CALL FOR CONTRIBUTIONS ON FREQUENCY SYNTHESIZER MODEL PARAMETERS

IEEE 802.16.1 Session #9

Deadline: 1 September 2000

The Task Group 1 of the IEEE 802.16 Working Group on Broadband Wireless Access has moved to a Final Task Group Review of its tentative air interface specification (Document IEEE 802.16.1-00/01). As the Task Group revises and finalizes its specification, it is interested in validating its method through simulation and possibly through measurement. One critical issue in the simulation of the PHY is the behavior of the frequency synthesizer. This will require a specific model and a specific set of parameters representing a typical frequency synthesizer as might be used in implementations of the 802.16.1 standard.

This Call for Contributions invites contributions suggesting a frequency synthesizer model, along with specific parameter data representing a typical synthesizer, for use in the system simulation. In addition, supporting measurements, as detailed below, are requested.

Contributions will be considered non-confidential and will be posted, as soon as possible following receipt, for public access on the 802.16 Web Site <http://ieee802.org/16>.

Contributions will be considered only if submitted using Revision 8 or higher of the 802.16 Document Submission Template <http://ieee802.org/16/docs/802_16_template.doc>. The template requires a cover page and a narrative. In the cover sheet category labeled “Re”, please cite IEEE 802.16.1-00/10.

Email your contribution, for receipt by the **deadline of 1 September 2000**, to each of the following:

- 802.16.1 Chair Roger Marks <mailto:marks@nist.gov>
- 802.16.1 PHY Chair Jay Klein <mailto:jay@ensemblecom.com>

Late submissions are subject to time constraints that may preclude full evaluation by the committee.

The following parameters should be provided:

Frequency range GHz	
Frequency raster MHz	
Raster offset MHz	
Tx/Rx switching time/accuracy Switching time from upstream to downstream frequency range (important for half-duplex terminals)	
Channel switching time/accuracy	
Power output dBm	
Harmonics suppression dBc	
Spurious response dBc	
Reference leakage dBc	
Single Side Band Phase Noise dBc/Hz at frequency offsets 1kHz 10kHz 100kHz 1MHz	
Noise Floor dBc	
Integrated phase noise Total integrated phase noise from 0 Hz to infinity, in radians squared, and multiplied by two	
Reference Frequency	

The following measurement data is requested:

Parameters	Conditions	Why is it important?
SSB Phase noise	Single side band phase noise in 1 Hz bandwidth is measured relative to the carrier power at a given offset from the carrier frequency (dBc/Hz)	SSB Phase noise characteristics, harmonics and spurious are fundamental properties of the frequency synthesizer and are needed for accurate simulations.
Harmonics	Harmonics levels are measured relative to the fundamental signal and expressed in dB referenced to the carrier (dBc)	
Spurious	Spurious frequencies are non-harmonically related signals present at the oscillator output and are referenced to the carrier (dBc)	

Contributions that relate experience in simulating systems with the frequency synthesizer and comparing these simulation results with real life behavior are welcomed, as are suggested models and other comments.

Appendix

A nonlinear frequency synthesizer model for 802.16 simulations should satisfy the following requirements:

- model must determine the signal output from the frequency synthesizer given the SSB phase noise, harmonics and spurious levels.

- model should be capable of taking into account the frequency stability of the reference, also in the case where the upstream uses the downstream as a reference.

- the model parameters must be externally measurable from real frequency synthesizers.

- the model must not require a large amount of computation.

In order of presumed accuracy, the models available are:

- Parameterized phase noise model :

Corner points from the SSB phase noise curve are identified and used for describing the phase noise characteristics of the synthesizer. A model for generating simulation data is developed using these parameters.

- Transform based models:

The measured SSB phase noise curve is used as a frequency mask. By a transform based method the output of the synthesizer in the time domain is generated.

- Component based modeling:

The frequency synthesizer is modeled by using a circuit simulation program. The different elements, such as the phase detector, VCO, divider and loop filter, can be accurately modeled using, e.g., SPICE models corresponding to real components with noise sources.

References

[1] D. Falconer, T. Kolze, Y. Leiba, and J. Liebetreu, "Proposed System Impairment Models," IEEE 802.16.1pc-00/15, February 2000.