

Using Excel to calculate spectral overlaps

The Fluorescein – Rhodamine 6G FRET pair

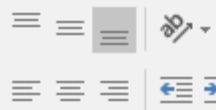


Clipboard



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Font



Alignment



Merge & Center

General

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Insert



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AutoSum



Fill



Clear

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Editing

A1 14000

	A	B	C
1	14000	0	0
2	14001	1.10204	8.52659
3	14002	2.20431	17.0516
4	14003	3.30707	25.5735
5	14004	4.41054	34.0906
6	14005	5.51496	42.6014
7	14006	6.62058	51.1044
8	14007	7.72764	59.5978
9	14008	8.83636	68.0803
10	14009	9.947	76.5501
11	14010	11.0598	85.0057
12	14011	12.175	93.4455
13	14012	13.2928	101.868
14	14013	14.4134	110.272
15	14014	15.5372	118.655
16	14015	16.6644	127.016
17	14016	17.7951	135.353
18	14017	18.9296	143.665
19	14018	20.0682	151.95
20	14019	21.2111	160.207
21	14020	22.3585	168.434
22	14021	23.5107	176.629
23	14022	24.668	184.792

Read in the wave number values (A), the donor fluorescence (B) and the acceptor absorption (C)
Note that C must be in units of $M^{-1}cm^{-1}$, while B can have any units since the fluorescence will be normalized.

File Home Insert Page Layout Formulas Data Review View Tell me what you want to do...

Clipboard: Paste, Cut, Copy, Format Painter

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Number: General, Currency, Percentage, Decimals

Styles: Conditional Formatting, Format as Table, Cell Styles

Cells: Insert, Delete, Format

Editing: AutoSum, Fill, Clear, Sort & Filter, Find & Select

D1: $=B1*C1$

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	14000	0	0	0																
2	14001	1.10204	8.52659	9.396643																
3	14002	2.20431	17.0516	37.58701																
4	14003	3.30707	25.5735	84.57335																
5	14004	4.41054	34.0906	150.358																
6	14005	5.51496	42.6014	234.945																
7	14006	6.62058	51.1044	338.3408																
8	14007	7.72764	59.5978	460.5503																
9	14008	8.83636	68.0803	601.582																
10	14009	9.947	76.5501	761.4438																
11	14010	11.0598	85.0057	940.146																
12	14011	12.175	93.4455	1137.699																
13	14012	13.2928	101.868	1354.111																
14	14013	14.4134	110.272	1589.394																
15	14014	15.5372	118.655	1843.566																
16	14015	16.6644	127.016	2116.645																
17	14016	17.7951	135.353	2408.62																
18	14017	18.9296	143.665	2719.521																
19	14018	20.0682	151.95	3049.363																
20	14019	21.2111	160.207	3398.167																
21	14020	22.3585	168.434	3765.932																
22	14021	23.5107	176.629	4152.671																
23	14022	24.668	184.792	4558.449																

The overlap is just the product of the emission and absorption Spectra in B and C, respectively. This is now in column D.

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E1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	14000	0	0	0	0															
2	14001	1.10204	8.52659	9.396643	4.02E-13															
3	14002	2.20431	17.0516	37.58701	8.03E-13															
4	14003	3.30707	25.5735	84.57335	1.2E-12															
5	14004	4.41054	34.0906	150.358	1.61E-12															
6	14005	5.51496	42.6014	234.945	2.01E-12															
7	14006	6.62058	51.1044	338.3408	2.41E-12															
8	14007	7.72764	59.5978	460.5503	2.81E-12															
9	14008	8.83636	68.0803	601.582	3.21E-12															
10	14009	9.947	76.5501	761.4438	3.62E-12															
11	14010	11.0598	85.0057	940.146	4.02E-12															
12	14011	12.175	93.4455	1137.699	4.43E-12															
13	14012	13.2928	101.868	1354.111	4.83E-12															
14	14013	14.4134	110.272	1589.394	5.24E-12															
15	14014	15.5372	118.655	1843.566	5.65E-12															
16	14015	16.6644	127.016	2116.645	6.05E-12															
17	14016	17.7951	135.353	2408.62	6.46E-12															
18	14017	18.9296	143.665	2719.521	6.87E-12															
19	14018	20.0682	151.95	3049.363	7.29E-12															
20	14019	21.2111	160.207	3398.167	7.7E-12															
21	14020	22.3585	168.434	3765.932	8.11E-12															
22	14021	23.5107	176.629	4152.671	8.53E-12															
23	14022	24.668	184.792	4558.449	8.95E-12															

Column E contains the terms to integrate for the fluorescence normalization:

$$\frac{f_D}{\tilde{\nu}^3}$$

Home Insert Page Layout Formulas Data Review View Tell me what you want to do...

Cut Copy Format Painter

Calibri 11 A A

B I U

Font

Wrap Text

Alignment

Merge & Center

General

Number

Conditional Formatting

Format as Table

Cell Styles

Styles

Insert

Delete

Format

Cells

AutoSum

Fill

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Editing

Sort & Filter

Find & Select

=D1/A1/A1/A1/A1

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
14000	0	0	0	0	0														
14001	1.10204	8.52659	9.396643	4.02E-13	2.45E-16														
14002	2.20431	17.0516	37.58701	8.03E-13	9.78E-16														
14003	3.30707	25.5735	84.57335	1.2E-12	2.2E-15														
14004	4.41054	34.0906	150.358	1.61E-12	3.91E-15														
14005	5.51496	42.6014	234.945	2.01E-12	6.11E-15														
14006	6.62058	51.1044	338.3408	2.41E-12	8.79E-15														
14007	7.72764	59.5978	460.5503	2.81E-12	1.2E-14														
14008	8.83636	68.0803	601.582	3.21E-12	1.56E-14														
14009	9.947	76.5501	761.4438	3.62E-12	1.98E-14														
14010	11.0598	85.0057	940.146	4.02E-12	2.44E-14														
14011	12.175	93.4455	1137.699	4.43E-12	2.95E-14														
14012	13.2928	101.868	1354.111	4.83E-12	3.51E-14														
14013	14.4134	110.272	1589.394	5.24E-12	4.12E-14														
14014	15.5372	118.655	1843.566	5.65E-12	4.78E-14														
14015	16.6644	127.016	2116.645	6.05E-12	5.49E-14														
14016	17.7951	135.353	2408.62	6.46E-12	6.24E-14														
14017	18.9296	143.665	2719.521	6.87E-12	7.04E-14														
14018	20.0682	151.95	3049.363	7.29E-12	7.9E-14														
14019	21.2111	160.207	3398.167	7.7E-12	8.8E-14														
14020	22.3585	168.434	3765.932	8.11E-12	9.75E-14														
14021	23.5107	176.629	4152.671	8.53E-12	1.07E-13														
14022	24.668	184.792	4558.449	8.95E-12	1.18E-13														

Column F contains the terms to integrate for the spectral overlap: $\frac{\epsilon f_D}{\tilde{\nu}^4}$

Chart Quick Layout Chart Layouts

Change Colors

Chart Styles

Switch Row/Column Data

Select Data

Change Chart Type

Move Chart Location

1 X ✓ f

14000	0	0	0	0	0
14001	1.10204	8.52659	9.396643	4.02E-13	2.45E-16
14002	2.20431	17.0516	37.58701	8.03E-13	9.78E-16
14003	3.30707	25.5735	84.57335	1.2E-12	2.2E-15
14004	4.41054	34.0906	150.358	1.61E-12	3.91E-15
14005	5.51496	42.6014	234.945	2.01E-12	6.11E-15
14006	6.62058	51.1044	338.3408	2.41E-12	8.79E-15
14007	7.72764	59.5978	460.5503	2.81E-12	1.2E-14
14008	8.83636	68.0803	601.582	3.21E-12	1.56E-14
14009	9.947	76.5501	761.4438	3.62E-12	1.98E-14
14010	11.0598	85.0057	940.146	4.02E-12	2.44E-14
14011	12.175	93.4455	1137.699	4.43E-12	2.95E-14
14012	13.2928	101.868	1354.111	4.83E-12	3.51E-14
14013	14.4134	110.272	1589.394	5.24E-12	4.12E-14
14014	15.5372	118.655	1843.566	5.65E-12	4.78E-14
14015	16.6644	127.016	2116.645	6.05E-12	5.49E-14
14016	17.7951	135.353	2408.62	6.46E-12	6.24E-14
14017	18.9296	143.665	2719.521	6.87E-12	7.04E-14
14018	20.0682	151.95	3049.363	7.29E-12	7.9E-14
14019	21.2111	160.207	3398.167	7.7E-12	8.8E-14
14020	22.3585	168.434	3765.932	8.11E-12	9.75E-14
14021	23.5107	176.629	4152.671	8.53E-12	1.07E-13
14022	24.668	184.792	4558.449	8.95E-12	1.18E-13

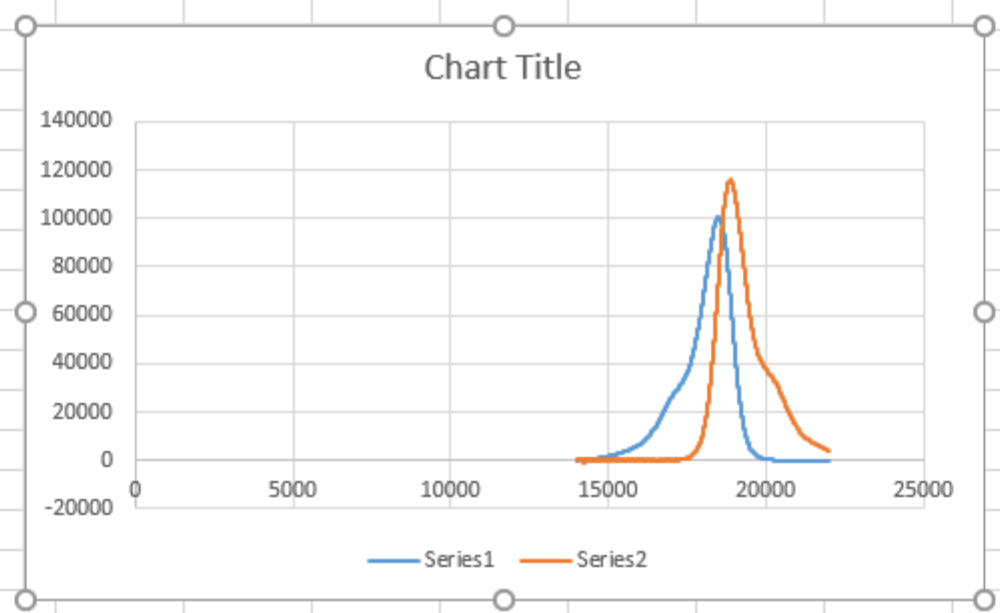


Chart context menu icons: Add (+), Format (brush), Filter (funnel).

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G8002 =SUM(F1:F8001)/SUM(E1:E8001)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
7980	21979.8	-21.4918	4106.59	-88258	-2.024E-12	-3.8E-13													
7981	21980.8	-21.4999	4078.26	-87682.2	-2.0244E-12	-3.8E-13													
7982	21981.8	-21.5079	4046.97	-87041.8	-2.0249E-12	-3.7E-13													
7983	21982.8	-21.5159	4013.82	-86360.9	-2.0254E-12	-3.7E-13													
7984	21983.8	-21.5239	3979.91	-85663.2	-2.0259E-12	-3.7E-13													
7985	21984.8	-21.5319	3946.37	-84972.8	-2.0264E-12	-3.6E-13													
7986	21985.8	-21.5398	3914.31	-84313.5	-2.0268E-12	-3.6E-13													
7987	21986.8	-21.5477	3884.82	-83708.9	-2.0273E-12	-3.6E-13													
7988	21987.8	-21.5556	3859.03	-83183.7	-2.0278E-12	-3.6E-13													
7989	21988.8	-21.5634	3838.05	-82761.4	-2.0282E-12	-3.5E-13													
7990	21989.8	-21.5712	3822.98	-82466.3	-2.0287E-12	-3.5E-13													
7991	21990.8	-21.579	3814.94	-82322.6	-2.0291E-12	-3.5E-13													
7992	21991.8	-21.5868	3814.38	-82340.3	-2.0296E-12	-3.5E-13													
7993	21992.8	-21.5945	3820.34	-82498.3	-2.03E-12	-3.5E-13													
7994	21993.8	-21.6022	3831.69	-82772.9	-2.0305E-12	-3.5E-13													
7995	21994.8	-21.6099	3847.29	-83139.6	-2.0309E-12	-3.6E-13													
7996	21995.8	-21.6175	3866.01	-83573.5	-2.0314E-12	-3.6E-13													
7997	21996.8	-21.6251	3886.71	-84050.5	-2.0318E-12	-3.6E-13													
7998	21997.8	-21.6327	3908.24	-84545.8	-2.0322E-12	-3.6E-13													
7999	21998.8	-21.6403	3929.48	-85035.1	-2.0327E-12	-3.6E-13													
8000	21999.8	-21.6478	3949.29	-85493.4	-2.0331E-12	-3.6E-13													
8001	22000.8	-21.6553	3966.52	-85896.2	-2.0335E-12	-3.7E-13													
8002					2.66489E-05	5.79E-05	2.17298												

Since the unit step is 1 cm⁻¹ the integral for each quantity Needed is just the sum. The normalized integral is boxed In this slide.