



Testing New Surveillance Equipment for Safeguards Applications

V. Fortakov, K. Gaertner, J. Whichello, O. Ali

IAEA

Optical surveillance is one of the important safeguards measures applied by the IAEA. Surveillance equipment currently in use (twin cine-camera units and one- or multi-channel closed circuit TV systems) was designed more than a decade ago and some of the systems authorized for inspection use - particularly single-channel TV systems - have a failure rate that contributes significantly to the overall number of surveillance failures. In October 1995 the Department of Safeguards finalized a policy for transition from the current surveillance equipment to digital image surveillance (DIS) and agreed on the essential requirements for DIS systems.

To be sure about the reliability of the new equipment, it was decided that all DIS systems must be adequately tested in the field before their acceptance by the Agency. Three DIS systems are under evaluation: Gemini, developed under a task of the US Support Programme to Agency safeguards; EMOSS-1, a product of the French Hymatom company; and VDIS, being completed under a task of the German Support Programme. Department-wide field test activities have been formulated with surveillance units installed in nuclear facilities under safeguards in different countries. Support Programmes of Hungary and Finland provide additional test locations.

The field test objective has been set "to determine the suitability of each surveillance system as routine use inspection equipment answering the User Requirements" with a goal of at least 150 operating unit-months for each system to accumulate, with all systems installed at locations broadly representing the spectrum of facilities where such equipment will be used. The goal of 150 unit-months was selected to determine with an acceptable confidence a lower limit value for the equipment-related Mean Time Between Failures (MTBF) from the test data collected.

Before DIS units are released for installation at a field location, each unit is subjected to a burn-in test at the Agency HQ to confirm the unit operability and ensure its configuration for the field testing. In addition, all DIS systems are subjected to a set of standard tests:

- environmental - to check how the system meets the environmental, mechanical and electromagnetic compatibility specifications,
 - usability - to assess if inspectors can efficiently interface with the system,
- and
- vulnerability - to assess the robustness and tamper-resistance of the system's data authentication features.

As of the end of April 1997, a major part of standard system tests have been completed. In the field testing, the following installed unit-months have been

accumulated: 78 unit-months for EMOSS, 32 for Gemini, and 27 for VDIS (for Gemini and VDIS those numbers include a number of units that are tested in their system's remote monitoring configurations). According to the field test schedule the number of surveillance unit-months accumulated by the end of 1997 will allow the Agency to complete the field testing of the first two systems mentioned above. The field testing of VDIS is expected to be completed in 1998.

To facilitate the tests, a close contact with the manufactures of the three DIS systems has been maintained. Procedures for burn-in tests and to collect and evaluate data collected by inspectors servicing the test units in the field have been detailed and implemented. A test database has been established to store and process the data accumulated, a uniform definition of what constitutes a DIS unit failure has been formulated and various categories of failures help organize the field test data in a way allowing to separate equipment-caused failures from those caused by other reasons.

The paper describes the test procedures and data evaluation process. It presents the main conclusions of the standard tests emphasizing aspects that are of general importance to equipment used for safeguards purposes. Field test results available by October 1997 are also presented in a generalized way.