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In this report, we will discuss applications for both Amplitude Modulation (AM) and Angle Modulation (FM and PM).

A. Application for Amplitude Modulation

Airband Radio Communications

The aircraft radio, is specially used for wireless communication between the ground and the aircraft, between the pilot and the pilot. It is an indispensable communication tool for ensuring air flight safety and effective air traffic management.



Airband or avionic radios are primarily used by pilots and Air Traffic Control as a means of two way communication and navigation. If you already have an aircraft you probably already know how important an Airband radio is. Because the aviation radio is used in a special environment, in order to ensure that the aviation working frequency is not disturbed, according to the relevant provisions of the ICAO Convention on Civil Aviation, the frequency range of the air communication is from 118.000 MHz to 136.975 MHz of the VHF frequency, and the channel frequency interval is Divided into three files: 50KHZ, 25KHZ and 8.3KHZ.

Airband radios are divided into COM for voice communication and NAV for navigation. The NAV channels are still in use for VOR (VHF Omni Directional Radio Range) even though GPS is now widely used. A VOR is a type of short-range radio navigation system for aircraft, enabling aircraft with a receiving unit to determine their position and stay on course by receiving radio signals transmitted by a network of fixed ground radio beacons. There are about 3,000 VOR stations worldwide.

Airband radios also include an emergency frequency at 121.5 MHz known as the International Air Distress (IAD) also known as the 'guard' frequency. On Icom radios this is accessed by a single button which will send out a distress signal.



One might ask why is AM used here instead of FM. The basic advantage of the AM system over the FM system is its good device compatibility and simple circuit structure.

Is that simple reason? Of course not, the most important problem is that the FM system has a capture effect, that is, two FM signals with the same or close frequency, only the stronger signals are mediated.

Generally speaking, when we are on the FM relay, if two people talk at the same time, we can only hear the sound from the station with strong signal, but we can't hear the sound of the station with weak signal. It is often said that someone has pressed the stage.

This situation does not affect much in daily communication, but it is not possible in the case of aviation, which requires strict signal communication, because a communication error will cause a major accident. Assuming

that the two planes simultaneously requested to land on Runway 3, the tower only heard a request, but did not know that there was a second request, so they replied with the consent, then both aircraft thought that their request was agreed to begin landing. The same runway eventually led to a collision between two aircraft.

B. Application for Angle Modulation

What is Angle Modulation

Angle Modulation (FM and PM) has several advantages over other modulation techniques, such as amplitude modulation(AM). FM is more resistant to noise and interference, as the amplitude of the signal remains constant and only the frequency changes. FM also has a higher bandwidth efficiency, as it can transmit more bits per second per hertz of bandwidth than AM. FM also has a better signal-to-noise ratio (SNR), as it can use a limiter and a discriminator to recover the original data from the noisy signal.

The Walkie-Talkie

The FM protocol (Frequency Modulation) is the radio protocol of choice for walkie-talkies due to its reliability and clarity. It is known for its ability to deliver high-quality audio without causing excessive interference. A modulation of the carrier frequency is achieved by responding to the audio input by modulating the frequency of the carrier signal.

How Do Walkie-Talkies Utilize FM Radio Protocol?

Transmission:

A walkie-talkie fascinatingly transmits a signal when the transmit button is pressed. You can use the device to convert your voice or message into electrical signals. The signals are modulated through FM, where the frequency of the carrier wave is altered following the input. The modulation creates the radio signal that transmits your message.

Broadcasting:

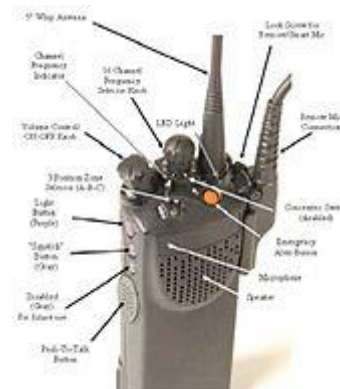
Modulated signals are transmitted through the antenna of the walkie-talkie into the airwaves. The range of the broadcast can vary according to many factors, including the power of the walkie-talkie and the terrain. The magic does not end here, however.

Receiving:

The walkie-talkie of your friend is tuned to the same frequency and awaits incoming signals. A radio signal undergoes a process of demodulation when it reaches the device. A signal is extracted from the original message, which is then converted back into sound waves. It's done! It is clear and audible that your message has been received.

Why is the FM protocol suitable for use in Walkie-Talkies?

- Excellent Sound Quality
- Minimal Interference
- Battery Conservation
- High-Quality Audio
- Resistance to Interference
- Wide Coverage



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