1 - Κώδικας matlab

```matlab
[s, fs] = audioread('dsbmix.wav');
t = (0:length(s)-1)' / fs;


fc_candidates = 10000:1:14000;
phases = [0, pi/4, pi/2, 3*pi/4, pi];

max_Ey = -1;
best_fc = 0;
best_phase = 0;


for fc = fc_candidates
    for phase = phases
        carrier = cos(2*pi*fc*t + phase);
        y = s .* carrier;
        Ey = sum(y.^2);

        if Ey > max_Ey
            max_Ey = Ey;
            best_fc = fc;
            best_phase = phase;
        end
    end
end

fprintf('Βέλτιστη συχνότητα: %d Hz\n', best_fc);
fprintf('Βέλτιστη φάση: %f rad\n', best_phase);
fprintf('Μέγιστη ενέργεια Ey: %f\n', max_Ey);


carrier_opt = cos(2*pi*best_fc*t + best_phase);
y_opt = s .* carrier_opt;


fc_cutoff = 4000;
y_filtered = lowpass_filter(y_opt, fs, fc_cutoff);
m = 2 * y_filtered;

audiowrite('demodulated.wav', m, fs);
sound(m, fs);


function y_filtered = lowpass_filter(x, fs, fc)
    order = 50;
    nyq = fs/2;
    normal_cutoff = fc / nyq;
    b = fir1(order, normal_cutoff, 'low');
    y_filtered = filter(b, 1, x);
end
```


2 - Αποτελέσματα

Μέγιστη ενέργεια Ey: 72.206832
Λέξη m(t) που ακούγεται: Άνεμος
Συχνότητα μίξης fc: 13543 Hz
Φάση θ: 2.356194 rad