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*Technical Specification*

**3<sup>rd</sup> Generation Partnership Project (3GPP)  
TSG-SA Codec Working Group  
Mandatory Speech Codec speech processing functions  
AMR Speech Codec; Source Controlled Rate operation**

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**3GPP**

Postal address

---

Office address

---

Internet

---

secretariat@3gpp.org  
Individual copies of this deliverable  
can be downloaded from  
<http://www.3gpp.org>

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## Intellectual Property Rights

### Foreword

This Technical Specification has been produced by the 3<sup>rd</sup> Generation Partnership Project, Technical Specification Group Services and System Aspects, Working Group 4 (Codec).

The contents of this informal document may be subject to continuing work within the 3GPP and may change following formal TSG-S4 approval. Should TSG-S4 modify the contents of this document, it will be re-released with an identifying change of release date and an increase in version number as follows:

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where:

- m indicates [major version number]
- x the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- y the third digit is incremented when editorial only changes have been incorporated into the specification.

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# 1. Scope

This document describes the operation of the Adaptive Multi Rate speech codec during Source Controlled Rate (SCR) operation.

For clarity, the description is structured according to the block diagrams in figures 1 and 3. This structure of distributing the various functions between system entities is not mandatory for implementation, as long as the operation on the speech decoder output remains the same.

The SCR functions described in this technical specification are mandatory for implementation in the UEs. The receiver requirements are mandatory for implementation in all Transcoders, the transmitter requirements only for those links where SCR will be used.

Annexes A-E describe the interworking operation of AMR with GSM-EFR, TDMA-EFR, TDMA-US1 and PDC-EFR. This mode of operation is F.F.S.

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## 2. Normative references

This document incorporates by dated and undated reference, provisions from other publications. These normative 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 document only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

- [1] TS 26.010 : "AMR Speech Codec; General description".
- [2] TS 26.012 : "AMR Speech Codec; ANSI-C code".
- [3] TS 26.013 : "AMR Speech Codec; Test sequences".
- [4] TS 26.011 : "AMR Speech Codec; Transcoding functions".
- [5] TS 26.015 : "AMR Speech Codec; Error concealment of lost frames".
- [6] TS 26.014 : "AMR Speech Codec; Comfort noise aspects".
- [7] TS 26.017 : "AMR Speech Codec; Voice Activity Detector (VAD)".
- [8] TS 26.018 : "AMR Speech Codec; Frame structure".

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## 3. Definitions, symbols and abbreviations

### 3.1 Definitions

For the purpose of this document, the following definitions apply.

**frame:** Time interval of 20 msec. corresponding to the time segmentation of the Adaptive Multi Rate speech transcoder, also used as a short term for a traffic frame.

**traffic frame:** Block of 95..244 information bits transmitted on the speech traffic channels.

**SID frame:** Frame that conveys information about the acoustic background noise.

**speech frame:** Traffic frame that has been classified as a SPEECH frame.

**VAD flag:** Boolean flag, generated by the VAD algorithm indicating the presence ("1") or the absence ("0") of a speech frame.

**RX\_TYPE:** , generated by the de-framing unit , indicating to the RX SCR handler the type of data in the current frame. Refer to Table 2 for an example.

**TX\_TYPE:** flag, generated by the TX SCR handler, indicating to the framin unit the type of data in the current frame. Refer to Table 1 for an example.

**hangover period:** A period of frames added at the end of a speech burst in which VAD flag ="0" and TX\_TYPE is ="00", this period provides the encoder with an extra window to analyze the Comfort Noise parameters .

## 3.2 Symbols

For the purpose of this document, the following symbols apply.

$N_{\text{elapsed}}$  Number of elapsed frames since the last updated SID frame.

## 3.3 Abbreviations

For the purpose of thisdocument , the following abbreviations apply.

|          |  |
|----------|--|
| AN       | Access Network                                       |
| SCR      | Source Controlled Rate operation                     |
| TS       | Telecommunication Standard                           |
| GSM      | Global System for Mobile Telecommunications          |
| GSM-EFR  | GSM Enhanced Full Rate speech codec                  |
| UE       | User Equipment                                       |
| PDC-EFR  | ARIB PDC-EFR 6.7 kbit/s speech coder                 |
| RAN      | Radio AN   |
| RX       | Receive  |
| SID      | Silence Descriptor (Background character Descriptor) |
| TDMA-EFR | TIA IS-641 Enhanced speech coder                     |
| TDMA-US1 | TIA TDMA-US1 (12.2 kbit/s EFR)                       |
| TX       | Transmit   |
| VAD      | Voice Activity Detector                              |

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## 4. General

Source Controlled Rate operation (SCR) is a mechanism in the AMR Speech Codec which allows the codec to encode speech at a lower average rate by taking speech inactivity into account. The SCR scheme may be used for the following purposes:

- to save power in the User Equipment;
- to reduce the overall load in the networks.

SCR shall be in operation in UEs if commanded so by the network.

### 4.1 General organisation

The default SCR mechanism described in this document requires the following functions:

- a Voice Activity Detector (VAD) on the transmit (TX) side;
- evaluation of the background acoustic noise on the transmit (TX) side, in order to transmit characteristic parameters to the receive (RX) side;
- generation on the receive (RX) side of a similar noise, called comfort noise, during periods where the transmission is switched off.

The Voice Activity Detector (VAD) is defined in [7] and the AMR-mode comfort noise functions in [6]. Both are based partly on the speech transcoder and its internal variables, defined in [4].

In addition to these functions, if the parameters arriving at the RX side are detected to be seriously corrupted by errors, the speech or comfort noise must be generated from substituted data in order to avoid seriously annoying effects for the listener. These functions for the AMR-mode are defined in [5].

An overall description of the speech processing parts can be found in [1]. An overview of one link SCR operation is shown in Figure 1.