August 15, 2006

To: Steven Dayhoff
Steven.Dayhoff@fcc.gov
FCC Application Processing Branch

Re: FCC ID PPIRM-126H

Applicant: Nokia GmbH
Correspondence Reference Number: 31213

## HAC T-coil test RT

1) Values added to the reports containing required clarifications:
Salo_HAC_0633_03.pdf, Chapter 6
Salo_HAC_0633_04.pdf, Chapter 6

2) The detailed measurements are documented in Speag technical report 0607051_TCoilProbe.pdf which has been delivered to FCC(Martin Perrine) by Speag. Calibration certificate of AM1DV2 SN:1001 probe provided in documents:
0607051_TCoilProbe.pdf
880-SDHACP02A-As.pdf
880-SPAM1001A-As.pdf
SPAM1001A_SN_1001_cal_2006.pdf

3) The voice based predefined signals provided with DASY4 base on a P50 sequence. The 300 to 3 kHz broadband signal is a 2 second sequence which has been band limited and partly equalized to give a flatter response. It can be looped for longer measurement durations. The 1 kHz narrowband signal is a 1 second sequence band limited to the 1 kHz third-octave band for fast scanning of the signal level.

Before actual measurements the gain setting was set by adjusting signal level as defined by the CMU200 manufacturer (1.4Vpeak) by using oscilloscope. Calibaration document of Oscilloscope TDS 3052, SN: T011185 provided in document
11-967533-218-ISO-3052.pdf

4) Timing: Measurement time is synchronized with the audio input signal.

Averaging: The signal stream is digitized and the samples during the measurement window length are processed. The result is the average from this window.

Spectral processing: ABM1 is the output of a 1 kHz third-octave filter, applied to the measurement samples and averaged over the above time. The other data visible in the 100 Hz to 5 kHz spectral display are outputs of other third-octave filters applied to the same sequence of samples. For the display of the frequency response, the spectrum measured during the reference measurement (in the beginning, after the calibration) is deducted from the spectrum measured over the WD. (If a reference measurement with the same signal is availbable, )The displayed response is therefore the net WD response. ABM2 values are obtained from the spectral processing using the combination of the required filters (half-band integrator, A-weighting filter) applied to the sequence.

Signal level measurement for frequency response: The frequency response does not depend on the BWC or level reported. It is only required to find the applicable frequency slope (in this case > - 10 dB A/m), relevant for a narrowband signal. With the broadband method, and the same input signal level as with the narrow-band signal, less amplitude is available within the 1 kHz subband. This is compensated for with the BWC, calculated from the sum of the power in all third-octave bands, divided by the power in the 1 kHz subband.

See also the description in the Application Note (AN_HAC_TCOIL.pdf, chapter 29).

5) There is no automatic solution supporting the visualization. Therefore we see that the box model

(the blue area of the graphics in the appendix a) of the phone should be enough to illustrate measurement locations and results.

6) See answer of question n:o 3

7) See answer of question n:o 3 & 4. The predefined signals supplied with the system are identical as the ones used by all Speag using companies are using in the same context.

8) Effect of RF frequency should be eliminated from T-coil results, this is done by RF-shielding of the probe. The performance was measured at both 850 and 1900 bands due to possibly different effects on currents generating audio band noise. One test frequency on each band is necessary to verify these effects.

9) RF field of the BT transmitter does not effect results due to RF shielding of the probe. Current generation due to BT transmitter is considered low compared to other noise sources. In this case bluetooth has no significant effect to TCoil measurements and T-categories.

10) Requested values added to the reports containing required clarifications:
Salo_HAC_0633_03.pdf, Appendix A
Salo_HAC_0633_04.pdf, Appendix A

11) The two reports cover different HW variants. Differences between the two HW variants of PPIRM-126H (HWID 0572, 0573):
- Different design in front cover, display decoration window and keypad
- FM Radio not implemented for HWID 0572

12) Requested values added to the reports containing required clarifications:
Salo_HAC_0633_03.pdf, Chapter 6
Salo_HAC_0633_04.pdf, Chapter 6

13) T-coil hearing aid mode "on" switches HAC T-coil to on state whereas the T-coil hearing aid mode "off" switches that off. Activating T-Coil hearing mode optimizes sound quality for a use with T-Coil hearing mode.

T-Coil HAC can be activated by user interface. Instruction for switching T-Coil mode on:
1. Press Menu button
2. Navigate and select icons -> Settings -> Enhancements -> Hearing aid -> T-coil hearing aid mode
3. Select option “on”

Clarification of HAC mode added in Tcoil report. The statement "Hearing aid mode" changed to "Hearing aid mode activated"

## For RF emission rating

14) PMF has been measured as described in C63.19 standard and in Speag's Application Note, Section 28.8, "Definition / Determination of the Probe Modulation Factor" : Measuring setup is arranged as in System Validation by using a RF signal generator capable for GSM modulation e.g. Agilent ESG-D series (E4433B) generator with approprate option (UN8).

CW (Continous Wave) signal is adjusted on the same level as it is for system validation measurement. The field reading from DASY4 is documented. In DASY4 crest factor = 1 and modulation frequency = 0 are used.

Modulation is changed from CW signal to GSM signal: GMSK / 1 slot up. Peak Amplitude of the GMSK modulated RF signal is kept exactly same as with CW. Field reading from DASY4 is documented. In DASY4: crest factor = 8.3 and modulation frequency = 214 Hz.

Observed Modulation Factor = E-fieldCW / E-fieldGSM or H-fieldCW / H-fieldGSM
Observed Crest Factor = (Modulation factor)2
Observed values are documented in the HAC report:
Salo_HAC_0633_02.pdf, Section 4.4.

15) Measured dutycycles has been used.

16) Effect of BT transmission to HA user is considered to be small due to different power level and modulation, when compared to GSM. ANSI C63.19 does not regognize BT as a communication system, also simultaneus tranmission are not concidered. BT antenna is located outside measuring zone and therefore among other reasons has minimal effect to the end result.

17) The probe used has 3 orthogonal elements, hence the probe rotation is not necessary to get appropriate reading. The standard states this rotation as an option for probes with 3 orthogonal elements, it is only required for 1D probes. Also, the probe isotropy errors are taken into account in measurement uncertainty calculations.

18) The WD has no VoIP capability to be used at the ear.

19) Excluded cells are now purple-coloured in the measuring plots (Salo_HAC_0633_02.pdf, Appendix B). See documents:

Salo_HAC_0633_02.pdf
Salo_HAC_0633_02_probe_certs.pdf
Salo_HAC_0633_02_dipole_certs.pdf

20) For ER3DV6 probe, the distance between WD surface and probe tip is 8.75mm (distance between probe tip and nearest point of sensors is 1.25mm)

For H3DV6 probe, the distance between WD surface and probe tip is 8.9mm (distance between probe tip and nearest point of sensors is 1.1mm)

21) The 80% AM modulated signal was not used because it is not relevant for actual measurements. Source for WD signal in verification was signal generator capable of producing GSM equivalent signal.