



# Technical Documentation

## AGC 1.X - OVERVIEW

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## History

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## Notes

- (1) Creation.
- (2) Approval.
- (3) Minor updates in (Table 4.1).
- (4) Minor update in (Table 4.1).
- (5) Updated reference table.

## Glossary

AGC      Automatic Gain Control  
VAD      Voice Activity Detector

## References

- [1] [L1D\\_AS331-1 – AGC 1.x – API Definition](#)
- [2] [L1D\\_AS250 – VAD 1.x, 2.x - Overview](#)

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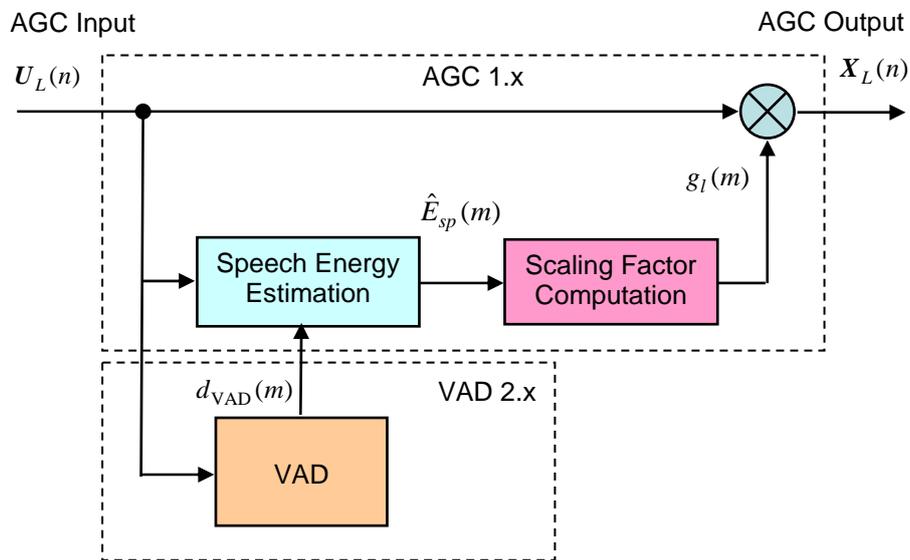
# 1 Introduction

This document provides an overview of the Automatic Gain Control (AGC) module. This document applies to AGC 1.x [1]. The AGC 1.x uses the Voice Activity Detector (VAD) 2.x module as external submodule **Error! Reference source not found.**

# 2 AGC Overview

The primary goal of the AGC is to adjust the input speech signal to a targeted level in the output. As the incoming signal is time varying, AGC relies on an adaptive strategy to track the level variations in the input and so to adjust a variable gain to reach the targeted level in the output.

The AGC adjusts the voice level as fast as possible while minimizing the output signal distortions such as peak clipping. Also, AGC avoids amplifying background noise to target level thanks to VAD that helps to discriminate between speech and noise (Figure 2.1).



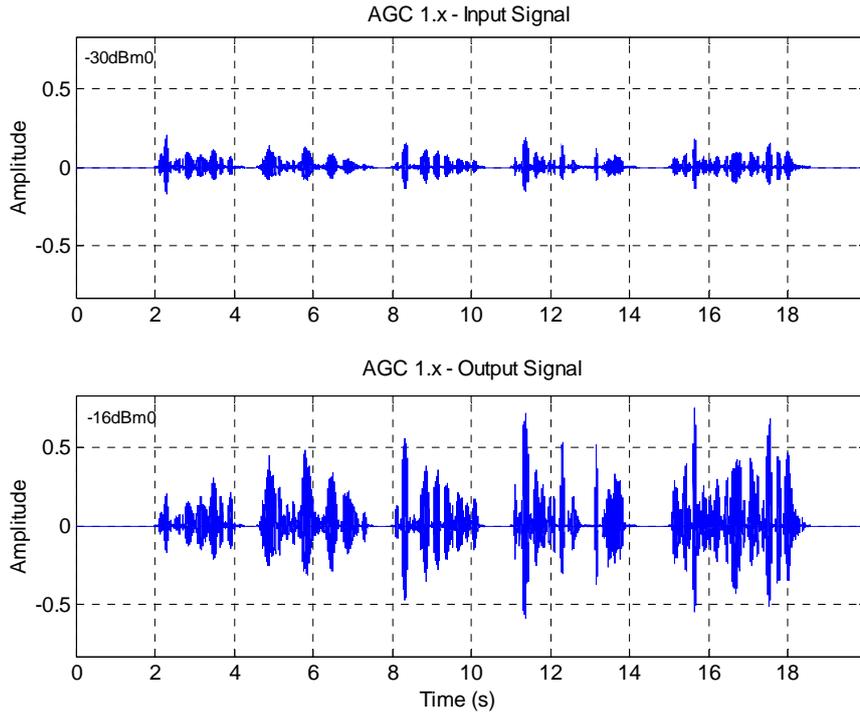
**Figure 2.1 The AGC 1.x – Module Overview**

The AGC 1.x, computation is based on 10ms or 20ms frames processing at 8kHz or 16kHz. The user can specify the targeted level in dBm0 (power) of AGC output. The maximum amplification provided by AGC could be limited at a specific value in dB (amplitude) [1].

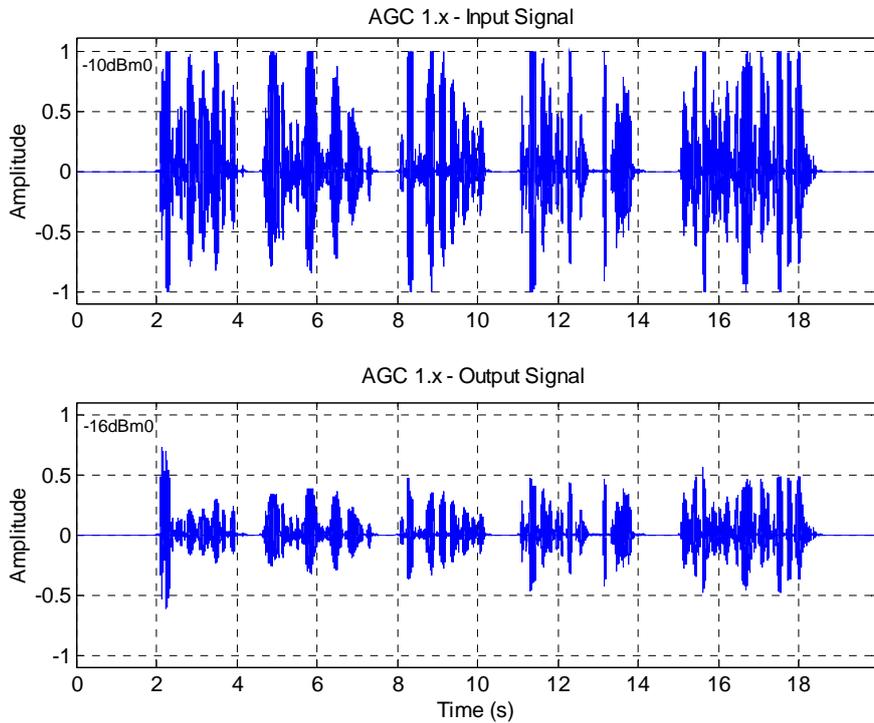
# 3 AGC Use Cases

In case of AGC implemented in the downlink or in the uplink, it keeps the far end or the near end speech signal at a predefined level (Figure 3.1), (Figure 3.2). This feature is particularly suitable in case of variation of the distance between the mouth and the microphone (handset mode) on both sides of the communication.

In case of several speakers at various levels (handsfree mode, conferencing) on one side, the uplink AGC is able to compensate the speech level variations due to various loudness between speakers and to various distances between speakers and microphone (Figure 3.3), (Figure 3.4).



**Figure 3.1 The AGC 1.x – Level Amplification in Long Term**



**Figure 3.2 The AGC 1.x – Level Reduction in Long Term**

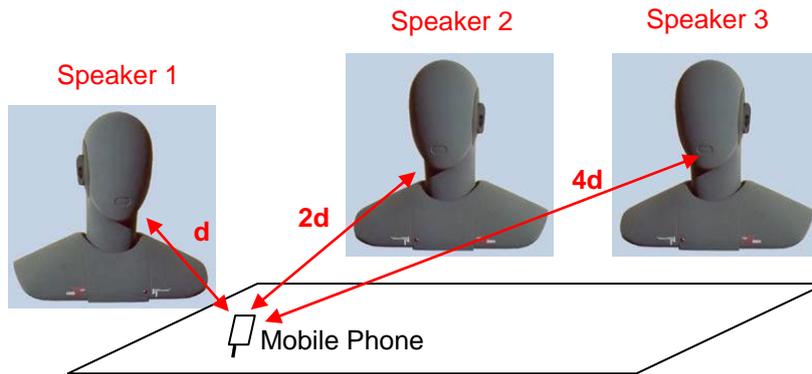


Figure 3.3 The AGC 1.x – Use Case – Handsfree Conferencing

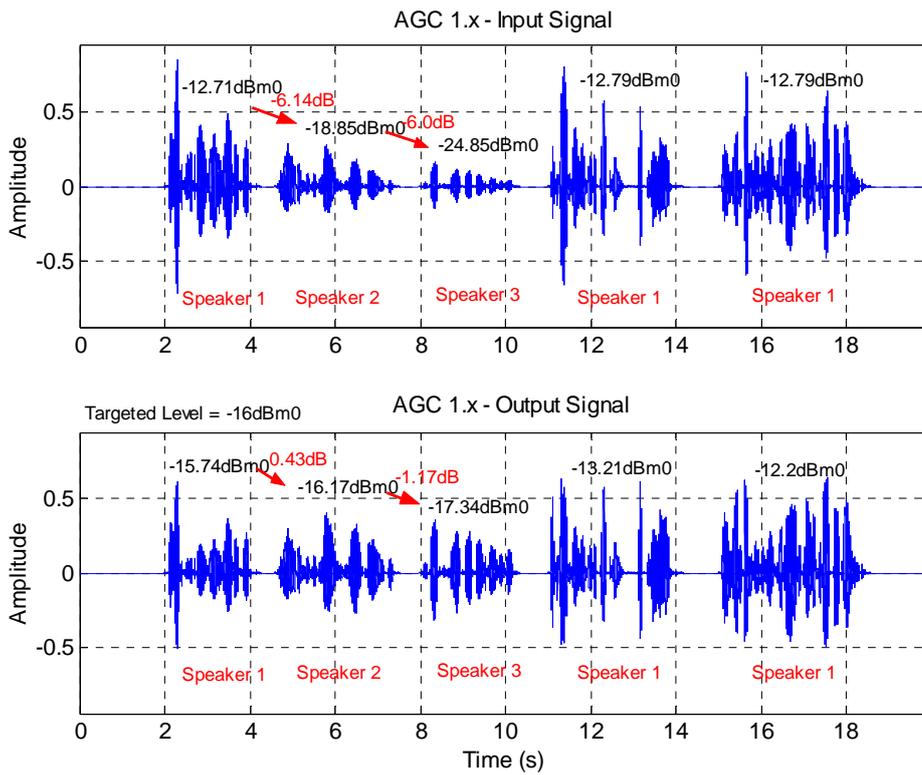


Figure 3.4 The AGC 1.x – Level Compensation – Handsfree Conferencing

## 4 AGC Features

The AGC 1.x features are summarized below (Table 4.1).

Features	Values	Comments
Sampling frequency	8000 Hz, 16000 Hz	
IO Digital amplitude	16-bits [-32768; 32767]	
IO Frame duration	10 ms, 20 ms	80, 160, 320 samples
Processing sub-frame duration	10ms	80, 160 samples
Processing delay	none	
Dynamic gain on the fly	Yes	see note (1)

**Table 4.1 The AGC 1.x – Features**

- (1) The AGC targeted level can be updated on the fly from frame to frame without re-initialization. For example, the targeted level can be changed from -16dBm0 to -10dBm0 from frame m to frame m + 1.