THE INVESTIGATION ORE DEPOSIT OF RADIOISOTOPE ELEMENT WITHIN THE MINING SUBSTANCE IN THE WEST TIMOR ISLAND NUSA TENGGARA TIMUR

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ABSTRACT

These research inspect the distribution and the accumulation shape of ore deposit anomaly of radioisotope element within the mining substance at Sub-district of Amarasi and East – Middle Kupang West Timor Island. The aims of the research: 1) to localize the distribution wide of radioisotope element within the mining substance, 2) to stake out the target reconstruction or shape of accumulation anomaly ore deposit of radioisotope element within the mining substance, 3) to decide counts range of nuclear radiation and thermal counts in the center region of radioisotope source in the West Timor Island.

The methods of research consist of: observation, survey, modeling, analysis, and interpretation. Procedures of research including: 1) to observe for determination the potential region and grid plot, 2) to calibrate equipment, 3) to measure background count in around of survey location, 4) to measure nuclear radiation and thermal count in the survey location, 5) to correct field count with background count, 6) two and three dimensional characteristic curve of radiation and thermal count plot, contour, contour slice, and distribution profile curve of ore deposit anomaly of radioisotope in the mining substance also plot, 7) to determine the depth of ore deposit of radioisotope element within the mining substance and radiation power, 8) to calculate radiation intensity for modeling of target reconstruction, 9) to stake out modeling and target reconstruction of ore deposit of radioisotope in the mining substance, 10) interpretation and conclusion.

The results of the research: radiation power to determine radiation intensity is 1183911,452 w. Based on characteristic curve, contour, profile curve, and modeling of ore deposit anomaly (target reconstruction) of radioisotope element within the mining substance, can be proposed that the wide of ore deposit distribution of radioisotope element in rock mineral 1.5 kilometers x 2.0 kilometers, and the wide of ore deposit center region 200 meters x 300 meters. The shape of ore deposit anomaly of radioisotope element within the mining substance resemble of oval ball vertically with diameters ± 54 meters horizontal, and ± 100 meters vertical on the average depth 22 meters, and the shape on above surface is dented. The range thermal and radiation counts of radioisotope element in the mining substance revolve between 20.3^o C to 50.7^o C and 9 counts per minute to 117 counts per minute.

Key words: *Investigation, ore, deposit, radioisotope, radiometric*

INTISARI

Penelitian ini mengkaji tentang distribusi penyebaran dan bentuk akumulasi anomali *ore* deposit unsur radioisotop dalam bahan galian (tambang) di Kecamatan Amarasi dan Kupang Tengah–Timur, Pulau Timor Barat. Tujuan penelitian: 1) melokalisir luas penyebaran unsur radioisotop dalam bahan galian (tambang), 2) merancang rekonstruksi target atau bentuk anomali akumulasi *ore* deposit unsur radioisotop dalam bahan galian (tambang), 3) menetapkan *range* cacah radiasi nuklir dan termal di daerah pusat sumber radioisotop di pulau Timor barat.

Metode penelitian terdiri atas observasi, survei, *modeling*, analisis, dan interpretasi. Prosedur pelaksanaan penelitian meliputi: 1) melakukan observasi untuk menentukan daerah-daerah yang berpotensi dan pembutan grid, 2) mengkaliberasi peralatan, 3) mengukur cacah latar di sekitar daerah survei, 4) mengukur cacah radiasi nuklir dan termal di lokasi survei, 5) mengoreksi data lapangan dengan cacah latar, 6) membuat kurva karakteristik cacah radiasi dan termal dua dan tiga dimensi, kontur, irisan kontur, dan kurva *profile*, 7) menentukan kedalaman *ore* deposit unsur radioisotop dalam bahan galian dan daya radiasi, 8) menghitung intensitas radiasi untuk pemodelan rekonstruksi target,

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9) merancang pemodelan dan rekontruksi target *ore* deposit unsur radioisotop dalam bahan galian, 10) melakukan interpretasi dan menarik kesimpulan.

Hasil penelitian: daya radiasi untuk menentukan intensitas radiasi yang bersesuaian dengan data lapangan besarnya 1183911,452 w. Berdasarkan kurva karakteristik, kontur, kurva *profile*, dan pemodelan bentuk anomali *ore* deposit (rekonstruksi target) unsur radioisotop dalam bahan galian, dapat dikemukakan bahwa luas penyebaran *ore* deposit unsur radioisotop dalam mineral batuan 1,5 kilometer x 2,0 kilometer, dan luas daerah inti deposit 200 meter x 300 meter. Bentuk anomali *ore* deposit unsur radioisotop dalam bahan galian, menyerupai bola lonjong vertikal dengan diameter ± 54 meter horizontal dan ± 100 meter vertikal, pada kedalaman rata-rata 22 meter, dan bentuk permukaan bagian atas berlekuk-lekuk. Interval cacah termal dan cacah radiasi unsur radioisotop dalam bahan galian berkisar antara 20,3^{o} C sampai dengan 50,7^{o} C, dan 9 cpm sampai dengan 117 cpm.

Kata kunci: Investigasi, *ore*, deposit, radioisotop, radiometri

INTRODUCTION

Timor is a large island of several islands in Nusa Tenggara Timur located approximately between 8^{o} – 11^{o} south latitude and 123^{o} – 126^{o} east longitude. These region is rich any kinds of mining mineral, among others: petroleum, natural gas, geothermal, coal or anthracite, iron, and tin/lead (A group extractive), gold, silver, aluminum, nickel, copper, manganese, and radioisotope element (B group extractive), sulfur, limestone, barite, marble, gypsum, granite, and dolomite (C group extractive).

Based on observation and pre-survey which have been done by researcher, the large of radiation counts range of radioisotope elements and thermal counts range at Sub-district of Amarasi and East – Middle Kupang, West Timor Island revolve between 32 cpm to 138 cpm and 22.8 ^{o} C to 51.9^{o} C. The radiation activities of radioisotope element within the mining substance revolve between 1,40 x 10^{-5} µCi to 6,20 x10^{-4} µCi (Pasangka, 2003).

The deposit or content of radio-isotope element within the mining substance is estimated since the forming of Timor Island, it is the result of uplift when the collision take place between Banda Arc and continetal Australian shelf on tectonic process (Hamilton, 1981). Grunau (1953, 1957), Gageonnet et al (1958), and Audley-Charles et al (1972) propose that the structure and association of rocks in the Timor Island, original resource uplift a part of continental Australian shelf deformation, and the others are masses that pushed or enclosed up to cover the all rocks in Timor Island (Hamilton, 1981). It is proposed that radioisotope element deposit in the rock mineral in Timor Island, is directly involved with earth material which a large part came from continental Australian shelf.

Because the energy source from petroleum is more decrease or diminish, it is necessary sought the other alternative to procure the energy on future. One alternative energy source possible is nuclear energy which sourced from nuclear fuel or radioisotope element, that begin to be developed in Indonesia, like as the reconstruction plan of electric generator of nuclear power plant in Jepara Middle Java. As an initial step to procure the nuclear fuel, the researcher is attracted to investigate ore deposit of radioisotope element in the rocks mineral around Amarasi and East–Middle Kupang, West Timor Island.

The principal problem inspected in these research is distribution and shape of ore deposit anomaly of radioisotope element within the mining substance. Problems specification are researched including: 1) distribution of ore deposit anomaly of radioisotope element within the mining substance in the West Timor Island, 2) target reconstruction or ore deposit shape of radioisotope element within the mining substance in the West Timor Island, 3) the counts range of nuclear radiation and thermal in the source center region of radioisotope element in the West Timor Island.

The general aim of these research: to investigate distribution and shape of ore deposit of radioisotope element within the mining substance at Sub-district of Amarasi and East-Middle Kupang West Timor Island, as a basic consideration to connected institutions for exploration and environment mapping. The specific aims of these research comprises of: 1) to localize or map the distribution of radioisotope element within the mining substance at sub-district of Amarasi and East-Middle Kupang, West Timor Island, 2) to stake out target reconstruction or shape of ore deposit anomaly of radioisotope element within the mining substance, and 3) to decide count range of nuclear radiation and thermal in the center region of radioisotope source in the West Timor Island.

For solving those problems and the aims which proposed above, are used radiometric and thermal survey approach, analysis, and interpretation. The main procedures are taken in realization of these research comprises of: 1) to observe for determination the center region of radio isotope source and grid plot, 2) to calibrate equipment, 3) to measure background in around of survey location, 4) to measure nuclear radiation count and thermal based on grid which have been designed, 5) to correct field count with background, 6) two and three dimensional characteristic curve of radiation and thermal count plot, contour, contour slice, and distribution profile curve of ore deposit anomaly of radioisotope in the mining substance also plot, 7) to determine the depth of ore deposit of radioisotope element within the mining substance, 8) to calculate radiation intensity for modeling of target reconstruction which appropriate with profile of field data, 9) to stake out modeling based on radiation intensity in two and three dimensions, 10) to stake out target reconstruction or shape of ore deposit anomaly of radioisotope element within the mining substance, and 11) interpretation and conclusion.

Radiometric and thermal survey in general there are two steps: observation step and field survey step. On the observation step is done identification of regions that content potential of radioisotope element, and then determine several locations which are estimated the most potential for local survey (Bell and Dlouhy, 1994., ElBaredei and Na, 2004., ElBaredei et al, 2006).

Field survey (nuclear radiation and thermal) is started on local survey appropriate with location potential which have been chosen, and then expanded for regional mapping. Local survey is proposed to determine accurately ore deposit distribution anomaly of radioisotope element in rock mineral, which aimed to localize ore deposit distribution of radioisotope element, and the other characteristics are required. The wide of region for local survey are only several kilometers square (Johnson, 1984., Bell and Dlouhy, 1994). Field survey need geology data as a proponent like as rock structure (igneous, sediment, and metamorphic rocks), geology map, topography, etc. Radiometric survey on local state, can be done on foot with using Geiger Muller portable detector, that can detect the total radiation (doses) counts from the source. These equipment is more effective because radiation from sources like as α, β, and γ radiation can be detected in an unison. If α and β radiation have radiation interval is short and can not pierce the thick rock layer, γ radiation still can be detected because only a part of γ radiation is absorbed by matter (electromagnetic wave). If γ radiation also can not be detected because the layer of rock extremely thick, the interpretation can be espoused with thermal survey. The radiation still can be detected on 100 feet distance (± 300 meters) above source surface if go through in air medium (Johnson, 1984).

Measurement of radiation count can be done based on measure point on each line (grid) that have planned, so that, we obtain the best mapping on survey location. Actually, measurement of radiation count on radiometric survey can be done randomly (Johnson, 1984). Radiometric local survey can be expanded for regional mapping, and can be continuous expanded for more wide region, that adjust with the wide of potential region. Target reconstruction of rock mineral can be predicted based on profile of ore deposit anomaly of radioisotope element within the rock mineral, in general appropriate with magnetic anomaly profile of rock (Telford et al, 1976., Aiken et al, 1981). For dry region and homogeneous rock structure relatively, deposit anomaly profile of radioisotope element within the mining substance, in general appropriate with thermal anomaly profile, It is produced by decay of radioisotope element.

If ore deposit of radioisotope in rock mineral shaped of Uranium mineral with composition U_3O_8, standard classification characteristics for ore deposit quality (ore grade deposit) are low if < 0.15% U_3O_8, middle : 0.15% to 0.50% U_3O_8, and high if > 0.50% U_3O_8 (Dahlkamp, 1989).

Target reconstruction model or shape of ore deposit anomaly of radioisotope element in mining substance can be planned with regard as profile is painted from contour slice, and shaped from target of small balls as a radiation source. The union of small balls are shaped the target reconstruction in mining substance. It is based on principle that a radioisotope source emit nuclear radiation to all directions with the same radius on one circle position appropriate with shape of target (source).

The shape or target modeling ore deposit can be became clearer with to paint profile of contour slice on several directions. Target modeling can be done with earlier or previous to determine the depth of ore deposit , based on magnetic theory, that the depth is determined by equation:

$$d = F\left(X_{\frac{1}{2}}\right) \qquad \text{............................(1)}$$

Where: d is the depth of ore deposit, $X_{1/2}$ is half value of x maximum anomaly profile ore deposit, F are geometry factors, the *value of* F = 1.990 for ball, F = 1.000 for infinite line pole, and F = 1.305 for point pole. Furthermore, to investigate radiation power: P (w) to calculate radiation intensity : I (w/m^2) that may be in mutual accord with profile of field data. In this case, are used the ball model because nuclear radiation from a source is emitted to all directions in the same radius (shaped of ball). The maximum intensities are calculated by equation:

$$I_o = \frac{P}{4\pi d^2} \qquad \text{...........................(2)}$$

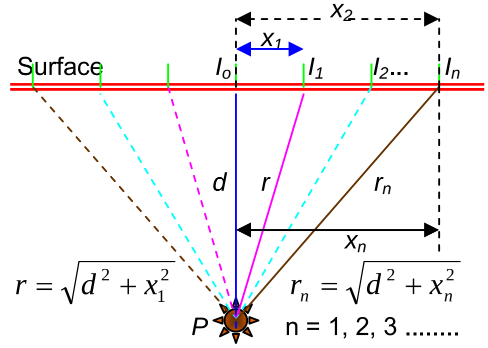

Figure 1. The shape of modeling geometry to calculate radiation intensity that it's profile may be in mutual accord with profile of field data on elevated or altitude correction

$$I_n = \frac{P}{4\pi r_n^2} = \frac{P}{4\pi\left(d^2 + x_n^2\right)} \qquad \text{..(3)}$$

For the region with topography is not flat, we can carry out the topography correction based on these geometry.

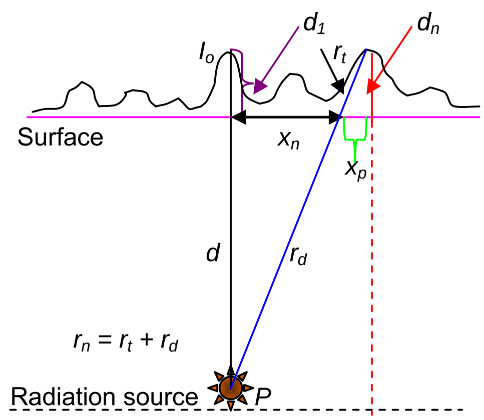

Figure 2. The shape of modeling geometry to calculate radiation intensity that it's profile may be in mutual accord with profile of field data on topography correction

$$I_o = \frac{P}{4\pi d_o^2} \qquad \text{...........................(4)}$$

where: $d_o = d + d_1$, d_1 and d_n is measured with altimeter..

$$I_n = \frac{P}{4\pi r_n^2} \Rightarrow r_n^2 = (r_d + r_t)^2 = \left[(x_n + x_p)^2 + (d + d_n)^2\right]$$

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$$I_n = \frac{P}{4\pi\left[\left(x_n + x_p\right)^2 + \left(d + d_n\right)^2\right]} \quad \text{.......(5)}$$

Geometry shape for three dimensions.

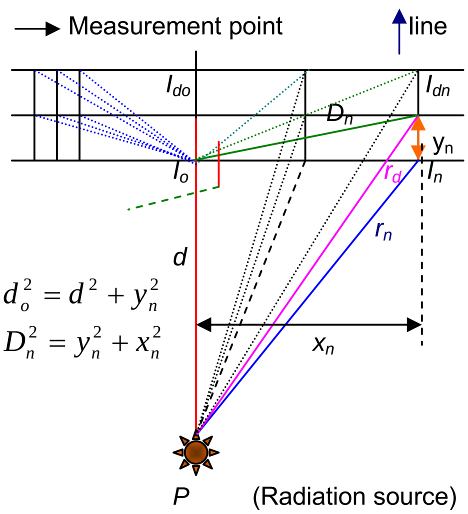

Figure 3. The shape of modeling geometry in three dimensions to calculate radiation intensity that it's profile may be in mutual accord with profile of field data on elevated correction

$$r_n^2 = d^2 + x_n^2 \,,\; r_d^2 = d^2 + D_n^2$$

$$I_o = \frac{P}{4\pi d^2} \quad \text{.......................................(6)}$$

$$I_n = \frac{P}{4\pi r_n^2} = \frac{P}{4\pi(d^2 + x_n^2)} \quad \text{...............(7)}$$

$$I_{do} = \frac{P}{4\pi d_o^2} = \frac{P}{4\pi\left(d^2 + y_n^2\right)} \quad \text{............(8)}$$

$$I_{dn} = \frac{P}{4\pi r_d^2} = \frac{P}{4\pi(d^2 + D_n^2)}$$

$$I_{dn} == \frac{P}{4\pi\left[d^2 + (y_n^2 + x_n^2)\right]} \quad \text{...............(9)}$$

DISCUSION

The measurement results of thermal and nuclear radiation counts of radioisotope element within the mining substance at Sub-district of Amarasi and East-Middle Kupang West Timor Island is shown in Table 1. Based on data in Table 1, are obtained the plotting results of characteristic curve of thermal and radiation count versus line (Figure 4 and 5), the map illustration of anomaly distribution ore deposit of radioisotope element in mining substance (Figure 6), Three dimensional characteristic curve of ore deposit anomaly of radioisotope element in mining substance (Figure 7), contour map (Figure 8), contour slice (Figure 9), and profile curve of ore deposit anomaly of radioisotope element in mining substance (Figure 10 and 11).

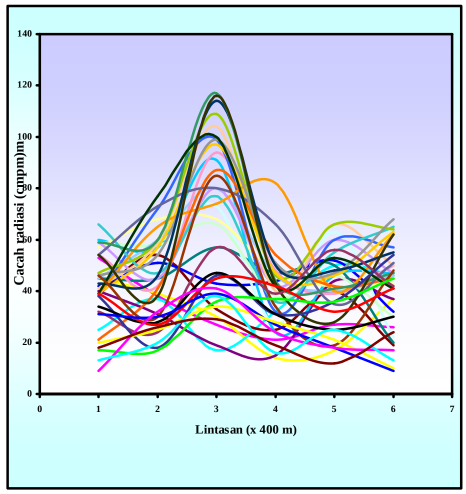

Figure 4. Characteristic curve of radiation count versus line

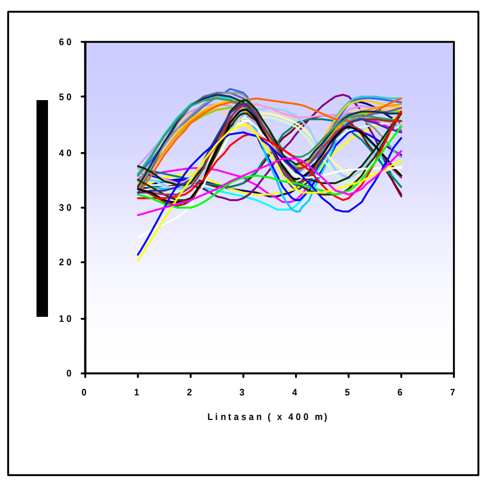

Figure 5. Characteristic curve of thermal count versus line

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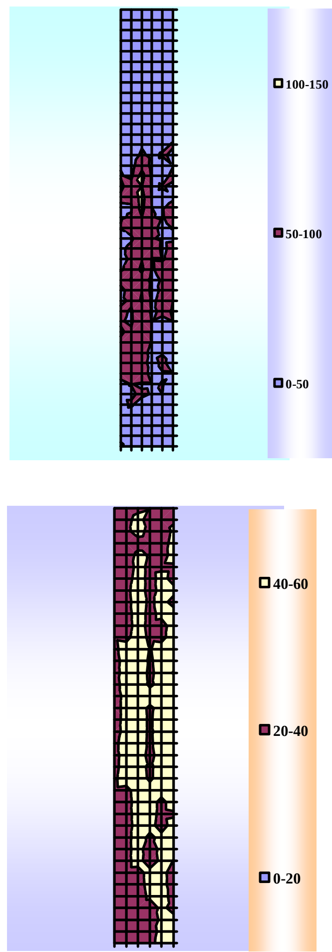
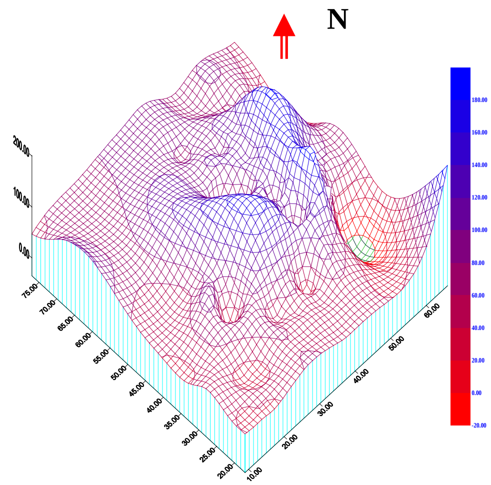


Figure 6. Deposit distribution map of radioisotope element within the mining substance based on thermal and radiation counts



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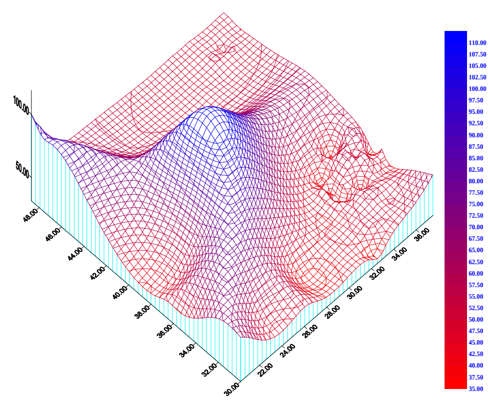

Figure 7. Three dimensional characteristic curve of thermal and radiation counts

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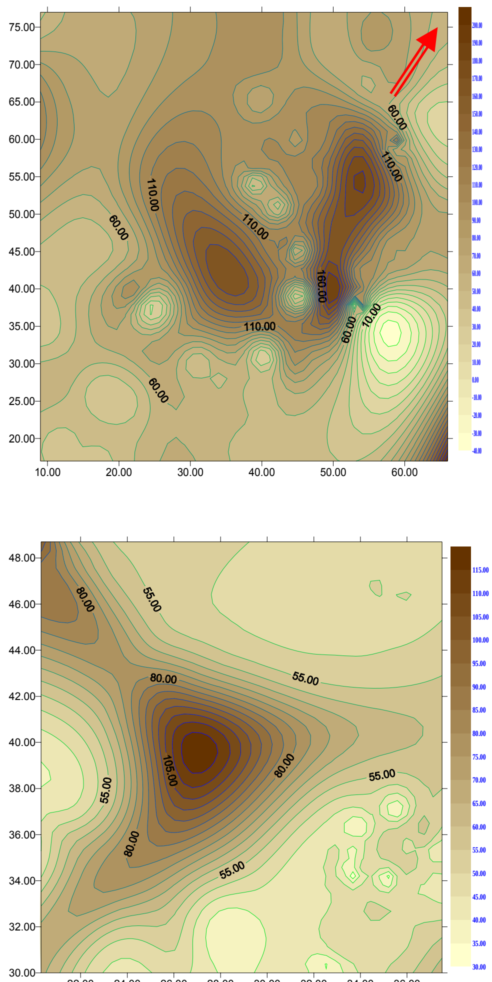

Figure 8. The deposit contour of radio-isotope element within the mining substance based on thermal and radiation counts in the West Timor Island

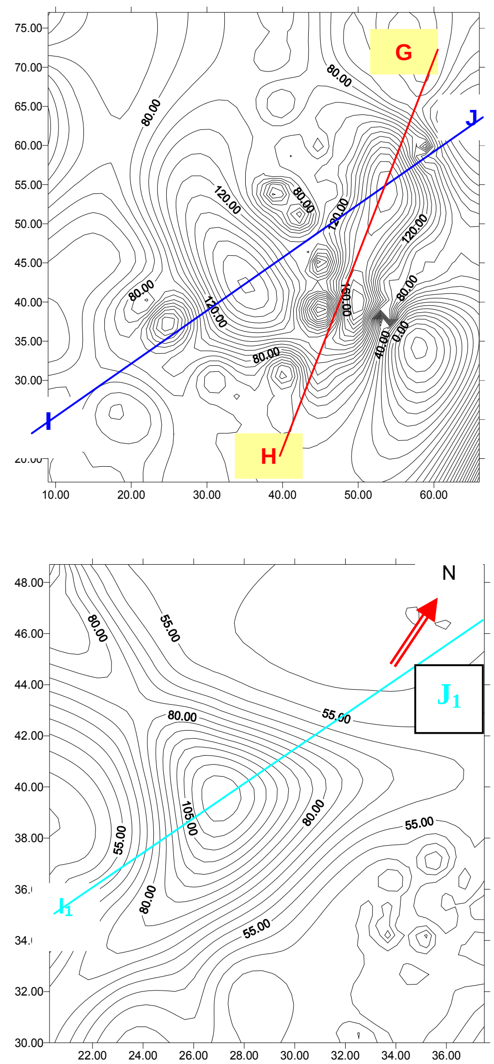

Figure 9. Contour slice

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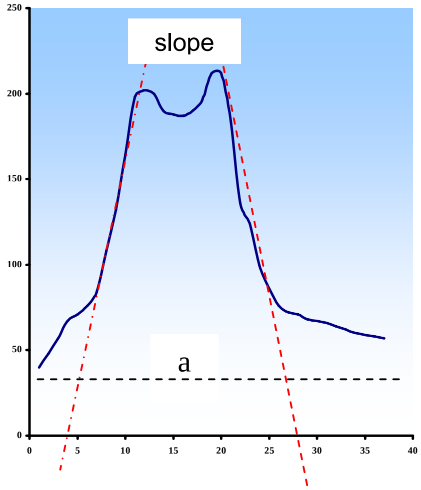

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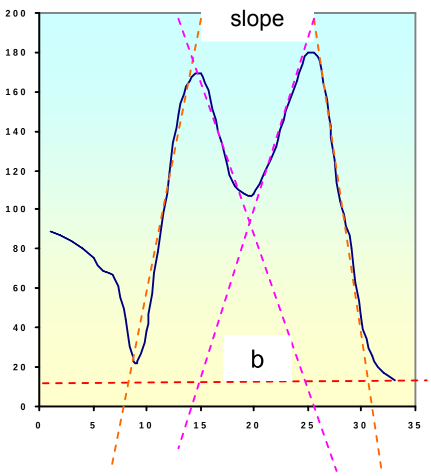

Figure 10. Ore deposit profile of radio-isotope element within the mining substance (a. G-H slice, and b. I-J slice)

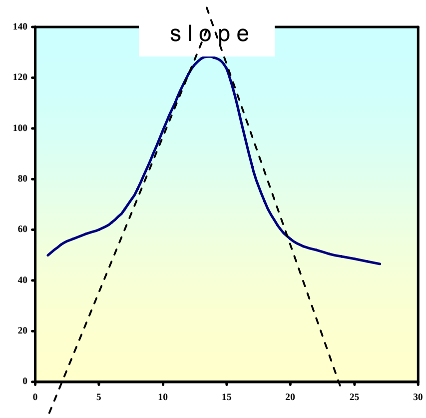

Figure 11. Ore deposit profile of radio-isotope element within the mining substance based on thermal count is produced by radioisotope decay ($I_1 - J_1$ slice)

For staking out of target reconstruction or ore deposit shape of radio-isotope element within the mining substance, the modeling of radiation intensity is plotted (to use equation 1 to 9) that shape of it's profile may be in mutual accord with profile of field data. Radiation power to calculate radiation intensity in mutual accord with profile of field data is 1183911.452 w, which determined from modeling. The position of each point shape profile and then is connected by broken line, so that, target reconstruction is composed, like as shown on Figure 12, 13, 16, and 17.

(1) d = 21,09 m, I_o = 211,8 w/m^2
2) d = 21,60 m, I_o = 201,9 w/m^2
(3) d = 22,46 m, I_o = 186,8 w/m^2
(4) d = 25,65 m, I_o = 143,2 w/m^2
(5) d = 26,58 m, I_o = 133,3 w/m^2
(6) d = 35,52 m, I_o = 74,7 w/m^2
(7) d = 36,43 m, I_o = 70,8 w/m^2
(8) d = 37,25 m, I_o = 67,0 w/m^2
(9) d = 47,36 m, I_o = 42,0 w/m^2
(10) d = 71,04 m, I_o = 18,7 w/m^2

d is the depth, and I_o is maximum intensities

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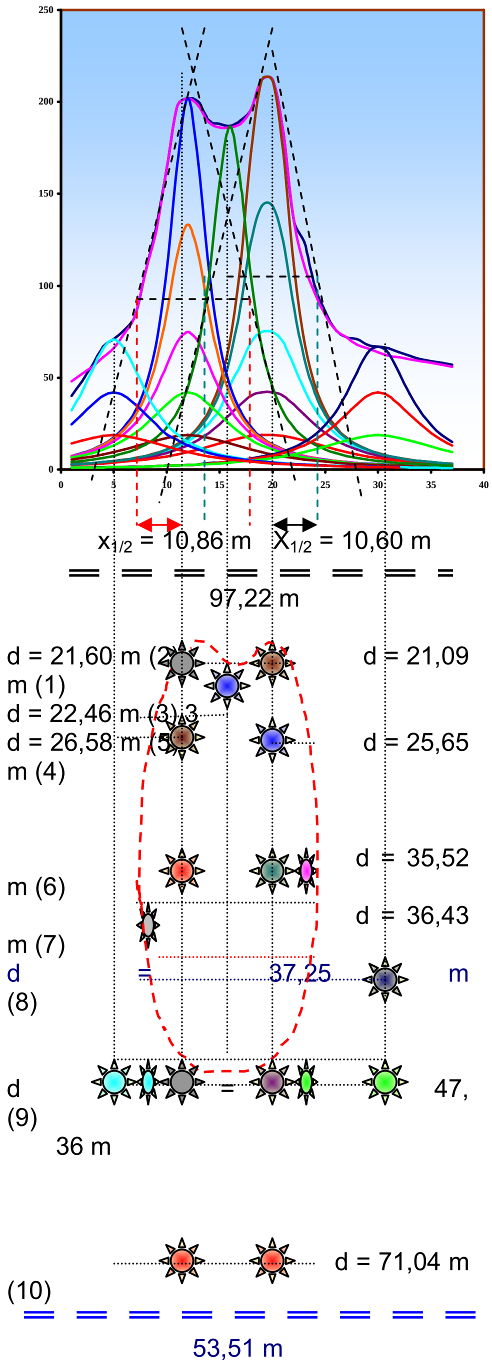

Figure 12. Profile verification of field data with modeling to reconstruct of target (G – H slice)

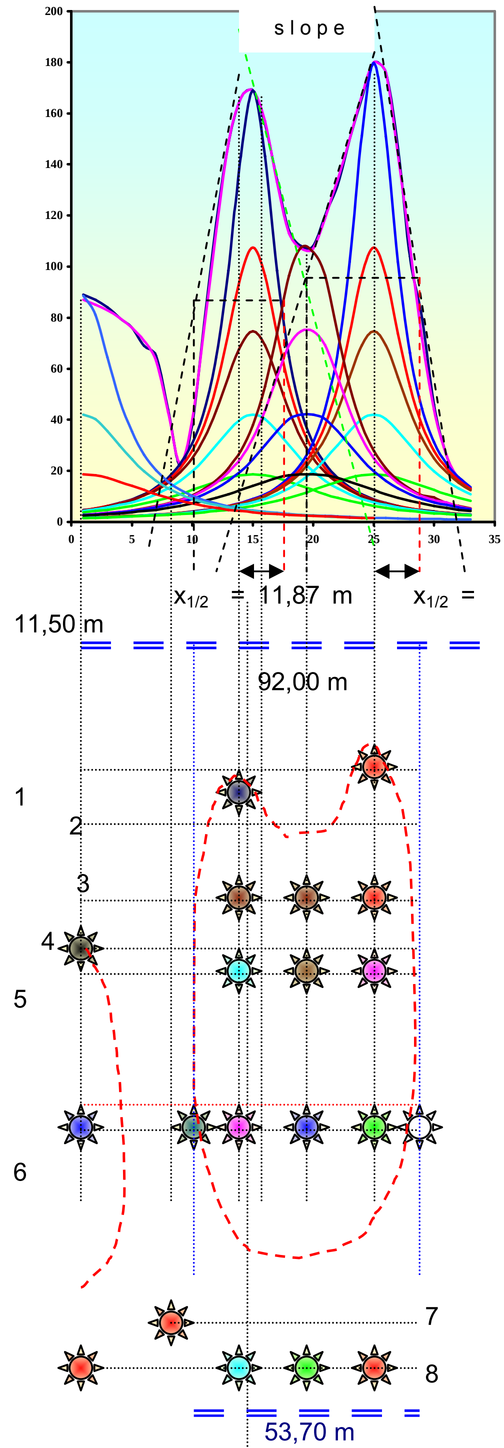

Figure 13. Profile verification of field data with modeling to reconstruct of target (I – J slice)

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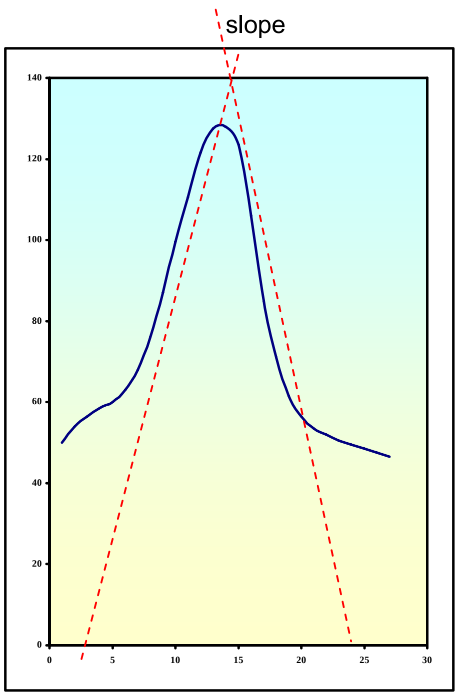
1. d = 22,89 m, I_o = 179,8 w/m^2
2. d = 23,62 m, I_o = 168,9 w/m^2
3. d = 29,60 m, I_o = 107,5 w/m^2
4. d = 32,59 m, I_o = 88,7 w/m^2
5. d = 35,52 m, I_o = 74,7 w/m^2
6. d = 47,36 m, I_o = 42,0 w/m^2
7. d = 65,44 m,
8. d = 71,04 m, I_o = 18,7 w/m^2



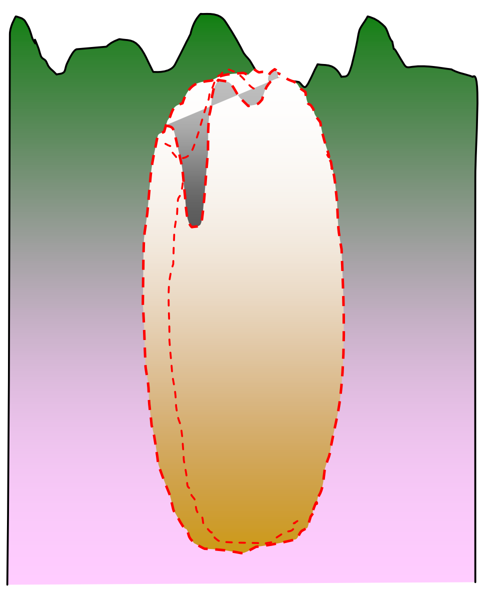


Figure 14. Deposit profile of radioisotope element in the mining substance at Sub-district of Amarasi and East-Middle Kupang West Timor Island based on thermal counts ($I_1 - J_1$ slice)

Based on equation (6), (7), (8) and (9), are obtained modeling curve in three dimensions like as shown on Figure 15, 16, and 17.

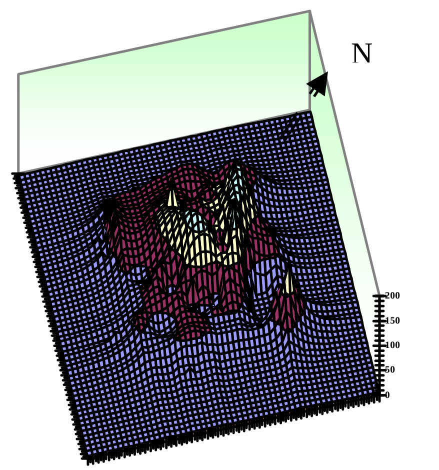


Figure 15. Three dimensional modeling curve of radiation intensity that is in mutual accord with profile of field data

Figure 16 shown these points:
1. d = 22,89 m, I_o = 179,8 w/m^2
2. d = 23,62 m, I_o = 168,9 w/m^2
3. d = 29,60 m, I_o = 107,5 w/m^2
4. d = 32,59 m, I_o = 88,7 w/m^2
5. d = 35,52 m, I_o = 74,7 w/m^2
6. d = 47,36 m, I_o = 42,0 w/m^2
7. d = 71,04 m, I_o = 18,7 w/m^2
8. d = 122,97 m, I_o = 6,2 w/m^2

To stake out of target reconstruction, is taken the tops of radiation intensity on each depth based on two and three dimensions modeling curve. The each point is plotted based on depth level appropriate with radiation intensity is connected, so that, the target reconstruction painted and It is shown ore deposit shape of radioisotope element in mining substance.

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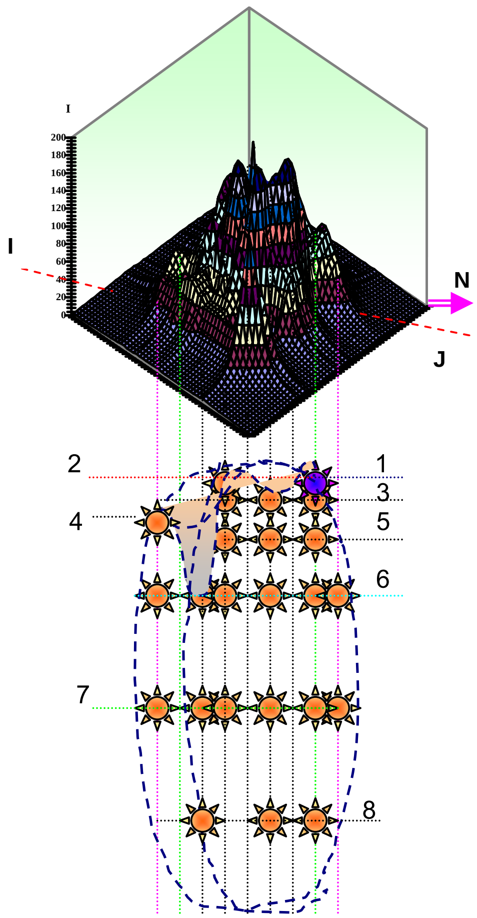

Figure 16. Curve of radiation intensity in three dimensions to reconstruct of target that is adjusted with two dimensions curve on contour I – J slice

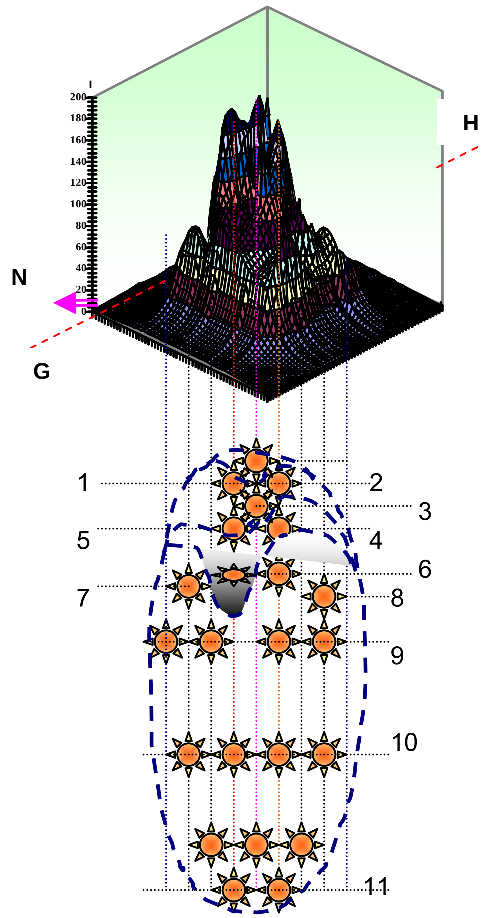

Figure 17. Curve of radiation intensity in three dimensions to reconstruct of target that is adjusted with two dimensions curve on contour G – H slice

From figure 17 has got these points:

1. d = 21,60 m, $I_o = 201,9$ w/m^2
2. d = 21,09 m, $I_o = 211.8$ w/m^2
3. d = 22,46 m, $I_o = 186,8$ w/m^2
4. d = 25,65 m, $I_o = 143,2$ w/m^2
5. d = 26,58 m, $I_o = 133,3$ w/m^2
6. d = 35,52 m, $I_o = 74,7$ w/m^2
7. d = 36,48 m, $I_o = 70,8$ w/m^2
8. d = 37,25 m, $I_o = 67,0$ w/m^2
9. d = 47,36 m, $I_o = 42,0$ w/m^2
10. d = 71,04 m, $I_o = 18,7$ w/m^2
11. d = 122,97 m , $I_o = 6,2$ w/m^2

Table 1. The measurement of thermal and nuclear radiation counts in the region of radioisotope source at Sub-district of Amarasi and East-Middle Kupang West Timor Island

No		L	i	n	e	
	L_1	L_2	L_3	L_4	L_5	L_6
1	53	38	27	21	27	26
2	45	39	30	14	17	37
3	25	37	17	32	50	46
4	40	31	19	15	44	37
5	39	54	33	25	40	19
6	45	45	57	47	50	20
7	42	51	43	44	52	32
8	60	57	91	24	46	47
9	58	59	73	27	63	22

10	59	58	66	38	46	30
11	57	68	68	47	42	43
12	45	60	80	46	40	46
13	54	42	94	48	39	50
14	59	45	80	42	60	47
15	41	59	104	40	66	50
16	38	72	99	32	60	57
17	66	47	77	36	55	65
18	47	60	109	46	66	64
19	39	57	97	47	46	63
20	39	65	74	82	40	62
21	21	41	87	54	42	45
22	54	73	80	66	35	51
23	46	54	99	51	47	68
24	43	46	114	50	48	55
25	59	60	117	44	41	47
26	39	77	100	42	53	41
27	54	38	116	43	28	62
28	46	30	85	34	19	48
29	32	24	57	39	56	42
30	38	18	46	31	36	54
31	34	28	47	31	25	30
32	39	27	45	42	32	41
33	17	17	36	37	36	45
34	31	30	39	27	18	9
35	20	25	34	28	21	10
36	9	32	41	24	18	17
37	13	20	38	16	25	13
38	18	26	29	19	12	24

The distance of measurement points: 85 meters, line distance : 400 meters. The distance of measurement point in the center region of deposit : 10 meters, the distance of line : 40 meters. The wide of research location: 2.000 kilometers x 3.145 kilometers, and the wide of the center region of deposit : 200 meters x 300 meters.

No		L	i	n	e	
	L_1	L_2	L_3	L_4	L_5	L_6
1	33,7	35,2	33,0	33,4	48,8	45,5
2	35,5	37,1	35,3	31,5	45,5	43,9
3	33,9	36,3	32,6	33,4	42,4	46,6
4	35,1	34,1	32,1	30,5	44,6	33,7
5	33,7	34,2	31,7	43,4	50,0	32,2
6	33,5	34,5	34,6	44,7	45,7	32,4
7	37,0	35,2	34,4	45,2	44,2	33,7
8	36,1	35,5	45,8	31,5	43,8	39,7
9	34,1	34,6	46,9	29,4	45,6	44,5
10	33,7	35,6	46,2	36,9	44,0	45,6
11	33,1	34,0	45,5	44,6	34,6	45,2
12	32,6	34,7	46,3	45,5	36,0	37,6
13	36,1	33,9	46,7	46,7	35,5	47,0
14	37,2	35,1	48,0	46,2	46,8	45,1
15	37,5	47,4	47,5	37,4	47,6	47,3
16	35,6	47,0	45,7	37,1	47,1	47,7
17	35,9	46,3	50,7	34,2	48,9	49,1
18	36,0	48,7	48,5	36,6	49,0	49,9
19	34,2	45,2	47,6	37,4	46,3	47,5
20	33,5	46,1	48,6	37,1	48,9	48,1
21	33,3	45,6	48,4	36,7	46,2	48,9
22	32,4	45,4	49,4	48,9	45,6	49,9
23	32,6	48,5	49,9	37,2	45,3	48,0
24	34,7	46,7	50,5	36,4	46,9	39,1
25	33,6	48,3	49,2	37,7	46,6	47,2
26	35,8	48,5	48,4	39,1	46,3	45,7
27	37,5	34,6	49,3	36,6	35,3	47,5
28	35,2	31,7	47,1	34,6	33,4	47,2
29	33,3	31,3	48,9	34,3	45,0	45,8
30	32,8	33,9	48,5	36,7	45,1	35,4
31	32,8	35,2	48,7	33,5	45,2	43,5
32	33,5	31,7	47,6	35,0	44,6	35,7
33	24,7	30,5	45,6	35,8	36,7	37,0
34	31,6	33,1	43,0	38,7	31,8	47,3
35	32,5	30,0	35,3	34,5	32,9	44,5
36	21,6	37,4	43,8	36,8	29,4	42,7
37	20,3	35,2	45,1	33,5	34,0	38,4
38	28,5	31,5	35,7	38,9	32,3	40,1

Based on Figure 16 and 17, can be proposed that the shape of ore deposit anomaly of radioisotope element in mining substance, resemble of oval ball vertically with diameters ± 54 meters horizontal, and ± 100 meters vertical on the average depth 22 meters, with the shape on above surface is dented. It is caused by the new sedimentation process on surface layer which is not flat.

Ore deposit shape of radioisotope element in rock mineral, initial follow the shape of basic rocks layer are dominated by tersier sediment rocks from Permian to Jurassic which shape of Timor Island. The new accumulation of radioisotope in the rock mineral is formed by tectonic process that cause faulting, folding, and dynamic motion of rocks.

The deposit of radioisotope detected in mining substance is very small, if we observe of it's deposit measurement, except there is the wide and larger distribution and deposit accumulation on the layer in more depth. To make certain that ore deposit of radioisotope in the mining substance is prospect to explore, still necessary espoused by others data like as drill data, magnetic, and seismic, that can become clearer of layer thickness, depth, and the shape of ore deposit anomaly of rock mineralization.

Based on characteristic curve, contour, profile, and shape modeling of ore deposit anomaly, can be proposed that ore deposit distribution of radioisotope element in rock mineral, have the wide about 1.5 kilometers x 2.0 kilometers, and the wide of deposit center region about 200 meters x 300 meters.

CONCLUSION

Ore deposit anomaly distribution of radioisotope element in mining substance based on characteristic curve, contour map, profile curve, and modeling curve is 1.5 kilometers x 2.0 kilometers, and the wide of deposit center region: 200 meters x 300 meters.

Profile curve from contour map of radiation counts of radioisotope element show the distribution anomaly and target reconstruction or ore deposit shape of radioisotope in mining substance. Accumulation shape of ore deposit anomaly of radioisotope element in the mining substance resemble of oval ball vertically with diameters ± 54 meters horizontal, and 100 meters vertical, the shape on above surface is dented, and the average depth 22 meters.

The range of thermal and radiation counts in the center region of radioisotope source, revolve between 20.3^{o} C to 50.7^{o} C, and 9 counts per minute (cp-m) to 117 counts per minute (cmp).

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