

Supplementary table F Biologically Equivalent Dose (BED) Worksheet for I-131 MIP-1095
 Computations from I-124 Data in Patients from Heidelberg, Germany

Assumptions										Kidney mass		299 gm (OLINDA phantom)								# Fractions			# Fractions			# Fractions								
alpha/beta= 2,6 Gy		G-function= Lea-Catcheside function for bi-exponential clearance								Tp(I-131)		192,48 hr		# Fractions 1		# Fractions 2		# Fractions 3		# Fractions 1		# Fractions 2		# Fractions 3		# Fractions 1		# Fractions 2		# Fractions 3				
T(repair)= 2,8 hr		BED = D(cort)*RE								Lambda_P		0,00360		Activity for 37 Gy BED		Activity for 44 Gy BED		Activity for 37 Gy BED		Activity for 44 Gy BED		BED (Gy) 37		BED (Gy) 44		BED (Gy) 37		BED (Gy) 44		BED (Gy) 37		BED (Gy) 44		
u(repair)= 0,248 /hr		RE = 1 + G*D(cort)/(alpha/beta)																																
v mean density 1,00 g/cc																																		
Patient ID	m(kidney) grams	D(phan) Gy	D(patient) Gy	a1(kid)	a2(kid)	lambda_1(Bio) /hr	lambda_2(Bio) /hr	lambda_1(eff) /hr	lambda_2(eff) /hr	G1,2-function	A(total) GBq	D(cort) Gy	RE@D(cort)	BED Gy	D(cort)/A Gy/GBq	# Fractions 1 Activity for 37 Gy BED GBq	# Fractions 1 Activity for 44 Gy BED GBq	# Fractions 2 Activity for 37 Gy BED GBq	# Fractions 2 Activity for 44 Gy BED GBq	# Fractions 3 Activity for 37 Gy BED GBq	# Fractions 3 Activity for 44 Gy BED GBq	D(cort) Gy	D(cort) Gy	D(cort) Gy	D(cort) Gy	D(cort) Gy	D(cort) Gy	D(cort) Gy	D(cort) Gy	D(cort) Gy	D(cort) Gy			
98																																		
07	314,8	2,9	2,8	0,018228	0,011782	0,40151	0,028707	0,4051	0,0323	0,1289	7,2	3,97	1,20	4,75	0,55	34,6	38,8	42,5	48,2	47,0	53,7	19,04	21,37	23,41	26,54	25,91	29,56	25,91	29,56	25,91	29,56			
04	437,19	13,9	9,5	0,066277		0,009539		0,0131	0,0036	0,0504	6,0	13,54	1,26	17,10	2,26	11,1	12,6	12,8	14,7	13,7	15,8	24,94	28,38	28,90	33,27	30,85	35,74	30,85	35,74	30,85	35,74			
05	258,56	1,0	1,1	0,004697	0,003771	0,468341	0,033809	0,4719	0,0374	0,1418	3,5	1,60	1,09	1,73	0,46	40,4	45,3	50,0	56,6	55,6	63,3	18,44	20,68	22,81	25,82	25,33	28,86	25,33	28,86	25,33	28,86			
02	305,27	2,0	2,0	0	0,013537	0,004525	0,009568	0,0081	0,0132	0,0505	3,4	2,80	1,05	2,95	0,82	30,3	34,5	35,1	40,4	37,5	43,4	24,93	28,37	28,89	33,26	30,84	35,73	30,84	35,73	30,84	35,73			
01	398,61	4,6	3,4	0	0,02271	0,202355	0,009089	0,2060	0,0127	0,0488	5,0	4,91	1,09	5,37	0,98	25,6	29,1	29,6	34,1	31,5	36,6	25,14	28,63	29,07	33,48	30,99	35,93	30,99	35,93	30,99	35,93			
03	665,62	7,7	3,5	0,040268		0,012804		0,0164	0,0036	0,0622	6,7	4,94	1,12	5,53	0,74	32,0	36,3	37,6	43,2	40,5	46,8	23,64	26,81	27,78	31,86	29,88	34,51	29,88	34,51	29,88	34,51			
10	376,82	4,2	3,3	0,02787		0,01079		0,0144	0,0036	0,0549	4,7	4,71	1,10	5,18	1,00	24,4	27,7	28,4	32,6	30,4	35,2	24,41	27,74	28,45	32,70	30,46	35,25	30,46	35,25	30,46	35,25			
09	530,78	10,7	6,0	0,013469	0,026378	0	0,044828	0,0036	0,0484	0,0190	5,4	8,60	1,06	9,15	1,59	19,0	22,0	20,7	24,2	21,4	25,2	30,28	35,02	33,01	38,56	34,15	40,08	34,15	40,08	34,15	40,08			
11	520,46	12,0	6,9	0,045709		0,006465		0,0101	0,0036	0,0391	6,0	9,85	1,15	11,31	1,64	16,1	18,4	18,4	21,2	19,4	22,6	26,47	30,25	30,16	34,86	31,90	37,10	31,90	37,10	31,90	37,10			
06	460,42	11,0	7,2	0,010385	0,012381	0,036299	0	0,0399	0,0036	0,0163	5,9	10,24	1,06	10,89	1,73	17,9	20,7	19,3	22,6	19,9	23,4	30,98	35,91	33,48	39,19	34,51	40,56	34,51	40,56	34,51	40,56			
16	593,66	10,0	5,0	0,055095		0,011306		0,0149	0,0036	0,0568	6,0	7,21	1,16	8,35	1,20	20,1	22,9	23,5	27,0	25,2	29,2	24,20	27,49	28,27	32,48	30,31	35,05	30,31	35,05	30,31	35,05			
08	682,84	17,1	7,5	0,019044	0,00944	0	0,09571	0,0036	0,0993	0,0148	6,8	10,68	1,06	11,32	1,57	20,0	23,2	21,5	25,2	22,1	26,0	31,40	36,46	33,77	39,56	34,72	40,84	34,72	40,84	34,72	40,84			
15	692,01	7,2	3,1	0,041858		0,010936		0,0145	0,0036	0,0555	5,3	4,42	1,09	4,83	0,83	29,2	33,2	34,1	39,2	36,5	42,2	24,35	27,67	28,40	32,64	30,42	35,19	30,42	35,19	30,42	35,19			
13	757,4	11,4	4,5	0,036088	0	0,005753	0,000341	0,0094	0,0039	0,0364	6,3	6,43	1,09	7,01	1,02	26,3	30,1	29,9	34,6	31,5	36,7	26,88	30,75	30,49	35,28	32,17	37,45	32,17	37,45	32,17	37,45			
99										NA																								
																Mean	24,8	28,2	28,8	33,1	30,9	35,7												
																Min	11,1	12,6	12,8	14,7	13,7	15,8												
																Max	40,4	45,3	50,0	56,6	55,6	63,3												
																SD	8,0	8,9	10,3	11,6	11,7	13,2												
G-function computation (4 components & denominator)																																		
Patient ID	N-term1	N-term2	N-term3	N-term4	Denom	G1,2-function	term1	term2	Key to columns/variables																									
98									Patient ID	Patient ID number																								
07	0,001257	0,001505	0,003509	0,015356	0,167837	0,128856	10,089	0,1982	m(kidney)	patient's total kidney mass from PET/CT (grams, assumes kidney density is 1.0 g/cc)																								
04	1,282658	0,000000	0,000000	0,000000	25,443469	0,050412	25,787	0,0776	D(phan)	Kidney radiation dose from OLINDA for total administered activity (Gy)																								
05	0,000065	0,000097	0,000244	0,001334	0,012267	0,141843	9,165	0,2182	D(patient)	Kidney radiation dose adjusted for patient-specific kidney mass (Gy)																								
02	0,000000	0,000000	0,000000	0,053386	1,056770	0,050518	25,734	0,0777	a1(kid)	Coefficient #1 of biexponential function for activity in kidney (at t=0; from biological modeling of kidney TAC)																								
01	0,000000	0,000000	0,000000	0,156208	3,202977	0,048770	26,656	0,0750	a2(kid)	Coefficient #2 of biexponential function for activity in kidney (at t=0; from biological modeling of kidney TAC)																								
03	0,374554	0,000000	0,000000	0,000000	6,025607	0,062160	20,914	0,0956	lambda_1(Bio)	Biological removal rate for component #1 of kidney biodel (1/hr)																								
10	0,206102	0,000000	0,000000	0,000000	3,750851	0,054948	23,659	0,0845	lambda_2(Bio)	Biological removal rate for component #2 of kidney biodel (1/hr)																								
09	0,200667	0,054390	0,046151	0,048551	18,367060	0,019043	68,268	0,0293	lambda_1(eff)	Effective removal rate for component #1, including I-131 decay																								
11	0,805909	0,000000	0,000000	0,000000	20,622609	0,039079	33,266	0,0601	lambda_2(eff)	Effective removal rate for component #2, including I-131 decay																								
06	0,009405	0,020569	0,023543	0,169557	13,683260	0,016303	79,741	0,0251	G1,2-function	Lea-Catcheside function for bi-exponential clearance curve for kidney (computed in cells G35-G48)																								
16	0,776029	0,000000	0,000000	0,000000	13,660932	0,056806	22,885	0,0874	A(total)	Total therapy administered activity (GBq)																								
08	0,401163	0,013914	0,010074	0,002587	28,992904	0,014753	88,116	0,0227	D(cort)	Radiation dose to renal cortex assuming 70% of total renal volume is cortical.																								
15	0,459980	0,000000	0,000000	0,000000	8,291723	0,055475	23,434	0,0853	RE@D(cort)	Relative effectiveness function computed for the total renal/cortical radiation dose (valid only for the patient's IA)																								
13	0,542091	0,000000	0,000000	0,000000	14,886377	0,036415	35,699	0,0560	BED	Biologically Equivalent Dose for the given patient and his therapeutic cortical radiation dose																								
99						0,055384			D(cort)/A	Radiation dose to renal cortex per unit administered activity (Gy/GBq)																								
									Activity for X Gy BED	This is the activity needed to deliver a BED of X Gy to the renal cortex for a given patient, Computed for 37 & 44 Gy BED, in 1 fraction																								
									Activity for 2 fractions	This computes the total injected activity that must be split between 2 fractions to achieve 37 & 44 Gy BED																								
									Activity for 3 fractions	This computes the total injected activity that must be split between 3 fractions to achieve 37 & 44 Gy BED																								