英　　语

技术阅讀部份

（内部試用）

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CONTENTS

Lesson 1

Advantages of Single-Sideband Communications

A comparison of the frequency and power relationships between single-sideband transmission and conventional a-m transmission is illustrated in figure 14-1. The SSB system is illustrated in part A of this figure.Only one sideband, peak-envelope power (PEP) of 50 watts, is needed to transmit intelligence. None of the power is contained in the carrier or in the upper sidedand. Although the lower sideband is transmitted the upper sideband could have been transmitted just as easily. In some systems both sidebands may be utilized independently.

In the familiar a-m system of communication (fig.14-1B), the radiated signal includes the carrier and an upper and a lower sideband frequency for eaeh frequency in the modulating signal. For example, if a l-mc carrier is modulated by a l-kc tone, the radiated signal will include the l-mc carrier, the lower sideband frequency(1 mc-1kc=999kc), and the upper sideband frequency (1mc+1kc=1001kc). If the modultaing signal contains many frequencies, there will be, of course, many frequencies in the sidebands. In this system of transmission, none of the trasmitted intelligence is contained in the carrier; therefore all of the power put into the carrier is wasted insofar as transmitting intelligence is concerned. Likewise, because duplicate information is contained in each of the two sidebands, the intelligence content of the transmitted signal could be recovered from one sideband only.

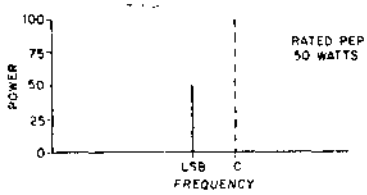
In a conventional a-m system where both sidebands and the carrier are transmitted, the power in the sidebands is dependent upon the amount of modulation. For 100% modulation the power in the sidebands is equal to one-half that in the carrier. Thus, a conventional a-m tsansmitter with

100-watts carrier power will have 50 watts in the sidebands (25 watts in the upper sideband and 25 watts in the lower sideband) at 100% modulation, making the total power transmitted 150 watts (fig. 14-1B). It can be seen, then, that two-thirds of the total radiated power in a conventional a-m system (assuming 100% modulation) is in the carrier and is therefore not useful in conveying intelligence.

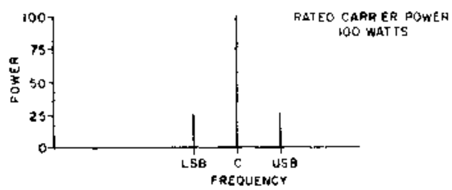
When the r-f signal is demodulated in the conventional a-m system, the audio output is a combination of the upper and lower sidebands. In this conventional type of detection (known as cohereret detection) the audio output is proportional to the power contained in the two sidebands.

In a single-sideband system, only one sideband is transmitted and therefore the audio output of the SSB receiver is proportonal to the power contained in the one sideband.

It therefore becomes apparent that an SSB transmitter and an a-m transmitter will perform equally (same signal-to-noise ratio) under ideal propagating conditions, if the total sideband power of the two transmitters is equal. Considering the relationship between sideband power and carrier power in a conventional a-m system, it is evident that an SSB transmitter



A SINGLE SIDEBAND SYSTEM

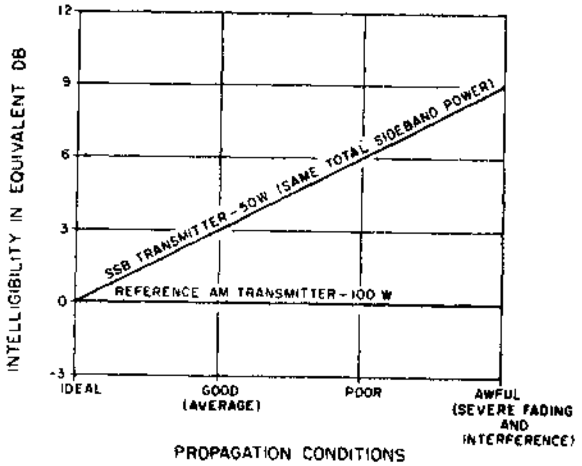


B CONVENTIONAL A-M SYSTEM (100% MOD)

will perform as well as an a-m transmitter of twice the power rating under ideal propagating conditions. Thus, a single-sideband transmitter rated at 50 watts will produce the same signal intelligence level at a receiver as a conventional a-m transmitter rated at 100 watts of carrier power (see figure 14-1).

As propagating conditions become less than ideal, the SSB system will show even a greater advantage over an a-m system. An a-m transmission is subject to deterioration under poor propagation conditions because all three components of the transmitted signal (the upper sideband, the lower sideband, and the carrier) must be received exactly as transmitted to realize perfect reception. Because there is only one component in the transmitted signal for an SSB system, it is not so affected by poor propagating conditions. Studies have shown that the SSB system will give from zero to nine decibel improvement under various conditions of propagation when the total sideband power in SSB is equal to that in amplitude modulation (fig.14-2)

Note that under average conditions, the SSB system shows about a 3 db advantage over the a-m system. In other words, in normal use, an SSB transmitter rated at 100 watts (PEP) will give equal performance with an a-m transmitter rated at 400-watts carrier power.



As far as bandwidth is concerned (assuming one sideband only), the SSB system requires only about one-half the frequency spectrum that the conventional a-m system requires.

The advantages of SSB over the conventional a-m system may be summarized as follows:

1. The SSB transmitter will perform as well as an a-m transmitter of twice the power rating under ideal propagating conditions. Under average conditions there is also an additional 3 db advantage of a SSB system over an a-m system having the same sideband power.

2. If only one sideband is used, the SSB system requires only one-half as much r-f spectrum as the a-m system.

3. The SSB transmitting system uses smaller units than comparable a-m units because less power is required.

4. By virtue of less power in the antenna, lower voltages are required, with attendant reduction of potential breakdown.

5. The SSB system is subject to less noise interference because the bandpass is narrower.

The advantages of SSB cannot be realized without the use of specially designed components and circuitry. First of all, there is the problem of frequency stability, especially when the carrier is totally suppressed. This means that the oscillators in the transmitter and in the receiver must not drift more than a few cycles. Actually, the permissible frequency variation for SSB systems is 1/100th of that for an a-m system.

In one type of double-sideband generation, filters of extreme selectivity are needed. Linear power amplifiers, which are difficult to design, are also needed.

Another problem, when SSB equipment is used on high-speed aircraft, is that of Doppler shift. This is especially noticeable at the higher radiated frequencies.

Word List

single-side band单边带

comparison比较

relationship关系

conventional平常的，惯例的，常规的

illustrate图解，说明，例证

peak波峰

envelope包络线，包迹，封皮

intelligence信息，情报

carrier载波，载流子

upper上部的，上面的

independently独立地，任意地

waste浪费，荒废

likewise同样，而且，也

duplicate双重的，副的

information信息，情报

recover恢复，再现

audio音频的，声音的，听觉的

proportional比例的，均衡的

coherent相关的，相干的

evident明显，明白

deterioration恶化，劣化

affect影响

decibel分贝

improvement改进，改良

summarize概括，总结，摘要

virtue优点，功能

attendant附带的，伴随的

reduction缩减，减少，简化，还原

potential电位，电势，潜在的

breakdown击穿，破坏

interference干扰，干涉

permissible可允许的

Doppler shift多普勒频移

selectivity选择性

Lesson 2

Miniature Receiving Antenna

The miniature receiving antenna was developed as an alternative to receiver multicoupling and to eliminate the problem of interaction between large, closely spaced antennas.

A small antenna will collect some signal on most frequencies. However, the energy is so small that something must be done to prevent the complete loss of signal because of mismatch conditions or transmission line losses.

The losses are offset in the Radio Frequency Control Unit of the AN/SRA-17B by a tunable tank circuit installed in the base of the antenna. This is an excellent impedance matching device which provides matched conditions between the antenna and the transmission line, and reduces the losses so that a reasonable signal reaches the receiver.

The AN/SRA-17Bprovides other advantages. The antennas can be installed at a point well up in the superstructure and when shielded coaxial transmission lines are used, the combination of small antenna and shielding greatly reduces electrical noise generated on the ship. Also, because of the small dimensions, the degree of mutual coupling between two miniature antennas is much less than the coupling between larger antennas with the same spacing between antennas. The disadvantage is that each receiver requires a separate antenna.

As shown in figure 8-27 the miniature receiving antenna is a small antenna that is supported by an insulator. A lead from the antenna is brought down through the insulator to the radio frequency control unit that is locatep directly under the insulator. Signals from the tuner are fed through an r-f transmission line to a receiver. The antenna control unit is mounted on top of the receiver so that the operator can tune and change bands in the radio frequency control unit without leaving the operating position.

This miniature receiving antenna system is designed to cover the frequency range from 14 kc to 600 kc in four bands.

Radar antennas operate on the same basic principles as other antennas. At radar frequencies the radiation properties of electromagnetic waves approach those of light waves. Therefore they can be directed by reflecting surfaces placed in their path.

The bedspring antenna consists of a stacked dipole array with an untuned reflector. It is so called because of its resemblance to a bedspring. The more dipoles that are used or stacked in one dimension (horizontal, for example), the more narrow the beam of radiated energy becomes in that same plane.

The linear parabolic type of antenna consists of a stacked dipole array in onearea, backed by a linear parabolic reflector. The width of the beam is determined by the number of stacked dipoles with the linear parabolic reflector concentrating or focusing the beam in the other direction. One of the principal uses of linear parabolic type antennas is in fire control radar.

The paraboloidal antenna consists of a dipole or feed horn radiator and a paraboloidal or dish type reflector. This type of reflector is also used in fire control radars. The antennas employed usually consist of movable reflectors epuipped with devices for feeding energy into them. As mentioned previously microwaves have characteristics that are similar in many respects to those of visible light. If a light source is placed at the focal point of a parabolic (dish shaped) mirror, a concentrated beam is produced, and the width of the beam depends on the diameter of the mirror. Similarly, if a metal reflector of the same general shape is used instead of the mirror, and if a source of microwave radiation is placed at the focal point, the metal reflector sends out a beam of electromagnetic waves. The width of the microwave beam also depends on the diameter of the reflector, for a given wavelength the wider the reflector, the narrower is the projected beam.

Word List

miniature 小型的
alternative 交替的,二中取一的,取舍,抉择,办法
multicoupling 多路耦合
eliminate 消除,取消,
Interaction 相互作用
collect 收集,聚集
mismatch 失配,失谐
offset 抵销,弥补
tank 箱,槽,槽路
install 安装
matching 匹配,配合
reasonable 合理的,适当的
superstructure 上层结构,甲板室
shield 屏蔽,鎧装
coaxial 同轴的
combination 结合,化合,组合
base 基础,基极,底座
dimension 尺寸,大小,量纲,维,度
mutual 互相的
separate 分开,析出
lead 引线,导线,铅
tuner 调谐器
radar 雷达
approach 途径,方法,进场,接近
reflect 反射
bedspring 垫簧
stack 组套,层迭
dipole 偶极子,偶极天线
array 阵,列
resemblance 类似
horizontal 水平的,视界的
plane 平面,飞机
linear 线性的,直线的
parabolic 抛物线的
excellent 优秀的,卓越的
area 面积,区域,范围
beam 波束,射线,电子注
concentrate 集中
focus 焦点,聚焦
paraboloidal 抛物面的
horn 喇叭形,喇叭
dish 盘,抛物面反射器
focal point 焦点
mirror 鏡,反射鏡
impedance 阻抗
disadvantage 缺点,不利,不利条件
feed 供应,馈给,供电
control 控制
radiator 辐射器,辐射体
mention 提到,讲述,记述

Lesson 3

Narrow Band Filters

The narrow band filters used after the first balanced modulator in transmitters employing the filter method of SSB generation and after the mixers in their associated receivers must have very high Q's and sharp cutoff characteristics. Mechanical or crystal lattice filters may be used. Crystal lattice filters have Q's of 10,000 to 20,000 or even higher. Mechanical filters have Q's of 2000 to 10,000 or more. Compact lattice filter units have been designed to operate up to 40 mc. However, at lower frequencies (for example, 200 kc to 250 kc) mechanical filters have proven to be compact and durable.

Several types of mechanical(electromechanical) filters have been designed for use with SSB equipment. Fundamentally, they all operate on the same principle. Metal rods or disks are mounted in a container in such a way as to form a group of mechanical resonating elements. Energy is put into the system by means of a magnetostrictive transducer, and energy is taken out the same way. Only a relatively narrow band of frequencies can cause the resonating elements to respond. Therefore, only these frequencies can produce a signal in the output transducer.

One type of disk mechanical filter (actually,an electromechanical filter) is illustrated in a simplified form in figure 5—6. The signal is fed into the input coil, which causes the first disk to vibrate because of magnetostrictive action of the coil and the driving wire.(The wire is a magnetic material.) The vibrations are coupled to the remaining disks by means of the coupling wires. The vibrations of the last disk cause the output driving wire to vibrate, and by the inverse magnetostrictive effect an output signal is developed in the output coil.

The disk resonators are precisely ground to resonate at frequencies very close to the center frequency of the pass band. The width of the pass band depends on the coupling elements, the center frequency depends on the size of the resonator elements, and the selectivity depends on the number of resonant elements.

A simplified diagram of another type of mechanical filter is illustrated in figure 5-7. This filter has seven resonant sections, and two quarter-wave end sections for support. The center resonator is encircled by a "snubber" bracket, (not shown) which prevents excessive excursions under shock. The hermetically sealed housing into which the filter is mounted contains a dry inert gas . This filter vibrates with a twisting motion(torsional vibration); the twisting motion is passed from one element to another through the coupling sections.

As in the case of the disk-type filter the center frequency depends on the resonant frequency of the tuned elements, the selectivity depends upon the number of tuning elements, and the width of the pass band depends on the design of the coupling elements.

The transducers at the input and output are specially processed ferrite rods. The resonator rods are made of a specially prepared nickel alloy heat-treated to maintain an essentially constant frequency, even during wide temperature changes.

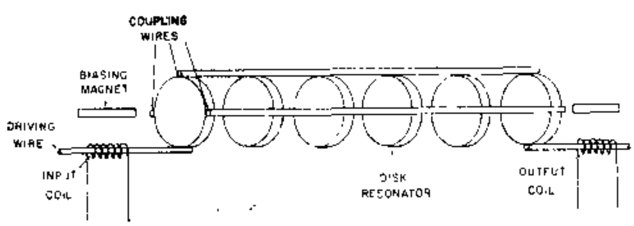


Figure 5-6. —Disk-type mechanical filter.

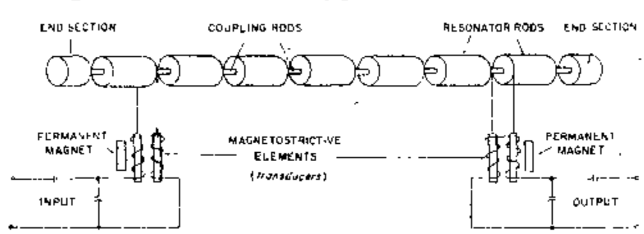


Figure 5-7. —Torsional-type mechanical filter

Word List

filter 滤波器,滤光器,滤色器
modulator 调制器
mixer 混频器，混合器
associate 联合,结合,参与，副…
cutoff 截止，断开
lattice 点阵，晶格
durable 耐用的，耐久的
compact 紧密,结实,简洁，紧凑
rod 桿，棒
disk (disc) 圆盘，圆片，唱片
mount 安装
container 容器，壳，套，槽
resonate谐振
element 元件，单元
magnetostrictive 磁致伸缩的
transducer 换能器
electromechanicl 机电的
simplify 简化
vibrate 振动
coil 线圈，绕组
inverse 相反的，逆的，倒置的
diagram 图，图表，曲线图
resonant 谐振的
section 部份,节,段,截面,区域
quarter-wave 四分之一波长
bracket 支架，托架，悬臂
excessive 过分的，过度的
excursion 偏移，漂移
shock 震动，冲击
hermetically 密封地，不透气地
seal 密封，封口，封焊
inert gas 惰性气体
torsional 扭转的，扭力的
motion 运动，运行
twist 扭，扭转，绞合
ferrite 铁氧体，铁淦氧
nickel 镍
alloy 合金
heat-treated 经过热处理的
essentially 根本上，本质上
constant 常数,稳定的,不变的,不断的
prove 证明
action 动作，作用
couple 耦合
pass band 通带
end 端，尾，终止
snubber 减震器，缓冲器
prevent 防止，预防，制止
encircle 围绕，合围，包围
maintain 维持，保持，保养
during 当…之际，在…时

Lesson 4

New Products and Developments

I.

A hand-held, wide-angle optical transceiver that provides clear, secure communications up to three miles has been doveloped. It resembles a binocular, weighs only four pounds including the rechargeable battery, and can be reliably operated after minutes of instruction.It was designed as a low cost walkie-talkie in line-of-site communications applications,such as ship-to-ship, ship-to-shore, helicopter-to-ground, and land-based operations. Other optical communicator designs provide secure communications over ranges up to 15 miles.

II.

More than a million hours in space without a failure is the record to date of the traveling wave tubes built for all the Syncom, Intelsat, ATS, TACSAT, Mariner, and Luner Orbiter satellites and the Surveyor and Apollo spacecraft. Though the Syncom II satellite was designed for a six-month experiment, its TWT is still operable after eight years. The TWT for Canada's Anik I domestic synchronous communications satellite is expected to operate for more than 12 years.

III.

A new digital system known as T2 is being developed to serve as a high-capacity communications link between cities. Designed to provide service economically over distance up to about 500 miles, it can carry more than 4,400 simultaneous telephone conversations over two 50-pair cables. The system transmits over cables containing twisted pairs of wires and provides capacity for 96 voice channels or one PICTUREPHONE signal for each wire-pair.

In addition to voice telephone traffic the T2 system will transmit data, facsimile and picturephone service, carrying information in digital form at a rate of 6.3 million bits per second. The T2 system is expected to be placed in commercial service in 1972.

Ⅳ.

A test device for complete noise analysis of microwave transmissions has been announced. Called WAND (wave analyzer for noise and deviation), the tester is built for evaluation of the total performance of any microwave transmission system in the frequency range of 9 to 10 GHz. Connected to the final RF transmitter output of a microwave system, the unit measures FM noise, AM noise, index of modulation and frequency deviation measurements by means of a heterodyne receiver which translates the spectrum under test to an intermediate frequency which is compared against a referenced, phase-locked IF source. The tester is divided into three sections, precision crystal frequency sources, IF phase-locked loop, and a self-contained wave analyzer capable of manual or automatic operation. The crystal frequency sources are utilized as the reference sources for AM and FM noise measurements.

The IF phase-locked loop allows measurement of the spectral priority of the unit under test to within 20 Hz of its carrier and within ±0.5 dB accuracy. It also functions as an FM discriminator and allows measurement of intentional modulation on the carrier. Also, frequency deviation and index of modulation can be measured.

Ⅴ.

By using gallinm arsenide as the basic material and by exploiting the Gunn effect, researchers have succeeded in making experimantal two-port amplifiers yielding gains of up to 32 dB at frequencies between 400 megahertz and 4 gigahertz in pulsed operation.

Once perfected, such devices should find wide use as traveling wave amplifiers, as input stages in high-frequency applications, and in phased-array antenna systems as output amplifiers. Futhermore, they could be used as the switching elements in a number of different logic circuits.

In particular, constant high-gain values are obtained over the whole 400 MHz-to-4-GHz range without any appreciable falloff over that 10-to-1 range. In addition, output power levels of between 100 milliwatts (below 700 MHz) and 0.1 mW at 4 GHz have been obtained.

The new device exploits the negative differential electron mobility that occurs in gallium arsenide when such material is subjected to high electric-field strengths. This mobility causes the periodic variations in density of the electrons drifting through the element to increase in the direction of drift. In the opposite direction, the density variations are damped. Such variations, or space-charge waves, are kicked into excitation by the signal which is to be amplified and which is applied at the cathode by means of a suitable coupling electrode. Signal conversion from its electrostatic to electromagnetic form takes place at the anode.

Word List

transceiver 收发报机

secure 安全的,保险的,牢固的

mile 英里，哩

resemble 类似，像

binocular 双筒镜

pound 磅

include 包括

rechargeable 可二次充电的，可再充电的

battery 电池

reliably 可靠地

instruction 指令，指示，说明书

design 设计

walkie-talkie 步谈机

line-of-site 视距

ship 船，舰

shore 岸

helicopter 直升飞机

failure 故障，损坏，事故

digital 数字的，计数的

rate 比率，速度，率，

record 记录