



Full wwPDB X-ray Structure Validation Report ⓘ

Aug 4, 2026 – 08:55 AM EDT

PDB ID : 6OP1 / pdb_00006op1
Title : Selenium incorporated, carbon monoxide inhibited FeMo-cofactor of azotobacter vinelandii
Authors : Arias, R.J.; Rees, D.C.
Deposited on : 2019-04-24
Resolution : 1.70 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	:	9.0.015 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.50

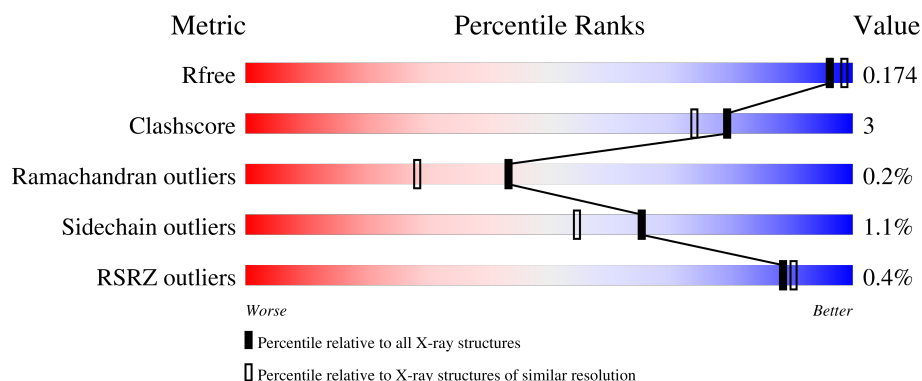
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.70 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	5551 (1.70-1.70)
Clashscore	190562	5924 (1.70-1.70)
Ramachandran outliers	187476	5846 (1.70-1.70)
Sidechain outliers	187428	5846 (1.70-1.70)
RSRZ outliers	180081	5554 (1.70-1.70)

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	477	% 91% 8%
1	C	477	92% 7% .
2	B	522	95% 5%
2	D	522	% 94% 6%

2 Entry composition [i](#)

There are 10 unique types of molecules in this entry. The entry contains 17994 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.

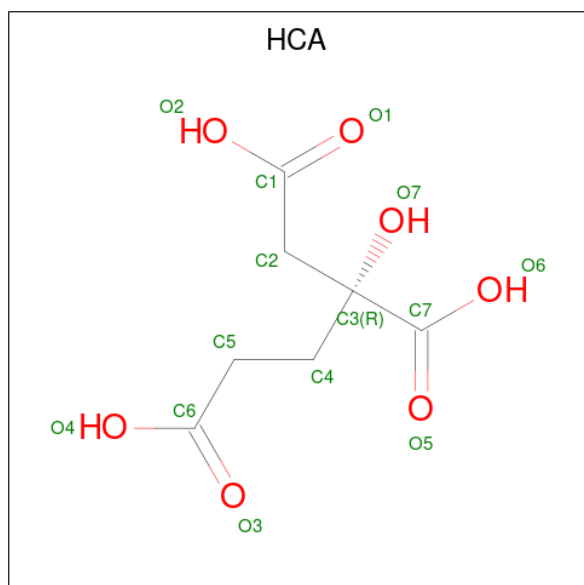
- Molecule 1 is a protein called Nitrogenase molybdenum-iron protein alpha chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	477	Total	C	N	O	S	0	5	0
			3832	2433	653	718	28			
1	C	477	Total	C	N	O	S	0	7	0
			3820	2426	652	714	28			

- Molecule 2 is a protein called Nitrogenase molybdenum-iron protein beta chain.

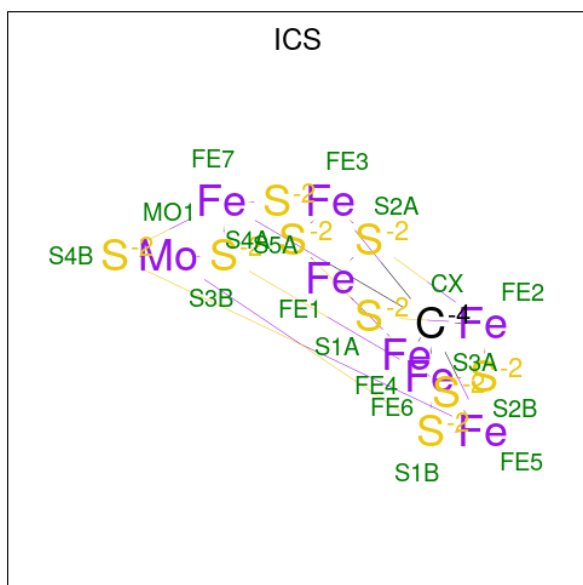
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	522	Total	C	N	O	S	0	4	0
			4186	2674	704	778	30			
2	D	522	Total	C	N	O	S	0	10	0
			4238	2702	715	790	31			

- Molecule 3 is 3-HYDROXY-3-CARBOXY-ADIPIC ACID (CCD ID: HCA) (formula: $C_7H_{10}O_7$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			14	7	7		
3	C	1	Total	C	O	0	0
			14	7	7		

- Molecule 4 is iron-sulfur-molybdenum cluster with interstitial carbon (CCD ID: ICS) (formula: CFe_7MoS_9) (labeled as "Ligand of Interest" by depositor).



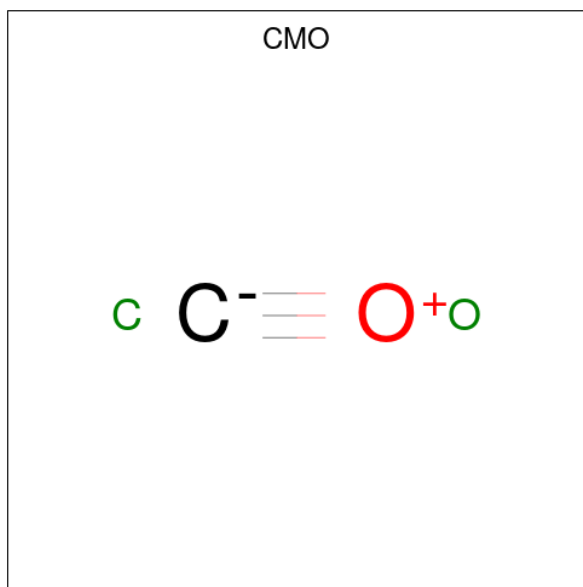
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	Fe	Mo	S	0	0
			17	1	7	1	8		
4	C	1	Total	C	Fe	Mo	S	0	0
			17	1	7	1	8		

- Molecule 5 is IMIDAZOLE (CCD ID: IMD) (formula: $\text{C}_3\text{H}_5\text{N}_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	N	0	0
			5	3	2		
5	A	1	Total	C	N	0	0
			5	3	2		
5	B	1	Total	C	N	0	0
			5	3	2		
5	B	1	Total	C	N	0	0
			5	3	2		
5	B	1	Total	C	N	0	0
			5	3	2		
5	C	1	Total	C	N	0	0
			5	3	2		
5	D	1	Total	C	N	0	0
			5	3	2		
5	D	1	Total	C	N	0	0
			5	3	2		

- Molecule 6 is CARBON MONOXIDE (CCD ID: CMO) (formula: CO).

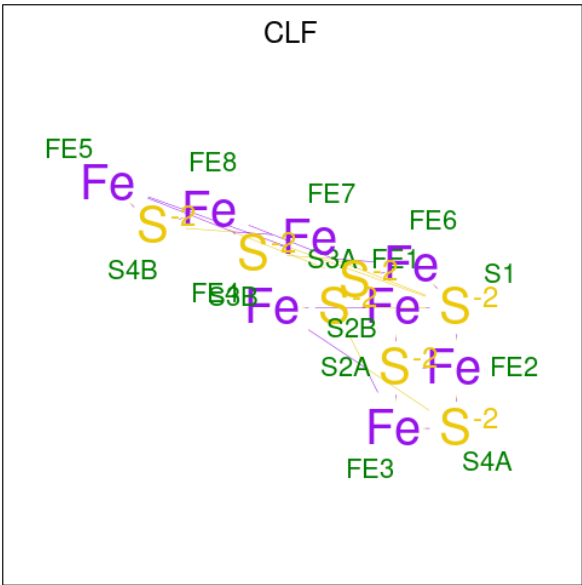


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	C	O	0	0
			2	1	1		
6	C	1	Total	C	O	0	0
			2	1	1		

- Molecule 7 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	2	Total	Mg	0	0
			2	2		
7	B	1	Total	Mg	0	0
			1	1		
7	D	2	Total	Mg	0	0
			2	2		

- Molecule 8 is FE(8)-S(7) CLUSTER (CCD ID: CLF) (formula: Fe₈S₇).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
8	A	1	Total	Fe	S	0	0
			15	8	7		
8	C	1	Total	Fe	S	0	0
			15	8	7		

- Molecule 9 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	B	2	Total	Ca	0	0
			2	2		

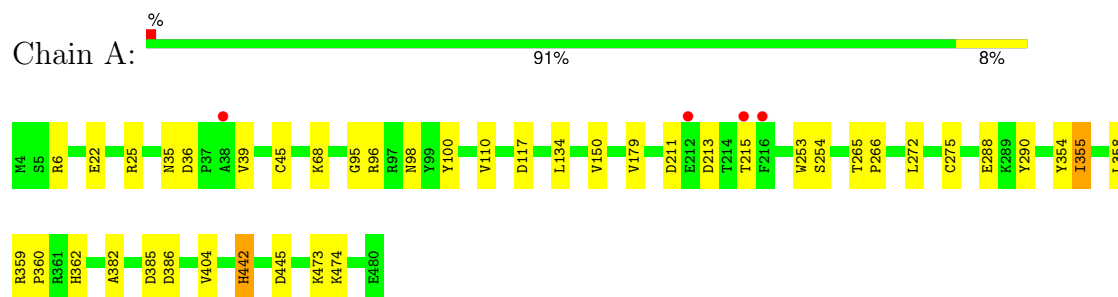
- Molecule 10 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	A	376	Total	O	0	0
			376	376		
10	B	512	Total	O	0	0
			512	512		
10	C	379	Total	O	0	0
			379	379		
10	D	503	Total	O	0	0
			503	503		

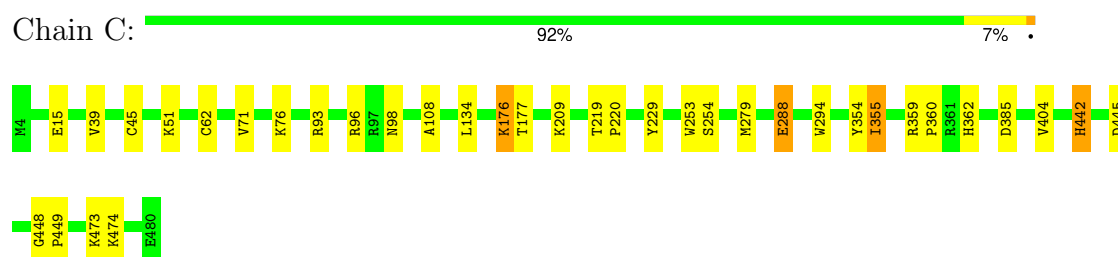
3 Residue-property plots

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.

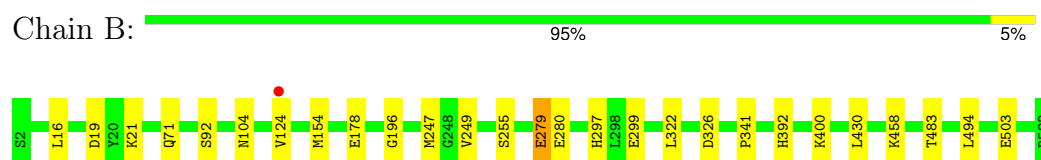
- Molecule 1: Nitrogenase molybdenum-iron protein alpha chain



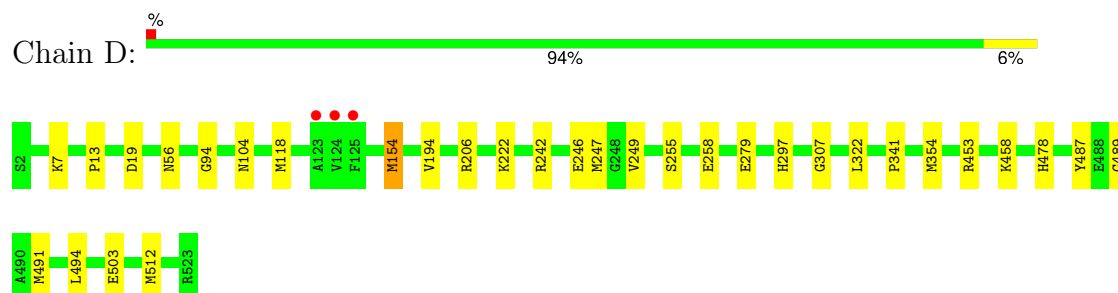
- Molecule 1: Nitrogenase molybdenum-iron protein alpha chain



- Molecule 2: Nitrogenase molybdenum-iron protein beta chain



- Molecule 2: Nitrogenase molybdenum-iron protein beta chain



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	77.19Å 128.00Å 107.63Å 90.00° 109.15° 90.00°	Depositor
Resolution (Å)	36.93 – 1.70 36.93 – 1.70	Depositor EDS
% Data completeness (in resolution range)	98.5 (36.93-1.70) 98.5 (36.93-1.70)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.35 (at 1.70Å)	Xtriage
Refinement program	REFMAC 5.8.0230	Depositor
R, R_{free}	0.132 , 0.165 0.145 , 0.174	Depositor DCC
R_{free} test set	10479 reflections (4.84%)	wwPDB-VP
Wilson B-factor (Å ²)	13.1	Xtriage
Anisotropy	0.023	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 41.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.019 for h,-k,-h-l	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	17994	wwPDB-VP
Average B, all atoms (Å ²)	16.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.44% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: CLF, ICS, CMO, MG, CA, HCA, IMD

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	0.99	4/3920 (0.1%)	1.04	2/5284 (0.0%)
1	C	0.96	2/3904 (0.1%)	1.02	3/5262 (0.1%)
2	B	0.97	1/4291 (0.0%)	1.01	5/5804 (0.1%)
2	D	0.97	3/4341 (0.1%)	1.00	3/5869 (0.1%)
All	All	0.97	10/16456 (0.1%)	1.01	13/22219 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1
1	C	0	1
2	D	0	2
All	All	0	4

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	307	GLY	N-CA	6.30	1.53	1.45
2	D	478	HIS	CE1-NE2	6.11	1.38	1.32
1	A	117	ASP	N-CA	5.88	1.55	1.46
1	A	272	LEU	N-CA	-5.54	1.39	1.46
1	A	150	VAL	C-O	-5.29	1.18	1.24
1	A	179	VAL	N-CA	-5.26	1.42	1.46
1	C	93	ARG	C-O	-5.23	1.18	1.24
2	D	489	GLY	C-O	5.22	1.30	1.23
2	B	392	HIS	CE1-NE2	5.18	1.37	1.32
1	C	71	VAL	C-O	5.02	1.28	1.24

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	19	ASP	CA-CB-CG	7.58	120.18	112.60
2	B	104	ASN	CA-CB-CG	6.97	119.57	112.60
1	C	385	ASP	CA-CB-CG	6.77	119.37	112.60
2	B	124	VAL	N-CA-C	-6.53	105.38	111.45
2	D	19	ASP	CA-CB-CG	6.34	118.94	112.60
1	C	442	HIS	CA-CB-CG	5.79	119.59	113.80
2	B	326	ASP	CA-CB-CG	5.62	118.22	112.60
2	D	104	ASN	CA-CB-CG	5.47	118.07	112.60
1	A	385	ASP	CA-CB-CG	5.45	118.05	112.60
1	C	288	GLU	CB-CA-C	5.22	119.72	110.85
2	B	297	HIS	CA-CB-CG	5.15	118.95	113.80
1	A	442	HIS	CA-CB-CG	5.09	118.89	113.80
2	D	56	ASN	CA-CB-CG	5.03	117.63	112.60

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	96	ARG	Sidechain
1	C	96	ARG	Sidechain
2	D	206[A]	ARG	Sidechain
2	D	453[A]	ARG	Sidechain

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	3832	0	3763	22	0
1	C	3820	0	3731	27	0
2	B	4186	0	4064	19	0
2	D	4238	0	4105	17	0
3	A	14	0	6	3	0
3	C	14	0	6	2	0
4	A	17	0	0	0	0
4	C	17	0	0	0	0
5	A	10	0	10	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	B	15	0	15	2	0
5	C	5	0	5	1	0
5	D	15	0	15	1	0
6	A	2	0	0	0	0
6	C	2	0	0	0	0
7	A	2	0	0	0	0
7	B	1	0	0	0	0
7	D	2	0	0	0	0
8	A	15	0	0	0	0
8	C	15	0	0	0	0
9	B	2	0	0	0	0
10	A	376	0	0	3	1
10	B	512	0	0	5	1
10	C	379	0	0	4	0
10	D	503	0	0	7	0
All	All	17994	0	15720	85	1

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 (85) 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:A:474:LYS:HE3	10:A:902:HOH:O	1.32	1.23
2:B:503:GLU:OE2	2:B:503:GLU:CG	2.00	1.10
5:A:504:IMD:H5	10:D:907:HOH:O	1.64	0.97
2:D:222:LYS:CD	10:D:1159:HOH:O	2.21	0.87
1:C:229:TYR:OH	1:C:279[B]:MET:HE3	1.82	0.78
1:A:95:GLY:HA3	10:A:734:HOH:O	1.83	0.76
1:C:51:LYS:HD2	10:D:737:HOH:O	1.84	0.75
2:B:178:GLU:OE2	10:B:701:HOH:O	2.07	0.71
5:D:602:IMD:H4	10:D:758:HOH:O	1.91	0.70
2:D:118:MET:HB3	2:D:154[A]:MET:HE1	1.73	0.70
1:C:229:TYR:CZ	1:C:279[B]:MET:HE3	2.27	0.68
2:B:280:GLU:OE1	5:B:605:IMD:H5	1.93	0.68
1:A:213:ASP:OD1	1:A:215:THR:HG23	1.95	0.66
1:A:39:VAL:HG11	1:A:45[C]:CYS:SG	2.37	0.64
1:C:473:LYS:CG	10:C:765:HOH:O	2.45	0.63
2:B:322:LEU:HD21	1:C:474:LYS:HB3	1.82	0.62
1:C:15:GLU:OE2	1:C:15:GLU:CB	2.48	0.62
2:B:92:SER:OG	2:B:154:MET:HG2	1.99	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:458:LYS:HE3	10:B:744:HOH:O	2.00	0.61
2:D:458:LYS:HE3	10:D:822:HOH:O	2.00	0.59
2:B:247[B]:MET:HG3	2:B:341:PRO:HD3	1.85	0.58
2:B:247[A]:MET:HG3	2:B:341:PRO:HD3	1.85	0.58
2:D:503:GLU:OE1	2:D:503:GLU:CG	2.52	0.57
1:A:39:VAL:CG1	1:A:45[C]:CYS:SG	2.94	0.56
1:A:25:ARG:HD3	10:A:637:HOH:O	2.05	0.56
2:D:247:MET:HB3	2:D:249:VAL:HG23	1.87	0.55
1:C:209[B]:LYS:HB2	1:C:209[B]:LYS:NZ	2.22	0.55
1:A:22:GLU:OE2	1:A:25:ARG:NH2	2.37	0.54
2:B:299:GLU:HG2	10:B:1134:HOH:O	2.07	0.54
1:C:176:LYS:HE3	10:C:902:HOH:O	2.08	0.53
1:A:474:LYS:HB3	2:D:322:LEU:HD21	1.90	0.52
2:D:354:MET:SD	2:D:491[A]:MET:HE2	2.49	0.52
2:B:279:GLU:O	2:B:279:GLU:CD	2.52	0.52
1:C:176:LYS:NZ	10:C:605:HOH:O	2.43	0.52
2:B:494:LEU:C	2:B:494:LEU:HD23	2.35	0.52
1:A:211:ASP:OD1	1:A:290:TYR:OH	2.28	0.52
2:D:458:LYS:CE	10:D:822:HOH:O	2.58	0.51
1:C:39:VAL:HG11	1:C:45[B]:CYS:SG	2.51	0.50
1:A:6:ARG:NH2	1:A:36:ASP:HA	2.27	0.49
2:B:458:LYS:CE	10:B:744:HOH:O	2.59	0.49
2:D:494:LEU:HD23	2:D:494:LEU:C	2.38	0.49
2:D:279:GLU:CG	2:D:279:GLU:OE1	2.61	0.48
2:D:242:ARG:HD3	2:D:246[A]:GLU:OE2	2.13	0.48
1:C:229:TYR:CE1	1:C:279[B]:MET:HE3	2.48	0.47
1:A:134:LEU:C	1:A:134:LEU:HD23	2.40	0.47
1:C:62:CYS:HB3	2:D:94:GLY:HA3	1.97	0.47
1:C:39:VAL:CG1	1:C:45[B]:CYS:SG	3.04	0.46
2:D:118:MET:CB	2:D:154[A]:MET:HE1	2.44	0.46
1:C:442:HIS:HB3	3:C:501:HCA:O5	2.16	0.46
1:A:6:ARG:NH2	1:A:35:ASN:O	2.49	0.46
1:C:209[B]:LYS:HE2	10:C:610:HOH:O	2.16	0.46
1:C:294:TRP:O	5:C:503:IMD:H2	2.17	0.45
2:D:512:MET:HE2	2:D:512:MET:HB2	1.74	0.45
1:A:100:TYR:CE1	1:A:110:VAL:HB	2.51	0.44
1:A:354:TYR:CZ	1:A:404:VAL:HG12	2.51	0.44
2:B:279:GLU:CD	2:B:279:GLU:C	2.85	0.44
1:A:442:HIS:CG	3:A:501:HCA:H52	2.54	0.42
2:D:247:MET:HG2	2:D:341:PRO:HD3	2.01	0.42
1:C:359:ARG:N	1:C:360:PRO:CD	2.81	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:194:VAL:HB	2:D:297:HIS:CG	2.54	0.42
1:A:359:ARG:N	1:A:360:PRO:CD	2.83	0.42
1:A:253:TRP:HA	1:A:254:SER:HA	1.82	0.42
1:C:177:THR:OG1	1:C:209[B]:LYS:HE2	2.20	0.42
1:C:354:TYR:CZ	1:C:404:VAL:HG12	2.54	0.42
1:A:265:THR:N	1:A:266:PRO:CD	2.83	0.41
1:A:442:HIS:HB3	3:A:501:HCA:O6	2.20	0.41
1:C:134:LEU:C	1:C:134:LEU:HD23	2.45	0.41
2:B:322:LEU:HD23	1:C:474:LYS:HG3	2.02	0.41
1:C:219:THR:HB	1:C:220:PRO:HD2	2.01	0.41
1:A:68:LYS:HD3	1:A:68:LYS:C	2.45	0.41
2:B:400:LYS:CG	10:B:1075:HOH:O	2.68	0.41
3:A:501:HCA:O2	3:A:501:HCA:O7	2.39	0.41
1:C:442:HIS:CG	3:C:501:HCA:H52	2.55	0.41
2:B:483:THR:O	5:B:602:IMD:H5	2.21	0.41
1:C:76:LYS:O	1:C:108:ALA:HA	2.21	0.41
1:A:382:ALA:HB1	1:A:386:ASP:HB2	2.02	0.40
2:B:16:LEU:O	2:B:21:LYS:HE3	2.22	0.40
2:B:71:GLN:O	2:B:196:GLY:HA3	2.21	0.40
2:B:247[B]:MET:HB3	2:B:249:VAL:HG23	2.03	0.40
1:C:253:TRP:HA	1:C:254:SER:HA	1.86	0.40
2:D:487:TYR:O	2:D:491[A]:MET:HG3	2.22	0.40
5:A:504:IMD:C5	10:D:907:HOH:O	2.41	0.40
1:C:51:LYS:HE2	1:C:51:LYS:HB2	1.55	0.40
1:C:448:GLY:HA2	1:C:449:PRO:C	2.45	0.40
1:A:275:CYS:HA	1:A:358:LEU:HD22	2.03	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
10:A:863:HOH:O	10:B:1075:HOH:O[2_646]	1.62	0.58

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	481/477 (101%)	465 (97%)	15 (3%)	1 (0%)	43	28
1	C	482/477 (101%)	462 (96%)	19 (4%)	1 (0%)	43	28
2	B	524/522 (100%)	514 (98%)	9 (2%)	1 (0%)	43	28
2	D	530/522 (102%)	522 (98%)	7 (1%)	1 (0%)	43	28
All	All	2017/1998 (101%)	1963 (97%)	50 (2%)	4 (0%)	43	28

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	255	SER
2	D	255	SER
1	C	355	ILE
1	A	355	ILE

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	413/407 (102%)	407 (98%)	6 (2%)	57	43
1	C	407/407 (100%)	401 (98%)	6 (2%)	57	43
2	B	451/454 (99%)	448 (99%)	3 (1%)	76	69
2	D	455/454 (100%)	450 (99%)	5 (1%)	65	54
All	All	1726/1722 (100%)	1706 (99%)	20 (1%)	65	51

All (20) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	98	ASN
1	A	288	GLU
1	A	355	ILE
1	A	362	HIS

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Mol	Chain	Res	Type
1	A	445	ASP
1	A	473	LYS
2	B	279	GLU
2	B	430[A]	LEU
2	B	430[B]	LEU
1	C	98	ASN
1	C	176	LYS
1	C	288	GLU
1	C	355	ILE
1	C	362	HIS
1	C	445	ASP
2	D	7	LYS
2	D	13	PRO
2	D	154[A]	MET
2	D	154[B]	MET
2	D	258	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	14	GLN
1	A	29	ASN
1	A	119	GLN
2	B	45	GLN
2	B	163	ASN
2	B	418	ASN
1	C	119	GLN
2	D	163	ASN
2	D	418	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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](#)

Of 24 ligands modelled in this entry, 7 are monoatomic - leaving 17 for Mogul analysis.

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	$\# Z > 2$
5	IMD	B	605	-	5,5,5	0.83	0	5,5,5	0.46	0
5	IMD	C	503	-	5,5,5	0.65	0	5,5,5	0.34	0
5	IMD	D	601	-	5,5,5	0.60	0	5,5,5	0.52	0
6	CMO	C	504	4	0,1,1	-	-	-		
5	IMD	B	603	-	5,5,5	0.63	0	5,5,5	0.67	0
3	HCA	C	501	4	13,13,13	1.35	1 (7%)	15,18,18	1.67	6 (40%)
8	CLF	C	505	1,2	0,24,24	-	-	-		
5	IMD	A	503	-	5,5,5	0.55	0	5,5,5	0.67	0
6	CMO	A	505	4	0,1,1	-	-	-		
8	CLF	A	508	1,2	0,24,24	-	-	-		
4	ICS	A	502	3,1,6	4,28,30	1.85	2 (50%)	-		
5	IMD	A	504	-	5,5,5	1.27	1 (20%)	5,5,5	0.88	0
5	IMD	D	602	-	5,5,5	0.50	0	5,5,5	0.52	0
5	IMD	D	603	-	5,5,5	0.74	0	5,5,5	0.45	0
4	ICS	C	502	3,1,6	4,28,30	1.48	1 (25%)	-		
3	HCA	A	501	4	13,13,13	1.29	2 (15%)	15,18,18	1.87	3 (20%)
5	IMD	B	602	-	5,5,5	0.73	0	5,5,5	0.77	0

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
5	IMD	B	605	-	-	-	0/1/1/1
5	IMD	D	601	-	-	-	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
8	CLF	C	505	1,2	-	-	0/12/10/10
5	IMD	B	603	-	-	-	0/1/1/1
3	HCA	C	501	4	-	0/17/17/17	-
5	IMD	A	503	-	-	-	0/1/1/1
8	CLF	A	508	1,2	-	-	0/12/10/10
5	IMD	A	504	-	-	-	0/1/1/1
5	IMD	D	602	-	-	-	0/1/1/1
5	IMD	D	603	-	-	-	0/1/1/1
5	IMD	C	503	-	-	-	0/1/1/1
3	HCA	A	501	4	-	2/17/17/17	-
5	IMD	B	602	-	-	-	0/1/1/1

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	502	ICS	S3A-FE5	2.84	2.31	2.24
3	C	501	HCA	O3-C6	2.64	1.30	1.22
3	A	501	HCA	O3-C6	2.55	1.30	1.22
5	A	504	IMD	C5-C4	2.46	1.44	1.35
3	A	501	HCA	O2-C1	-2.33	1.23	1.30
4	A	502	ICS	S3A-FE4	2.29	2.30	2.24
4	C	502	ICS	S3A-FE4	2.26	2.30	2.24

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	501	HCA	O3-C6-C5	-3.49	112.01	123.09
3	A	501	HCA	C4-C5-C6	3.42	120.70	112.77
3	C	501	HCA	C4-C5-C6	3.02	119.76	112.77
3	C	501	HCA	O7-C3-C7	-2.90	104.84	108.96
3	A	501	HCA	O1-C1-C2	-2.79	115.05	122.95
3	C	501	HCA	O1-C1-C2	-2.19	116.76	122.95
3	C	501	HCA	O6-C7-C3	2.18	117.33	113.14
3	C	501	HCA	O3-C6-C5	-2.09	116.47	123.09
3	C	501	HCA	O4-C6-O3	2.08	128.67	123.33

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	501	HCA	O2-C1-C2-C3

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Mol	Chain	Res	Type	Atoms
3	A	501	HCA	O1-C1-C2-C3

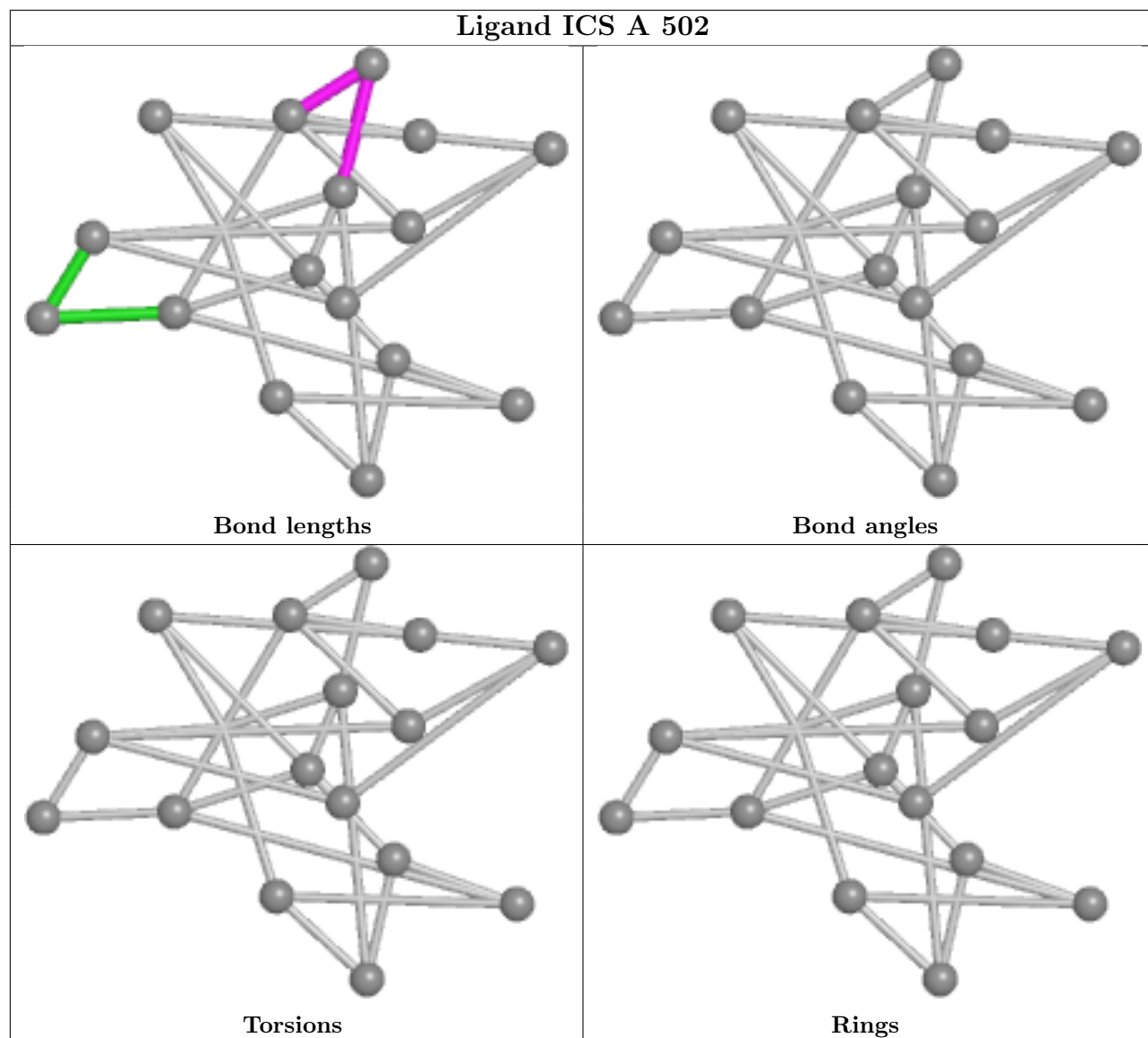
There are no ring outliers.

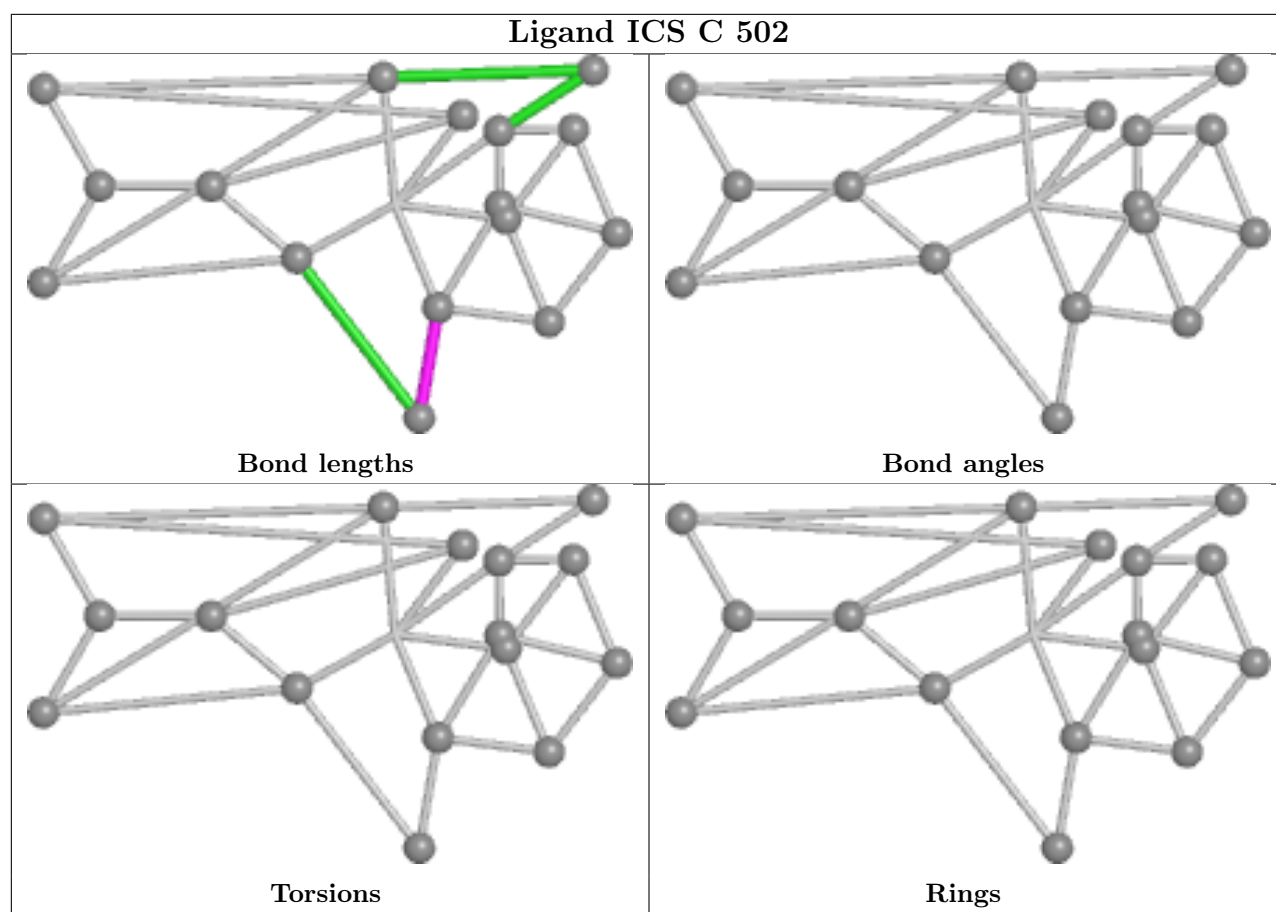
7 monomers are involved in 11 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	B	605	IMD	1	0
5	C	503	IMD	1	0
3	C	501	HCA	2	0
5	A	504	IMD	2	0
5	D	602	IMD	1	0
3	A	501	HCA	3	0
5	B	602	IMD	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.

Ligand ICS A 502





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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	477/477 (100%)	-0.39	4 (0%) 82 85	6, 15, 32, 54	5 (1%)
1	C	477/477 (100%)	-0.48	0 100 100	7, 14, 27, 52	7 (1%)
2	B	522/522 (100%)	-0.62	1 (0%) 91 92	5, 13, 23, 34	4 (0%)
2	D	522/522 (100%)	-0.55	3 (0%) 85 88	6, 14, 24, 33	10 (1%)
All	All	1998/1998 (100%)	-0.51	8 (0%) 88 90	5, 14, 26, 54	26 (1%)

All (8) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	D	124	VAL	3.4
1	A	215	THR	3.4
2	D	125	PHE	3.1
1	A	38	ALA	2.5
2	B	124	VAL	2.3
1	A	216	PHE	2.3
1	A	212	GLU	2.1
2	D	123[A]	ALA	2.1

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 ⓘ

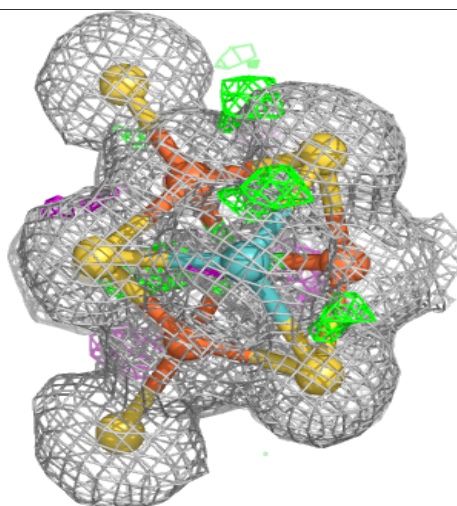
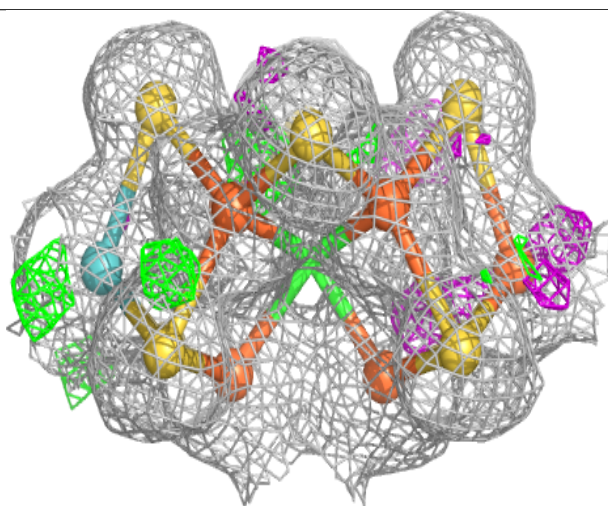
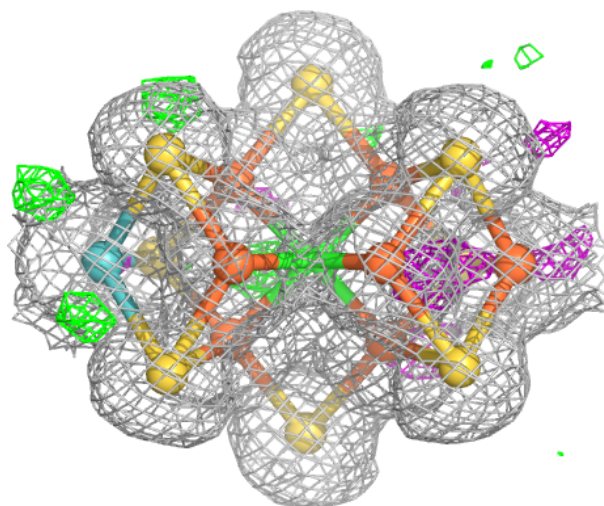
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
7	MG	D	605	1/1	0.79	0.32	54,54,54,54	0
5	IMD	A	504	5/5	0.84	0.18	26,27,29,31	0
5	IMD	D	601	5/5	0.86	0.12	35,35,38,39	0
7	MG	D	604	1/1	0.88	0.17	44,44,44,44	0
5	IMD	B	603	5/5	0.89	0.12	29,30,31,31	0
5	IMD	B	605	5/5	0.91	0.10	18,20,21,23	0
7	MG	A	506	1/1	0.91	0.30	46,46,46,46	0
5	IMD	A	503	5/5	0.92	0.09	29,29,30,31	0
7	MG	B	604	1/1	0.93	0.11	44,44,44,44	0
5	IMD	C	503	5/5	0.94	0.08	27,28,29,29	0
5	IMD	D	602	5/5	0.95	0.09	14,15,17,18	0
5	IMD	B	602	5/5	0.96	0.07	15,15,15,17	0
5	IMD	D	603	5/5	0.96	0.07	20,21,23,23	0
7	MG	A	507	1/1	0.97	0.12	38,38,38,38	0
3	HCA	A	501	14/14	0.98	0.04	9,10,11,11	0
3	HCA	C	501	14/14	0.98	0.04	9,10,13,13	0
6	CMO	C	504	2/2	0.99	0.04	6,6,6,7	0
6	CMO	A	505	2/2	0.99	0.05	8,8,8,9	0
8	CLF	A	508	15/15	0.99	0.03	10,10,11,12	0
8	CLF	C	505	15/15	0.99	0.03	10,11,12,12	0
9	CA	B	601	1/1	0.99	0.09	20,20,20,20	0
9	CA	B	606	1/1	0.99	0.08	19,19,19,19	0
4	ICS	A	502	17/18	1.00	0.02	9,11,12,12	0
4	ICS	C	502	17/18	1.00	0.02	8,11,11,12	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.

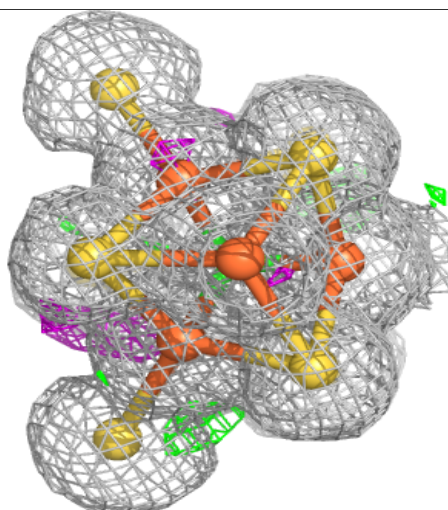
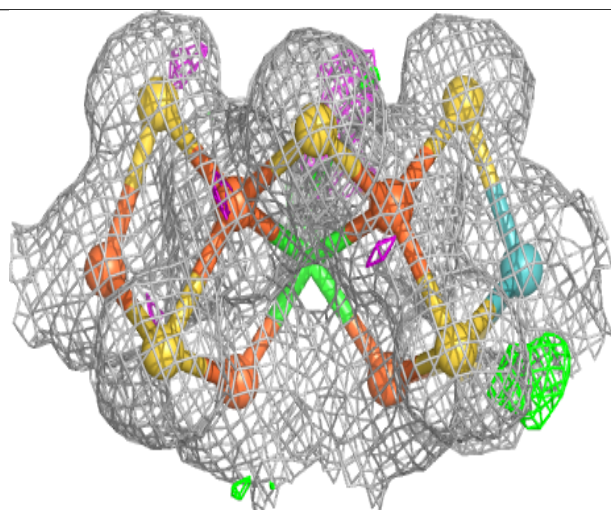
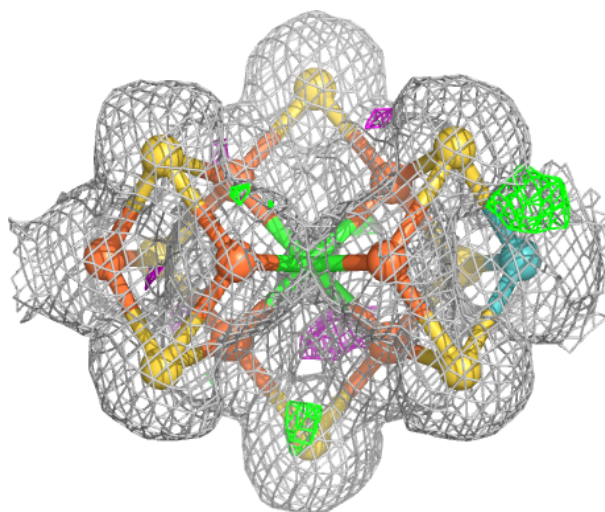
Electron density around ICS A 502:

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



Electron density around ICS C 502:

$2mF_o-DF_c$ (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.