

# TWELP™ 300 bps Vocoder



[TWELP vocoders](#), [TWELP 300 bps](#), [TWELP 600 bps](#), [TWELP 1200 bps](#), [TWELP 2400 bps](#), [TWELP Robust 3600 bps](#)

*October 14, 2014 - DSP Innovations Inc. (DSPINI) announces proprietary 300 bps vocoder, based on the newest speech coding technology TWELP™, for HF Radio and other markets.*

**TWELP™ technology features.** The vocoder is based on newest technology of speech coding called "Tri-Wave Excited Linear Prediction"™ (TWELP) that was developed by experts of DSPINI. The technology provides the best speech quality among competitors today. Please visit: <http://twelp.pro> for details.

**Speech quality.** TWELP 300 bps vocoder was tested, using ITU-T P.50 speech base for 20 different languages. ITU-T P.862 utility was used for estimation of the speech quality in PESQ terms. Average PESQ exceed 2.1 that is a bit lower in comparison with MELPe 600 bps vocoder, that operates on twice more bit rate

A few independent experts tested by listening TWELP 300 vocoder and found that speech quality and intellegibility of the TWELP 300 bps vocoder is acceptable for voice communication in hard conditions. Moreover, they found that in spite of the such low bit rate, vocoder keeps even recognizability of voice of speaker.

**Quality of the non-speech signals.** In spite of the very low bit rate, TWELP 300 bps vocoder provides acceptable quality of non-speech signals, including police, ambulance, fire sirens, etc. This feature in conjunction with acceptable speech quality makes TWELP 300 bps vocoder well suitable for usage in applications, where analog radio is used traditionally, but in such conditions, when analog radio is not capable to work at all.

**High robustness to acoustic noise.** In contrast to other LBR vocoders, TWELP vocoders are well robust to acoustic noise thanks to robust reliable method of pitch estimation and other features of TWELP technology.

**High Robustness to the channel errors.** "Robust" versions of the TWELP vocoders include FEC that are integrated with vocoder on base of "joint source-channel coding" approach that provides high speech quality simultaneously in noisy channel as well as in noiseless channel. FEC can operate with "soft decisions" as well as with "hard decisions" from a modem. Mode of "soft decisions" provides much better robustness in comparison

with mode of "hard decisions".

**Additional functionalities.** The following additional functionalities are developed by DSPINI and integrated into TWELP vocoders:

- Automatic Gain Control (AGC),
- Noise Cancellation for Speech Enhancement (NCSE)
- Voice Activity Detector (VAD),
- Tone Detection/Generation (Single tones and Dual tones). The tones are transmitted through vocoder.

**Technical characteristics and resource requirements:**

**Technical characteristics**

| Bit Rate<br>(bps) | Algorithm | Frame size<br>(ms) | Algorithmic delay (including frame size)<br>(ms) | Sampling rate<br>(kHz) | Signal format     | Bit stream format |
|-------------------|-----------|--------------------|--|------------------------|-------------------|-------------------|
| 300               | TWELP     | 320                | 340  | 8                      | Linear 16-bit PCM | 96                |

**Additional functionalities**

| Name | Functionality                     | Technical characteristics  |              |
|------|-----------------------------------|----------------------------|--------------|
|      |                                   | Name                       | Value        |
| AGC  | Automatic Gain Control            | Control range:             | 0 ... +20 dB |
| NCSE | Noise Canceller - Speech Enhancer | SNR increasing             | > 6 dB       |
|      |                                   | Speech quality improvement | > 0.1 PESQ   |
| Tone | Single/Dual tones                 |                            |              |

|                |                              |  |         |
|----------------|------------------------------|--|---------|
| Detector       | detection                    | In accordance with international standards   |         |
| Tone Generator | Single/Dual tones generation | Special generator, kept continuity of signal (phase and amplitude of signal of previous frame) |         |
|                |                              |  |         |
| VAD            | Voice Activity Detection     | Reliable detection speech in background noise  |         |
| CNG            | Comfort Noise Generation     | Type of noise  | "white" |
|                |                              | Level  | - 60 dB |

### Resources for TI's C64 DSP platform

| Module                        | MIPS*<br>peak | Memory (KBytes) |           |         |      |       |
|-------------------------------|---------------|-----------------|-----------|---------|------|-------|
|                               |               | Program         | Data      |         |      |       |
|                               |               |                 | Constants | Channel | Heap | Stack |
| Voice Encoder                 | 20            | 92              | 156       | 4.5     | 4.8  | 1.0   |
| NCSE                          | 3.7           |                 |           |         |      |       |
| AGC                           | 0.1           |                 |           |         |      |       |
| Voice Decoder                 | 4.1           |                 |           |         |      |       |
| Voice Encoder + Voice Decoder | 24.1          |                 |           |         |      |       |
| Total                         | 27.9          |                 |           |         |      |       |

### Resources (estimated) for TI's C55 DSP platform

|  | Memory (KBytes) |
|--|-----------------|
|  |                 |

| Module                        | MIPS*<br>peak | Program | Data      |         |      |       |
|-------------------------------|---------------|---------|-----------|---------|------|-------|
|                               |               |         | Constants | Channel | Heap | Stack |
| Voice Encoder                 | 50            | 21      | 155       | 11.8    | 8.0  | 1.0   |
| NCSE                          | 6.9           |         |           |         |      |       |
| AGC                           | 0.2           |         |           |         |      |       |
| Voice Decoder                 | 10.0          |         |           |         |      |       |
| Voice Encoder + Voice Decoder | 60            |         |           |         |      |       |
| Total                         | 67.1          |         |           |         |      |       |

\* DSPINI continues optimization of the TWELP algorithm and code in order to minimize computational complexity of the vocoder.

**Guarantee and support.** DSPINI guarantees a quality and accordance of all technical characteristics of the product to requirement of current specifications. Testing and other method of quality control are used for guarantee support.

**Any platform.** DSPINI can port this vocoder software into any other DSP, RISC or general- purposes platform inshort time: 2-3 months.

**Licensing terms.** To use the vocoder, customer should obtain a license from DSPINI only.

**Low price** is another advantage of this vocoder. Please contact us to check it out.

**Prospects.** DSPINI are developing a set of new vocoders with range from 300 bps up to 9600 bps, based on TWELP technology. Please visit the <http://twelp.pro> web-site to get more information.

**Related software.** This vocoder may be effectively used in a bundle with other DSPINI's products:

- Linear and acoustic echo cancellers,
- Multichannel noise cancellers (including two-microphone adaptive array),
- Wired or radiomodems for any types of channels and bitrates,
- Other products.

[Download a datasheet \(pdf\)](#)

More DSPINI's products on <http://www.dspini.com>

Please contact to evaluate and purchase:

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