

RE-187	8E-1 D	4 1E-11	8E-1	2 2E-11	1 3E-11	7.1E-12	3.8E-12	3.0E-12
RE-188	8E-1 W	9.8E-09	8E-1	5 3E-09	3 2E-09	1 7E-09	8.9E-10	6 9E-10
RE-188	8E-1 D	1.1E-08	8E-1	6.3E-09	3 7E-09	1.9E-09	1.0E-09	8.0E-10
OS-185	2E-2 Y	1.6E-08	1E-2	1.2E-08	7.9E-09	4.9E-09	3.1E-09	2.6E-09
OS-185	2E-2 W	1.1E-08	1E-2	7.3E-09	5 0E-09	3.1E-09	2.0E-09	1.7E-09
OS-185	2E-2 D	1.2E-08	1E-2	8.4E-09	5.9E-09	3.8E-09	2.5E-09	2.2E-09
OS-191	2E-2 Y	1.6E-08	1E-2	8.5E-09	5.2E-09	2.9E-09	1.6E-09	1.3E-09
OS-191	2E-2 W	1.4E-08	1E-2	7.4E-09	4.6E-09	2 5E-09	1.4E-09	1.1E-09
OS-191	2E-2 D	6.0E-09	1E-2	3.3E-09	2.0E-09	1 1E-09	6.3E-10	5 0E-10
OS-191M	2E-2 Y	1.2E-09	1E-2	6.2E-10	3.8E-10	2 1E-10	1.1E-10	9 0E-11
OS-191M	2E-2 W	1.0E-09	1E-2	5.5E-10	3.4E-10	1 8E-10	1.0E-10	8.0E-11
OS-191M	2E-2 D	5.9E-10	1E-2	3.1E-10	1.9E-10	1 0E-10	5.7E-11	4.6E-11
OS-193	2E-2 Y	8.7E-09	1E-2	4.5E-09	2.8E-09	1.5E-09	8.2E-10	6.5E-10
OS-193	2E-2 W	7.9E-09	1E-2	4.1E-09	2.5E-09	1.4E-09	7.4E-10	5 9E-10
OS-193	2E-2 D	4.4E-09	1E-2	2.3E-09	1.4E-09	7.6E-10	4.1E-10	3 3E-10
IR-190	2E-2 Y	1.8E-08	1E-2	1.0E-08	6.6E-09	3.9E-09	2.3E-09	1 9E-09
IR-190	2E-2 W	1.6E-08	1E-2	9.3E-09	6.1E-09	3.6E-09	2 2E-09	1.8E-09
IR-190	2E-2 D	9.7E-09	1E-2	5.8E-09	3.9E-09	2.4E-09	1.5E-09	1.3E-09
IR-192	2E-2 Y	7.4E-08	1E-2	4.7E-08	3.0E-08	1.7E-08	9.5E-09	7.8E-09
IR-192	2E-2 W	4.8E-08	1E-2	2.9E-08	1.8E-08	1.0E-08	5.9E-09	4.8E-09
IR-192	2E-2 D	3.0E-08	1E-2	1.9E-08	1.3E-08	7.5E-09	4.5E-09	3.7E-09
IR-193M	2E-2 Y	7.0E-09	1E-2	3.7E-09	2.3E-09	1.2E-09	6.7E-10	5 3E-10
IR-193M	2E-2 W	6.3E-09	1E-2	3 3E-09	2.0E-09	1.1E-09	6.0E-10	4.7E-10
IR-193M	2E-2 D	2.6E-09	1E-2	1.4E-09	8.5E-10	4.6E-10	2.5E-10	2.0E-10
IR-194	2E-2 Y	1.2E-08	1E-2	6.3E-09	3 9E-09	2.1E-09	1.2E-09	9.1E-10
IR-194	2E-2 W	1.1E-08	1E-2	5.7E-09	3.5E-09	1.9E-09	1.0E-09	8.2E-10
IR-194	2E-2 D	7.0E-09	1E-2	3.6E-09	2.2E-09	1.2E-09	6.5E-10	5.2E-10
PT-190	2E-2 D	2.5E-06	1E-2	1.5E-06	9.3E-07	5.1E-07	2.8E-07	2.3E-07
PT-191	2E-2 D	1.6E-09	1E-2	8.5E-10	5.5E-10	3.2E-10	1.9E-10	1.5E-10
PT-193M	2E-2 D	2.9E-09	1E-2	1.5E-09	9.4E-10	5 1E-10	2.8E-10	2 2E-10
PT-195M	2E-2 D	3.9E-09	1E-2	2.0E-09	1.3E-09	7 0E-10	3.8E-10	3.0E-10
PT-197	2E-2 D	2.1E-09	1E-2	1.1E-09	6.6E-10	3.6E-10	1.9E-10	1.5E-10
PT-197M	2E-2 D	4.4E-10	1E-2	2.2E-10	1.4E-10	7.5E-11	4.1E-11	3.3E-11
AU-193	2E-1 Y	9.4E-10	1E-1	5.2E-10	3.3E-10	1.8E-10	1.0E-10	8.4E-11
AU-193	2E-1 W	8.6E-10	1E-1	4.7E-10	3.0E-10	1.7E-10	9.4E-11	7.6E-11
AU-193	2E-1 D	5 8E-10	1E-1	3 2E-10	2.0E-10	1.1E-10	6.5E-11	5.3E-11
AU-194	2E-1 Y	2.2E-09	1E-1	1.3E-09	9.0E-10	5.5E-10	3.4E-10	2.9E-10
AU-194	2E-1 W	2 1E-09	1E-1	1.2E-09	8.3E-10	5.1E-10	3.2E-10	2 6E-10

AU-194	2E-1 D	1.3E-09	1E-1	7.6E-10	5.2E-10	3.3E-10	2.1E-10	1.7E-10
AU-195	2E-1 Y	3.0E-08	1E-1	2.2E-08	1.3E-08	7.4E-09	4.1E-09	3.5E-09
AU-195	2E-1 W	1.2E-08	1E-1	7.5E-09	4.7E-09	2.6E-09	1.4E-09	1.2E-09
AU-195	2E-1 D	1.4E-09	1E-1	7.9E-10	5.0E-10	2.8E-10	1.6E-10	1.3E-10
AU-196	2E-1 Y	3.1E-09	1E-1	1.9E-09	1.2E-09	7.3E-10	4.4E-10	3.7E-10
AU-196	2E-1 W	2.9E-09	1E-1	1.7E-09	1.1E-09	6.7E-10	4.1E-10	3.4E-10
AU-196	2E-1 D	1.2E-09	1E-1	7.3E-10	4.9E-10	3.0E-10	1.9E-10	1.6E-10
AU-198	2E-1 Y	1.3E-08	1E-1	7.0E-09	4.3E-09	2.4E-09	1.3E-09	1.1E-09
AU-198	2E-1 W	1.2E-08	1E-1	6.4E-09	4.0E-09	2.2E-09	1.2E-09	9.6E-10
AU-198	2E-1 D	5.2E-09	1E-1	2.9E-09	1.8E-09	1.0E-09	5.6E-10	4.4E-10
AU-199	2E-1 Y	6.1E-09	1E-1	3.3E-09	2.0E-09	1.1E-09	6.2E-10	4.9E-10
AU-199	2E-1 W	5.5E-09	1E-1	3.0E-09	1.9E-09	1.0E-09	5.6E-10	4.5E-10
AU-199	2E-1 D	2.4E-09	1E-1	1.3E-09	7.9E-10	4.4E-10	2.4E-10	1.9E-10
HG-194	1E+0 D	8.4E-08	1E+0	7.3E-08	5.6E-08	4.3E-08	3.6E-08	3.4E-08
HI-194	7E-1 V	8.9E-08	7E-1	7.8E-08	6.1E-08	4.8E-08	4.1E-08	3.9E-08
HI-194	4E-2 W	3.8E-08	2E-2	2.8E-08	2.0E-08	1.4E-08	1.1E-08	1.0E-08
HI-194	4E-2 D	6.1E-08	2E-2	5.3E-08	4.1E-08	3.3E-08	2.8E-08	2.6E-08
HG-197M	1E+0 D	1.5E-09	1E+0	8.0E-10	4.9E-10	2.7E-10	1.5E-10	1.2E-10
HI-197M	7E-1 V	4.0E-09	7E-1	2.1E-09	1.3E-09	7.1E-10	3.9E-10	3.1E-10
HI-197M	4E-2 W	4.5E-09	2E-2	2.3E-09	1.4E-09	7.9E-10	4.4E-10	3.5E-10
HI-197M	4E-2 D	2.6E-09	2E-2	1.3E-09	8.2E-10	4.5E-10	2.5E-10	2.0E-10
HG-203	1E+0 D	1.1E-08	1E+0	6.5E-09	4.2E-09	2.4E-09	1.4E-09	1.2E-09
HI-203	7E-1 V	1.4E-08	7E-1	7.9E-09	5.0E-09	2.9E-09	1.7E-09	1.4E-09
HI-203	4E-2 W	1.8E-08	2E-2	1.0E-08	6.3E-09	3.5E-09	2.0E-09	1.6E-09
HI-203	4E-2 D	8.7E-09	2E-2	5.1E-09	3.3E-09	1.9E-09	1.1E-09	9.0E-10
TL-200	1E+0 D	8.3E-10	1E+0	5.0E-10	3.5E-10	2.2E-10	1.4E-10	1.2E-10
TL-201	1E+0 D	6.1E-10	1E+0	3.3E-10	2.1E-10	1.2E-10	7.1E-11	5.8E-11
TL-202	1E+0 D	1.7E-09	1E+0	1.0E-09	7.1E-10	4.5E-10	2.9E-10	2.5E-10
TL-204	1E+0 D	7.4E-09	1E+0	4.0E-09	2.4E-09	1.3E-09	7.2E-10	5.7E-10
PB-201	4E-1 D	5.7E-10	2E-1	3.4E-10	2.2E-10	1.3E-10	7.9E-11	6.5E-11
PB-202	4E-1 D	4.7E-08	2E-1	4.1E-08	3.3E-08	2.7E-08	2.3E-08	2.2E-08
PB-205	4E-1 D	2.6E-09	2E-1	2.1E-09	1.5E-09	1.1E-09	8.8E-10	8.2E-10
PB-210	4E-1 D	7.5E-06	2E-1	6.3E-06	4.2E-06	2.8E-06	2.3E-06	2.2E-06
PB-212	4E-1 D	5.2E-07	2E-1	2.6E-07	1.6E-07	8.6E-08	4.7E-08	3.7E-08
BI-206	1E-1 D	6.1E-09	5E-2	3.6E-09	2.5E-09	1.5E-09	9.5E-10	8.0E-10
BI-206	1E-1 W	1.5E-08	5E-2	8.6E-09	5.8E-09	3.5E-09	2.2E-09	1.8E-09
BI-207	1E-1 D	5.5E-09	5E-2	3.2E-09	2.1E-09	1.3E-09	7.7E-10	6.4E-10
BI-207	1E-1 W	4.4E-08	5E-2	2.9E-08	1.9E-08	1.1E-08	6.6E-09	5.5E-09

BI-208	1E-1 D	3.4E-09	5E-2	2.2E-09	1.5E-09	1.0E-09	6.6E-10	5.6E-10
BI-208	1E-1 W	2.2E-08	5E-2	1.6E-08	1.1E-08	7.2E-09	4.7E-09	4.0E-09
BI-210	1E-1 D	2.9E-08	5E-2	1.5E-08	9.4E-09	5.1E-09	2.8E-09	2.2E-09
BI-210	1E-1 W	5.8E-07	5E-2	3.5E-07	2.2E-07	1.2E-07	6.4E-08	5.1E-08
BI-210M	1E-1 D	1.6E-06	5E-2	8.3E-07	5.1E-07	2.8E-07	1.5E-07	1.2E-07
BI-210M	1E-1 W	2.2E-05	5E-2	1.4E-05	8.3E-06	4.5E-06	2.5E-06	2.0E-06
BI-212	1E-1 D	6.6E-08	5E-2	3.4E-08	2.1E-08	1.1E-08	6.1E-09	4.8E-09
BI-212	1E-1 W	6.6E-08	5E-2	3.4E-08	2.1E-08	1.1E-08	6.1E-09	4.8E-09
PO-206	2E-1 W	5.1E-06	1E-1	2.6E-06	1.6E-06	8.6E-07	4.7E-07	3.7E-07
PO-206	2E-1 D	3.1E-06	1E-1	1.6E-06	9.9E-07	5.4E-07	2.9E-07	2.3E-07
PO-208	2E-1 W	2.7E-05	1E-1	1.6E-05	9.9E-06	5.4E-06	2.9E-06	2.4E-06
PO-208	2E-1 D	1.5E-05	1E-1	8.9E-06	5.4E-06	3.0E-06	1.6E-06	1.3E-06
PO-209	2E-1 W	2.6E-05	1E-1	1.6E-05	9.9E-06	5.4E-06	2.9E-06	2.4E-06
PO-209	2E-1 D	1.5E-05	1E-1	8.8E-06	5.4E-06	2.9E-06	1.6E-06	1.3E-06
PO-210	2E-1 W	2.2E-05	1E-1	1.3E-05	8.0E-06	4.4E-06	2.4E-06	1.9E-06
PO-210	2E-1 D	1.2E-05	1E-1	7.2E-06	4.4E-06	2.4E-06	1.3E-06	1.0E-06
AT-211	1E+0 D	3.0E-07	1E+0	1.5E-07	9.4E-08	5.1E-08	2.8E-08	2.2E-08
AT-211	1E+0 W	3.7E-07	1E+0	1.9E-07	1.2E-07	6.3E-08	3.4E-08	2.7E-08
RA-223	4E-1 W	2.7E-05	2E-1	1.4E-05	8.7E-06	4.8E-06	2.6E-06	2.0E-06
RA-224	4E-1 W	1.1E-05	2E-1	5.7E-06	3.5E-06	1.9E-06	1.0E-06	8.2E-07
RA-225	4E-1 W	2.5E-05	2E-1	1.4E-05	8.6E-06	4.7E-06	2.5E-06	2.0E-06
RA-226	4E-1 W	2.2E-05	2E-1	1.4E-05	8.5E-06	4.7E-06	2.6E-06	2.1E-06
RA-228	4E-1 W	9.6E-06	2E-1	6.8E-06	4.2E-06	2.3E-06	1.3E-06	1.1E-06
AC-225	1E-2 Y	2.8E-05	1E-3	1.5E-05	9.2E-06	5.0E-06	2.7E-06	2.1E-06
AC-225	1E-2 W	2.8E-05	1E-3	1.5E-05	9.1E-06	4.9E-06	2.7E-06	2.1E-06
AC-225	1E-2 D	2.4E-05	1E-3	1.3E-05	7.8E-06	4.3E-06	2.3E-06	1.8E-06
AC-227	1E-2 Y	1.2E-03	1E-3	1.0E-03	6.5E-04	4.1E-04	2.9E-04	2.8E-04
AC-227	1E-2 W	8.0E-04	1E-3	6.9E-04	4.8E-04	3.5E-04	2.9E-04	2.8E-04
AC-227	1E-2 D	2.8E-03	1E-3	2.5E-03	1.8E-03	1.3E-03	1.1E-03	1.1E-03
AC-228	1E-2 Y	2.3E-07	1E-3	1.9E-07	1.1E-07	6.2E-08	3.6E-08	3.2E-08
AC-228	1E-2 W	1.2E-07	1E-3	9.2E-08	5.6E-08	3.1E-08	1.8E-08	1.6E-08
AC-228	1E-2 D	3.1E-07	1E-3	2.6E-07	1.6E-07	8.8E-08	5.3E-08	5.0E-08
TH-227	2E-3 Y	5.0E-05	2E-4	2.9E-05	1.8E-05	9.8E-06	5.3E-06	4.3E-06
TH-227	2E-3 W	4.2E-05	2E-4	2.4E-05	1.5E-05	8.1E-06	4.4E-06	3.5E-06
TH-228	2E-3 Y	6.2E-04	2E-4	5.0E-04	3.1E-04	1.7E-04	9.6E-05	8.6E-05
TH-228	2E-3 W	3.0E-04	2E-4	2.3E-04	1.4E-04	7.7E-05	4.5E-05	4.0E-05
TH-229	2E-3 Y	1.3E-03	2E-4	1.2E-03	7.7E-04	5.0E-04	3.7E-04	3.5E-04

TH-229	2E-3 W	8.0E-04	2E-4	7.1E-04	5.0E-04	3.7E-04	3.1E-04	2.9E-04
TH-230	2E-3 Y	2.0E-04	2E-4	1.7E-04	1.2E-04	7.4E-05	5.5E-05	5.1E-05
TH-230	2E-3 W	1.2E-04	2E-4	1.1E-04	7.6E-05	5.5E-05	4.6E-05	4.3E-05
TH-231	2E-3 Y	3.5E-09	2E-4	1.8E-09	1.1E-09	6.1E-10	3.4E-10	2.7E-10
TH-231	2E-3 W	3.2E-09	2E-4	1.7E-09	1.0E-09	5.6E-10	3.1E-10	2.5E-10
TH-232	2E-3 Y	4.9E-04	2E-4	4.4E-04	3.3E-04	2.6E-04	2.3E-04	2.1E-04
TH-232	2E-3 W	4.0E-04	2E-4	3.7E-04	3.0E-04	2.5E-04	2.3E-04	2.2E-04
TH-234	2E-3 Y	1.3E-07	2E-4	7.2E-08	4.4E-08	2.4E-08	1.3E-08	1.0E-08
TH-234	2E-3 W	1.1E-07	2E-4	6.1E-08	3.7E-08	2.0E-08	1.1E-08	8.7E-09
PA-230	1E-2 Y	4.3E-06	1E-3	2.6E-06	1.6E-06	8.8E-07	4.8E-07	3.9E-07
PA-230	1E-2 W	3.0E-06	1E-3	1.8E-06	1.1E-06	6.0E-07	3.3E-07	2.6E-07
PA-231	1E-2 Y	4.4E-04	1E-3	3.9E-04	2.9E-04	2.2E-04	1.8E-04	1.6E-04
PA-231	1E-2 W	3.5E-04	1E-3	3.2E-04	2.7E-04	2.2E-04	1.9E-04	1.7E-04
PA-232	1E-2 Y	4.8E-08	1E-3	4.1E-08	2.8E-08	1.9E-08	1.5E-08	1.4E-08
PA-232	1E-2 W	3.1E-08	1E-3	2.6E-08	2.0E-08	1.6E-08	1.3E-08	1.3E-08
PA-233	1E-2 Y	3.3E-08	1E-3	1.8E-08	1.1E-08	6.3E-09	3.5E-09	2.8E-09
PA-233	1E-2 W	2.7E-08	1E-3	1.5E-08	9.4E-09	5.1E-09	2.8E-09	2.3E-09
U-230	1E-1 D	1.7E-05	5E-2	8.7E-06	5.4E-06	2.9E-06	1.6E-06	1.3E-06
U-230	1E-1 W	5.2E-05	5E-2	2.8E-05	1.7E-05	9.4E-06	5.1E-06	4.1E-06
U-230	2E-2 Y	6.3E-05	2E-3	3.6E-05	2.2E-05	1.2E-05	6.5E-06	5.2E-06
U-232	1E-1 D	6.0E-06	5E-2	4.7E-06	3.1E-06	2.1E-06	1.7E-06	1.6E-06
U-232	1E-1 W	3.2E-05	5E-2	2.1E-05	1.3E-05	7.3E-06	4.1E-06	3.4E-06
U-232	2E-2 Y	6.8E-04	2E-3	6.1E-04	4.0E-04	2.5E-04	1.8E-04	1.7E-04
U-233	1E-1 D	2.4E-06	5E-2	1.5E-06	9.8E-07	5.9E-07	4.0E-07	3.7E-07
U-233	1E-1 W	2.1E-05	5E-2	1.3E-05	8.2E-06	4.5E-06	2.5E-06	2.0E-06
U-233	2E-2 Y	1.7E-04	2E-3	1.5E-04	9.5E-05	5.7E-05	3.9E-05	3.6E-05
U-234	1E-1 D	2.3E-06	5E-2	1.5E-06	9.6E-07	5.8E-07	4.0E-07	3.6E-07
U-234	1E-1 W	2.1E-05	5E-2	1.3E-05	8.2E-06	4.4E-06	2.4E-06	2.0E-06
U-234	2E-2 Y	1.7E-04	2E-3	1.5E-04	9.3E-05	5.6E-05	3.8E-05	3.5E-05
U-235	1E-1 D	2.2E-06	5E-2	1.4E-06	8.9E-07	5.4E-07	3.7E-07	3.4E-07
U-235	1E-1 W	1.9E-05	5E-2	1.2E-05	7.5E-06	4.1E-06	2.3E-06	1.8E-06
U-235	2E-2 Y	1.6E-04	2E-3	1.3E-04	8.6E-05	5.2E-05	3.5E-05	3.3E-05
U-236	1E-1 D	2.2E-06	5E-2	1.4E-06	9.1E-07	5.5E-07	3.8E-07	3.4E-07
U-236	1E-1 W	2.0E-05	5E-2	1.3E-05	7.7E-06	4.2E-06	2.3E-06	1.9E-06
U-236	2E-2 Y	1.6E-04	2E-3	1.4E-04	8.8E-05	5.3E-05	3.6E-05	3.3E-05
U-238	1E-1 D	2.1E-06	5E-2	1.3E-06	8.6E-07	5.2E-07	3.6E-07	3.3E-07
U-238	1E-1 W	1.9E-05	5E-2	1.2E-05	7.2E-06	3.9E-06	2.2E-06	1.8E-06
U-238	2E-2 Y	1.5E-04	2E-3	1.3E-04	8.3E-05	5.0E-05	3.4E-05	3.1E-05

NP-233	1E-2 W	5.9E-12	1E-3	3.1E-12	2.0E-12	1.2E-12	6.7E-13	5.5E-13
NP-233	5E-3 W	5.9E-12	5E-4	3.1E-12	2.0E-12	1.2E-12	6.7E-13	5.5E-13
NP-234	1E-2 W	6.4E-09	1E-3	3.7E-09	2.4E-09	1.5E-09	9.0E-10	7.4E-10
NP-234	5E-3 W	6.4E-09	5E-4	3.7E-09	2.4E-09	1.5E-09	9.0E-10	7.4E-10
NP-235	1E-2 W	7.0E-09	1E-3	4.9E-09	3.0E-09	1.6E-09	9.1E-10	7.8E-10
NP-235	5E-3 W	6.9E-09	5E-4	4.9E-09	3.0E-09	1.6E-09	9.1E-10	7.8E-10
NP-236L	1E-2 W	2.8E-05	1E-3	2.6E-05	2.2E-05	1.9E-05	1.7E-05	1.5E-05
NP-236L	5E-3 W	2.8E-05	5E-4	2.6E-05	2.2E-05	1.9E-05	1.7E-05	1.5E-05
NP-236S	1E-2 W	4.8E-08	1E-3	3.8E-08	2.6E-08	1.7E-08	1.3E-08	1.2E-08
NP-236S	5E-3 W	4.7E-08	5E-4	3.8E-08	2.6E-08	1.7E-08	1.3E-08	1.2E-08
NP-237	1E-2 W	2.0E-04	1E-3	1.7E-04	1.3E-04	9.8E-05	8.4E-05	7.8E-05
NP-237	5E-3 W	1.9E-04	5E-4	1.7E-04	1.3E-04	9.8E-05	8.3E-05	7.7E-05
NP-238	1E-2 W	2.3E-08	1E-3	1.6E-08	1.1E-08	7.9E-09	6.3E-09	5.7E-09
NP-238	5E-3 W	2.2E-08	5E-4	1.6E-08	1.1E-08	7.9E-09	6.2E-09	5.7E-09
NP-239	1E-2 W	9.6E-09	1E-3	5.0E-09	3.1E-09	1.7E-09	9.5E-10	7.5E-10
NP-239	5E-3 W	9.6E-09	5E-4	5.0E-09	3.1E-09	1.7E-09	9.5E-10	7.5E-10
NP-240	1E-2 W	2.9E-10	1E-3	1.5E-10	9.6E-11	5.4E-11	3.1E-11	2.5E-11
NP-240	5E-3 W	2.9E-10	5E-4	1.5E-10	9.6E-11	5.4E-11	3.1E-11	2.5E-11
PU-236	1E-4 Y	1.5E-04	1E-5	1.3E-04	8.2E-05	4.8E-05	3.2E-05	2.9E-05
PU-236	1E-3 W	9.3E-05	1E-4	7.7E-05	5.1E-05	3.4E-05	2.5E-05	2.4E-05
PU-236	1E-2 W	9.6E-05	1E-3	7.7E-05	5.1E-05	3.4E-05	2.5E-05	2.4E-05
PU-238	1E-4 Y	2.3E-04	1E-5	2.0E-04	1.3E-04	8.7E-05	6.5E-05	6.1E-05
PU-238	1E-3 W	1.7E-04	1E-4	1.5E-04	1.1E-04	7.8E-05	6.6E-05	6.2E-05
PU-238	1E-2 W	1.7E-04	1E-3	1.5E-04	1.1E-04	7.8E-05	6.6E-05	6.2E-05
PU-239	1E-4 Y	2.3E-04	1E-5	2.0E-04	1.4E-04	9.1E-05	6.9E-05	6.4E-05
PU-239	1E-3 W	1.8E-04	1E-4	1.6E-04	1.1E-04	8.6E-05	7.3E-05	6.8E-05
PU-239	1E-2 W	1.8E-04	1E-3	1.6E-04	1.1E-04	8.6E-05	7.3E-05	6.8E-05
PU-240	1E-4 Y	2.3E-04	1E-5	2.0E-04	1.4E-04	9.1E-05	6.9E-05	6.4E-05
PU-240	1E-3 W	1.8E-04	1E-4	1.6E-04	1.1E-04	8.6E-05	7.3E-05	6.8E-05
PU-240	1E-2 W	1.8E-04	1E-3	1.6E-04	1.1E-04	8.6E-05	7.3E-05	6.8E-05
PU-241	1E-4 Y	1.9E-06	1E-5	1.8E-06	1.4E-06	1.2E-06	1.0E-06	9.3E-07
PU-241	1E-3 W	2.2E-06	1E-4	2.1E-06	1.8E-06	1.5E-06	1.4E-06	1.3E-06
PU-241	1E-2 W	2.3E-06	1E-3	2.1E-06	1.8E-06	1.6E-06	1.4E-06	1.3E-06
PU-242	1E-4 Y	2.2E-04	1E-5	1.9E-04	1.3E-04	8.6E-05	6.5E-05	6.1E-05
PU-242	1E-3 W	1.7E-04	1E-4	1.5E-04	1.1E-04	8.2E-05	6.9E-05	6.5E-05
PU-242	1E-2 W	1.7E-04	1E-3	1.5E-04	1.1E-04	8.2E-05	7.0E-05	6.5E-05
PU-243	1E-4 Y	5.3E-10	1E-5	2.8E-10	1.7E-10	9.4E-11	5.3E-11	4.2E-11
PU-243	1E-3 W	4.8E-10	1E-4	2.5E-10	1.6E-10	8.7E-11	4.9E-11	4.0E-11

PU-243	1E-2 W	4.8E-10	1E-3	2.5E-10	1.6E-10	8.7E-11	4.9E-11	4.0E-11
PU-244	1E-4 Y	2.2E-04	1E-5	1.9E-04	1.3E-04	8.6E-05	6.5E-05	6.0E-05
PU-244	1E-3 W	1.7E-04	1E-4	1.5E-04	1.1E-04	8.1E-05	6.9E-05	6.4E-05
PU-244	1E-2 W	1.7E-04	1E-3	1.5E-04	1.1E-04	8.1E-05	6.9E-05	6.4E-05
AM-241	1E-2 W	1.9E-04	1E-3	1.6E-04	1.2E-04	8.9E-05	7.5E-05	7.0E-05
AM-241	5E-3 W	1.9E-04	5E-4	1.6E-04	1.2E-04	8.9E-05	7.5E-05	7.0E-05
AM-242	1E-2 W	1.1E-07	1E-3	7.5E-08	4.6E-08	2.6E-08	1.4E-08	1.2E-08
AM-242	5E-3 W	1.1E-07	5E-4	7.5E-08	4.6E-08	2.5E-08	1.4E-08	1.2E-08
AM-242M	1E-2 W	1.5E-04	1E-3	1.4E-04	1.0E-04	8.2E-05	7.1E-05	6.7E-05
AM-242M	5E-3 W	1.5E-04	5E-4	1.4E-04	1.0E-04	8.1E-05	7.1E-05	6.7E-05
AM-243	1E-2 W	1.9E-04	1E-3	1.6E-04	1.2E-04	8.8E-05	7.5E-05	7.0E-05
AM-243	5E-3 W	1.8E-04	5E-4	1.6E-04	1.2E-04	8.8E-05	7.5E-05	7.0E-05
CM-242	1E-2 W	3.4E-05	1E-3	2.2E-05	1.4E-05	7.5E-06	4.2E-06	3.5E-06
CM-242	5E-3 W	3.3E-05	5E-4	2.2E-05	1.4E-05	7.5E-06	4.2E-06	3.5E-06
CM-243	1E-2 W	1.5E-04	1E-3	1.3E-04	8.9E-05	6.3E-05	5.2E-05	4.9E-05
CM-243	5E-3 W	1.5E-04	5E-4	1.3E-04	8.9E-05	6.3E-05	5.2E-05	4.9E-05
CM-244	1E-2 W	1.4E-04	1E-3	1.1E-04	7.7E-05	5.2E-05	4.2E-05	4.0E-05
CM-244	5E-3 W	1.4E-04	5E-4	1.1E-04	7.7E-05	5.2E-05	4.2E-05	4.0E-05
CM-245	1E-2 W	1.9E-04	1E-3	1.6E-04	1.2E-04	9.1E-05	7.8E-05	7.2E-05
CM-245	5E-3 W	1.9E-04	5E-4	1.6E-04	1.2E-04	9.1E-05	7.7E-05	7.2E-05
CM-246	1E-2 W	1.9E-04	1E-3	1.6E-04	1.2E-04	9.1E-05	7.7E-05	7.2E-05
CM-246	5E-3 W	1.9E-04	5E-4	1.6E-04	1.2E-04	9.1E-05	7.7E-05	7.2E-05
CM-247	1E-2 W	1.7E-04	1E-3	1.5E-04	1.1E-04	8.3E-05	7.1E-05	6.6E-05
CM-247	5E-3 W	1.7E-04	5E-4	1.5E-04	1.1E-04	8.3E-05	7.1E-05	6.6E-05
CM-248	1E-2 W	7.0E-04	1E-3	6.0E-04	4.4E-04	3.3E-04	2.8E-04	2.6E-04
CM-248	5E-3 W	6.8E-04	5E-4	6.0E-04	4.4E-04	3.3E-04	2.8E-04	2.6E-04
BK-245	5E-3 W	1.3E-08	5E-4	6.9E-09	4.3E-09	2.4E-09	1.4E-09	1.1E-09
BK-246	5E-3 W	3.0E-09	5E-4	1.8E-09	1.2E-09	7.4E-10	4.8E-10	4.0E-10
BK-247	5E-3 W	2.2E-04	5E-4	1.9E-04	1.4E-04	1.1E-04	9.1E-05	8.5E-05
BK-249	5E-3 W	4.5E-07	5E-4	4.1E-07	3.1E-07	2.5E-07	2.2E-07	2.0E-07
CF-246	5E-3 Y	1.9E-06	5E-4	1.1E-06	6.6E-07	3.6E-07	2.0E-07	1.6E-07
CF-246	5E-3 W	1.8E-06	5E-4	9.5E-07	5.8E-07	3.2E-07	1.7E-07	1.4E-07
CF-248	5E-3 Y	9.4E-05	5E-4	7.3E-05	4.5E-05	2.5E-05	1.4E-05	1.3E-05
CF-248	5E-3 W	5.4E-05	5E-4	3.9E-05	2.4E-05	1.4E-05	8.5E-06	7.5E-06
CF-249	5E-3 Y	2.7E-04	5E-4	2.3E-04	1.6E-04	1.1E-04	8.0E-05	7.5E-05
CF-249	5E-3 W	2.2E-04	5E-4	1.9E-04	1.4E-04	1.1E-04	9.1E-05	8.5E-05
CF-250	5E-3 Y	2.2E-04	5E-4	1.8E-04	1.2E-04	6.9E-05	4.7E-05	4.4E-05
CF-250	5E-3 W	1.4E-04	5E-4	1.2E-04	7.9E-05	5.2E-05	4.1E-05	4.0E-05

CF-251	5E-3 Y	2.7E-04	5E-4	2.3E-04	1.6E-04	1.1E-04	8.1E-05	7.6E-05
CF-251	5E-3 W	2.2E-04	5E-4	1.9E-04	1.4E-04	1.1E-04	9.3E-05	8.7E-05
CF-252	5E-3 Y	2.7E-04	5E-4	2.2E-04	1.3E-04	7.4E-05	4.3E-05	3.9E-05
CF-252	5E-3 W	1.5E-04	5E-4	1.2E-04	7.1E-05	4.0E-05	2.4E-05	2.2E-05
CF-253	5E-3 Y	9.2E-06	5E-4	5.6E-06	3.4E-06	1.9E-06	1.0E-06	8.2E-07
CF-253	5E-3 W	7.2E-06	5E-4	4.3E-06	2.6E-06	1.4E-06	7.9E-07	6.3E-07
CF-254	5E-3 Y	8.4E-04	5E-4	5.3E-04	3.3E-04	1.8E-04	9.7E-05	7.8E-05
CF-254	5E-3 W	6.4E-04	5E-4	3.8E-04	2.4E-04	1.3E-04	7.0E-05	5.6E-05
ES-250	5E-3 W	2.7E-09	5E-4	2.2E-09	1.5E-09	9.6E-10	7.6E-10	7.3E-10
ES-251	5E-3 W	8.9E-09	5E-4	4.9E-09	3.1E-09	1.8E-09	1.1E-09	9.5E-10
ES-253	5E-3 W	1.2E-05	5E-4	6.3E-06	3.9E-06	2.1E-06	1.2E-06	9.2E-07
ES-254	5E-3 W	5.1E-05	5E-4	3.7E-05	2.3E-05	1.3E-05	7.9E-06	7.0E-06
ES-254M	5E-3 W	1.7E-06	5E-4	8.8E-07	5.4E-07	3.0E-07	1.7E-07	1.3E-07
FM-252	5E-3 W	1.2E-06	5E-4	6.4E-07	3.9E-07	2.1E-07	1.2E-07	9.6E-08
FM-253	5E-3 W	1.7E-06	5E-4	9.2E-07	5.7E-07	3.1E-07	1.7E-07	1.3E-07
FM-254	5E-3 W	1.9E-07	5E-4	9.6E-08	5.9E-08	3.2E-08	1.8E-08	1.4E-08
FM-255	5E-3 W	9.3E-07	5E-4	4.7E-07	2.9E-07	1.6E-07	8.6E-08	6.8E-08
FM-257	5E-3 W	4.7E-05	5E-4	3.1E-05	1.9E-05	1.0E-05	5.6E-06	4.6E-06
MD-257	5E-3 W	1.3E-07	5E-4	8.1E-08	4.9E-08	2.7E-08	1.5E-08	1.2E-08

Notes on Tables 1 and 2 of Appendix II

<i>H</i>	<i>Hydrogen (tritium)</i>
<i>OT</i>	<i>Organically bound tritium</i>
<i>C</i>	<i>Carbon (organic compounds)</i>
<i>CX</i>	<i>Carbon dioxide</i>
<i>CY</i>	<i>Carbon monoxide</i>
<i>S</i>	<i>Sulphur</i>
<i>SO</i>	<i>Sulphur (organic)</i>
<i>CO</i>	<i>Cobalt</i>
<i>CC</i>	<i>Cyanocobalamin</i>
<i>HI</i>	<i>Mercury (inorganic)</i>
<i>HG</i>	<i>Mercury (organic)</i>
<i>M</i>	<i>Metastable state</i>
<i>S</i>	<i>Shorter of two metastable states</i>
<i>L</i>	<i>Longer of two metastable states</i>
<i>D</i>	<i>Lung class, days</i>
<i>W</i>	<i>Lung class, weeks</i>
<i>Y</i>	<i>Lung class, years</i>
<i>V</i>	<i>Vapour</i>
<i>f₁</i>	<i>Gut uptake factor</i>

Committed effective doses via inhalation are for particles with an activity-median aerodynamic diameter (AMAD) of 1 μm , i.e. the diameter of a unit density spherical particle with the same terminal settling velocity in air as that of the aerosol particle whose activity is the median for all the aerosol particles considered.

Committed effective doses for infants, children and 15 year olds are integrated to age 70 years, and for adults to 50 years following intake.

Notes on Tables 1 and 2 of Appendix II

H	Hydrogen (tritium)
OT	Organically bound tritium
C	Carbon (organic compounds)
CX	Carbon dioxide
CY	Carbon monoxide
S	Sulphur
SO	Sulphur (organic)
CO	Cobalt
CC	Cyanocobalamin
HI	Mercury (inorganic)
HG	Mercury (organic)
M	Metastable state
S	Shorter of two metastable states
L	Longer of two metastable states
D	Lung class, days
W	Lung class, weeks
Y	Lung class, years
V	Vapour
f _i	Gut uptake factor

Committed effective doses via inhalation are for particles with an activity-median aerodynamic diameter (AMAD) of 1 μm , i.e. the diameter of a unit density spherical particle with the same terminal settling velocity in air as that of the aerosol particle whose activity is the median for all the aerosol particles considered.

Committed effective doses for infants, children and 15 year olds are integrated to age 70 years, and for adults to 50 years following intake.

TABLE 3 of APPENDIX II

Annual limits of intake and exposure for radon and thoron daughters

Limit	Unit	Radon daughters ¹	Thoron daughters ²
Potential α -energy intake	J	0.02	0.06
Potential α -energy exposure	J h m ⁻³	0.017	0.050
Exposure	WLM ³	4.8	14

¹ **radon daughters:** short-lived decay products of ²²²Rn: ²¹⁸Po(RaA), ²¹⁸At, ²¹⁴Pb(RaB), and ²¹⁰Pb(RaC")

² **thoron daughters:** short-lived decay products of ²²⁰Rn: ²¹⁶Po(ThA), ²¹²Pb(ThB), ²¹²Po(ThC), and ²⁰⁸Tl(ThC")

³ **working level month (WLM):** A unit of exposure to radon or thoron daughters. One working level month is 3.54mJ·h·m⁻³ or 170 WL·h, where one working level (WL) is any combination of radon or thoron daughters in one litre of air that will result in the ultimate emission of 1.3x10⁵ MeV of alpha energy. In SI units, the WL is equivalent to 2.1x10⁻⁵ J·m⁻³.

APPENDIX III

INDICATIVE DOSE CONSTRAINTS

As part of the process of optimization and also to ensure that individual dose limits are not exceeded from all sources under control, annual dose constraints for industrial sources or practices should be applied to public and occupational exposures. The public dose constraint should be in the range 0.1 to 0.5 mSv, the value depending on the location of the source or practice and its nature. For occupational dose constraints, the maximum level is 20 mSv.

APPENDIX IV

CONSTRAINTS ON THE PROBABILITY OF ACCIDENT SEQUENCES LEADING TO POTENTIAL EXPOSURES

The following constraints apply to the annual probability of occurrence of accident sequences that could lead to potential exposure:

sequence of events leading to doses considered as part of normal exposures	10^{-1} to 10^{-2}
sequence of events leading to doses not able to cause deterministic effects	10^{-2} to 10^{-5}
sequence of events leading to doses able to cause some deterministic effects	10^{-5} to 10^{-6}
sequence of events leading to doses where death is likely to result	$< 10^{-6}$

APPENDIX V

REFERENCE VALUES FOR MEDICAL DIAGNOSTIC EXPOSURES FOR A STANDARD SIZE PATIENT

I. Radiography

Radiograph	Entrance Surface Dose per Radiograph (*) (mGy)	
Lumbar spine	AP	10
	Lat	25
	LSJ	30
Abdomen	AP	8
Pelvis	AP	8
Chest	PA	0.4
	Lat	1
Skull	AP	5
	PA	5
	Lat	3

These values are for conventional film-screen combinations in the relative speed range of 200. For high speed film-screen combinations, the values should be reduced by a factor from 2 to 3.

II. Fluoroscopy

Mode of Operation	Entrance Surface Dose Rate (*) (mGy/min)
Normal	50
High Level	150

- 1 (*) In tissue with backscatter
- 2
- 3

APPENDIX VI LEVELS OF DOSE AT WHICH INTERVENTION IS NEARLY ALWAYS JUSTIFIED

Single acute doses

Organ or Tissue	Dose ^(a) to the organ or tissue in 2 days (Gy)
Whole body	1 ^b
Lung	6 ^c
Skin	3 ^d
Thyroid	5 ^e
Lens of the eye	2 ^f
Gonads	2 ^g

Footnotes

- a Acute single dose. The shorter the time, the more severe the potential deterministic effect. In all cases presented here, the dose would have to be delivered in less than 2 days to produce the effects noted here. These doses are applicable to a normal population. For some specific conditions (e.g. people already undergoing hospital treatment for illness) these values may be reduced.
- b To avoid death in 1-2 months. Vomiting could be expected for doses over 0.5 Gy.
- c To avoid death in 2-12 months.
- d To avoid erythema in a few weeks.
- e To avoid hypothyroidism in a few years.
- f To avoid cataracts in a few years. Detectable opacities could occur at doses above 0.5 Gy.
- g To avoid permanent sterility. Temporary sterility of males could occur at doses above 0.15 Sv.

Annual dose rate if received over many years

Organ or Tissue	Annual Dose (Sv.y ⁻¹)
Gonads	0.2
Lens of the eye	0.1
Bone Marrow	0.4

APPENDIX VII
INTERVENTION LEVELS

A) GENERIC INTERVENTION LEVELS FOR LONG STANDING SITUATIONS
(for simple remedial actions)

Effective dose rate: 10 mSv y^{-1}

Radon concentration
in buildings: 400 Bq m^{-3}

B) INDICATIVE GUIDANCE ON GENERIC INTERVENTION LEVELS FOR URGENT COUNTERMEASURES ^a

Protective Measure	Quantity to be compared with Intervention Level ^a	Effective Dose	Thyroid Dose
Sheltering	External dose plus committed dose from intakes in the first 24 h (mSv)	5 mSv	
Administration of stable iodine	Committed doses from intakes in the first 24 h (mSv)	5 mSv	A few tens to a few hundred mSv
Evacuation	External dose plus committed doses from intakes in the first 24 h (mSv)	50 mSv	

^a The quantitative guidance is indicative only. The ranges of values should not be adopted without first analysing carefully their appropriateness for the particular circumstances.

^b In principle this quantity refers to the dose averted by a countermeasure but in practice this can often be equated with the projected dose

**C) GENERIC INTERVENTION LEVELS FOR WITHDRAWAL AND SUBSTITUTION OF
FOOD AND DRINKING WATER
FOLLOWING AN ACCIDENT OR EMERGENCY (Bq/kg)**

Radionuclide	Fresh milk, vegetables, grain, fruit (Bq/kg)	Meat, milk products, drinking water ³³ (Bq/kg)
Ru-106, I-131, Cs-134, Cs-137	3000	30000
Sr-90	300	3000
Pu-238, Pu-239, Am-241	30	300

³³ For lake, river and reservoir water, reference levels lower than these intervention levels should be applied because the consumption of fish is usually more critical than consumption of the water itself

**D) CODEX ALIMENTARIUS COMMISSION GUIDELINE LEVELS FOR RADIONUCLIDES
IN FOODS FOR USE IN INTERNATIONAL TRADE
FOLLOWING ACCIDENTAL NUCLEAR CONTAMINATION ³⁴**

FOODS DESTINED FOR GENERAL CONSUMPTION		
Dose per Unit Intake (Sv/Bq)	Representative Radionuclides	Level (Bq/Kg)
10^{-6}	^{241}Am , ^{239}Pu	10
10^{-7}	^{90}Sr	100
10^{-8}	^{31}I , ^{134}Cs , ^{137}Cs	1000
MILK AND INFANT FOODS		
10^{-5}	^{241}Am , ^{239}Pu	1
10^{-7}	^{131}I , ^{90}Sr	100
10^{-8}	^{134}Cs , ^{137}Cs	1000

Notes:

These levels are intended only for radionuclide contamination in food moving in international trade following an accident and not to naturally occurring radionuclides which are normally present in the diet. The Guideline Levels remain applicable for one year following a nuclear accident. By an accident, a situation is meant

³⁴ Food and Agriculture Organization of the United Nations World Health Organization, Joint FAO/WHO Food Standards Programme Codex Alimentarius Commission; Codex Alimentarius, Volume 1-1991; Section 6 1, 'Levels for Radionuclides'

1 where the uncontrolled release of radionuclides to the environment results in the contamination
2 of food offered in international trade.

3
4 As the proposed levels were derived using extensive conservative assumptions, there
5 is no need to add contributions, and from each of the three groups; each group should be
6 treated independently. However, if more than one radionuclide is present, the activities of the
7 different accidentally contaminating radionuclides within a group should be added together.
8 Thus the 1000 Bq/kg value is assigned to that group. For example, following a power reactor
9 accident, ^{134}Cs and ^{137}Cs could be contaminants of food, and the 1000 Bq/Kg refers to the
10 summed activity of both these radionuclides.

11
12 These levels are intended to be applied to food prepared for consumption, and would
13 be unnecessarily restrictive if applied to dried or concentrated food prior to dilution or
14 reconstitution.

15
16 Both FAO and WHO have called attention in the expert meeting reports to special
17 consideration which might apply to certain classes of food which are consumed in small
18 quantities, such as spices. Some of the foods grown in the areas affected by the Chernobyl
19 accident fallout contained very high levels of radionuclides following the accident. Because
20 they represent a very small percentage of total diets and hence would make very small
21 additions to the total dose, application of the Guideline Levels to products of this type may be
22 unnecessarily restrictive. FAO and WHO are aware that policies vary at present in different
23 countries regarding such classes of food.

**E) GENERIC INTERVENTION LEVEL FOR TEMPORARY RELOCATION
FOLLOWING AN ACCIDENT OR EMERGENCY**

Averted Dose: 10 mSv in any month

This refers to relocation of people from their homes to temporary accommodation with the full expectation of returning to their homes within a few months.

The dose to be compared with the intervention level is the total dose from all sources of exposure that can be avoided by taking the countermeasure (and usually will exclude food and water).

**F) GENERIC INTERVENTION LEVEL FOR PERMANENT RESETTLEMENT
FOLLOWING AN ACCIDENT OR EMERGENCY**

Averted Dose: 1 Sv

This refers to resettlement of people from their homes to permanent accommodation with no expectation of returning to their original homes.

This dose is to be compared with the intervention level of total dose for all sources of exposure that can be avoided by taking the countermeasure.