Lower limits of detection for Triathler

Triathler is a portable LSC counter with integrated α / β - separation

The calculation is done according to the german DIN 25482 part1, for a 20 ml Vial, no quench; here we use the approximation with α = β = 0.1586 (corresponds to $k_{1-\alpha} + k_{1-\beta} = 2$):

$$NWG = V^{-1} \bullet K \ (\ k_{1-\alpha} + k_{1-\beta} \ ) \ \sqrt{\frac{2 \bullet R_0}{t_b}}$$

K = (1 / Efficiency)
$k_{1-\alpha}$ = Quantile of the standard - normaldistribution for error of 1st type
$k_{1-\beta}$ = Quantile of the standard - normaldistribution for error of 2nd type
t_b = Measuring time of the sample
R_0 = Background
V = 0,01 l

With this formula the LLoD is:

	without lead		with 6 - 8 mm lead	
	3600 s	60000 s	3600 s	60000 s
H – 3,V=0.01 l[1]	18 Bq / l	5 Bq / l	14 Bq / l	3 Bq / l
C – 14;V=0.01 l[2]	11 Bq / l	3 Bq / l	8 Bq / l	2 Bq / l
	direct measurement, Aqualight		Extraction,MaxiLight	
Rn – 222	**2 Bq /l in 10 minutes, 20 ml vial**		< 0.5 Bq/l in 10 minutes, 20 ml vial	
Ra - 226	< 0.004 Bq / l with 14.000 seconds measuring time, emanation method			
U-238/U-234	< 0.01 Bq/l in 60 minutes measuring time, extraction from 250 ml with MaxiLight and HDEHP, accord. to sä. UBG modification			
α - Wipe test	< 0.005 Bq/cm^2 in 10 minutes measuring time, averaged over 100 cm^2, retention factor: 0.1			

1 Assumption: no quench
2 Assumption: no quench