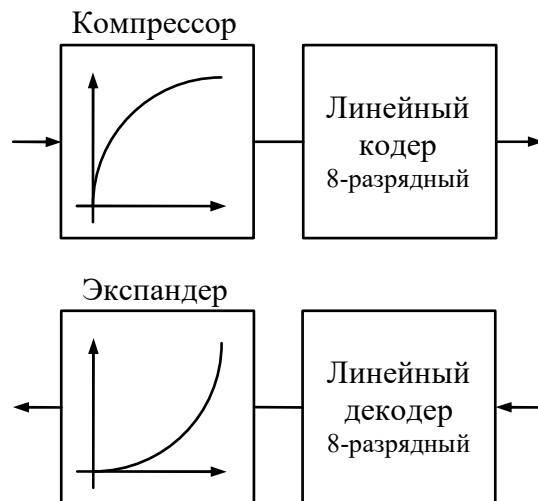
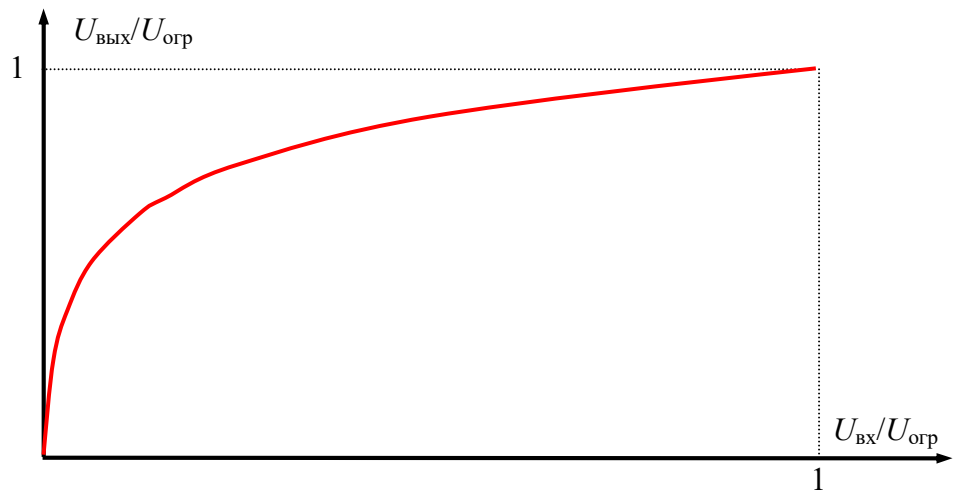


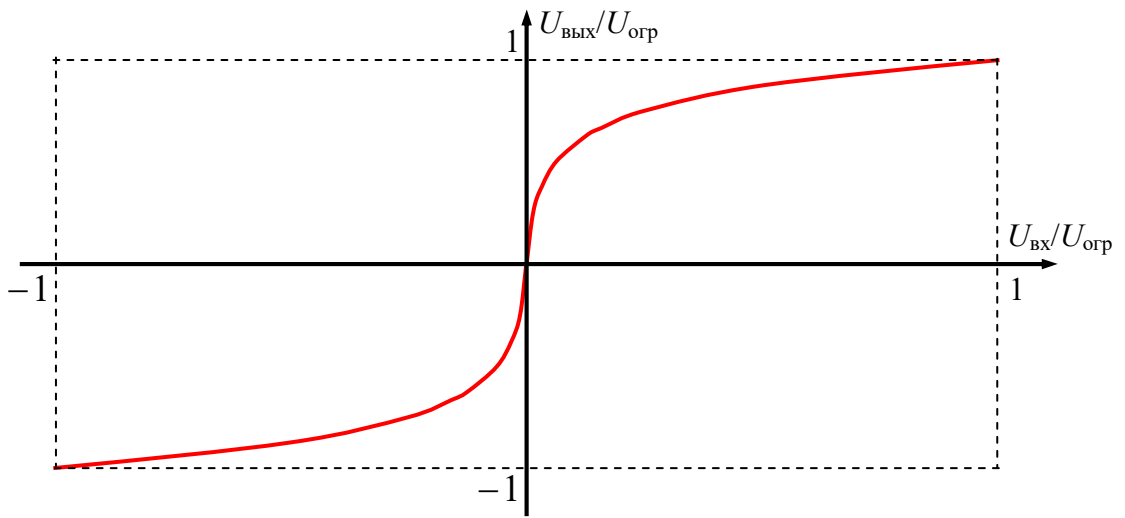
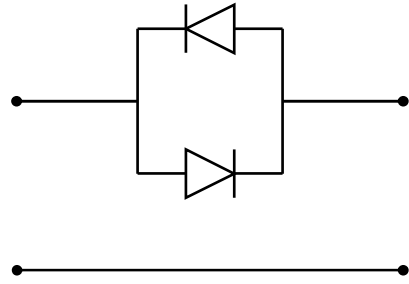
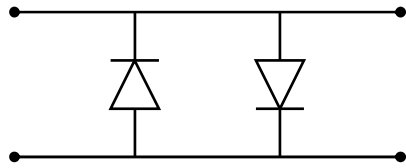
$$y = \frac{\ln(1 + \mu|x|)}{\ln(1 + \mu)} \text{sign}(x), -1 \leq x \leq 1$$

$$\mu = 100 \quad \mu = 255$$

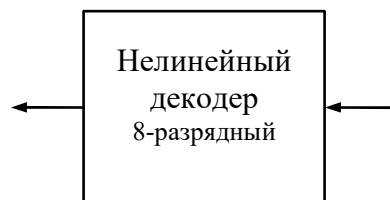
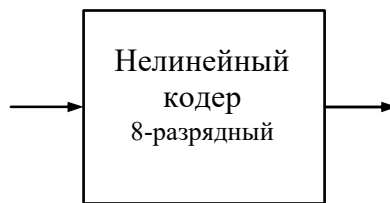
$$u_{\text{ВЫХ}}(u_{\text{ВХ}}) = \begin{cases} \frac{A u_{\text{ВХ}} / U_{\text{огр}}}{1 + \ln A}, & 0 \leq \frac{|u_{\text{ВХ}}|}{U_{\text{огр}}} \leq \frac{1}{A}, \\ \frac{1 + \ln(A |u_{\text{ВХ}}| / U_{\text{огр}})}{1 + \ln A} \text{sign}(u_{\text{ВХ}}), & \frac{1}{A} \leq \frac{|u_{\text{ВХ}}|}{U_{\text{огр}}} \leq 1, \end{cases}$$

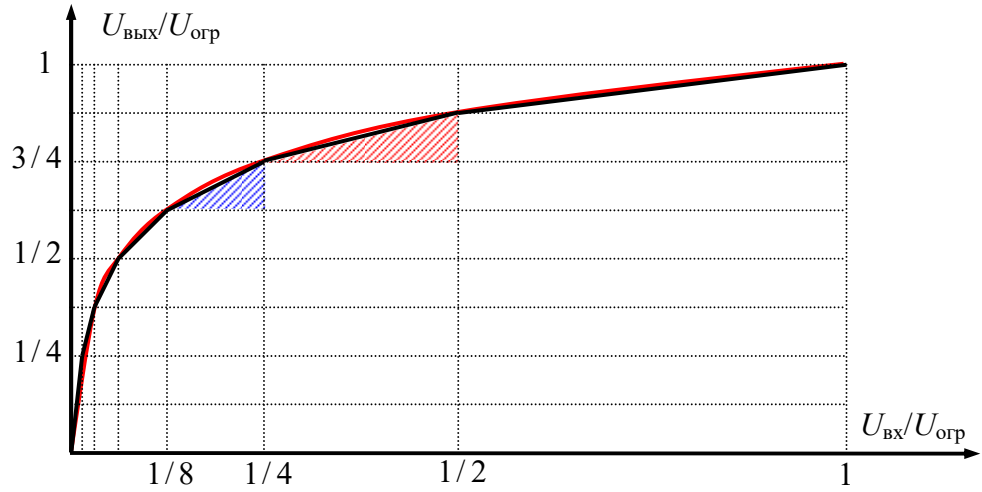
$$A = 87,6$$



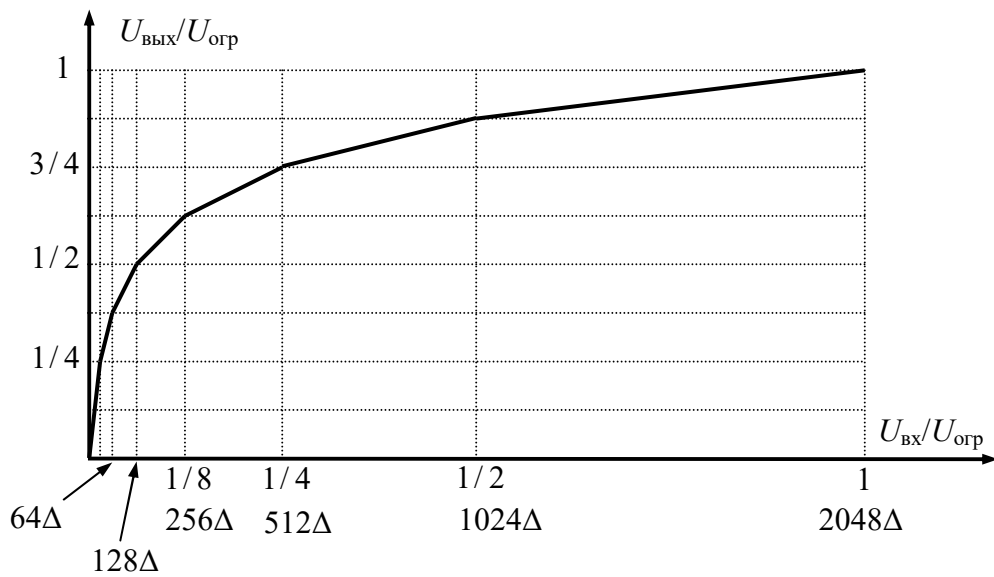


Шкала А=87,6/13





$$U_{\text{огр}} = 2048\Delta$$



$$U_c \quad m = 8$$

$$a_1 a_2 a_3 a_4 a_5 a_6 a_7 a_8$$

a_1 – знак U_c (+) – "0"

(-) – "1"

$a_2 a_3 a_4$ – номер сегмента

$a_5 a_6 a_7 a_8$ – номер уровня внутри сегмента

		<i>шаг квантования</i>	
000	0 Δ		
	I	$\Delta, 2\Delta, 4\Delta, 8\Delta$	Δ
001	16 Δ		
	II	$\Delta, 2\Delta, 4\Delta, 8\Delta$	Δ
010	32 Δ		
	III	$2\Delta, 4\Delta, 8\Delta, 16\Delta$	2Δ
011	64 Δ		
	IV	$4\Delta, 8\Delta, 16\Delta, 32\Delta$	4Δ
100	128 Δ		
	V	$8\Delta, 16\Delta, 32\Delta, 64\Delta$	8Δ
101	256 Δ		
	VI	$16\Delta, 32\Delta, 64\Delta, 128\Delta$	16Δ
110	512 Δ		
	VII	$32\Delta, 64\Delta, 128\Delta, 256\Delta$	32Δ
111	1024 Δ		
	VIII	$64\Delta, 128\Delta, 256\Delta, 512\Delta$	64Δ
	$U_{\text{огр}} = 2048\Delta$		

Пример

$$\Delta = 1\text{мВ}$$

$$U_c = -754\text{мВ} = -754\Delta$$

$$-754\Delta < 0 \rightarrow a_1 = 1$$

определение номера сегмента

$$754\Delta > 128\Delta \rightarrow a_2 = 1 \rightarrow \text{след. эталон } 512\Delta$$

$$754\Delta > 512\Delta \rightarrow a_3 = 1 \rightarrow \text{след. эталон } 1024\Delta$$

$$754\Delta < 1024\Delta \rightarrow a_4 = 0$$

$$110 \quad \text{нижняя граница сегмента } 512\Delta \rightarrow 754\Delta - 512\Delta = 242\Delta$$

4 эталона : 32 Δ , 64 Δ , 128 Δ , 256 Δ

$$242\Delta < 256\Delta \rightarrow a_5 = 0 \rightarrow 242\Delta$$

$$242\Delta > 128\Delta \rightarrow a_6 = 1 \rightarrow 242\Delta - 128\Delta = 114\Delta$$

$$114\Delta > 64\Delta \rightarrow a_7 = 1 \rightarrow 114\Delta - 64\Delta = 50\Delta$$

$$50\Delta > 32\Delta \rightarrow a_8 = 1$$

1 1100111

$$-(512\Delta + 0 \cdot 256\Delta + 1 \cdot 128\Delta + 1 \cdot 64\Delta + 1 \cdot 32\Delta) = -736\Delta$$

$$\varepsilon_{\text{кв}} = 18\Delta > \frac{32\Delta}{2} = 16\Delta$$

$$\text{коррекция} \quad \frac{32\Delta}{2} = 16\Delta$$

$$-\left(512\Delta + 0 \cdot 256\Delta + 1 \cdot 128\Delta + 1 \cdot 64\Delta + 1 \cdot 32\Delta + \frac{32\Delta}{2}\right) = -752\Delta$$

$$\varepsilon_{\text{кв}} = 2\Delta < \frac{32\Delta}{2}$$



Номер сегмента	Код до компрессии (12 бит)	Код после компрессии (8 бит)	Код после экспандирования (13 бит)
I	P0000000WXYZ n	P000WXYZ 7-n	P0000000WXYZ1
II	P0000001WXYZ n	P001WXYZ 7-n	P0000001WXYZ1
III	P000001WXYZa	P010WXYZ	P000001WXYZ10
IV	P00001WXYZab	P011WXYZ	P00001WXYZ100
V	P0001WXYZabc	P100WXYZ	P0001WXYZ1000
VI	P001WXYZabcd	P101WXYZ	P001WXYZ10000
VII	P01WXYZabcde	P110WXYZ	P01WXYZ100000
VIII	P1WXYZabcdef	P111WXYZ	P1WXYZ1000000
	шаг квантования Δ		шаг квантования $\frac{\Delta}{2}$

Пример

$$m = 12 \quad \Delta = 1\text{мВ}$$

$$U_c = -754\text{мВ} = -754\Delta$$

$$-754\Delta < 0 \rightarrow a_1 = 1$$

11 эталонов: $\Delta, 2\Delta, 4\Delta, 8\Delta, 16\Delta, 32\Delta, 64\Delta, 128\Delta, 256\Delta, 512\Delta, 1024\Delta$

$$754\Delta < 1024\Delta \rightarrow a_2 = 0 \rightarrow 754\Delta$$

$$754\Delta > 512\Delta \rightarrow a_3 = 1 \rightarrow 754\Delta - 512\Delta = 242\Delta$$

$$242\Delta < 256\Delta \rightarrow a_4 = 0 \rightarrow 242\Delta$$

$$242\Delta > 128\Delta \rightarrow a_5 = 1 \rightarrow 242\Delta - 128\Delta = 114\Delta$$

$$114\Delta > 64\Delta \rightarrow a_6 = 1 \rightarrow 114\Delta - 64\Delta = 50\Delta$$

$$50\Delta > 32\Delta \rightarrow a_7 = 1 \rightarrow 50\Delta - 32\Delta = 18\Delta$$

$$18\Delta > 16\Delta \rightarrow a_8 = 1 \rightarrow 18\Delta - 16\Delta = 2\Delta$$

$$2\Delta < 8\Delta \rightarrow a_9 = 0 \rightarrow 2\Delta$$

$$2\Delta < 4\Delta \rightarrow a_{10} = 0 \rightarrow 2\Delta$$

$$2\Delta \geq 2\Delta \rightarrow a_{11} = 1 \rightarrow 2\Delta - 2\Delta = 0\Delta$$

$$0\Delta < \Delta \rightarrow a_{12} = 0$$

101011110010

$$P = 1$$

$$n = 1 \rightarrow 7 - n = 6 \rightarrow 110$$

WXYZ \rightarrow 0111

11100111

1010111100000

$$-\left(0 \cdot 2048 \frac{\Delta}{2} + 1 \cdot 1024 \frac{\Delta}{2} + 0 \cdot 512 \frac{\Delta}{2} + 1 \cdot 256 \frac{\Delta}{2} + 1 \cdot 128 \frac{\Delta}{2} + 1 \cdot 64 \frac{\Delta}{2} + 1 \cdot 32 \frac{\Delta}{2} + 0 \cdot 16 \frac{\Delta}{2} + 0 \cdot 8 \frac{\Delta}{2} + 0 \cdot 4 \frac{\Delta}{2} + 0 \cdot 2 \frac{\Delta}{2} + 0 \cdot \frac{\Delta}{2}\right) = -752\Delta$$

$$\varepsilon_{к6} = 2\Delta$$