List of corrections of the ITU-R Recommendation BS.1387

The ITU-R BS.1387 publication, entitled "Method for Objective Measurements of Perceived Audio Quality", was published in 1998. Since then, a number of errors have been discovered in the document which make it difficult or impossible to meet the conformance criteria. The following describes the changes that should be applied to the document as it is currently written.

Section 2.1.7 Spreading

Replace in equations 17 to 20: Z by Z-1

Section 2.1.5.1 Pseudocode

Replace:

```
Pe[i] += Fsp[k]*(fl[i]-fu[i])/Fres;
```

By:

```
Pe[i] += Fsp[k]*(fu[i]-fl[i])/Fres;
```

Section 2.2.5 Filter Bank

Replace equation 29 by:

$$\left.\begin{aligned} h_{re}(k,n) &= \frac{4}{N[k]}\cdot \sin^2\left(p\cdot\frac{n}{N[k]}\right)\cdot\cos\left(2p\cdot f_c[k]\cdot\left(n-\frac{N[k]}{2}\right)\cdot T\right) \\ h_{im}(k,n) &= \frac{4}{N[k]}\cdot \sin^2\left(p\cdot\frac{n}{N[k]}\right)\cdot\sin\left(2p\cdot f_c[k]\cdot\left(n-\frac{N[k]}{2}\right)\cdot T\right) \end{aligned}\right| \quad 0 \le n < N[k]$$

$$h_{re}(k,n) = h_{im}(k,n) = 0 \quad \left| \begin{array}{l} n < 0 \\ n \ge N[k] \end{array}\right.$$

Section 2.2.7.1 Pseudocode

Replace last loop by:

```
/* downward spreading */
cl      = pow(dist,31);
d1      = 0;
d2      = 0;
for(k=39..0)
{
        /* spreading of band k */
        d1    = d1 * cl + A_re[k];
        d2    = d2 * cl + A_im[k];
        A_re[k]    = d1;
```



```
        A_im[k]   = d2;
}
```

Section 2.2.11 Time domain smearing (2) – Forward masking

Replace equation 38 by :

$$t = t_{\min} + \frac{100\,Hz}{f_c[k]} \cdot (t_{100} - t_{\min}) \quad \Bigg| \quad \begin{array}{lll} t_{100} & = & 0.020\,s \\ t_{\min} & = & 0.004\,s \end{array}$$

Section 3 Pre-processing of excitation patterns

Add the sentence:

If not given otherwise all variables and recursive filters are initialized to zero.

Section 3.4 Calculation of the error signal

Replace in the second sentence:

... ear filtered power spectra

by

... ear filtered magnitude spectra

Section 4.3.2 RmsMissingComponents

Replace in the second sentence:

It is computed with the *excitation patterns* of test and Reference Signals ...

By:

It is computed with the *Spectraly Adapted Excitation* patterns of test and Reference Signals ...

Section 4.4.1 Bandwidth Pseudocode

Change
ZeroThreshold= -1.0E-10
To
ZeroThreshold= FLevelTst(921)

Move the *break* in the second *for* loop to the inside of the preceding *if* block after *BwRef= k+1;*

Section 4.8 Harmonic Structure of error

Extend the first sentence of the second paragraph to read...

The error is defined as the difference in the log spectra of the reference and processed signals, *each weighted by the frequency response of the outer and middle ear (Sect 2.1.4, Eq. 7).*

Section 4.8.1 EHS_B

Add to the first paragraph...

...by a certain amount. *The length of the correlation is the same as the maximum lag (i.e., 256 in the example below).* Modify the last paragraph to read...

The resulting vector of correlations is windowed with a normalized Hann window and, after removing the DC component by subtracting the average value, a *power* spectrum is computed with an FFT. The maximum peak in the spectrum *after the first valley* identifies the dominant frequency in the autocorrelation function. The average value of this maximum over frames multiplied by 1000.0 is the Error Harmonic Structure (EHS) variable.

Section 5.2.4.3 Energy Threshold

Clarify the first sentence to read...

When the energy of the most recent half of a frame of 2048 samples is less than 8000^* in the mono channel, or *in each of the left and right channels* of both the reference and test data, the frame is ignored.

Section 5.2.4.4 Data boundary

Replace in the first sentence:

... the reference *level is zero*

by:

... the reference level *approaches minus infinity*

Section 6.3 Advanced Version

Replace Table 19 by:

Scaling factors for the input nodes of the Advanced Version

Index (i)	MOV (x[i])	$a_{min}[i]$	$a_{max}[i]$
0	$RmsModDiff_A$	13.298751	2166.5
1	$RmsNoiseLoudAsym_A$	0.041073	13.24326
2	Segmental NMR_B	-25.018791	13.46708
3	EHS_B	0.061560	10.226771
4	$AvgLinDist_A$	0.024523	14.224874

Replace Table 20 by:

Weights for the inputs of the Advanced Version

index (i)	MOV (x[i])	node 1 (w_x[i,0])	node 2 (w_x[i,1])	node 3 (w_x[i,2])	node 4 (w_x[i,3])	node 5 (w_4[i,4])
0	$RmsModDiff_A$	21.211773	-39.913052	-1.382553	-14.545348	-0.320899
1	$RmsNoiseLoudAsym_A$	-8.981803	19.956049	0.935389	-1.686586	-3.238586
2	Segmental NMR_B	1.633830	-2.877505	-7.442935	5.606502	-1.783120
3	EHS_B	6.103821	19.587435	-0.240284	1.088213	-0.511314
4	$AvgLinDist_A$	11.556344	3.892028	9.720441	-3.287205	-11.031250
2	Bias	1.330890	2.686103	2.096598	-1.327851	3.087055

Replace Table 21 by:

Weights for the output node of the Advanced Version

node 1 (w_x[i,0])	node 2 (w_x[i,1])	node 3 (w_x[i,2])	node 4 (w_x[i,3])	node 5 (w_4[i,4])	Bias (w_y[5])
-4.696996	-3.289959	7.004782	6.651897	4.009144	-1.360308

Section 7.5 Test Items

Replace Table 23 by

Test items and resulting DI values for the Basic Version

Item	DI	ODG
Acodsna.wav	1.304	-0.676
Bcodtri.wav	1.949	-0.304
Ccodsax.wav	0.048	-1.829
Dcodryc.wav	1.648	-0.458
Ecodsmg.wav	1.731	-0.412
Fcodsb1.wav	0.677	-1.195
Fcodtr1.wav	1.419	-0.598

Item	DI	ODG
fcodtr2.wav	-0.045	-1.927
fcodtr3.wav	-0.715	-2.601
gcodcla.wav	1.781	-0.386
hcodryc.wav	2.291	-0.166
hcodstr.wav	2.403	-0.128
Icodsna.wav	-3.029	-3.786
kcodsme.wav	3.093	0.038

Item	DI	ODG
lcodhrp.wav	1.041	-0.876
lcodpip.wav	1.973	-0.293
mcodcla.wav	-0.436	-2.331
ncodsfe.wav	3.135	0.045
scodclv.wav	1.689	-0.435

Replace Table 24 by:

Test items and resulting DI values for the Advanced Version

Item	DI	ODG
Acodsna.wav	1.632	-0.467
Bcodtri.wav	2.000	-0.281

Item	DI	ODG
Ccodsax.wav	0.567	-1.300
Dcodryc.wav	1.725	-0.415

Item	DI	ODG
Ecodsmg.wav	1.594	-0.489
Fcodsb1.wav	1.039	-0.877

Item	DI	ODG
Fcodtr1.wav	1.555	-0.512
Fcodtr2.wav	0.162	-1.711
Fcodtr3.wav	-0.783	-2.662
Gcodcla.wav	1.457	-0.573
Hcodryc.wav	2.410	-0.126
Hcodstr.wav	2.232	-0.187
Icodsna.wav	-2.510	-3.664
Kcodsme.wav	2.765	-0.029
Lcodhrp.wav	1.538	-0.523
Lcodpip.wav	2.149	-0.219
Mcodcla.wav	0.430	-1.435
Ncodsfe.wav	3.163	0.050
Scodclv.wav	1.972	-0.293

Proposed changes to ITU-R BS.1387

Section 5.2.4.4 Data boundary

Change last sentence to:

This criterion is used for all Model output Variables