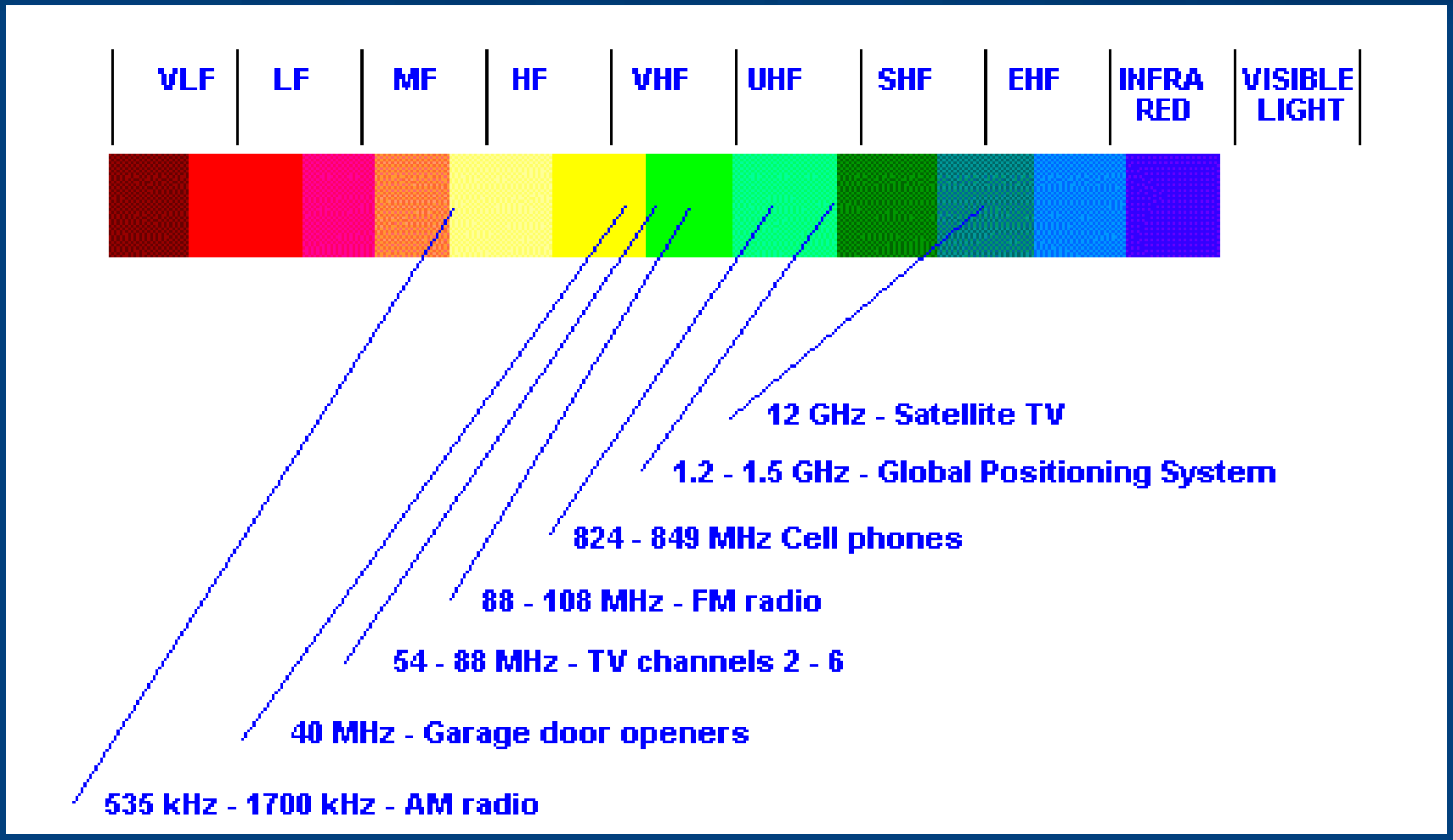
Radio 101

Alabama's coordinating agency for disaster preparedness, response, and recovery

TOPICS

- Radio Spectrum
- Radio wave characteristics and propagation
- Simplex, Repeater and Trunking Operation
- The AEMA UHF system
- Amateur Radio
- Where to get information

Radio Spectrum



MF Radio Propagation

1. Longer wavelength

2. Readily reflects off of the ionosphere

3. AM radio stations are on this band- lower power at night and cover great distances

4. Atmospheric interference problems

HF Radio Propagation

1. Long wavelength
2. Readily reflects off of the ionosphere- different characteristics at different times of the day
3. The military and amateur radio stations use this band extensively
4. Great for long distance communications, but lousy for short range communications

VHF Radio Propagation

1. Short wavelength
2. More line of sight
3. Usually penetrates the ionosphere and usually does not reflect-Some occasional reflection depending on atmospheric conditions
4. Typical users are County Sheriffs Offices

UHF Radio Propagation

1. Even shorter wavelength
2. Line of sight
3. Penetrates the ionosphere and will rarely reflect
4. Good in-building coverage

5 Typical users are Fire Departments

Higher Bands Propagation

700/800 MHz

1. Very shorter wavelength
2. Absolutely line of sight
3. Always penetrates the ionosphere and does not reflect
4. High data rates
5. Typical uses are cellular and wireless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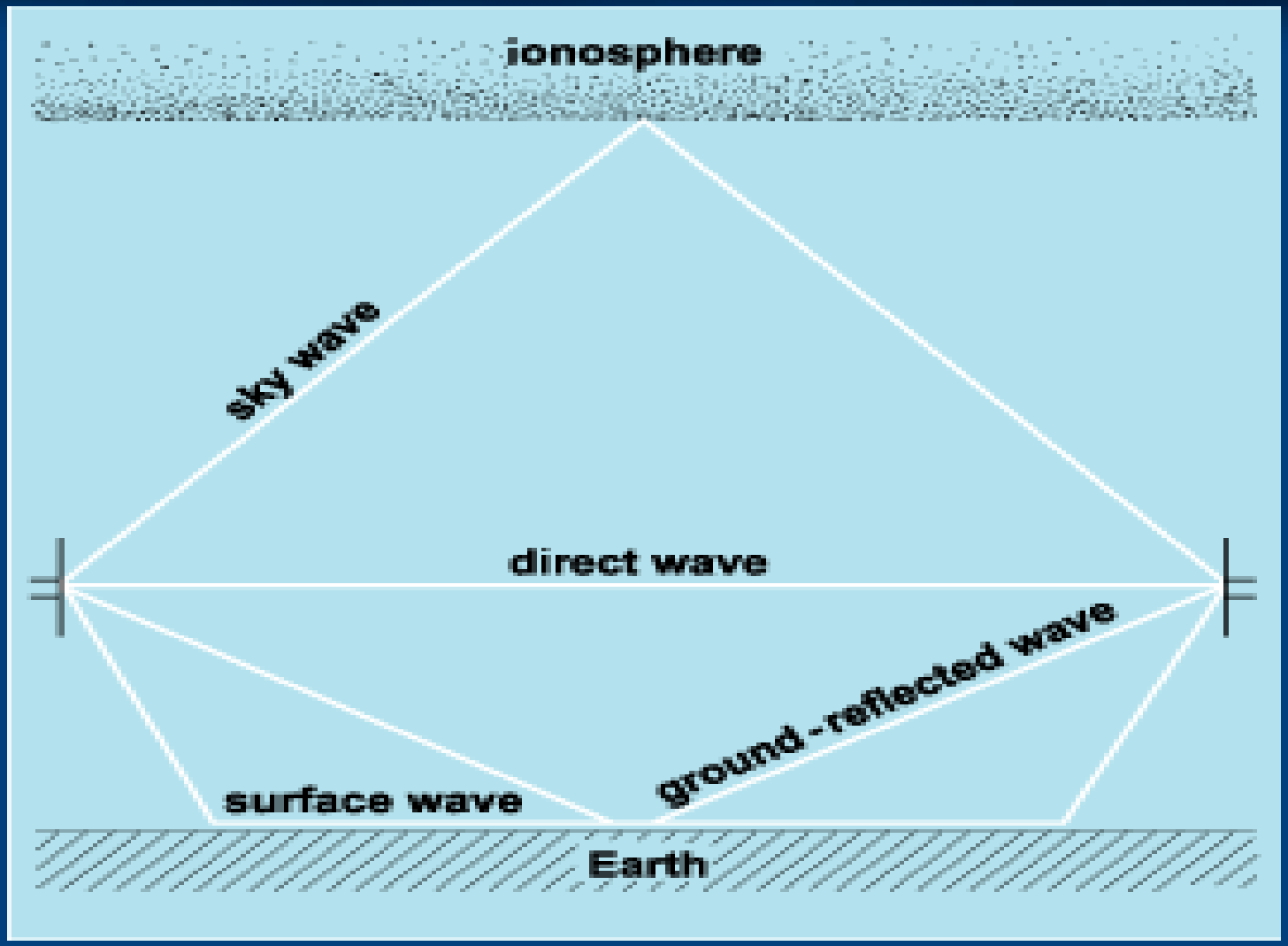
ionosphere
sky wave
direct wave
ground-reflected wave
surface wave
Earth


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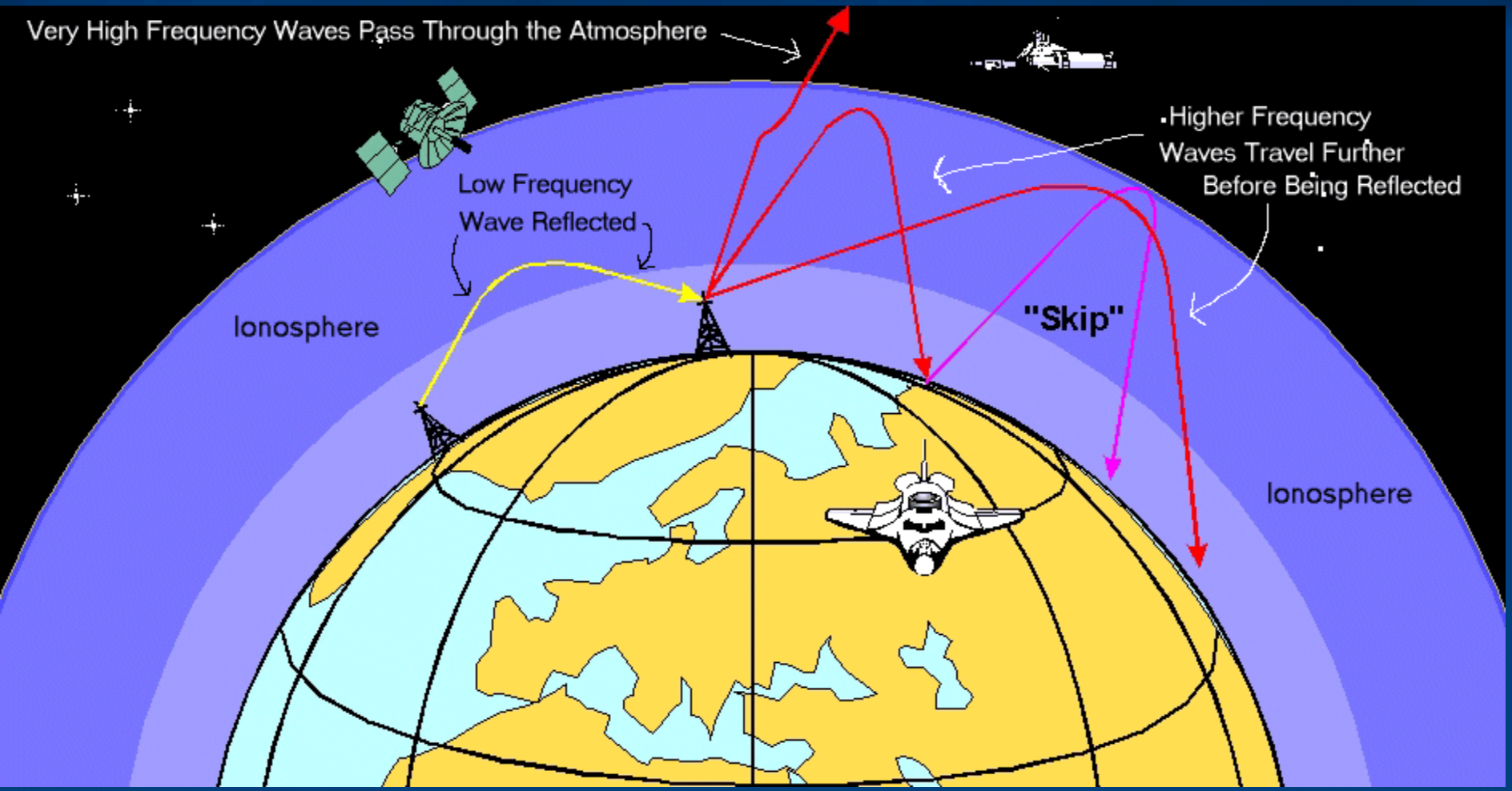
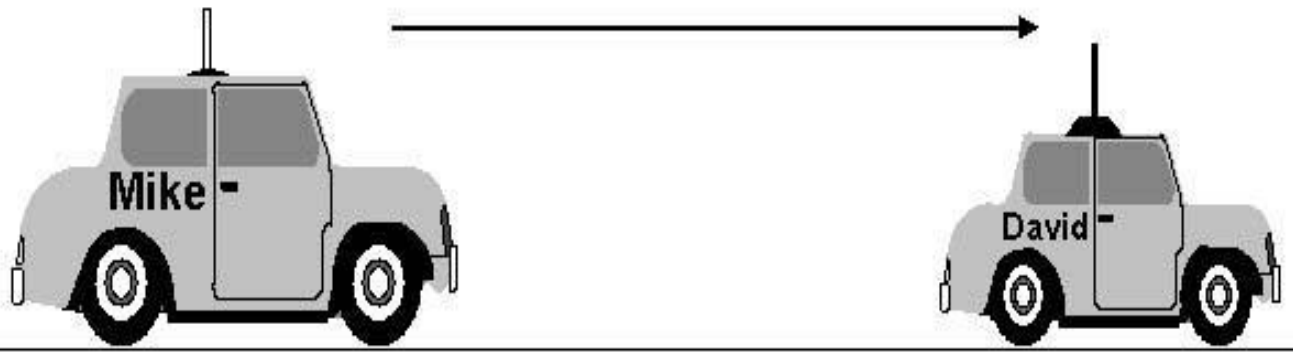

Very High Frequency Waves Pass Through the Atmosphere
Higher Frequency
Waves Travel Further
Before Being Reflected
Low Frequency
Wave Reflected
Ionosphere
"Skip"
Ionosphere

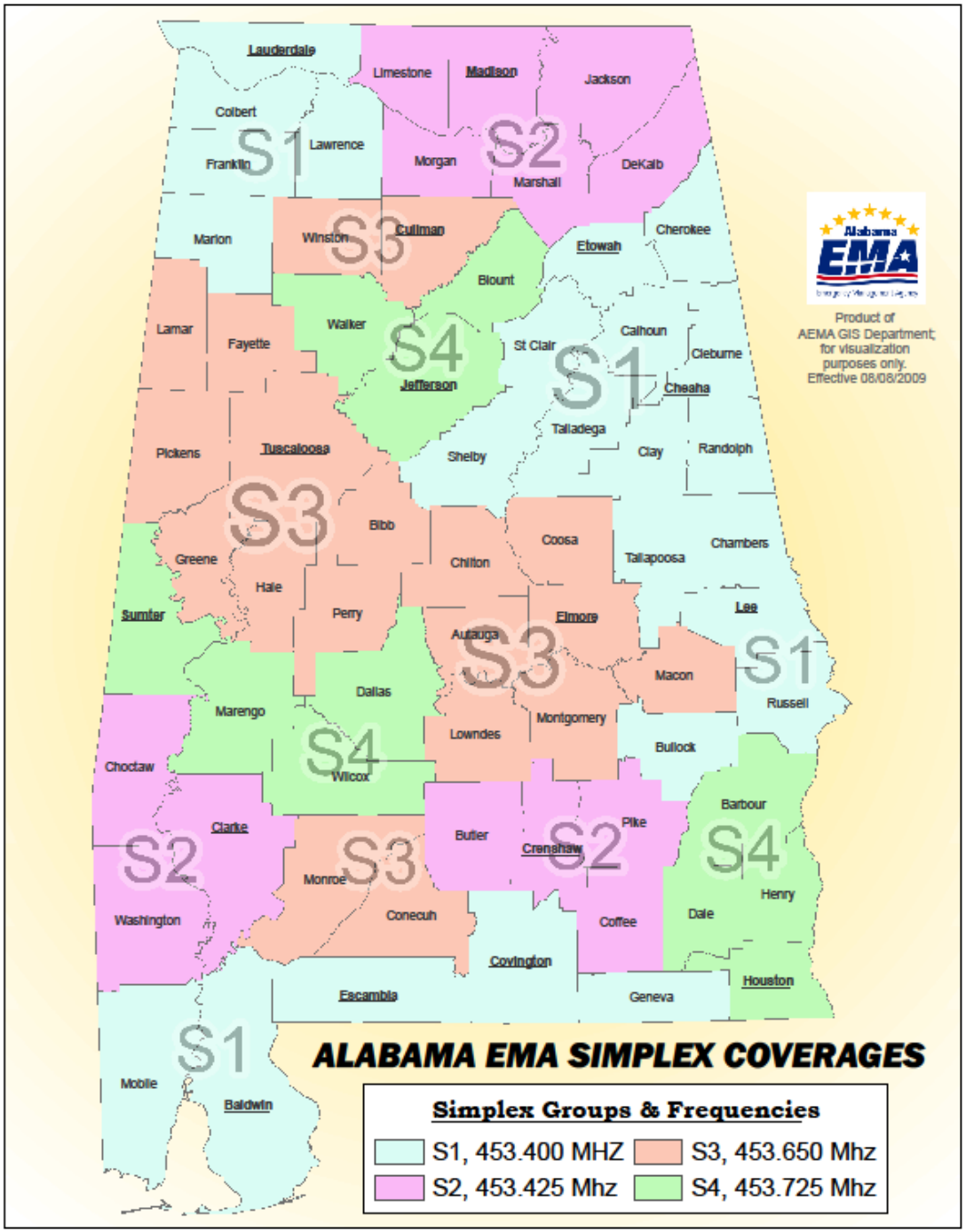
Simplex Operation

- Point to point
- Limited range- approx 4-5 miles depending on terrain and conditions
- No infrastructure required
- AEMA UHF frequencies are designated as AEMA S-1 through AEMA S-4
- LINC Around

Simplex Operation

Simplex Operation- Point to Point
using a single frequency




Lauderdale
Limestone
Madison
Jackson
Colbert
Lawrence
Franklin
Morgan
Marshall
DeKalb
Marion
Winston
Cullman
Etowah
Cherokee
Blount
Walker
Lamar
Fayette
St Clair
Calhoun
Cleburne
Jefferson
Cheaha
Talladega
Pickens
Tuscaloosa
Shelby
Clay
Randolph
Bibb
Coosa
Chambers
Greene
Chilton
Tallapoosa
Hale
Sumter
Perry
Elmore
Lee
Autauga
Macon
Russell
Dallas
Marengo
Montgomery
Lowndes
Bullock
Choctaw
Wilcox
Barbour
Clarke
Butler
Crenshaw
Pike
Monroe
Henry
Washington
Conecuh
Coffee
Dale
Covington
Houston
Escambia
Geneva
Mobile
Baldwin
S1
S2
S3
S4
Alabama EMA
Product of AEMA GIS Department; for visualization purposes only. Effective 08/08/2009
ALABAMA EMA SIMPLEX COVERAGES
Simplex Groups & Frequencies
S1, 453.400 MHZ
S3, 453.650 Mhz
S2, 453.425 Mhz
S4, 453.725 Mhz

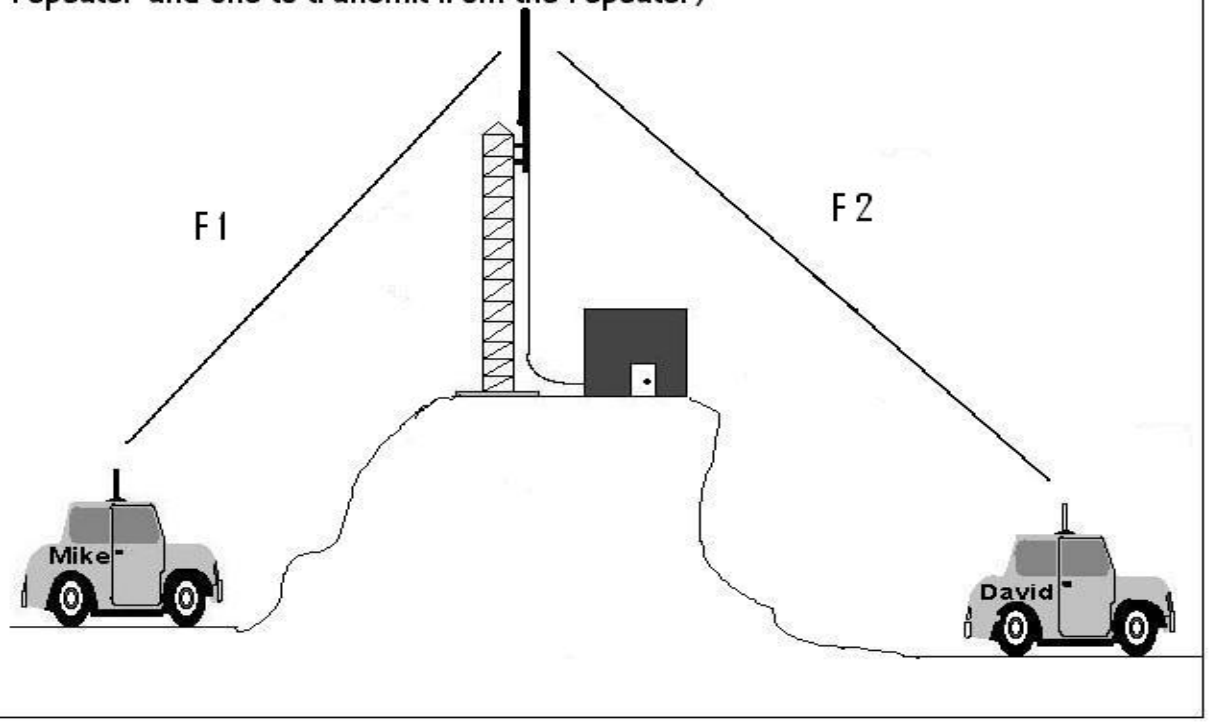
Simplex Operation

- When to use
  - When you need only local area or limited range communication
  - When no repeater is available

Repeater Operations

- Uses two frequencies- one for TX and one for RX
- Signal retransmitted (repeated) at higher power from a site with high elevation for greater coverage area- around 34-45 miles depending on terrain
- Requires infrastructure
- AEMA repeater frequencies are designated by county site names

Duplex Operation using two seperate frequencies (one to transmit to the repeater and one to transmit from the repeater)



AEMA UHF Radio System

- Purpose of this system
- Repeater locations and coverage areas
- Naming scheme- by counties
- Simplex frequencies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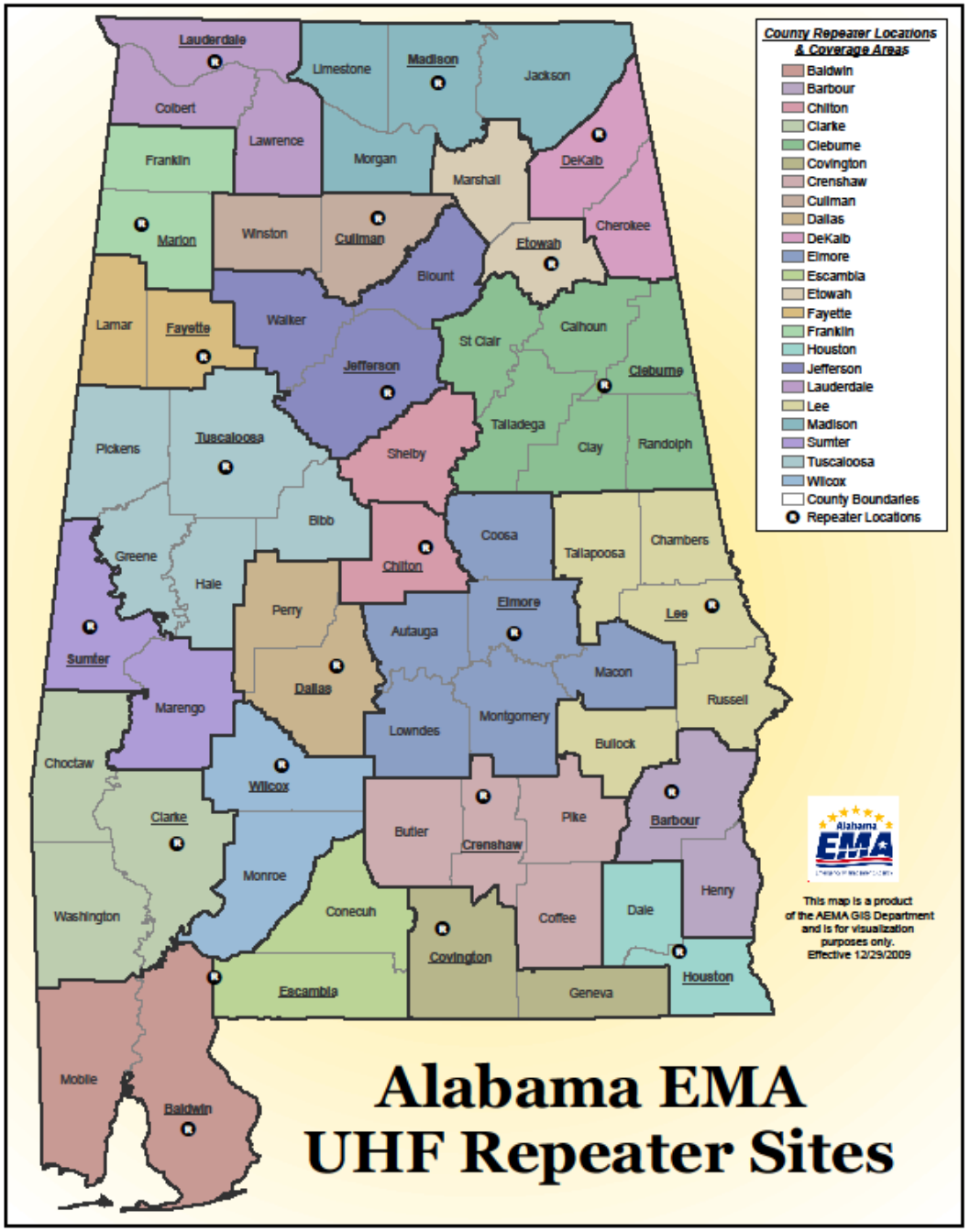

County Repeater Locations & Coverage Areas
Baldwin
Barbour
Chilton
Clarke
Cleburne
Covington
Crenshaw
Cullman
Dallas
DeKalb
Elmore
Escambia
Etowah
Fayette
Franklin
Houston
Jefferson
Lauderdale
Lee
Madison
Sumter
Tuscaloosa
Wilcox
County Boundaries
Repeater Locations
Lauderdale
Limestone
Madison
Jackson
Colbert
Lawrence
Morgan
Marshall
DeKalb
Franklin
Marion
Winston
Cullman
Etowah
Cherokee
Blount
Lamar
Fayette
Walker
St Clair
Calhoun
Jefferson
Cleburne
Pickens
Tuscaloosa
Shelby
Talladega
Clay
Randolph
Bibb
Coosa
Tallapoosa
Chambers
Greene
Hale
Chilton
Perry
Elmore
Lee
Autauga
Sumter
Dallas
Macon
Marengo
Montgomery
Russell
Lowndes
Bullock
Choctaw
Wilcox
Barbour
Clarke
Butler
Crenshaw
Pike
Monroe
Henry
Washington
Conecuh
Coffee
Dale
Covington
Houston
Escambia
Geneva
Mobile
Baldwin
Alabama EMA
This map is a product of the AEMA GIS Department and is for visualization purposes only.
Effective 12/29/2009
Alabama EMA
UHF Repeater Sites

Repeater Operation

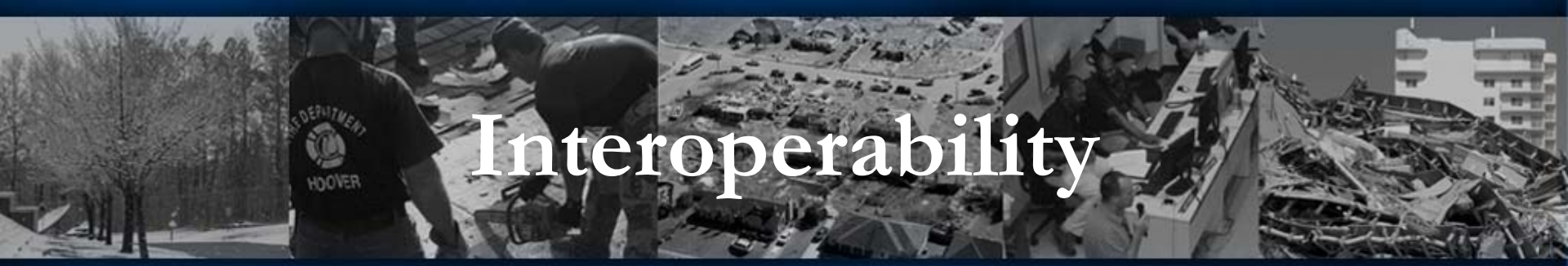
- When to use
  - When the distance is too far for Simplex
  - When there are signal obstructions that prevent Simplex operation
  - When wide area communications are needed

Trunking Systems

- Southern LINC and multiple municipal systems statewide
- Allows multiple users from one site- individual calls or groups
- Multiple transmitters at each fixed site
- Queuing of users among the available receivers/transmitters

Trunking Systems

- The system determines the transmit and receive frequency and tunes the radios
- Wait for the beep before transmitting
- Some systems allow groups
- Most efficient use of equipment and sites
- Most expensive infrastructure



Interoperability

Interoperability

- VHF
  - VCALL10 as the calling channel (Simplex)
- UHF
  - UCALL40D as the calling channel (Simplex)
  - UCALL40 as the calling channel (Repeater)

Amateur Radio

- Readily available trained and experienced licensed pool of operators
  - AL ~11,300 active licenses (12/09)
  - US ~ 680,900 active licenses (12/09)
  - Emergency Nets/ SKYWARN
- Minimal equipment and antennas ($)
- Mobile mounted units for field reports

Amateur Radio

- Many operating frequencies- can easily shift frequencies due to congestion or conditions
- Available for long term recovery efforts
- Their motto is “When all else fails”

County Intranet

- http://county.ema.alabama.gov
- Communications Tab
  - ACU-1000 basic operators instructions
  - Frequency Use Agreement
  - I/O Plan
  - Channel Naming Report
  - VHF and UHF frequency lists

County Intranet

- LINC instruction for i325 and i355
- GETS and WPS information
- Frequent updates


HOOVER

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