



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 7, 2018 – 09:08 am GMT

PDB ID : 1QW8
Title : Crystal structure of a family 51 alpha-L-arabinofuranosidase in complex with Ara-alpha(1,3)-Xyl
Authors : Hoevel, K.; Shallom, D.; Niefind, K.; Belakhov, V.; Shoham, G.; Bassov, T.; Shoham, Y.; Schomburg, D.
Deposited on : 2003-09-01
Resolution : 1.80 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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

MolProbity : 4.02b-467
Mogul : 1.7.3 (157068), CSD as539be (2018)
Xtriage (Phenix) : 1.13
EDS : trunk30967
Percentile statistics : (not set)
Refmac : 5.8.0158
CCP4 : 7.0 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk30967

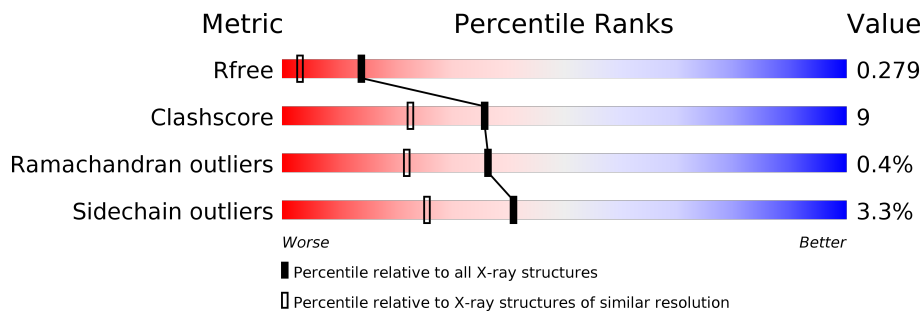
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.80 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	111664	5253 (1.80-1.80)
Clashscore	122126	6077 (1.80-1.80)
Ramachandran outliers	120053	6011 (1.80-1.80)
Sidechain outliers	120020	6010 (1.80-1.80)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments 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 $\leq 5\%$.

Mol	Chain	Length	Quality of chain
1	A	502	
1	B	502	

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 8940 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.

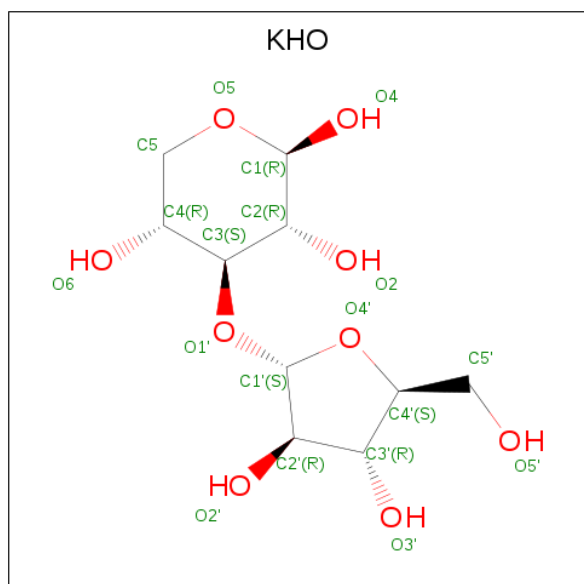
- Molecule 1 is a protein called Alpha-L-arabinofuranosidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	497	Total	C	N	O	S	0	0	0
			3986	2540	680	746	20			
1	B	497	Total	C	N	O	S	0	0	0
			3986	2540	680	746	20			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	175	ALA	GLU	ENGINEERED	UNP Q9XBQ3
B	175	ALA	GLU	ENGINEERED	UNP Q9XBQ3

- Molecule 2 is 4-(3,4-DIHYDROXY-5-HYDROXYMETHYL-TETRAHYDRO-FURAN-2-YLOXY)-TETRAHYDRO-PYRAN-2,3,5-TRIOL (three-letter code: KHO) (formula: $C_{10}H_{18}O_9$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			19	10	9		
2	B	1	Total	C	O	0	0
			19	10	9		

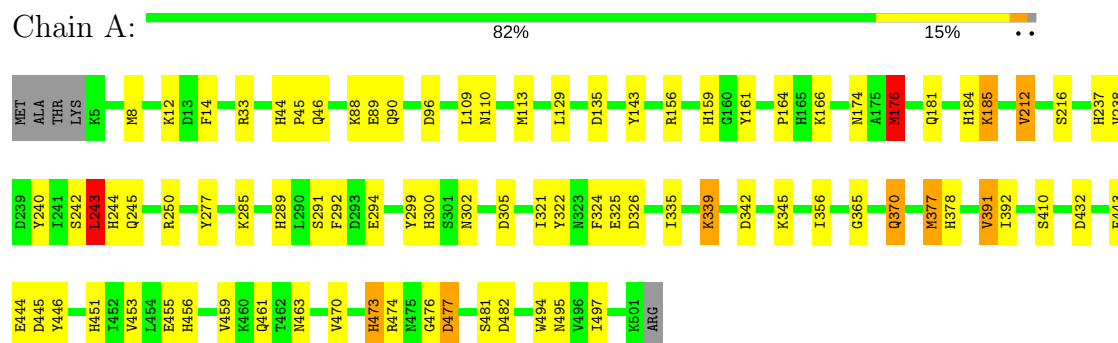
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	468	Total	O	0	0
			468	468		
3	B	462	Total	O	0	0
			462	462		

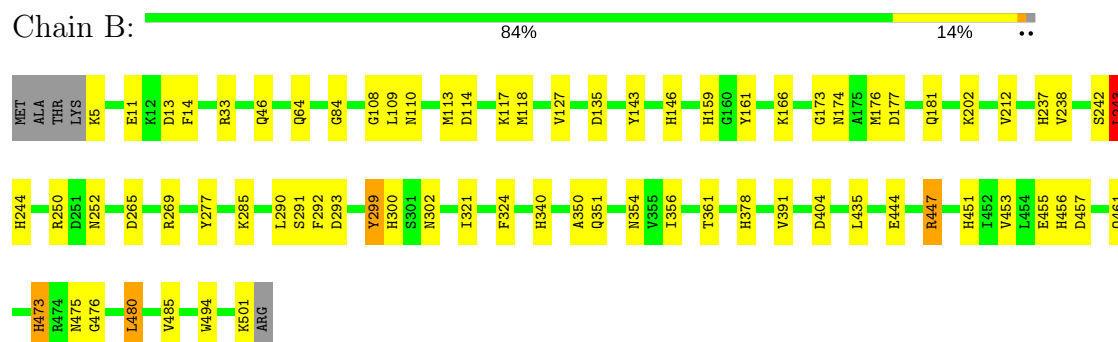
3 Residue-property plots

These plots are drawn for all protein, RNA and DNA 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. 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. 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: Alpha-L-arabinofuranosidase



• Molecule 1: Alpha-L-arabinofuranosidase



4 Data and refinement statistics

Property	Value	Source
Space group	H 3	Depositor
Cell constants a, b, c, α , β , γ	179.43Å 179.43Å 100.23Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	20.00 – 1.80 14.99 – 1.80	Depositor EDS
% Data completeness (in resolution range)	97.2 (20.00-1.80) 96.4 (14.99-1.80)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.34 (at 1.79Å)	Xtriage
Refinement program	REFMAC 5.0	Depositor
R, R_{free}	0.174 , 0.213 0.255 , 0.279	Depositor DCC
R_{free} test set	5394 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å ²)	26.7	Xtriage
Anisotropy	0.007	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.40 , 48.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	0.012 for h,-h-k,-l	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	8940	wwPDB-VP
Average B, all atoms (Å ²)	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.95% 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: KHO

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	0.62	0/4087	0.83	12/5553 (0.2%)
1	B	0.60	0/4087	0.81	10/5553 (0.2%)
All	All	0.61	0/8174	0.82	22/11106 (0.2%)

There are no bond length outliers.

All (22) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	243	LEU	CA-CB-CG	6.78	130.89	115.30
1	B	33	ARG	NE-CZ-NH1	6.32	123.46	120.30
1	A	176	MET	CG-SD-CE	-6.25	90.21	100.20
1	B	457	ASP	CB-CG-OD2	6.17	123.85	118.30
1	A	135	ASP	CB-CG-OD2	6.14	123.83	118.30
1	B	33	ARG	NE-CZ-NH2	-5.92	117.34	120.30
1	A	33	ARG	NE-CZ-NH2	-5.91	117.34	120.30
1	A	185	LYS	CD-CE-NZ	-5.88	98.18	111.70
1	B	265	ASP	CB-CG-OD2	5.84	123.56	118.30
1	A	243	LEU	CA-CB-CG	5.68	128.36	115.30
1	A	445	ASP	CB-CG-OD2	5.63	123.37	118.30
1	B	177	ASP	CB-CG-OD2	5.59	123.33	118.30
1	A	477	ASP	CB-CG-OD2	5.46	123.21	118.30
1	A	432	ASP	CB-CG-OD2	5.31	123.08	118.30
1	A	342	ASP	CB-CG-OD1	5.27	123.05	118.30
1	B	135	ASP	CB-CG-OD2	5.26	123.03	118.30
1	A	33	ARG	NE-CZ-NH1	5.25	122.93	120.30
1	B	13	ASP	CB-CG-OD2	5.12	122.90	118.30
1	B	114	ASP	CB-CG-OD2	5.11	122.90	118.30
1	A	305	ASP	CB-CG-OD2	5.10	122.89	118.30
1	B	404	ASP	CB-CG-OD2	5.05	122.84	118.30
1	A	96	ASP	CB-CG-OD2	5.02	122.81	118.30

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	3986	0	3890	81	0
1	B	3986	0	3890	59	0
2	A	19	0	18	0	0
2	B	19	0	18	0	0
3	A	468	0	0	33	3
3	B	462	0	0	17	1
All	All	8940	0	7816	138	3

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 9.

All (138) 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:B:244:HIS:CE1	3:B:1364:HOH:O	1.65	1.28
1:A:216:SER:CB	3:A:1370:HOH:O	1.82	1.25
1:A:377:MET:SD	3:A:1369:HOH:O	2.08	1.08
1:A:216:SER:HB3	3:A:1370:HOH:O	1.42	1.07
1:B:118:MET:HG3	3:B:1373:HOH:O	1.57	1.03
1:A:451:HIS:ND1	1:A:476:GLY:HA3	1.81	0.95
1:A:129:LEU:O	1:A:176:MET:HE1	1.72	0.90
1:A:244:HIS:CE1	3:A:1404:HOH:O	2.25	0.89
1:B:354:ASN:HD21	1:B:361:THR:H	1.22	0.87
1:A:473:HIS:CE1	3:A:1374:HOH:O	2.27	0.86
1:A:377:MET:CG	3:A:1369:HOH:O	2.22	0.85
1:B:244:HIS:NE2	1:B:293:ASP:OD1	2.13	0.81
1:B:244:HIS:ND1	3:B:1364:HOH:O	1.81	0.81
1:A:174:ASN:O	1:A:176:MET:HG2	1.82	0.80
1:A:8:MET:SD	3:A:1410:HOH:O	2.39	0.80
1:A:250:ARG:HH21	1:A:302:ASN:HD21	1.31	0.78
1:B:300:HIS:HD2	1:B:321:ILE:O	1.66	0.76

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:378:HIS:HD2	1:B:494:TRP:HE1	1.33	0.74
1:A:44:HIS:HD2	1:A:46:GLN:H	1.33	0.74
1:B:456:HIS:CE1	1:B:461:GLN:HG2	2.22	0.74
1:B:243:LEU:O	1:B:244:HIS:HD2	1.72	0.73
1:B:480:LEU:HD22	1:B:485:VAL:HG22	1.73	0.71
1:A:463:ASN:HD21	1:A:470:VAL:H	1.39	0.70
1:B:244:HIS:HE1	3:B:1364:HOH:O	1.31	0.70
1:A:473:HIS:ND1	3:A:1374:HOH:O	2.21	0.70
1:A:451:HIS:CD2	1:A:497:ILE:HG12	2.27	0.70
1:A:174:ASN:C	3:A:1397:HOH:O	2.30	0.68
1:A:377:MET:HG2	3:A:1369:HOH:O	1.87	0.68
1:B:456:HIS:HE1	1:B:461:GLN:HG2	1.58	0.67
1:A:216:SER:OG	3:A:1370:HOH:O	1.69	0.66
1:A:473:HIS:CG	3:A:1374:HOH:O	2.49	0.66
1:B:118:MET:SD	3:B:1373:HOH:O	2.54	0.65
1:B:202:LYS:HD2	3:B:1293:HOH:O	1.97	0.65
1:A:451:HIS:CE1	1:A:495:ASN:HD22	2.15	0.64
1:B:176:MET:HE3	3:B:1370:HOH:O	1.97	0.64
1:B:300:HIS:CD2	1:B:321:ILE:O	2.49	0.63
1:A:300:HIS:HE1	1:A:326:ASP:OD2	1.81	0.63
1:B:176:MET:HG2	1:B:181:GLN:HG2	1.81	0.63
1:B:174:ASN:HD22	1:B:181:GLN:HE22	1.48	0.61
1:A:174:ASN:O	3:A:1397:HOH:O	2.16	0.61
1:B:212:VAL:HG13	1:B:238:VAL:HG11	1.83	0.61
1:A:245:GLN:NE2	3:A:1122:HOH:O	2.35	0.60
1:B:250:ARG:HH21	1:B:302:ASN:HD21	1.48	0.59
1:B:299:TYR:CE1	1:B:300:HIS:CE1	2.90	0.59
1:B:143:TYR:OH	1:B:159:HIS:HD2	1.84	0.59
1:A:289:HIS:ND1	1:A:345:LYS:HE2	2.18	0.59
1:A:44:HIS:CD2	1:A:46:GLN:H	2.20	0.59
1:A:391:VAL:HB	1:B:14:PHE:CZ	2.38	0.59
1:A:174:ASN:HD22	1:A:181:GLN:HE22	1.50	0.58
1:A:143:TYR:OH	1:A:159:HIS:HD2	1.87	0.57
1:B:118:MET:CG	3:B:1373:HOH:O	2.26	0.57
1:A:377:MET:CE	3:A:1369:HOH:O	2.46	0.57
1:B:456:HIS:HD2	3:B:1286:HOH:O	1.89	0.56
1:B:243:LEU:C	1:B:244:HIS:CD2	2.79	0.55
1:B:243:LEU:C	1:B:244:HIS:HD2	2.10	0.55
1:B:299:TYR:CZ	1:B:300:HIS:CE1	2.94	0.55
1:A:456:HIS:CE1	1:A:461:GLN:HG2	2.42	0.55
1:B:237:HIS:HE1	3:B:1306:HOH:O	1.89	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:166:LYS:HG2	3:A:1342:HOH:O	2.06	0.54
1:A:244:HIS:CE1	3:A:1382:HOH:O	2.61	0.54
1:A:237:HIS:HE1	3:A:1320:HOH:O	1.91	0.53
1:A:473:HIS:CE1	3:A:1403:HOH:O	2.60	0.53
1:A:244:HIS:HE1	3:A:1047:HOH:O	1.91	0.52
1:B:146:HIS:HD2	3:B:1058:HOH:O	1.92	0.52
1:B:378:HIS:HE1	3:B:1163:HOH:O	1.94	0.51
1:B:354:ASN:ND2	1:B:361:THR:H	2.01	0.51
1:A:392:ILE:HD11	3:A:1410:HOH:O	2.10	0.50
1:A:245:GLN:NE2	3:A:1314:HOH:O	2.45	0.50
1:B:146:HIS:HE1	3:B:1131:HOH:O	1.93	0.50
1:B:453:VAL:HB	1:B:473:HIS:CD2	2.47	0.50
1:B:378:HIS:CD2	1:B:494:TRP:HE1	2.22	0.50
1:A:44:HIS:HE1	1:A:365:GLY:O	1.94	0.49
1:A:250:ARG:HH21	1:A:302:ASN:ND2	2.07	0.48
1:A:324:PHE:CZ	1:A:455:GLU:HA	2.48	0.48
1:B:64:GLN:NE2	3:B:1047:HOH:O	2.46	0.48
1:B:269:ARG:HG3	1:B:340:HIS:HE1	1.78	0.48
1:A:176:MET:O	1:A:184:HIS:HD2	1.96	0.48
1:A:243:LEU:N	1:A:243:LEU:HD12	2.28	0.48
1:B:174:ASN:HD22	1:B:181:GLN:NE2	2.11	0.48
1:A:322:TYR:H	1:A:370:GLN:NE2	2.11	0.47
1:A:453:VAL:HB	1:A:473:HIS:CE1	2.50	0.47
1:B:110:ASN:HB3	1:B:161:TYR:CZ	2.49	0.47
1:B:447:ARG:NH2	3:B:1304:HOH:O	2.47	0.47
1:B:242:SER:HA	1:B:291:SER:O	2.14	0.47
1:B:127:VAL:O	1:B:173:GLY:HA2	2.16	0.46
1:A:212:VAL:HG13	1:A:238:VAL:HG11	1.97	0.46
1:A:129:LEU:O	1:A:185:LYS:HE3	2.16	0.46
1:B:451:HIS:CG	1:B:476:GLY:HA3	2.51	0.46
1:A:242:SER:C	1:A:243:LEU:HD12	2.36	0.46
1:A:451:HIS:HD2	1:A:497:ILE:HG12	1.76	0.46
1:B:117:LYS:HB3	1:B:117:LYS:HZ3	1.81	0.46
1:A:242:SER:HA	1:A:291:SER:O	2.16	0.46
1:A:322:TYR:H	1:A:370:GLN:HE22	1.64	0.46
1:A:181:GLN:NE2	3:A:1397:HOH:O	2.49	0.45
1:A:176:MET:O	1:A:184:HIS:CD2	2.70	0.45
1:B:174:ASN:O	1:B:176:MET:HG3	2.16	0.45
1:B:480:LEU:HD22	1:B:485:VAL:CG2	2.43	0.45
1:A:377:MET:HE3	1:A:377:MET:HB3	1.78	0.45
1:A:240:TYR:HA	1:A:289:HIS:O	2.17	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:324:PHE:CZ	1:B:455:GLU:HA	2.51	0.45
1:A:159:HIS:HE1	3:A:1022:HOH:O	1.98	0.44
1:A:378:HIS:CD2	1:A:494:TRP:HE1	2.36	0.44
1:B:109:LEU:O	1:B:113:MET:HG2	2.17	0.44
1:B:11:GLU:CG	1:B:14:PHE:HD1	2.31	0.44
1:A:164:PRO:HG2	1:A:166:LYS:HE2	1.99	0.44
1:A:473:HIS:CD2	3:A:1374:HOH:O	2.69	0.44
1:A:244:HIS:CE1	3:A:1047:HOH:O	2.69	0.44
1:A:446:TYR:OH	3:A:1386:HOH:O	2.21	0.43
1:A:325:GLU:HB3	1:A:459:VAL:HB	2.01	0.43
1:B:243:LEU:HD12	1:B:243:LEU:N	2.33	0.43
1:B:166:LYS:HG3	3:B:1209:HOH:O	2.18	0.43
1:B:473:HIS:CE1	1:B:475:ASN:HB2	2.54	0.43
1:A:89:GLU:HG2	1:A:90:GLN:NE2	2.33	0.43
1:A:289:HIS:CE1	1:A:345:LYS:HE2	2.54	0.43
1:A:110:ASN:HB3	1:A:161:TYR:CZ	2.54	0.42
1:A:321:ILE:HA	1:A:370:GLN:HE22	1.85	0.42
1:A:378:HIS:HE1	3:A:1162:HOH:O	2.02	0.42
1:A:451:HIS:CG	1:A:476:GLY:HA3	2.51	0.42
1:A:335:ILE:O	1:A:339:LYS:HG2	2.19	0.42
1:A:477:ASP:OD1	1:A:477:ASP:C	2.57	0.42
1:B:299:TYR:CZ	1:B:300:HIS:HE1	2.37	0.42
1:B:456:HIS:CD2	3:B:1286:HOH:O	2.68	0.42
1:A:184:HIS:HE1	3:A:1409:HOH:O	2.03	0.41
1:B:11:GLU:HG2	1:B:14:PHE:HD1	1.85	0.41
1:A:14:PHE:CE2	1:B:391:VAL:CG2	3.03	0.41
1:A:166:LYS:HG3	3:A:1108:HOH:O	2.20	0.41
1:A:174:ASN:HD22	1:A:181:GLN:NE2	2.16	0.41
1:A:88:LYS:NZ	3:A:1283:HOH:O	2.47	0.41
1:A:109:LEU:O	1:A:113:MET:HG2	2.21	0.41
1:A:44:HIS:CD2	1:A:45:PRO:HD2	2.56	0.41
1:B:84:GLY:O	1:B:108:GLY:HA3	2.20	0.41
1:A:245:GLN:CD	3:A:1314:HOH:O	2.60	0.41
1:A:143:TYR:O	1:A:156:ARG:HD3	2.21	0.41
1:B:350:ALA:HA	1:B:351:GLN:HA	1.86	0.41
1:A:410:SER:HB3	3:A:1410:HOH:O	2.21	0.40
1:A:244:HIS:CD2	1:A:294:GLU:HB2	2.56	0.40
1:A:12:LYS:HE2	1:A:443:PHE:CE2	2.57	0.40
1:B:243:LEU:HD11	1:B:290:LEU:HD23	2.02	0.40

All (3) 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)
3:A:1237:HOH:O	3:A:1390:HOH:O[3_665]	1.92	0.28
3:A:1044:HOH:O	3:B:1301:HOH:O[1_554]	2.10	0.10
3:A:1116:HOH:O	3:A:1409:HOH:O[3_665]	2.15	0.05

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	495/502 (99%)	479 (97%)	14 (3%)	2 (0%)	36	22
1	B	495/502 (99%)	473 (96%)	20 (4%)	2 (0%)	36	22
All	All	990/1004 (99%)	952 (96%)	34 (3%)	4 (0%)	36	22

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	299	TYR
1	A	299	TYR
1	B	356	ILE
1	A	356	ILE

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	429/433 (99%)	414 (96%)	15 (4%)	39	23
1	B	429/433 (99%)	416 (97%)	13 (3%)	44	29

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
All	All	858/866 (99%)	830 (97%)	28 (3%)	41	26

All (28) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	176	MET
1	A	212	VAL
1	A	243	LEU
1	A	277	TYR
1	A	285	LYS
1	A	292	PHE
1	A	339	LYS
1	A	370	GLN
1	A	377	MET
1	A	391	VAL
1	A	444	GLU
1	A	473	HIS
1	A	474	ARG
1	A	481	SER
1	A	482	ASP
1	B	5	LYS
1	B	46	GLN
1	B	243	LEU
1	B	252	ASN
1	B	277	TYR
1	B	285	LYS
1	B	292	PHE
1	B	435	LEU
1	B	444	GLU
1	B	447	ARG
1	B	473	HIS
1	B	480	LEU
1	B	501	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (26) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	44	HIS
1	A	159	HIS
1	A	181	GLN
1	A	184	HIS

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Mol	Chain	Res	Type
1	A	237	HIS
1	A	244	HIS
1	A	300	HIS
1	A	302	ASN
1	A	370	GLN
1	A	378	HIS
1	A	451	HIS
1	A	456	HIS
1	A	463	ASN
1	A	495	ASN
1	B	64	GLN
1	B	146	HIS
1	B	159	HIS
1	B	181	GLN
1	B	184	HIS
1	B	252	ASN
1	B	300	HIS
1	B	302	ASN
1	B	354	ASN
1	B	364	ASN
1	B	378	HIS
1	B	475	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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

2 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	KHO	A	950	-	20,20,20	0.94	0	27,29,29	1.48	5 (18%)
2	KHO	B	951	-	20,20,20	1.07	1 (5%)	27,29,29	1.71	4 (14%)

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	KHO	A	950	-	-	0/6/39/39	0/2/2/2
2	KHO	B	951	-	-	0/6/39/39	0/2/2/2

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	951	KHO	C1'-C2'	2.77	1.56	1.52

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	951	KHO	O1'-C1'-O4'	-5.29	105.70	111.43
2	A	950	KHO	O1'-C1'-O4'	-2.90	108.29	111.43
2	A	950	KHO	O5-C1-C2	-2.17	106.40	109.31
2	B	951	KHO	C5-C4-C3	2.14	111.75	109.17
2	B	951	KHO	O5-C5-C4	2.31	114.39	110.78
2	A	950	KHO	O5-C5-C4	2.58	114.79	110.78
2	A	950	KHO	C5-C4-C3	2.67	112.40	109.17
2	A	950	KHO	C1'-O1'-C3	3.22	126.02	117.97
2	B	951	KHO	C1'-O1'-C3	4.28	128.67	117.97

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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](#)

Unable to reproduce the depositors R factor - this section is therefore empty.

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

Unable to reproduce the depositors R factor - this section is therefore empty.

6.3 Carbohydrates [i](#)

Unable to reproduce the depositors R factor - this section is therefore empty.

6.4 Ligands [i](#)

Unable to reproduce the depositors R factor - this section is therefore empty.

6.5 Other polymers [i](#)

Unable to reproduce the depositors R factor - this section is therefore empty.