

# 1090 RADIO FREQUENCY MEASUREMENT FACILITY (RMF) ENHANCED RECEPTION IMPLEMENTATION

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# RADIO FREQUENCY MEASUREMENT FACILITY (RMF)

- Developed to Measure 1090 RF Environment & Perform Bench Tests
- Samples Analog Video Signal at 10 MHz Rate
- Stores Digitized Video on High Density Digital Tape
- Recorded Signals Processed Off-line with Enhanced Reception Software

# ENHANCED RECEPTION SOFTWARE

- Enhanced Preamble Detection
- Enhanced Bit and Confidence Declaration
- Enhanced Error Detection and Correction Techniques

# ENHANCED PREAMBLE DETECTION

- Locate 4-Pulse Preamble with Timing Tolerance Limited to either 1 Sample Plus or 1 Sample Minus but not Both
- Must be at least 2 Leading Edges Declared within the Above Sample Tolerance
- Reference Time may be Shifted if 2 or More if Leading Edges are Offset
- Enhanced Preamble Detection Continues with Reference Level Generation ...

# ENHANCED PREAMBLE DETECTION REFERENCE LEVEL GENERATION

- Reference Level Based on Amplitude of Preamble Pulses that have Leading Edges Declared in their Reference Positions
- DMTL set to 6 dB below Reference Level
- Enhanced Preamble Detection Continues with Preamble Validation ...

# ENHANCED PREAMBLE DETECTION PREAMBLE VALIDATION

- Pulse Must be Located Within + or - 1 Sample of the Start of the Either the 1 Chip or the 0 chip of each of the First 5 Data Bits
- Pulse Peak Amplitude Must Meet or Exceed the DMTL set by Reference Level Generation
- Effectively Makes it a 9 - Pulse Preamble Detector

# RE-TRIGGERABLE PREAMBLE DETECTION

- Will Re-Trigger if New Signal is at Least 3 dB Stronger than Existing Signal
  - New Reference Level must be 3 dB Stronger
  - Amplitude of 5 Data Pulses must be 3 dB Stronger

# ENHANCED BIT AND CONFIDENCE DECLARATION

- 3 Techniques Developed for RMF:
  - Center Sample (Like Appendix I)
  - 5-5 Multiple Amplitude (Variation of Appendix I 4-4 Approach)
  - New Multiple Amplitude Approach with no Look-up Tables

# ENHANCED BIT AND CONFIDENCE DECLARATION CENTER SAMPLE TECHNIQUE

- Bit and Confidence Value Determined using only the Center Sample of each Chip
- Performance Significantly Weaker than the other 2 Techniques

# ENHANCED BIT AND CONFIDENCE DECLARATION

## 5-5 MULTIPLE AMPLITUDE TECHNIQUE

- Uses all 10 Samples per Bit to Determine Bit and Confidence Values
- Separates Odd and Even Sample Patterns to Index Look-up Tables (size 1024 each)
- Look-up Results Combined to form Bit and Confidence Value
- Look-up Tables Built and “Trained” via Simulation

# ENHANCED BIT AND CONFIDENCE DECLARATION

## NEW MULTIPLE SAMPLE TECHNIQUE

- Uses all 10 Samples per Bit to Determine Bit and Confidence Values
- Using the Preamble Reference Amplitude for Comparison, a Brief Formula Measures how well the 10 Amplitude Samples Resemble a “1” and how well they resemble a “0”
- Bit and Confidence Values are Based on the Result of the Comparison

# ENHANCED ERROR DETECTION AND CORRECTION TECHNIQUES

- Conservative Technique
  - Span of all Low Confidence Bits Limited to 24 Bits
  - Limit of 12 Low Confidence Bits Total
- Brute Force Technique
  - Applied if Conservative Technique Failed or not Applicable
  - Limit of 5 or fewer Low Confidence Bits Total (no limit on span)
- Error Correction is Successful when a conversion of Some or All Low Confidence Bits Results in a Zero Error Syndrome