

**ETSI AMR-GSM Speech Coder  
(incorporating EFR-GSM and IS-641A)**



**Processor**

Motorola DSP56300 range.

**Background**

The algorithm implemented is the ETSI Adaptive Multi-Rate (AMR) GSM recommendation, digital cellular telecommunications system. The encoder compresses linear-PCM (Pulse Code Modulated) speech input data, at a sample rate of 8kHz, to one of eight data rate modes 12 200, 10 200, 7 950, 7 400, 6 700, 5 900, 5 500 and 4 750 bps. There is also one mode to handle non-speech frames. The data rate will be run-time selectable by the user.

The AMR-GSM algorithm implements silence compression techniques to reduce the transmitted bit rate during the silent intervals of speech. Systems allowing discontinuous transmission (DTX) are based on Voice Activity Detection (VAD) algorithms and Comfort Noise Generator (CNG) algorithms that allows the insertion of Silence Insertion Descriptor (SID) frames during the silence intervals. This also provides the additional advantage of using lower processing loads and DSP bandwidth resource during silence frames.

**Features and Performance**

- Passes all ETSI AMR-GSM test vectors
- 4 channels of AMR-GSM on 100MHz device
- Less than 30K data memory required for 4 channels of AMR-GSM
- Incorporates EFR and IS-641-A functionality
- Incorporates VAD1 and VAD2 functionality.

AMR GSM	Program Memory		X Data Memory		Y Data Memory		Processing Load (MHz)	
	Code (Kwords)	Tables (Kwords)	Variables (Kwords)	Tables (Kwords)	Variables (Kwords)	Tables (Kwords)	VAD1	VAD2
Encoder	19.13	14.16	2.08+n*1.25	3.15	0.55+n*0.78	11.01	n* 18.3	n*19.2
Decoder	7.73	13.34	0.51+n*0.6	3.18	0.5+n*0.41	10.16	n* 2.6	n* 2.6
Encoder + Decoder	26.11	14.9	2.08+n*1.85	3.84	0.55+n*1.19	11.06	n*20.9	n*21.8

**Table 1 : DSP Requirements for AMR-GSM**

**Note:** Processing loads quote worst-case scenarios and n represents the number of channels.  
Program memory table values are initialisation values. 1 word equals 24 bits. Kwords equals 1024 words.

**Technical Notes**

The AMR-GSM speech coding algorithm is a member of a subset of the linear predictive coders (LPC) known as the ACELP (Algebraic-Codebook-Excited Linear Predictive Coding) class of coders.

### Interface Details

For convenience the individual software functions are supplied as a single library module. The library contains all the object code that is required to link in to a user's top-level application code.

### Availability

Fully optimised code is available now, for a one-off payment and/or royalties depending on the commercial application.

Also available for DSP56300™ are a full range of vocoders including FR-GSM, HR-GSM, EFR-GSM as well as other communication algorithms.

### SIGNALS+SOFTWARE

**SIGNALS+SOFTWARE** was founded in 1992 as a developer of high quality Digital Signal Processing application software for the communications industry. Supplying to a whole range of customers, including large blue chip corporations, **SIGNALS+SOFTWARE** has quickly established itself as the world leader in DSP software design and production.

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