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AN OPTIMAL ELECTRODE ARRAY OF MICROLOG

OPTIMÁLNÍ ROZLOŽENÍ ELEKTROD PRO MIKROLOG

Abstract

It is about projection of an optimal electrode array. In spite of that the disc electrodes are very convenient for Microlog they are not ideal. The functional relationships are tiny curved due to influence of electrode dimensions. Absolutely ideal functional relationship is for the diamond electrodes having magnification factor (A/a) = 0.861. That relationship is presented by half-line completely lying in asymptote representing ideal relation like relation for the point electrodes. Its beginning is in the point of intersection between the above asymptote and the envelope curve.

Abstrakt

Příspěvek popisuje návrh optimálního rozložení elektrod pro mikrolog. Diskové elektrody jsou velmi výhodné, avšak nejsou ideální. Funkční závislosti jsou křivkové, což je následek vlivu rozměru elektrod. Nejideálnější funkční závislost je pro kosočtvercové elektrody, které mají faktor zesílení (A/a) = 0.861. Tato závislost je reprezentována polopřímkou ležící v asymptotě, která představuje ideální vztah odpovídající bodovým elektrodám. Začátek polopřímky leží ve průsečíku mezi asymptotou a obálkovou křivkou.

Introduction

In my before works about Microlog it was said the disc electrode array to be best of all ones. Only the electrode array of the diamond electrodes having magnification factor (A/a) = 1 tends to the disc ones. This all is true, but not so quite. The all depicted curves are more or less curved due to dimensions of electrodes in the domain of near distance. However, there exists the only array being linear all immediately from its beginning point.

The disc electrodes and the square electrodes have their envelope curve and the line being the asymptote for the point electrodes parallel one another. Both can never themselves intersect. But the diamond electrodes are those where you find out the point of intersection of both above curves. This point is referred to certain magnification factor having its correctly defined value for a half-line located all in the asymptote of the point electrodes.

This is that all linear relationship not being curved. All curves above it including also the one for (A/a) = 1 are curved upwards, whereas, those under are curved

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downwards. So the diamond electrodes offer us an optimal electrode array that is very simple, well-projected and easy manufactured.

Projection of optimal array

Fig.1 is that presenting the field of curves for the diamond electrodes. Among the curves you can observe that linear remarked as a bold half-line. The beginning is the point of intersection between the envelope curve and the asymptote. Coordinates of the above point are following: (2m/a) = 2.632 and (k/a) = 16.54. Value of magnification factor presents (A/a) = 0.861. As it was said before, this was lower value than (A/a) = 1. It follows that the dimensions of the current electrode will be lower than those for the potential one. Further, because it is linear relation, it holds that $\underline{AM} = 2 \times \underline{AN}$

Now, you can begin to project the electrode array. What is important is to determine a distance between both electrodes. You can use for that this inequality:

$$m \rangle \frac{\sqrt{2}}{2} \times (a + A). \qquad (1)$$

If the side of diamond of the potential electrode is a, the side of diamond for the current electrode remarked like A will be managed with relation:

$$A = \left(\frac{A}{a}\right) \times a\ . \qquad (2)$$

If you select that a = 10mm and (A/a) = 0.861, you will have A = 8.6mm. When you imply values for both symbols in formula (1), the inequality will be this: m > 13.2mm.

In such case you can have two variances. The first is for longer distance, the second for shorter distance. What is very convenient is formula:

$$m_M = 2 \times m_N\ . \qquad (3)$$

This formula is competent thanks to that curve is a half-line identical with asymptote. The next important formula is for counting of Microlog constants. It holds that:

$$k_g = k_p = k_M\ . \qquad (4)$$

Value of constant k we specify after linear asymptotic relation:

$$\left(\frac{k}{a}\right) = 2\pi \times \left(\frac{2m}{a}\right). \qquad (5)$$

The longer distance.

Basic input factors are these: a = 10mm, A = 8.5mm, m_N = 25mm and m_M = 50mm. Then we get following factors: $(2m/a)_N$ = 5 and $(2m/a)_M$ = 10. Ratios (k/a) are these: $(k/a)_N$ = 31.416 and $(k/a)_M$ = 62.832. The last ratio provides value important for counting of both constants of Microlog; $k_g = k_p$ = 0.628m.

The shorter distance.

Here are these input factors: a = 10mm, A = 8.5mm, m_N = 20mm and m_M = 40mm. From that it results that: $(2m/a)_N$ = 4 and $(2m/a)_M$ = 8.For ratios (k/a) it holds that

$(k/a)_N = 25.133$ and $(k/a)_M = 50.265$.You will have that $k_M = 0.503$m. Then it is possible to write: $k_g = k_p = 0.503$m.

The schematic depiction of such array is in fig.2.

Conclusion

Owing to proposed projection it is possible easy to manufacture an optimal electrode array for Microlog in two variances. The one having longer distance supposes mud cake is less than 50mm, so that electrode M registers flushed zone yet. Very often it is observed the mud cake is thinner than is expected. And just in such case you can use the variance with shorter distance.

I can see, as well, the tool having three spring arms; the first of them has the pad with longer array, the second the pad having shorter array and the remaining registers calliper. And body of the tool can record, moreover, resistivity of mud. All six curves of such tool are recorded simultaneously like the only run. I think such conception could be interested for manufacturers.

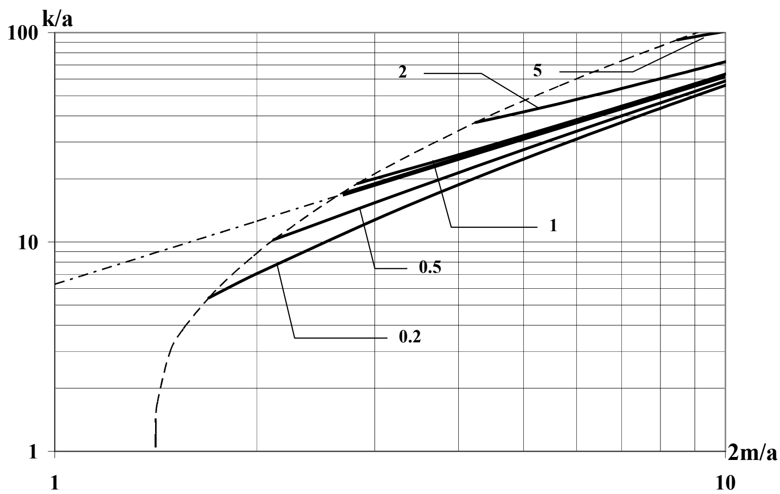

Fig. 1 Relation k/a = f (2m/a, A/a)

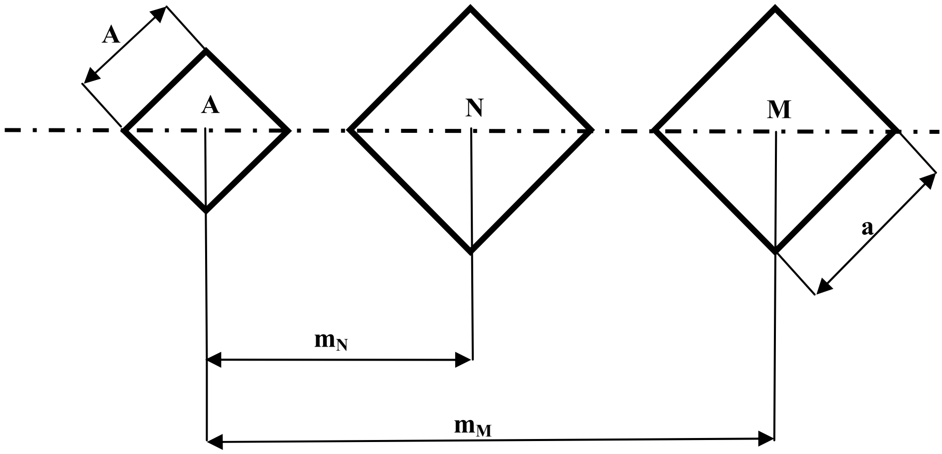

Fig.2 Optimal electrode array of Microlog

References

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