SSD

Version : 1.0

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# Report on the Statistical Study of the Detector

## Additional informations

User Name: LAHCEN EL AMRI

Laboratory: cLaboratory of Condensed Matter and Interdisciplinary Sciences (LaMCScI), Faculty of Sciences, Mohammed

Detector Type: Geiger-Müller

Source: Thallium-204

Activity: 10

Production Date: March 2018

Applied Voltage: 900

Counting Time: 20

Repetitions: 500

Dead Time: 325

Saturation: 2344

Other informations: .....

## Operating conditions

Group width (l): 6

## Measurement table

| N1 | N2 | N3 | N4 | N5 | N6 | N7 | N8 | N9 | N10 |
|---|---|---|---|---|---|---|---|---|---|
| 228.0 | 229.0 | 234.0 | 234.0 | 234.0 | 235.0 | 239.0 | 239.0 | 239.0 | 239.0 |
| 239.0 | 240.0 | 241.0 | 243.0 | 243.0 | 243.0 | 243.0 | 243.0 | 244.0 | 244.0 |
| 245.0 | 246.0 | 246.0 | 246.0 | 247.0 | 247.0 | 247.0 | 247.0 | 247.0 | 247.0 |
| 248.0 | 248.0 | 249.0 | 249.0 | 249.0 | 250.0 | 250.0 | 250.0 | 250.0 | 250.0 |
| 251.0 | 252.0 | 252.0 | 252.0 | 252.0 | 252.0 | 253.0 | 253.0 | 253.0 | 253.0 |
| 253.0 | 254.0 | 254.0 | 254.0 | 254.0 | 254.0 | 254.0 | 254.0 | 254.0 | 255.0 |
| 255.0 | 255.0 | 255.0 | 255.0 | 255.0 | 256.0 | 257.0 | 257.0 | 257.0 | 257.0 |
| 257.0 | 257.0 | 257.0 | 258.0 | 258.0 | 258.0 | 258.0 | 258.0 | 258.0 | 258.0 |
| 258.0 | 259.0 | 259.0 | 259.0 | 259.0 | 259.0 | 259.0 | 259.0 | 259.0 | 259.0 |
| 259.0 | 259.0 | 260.0 | 260.0 | 260.0 | 260.0 | 260.0 | 260.0 | 260.0 | 260.0 |
| 260.0 | 260.0 | 261.0 | 261.0 | 261.0 | 261.0 | 261.0 | 261.0 | 261.0 | 262.0 |
| 262.0 | 262.0 | 262.0 | 262.0 | 262.0 | 262.0 | 262.0 | 262.0 | 262.0 | 262.0 |
| 263.0 | 263.0 | 263.0 | 263.0 | 263.0 | 263.0 | 263.0 | 263.0 | 264.0 | 264.0 |
| 264.0 | 264.0 | 264.0 | 264.0 | 264.0 | 264.0 | 264.0 | 264.0 | 264.0 | 265.0 |
| 265.0 | 265.0 | 265.0 | 265.0 | 266.0 | 266.0 | 266.0 | 266.0 | 266.0 | 266.0 |
| 266.0 | 266.0 | 266.0 | 266.0 | 266.0 | 266.0 | 266.0 | 266.0 | 266.0 | 267.0 |
| 267.0 | 267.0 | 267.0 | 267.0 | 267.0 | 267.0 | 267.0 | 267.0 | 267.0 | 267.0 |
| 267.0 | 267.0 | 267.0 | 267.0 | 268.0 | 268.0 | 268.0 | 268.0 | 268.0 | 268.0 |
| 268.0 | 268.0 | 268.0 | 269.0 | 269.0 | 269.0 | 269.0 | 269.0 | 269.0 | 269.0 |
| 269.0 | 269.0 | 269.0 | 269.0 | 269.0 | 269.0 | 269.0 | 269.0 | 269.0 | 269.0 |

| N1 | N2 | N3 | N4 | N5 | N6 | N7 | N8 | N9 | N10 |
|---|---|---|---|---|---|---|---|---|---|
| 270.0 | 270.0 | 270.0 | 270.0 | 270.0 | 270.0 | 270.0 | 270.0 | 270.0 | 270.0 |
| 271.0 | 271.0 | 271.0 | 271.0 | 271.0 | 271.0 | 271.0 | 271.0 | 271.0 | 271.0 |
| 271.0 | 271.0 | 272.0 | 272.0 | 272.0 | 272.0 | 272.0 | 272.0 | 272.0 | 272.0 |
| 272.0 | 272.0 | 273.0 | 273.0 | 273.0 | 273.0 | 273.0 | 273.0 | 273.0 | 273.0 |
| 273.0 | 273.0 | 273.0 | 273.0 | 273.0 | 273.0 | 274.0 | 274.0 | 274.0 | 274.0 |
| 274.0 | 274.0 | 274.0 | 274.0 | 274.0 | 274.0 | 274.0 | 274.0 | 274.0 | 275.0 |
| 275.0 | 275.0 | 275.0 | 275.0 | 275.0 | 275.0 | 275.0 | 275.0 | 275.0 | 275.0 |
| 276.0 | 276.0 | 276.0 | 276.0 | 276.0 | 276.0 | 276.0 | 276.0 | 276.0 | 276.0 |
| 276.0 | 276.0 | 277.0 | 277.0 | 277.0 | 277.0 | 277.0 | 277.0 | 277.0 | 277.0 |
| 277.0 | 277.0 | 278.0 | 278.0 | 278.0 | 278.0 | 278.0 | 278.0 | 278.0 | 278.0 |
| 278.0 | 279.0 | 279.0 | 279.0 | 279.0 | 279.0 | 279.0 | 279.0 | 279.0 | 279.0 |
| 279.0 | 280.0 | 280.0 | 280.0 | 280.0 | 280.0 | 280.0 | 280.0 | 280.0 | 280.0 |
| 280.0 | 281.0 | 281.0 | 281.0 | 281.0 | 281.0 | 281.0 | 281.0 | 281.0 | 281.0 |
| 281.0 | 281.0 | 281.0 | 282.0 | 282.0 | 282.0 | 282.0 | 282.0 | 282.0 | 282.0 |
| 282.0 | 282.0 | 282.0 | 282.0 | 282.0 | 282.0 | 282.0 | 283.0 | 283.0 | 283.0 |
| 283.0 | 283.0 | 283.0 | 283.0 | 284.0 | 284.0 | 284.0 | 284.0 | 285.0 | 285.0 |
| 285.0 | 285.0 | 285.0 | 286.0 | 286.0 | 286.0 | 286.0 | 286.0 | 286.0 | 286.0 |
| 286.0 | 286.0 | 287.0 | 287.0 | 287.0 | 287.0 | 287.0 | 287.0 | 287.0 | 287.0 |
| 287.0 | 288.0 | 288.0 | 288.0 | 288.0 | 288.0 | 288.0 | 288.0 | 288.0 | 289.0 |
| 289.0 | 289.0 | 289.0 | 289.0 | 289.0 | 289.0 | 289.0 | 289.0 | 289.0 | 289.0 |
| 290.0 | 290.0 | 290.0 | 290.0 | 290.0 | 290.0 | 290.0 | 291.0 | 291.0 | 291.0 |
| 291.0 | 291.0 | 291.0 | 291.0 | 291.0 | 291.0 | 291.0 | 292.0 | 292.0 | 292.0 |
| 292.0 | 292.0 | 292.0 | 292.0 | 292.0 | 292.0 | 293.0 | 293.0 | 293.0 | 293.0 |
| 293.0 | 294.0 | 294.0 | 294.0 | 294.0 | 294.0 | 294.0 | 294.0 | 295.0 | 295.0 |
| 295.0 | 295.0 | 295.0 | 295.0 | 295.0 | 296.0 | 296.0 | 296.0 | 296.0 | 296.0 |
| 296.0 | 296.0 | 297.0 | 297.0 | 297.0 | 297.0 | 298.0 | 298.0 | 298.0 | 299.0 |
| 300.0 | 300.0 | 300.0 | 300.0 | 300.0 | 300.0 | 301.0 | 301.0 | 302.0 | 302.0 |
| 302.0 | 302.0 | 303.0 | 303.0 | 303.0 | 303.0 | 304.0 | 304.0 | 306.0 | 307.0 |
| 307.0 | 307.0 | 308.0 | 308.0 | 308.0 | 308.0 | 309.0 | 309.0 | 309.0 | 310.0 |
| 311.0 | 312.0 | 312.0 | 312.0 | 314.0 | 319.0 | 321.0 | 322.0 | 329.0 | 334.0 |

## Statistical values

N: 500
Mean ($\bar{X}$): 274,67
σ_theoretical: 16,57
σ_experimental: 17,23
$P(\bar{X} - \sigma\_exp < X(N+1) < \bar{X} + \sigma\_exp) =$ : 68,80 %

## Comment on the results:

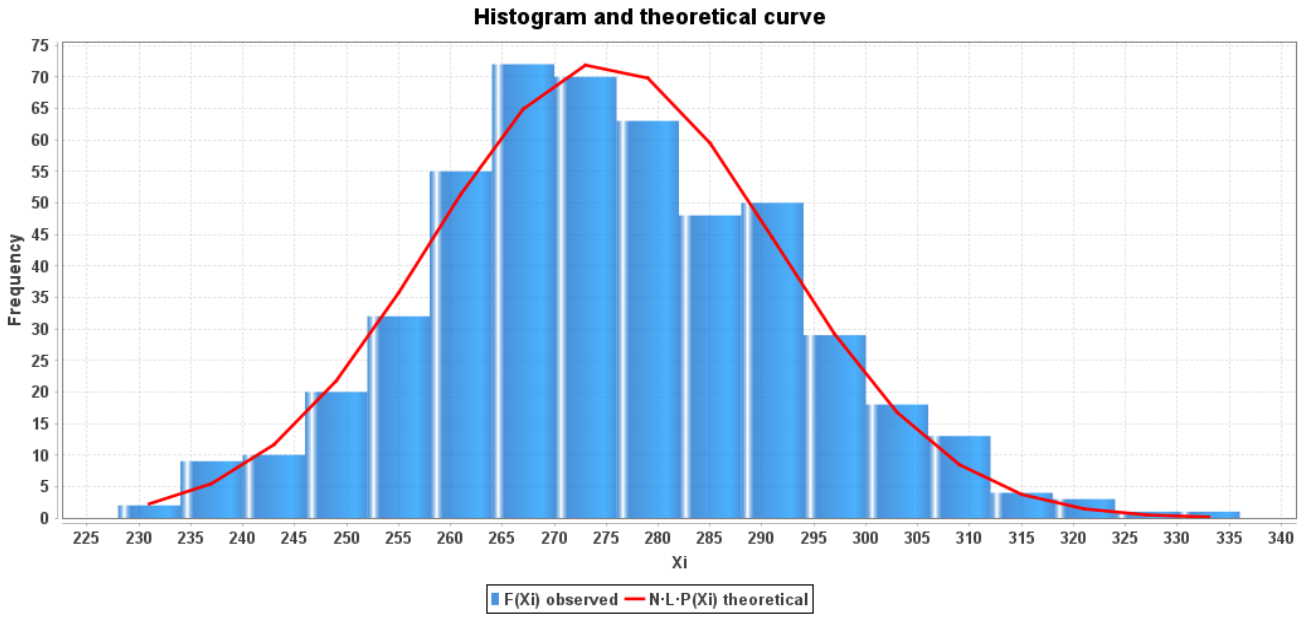
Experimental result closely matches theoretical σ. Detector is very consistent.

## Statistical distribution table

| Interval | $X_i$ | $F(X_i)$ | $P(X_i)$ | $N \cdot I \cdot P(X_i)$ |
|---|---|---|---|---|
| [228,00; 234,00[ | 231,00 | 2 | 0,000747 | 2,24 |
| [234,00; 240,00[ | 237,00 | 9 | 0,001817 | 5,45 |
| [240,00; 246,00[ | 243,00 | 10 | 0,003876 | 11,63 |

| Interval | $X_i$ | $F(X_i)$ | $P(X_i)$ | $N \cdot I \cdot P(X_i)$ |
|---|---|---|---|---|
| [246,00; 252,00[ | 249,00 | 20 | 0,007251 | 21,75 |
| [252,00; 258,00[ | 255,00 | 32 | 0,011899 | 35,70 |
| [258,00; 264,00[ | 261,00 | 55 | 0,017127 | 51,38 |
| [264,00; 270,00[ | 267,00 | 72 | 0,021624 | 64,87 |
| [270,00; 276,00[ | 273,00 | 70 | 0,023949 | 71,85 |
| [276,00; 282,00[ | 279,00 | 63 | 0,023265 | 69,80 |
| [282,00; 288,00[ | 285,00 | 48 | 0,019825 | 59,47 |
| [288,00; 294,00[ | 291,00 | 50 | 0,014818 | 44,45 |
| [294,00; 300,00[ | 297,00 | 29 | 0,009715 | 29,15 |
| [300,00; 306,00[ | 303,00 | 18 | 0,005587 | 16,76 |
| [306,00; 312,00[ | 309,00 | 13 | 0,002818 | 8,46 |
| [312,00; 318,00[ | 315,00 | 4 | 0,001247 | 3,74 |
| [318,00; 324,00[ | 321,00 | 3 | 0,000484 | 1,45 |
| [324,00; 330,00[ | 327,00 | 1 | 0,000165 | 0,49 |
| [330,00; 336,00[ | 333,00 | 1 | 0,000049 | 0,15 |
| | | | | |
| | | | | |

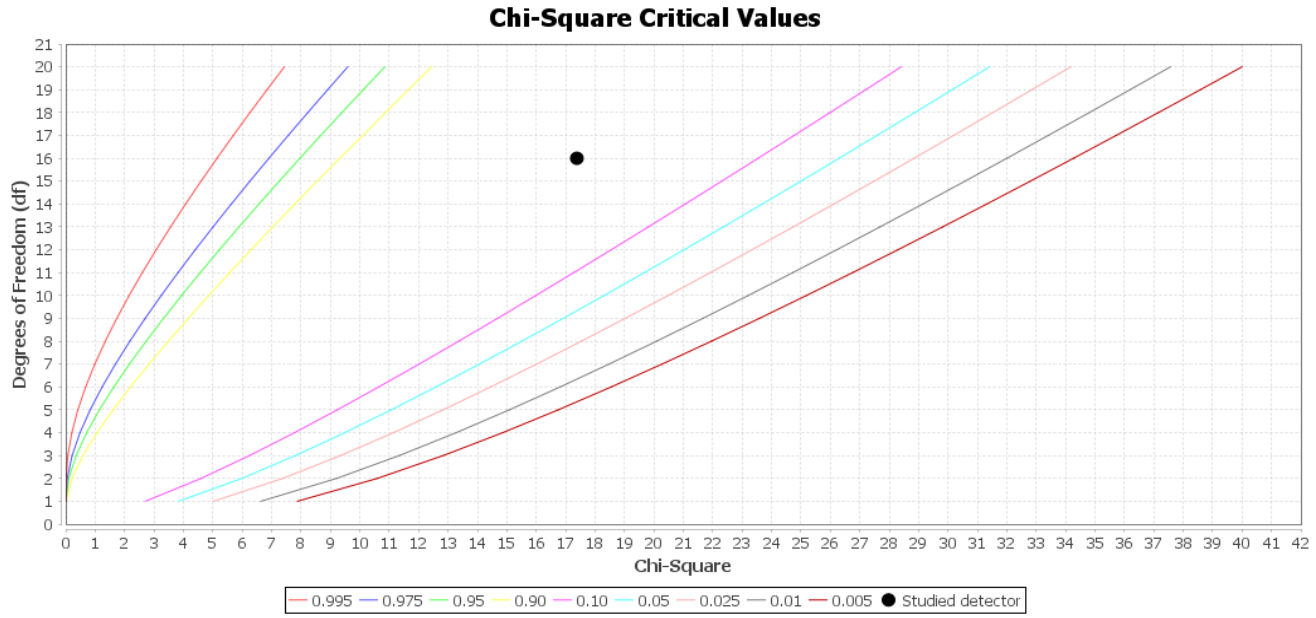
## Statistical distribution Graph




## Pearson chi-square test

$\chi^2$: 17,38
Degrees of freedom (L): 16
Probability P: 0.10

## Chi-Square Critical Values Graph




## Comment on the Chi-Square Graph:

Poor agreement, caution required.

## Chi-Square Critical Values Table

| df | 0.995 | 0.975 | 0.95 | 0.90 | 0.10 | 0.05 | 0.025 | 0.01 | 0.005 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0 | 0.0 | 0.004 | 0.016 | 2.706 | 3.841 | 5.024 | 6.635 | 7.879 |
| 2 | 0.01 | 0.051 | 0.103 | 0.211 | 4.605 | 5.991 | 7.378 | 9.21 | 10.597 |
| 3 | 0.072 | 0.216 | 0.352 | 0.584 | 6.251 | 7.815 | 9.348 | 11.345 | 12.838 |
| 4 | 0.207 | 0.484 | 0.711 | 1.064 | 7.779 | 9.488 | 11.143 | 13.277 | 14.86 |
| 5 | 0.412 | 0.831 | 1.145 | 1.61 | 9.236 | 11.07 | 12.833 | 15.086 | 16.75 |
| 6 | 0.676 | 1.237 | 1.635 | 2.204 | 10.645 | 12.592 | 14.449 | 16.812 | 18.548 |
| 7 | 0.989 | 1.69 | 2.167 | 2.833 | 12.017 | 14.067 | 16.013 | 18.475 | 20.278 |
| 8 | 1.344 | 2.18 | 2.733 | 3.49 | 13.362 | 15.507 | 17.535 | 20.09 | 21.955 |
| 9 | 1.735 | 2.7 | 3.325 | 4.168 | 14.684 | 16.919 | 19.023 | 21.666 | 23.589 |
| 10 | 2.156 | 3.247 | 3.94 | 4.865 | 15.987 | 18.307 | 20.483 | 23.209 | 25.188 |
| 11 | 2.603 | 3.816 | 4.575 | 5.578 | 17.275 | 19.675 | 21.92 | 24.725 | 26.757 |
| 12 | 3.074 | 4.404 | 5.226 | 6.304 | 18.549 | 21.026 | 23.337 | 26.217 | 28.299 |
| 13 | 3.565 | 5.009 | 5.892 | 7.042 | 19.812 | 22.362 | 24.736 | 27.688 | 29.819 |
| 14 | 4.075 | 5.629 | 6.571 | 7.79 | 21.064 | 23.685 | 26.119 | 29.141 | 31.319 |
| 15 | 4.601 | 6.262 | 7.261 | 8.547 | 22.307 | 25.0 | 27.488 | 30.578 | 32.801 |
| 16 | 5.142 | 6.908 | 7.962 | 9.312 | 23.542 | 26.296 | 28.845 | 31.999 | 34.267 |
| 17 | 5.697 | 7.564 | 8.672 | 10.11 | 24.769 | 27.587 | 30.191 | 33.409 | 35.718 |
| 18 | 6.265 | 8.231 | 9.39 | 10.868 | 25.989 | 28.869 | 31.526 | 34.805 | 37.156 |
| 19 | 6.844 | 8.907 | 10.117 | 11.651 | 27.204 | 30.144 | 32.852 | 36.191 | 38.582 |
| 20 | 7.434 | 9.591 | 10.851 | 12.443 | 28.412 | 31.41 | 34.17 | 37.566 | 40.0 |

## Validation

Operator :

Validated by:

Signature :

Signature :