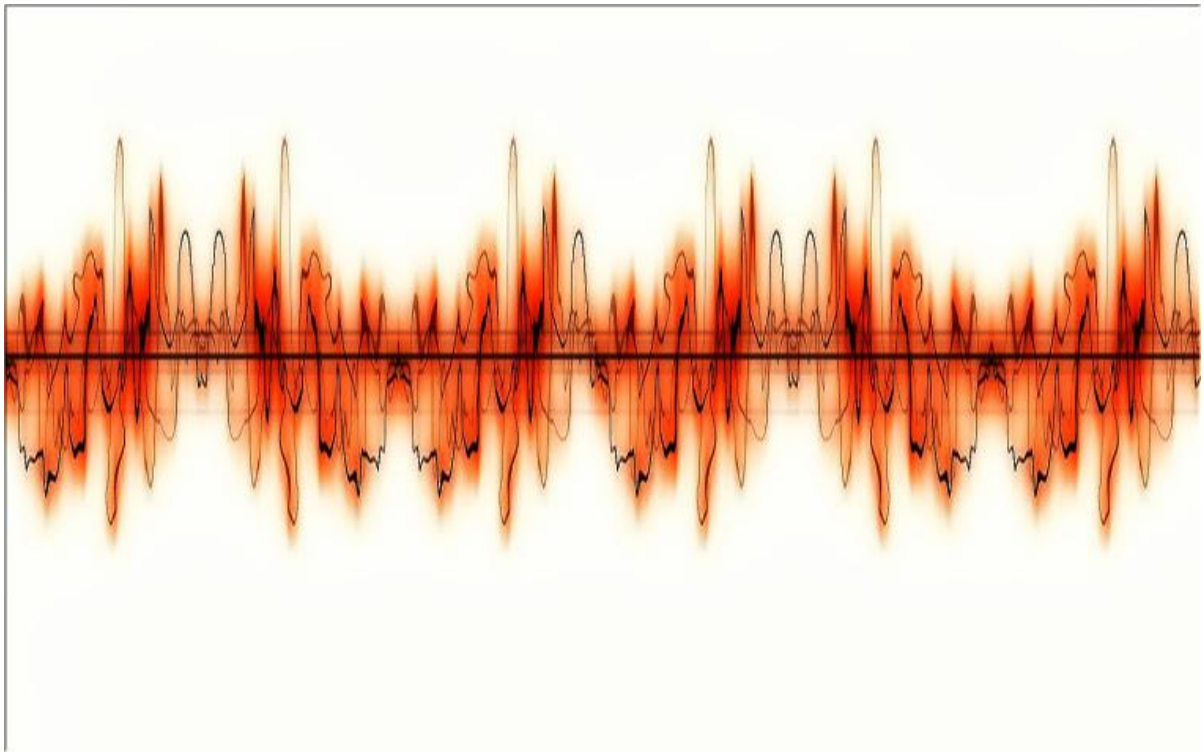
Tarih

Marmara Üniversitesi
Köklü Geçmiş... Güçlü Gelecek...

Teknik Bilimler Meslek Yüksekokulu
Elektronik Teknolojisi

Analog Haberleşme Dersi

Not Defteri



Öğrencinin

Adı:

Soyadı:

Nosu:

Dersin Öğretim Üyesi:Serkan AYDIN

Tarih

-MODERN ELEKTRONİK HABERLEŞME

GENEL BAKIŞ

TEMEL KAVRAMLAR

gütültü,bantgenişliği LC devreleri ,osilatörler,filitreler

GENLİK MODÜLASYONU

Am modülasyonu ve temelleri, demodülasyon, Matematiksel ifadeler,sinyal şekilleri, güç ölçümleri, AM jeneratör devreleri

TEK YAN BANT MODÜLASYONU

Tek yan bant karakteristiği, Tek yan bant üretimi,SSB filitreler-vericiler-demodulatörler ve alıcılar

FREKANS MODÜLASYONU

açısal modülasyon , fm jeneratör devreleri, Gürültü bastırma, Stereo FM, FM alıcılar, FR kuvvetlerdirici, Limitör, Fark alıcı- diskriminatör, PLL

TELEVİZYON

Yayın Gönderme ve Alma Prensipleri

(seçmeli dersi bulunmaktadır)

KOMİNİKASYON TEKNİKLERİ

Frekans dönüşümleri, Frekans Üretimi,Direkt Sayısal Üretim

Tarih

SAYISAL HABERLEŞME İLETİM

Darbe Kod Modülasyonu, Bilgisayarda paralel ve seri iletişim

(seçmeli dersi bulunmaktadır)

SAYISAL HABERLEŞMEDE KODLAMA TEKNİKLERİ

kodlama, ASCI, Sayısal sinyal kodlama formatları, kod hata tespiti ve doğrulama

(seçmeli dersi bulunmaktadır)

ŞEBEKE HABERLEŞMESİ

Basit Telefon Operasyonu, Modem,CEp Telefonları, Telefon Trafiği, Bilgisayar Ağları ve Protokoller, LAN, Internet

(seçmeli dersi bulunmaktadır)

İLETİM HATLARI

İletim hattının elektriksel karakteristiği, Simit Abağı

(seçmeli dersi bulunmaktadır)

DALGA PROPOGASYONU

Elektro Manyetik Dalga, Gökyüzünde dalga yayılımı, Uydu Haberleşmesi

(seçmeli dersi bulunmaktadır)

ANTENLER

Basit Anten Teorisi, Anten boyu hesabı, Anten Çeşitleri

(seçmeli dersi bulunmaktadır)

DALGA KILAVUZLARI VE RADAR

İletim hatlarının karşılaştırılması, Dalga kılavuzları tipleri,sonlandırma ve zayıflatma

MİKRODALGA VE LAZERLER

mikrodalga antenler, mikrodalga tüpler, feritler, LNA, Lazer

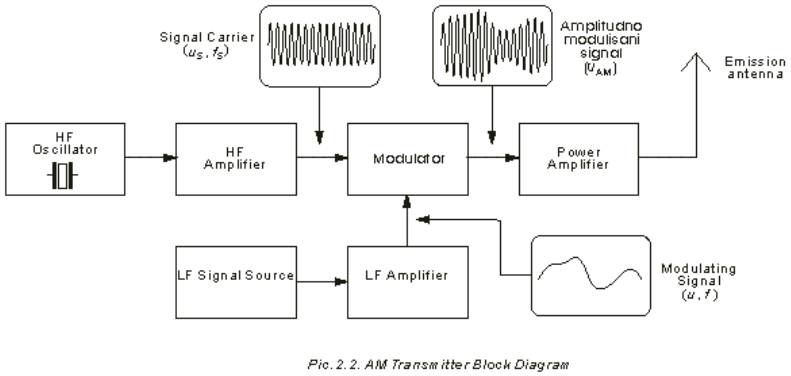
FİBER OPTİK

Işık, optik fiber, fiberde zayıflama ve dispersiyon,ışık kaynakları,dedektörler, konektörleri Fiber alıcı vericiler

(seçmeli dersi bulunmaktadır)

Tarih

TEMEL KAVRAMLAR



Pic. 2. 2. AM Transmitter Block Diagram

Verici Alıcı

Modülasyon

Neden Modülasyon

1

2

3

4

5

Tarih

Radyo Frekans Spektrumu

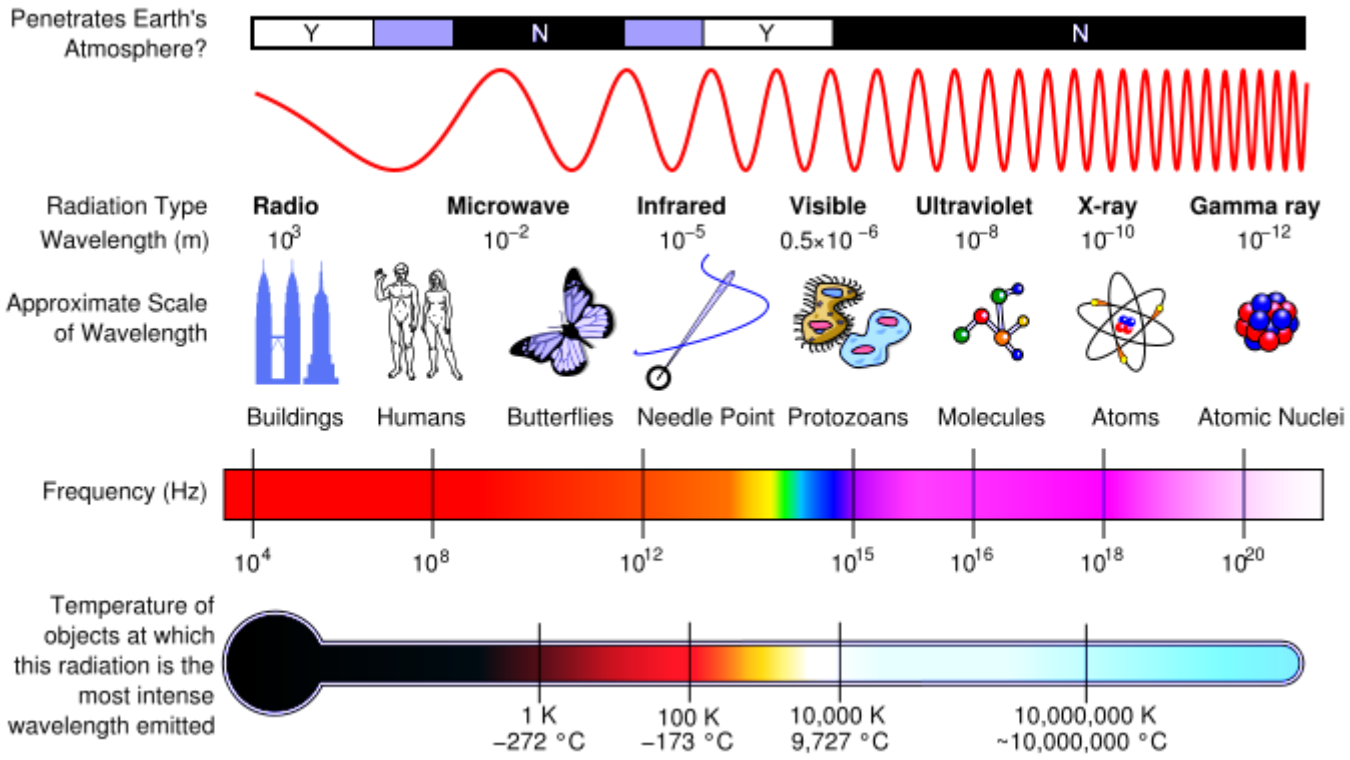


Table No.1

Range	Frequency	Wavelength
Long waves (LF)	30 - 300 kHz	10 km - 1 km
Mid waves (MF)	300 - 3000 kHz	100 m - 100 m
Short waves (HF)	3 - 30 MHz	100 m - 10 m
Ultra short waves:		
a. Metre range (VHF)	30 - 300 MHz	10 m - 1 m
b. Decimetre range (UHF)	300 - 3000MHz	100 cm - 1 cm
c. Centimetre range (SHF)	3 - 30 GHz	10 cm - 1 cm
d. Millimetre range (EHF)	30 - 300 GHz	10 mm - 1 mm

GÜRÜLTÜ

HARİCİ GÜRÜLTÜLER

Tarih

Atmosferik Gürültüler

Uzay Gürültüleri

DAHİLİ GÜRÜLTÜLER

Termik Gürültü

Transistör Gürültüsü

FREKANS GÜRÜLTÜ ETKİSİ

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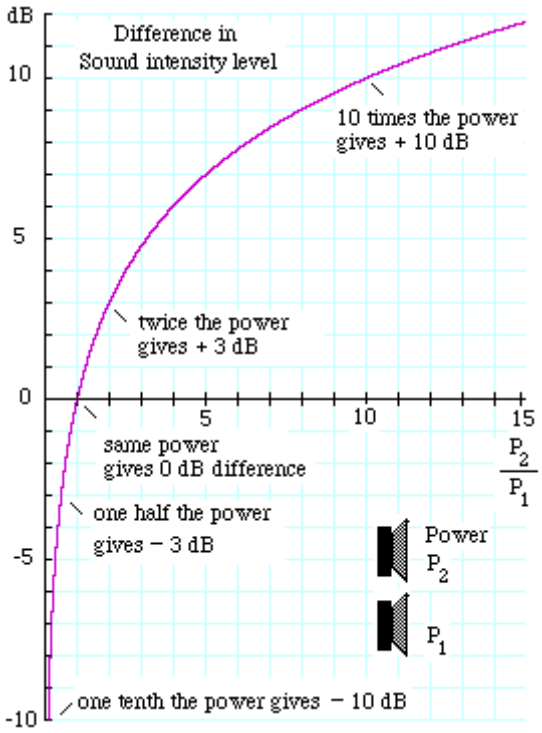
SİNYAL GÜRÜLTÜ ORANI

Noise Figure:

LOGARİTMİK HESAPLAMALAR



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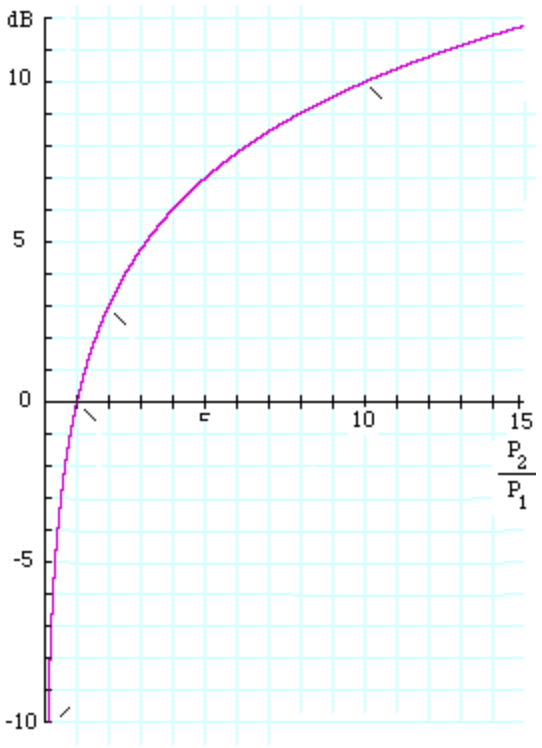
dB Hesaplamaları

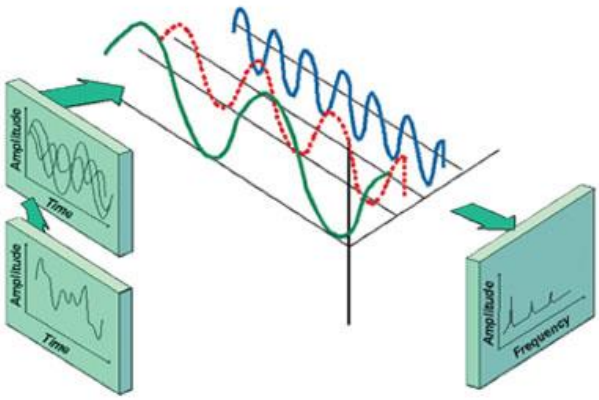
Örnek:



Tarih

BİLGİ VE BANTGENİŞLİĞİ

Fourier Analizi



$$ef(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos\frac{n\pi x}{L} + b_n \sin\frac{n\pi x}{L} \right)$$

$\sin x = \frac{e^{jx} - e^{-jx}}{2j}$ $\cos x = \frac{e^{jx} + e^{-jx}}{2}$

$$e^{-j2\pi ft}$$

$$\int$$

Tarih

Seçili İşaretler İçin Fourier Analizi

Tarih

LC DEVRELERİ

RESONANS

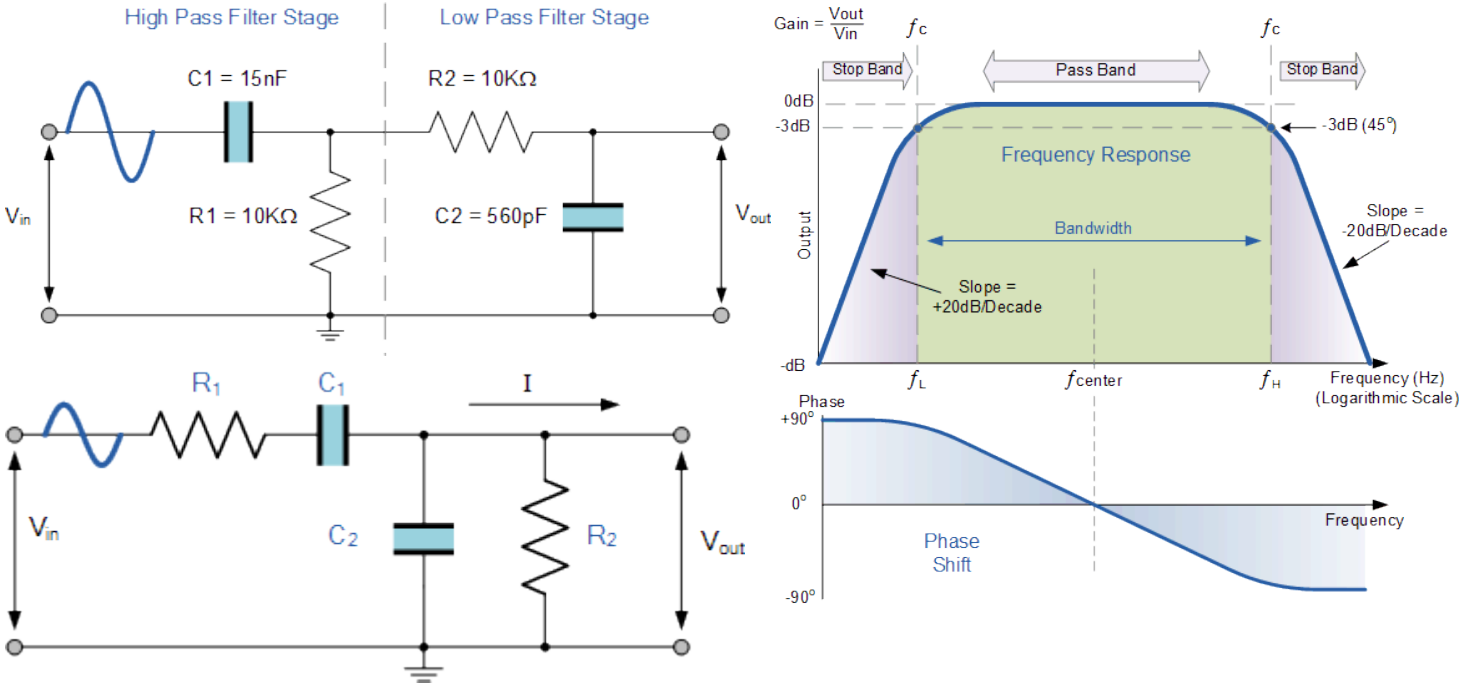
FİLİTRELER

Tarih

ALÇAK GEÇİREN FİLİTRE

YÜKSEK GEÇİREN FİLİTRE

BANT GEÇİREN FİLİTRE



BANT DURDURAN FİLİTRE

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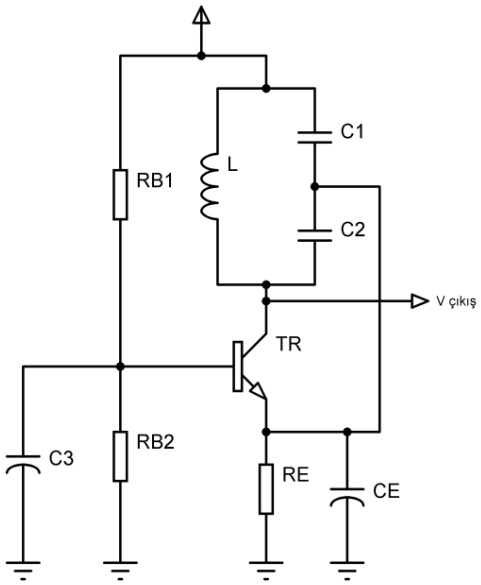
OSİLATÖRLER

RC OSİLATÖR

HARTLEY OSİLATÖR

COLPİTTS OSİLATÖR

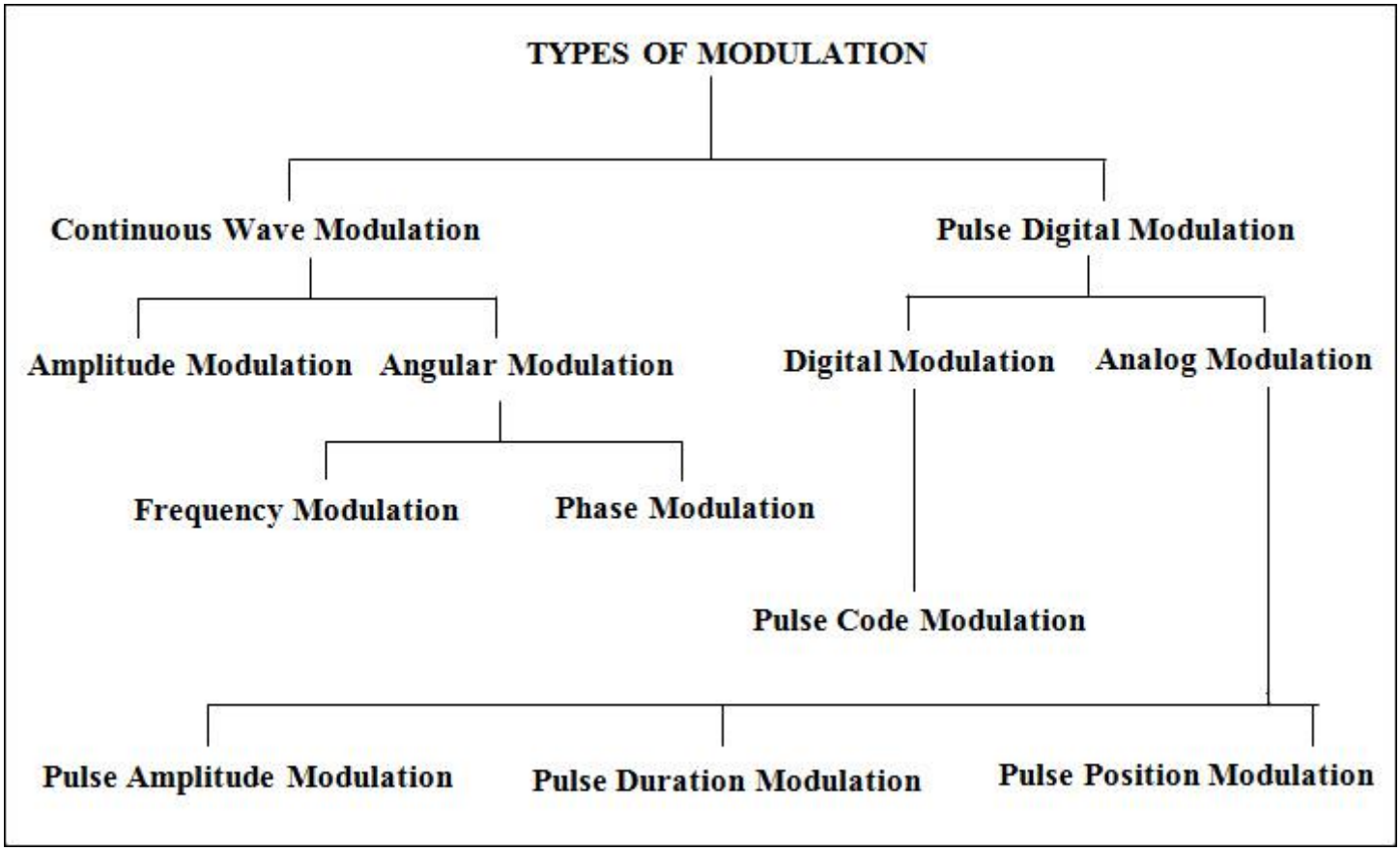


değer vererek rezönans frekansını hesaplayalım

KRİSTAL OSİLATÖR

Tarih

MODÜLASYON ÇEŞİTLERİ



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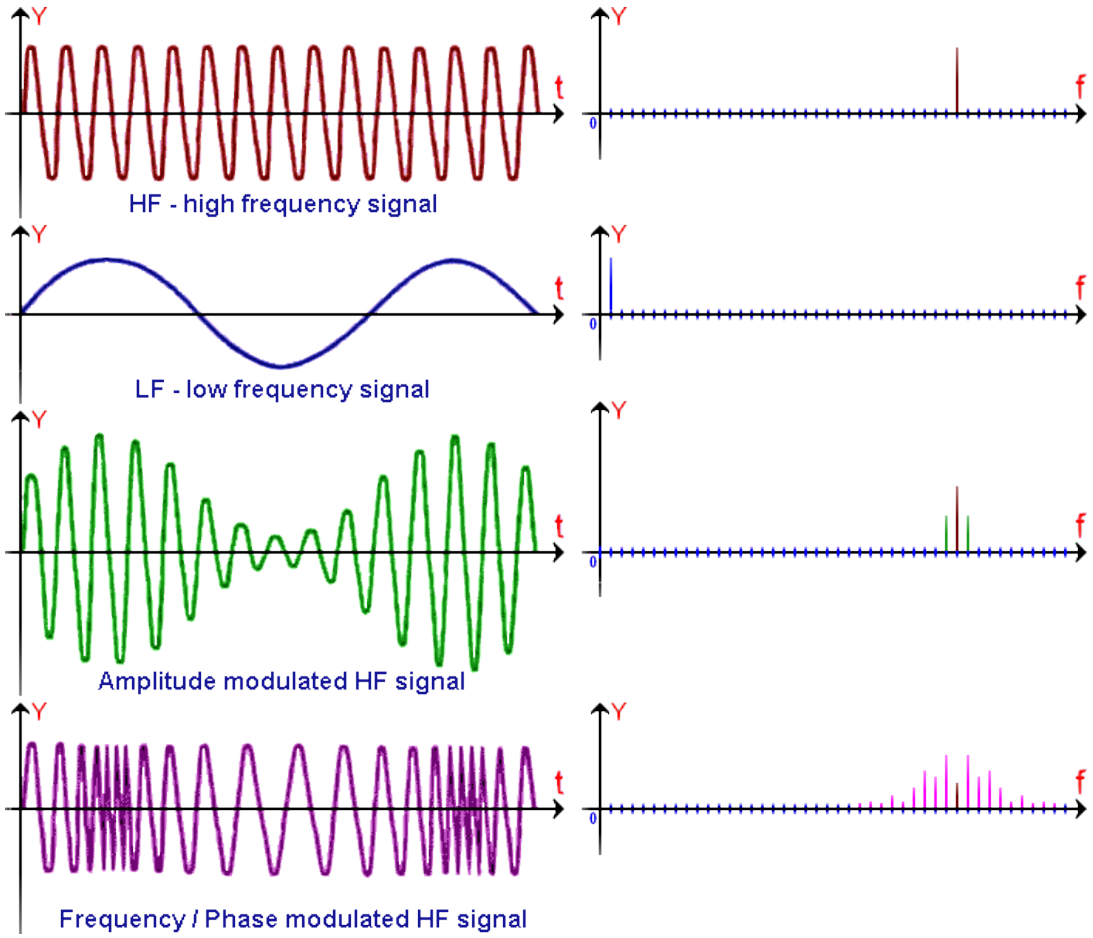
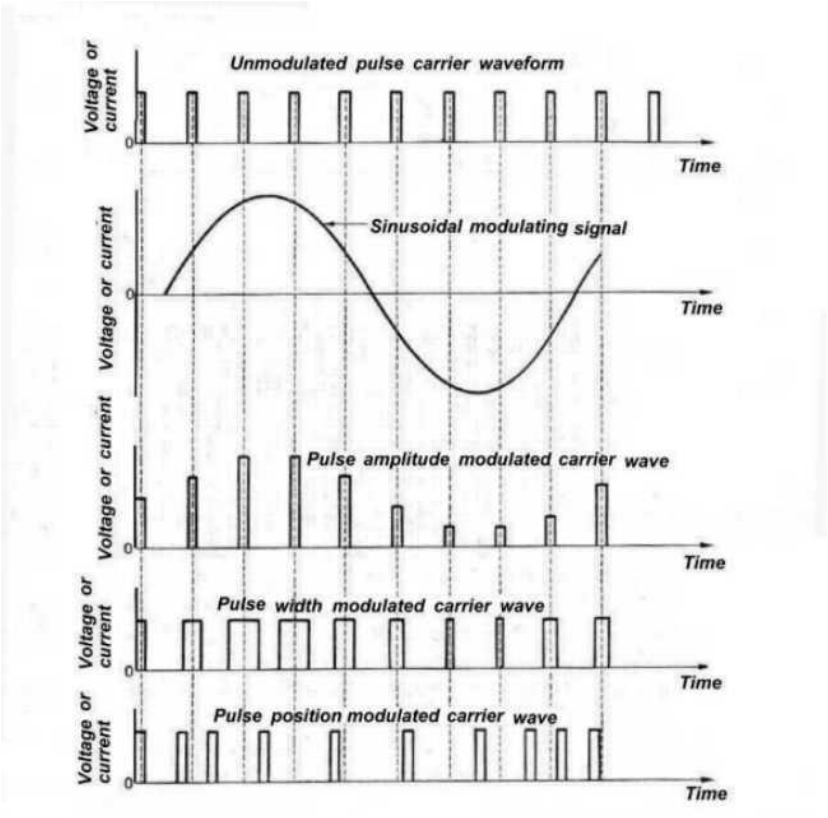


Sayısal Modülasyon



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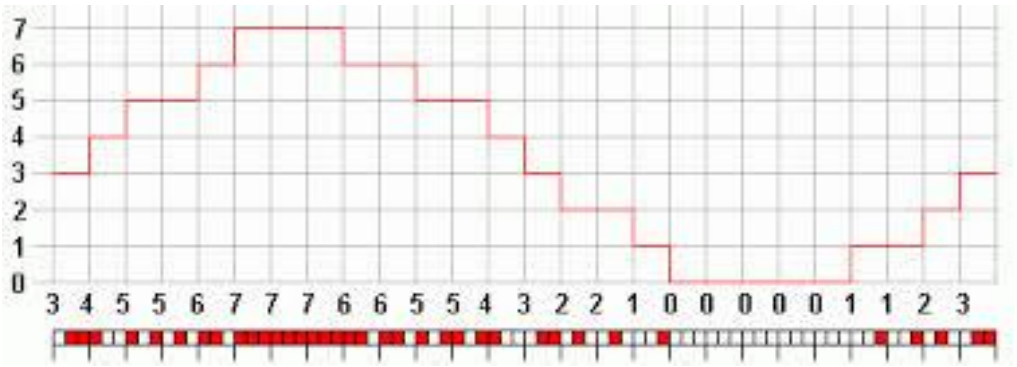

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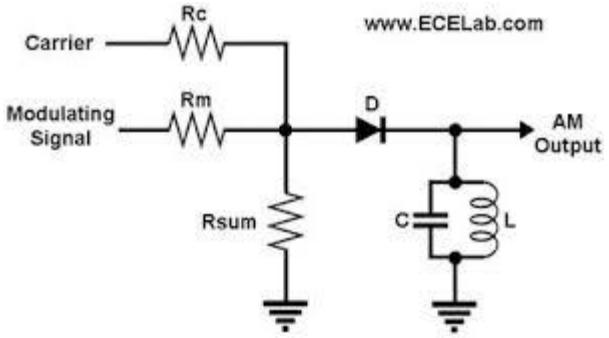
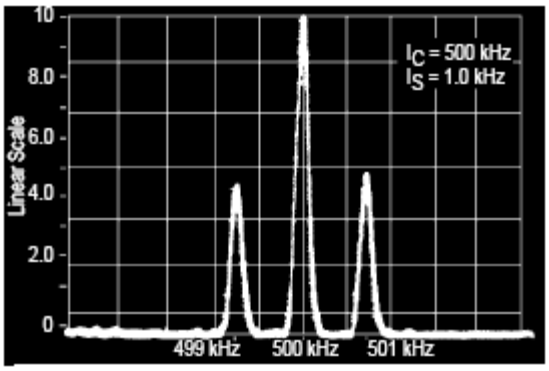
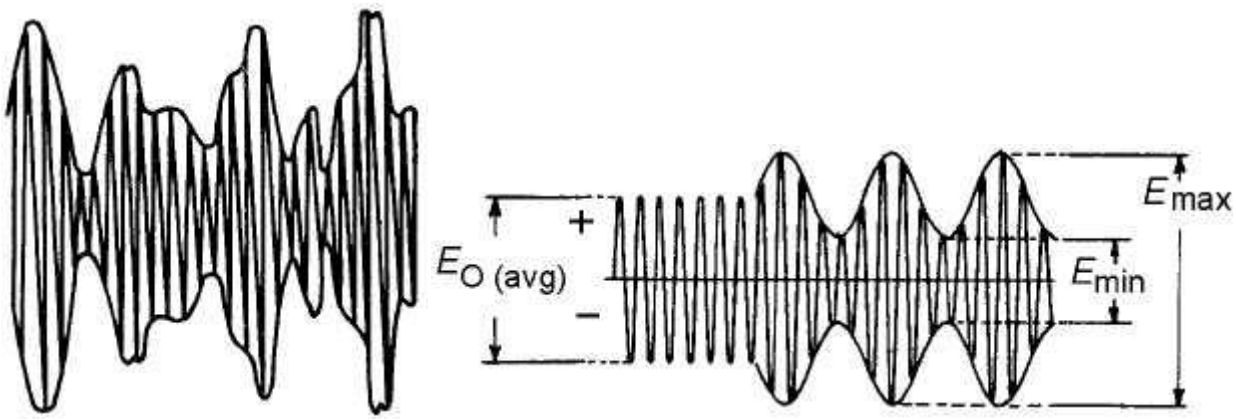
AM-GM-GENLİK MODÜLASYONU





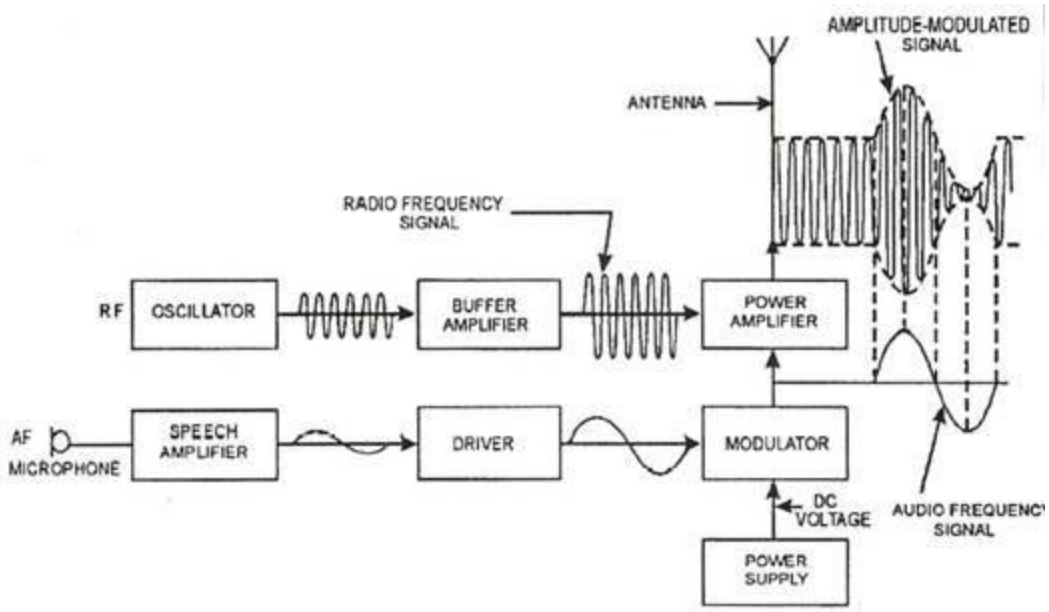
MODÜLASYON Temelleri ve Matematik İfadesi



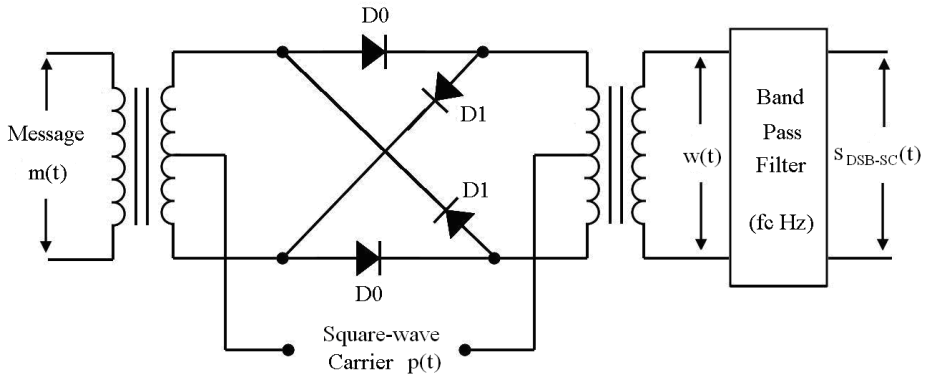
$$e_{am} = (1 + m_{am} \sin(\omega_m t)) \sin(\omega_c t)$$

Tarih

AM-GM Modülasyon Türevleri ve Güç Hesaplamaları



Çift Yan Bant DSB-DSBSC Tek Yan Bant SSB GENLİK MODÜLASYONU



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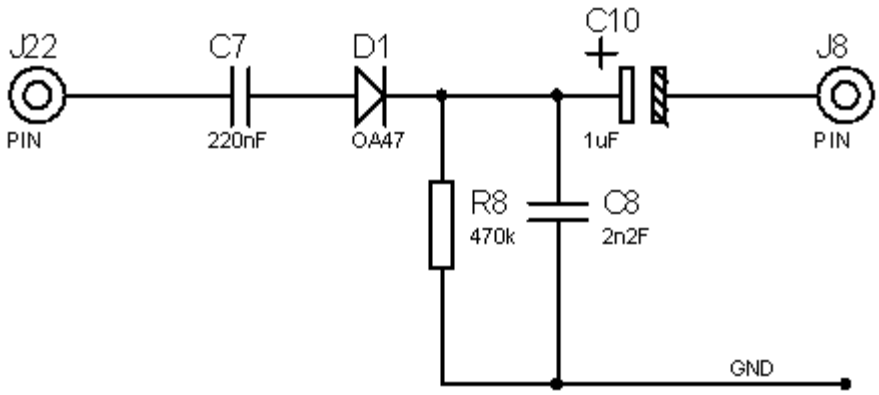
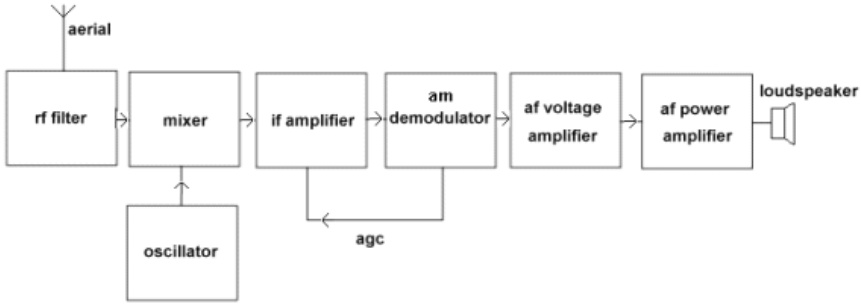
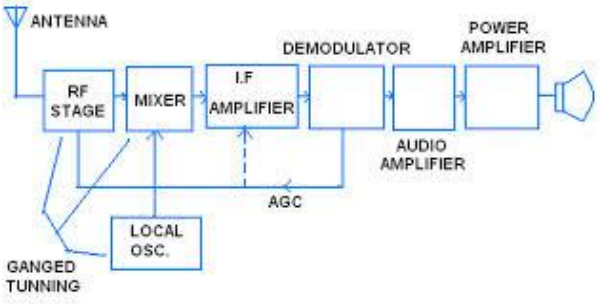
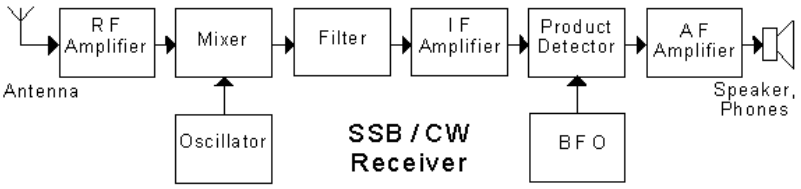
AM-GM-GENLİK DEMODÜLASYONU









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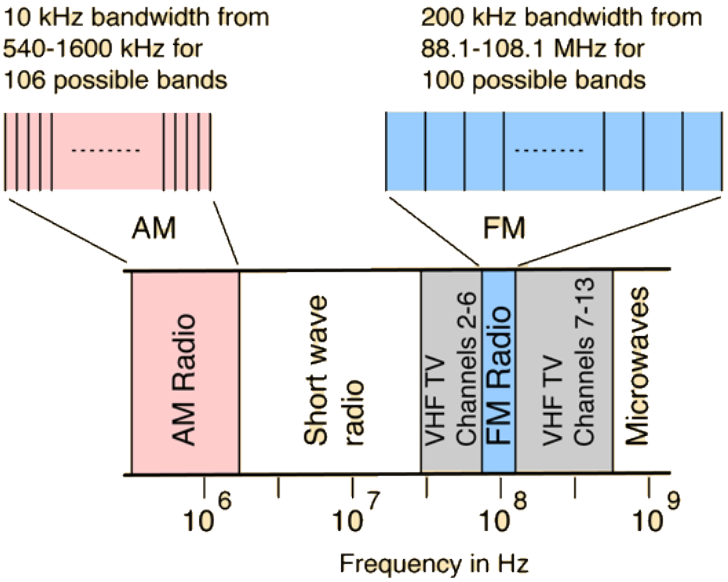
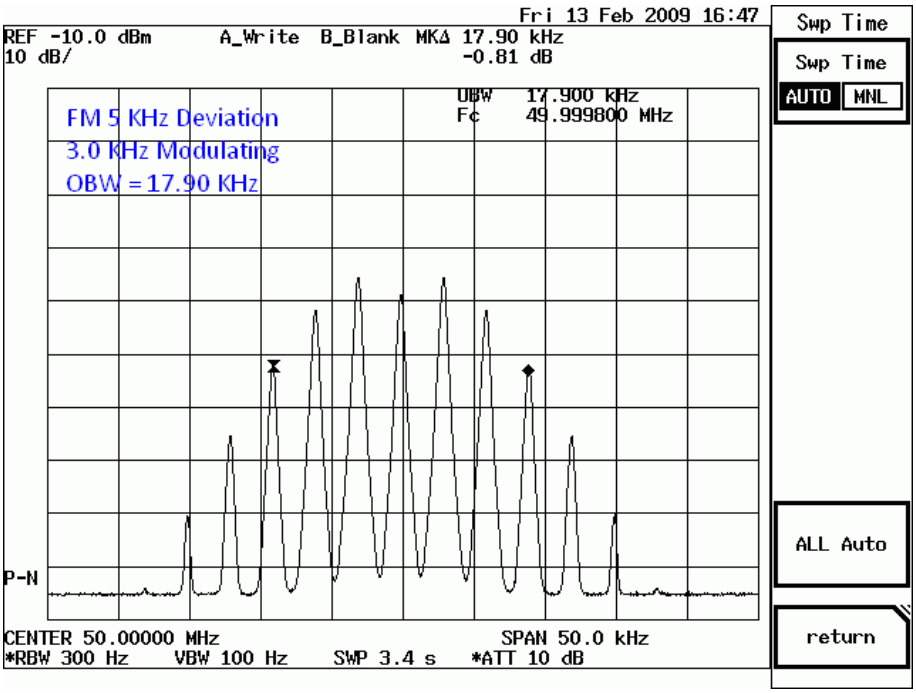
FREKANS MODÜLASYONU-DEMODÜLASYONU



Temelleri ve Matematiksel İfadesi



$$= A_c \cos\left(2\pi f_c t + 2\pi f_\Delta \int_0^t x_m(\tau)d\tau\right)$$

$$h = \frac{\Delta f}{f_m} = \frac{f_\Delta |x_m(t)|}{f_m}$$

$B_T = 2(\Delta f + f_m)$ $h \ll 1$, darbant *FM*, yaklaşık bant genişliği $2f_m$

Tarih

Modulation index	Sideband						
	Carrier	1	2	3	4	5	6
0.00	1.00						
0.25	0.98	0.12					
0.5	0.94	0.24	0.03				
1.0	0.77	0.44	0.11	0.02			
1.5	0.51	0.56	0.23	0.06	0.01		
2.0	0.22	0.58	0.35	0.13	0.03		
2.41	0	0.52	0.43	0.20	0.06	0.02	
2.5	−0.05	0.50	0.45	0.22	0.07	0.02	0.01

Elektronik Devreler MO-DEM

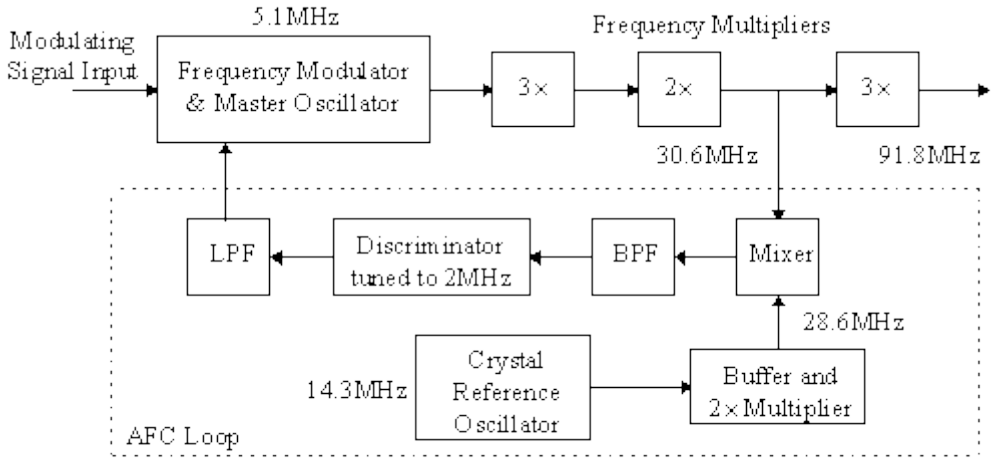


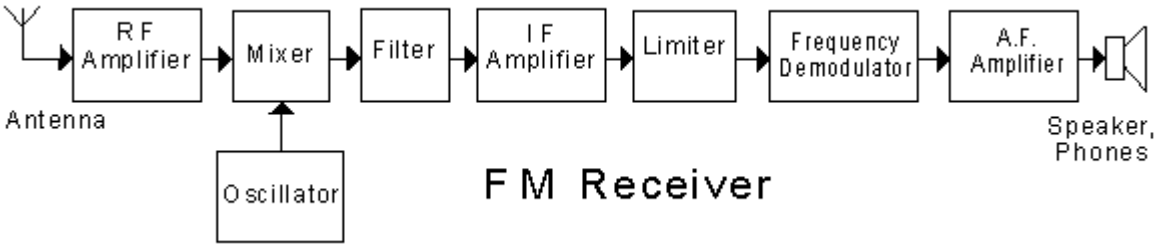
Figure 4 Crosby Direct FM transmitter

75kHz, Modülatörde müsade edilen sapma miktarı çarpım sayısana böl

$$\Delta f = \frac{75\text{kHz}}{18} = 4166.7\text{Hz}$$

Maksimum bilgi işareti fm = 15kHz ise modulation indeksi

$$\beta = \frac{\Delta f}{f_m} = 0.2778$$



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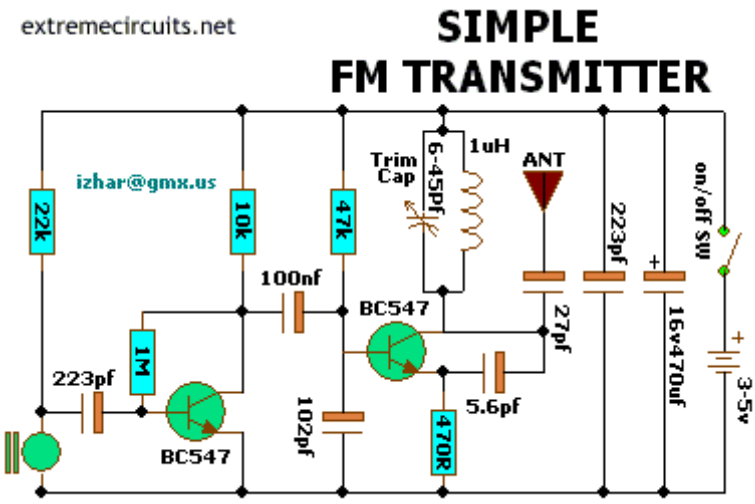

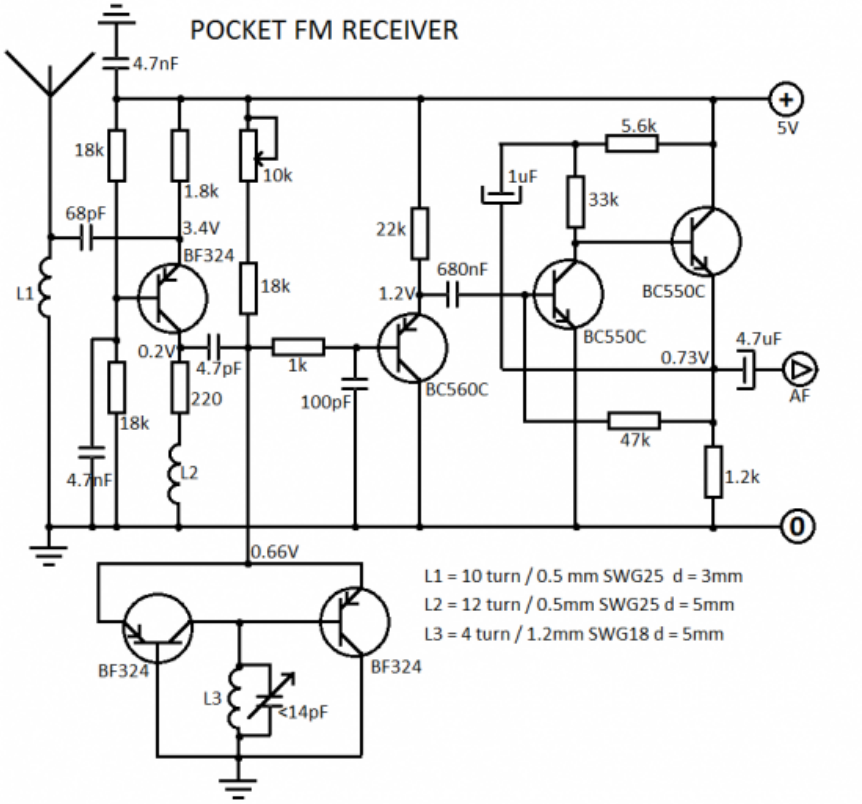

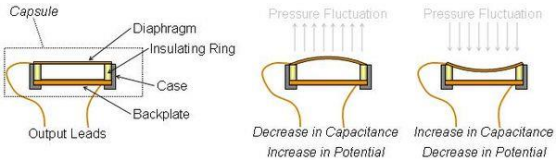

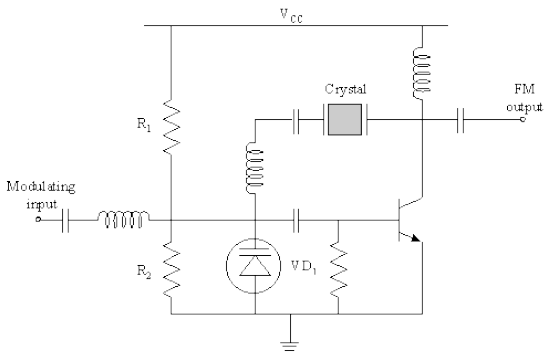

Figure 1 Varactor Diode Frequency Modulator