Full wwPDB X-ray Structure Validation Report (i)

Jan 31, 2016 – 08:01 PM GMT

PDB ID	:	1IDC
Title	:	ISOCITRATE DEHYDROGENASE FROM E.COLI (MUTANT K230M), STEADY-STATE INTERMEDIATE COMPLEX DETERMINED BY LAUE CRYSTALLOGRAPHY
Authors	:	Bolduc, J.M.; Dyer, D.H.; Scott, W.G.; Singer, P.; Sweet, R.M.; Koshland Junior, D.E.; Stoddard, B.L.
Deposited on	:	1995-01-18
Resolution	:	2.50 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
http://wwpdb.org/validation/2016/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

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

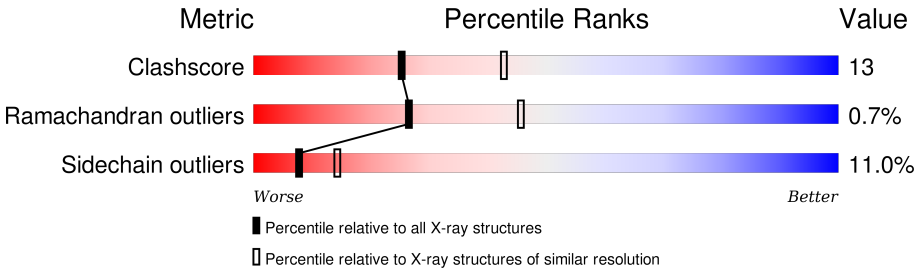
MolProbity	:	4.02b-467
Mogul	:	1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	trunk26865

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 2.50 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))
Clashscore	102246	4242 (2.50-2.50)
Ramachandran outliers	100387	4156 (2.50-2.50)
Sidechain outliers	100360	4158 (2.50-2.50)

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 on the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria. 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.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	416	59% 34% 6%

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 criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	OXS	A	418	-	-	X	-

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3231 atoms, of which 22 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 ISOCITRATE DEHYDROGENASE.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	414	Total	C	H	N	O	S	30	0	0
			3217	2034	22	537	605	19			

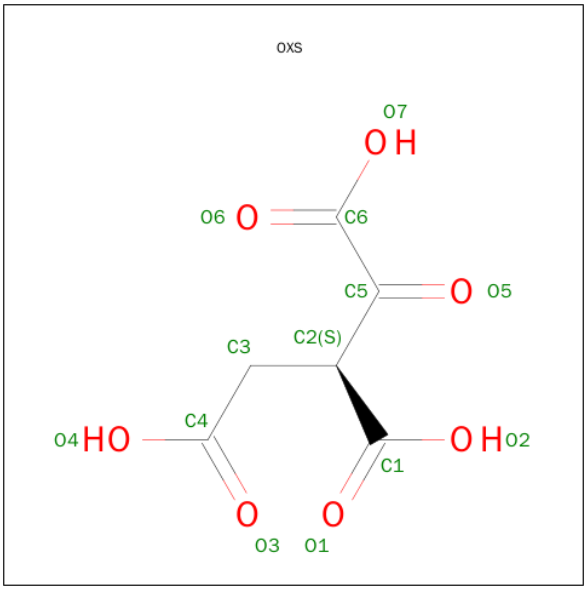
There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	230	MET	LYS	ENGINEERED	UNP P08200

- Molecule 2 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

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

- Molecule 3 is 2-OXALOSUCCINIC ACID (three-letter code: OXS) (formula: $C_6H_6O_7$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			13	6	7		

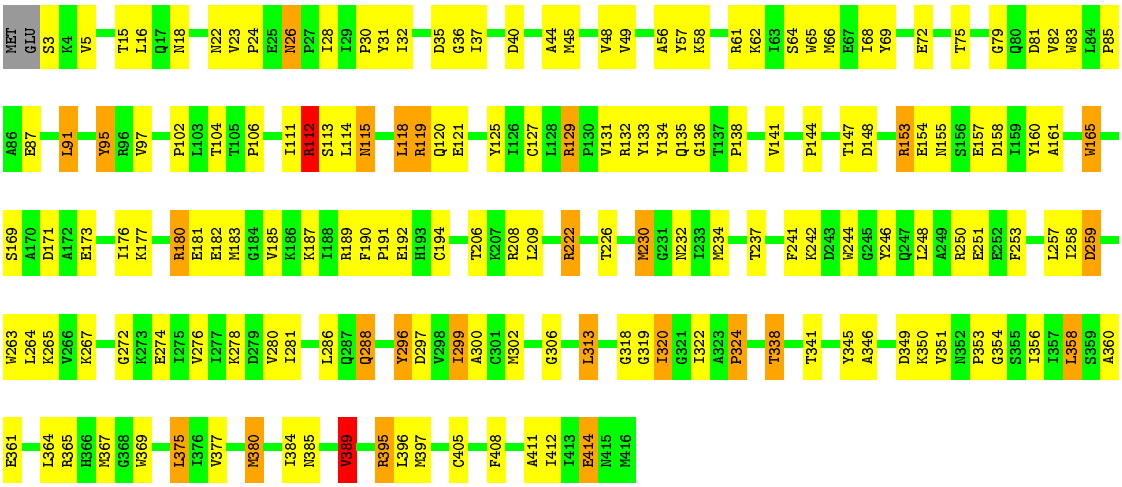
3 Residue-property plots (i)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

Note EDS was not executed.

- Molecule 1: ISOCITRATE DEHYDROGENASE

Chain A:



4 Data and refinement statistics (i)

Xtriage (Phenix) and EDS were not executed - this section will therefore be incomplete.

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α, β, γ	105.10Å 105.10Å 150.30Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	(Not available) – 2.50	Depositor
% Data completeness (in resolution range)	(Not available) ((Not available)-2.50)	Depositor
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR 3.1	Depositor
R, R_{free}	0.169 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3231	wwPDB-VP
Average B, all atoms (Å^2)	23.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

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

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	0.93	0/3256	1.78	60/4404 (1.4%)

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	3

There are no bond length outliers.

All (60) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	119	ARG	NE-CZ-NH1	13.70	127.15	120.30
1	A	83	TRP	CD1-CG-CD2	9.79	114.13	106.30
1	A	112	ARG	NE-CZ-NH1	9.41	125.00	120.30
1	A	119	ARG	NE-CZ-NH2	-9.27	115.66	120.30
1	A	61	ARG	NE-CZ-NH1	9.19	124.89	120.30
1	A	165	TRP	CD1-CG-CD2	9.06	113.55	106.30
1	A	389	VAL	N-CA-CB	-8.75	92.25	111.50
1	A	112	ARG	NE-CZ-NH2	-8.32	116.14	120.30
1	A	83	TRP	CE2-CD2-CG	-8.30	100.66	107.30
1	A	250	ARG	NE-CZ-NH2	-7.91	116.35	120.30
1	A	165	TRP	CE2-CD2-CG	-7.89	100.99	107.30
1	A	244	TRP	CE2-CD2-CG	-7.69	101.14	107.30
1	A	230	MET	CG-SD-CE	7.65	112.44	100.20
1	A	389	VAL	CG1-CB-CG2	7.48	122.87	110.90
1	A	57	TYR	CB-CG-CD1	-7.28	116.63	121.00
1	A	244	TRP	CD1-CG-CD2	7.20	112.06	106.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	286	LEU	CA-CB-CG	6.97	131.33	115.30
1	A	65	TRP	CG-CD2-CE3	6.86	140.07	133.90
1	A	208	ARG	NE-CZ-NH1	6.85	123.72	120.30
1	A	65	TRP	CE2-CD2-CG	-6.83	101.83	107.30
1	A	369	TRP	CD1-CG-CD2	6.80	111.74	106.30
1	A	395	ARG	NE-CZ-NH1	6.58	123.59	120.30
1	A	83	TRP	CG-CD2-CE3	6.49	139.74	133.90
1	A	141	VAL	N-CA-CB	-6.40	97.42	111.50
1	A	69	TYR	CA-C-N	-6.37	103.20	117.20
1	A	259	ASP	CA-C-N	6.31	128.81	116.20
1	A	244	TRP	CG-CD2-CE3	6.29	139.56	133.90
1	A	369	TRP	CE2-CD2-CG	-6.24	102.31	107.30
1	A	299	ILE	CG1-CB-CG2	-6.23	97.69	111.40
1	A	83	TRP	CB-CG-CD1	-6.21	118.93	127.00
1	A	389	VAL	CB-CA-C	6.18	123.14	111.40
1	A	69	TYR	O-C-N	6.16	132.55	122.70
1	A	153	ARG	NE-CZ-NH2	-6.10	117.25	120.30
1	A	83	TRP	CG-CD1-NE1	-6.06	104.04	110.10
1	A	95	TYR	CA-CB-CG	-6.02	101.96	113.40
1	A	165	TRP	CG-CD1-NE1	-5.96	104.14	110.10
1	A	313	LEU	CA-CB-CG	5.94	128.95	115.30
1	A	65	TRP	CB-CG-CD1	-5.91	119.32	127.00
1	A	180	ARG	NE-CZ-NH1	5.80	123.20	120.30
1	A	31	TYR	CB-CG-CD2	-5.79	117.52	121.00
1	A	365	ARG	NE-CZ-NH2	-5.74	117.43	120.30
1	A	276	VAL	CG1-CB-CG2	-5.69	101.80	110.90
1	A	251	GLU	CA-CB-CG	5.67	125.88	113.40
1	A	157	GLU	N-CA-CB	-5.64	100.45	110.60
1	A	208	ARG	CA-CB-CG	5.63	125.79	113.40
1	A	263	TRP	CE2-CD2-CG	-5.62	102.80	107.30
1	A	165	TRP	CG-CD2-CE3	5.59	138.93	133.90
1	A	237	THR	CA-CB-CG2	5.49	120.08	112.40
1	A	338	THR	O-C-N	-5.41	114.04	122.70
1	A	185	VAL	CA-C-N	-5.37	105.38	117.20
1	A	244	TRP	CB-CG-CD1	-5.29	120.13	127.00
1	A	3	SER	N-CA-C	-5.20	96.95	111.00
1	A	165	TRP	CB-CG-CD1	-5.19	120.25	127.00
1	A	300	ALA	N-CA-CB	5.18	117.35	110.10
1	A	414	GLU	CA-CB-CG	5.14	124.71	113.40
1	A	3	SER	N-CA-CB	-5.14	102.79	110.50
1	A	125	TYR	CA-C-N	5.11	128.43	117.20
1	A	134	TYR	CB-CG-CD2	-5.06	117.97	121.00

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	157	GLU	CA-CB-CG	5.02	124.44	113.40
1	A	153	ARG	NE-CZ-NH1	5.01	122.81	120.30

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	296	TYR	Sidechain
1	A	345	TYR	Sidechain
1	A	95	TYR	Sidechain

5.2 Too-close contacts (i)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3195	22	3218	79	0
2	A	1	0	0	0	0
3	A	13	0	3	4	0
All	All	3209	22	3221	79	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 13.

All (79) 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:160:TYR:OH	3:A:418:OXS:C1	2.17	0.92
1:A:258:ILE:HG12	1:A:265:LYS:HG2	1.57	0.85
1:A:160:TYR:HH	3:A:418:OXS:C1	1.89	0.84
1:A:127:CYS:HB2	1:A:155:ASN:ND2	2.01	0.76
1:A:153:ARG:HB2	1:A:306:GLY:HA3	1.69	0.74
1:A:30:PRO:HA	1:A:66:MET:O	1.95	0.66
1:A:127:CYS:HB2	1:A:155:ASN:HD21	1.60	0.65
1:A:324:PRO:HB3	1:A:358:LEU:HB3	1.78	0.65
1:A:37:ILE:HG21	1:A:351:VAL:HG11	1.80	0.63

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:114:LEU:O	1:A:118:LEU:HD12	2.00	0.62
1:A:32:ILE:HG13	1:A:68:ILE:HG13	1.82	0.62
1:A:112:ARG:HG3	1:A:112:ARG:HH11	1.67	0.60
1:A:354:GLY:O	1:A:358:LEU:HB2	2.02	0.59
1:A:395:ARG:HG3	1:A:396:LEU:HG	1.84	0.59
1:A:106:PRO:HG2	1:A:111:ILE:HD13	1.84	0.58
1:A:176:ILE:HG21	1:A:191:PRO:HB3	1.85	0.58
1:A:49:VAL:HG21	1:A:360:ALA:HB1	1.85	0.58
1:A:26:ASN:HA	1:A:62:LYS:O	2.04	0.58
1:A:30:PRO:HD2	1:A:97:VAL:O	2.05	0.56
1:A:45:MET:HB2	1:A:356:ILE:HG23	1.88	0.56
1:A:36:GLY:HA3	1:A:341:THR:HB	1.86	0.56
1:A:115:ASN:O	1:A:119:ARG:HD3	2.05	0.56
1:A:182:GLU:HG3	1:A:183:MET:HE2	1.87	0.56
1:A:15:THR:HB	1:A:22:ASN:HB3	1.89	0.55
1:A:354:GLY:HA2	1:A:380:MET:HE1	1.90	0.53
1:A:319:GLY:CA	1:A:322:ILE:HG22	2.39	0.53
1:A:206:THR:HG21	1:A:241:PHE:HA	1.90	0.53
1:A:23:VAL:HG12	1:A:24:PRO:O	2.08	0.53
1:A:206:THR:HG23	1:A:241:PHE:CD2	2.45	0.52
1:A:349:ASP:OD1	1:A:405:CYS:HB3	2.09	0.52
1:A:138:PRO:O	1:A:318:GLY:HA3	2.09	0.52
1:A:319:GLY:HA3	1:A:322:ILE:HG22	1.92	0.52
1:A:75:THR:HA	1:A:79:GLY:O	2.10	0.51
1:A:411:ALA:HA	1:A:414:GLU:HG2	1.92	0.51
1:A:320:ILE:H	1:A:320:ILE:HD12	1.77	0.50
1:A:288:GLN:HA	1:A:288:GLN:HE21	1.77	0.50
1:A:177:LYS:O	1:A:181:GLU:HG3	2.11	0.50
1:A:129:ARG:HH21	1:A:338:THR:HB	1.75	0.49
1:A:265:LYS:HD2	1:A:274:GLU:HB3	1.94	0.49
1:A:120:GLN:NE2	1:A:161:ALA:HA	2.27	0.49
1:A:120:GLN:HE22	1:A:161:ALA:HA	1.78	0.49
1:A:154:GLU:HA	1:A:209:LEU:HD13	1.94	0.48
1:A:361:GLU:HG3	1:A:377:VAL:HG23	1.96	0.48
1:A:35:ASP:OD1	1:A:72:GLU:HB3	2.13	0.48
1:A:296:TYR:HB3	1:A:299:ILE:HD11	1.95	0.48
1:A:160:TYR:OH	3:A:418:OXS:O2	2.31	0.47
1:A:169:SER:O	1:A:173:GLU:HB2	2.14	0.47
1:A:226:THR:HG23	1:A:280:VAL:HG12	1.96	0.46
1:A:106:PRO:CG	1:A:111:ILE:HD13	2.45	0.46
1:A:182:GLU:HG3	1:A:183:MET:CE	2.44	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:23:VAL:HG21	1:A:367:MET:O	2.15	0.46
1:A:408:PHE:CE2	1:A:412:ILE:HD11	2.51	0.46
1:A:37:ILE:HG22	1:A:346:ALA:HA	1.97	0.46
1:A:232:ASN:H	1:A:281:ILE:HD11	1.81	0.46
1:A:384:ILE:HD13	1:A:384:ILE:HG21	1.71	0.46
1:A:248:LEU:HD21	1:A:253:PHE:HE1	1.81	0.45
1:A:44:ALA:O	1:A:48:VAL:HG13	2.16	0.45
1:A:82:VAL:CG1	1:A:85:PRO:HG3	2.46	0.45
1:A:49:VAL:HG13	1:A:364:LEU:HD11	1.99	0.45
1:A:133:TYR:CD1	1:A:144:PRO:HB2	2.52	0.45
1:A:5:VAL:HG21	1:A:91:LEU:HD21	1.98	0.45
1:A:112:ARG:HG3	1:A:112:ARG:NH1	2.31	0.44
1:A:56:ALA:HB2	1:A:375:LEU:HD22	2.00	0.44
1:A:132:ARG:HA	1:A:147:THR:O	2.17	0.44
1:A:190:PHE:O	1:A:194:CYS:HB2	2.17	0.43
1:A:158:ASP:OD2	1:A:302:MET:HB3	2.18	0.43
1:A:258:ILE:CG1	1:A:265:LYS:HG2	2.39	0.43
1:A:353:PRO:O	1:A:356:ILE:HG22	2.19	0.43
1:A:191:PRO:O	1:A:194:CYS:HB3	2.19	0.43
1:A:226:THR:CG2	1:A:280:VAL:HG12	2.49	0.43
1:A:389:VAL:HG11	1:A:397:MET:HE3	2.00	0.43
1:A:113:SER:OG	3:A:418:OXS:O4	2.36	0.42
1:A:267:LYS:HE3	1:A:272:GLY:CA	2.49	0.42
1:A:136:GLY:O	1:A:138:PRO:HD3	2.20	0.42
1:A:253:PHE:CD1	1:A:253:PHE:N	2.88	0.42
1:A:165:TRP:CD1	1:A:171:ASP:HB3	2.55	0.41
1:A:28:ILE:HA	1:A:64:SER:O	2.20	0.41
1:A:102:PRO:HB2	1:A:341:THR:HG22	2.02	0.41
1:A:222:ARG:HB3	1:A:297:ASP:OD2	2.21	0.41

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	412/416 (99%)	378 (92%)	31 (8%)	3 (1%)	26 46

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	259	ASP
1	A	131	VAL
1	A	18	ASN

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	336/338 (99%)	299 (89%)	37 (11%)	8 14

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

Mol	Chain	Res	Type
1	A	16	LEU
1	A	26	ASN
1	A	40	ASP
1	A	58	LYS
1	A	81	ASP
1	A	87	GLU
1	A	91	LEU
1	A	104	THR
1	A	112	ARG
1	A	115	ASN
1	A	118	LEU
1	A	121	GLU
1	A	129	ARG
1	A	135	GLN
1	A	148	ASP
1	A	180	ARG
1	A	187	LYS
1	A	189	ARG

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Mol	Chain	Res	Type
1	A	192	GLU
1	A	222	ARG
1	A	230	MET
1	A	234	MET
1	A	242	LYS
1	A	246	TYR
1	A	257	LEU
1	A	264	LEU
1	A	278	LYS
1	A	288	GLN
1	A	313	LEU
1	A	320	ILE
1	A	324	PRO
1	A	350	LYS
1	A	358	LEU
1	A	375	LEU
1	A	380	MET
1	A	385	ASN
1	A	389	VAL

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

Mol	Chain	Res	Type
1	A	26	ASN
1	A	120	GLN
1	A	143	HIS
1	A	155	ASN
1	A	288	GLN
1	A	316	GLN
1	A	348	GLN

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates (i)

There are no carbohydrates in this entry.

5.6 Ligand geometry (i)

Of 2 ligands modelled in this entry, 1 is monoatomic - leaving 1 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	OXS	A	418	1,2	1,12,12	16.34	1 (100%)	4,16,16	2.56	3 (75%)

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	OXS	A	418	1,2	-	0/6/16/16	0/0/0/0

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	418	OXS	O5-C5	-16.34	0.97	1.22

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	418	OXS	C3-C2-C5	-2.56	104.92	110.83
3	A	418	OXS	C4-C3-C2	-2.54	108.44	113.44
3	A	418	OXS	O5-C5-C2	3.63	124.75	119.88

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	418	OXS	4	0

5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

EDS was not executed - this section will therefore be empty.

6.2 Non-standard residues in protein, DNA, RNA chains

EDS was not executed - this section will therefore be empty.

6.3 Carbohydrates

EDS was not executed - this section will therefore be empty.

6.4 Ligands

EDS was not executed - this section will therefore be empty.

6.5 Other polymers

EDS was not executed - this section will therefore be empty.