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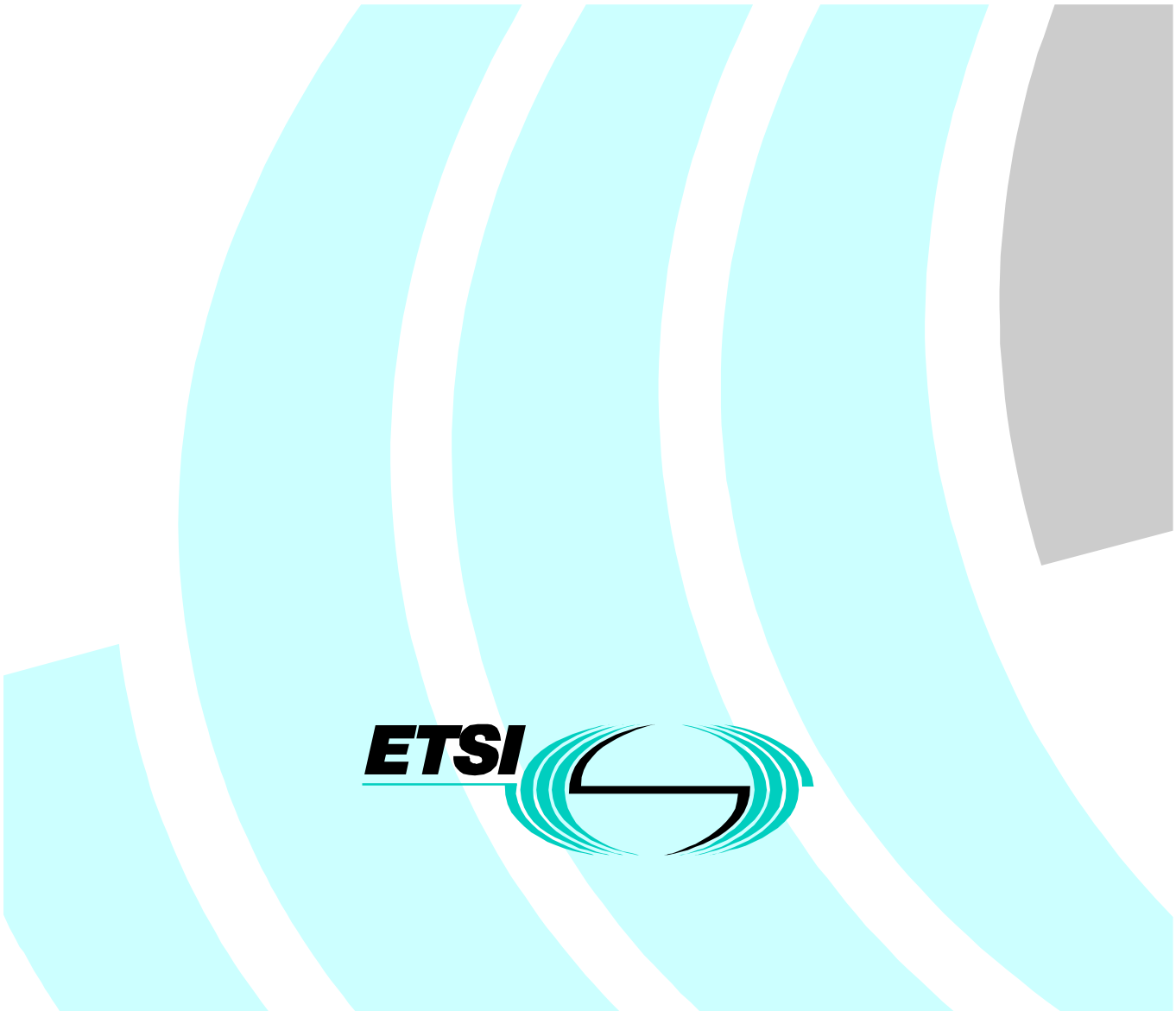
Technical Report

Terrestrial Trunked Radio (TETRA); RF Sensitive Area Mode



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Contents

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Foreword

This Technical Report (TR) has been produced by ETSI Project Terrestrial Trunked Radio (TETRA).

Introduction

The present document seeks to address, on behalf of specific TETRA user groups, a general problem associated with transmissions of all wireless technologies because of the excessive susceptibility of some devices to interference from some RF transmitters in very close proximity. The interference occurs despite the transmitter of the wireless device being well within its specification. There also are other requirements within the wide scope of public safety operations to avoid transmissions from terminals while maintaining some level of communications.

It is intended that there shall be optional operational modes for TETRA terminals which are required to operate in such RF sensitive areas (RF SAs). These RF SA modes include:

- modes in which all transmissions from the terminal are temporarily inhibited (Transmit-inhibit modes)
- a mode in which the terminal operates at a pre-set low value of transmitted power (low-power mode)

The contents of the present document define the requirements for basic and enhanced Transmit-inhibit (TxI) modes. It is intended that the requirements of low-power mode will be addressed in a 2nd version of the present document and a later version will address aspects of network management, security implications and network enhancements, all relating to RF SA modes.

The present TETRA Release 1 standards are defined in TS 100 392-17 [1].

1 Scope

The present document defines the requirements for basic and enhanced TxI modes. The present document is applicable to the specification of TETRA terminal equipment.

2 References

For the purposes of this Technical Report (TR) the following references apply:

[1] ETSI TS 100 392-17 (V1.1.1): "Terrestrial Trunked Radio (TETRA) - Voice plus Data (V+D) - Part 17: TETRA V+D and DMO Release 1.1 specifications"

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

Transmit-inhibit mode: mode of operation for a TETRA terminal in which all transmissions from the terminal are prohibited

Low-power mode: mode of operation for a TETRA terminal in which the transmit power output from the terminal is temporarily restricted to a low value

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

DMO	Direct Mode Operation
I/O	Input/Output
MMI	Man Machine Interface
MS	Mobile Station
PEI	Periferial Equipment Interface
RF	Radio Frequency
RF SA	Radio Frequency Sensitive Area
SDS	Short Data Service
SwMI	Switching and Management Infrastructure
TMO	Trunked Mode Operation
TxI	Transmit inhibit

4 RF Sensitive Area modes

4.1 Introduction

The requirements in the present document have arisen from some of the unique requirements of public safety users. In some cases, at safety critical situations in RF SAs, minimum communication must be maintained, rather than insisting that users turn off their phones as is commonly done in airplanes and hospitals etc.

In an optional TxI mode all transmissions from a TETRA terminal would be temporarily inhibited. The terminal would be unable to initiate any calls or respond to messages sent by SwMI or by other terminals and consequently the terminal would support only limited services. This option is intended primarily for the public safety community. It should be noted that this mode of operation is made possible due to the unacknowledged nature of some of TETRA's services.

This key capability provides an opportunity for TETRA to offer a TETRA receive-only mode to be used in particularly sensitive environments.

In an optional low-power mode the transmit power output from the terminal would be temporarily restricted to a low value, so that the terminal causes no interference to sensitive devices in its vicinity. The actual low power value to be used would take account of particular regulatory/safety requirements and local conditions in individual environments. In low-power mode the terminal would continue to support all its TETRA services, provided that a viable two-way communications link was maintained.

TxI and low-power modes would apply to terminal equipment (i.e. MSs). Base station equipment is outside the scope of the present document.

Minimum requirement specifications for various RF SA modes are contained in the annexes to the present document. The tables in the annexes indicate any impact on standardization.

All requirements are to be considered primary requirements, unless marked as "Optional" in the notes columns of the tables in the annexes.

Manufacturers are naturally free to offer additional functionality above these minimum requirements.

4.2 Basic RF SA mode

See annex A.

4.3 Enhanced RF SA mode

See annex B.

Annex A:
Basic RF SA mode

When in basic RF SA mode the TETRA terminal does not transmit RF energy under any circumstances and this requirement takes precedence over all other requirements in the following table. basic RF SA mode provides a TxI functionality.

Basic RF SA requirements are based on a solution that:

- does not need any network signalling;
- does not provide MMI indications; and
- does not provide automatic restoration to normal mode if an emergency call set-up attempt is made.

The basic RF SA mode user requirements are presented in table A.1.

Table A.1: Basic RF SA mode user requirements

	Feature	Basic RF SA mode user requirement	Impact on ETSI standard?	Remarks
Activation of RF SA mode				
1.1	Command	Under manual control of terminal user.	No	
		Designed to avoid inadvertent activation.	No	
1.2	Indication	No alerts or display on terminal MMI.	No	
		Clear and unambiguous indication (visual and/or tactile) to terminal user, e.g. by position of activation switch.	No	
		Use voice message sent by the terminal user to inform others before entering basic RF SA mode.	No	
De-activation of RF SA mode				
2.1	Command	Under manual control of terminal user.	No	
		Provide rapid, easy de-activation on demand.	No	
		Designed to avoid inadvertent de-activation.	No	
2.2	Indication	No alerts or display on terminal MMI.	No	
		Use voice message sent by the terminal user to inform others when returned to normal mode.	No	Optional
2.3	Basic RF SA mode selection integrity	There shall be no inadvertent change back from basic RF SA mode to normal mode, e.g. due to I/O signalling through any interface, operation of MMI switches, etc., plus either Option 1 There shall be no inadvertent change back from basic RF SA mode to normal mode due to power off, battery exhaustion or battery changes. or Option 2 The state of being in basic RF SA mode shall be cancelled at switch-off or battery removal or exhaustion. (This would prevent a stolen terminal being fitted with a fresh battery and being used to eavesdrop on TMO communications in a particular cell or location area, until de-registered by the network or removed from TMO group addresses. It would also prevent a stolen terminal being fitted with a fresh battery and being used to eavesdrop on DMO communications until removed from DMO group addresses.)	No	
Calls supported (Trunked mode) Individual voice or calls are not supported in basic RF SA mode				
3.1	Voice Calls	Able to continue to receive unacknowledged Group Voice Calls in the group last selected before entering basic RF SA mode, including an emergency voice message from a unit within that talk-group.	No	

	Feature	Basic RF SA mode user requirement	Impact on ETSI standard?	Remarks
3.2	Data Calls	Able to continue to receive unacknowledged group data calls in the group last selected before entering basic RF SA mode.	No	Optional see note 1
3.3	SDS and status messages	Able to continue to receive unacknowledged SDS and status messages in the group last selected before entering basic RF SA mode.	No	Optional see note 1
Service aspects (Trunked mode)				
4.1	Duration of service in RF SA mode	As allowed by the network (e.g. network may de-register a terminal if it has not indicated its presence for [e.g. 4] hours).	No	see note 4
4.2	Mobility 1	Group calls to the terminal will continue to be carried by the base station cell that was selected when basic RF SA mode was entered.	No	see note 4
4.3	Mobility 2	If the terminal moves to a new cell within the current location area, Undeclared cell re-selection would apply. The terminal could receive unacknowledged group calls being carried by the new cell for other terminals.	No	see notes 2 and 4
4.4	Group Selection	User can set the terminal to receive any group call of which it is a member, but actual reception of any group will be dependent on the mobility constraints (4.2 4.3).	No	
Direct Mode Individual voice and data calls and SDS messages are not supported in basic RF SA mode				
5.1	Voice Calls	Able to continue to receive unacknowledged Group Voice Calls in any selected group, including an emergency voice message.	No	see note 3
5.2	Data Calls	Able to continue to receive unacknowledged group data calls in any selected group.	No	Optional see notes 1 and 3
5.3	SDS and status messages	Able to continue to receive unacknowledged SDS and status messages in any selected group.	No	Optional see notes 1 and 3
5.4	Group Selection	User can set the terminal to receive any group of which it is a member and for which it is in range of the transmitting master.	No	

NOTE 1: Provided there is no adverse development impact.
NOTE 2: The minimum area in which an MS may be registered is termed its location area; this may correspond to a single cell or a group of cells. The total of all location areas in which the MS is registered and in which paging messages to the MS will be issued is termed its registration area. The network routes all messages to the called MS to its registration area.
NOTE 3: Individual calls through a Gateway to a RF SA mode user in DMO would not be supported. This type of individual call would be the same as those experienced by users calling a TMO user in RF SA mode.
NOTE 4: Provided the terminal contains the necessary, valid encryption keys.

Annex B:
Enhanced RF SA mode

When in enhanced RF SA mode the TETRA terminal does not transmit RF energy under any circumstances and this requirement takes precedence over all other requirements in the following table. Enhanced RF SA mode provides a TxI functionality.

Enhanced RF SA mode requirements are based on a solution that includes the minimum requirements of Stage 1 (basic), but additionally offers:

- alert/MMI display of RF SA mode status;
- status message to network just before RF SA mode is activated;
- status message to network when RF SA mode is de-activated; and
- automatic restoration to normal mode if an emergency call set-up attempt is made.

The enhanced RF SA mode user requirements are presented in table B.1.

Functionality that is present in enhanced mode, but not in basic mode, is shown by note 6 in the notes column of the table B.1.

Table B.1: Enhanced RF SA mode user requirements

	Feature	Enhanced RF SA mode user requirement	Impact on ETSI standard?	Remarks
Activation of RF SA mode				
1.1	Command	Under manual control of terminal user.	No	
		Designed to avoid inadvertent activation.	No	
		Via PEI (A bespoke interface is considered acceptable initially)	Yes (No)	Optional see notes 6 and 5
1.2	Indication	Alert and/or display on terminal MMI.	No	see note 6
		Use voice message sent by the terminal user to inform others before entering enhanced RF SA mode.	No	Optional
		Use Status message to notify dispatcher before entering enhanced RF SA mode.	Yes (Status code)	see note 6
		Via PEI (A bespoke interface is considered acceptable initially)	Yes (No)	Optional see notes 6 and 5
De-activation of RF SA mode				
2.1	Command	Under manual control of terminal user.	No	
		Provide rapid, easy de-activation on demand.	No	
		Designed to avoid inadvertent de-activation.	No	
		Via PEI (A bespoke interface is considered acceptable initially)	Yes (No)	Optional see notes 6 and 5
2.2	Indication	Alert and/or display on terminal MMI.	No	see note 6
		Use voice message sent by the terminal user to inform others when returned to normal mode.	No	Optional
		Use Status message to notify dispatcher when returned to normal mode.	Yes (Status code)	see note 6
		Via PEI (A bespoke interface is considered acceptable initially)	Yes (No)	see notes 6 and 5

	Feature	Enhanced RF SA mode user requirement	Impact on ETSI standard?	Remarks
2.3	Enhanced RF SA mode selection integrity	There shall be no inadvertent change back from enhanced RF SA mode to normal mode, e.g. due to I/O signalling through any interface, operation of MMI switches, etc., plus either Option 1 There shall be no inadvertent change back from enhanced RF SA mode to normal mode due to power off, battery exhaustion or battery changes. or Option 2 The state of being in enhanced RF SA mode shall be cancelled at switch-off or battery removal or exhaustion. (This would prevent a stolen terminal being fitted with a fresh battery and being used to eavesdrop on TMO communications in a particular cell or location area, until de-registered by the network or removed from TMO group addresses. It would also prevent a stolen terminal being fitted with a fresh battery and being used to eavesdrop on DMO communications until removed from DMO group addresses.)	No	
	Calls supported (Trunked mode) Individual voice and data calls and SDS messages are not supported in enhanced RF SA mode			
3.1	Voice Calls	Able to continue to receive unacknowledged Group Voice Calls in the group last selected before entering enhanced RF SA mode, including an emergency voice message from a unit within that talk-group.	No	
3.2	Data Calls	Able to continue to receive unacknowledged group data calls in the group last selected before entering enhanced RF SA mode.	No	Optional see note 1
3.3	SDS and status messages	Able to continue to receive unacknowledged SDS and status messages in the group last selected before entering enhanced RF SA mode.	No	Optional see note 1
3.4	Emergency call	User can specify that initiating an emergency call will automatically cause the terminal to de-activate enhanced RF SA mode.	No	Optional see note 6
	Service aspects (Trunked mode)			
4.1	Duration of service in TxI mode	As allowed by the network (e.g. network may de-register a terminal if it has not indicated its presence for [e.g. 4] hours).	No	see note 4
4.2	Mobility 1	Group calls to the terminal will continue to be carried by the base station cell that was selected when enhanced RF SA mode was entered.	No	see note 4
4.3	Mobility 2	If the terminal moves to a new cell within the current location area, Undeclared cell re-selection would apply. The terminal could receive unacknowledged group calls being carried by the new cell for other terminals.	No	see notes 2 and 4
4.4	Group Selection	User can set the terminal to receive any group call of which it is a member, but actual reception of any group will be dependent on the mobility constraints (4.2 4.3).	No	
4.5	MMI feature (1) when in RF SA mode	Audible/visual warning to user if the press-to-talk switch or other call-invoking buttons are pressed.		Optional see notes 6 and 1
4.6	MMI feature (2) when in RF SA mode	Audible/visual warning to user if the terminal is moving out of coverage of the initial base station cell.		Optional see notes 6 and 1
4.7	MMI feature (3) when in RF SA mode	Audible/visual warning to user if the terminal goes out of coverage of the initial base station cell.		Optional
4.8	MMI feature (4) when in RF SA mode	Terminal shall give no indication of any incoming calls that require a terminal acknowledgement.		Optional see notes 6 and 1

	Feature	Enhanced RF SA mode user requirement	Impact on ETSI standard?	Remarks
Direct Mode Individual voice and data calls and SDS messages are not supported in enhanced RF SA mode				
5.1	Voice Calls	Able to continue to receive unacknowledged Group Voice Calls in any selected group, including an emergency voice message.	No	see note 3
5.2	Data Calls	Able to continue to receive unacknowledged group data calls in any selected group.	No	Optional see note 1 and 3
5.3	SDS and status messages	Able to continue to receive unacknowledged SDS and status messages in any selected group.	No	Optional see notes 1 and 3
5.4	Group Selection	User can set the terminal to receive any group of which it is a member and for which it is in range of the transmitting master.	No	

NOTE 1: Provided there is no adverse development impact.
NOTE 2: The minimum area in which a terminal may be registered is termed its location area; this may correspond to a single cell or a group of cells. The total of all location areas in which the terminal is registered and in which paging messages to the terminal will be issued is termed its registration area. The network routes all messages to the called terminal to its registration area.
NOTE 3: Individual calls through a Gateway to a user in enhanced RF SA mode in DMO would not be supported. This type of individual call would be the same as those experienced by users calling a TMO user in enhanced RF SA mode.
NOTE 4: Provided the terminal contains the necessary, valid encryption keys.
NOTE 5: Needed for applications which require a data input to TETRA terminal equipment, e.g. intruder alarms.
NOTE 6: Functionality that is present in enhanced mode, but not in basic mode.

History

Document history		
V1.1.1	July 2001	Publication