



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 06:42 AM UTC

PDB ID : 2BIX / pdb_00002bix
Title : Crystal structure of apocarotenoid cleavage oxygenase from Synechocystis, Fe-free apoenzyme
Authors : Kloer, D.P.; Ruch, S.; Al-Babili, S.; Beyer, P.; Schulz, G.E.
Deposited on : 2005-01-26
Resolution : 2.68 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

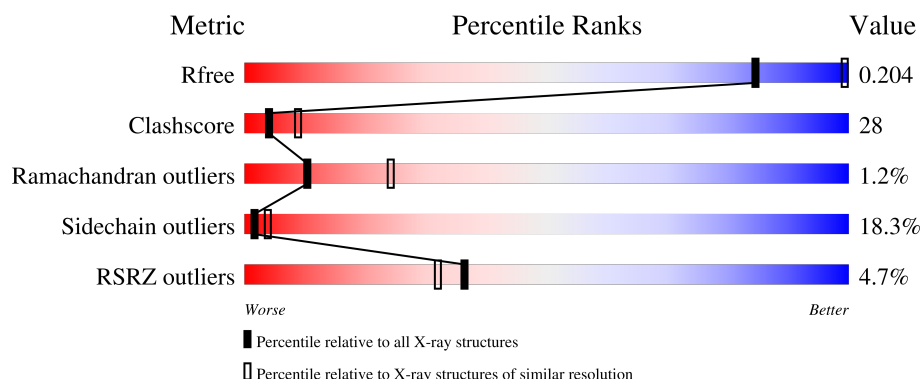
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.68 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	5070 (2.70-2.66)
Clashscore	190562	5409 (2.70-2.66)
Ramachandran outliers	187476	5324 (2.70-2.66)
Sidechain outliers	187428	5324 (2.70-2.66)
RSRZ outliers	180081	5070 (2.70-2.66)

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	490	4% 56% 31% 9% ..
1	B	490	6% 52% 36% 9% ..

2 Entry composition [i](#)

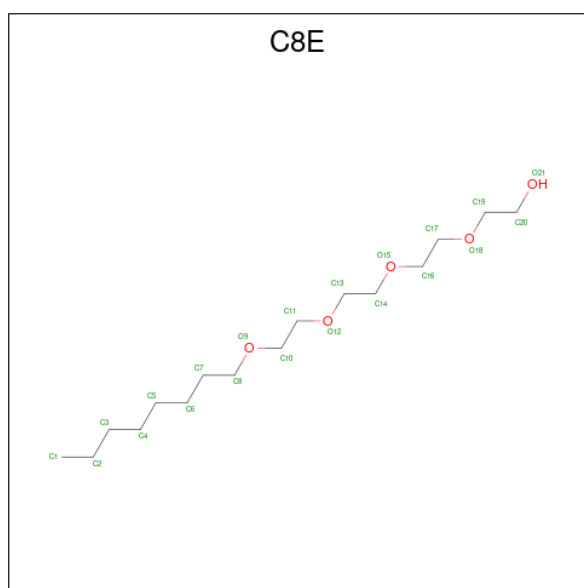
There are 4 unique types of molecules in this entry. The entry contains 7702 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 APOCAROTENOID-CLEAVING OXYGENASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	479	Total	C	N	O	S	0	0	0
			3767	2417	650	690	10			
1	B	479	Total	C	N	O	S	0	0	0
			3767	2417	650	690	10			

- Molecule 2 is (HYDROXYETHYLOXY)TRI(ETHYLOXY)OCTANE (CCD ID: C8E) (formula: C₁₆H₃₄O₅).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			21	16	5		
2	B	1	Total	C	O	0	0
			21	16	5		

- Molecule 3 is GLYCEROL (CCD ID: GOL) (formula: C₃H₈O₃).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			6	3	3		
3	A	1	Total	C	O	0	0
			6	3	3		

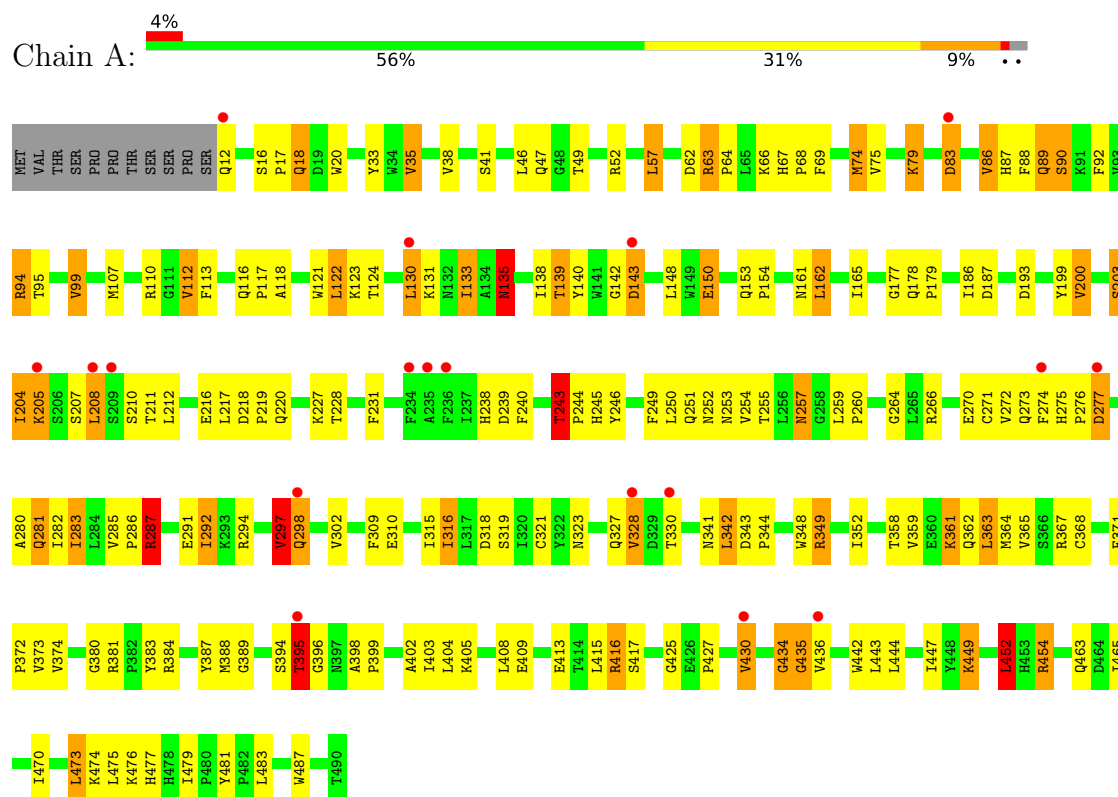
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	47	Total	O	0	0
			47	47		
4	B	67	Total	O	0	0
			67	67		

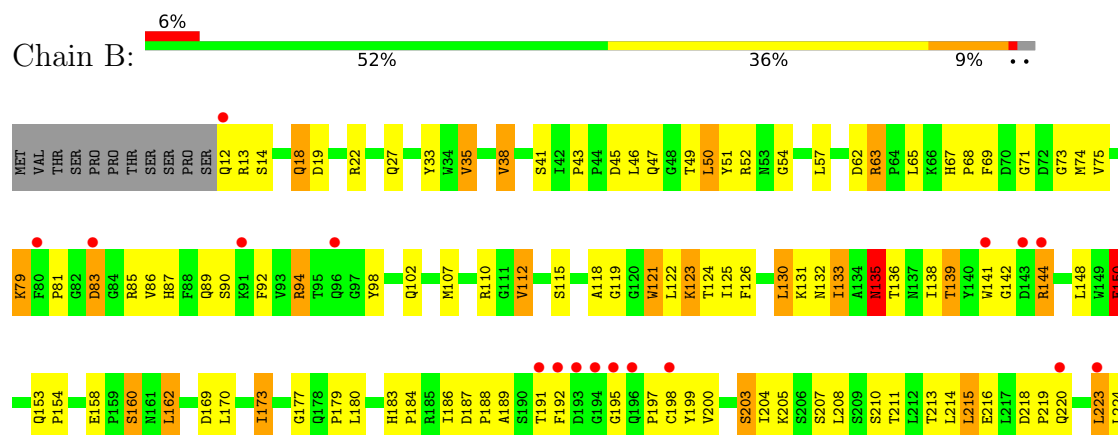
3 Residue-property plots

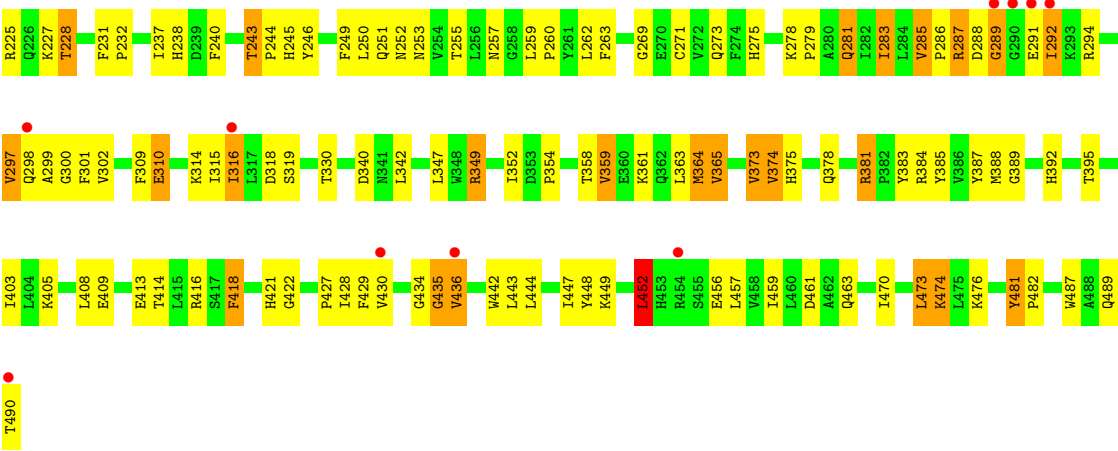
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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: APOCAROTENOID-CLEAVING OXYGENASE



• Molecule 1: APOCAROTENOID-CLEAVING OXYGENASE





4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α , β , γ	122.93Å 122.93Å 205.56Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	47.14 – 2.68 47.14 – 2.68	Depositor EDS
% Data completeness (in resolution range)	(Not available) (47.14-2.68) 98.6 (47.14-2.68)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.90 (at 2.69Å)	Xtriage
Refinement program	TNT 5.6.1	Depositor
R, R_{free}	0.210 , 0.243 0.209 , 0.204	Depositor DCC
R_{free} test set	2250 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å ²)	58.0	Xtriage
Anisotropy	0.075	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 42.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	7702	wwPDB-VP
Average B, all atoms (Å ²)	53.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.90% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: GOL, C8E

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	0.63	1/3880 (0.0%)	1.04	16/5285 (0.3%)
1	B	0.56	0/3880	1.03	17/5285 (0.3%)
All	All	0.60	1/7760 (0.0%)	1.04	33/10570 (0.3%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	74	MET	SD-CE	10.66	2.06	1.79

All (33) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	452	LEU	N-CA-C	-12.72	93.38	110.55
1	A	133	ILE	N-CA-C	-11.44	93.54	109.45
1	B	452	LEU	N-CA-C	-10.90	96.47	110.53
1	B	395	THR	N-CA-C	9.29	124.85	112.13
1	B	83	ASP	N-CA-C	8.96	121.17	108.54
1	A	395	THR	N-CA-C	8.21	123.54	111.96
1	B	389	GLY	N-CA-C	-7.95	101.24	112.37
1	A	143	ASP	N-CA-C	-7.83	101.17	111.74
1	A	243	THR	N-CA-C	-7.44	99.62	108.25
1	B	289	GLY	N-CA-C	-7.41	102.01	111.72
1	B	436	VAL	N-CA-C	7.33	117.84	111.90
1	B	300	GLY	N-CA-C	-7.16	103.34	112.65
1	A	208	LEU	N-CA-C	-7.13	105.11	113.88
1	A	430	VAL	CB-CA-C	-6.62	103.23	110.85
1	A	434	GLY	N-CA-C	-6.10	102.15	111.24
1	A	297	VAL	CB-CA-C	-6.03	103.42	111.80
1	B	133	ILE	N-CA-C	-5.96	96.94	109.34
1	B	135	ASN	N-CA-C	5.87	122.42	113.61

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	215	LEU	N-CA-C	5.63	116.96	108.46
1	A	83	ASP	N-CA-C	5.62	117.19	110.44
1	A	150	GLU	N-CA-C	5.50	119.10	112.38
1	B	285	VAL	N-CA-C	5.46	113.44	107.60
1	B	150	GLU	N-CA-C	5.41	122.32	110.80
1	B	133	ILE	CA-C-N	-5.32	114.58	123.04
1	B	133	ILE	C-N-CA	-5.32	114.58	123.04
1	B	148	LEU	N-CA-C	5.22	118.58	110.17
1	A	133	ILE	CA-C-N	-5.18	116.09	123.03
1	A	133	ILE	C-N-CA	-5.18	116.09	123.03
1	B	418	PHE	N-CA-C	-5.15	105.67	112.94
1	A	389	GLY	N-CA-C	-5.15	102.72	112.51
1	B	299	ALA	N-CA-C	5.08	121.02	114.56
1	A	371	PHE	CB-CA-C	-5.06	107.61	111.20
1	A	135	ASN	N-CA-C	5.01	121.13	113.61

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	3767	0	3659	203	0
1	B	3767	0	3659	212	0
2	A	21	0	34	7	0
2	B	21	0	34	3	0
3	A	12	0	16	0	0
4	A	47	0	0	2	0
4	B	67	0	0	5	0
All	All	7702	0	7402	415	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 28.

All (415) 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:74:MET:SD	1:A:74:MET:CE	2.06	1.42
1:B:384:ARG:HG3	1:B:409:GLU:HG3	1.29	1.14
1:B:218:ASP:HB3	1:B:224:LEU:HD21	1.36	1.07
1:A:287:ARG:HG2	1:A:287:ARG:HH11	1.15	1.04
1:B:349:ARG:HG3	1:B:349:ARG:HH11	1.24	1.00
1:B:243:THR:HG22	1:B:246:TYR:H	1.24	0.99
1:B:67:HIS:HD2	1:B:69:PHE:H	1.06	0.96
1:B:430:VAL:HG13	1:B:487:TRP:NE1	1.83	0.93
1:A:35:VAL:HG13	1:A:86:VAL:HG13	1.50	0.93
1:A:416:ARG:HG3	1:A:416:ARG:HH11	1.33	0.92
1:B:110:ARG:HD3	1:B:124:THR:HG22	1.52	0.92
1:B:403:ILE:HD13	1:B:418:PHE:HE1	1.34	0.92
1:A:63:ARG:HH11	1:A:118:ALA:HB2	1.32	0.91
1:A:67:HIS:HD2	1:A:69:PHE:H	1.03	0.91
1:A:454:ARG:HG2	1:A:454:ARG:HH11	1.35	0.89
1:A:281:GLN:HG2	1:A:294:ARG:NH1	1.88	0.88
1:B:364:MET:HE1	1:B:408:LEU:HD22	1.55	0.88
1:A:35:VAL:CG1	1:A:86:VAL:HG13	2.06	0.85
1:A:349:ARG:HG3	1:A:349:ARG:HH11	1.43	0.84
1:B:246:TYR:CD1	1:B:315:ILE:HD11	2.12	0.84
1:A:67:HIS:CD2	1:A:69:PHE:H	1.93	0.84
1:B:287:ARG:HH11	1:B:287:ARG:HG2	1.42	0.83
1:B:214:LEU:HD12	1:B:215:LEU:H	1.44	0.82
1:B:283:ILE:HG22	1:B:292:ILE:CD1	2.10	0.82
1:B:430:VAL:HG21	1:B:444:LEU:HD11	1.62	0.81
1:A:430:VAL:HG13	1:A:487:TRP:NE1	1.96	0.80
1:B:12:GLN:HG3	1:B:13:ARG:H	1.48	0.79
1:A:281:GLN:HG2	1:A:294:ARG:CZ	2.14	0.78
1:A:287:ARG:HG2	1:A:287:ARG:NH1	1.91	0.78
1:A:287:ARG:HH11	1:A:287:ARG:CG	1.97	0.76
1:B:384:ARG:CG	1:B:409:GLU:HG3	2.13	0.76
1:B:46:LEU:HD12	1:B:430:VAL:HG11	1.66	0.76
1:A:430:VAL:HG13	1:A:487:TRP:CE2	2.19	0.76
1:B:309:PHE:CZ	1:B:316:ILE:HG12	2.21	0.76
1:B:74:MET:HE3	1:B:92:PHE:CZ	2.22	0.75
1:B:364:MET:CE	1:B:408:LEU:HD22	2.16	0.75
1:B:67:HIS:CD2	1:B:68:PRO:HD2	2.22	0.74
1:A:309:PHE:CZ	1:A:316:ILE:HG12	2.23	0.74
1:B:112:VAL:HG13	4:B:2013:HOH:O	1.88	0.74
1:A:67:HIS:CD2	1:A:68:PRO:HD2	2.24	0.73
1:A:250:LEU:HD13	1:A:302:VAL:HG11	1.69	0.73
1:B:384:ARG:HD3	1:B:385:TYR:CZ	2.24	0.73

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:384:ARG:HG3	1:B:409:GLU:CG	2.14	0.72
1:B:214:LEU:HD12	1:B:215:LEU:N	2.03	0.72
1:B:347:LEU:HB3	1:B:365:VAL:HG13	1.69	0.72
1:B:287:ARG:HH11	1:B:287:ARG:CG	2.03	0.72
1:A:454:ARG:HG2	1:A:454:ARG:NH1	2.03	0.71
1:A:139:THR:HG21	1:A:199:TYR:OH	1.92	0.70
1:A:243:THR:HG22	1:A:245:HIS:H	1.57	0.70
1:A:318:ASP:OD1	1:A:349:ARG:NH1	2.26	0.69
1:B:51:TYR:HB3	1:B:138:ILE:HD13	1.75	0.69
1:B:35:VAL:HG13	1:B:86:VAL:HG13	1.74	0.69
1:B:67:HIS:CD2	1:B:69:PHE:H	1.98	0.69
1:A:281:GLN:HG2	1:A:294:ARG:HH12	1.57	0.68
1:B:283:ILE:HG23	1:B:294:ARG:HE	1.57	0.68
1:B:75:VAL:HG11	1:B:138:ILE:HD12	1.76	0.68
1:B:373:VAL:HG21	1:B:427:PRO:O	1.93	0.68
1:B:318:ASP:OD1	1:B:349:ARG:NH1	2.27	0.68
1:A:205:LYS:O	1:A:210:SER:HA	1.94	0.68
1:B:349:ARG:HG3	1:B:349:ARG:NH1	1.99	0.68
1:A:218:ASP:HB2	1:A:219:PRO:HD2	1.76	0.67
1:A:252:ASN:HD21	1:A:302:VAL:H	1.42	0.66
1:B:252:ASN:HD21	1:B:302:VAL:H	1.42	0.66
1:B:287:ARG:HG2	1:B:287:ARG:NH1	2.05	0.66
1:B:187:ASP:OD2	1:B:287:ARG:NH2	2.27	0.66
1:B:223:LEU:HD12	1:B:224:LEU:H	1.60	0.66
1:B:179:PRO:O	1:B:203:SER:HB2	1.94	0.66
1:B:403:ILE:HD13	1:B:418:PHE:CE1	2.24	0.66
1:B:46:LEU:CD1	1:B:430:VAL:HG11	2.24	0.66
1:A:150:GLU:HG2	4:A:2021:HOH:O	1.96	0.66
1:B:430:VAL:CG2	1:B:444:LEU:HD11	2.26	0.66
1:A:63:ARG:HH11	1:A:118:ALA:CB	2.09	0.65
1:B:349:ARG:HH11	1:B:349:ARG:CG	2.04	0.65
1:B:249:PHE:O	1:B:283:ILE:HG12	1.97	0.65
1:A:266:ARG:HH12	1:A:328:VAL:HG21	1.61	0.64
1:B:27:GLN:O	1:B:74:MET:HE1	1.97	0.64
1:A:281:GLN:HG2	1:A:294:ARG:NH2	2.13	0.64
1:A:107:MET:HE2	1:A:116:GLN:C	2.22	0.64
1:B:67:HIS:HD2	1:B:69:PHE:N	1.88	0.64
1:B:318:ASP:OD1	1:B:349:ARG:HG3	1.97	0.64
1:A:274:PHE:CE2	1:A:276:PRO:HB3	2.32	0.64
1:A:250:LEU:HD13	1:A:302:VAL:CB	2.28	0.64
1:B:75:VAL:CG1	1:B:138:ILE:HD12	2.28	0.63

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:130:LEU:HD13	4:B:2021:HOH:O	1.97	0.63
1:B:250:LEU:HD13	1:B:302:VAL:HG11	1.81	0.63
1:B:198:CYS:SG	1:B:216:GLU:HB3	2.38	0.63
1:A:94:ARG:HH11	1:A:94:ARG:CG	2.11	0.63
1:B:281:GLN:HG2	1:B:294:ARG:NH2	2.13	0.63
1:B:243:THR:HG23	1:B:310:GLU:OE2	1.98	0.62
1:B:121:TRP:CZ2	1:B:122:LEU:HD13	2.35	0.62
1:A:204:ILE:HG13	1:A:205:LYS:N	2.14	0.62
1:A:250:LEU:HD13	1:A:302:VAL:CG1	2.29	0.62
1:B:52:ARG:HH21	1:B:52:ARG:HG3	1.64	0.61
1:B:150:GLU:OE2	1:B:238:HIS:ND1	2.31	0.61
1:B:259:LEU:HB2	1:B:260:PRO:HD3	1.81	0.61
1:A:244:PRO:HD3	1:A:380:GLY:O	2.01	0.61
1:A:283:ILE:HG22	1:A:292:ILE:HD11	1.82	0.61
1:B:449:LYS:O	1:B:452:LEU:O	2.18	0.61
1:A:67:HIS:HD2	1:A:69:PHE:N	1.87	0.61
1:A:349:ARG:HG3	1:A:349:ARG:NH1	2.14	0.61
1:A:416:ARG:HG3	1:A:465:ILE:O	2.02	0.60
1:A:46:LEU:CD1	1:A:430:VAL:HG11	2.31	0.60
1:A:116:GLN:HB2	1:A:117:PRO:HD2	1.82	0.60
1:A:276:PRO:HD2	1:A:277:ASP:H	1.67	0.60
1:B:94:ARG:HH11	1:B:94:ARG:HG2	1.66	0.60
1:A:204:ILE:HG13	1:A:205:LYS:H	1.67	0.60
1:B:126:PHE:CD2	1:B:262:LEU:HD11	2.37	0.60
1:B:153:GLN:NE2	1:B:177:GLY:H	2.00	0.60
1:B:123:LYS:HD2	1:B:123:LYS:N	2.15	0.60
1:B:188:PRO:HD2	1:B:381:ARG:NH1	2.16	0.60
1:A:309:PHE:CE2	1:A:316:ILE:HG12	2.37	0.60
1:B:65:LEU:HD11	1:B:71:GLY:HA2	1.84	0.60
1:A:273:GLN:NE2	1:A:275:HIS:HE1	2.00	0.60
1:A:57:LEU:HD13	1:A:92:PHE:CZ	2.37	0.59
1:B:110:ARG:HD3	1:B:124:THR:CG2	2.31	0.59
1:A:364:MET:CE	1:A:408:LEU:HD22	2.33	0.59
1:A:266:ARG:HH12	1:A:328:VAL:CG2	2.15	0.59
1:A:250:LEU:CD1	1:A:302:VAL:HG21	2.33	0.59
1:A:430:VAL:CG2	1:A:444:LEU:HD11	2.33	0.59
1:B:223:LEU:HD11	1:B:225:ARG:O	2.01	0.58
1:B:470:ILE:N	1:B:470:ILE:HD12	2.18	0.58
1:A:187:ASP:OD2	1:A:287:ARG:NH2	2.36	0.58
1:A:318:ASP:OD1	1:A:349:ARG:HG3	2.04	0.58
1:B:283:ILE:HG22	1:B:292:ILE:HD11	1.84	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:282:ILE:HG13	1:A:297:VAL:CG2	2.34	0.58
1:B:430:VAL:HG13	1:B:487:TRP:CE2	2.39	0.58
1:A:434:GLY:O	1:A:435:GLY:O	2.22	0.57
1:A:74:MET:HE2	1:A:90:SER:OG	2.04	0.57
1:A:94:ARG:HH11	1:A:94:ARG:HG2	1.69	0.57
1:A:297:VAL:HG13	1:A:359:VAL:CG1	2.35	0.57
1:A:483:LEU:HD22	2:A:1491:C8E:C8	2.34	0.57
1:B:374:VAL:HG13	1:B:375:HIS:N	2.18	0.57
1:B:250:LEU:HD22	1:B:302:VAL:HB	1.85	0.57
1:B:456:GLU:OE2	1:B:474:LYS:HE2	2.05	0.57
1:A:131:LYS:HE3	1:A:133:ILE:CG2	2.34	0.57
1:A:316:ILE:HD11	1:A:349:ARG:CZ	2.35	0.57
1:A:316:ILE:HD11	1:A:349:ARG:NH1	2.19	0.57
1:A:402:ALA:HB2	1:A:417:SER:HA	1.87	0.57
1:A:63:ARG:NH1	1:A:118:ALA:HB2	2.12	0.57
1:A:112:VAL:HG13	4:A:2006:HOH:O	2.03	0.57
1:A:274:PHE:HE2	1:A:276:PRO:HB3	1.70	0.56
1:A:250:LEU:HD11	1:A:302:VAL:HG21	1.87	0.56
1:A:276:PRO:CD	1:A:277:ASP:H	2.18	0.56
1:B:125:ILE:HG12	1:B:126:PHE:CD1	2.40	0.56
1:B:387:TYR:CD1	1:B:443:LEU:HD11	2.40	0.56
1:B:316:ILE:HD11	1:B:349:ARG:NH1	2.20	0.56
1:B:434:GLY:O	1:B:435:GLY:O	2.23	0.56
1:A:253:ASN:HD22	1:A:275:HIS:HD2	1.53	0.56
1:A:266:ARG:NH1	1:A:328:VAL:HG21	2.20	0.56
1:B:316:ILE:HD11	1:B:349:ARG:CZ	2.36	0.56
1:A:416:ARG:HG3	1:A:416:ARG:NH1	2.12	0.56
1:B:283:ILE:HG22	1:B:292:ILE:HD12	1.85	0.56
1:A:251:GLN:OE1	1:A:283:ILE:HD11	2.06	0.56
1:A:416:ARG:HH11	1:A:416:ARG:CG	2.12	0.56
1:B:470:ILE:HD12	1:B:470:ILE:H	1.71	0.56
1:B:297:VAL:HG13	1:B:359:VAL:HG11	1.87	0.55
1:B:210:SER:HB2	1:B:231:PHE:CE1	2.41	0.55
1:B:403:ILE:CD1	1:B:418:PHE:HE1	2.14	0.55
1:A:121:TRP:CE2	1:A:122:LEU:HD13	2.42	0.55
1:A:210:SER:HB2	1:A:231:PHE:CZ	2.41	0.55
1:B:98:TYR:O	1:B:102:GLN:HG2	2.07	0.55
1:A:238:HIS:CE1	2:A:1491:C8E:H71	2.41	0.55
1:A:283:ILE:CG2	1:A:292:ILE:HD11	2.36	0.55
1:A:259:LEU:HB2	1:A:260:PRO:HD3	1.87	0.55
1:A:94:ARG:HG2	1:A:94:ARG:NH1	2.22	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:173:ILE:HG23	1:B:223:LEU:HD22	1.89	0.55
1:B:126:PHE:CE2	1:B:262:LEU:HD11	2.42	0.54
1:A:253:ASN:HD22	1:A:275:HIS:CD2	2.24	0.54
1:A:107:MET:HE2	1:A:116:GLN:CA	2.38	0.54
1:A:283:ILE:HG22	1:A:292:ILE:CD1	2.38	0.54
1:B:223:LEU:HD12	1:B:224:LEU:N	2.23	0.54
1:B:63:ARG:HH11	1:B:118:ALA:HB2	1.73	0.54
1:B:119:GLY:HA3	1:B:123:LYS:HG2	1.89	0.54
1:B:169:ASP:O	1:B:170:LEU:HB2	2.07	0.54
1:A:210:SER:HB2	1:A:231:PHE:CE2	2.42	0.54
1:B:63:ARG:HG3	4:B:2010:HOH:O	2.07	0.54
1:A:200:VAL:HG22	1:A:240:PHE:HZ	1.72	0.54
1:A:449:LYS:O	1:A:452:LEU:O	2.26	0.54
1:B:141:TRP:CZ3	1:B:186:ILE:HD13	2.43	0.53
1:B:35:VAL:CG1	1:B:86:VAL:HG13	2.39	0.53
1:B:461:ASP:HB2	1:B:470:ILE:HD11	1.90	0.53
1:A:140:TYR:CZ	1:A:143:ASP:HA	2.43	0.53
1:A:367:ARG:CZ	1:A:415:LEU:HD22	2.39	0.53
1:B:131:LYS:HE3	1:B:133:ILE:CG2	2.39	0.53
1:B:189:ALA:HB1	1:B:195:GLY:HA2	1.91	0.53
1:B:387:TYR:HE1	1:B:405:LYS:HD2	1.74	0.53
1:A:75:VAL:HG11	1:A:138:ILE:CD1	2.38	0.52
1:A:131:LYS:HE3	1:A:133:ILE:HG22	1.90	0.52
1:A:430:VAL:HG13	1:A:487:TRP:CD1	2.43	0.52
1:B:22:ARG:HG2	1:B:448:TYR:OH	2.09	0.52
1:B:67:HIS:CD2	1:B:68:PRO:CD	2.92	0.52
1:B:428:ILE:HG21	1:B:487:TRP:HB2	1.92	0.52
1:A:95:THR:O	1:A:99:VAL:HG13	2.09	0.52
1:B:283:ILE:CG2	1:B:294:ARG:HE	2.22	0.52
1:B:18:GLN:CD	1:B:18:GLN:H	2.18	0.52
1:B:288:ASP:OD2	1:B:289:GLY:O	2.28	0.52
1:A:135:ASN:HD22	1:A:135:ASN:H	1.58	0.51
1:A:250:LEU:C	1:A:250:LEU:HD23	2.35	0.51
1:A:140:TYR:OH	1:A:143:ASP:HA	2.10	0.51
1:A:250:LEU:HD21	1:A:280:ALA:HB1	1.92	0.51
1:A:113:PHE:HE2	2:A:1491:C8E:H21	1.74	0.51
1:A:253:ASN:ND2	1:A:275:HIS:HD2	2.08	0.51
1:B:141:TRP:HH2	1:B:197:PRO:HB2	1.75	0.51
1:A:216:GLU:OE2	1:A:287:ARG:HG2	2.11	0.51
1:B:246:TYR:CE1	1:B:315:ILE:HD11	2.44	0.51
1:A:243:THR:HG23	1:A:310:GLU:CD	2.36	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:243:THR:HG23	1:A:310:GLU:OE2	2.10	0.51
1:A:483:LEU:HD22	2:A:1491:C8E:H82	1.93	0.51
1:A:349:ARG:HH11	1:A:349:ARG:CG	2.18	0.51
1:B:473:LEU:CD1	1:B:473:LEU:N	2.73	0.51
1:B:257:ASN:C	1:B:257:ASN:HD22	2.17	0.50
1:A:318:ASP:CG	1:A:349:ARG:NH1	2.69	0.50
1:A:430:VAL:HG21	1:A:444:LEU:HD11	1.94	0.50
1:B:173:ILE:CG2	1:B:223:LEU:HD22	2.41	0.50
1:B:74:MET:CE	1:B:92:PHE:CE2	2.94	0.50
1:A:298:GLN:HA	1:A:298:GLN:OE1	2.12	0.50
1:A:473:LEU:CD1	1:A:473:LEU:N	2.74	0.50
1:B:139:THR:HG21	1:B:199:TYR:OH	2.12	0.50
1:B:89:GLN:HG3	1:B:162:LEU:HD22	1.94	0.49
1:B:154:PRO:HG3	1:B:180:LEU:HD23	1.94	0.49
1:B:316:ILE:CD1	1:B:349:ARG:CZ	2.90	0.49
1:A:384:ARG:HD2	1:A:409:GLU:OE2	2.12	0.49
1:B:67:HIS:CG	1:B:68:PRO:HD2	2.46	0.49
1:B:74:MET:CE	1:B:92:PHE:CZ	2.93	0.49
1:B:131:LYS:HE3	1:B:133:ILE:HG22	1.93	0.49
1:A:139:THR:HG21	1:A:199:TYR:CE2	2.47	0.49
1:B:227:LYS:C	1:B:228:THR:HG22	2.38	0.49
1:A:75:VAL:HG11	1:A:138:ILE:HD12	1.94	0.49
1:A:273:GLN:NE2	1:A:275:HIS:CE1	2.81	0.49
1:A:130:LEU:HD13	1:A:130:LEU:HA	1.66	0.49
1:A:139:THR:HG21	1:A:199:TYR:CZ	2.48	0.49
1:A:318:ASP:HA	1:A:348:TRP:O	2.13	0.49
1:A:297:VAL:HG13	1:A:359:VAL:HG11	1.93	0.49
1:B:33:TYR:C	1:B:87:HIS:HD2	2.21	0.49
1:B:132:ASN:OD1	1:B:133:ILE:O	2.31	0.49
1:A:327:GLN:HG2	1:A:328:VAL:N	2.28	0.48
1:B:52:ARG:HG3	1:B:52:ARG:NH2	2.27	0.48
1:A:218:ASP:HB2	1:A:219:PRO:CD	2.43	0.48
1:B:470:ILE:H	1:B:470:ILE:CD1	2.25	0.48
1:A:62:ASP:O	1:A:64:PRO:HD3	2.14	0.48
1:A:430:VAL:CG1	1:A:487:TRP:CE2	2.95	0.48
1:A:341:ASN:O	1:A:342:LEU:HD12	2.14	0.48
1:B:35:VAL:HG22	1:B:38:VAL:HG12	1.96	0.48
1:A:298:GLN:O	1:A:361:LYS:HE2	2.14	0.48
1:A:352:ILE:HG13	1:A:359:VAL:HG23	1.96	0.48
1:B:126:PHE:CD2	1:B:262:LEU:CD1	2.97	0.48
1:B:150:GLU:HG3	2:B:1491:C8E:H13	1.95	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:20:TRP:O	1:A:481:TYR:OH	2.30	0.48
1:A:148:LEU:HD23	1:A:154:PRO:HB3	1.96	0.48
1:B:150:GLU:CD	2:B:1491:C8E:H31	2.38	0.48
1:B:215:LEU:C	1:B:215:LEU:HD12	2.39	0.48
1:A:66:LYS:NZ	1:A:270:GLU:OE2	2.47	0.47
1:B:218:ASP:O	1:B:220:GLN:N	2.47	0.47
1:A:246:TYR:CD1	1:A:315:ILE:HD11	2.50	0.47
1:B:107:MET:HE1	1:B:115:SER:HB3	1.96	0.47
1:A:402:ALA:CB	1:A:417:SER:HA	2.44	0.47
1:B:43:PRO:HG3	1:B:470:ILE:HG21	1.97	0.47
1:B:218:ASP:C	1:B:220:GLN:H	2.22	0.47
1:B:457:LEU:HD23	1:B:473:LEU:HD22	1.96	0.47
1:B:457:LEU:HB3	1:B:473:LEU:HD22	1.96	0.47
1:A:94:ARG:CG	1:A:94:ARG:NH1	2.75	0.47
1:A:364:MET:HE3	1:A:408:LEU:CD2	2.43	0.47
1:A:316:ILE:CD1	1:A:349:ARG:CG	2.93	0.47
1:B:213:THR:HG23	1:B:228:THR:HG22	1.97	0.47
1:A:204:ILE:CG1	1:A:205:LYS:N	2.78	0.47
1:B:316:ILE:HD12	1:B:349:ARG:CG	2.45	0.47
1:A:323:ASN:HB3	1:A:343:ASP:OD2	2.15	0.46
1:B:49:THR:OG1	1:B:79:LYS:HG2	2.15	0.46
1:B:13:ARG:NH1	1:B:340:ASP:OD2	2.44	0.46
1:B:231:PHE:HB2	1:B:232:PRO:HD2	1.97	0.46
1:B:243:THR:HG23	1:B:244:PRO:N	2.30	0.46
1:B:262:LEU:HD23	1:B:263:PHE:CE1	2.50	0.46
1:A:416:ARG:HB2	1:A:465:ILE:HD12	1.97	0.46
1:A:473:LEU:N	1:A:473:LEU:HD12	2.31	0.46
1:A:63:ARG:NH1	1:A:118:ALA:CA	2.78	0.46
1:A:259:LEU:N	1:A:260:PRO:CD	2.78	0.46
1:B:216:GLU:OE2	1:B:287:ARG:NH1	2.49	0.46
1:B:388:MET:HE3	1:B:388:MET:HB2	1.82	0.46
1:A:107:MET:CE	1:A:116:GLN:N	2.78	0.46
1:B:75:VAL:HG11	1:B:138:ILE:CD1	2.44	0.46
1:A:249:PHE:O	1:A:283:ILE:HG12	2.16	0.45
1:A:316:ILE:HD12	1:A:349:ARG:HG2	1.98	0.45
1:A:398:ALA:HB1	1:A:399:PRO:HD2	1.97	0.45
1:A:63:ARG:NH1	1:A:118:ALA:HA	2.31	0.45
1:B:285:VAL:HA	1:B:286:PRO:HD2	1.86	0.45
1:A:316:ILE:HD12	1:A:349:ARG:CG	2.46	0.45
1:B:259:LEU:N	1:B:260:PRO:CD	2.79	0.45
1:B:283:ILE:HG22	1:B:294:ARG:HG2	1.98	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:33:TYR:O	1:A:87:HIS:HD2	2.00	0.45
1:A:110:ARG:NH1	1:A:264:GLY:HA2	2.32	0.45
1:B:273:GLN:NE2	1:B:275:HIS:CE1	2.85	0.45
1:A:254:VAL:HG22	1:A:255:THR:N	2.31	0.45
1:A:282:ILE:HD11	1:A:297:VAL:HG21	1.97	0.45
1:A:318:ASP:CG	1:A:349:ARG:HH12	2.24	0.45
1:A:372:PRO:HA	1:A:388:MET:HG2	1.99	0.45
1:B:126:PHE:HD2	1:B:262:LEU:CD1	2.30	0.45
1:A:250:LEU:CD1	1:A:302:VAL:HG11	2.41	0.45
1:B:281:GLN:HG2	1:B:294:ARG:CZ	2.47	0.45
1:A:282:ILE:HG13	1:A:297:VAL:HG21	1.98	0.45
1:A:483:LEU:CD2	2:A:1491:C8E:H81	2.47	0.45
1:A:297:VAL:HG13	1:A:359:VAL:HG13	1.98	0.45
1:B:227:LYS:O	1:B:228:THR:HG22	2.16	0.45
1:A:257:ASN:O	1:A:271:CYS:HB3	2.17	0.45
1:B:73:GLY:HA2	1:B:135:ASN:HB3	1.99	0.45
1:B:121:TRP:CZ2	1:B:122:LEU:CD1	3.00	0.45
1:B:218:ASP:C	1:B:220:GLN:N	2.75	0.44
1:B:243:THR:CG2	1:B:245:HIS:H	2.30	0.44
1:A:113:PHE:CE2	2:A:1491:C8E:H21	2.51	0.44
1:B:141:TRP:CE2	1:B:199:TYR:HB2	2.51	0.44
1:A:483:LEU:HD22	2:A:1491:C8E:H81	1.99	0.44
1:B:278:LYS:HB3	1:B:279:PRO:HD2	2.00	0.44
1:B:19:ASP:OD2	1:B:421:HIS:HD2	2.01	0.44
1:A:250:LEU:HD13	1:A:302:VAL:HB	1.97	0.44
1:B:318:ASP:CG	1:B:349:ARG:NH1	2.75	0.44
1:A:135:ASN:HD22	1:A:135:ASN:N	2.15	0.44
1:B:52:ARG:HD3	1:B:482:PRO:CG	2.47	0.44
1:B:52:ARG:HD3	1:B:482:PRO:HB2	1.99	0.44
1:B:183:HIS:N	1:B:184:PRO:CD	2.80	0.44
1:A:416:ARG:NH1	1:A:416:ARG:CG	2.75	0.44
1:B:50:LEU:HD13	1:B:444:LEU:HD12	2.00	0.44
1:A:442:TRP:HD1	1:A:470:ILE:HD13	1.83	0.44
1:B:158:GLU:HG3	1:B:160:SER:OG	2.18	0.44
1:A:110:ARG:HD3	1:A:124:THR:HB	1.99	0.43
1:A:430:VAL:HG22	1:A:444:LEU:HD11	1.99	0.43
1:B:14:SER:HB3	1:B:392:HIS:HD2	1.83	0.43
1:B:33:TYR:O	1:B:87:HIS:HD2	2.01	0.43
1:B:187:ASP:OD1	1:B:188:PRO:HD2	2.18	0.43
1:B:316:ILE:CD1	1:B:349:ARG:CG	2.96	0.43
1:A:425:GLY:O	1:A:427:PRO:HD3	2.17	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:135:ASN:C	1:B:135:ASN:HD22	2.24	0.43
1:A:285:VAL:HA	1:A:286:PRO:HD2	1.89	0.43
1:B:374:VAL:CG1	1:B:375:HIS:N	2.82	0.43
1:A:49:THR:OG1	1:A:79:LYS:HG2	2.18	0.43
1:A:243:THR:CG2	1:A:310:GLU:CD	2.91	0.43
1:A:327:GLN:HG2	1:A:328:VAL:H	1.83	0.43
1:B:257:ASN:C	1:B:257:ASN:ND2	2.77	0.43
1:A:161:ASN:O	1:A:162:LEU:HB2	2.18	0.43
1:A:283:ILE:HD13	1:A:283:ILE:HG23	1.44	0.43
1:B:243:THR:HG23	1:B:244:PRO:HD2	2.01	0.43
1:A:142:GLY:O	1:A:143:ASP:HB3	2.19	0.43
1:A:250:LEU:HD23	1:A:251:GLN:N	2.34	0.42
1:A:387:TYR:CE1	1:A:405:LYS:HG3	2.54	0.42
1:B:62:ASP:OD1	1:B:62:ASP:N	2.47	0.42
1:B:257:ASN:O	1:B:271:CYS:HB3	2.19	0.42
1:B:297:VAL:HG13	1:B:359:VAL:CG1	2.48	0.42
1:A:316:ILE:CD1	1:A:349:ARG:CZ	2.98	0.42
1:B:292:ILE:O	1:B:292:ILE:HG13	2.15	0.42
1:A:17:PRO:HB2	1:A:18:GLN:HE21	1.84	0.42
1:B:135:ASN:HD22	1:B:136:THR:N	2.17	0.42
1:A:74:MET:CE	1:A:74:MET:CG	2.91	0.42
1:A:239:ASP:OD2	1:A:240:PHE:N	2.51	0.42
1:B:191:THR:HG23	1:B:192:PHE:CD1	2.54	0.42
1:B:243:THR:CG2	1:B:246:TYR:H	2.11	0.42
1:B:251:GLN:HG3	1:B:251:GLN:O	2.18	0.42
1:B:375:HIS:HB3	1:B:378:GLN:CG	2.50	0.42
1:A:318:ASP:OD2	1:A:383:TYR:OH	2.27	0.42
1:A:344:PRO:CB	1:A:368:CYS:HB2	2.48	0.42
1:B:94:ARG:HG2	1:B:94:ARG:NH1	2.34	0.42
1:B:309:PHE:CE2	1:B:316:ILE:HG12	2.53	0.42
1:A:87:HIS:CD2	1:A:88:PHE:H	2.38	0.42
1:A:89:GLN:HB2	1:A:162:LEU:HD22	2.02	0.42
1:B:12:GLN:HG3	1:B:13:ARG:N	2.26	0.42
1:B:142:GLY:C	1:B:144:ARG:N	2.76	0.42
1:B:243:THR:HG22	1:B:245:HIS:H	1.85	0.42
1:B:422:GLY:HA2	1:B:448:TYR:O	2.19	0.42
1:A:216:GLU:OE2	1:A:287:ARG:NH1	2.52	0.42
1:B:316:ILE:HD13	1:B:349:ARG:NE	2.34	0.42
1:A:153:GLN:NE2	1:A:177:GLY:H	2.17	0.42
1:B:110:ARG:HD2	4:B:2022:HOH:O	2.20	0.42
1:B:210:SER:HB2	1:B:231:PHE:CZ	2.55	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:374:VAL:CG2	1:B:383:TYR:CD1	3.03	0.41
1:A:243:THR:HG22	1:A:246:TYR:H	1.84	0.41
1:B:107:MET:HE3	4:B:2006:HOH:O	2.21	0.41
1:B:375:HIS:HB3	1:B:378:GLN:HG2	2.01	0.41
1:B:375:HIS:CD2	1:B:429:PHE:CE2	3.08	0.41
1:A:63:ARG:NH1	1:A:118:ALA:CB	2.77	0.41
1:A:404:LEU:HD13	1:A:415:LEU:HD13	2.02	0.41
1:B:452:LEU:H	1:B:452:LEU:HG	1.70	0.41
1:A:87:HIS:CD2	1:A:88:PHE:N	2.88	0.41
1:B:18:GLN:CD	1:B:18:GLN:N	2.78	0.41
1:B:204:ILE:HG12	1:B:205:LYS:N	2.35	0.41
1:A:74:MET:HE3	1:A:92:PHE:CE2	2.55	0.41
1:A:178:GLN:HA	1:A:179:PRO:HD2	1.91	0.41
1:A:252:ASN:ND2	1:A:302:VAL:H	2.12	0.41
1:B:126:PHE:HD2	1:B:262:LEU:HD11	1.82	0.41
1:A:282:ILE:CD1	1:A:297:VAL:HG21	2.50	0.41
1:A:398:ALA:HB1	1:A:399:PRO:CD	2.51	0.41
1:A:33:TYR:OH	1:A:477:HIS:CE1	2.74	0.41
1:B:112:VAL:O	1:B:269:GLY:N	2.48	0.41
1:A:250:LEU:HD13	1:A:302:VAL:HG21	2.03	0.41
1:A:283:ILE:HG21	1:A:283:ILE:HD12	1.56	0.41
1:A:395:THR:HG22	1:A:396:GLY:N	2.34	0.41
1:A:475:LEU:CD1	1:A:479:ILE:HD11	2.50	0.41
1:B:122:LEU:HD12	1:B:122:LEU:HA	1.90	0.41
1:B:213:THR:HG23	1:B:228:THR:CG2	2.51	0.41
1:B:238:HIS:CE1	2:B:1491:C8E:H71	2.56	0.41
1:B:255:THR:HG23	1:B:275:HIS:NE2	2.36	0.41
1:B:430:VAL:HB	1:B:442:TRP:HE3	1.86	0.41
1:B:481:TYR:HA	1:B:482:PRO:HD2	1.87	0.41
1:A:87:HIS:HD2	1:A:88:PHE:H	1.68	0.41
1:A:122:LEU:HD12	1:A:122:LEU:HA	1.88	0.41
1:A:179:PRO:O	1:A:203:SER:HB2	2.21	0.41
1:B:45:ASP:OD1	1:B:45:ASP:N	2.36	0.41
1:B:283:ILE:HG23	1:B:283:ILE:HD13	1.72	0.41
1:B:54:GLY:HA3	1:B:482:PRO:HA	2.03	0.40
1:A:67:HIS:CD2	1:A:68:PRO:CD	3.01	0.40
1:B:374:VAL:CG2	1:B:383:TYR:CE1	3.05	0.40
1:B:470:ILE:N	1:B:470:ILE:CD1	2.82	0.40
1:B:259:LEU:HD23	1:B:259:LEU:HA	1.93	0.40
1:B:273:GLN:CD	1:B:275:HIS:CE1	3.00	0.40
1:A:274:PHE:CG	1:A:275:HIS:N	2.89	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:352:ILE:O	1:B:354:PRO:HD3	2.21	0.40
1:B:430:VAL:CG2	1:B:444:LEU:CD1	2.97	0.40
1:A:302:VAL:HG22	1:A:321:CYS:SG	2.61	0.40
1:A:363:LEU:HD12	1:A:364:MET:H	1.86	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	477/490 (97%)	448 (94%)	26 (6%)	3 (1%)	21	41
1	B	477/490 (97%)	442 (93%)	27 (6%)	8 (2%)	7	17
All	All	954/980 (97%)	890 (93%)	53 (6%)	11 (1%)	10	24

All (11) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	435	GLY
1	B	435	GLY
1	A	207	SER
1	B	150	GLU
1	B	301	PHE
1	B	121	TRP
1	B	207	SER
1	A	287	ARG
1	B	81	PRO
1	B	219	PRO
1	B	481	TYR

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	399/410 (97%)	321 (80%)	78 (20%)	1	3
1	B	399/410 (97%)	331 (83%)	68 (17%)	2	5
All	All	798/820 (97%)	652 (82%)	146 (18%)	2	4

All (146) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	12	GLN
1	A	16	SER
1	A	18	GLN
1	A	35	VAL
1	A	38	VAL
1	A	41	SER
1	A	47	GLN
1	A	52	ARG
1	A	57	LEU
1	A	63	ARG
1	A	79	LYS
1	A	83	ASP
1	A	86	VAL
1	A	89	GLN
1	A	90	SER
1	A	94	ARG
1	A	99	VAL
1	A	112	VAL
1	A	122	LEU
1	A	123	LYS
1	A	130	LEU
1	A	135	ASN
1	A	139	THR
1	A	162	LEU
1	A	165	ILE
1	A	186	ILE
1	A	193	ASP

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Mol	Chain	Res	Type
1	A	200	VAL
1	A	203	SER
1	A	204	ILE
1	A	205	LYS
1	A	208	LEU
1	A	211	THR
1	A	212	LEU
1	A	217	LEU
1	A	220	GLN
1	A	227	LYS
1	A	228	THR
1	A	243	THR
1	A	257	ASN
1	A	272	VAL
1	A	277	ASP
1	A	281	GLN
1	A	283	ILE
1	A	287	ARG
1	A	291	GLU
1	A	292	ILE
1	A	297	VAL
1	A	298	GLN
1	A	316	ILE
1	A	319	SER
1	A	328	VAL
1	A	330	THR
1	A	342	LEU
1	A	349	ARG
1	A	358	THR
1	A	361	LYS
1	A	362	GLN
1	A	363	LEU
1	A	365	VAL
1	A	373	VAL
1	A	374	VAL
1	A	381	ARG
1	A	394	SER
1	A	395	THR
1	A	403	ILE
1	A	413	GLU
1	A	416	ARG
1	A	436	VAL

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Mol	Chain	Res	Type
1	A	443	LEU
1	A	447	ILE
1	A	449	LYS
1	A	452	LEU
1	A	454	ARG
1	A	463	GLN
1	A	473	LEU
1	A	474	LYS
1	A	476	LYS
1	B	18	GLN
1	B	35	VAL
1	B	38	VAL
1	B	41	SER
1	B	47	GLN
1	B	50	LEU
1	B	57	LEU
1	B	63	ARG
1	B	79	LYS
1	B	83	ASP
1	B	85	ARG
1	B	90	SER
1	B	94	ARG
1	B	112	VAL
1	B	123	LYS
1	B	130	LEU
1	B	135	ASN
1	B	139	THR
1	B	144	ARG
1	B	160	SER
1	B	162	LEU
1	B	173	ILE
1	B	200	VAL
1	B	203	SER
1	B	208	LEU
1	B	211	THR
1	B	223	LEU
1	B	228	THR
1	B	237	ILE
1	B	240	PHE
1	B	243	THR
1	B	253	ASN
1	B	281	GLN

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Mol	Chain	Res	Type
1	B	283	ILE
1	B	287	ARG
1	B	291	GLU
1	B	292	ILE
1	B	297	VAL
1	B	298	GLN
1	B	310	GLU
1	B	314	LYS
1	B	316	ILE
1	B	319	SER
1	B	330	THR
1	B	342	LEU
1	B	349	ARG
1	B	358	THR
1	B	359	VAL
1	B	361	LYS
1	B	363	LEU
1	B	364	MET
1	B	365	VAL
1	B	373	VAL
1	B	374	VAL
1	B	381	ARG
1	B	413	GLU
1	B	414	THR
1	B	416	ARG
1	B	436	VAL
1	B	447	ILE
1	B	452	LEU
1	B	459	ILE
1	B	463	GLN
1	B	473	LEU
1	B	474	LYS
1	B	476	LYS
1	B	489	GLN
1	B	490	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (34) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	18	GLN
1	A	29	GLN
1	A	47	GLN

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Mol	Chain	Res	Type
1	A	67	HIS
1	A	87	HIS
1	A	135	ASN
1	A	153	GLN
1	A	196	GLN
1	A	220	GLN
1	A	245	HIS
1	A	252	ASN
1	A	253	ASN
1	A	257	ASN
1	A	273	GLN
1	A	346	GLN
1	A	397	ASN
1	A	477	HIS
1	A	489	GLN
1	B	12	GLN
1	B	27	GLN
1	B	29	GLN
1	B	67	HIS
1	B	87	HIS
1	B	135	ASN
1	B	153	GLN
1	B	196	GLN
1	B	252	ASN
1	B	257	ASN
1	B	273	GLN
1	B	377	GLN
1	B	397	ASN
1	B	421	HIS
1	B	477	HIS
1	B	489	GLN

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](#)

4 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	C8E	B	1491	-	20,20,20	0.73	0	19,19,19	1.45	4 (21%)
3	GOL	A	1493	-	5,5,5	0.32	0	5,5,5	0.41	0
3	GOL	A	1492	-	5,5,5	0.24	0	5,5,5	0.36	0
2	C8E	A	1491	-	20,20,20	0.69	0	19,19,19	1.53	5 (26%)

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	C8E	B	1491	-	-	6/18/18/18	-
3	GOL	A	1493	-	-	1/4/4/4	-
3	GOL	A	1492	-	-	2/4/4/4	-
2	C8E	A	1491	-	-	8/18/18/18	-

There are no bond length outliers.

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1491	C8E	O18-C17-C16	3.62	126.84	110.35
2	B	1491	C8E	O18-C17-C16	3.52	126.38	110.35
2	A	1491	C8E	O12-C11-C10	2.14	120.12	110.35
2	A	1491	C8E	O18-C19-C20	2.13	119.52	110.11
2	B	1491	C8E	O12-C11-C10	2.13	120.06	110.35

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	1491	C8E	O18-C19-C20	2.07	119.23	110.11
2	A	1491	C8E	O9-C8-C7	2.04	121.02	110.32
2	B	1491	C8E	O15-C14-C13	2.03	119.60	110.35
2	A	1491	C8E	O15-C14-C13	2.00	119.47	110.35

There are no chirality outliers.

All (17) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	1492	GOL	C1-C2-C3-O3
2	B	1491	C8E	O15-C16-C17-O18
2	A	1491	C8E	O12-C13-C14-O15
3	A	1493	GOL	C1-C2-C3-O3
2	A	1491	C8E	O15-C16-C17-O18
3	A	1492	GOL	O2-C2-C3-O3
2	B	1491	C8E	O9-C10-C11-O12
2	A	1491	C8E	C2-C3-C4-C5
2	A	1491	C8E	C20-C19-O18-C17
2	B	1491	C8E	C10-C11-O12-C13
2	A	1491	C8E	C14-C13-O12-C11
2	B	1491	C8E	C7-C8-O9-C10
2	A	1491	C8E	O9-C10-C11-O12
2	A	1491	C8E	C3-C4-C5-C6
2	A	1491	C8E	C13-C14-O15-C16
2	B	1491	C8E	C20-C19-O18-C17
2	B	1491	C8E	O12-C13-C14-O15

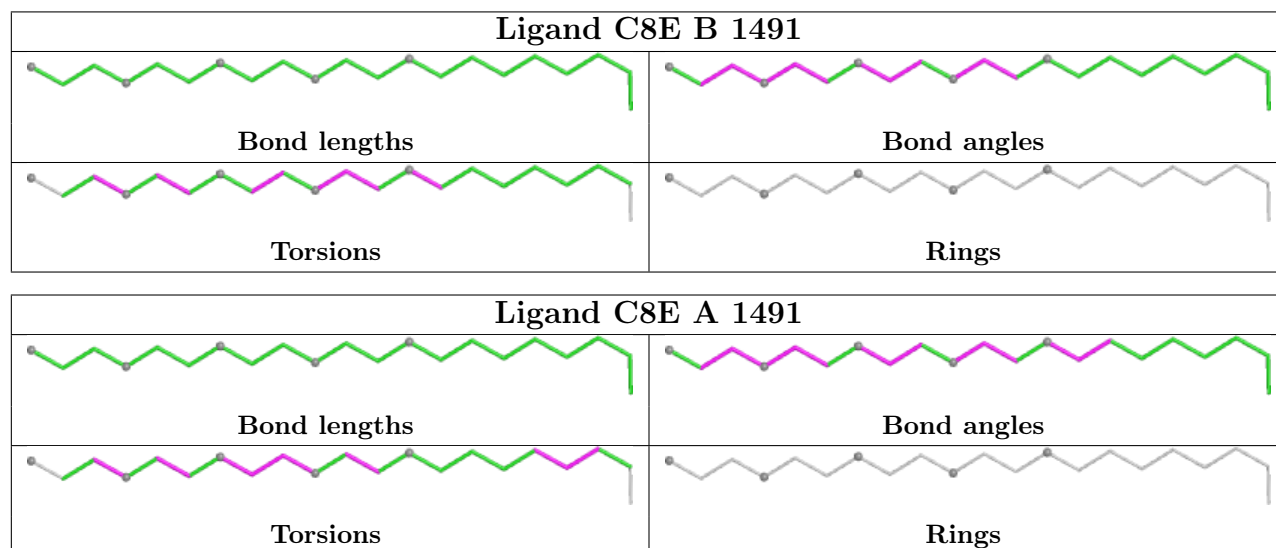
There are no ring outliers.

2 monomers are involved in 10 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	1491	C8E	3	0
2	A	1491	C8E	7	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	479/490 (97%)	0.15	18 (3%) 44 39	31, 50, 78, 104	0
1	B	479/490 (97%)	0.30	27 (5%) 30 26	30, 53, 78, 95	0
All	All	958/980 (97%)	0.23	45 (4%) 36 32	30, 51, 78, 104	0

All (45) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	194	GLY	5.0
1	B	83	ASP	4.2
1	B	195	GLY	4.1
1	B	198	CYS	4.1
1	B	436	VAL	3.8
1	A	430	VAL	3.7
1	A	83	ASP	3.6
1	A	208	LEU	3.5
1	A	330	THR	3.2
1	B	143	ASP	3.2
1	A	234	PHE	3.1
1	B	290	GLY	2.9
1	A	298	GLN	2.8
1	B	490	THR	2.8
1	A	274	PHE	2.8
1	B	430	VAL	2.8
1	B	12	GLN	2.8
1	B	193	ASP	2.7
1	A	236	PHE	2.7
1	B	80	PHE	2.7
1	B	289	GLY	2.6
1	A	328	VAL	2.6
1	A	205	LYS	2.5
1	A	209	SER	2.5

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Mol	Chain	Res	Type	RSRZ
1	A	436	VAL	2.5
1	B	91	LYS	2.5
1	A	130	LEU	2.4
1	A	235	ALA	2.4
1	B	291	GLU	2.4
1	B	141	TRP	2.4
1	B	292	ILE	2.3
1	B	96	GLN	2.3
1	B	144	ARG	2.3
1	B	223	LEU	2.3
1	A	277	ASP	2.3
1	B	454	ARG	2.2
1	A	12	GLN	2.2
1	B	298	GLN	2.2
1	B	192	PHE	2.2
1	B	220	GLN	2.1
1	B	316	ILE	2.1
1	B	191	THR	2.0
1	A	143	ASP	2.0
1	A	395	THR	2.0
1	B	196	GLN	2.0

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

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

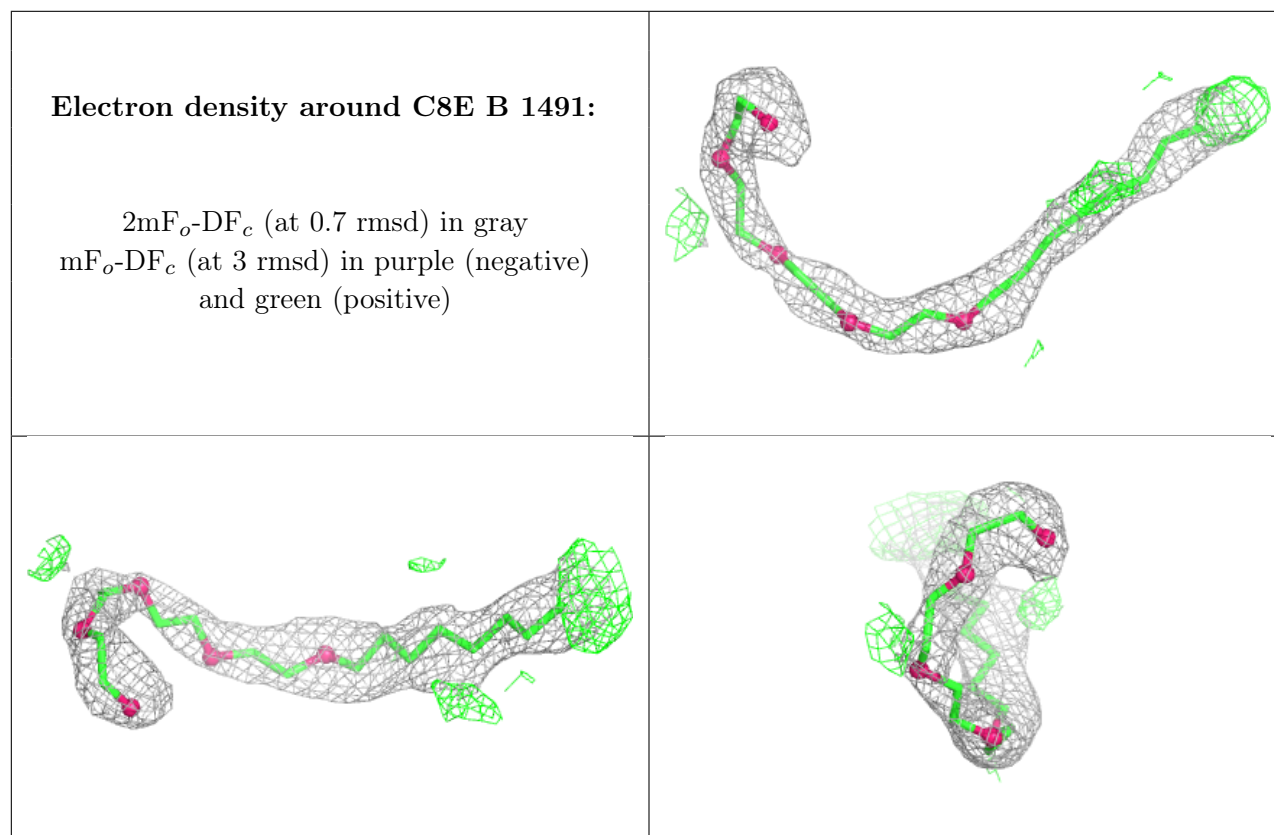
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	GOL	A	1492	6/6	0.78	0.25	88,89,89,89	0
2	C8E	B	1491	21/21	0.83	0.19	55,65,80,81	0

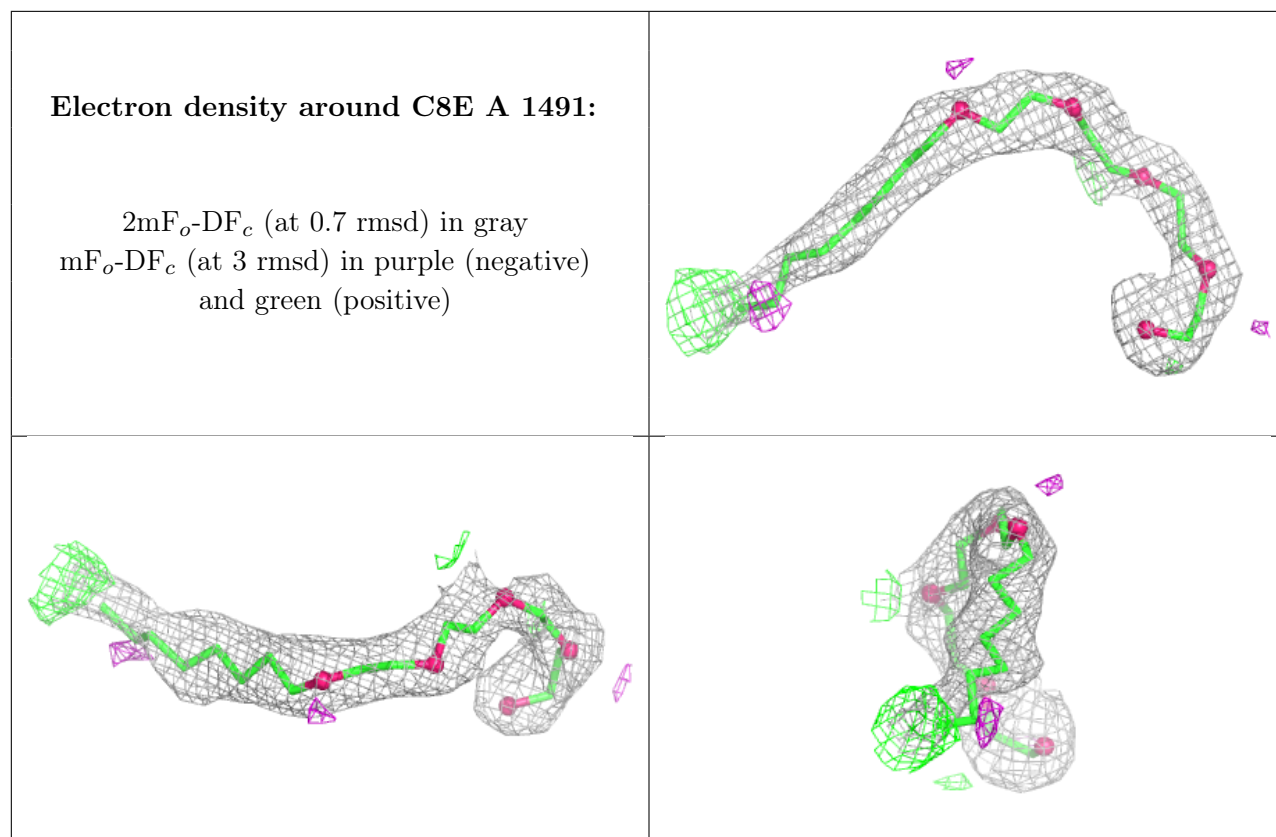
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	GOL	A	1493	6/6	0.85	0.27	62,70,74,75	0
2	C8E	A	1491	21/21	0.86	0.20	67,69,77,79	0

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.





6.5 Other polymers [i](#)

There are no such residues in this entry.