

25/01/2020



ITESO

Universidad Jesuita
de Guadalajara

Sistemas de Comunicaciones Digitales

Tarea 1

25/01/2020

1.

bits	M
8	256
16	65,536
32	4,294,967,296

2.

bits	SNR $6.0206 \cdot k + 1.7609 \text{ db}$
16	98.0905
12	74.0081
8	49.9257
4	25.8433

3.

bits	$k \cdot f_s$ bits/s
12	529 200
10	441 000
8	352 800

4.

 $t = 75 \text{ min} \rightarrow 4,500 \text{ seg}$
 $M = 16 \text{ bits}$
 $f_s = 44,100 \text{ Hz}$
 $f_s \cdot M \cdot t = 3,175,200,000 \text{ bps}$
 3.175 Gbps

Being Stereo, the result that we got, now is x2

 $f_s \cdot M \cdot t = 6.35 \text{ Gbps}$

25/01/2020

5.

FLAC: This one can be used for the desired application. Since it has the requirements for the audio to compress.

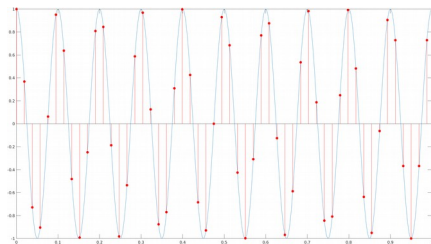
Opción de Compresión	Original	Comprimido	Duración	Razón	Tiempo de Codificación	Tasa de Codificación	Tiempo de Decodificación	Tasa de Decodificación
-0	2.030 GiB	1.435 GiB	03:18:21	70,67%	01:29	134x	01:24	141x
-5	2.030 GiB	1.334 GiB	03:18:21	65,72% (-4,95)%	03:44	53x (2,5x más lento)	01:36	124x
-6	2.030 GiB	1.334 GiB	03:18:21	65,71% (-4,96, -0,01)%	03:51	52x (2,6x más lento)	01:36	124x
-7	2.030 GiB	1.333 GiB	03:18:21	65,67% (-5, -0,04)%	07:47	25x (5,3x más lento)	01:36	123x
-8	2.030 GiB	1.329 GiB	03:18:21	65,47% (-5,2, -0,2)%	10:17	19x (7x más lento)	01:40	120x
-8 -Ax2	2.030 GiB	1.328 GiB	03:18:21	65,40% (-5,27, -0,07)%	16:39	12x (11x más lento)	01:35	125x

MP3: This type of compressor it would be the best to use, since it is one of the most use compressors. But one thing that needs to be aware, its that it would be needed MPEG-2 or MPEG-3. Thus the MPEG-1 does not support 61 bits rate.

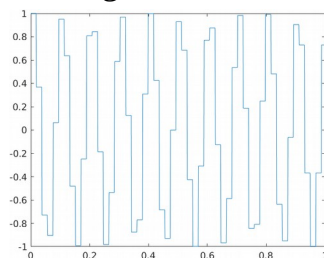
Thus considering the applications, the best options would be FLAC for the resolution we can achieve.

6.

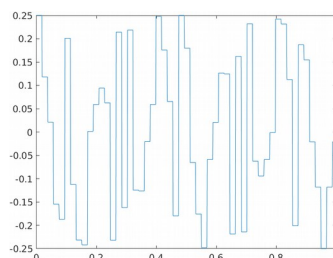
- $M = 2$



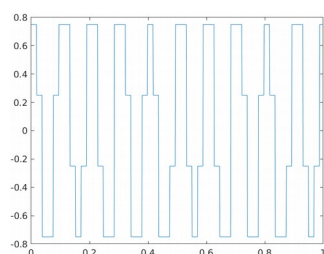
PAM Signal



Difference

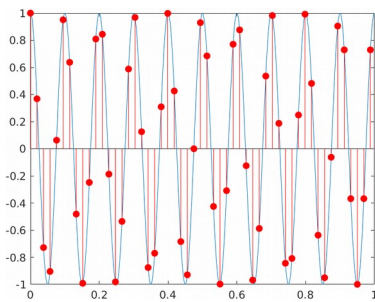


Quantitative Signal

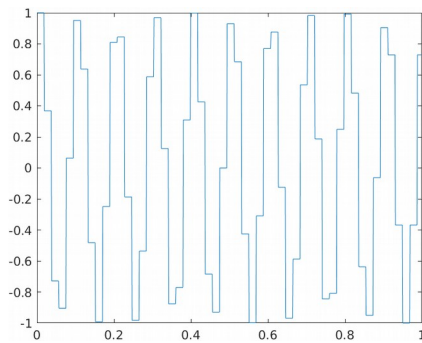


25/01/2020

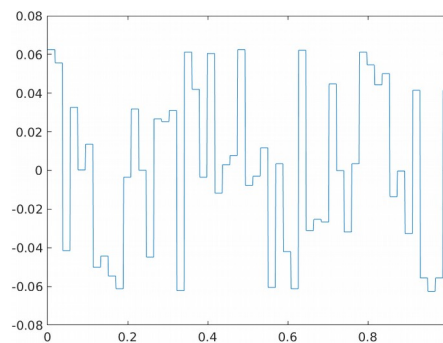
- $M = 16$



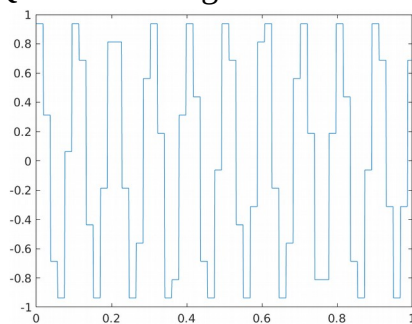
PAM Signal



Difference

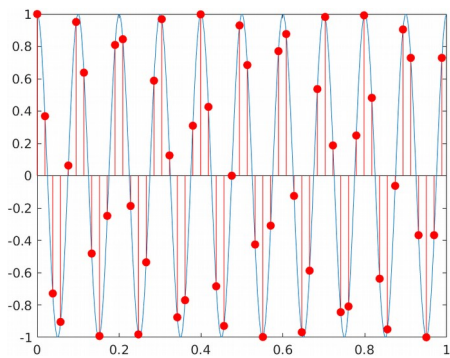


Quantitative Signal

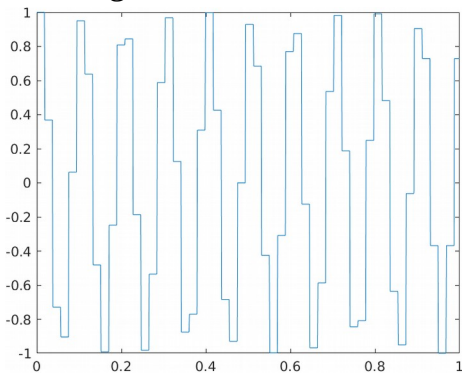


25/01/2020

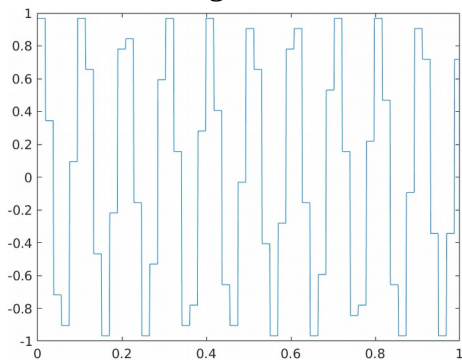
- $M = 32$



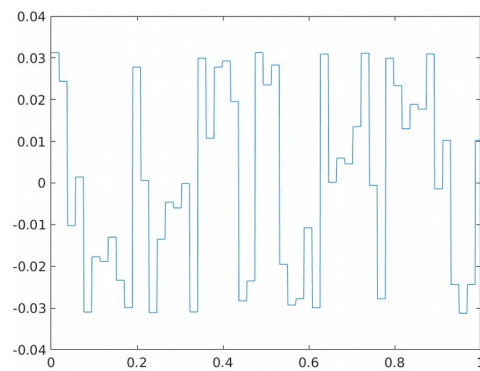
PAM Signal



Quantitative Signal

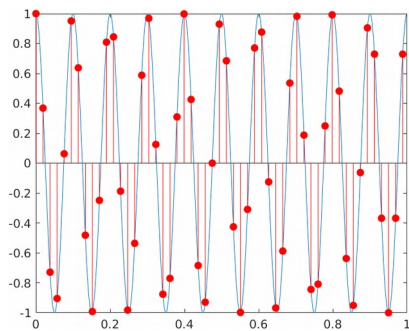


Difference

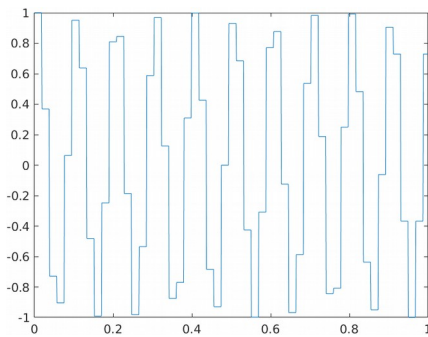


25/01/2020

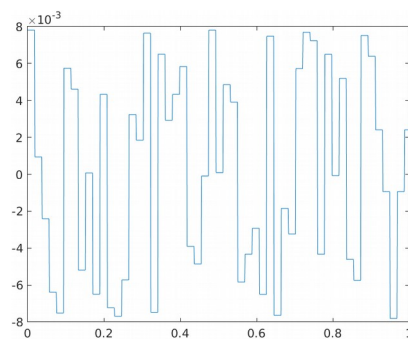
- $M = 128$



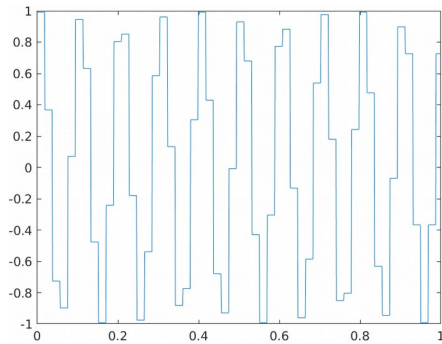
PAM Signal



Difference

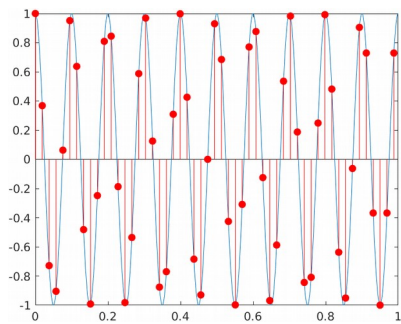


Quantitative Signal

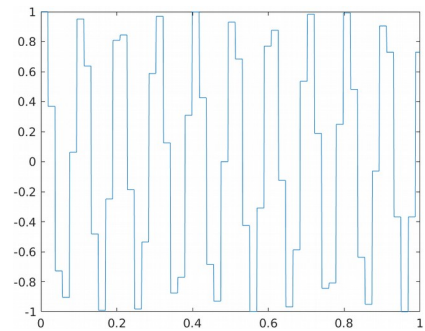


25/01/2020

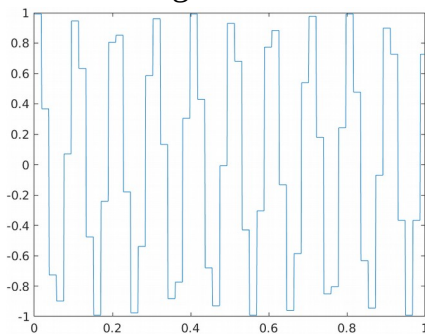
- $M = 256$



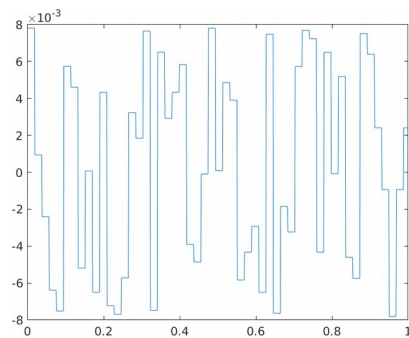
PAM Signal



Quantitative Signal

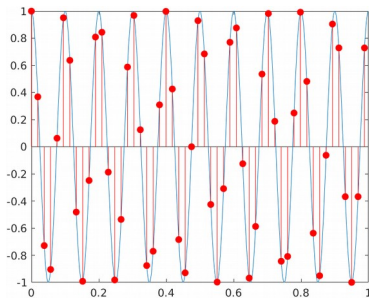


Difference

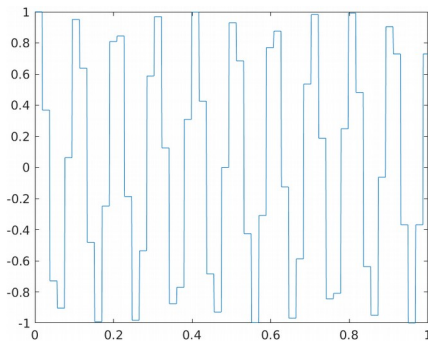


25/01/2020

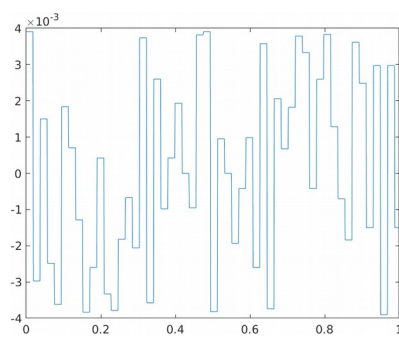
- $M = 256$



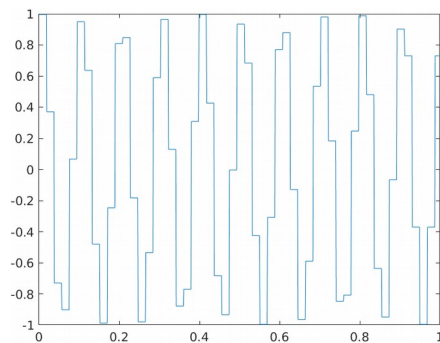
PAM Signal



Difference



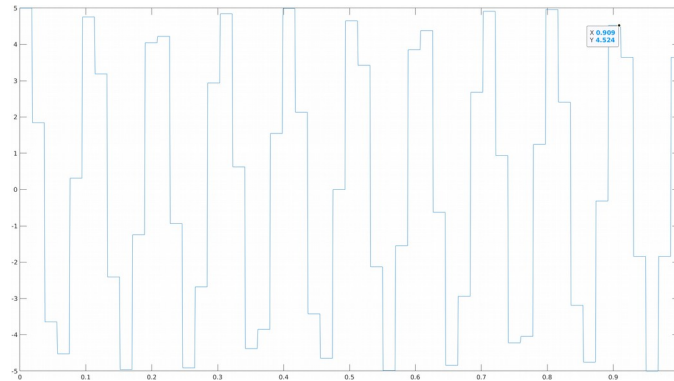
Quantitative Signal



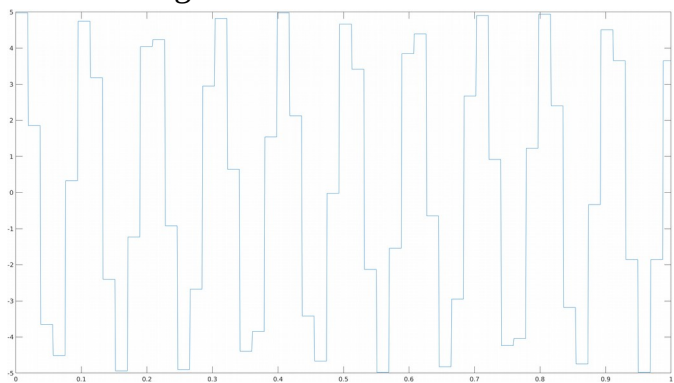
25/01/2020

- Amplitude 5

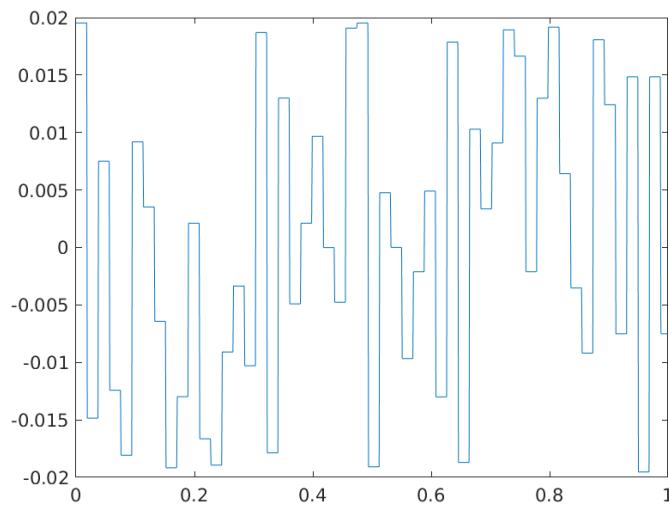
PAM Signal



Quantitative Signal



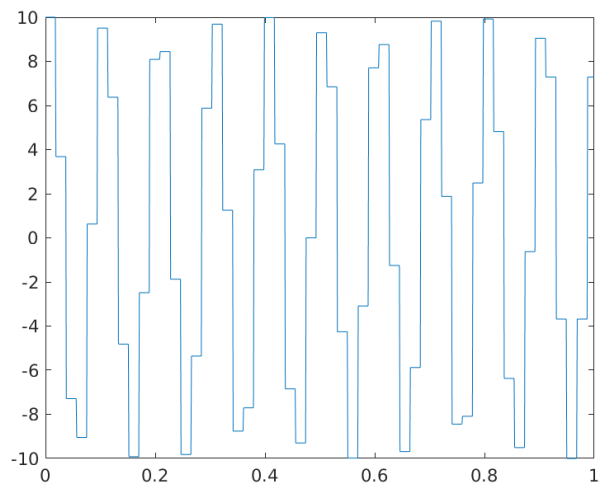
Difference



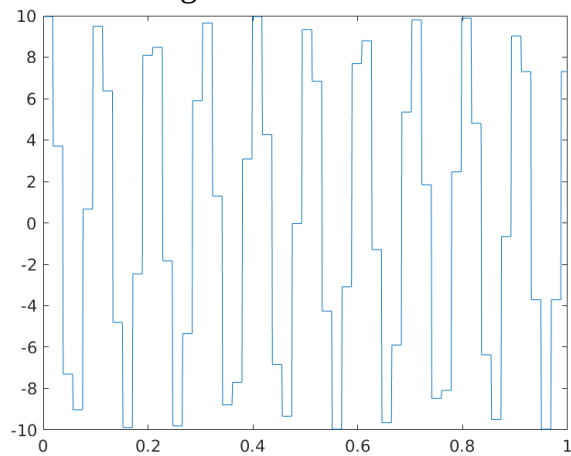
25/01/2020

- Amplitude 10

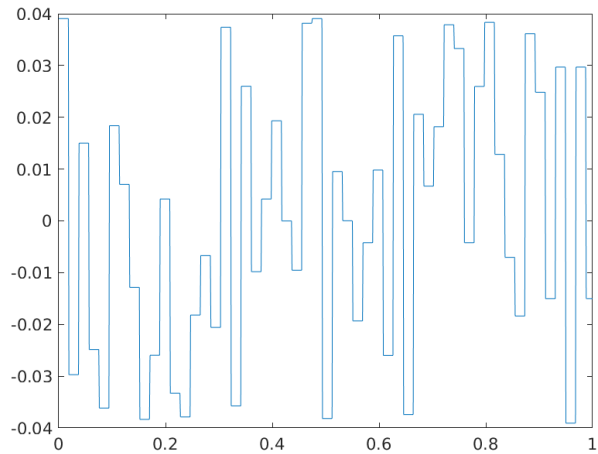
PAM Signal



Quantitative Signal



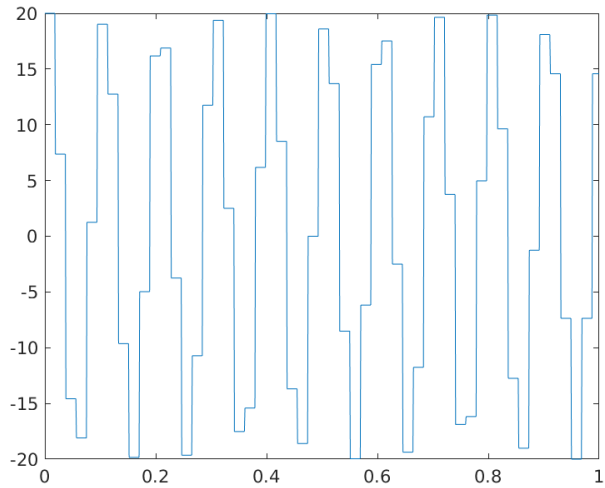
Difference



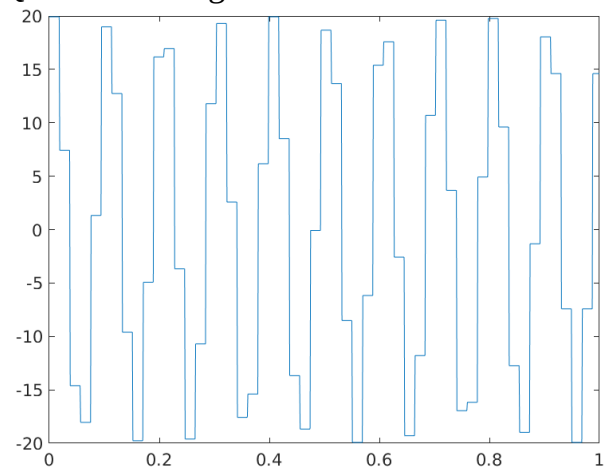
25/01/2020

- Amplitude 20

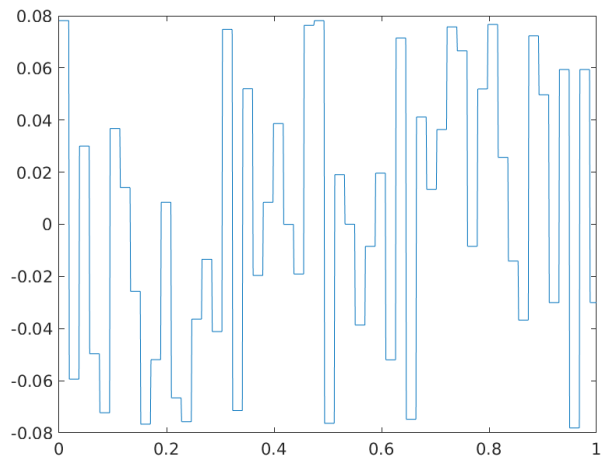
PAM Signal



Quantitative Signal



Difference



25/01/2020

7.

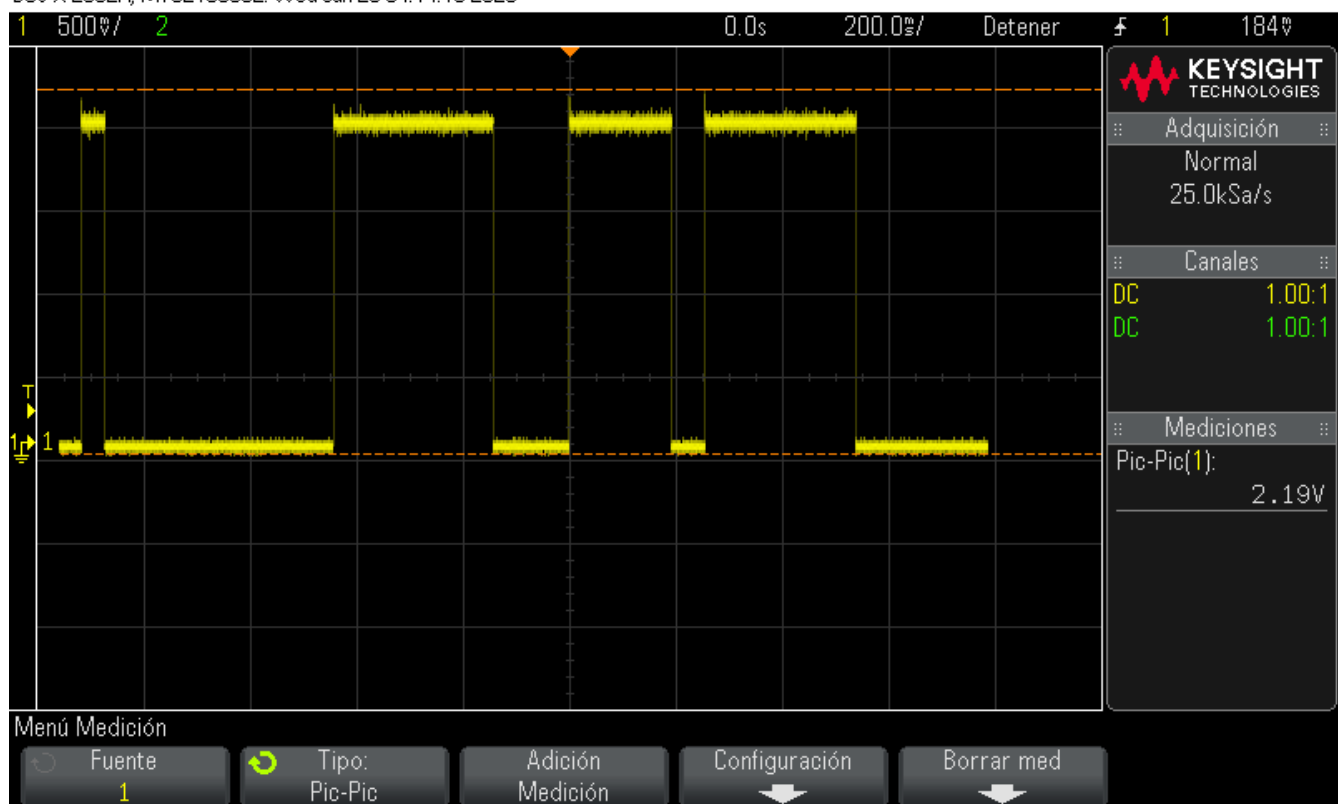
bits	k	Px	Pq	SNRdb
16	4	0.5030	0.0017	24.809
12	3.5850	0.5030	0.0026	22.8004
8	3	0.5030	0.0064	18.9831
4	2	0.5030	0.0264	12.8062

8.

- Tx

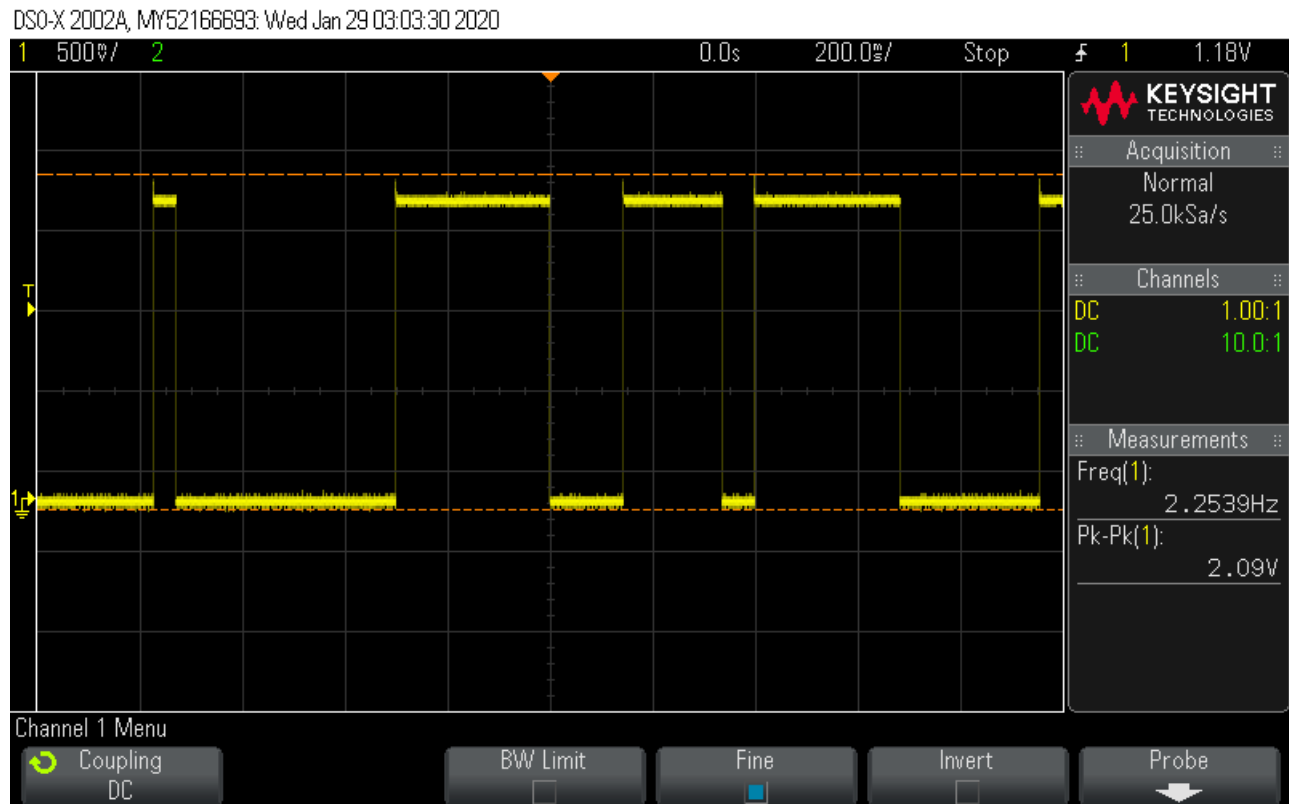
Small section of the signal transmitted via cable.

DSO-X 2002A, MY52166652: Wed Jan 29 04:14:16 2020



25/01/2020

- Rx



The most significant part that I could perceive was that at certain part of the signal it had some noise. Besides that noise and the voltage amplitude lost due to the length of the via to transmit. By watching the signal for a certain of time I did not notices some difference beside that.