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**Satellite Earth Stations (SES);
Control and monitoring functions at a
Very Small Aperture Terminal (VSAT)**

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Foreword

This European Telecommunication Standard (ETS) has been produced by the Satellite Earth Stations (SES) Technical Committee of the European Telecommunications Standards Institute (ETSI), and, has undergone the ETSI standards approval procedure in Public Enquiry 20 and Vote 25.

Every ETS approved by ETSI is a voluntary standard. This ETS may contain text concerning type approval of the equipment to which it relates. This text should be considered as guidance only and does not make this ETS mandatory.

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1 Scope

This European Telecommunication Standard (ETS) is applicable to two-way (transmit and receive) Very Small Aperture Terminal (VSAT) satellite earth stations operating in the framework of a satellite network for digital communication purposes as defined in ETS 300 159 [1]. In these networks there is a set of control and monitoring functions at each VSAT and a separate set of Centralised Control and Monitoring Functions (CCMF). The control and monitoring functions are designed to limit interferences to users of the frequency spectrum due to a fault condition at the VSAT. This ETS is applicable to VSATs operating in any network configuration including star, mesh and point to point connections.

This ETS defines the requirements for the control and monitoring functions in a VSAT and is only applicable to the satellite access subsystem of the VSAT. ETS 300 161 [2] contains requirements for the Centralised Control and Monitoring Functions (CCMF).

This ETS does not include any requirement, recommendation or information about the installation of the VSAT.

2 Normative references

This ETS incorporates by dated or undated references, provisions from other publications. These applicable references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to, or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1] ETS 300 159: "Satellite Earth Stations (SES); Transmit/receive Very Small Aperture Terminals (VSATs) used for data communications operating in the Fixed Satellite Service (FSS) 11/12/14 GHz frequency bands".

[2] ETS 300 161: "Satellite Earth Stations (SES); Centralised control and monitoring functions for VSAT networks".

3 Definitions

The VSATs which are the subject of this ETS, are designed for unattended operation and with transmission capability limited to baseband digital signals. Transmission and reception at a VSAT relate to transmission and reception over the satellite.

CCMF constitute a set of functional entities that, at system level, monitor and control the correct operation of all VSATs in a system.

Control channel(s): a channel or channels by which VSATs receive control information from the CCMF.

4 Abbreviations

For the purpose of this ETS, the following abbreviations apply:

CCD	Central Control Disable
CCE	Central Control Enable
CCMF	Centralised Control and Monitoring Functions
SMV	Self Monitoring Variable
SMF	Status Monitoring Fail event
SMP	Status Monitoring Pass event
VSAT	Very Small Aperture Terminal
RE	Reset Event

5 Requirements

5.1 General

This ETS specifies a minimum set of control and monitoring functions that shall be implemented on two way VSATs in order to minimise the probability that they may originate transmissions that may interfere with other systems.

A VSAT shall implement two sets of control and monitoring functions:

- a) Monitoring function: this function encompasses all the checks and verifications that the VSAT shall perform in order to identify any anomalous situation which may cause impairments to other systems.

The overall result of these checks and verifications are contained in a functional variable which shall be called Self Monitoring Variable (SMV). The states of this variable are "Pass" and "Fail".

The state of the SMV may change as a result of events. These are:

- Status Monitoring Pass event (SMP);
- Status Monitoring Fail event (SMF).

The circumstances under which these events may take place are specified in subclause 5.3.1 of this ETS.

- b) Control function: this function is associated with the ability of the CCMF to inhibit and to permit transmissions from an individual VSAT as specified in ETS 300 161 [2].

This function is reflected in the state of a functional variable, resident at each VSAT named Control Variable .

The states of this variable are "enable" and "disable".

The Control Variable may change as a result of events. These are:

- Central Control Disable (CCD);
- Central Control Enable (CCE).

The circumstances associated to the reception of the messages resulting in these events are specified in subclause 5.3.2 of this ETS.

Besides these two sets of control and monitoring functions, the VSATs are requested to achieve a controlled non transmitting state following the activation of the terminal (power on).

VSATs that allow local operator intervention may include a terminal reset function which when actuated results in a Reset Event (RE).

Subclause 5.3.3 specifies the functions associated to the occurrence of the "power on" and REs.

The combination of the SMV and the Control Variable results in the definition of four possible states in which a two way VSAT may be from the control and monitoring point of view.

The states of the VSAT are:

- Out of service;
- Checking;
- Stand by;
- In Service.

Figure 1 shows the state transition diagram associated to these four states. The operational behaviour of the VSAT, (with respect to control and monitoring), in each of these states, is specified in subclause 5.2.

In the "In Service" state, the events SMF and CCD may be processed as the RE, in order to set the VSAT in the "Out of Service" state.

In the "Out of Service" state the CCE event may be ignored.

When the VSAT transmits several carriers having different frequencies, a VSAT state machine as described above may be associated with each carrier. The events then apply to the subsystem associated with the specific carrier, rather than the whole VSAT.

5.2 Specification of states

The "Checking" state shall apply when the SMV is "Fail" and when the Control Variable is "enable". In the "Checking" state, the VSAT shall not transmit.

The "Out of Service" state shall apply when the SMV is "Fail" and when the Control Variable is "disable". In the "Out of Service" state the VSAT shall not transmit. This state shall be entered following power on or reset.

The "Stand by" state shall apply when the SMV is "Pass" and when the Control Variable is "disable". In the "Stand by" state, the VSAT shall not transmit.

The "In Service" state applies when the SMV is "Pass" and when the Control Variable is "enable". In the "In Service" state the VSAT is allowed to transmit.

5.3 Transition requirements

5.3.1 Self monitoring functions

This subclause specifies the functions that the VSAT shall satisfy so as to consider that all its subsystems are operating correctly.

These are:

- processor monitoring;
- receive subsystem monitoring;
- transmit subsystem monitoring;
- central control reception;
- VSAT transmission validation.

The successful verification of all conditions shall result in an SMP event.

The failure of any of the conditions shall result in an SMF event.

The change of state originated by the SMF event shall occur within 3 s of the occurrence of the event.

The monitoring functions shall be performed in all states of the VSAT.

5.3.1.1 Processor monitoring

Purpose:

To ensure that the VSAT can suppress transmissions in the event of a processor failure.

Specification:

A VSAT shall incorporate a processor monitoring function for each of its processors involved in the manipulation of traffic and in the control and monitoring functions.

The processor monitoring function shall verify the correct operation of the processor hardware and software.

The detection by the processor monitoring function of a processor fault lasting longer than 30 seconds shall result in an SMF event.

Verification:

Compliance shall be verified by documentary evidence and demonstration.

The demonstration shall show that all transmissions are suppressed within 33 seconds following a controllable processor induced fault (e.g. processor reset applied; processor board disconnected). The manufacturer shall provide the explanation of how to induce the appropriate fault(s).

5.3.1.2 Receive subsystem monitoring

Purpose:

To ensure that the VSAT operates with the correct parameters and can receive control information from the CCMF.

Specification:

A VSAT shall monitor the operation of its receive subsystem and demonstrate that it can lock to the received carrier frequency, demodulate and decode the signals from the CCMF.

Failure of the receive subsystem for a period longer than 30 seconds shall result in an SMF event.

Verification:

Compliance shall be verified by documentary evidence and demonstration. The demonstration shall show that all transmissions are suppressed within 33 seconds following a receive subsystem fault.

The manufacturer shall provide the explanation of how to induce the appropriate fault(s).

5.3.1.3 Transmit subsystem monitoring

Purpose:

To ensure that the VSAT can suppress the transmissions in the event of misoperation of the transmit subsystem.

Specification:

A VSAT shall monitor the operation of its transmit frequency generation subsystem.

The failure of the transmit frequency generation subsystem for a period longer than 5 seconds shall result in an SMF event.

Verification:

Compliance shall be verified by documentary evidence and demonstration.

The demonstration shall show that the transmission is suppressed within 8 seconds following a controllable transmit frequency generation subsystem fault (e.g. replacement of frequency reference).

The manufacturer shall provide the explanation of how to induce the appropriate fault(s).

5.3.1.4 Control channel reception

Purpose:

These requirements ensure that the VSAT shall be capable of receiving and executing commands from the CCMF through correct reception of the appropriate control channel(s), and that it can retain its unique identification in the network.

Specification:

The VSAT shall hold, in non-volatile memory, two unique identification codes:

- a) the identification code of the control channel or channels which it is authorised to receive; and
- b) the identification code of the VSAT.

Failure to receive and validate an authorised control channel identification code for a period longer than one minute shall result in SMF event.

The VSAT shall be capable of receiving, via any authorised control channel, messages addressed to the VSAT containing CCD and CCE. The control channel(s) shall be carried by the same satellite in which the system operates.

Verification:

The method of setting and storing the control channel(s) and the VSAT identification codes shall be verified by documentary evidence.

The VSAT shall suppress its transmissions within 63 seconds following the interruption of the reception of the all authorised control channel(s).

5.3.1.5 VSAT transmission validation

There shall be two alternative methods to confirm that the transmissions by a transmitting VSAT are being correctly received. These are:

- transmission validation by the CCMF;
- transmission validation by receiving station(s).

5.3.1.5.1 VSAT transmission validation by the CCMF

Purpose:

A transmitting VSAT shall be requested to send to the CCMF one or multiple status messages in order to validate its correct operation.

Specification:

When the VSAT is in the "In Service" state, and when it receives a "poll for status message", as defined in subclause 5.4.1 of ETS 300 161 [2], the VSAT shall transmit a "status message". The status message may be transmitted by the VSAT periodically thereafter without further stimuli from the CCMF.

Verification:

Compliance by documentary evidence and demonstration.

5.3.1.5.2 VSAT transmission validation by receiving station(s)

Purpose:

A transmitting VSAT shall confirm that its transmissions are being correctly received at receiving station(s).

For every ten minutes during which the VSAT transmits at least once, the VSAT should receive at least one "transmission validation message" indicating that its transmissions are being received at the receiving station(s).

Specification:

If no transmission validation message has been received by the VSAT for more than ten minutes after any transmission indicating that such transmission has been received, it shall result in a monitoring status "Fail".

Verification:

Compliance by documentary evidence and demonstration.

5.3.2 Central control functions

This subclause specifies the conditions the VSAT shall satisfy to consider that it is authorised to transmit.

The reception from the CCMF of a CCE message shall result in a CCE event.

The reception from the CCMF of a CCD message shall result in a CCD event.

The change of state originated by the occurrence of the CCE and CCD events shall take place within 3 seconds of the events.

5.3.2.1 Disable message

Purpose:

A transmitting VSAT shall suppress all transmissions if it receives a CCD message from the CCMF.

Specification:

Reception of a CCD message shall result in a CCD event.

Verification:

Compliance shall be determined by documentary evidence and demonstration.

It shall be demonstrated that a transmitting VSAT shall suppress all transmissions when receiving the CCD message on the control channel.

5.3.2.2 Enable message

Purpose:

To allow the CCMF to enable a VSAT to transmit.

Specification:

Reception of CCE message shall result in a CCE event.

Verification:

Compliance shall be determined by documentary evidence and demonstration.

It shall be demonstrated that a previously disabled VSAT shall begin transmission upon the reception of a CCE message when the VSAT has data to transmit.

5.3.3 Power on/reset

Purpose:

To demonstrate that the VSAT shall achieve a controlled non-transmitting state following the powering of the unit, or the occurrence of a reset made by a local operator when this function is implemented.

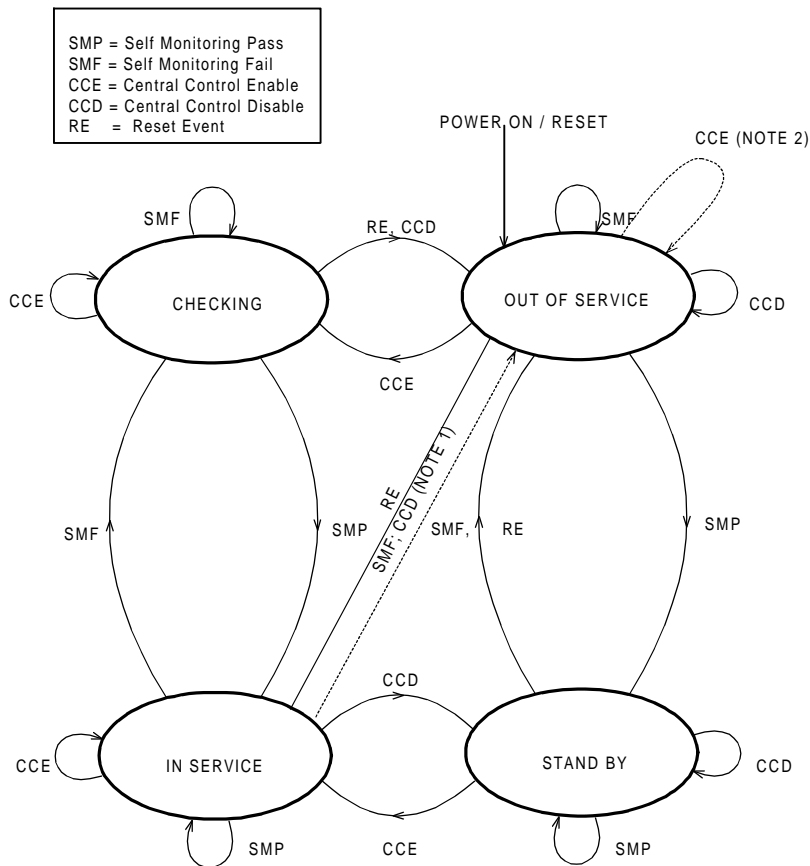
Specification:

Following "power on" the VSAT shall enter the "Out of Service" state.

Following the application of a reset to the VSAT, a RE shall be considered to have taken place, causing the unit to enter the "Out of Service" state within 3 seconds.

Verification:

Compliance shall be verified by documentary evidence and demonstration.



NOTE 1: In the "In Service" state, the occurrence of SMF and/or CCD may result in a transition to the "Out of Service" state.

NOTE 2: In the "Out of Service" state, the occurrence of the CCE event may be ignored.

Figure 1: State transition diagram of the control and monitoring function of a VSAT

History

Document history	
November 1992	First Edition
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