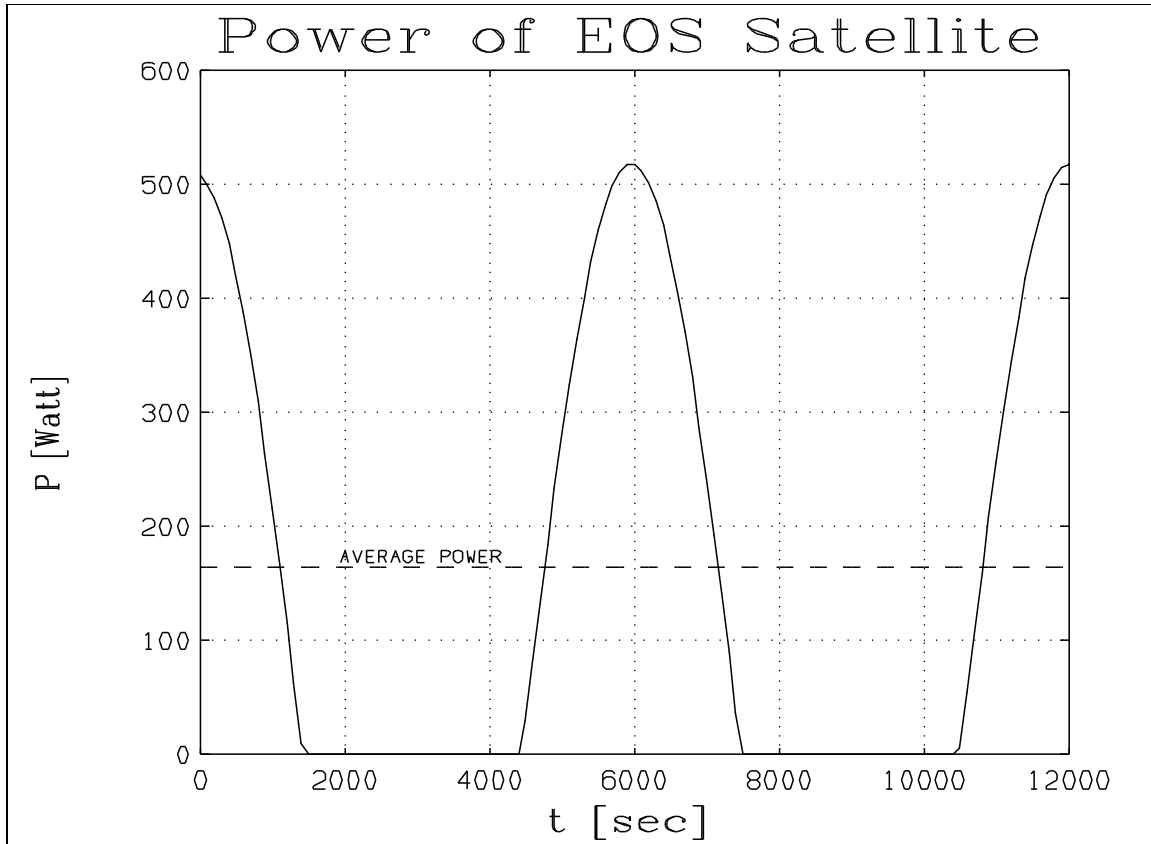


## EOS Power Analysis

The SatLab graph below analyzes the power output of an Earth Observation Satellite under maximum solar gain.



**Figure 1: Calculated EOS power levels**

The script that generated this graph is shown below.

**Note:** This example was generated in seven seconds with 1.2GHz Pentium 4 under Linux.

### Script

```
% Demo: EOS satellite
%
% This demo sets up a satellite for earth observation that passes
% over the earth at noon for optimum light conditions
%

removeAll;
clearGraphic();
setSimEpoch(2000,3,21,12,0,0);
```

```

addEpoch('equinox',2000,3,21,12,0,0);
addSatellite('EOS Sat',7171,0,98,0,0,0,'equinox');

%earthstation
earth0 = "Frankfurt";
addStation('Frankfurt', I_earth, 10, 50.05, 8.4, 0.1);

dtime=100;
alphaleft = 45 *d2r;
alphanop   = 0  *d2r;
alphanright=-45 *d2r;

setSimTime(0);
setSimStepSize(dtime);

t=0:dtime:120*dtime;
fleft = rotx(alphaleft)*[ 0
                          0
                          -1 ];
ftop  = rotx(alphanop)* [ 0
                          0
                          -1 ];
fright= rotx(alphanright)*[ 0
                             0
                             -1 ];

z_matrix = [ 0   26.75 27.25 27.75 28.25 28.75 29.25 29.75 30.25 30.75
31.25
              100 12.39 12.23 12.14 12.14 11.95 10.64 10.51 10.33 10.14
9.94
              90  12.67 12.59 12.50 12.39 12.26 11.76 11.68 11.36 11.48
11.36
              80  12.77 12.73 12.68 12.63 12.57 12.31 12.27 12.22 12.17
12.11
              70  12.78 12.76 12.74 12.71 12.68 12.55 12.53 12.51 12.48
12.45
              60  12.74 12.73 12.72 12.71 12.69 12.63 12.62 12.61 12.60
12.68
              50  12.68 12.68 12.67 12.67 12.66 12.63 12.63 12.62 12.62
12.91
              40  12.61 12.61 12.61 12.61 12.60 12.59 12.59 12.79 12.88
13.18
              30  12.53 12.53 12.53 12.53 12.53 12.53 12.57 12.63 12.73
12.72
              20  12.46 12.45 12.45 12.45 12.45 12.45 12.45 12.45 12.65
12.45
              10  12.38 12.38 12.38 12.38 12.38 12.38 12.38 12.38 12.58
12.38
              0   12.30 12.30 12.30 12.30 12.30 12.30 12.30 12.30 12.40
12.30
              -10 12.22 12.22 12.22 12.22 12.22 12.22 12.22 12.22 12.22
12.22
              -20 12.14 12.14 12.14 12.14 12.14 12.14 12.14 12.14 12.14
12.14
              -30 12.06 12.06 12.06 12.06 12.06 12.06 12.06 12.06 12.06
12.06

```

```

-40 11.98 11.98 11.98 11.98 11.98 11.98 11.98 11.98 11.98 11.98
11.98
-50 11.70 11.84 11.90 11.90 11.90 11.90 11.90 11.90 11.90 11.90
11.90
-60 11.32 11.62 11.72 11.82 11.82 11.82 11.82 11.82 11.82 11.82
11.82
-70 11.14 11.24 11.44 11.64 11.74 11.74 11.74 11.74 11.74 11.74
11.74
-80 10.95 10.95 11.35 11.45 11.65 11.65 11.65 11.65 11.65 11.65
11.65 ];

j=0;
temptop = 0;
templeft = 0;
tempright= 0;

solarflux = 1420;
alpha = 0.65;
epsilon = 0.81;
albedo = 0.3;
sigma = 5.67e-8;
capacity = 660;
qir = 0;
strings_top = 4;
strings_side = 10;

eview=0.045;
dt=60;

dtc = dt/capacity;

reference_flux_si = 1353;
voltage=28;
current=zeros(size(t));
for i=t,j=j+1;
    stepSim;
    [d,r,a,e,v]=PlanetPosition();
    theta = ftop' * unitvector(a(2),e(2));
    theta = max(0,theta);

    temptop= temptop+((theta*solarflux*alpha)-(epsilon*(temptop^4)
*sigma))*(dtc);
    current_top = ((strings_top*theta)*table(z_matrix,(temptop-273.15),
voltage)
*((solarflux/reference_flux_si)/
12));

    theta = fleft' * unitvector(a(2),e(2));
    theta = max(0,theta);

    templeft= (templeft+
(((theta*solarflux*alpha)+
(theta*solarflux*albedo*alpha*eview)
-(epsilon*(templeft^4)*sigma)
+theta*qir)
*(dtc)));

```

```
current_left = ((strings_side*theta)*
                table(z_matrix,(templeft-273.15),voltage)
                *((solarflux/reference_flux_si)/12));

theta = fright' * unitvector(a(2),e(2));
theta = max(0,theta);

tempright= (tempright+
            (((theta*solarflux*alpha)+
            (theta*solarflux*albedo*alpha*eview))
            -(epsilon*(tempright^4)*sigma)+theta*qir)
            *(dte));
current_right = ((strings_side*theta)
                 *table(z_matrix,(tempright-273.15),voltage)
                 *((solarflux/reference_flux_si)/12));
current(j)=current_top+current_left+current_right;

end
average=sum(current*voltage)/prod(size(t));
erase
window('111');
plot(t,current*voltage,
      t,ones(size(t))*average, 'grid');
title('Power of EOS Satellite')
ylabel('P [Watt]');
xlabel('t [sec]')
wtext(2000,average+10,'Average Power');
```