Enhanced Processing Technique Test Procedure Approach

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Introduction

- Need for enhanced techniques
  - Long-range air-air in high interference environment
- Elements of enhanced processing
  - Improved preamble detection
  - Improved code and confidence bit declaration
  - More capable error correction techniques, optimized to the characteristics of the code and confidence process
- Error correction restriction
  - Cannot use sliding-window technique
  - Unacceptably high undetected error rate in high fruit environments

MOPS Overview

- **Requirements (Section 2.2.4.4)**
  - Description of enhanced technique functionality
  - Requires compliance only with test procedures
  - No specific technique is required, except that sliding window shall not be used

- **Test Procedures (Section 2.4.4.4)**
  - Test equipment requirements
  - Data block tests with Mode A/C and Mode S fruit
  - Four-pulse preamble tests
  - Preamble validation tests
  - Combined preamble and data block tests with Mode A/C fruit

Test Equipment Requirements

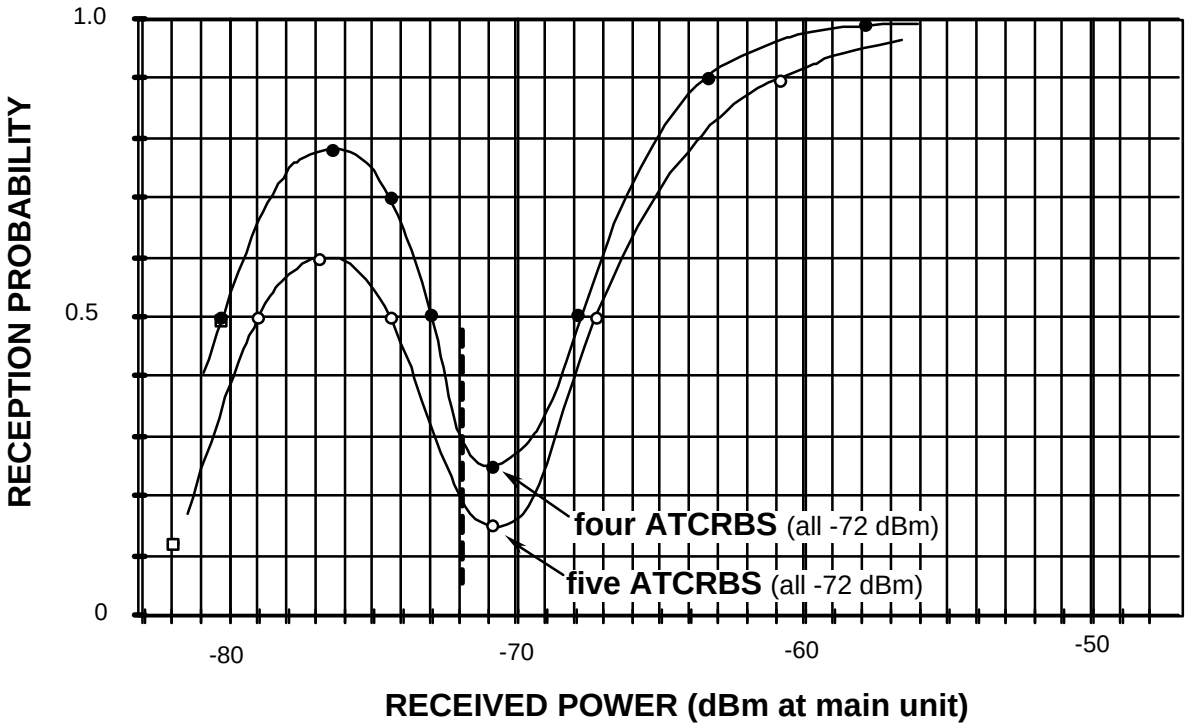
- Mode A/C fruit signal source
  - Five sources required
  - Non-coherent with any other fruit source
  - Framing plus five data pulses (randomly distributed)
  - Pseudo random timing distribution
- Mode S fruit signal source
  - One required
  - Arbitrary 112-bit format content
  - Non-coherent with extended squitter signal source
- Extended squitter signal source
  - One required
  - Non-coherent with any other fruit source
  - Power level controllable to -12, -8, -4, 0, +4, +8, +12 relative to fruit source
  - Content set to DF=17, option for fixed Format Type Code
  - Remainder of message set pseudo-randomly with appropriate 24-bit PI field for the message content

Data Block Tests

- Data block tests with Mode A/C fruit
- Data block tests with Mode S fruit
- Averaging performance across relative power levels

Averaging Performance Across Power Levels

Bench test measurements,
showing the dip in reception when S/I = 0 dB.



Comparison: Equal and Unequal Interferers

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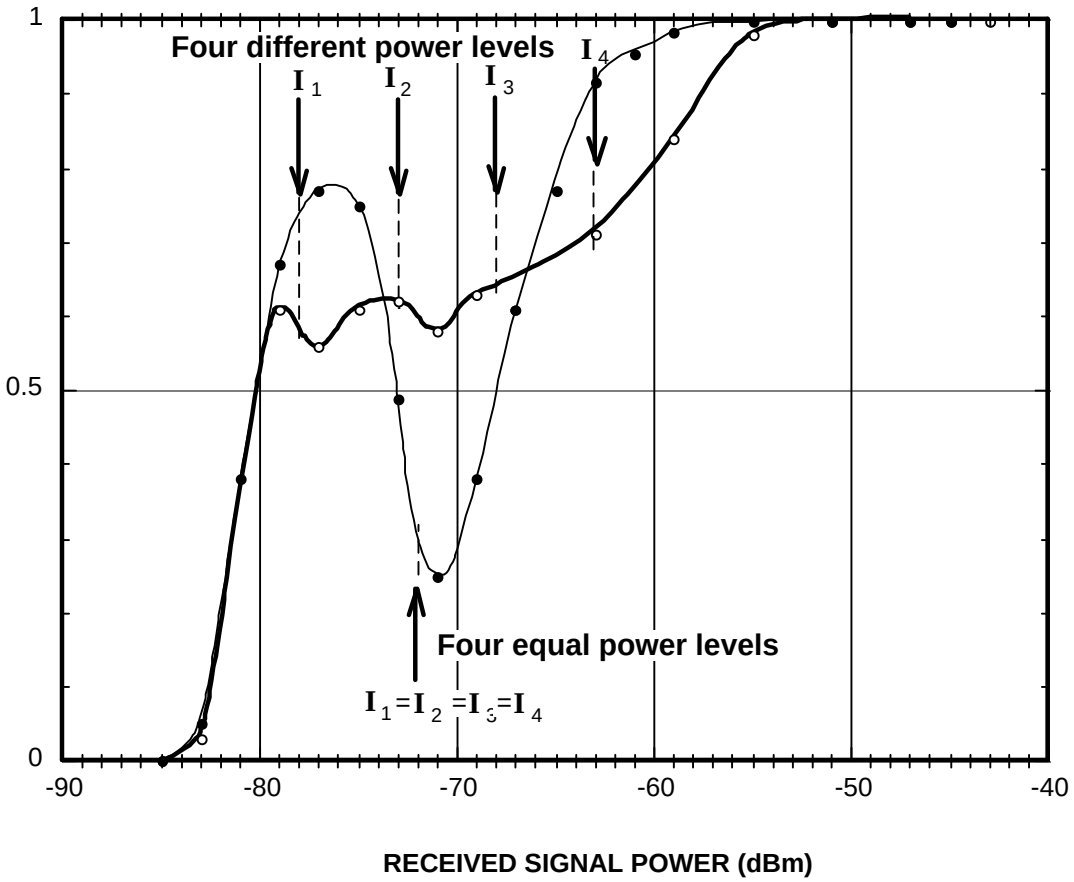
Extended Squitter Bench Tests

Tests performed by APL on an LDPU (minus preamp)

Extended Squitter with Four ATCRBS Interferers



Averaging

	RECEPTION PROBABILITY	
	Case 1	Case 2
Signal power	(equal interferers)	(distributed interferers)
S = -72 dBm	0.34	0.6
3 dB lower	0.75	0.61
6 dB lower	0.74	0.6
3 dB higher	0.38	0.63
6 dB higher	0.70	0.62
9 dB higher.	0.92	0.71
	average = 0.64	average = 0.63

Data Block Tests with Mode A/C Fruit

- **Step 1: Zero fruit**
  - **Verify correct operation**
- **Step 2: One fruit overlap**
  - **Set extended squitter power to -12 dB relative to fruit signal**
  - **Mode A/C fruit pseudo-randomly distributed across data block**
  - **Inject extended squitter waveform 1000 times**
  - **Record performance, test for undetected errors**
  - **Repeat above for relative powers of -8, -4, 0, +4, +8, +12 dB**
  - **Calculate average probability of reception and number of undetected errors**
- **Step 3: Repeat step 2 with two fruit overlaps**
- **Step 4: Repeat step 2 with three fruit overlaps**
- **Step 5: Repeat step 2 with four fruit overlaps**
- **Step 6: Repeat step 2 with five fruit overlaps**
- **Step 7: Determination of success or failure**
  - **Compare results with requirements table**

Data Block Tests with Mode S Fruit

- **Step 1: Zero fruit**
  - **Verify correct operation**
- **Step 2: One fruit overlap**
  - **Set extended squitter power to 0 dB relative to fruit signal**
  - **Mode S fruit pseudo-randomly distributed across data block**
  - **Inject extended squitter waveform 1000 times**
  - **Record performance, test for undetected errors**
  - **Repeat above for relative powers of -8, +4, +8, +12 dB**
  - **Calculate average probability of reception and number of undetected errors**
- **Step 3: Determination of success or failure**
  - **Compare results with requirements table**

Four-Pulse Preamble Detection Tests

- **Steps 1-4:**
  - **Preamble pulse characteristics set to the extreme limits of their tolerance range**
- **Steps 5-6:**
  - **Preamble pulse widths set to out-of-tolerance values**
- **Steps 7-12:**
  - **Preamble pulse positions set to out-of-tolerance values**
- **Steps 13-14:**
  - **Preamble single pulse**

Preamble Validation Tests

- **Steps 1-2:**
  - **Preamble Validation – Missing First Data Bit - Part 1**
- **Steps 3-4:**
  - **Preamble Validation – Missing Second Data Bit - Part 1**
- **Steps 5-6:**
  - **Preamble Validation – Missing Third Data Bit - Part 1**
- **Steps 7-8:**
  - **Preamble Validation – Missing Fourth Data Bit - Part 1**
- **Steps 9-10:**
  - **Preamble Validation – Missing Fifth Data Bit - Part 1**
- **Steps 11-12:**
  - **Preamble Validation – Missing Sixth Data Bit - Part 1**

Combined Preamble and Data Block Tests with Mode A/C Fruit

- Step 1: Zero fruit
  - Verify correct operation
- Step 2: One fruit overlap
  - Set extended squitter power to -12 dB relative to fruit signal
  - Mode A/C fruit pseudo-randomly dist across preamble & data block
  - Inject extended squitter waveform 1000 times
  - Record performance, test for undetected errors
  - Repeat above for relative powers of -8, -4, 0, +4, +8, +12 dB
  - Calculate average probability of reception and number of undetected errors
- Step 3: Repeat step 2 with two fruit overlaps
- Step 4: Repeat step 2 with three fruit overlaps
- Step 5: Repeat step 2 with four fruit overlaps
- Step 6: Repeat step 2 with five fruit overlaps
- Step 7: Determination of success or failure
  - Compare results with requirements table