A brief history

- **1931**
  - Alan Blumlein, working for EMI in London patents the stereo recording technique, using a figure-eight miking arrangement.
- **1933**
  - Armstrong demonstrates FM transmission to RCA
- **1935**
  - Armstrong begins 50kW experimental FM station at Alpine, NJ
- **1939**
  - GE inaugurates FM broadcasting in Schenectady, NY
  - TV demonstrations held at World's Fair in New York and Golden Gate International Exhibition in San Francisco
  - Roosevelt becomes first U.S. president to give a speech on television
  - DuMont company begins producing television sets for consumers
- **1942**
  - Digital computer conceived
- **1945**
  - FM broadcast band moved to 88-108MHz
- **1947**
  - First taped US radio network program airs, featuring Bing Crosby
  - 3M introduces Scotch 100 audio tape
  - Transistor effect demonstrated at Bell Labs
- **1950**
  - Stereo tape recorder, Magnecord 1250, introduced
- **1953**
  - Wireless microphone demonstrated
  - AM transmitter remote control authorized by FCC
  - 405-line color system developed by CBS with "crispening circuits" to improve apparent picture resolution

  - FCC reverses its decision to approve the CBS color system, deciding instead to authorize use of the color-compatible system developed by NTSC
  - Color TV broadcasting begins

- **1955**
  - Computer hard disk introduced

- **1957**
  - Laser developed

- **1959**
  - National Stereophonic Radio Committee formed to decide on an FM stereo system

- **1960**
  - Stereo FM tests conducted over KDKA-FM Pittsburgh

- **1961**
  - Great Rose Bowl Hoax University of Washington vs. Minnesota (17-7)
  - Chevrolet Impala 'Super Sport' Convertible with 409 cubic inch V8 built
  - FM stereo transmission system approved by FCC
  - First live televised presidential news conference (John Kennedy)

- **1962**
  - Philips introduces audio cassette tape player
  - The Beatles release their first UK single *Love Me Do/P.S. I Love You,* on EMI/Parlophone Records

- **1969**
  - Neil Armstrong walks on the moon (July 21); worldwide audience watches the event live

FM Stereo Format [1]

We have seen how frequency modulation can be used to encode a signal. But for stereo you need two signals. How can you put two signals on an electromagnetic wave? The answer is that you actually combine more than one wave. The FM broadcast for a stereo signal from a commercial radio station is actually fairly complicated. It contains a frequency modulated carrier wave that is modulated with the left plus right channel audio signals. In addition,

[1] from Dr. Malcolm Ingham, Victoria University of Wellington, New Zealand.

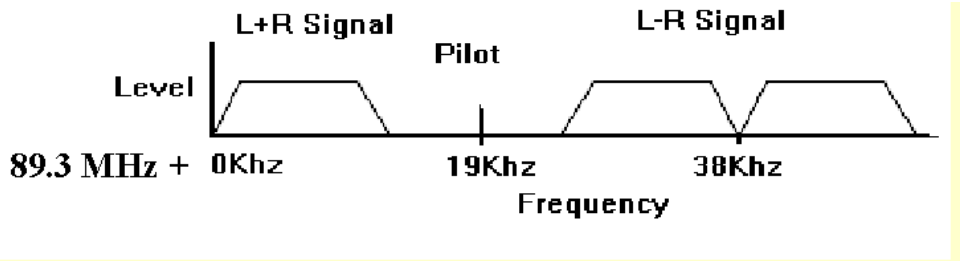

Figure 1: FM stereo spectrum

there is plus an amplitude modulated "sub-carrier" at 38 KHz higher frequency than the FM modulated carrier. The AM modulated carrier is modulated with left-right signal. An older mono receiver would play only the left + right signal. The stereo receiver would get the L+R and L_R signals and use them to produce L and R separately. These were then sent to the two speakers. Finally, another signal is added at 19 KHz above the FM modulated carrier. This signal, called a pilot signal, makes the receiver aware that this is a stereo broadcast. The EM wave from and FM stereo station is complicated to look at in time domain, but in frequency domain it is easier to understand. Figure 1 shows a sketch of the FM radiostation EM wave versus frequency.