



**COST Action BM0607 Targeted Radionuclide Therapy (TRNT)  
Training School on PET-radionuclide generators for trivalent metals:  
 $^{68}\text{Ge}/^{68}\text{Ga}$  and  $^{44}\text{Ti}/^{44}\text{Sc}$**

**Institute of Nuclear Chemistry  
Fritz-Strassmann-Weg 2, Johannes Gutenberg-University Mainz, Germany  
September 28 – 30, 2009**

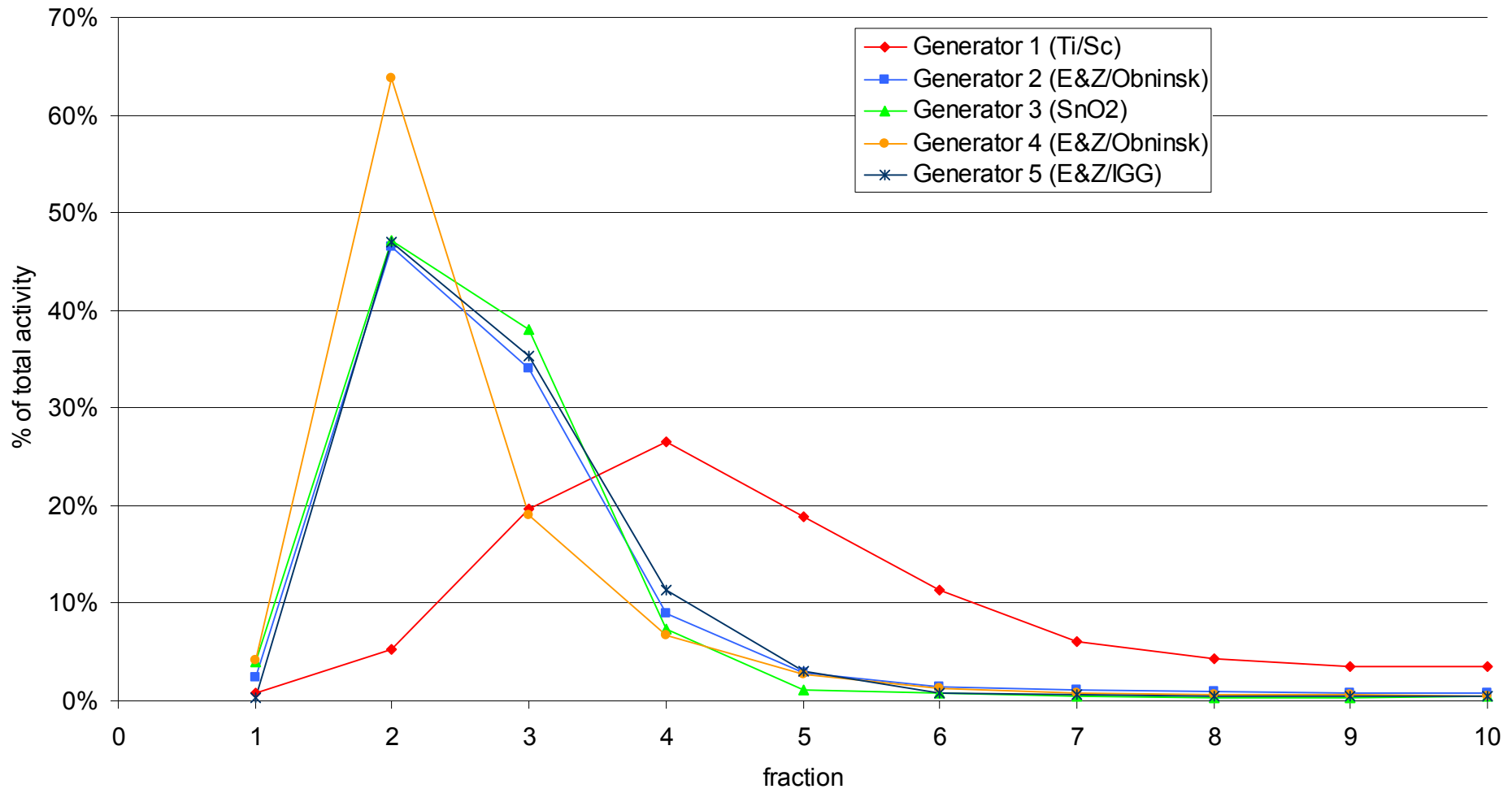
Short summary of experimental results  
**N.S. Loktionova, M. Fellner, C. Burchardt**  
Institute of Nuclear Chemistry, University of Mainz, Germany

# elution profiles of the $^{44}\text{Ti}/^{44}\text{Sc}$ and the four $^{68}\text{Ge}/^{68}\text{Ga}$ generators

	Generator 1 (Ti/Sc)		Generator 2 (E&Z/Obninsk)		Generator 3 (SnO <sub>2</sub> )		Generator 4 (E&Z/Obninsk)		Generator 5 (E&Z/IGG)	
fraction	activity [MBq]	% total	activity [MBq]	% total	activity [MBq]	% total	activity [MBq]	% total	activity [MBq]	% total
1	1.477	1%	9.388	2%	4.737	4%	7.795	4%	0.389	0%
2	9.988	5%	187.2	47%	55.83	47%	121.7	64%	48.5	47%
3	37.19	20%	137.2	34%	45.01	38%	36.21	19%	36.4	35%
4	50.04	27%	35.96	9%	8.6	7%	12.78	7%	11.65	11%
5	35.621	19%	11.53	3%	1.325	1%	5.061	3%	3.07	3%
6	21.41	11%	5.855	1%	0.862	1%	2.528	1%	0.865	1%
7	11.54	6%	4.502	1%	0.576	0%	1.409	1%	0.731	1%
8	8.027	4%	4.116	1%	0.414	0%	1.271	1%	0.531	1%
9	6.733	4%	3.467	1%	0.398	0%	1.122	1%	0.549	1%
10	6.481	3%	3.145	1%	0.502	0%	0.873	0%	0.458	0%
	total activity	188.51 MBq		402.36 MBq		118.25 MBq		190.75 MBq		103.14 MBq
	fraction size:	2 mL	fraction size:	1 mL	fraction size:	1 mL	fraction size:	1 mL	fraction size:	1 mL



# elution profiles of the $^{44}\text{Ti}/^{44}\text{Sc}$ and the four $^{68}\text{Ge}/^{68}\text{Ga}$ generators



# $^{68}\text{Ge}$ breakthrough of the four $^{68}\text{Ge}/^{68}\text{Ga}$ generators

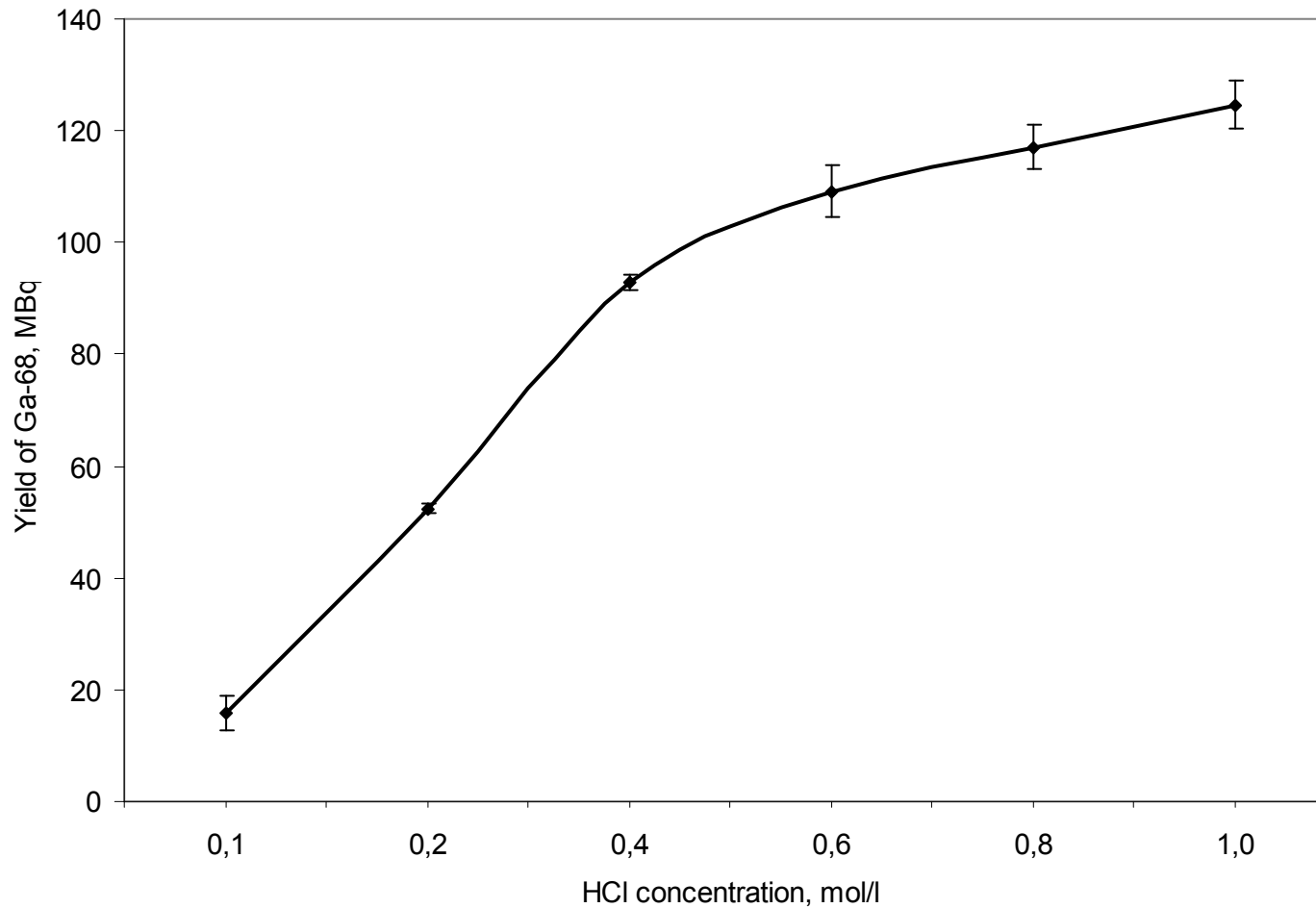
$^{68}\text{Ge}$  breakthrough of the four  $^{68}\text{Ge}/^{68}\text{Ga}$  generators

	Generator 1 (Ti/Sc)	Generator 2 (E&Z/Obninsk)		Generator 3 (SnO <sub>2</sub> ) *		Generator 4 (E&Z/Obninsk)		Generator 5 (E&Z/IGG)	
fraction		CPM	activity [kBq]	CPM	activity [kBq]	CPM	activity [kBq]	CPM	activity [kBq]
1		17908.99	2.04	1113311.15	126.92	58751.13	6.70	247.18	0.03
2		17610.79	2.01	1298568.76	148.04	61285.5	6.99	543.66	0.06
3		20025.34	2.28	1294614.73	147.59	41302.6	4.71	254.09	0.03
4		25402.07	2.90	1380799.36	157.41	49049.53	5.59	279.44	0.03
5		19114.14	2.18	1368673.03	156.03	59291.2	6.76	360.46	0.04
6		15163.82	1.73	1577154.07	179.80	74270.06	8.47	187.67	0.02
7		16508.14	1.88	1589518.13	181.21	85415.62	9.74	139.68	0.02
8		17560.85	2.00	1587220.26	180.94	84042.23	9.58	148.88	0.02
9		20145.09	2.30	1651242.17	188.24	88541.94	10.09	127.97	0.01
10		23760.97	2.71	2222336.96	253.35	95896.91	10.93	150.49	0.02
calculation CPM to kBq		total	22.02 kBq		1719.51 kBq		79.55 kBq		0.28 kBq
counts: 1,000,000		breakthrough**	0.005%		1.450%		0.042%		0.0003%
kBq: 114		fraction size:	1 mL	fraction size:	1 mL	fraction size:	1 mL	fraction size:	1 mL

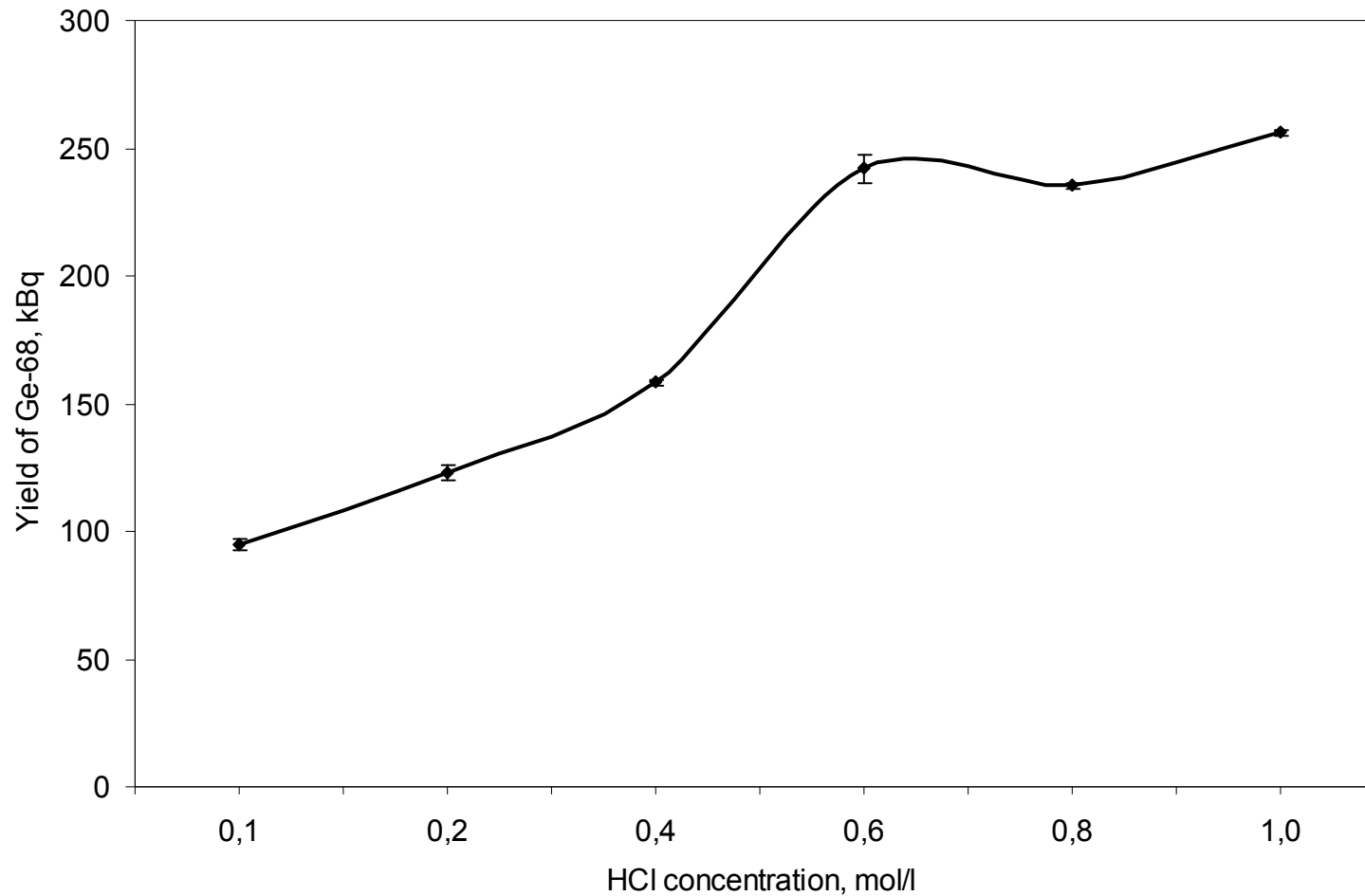
\* first elution of this generator since long time

\*\* defined as  $^{68}\text{Ge}$  per  $^{68}\text{Ga}$  eluted

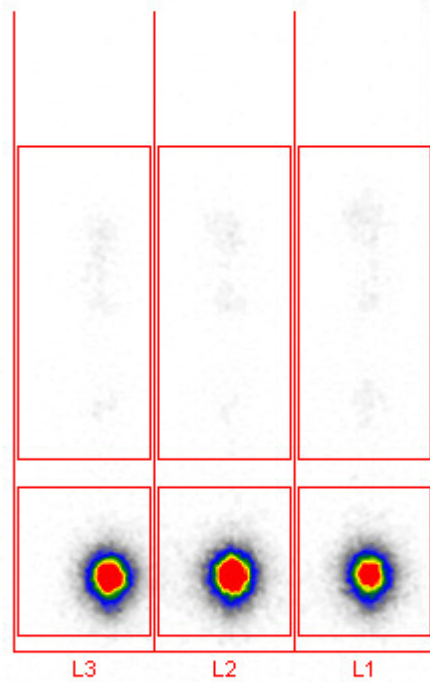
# $^{68}\text{Ga}$ yield depending on HCl concentration from generator based on $\text{SnO}_2$



# $^{68}\text{Ge}$ yield depending on HCl concentration from generator based on $\text{SnO}_2$



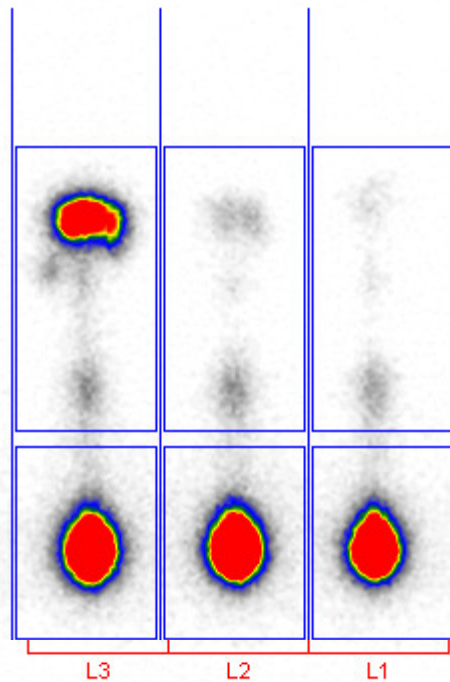
# Labelling DOTATOC with $^{68}\text{Ga}$ fractionation method - TLC



TLC Data: Merck Silica SG60 Plates  
developed with 0.1M Na-citrate buffer pH=4

L1-L3: reaction TLC after 10 min heating at  
100°C; yields of complex: 94% (mean value)

# Labelling DOTATOC with $^{68}\text{Ga}$ cationic method - TLC



T2

TLC Data: Merck Silica SG60 Plates  
developed with 0.1M Na-citrate buffer pH=4

reaction kinetic TLC after 10 min heating at  
100°C; yields of complex:

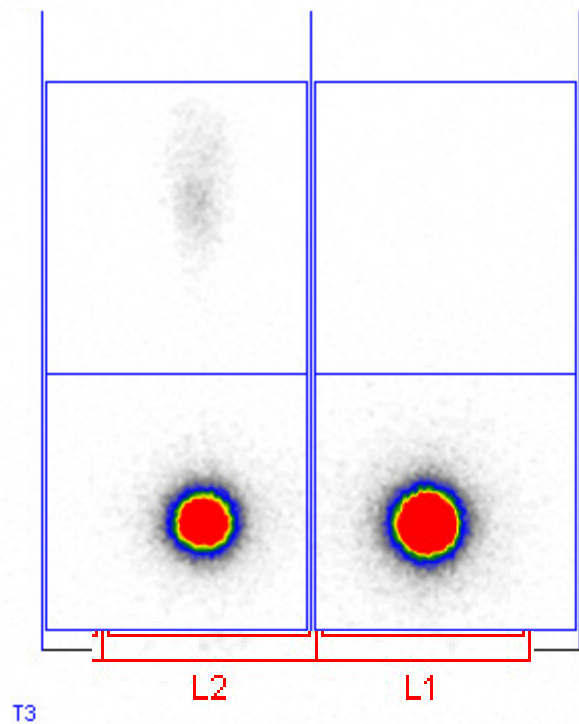
L3: 1 min; 68.0%

L2: 5 min; 93.5%

L1: 10 min; 95.0%

# Labelling DOTATOC with $^{44}\text{Sc}$

## TLC-analysis



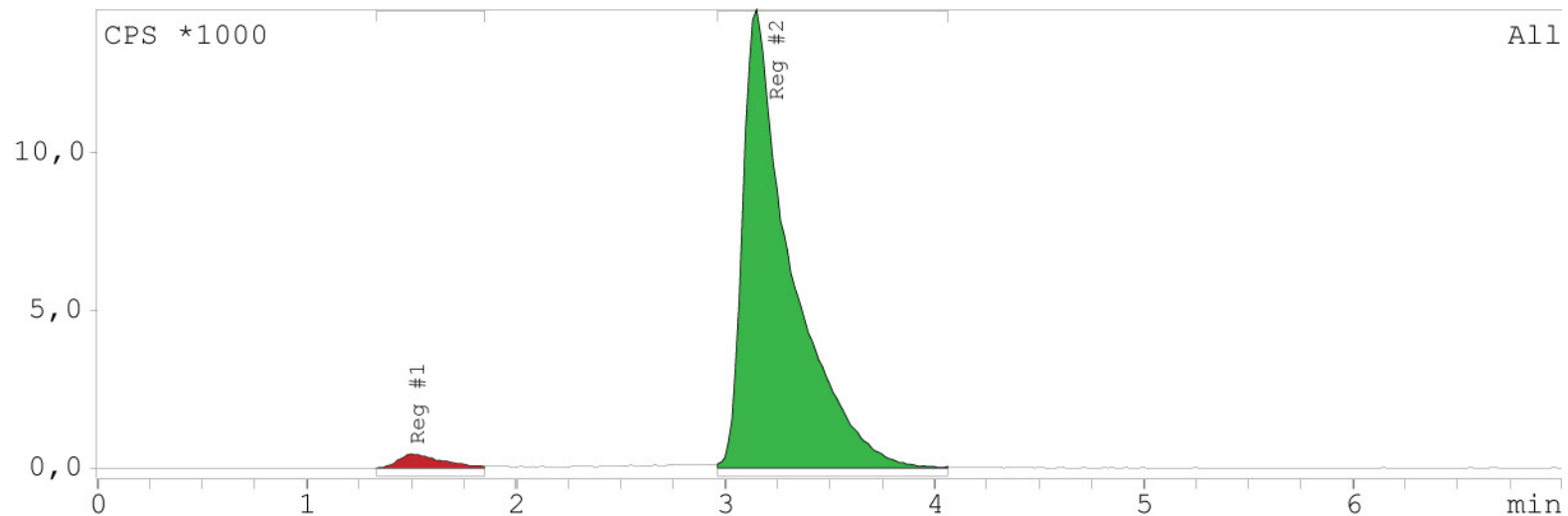
TLC Data: Merck Silica SG60 Plates  
developed with 0.1M Na-citrate buffer pH=4

reaction TLC after 10 min heating at 100°C;  
yields of complex:

L2: before purification over Strata-X; 93.5%

L1: after purification; 99.0%

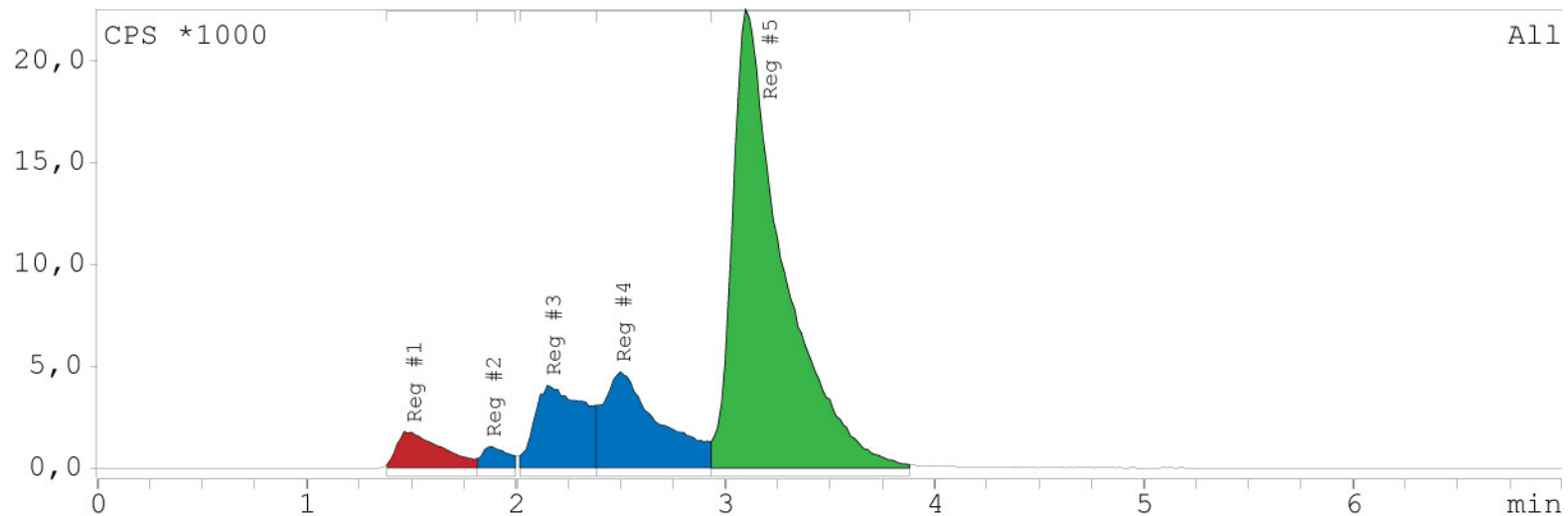
# Labelling DOTATOC with $^{68}\text{Ga}$ fractionation method



HPLC-Data: Nucleosil 100-5 C<sub>18</sub> AB with 25% Acetonitrile/75% 0.1%TFA in water at 0.75 mL flow; Raytest Gabi radioactive detector

Retention: 1.5 min ( $^{68}\text{Ga}$ , 2.7%); 3.2 min ( $^{68}\text{Ga}$ -DOTATOC, 97.3%)

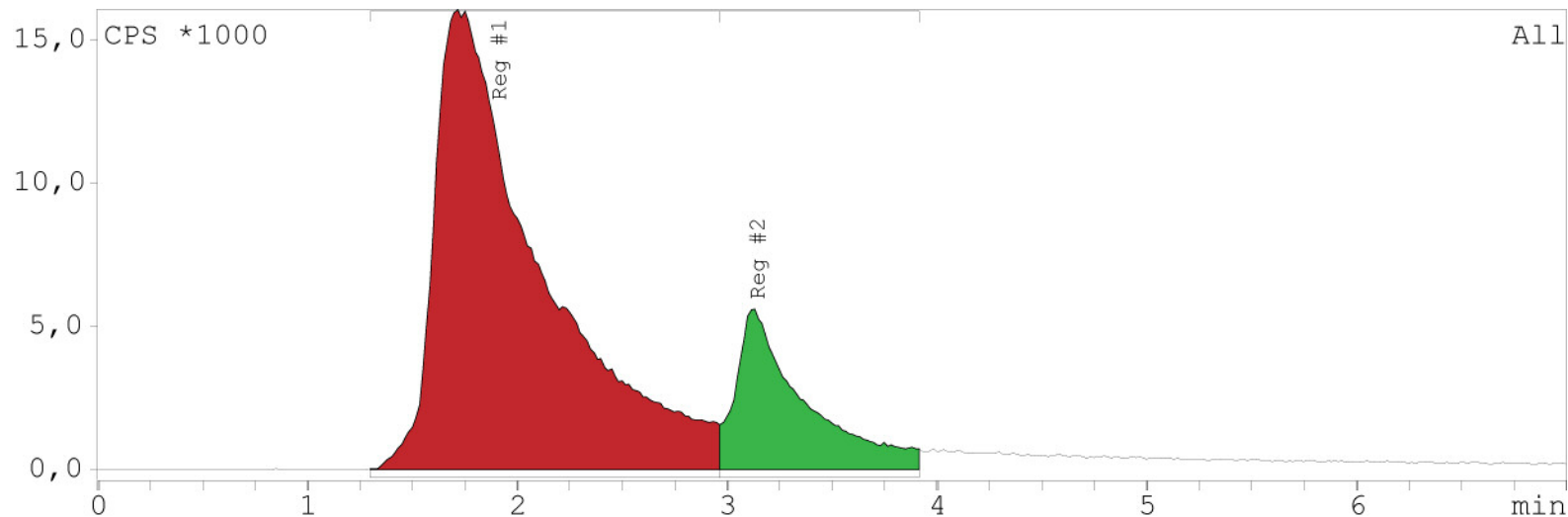
# Labelling DOTATOC with $^{68}\text{Ga}$ cationic method



HPLC-Data: Nucleosil 100-5 C<sub>18</sub> AB with 25% Acetonitrile/75% 0.1%TFA in water at 0.75 mL flow; Raytest Gabi radioactive detector

Retention: 1.5 min ( $^{68}\text{Ga}$ , 4.7%); 3.2 min ( $^{68}\text{Ga}$ -DOTATOC, 66.6%)  
possible contamination of HPLC due to many injections in short times

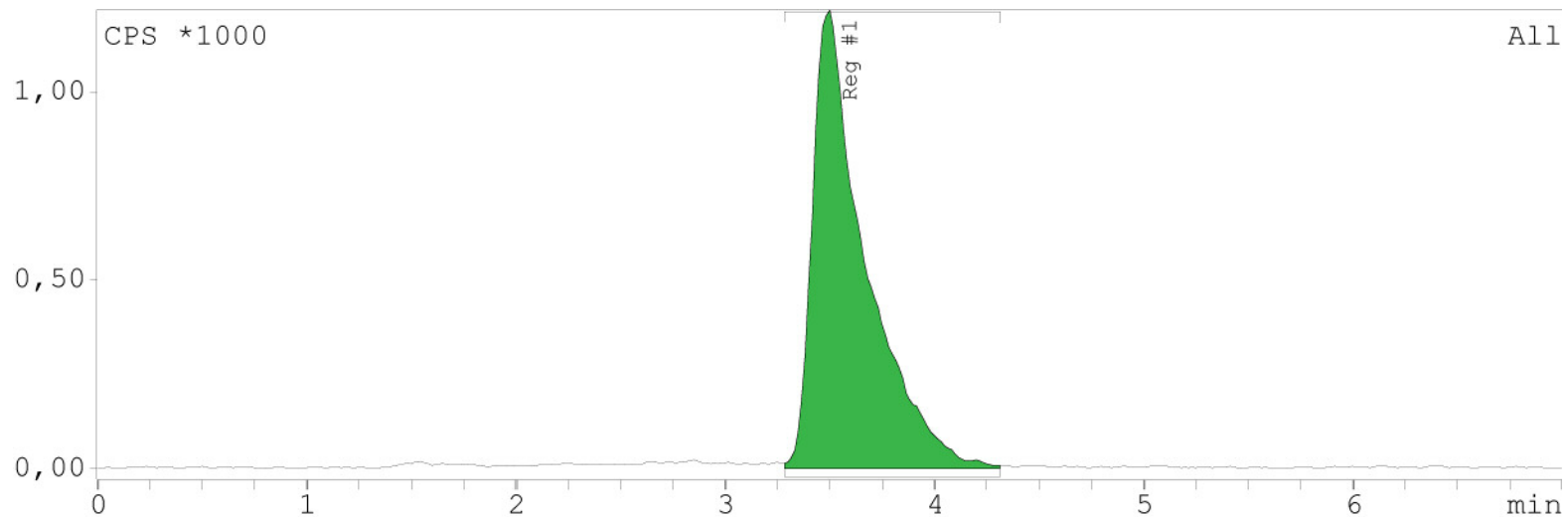
# Labelling DOTATOC with $^{68}\text{Ga}$ anionic method



HPLC-Data: Nucleosil 100-5 C<sub>18</sub> AB with 25% Acetonitrile/75% 0.1%TFA in water at 0.75 mL flow; Raytest Gabi radioactive detector

Retention: 1.7 min ( $^{68}\text{Ga}$ , 81.5%); 3.2 min ( $^{68}\text{Ga}$ -DOTATOC, 18.5%)

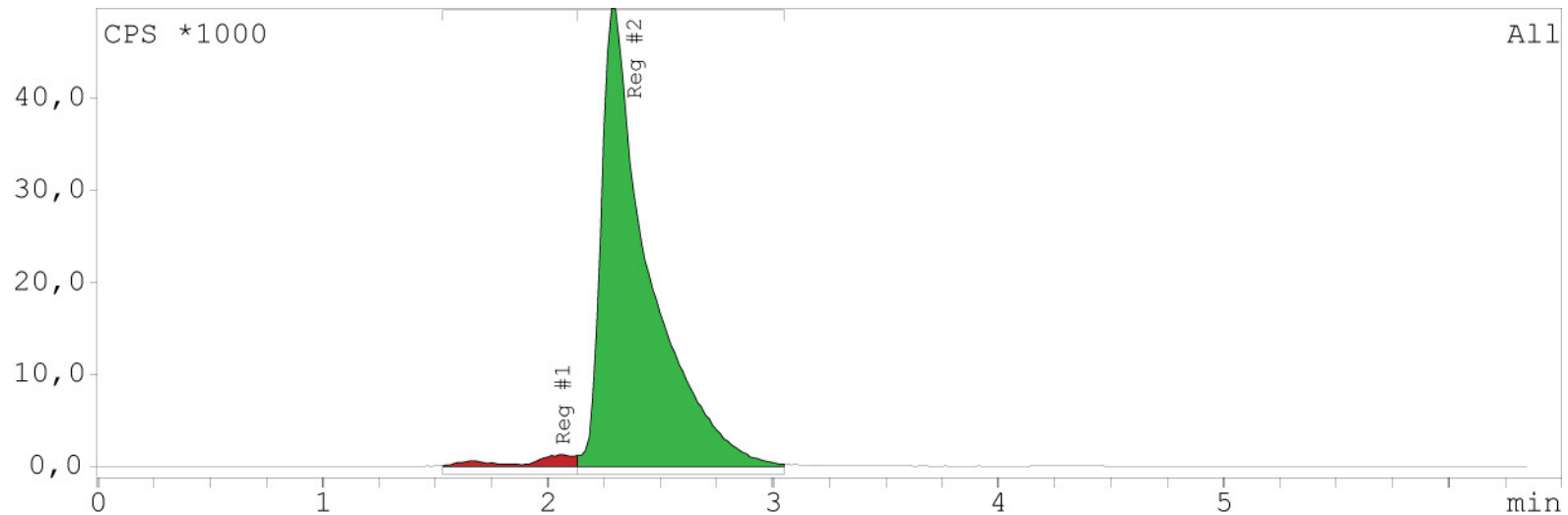
# Labelling DOTATOC with $^{68}\text{Ga}$ Eckert & Ziegler automated synthesis



HPLC-Data: Nucleosil 100-5 C<sub>18</sub> AB with 25% Acetonitrile/75% 0.1%TFA in water at 0.75 mL flow; Raytest Gabi radioactive detector

Retention: 3.4 min ( $^{68}\text{Ga}$ -DOTATOC, after purification using C18-cartridge)

# Labelling DOTATATE with $^{177}\text{Lu}$



HPLC-Data: Nucleosil 100-5 C<sub>18</sub> AB with 25% Acetonitrile/75% 0.1%TFA in water at 0.75 mL flow; Raytest Gabi radioactive detector

Retention: 2.4 min ( $^{177}\text{Lu}$ -DOTATATE, 98.5%)