



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 10:51 AM UTC

PDB ID : 9RK4 / pdb_00009rk4
Title : Soluble domain of kuste4569, a Rieske iron-sulfur cluster protein from *Kuene-
nia stuttgartensis*
Authors : Hauser, D.; Barends, T.
Deposited on : 2025-06-12
Resolution : 2.80 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

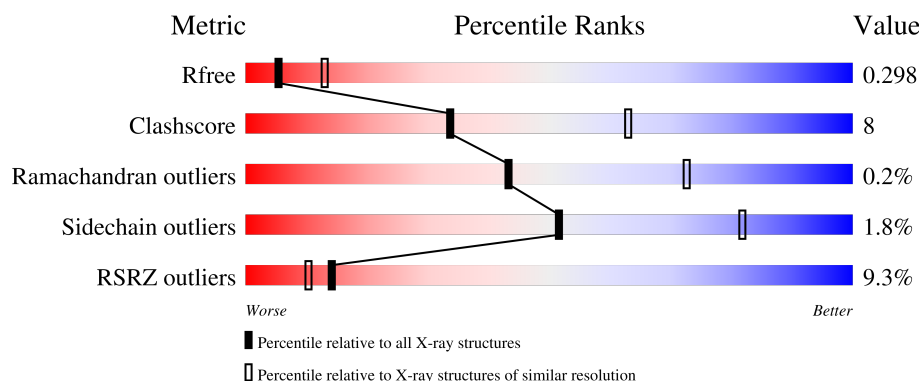
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.80 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.



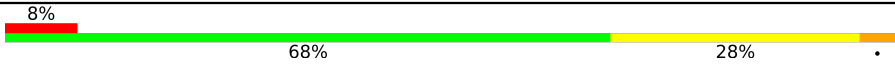
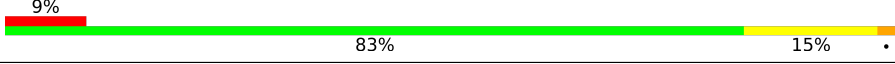
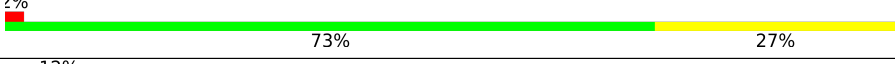
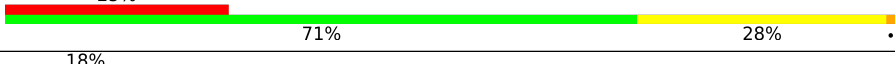
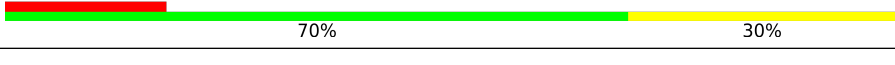
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	3866 (2.80-2.80)
Clashscore	190562	4276 (2.80-2.80)
Ramachandran outliers	187476	4196 (2.80-2.80)
Sidechain outliers	187428	4198 (2.80-2.80)
RSRZ outliers	180081	3869 (2.80-2.80)

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	110	
1	B	110	
1	C	110	
1	D	110	
1	E	110	

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Mol	Chain	Length	Quality of chain
1	F	110	
1	G	110	
1	H	110	
1	I	110	
1	J	110	
1	K	110	
1	L	110	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 10368 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 Similar to the Rieske Protein II of bc1 complex.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	110	Total	C	N	O	S	0	0	0
			855	548	147	155	5			
1	B	110	Total	C	N	O	S	0	0	0
			855	548	147	155	5			
1	C	110	Total	C	N	O	S	0	0	0
			855	548	147	155	5			
1	D	110	Total	C	N	O	S	0	0	0
			855	548	147	155	5			
1	E	110	Total	C	N	O	S	0	0	0
			855	548	147	155	5			
1	F	110	Total	C	N	O	S	0	0	0
			855	548	147	155	5			
1	G	110	Total	C	N	O	S	0	0	0
			855	548	147	155	5			
1	H	110	Total	C	N	O	S	0	0	0
			855	548	147	155	5			
1	I	110	Total	C	N	O	S	0	0	0
			855	548	147	155	5			
1	J	110	Total	C	N	O	S	0	0	0
			855	548	147	155	5			
1	K	110	Total	C	N	O	S	0	0	0
			855	548	147	155	5			
1	L	110	Total	C	N	O	S	0	0	0
			855	548	147	155	5			

- Molecule 2 is FE2/S2 (INORGANIC) CLUSTER (CCD ID: FES) (formula: Fe₂S₂) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	Fe	S	0	0
			4	2	2		
2	B	1	Total	Fe	S	0	0
			4	2	2		
2	C	1	Total	Fe	S	0	0
			4	2	2		
2	D	1	Total	Fe	S	0	0
			4	2	2		
2	E	1	Total	Fe	S	0	0
			4	2	2		
2	F	1	Total	Fe	S	0	0
			4	2	2		
2	G	1	Total	Fe	S	0	0
			4	2	2		
2	H	1	Total	Fe	S	0	0
			4	2	2		
2	I	1	Total	Fe	S	0	0
			4	2	2		
2	J	1	Total	Fe	S	0	0
			4	2	2		
2	K	1	Total	Fe	S	0	0
			4	2	2		
2	L	1	Total	Fe	S	0	0
			4	2	2		

- Molecule 3 is SULFATE ION (CCD ID: SO4) (formula: O₄S).

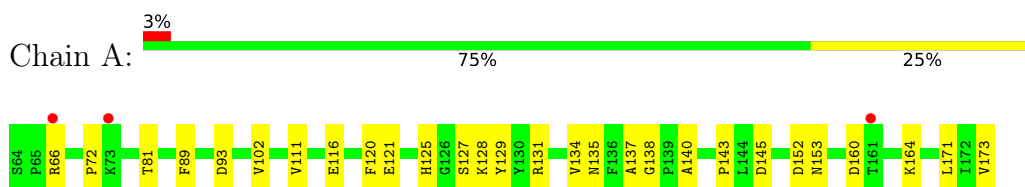


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	O	S	0	0
			5	4	1		
3	B	1	Total	O	S	0	0
			5	4	1		
3	C	1	Total	O	S	0	0
			5	4	1		
3	D	1	Total	O	S	0	0
			5	4	1		
3	E	1	Total	O	S	0	0
			5	4	1		
3	F	1	Total	O	S	0	0
			5	4	1		
3	G	1	Total	O	S	0	0
			5	4	1		
3	H	1	Total	O	S	0	0
			5	4	1		
3	I	1	Total	O	S	0	0
			5	4	1		
3	J	1	Total	O	S	0	0
			5	4	1		
3	K	1	Total	O	S	0	0
			5	4	1		
3	L	1	Total	O	S	0	0
			5	4	1		

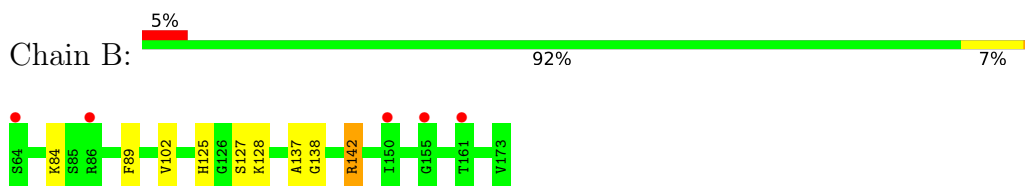
3 Residue-property plots

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.

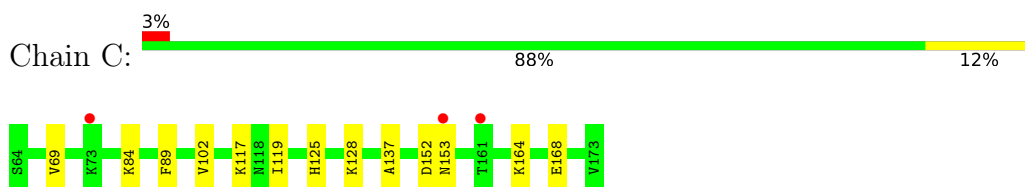
- Molecule 1: Similar to the Rieske Protein II of bc1 complex



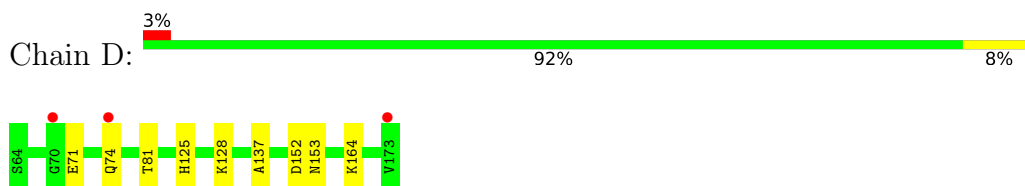
- Molecule 1: Similar to the Rieske Protein II of bc1 complex



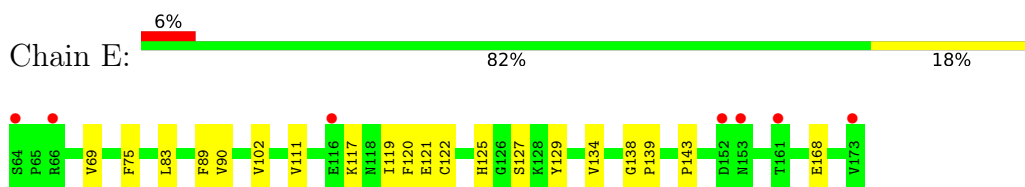
- Molecule 1: Similar to the Rieske Protein II of bc1 complex



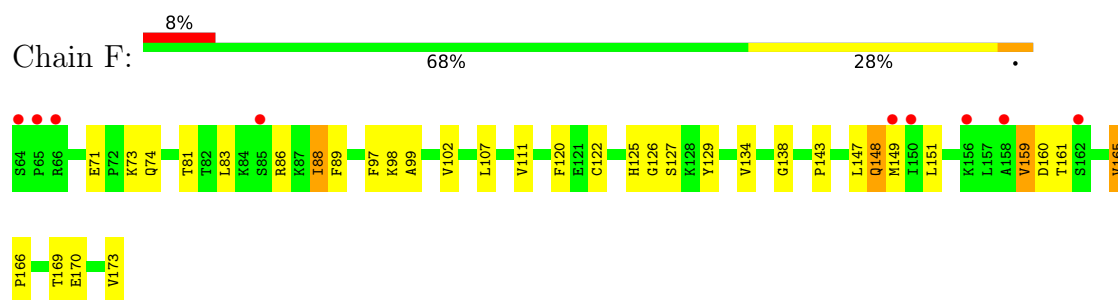
- Molecule 1: Similar to the Rieske Protein II of bc1 complex



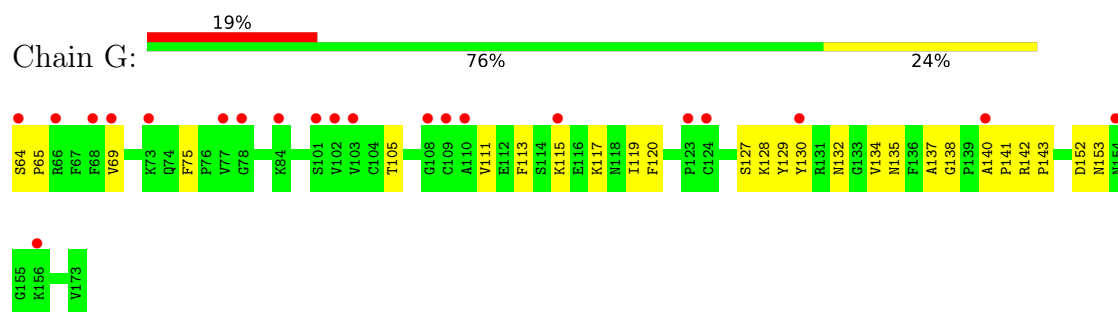
- Molecule 1: Similar to the Rieske Protein II of bc1 complex



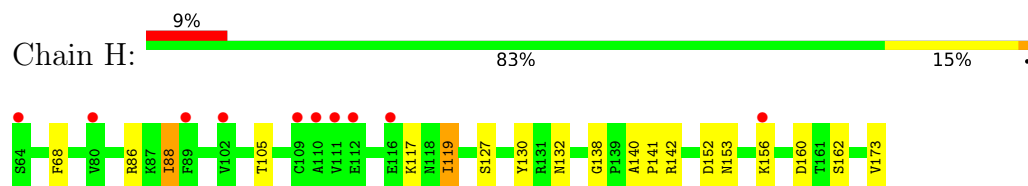
- Molecule 1: Similar to the Rieske Protein II of bc1 complex



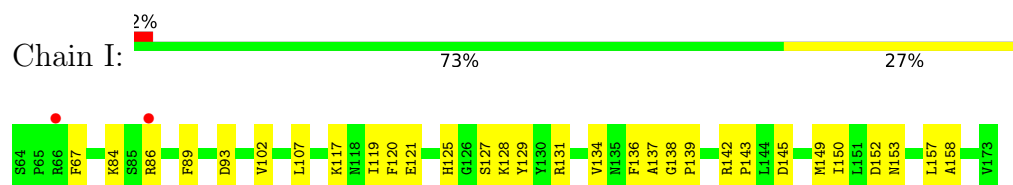
- Molecule 1: Similar to the Rieske Protein II of bc1 complex



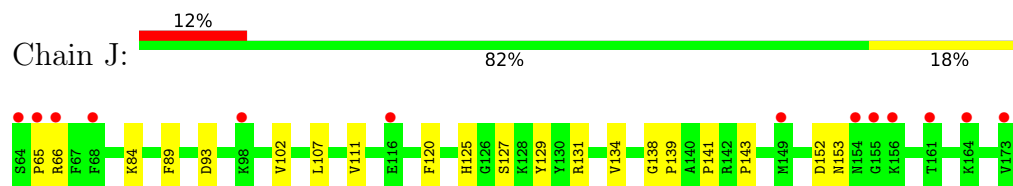
- Molecule 1: Similar to the Rieske Protein II of bc1 complex



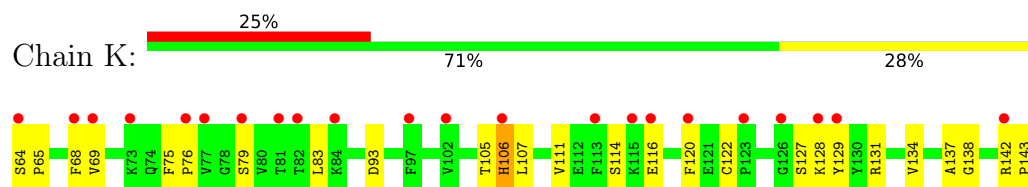
- Molecule 1: Similar to the Rieske Protein II of bc1 complex



- Molecule 1: Similar to the Rieske Protein II of bc1 complex

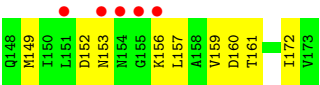
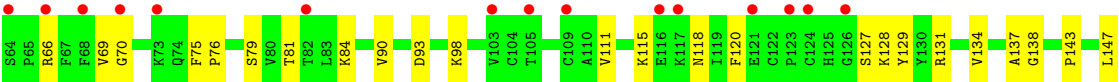


- Molecule 1: Similar to the Rieske Protein II of bc1 complex





● Molecule 1: Similar to the Rieske Protein II of bc1 complex



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	103.96Å 120.73Å 209.25Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	73.74 – 2.80 73.74 – 2.80	Depositor EDS
% Data completeness (in resolution range)	99.6 (73.74-2.80) 99.5 (73.74-2.80)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.77 (at 2.82Å)	Xtriage
Refinement program	PHENIX (1.20.1_4487: ???)	Depositor
R, R_{free}	0.265 , 0.297 0.265 , 0.298	Depositor DCC
R_{free} test set	5080 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å ²)	65.0	Xtriage
Anisotropy	0.548	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 42.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	10368	wwPDB-VP
Average B, all atoms (Å ²)	72.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 52.95 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 4.5233e-05. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: SO4, FES

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	0.10	0/875	0.26	0/1183
1	B	0.12	0/875	0.27	0/1183
1	C	0.10	0/875	0.27	0/1183
1	D	0.09	0/875	0.25	0/1183
1	E	0.09	0/875	0.27	0/1183
1	F	0.11	0/875	0.28	0/1183
1	G	0.11	0/875	0.27	0/1183
1	H	0.10	0/875	0.27	0/1183
1	I	0.09	0/875	0.27	0/1183
1	J	0.09	0/875	0.24	0/1183
1	K	0.11	0/875	0.31	0/1183
1	L	0.09	0/875	0.27	0/1183
All	All	0.10	0/10500	0.27	0/14196

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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	855	0	861	17	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	855	0	861	6	0
1	C	855	0	861	7	0
1	D	855	0	861	5	0
1	E	855	0	861	13	0
1	F	855	0	861	20	0
1	G	855	0	861	16	0
1	H	855	0	861	10	0
1	I	855	0	861	18	0
1	J	855	0	861	12	0
1	K	855	0	861	18	0
1	L	855	0	861	23	0
2	A	4	0	0	1	0
2	B	4	0	0	1	0
2	C	4	0	0	1	0
2	D	4	0	0	1	0
2	E	4	0	0	1	0
2	F	4	0	0	1	0
2	G	4	0	0	0	0
2	H	4	0	0	0	0
2	I	4	0	0	1	0
2	J	4	0	0	1	0
2	K	4	0	0	1	0
2	L	4	0	0	0	0
3	A	5	0	0	0	0
3	B	5	0	0	1	0
3	C	5	0	0	0	0
3	D	5	0	0	0	0
3	E	5	0	0	0	0
3	F	5	0	0	0	0
3	G	5	0	0	0	0
3	H	5	0	0	0	0
3	I	5	0	0	1	0
3	J	5	0	0	1	0
3	K	5	0	0	0	0
3	L	5	0	0	0	0
All	All	10368	0	10332	159	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 8.

All (159) 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:D:164:LYS:HG3	1:J:139:PRO:HA	1.64	0.80
1:A:164:LYS:HG3	1:E:139:PRO:HA	1.65	0.77
1:C:164:LYS:HG3	1:I:139:PRO:HA	1.65	0.76
1:K:105:THR:HG23	1:K:142:ARG:HH11	1.53	0.72
1:A:128:LYS:HB2	1:A:137:ALA:HB3	1.74	0.70
1:L:134:VAL:HA	1:L:143:PRO:HB3	1.74	0.69
1:K:128:LYS:HB2	1:K:137:ALA:HB3	1.76	0.68
1:L:93:ASP:OD1	1:L:131:ARG:NH1	2.27	0.67
1:G:134:VAL:HA	1:G:143:PRO:HB3	1.75	0.67
1:A:66:ARG:NE	1:A:160:ASP:OD2	2.24	0.65
1:J:65:PRO:HG2	1:J:66:ARG:HD2	1.78	0.64
1:C:128:LYS:HB2	1:C:137:ALA:HB3	1.79	0.63
1:K:69:VAL:HG23	1:K:83:LEU:HD21	1.80	0.63
1:F:71:GLU:H	1:F:74:GLN:HE21	1.45	0.63
1:D:71:GLU:N	1:D:74:GLN:OE1	2.32	0.62
1:G:105:THR:HG23	1:G:141:PRO:HD2	1.81	0.62
1:K:93:ASP:OD1	1:K:131:ARG:NH1	2.31	0.62
1:A:152:ASP:OD1	1:A:153:ASN:N	2.32	0.61
1:H:152:ASP:OD1	1:H:153:ASN:N	2.33	0.61
1:J:152:ASP:OD1	1:J:153:ASN:N	2.34	0.60
1:E:134:VAL:HA	1:E:143:PRO:HB3	1.83	0.60
1:H:127:SER:HA	1:H:138:GLY:HA3	1.84	0.60
1:K:151:LEU:HD23	1:K:157:LEU:HD13	1.84	0.60
1:G:120:PHE:HB2	1:G:129:TYR:HB2	1.86	0.58
1:A:93:ASP:OD1	1:A:131:ARG:NH1	2.37	0.57
1:F:165:VAL:HG12	1:F:166:PRO:HD2	1.87	0.57
1:K:127:SER:HA	1:K:138:GLY:HA3	1.86	0.57
1:J:120:PHE:HB2	1:J:129:TYR:HB2	1.87	0.57
1:L:69:VAL:HG12	1:L:75:PHE:HZ	1.70	0.56
1:F:99:ALA:HB2	1:F:149:MET:HG3	1.88	0.56
1:F:97:PHE:HB3	1:F:149:MET:HE1	1.87	0.56
1:J:93:ASP:OD1	1:J:131:ARG:NH1	2.39	0.56
1:F:134:VAL:HA	1:F:143:PRO:HB3	1.88	0.55
1:I:128:LYS:HB2	1:I:137:ALA:HB3	1.89	0.55
1:A:145:ASP:HB3	1:A:164:LYS:HD2	1.89	0.54
1:H:105:THR:HG23	1:H:141:PRO:HD2	1.89	0.54
1:L:128:LYS:HB2	1:L:137:ALA:HB3	1.88	0.54
1:E:69:VAL:HG13	1:E:83:LEU:HD11	1.89	0.54
1:B:84:LYS:N	3:B:202:SO4:O2	2.41	0.54
1:L:84:LYS:HD3	1:L:84:LYS:H	1.73	0.53
1:I:93:ASP:OD1	1:I:131:ARG:NH1	2.41	0.53
1:I:121:GLU:HG2	1:I:128:LYS:HE3	1.90	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:H:119:ILE:HG22	1:H:130:TYR:HA	1.89	0.53
1:K:134:VAL:HA	1:K:143:PRO:HB3	1.88	0.53
1:L:120:PHE:HB2	1:L:129:TYR:HB2	1.90	0.53
1:J:127:SER:HA	1:J:138:GLY:HA3	1.91	0.52
1:K:120:PHE:HB2	1:K:129:TYR:HB2	1.92	0.52
1:J:134:VAL:HA	1:J:143:PRO:HB3	1.92	0.52
1:G:128:LYS:HB2	1:G:137:ALA:HB3	1.91	0.52
1:L:127:SER:HA	1:L:138:GLY:HA3	1.91	0.52
1:F:83:LEU:HD12	1:F:88:ILE:HD11	1.91	0.51
1:L:76:PRO:HG2	1:L:79:SER:HB3	1.92	0.51
1:F:71:GLU:OE1	1:F:73:LYS:HE2	2.11	0.51
1:K:68:PHE:CG	1:K:156:LYS:HE2	2.45	0.51
1:K:114:SER:OG	1:K:116:GLU:OE1	2.28	0.51
1:F:120:PHE:HB2	1:F:129:TYR:HB2	1.92	0.51
1:B:142:ARG:HD2	1:F:126:GLY:HA3	1.93	0.50
1:I:120:PHE:HB2	1:I:129:TYR:HB2	1.93	0.50
1:L:69:VAL:HG11	1:L:90:VAL:HG21	1.93	0.50
1:G:152:ASP:OD1	1:G:153:ASN:N	2.44	0.50
1:F:148:GLN:HG2	1:F:160:ASP:HB3	1.94	0.50
1:I:117:LYS:HE3	1:I:119:ILE:HD11	1.94	0.49
1:F:165:VAL:HG12	1:F:169:THR:HG21	1.93	0.49
1:F:107:LEU:HD21	1:L:172:ILE:HD12	1.94	0.49
1:A:121:GLU:HG2	1:A:128:LYS:HG2	1.93	0.49
1:E:111:VAL:HG12	1:E:122:CYS:HB2	1.94	0.49
1:I:127:SER:HA	1:I:138:GLY:HA3	1.93	0.49
1:L:70:GLY:HA2	1:L:156:LYS:HE3	1.95	0.49
1:G:105:THR:HG21	1:G:142:ARG:O	2.12	0.49
1:J:84:LYS:N	3:J:202:SO4:O2	2.45	0.49
1:J:111:VAL:HG11	1:J:120:PHE:HB3	1.95	0.48
1:K:105:THR:HG21	1:K:142:ARG:HG2	1.96	0.48
1:G:69:VAL:HG12	1:G:75:PHE:HZ	1.78	0.48
1:A:120:PHE:HB2	1:A:129:TYR:HB2	1.95	0.48
1:I:149:MET:HE2	1:I:157:LEU:HD13	1.95	0.48
1:I:150:ILE:HG22	1:I:158:ALA:HB3	1.96	0.48
1:F:98:LYS:HE2	1:F:170:GLU:HB3	1.95	0.48
1:A:111:VAL:HG11	1:A:120:PHE:HB3	1.96	0.47
1:I:125:HIS:HB2	2:I:201:FES:S1	2.54	0.47
1:L:111:VAL:HG11	1:L:120:PHE:HB3	1.96	0.47
1:J:125:HIS:HB2	2:J:201:FES:S2	2.54	0.47
1:I:152:ASP:OD1	1:I:153:ASN:N	2.42	0.47
1:L:93:ASP:OD2	1:L:98:LYS:NZ	2.48	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:149:MET:HG2	1:F:159:VAL:HG12	1.97	0.46
1:K:64:SER:HB3	1:K:65:PRO:HD3	1.97	0.46
1:L:66:ARG:HG2	1:L:160:ASP:CG	2.40	0.46
1:I:134:VAL:HA	1:I:143:PRO:HB3	1.97	0.46
1:K:160:ASP:OD1	1:K:162:SER:OG	2.32	0.46
1:E:120:PHE:HB2	1:E:129:TYR:HB2	1.96	0.46
1:F:125:HIS:HB2	2:F:201:FES:S1	2.55	0.46
1:H:68:PHE:HB3	1:H:156:LYS:HE2	1.97	0.46
1:K:76:PRO:HG2	1:K:79:SER:HB3	1.97	0.46
1:B:125:HIS:HB2	2:B:201:FES:S1	2.56	0.46
1:E:117:LYS:HE2	1:E:119:ILE:HD11	1.98	0.46
1:E:127:SER:HA	1:E:138:GLY:HA3	1.96	0.46
1:H:160:ASP:OD1	1:H:162:SER:OG	2.33	0.46
1:H:105:THR:HG21	1:H:142:ARG:O	2.16	0.46
1:K:69:VAL:HG22	1:K:75:PHE:HZ	1.81	0.45
1:I:142:ARG:NH2	1:I:145:ASP:OD1	2.49	0.45
1:A:125:HIS:HB2	2:A:201:FES:S1	2.56	0.45
1:L:66:ARG:NE	1:L:160:ASP:OD2	2.46	0.45
1:C:84:LYS:HE2	1:C:84:LYS:HB3	1.80	0.45
1:A:135:ASN:ND2	1:A:140:ALA:O	2.50	0.45
1:E:69:VAL:HG11	1:E:90:VAL:HG21	1.99	0.45
1:K:111:VAL:HG12	1:K:122:CYS:HB2	1.99	0.45
1:L:69:VAL:HG12	1:L:69:VAL:O	2.16	0.45
1:B:127:SER:HA	1:B:138:GLY:HA3	1.99	0.45
1:B:128:LYS:HB2	1:B:137:ALA:HB3	1.99	0.44
1:E:117:LYS:NZ	1:E:121:GLU:OE2	2.40	0.44
1:L:118:ASN:HD21	1:L:131:ARG:HD2	1.81	0.44
1:A:134:VAL:HA	1:A:143:PRO:HB3	2.00	0.44
1:F:111:VAL:HG12	1:F:122:CYS:HB2	2.00	0.44
1:A:89:PHE:CE2	1:A:102:VAL:HG12	2.53	0.43
1:G:115:LYS:HB3	1:G:115:LYS:HE2	1.75	0.43
1:F:151:LEU:HD22	1:F:173:VAL:HG22	2.00	0.43
1:E:89:PHE:CE2	1:E:102:VAL:HG12	2.52	0.43
1:I:128:LYS:HB3	1:I:136:PHE:CZ	2.52	0.43
1:J:107:LEU:HD12	1:J:125:HIS:CE1	2.53	0.43
1:D:125:HIS:HB2	2:D:201:FES:S2	2.59	0.43
1:K:116:GLU:CD	1:K:116:GLU:H	2.26	0.43
1:B:89:PHE:CE2	1:B:102:VAL:HG12	2.54	0.43
1:E:125:HIS:HB2	2:E:201:FES:S2	2.58	0.43
1:G:113:PHE:HB2	1:G:120:PHE:CE1	2.53	0.43
1:G:127:SER:HA	1:G:138:GLY:HA3	2.00	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:J:89:PHE:CE2	1:J:102:VAL:HG12	2.53	0.43
1:C:117:LYS:HB3	1:C:119:ILE:HG12	2.01	0.43
1:G:111:VAL:HG11	1:G:120:PHE:HB3	2.01	0.43
1:D:128:LYS:HB2	1:D:137:ALA:HB3	2.00	0.43
1:D:152:ASP:OD1	1:D:153:ASN:N	2.44	0.43
1:F:127:SER:HA	1:F:138:GLY:HA3	2.00	0.43
1:I:67:PHE:CZ	1:I:86:ARG:HB3	2.54	0.43
1:F:89:PHE:CE2	1:F:102:VAL:HG12	2.54	0.42
1:I:89:PHE:CE2	1:I:102:VAL:HG12	2.53	0.42
1:A:111:VAL:CG1	1:A:120:PHE:HB3	2.49	0.42
1:A:116:GLU:O	1:H:132:ASN:ND2	2.49	0.42
1:L:147:LEU:HD13	1:L:161:THR:HG22	2.01	0.42
1:A:127:SER:HA	1:A:138:GLY:HA3	2.01	0.42
1:L:149:MET:HG3	1:L:159:VAL:HG22	2.00	0.42
1:H:127:SER:HB2	1:H:140:ALA:HB2	2.02	0.42
1:L:84:LYS:HE2	1:L:84:LYS:HB2	1.86	0.42
1:E:69:VAL:HG12	1:E:75:PHE:HZ	1.84	0.42
1:F:147:LEU:HD13	1:F:161:THR:HA	2.02	0.41
1:G:130:TYR:HD2	1:G:134:VAL:HG23	1.84	0.41
1:C:125:HIS:HB2	2:C:201:FES:S2	2.60	0.41
1:H:86:ARG:O	1:H:88:ILE:HG23	2.20	0.41
1:L:111:VAL:CG1	1:L:120:PHE:HB3	2.51	0.41
1:I:107:LEU:HD12	1:I:125:HIS:CE1	2.55	0.41
1:A:72:PRO:HB3	1:A:173:VAL:HG21	2.02	0.41
1:C:152:ASP:OD1	1:C:153:ASN:N	2.50	0.41
1:G:135:ASN:ND2	1:G:140:ALA:O	2.53	0.41
1:K:106:HIS:HB3	2:K:201:FES:S1	2.60	0.41
1:E:168:GLU:OE1	1:E:168:GLU:N	2.50	0.41
1:C:89:PHE:CE2	1:C:102:VAL:HG12	2.56	0.40
1:G:64:SER:HA	1:G:65:PRO:HD3	1.97	0.40
1:G:132:ASN:OD1	1:G:134:VAL:HG22	2.21	0.40
1:L:69:VAL:HG12	1:L:75:PHE:CZ	2.54	0.40
1:G:117:LYS:HB3	1:G:119:ILE:HG12	2.03	0.40
1:L:152:ASP:OD1	1:L:153:ASN:N	2.47	0.40
1:I:84:LYS:N	3:I:202:SO4:O3	2.54	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	108/110 (98%)	105 (97%)	3 (3%)	0	100	100
1	B	108/110 (98%)	105 (97%)	3 (3%)	0	100	100
1	C	108/110 (98%)	106 (98%)	2 (2%)	0	100	100
1	D	108/110 (98%)	103 (95%)	5 (5%)	0	100	100
1	E	108/110 (98%)	105 (97%)	3 (3%)	0	100	100
1	F	108/110 (98%)	104 (96%)	4 (4%)	0	100	100
1	G	108/110 (98%)	105 (97%)	3 (3%)	0	100	100
1	H	108/110 (98%)	103 (95%)	5 (5%)	0	100	100
1	I	108/110 (98%)	103 (95%)	5 (5%)	0	100	100
1	J	108/110 (98%)	103 (95%)	4 (4%)	1 (1%)	14	41
1	K	108/110 (98%)	104 (96%)	3 (3%)	1 (1%)	14	41
1	L	108/110 (98%)	104 (96%)	4 (4%)	0	100	100
All	All	1296/1320 (98%)	1250 (96%)	44 (3%)	2 (0%)	43	72

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	K	106	HIS
1	J	141	PRO

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	97/97 (100%)	95 (98%)	2 (2%)	47	79
1	B	97/97 (100%)	96 (99%)	1 (1%)	68	88
1	C	97/97 (100%)	95 (98%)	2 (2%)	47	79
1	D	97/97 (100%)	96 (99%)	1 (1%)	68	88
1	E	97/97 (100%)	97 (100%)	0	100	100
1	F	97/97 (100%)	91 (94%)	6 (6%)	16	45
1	G	97/97 (100%)	97 (100%)	0	100	100
1	H	97/97 (100%)	93 (96%)	4 (4%)	27	62
1	I	97/97 (100%)	97 (100%)	0	100	100
1	J	97/97 (100%)	97 (100%)	0	100	100
1	K	97/97 (100%)	95 (98%)	2 (2%)	47	79
1	L	97/97 (100%)	94 (97%)	3 (3%)	35	70
All	All	1164/1164 (100%)	1143 (98%)	21 (2%)	51	82

All (21) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	81	THR
1	A	171	LEU
1	B	142	ARG
1	C	69	VAL
1	C	168	GLU
1	D	81	THR
1	F	81	THR
1	F	86	ARG
1	F	88	ILE
1	F	148	GLN
1	F	159	VAL
1	F	165	VAL
1	H	88	ILE
1	H	117	LYS
1	H	119	ILE
1	H	173	VAL
1	K	107	LEU
1	K	153	ASN
1	L	81	THR
1	L	115	LYS
1	L	157	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	148	GLN
1	B	148	GLN
1	F	74	GLN
1	F	148	GLN
1	G	148	GLN
1	I	148	GLN
1	J	148	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](#)

24 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	$\# Z > 2$
3	SO4	I	202	-	4,4,4	0.24	0	6,6,6	0.09	0
3	SO4	C	202	-	4,4,4	0.23	0	6,6,6	0.07	0
3	SO4	E	202	-	4,4,4	0.24	0	6,6,6	0.08	0
2	FES	G	201	1	0,4,4	-	-	-		
2	FES	F	201	1	0,4,4	-	-	-		

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	FES	C	201	1	0,4,4	-	-	-		
3	SO4	L	202	-	4,4,4	0.23	0	6,6,6	0.08	0
3	SO4	J	202	-	4,4,4	0.23	0	6,6,6	0.07	0
3	SO4	B	202	-	4,4,4	0.23	0	6,6,6	0.08	0
3	SO4	H	202	-	4,4,4	0.24	0	6,6,6	0.08	0
2	FES	L	201	1	0,4,4	-	-	-		
3	SO4	A	202	-	4,4,4	0.23	0	6,6,6	0.08	0
2	FES	H	201	1	0,4,4	-	-	-		
3	SO4	G	202	-	4,4,4	0.24	0	6,6,6	0.08	0
3	SO4	D	202	-	4,4,4	0.23	0	6,6,6	0.07	0
2	FES	B	201	1	0,4,4	-	-	-		
3	SO4	K	202	-	4,4,4	0.23	0	6,6,6	0.07	0
2	FES	A	201	1	0,4,4	-	-	-		
2	FES	K	201	1	0,4,4	-	-	-		
2	FES	D	201	1	0,4,4	-	-	-		
2	FES	I	201	1	0,4,4	-	-	-		
2	FES	E	201	1	0,4,4	-	-	-		
3	SO4	F	202	-	4,4,4	0.24	0	6,6,6	0.07	0
2	FES	J	201	1	0,4,4	-	-	-		

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	FES	C	201	1	-	-	0/1/1/1
2	FES	B	201	1	-	-	0/1/1/1
2	FES	D	201	1	-	-	0/1/1/1
2	FES	I	201	1	-	-	0/1/1/1
2	FES	A	201	1	-	-	0/1/1/1
2	FES	G	201	1	-	-	0/1/1/1
2	FES	E	201	1	-	-	0/1/1/1
2	FES	L	201	1	-	-	0/1/1/1
2	FES	F	201	1	-	-	0/1/1/1
2	FES	K	201	1	-	-	0/1/1/1
2	FES	J	201	1	-	-	0/1/1/1
2	FES	H	201	1	-	-	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

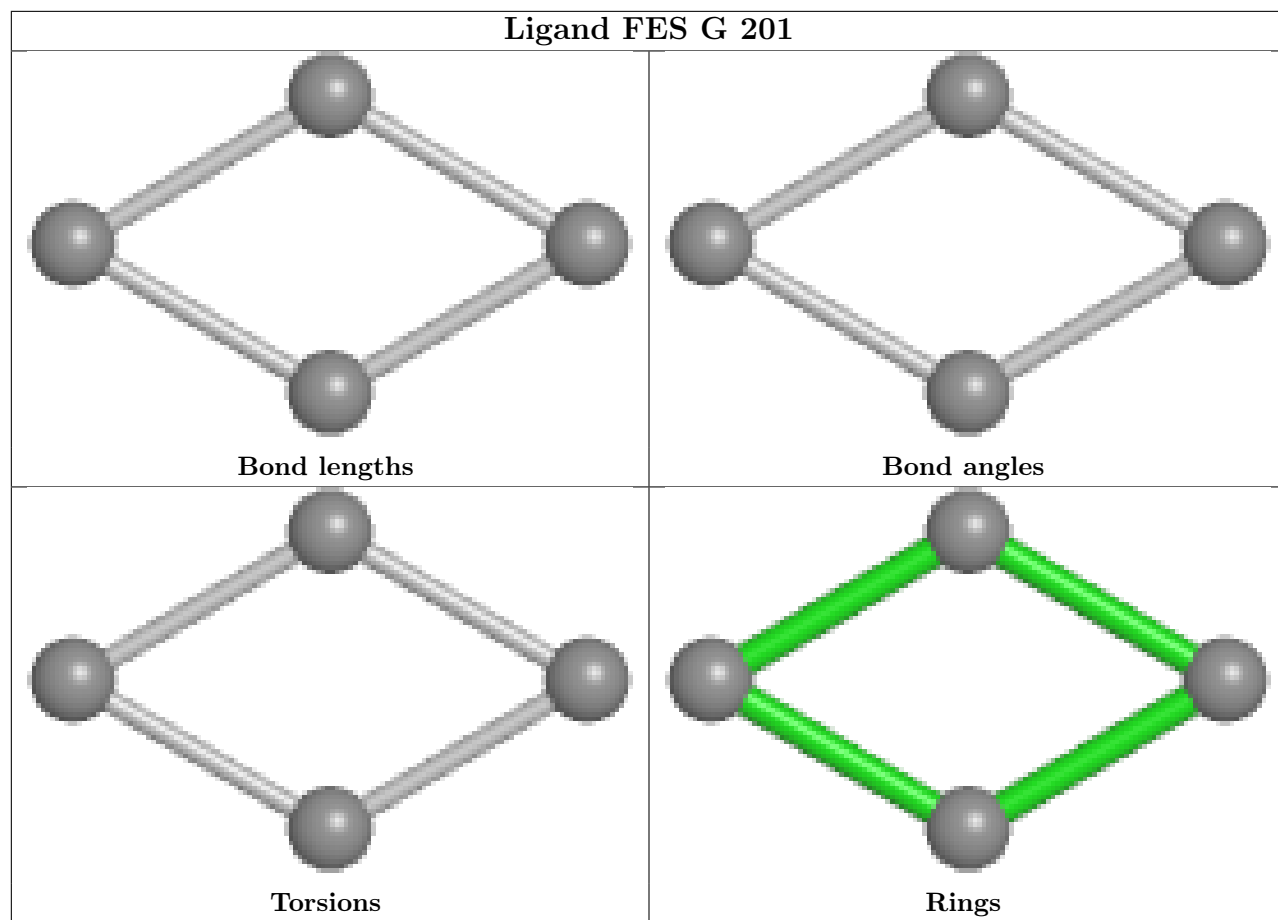
There are no torsion outliers.

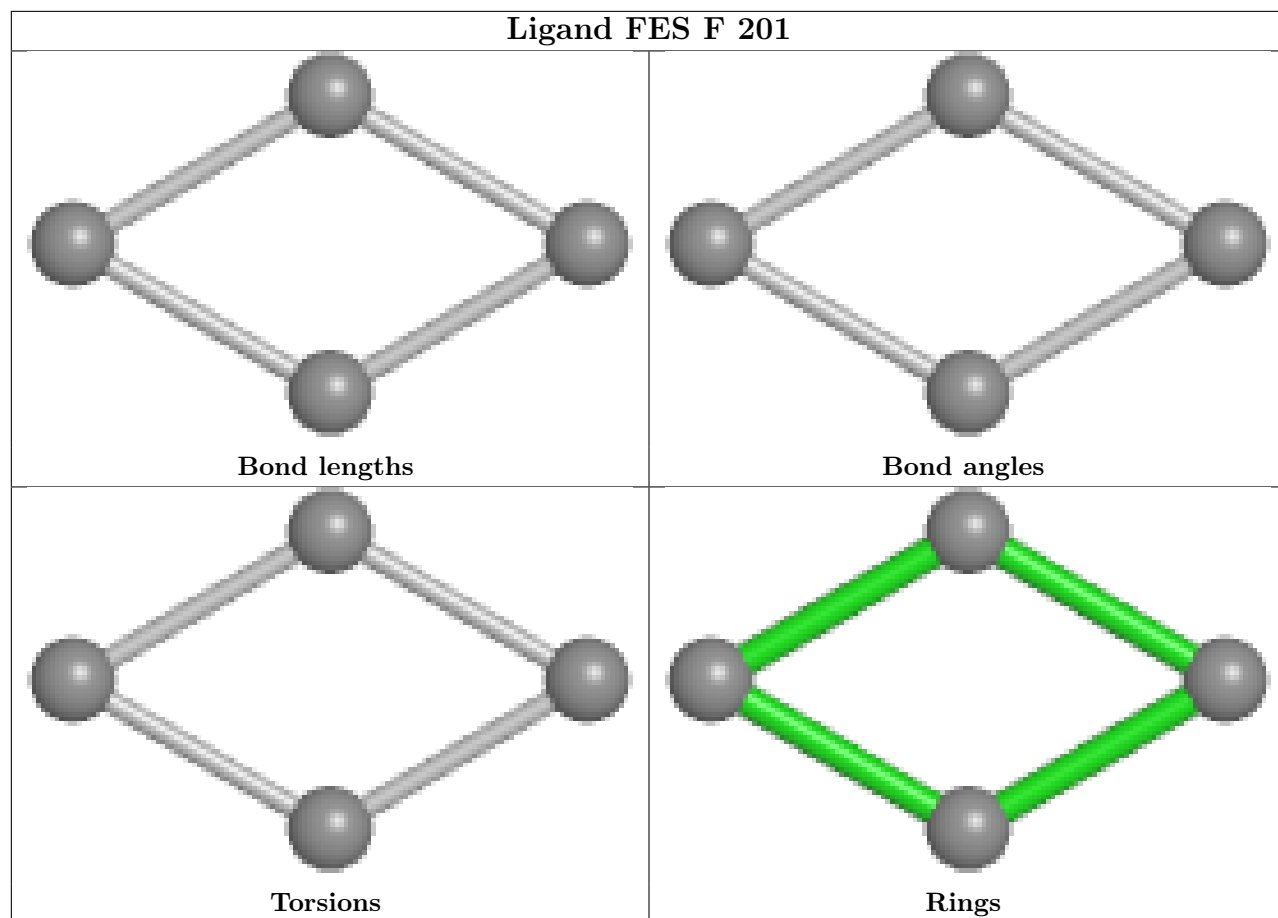
There are no ring outliers.

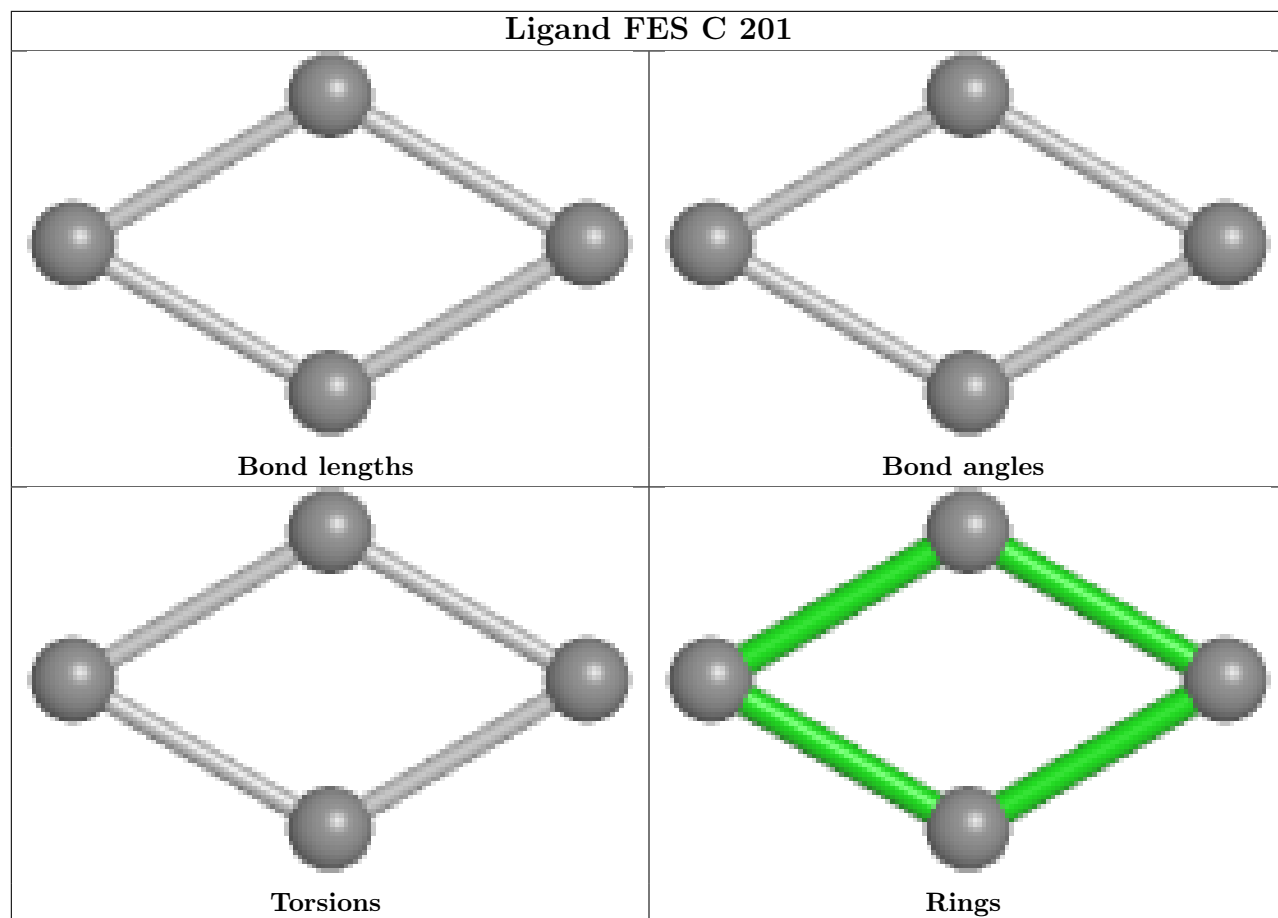
12 monomers are involved in 12 short contacts:

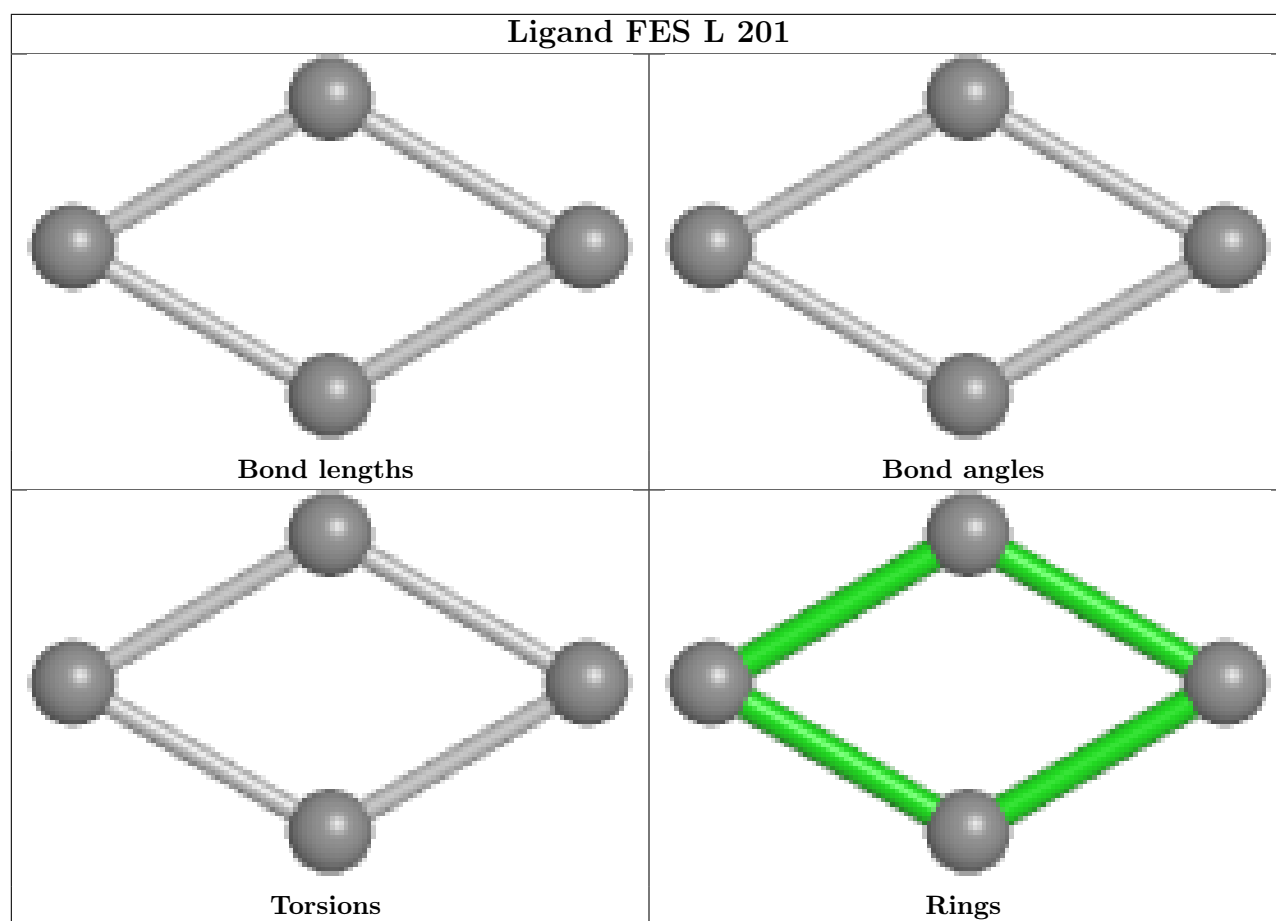
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	I	202	SO4	1	0
2	F	201	FES	1	0
2	C	201	FES	1	0
3	J	202	SO4	1	0
3	B	202	SO4	1	0
2	B	201	FES	1	0
2	A	201	FES	1	0
2	K	201	FES	1	0
2	D	201	FES	1	0
2	I	201	FES	1	0
2	E	201	FES	1	0
2	J	201	FES	1	0

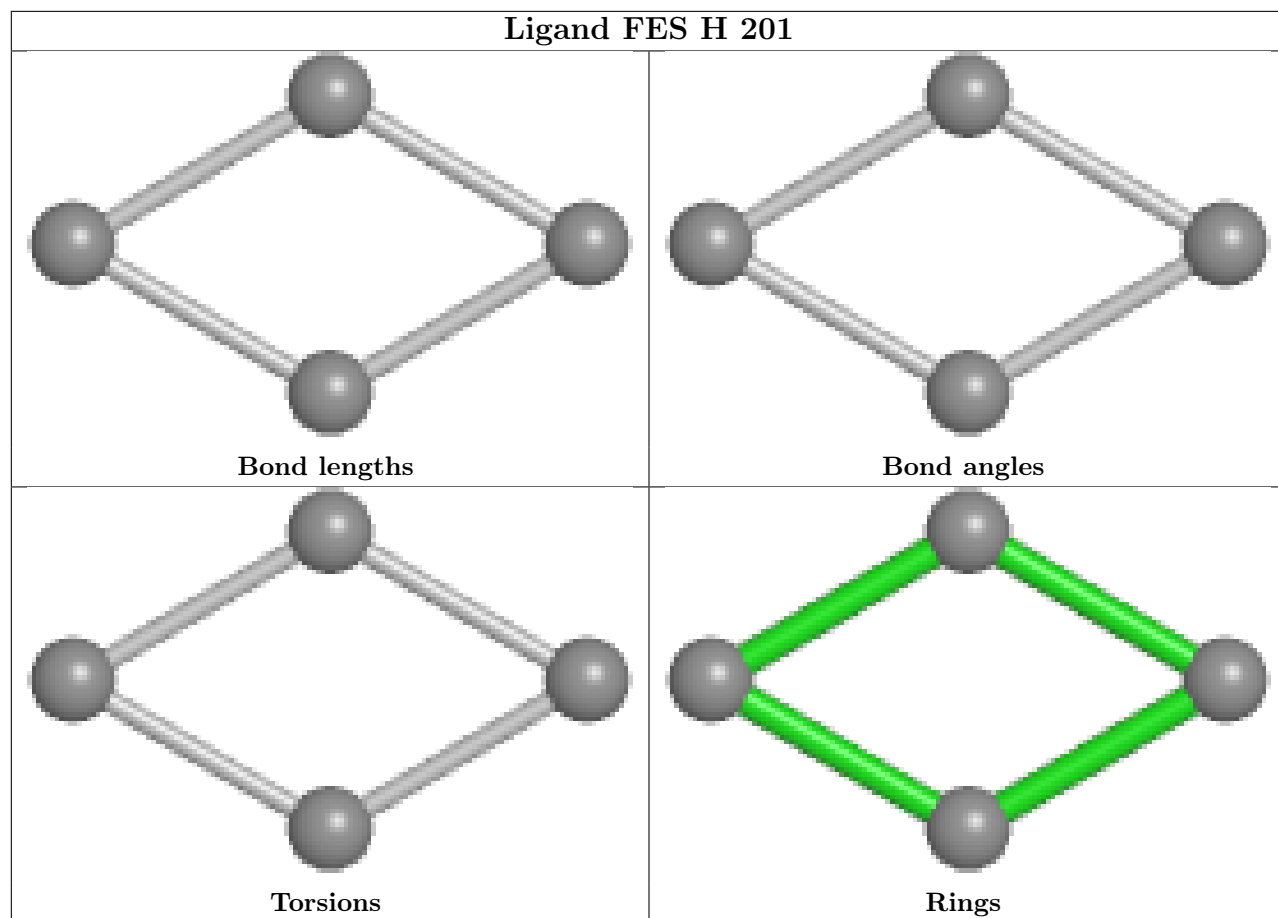
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.

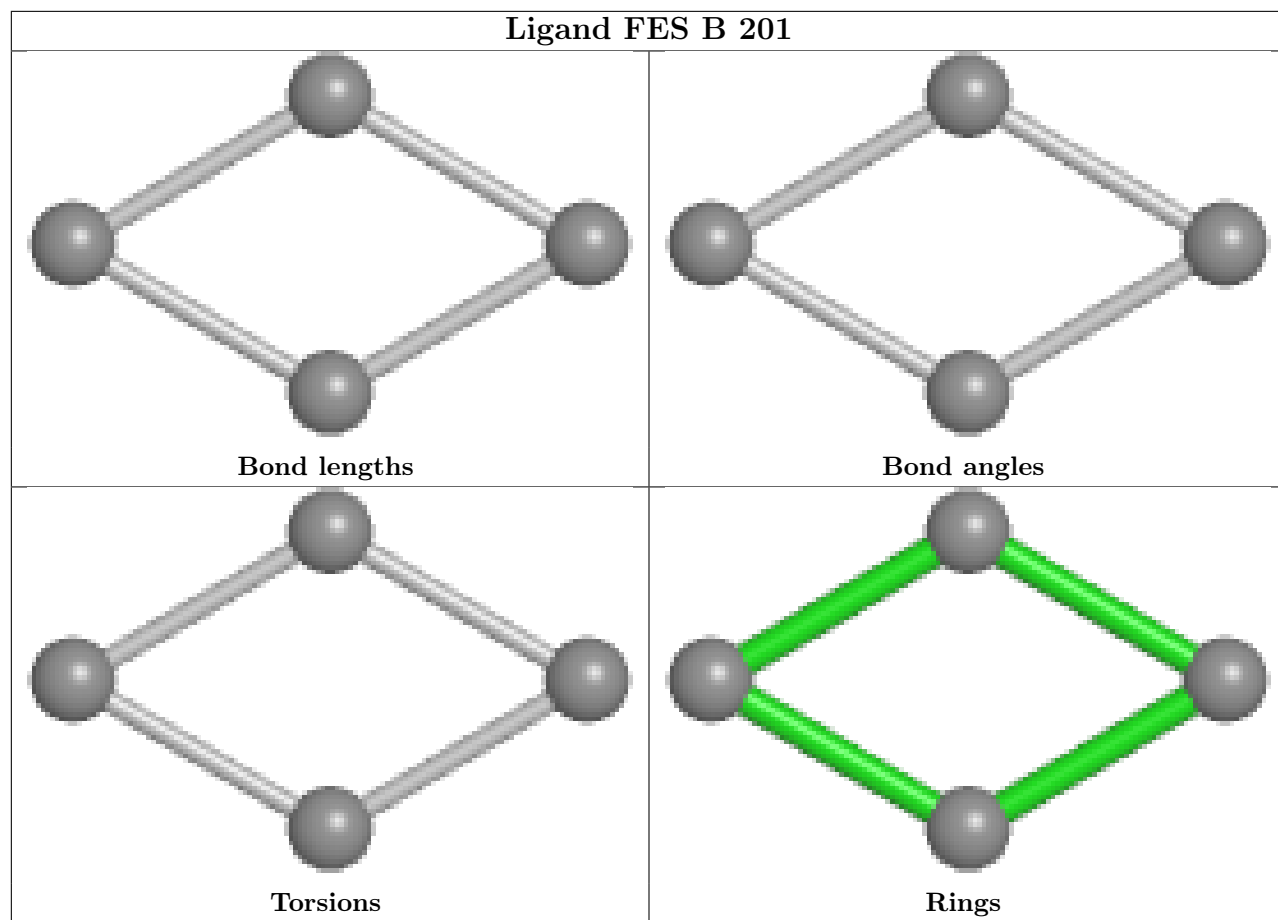


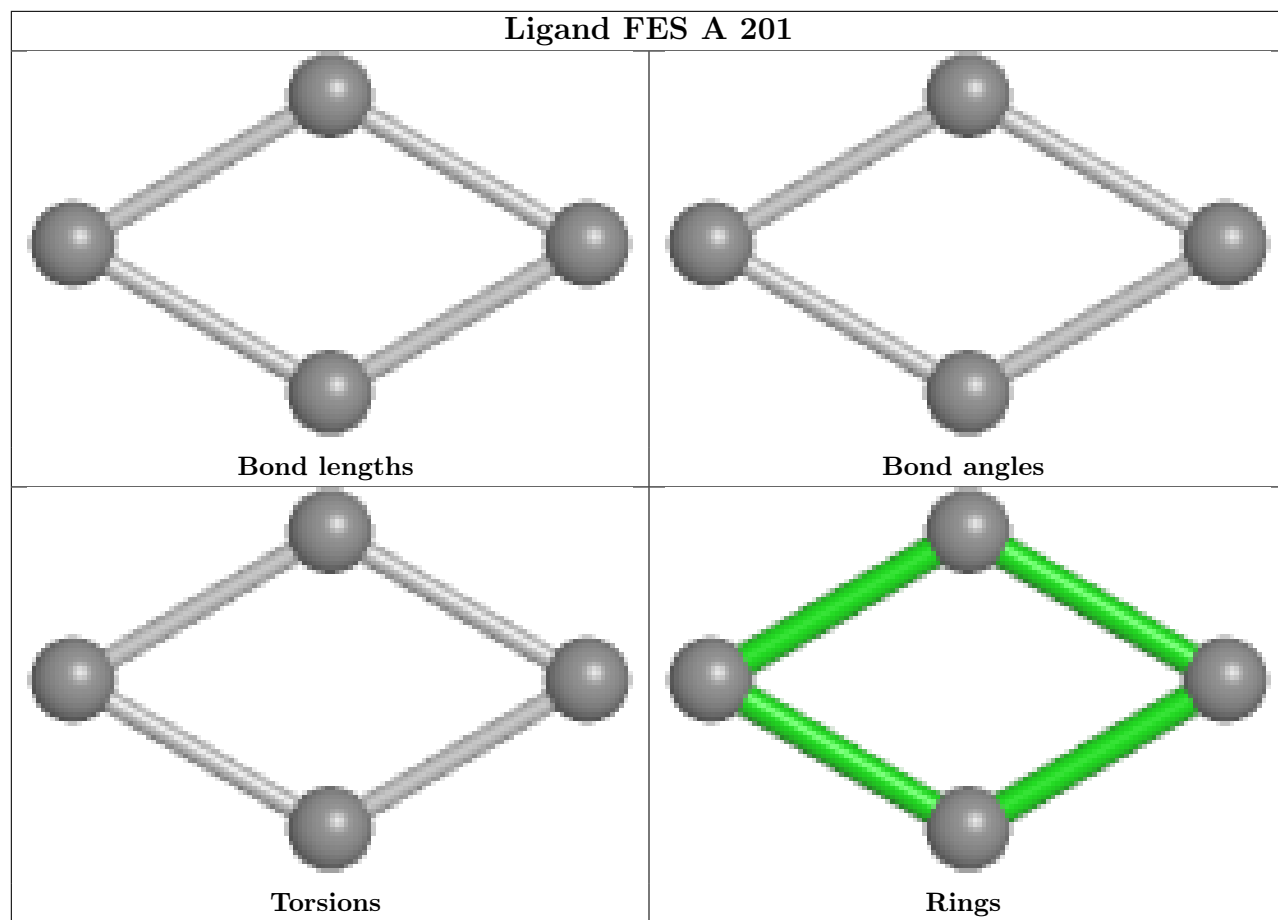


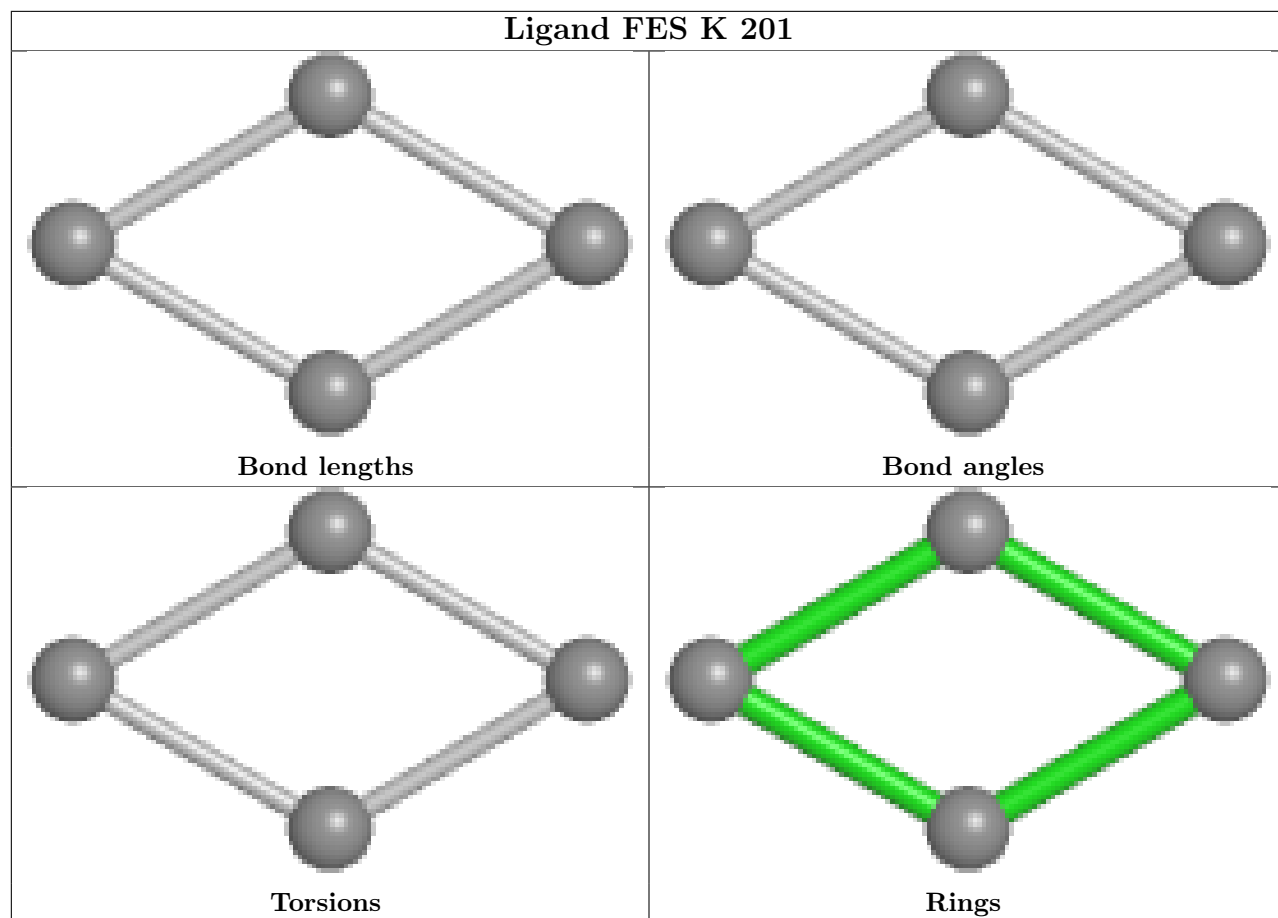


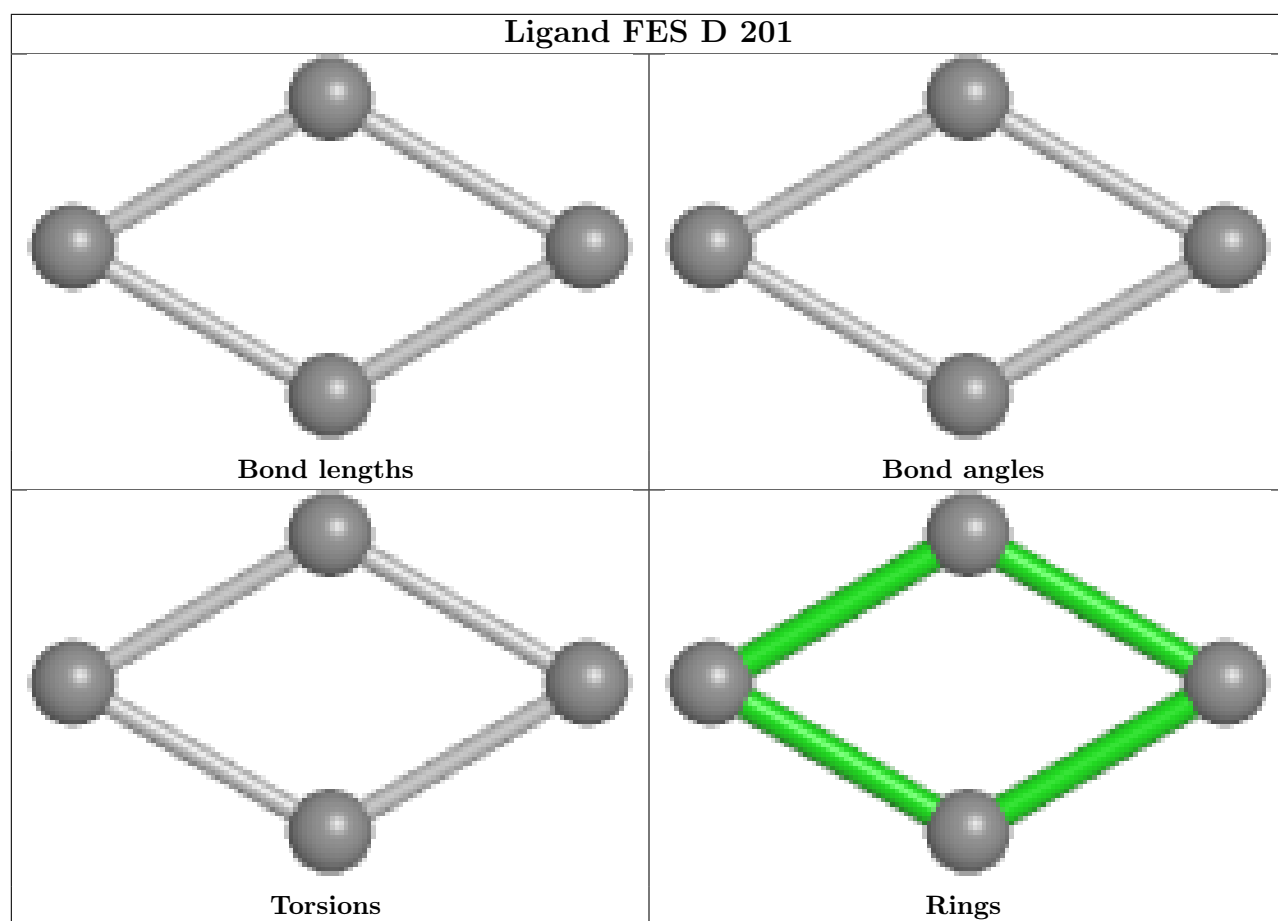


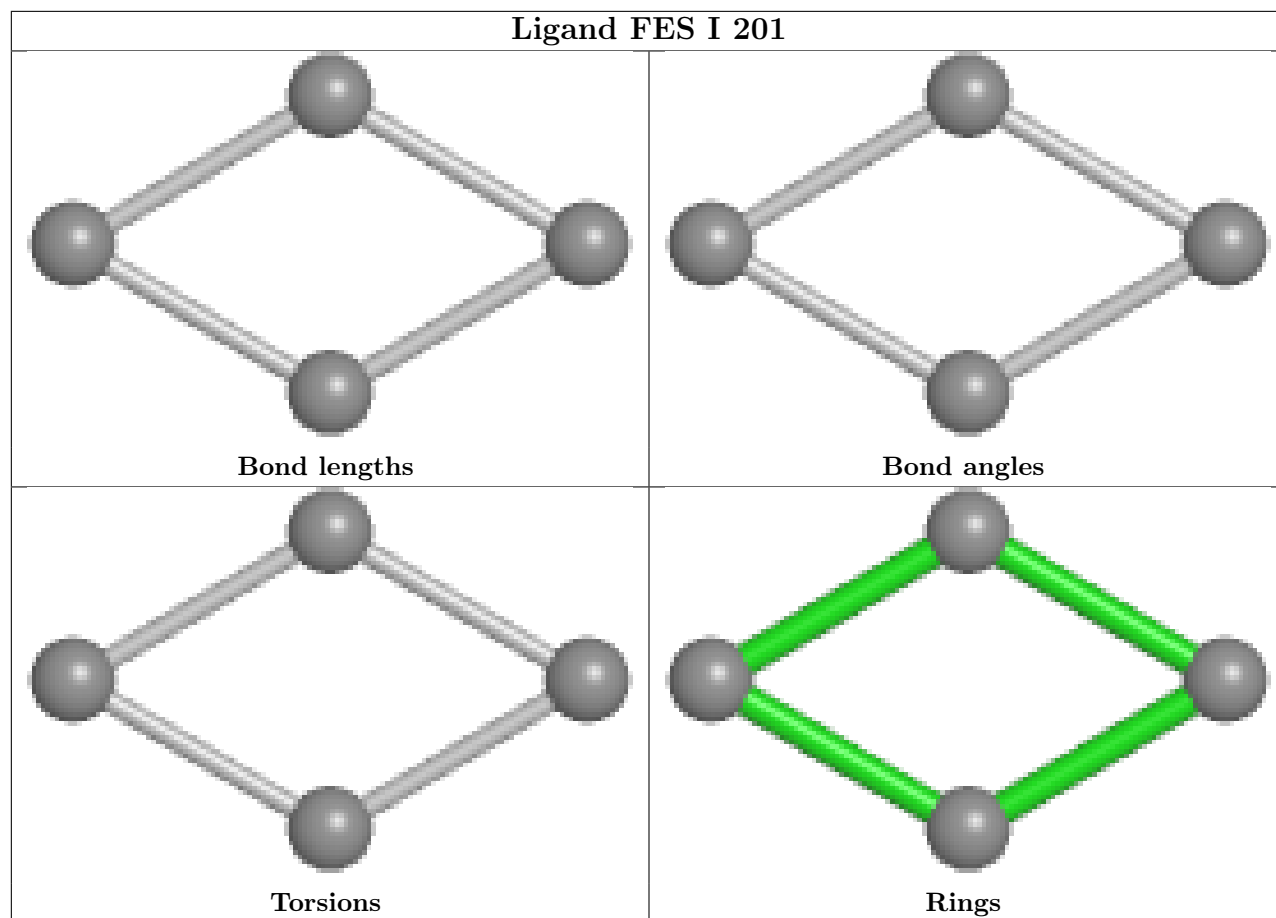


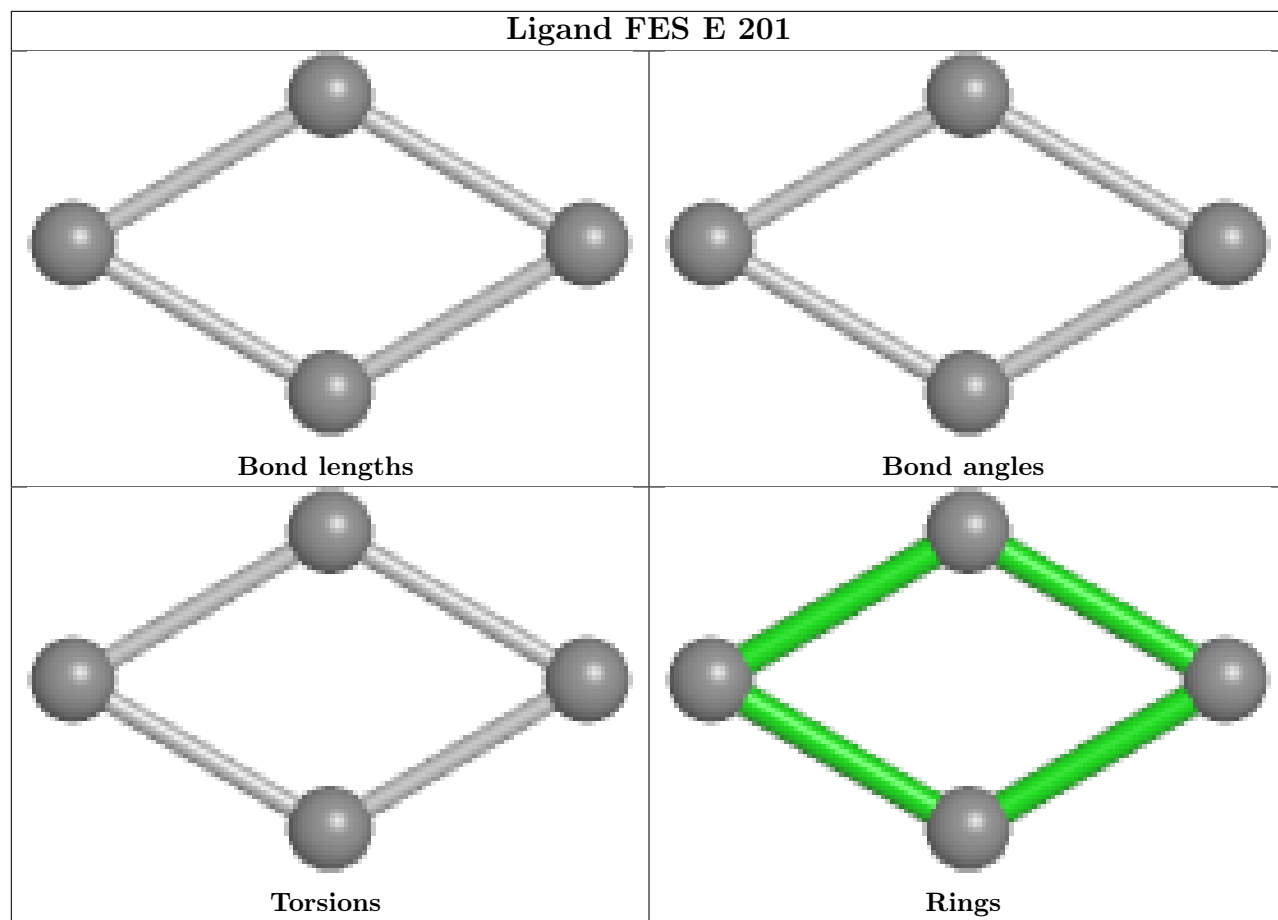


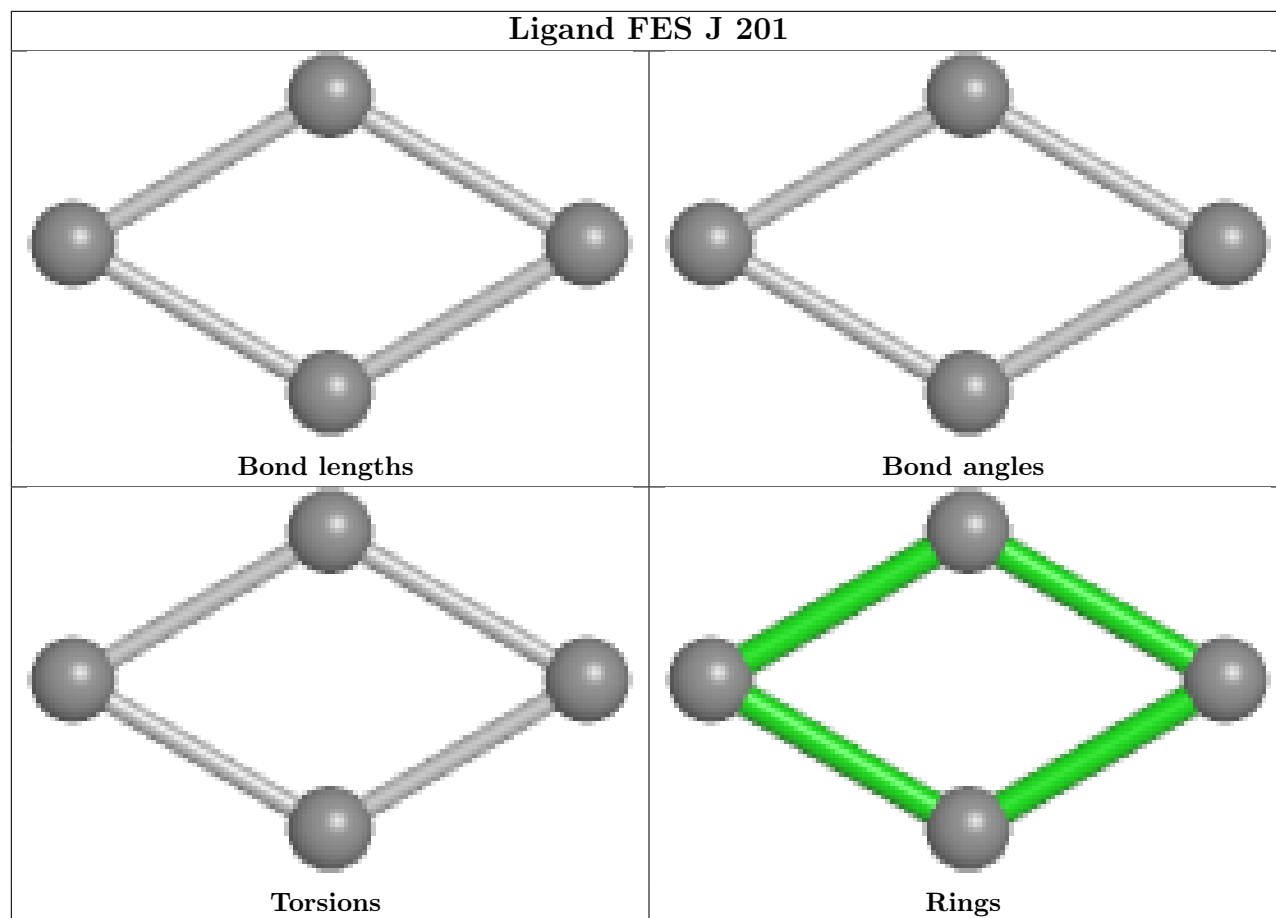












5.7 Other polymers [i](#)

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	110/110 (100%)	0.46	3 (2%) 56 46	45, 64, 94, 109	0
1	B	110/110 (100%)	0.46	5 (4%) 38 30	46, 61, 92, 105	0
1	C	110/110 (100%)	0.42	3 (2%) 56 46	46, 63, 85, 97	0
1	D	110/110 (100%)	0.42	3 (2%) 56 46	46, 65, 95, 107	0
1	E	110/110 (100%)	0.57	7 (6%) 25 18	51, 60, 79, 92	0
1	F	110/110 (100%)	0.71	9 (8%) 17 13	56, 67, 95, 108	0
1	G	110/110 (100%)	1.13	21 (19%) 3 2	56, 78, 97, 104	0
1	H	110/110 (100%)	0.99	10 (9%) 15 11	59, 82, 96, 114	0
1	I	110/110 (100%)	0.40	2 (1%) 67 58	48, 59, 81, 95	0
1	J	110/110 (100%)	0.86	13 (11%) 9 7	54, 69, 97, 111	0
1	K	110/110 (100%)	1.39	27 (24%) 2 1	62, 85, 102, 112	0
1	L	110/110 (100%)	1.19	20 (18%) 3 2	62, 85, 104, 117	0
All	All	1320/1320 (100%)	0.75	123 (9%) 14 10	45, 72, 97, 117	0

All (123) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	K	128	LYS	4.3
1	E	64	SER	4.2
1	L	73	LYS	3.9
1	J	161	THR	3.9
1	K	155	GLY	3.8
1	H	110	ALA	3.7
1	L	121	GLU	3.7
1	D	173	VAL	3.5
1	A	66	ARG	3.5
1	K	79	SER	3.5
1	K	113	PHE	3.5

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Mol	Chain	Res	Type	RSRZ
1	K	84	LYS	3.4
1	G	102	VAL	3.4
1	C	73	LYS	3.4
1	L	66	ARG	3.3
1	J	154	ASN	3.3
1	A	73	LYS	3.3
1	L	64	SER	3.2
1	G	66	ARG	3.2
1	K	115	LYS	3.2
1	I	66	ARG	3.2
1	L	123	PRO	3.2
1	G	64	SER	3.2
1	H	111	VAL	3.1
1	L	124	CYS	3.1
1	F	65	PRO	3.1
1	L	126	GLY	3.1
1	K	156	LYS	3.0
1	B	64	SER	3.0
1	E	116	GLU	2.9
1	L	154	ASN	2.9
1	J	156	LYS	2.9
1	K	68	PHE	2.9
1	K	64	SER	2.9
1	K	81	THR	2.9
1	G	124	CYS	2.9
1	J	155	GLY	2.9
1	G	140	ALA	2.8
1	E	153	ASN	2.8
1	J	68	PHE	2.8
1	D	74	GLN	2.7
1	G	115	LYS	2.7
1	G	156	LYS	2.7
1	H	116	GLU	2.7
1	F	64	SER	2.7
1	G	103	VAL	2.7
1	L	116	GLU	2.7
1	F	156	LYS	2.7
1	B	155	GLY	2.7
1	L	117	LYS	2.6
1	L	109	CYS	2.6
1	K	154	ASN	2.6
1	G	110	ALA	2.6

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Mol	Chain	Res	Type	RSRZ
1	E	161	THR	2.5
1	K	82	THR	2.5
1	I	86	ARG	2.5
1	J	66	ARG	2.5
1	K	126	GLY	2.5
1	K	173	VAL	2.5
1	A	161	THR	2.5
1	J	65	PRO	2.5
1	H	156	LYS	2.5
1	K	120	PHE	2.5
1	L	153	ASN	2.4
1	G	154	ASN	2.4
1	B	150	ILE	2.4
1	K	76	PRO	2.4
1	J	173	VAL	2.4
1	H	64	SER	2.4
1	C	153	ASN	2.3
1	F	66	ARG	2.3
1	K	142	ARG	2.3
1	K	153	ASN	2.3
1	L	103	VAL	2.3
1	G	108	GLY	2.3
1	G	68	PHE	2.3
1	H	89	PHE	2.3
1	E	152	ASP	2.3
1	K	116	GLU	2.3
1	G	84	LYS	2.3
1	K	123	PRO	2.3
1	G	77	VAL	2.3
1	J	149	MET	2.3
1	K	106	HIS	2.3
1	E	173	VAL	2.3
1	L	105	THR	2.3
1	H	102	VAL	2.3
1	K	129	TYR	2.2
1	G	78	GLY	2.2
1	F	162	SER	2.2
1	B	161	THR	2.2
1	G	73	LYS	2.2
1	L	155	GLY	2.2
1	F	85	SER	2.2
1	J	64	SER	2.2

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Mol	Chain	Res	Type	RSRZ
1	G	123	PRO	2.1
1	K	102	VAL	2.1
1	F	149	MET	2.1
1	L	82	THR	2.1
1	L	156	LYS	2.1
1	F	158	ALA	2.1
1	H	112	GLU	2.1
1	C	161	THR	2.1
1	L	151	LEU	2.1
1	B	86	ARG	2.1
1	E	66	ARG	2.1
1	J	116	GLU	2.1
1	G	69	VAL	2.1
1	G	101	SER	2.1
1	G	109	CYS	2.0
1	H	80	VAL	2.0
1	K	77	VAL	2.0
1	H	109	CYS	2.0
1	D	70	GLY	2.0
1	K	97	PHE	2.0
1	L	68	PHE	2.0
1	L	70	GLY	2.0
1	F	150	ILE	2.0
1	J	98	LYS	2.0
1	J	164	LYS	2.0
1	K	73	LYS	2.0
1	G	130	TYR	2.0
1	K	69	VAL	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,

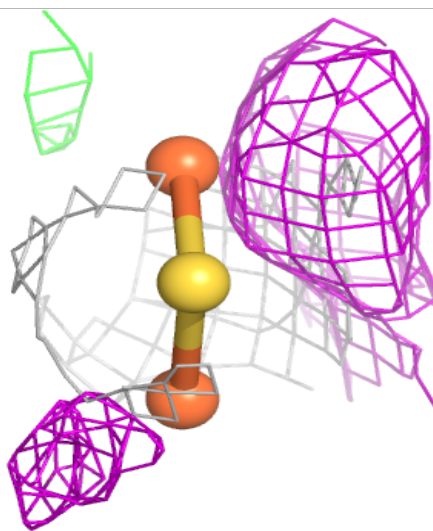
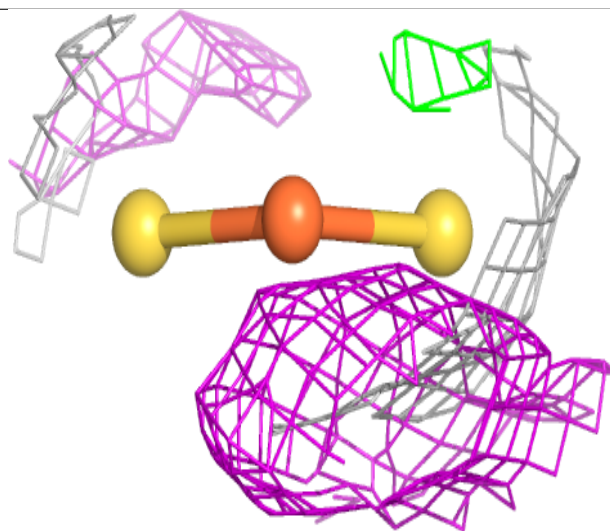
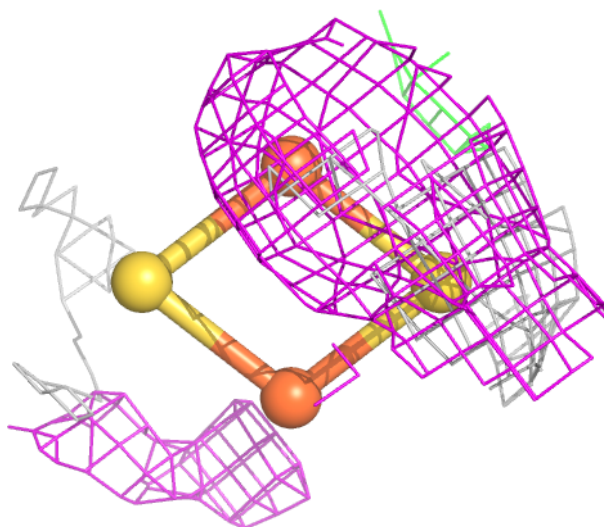
median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	SO4	K	202	5/5	0.50	0.15	106,106,121,124	0
3	SO4	J	202	5/5	0.64	0.17	93,101,109,116	0
3	SO4	I	202	5/5	0.64	0.21	83,87,103,110	0
3	SO4	D	202	5/5	0.74	0.20	86,90,100,104	0
3	SO4	A	202	5/5	0.76	0.16	91,92,108,121	0
3	SO4	E	202	5/5	0.78	0.16	79,83,103,105	0
3	SO4	F	202	5/5	0.79	0.12	87,96,106,114	0
3	SO4	B	202	5/5	0.79	0.17	86,92,104,105	0
3	SO4	L	202	5/5	0.80	0.09	101,106,120,122	0
3	SO4	G	202	5/5	0.81	0.16	89,93,105,111	0
3	SO4	C	202	5/5	0.84	0.18	87,89,109,110	0
3	SO4	H	202	5/5	0.89	0.07	91,92,97,103	0
2	FES	H	201	4/4	0.95	0.08	71,81,82,88	0
2	FES	K	201	4/4	0.95	0.07	83,84,85,90	0
2	FES	G	201	4/4	0.96	0.06	71,74,76,93	0
2	FES	L	201	4/4	0.96	0.06	78,80,86,87	0
2	FES	I	201	4/4	0.99	0.03	50,57,58,65	0
2	FES	J	201	4/4	0.99	0.03	61,62,62,65	0
2	FES	C	201	4/4	0.99	0.04	50,53,54,59	0
2	FES	D	201	4/4	0.99	0.04	47,52,55,55	0
2	FES	E	201	4/4	0.99	0.04	58,58,62,68	0
2	FES	F	201	4/4	0.99	0.04	61,62,62,64	0
2	FES	A	201	4/4	0.99	0.03	51,52,55,59	0
2	FES	B	201	4/4	0.99	0.04	54,54,55,55	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.

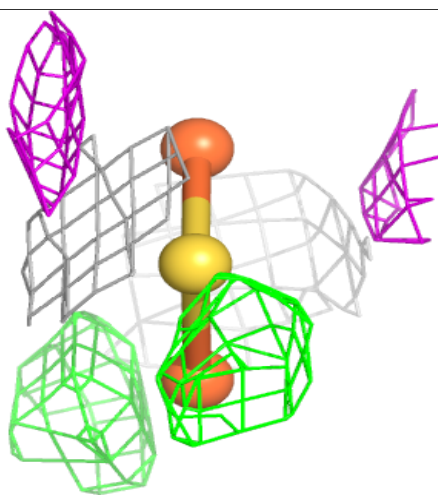
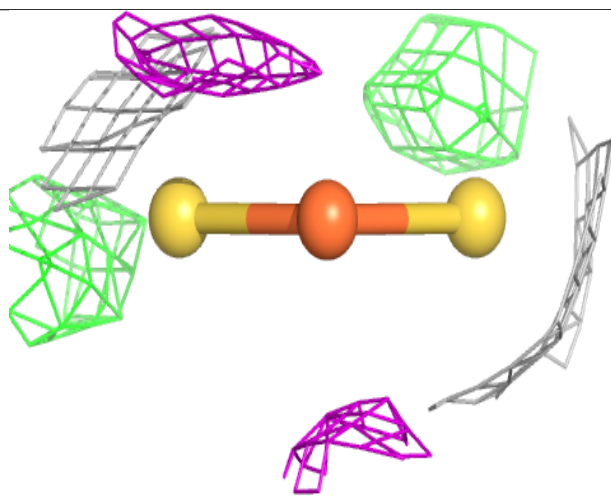
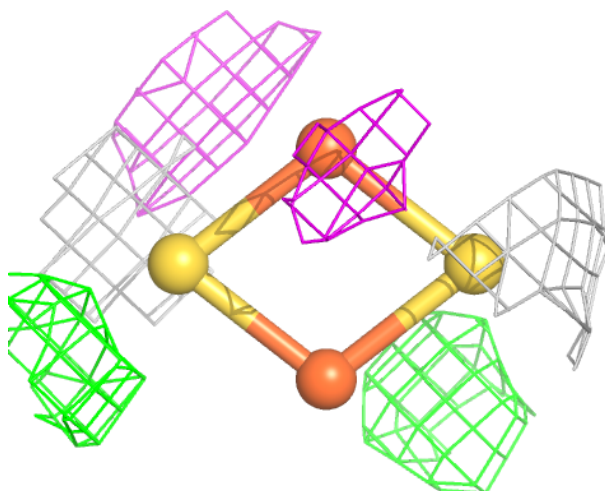
Electron density around FES H 201:

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



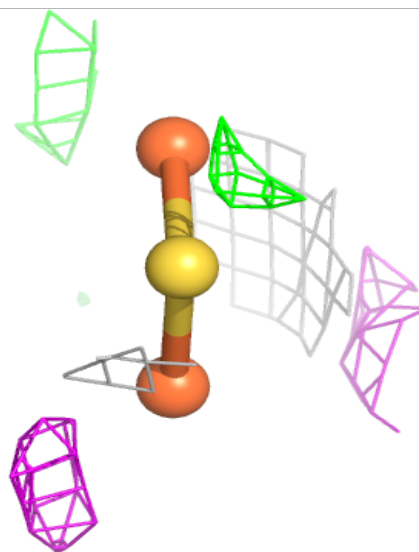
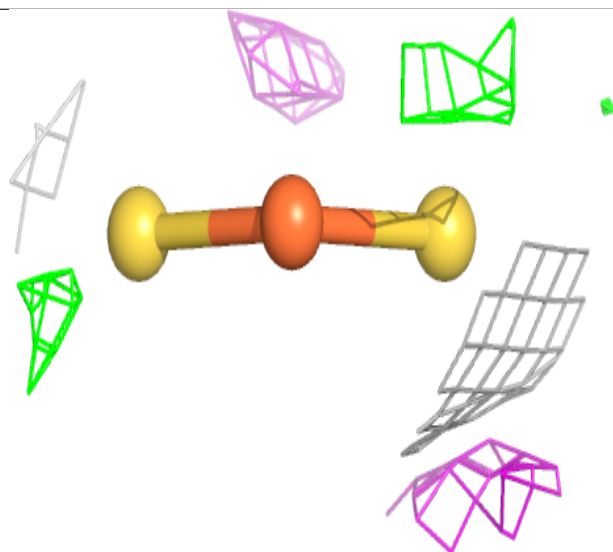
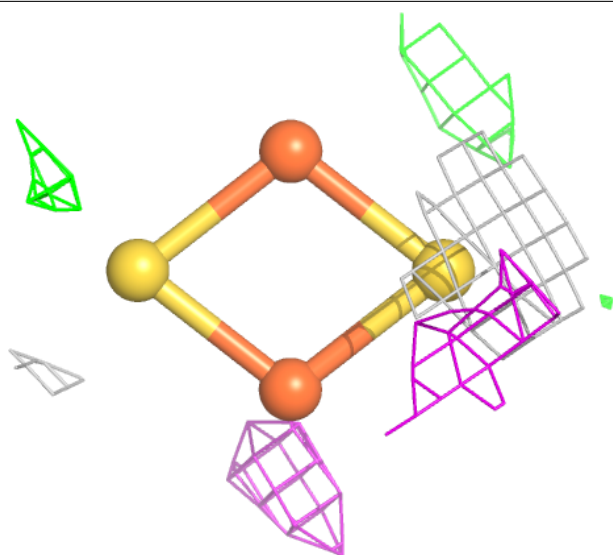
Electron density around FES K 201:

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



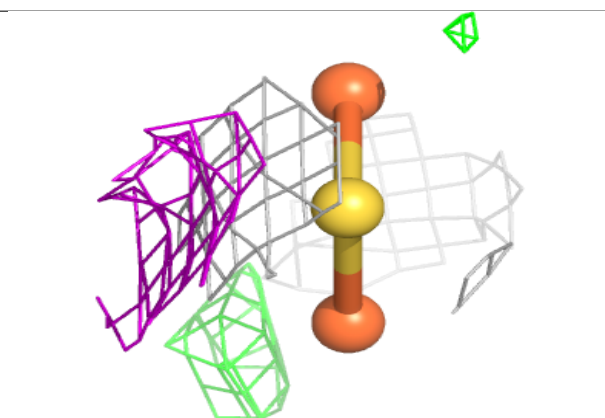
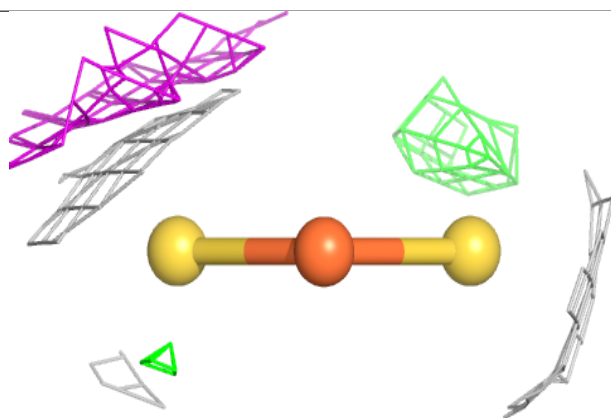
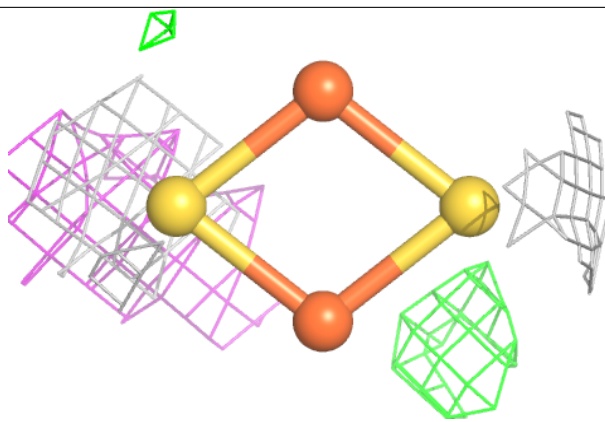
Electron density around FES G 201:

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

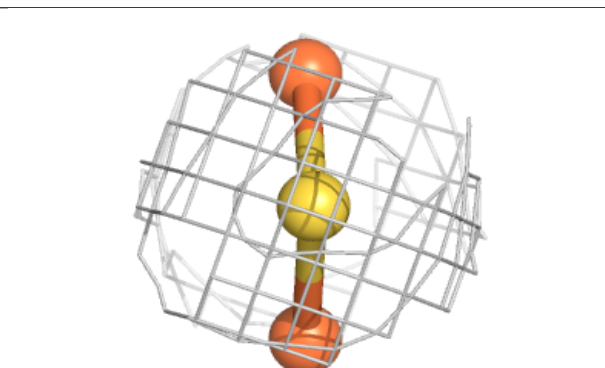
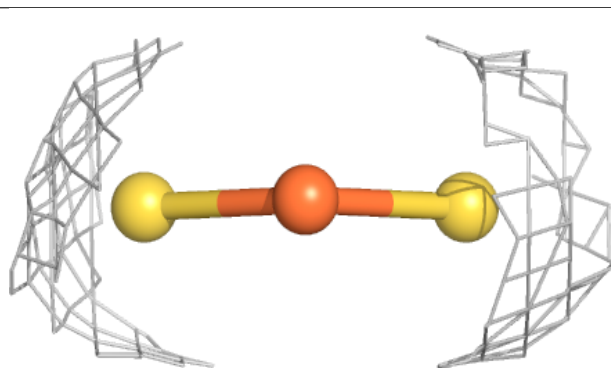
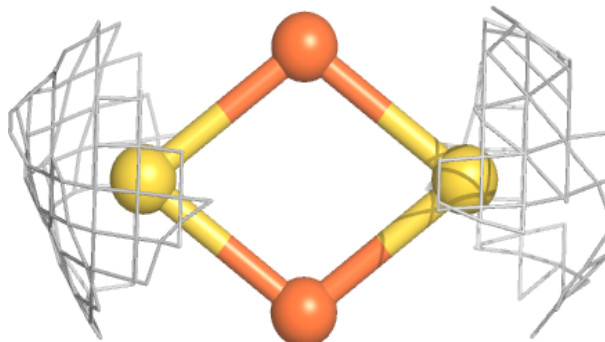


Electron density around FES L 201:

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

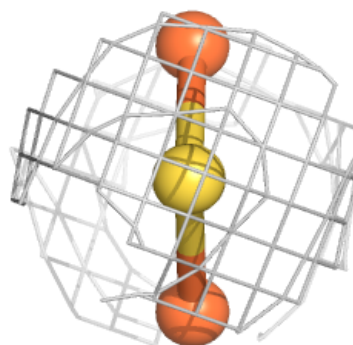
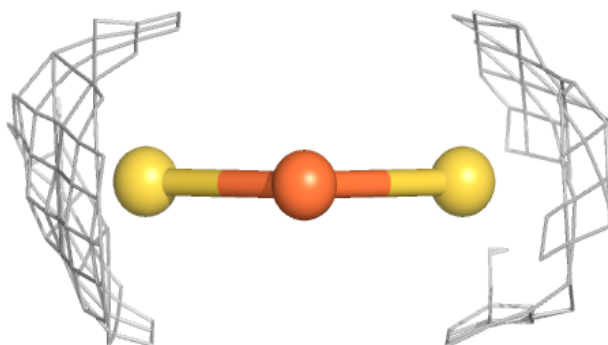
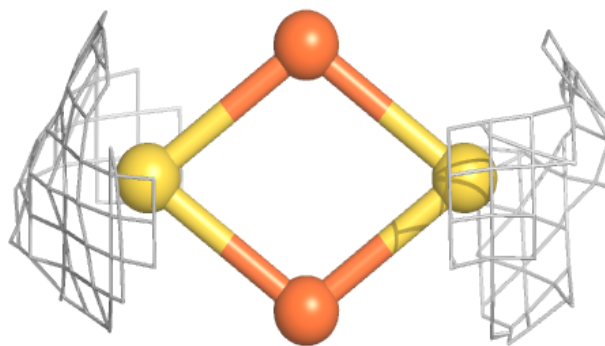
**Electron density around FES I 201:**

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

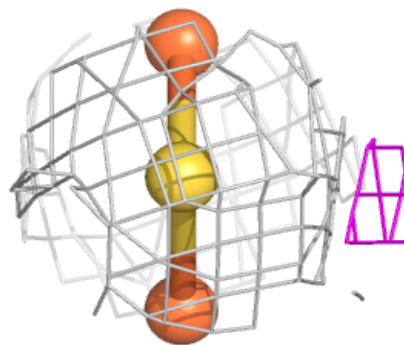
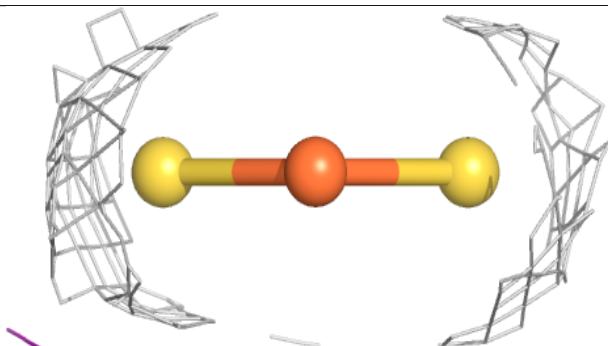
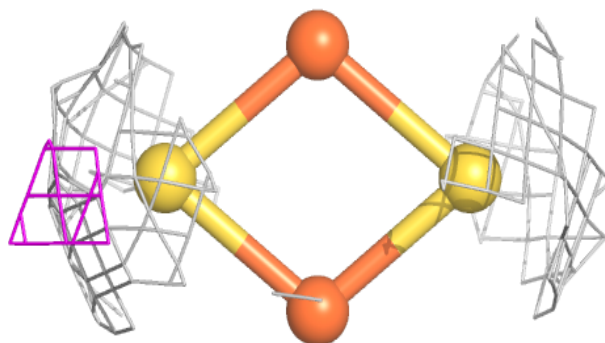


Electron density around FES J 201:

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and green (positive)

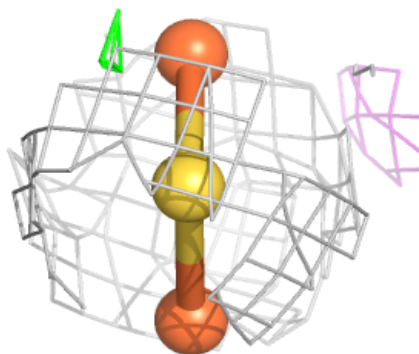
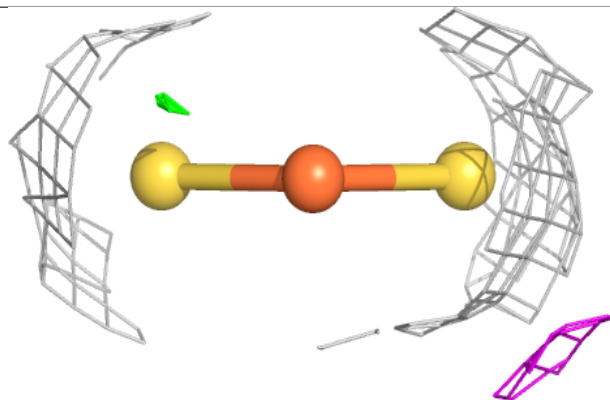
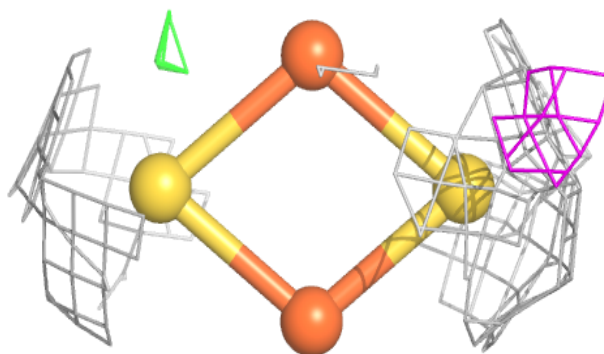
**Electron density around FES C 201:**

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and green (positive)

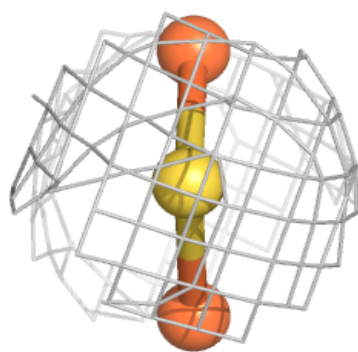
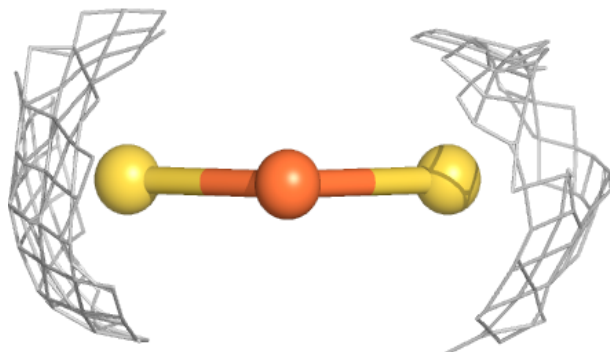
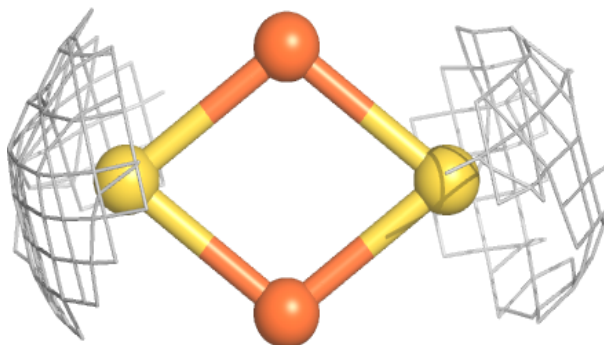


Electron density around FES D 201:

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

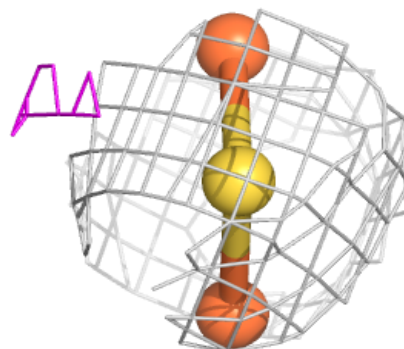
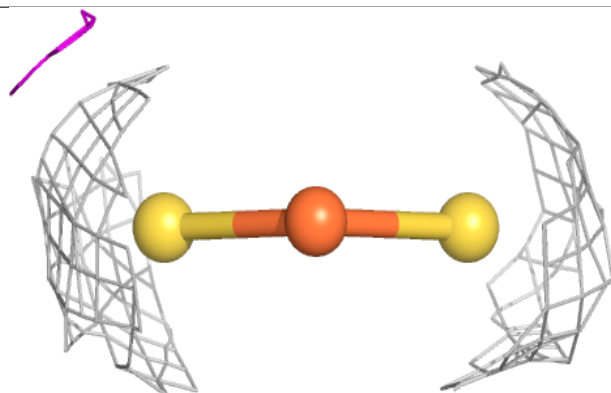
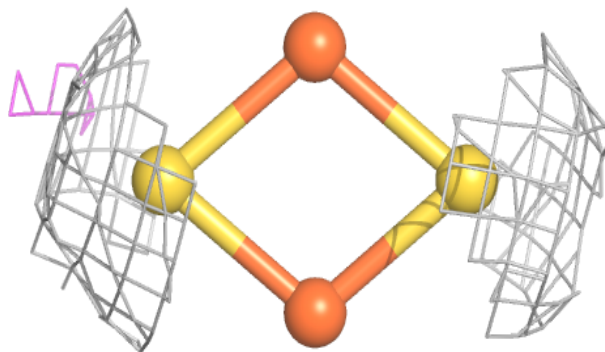
**Electron density around FES E 201:**

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

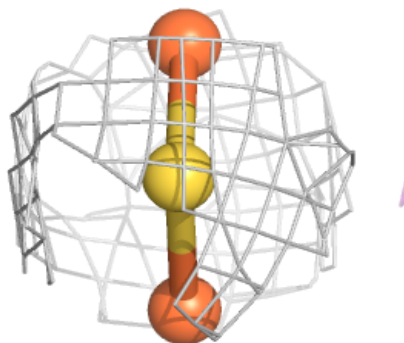
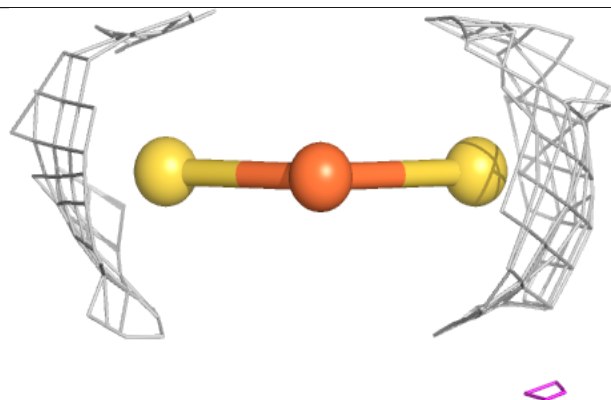
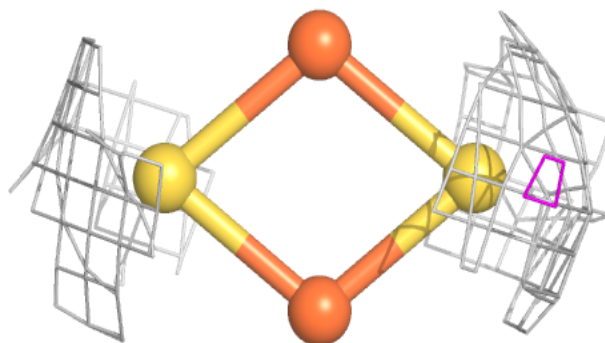


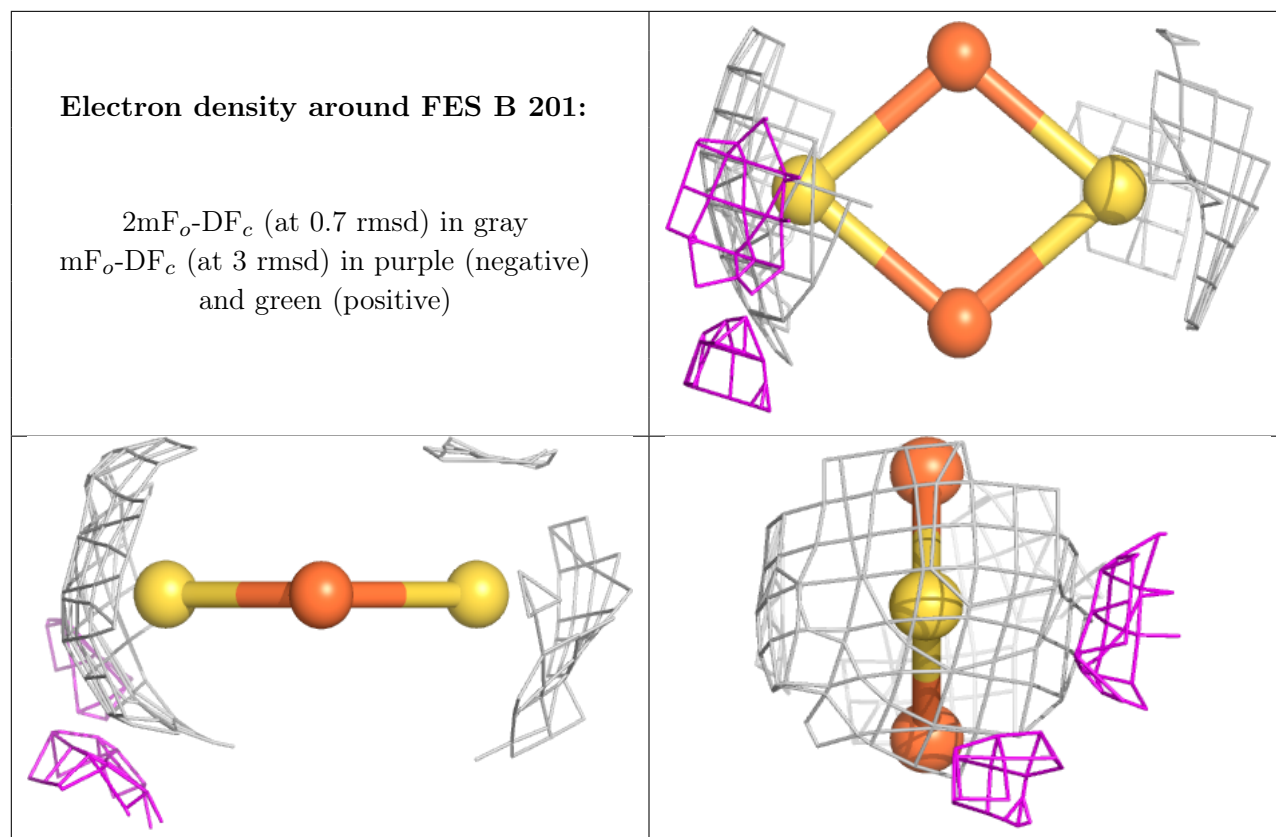
Electron density around FES F 201:

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

**Electron density around FES A 201:**

$2mF_o-DF_c$ (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.