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Standardized Observational Protocols for Distributed Signal Monitoring Networks

1. Introduction

1.1 Purpose and Scope

The Static Research Network operates geographically distributed monitoring facilities conducting continuous observation of electromagnetic signals across multiple frequency ranges. Effective coordination and data integration across sites requires standardized methodologies for observation, recording, and reporting.

This document establishes mandatory protocols for:

- Equipment calibration and verification
- Data acquisition and logging
- Event classification and reporting
- Inter-site communication and coordination
- Quality assurance and data validation

1.2 Applicability

These protocols apply to all SRN monitoring facilities and collaborative institutional partners participating in coordinated observation programmes. Deviations from established protocols require written authorization from the Technical Standards Committee.

1.3 Effective Date

Implementation required: 1 May 1972

All facilities must complete protocol implementation and submit compliance verification by 15 May 1972.

2. Timing and Timestamp Standards

2.1 Universal Time Coordination (UTC)

All observations, data logs, and event reports shall use Coordinated Universal Time (UTC) as the primary temporal reference. Local time may be recorded as supplementary information but shall not serve as primary timestamp.

Format Specification:

- Date: YYYY-MM-DD (year-month-day)
- Time: HH:MM:SS (hours-minutes-seconds, 24-hour format)
- Example: 1972-03-15 14:37:22 UTC

2.2 Time Synchronization Requirements

Primary Facilities:

All primary monitoring facilities shall maintain time synchronization with national time standards accurate to ±100 milliseconds.

Synchronization methods:

- WWV/WWVH radio time signals (primary)
- LORAN-C timing signals (backup)
- Telephone time service (emergency)

Secondary Facilities:

Secondary facilities shall maintain time synchronization accurate to ±500 milliseconds using available methods.

2.3 Clock Verification Procedures

Timing system accuracy shall be verified:

- Daily: Comparison with broadcast time signals
- Weekly: Documentation of measured time offset
- Monthly: Comprehensive timing system diagnostic

Time offset exceeding specified tolerance requires immediate correction and event log notation.

3. Equipment Calibration Standards

3.1 Calibration Schedule

Mandatory Calibration Intervals:

Daily Verification:

- Receiver gain check using calibrated signal source
- Noise floor measurement
- Frequency reference verification

Weekly Calibration:

- Full receiver sensitivity measurement
- Frequency accuracy verification (±1 Hz at 10 MHz)
- Antenna system VSWR check

Monthly Calibration:

- Comprehensive system performance characterization
- Comparison with calibrated reference equipment
- Documentation of long-term drift characteristics

Annual Calibration:

- Complete system recalibration using laboratory standards
- Equipment replacement assessment
- Facility environmental survey

3.2 Calibration Signal Standards

Standard calibration signals shall be derived from:

- Precision signal generator (frequency accuracy $\pm 10^{-8}$)
- Calibrated noise source (ENR specified ±0.3 dB)
- Reference antenna with documented gain characteristics

3.3 Calibration Documentation

All calibration activities shall be documented in facility calibration logs including:

- Date and time of calibration
- Personnel performing calibration
- Measured equipment parameters
- Comparison with previous measurements
- Corrective actions taken (if required)

4. Data Acquisition Protocols

4.1 Continuous Monitoring Requirements

Primary monitoring facilities shall maintain continuous data acquisition 24 hours per day, 7 days per week. Acceptable monitoring interruptions:

- Scheduled maintenance: ~2 hours per week
- Equipment failure: Immediate notification to central coordination required
- Emergency situations: As circumstances require

4.2 Sampling and Recording Rates

Frequency Domain Data:

- Spectral resolution: ≤100 Hz
- Update rate: ≥1 per second for monitored bands
- Dynamic range: ≥60 dB

Time Domain Data:

- Sampling rate: Minimum 2× highest frequency of interest (Nyquist criterion)
- Recording bandwidth: As required for specific observation programmes
- Data archival: Continuous for designated frequencies, event-triggered for others

4.3 Data Storage Requirements

Primary Data:

- Continuous spectral recordings for designated frequency bands
- Storage medium: Magnetic tape (primary), paper chart (backup)
- Retention period: Minimum 2 years

Event Data:

- High-resolution recordings triggered by anomaly detection
- Storage medium: Magnetic tape with rapid-access archival
- Retention period: Minimum 5 years

Metadata:

- Equipment configuration records
- Calibration data
- Environmental monitoring data
- Retention period: Minimum 10 years

4.4 Data Formats

Spectral Data Format:

Timestamp | Frequency (MHz) | Amplitude (dBm) | Bandwidth (Hz) | Quality Flag

Event Data Format:

Event ID | Start Time | Duration | Frequency | Max Amplitude | Classification | Notes

Environmental Data Format:

Timestamp | Temperature (°C) | Humidity (%) | Pressure (hPa) | Wind Speed (m/s) | Sky Conditions

5. Event Classification and Reporting

5.1 Event Detection Thresholds

Signal anomalies warranting event classification:

Threshold Levels:

- Level 1: Signal exceeds background by 10 dB
- Level 2: Signal exceeds background by 20 dB
- Level 3: Signal exceeds background by 30 dB or exhibits anomalous characteristics

Duration Requirements:

- Minimum event duration: 10 seconds
- Events <10 seconds classified as transient impulse noise

5.2 Event Classification Categories

Category A - Natural Phenomena:

- Lightning-related impulse noise
- Atmospheric propagation enhancement
- Solar/cosmic radio bursts

Category B - Anthropogenic Sources:

- Known transmitter signals
- Industrial interference
- Facility equipment self-interference

Category C - Unidentified:

- Events not matching Categories A or B
- Require detailed documentation and multi-site coordination

5.3 Event Reporting Procedures

Level 1 Events:

- Documentation in facility event log
- No immediate external reporting required
- Monthly summary to central coordination

Level 2 Events:

- Documentation in facility event log
- Same-day notification to central coordination via telephone
- Detailed report within 48 hours

Level 3 Events:

- Immediate notification to central coordination (within 1 hour)
- Initiate multi-site coordination protocol
- Comprehensive technical report within 7 days

5.4 Category C (Unidentified) Event Protocol

All Category C events require:

1. High-resolution data recording
2. Environmental condition documentation
3. Equipment status verification
4. Request for correlative observations from other facilities
5. Preliminary analysis within 24 hours
6. Detailed technical analysis within 30 days

6. Inter-Site Coordination

6.1 Scheduled Communications

Daily Check-In:

- Time: 18:00 UTC
- Method: Telephone conference
- Participants: Facility duty officers
- Purpose: Status updates, immediate issues

Weekly Coordination:

- Time: Monday 14:00 UTC
- Method: Telephone conference
- Participants: Facility directors, technical coordinators
- Purpose: Technical issues, observation planning

Monthly Technical Review:

- First Wednesday of each month, 10:00 UTC
- Method: In-person or telephone conference
- Participants: Technical staff, research personnel
- Purpose: Data review, methodology updates, planning

6.2 Emergency Communications

Level 3 events or equipment emergencies require immediate multi-site notification:

Primary Contact Method: Direct telephone (facility-to-facility)

Backup Method: Telegraph or radio communication

Response Time: Acknowledge within 30 minutes

6.3 Data Sharing Protocols

Facilities shall share:

- Real-time event notifications (Level 2 and 3)
- Daily summary logs (transmitted weekly)
- Detailed event data (upon request)
- Calibration and performance data (monthly)

Data Transmission Methods:

- Magnetic tape (mail service)
- Telegraph for urgent numerical data
- Telephone for immediate coordination

7. Quality Assurance

7.1 Data Quality Indicators

All recorded data shall include quality flags:

- **Q1 (High Quality):** All systems nominal, calibration current
- **Q2 (Good Quality):** Minor issues, data usable with caveats
- **Q3 (Questionable):** Significant issues, data requires careful validation
- **Q4 (Poor Quality):** Equipment malfunction, data unreliable

7.2 Validation Procedures

Automated Validation:

- Timestamp consistency checks
- Signal level sanity checks (prevent overflow/underflow)
- Calibration status verification

Manual Validation:

- Daily review of automated data logs
- Investigation of anomalous readings
- Cross-referencing with environmental conditions

7.3 Corrective Actions

Data quality issues require:

1. Immediate investigation of root cause
2. Documentation in facility maintenance log
3. Notification to central coordination if affecting >4 hours of data
4. Implementation of corrective measures
5. Verification of correction effectiveness

8. Training and Documentation

8.1 Personnel Training Requirements

All facility technical staff shall complete:

- Initial protocol training (16 hours)
- Equipment-specific training (as required)
- Annual refresher training (4 hours)
- Emergency procedure drills (quarterly)

8.2 Reference Documentation

Each facility shall maintain:

- Complete set of protocol documentation (this document and supplements)
- Equipment technical manuals
- Facility-specific operating procedures
- Emergency contact lists
- Historical calibration records

8.3 Protocol Updates

Protocol modifications require:

- Technical Standards Committee review
- 30-day comment period for participating facilities
- Approval by Programme Director
- 60-day implementation period following approval

9. Implementation Checklist

Facilities must complete the following by 15 May 1972:

- [ ] UTC timing system implementation and verification
- [ ] Calibration schedule establishment and initial baseline
- [ ] Data logging format conversion
- [ ] Event classification procedures implementation
- [ ] Communication schedule integration
- [ ] Personnel training completion
- [ ] Compliance verification submission to Technical Standards Committee

Prepared By:

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Static Research Network

Approved By:

Programme Director

Distribution:

- All SRN Monitoring Facilities
- Participating Institutional Partners
- Central Coordination Office
- Technical Standards Committee

Revision History:

- Version 1.0: March 1972 (Initial Release)