



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 25, 2023 – 09:01 PM EDT

PDB ID : 2ZI8  
Title : Crystal structure of the HsaC extradiol dioxygenase from *M. tuberculosis* in complex with 3,4-dihydroxy-9,10-seconandrost-1,3,5(10)-triene-9,17-dione (DHSA)  
Authors : D'Angelo, I.; Yam, K.C.; Eltis, L.D.; Strynadka, N.  
Deposited on : 2008-02-13  
Resolution : 2.20 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](mailto: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>.

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

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtrriage (Phenix) : 1.13  
EDS : 2.36  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.36

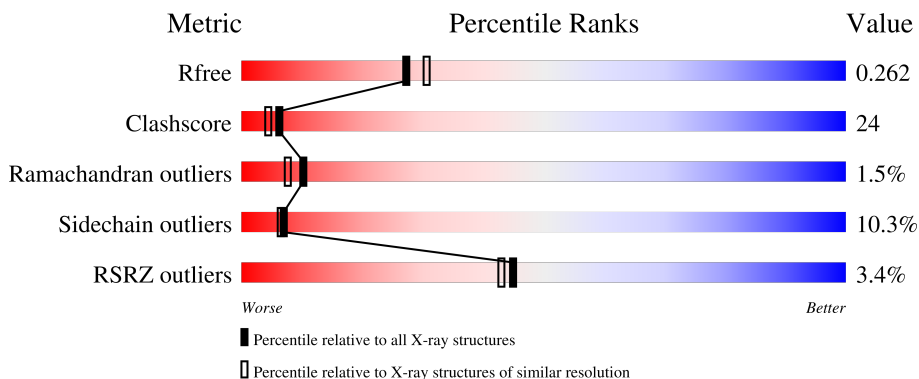
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.20 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))
$R_{free}$	130704	4898 (2.20-2.20)
Clashscore	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)
RSRZ outliers	127900	4800 (2.20-2.20)

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  $\geq 3$ , 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	300	 5% 63% 26% 8%
1	B	300	 2% 69% 23% 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	SDT	A	702	-	-	X	-
3	SDT	B	702	-	-	X	-

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 5236 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.

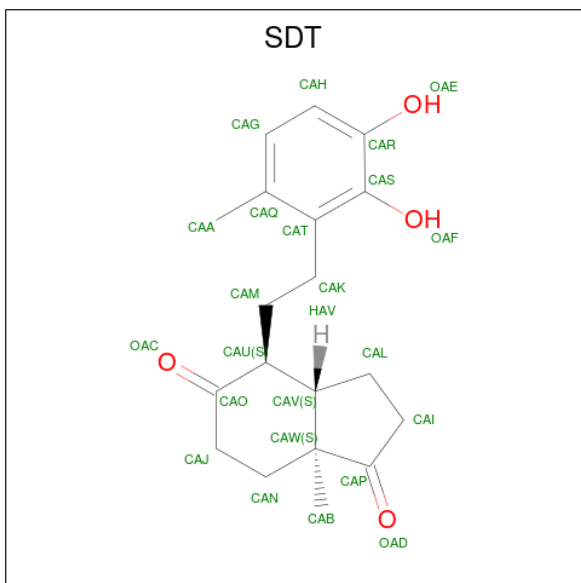
- Molecule 1 is a protein called PROBABLE BIPHENYL-2,3-DIOL 1,2-DIOXYGENASE BPHC.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	299	Total 2352	C 1478	N 428	O 428	S 18	0	1	0
1	B	298	Total 2352	C 1478	N 428	O 428	S 18	0	2	0

- Molecule 2 is FE (II) ION (three-letter code: FE2) (formula: Fe).

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

- Molecule 3 is 3,4-dihydroxy-9,10-secoandrosta-1(10),2,4-triene-9,17-dione (three-letter code: SDT) (formula: C<sub>19</sub>H<sub>24</sub>O<sub>4</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			23	19	4		
3	B	1	Total	C	O	0	0
			23	19	4		

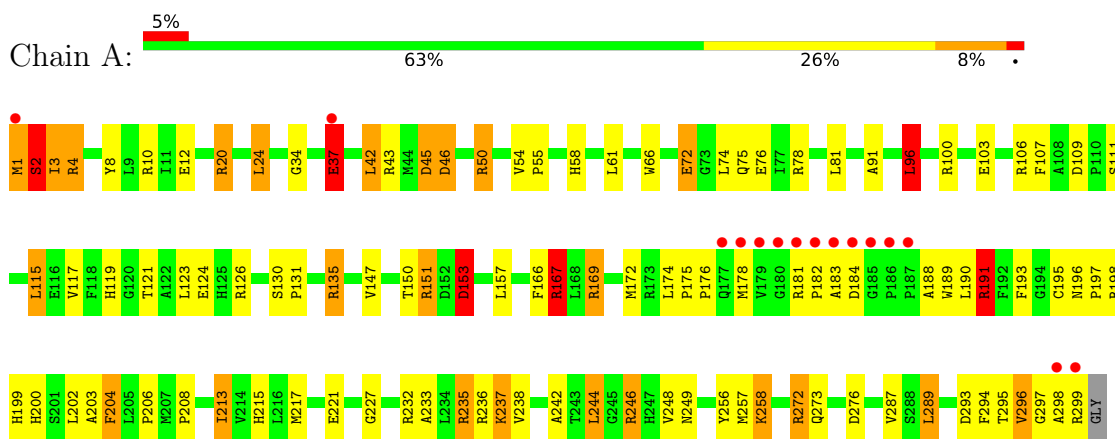
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	241	Total	O	0	0
			241	241		
4	B	243	Total	O	0	0
			243	243		

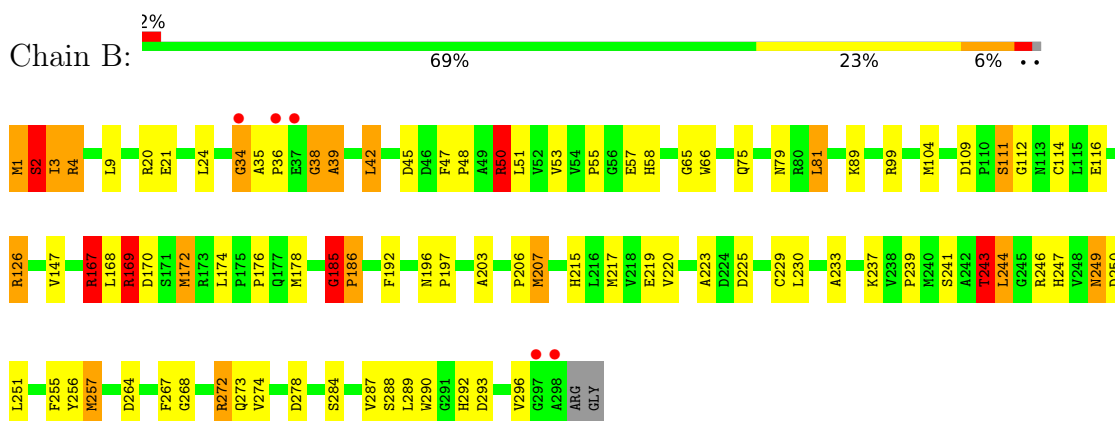
### 3 Residue-property plots

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: PROBABLE BIPHENYL-2,3-DIOL 1,2-DIOXYGENASE BPHC



- Molecule 1: PROBABLE BIPHENYL-2,3-DIOL 1,2-DIOXYGENASE BPHC



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 4 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	124.32Å 124.32Å 106.38Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 2.20 19.95 – 2.20	Depositor EDS
% Data completeness (in resolution range)	99.9 (20.00-2.20) 99.9 (19.95-2.20)	Depositor EDS
$R_{merge}$	0.08	Depositor
$R_{sym}$	0.08	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	5.23 (at 2.19Å)	Xtrriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.194 , 0.264 0.195 , 0.262	Depositor DCC
$R_{free}$ test set	2156 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	24.7	Xtrriage
Anisotropy	0.037	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 44.5	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.45$ , $\langle L^2 \rangle = 0.27$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	5236	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	25.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.63% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

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

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: SDT, FE2

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	1.14	4/2411 (0.2%)	1.32	26/3262 (0.8%)
1	B	1.16	3/2414 (0.1%)	1.35	30/3266 (0.9%)
All	All	1.15	7/4825 (0.1%)	1.34	56/6528 (0.9%)

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	1	4
1	B	0	6
All	All	1	10

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	8	TYR	CD1-CE1	6.01	1.48	1.39
1	B	223	ALA	CA-CB	5.60	1.64	1.52
1	A	235	ARG	CG-CD	5.43	1.65	1.51
1	A	204	PHE	CE1-CZ	5.27	1.47	1.37
1	B	274	VAL	CB-CG1	-5.19	1.42	1.52
1	B	289	LEU	CG-CD1	5.14	1.70	1.51
1	A	248	VAL	CB-CG1	-5.03	1.42	1.52

All (56) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	169	ARG	NE-CZ-NH2	-20.77	109.91	120.30
1	A	169	ARG	NE-CZ-NH2	-20.57	110.01	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	169	ARG	NE-CZ-NH1	15.68	128.14	120.30
1	B	169	ARG	NE-CZ-NH1	13.58	127.09	120.30
1	A	246	ARG	NE-CZ-NH2	-12.76	113.92	120.30
1	B	2	SER	N-CA-C	12.62	145.06	111.00
1	B	50	ARG	NE-CZ-NH1	11.66	126.13	120.30
1	A	50	ARG	NE-CZ-NH1	11.10	125.85	120.30
1	A	50	ARG	NE-CZ-NH2	-11.06	114.77	120.30
1	B	272	ARG	NE-CZ-NH2	-10.28	115.16	120.30
1	B	169	ARG	CG-CD-NE	-9.66	91.51	111.80
1	A	272	ARG	NE-CZ-NH2	-9.40	115.60	120.30
1	A	169	ARG	CG-CD-NE	-8.26	94.46	111.80
1	B	50	ARG	NE-CZ-NH2	-8.04	116.28	120.30
1	A	246	ARG	NE-CZ-NH1	7.78	124.19	120.30
1	B	169	ARG	CD-NE-CZ	7.77	134.48	123.60
1	A	4	ARG	NE-CZ-NH2	-7.65	116.47	120.30
1	B	2	SER	CA-C-N	7.53	133.76	117.20
1	A	169	ARG	CD-NE-CZ	7.39	133.94	123.60
1	B	289	LEU	CB-CG-CD1	7.37	123.53	111.00
1	B	278	ASP	CB-CA-C	-7.13	96.14	110.40
1	B	1	MET	N-CA-C	7.04	129.99	111.00
1	A	4	ARG	NE-CZ-NH1	6.94	123.77	120.30
1	B	217	MET	CG-SD-CE	6.87	111.19	100.20
1	B	42	LEU	CB-CG-CD1	6.85	122.64	111.00
1	A	191	ARG	NE-CZ-NH2	-6.68	116.96	120.30
1	A	42	LEU	CA-CB-CG	6.55	130.37	115.30
1	B	246	ARG	NE-CZ-NH1	6.54	123.57	120.30
1	B	167	ARG	NE-CZ-NH2	-6.39	117.10	120.30
1	B	243	THR	N-CA-CB	-6.28	98.37	110.30
1	A	191	ARG	NE-CZ-NH1	6.15	123.37	120.30
1	B	246	ARG	NE-CZ-NH2	-6.14	117.23	120.30
1	B	4	ARG	NE-CZ-NH2	-6.12	117.24	120.30
1	A	244	LEU	CB-CG-CD2	6.00	121.21	111.00
1	B	167	ARG	NE-CZ-NH1	5.97	123.28	120.30
1	B	2	SER	CB-CA-C	-5.90	98.89	110.10
1	A	34	GLY	N-CA-C	-5.89	98.37	113.10
1	A	4	ARG	CG-CD-NE	-5.83	99.56	111.80
1	A	151	ARG	NE-CZ-NH1	5.80	123.20	120.30
1	B	9	LEU	CB-CG-CD1	-5.77	101.20	111.00
1	A	153	ASP	CB-CG-OD2	-5.67	113.20	118.30
1	B	2	SER	CA-C-O	-5.66	108.21	120.10
1	B	207	MET	CG-SD-CE	-5.54	91.34	100.20
1	A	167	ARG	NE-CZ-NH2	-5.50	117.55	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	169	ARG	CB-CG-CD	5.46	125.80	111.60
1	B	111	SER	N-CA-C	5.44	125.70	111.00
1	A	296	VAL	N-CA-C	5.42	125.63	111.00
1	B	81	LEU	CB-CG-CD1	5.33	120.06	111.00
1	A	43	ARG	NE-CZ-NH1	5.18	122.89	120.30
1	A	96	LEU	CB-CG-CD1	5.17	119.79	111.00
1	A	135	ARG	NE-CZ-NH1	5.12	122.86	120.30
1	B	278	ASP	CB-CG-OD1	5.11	122.90	118.30
1	B	272	ARG	NE-CZ-NH1	5.06	122.83	120.30
1	B	244	LEU	CB-CG-CD2	5.04	119.56	111.00
1	A	2	SER	N-CA-CB	5.03	118.04	110.50
1	A	244	LEU	CA-CB-CG	5.00	126.81	115.30

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
1	A	2	SER	CA

All (10) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	1	MET	Peptide
1	A	2	SER	Peptide
1	A	37	GLU	Peptide
1	B	111	SER	Peptide
1	B	185	GLY	Peptide
1	B	2	SER	Mainchain,Peptide
1	B	38	GLY	Peptide

## 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	2352	0	2292	117	0
1	B	2352	0	2296	102	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
3	A	23	0	22	11	0
3	B	23	0	24	18	0
4	A	241	0	0	50	0
4	B	243	0	0	30	0
All	All	5236	0	4634	228	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 24.

All (228) 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:169:ARG:HB2	4:B:809:HOH:O	1.18	1.27
1:B:203:ALA:HB1	4:B:798:HOH:O	1.28	1.25
1:B:273:GLN:HG2	4:B:814:HOH:O	1.11	1.24
1:A:237:LYS:HG2	4:A:892:HOH:O	1.43	1.19
1:B:34:GLY:HA2	1:B:35:ALA:HB3	1.33	1.08
1:A:273:GLN:HB2	4:A:806:HOH:O	1.51	1.08
1:B:1:MET:HB3	1:B:4:ARG:NH1	1.70	1.06
3:B:702:SDT:CAA	3:B:702:SDT:HALA	1.91	1.00
1:B:243:THR:HG22	1:B:293:ASP:H	1.25	1.00
3:B:702:SDT:HALA	3:B:702:SDT:HAAA	1.47	0.95
1:B:170:ASP:CG	1:B:249[A]:ASN:HD21	1.71	0.94
1:A:153:ASP:CB	4:A:730:HOH:O	2.13	0.94
1:A:295:THR:HG22	4:A:731:HOH:O	1.67	0.94
1:B:273:GLN:CD	4:B:814:HOH:O	1.93	0.93
1:B:174:LEU:HD13	1:B:207:MET:CE	1.98	0.92
1:A:215:HIS:CB	4:A:765:HOH:O	2.18	0.91
1:A:153:ASP:HB2	4:A:730:HOH:O	1.71	0.91
1:A:193:PHE:HE1	1:A:204:PHE:CE1	1.91	0.88
1:A:193:PHE:CE1	1:A:204:PHE:CE1	2.62	0.88
1:A:217:MET:CE	4:A:916:HOH:O	2.23	0.87
1:A:103:GLU:OE2	1:A:119:HIS:HE1	1.58	0.87
1:A:217:MET:HE2	4:A:916:HOH:O	1.74	0.87
1:B:169:ARG:CB	4:B:809:HOH:O	1.90	0.87
1:B:1:MET:HB3	1:B:4:ARG:HH11	1.37	0.84
1:A:115:LEU:HD11	4:A:923:HOH:O	1.76	0.84
1:B:192:PHE:HB2	4:B:804:HOH:O	1.77	0.83
1:B:273:GLN:CG	4:B:814:HOH:O	1.74	0.83
1:B:1:MET:CB	1:B:4:ARG:NH1	2.42	0.83
1:A:58:HIS:HD2	4:A:801:HOH:O	1.62	0.82

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:167:ARG:CG	4:A:812:HOH:O	2.26	0.82
1:B:34:GLY:HA2	1:B:35:ALA:CB	2.11	0.81
1:A:298:ALA:HB1	1:A:299:ARG:C	2.01	0.80
1:A:206:PRO:HG3	4:A:730:HOH:O	1.82	0.80
1:B:243:THR:HG21	4:B:708:HOH:O	1.81	0.79
1:A:215:HIS:CG	4:A:765:HOH:O	2.36	0.79
1:B:1:MET:CB	1:B:4:ARG:HH11	1.95	0.79
1:A:115:LEU:CD1	4:A:923:HOH:O	2.28	0.78
1:A:157:LEU:HD13	1:A:191:ARG:HD3	1.65	0.78
1:A:172:MET:HE1	4:A:870:HOH:O	1.83	0.78
1:B:39:ALA:H	1:B:55:PRO:HD3	1.49	0.78
1:A:235:ARG:HD3	4:A:777:HOH:O	1.85	0.77
1:A:273:GLN:HG3	4:A:814:HOH:O	1.84	0.77
1:A:287:VAL:HG21	3:A:702:SDT:HAIA	1.66	0.77
1:A:153:ASP:HB3	4:A:730:HOH:O	1.78	0.76
1:B:267:PHE:CE1	4:B:770:HOH:O	2.37	0.76
3:B:702:SDT:HALA	3:B:702:SDT:HAAB	1.66	0.75
1:A:1:MET:HB3	1:A:4:ARG:NH1	2.01	0.74
1:B:243:THR:CG2	1:B:293:ASP:H	1.98	0.73
1:A:167:ARG:HG3	4:A:812:HOH:O	1.88	0.72
1:B:169:ARG:CG	4:B:809:HOH:O	2.28	0.72
1:B:114:CYS:HB3	4:B:882:HOH:O	1.90	0.71
1:A:208:PRO:HD2	4:A:799:HOH:O	1.88	0.71
1:B:3[A]:ILE:HD13	1:B:66:TRP:HB3	1.71	0.71
1:B:255:PHE:HE2	1:B:257:MET:HE3	1.54	0.71
3:A:702:SDT:OAE	4:A:839:HOH:O	2.08	0.71
1:A:199:HIS:HD2	1:A:200:HIS:ND1	1.89	0.69
1:A:256:TYR:CD1	4:A:765:HOH:O	2.44	0.69
1:A:215:HIS:CE1	3:A:702:SDT:OAF	2.46	0.69
1:A:172:MET:CE	4:A:870:HOH:O	2.39	0.69
1:A:46:ASP:HB3	4:A:791:HOH:O	1.93	0.68
1:A:1:MET:HB3	1:A:4:ARG:HH11	1.57	0.68
1:B:249[B]:ASN:HD22	1:B:250:ASP:H	1.40	0.68
1:A:37:GLU:O	4:A:793:HOH:O	2.12	0.67
3:A:702:SDT:OAF	4:A:839:HOH:O	2.12	0.66
1:B:174:LEU:HD13	1:B:207:MET:HE2	1.77	0.66
1:A:233:ALA:HB1	1:A:257:MET:CE	2.25	0.66
1:A:195:CYS:O	4:A:773:HOH:O	2.13	0.66
1:B:58:HIS:HD2	4:B:723:HOH:O	1.78	0.65
1:B:169:ARG:CD	4:B:809:HOH:O	2.44	0.65
1:B:233:ALA:HB2	1:B:257:MET:HE1	1.77	0.65

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:233:ALA:CB	1:A:257:MET:HE3	2.26	0.65
1:A:293:ASP:OD1	1:A:295:THR:HB	1.96	0.65
1:A:119:HIS:HD2	4:A:848:HOH:O	1.80	0.65
1:A:246:ARG:HD3	4:B:911:HOH:O	1.97	0.65
1:A:237:LYS:NZ	4:A:823:HOH:O	2.30	0.65
1:A:172:MET:HE1	3:A:702:SDT:HAA	1.79	0.64
1:B:249[B]:ASN:ND2	3:B:702:SDT:HAH	2.12	0.64
1:A:233:ALA:CB	1:A:257:MET:CE	2.75	0.64
1:B:38:GLY:HA2	1:B:39:ALA:HB3	1.79	0.63
1:B:170:ASP:OD2	1:B:249[A]:ASN:ND2	2.29	0.63
1:B:243:THR:HG22	1:B:293:ASP:N	2.06	0.63
1:A:215:HIS:HB3	4:A:765:HOH:O	1.90	0.63
1:A:1:MET:HE3	4:A:794:HOH:O	1.98	0.63
1:A:2:SER:CB	1:A:76:GLU:OE1	2.48	0.62
1:A:126:ARG:HD3	4:A:751:HOH:O	2.00	0.62
1:A:75:GLN:NE2	1:A:78:ARG:HH11	1.99	0.61
1:B:20:ARG:HD3	4:B:761:HOH:O	2.01	0.61
1:A:258:LYS:NZ	1:A:298:ALA:HB3	2.16	0.60
3:B:702:SDT:HAJ	4:B:921:HOH:O	2.01	0.60
1:A:111:SER:OG	1:A:151:ARG:HG3	2.00	0.60
1:B:287:VAL:HG13	3:B:702:SDT:HAAB	1.84	0.60
1:A:273:GLN:CB	4:A:806:HOH:O	2.29	0.60
3:B:702:SDT:HAAA	3:B:702:SDT:CAL	2.29	0.60
1:A:1:MET:CB	1:A:4:ARG:HH11	2.14	0.59
1:A:1:MET:CB	1:A:4:ARG:NH1	2.66	0.59
1:A:249:ASN:OD1	3:A:702:SDT:HAH	2.03	0.59
1:B:174:LEU:HD13	1:B:207:MET:HE3	1.82	0.59
1:B:247:HIS:HE1	1:B:256:TYR:OH	1.86	0.59
1:B:287:VAL:HG22	3:B:702:SDT:CAA	2.33	0.58
1:B:229:CYS:HB2	4:B:770:HOH:O	2.03	0.58
1:B:249[B]:ASN:CG	3:B:702:SDT:HAH	2.24	0.58
1:A:256:TYR:CE1	4:A:765:HOH:O	2.55	0.58
1:B:233:ALA:CB	1:B:257:MET:CE	2.82	0.57
1:B:233:ALA:CB	1:B:257:MET:HE1	2.34	0.57
1:A:91:ALA:HB3	1:A:96:LEU:HD13	1.86	0.57
1:B:247:HIS:CE1	1:B:256:TYR:OH	2.57	0.57
1:A:3[A]:ILE:HD13	1:A:66:TRP:HE3	1.71	0.56
1:B:255:PHE:HE2	1:B:257:MET:CE	2.18	0.56
1:B:249[B]:ASN:HD22	1:B:250:ASP:N	2.04	0.56
1:A:256:TYR:HD1	4:A:765:HOH:O	1.86	0.56
1:A:3[A]:ILE:HD13	1:A:66:TRP:CE3	2.40	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:147:VAL:HG21	1:B:215:HIS:CE1	2.41	0.56
1:A:147:VAL:HG22	1:A:203:ALA:HB3	1.88	0.55
1:A:61:LEU:HB2	1:A:213:ILE:HG22	1.89	0.55
1:A:103:GLU:OE2	1:A:119:HIS:CE1	2.49	0.55
1:B:169:ARG:HB3	4:B:804:HOH:O	2.07	0.55
1:A:121:THR:HG22	4:A:867:HOH:O	2.06	0.55
1:A:46:ASP:OD1	1:A:123:LEU:HD22	2.06	0.54
1:B:1:MET:HB3	1:B:4:ARG:HH12	1.64	0.54
1:B:249[B]:ASN:ND2	1:B:250:ASP:H	2.02	0.53
1:A:193:PHE:CE1	1:A:204:PHE:HE1	2.21	0.53
1:B:293:ASP:O	1:B:296:VAL:HG22	2.09	0.53
1:B:75:GLN:HE21	1:B:79:ASN:HD21	1.58	0.52
1:B:287:VAL:HG13	3:B:702:SDT:CAA	2.40	0.52
1:A:2:SER:HB2	1:A:76:GLU:OE1	2.10	0.51
1:B:233:ALA:HB1	1:B:257:MET:HE2	1.91	0.51
1:A:20:ARG:HD3	4:A:844:HOH:O	2.09	0.51
1:B:249[B]:ASN:ND2	1:B:250:ASP:N	2.59	0.51
1:B:287:VAL:HG22	3:B:702:SDT:HAA	1.93	0.51
1:A:188:ALA:HB1	1:A:206:PRO:HG2	1.93	0.51
1:A:276:ASP:OD1	4:A:745:HOH:O	2.19	0.50
3:A:702:SDT:CAR	4:A:839:HOH:O	2.57	0.50
1:B:168:LEU:HD21	4:B:793:HOH:O	2.11	0.50
1:A:91:ALA:HB3	1:A:96:LEU:CD1	2.42	0.50
1:A:20:ARG:HG2	1:A:24:LEU:HD22	1.94	0.50
1:B:219:GLU:HA	1:B:268:GLY:O	2.11	0.50
1:B:172:MET:CE	4:B:859:HOH:O	2.60	0.49
1:B:233:ALA:HB2	1:B:257:MET:CE	2.41	0.49
1:B:176:PRO:HB3	1:B:185:GLY:HA3	1.94	0.49
1:B:34:GLY:CA	1:B:35:ALA:HB3	2.24	0.49
1:A:189:TRP:O	4:A:730:HOH:O	2.20	0.49
1:A:296:VAL:N	1:A:297:GLY:HA3	2.27	0.49
3:A:702:SDT:CAS	4:A:839:HOH:O	2.60	0.49
1:A:46:ASP:CG	4:A:760:HOH:O	2.51	0.49
1:A:107:PHE:CE2	1:A:115:LEU:HD23	2.48	0.49
1:B:109:ASP:OD1	1:B:112:GLY:HA2	2.13	0.48
1:A:233:ALA:HB2	1:A:257:MET:CE	2.43	0.48
1:A:287:VAL:HG21	3:A:702:SDT:CAI	2.38	0.48
1:B:287:VAL:HG21	3:B:702:SDT:HAIA	1.97	0.47
1:B:249[B]:ASN:OD1	3:B:702:SDT:HAH	2.15	0.47
1:A:100:ARG:NH1	1:A:124:GLU:OE2	2.38	0.47
1:A:115:LEU:HD12	4:A:923:HOH:O	2.03	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:246:ARG:HG2	1:A:289:LEU:HD13	1.97	0.47
1:B:75:GLN:HE21	1:B:79:ASN:ND2	2.13	0.47
1:B:185:GLY:HA2	1:B:186:PRO:HD2	1.73	0.47
1:B:257:MET:HE3	1:B:257:MET:HB3	1.70	0.47
1:B:126:ARG:HD2	4:B:731:HOH:O	2.14	0.47
1:A:10:ARG:NH1	4:A:767:HOH:O	2.41	0.46
1:A:135:ARG:NH1	1:A:221:GLU:OE1	2.48	0.46
1:A:20:ARG:O	1:A:24:LEU:HB2	2.16	0.46
1:B:147:VAL:HG22	1:B:203:ALA:HB3	1.97	0.46
1:B:237:LYS:HE3	4:B:812:HOH:O	2.15	0.46
1:A:12:GLU:HG3	4:A:705:HOH:O	2.15	0.46
1:B:172:MET:HE2	1:B:172:MET:HB2	1.74	0.46
3:B:702:SDT:HAV	3:B:702:SDT:HAK	1.80	0.46
1:B:287:VAL:CG1	3:B:702:SDT:HAAB	2.47	0.45
1:A:72:GLU:HB2	4:A:846:HOH:O	2.15	0.45
1:B:220:VAL:CG2	1:B:225:ASP:HB2	2.46	0.45
1:B:267:PHE:CZ	4:B:770:HOH:O	2.65	0.45
1:A:257:MET:HB2	1:A:257:MET:HE2	1.91	0.45
1:A:287:VAL:HG13	3:A:702:SDT:HAAB	1.97	0.45
1:A:130:SER:HA	1:A:131:PRO:HD2	1.81	0.45
1:A:169:ARG:HD3	4:A:745:HOH:O	2.17	0.45
1:A:157:LEU:HD12	1:A:193:PHE:HZ	1.81	0.45
1:B:89:LYS:HE2	4:B:735:HOH:O	2.16	0.45
1:A:196:ASN:HB2	1:A:197:PRO:CD	2.47	0.44
1:A:233:ALA:HB1	1:A:257:MET:HE3	1.95	0.44
1:A:169:ARG:NH2	1:A:198:ARG:O	2.50	0.44
1:B:167:ARG:NH2	4:B:878:HOH:O	2.50	0.44
1:A:233:ALA:CB	1:A:257:MET:HE1	2.46	0.44
1:A:198:ARG:O	1:A:199:HIS:C	2.57	0.44
1:B:169:ARG:HD2	4:B:875:HOH:O	2.17	0.44
1:A:91:ALA:CB	1:A:96:LEU:HD13	2.48	0.43
1:B:233:ALA:CB	1:B:257:MET:HE2	2.48	0.43
1:B:256:TYR:N	1:B:256:TYR:CD1	2.85	0.43
1:A:233:ALA:HB2	1:A:257:MET:HE3	1.98	0.43
1:B:196:ASN:HB2	1:B:197:PRO:CD	2.48	0.43
1:A:167:ARG:HG2	4:A:812:HOH:O	2.09	0.43
1:B:172:MET:HE1	4:B:859:HOH:O	2.17	0.43
1:A:54:VAL:HA	1:A:55:PRO:HD3	1.93	0.43
1:B:39:ALA:HA	1:B:53:VAL:O	2.19	0.43
1:A:237:LYS:HA	1:A:237:LYS:HD2	1.80	0.43
1:B:65:GLY:HA2	1:B:116:GLU:O	2.19	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:287:VAL:HG22	3:A:702:SDT:HAAB	2.00	0.43
1:A:227:GLY:HA3	1:B:290:TRP:CD2	2.53	0.43
1:B:288:SER:OG	1:B:292:HIS:HB2	2.18	0.43
1:B:45:ASP:OD1	1:B:50:ARG:HD2	2.19	0.42
1:A:66:TRP:HB2	1:A:117:VAL:HG22	2.00	0.42
1:B:176:PRO:CB	1:B:185:GLY:HA3	2.49	0.42
1:B:99:ARG:HG3	1:B:104:MET:CE	2.50	0.42
1:B:220:VAL:HG21	1:B:225:ASP:HB2	2.00	0.42
1:B:249[A]:ASN:HB2	3:B:702:SDT:HAH	2.01	0.42
1:B:267:PHE:HE1	4:B:770:HOH:O	1.85	0.42
1:B:126:ARG:HH11	1:B:126:ARG:CB	2.33	0.42
1:B:287:VAL:HG22	3:B:702:SDT:HAAB	1.99	0.42
1:A:45:ASP:OD1	1:A:50:ARG:HD2	2.20	0.42
1:B:174:LEU:HD11	1:B:206:PRO:HD2	2.01	0.42
1:B:233:ALA:HB1	1:B:257:MET:CE	2.49	0.42
1:A:242:ALA:HB2	1:A:294:PHE:CD1	2.54	0.41
1:A:109:ASP:OD1	1:A:109:ASP:C	2.59	0.41
1:B:241:SER:OG	1:B:264:ASP:OD1	2.36	0.41
1:B:34:GLY:CA	1:B:35:ALA:CB	2.91	0.41
1:B:126:ARG:HH11	1:B:126:ARG:HB2	1.85	0.41
1:B:172:MET:HE1	3:B:702:SDT:HAG	2.03	0.41
1:A:215:HIS:HB2	4:A:765:HOH:O	2.06	0.41
1:A:238:VAL:HG11	1:A:257:MET:CE	2.50	0.41
1:A:119:HIS:CD2	4:A:848:HOH:O	2.63	0.41
1:A:166:PHE:HB3	1:A:193:PHE:HB3	2.02	0.41
1:A:175:PRO:HA	1:A:176:PRO:HD2	1.97	0.41
1:A:258:LYS:HZ3	1:A:298:ALA:HB3	1.84	0.41
1:A:298:ALA:CB	1:A:299:ARG:C	2.83	0.41
1:A:232:ARG:O	1:A:236:ARG:HG3	2.20	0.40
1:B:58:HIS:CD2	4:B:723:HOH:O	2.63	0.40
1:B:172:MET:HE2	4:B:859:HOH:O	2.21	0.40
1:A:174:LEU:N	1:A:188:ALA:O	2.43	0.40
1:B:47:PHE:HA	1:B:48:PRO:HD3	1.95	0.40
1:A:3[A]:ILE:HD11	1:A:195:CYS:SG	2.61	0.40
1:A:147:VAL:HG21	1:A:215:HIS:CE1	2.56	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	298/300 (99%)	284 (95%)	10 (3%)	4 (1%)	12	9
1	B	298/300 (99%)	275 (92%)	18 (6%)	5 (2%)	9	6
All	All	596/600 (99%)	559 (94%)	28 (5%)	9 (2%)	10	8

All (9) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	182	PRO
1	B	36	PRO
1	A	2	SER
1	A	183	ALA
1	B	34	GLY
1	B	185	GLY
1	B	39	ALA
1	A	45	ASP
1	B	186	PRO

### 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	244/244 (100%)	216 (88%)	28 (12%)	5	5
1	B	245/244 (100%)	220 (90%)	25 (10%)	7	6
All	All	489/488 (100%)	436 (89%)	53 (11%)	7	6

All (53) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	3[A]	ILE
1	A	3[B]	ILE
1	A	20	ARG
1	A	24	LEU
1	A	37	GLU
1	A	42	LEU
1	A	46	ASP
1	A	72	GLU
1	A	74	LEU
1	A	81	LEU
1	A	96	LEU
1	A	106	ARG
1	A	115	LEU
1	A	150	THR
1	A	153	ASP
1	A	167	ARG
1	A	178	MET
1	A	181	ARG
1	A	184	ASP
1	A	190	LEU
1	A	191	ARG
1	A	202	LEU
1	A	213	ILE
1	A	237	LYS
1	A	244	LEU
1	A	258	LYS
1	A	272	ARG
1	A	289	LEU
1	B	2	SER
1	B	3[A]	ILE
1	B	3[B]	ILE
1	B	21	GLU
1	B	24	LEU
1	B	42	LEU
1	B	50	ARG
1	B	51	LEU
1	B	57	GLU
1	B	81	LEU
1	B	126	ARG
1	B	167	ARG
1	B	169	ARG
1	B	172	MET

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Mol	Chain	Res	Type
1	B	178	MET
1	B	230	LEU
1	B	239	PRO
1	B	243	THR
1	B	244	LEU
1	B	249[A]	ASN
1	B	249[B]	ASN
1	B	251	LEU
1	B	257	MET
1	B	272	ARG
1	B	284	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	58	HIS
1	A	75	GLN
1	A	119	HIS
1	A	199	HIS
1	A	247	HIS
1	B	79	ASN
1	B	134	HIS
1	B	247	HIS

### 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 monosaccharides in this entry.

### 5.6 Ligand geometry [i](#)

Of 4 ligands modelled in this entry, 2 are monoatomic - leaving 2 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	SDT	A	702	2	25,25,25	1.19	1 (4%)	35,38,38	2.16	11 (31%)
3	SDT	B	702	-	25,25,25	1.03	2 (8%)	35,38,38	1.78	8 (22%)

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	SDT	A	702	2	-	0/5/36/36	0/3/3/3
3	SDT	B	702	-	-	0/5/36/36	0/3/3/3

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	702	SDT	CAR-CAS	2.97	1.43	1.40
3	B	702	SDT	CAJ-CAO	2.77	1.55	1.50
3	B	702	SDT	CAR-CAS	2.31	1.42	1.40

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	702	SDT	CAK-CAT-CAQ	4.96	125.15	120.28
3	A	702	SDT	CAJ-CAO-CAU	4.93	123.00	115.82
3	A	702	SDT	CAG-CAH-CAR	-4.66	115.71	120.50
3	B	702	SDT	CAV-CAW-CAP	-4.48	95.45	100.59
3	A	702	SDT	OAC-CAO-CAJ	-3.80	115.04	122.11
3	A	702	SDT	CAH-CAR-CAS	3.14	123.28	120.06
3	A	702	SDT	CAI-CAP-CAW	3.01	111.56	108.59
3	B	702	SDT	CAL-CAV-CAW	2.96	106.73	104.08
3	A	702	SDT	CAA-CAQ-CAG	-2.95	114.55	120.31
3	B	702	SDT	CAV-CAU-CAO	-2.94	104.83	110.85
3	B	702	SDT	CAB-CAW-CAV	2.93	117.30	112.98
3	A	702	SDT	CAL-CAI-CAP	-2.74	102.94	105.70

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	702	SDT	CAM-CAU-CAO	2.71	116.28	112.82
3	B	702	SDT	CAA-CAQ-CAG	-2.71	115.02	120.31
3	B	702	SDT	OAE-CAR-CAS	2.63	124.70	117.90
3	B	702	SDT	CAI-CAP-CAW	2.44	111.00	108.59
3	A	702	SDT	CAA-CAQ-CAT	2.33	124.87	122.01
3	A	702	SDT	CAV-CAU-CAO	-2.20	106.35	110.85
3	B	702	SDT	CAK-CAT-CAQ	2.08	122.33	120.28

There are no chirality outliers.

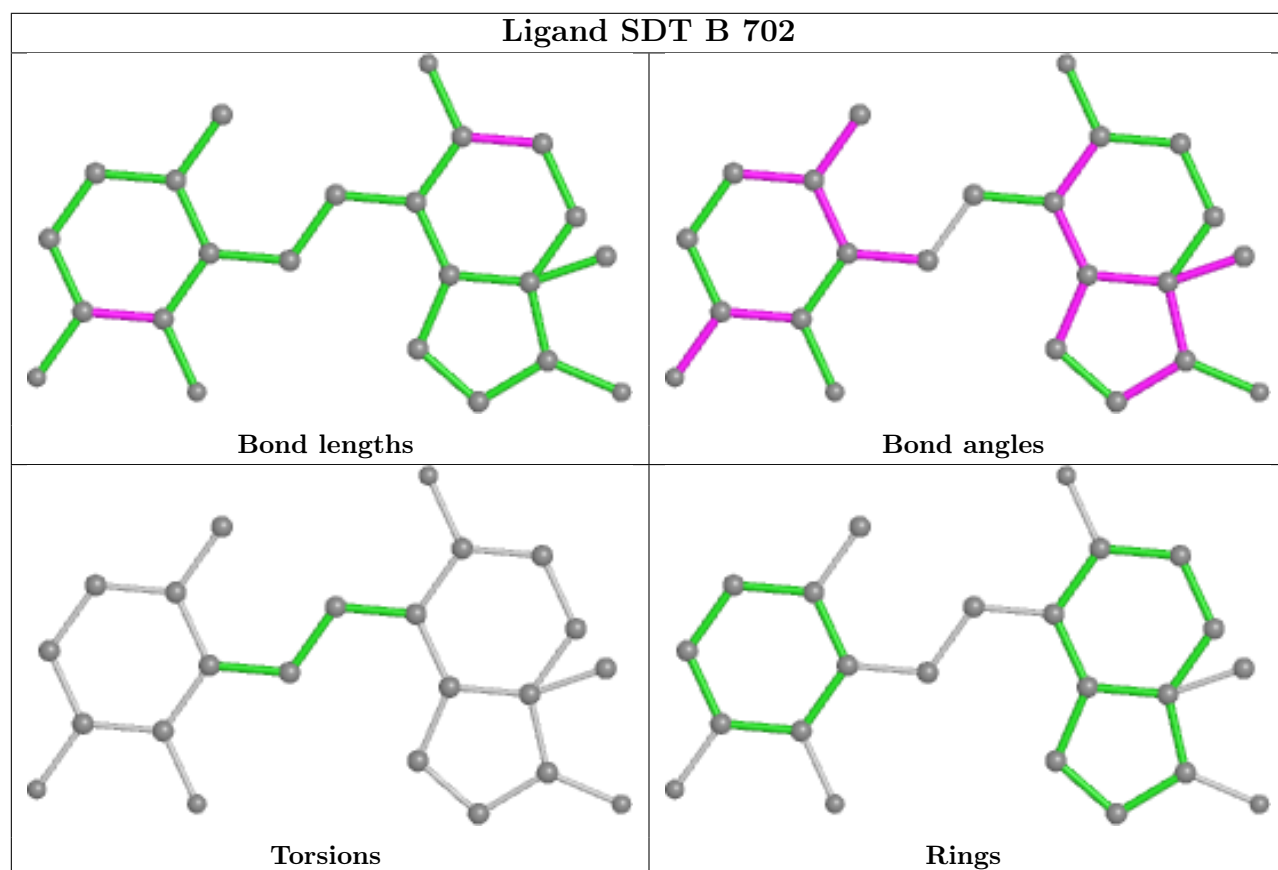
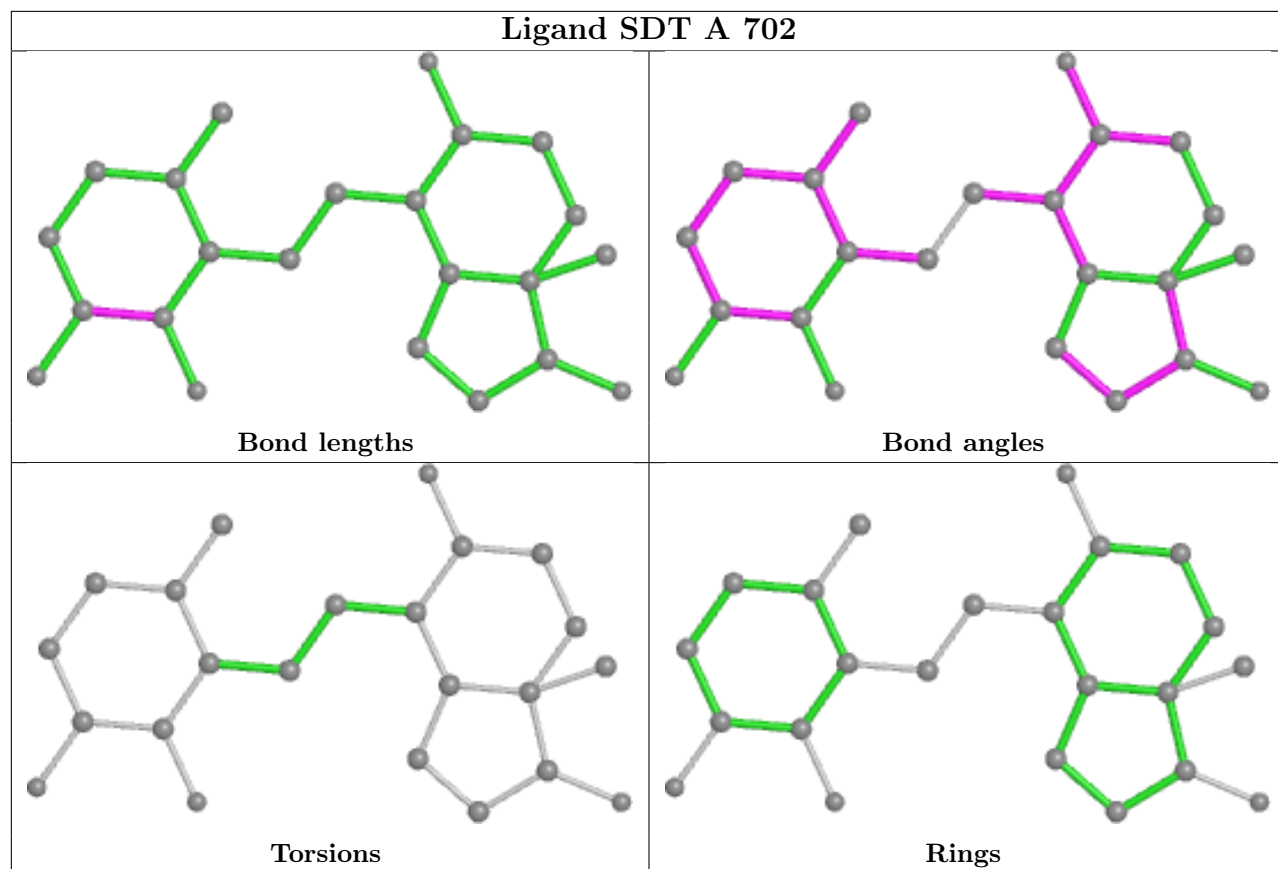
There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 29 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	702	SDT	11	0
3	B	702	SDT	18	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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	299/300 (99%)	-0.35	15 (5%) 28 27	12, 23, 57, 92	0
1	B	298/300 (99%)	-0.57	5 (1%) 70 68	10, 21, 36, 60	0
All	All	597/600 (99%)	-0.46	20 (3%) 45 43	10, 22, 47, 92	0

All (20) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	298	ALA	7.6
1	A	299	ARG	6.1
1	A	184	ASP	4.2
1	A	186	PRO	4.1
1	B	34	GLY	4.0
1	B	298	ALA	3.8
1	A	183	ALA	3.7
1	A	180	GLY	3.6
1	A	185	GLY	3.4
1	A	179	VAL	3.4
1	A	178	MET	3.2
1	B	37	GLU	3.1
1	B	36	PRO	2.9
1	A	177	GLN	2.8
1	A	181	ARG	2.8
1	B	297	GLY	2.7
1	A	187	PRO	2.6
1	A	182	PRO	2.3
1	A	1	MET	2.3
1	A	37	GLU	2.1



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

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

## 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 6.4 Ligands [i](#)

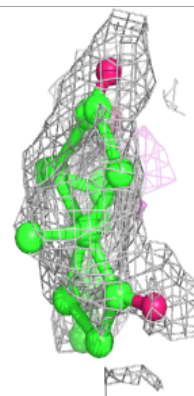
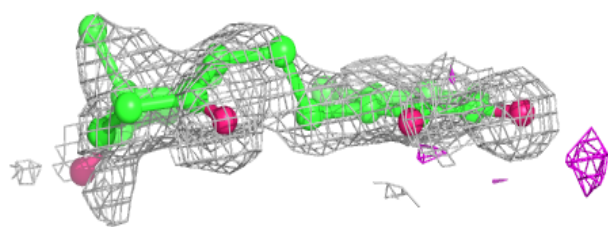
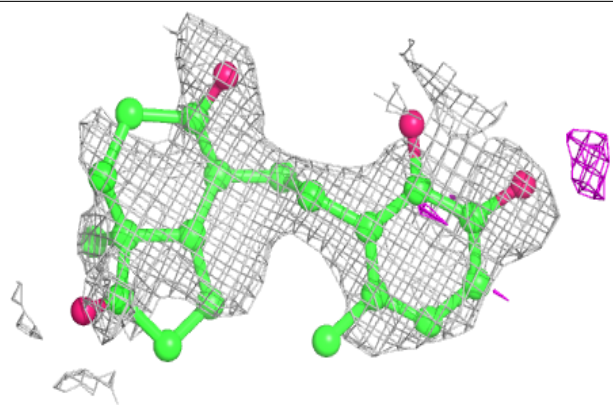
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
3	SDT	B	702	23/23	0.74	0.26	54,59,71,74	0
3	SDT	A	702	23/23	0.83	0.19	38,50,59,62	0
2	FE2	A	701	1/1	1.00	0.06	24,24,24,24	0
2	FE2	B	701	1/1	1.00	0.06	17,17,17,17	0

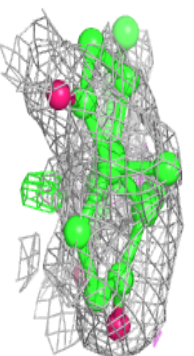
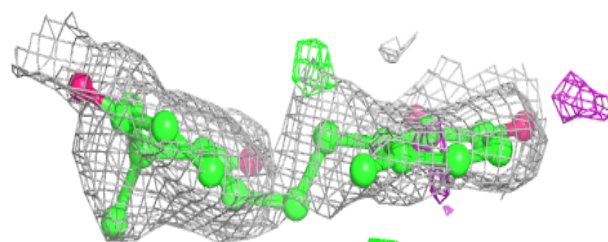
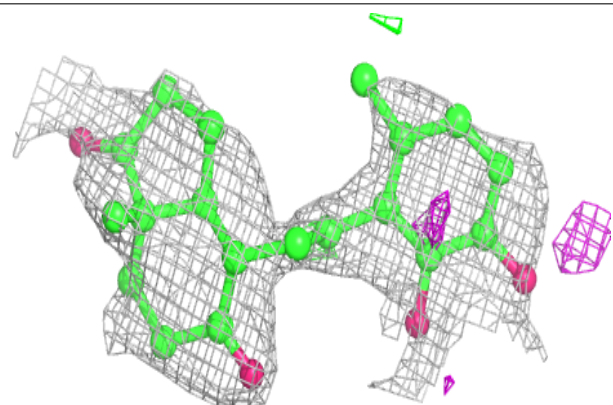
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

**Electron density around SDT B 702:**

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

**Electron density around SDT A 702:**

$2mF_o-DF_c$  (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.