



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 08:32 PM UTC

PDB ID : 5A4W / pdb_00005a4w
Title : AtGSTF2 from Arabidopsis thaliana in complex with quercetrin
Authors : Ahmad, L.; Rylott, E.; Bruce, N.C.; Edwards, R.; Grogan, G.
Deposited on : 2015-06-15
Resolution : 2.25 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

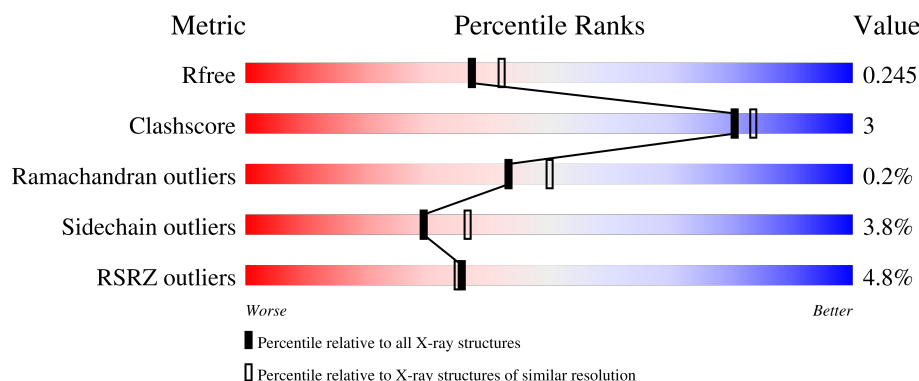
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.25 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	1898 (2.26-2.26)
Clashscore	190562	2005 (2.26-2.26)
Ramachandran outliers	187476	1965 (2.26-2.26)
Sidechain outliers	187428	1966 (2.26-2.26)
RSRZ outliers	180081	1898 (2.26-2.26)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	212	 92% 7%
1	B	212	 91% 7% ..
1	C	212	 91% 7% .
1	D	212	 92% 7%
1	E	212	 90% 8% .

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Mol	Chain	Length	Quality of chain
1	F	212	7% 89% 6% . .

2 Entry composition [i](#)

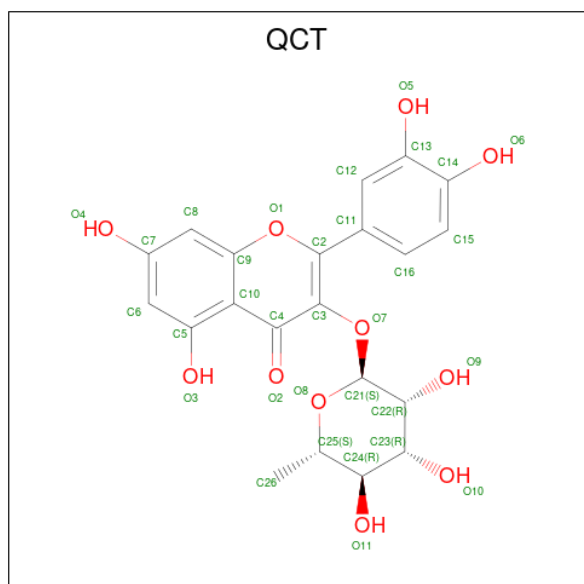
There are 4 unique types of molecules in this entry. The entry contains 10395 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called GLUTATHIONE S-TRANSFERASE F2.

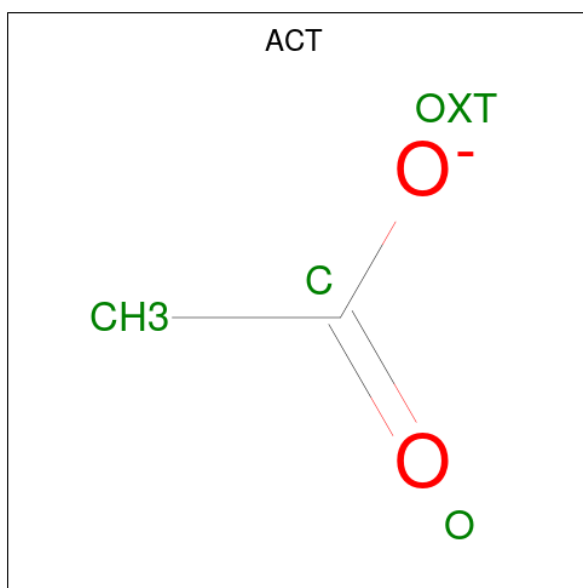
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	211	Total	C	N	O	S	0	1	0
			1665	1074	277	312	2			
1	B	210	Total	C	N	O	S	0	1	0
			1663	1068	282	311	2			
1	C	211	Total	C	N	O	S	0	0	0
			1618	1047	273	296	2			
1	D	211	Total	C	N	O	S	0	0	0
			1617	1043	268	304	2			
1	E	211	Total	C	N	O	S	0	0	0
			1643	1058	273	310	2			
1	F	204	Total	C	N	O	S	0	1	0
			1594	1027	270	295	2			

- Molecule 2 is 2-(3,4-dihydroxyphenyl)-5,7-dihydroxy-4-oxo-4H-chromen-3-yl 6-deoxy- α -L-mannopyranoside (CCD ID: QCT) (formula: $C_{21}H_{20}O_{11}$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total C O 32 21 11	0	0
2	A	1	Total C O 32 21 11	0	0
2	B	1	Total C O 32 21 11	0	0
2	C	1	Total C O 32 21 11	0	0
2	C	1	Total C O 22 15 7	0	0
2	D	1	Total C O 32 21 11	0	0
2	E	1	Total C O 32 21 11	0	0
2	F	1	Total C O 32 21 11	0	0

- Molecule 3 is ACETATE ION (CCD ID: ACT) (formula: $C_2H_3O_2$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	C	1	Total C O 4 2 2	0	0
3	D	1	Total C O 4 2 2	0	0

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	E	1	Total	C	O	0	0
			4	2	2		
3	F	1	Total	C	O	0	0
			4	2	2		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	79	Total	O	0	0
			79	79		
4	B	55	Total	O	0	0
			55	55		
4	C	52	Total	O	0	0
			52	52		
4	D	42	Total	O	0	0
			42	42		
4	E	42	Total	O	0	0
			42	42		
4	F	55	Total	O	0	0
			55	55		

3 Residue-property plots [i](#)

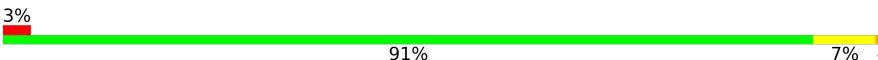
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

- Molecule 1: GLUTATHIONE S-TRANSFERASE F2

Chain A: 

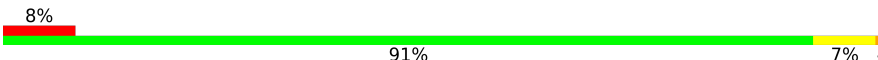


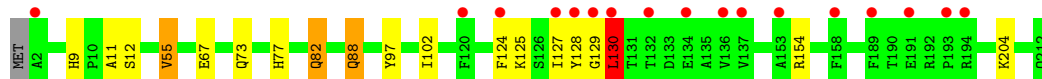
- Molecule 1: GLUTATHIONE S-TRANSFERASE F2

Chain B: 



- Molecule 1: GLUTATHIONE S-TRANSFERASE F2

Chain C: 

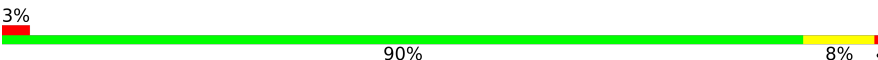


- Molecule 1: GLUTATHIONE S-TRANSFERASE F2

Chain D: 

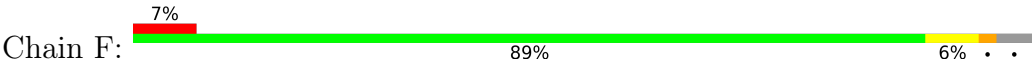


- Molecule 1: GLUTATHIONE S-TRANSFERASE F2

Chain E: 



- Molecule 1: GLUTATHIONE S-TRANSFERASE F2



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	87.35Å 93.57Å 152.42Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	59.09 – 2.25 59.09 – 2.25	Depositor EDS
% Data completeness (in resolution range)	100.0 (59.09-2.25) 100.0 (59.09-2.25)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.68 (at 2.25Å)	Xtriage
Refinement program	REFMAC 5.8.0103	Depositor
R, R_{free}	0.207 , 0.242 0.213 , 0.245	Depositor DCC
R_{free} test set	2935 reflections (4.90%)	wwPDB-VP
Wilson B-factor (Å ²)	32.3	Xtriage
Anisotropy	0.891	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 32.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	10395	wwPDB-VP
Average B, all atoms (Å ²)	40.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.91% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: QCT, ACT

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# $ Z > 5$	RMSZ	# $ Z > 5$
1	A	0.90	0/1706	0.99	6/2317 (0.3%)
1	B	0.85	2/1704 (0.1%)	0.97	2/2312 (0.1%)
1	C	0.88	0/1654	0.98	4/2250 (0.2%)
1	D	0.91	0/1654	0.97	4/2255 (0.2%)
1	E	0.89	1/1680 (0.1%)	1.02	4/2285 (0.2%)
1	F	0.93	0/1634	1.02	3/2221 (0.1%)
All	All	0.89	3/10032 (0.0%)	0.99	23/13640 (0.2%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	E	55	VAL	CA-C	6.35	1.59	1.52
1	B	127	ILE	C-O	-5.19	1.18	1.24
1	B	116	SER	CA-C	5.03	1.59	1.52

All (23) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	F	120	PHE	CB-CA-C	12.18	131.56	110.85
1	F	123	ILE	N-CA-C	-10.07	100.75	110.42
1	F	127	ILE	N-CA-C	9.04	119.86	111.45
1	B	127	ILE	N-CA-C	-8.61	98.54	109.30
1	E	55	VAL	N-CA-CB	-8.02	99.98	111.21
1	E	124	PHE	CB-CA-C	7.65	122.74	110.96
1	C	55	VAL	N-CA-CB	-6.92	101.52	111.21
1	A	123	ILE	N-CA-C	6.54	117.62	111.48
1	C	204	LYS	CB-CA-C	6.32	121.38	110.01
1	E	81	ASN	CB-CA-C	6.23	121.08	110.56
1	A	123	ILE	CB-CA-C	-6.21	106.43	111.71
1	E	123	ILE	CB-CA-C	-5.58	106.97	111.71

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	123	ILE	N-CA-C	5.57	116.71	111.48
1	D	123	ILE	CB-CA-C	-5.55	106.99	111.71
1	A	116	SER	CB-CA-C	-5.43	102.35	110.88
1	A	125	LYS	CA-C-N	5.40	127.52	120.28
1	A	125	LYS	C-N-CA	5.40	127.52	120.28
1	A	197	GLU	CA-CB-CG	5.25	124.61	114.10
1	D	190	THR	CA-C-N	5.22	128.00	120.38
1	D	190	THR	C-N-CA	5.22	128.00	120.38
1	B	127	ILE	N-CA-CB	5.19	116.70	110.31
1	C	82	GLN	CA-CB-CG	5.12	124.35	114.10
1	C	130	LEU	N-CA-C	5.11	121.69	110.80

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts ⓘ

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1665	0	1604	10	0
1	B	1663	0	1614	13	0
1	C	1618	0	1540	14	0
1	D	1617	0	1524	8	0
1	E	1643	0	1569	13	0
1	F	1594	0	1513	8	0
2	A	64	0	36	3	0
2	B	32	0	18	1	0
2	C	54	0	25	2	0
2	D	32	0	17	0	0
2	E	32	0	18	1	0
2	F	32	0	19	0	0
3	A	4	0	3	0	0
3	B	4	0	3	0	0
3	C	4	0	3	0	0
3	D	4	0	3	0	0
3	E	4	0	3	0	0
3	F	4	0	3	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	A	79	0	0	1	0
4	B	55	0	0	1	0
4	C	52	0	0	1	0
4	D	42	0	0	1	0
4	E	42	0	0	1	0
4	F	55	0	0	0	0
All	All	10395	0	9515	51	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 3.

All (51) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:36:LEU:HB3	1:C:127:ILE:HG12	1.56	0.86
1:A:124[A]:PHE:CD2	1:E:128:TYR:CE1	2.74	0.76
1:A:124[A]:PHE:CD2	1:E:128:TYR:HE1	2.10	0.69
1:E:49:ARG:HH11	1:E:49:ARG:HG2	1.59	0.68
1:B:127:ILE:O	1:B:128:TYR:HB2	1.92	0.68
1:D:126:SER:CB	1:F:37:LYS:HB3	2.25	0.66
1:E:49:ARG:HG2	1:E:49:ARG:NH1	2.12	0.65
1:C:9:HIS:CD2	1:C:11:ALA:H	2.16	0.62
1:B:127:ILE:O	1:B:128:TYR:CB	2.48	0.62
1:C:125:LYS:HG2	1:C:130:LEU:HD12	1.81	0.61
2:A:1213:QCT:H15	1:B:64:LYS:O	2.01	0.61
1:E:81:ASN:HD22	1:E:81:ASN:C	2.09	0.60
1:A:108:ASP:OD1	1:B:109:HIS:HE1	1.87	0.58
1:C:9:HIS:HD2	1:C:11:ALA:H	1.52	0.57
1:A:124[A]:PHE:CE2	1:E:128:TYR:HE1	2.24	0.56
1:D:88:GLN:HG2	1:D:96:GLN:HB3	1.87	0.56
1:E:88:GLN:HG2	1:E:96:GLN:HB3	1.88	0.56
1:F:120:PHE:O	1:F:124:PHE:CD2	2.59	0.56
1:F:88:GLN:HG2	1:F:96:GLN:HB3	1.87	0.55
1:A:17:ARG:NH2	4:A:2010:HOH:O	2.39	0.55
1:B:88:GLN:HG2	1:B:96:GLN:HB3	1.89	0.54
1:A:88:GLN:HG2	1:A:96:GLN:HB3	1.89	0.53
1:E:108:ASP:OD1	1:F:109:HIS:HE1	1.93	0.52
1:C:102:ILE:HD11	1:D:65:LEU:HD23	1.92	0.51
1:C:102:ILE:HD11	1:D:65:LEU:CD2	2.40	0.51
1:F:122:GLN:O	1:F:123:ILE:C	2.51	0.51
1:A:131:THR:HG22	4:E:2016:HOH:O	2.13	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:73:GLN:NE2	2:C:1214:QCT:H8	2.28	0.49
1:A:124[A]:PHE:HD2	1:E:128:TYR:CE1	2.31	0.47
1:B:124:PHE:O	1:B:127:ILE:O	2.33	0.47
1:E:8:GLY:HA2	1:E:55:VAL:HG22	1.97	0.46
1:B:128:TYR:CZ	1:C:124:PHE:HB3	2.50	0.46
1:F:77:HIS:HE1	1:F:97:TYR:OH	1.99	0.46
1:B:33[A]:HIS:CD2	4:B:2013:HOH:O	2.70	0.45
1:A:77:HIS:HE1	1:A:97:TYR:OH	2.00	0.44
1:C:67:GLU:OE2	1:D:109:HIS:HD2	1.99	0.44
2:A:1214:QCT:H8	1:B:73:GLN:NE2	2.33	0.44
1:C:88:GLN:NE2	4:C:2035:HOH:O	2.48	0.43
1:E:77:HIS:HE1	1:E:97:TYR:OH	2.02	0.43
1:D:77:HIS:HE1	1:D:97:TYR:OH	2.01	0.43
1:E:63:LEU:HD13	1:F:95:SER:HB3	2.01	0.43
2:A:1214:QCT:C7	1:B:73:GLN:HB3	2.49	0.43
1:B:77:HIS:HE1	1:B:97:TYR:OH	2.02	0.42
1:C:77:HIS:HE1	1:C:97:TYR:OH	2.01	0.42
1:D:88:GLN:NE2	4:D:2023:HOH:O	2.49	0.42
1:B:124:PHE:CD2	1:C:128:TYR:CE1	3.08	0.42
1:D:129:GLY:HA2	1:F:36:LEU:HD23	2.02	0.41
1:A:64:LYS:O	2:B:1213:QCT:O5	2.39	0.41
1:C:73:GLN:NE2	2:C:1214:QCT:C8	2.84	0.41
1:C:129:GLY:O	1:C:130:LEU:O	2.39	0.41
1:E:154:ARG:CZ	2:E:1213:QCT:H12	2.51	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	A	210/212 (99%)	208 (99%)	2 (1%)	0	100 100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	209/212 (99%)	206 (99%)	2 (1%)	1 (0%)	24	24
1	C	209/212 (99%)	204 (98%)	4 (2%)	1 (0%)	24	24
1	D	209/212 (99%)	207 (99%)	2 (1%)	0	100	100
1	E	209/212 (99%)	205 (98%)	3 (1%)	1 (0%)	24	24
1	F	201/212 (95%)	199 (99%)	2 (1%)	0	100	100
All	All	1247/1272 (98%)	1229 (99%)	15 (1%)	3 (0%)	43	50

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	128	TYR
1	C	130	LEU
1	E	3	GLY

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	168/182 (92%)	164 (98%)	4 (2%)	43	54
1	B	171/182 (94%)	163 (95%)	8 (5%)	23	26
1	C	156/182 (86%)	151 (97%)	5 (3%)	34	43
1	D	158/182 (87%)	151 (96%)	7 (4%)	25	29
1	E	164/182 (90%)	156 (95%)	8 (5%)	22	24
1	F	158/182 (87%)	153 (97%)	5 (3%)	34	43
All	All	975/1092 (89%)	938 (96%)	37 (4%)	29	36

All (37) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	12	SER
1	A	82	GLN
1	A	88	GLN

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Mol	Chain	Res	Type
1	A	132	THR
1	B	12	SER
1	B	17	ARG
1	B	36	LEU
1	B	88	GLN
1	B	127	ILE
1	B	132	THR
1	B	154	ARG
1	B	197	GLU
1	C	12	SER
1	C	55	VAL
1	C	82	GLN
1	C	88	GLN
1	C	154	ARG
1	D	12	SER
1	D	17	ARG
1	D	36	LEU
1	D	82	GLN
1	D	88	GLN
1	D	132	THR
1	D	154	ARG
1	E	12	SER
1	E	32	VAL
1	E	55	VAL
1	E	81	ASN
1	E	82	GLN
1	E	88	GLN
1	E	132	THR
1	E	188	LEU
1	F	12	SER
1	F	17	ARG
1	F	36	LEU
1	F	82	GLN
1	F	88	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (26) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	33	HIS
1	A	77	HIS
1	A	88	GLN
1	B	73	GLN

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Mol	Chain	Res	Type
1	B	77	HIS
1	B	88	GLN
1	B	109	HIS
1	B	122	GLN
1	C	9	HIS
1	C	33	HIS
1	C	73	GLN
1	C	77	HIS
1	C	88	GLN
1	D	77	HIS
1	D	88	GLN
1	D	109	HIS
1	E	73	GLN
1	E	77	HIS
1	E	81	ASN
1	E	88	GLN
1	E	105	GLN
1	F	73	GLN
1	F	77	HIS
1	F	88	GLN
1	F	109	HIS
1	F	122	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

14 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and

the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	QCT	E	1213	-	35,35,35	1.72	8 (22%)	53,53,53	2.06	13 (24%)
3	ACT	B	1214	-	3,3,3	1.16	0	3,3,3	0.47	0
2	QCT	B	1213	-	35,35,35	1.19	5 (14%)	53,53,53	1.54	11 (20%)
2	QCT	D	1213	-	35,35,35	1.42	6 (17%)	53,53,53	1.76	13 (24%)
2	QCT	A	1214	-	35,35,35	1.59	6 (17%)	53,53,53	1.63	13 (24%)
3	ACT	C	1215	-	3,3,3	1.04	0	3,3,3	1.29	0
2	QCT	F	1213	-	35,35,35	1.63	10 (28%)	53,53,53	1.89	16 (30%)
2	QCT	A	1213	-	35,35,35	1.51	8 (22%)	53,53,53	1.40	8 (15%)
3	ACT	E	1214	-	3,3,3	0.95	0	3,3,3	1.30	0
3	ACT	F	1214	-	3,3,3	0.98	0	3,3,3	1.10	0
3	ACT	A	1215	-	3,3,3	0.61	0	3,3,3	1.80	1 (33%)
2	QCT	C	1214	-	24,24,35	1.90	6 (25%)	36,36,53	1.80	10 (27%)
3	ACT	D	1214	-	3,3,3	1.19	0	3,3,3	1.51	0
2	QCT	C	1213	-	35,35,35	1.36	4 (11%)	53,53,53	1.58	10 (18%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	QCT	E	1213	-	-	2/8/28/28	0/4/4/4
2	QCT	B	1213	-	-	2/8/28/28	0/4/4/4
2	QCT	D	1213	-	-	1/8/28/28	0/4/4/4
2	QCT	A	1214	-	-	0/8/28/28	0/4/4/4
2	QCT	F	1213	-	-	0/8/28/28	0/4/4/4
2	QCT	A	1213	-	-	2/8/28/28	0/4/4/4
2	QCT	C	1214	-	-	0/4/4/28	0/3/3/4
2	QCT	C	1213	-	-	2/8/28/28	0/4/4/4

All (53) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	1214	QCT	C3-C2	6.06	1.42	1.36

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1213	QCT	C11-C2	-4.46	1.40	1.47
2	C	1213	QCT	C11-C2	-3.91	1.41	1.47
2	E	1213	QCT	C11-C2	-3.61	1.41	1.47
2	E	1213	QCT	O8-C21	3.47	1.50	1.41
2	A	1214	QCT	C11-C2	-3.44	1.42	1.47
2	C	1213	QCT	O7-C21	3.34	1.49	1.43
2	D	1213	QCT	C11-C2	-3.26	1.42	1.47
2	A	1214	QCT	C24-C23	3.15	1.60	1.52
2	C	1214	QCT	C16-C11	3.10	1.44	1.39
2	E	1213	QCT	O8-C25	3.06	1.51	1.44
2	F	1213	QCT	C16-C11	3.01	1.44	1.39
2	A	1213	QCT	O7-C21	2.94	1.48	1.43
2	B	1213	QCT	C11-C2	-2.92	1.43	1.47
2	F	1213	QCT	O1-C2	-2.83	1.34	1.37
2	D	1213	QCT	C24-C25	2.80	1.59	1.52
2	F	1213	QCT	C11-C2	-2.80	1.43	1.47
2	E	1213	QCT	O7-C21	2.77	1.48	1.43
2	D	1213	QCT	O1-C2	2.74	1.40	1.37
2	A	1213	QCT	C3-C4	-2.69	1.38	1.47
2	A	1214	QCT	O9-C22	2.66	1.49	1.43
2	C	1214	QCT	C6-C5	2.59	1.42	1.38
2	A	1214	QCT	O8-C21	2.58	1.48	1.41
2	E	1213	QCT	C16-C15	2.56	1.42	1.38
2	B	1213	QCT	C10-C4	-2.52	1.40	1.46
2	A	1213	QCT	C10-C4	-2.52	1.40	1.46
2	E	1213	QCT	C8-C7	2.51	1.42	1.39
2	D	1213	QCT	C3-C4	-2.49	1.39	1.47
2	F	1213	QCT	O8-C21	2.47	1.48	1.41
2	F	1213	QCT	C6-C5	2.45	1.42	1.38
2	B	1213	QCT	O1-C2	2.43	1.40	1.37
2	F	1213	QCT	C10-C5	2.43	1.45	1.41
2	C	1214	QCT	C12-C11	2.42	1.43	1.39
2	E	1213	QCT	C8-C9	2.40	1.42	1.38
2	F	1213	QCT	C24-C23	2.38	1.58	1.52
2	C	1214	QCT	C11-C2	-2.38	1.43	1.47
2	F	1213	QCT	O7-C21	2.36	1.47	1.43
2	A	1214	QCT	C10-C5	2.35	1.45	1.41
2	B	1213	QCT	O7-C21	2.30	1.47	1.43
2	E	1213	QCT	O1-C2	2.29	1.40	1.37
2	D	1213	QCT	C10-C4	-2.28	1.40	1.46
2	F	1213	QCT	C8-C9	2.27	1.42	1.38
2	C	1213	QCT	C3-C4	-2.21	1.40	1.47

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1213	QCT	C15-C14	-2.20	1.35	1.39
2	A	1214	QCT	C16-C11	2.20	1.42	1.39
2	F	1213	QCT	C10-C4	-2.18	1.41	1.46
2	A	1213	QCT	C3-C2	2.17	1.41	1.37
2	C	1213	QCT	O8-C21	2.15	1.47	1.41
2	A	1213	QCT	O8-C21	2.12	1.47	1.41
2	C	1214	QCT	C6-C7	2.09	1.42	1.39
2	D	1213	QCT	C3-C2	2.08	1.41	1.37
2	A	1213	QCT	C21-C22	2.03	1.58	1.52
2	B	1213	QCT	C3-C2	2.02	1.41	1.37

All (95) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	1214	QCT	O1-C2-C3	-6.12	114.39	120.19
2	E	1213	QCT	O1-C2-C11	5.93	119.18	110.87
2	D	1213	QCT	O1-C2-C11	5.34	118.35	110.87
2	E	1213	QCT	C11-C2-C3	-4.88	122.18	128.52
2	F	1213	QCT	O1-C2-C3	-4.85	114.33	120.44
2	E	1213	QCT	C11-C12-C13	4.85	124.32	120.09
2	F	1213	QCT	C16-C15-C14	-4.63	115.87	120.50
2	B	1213	QCT	O1-C2-C11	4.61	117.33	110.87
2	E	1213	QCT	O1-C9-C8	4.58	122.32	115.83
2	C	1213	QCT	O8-C21-O7	4.47	119.76	107.90
2	A	1214	QCT	O1-C2-C3	-4.44	114.85	120.44
2	D	1213	QCT	O1-C9-C8	4.20	121.79	115.83
2	B	1213	QCT	C16-C15-C14	-3.88	116.62	120.50
2	C	1213	QCT	O1-C2-C11	3.85	116.27	110.87
2	E	1213	QCT	O8-C21-O7	3.80	117.99	107.90
2	E	1213	QCT	C16-C11-C2	3.55	125.93	120.71
2	A	1214	QCT	O8-C21-O7	3.53	117.26	107.90
2	D	1213	QCT	O1-C2-C3	-3.47	116.06	120.44
2	B	1213	QCT	C15-C16-C11	3.47	124.51	120.80
2	F	1213	QCT	C21-O8-C25	3.46	119.53	113.63
2	A	1213	QCT	C21-O7-C3	3.44	123.38	115.60
2	E	1213	QCT	C21-O7-C3	3.35	123.17	115.60
2	A	1213	QCT	O1-C2-C11	3.29	115.48	110.87
2	D	1213	QCT	O8-C21-O7	3.23	116.47	107.90
2	A	1214	QCT	C5-C10-C4	3.22	126.22	121.45
2	C	1214	QCT	C5-C10-C4	3.15	126.10	121.45
2	F	1213	QCT	O7-C3-C2	-3.10	115.84	119.80
2	D	1213	QCT	C21-O7-C3	3.02	122.42	115.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	1213	QCT	C11-C2-C3	-3.02	124.61	128.52
2	A	1214	QCT	C9-O1-C2	2.99	125.26	120.67
2	E	1213	QCT	O1-C9-C10	-2.97	118.28	121.19
2	F	1213	QCT	C23-C24-C25	2.93	114.27	109.81
2	D	1213	QCT	O1-C9-C10	-2.88	118.36	121.19
2	E	1213	QCT	C21-O8-C25	2.87	118.54	113.63
2	F	1213	QCT	C5-C10-C4	2.84	125.65	121.45
2	F	1213	QCT	C15-C16-C11	2.79	123.78	120.80
2	C	1213	QCT	C21-O7-C3	2.79	121.90	115.60
2	D	1213	QCT	C11-C2-C3	-2.78	124.91	128.52
2	A	1213	QCT	O1-C9-C8	2.76	119.74	115.83
2	C	1214	QCT	C2-C3-C4	2.70	123.45	121.52
2	B	1213	QCT	C12-C13-C14	2.67	122.36	119.89
2	D	1213	QCT	C6-C5-C10	2.66	123.90	120.92
2	A	1214	QCT	O1-C9-C8	2.66	119.61	115.83
2	E	1213	QCT	C12-C11-C2	-2.63	116.94	120.65
2	C	1213	QCT	O1-C9-C8	2.62	119.55	115.83
2	A	1213	QCT	C21-O8-C25	2.59	118.05	113.63
2	F	1213	QCT	C9-O1-C2	2.58	124.63	120.67
2	A	1213	QCT	O1-C9-C10	-2.58	118.66	121.19
2	B	1213	QCT	C21-O7-C3	2.57	121.41	115.60
2	B	1213	QCT	C12-C11-C2	2.56	124.27	120.65
2	C	1214	QCT	C9-C10-C4	-2.55	116.95	120.03
2	C	1214	QCT	C9-O1-C2	2.54	124.56	120.67
2	C	1213	QCT	O1-C2-C3	-2.52	117.26	120.44
2	F	1213	QCT	O8-C21-O7	2.51	114.55	107.90
3	A	1215	ACT	OXT-C-CH3	2.50	125.55	115.05
2	F	1213	QCT	C2-C3-C4	2.49	124.64	122.02
2	D	1213	QCT	C21-O8-C25	2.46	117.84	113.63
2	F	1213	QCT	C15-C14-C13	2.45	122.27	119.66
2	C	1213	QCT	C12-C11-C2	-2.45	117.20	120.65
2	B	1213	QCT	O1-C2-C3	-2.44	117.37	120.44
2	A	1214	QCT	C23-C24-C25	2.44	113.52	109.81
2	A	1213	QCT	O3-C5-C10	-2.42	116.66	121.14
2	E	1213	QCT	O1-C2-C3	-2.42	117.39	120.44
2	C	1213	QCT	C11-C12-C13	2.40	122.19	120.09
2	F	1213	QCT	O1-C2-C11	2.37	114.19	110.87
2	C	1213	QCT	C24-C23-C22	2.34	114.94	110.83
2	E	1213	QCT	O3-C5-C10	-2.32	116.85	121.14
2	D	1213	QCT	C16-C11-C2	2.32	124.11	120.71
2	D	1213	QCT	C10-C4-C3	2.31	119.98	115.66
2	A	1214	QCT	O10-C23-C24	2.30	115.80	110.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	1214	QCT	C16-C15-C14	-2.28	118.22	120.50
2	A	1213	QCT	O8-C25-C24	2.26	113.62	109.55
2	B	1213	QCT	O1-C9-C8	2.23	119.00	115.83
2	D	1213	QCT	C16-C11-C12	-2.23	116.67	119.25
2	C	1213	QCT	C23-C24-C25	2.22	113.18	109.81
2	A	1214	QCT	C9-C10-C4	-2.21	117.36	120.03
2	C	1214	QCT	C16-C11-C2	2.20	123.94	120.71
2	A	1213	QCT	C23-C24-C25	-2.18	106.50	109.81
2	C	1214	QCT	O7-C3-C2	-2.18	118.49	120.74
2	C	1213	QCT	C16-C11-C2	2.17	123.90	120.71
2	F	1213	QCT	O6-C14-C13	-2.16	112.65	118.42
2	C	1214	QCT	O1-C2-C11	2.15	113.88	110.87
2	F	1213	QCT	O6-C14-C15	2.13	125.07	119.36
2	B	1213	QCT	C11-C12-C13	-2.13	118.23	120.09
2	A	1214	QCT	O11-C24-C25	-2.11	105.08	109.74
2	A	1214	QCT	C16-C11-C2	2.10	123.80	120.71
2	A	1214	QCT	C12-C11-C2	-2.10	117.69	120.65
2	A	1214	QCT	C10-C4-C3	2.09	119.57	115.66
2	C	1214	QCT	C11-C2-C3	2.07	131.70	128.44
2	A	1214	QCT	C16-C15-C14	-2.07	118.43	120.50
2	E	1213	QCT	O8-C25-C26	2.07	111.33	106.74
2	B	1213	QCT	C16-C11-C2	-2.06	117.68	120.71
2	F	1213	QCT	C12-C13-C14	2.06	121.79	119.89
2	D	1213	QCT	C5-C6-C7	-2.05	117.78	119.67
2	F	1213	QCT	C11-C2-C3	2.01	131.12	128.52

There are no chirality outliers.

All (9) torsion outliers are listed below:

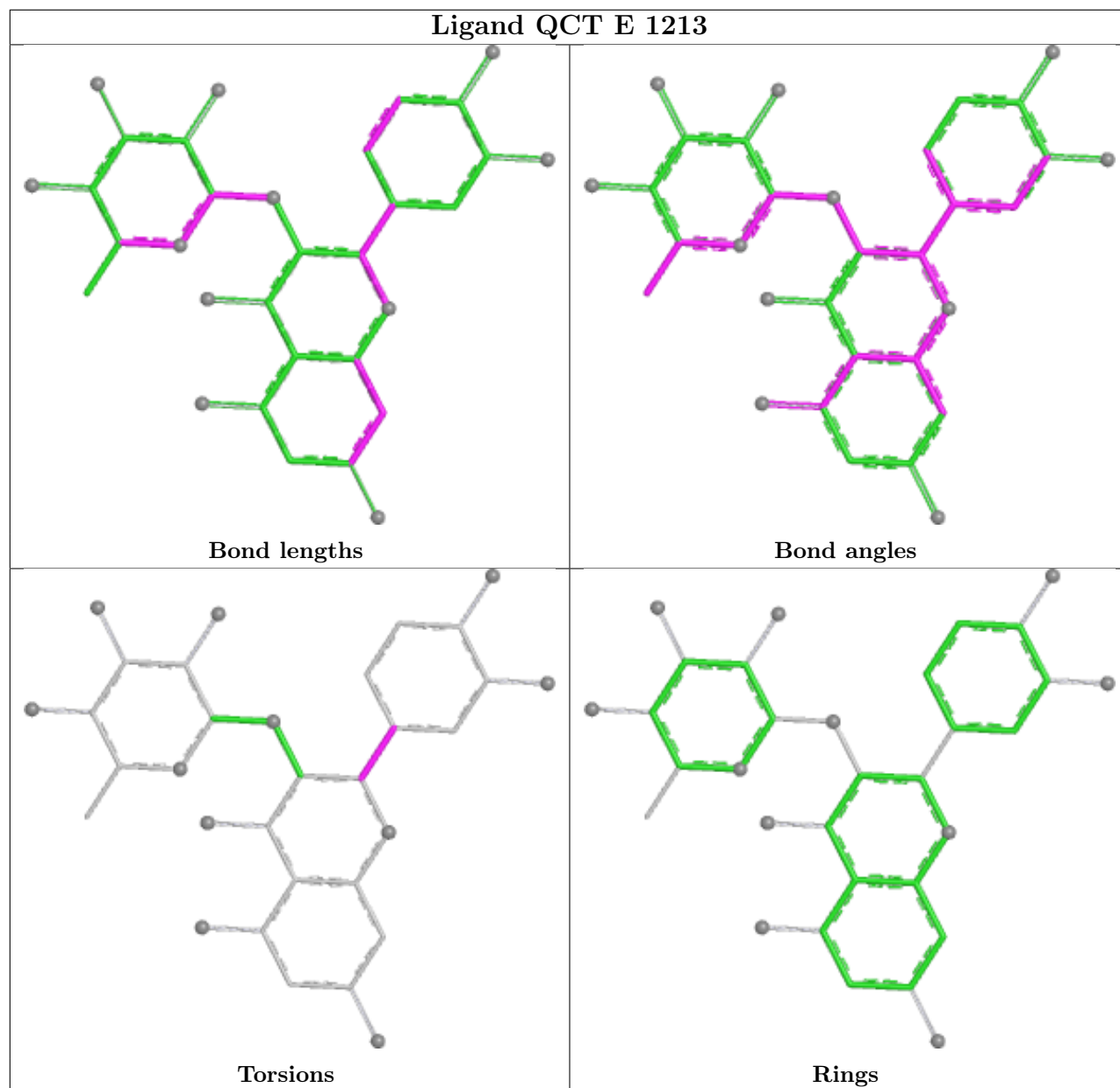
Mol	Chain	Res	Type	Atoms
2	E	1213	QCT	C12-C11-C2-C3
2	E	1213	QCT	C16-C11-C2-C3
2	B	1213	QCT	C16-C11-C2-C3
2	B	1213	QCT	C12-C11-C2-C3
2	A	1213	QCT	C12-C11-C2-C3
2	C	1213	QCT	C12-C11-C2-C3
2	A	1213	QCT	C16-C11-C2-C3
2	C	1213	QCT	C16-C11-C2-C3
2	D	1213	QCT	C12-C11-C2-C3

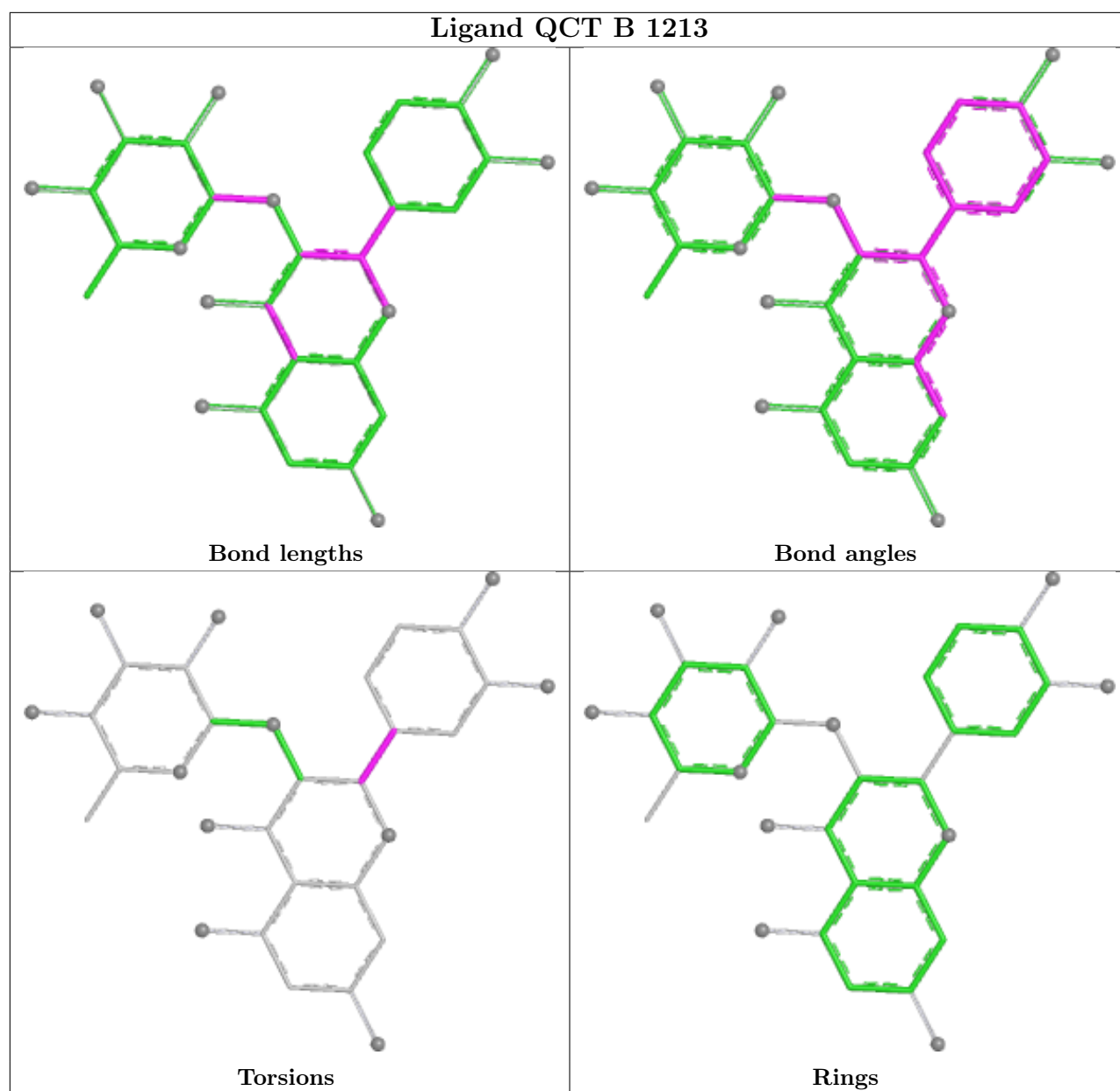
There are no ring outliers.

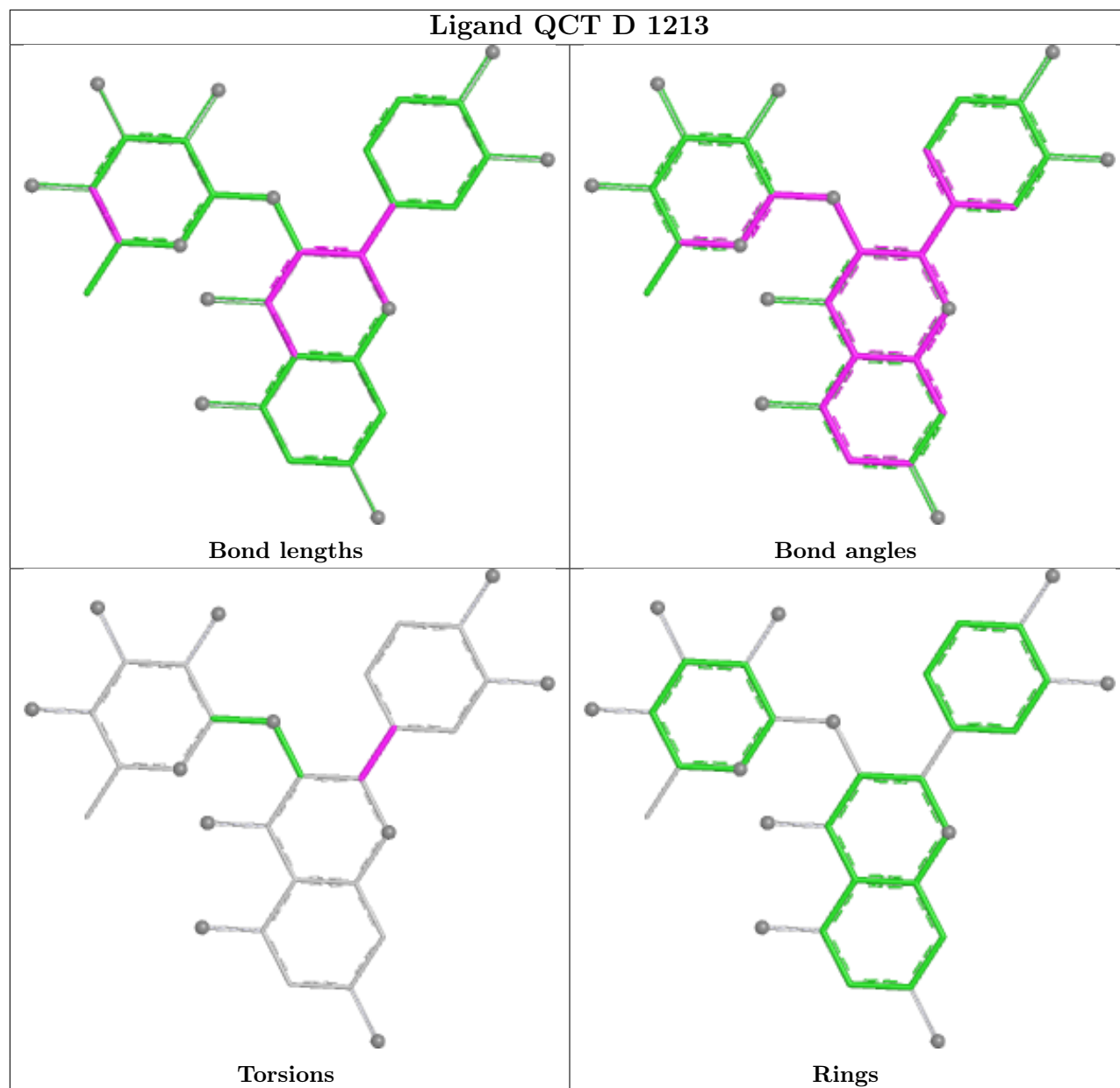
5 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	E	1213	QCT	1	0
2	B	1213	QCT	1	0
2	A	1214	QCT	2	0
2	A	1213	QCT	1	0
2	C	1214	QCT	2	0

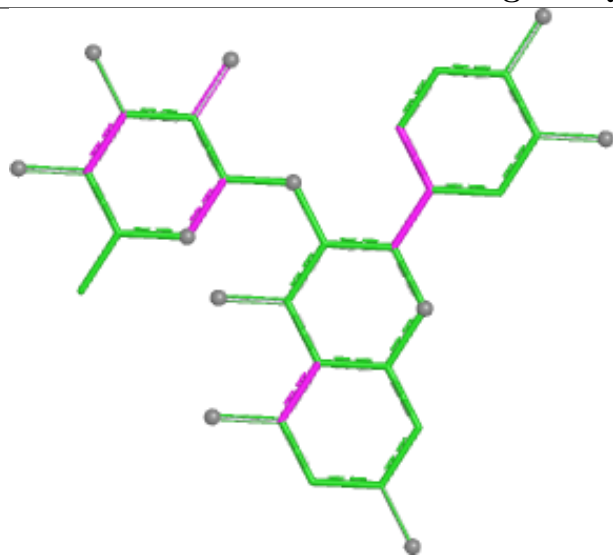
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



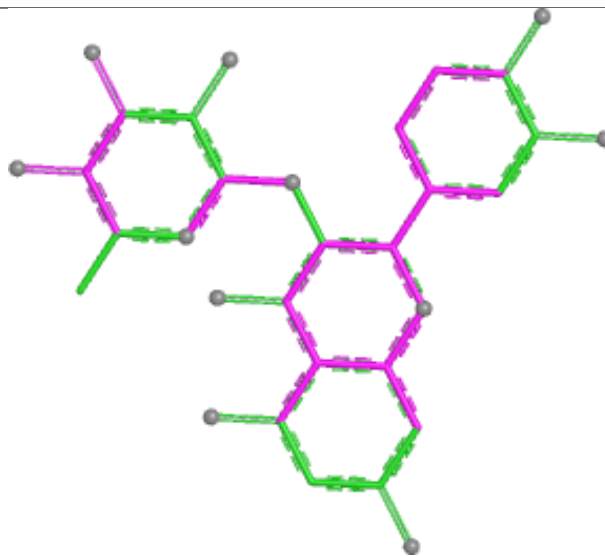




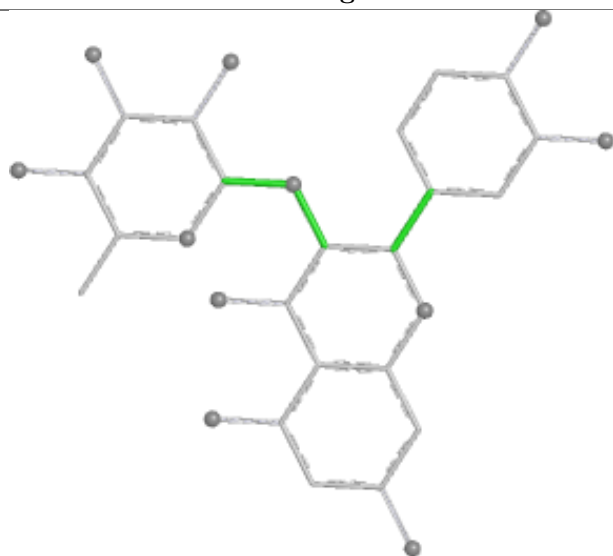
Ligand QCT A 1214



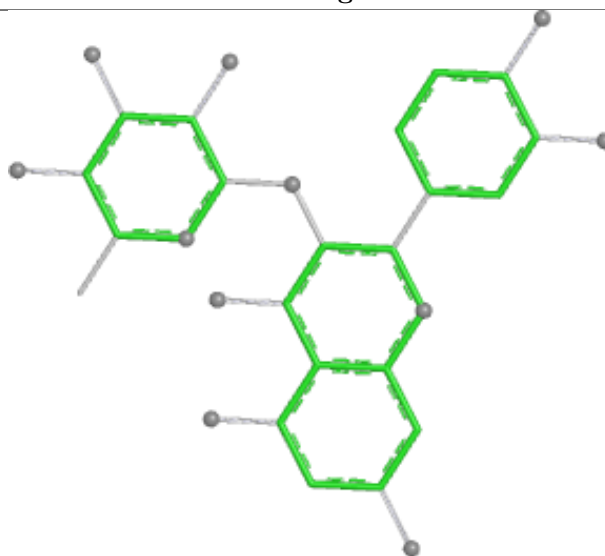
Bond lengths



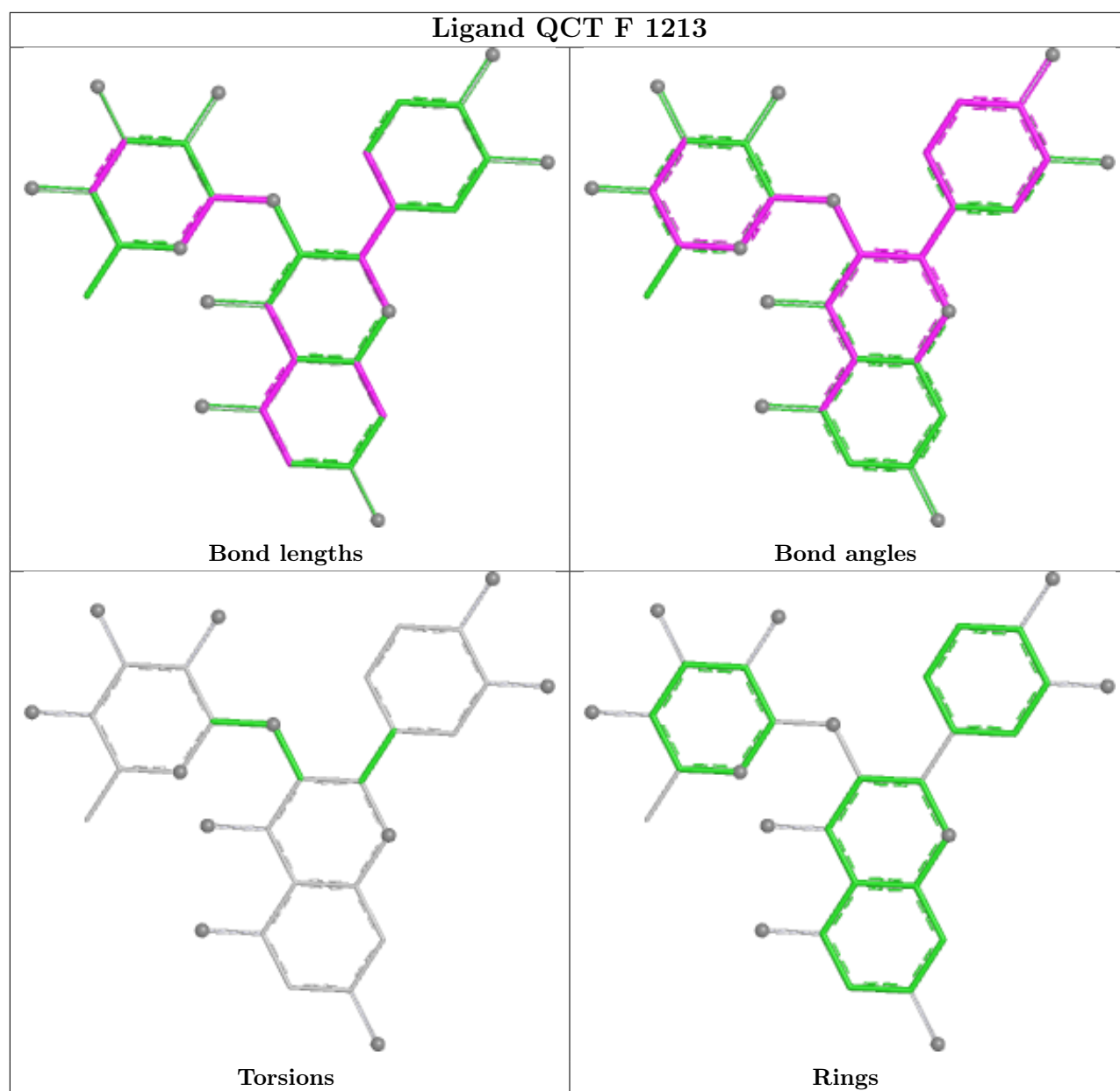
Bond angles

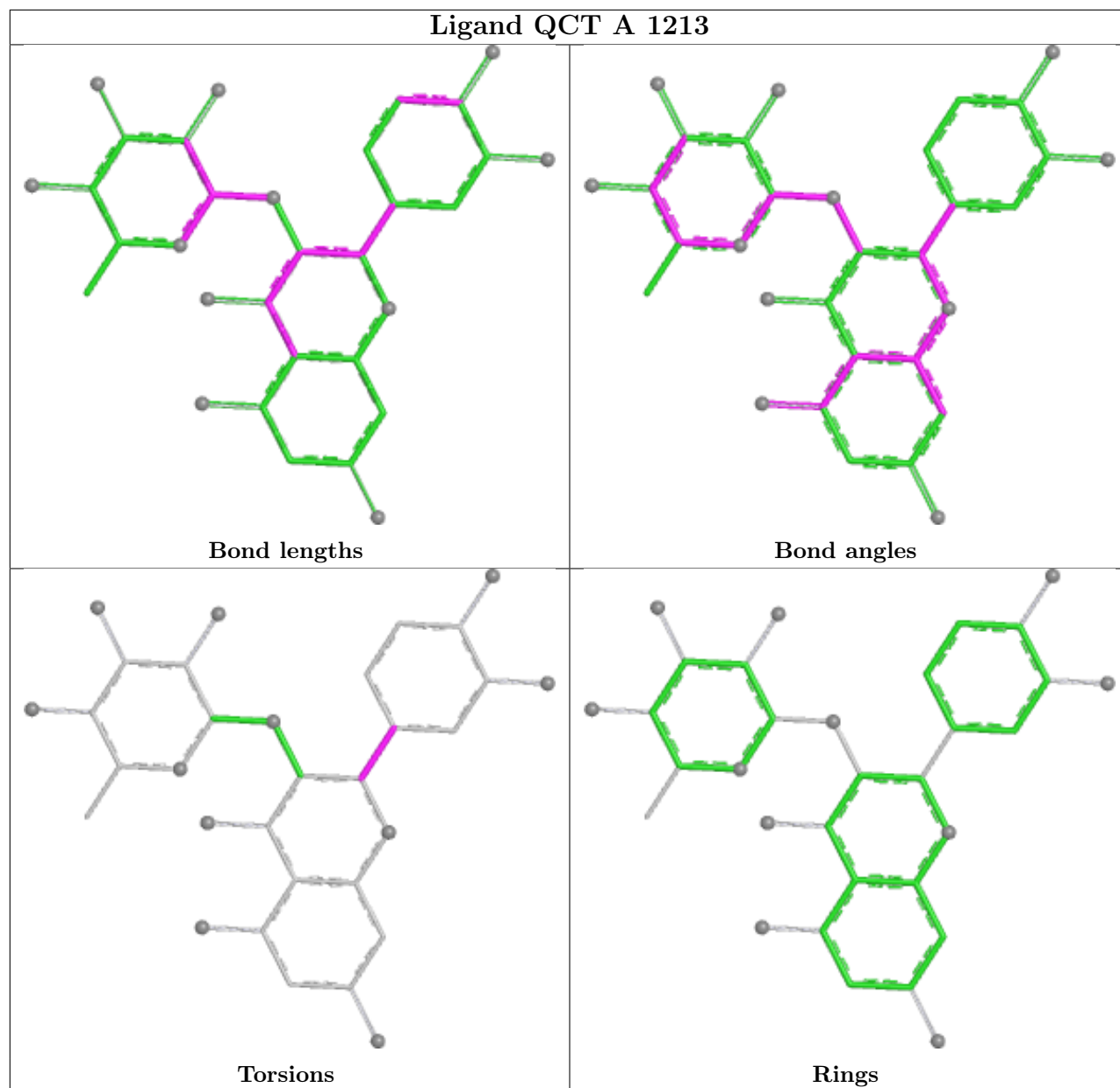


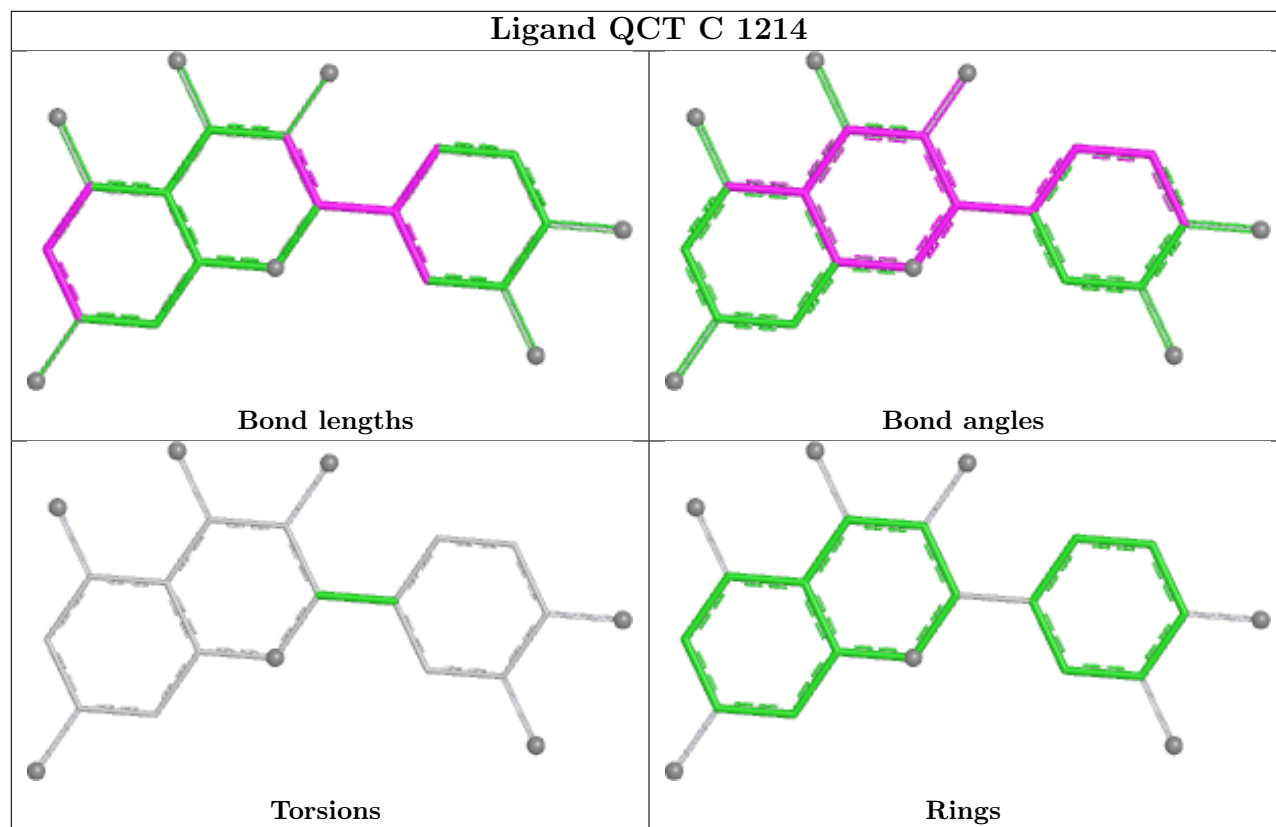
Torsions

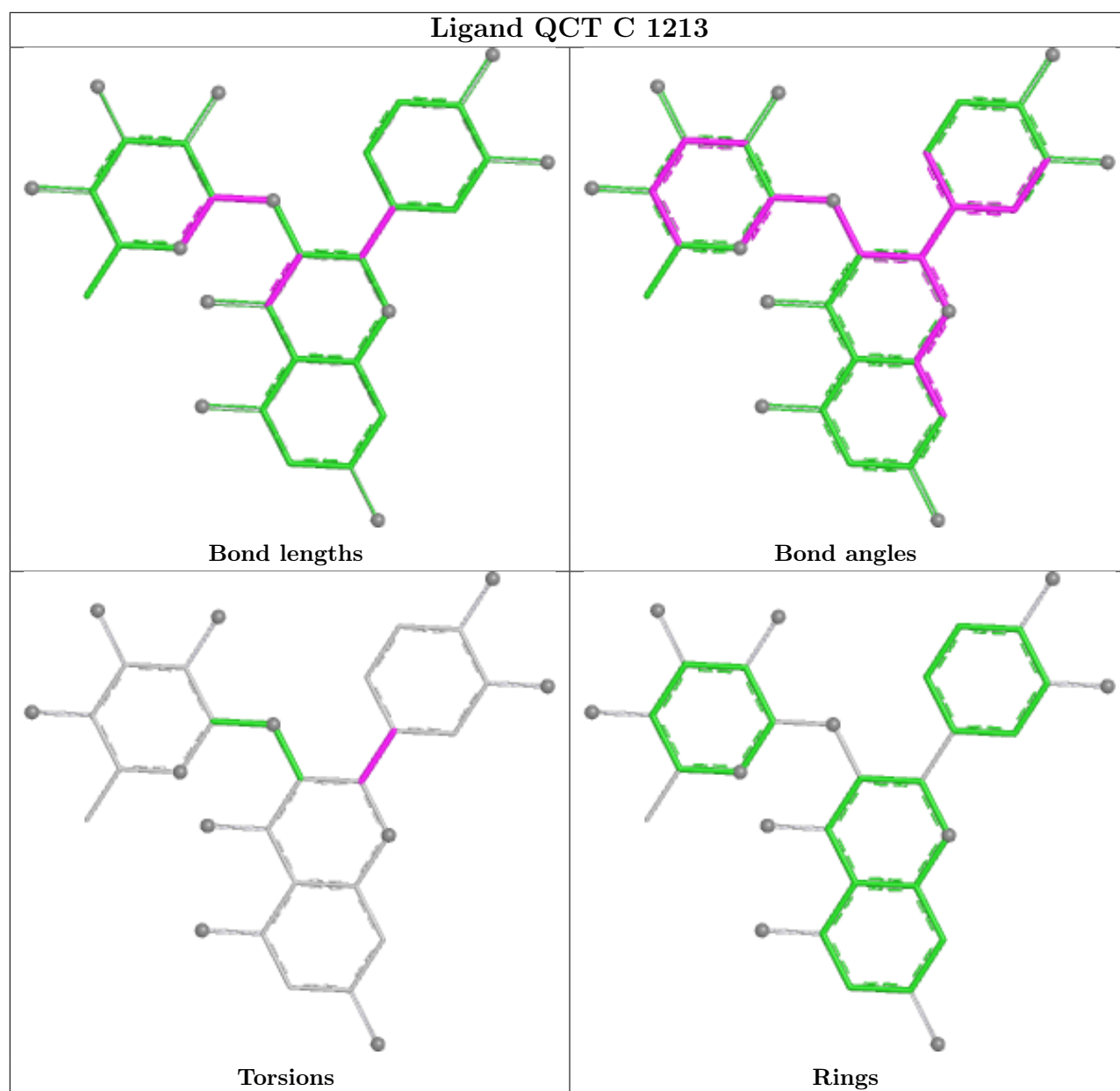


Rings









5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	211/212 (99%)	-0.05	1 (0%) 87 88	19, 34, 47, 57	1 (0%)
1	B	210/212 (99%)	-0.03	6 (2%) 53 54	16, 35, 63, 86	1 (0%)
1	C	211/212 (99%)	0.52	17 (8%) 18 16	23, 42, 70, 85	0
1	D	211/212 (99%)	0.52	16 (7%) 20 18	22, 42, 68, 77	0
1	E	211/212 (99%)	0.33	7 (3%) 49 49	23, 40, 59, 69	0
1	F	204/212 (96%)	0.17	14 (6%) 23 21	21, 35, 64, 80	1 (0%)
All	All	1258/1272 (98%)	0.24	61 (4%) 35 35	16, 37, 65, 86	3 (0%)

All (61) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	F	120	PHE	4.4
1	C	193	PRO	3.8
1	D	62	ASP	3.7
1	F	123	ILE	3.5
1	C	130	LEU	3.5
1	F	130	LEU	3.5
1	D	2	ALA	3.4
1	B	128	TYR	3.4
1	C	127	ILE	3.3
1	D	128	TYR	3.3
1	C	2	ALA	3.2
1	D	39	GLY	3.2
1	D	38	ASP	3.1
1	F	124	PHE	3.0
1	F	138	ALA	3.0
1	F	137	VAL	3.0
1	D	45	PRO	3.0
1	C	129	GLY	2.9
1	D	127	ILE	2.9

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Mol	Chain	Res	Type	RSRZ
1	D	154	ARG	2.8
1	C	189	PHE	2.8
1	B	129	GLY	2.8
1	C	120	PHE	2.7
1	F	126	SER	2.7
1	C	124	PHE	2.7
1	E	31	LEU	2.7
1	A	124[A]	PHE	2.6
1	F	119	ALA	2.6
1	D	81	ASN	2.5
1	E	33	HIS	2.5
1	D	158	PHE	2.5
1	B	130	LEU	2.5
1	C	132	THR	2.5
1	C	191	GLU	2.5
1	B	127	ILE	2.4
1	E	130	LEU	2.4
1	D	124	PHE	2.4
1	D	26	ASN	2.4
1	E	92	LYS	2.4
1	D	53	GLY	2.3
1	D	131	THR	2.3
1	C	194	ARG	2.3
1	C	136	VAL	2.3
1	F	38	ASP	2.3
1	F	139	GLU	2.3
1	E	81	ASN	2.2
1	C	128	TYR	2.2
1	C	153	ALA	2.2
1	E	129	GLY	2.2
1	F	41	HIS	2.2
1	C	158	PHE	2.2
1	F	45	PRO	2.2
1	D	37	LYS	2.2
1	D	48	SER	2.2
1	E	2	ALA	2.2
1	B	136	VAL	2.1
1	C	137	VAL	2.1
1	F	36	LEU	2.1
1	B	131	THR	2.0
1	C	134	GLU	2.0
1	F	3	GLY	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

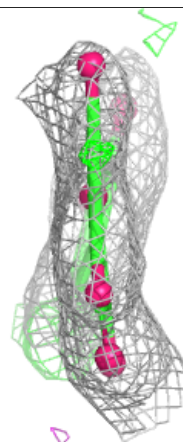
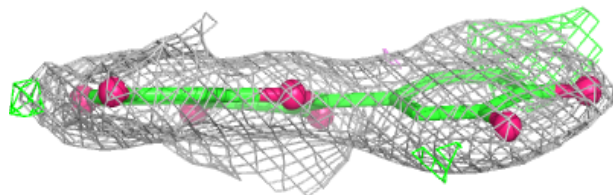
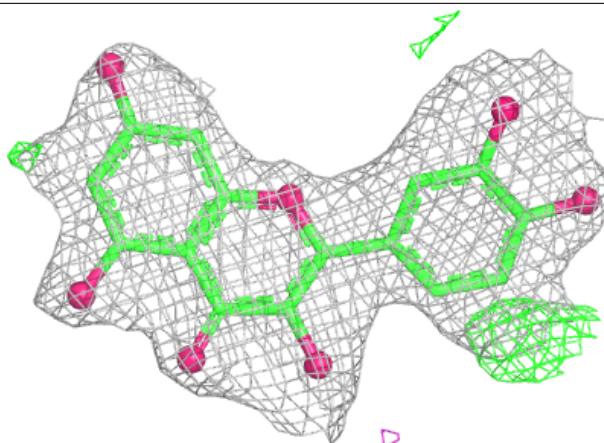
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	QCT	C	1214	22/32	0.73	0.14	51,58,66,79	0
3	ACT	D	1214	4/4	0.73	0.15	39,39,42,44	0
3	ACT	C	1215	4/4	0.75	0.16	35,38,39,40	0
3	ACT	F	1214	4/4	0.77	0.13	36,37,42,43	0
3	ACT	E	1214	4/4	0.82	0.12	24,28,28,28	0
2	QCT	E	1213	32/32	0.82	0.12	43,61,83,91	0
2	QCT	A	1214	32/32	0.85	0.11	44,50,64,70	0
2	QCT	C	1213	32/32	0.86	0.10	43,53,68,71	0
2	QCT	F	1213	32/32	0.88	0.10	30,38,57,59	0
2	QCT	D	1213	32/32	0.89	0.09	41,51,57,66	0
2	QCT	B	1213	32/32	0.90	0.09	36,43,60,62	0
2	QCT	A	1213	32/32	0.90	0.09	33,48,59,61	0
3	ACT	B	1214	4/4	0.92	0.08	33,34,36,36	0
3	ACT	A	1215	4/4	0.95	0.08	27,30,30,32	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

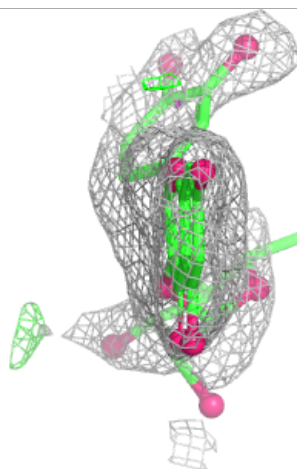
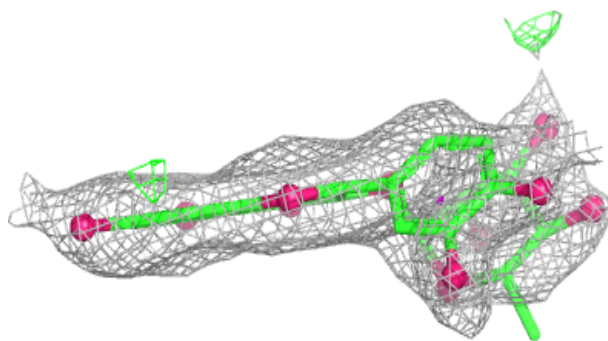
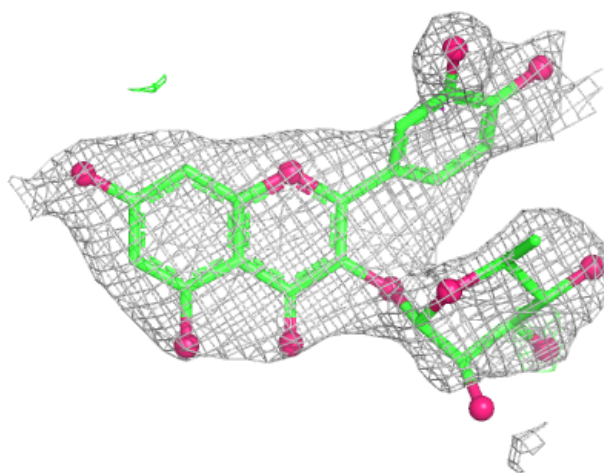
Electron density around QCT C 1214:

$2mF_o - DF_c$ (at 0.7 rmsd) in gray
 $mF_o - DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)



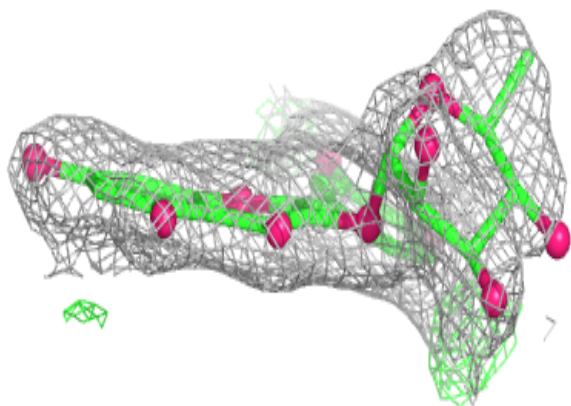
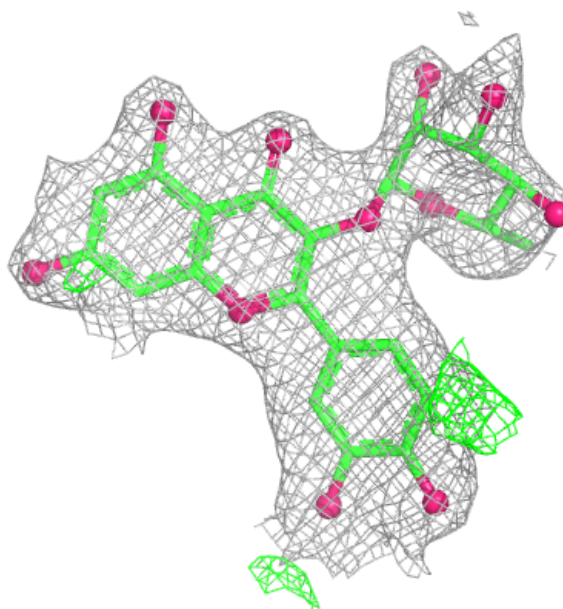
Electron density around QCT E 1213:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



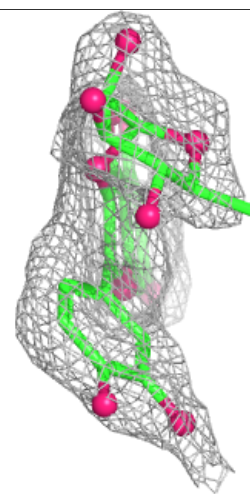
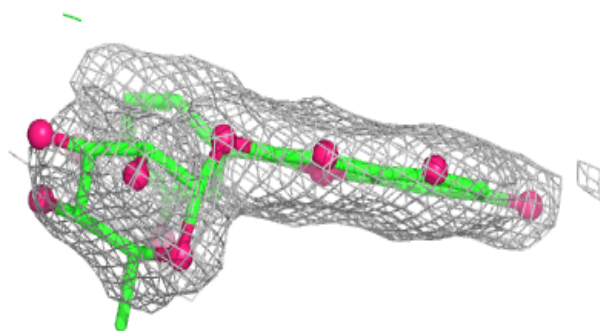
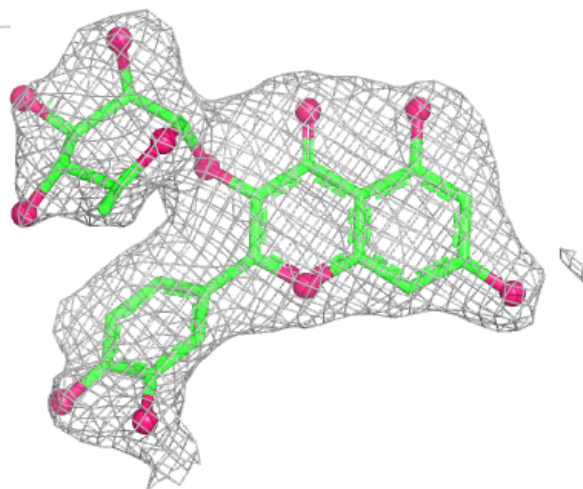
Electron density around QCT A 1214:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



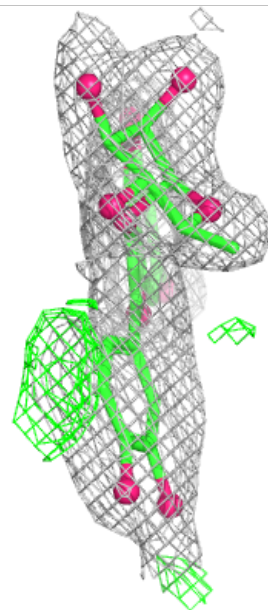
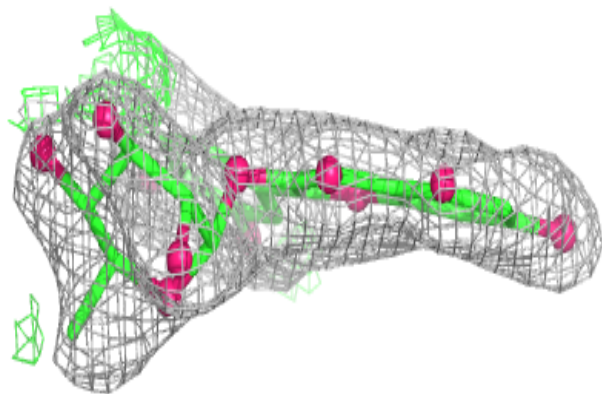
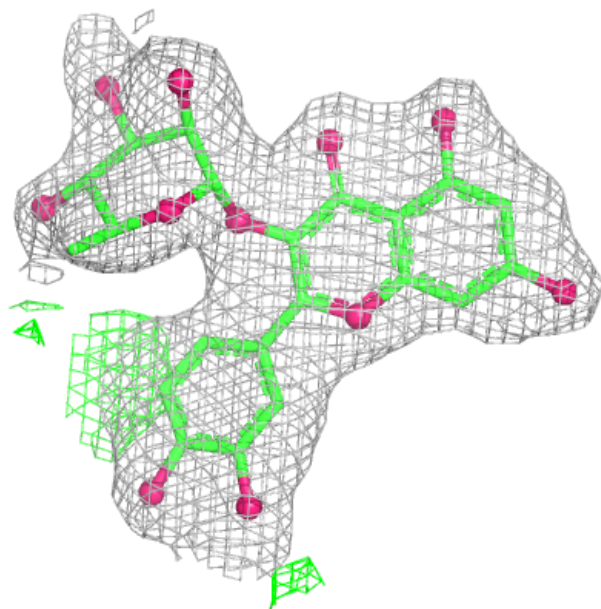
Electron density around QCT C 1213:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



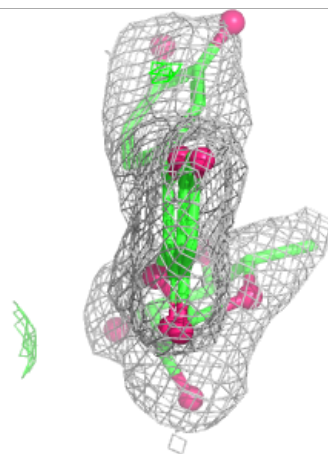
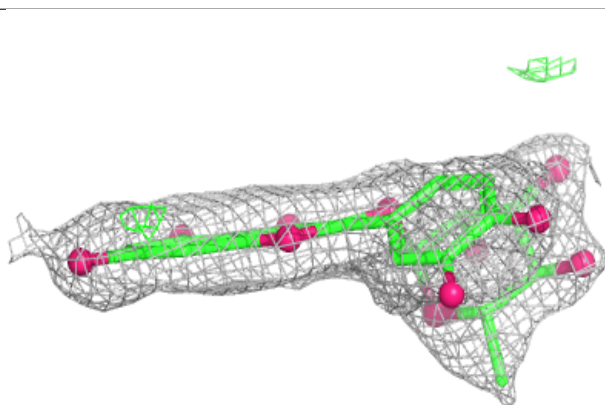
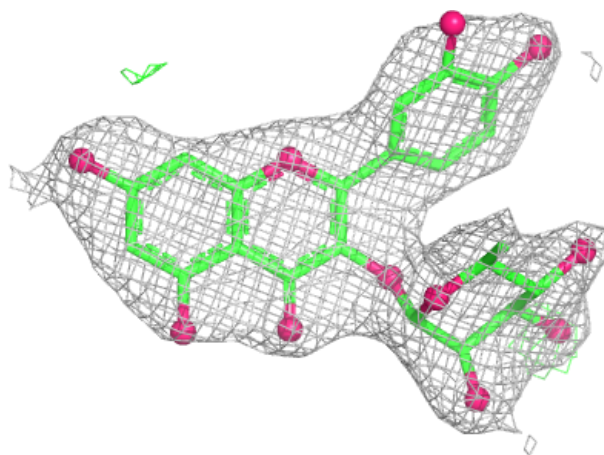
Electron density around QCT F 1213:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



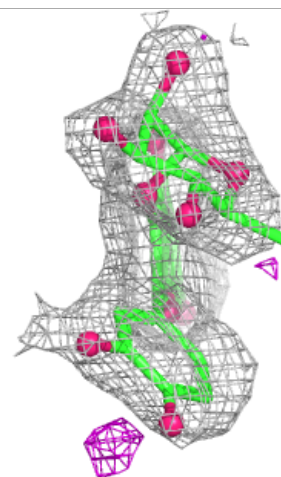
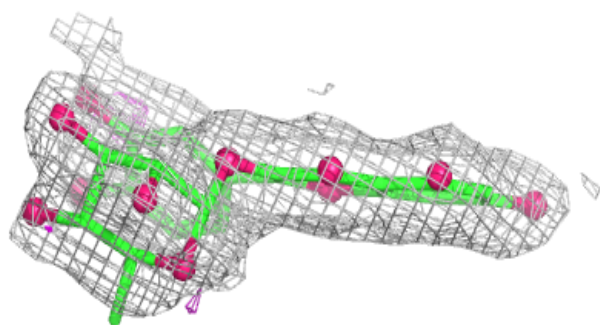
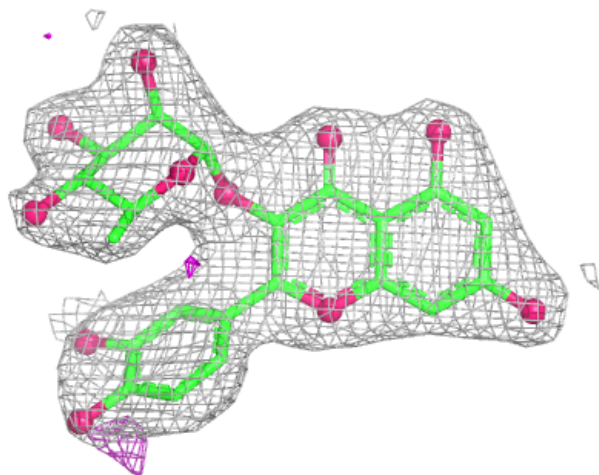
Electron density around QCT D 1213:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



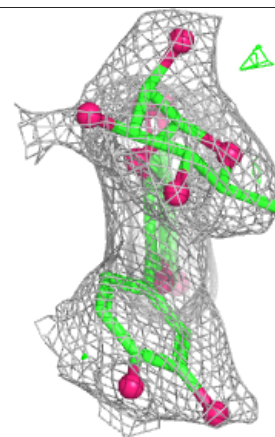
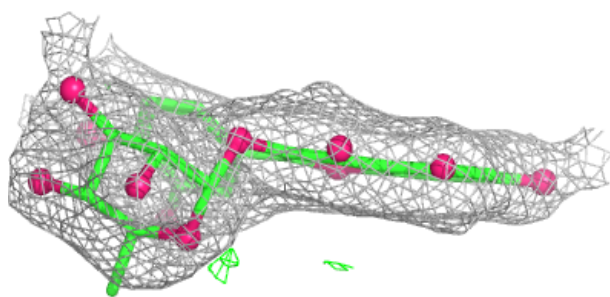
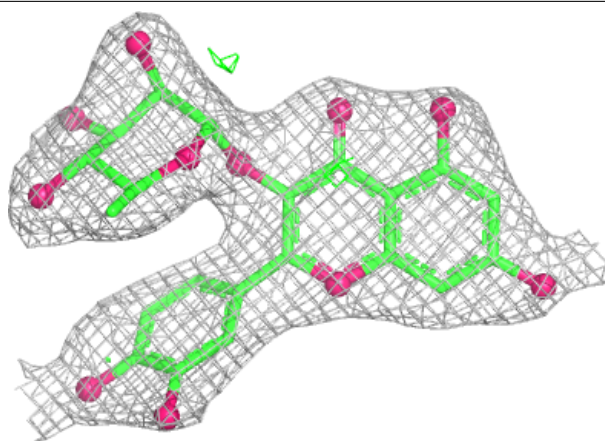
Electron density around QCT B 1213:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around QCT A 1213:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



6.5 Other polymers [i](#)

There are no such residues in this entry.