Full wwPDB X-ray Structure Validation Report (i)

Nov 17, 2026 – 02:55 AM JST

PDB ID	:	9XSJ / pdb_00009xsj
Title	:	Fe(II)/(alpha)ketoglutarate-dependent dioxygenase cnsJ with metal Iron
Authors	:	Wang, J.; Wang, X.Y.; Yan, W.P.
Deposited on	:	2025-11-21
Resolution	:	2.28 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 (i) 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 (1)) were used in the production of this report:

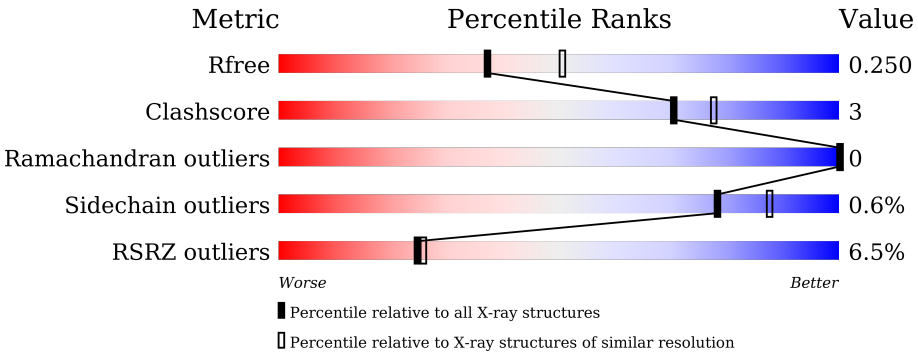
MolProbity	:	4-5-2 with Phenix2.2
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	2.2
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.015 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.51

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.28 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	9078 (2.30-2.26)
Clashscore	190562	9802 (2.30-2.26)
Ramachandran outliers	187476	9690 (2.30-2.26)
Sidechain outliers	187428	9691 (2.30-2.26)
RSRZ outliers	180081	9085 (2.30-2.26)

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 <=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	329	8% 79% 8% 13%
1	B	329	5% 80% 8% 12%
1	C	329	5% 81% 6% 13%
1	D	329	5% 77% 11% 12%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit crite-

ria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	ACY	D	402	-	-	X	-

2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 9350 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 Dioxygenase cnsJ.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	286	Total	C	N	O	S	0	0	0
			2238	1410	388	429	11			
1	B	290	Total	C	N	O	S	0	0	0
			2293	1442	400	440	11			
1	C	285	Total	C	N	O	S	0	0	0
			2211	1397	382	421	11			
1	D	289	Total	C	N	O	S	0	0	0
			2282	1434	399	438	11			

There are 56 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-12	MET	-	initiating methionine	UNP A0A0A2JYK3
A	-11	GLY	-	expression tag	UNP A0A0A2JYK3
A	-10	SER	-	expression tag	UNP A0A0A2JYK3
A	-9	SER	-	expression tag	UNP A0A0A2JYK3
A	-8	TRP	-	expression tag	UNP A0A0A2JYK3
A	-7	SER	-	expression tag	UNP A0A0A2JYK3
A	-6	HIS	-	expression tag	UNP A0A0A2JYK3
A	-5	PRO	-	expression tag	UNP A0A0A2JYK3
A	-4	GLN	-	expression tag	UNP A0A0A2JYK3
A	-3	PHE	-	expression tag	UNP A0A0A2JYK3
A	-2	GLU	-	expression tag	UNP A0A0A2JYK3
A	-1	LYS	-	expression tag	UNP A0A0A2JYK3
A	0	MET	-	expression tag	UNP A0A0A2JYK3
A	1	SER	-	expression tag	UNP A0A0A2JYK3
B	-12	MET	-	initiating methionine	UNP A0A0A2JYK3
B	-11	GLY	-	expression tag	UNP A0A0A2JYK3
B	-10	SER	-	expression tag	UNP A0A0A2JYK3
B	-9	SER	-	expression tag	UNP A0A0A2JYK3
B	-8	TRP	-	expression tag	UNP A0A0A2JYK3
B	-7	SER	-	expression tag	UNP A0A0A2JYK3
B	-6	HIS	-	expression tag	UNP A0A0A2JYK3

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-5	PRO	-	expression tag	UNP A0A0A2JYK3
B	-4	GLN	-	expression tag	UNP A0A0A2JYK3
B	-3	PHE	-	expression tag	UNP A0A0A2JYK3
B	-2	GLU	-	expression tag	UNP A0A0A2JYK3
B	-1	LYS	-	expression tag	UNP A0A0A2JYK3
B	0	MET	-	expression tag	UNP A0A0A2JYK3
B	1	SER	-	expression tag	UNP A0A0A2JYK3
C	-12	MET	-	initiating methionine	UNP A0A0A2JYK3
C	-11	GLY	-	expression tag	UNP A0A0A2JYK3
C	-10	SER	-	expression tag	UNP A0A0A2JYK3
C	-9	SER	-	expression tag	UNP A0A0A2JYK3
C	-8	TRP	-	expression tag	UNP A0A0A2JYK3
C	-7	SER	-	expression tag	UNP A0A0A2JYK3
C	-6	HIS	-	expression tag	UNP A0A0A2JYK3
C	-5	PRO	-	expression tag	UNP A0A0A2JYK3
C	-4	GLN	-	expression tag	UNP A0A0A2JYK3
C	-3	PHE	-	expression tag	UNP A0A0A2JYK3
C	-2	GLU	-	expression tag	UNP A0A0A2JYK3
C	-1	LYS	-	expression tag	UNP A0A0A2JYK3
C	0	MET	-	expression tag	UNP A0A0A2JYK3
C	1	SER	-	expression tag	UNP A0A0A2JYK3
D	-12	MET	-	initiating methionine	UNP A0A0A2JYK3
D	-11	GLY	-	expression tag	UNP A0A0A2JYK3
D	-10	SER	-	expression tag	UNP A0A0A2JYK3
D	-9	SER	-	expression tag	UNP A0A0A2JYK3
D	-8	TRP	-	expression tag	UNP A0A0A2JYK3
D	-7	SER	-	expression tag	UNP A0A0A2JYK3
D	-6	HIS	-	expression tag	UNP A0A0A2JYK3
D	-5	PRO	-	expression tag	UNP A0A0A2JYK3
D	-4	GLN	-	expression tag	UNP A0A0A2JYK3
D	-3	PHE	-	expression tag	UNP A0A0A2JYK3
D	-2	GLU	-	expression tag	UNP A0A0A2JYK3
D	-1	LYS	-	expression tag	UNP A0A0A2JYK3
D	0	MET	-	expression tag	UNP A0A0A2JYK3
D	1	SER	-	expression tag	UNP A0A0A2JYK3

- Molecule 2 is FE (II) ION (CCD ID: FE2) (formula: Fe) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Fe		
2	A	1	1	1	0	0

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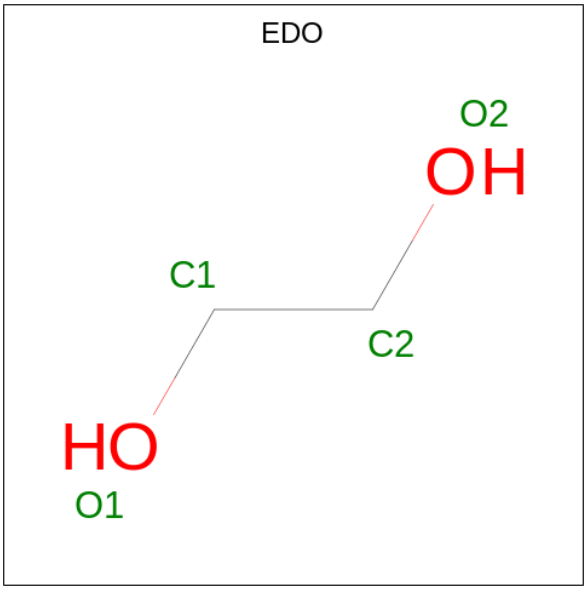
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	B	1	Total Fe 1 1	0	0
2	C	1	Total Fe 1 1	0	0
2	D	1	Total Fe 1 1	0	0

- Molecule 3 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: $C_2H_6O_2$).



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	B	1	Total C O 4 2 2	0	0
3	C	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
3	D	1	Total C O 4 2 2	0	0
3	D	1	Total C O 4 2 2	0	0

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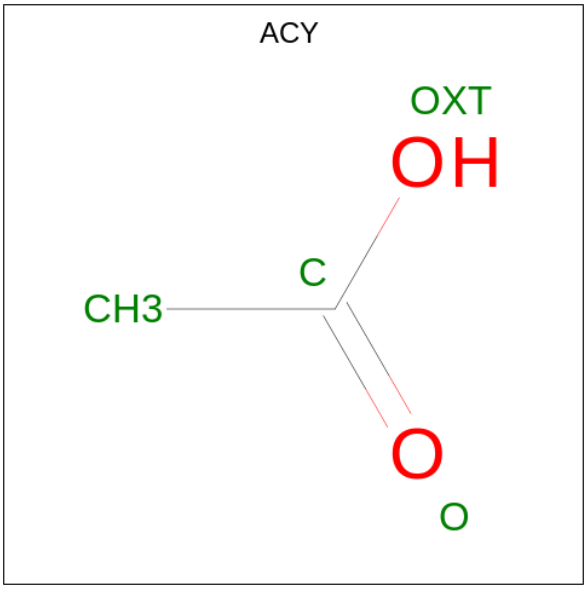
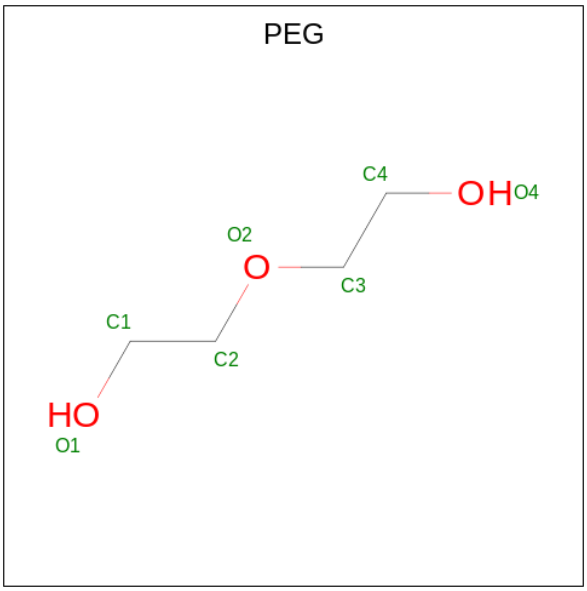
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	D	1	Total C O 4 2 2	0	0
3	D	1	Total C O 4 2 2	0	0
3	D	1	Total C O 4 2 2	0	0
3	D	1	Total C O 4 2 2	0	0
3	D	1	Total C O 4 2 2	0	0
3	D	1	Total C O 4 2 2	0	0

- Molecule 4 is ACETIC ACID (CCD ID: ACY) (formula: $C_2H_4O_2$).



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

- Molecule 5 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula: $C_4H_{10}O_3$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	B	1	Total C O 7 4 3	0	0
5	B	1	Total C O 7 4 3	0	0
5	C	1	Total C O 7 4 3	0	0
5	D	1	Total C O 7 4 3	0	0

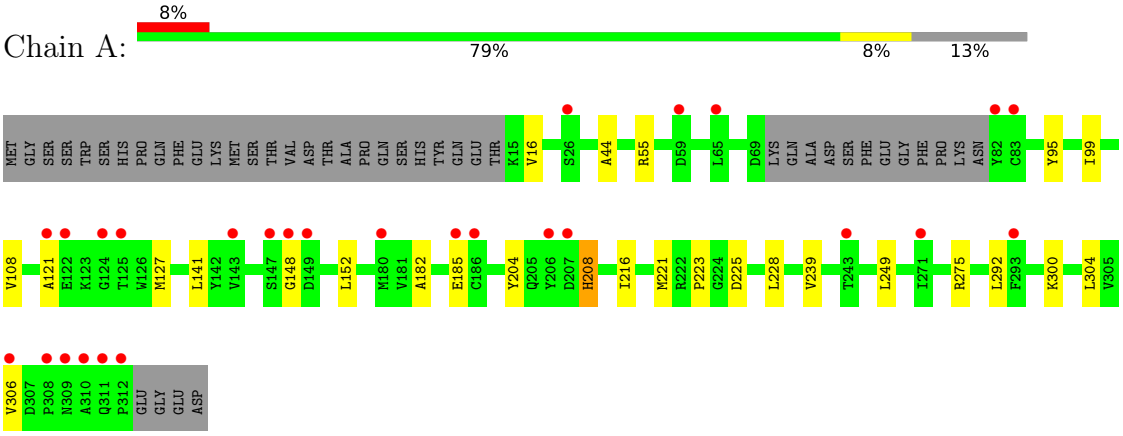
- Molecule 6 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	51	Total O 51 51	0	0
6	B	63	Total O 63 63	0	0
6	C	55	Total O 55 55	0	0
6	D	61	Total O 61 61	0	0

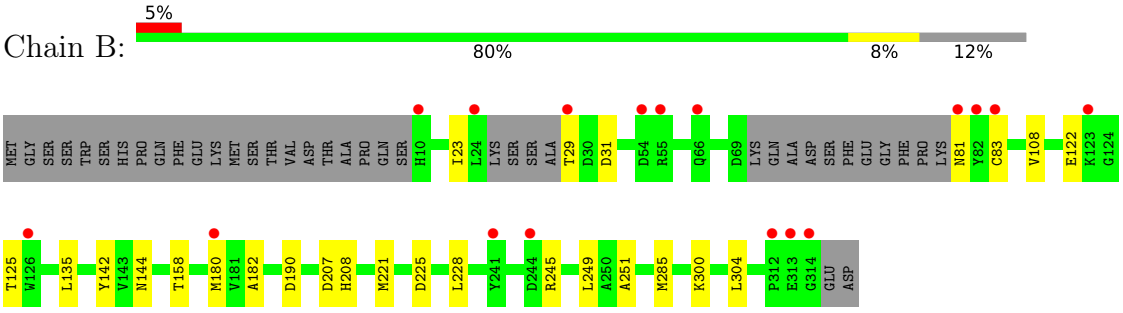
3 Residue-property plots (i)

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.

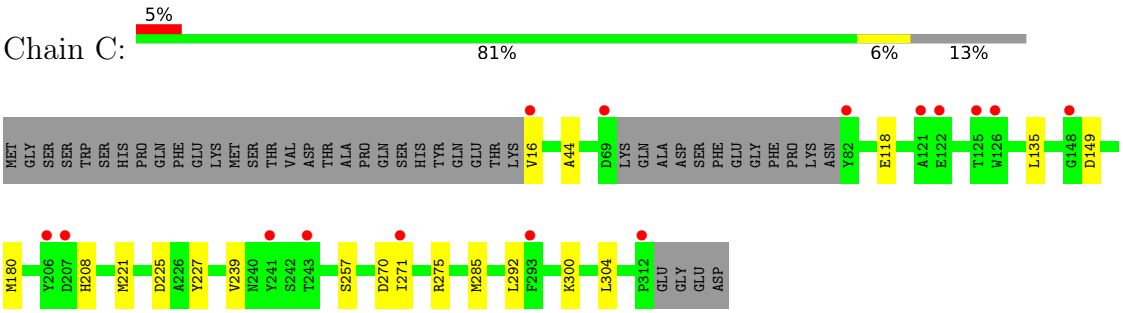
• Molecule 1: Dioxygenase cnsJ



• Molecule 1: Dioxygenase cnsJ

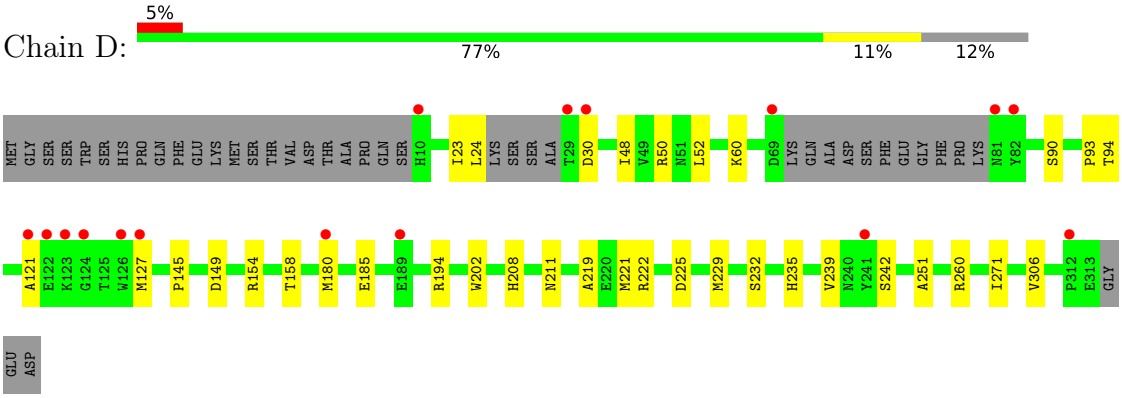


• Molecule 1: Dioxygenase cnsJ



• Molecule 1: Dioxygenase cnsJ

Chain D:


5%
77%
11%
12%
MET GLY SER SER TRP SER HIS PRO GLN PHE GLU LYS MET SER THR VAL ASP THR ALA PRO GLN SER H10 I23 L24 LYS SER SER ALA T29 D30 I48 V49 R50 N51 L52 K60 D69 LYS GLN ALA ASP SER PHE GLU GLY PHE PRO LYS N81 Y82 S90 P93 T94
A121 E122 K123 G124 T125 W126 M127 P145 D149 R154 T158 M180 E185 E189 R194 W202 H208 N211 A219 E220 M221 R222 D225 M229 S232 H235 V239 N240 Y241 S242 A251 R260 I271 V306 P312 E313 GLY
GLU ASP

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	90.27Å 48.90Å 141.03Å 90.00° 105.03° 90.00°	Depositor
Resolution (Å)	62.04 – 2.28 62.04 – 2.28	Depositor EDS
% Data completeness (in resolution range)	97.8 (62.04-2.28) 92.4 (62.04-2.28)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.57 (at 2.29Å)	Xtriage
Refinement program	PHENIX 1.19.2_4158	Depositor
R, R_{free}	0.200 , 0.249 0.200 , 0.250	Depositor DCC
R_{free} test set	1993 reflections (3.72%)	wwPDB-VP
Wilson B-factor (Å^2)	32.3	Xtriage
Anisotropy	0.478	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 43.4	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	9350	wwPDB-VP
Average B, all atoms (Å^2)	44.0	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 29.06 % 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 1.6540e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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: FE2, PEG, EDO, ACY

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	0.08	0/2290	0.25	0/3117
1	B	0.16	0/2347	0.26	0/3194
1	C	0.07	0/2263	0.24	0/3083
1	D	0.17	0/2335	0.27	1/3178 (0.0%)
All	All	0.13	0/9235	0.26	1/12572 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	D	30	ASP	N-CA-C	-6.29	104.53	111.82

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	2238	0	2165	16	0
1	B	2293	0	2202	14	0
1	C	2211	0	2125	11	0
1	D	2282	0	2192	23	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	C	1	0	0	0	0
2	D	1	0	0	0	0
3	A	4	0	6	2	0
3	B	8	0	12	0	0
3	C	8	0	12	0	0
3	D	36	0	54	3	0
4	B	4	0	3	0	0
4	D	4	0	3	3	0
5	B	14	0	20	0	0
5	C	7	0	10	1	0
5	D	7	0	10	0	0
6	A	51	0	0	0	0
6	B	63	0	0	0	0
6	C	55	0	0	0	0
6	D	61	0	0	0	0
All	All	9350	0	8814	61	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 (61) 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:154:ARG:NH1	1:D:232:SER:O	2.30	0.65
1:B:83:CYS:HB3	1:B:142:TYR:HB2	1.80	0.63
1:D:185:GLU:OE1	1:D:222:ARG:NH1	2.32	0.62
1:C:149:ASP:HB2	1:C:239:VAL:HG22	1.84	0.59
1:C:180:MET:HG3	1:C:227:TYR:CZ	2.39	0.56
1:A:292:LEU:HB3	1:B:158:THR:HA	1.88	0.55
1:D:24:LEU:HD12	1:D:52:LEU:HA	1.89	0.55
1:A:121:ALA:HB2	1:A:127:MET:HE3	1.89	0.54
1:D:90:SER:HA	3:D:411:EDO:H21	1.89	0.54
1:D:154:ARG:NH2	4:D:402:ACY:OXT	2.40	0.54
1:C:16:VAL:HG21	1:C:44:ALA:HB2	1.91	0.53
1:A:275:ARG:NH2	1:A:306:VAL:O	2.41	0.52
1:D:271:ILE:HG23	1:D:306:VAL:HG12	1.93	0.50
1:B:81:ASN:HA	1:B:144:ASN:HD22	1.76	0.50
1:C:118:GLU:H	5:C:402:PEG:H11	1.75	0.49
1:C:300:LYS:HB3	1:C:304:LEU:HD12	1.95	0.49
1:A:185:GLU:HG2	1:A:223:PRO:HD3	1.94	0.49
1:B:182:ALA:HA	1:B:249:LEU:HD23	1.94	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:60:LYS:HD3	1:D:94:THR:HG21	1.95	0.48
1:D:93:PRO:HG3	3:D:411:EDO:H22	1.96	0.48
1:C:292:LEU:HB3	1:D:158:THR:HA	1.94	0.48
1:B:180:MET:SD	1:B:251:ALA:HB2	2.54	0.47
1:D:154:ARG:H	3:D:404:EDO:H22	1.79	0.47
1:B:300:LYS:HB3	1:B:304:LEU:HD12	1.97	0.47
1:D:221:MET:HB3	1:D:225:ASP:HB2	1.97	0.47
1:D:194:ARG:NH1	1:D:211:ASN:OD1	2.47	0.46
1:D:180:MET:HG3	1:D:251:ALA:HB2	1.98	0.46
1:D:154:ARG:HH22	1:D:202:TRP:HB2	1.81	0.46
1:A:148:GLY:HA2	1:A:239:VAL:HG22	1.98	0.45
1:A:16:VAL:HG21	1:A:44:ALA:HB2	1.99	0.45
1:D:149:ASP:HB2	1:D:239:VAL:HB	1.98	0.45
1:A:300:LYS:HB3	1:A:304:LEU:HD12	1.98	0.44
1:A:182:ALA:HA	1:A:249:LEU:HD23	1.99	0.44
1:C:271:ILE:O	1:C:275:ARG:HG3	2.18	0.44
1:A:204:TYR:O	3:A:402:EDO:O2	2.34	0.44
1:C:221:MET:HB3	1:C:225:ASP:HB2	2.00	0.44
1:D:229:MET:HE1	1:D:235:HIS:CE1	2.53	0.44
1:B:182:ALA:HB2	1:B:221:MET:HE3	2.00	0.43
1:C:270:ASP:OD1	1:C:270:ASP:N	2.51	0.43
1:A:152:LEU:HD11	1:A:216:ILE:HD11	2.00	0.43
1:A:221:MET:HB3	1:A:225:ASP:HB2	2.01	0.42
1:B:207:ASP:OD1	1:B:208:HIS:N	2.52	0.42
1:C:257:SER:O	1:D:260:ARG:HD2	2.20	0.42
1:B:221:MET:HB3	1:B:225:ASP:HB2	2.02	0.42
1:D:145:PRO:HB3	1:D:242:SER:O	2.19	0.42
1:D:121:ALA:HB2	1:D:127:MET:HG2	2.01	0.42
1:D:50:ARG:HH12	1:D:221:MET:HA	1.85	0.41
1:D:48:ILE:HD11	1:D:219:ALA:HA	2.02	0.41
1:A:95:TYR:HD1	1:A:99:ILE:HD12	1.86	0.41
1:B:135:LEU:HB3	1:B:285:MET:HA	2.03	0.41
1:C:135:LEU:HB3	1:C:285:MET:HA	2.03	0.41
1:B:180:MET:HE2	1:B:180:MET:HB2	1.88	0.41
1:B:108:VAL:HG21	1:B:228:LEU:HD13	2.03	0.41
1:D:208:HIS:CE1	4:D:402:ACY:H2	2.56	0.41
1:B:122:GLU:HG2	1:B:125:THR:HB	2.03	0.41
1:A:208:HIS:CE1	3:A:402:EDO:H22	2.56	0.40
1:B:190:ASP:OD1	1:B:245:ARG:NH2	2.48	0.40
1:A:108:VAL:HG21	1:A:228:LEU:HD13	2.03	0.40
1:D:154:ARG:HH21	4:D:402:ACY:C	2.33	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:55:ARG:HD2	1:A:55:ARG:HA	1.89	0.40
1:A:141:LEU:HB2	1:A:249:LEU:HB2	2.02	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	282/329 (86%)	276 (98%)	6 (2%)	0	100	100
1	B	284/329 (86%)	277 (98%)	7 (2%)	0	100	100
1	C	281/329 (85%)	275 (98%)	6 (2%)	0	100	100
1	D	283/329 (86%)	278 (98%)	5 (2%)	0	100	100
All	All	1130/1316 (86%)	1106 (98%)	24 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains (i)

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	242/284 (85%)	241 (100%)	1 (0%)	84	91
1	B	248/284 (87%)	245 (99%)	3 (1%)	63	77
1	C	235/284 (83%)	234 (100%)	1 (0%)	84	91

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	D	247/284 (87%)	246 (100%)	1 (0%)	84 91
All	All	972/1136 (86%)	966 (99%)	6 (1%)	78 87

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	208	HIS
1	B	23	ILE
1	B	29	THR
1	B	31	ASP
1	C	208	HIS
1	D	23	ILE

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	200	HIS
1	A	208	HIS
1	B	84	GLN
1	B	144	ASN
1	C	110	ASN
1	C	200	HIS
1	C	211	ASN

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)

Of 24 ligands modelled in this entry, 4 are monoatomic - leaving 20 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	$\#\|Z\| > 2$
3	EDO	D	408	-	3,3,3	0.46	0	2,2,2	0.32	0
3	EDO	C	404	-	3,3,3	0.46	0	2,2,2	0.34	0
3	EDO	D	412	-	3,3,3	0.46	0	2,2,2	0.33	0
4	ACY	B	402	-	3,3,3	1.29	0	3,3,3	1.38	0
3	EDO	D	404	-	3,3,3	0.46	0	2,2,2	0.31	0
4	ACY	D	402	-	3,3,3	1.32	0	3,3,3	1.36	0
3	EDO	A	402	-	3,3,3	0.46	0	2,2,2	0.34	0
3	EDO	D	407	-	3,3,3	0.47	0	2,2,2	0.35	0
3	EDO	D	411	-	3,3,3	0.47	0	2,2,2	0.32	0
3	EDO	B	405	-	3,3,3	0.47	0	2,2,2	0.31	0
5	PEG	D	403	-	6,6,6	0.10	0	5,5,5	0.09	0
5	PEG	C	402	-	6,6,6	0.12	0	5,5,5	0.08	0
3	EDO	B	406	-	3,3,3	0.46	0	2,2,2	0.32	0
3	EDO	D	405	-	3,3,3	0.46	0	2,2,2	0.32	0
3	EDO	C	403	-	3,3,3	0.48	0	2,2,2	0.30	0
3	EDO	D	409	-	3,3,3	0.45	0	2,2,2	0.34	0
3	EDO	D	410	-	3,3,3	0.46	0	2,2,2	0.33	0
5	PEG	B	404	-	6,6,6	0.11	0	5,5,5	0.08	0
5	PEG	B	403	-	6,6,6	0.11	0	5,5,5	0.07	0
3	EDO	D	406	-	3,3,3	0.48	0	2,2,2	0.28	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
3	EDO	D	410	-	-	0/1/1/1	-
3	EDO	D	411	-	-	0/1/1/1	-
3	EDO	B	405	-	-	0/1/1/1	-
3	EDO	D	412	-	-	0/1/1/1	-
5	PEG	B	404	-	-	1/4/4/4	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	PEG	D	403	-	-	0/4/4/4	-
5	PEG	C	402	-	-	2/4/4/4	-
3	EDO	D	408	-	-	0/1/1/1	-
3	EDO	D	409	-	-	0/1/1/1	-
5	PEG	B	403	-	-	1/4/4/4	-
3	EDO	D	406	-	-	0/1/1/1	-
3	EDO	D	404	-	-	0/1/1/1	-
3	EDO	B	406	-	-	0/1/1/1	-
3	EDO	D	405	-	-	0/1/1/1	-
3	EDO	C	404	-	-	0/1/1/1	-
3	EDO	C	403	-	-	0/1/1/1	-
3	EDO	A	402	-	-	0/1/1/1	-
3	EDO	D	407	-	-	0/1/1/1	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	C	402	PEG	C1-C2-O2-C3
5	B	404	PEG	O1-C1-C2-O2
5	B	403	PEG	C4-C3-O2-C2
5	C	402	PEG	O1-C1-C2-O2

There are no ring outliers.

5 monomers are involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	D	404	EDO	1	0
4	D	402	ACY	3	0
3	A	402	EDO	2	0
3	D	411	EDO	2	0
5	C	402	PEG	1	0

5.7 Other polymers

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	286/329 (86%)	0.56	27 (9%)	14	15	25, 44, 75, 104	0
1	B	290/329 (88%)	0.34	17 (5%)	28	29	24, 36, 70, 96	0
1	C	285/329 (86%)	0.54	15 (5%)	32	33	27, 44, 78, 104	0
1	D	289/329 (87%)	0.38	16 (5%)	30	31	25, 38, 68, 96	0
All	All	1150/1316 (87%)	0.45	75 (6%)	25	26	24, 40, 76, 104	0

All (75) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	312	PRO	4.4
1	C	206	TYR	3.7
1	A	206	TYR	3.6
1	D	82	TYR	3.6
1	D	29	THR	3.6
1	C	122	GLU	3.6
1	A	82	TYR	3.5
1	C	271	ILE	3.5
1	A	207	ASP	3.4
1	C	312	PRO	3.4
1	C	82	TYR	3.4
1	B	24	LEU	3.2
1	A	124	GLY	3.2
1	B	29	THR	3.1
1	C	69	ASP	3.0
1	A	309	ASN	2.9
1	A	310	ALA	2.9
1	B	313	GLU	2.9
1	D	122	GLU	2.9
1	C	148	GLY	2.9
1	C	293	PHE	2.9

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Mol	Chain	Res	Type	RSRZ
1	A	147	SER	2.8
1	B	180	MET	2.8
1	B	83	CYS	2.8
1	C	125	THR	2.8
1	C	121	ALA	2.8
1	D	30	ASP	2.7
1	C	207	ASP	2.7
1	D	127	MET	2.7
1	A	293	PHE	2.7
1	D	126	TRP	2.7
1	A	122	GLU	2.6
1	A	311	GLN	2.6
1	D	121	ALA	2.6
1	B	123	LYS	2.6
1	A	143	VAL	2.6
1	B	82	TYR	2.6
1	B	241	TYR	2.5
1	A	148	GLY	2.5
1	A	306	VAL	2.5
1	B	10	HIS	2.4
1	C	243	THR	2.4
1	C	16	VAL	2.4
1	B	126	TRP	2.4
1	D	189	GLU	2.4
1	D	241	TYR	2.3
1	B	312	PRO	2.3
1	C	241	TYR	2.3
1	A	149	ASP	2.3
1	D	180	MET	2.3
1	B	81	ASN	2.2
1	A	121	ALA	2.2
1	A	59	ASP	2.2
1	A	186	CYS	2.2
1	D	312	PRO	2.2
1	A	125	THR	2.2
1	A	243	THR	2.2
1	A	26	SER	2.2
1	C	126	TRP	2.2
1	A	185	GLU	2.2
1	B	66	GLN	2.2
1	B	54	ASP	2.1
1	B	244	ASP	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	180	MET	2.1
1	D	69	ASP	2.1
1	D	10	HIS	2.1
1	B	55	ARG	2.1
1	D	123	LYS	2.1
1	A	65	LEU	2.1
1	B	314	GLY	2.1
1	D	81	ASN	2.1
1	A	308	PRO	2.1
1	D	124	GLY	2.0
1	A	83	CYS	2.0
1	A	271	ILE	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	EDO	D	405	4/4	0.66	0.19	46,47,50,52	0
3	EDO	C	403	4/4	0.67	0.19	39,47,52,59	0
5	PEG	B	403	7/7	0.68	0.19	53,54,55,57	0
3	EDO	D	406	4/4	0.70	0.20	43,45,48,49	0
3	EDO	B	406	4/4	0.73	0.17	37,48,48,49	0
4	ACY	B	402	4/4	0.74	0.16	35,48,48,55	0
3	EDO	C	404	4/4	0.75	0.18	54,58,60,60	0
3	EDO	D	409	4/4	0.75	0.15	50,54,56,63	0
3	EDO	B	405	4/4	0.78	0.16	37,41,44,47	0
4	ACY	D	402	4/4	0.82	0.15	43,45,55,61	0
5	PEG	C	402	7/7	0.82	0.12	37,41,54,59	0

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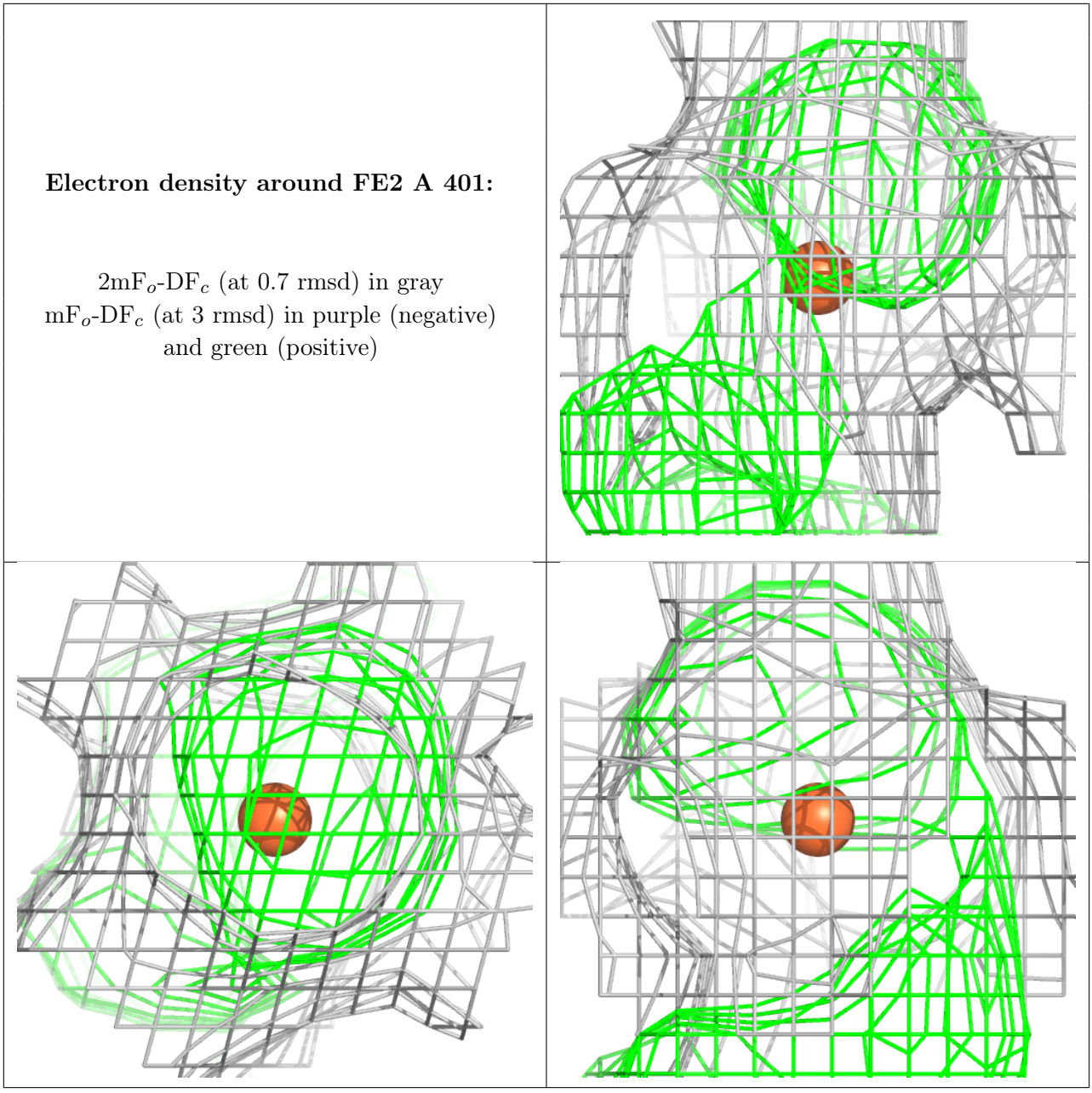
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	EDO	D	407	4/4	0.83	0.14	41,43,44,57	0
5	PEG	B	404	7/7	0.83	0.18	42,46,54,55	0
3	EDO	D	411	4/4	0.83	0.17	43,44,47,51	0
5	PEG	D	403	7/7	0.83	0.15	40,46,58,60	0
3	EDO	D	408	4/4	0.84	0.17	39,48,58,59	0
3	EDO	D	412	4/4	0.85	0.17	45,47,48,57	0
3	EDO	D	404	4/4	0.88	0.14	42,44,46,49	0
2	FE2	A	401	1/1	0.88	0.12	50,50,50,50	0
3	EDO	A	402	4/4	0.90	0.16	39,41,54,54	0
3	EDO	D	410	4/4	0.91	0.11	55,55,56,57	0
2	FE2	C	401	1/1	0.93	0.12	53,53,53,53	0
2	FE2	D	401	1/1	0.94	0.08	48,48,48,48	0
2	FE2	B	401	1/1	0.95	0.09	49,49,49,49	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.

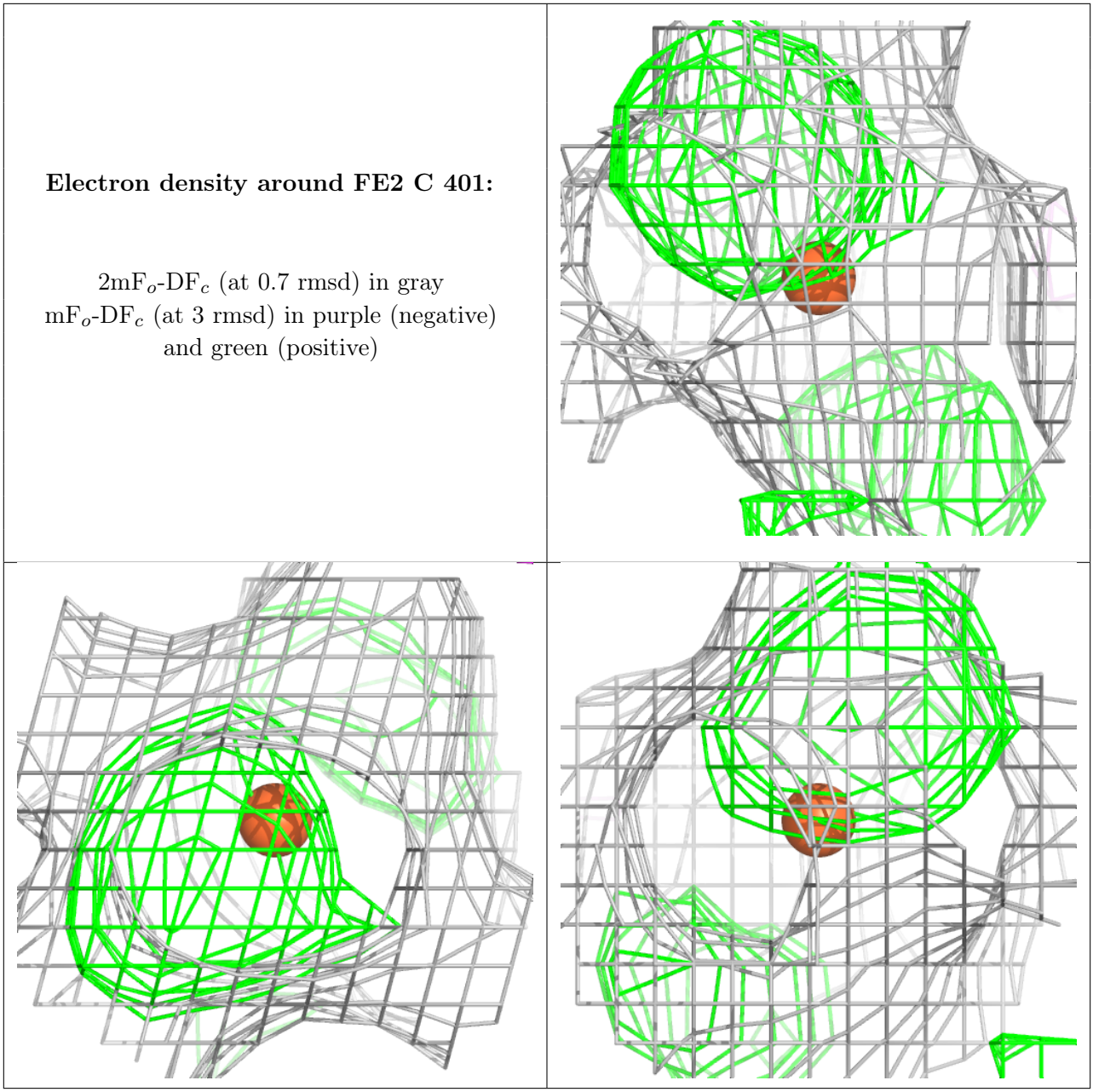
Electron density around FE2 A 401:

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



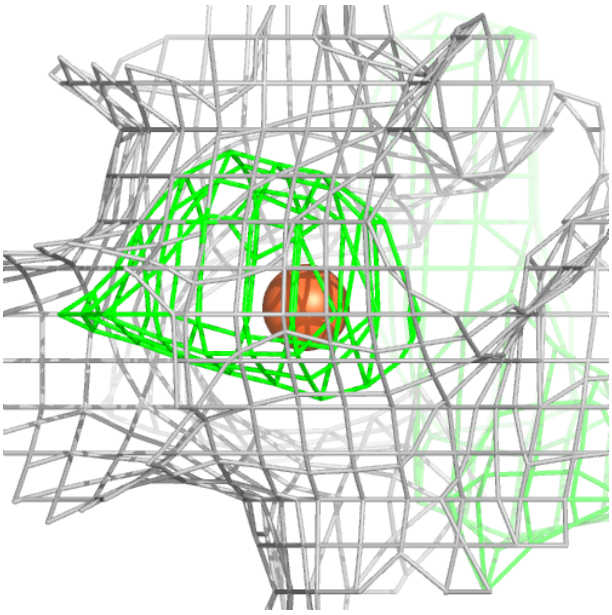
Electron density around FE2 C 401:

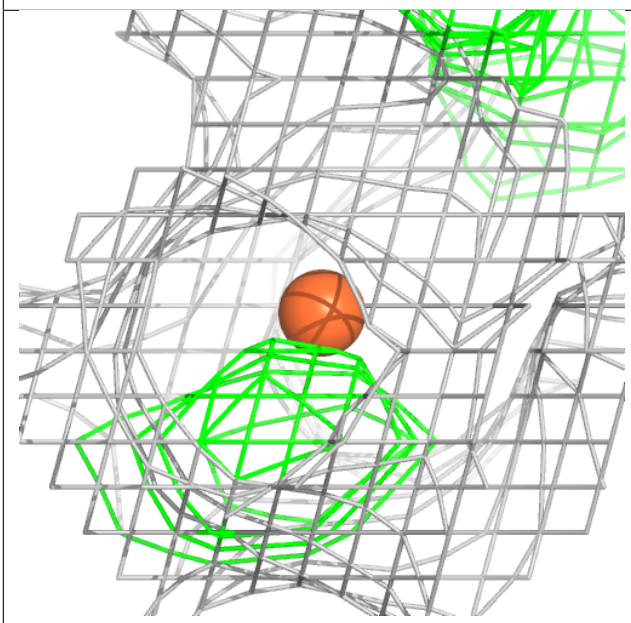
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

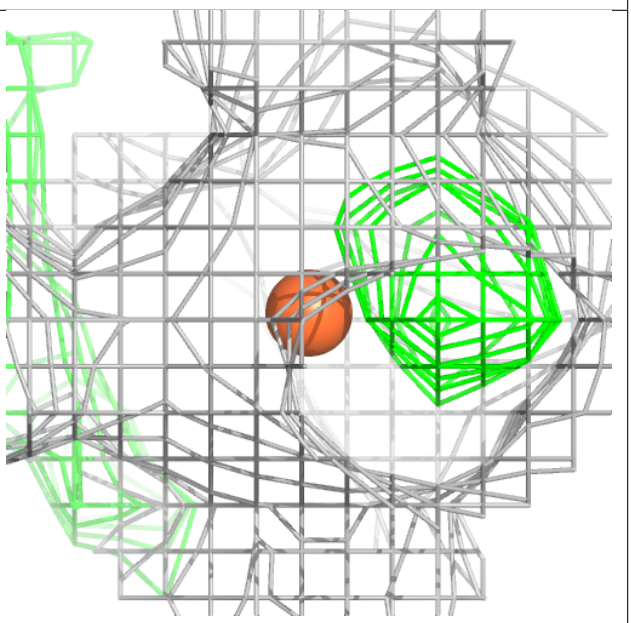


Electron density around FE2 D 401:

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

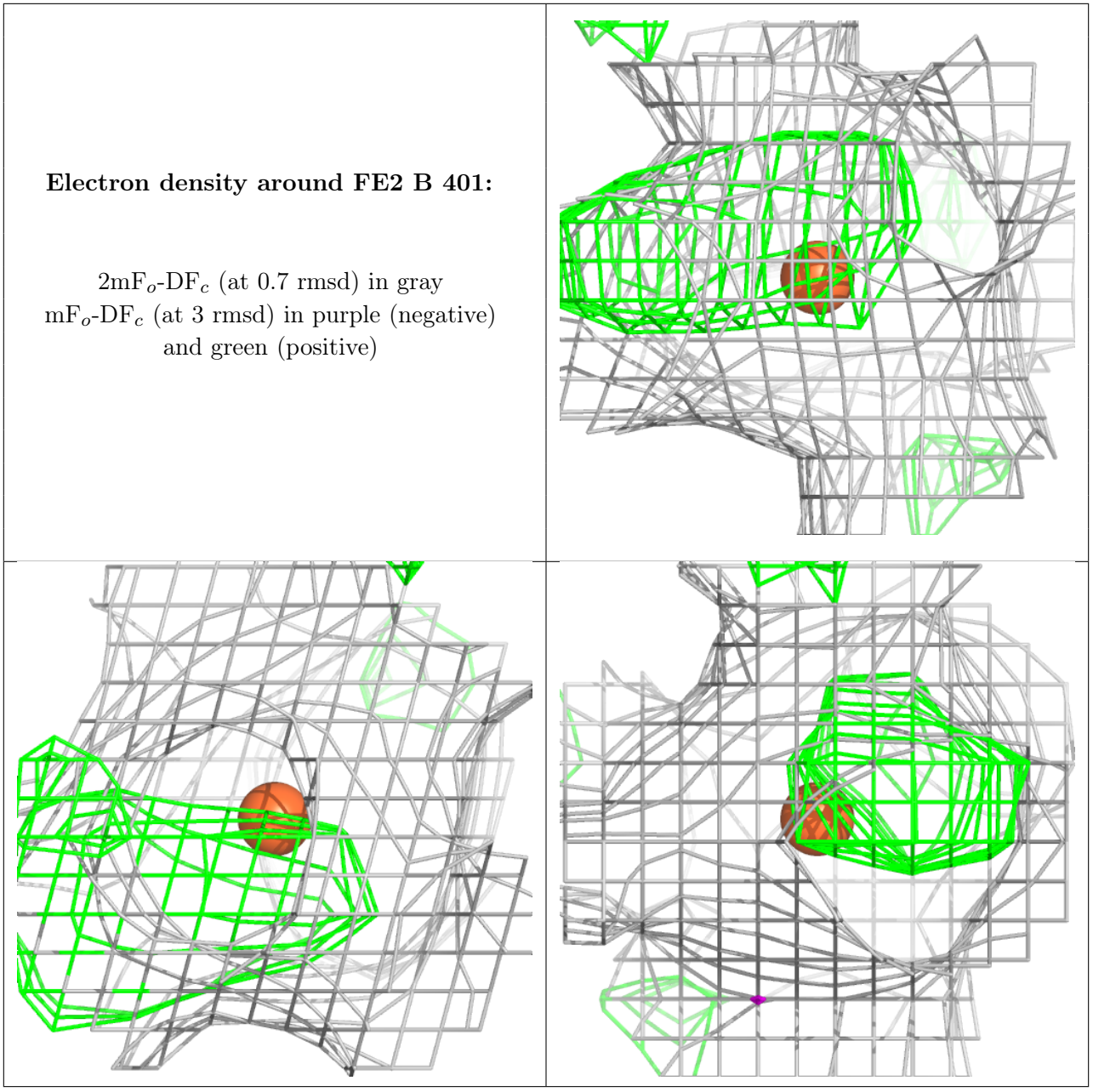






Electron density around FE2 B 401:

$2mF_o$-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.