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```
%Demodulator. Created by David McKnight, April/May 2018
```

Preliminary: Grab Signal

```
signal = am_signal';
```

Preliminary: Prepare Time Information

```
ts = 1/320000;   %Time between samples
tmax = 0.625;    %Maximum time
t = (0:1:200000-1)*tmax/(200000-1);    %Time values
```

Part 1: Tuning/Bandpass Filter

```
i = 0;               %number of 4.5kHz offsets for carrier frequency
f0 = (20 + 4.5*0)*10^3      %carrier frequency (Hz)
w0 = f0*2*pi;        %carrier freq (radians/s)
B  = 2000*2*pi;      %4000 Hz bandwidth
num = [B, 0];        %Bs in the numerator
den = [1, B, w0^2];  %s^2 + Bs + w0^2 in the denominator
sys = tf(num, den);  %Bandpass filter transfer function
signal = lsim(sys, signal, t);  %Apply the bandpass filter to the
 signal
```

```
f0 =

     20000
```

Part 2: Half-wave Rectification

```
lambda = (@(x) (x>0)*x);
signal = arrayfun(lambda, signal);
```

Part 3: Lowpass Filter:

```matlab
num = 2.49367*10^16
den = [1, 32837.5, 5.39151*10^8, 5.18549*10^12, num]
sys = tf(num, den); %2000 Hz second-order lowpass filter
signal = lsim(sys^2, signal, t);  %Apply the lowpass filter to the
 signal
```

num =

   2.4937e+16

den =

   *1.0e+16 ***

    0.0000   0.0000   0.0000   0.0005   2.4937

Part 4: Remove DC Offset

```matlab
signal = signal-mean(signal(1000:end));
```

Part 5: Down-sample:

```matlab
signal = decimate(signal, 40, 'fir');
```

Part 6: Play back:

```matlab
sound(signal, 8000)
```

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