
              dopAvg: []
        antennaSizeX: 5
        antennaSizeY: 5
          numAntenna: 4
         antennaSpin: []
            rangeRes: []
                  Ae: 25
             TpTrack: 6.6713e-08
            TpSearch: 2.0014e-07
           PRISearch: []
            PRITrack: []
                freq: 1.0000e+09
              lambda: []
         PRIPerDwell: []
      bandWidthTrack: 1.4990e+07
     bandWidthSearch: 4.9965e+06
        TDwellSearch: []
         TDwellTrack: []
        TfsSearchMin: []
        TfsSearchMax: []
           PRFAvgMin: []
           PRFMaxMin: []
               PPeak: 1000000
                  Pt: 1000
            Pt_track: 50000
          duty_cycle: 1.0000e-03
                Gain: []
          rangeTrack: [300 30000]
         rangeSearch: [30000 300000]
          azCoverage: 6.2832
         elCoverageS: []
         elCoverageT: []
    solidAngleTrack: []
   solidAngleSearch: []
     beamWidthTrack: []
    beamWidthSearch: []
            nBeamsS: []
            nBeamsT: []
      R_warningTime: 300
    R_rangeResTrack: 10
   R_rangeResSearch: 30
      SNRmin_search: 398.1072
       SNRmin_track: []
                  c: 299792458
                  k: 1.3807e-23
                 To: 290
```

```
            Ls: 1
             F: 1.4130
  calcSNRTrack: []
 calcSNRSearch: []
```

calculation requirements

```
% required el angle
dewds1.elCoverageS = dewds1.elAngle(min(dewds1.rangeSearch),
 dragon.maxAltitude);

dewds2.elCoverageS = dewds2.elAngle(min(dewds2.rangeSearch),
 dragon.maxAltitude);
dewds2.elCoverageT = dewds2.elAngle(min(dewds2.rangeTrack),
 dragon.maxAltitude);

%min PRI
dewds1.PRISearch = dewds1.PRI_calc(max(dewds1.rangeSearch));
dewds1.PRIPerDwell = dewds1.beamWidthSearch/dewds1.PRISearch;

dewds2.PRISearch = dewds2.PRI_calc(max(dewds2.rangeSearch));
dewds2.PRITrack = dewds2.PRI_calc(max(dewds2.rangeTrack));

%total solid Angle coverage
dewds1.solidAngleSearch = dewds1.solidAngle(dewds1.elCoverageS);
dewds2.solidAngleSearch = dewds2.solidAngle(dewds2.elCoverageS);
dewds2.solidAngleTrack = dewds2.solidAngle(dewds2.elCoverageT);

%beamWidth
%beamWidth @ 1 GHz
GHz = 1*10^9;

dewds1BW_preCalc = dewds1.beamWidth(1*GHz, dewds1.antennaSizeX);
dewds2BW_preCalc = dewds2.beamWidth(1*GHz, dewds2.antennaSizeX);


%beamwidth for Radar Freq
dewds1.beamWidthSearch = dewds1.beamWidth(dewds1.freq,
 dewds1.antennaSizeX);
dewds2.beamWidthSearch = dewds2.beamWidth(dewds2.freq,
 dewds2.antennaSizeX);
dewds2.beamWidthTrack = dewds2.beamWidth(dewds2.freq,
 dewds2.antennaSizeX);


dewds1.nBeamsS = dewds1.beamCoverage(dewds1.solidAngleSearch,
 dewds1.beamWidthSearch, dewds1.beamWidthSearch);
dewds2.nBeamsS = dewds2.beamCoverage(dewds2.solidAngleSearch,
 dewds2.beamWidthSearch, dewds2.beamWidthSearch);
dewds2.nBeamsT = dewds2.beamCoverage(dewds2.solidAngleTrack,
 dewds2.beamWidthTrack, dewds2.beamWidthTrack);
```

Search and Track TFS

```
numPulses = 1:2;
dewds1 = dewds1.time_range(0, max(dragon.speedRange), 0);
dewds2 = dewds2.time_range(numPulses, max(dragon.speedRange), 25); %%
 too many dragons at this speed
dewds2 = dewds2.time_range(numPulses, max(dragon.speedRange), 18); %%
 can only use 1 pulse, # of dragons okay
dewds2 = dewds2.time_range(1, dragon.averageSpeed, 47); % we can use 1
 pulse and track 48 avg speed dragons.
dewds2 = dewds2.time_range(numPulses, dragon.averageSpeed, 23); % we
 can use 2 pulses and track 23 avg speed dragons
```

```
Number of dragons is too high!Number of dragons is too high!
```

Sweep Duty Cycles to see a range of Pave we can get

```
dutyCycle = 0.1:0.1:0.5;        % 10% - 50% duty cycle in 10%
 increments
pAve = dewds1.sweep_Pave(1e6, dutyCycle);

dewds2 = dewds2.SNRTrack(dragon.RCSRange);
dewds2 = dewds2.SNRSearch(dragon.RCSRange);
testSNR = 10*log10(dewds2.calcSNRSearch(1));

dewds1 = dewds1.SNRSearch(dragon.RCSRange);
testSNR = 10*log10(dewds1.calcSNRSearch(1));


dewds1.storage = calc_storage(dewds1);
dewds2.storage = calc_storage(dewds2);
% figure
% plot(dutyCycle.*100, pAve./1e3)
% xlabel('Duty Cycle (%)')
% ylabel('P_{ave} (kW)')
% grid on
% title('Avg Power from duty cycle')

%  dewdrs1 = time_range(dewds1,  num_pulse, maxspeedRange,
 dragons_Tracked);
dewds1 = dewds1.time_range(numPulses, max(dragon.speedRange), 18); %%
 can only use 1 pulse, # of dragons okay

dewds1.storage = calc_storage(dewds1, dragon)
dewds2.storage = calc_storage(dewds2, dragon)
```

```
stop
stop
```

```
dewds1 =
```

```
radarClass with properties:

              type: "dewds1"
           storage: [44.7191 17.8877]
            dopMax: 1.6678e+03
            dopAvg: 667.1282
       antennaSizeX: 5
       antennaSizeY: 5
         numAntenna: 1
        antennaSpin: 60
           rangeRes: []
                 Ae: 25
            TpTrack: []
           TpSearch: 2.0014e-07
          PRISearch: 0.0020
           PRITrack: []
               freq: 500000000
             lambda: 0.5996
        PRIPerDwell: []
     bandWidthTrack: []
    bandWidthSearch: 4.9965e+06
       TDwellSearch: 0.0335
        TDwellTrack: []
       TfsSearchMin: 8.2713
       TfsSearchMax: 19.2107
          PRFAvgMin: 1.3343e+03
          PRFMaxMin: 3.3356e+03
              PPeak: 1000000
                 Pt: 1000
           Pt_track: []
         duty_cycle: 1.0000e-03
               Gain: 866.4796
         rangeTrack: []
        rangeSearch: [30000 300000]
         azCoverage: 6.2832
        elCoverageS: 0.4636
        elCoverageT: []
    solidAngleTrack: []
   solidAngleSearch: 2.8099
     beamWidthTrack: []
    beamWidthSearch: 0.1067
            nBeamsS: 246.6911
            nBeamsT: []
      R_warningTime: 300
    R_rangeResTrack: 10
   R_rangeResSearch: 30
      SNRmin_search: 398.1072
       SNRmin_track: []
                  c: 299792458
                  k: 1.3807e-23
                 To: 290
                 Ls: 1
                  F: 1.4130
       calcSNRTrack: []
```

```
        calcSNRSearch: [2.9680e+06 296.8039]


dewds2 =

  radarClass with properties:

                type: "dewds2"
             storage: [178.6955 71.4782]
              dopMax: 3.3356e+03
              dopAvg: 1.3343e+03
        antennaSizeX: 5
        antennaSizeY: 5
          numAntenna: 4
         antennaSpin: []
            rangeRes: []
                  Ae: 25
             TpTrack: 6.6713e-08
            TpSearch: 2.0014e-07
           PRISearch: 0.0020
            PRITrack: 2.0014e-04
                freq: 1.0000e+09
              lambda: 0.2998
         PRIPerDwell: []
      bandWidthTrack: 1.4990e+07
     bandWidthSearch: 4.9965e+06
        TDwellSearch: [0.0020 0.0040]
         TDwellTrack: [2.0014e-04 4.0028e-04]
        TfsSearchMin: [1.9749 3.9498]
        TfsSearchMax: 24.0134
           PRFAvgMin: 2.6685e+03
           PRFMaxMin: 6.6713e+03
               PPeak: 1000000
                  Pt: 1000
            Pt_track: 50000
          duty_cycle: 1.0000e-03
                Gain: 3.4659e+03
         rangeTrack: [300 30000]
        rangeSearch: [30000 300000]
         azCoverage: 6.2832
        elCoverageS: 0.4636
        elCoverageT: 1.5508
      solidAngleTrack: 6.2819
     solidAngleSearch: 2.8099
       beamWidthTrack: 0.0534
      beamWidthSearch: 0.0534
              nBeamsS: 986.7644
              nBeamsT: 2.2060e+03
        R_warningTime: 300
       R_rangeResTrack: 10
      R_rangeResSearch: 30
        SNRmin_search: 398.1072
         SNRmin_track: []
                    c: 299792458
```

```
             k: 1.3807e-23
            To: 290
            Ls: 1
             F: 1.4130
  calcSNRTrack: [1.3210e+11 1.3210e+03]
 calcSNRSearch: [3.7100e+06 371.0049]
```

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