

Audio 3.1 DeltaKompression

d)

i. Fehler bei Quantisierung von 1

Play/Pause Übung3: A-Generator - Deltakompression Quant-Faktor(1,2,4,8,16,...4096, off: 66000): 1

Logging of:

```
AudioTestArray: 0.0000, 0.1000, 0.2000, 0.3000, 0.4000, 0.5000, 0.6000, 0.7000,
DeltaSamplesP: 0.0000, 0.1000, 0.1000, 0.1000, 0.1000, 0.1000, 0.1000, 0.1000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0
QuantSamplesP: 0.0000, 0.1000, 0.1000, 0.1000, 0.1000, 0.1000, 0.1000, 0.1000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0
iQuantSamplesP: 0.0000, 0.1000, 0.1000, 0.1000, 0.1000, 0.1000, 0.1000, 0.1000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0
iDeltaSamplesP: 0.0000, 0.1000, 0.2000, 0.3000, 0.4000, 0.5000, 0.6000, 0.7000, 0.7000, 0.7000, 0.7000, 0.7000, 0.
ErrorLog: 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
Error - SAD: 0.00, MSE: 0.00, PSNR: 0.00
```

ii. Fehler bei Quantisierung von 8

Play/Pause Übung3: Audio - Deltakompression Quant-Faktor(1,2,

Logging of:

```
monoSamples: 0.0063, 0.0068, 0.0058, 0.0045, 0.0034, 0.0026, 0.0017, 0.00
DeltaSamplesP: 0.0063, 0.0005, -0.0010, -0.0014, -0.0010, -0.0009, -0.000
QuantSamplesP: 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.
iQuantSamplesP: 0.0082, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0
iDeltaSamplesP: 0.0082, 0.0082, 0.0082, 0.0082, 0.0082, 0.0082, 0.0082, 0
ErrorLogP: 0.0019, 0.0014, 0.0023, 0.0037, 0.0047, 0.0056, 0.0065, 0.0072
Error - SAD: NaN.00, MSE: NaN.00, PSNR: NaN.00
-----Compression Data -----
Original Wortbreite: 1 Bit , Codec Wortbreite: 1 Bit
TP-Quant-Wortbreite = 2 Bit, HP-Quant-Wortbreite = 3 Bit
TP-Codec-Wortbreite = 4 Bit, HP-Codec-Wortbreite = 5 Bit
Datarate at AudioBuffer (16384, Ch: 1): Original: 6 MBit/s, Codec: 9 MBit/s
Kompressionsrate: 1 : 10
```

Audio 3.2 SubbandKompression

c)

i. Fehler bei Quantisierung von 1

Play/Pause

Übung3: A-Generator - Subbandkompression

Quant-Faktor(1,2,4,8,16,...4096, off: 66000):

1

Log

Logging of:

```
AudioTestArray: 0.0000, 0.1000, 0.2000, 0.3000, 0.4000, 0.5000, 0.6000, 0.7000,
DeltaSamplesP: 0.0000, 0.1000, 0.1000, 0.1000, 0.1000, 0.1000, 0.1000, 0.1000, 0.0000, 0.0000, 0.0000,
QuantSamplesP: 0.0000, 0.1000, 0.1000, 0.1000, 0.1000, 0.1000, 0.1000, 0.1000, 0.0000, 0.0000, 0.0000,
iQuantSamplesP: 0.0000, 0.1000, 0.1000, 0.1000, 0.1000, 0.1000, 0.1000, 0.1000, 0.0000, 0.0000, 0.0000,
iDeltaSamplesP: 0.0000, 0.1000, 0.2000, 0.3000, 0.4000, 0.5000, 0.6000, 0.7000, 0.7000, 0.7000, 0.7000,
ErrorLog: 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
Error - SAD: 0.00, MSE: 0.00, PSNR: 0.00
```

[Measurment Video](#) [Measurment Audio](#)

ii. Fehler bei Quantisierung von 8

Play/Pause

Übung3: A-Generator - Subbandkompression

Quant-Faktor(1,2,4,8,16,...4096, off: 66000):

8

Log

Logging of:

```
AudioTestArray: 0.0000, 0.1000, 0.2000, 0.3000, 0.4000, 0.5000, 0.6000, 0.7000,
ALengthSamples: 0.0000, 0.1000, 0.2000, 0.3000, 0.4000, 0.5000, 0.6000, 0.7000, 0.0000,
TPsamples: 0.0000, 0.0500, 0.1500, 0.2500, 0.3500, 0.4500, 0.5500, 0.6500, 0.3500,
HPsamples: 0.0000, 0.0500, 0.0500, 0.0500, 0.0500, 0.0500, 0.0500, 0.0500, -0.3500,
TPdownsamples: 0.0000, 0.1500, 0.3500, 0.5500, 0.3500,
HPdownsamples: 0.0000, 0.0500, 0.0500, 0.0500, -0.3500,
TPquantsamples: 0.0000, 0.0188, 0.0437, 0.0688, 0.0437,
HPquantsamples: 0.0000, 0.0500, 0.0500, 0.0500, -0.3500,
TPIquantsamples: 0.0000, 0.1500, 0.3500, 0.5500, 0.3500,
HPIquantsamples: 0.0000, 0.0500, 0.0500, 0.0500, -0.3500,
TPupsamples: 0.0000, 0.0000, 0.1500, 0.0000, 0.3500, 0.0000, 0.5500, 0.0000, 0.3500,
HPupsamples: 0.0000, 0.0000, 0.0500, 0.0000, 0.0500, 0.0000, 0.0500, 0.0000, -0.3500,
ATPOutsamples: 0.0000, 0.0000, 0.0750, 0.0750, 0.1750, 0.1750, 0.2750, 0.2750, 0.1750,
AHPOutsamples: 0.0000, 0.0000, -0.0250, 0.0250, -0.0250, 0.0250, -0.0250, 0.0250, 0.1750,
MixOutSamples: 0.0000, 0.0000, 0.0500, 0.1000, 0.1500, 0.2000, 0.2500, 0.3000, 0.3500,
DelaySamples: 0.0000, 0.0500, 0.1000, 0.1500, 0.2000, 0.2500, 0.3000, 0.3500,
ScaleSamples: 0.0000, 0.1000, 0.2000, 0.3000, 0.4000, 0.5000, 0.6000, 0.7000,
ErrorLog: 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
Error - SAD: 0.00, MSE: 0.00, PSNR: 0.00
```

Audio 3.3 FFT

c)

i. Fehler bei Quantisierung von TP: 1 HP: 1 Grenzwert: 1

Play/Pause Übung3: A-Generator - oneHz4 - FFT-Kompression Quant-Faktor(1,2,4,8,16,... 24 Bit. , off: 88888888):

1 HP-Quant-Faktor: 1 Grenzfrequ.(1-2 Hz): 1 Log

Logging of:

```
oneHzAudio:      1.0000, 0.4200, -0.4200, -1.0000, -1.0000, -0.4200, 0.4200, 1.0000,
QuantMatrix:      1.0000, 1.0000, 1.0000, 1.0000, 1.0000, 1.0000, 1.0000, 1.0000,
FFTKoef.spectrumLong:  0.0000, 5.6684, 0.0000, 0.0279, 0.0000, 0.0279, 0.0000, 5.6684,
QuantFFT.spectrumLong:  0.0000, 5.6684, 0.0000, 0.0279, 0.0000, 0.0279, 0.0000, 5.6684,
iQuantFFT.spectrumLong:  0.0000, 5.6684, 0.0000, 0.0279, 0.0000, 0.0279, 0.0000, 5.6684,
iInverseFFT:      1.0000, 0.4200, -0.4200, -1.0000, -1.0000, -0.4200, 0.4200, 1.0000,
ErrorLog:         0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
Error - SAD: 0.00, MSE: 0.00, PSNR: 0.00
```

ii. Fehler bei Quantisierung von TP: 16 HP: 32 Grenzwert: 1

Play/Pause Übung3: A-Generator - oneHz4 - FFT-Kompression Quant-Faktor(1,2,4,8,16,... 24 Bit. , off: 88888888):

16 HP-Quant-Faktor: 32 Grenzfrequ.(1-2 Hz): 1 Log

Logging of:

```
oneHzAudio:      1.0000, 0.4200, -0.4200, -1.0000, -1.0000, -0.4200, 0.4200, 1.0000,
QuantMatrix:      16.0000, 32.0000, 32.0000, 32.0000, 32.0000, 32.0000, 32.0000, 32.0000,
FFTKoef.spectrumLong:  0.0000, 5.6684, 0.0000, 0.0279, 0.0000, 0.0279, 0.0000, 5.6684,
QuantFFT.spectrumLong:  0.0000, 0.1771, 0.0000, 0.0009, 0.0000, 0.0009, 0.0000, 0.1771,
iQuantFFT.spectrumLong:  0.0000, 5.6685, 0.0000, 0.0282, 0.0000, 0.0282, 0.0000, 5.6685,
iInverseFFT:      1.0000, 0.4201, -0.4200, -1.0000, -1.0000, -0.4201, 0.4200, 1.0000,
ErrorLog:         0.0000, 0.0001, 0.0000, 0.0000, 0.0000, -0.0001, 0.0000, 0.0000,
Error - SAD: 0.00, MSE: 0.00, PSNR: 0.00
```

Audio 3.4 Delta

b) höchste Quantisierung bei bester Wahrnehmungs-Qualität

1500

Play/Pause

Übung3: Audio - Subbandkompression

▼

TP-Quant-Faktor(1,2,4,8,16,...4096, off: 66000):

1500

HP-Quant-Faktor:

1

Logging of:

```
monoSamples:      0.0058, 0.0080, 0.0110, 0.0140, 0.0171, 0.0206, 0.0249, 0.0302, 0.0352, 0.0379, 0.0379, 0.0369, 0.0372, 0.0390, 0.0411, 0.0
ALengthSamplesP:  0.0058, 0.0080, 0.0110, 0.0140, 0.0171, 0.0206, 0.0249, 0.0302, 0.0352, 0.0379, 0.0379, 0.0369, 0.0372, 0.0390, 0.0411, 0.0
TPsamplesP:       0.0029, 0.0069, 0.0095, 0.0125, 0.0156, 0.0189, 0.0228, 0.0275, 0.0327, 0.0365, 0.0379, 0.0374, 0.0370, 0.0381, 0.0401, 0.04
HPsamplesP:       0.0058, 0.0011, 0.0015, 0.0015, 0.0016, 0.0017, 0.0022, 0.0026, 0.0025, 0.0014, 0.0000, -0.0005, 0.0001, 0.0009, 0.0011, 0.0
TPdownsamplesP:   0.0029, 0.0095, 0.0156, 0.0228, 0.0327, 0.0379, 0.0370, 0.0401, 0.0433, 0.0472, 0.0533, 0.0547, 0.0482, 0.0403, 0.0325, 0.0
HPdownsamplesP:   0.0058, 0.0015, 0.0016, 0.0022, 0.0025, 0.0000, 0.0001, 0.0011, 0.0006, 0.0015, 0.0013, -0.0008, -0.0021, -0.0018, -0.00
TPquantsamplesP:  0.0000, 0.0000, 0.0000, 0.0000, 0.0001, 0.0001, 0.0001, 0.0001, 0.0001, 0.0001, 0.0001, 0.0001, 0.0001, 0.0001, 0.0001, 0.0001
HPquantsamplesP:  0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000
TPiquantsamplesP: 0.0051, 0.0102, 0.0154, 0.0205, 0.0307, 0.0358, 0.0358, 0.0410, 0.0410, 0.0461, 0.0512, 0.0563, 0.0461, 0.0410, 0.0307
HPiquantsamplesP: 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000
TPupsamplesP:     0.0051, 0.0000, 0.0102, 0.0000, 0.0154, 0.0000, 0.0205, 0.0000, 0.0307, 0.0000, 0.0358, 0.0000, 0.0358, 0.0000, 0.0410, 0.0
HPupsamplesP:     0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0
ATPOutsamplesP:   0.0026, 0.0026, 0.0051, 0.0051, 0.0077, 0.0077, 0.0102, 0.0102, 0.0154, 0.0154, 0.0179, 0.0179, 0.0179, 0.0179, 0.0205, 0.0205
AHPOutsamplesP:   0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000
MixOutSamplesP:   0.0026, 0.0026, 0.0051, 0.0051, 0.0077, 0.0077, 0.0102, 0.0102, 0.0154, 0.0154, 0.0179, 0.0179, 0.0179, 0.0179, 0.0205, 0.0205
DelaySamplesP:    0.0026, 0.0051, 0.0051, 0.0077, 0.0077, 0.0102, 0.0102, 0.0154, 0.0154, 0.0179, 0.0179, 0.0179, 0.0179, 0.0179, 0.0205, 0.0205
ScaleSamplesP:    0.0051, 0.0102, 0.0102, 0.0154, 0.0154, 0.0205, 0.0205, 0.0307, 0.0307, 0.0358, 0.0358, 0.0358, 0.0358, 0.0410, 0.0410, 0.0410, 0
ErrorLogP:        -0.0006, 0.0022, -0.0007, 0.0014, -0.0018, -0.0001, -0.0044, 0.0006, -0.0045, -0.0021, -0.0020, -0.0010, -0.0013, 0.0019, -0.
Error - SAD: NaN.00, MSE: NaN.00, PSNR: NaN.00
-----Compression Data -----
Original Wortbreite: 1 Bit , Codec Wortbreite: 1 Bit
TP-Quant-Wortbreite = 2 Bit, HP-Quant-Wortbreite = 3 Bit
TP-Codec-Wortbreite = 4 Bit, HP-Codec-Wortbreite = 5 Bit
Datarate at AudioBuffer (16384, Ch: 1): Original: 6 MBit/s, Codec: 9 MBit/s
Kompressionsrate: 1 : 10
```

Audio 3.4 Delta

c) Wortbreite bei der optimalen Quantisierung

16 bit

d) Datenrate bei 48kHz

Unkomprimierte Datenrate:

$\text{samplerate} * \text{word size} * \text{channels}$

$48000 * 16\text{bit} * 2 = 1536000 \text{ bit/s}$

$1536000 \text{ bit/s} = 192000 \text{ byte/s} = 192 \text{ kbyte/s}$

Komprimierte Datenrate (wort längen reduktion) bei quant. Fakt. 2:

$48000 * 15\text{bit} * 2 = 1440000 \text{ bit/s}$

$1440000 \text{ bit/s} = 180000 \text{ byte/s} = 180 \text{ kbyte/s}$

e) Kompression

Runden mit Quantisierungsfaktor 6

Wertebereich 17Bit (Statt 16Bit)

-64.000 bis +64.000

Bestimmen der höchsten Quantisierung bei bester Wahrnehmungsqualität:

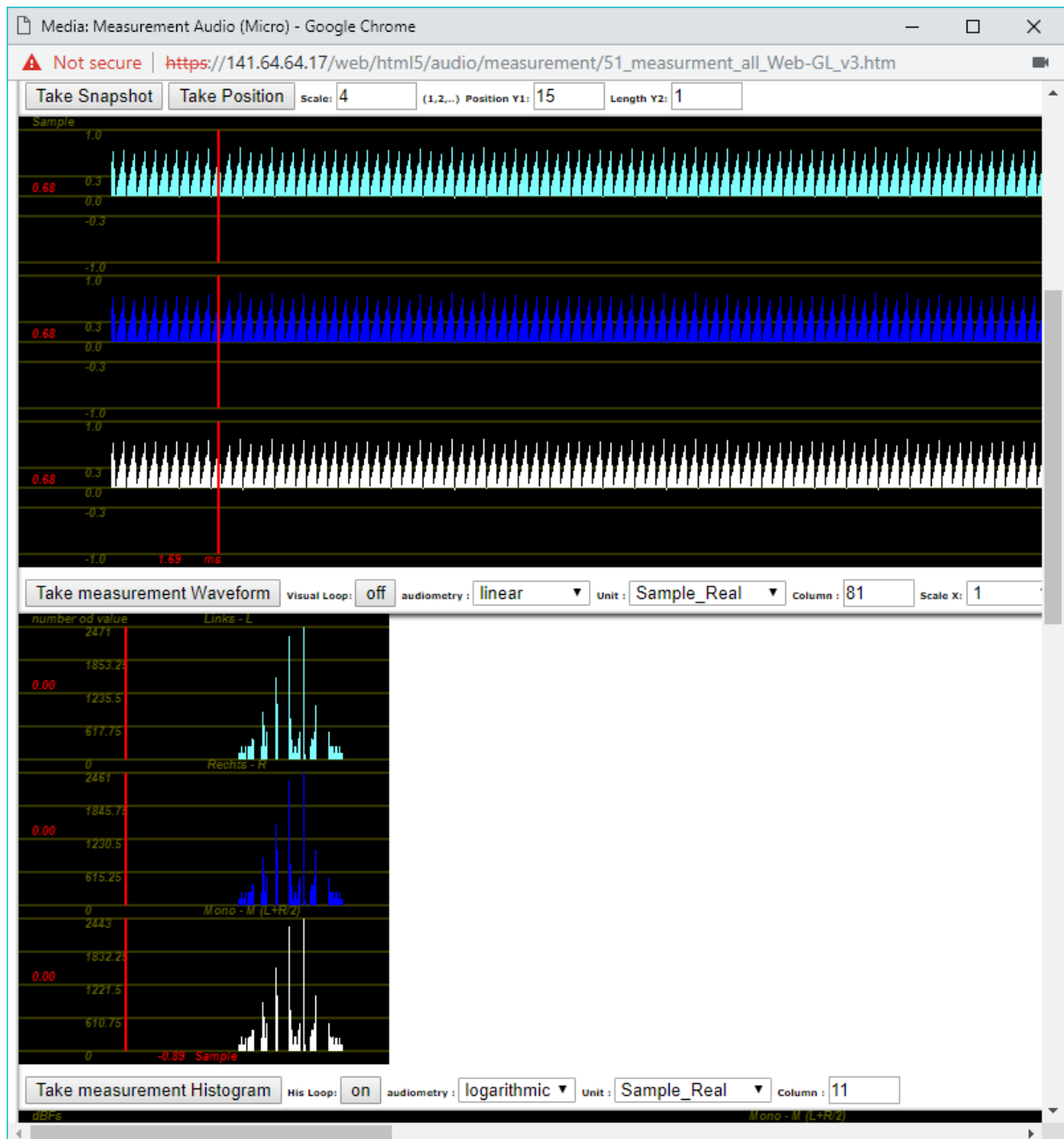
$Q=64 \rightarrow 6 \text{ bit weil } 2^6 = 64$

Berechnen der optimalen Wortbreite bei der optimalen Quantisierung:

$17 \text{ bit} - 6 \text{ bit} = 11 \text{ bit}$ (17 bit weil bei der Deltakomp. 1 bit hinzugefügt wird.)

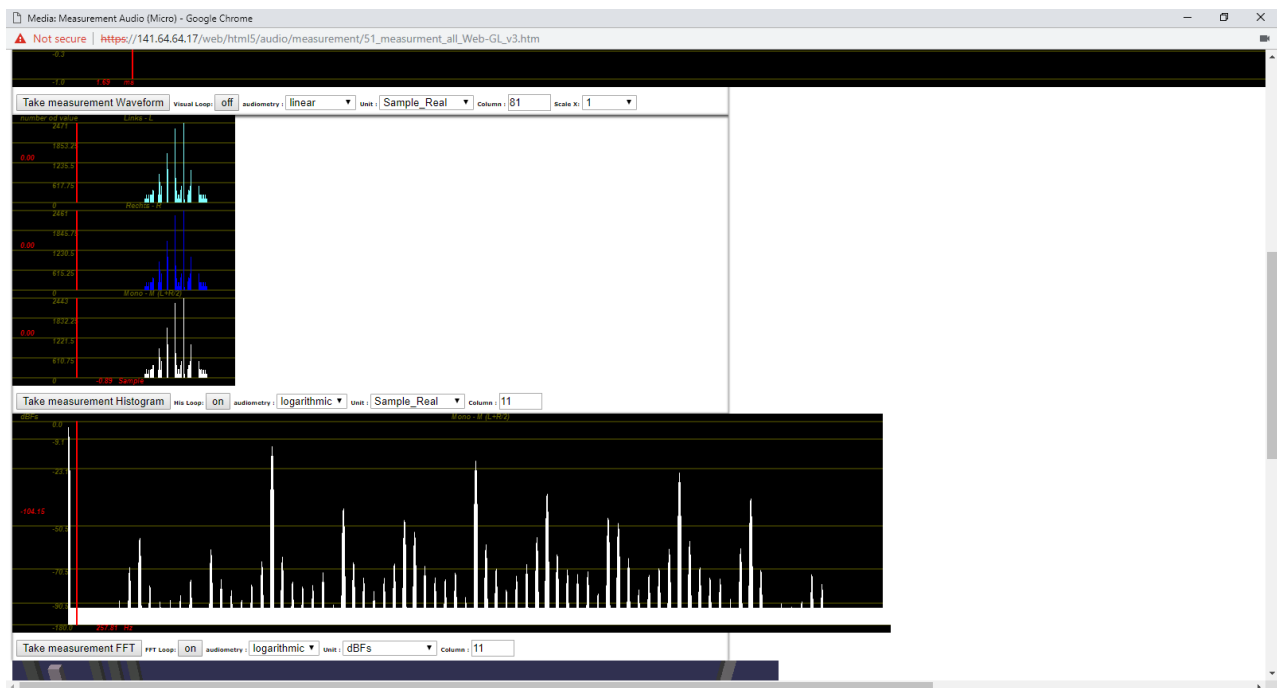
Audio 3.4 Delta

f) Measurement



Audio 3.4 Delta

f) Measurement



Audio 3.4 Delta

f) Measurement

Play/Pause Übung3: Audio - Deltakompression ▼ Quant-Faktor(1,2,

Logging of:

```
monoSamples:      0.0063, 0.0068, 0.0058, 0.0045, 0.0034, 0.0026, 0.0017, 0.00
DeltaSamplesP:    0.0063, 0.0005, -0.0010, -0.0014, -0.0010, -0.0009, -0.000
QuantSamplesP:    0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.
iQuantSamplesP:   0.0082, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0
iDeltaSamplesP:   0.0082, 0.0082, 0.0082, 0.0082, 0.0082, 0.0082, 0.0082, 0
ErrorLogP:        0.0019, 0.0014, 0.0023, 0.0037, 0.0047, 0.0056, 0.0065, 0.0072
Error - SAD: NaN.00, MSE: NaN.00, PSNR: NaN.00
-----Compression Data -----
Original Wortbreite: 1 Bit , Codec Wortbreite: 1 Bit
TP-Quant-Wortbreite = 2 Bit,  HP-Quant-Wortbreite = 3 Bit
TP-Codec-Wortbreite = 4 Bit,  HP-Codec-Wortbreite = 5 Bit
Datarate at AudioBuffer (16384, Ch: 1): Original: 6 MBit/s, Codec: 9 MBit/s
Kompressionsrate: 1 : 10
```


Audio 3.5 Subband

b) höchste Quantisierung bei bester Wahrnehmungs-Qualität

1500

Play/Pause

Übung3: Audio - Subbandkompression

▼

TP-Quant-Faktor(1,2,4,8,16,...4096, . off: 66000):

1500

HP-Quant-Faktor:

1

Logging of:

```
monoSamples: 0.0058, 0.0080, 0.0110, 0.0140, 0.0171, 0.0206, 0.0249, 0.0302, 0.0352, 0.0379, 0.0379, 0.0369, 0.0372, 0.0390, 0.0411, 0.0
ALengthSamplesP: 0.0058, 0.0080, 0.0110, 0.0140, 0.0171, 0.0206, 0.0249, 0.0302, 0.0352, 0.0379, 0.0379, 0.0369, 0.0372, 0.0390, 0.0411,
TPsamplesP: 0.0029, 0.0069, 0.0095, 0.0125, 0.0156, 0.0189, 0.0228, 0.0275, 0.0327, 0.0365, 0.0379, 0.0374, 0.0370, 0.0381, 0.0401, 0.04
HPsamplesP: 0.0058, 0.0011, 0.0015, 0.0015, 0.0016, 0.0017, 0.0022, 0.0026, 0.0025, 0.0014, 0.0000, -0.0005, 0.0001, 0.0009, 0.0011, 0.0
TPdownsamplesP: 0.0029, 0.0095, 0.0156, 0.0228, 0.0327, 0.0379, 0.0370, 0.0401, 0.0433, 0.0472, 0.0533, 0.0547, 0.0482, 0.0403, 0.0325,
HPdownsamplesP: 0.0058, 0.0015, 0.0016, 0.0022, 0.0025, 0.0000, 0.0001, 0.0011, 0.0006, 0.0015, 0.0013, -0.0008, -0.0021, -0.0018, -0.00
TPquantsamplesP: 0.0000, 0.0000, 0.0000, 0.0000, 0.0001, 0.0001, 0.0001, 0.0001, 0.0001, 0.0001, 0.0001, 0.0001, 0.0001, 0.0001, 0.0001, 0.0001,
HPquantsamplesP: 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
TPiquantsamplesP: 0.0051, 0.0102, 0.0154, 0.0205, 0.0307, 0.0358, 0.0358, 0.0410, 0.0410, 0.0461, 0.0512, 0.0563, 0.0461, 0.0410, 0.0307
HPiquantsamplesP: 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
TPupsamplesP: 0.0051, 0.0000, 0.0102, 0.0000, 0.0154, 0.0000, 0.0205, 0.0000, 0.0307, 0.0000, 0.0358, 0.0000, 0.0358, 0.0000, 0.0410, 0.
HPupsamplesP: 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.
ATPOutsamplesP: 0.0026, 0.0026, 0.0051, 0.0051, 0.0077, 0.0077, 0.0102, 0.0102, 0.0154, 0.0154, 0.0179, 0.0179, 0.0179, 0.0179, 0.0205,
AHPOutsamplesP: 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
MixOutSamplesP: 0.0026, 0.0026, 0.0051, 0.0051, 0.0077, 0.0077, 0.0102, 0.0102, 0.0154, 0.0154, 0.0179, 0.0179, 0.0179, 0.0179, 0.0205,
DelaySamplesP: 0.0026, 0.0051, 0.0051, 0.0077, 0.0077, 0.0102, 0.0102, 0.0154, 0.0154, 0.0179, 0.0179, 0.0179, 0.0179, 0.0205, 0.0205, 0
ScaleSamplesP: 0.0051, 0.0102, 0.0102, 0.0154, 0.0154, 0.0205, 0.0205, 0.0307, 0.0307, 0.0358, 0.0358, 0.0358, 0.0358, 0.0410, 0.0410, 0
ErrorLogP: -0.0006, 0.0022, -0.0007, 0.0014, -0.0018, -0.0001, -0.0044, 0.0006, -0.0045, -0.0021, -0.0020, -0.0010, -0.0013, 0.0019, -0.
Error - SAD: NaN.00, MSE: NaN.00, PSNR: NaN.00
-----Compression Data -----
Original Wortbreite: 1 Bit , Codec Wortbreite: 1 Bit
TP-Quant-Wortbreite = 2 Bit, HP-Quant-Wortbreite = 3 Bit
TP-Codec-Wortbreite = 4 Bit, HP-Codec-Wortbreite = 5 Bit
Datarate at AudioBuffer (16384, Ch: 1): Original: 6 MBit/s, Codec: 9 MBit/s
Kompressionsrate: 1 : 10
```

c) Wortbreite bei der optimalen Quantisierung

16 bit

d) Datenrate bei 48kHz

$48000\text{hz} * 1 \text{ channel} * 11 \text{ bit}$

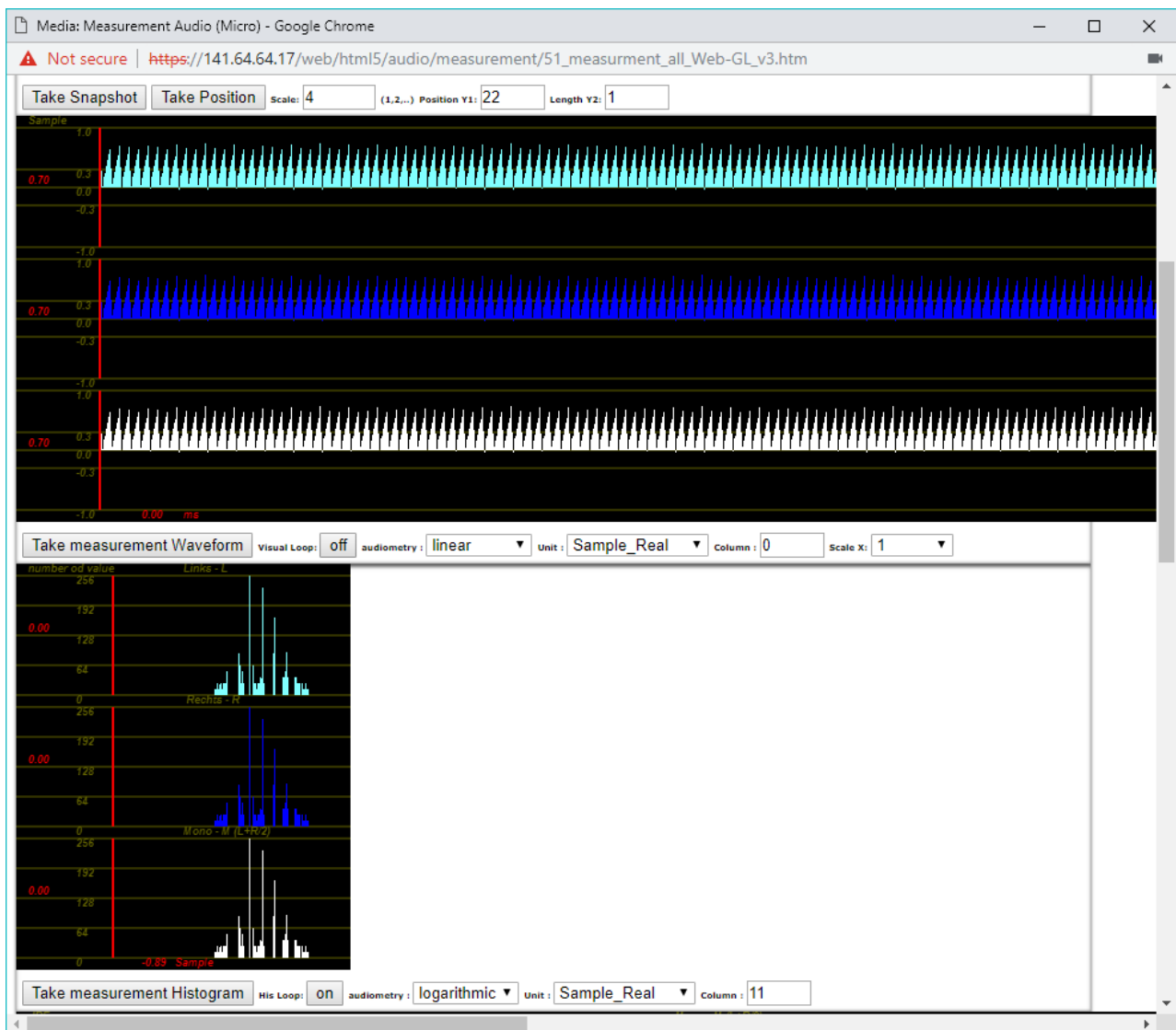
Berechnen der Compression Ratio:

e) Kompression

16:11 weil 16 bit auf 11 bit reduziert wurden.

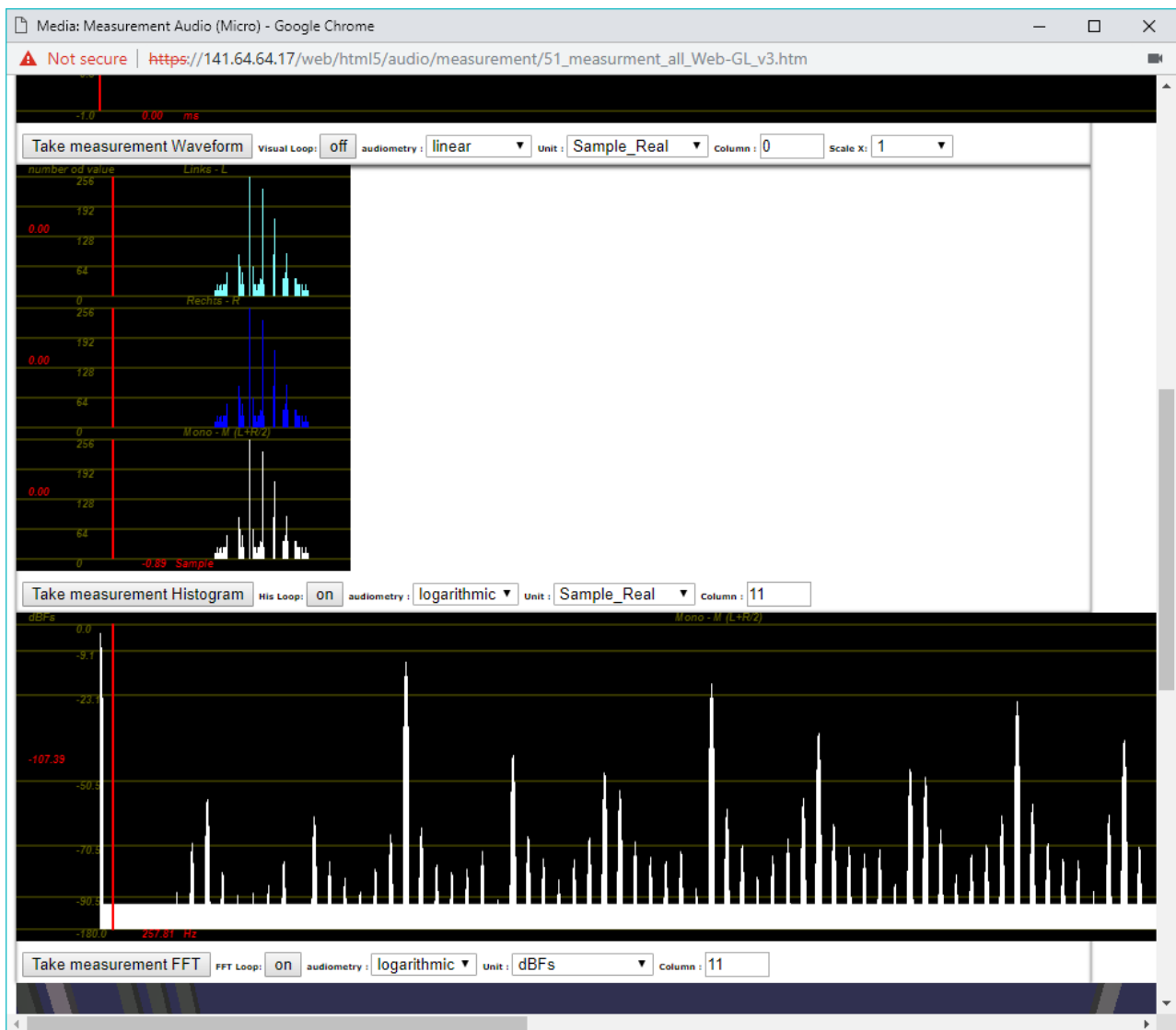
Audio 3.5 Subband

f) Measurement



Audio 3.5 Subband

f) Measurement



Audio 3.5 Subband

f) Measurement

Play/Pause

Übung3: A-Generator - Subbandkompression ▼

Quant-Faktor(1,2,4,8,16,..4096. , off: 66000):

8

Log

Logging of:

```
AudioTestArray:      0.0000, 0.1000, 0.2000, 0.3000, 0.4000, 0.5000, 0.6000, 0.7000,
ALengthSamples:      0.0000, 0.1000, 0.2000, 0.3000, 0.4000, 0.5000, 0.6000, 0.7000, 0.0000,
TPsamples:           0.0000, 0.0500, 0.1500, 0.2500, 0.3500, 0.4500, 0.5500, 0.6500, 0.3500,
HPsamples:           0.0000, 0.0500, 0.0500, 0.0500, 0.0500, 0.0500, 0.0500, 0.0500, -0.3500,
TPdownsamples:       0.0000, 0.1500, 0.3500, 0.5500, 0.3500,
HPdownsamples:       0.0000, 0.0500, 0.0500, 0.0500, -0.3500,
TPquantsamples:      0.0000, 0.0188, 0.0437, 0.0688, 0.0437,
HPquantsamples:      0.0000, 0.0500, 0.0500, 0.0500, -0.3500,
TPIquantsamples:     0.0000, 0.1500, 0.3500, 0.5500, 0.3500,
HPIquantsamples:     0.0000, 0.0500, 0.0500, 0.0500, -0.3500,
TPupsamples:         0.0000, 0.0000, 0.1500, 0.0000, 0.3500, 0.0000, 0.5500, 0.0000, 0.3500,
HPupsamples:         0.0000, 0.0000, 0.0500, 0.0000, 0.0500, 0.0000, 0.0500, 0.0000, -0.3500,
ATPOutsamples:       0.0000, 0.0000, 0.0750, 0.0750, 0.1750, 0.1750, 0.2750, 0.2750, 0.1750,
AHPOutsamples:       0.0000, 0.0000, -0.0250, 0.0250, -0.0250, 0.0250, -0.0250, 0.0250, 0.1750,
MixOutSamples:       0.0000, 0.0000, 0.0500, 0.1000, 0.1500, 0.2000, 0.2500, 0.3000, 0.3500,
DelaySamples:        0.0000, 0.0500, 0.1000, 0.1500, 0.2000, 0.2500, 0.3000, 0.3500,
ScaleSamples:        0.0000, 0.1000, 0.2000, 0.3000, 0.4000, 0.5000, 0.6000, 0.7000,
ErrorLog:            0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
Error - SAD: 0.00, MSE: 0.00, PSNR: 0.00
```

Audio 3.6 FFT

b) höchste Quantisierung bei bester Wahrnehmungs-Qualität

ca 66000

Play/Pause Übung3: Audio - Audio16384/2 - FFT-Kompression ▾ TP-Quant-Faktor(1,2,4,8,16,.. 24 Bit. , off: 88888888): 66000 HP-Quant-Faktor: 1888888 Grenzfreq.(1-16000/2 Hz): 1000 Log

Logging of:

```

monoSamples:      -0.0032, -0.0030, -0.0029, -0.0030, -0.0032, -0.0034, -0.0038, -0.0039, -0.0039, -0.0040, -0.0039, -0.0037, -0.0036, -0
QuantMatrixP:      66000.0000, 66000.0000, 66000.0000, 66000.0000, 66000.0000, 66000.0000, 66000.0000, 66000.0000, 66000.0000, 66000.0000, 66000.0000
FFTKoeFP.spectrumLong: 0.0763, 0.8991, 0.1085, 0.8462, 0.5685, 0.2943, 0.7600, 0.2304, 0.5446, 0.5107, 0.7018, 0.0653, 0.6209, 0.497
QuantFFTP.spectrumLong: 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.00
iQuantFFTP.spectrumLong: 0.0000, 0.6600, 0.0000, 1.3200, 0.6600, 0.0000, 0.6600, 0.0000, 0.0000, 0.6600, 0.0000, 0.6600, 0.0000, 0.0
iInverseFFTP:      -0.0006, -0.0007, -0.0008, -0.0009, -0.0010, -0.0011, -0.0012, -0.0012, -0.0013, -0.0014, -0.0014, -0.0015, -0.0015, 0
ErrorLogP:         0.0025, 0.0023, 0.0021, 0.0021, 0.0022, 0.0024, 0.0026, 0.0026, 0.0026, 0.0026, 0.0025, 0.0022, 0.0022, 0.0024, 0.0027, 0
Error - SAD: NaN.00, MSE: NaN.00, PSNR: NaN.00
-----Compression Data -----
Original Wortbreite: 1 Bit , Codec Wortbreite: 1 Bit
TP-Quant-Wortbreite = 2 Bit, HP-Quant-Wortbreite = 3 Bit
TP-Codec-Wortbreite = 4 Bit, HP-Codec-Wortbreite = 5 Bit
Date rate at AudioBuffer (16384, Ch: 1): Original: 6 MBit/s, Codec: 9 MBit/s
Kompressionsrate: 1 : 10

```

Audio 3.6 FFT

c) Wortbreite bei der optimalen Quantisierung

TP 24-16bit = 8 Bit

HP = 0 bit

d) Datenrate bei 48kHz

1000 Koeffizienten * 2 (real & imaginär) * 3 Blöcke * 1 * 8 Bit

= 48.000

e) Kompression

2000 * 8 Bit

1 : 16

Audio 3.6 FFT

f) Measurement

Play/Pause

Übung3: A-Generator - oneHz4 - FFT-Kompression

Quant-Faktor(1,2,4,8,16... 24 Bit , off: 88888888): 1

HP-Quant-Faktor: 1

Grenzfreq.(1-2 Hz): 2

Logging of:

```

oneHzAudio:      1.0000, 0.4200, -0.4200, -1.0000, -1.0000, -0.4200, 0.4200, 1.0000,
QuantMatrix:     NaN.0000, NaN.0000, NaN.0000, NaN.0000, NaN.0000, NaN.0000, NaN.0000, NaN.0000,
FTTKoeff.spectrumLong:  0.0000, 5.6684, 0.0000, 0.0279, 0.0000, 0.0000, 0.0279, 0.0000, 5.6684,
QuantFFT.spectrumLong:  0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
iQuantFFT.spectrumLong:  0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
iInverseFFT:       0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
ErrorLog:         -1.0000, -0.4200, 0.4200, 1.0000, 1.0000, 0.4200, -0.4200, -1.0000,
Error - SAD: 5.68, MSE: 0.59, PSNR: 3.81

```

Play/Pause

Übung3: Audio - Audio16384/2 - FFT-Kompression

TP-Quant-Faktor(1,2,4,8,16... 24 Bit , off: 88888888): 66000

HP-Quant-Faktor: 1888888

Grenzfreq.(1-16000/2 Hz): 1000

Log

Logging of:

```

monoSamples:      0.0137, 0.0361, -0.0106, -0.0623, -0.0313, 0.0531, 0.0655, -0.0076, -0.0639, -0.0404, 0.0049, 0.0104, 0.0069, 0.0096, -0.0005, -0.0186, -0.0260, -0.0150, 0.0021,
QuantMatrixXp:    66000.0000, 66000.0000, 66000.0000, 66000.0000, 66000.0000, 66000.0000, 66000.0000, 66000.0000, 66000.0000, 66000.0000, 66000.0000, 66000.0000, 66000.0000, 66000.0000,
FTTKoeff.spectrumLong:  3.1541, 3.1383, 2.4186, 2.4756, 2.4391, 2.8575, 2.2651, 1.9390, 2.6287, 2.7828, 2.4696, 2.9968, 2.2752, 2.0105, 3.7327, 3.2008, 2.8544, 1.7742, 2.6123,
QuantFFT.spectrumLong:  0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0001, 0.0000, 0.0000, 0.0000, 0.0000,
iQuantFFT.spectrumLong:  3.3000, 3.3000, 1.9800, 1.9800, 2.6400, 2.6400, 1.9800, 1.9800, 2.6400, 2.6400, 3.3000, 3.3000, 1.9800, 1.9800, 3.9600, 2.6400, 2.6400, 1.9800, 2.6400,
iInverseFFT:       -0.0006, -0.0015, -0.0021, -0.0025, -0.0028, -0.0029, -0.0029, -0.0028, -0.0026, -0.0025, -0.0023, -0.0021, -0.0020, -0.0020, -0.0021, -0.0023, -0.0026, -0.0030,
ErrorLogP:        -0.0144, -0.0376, 0.0085, 0.0598, 0.0285, -0.0560, -0.0684, 0.0048, 0.0613, 0.0380, -0.0071, -0.0125, -0.0089, -0.0116, -0.0016, 0.0163, 0.0234, 0.0120, -0.0055, -0
Error - SAD: NaN.00, MSE: NaN.00, PSNR: NaN.00
-----Compression Data-----
Original Wortbreite: 1 Bit , Codec Wortbreite: 1 Bit
TP-Quant-Wortbreite = 2 Bit , HP-Quant-Wortbreite = 3 Bit
TP-Codec-Wortbreite = 4 Bit , HP-Codec-Wortbreite = 5 Bit
Datarate at AudioBuffer (16384, Ch: 1): Original: 6 MBit/s, Codec: 9 MBit/s
Kompressionsrate: 1 : 10

```

Play/Pause

Übung3: A-Generator - WhiteNoise - FFT-Kompression

TP-Quant-Faktor(1,2,4,8,16... 24 Bit , off: 88888888): 66000

HP-Quant-Faktor: 1888888

Grenzfreq.(1-16000/2 Hz): 1000

Log

Logging of:

```

monoSamples:      0.5472, 0.8186, -0.8860, 0.6838, -0.4255, -0.0135, -0.3372, 0.8877, -0.5637, -0.9602, -0.4231, 0.4750, 0.3372, 0.9736, -0.7438, -0.8986, 0.6872, 0.7917,
QuantMatrixXp:    NaN.0000, NaN.0000, NaN.0000, NaN.0000, NaN.0000, NaN.0000, NaN.0000, NaN.0000, NaN.0000, NaN.0000, NaN.0000, NaN.0000, NaN.0000, NaN.0000, NaN.0000, NaN.0000, NaN.0000, NaN.0000,
FTTKoeff.spectrumLong:  45.0465, 31.3870, 36.2377, 20.2054, 36.4623, 40.7281, 42.5599, 49.9107, 83.6777, 150.1594, 8.3577, 22.6046, 8.6920, 47.4584, 149.6251, 18.1295, 93.8457, 41.9810,
QuantFFT.spectrumLong:  0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
iQuantFFT.spectrumLong:  0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
iInverseFFT:       0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000,
ErrorLog:         -0.5472, 0.8186, 0.8860, -0.6838, 0.4255, 0.0135, 0.3372, -0.8877, 0.5637, 0.9602, 0.4231, -0.4750, -0.3372, -0.9736, 0.7438, 0.8986, -0.6872, -0.7917,
Error - SAD: 4115.54, MSE: 0.34, PSNR: 6.24

```