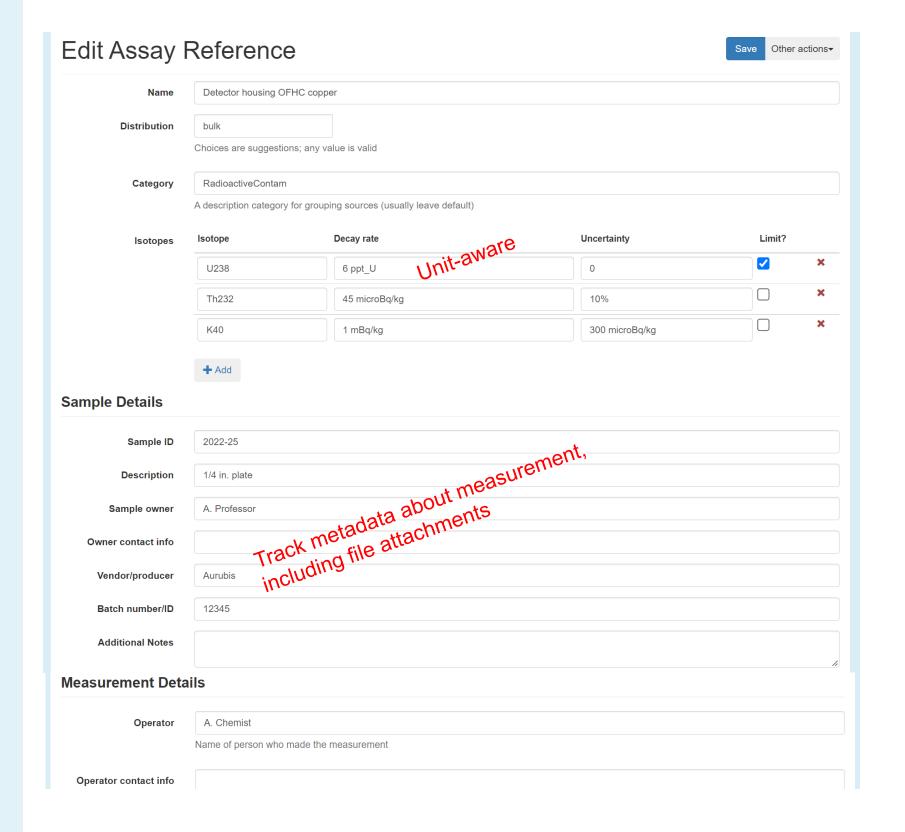
https://github.com/bloer/bgexplorer-demo

Background Explorer was originally designed to handle the 300+ components and 800+ simulation datasets needed to construct the background model for the SuperCDMS dark matter experiment. It has been adapted to be a general-purpose tool that anyone can use. The software is written in python, with a MongoDB backend and Flask providing a user-friendly web interface that allows models to be constructed with minimal programming expertise.

Inputs

- + Record concentration of radioactive isotopes in materials around detector
- + Helpful tools to model cosmogenic activation and radon daughter deposition on surfaces from an exposure time



- + Record components to be tracked and simulated
- + Allows arbitrarily deep nested assemblies and multiple placements of common parts (e.g., screws, resistors, etc.)
- + Each component has one or more radiation sources associated

Components Specifica	ations		Edit Cor	nponent		Save	Other actions				
Saarah		×	Name								
Search		^	cuBox_top								
Components	Create new:	Component Assembly	Description								
•			Description								
Name Assambly Tras	Description	Status									
Assembly Tree	Low background chiefded H	DCE detector	Comment								
HPGE System →	Low background shielded H	FGE detector									
detector housing $\sqrt{}$			Details of current	implementation							
can			Additional Info								
top lid bottom lid			owner: <part ov<="" td=""><td>wner/designer/buyer></td><td></td><td></td><td></td></part>	wner/designer/buyer>							
M4x1.5 brass screw			partnum: <part vendor: <part td="" v<=""><td></td><td></td><td></td><td></td></part></part 								
sample holder	HDPE blocks for placing larg	ne samnles		endor> RL for datasheet>							
shield 3	copper and lead shielding	go oampioo	Quary Madifier								
copper box ¬	coppor and lead silledilly		Query Modifier								
cuBox_top			0								
cuBox_bot			JSON object mod	lifying DB queries							
cuBox_side			Emission specs								
cuBox_frt			Name	Category	Dist.	Querymod					
cuBox_bck			copper contam	RadioactiveContam	bulk	8	×				
M4x1.5 brass screw							×				
lead shield			copper activation	CosmogenicActivation	bulk	{}					
environment	dummy component to attach	n room flux	inner radon	RadonExposure	surface	{}	×				
Unplaced components							×				
copper box (single element exa	mple)		outer radon	RadonExposure	surface	{}	"				
uBox_right											
:uBox_bck			∔ Add								
			Material								
	-01	^{ice} s	copper								
	ativity 500	4 64	Maca								
Multiple radioactivity sources Multiple radioactivity sources by automatically normalized by automatically normalized (e.g., automatically normalized (e.g., automatically normalized area) automatically normalized area automatically normalized area automatically normalized area automatically normalized by automatically normalized area automatically normalized by automatically normalized (e.g., automatically normalized (e.g., automatically normalized (e.g., automatically normalized by automatically normalized (e.g., automatically normalized (e.g., automatically normalized (e.g., automatically normalized by automatically normalized (e.g., automatically normali			Wass 63.4 kg Volume 0 cm³								
								automat			
								COLLECT	Jolume, J	Inner Surface	
mass,	40.							10 cm ²			

Each o Multipl	Map spectrum in detector from radiation sources at different locations Each gomponent associated with multiple datasets Multiple components can point to the same dataset Simulation Database				"output/can1_19-40" 1 0 1000000 0 1 1 "c28e6c7d-ed50-4fcc" "(35, May 2010)"
	volume	primary	nprimaries	G4Date: G4VERSION NUMBER:	"(25-May-2018)" 1042
Q	can1	19-40	100000	G4Version:	"\$Name: geant4-10-0
Q	can1	19-40	10000000	command_args:	[]
Q	can1	27-60	100000	commandhistory:	[]
Q	can1	27-60	1000000	executable:	"./bin/gopherMC"
				geant4version:	"geant4-10-04-patch
Q	can1	82-210	100000	geomversion:	""
Q	can1	82-210	10000000	gitversion:	"v1.0-7-gd671b5e"
Q	can1	90-232	10000000	macro_file:	"mymacros/setisotop
Q	can1	90-232	100000	maxdecaytime:	1000000000
	Odiff	00 202	10000	physicslist:	"FTFP BERT EMV"

	dill	21-00	100000
Q	can1	27-60	10000000
Q	can1	82-210	100000
Q	can1	82-210	10000000
Q	can1	90-232	10000000
Q	can1	90-232	100000
Q	can1	92-238	100000
Q	can1	92-238	10000000
Q	cuBox_bck	19-40	10000000
Q	cuBox_bck	19-40	100000
Q	cuBox_bck	27-60	100000
Q	cuBox_bck	27-60	10000000
Q	cuBox_bck	82-210	100000
Q	cuBox_bck	82-210	10000000
Q	cuBox_bck	90-232	10000000
Q	cuBox_bck	90-232	100000
Q	cuBox_bck	92-238	100000
Q	cuBox_bck	92-238	10000000
Q	cuBox_bot	19-40	100000
Q	cuBox_bot	19-40	10000000
Q	cuBox_bot	27-60	100000
Q	cuBox_bot	27-60	10000000
Q	cuBox_bot	82-210	100000
Q	cuBox_bot	82-210	10000000
Q	cuBox_bot	90-232	100000
Q	cuBox_bot	90-232	10000000
Q	cuBox_bot	92-238	100000
(a)	auPay hat	02.220	1000000

+ Upload radiation transport simulation outputs as JSON data

Outputs

+ Exportable bill of materials summarizing components and associated radioactivity

#	Name	Weight	Description	Comment	Partnum	Material	Vendor	Mass	Assay Ref	U238 [mBq/kg]	Th232 [mBq/kg]	K40 [mBq/kg]
	HPGE System ⊋	1	Low background shielded HPGE detector					7274915.15 g				
1	detector housing ¬	1						615.15 g				
1.1	can	1				aluminum		478 g	radiopurity.org	108+/-5	5.6+/-1.4	10+/-5
1.2	top lid	1				aluminum		33.25 g	radiopurity.org	108+/-5	5.6+/-1.4	10+/-5
1.3	bottom lid	1				aluminum		103.9 g	radiopurity.org	108+/-5	5.6+/-1.4	10+/-5
2	sample holder	1	HDPE blocks for placing large samples			HDPE		2 kg	N. Abgrall et al., Nucl. Instr. and Meth. A 828 (2016)	19.2+/-1.2	12.3+/-0.8	43+/-6
3	shield 录	1	copper and lead shielding					7272.3 kg				
3.1	copper box →	1						242.3 kg				
3.1.1	cuBox_top	1				copper		40 kg	E. Aprile et al., Astropart. Phys., 35 (2011)	0.070+/-0.020	0.021+/-0.007	0.023+/-0.00
3.1.2	cuBox_bot	1				copper		56.3 kg	E. Aprile et al., Astropart. Phys., 35 (2011)	0.070+/-0.020	0.021+/-0.007	0.023+/-0.00
3.1.3	cuBox_side	2				copper		45 kg	E. Aprile et al., Astropart. Phys., 35 (2011)	0.070+/-0.020	0.021+/-0.007	0.023+/-0.00
3.1.4	cuBox_frt	1				copper		28 kg	E. Aprile et al., Astropart. Phys., 35 (2011)	0.070+/-0.020	0.021+/-0.007	0.023+/-0.00
3.1.5	cuBox_frt	1				copper		28 kg	E. Aprile et al., Astropart. Phys., 35 (2011)	0.070+/-0.020	0.021+/-0.007	0.023+/-0.00
3.2	lead shield	1				lead		7030 kg	N. Abgrall et al., Nucl. Instr. and Meth. A 828 (2016)	<0.12	<0.032799999999999996	0.71+/-0.34
4	environment	1	dummy component to attach room flux									

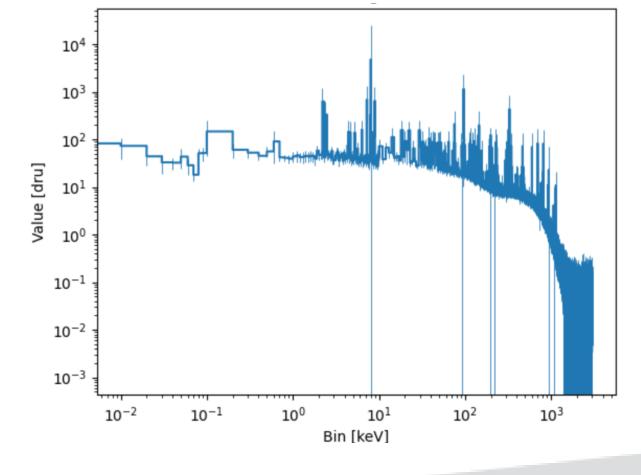
+ Detail views for each component, assay, etc. with abundant cross-links

	івох_іор					
General Info	None				ts Total weight: 1	on on
Physical Cha material mass surface_in surface_out surface_interior volume	copper 63.4 kg 10 cm ² 20 cm ² 0 cm ² 0 cm ³			nroe system / s	meid / соррег вох / сивох_к	th
Name	Туре	Dist.	Rate spec		Total Rate	Simulated Livetime
copper contam	RadioactiveContam	bulk	1.1e+02 uBq/	kg +/- 19%		
U238	RadioactiveContam	bulk	70 uBq/kg +/-	29%	(3.8+/-1.1)e+02 /day	(2.7+/-0.8)e+04 day
Th232	RadioactiveContam	bulk	21 uBq/kg +/-	33%	(1.1+/-0.3)e+02 /day	(8.8+/-2.9)e+04 day
K40	RadioactiveContam	bulk	23 uBq/kg +/-	26%	(1.3+/-0.3)e+02 /day	(8.0+/-2.1)e+04 day
copper activation	CosmogenicActivation	bulk	61 1/day/kg			
Mn54	CosmogenicActivation	bulk	4.7 1/day/kg		3e+02 /day	0 day
Co57	CosmogenicActivation	bulk	37 1/day/kg		2.3e+03 /day	0 day
Co60	CosmogenicActivation	bulk	19 1/day/kg		1.2e+03 /day	8.3e+03 day
inner radon	RadonExposure	surface	0.085 Bq·cm/	m³	0.22 /day	0 day
	RadonExposure RadonExposure	surface	0.085 Bq·cm/ 2.5 Bq·cm/m ²		0.22 /day 6.6 /day	0 day

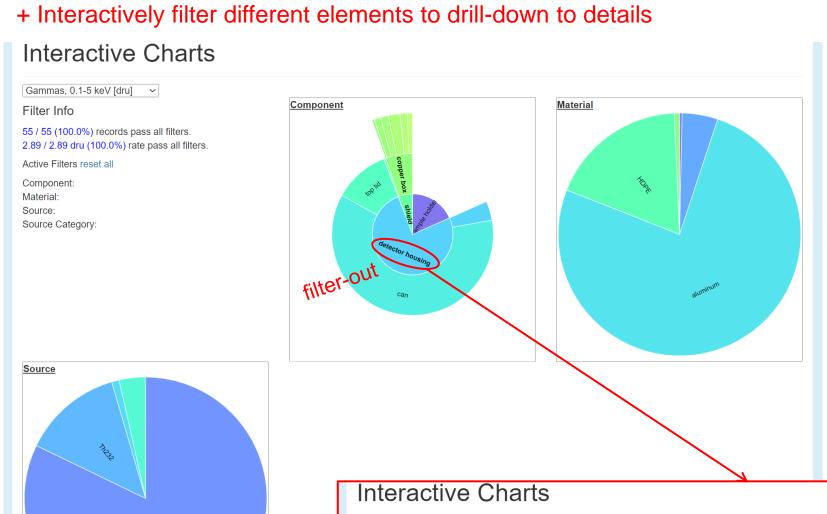
+ Summarize backgrounds by different contribution with expandable tables

Component	Gammas, 0.1-5 keV [dru]	Gammas, 3-100 keV [dru]	Gammas, 10-2000 keV [dru]
Total ▼	2.89(9)	60(10)	14(1)
sample holder	0.53(2)	1.77(8)	0.32(1)
detector housing ▼	2.19(9)	8.4(3)	1.48(5)
bottom lid	0.111(5)	0.37(2)	0.067(
can	1.76(8)	6.8(3)	1.19(5
top lid	0.32(1)	1.23(5)	0.23(1
shield -	0.167(7)	50(10)	12(1)
lead shield	0.010(2)	50(10)	12(1)
copper box ▼	0.157(7)	0.219(9)	0.095(
cuBox_bck	0.009(6)	0.015(1)	0.005(
cuBox_bot	0.025(2)	0.036(2)	0.014(
cuBox_frt	0.030(2)	0.040(3)	0.019(
cuBox_side	0.045(3)	0.065(5)	0.029(
cuBox_top	0.028(2)	0.034(2)	0.015(
hinge	0.020(5)	0.029(7)	0.011(
Material	Gammas, 0.1-5 keV [dru]	Gammas, 3-100 keV [dru]	Gammas, 10-2000 keV [dru]
Total ▼	2.89(9)	60(10)	14(1)
ead	0.010(2)	50(10)	12(1)
copper	0.137(5)	0.190(7)	0.084(
aluminum	2.19(9)	8.4(3)	1.48(5
HDPE	0.53(2)	1.77(8)	0.32(1
brass	0.020(5)	0.029(7)	0.011(

+ Click a cell to draw the associated spectrum



+ Fractional contribution from nested assemblies in pie charts



Gammas, 0.1-5 keV [dru] V







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