



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 12:42 AM UTC

PDB ID : 3THY / pdb\_00003thy  
Title : Human MutSbeta complexed with an IDL of 2 bases (Loop2) and ADP  
Authors : Yang, W.  
Deposited on : 2011-08-19  
Resolution : 2.89 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 : 4-5-2 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

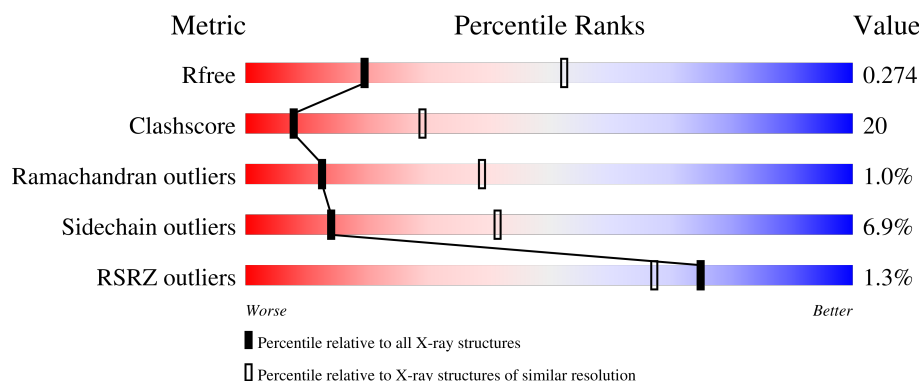
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*





The reported resolution of this entry is 2.89 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	2481 (2.90-2.90)
Clashscore	190562	2690 (2.90-2.90)
Ramachandran outliers	187476	2623 (2.90-2.90)
Sidechain outliers	187428	2625 (2.90-2.90)
RSRZ outliers	180081	2481 (2.90-2.90)

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	934	
2	B	918	
3	D	24	
4	E	24	

## 2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 14678 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 DNA mismatch repair protein Msh2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	883	Total	C	N	O	S	0	4	0
			6901	4383	1175	1307	36			

- Molecule 2 is a protein called DNA mismatch repair protein Msh3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	857	Total	C	N	O	S	0	5	0
			6819	4353	1164	1270	32			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	208	GLY	-	expression tag	GB 119616268
B	209	PRO	-	expression tag	GB 119616268

- Molecule 3 is a DNA chain called DNA Loop2 minus strand.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	D	21	Total	C	N	O	P	0	0	0
			427	205	77	125	20			

- Molecule 4 is a DNA chain called DNA Loop2 plus strand.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	E	24	Total	C	N	O	P	0	0	0
			489	234	90	142	23			

- Molecule 5 is ADENOSINE-5'-DIPHOSPHATE (CCD ID: ADP) (formula: C<sub>10</sub>H<sub>15</sub>N<sub>5</sub>O<sub>10</sub>P<sub>2</sub>).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	A	1	Total	C	N	O	P	0	0
			27	10	5	10	2		

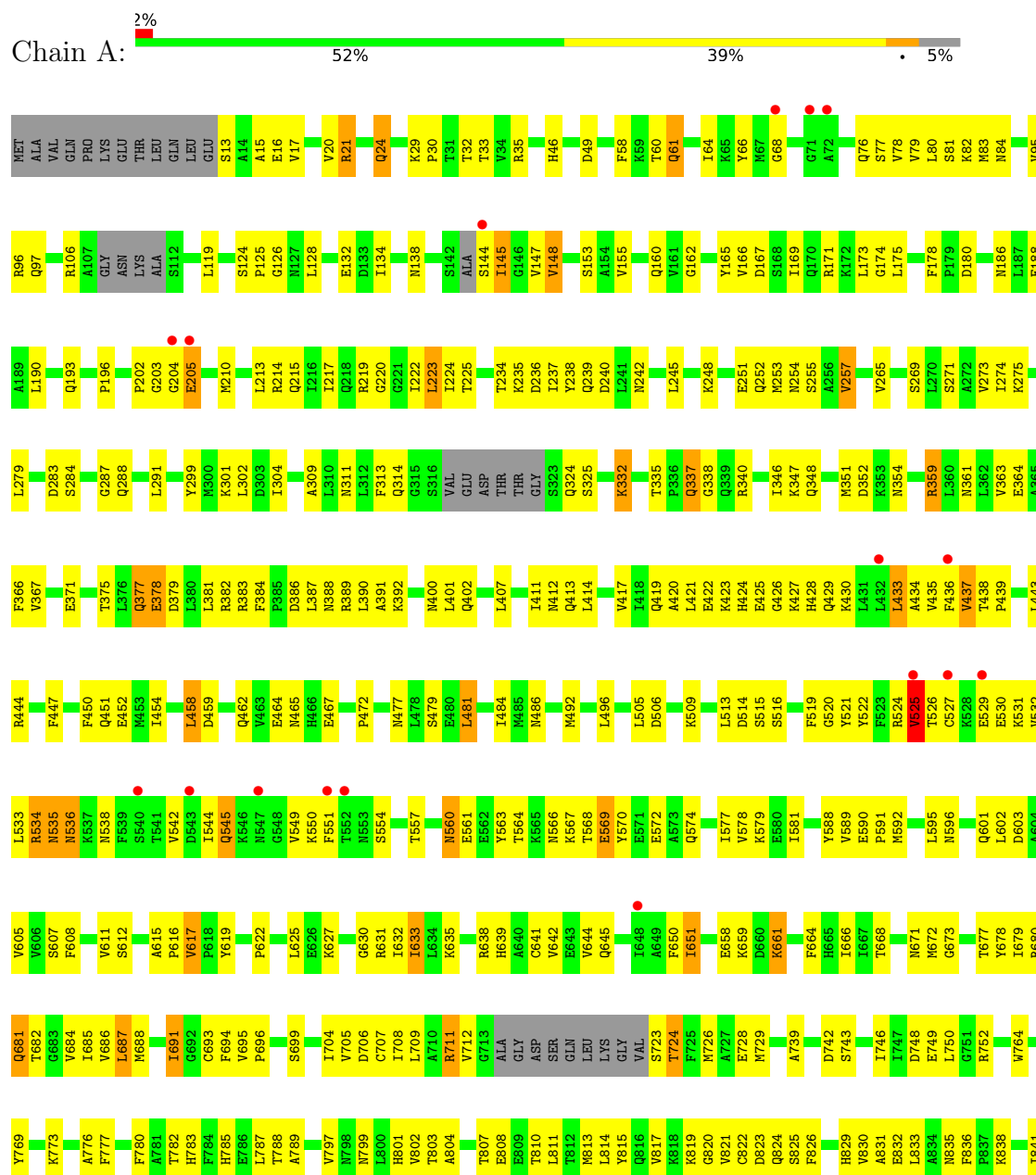
- Molecule 6 is water.

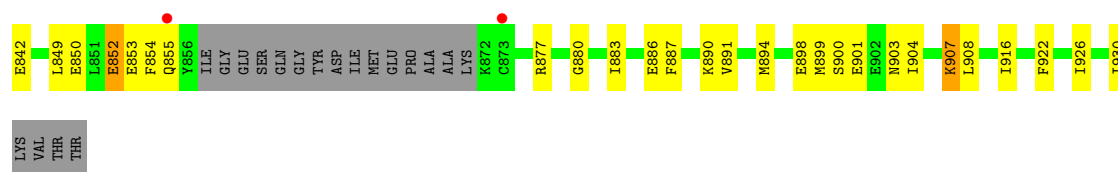
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	7	Total O 7 7	0	0
6	B	8	Total O 8 8	0	0

### 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.

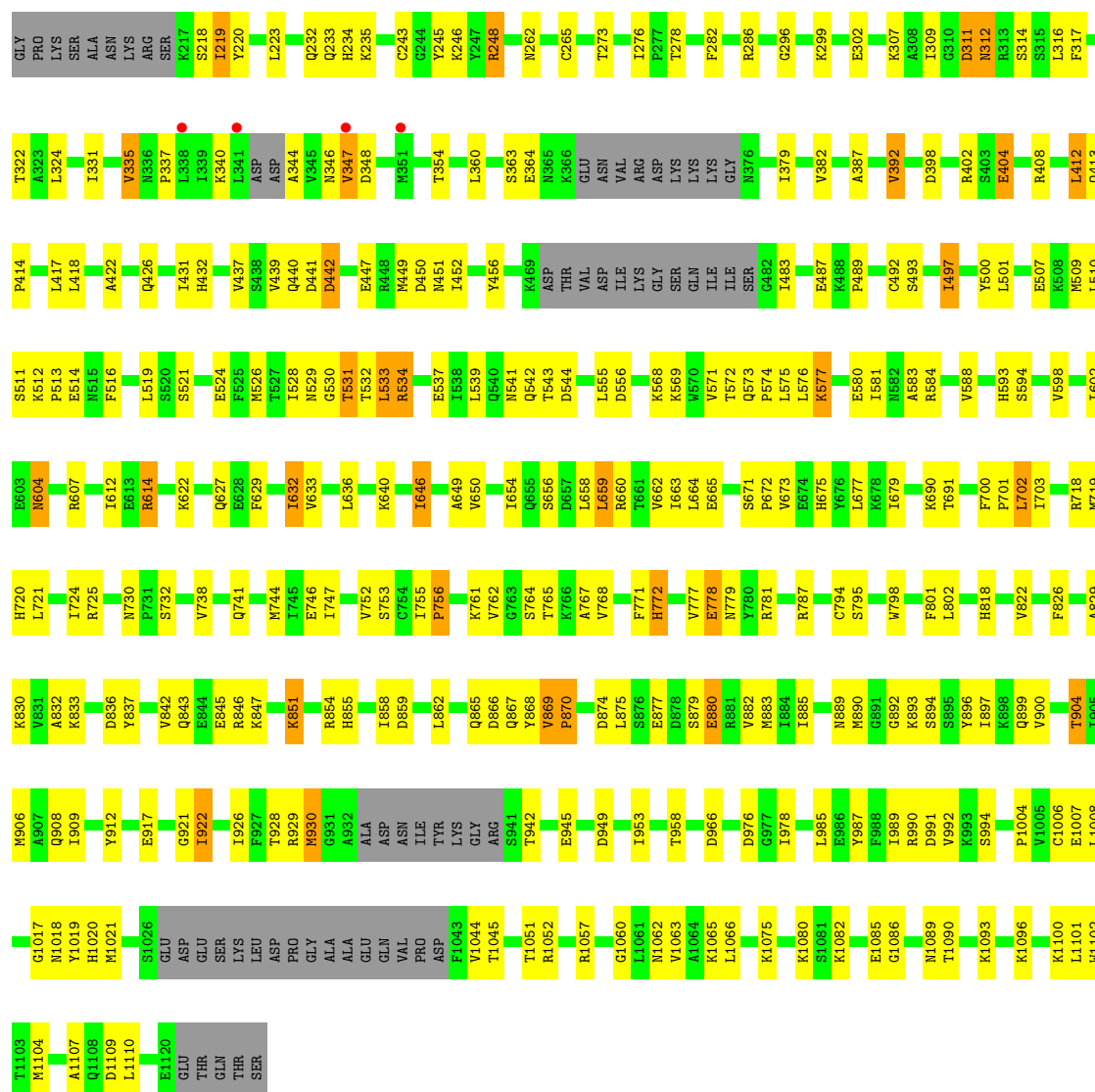
- Molecule 1: DNA mismatch repair protein Msh2





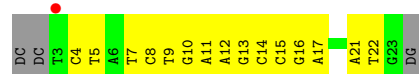
• Molecule 2: DNA mismatch repair protein Msh3

Chain B: 61% 29% 7%

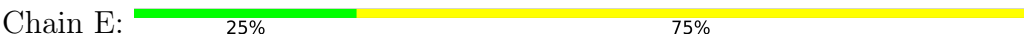


• Molecule 3: DNA Loop2 minus strand

Chain D: 4% 25% 63% 12%



● Molecule 4: DNA Loop2 plus strand



T26	C27	A28	T29	C30	G31	G35	C36	A37	G38	C39	T40	T41	C42	A43	G44	A45	T46	A47	G48	G49
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## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	66.27Å 91.11Å 95.63Å 67.82° 86.98° 73.35°	Depositor
Resolution (Å)	44.19 – 2.89 44.19 – 2.89	Depositor EDS
% Data completeness (in resolution range)	90.3 (44.19-2.89) 90.3 (44.19-2.89)	Depositor EDS
$R_{merge}$	0.05	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.23 (at 2.90Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.6.4_486), CNS	Depositor
R, $R_{free}$	0.194 , 0.274 0.194 , 0.274	Depositor DCC
$R_{free}$ test set	1125 reflections (2.82%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	58.4	Xtriage
Anisotropy	0.475	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 82.6	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	14678	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	87.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.52% 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: ADP

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	0.31	0/7022	0.71	0/9473
2	B	0.32	0/6957	0.70	0/9401
3	D	0.13	0/478	0.52	0/736
4	E	0.12	0/548	0.51	0/844
All	All	0.31	0/15005	0.69	0/20454

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

### 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	6901	0	6867	315	0
2	B	6819	0	6878	233	0
3	D	427	0	239	21	0
4	E	489	0	272	24	0
5	A	27	0	12	1	0
6	A	7	0	0	1	0
6	B	8	0	0	0	0
All	All	14678	0	14268	569	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 20.

All (569) 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:711:ARG:HG3	1:A:711:ARG:HH21	1.01	1.13
1:A:711:ARG:HG3	1:A:711:ARG:NH2	1.82	0.87
1:A:534:ARG:HH21	1:A:534:ARG:HB2	1.39	0.85
3:D:11:DA:H2''	3:D:12:DA:O5'	1.77	0.83
4:E:28:DA:H2''	4:E:29:DT:H5'	1.59	0.83
4:E:26:DT:H2''	4:E:27:DC:H5'	1.62	0.82
2:B:501:LEU:HD21	2:B:509:MET:HE3	1.62	0.82
1:A:425:GLU:HA	1:A:430:LYS:HG2	1.61	0.81
2:B:387:ALA:HB1	2:B:614:ARG:HD2	1.62	0.81
2:B:531:THR:HA	2:B:534:ARG:NH1	1.98	0.79
1:A:61:GLN:HG3	1:A:64:ILE:HD12	1.66	0.78
2:B:1004:PRO:O	2:B:1007:GLU:HG2	1.85	0.76
2:B:691:THR:HA	2:B:794:CYS:SG	2.25	0.76
1:A:128:LEU:HD13	1:A:134:ILE:HG22	1.67	0.76
1:A:706:ASP:HB2	1:A:742:ASP:HB2	1.67	0.76
2:B:439:VAL:HG12	2:B:440:GLN:H	1.49	0.76
1:A:711:ARG:HH21	1:A:711:ARG:CG	1.91	0.74
2:B:246:LYS:NZ	4:E:35:DG:H1'	2.02	0.74
2:B:738:VAL:HB	2:B:744:MET:HE1	1.70	0.73
1:A:590:GLU:HB3	1:A:591:PRO:HD3	1.71	0.73
2:B:985:LEU:HD23	2:B:1008:LEU:HD12	1.71	0.73
1:A:525:VAL:HG21	1:A:529:GLU:HG2	1.69	0.72
2:B:851:LYS:HG3	2:B:917:GLU:HG2	1.71	0.72
2:B:418:LEU:HD11	2:B:449:MET:HE3	1.70	0.72
1:A:414:LEU:HD23	1:A:444:ARG:HD3	1.71	0.71
3:D:14:DC:H5''	3:D:15:DC:C5	2.25	0.71
1:A:301:LYS:HB2	1:A:707:CYS:HB3	1.71	0.71
2:B:246:LYS:HZ3	4:E:35:DG:H1'	1.55	0.71
2:B:529:ASN:OD1	2:B:531:THR:HB	1.89	0.71
1:A:532:VAL:HG12	1:A:535:ASN:HD22	1.56	0.70
2:B:439:VAL:HG12	2:B:440:GLN:N	2.06	0.70
3:D:21:DA:H2''	3:D:22:DT:H5''	1.72	0.70
3:D:13:DG:H2''	3:D:14:DC:O5'	1.92	0.69
1:A:672:MET:HA	1:A:672:MET:HE2	1.74	0.69
2:B:890[A]:MET:HE2	2:B:1021:MET:HB3	1.75	0.69
1:A:899:MET:HE2	1:A:903:ASN:HB3	1.76	0.68
2:B:233:GLN:HG3	2:B:234:HIS:CD2	2.28	0.68
1:A:20:VAL:HG21	1:A:68:GLY:HA2	1.74	0.67

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:858:ILE:HG23	2:B:862:LEU:HD12	1.77	0.67
2:B:447:GLU:HG2	2:B:500:TYR:CE1	2.29	0.67
2:B:569:LYS:O	2:B:573:GLN:HG2	1.93	0.67
1:A:242:ASN:HD21	1:A:255:SER:H	1.41	0.67
1:A:391:ALA:HB2	1:A:592:MET:HG3	1.76	0.67
2:B:331:ILE:HD11	2:B:387:ALA:HA	1.75	0.66
1:A:513:LEU:HD23	1:A:513:LEU:H	1.61	0.66
1:A:254:ASN:O	1:A:257:VAL:HG13	1.95	0.66
1:A:346:ILE:HA	1:A:691:ILE:HD11	1.76	0.66
1:A:530:GLU:O	1:A:533:LEU:HB2	1.96	0.66
2:B:576:LEU:O	2:B:922:ILE:HD13	1.95	0.66
3:D:9:DT:H2''	3:D:10:DG:C8	2.31	0.65
1:A:242:ASN:ND2	1:A:255:SER:H	1.94	0.65
1:A:271:SER:O	1:A:275:LYS:HG2	1.97	0.65
2:B:679:ILE:HD11	2:B:801:PHE:HE1	1.61	0.65
1:A:522:TYR:CE1	1:A:550:LYS:HD3	2.32	0.65
1:A:880:GLY:HA2	1:A:883:ILE:HD12	1.77	0.65
2:B:865:GLN:HE21	2:B:868:TYR:HB2	1.62	0.65
2:B:286:ARG:HH11	2:B:335:VAL:HG13	1.61	0.65
1:A:351:MET:O	1:A:704:ILE:HD13	1.96	0.64
2:B:761:LYS:HD3	2:B:764:SER:HB3	1.80	0.64
1:A:764:TRP:CE2	2:B:1080:LYS:HE3	2.32	0.64
1:A:801:HIS:CD2	1:A:803:THR:HG23	2.32	0.64
2:B:865:GLN:HE21	2:B:868:TYR:H	1.45	0.64
2:B:537:GLU:HG2	2:B:542:GLN:HG2	1.80	0.64
2:B:747:ILE:HD11	2:B:771:PHE:HE2	1.63	0.64
2:B:530:GLY:O	2:B:534:ARG:HD3	1.98	0.64
1:A:496:LEU:HD22	1:A:513:LEU:HD22	1.80	0.64
1:A:677:THR:O	1:A:681:GLN:HB3	1.99	0.63
2:B:531:THR:HA	2:B:534:ARG:HH11	1.63	0.63
1:A:825:SER:HB3	2:B:976:ASP:OD2	1.99	0.63
1:A:387:LEU:HD11	1:A:595:LEU:HD23	1.80	0.62
2:B:836:ASP:HB2	2:B:854:ARG:HH12	1.63	0.62
2:B:702:LEU:HD23	2:B:703:ILE:HG12	1.80	0.62
1:A:337:GLN:HG2	1:A:596:ASN:OD1	2.00	0.62
2:B:497:ILE:HG22	2:B:510:LEU:HD11	1.82	0.62
4:E:26:DT:C2'	4:E:27:DC:H5'	2.30	0.62
1:A:29:LYS:HE2	1:A:49:ASP:OD2	1.99	0.62
2:B:501:LEU:HD21	2:B:509:MET:CE	2.29	0.62
1:A:364:GLU:HG2	1:A:429:GLN:HE21	1.65	0.61
2:B:541:ASN:HD21	2:B:544:ASP:HB3	1.65	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:13:SER:HB2	1:A:16:GLU:HB2	1.82	0.61
1:A:832:GLU:HG2	1:A:841:ILE:HD12	1.83	0.61
1:A:534:ARG:HD3	1:A:534:ARG:N	2.16	0.61
1:A:589:VAL:O	1:A:592:MET:HG2	2.01	0.61
1:A:752:ARG:NH2	1:A:783[A]:HIS:HD2	1.99	0.61
2:B:836:ASP:HB2	2:B:854:ARG:NH1	2.15	0.61
1:A:666:ILE:HB	1:A:799:ASN:ND2	2.16	0.61
2:B:363:SER:HB3	2:B:493:SER:HB3	1.83	0.61
1:A:411:ILE:HD13	1:A:447:PHE:CG	2.36	0.60
1:A:145:ILE:HD11	1:A:165:TYR:HB2	1.83	0.60
1:A:202:PRO:C	1:A:204:GLY:N	2.53	0.60
2:B:869:VAL:HG23	2:B:870:PRO:HD2	1.84	0.60
2:B:232:GLN:HA	2:B:235:LYS:HE3	1.81	0.60
2:B:650:VAL:HG13	2:B:654:ILE:HD12	1.82	0.60
2:B:598:VAL:HG22	2:B:649:ALA:HB1	1.82	0.60
1:A:234:THR:O	1:A:237:ILE:HG22	2.01	0.60
2:B:452:ILE:H	2:B:452:ILE:HD12	1.65	0.60
2:B:511:SER:O	2:B:512:LYS:HB2	2.01	0.60
1:A:462:GLN:HA	1:A:465:ASN:HD22	1.65	0.60
2:B:450:ASP:HB3	2:B:452:ILE:HD13	1.83	0.60
2:B:690:LYS:HZ3	2:B:798:TRP:CD1	2.20	0.59
2:B:832:ALA:HB2	2:B:912:TYR:HB2	1.85	0.59
2:B:930:MET:HB3	2:B:966:ASP:HB3	1.85	0.59
2:B:875:LEU:HD21	2:B:883:MET:HE3	1.83	0.59
1:A:165:TYR:CE2	1:A:174:GLY:HA3	2.38	0.59
1:A:436:PHE:HZ	1:A:602:LEU:HB2	1.67	0.59
2:B:314:SER:HB3	4:E:29:DT:OP2	2.03	0.59
1:A:427:LYS:HA	1:A:430:LYS:HB2	1.84	0.59
2:B:302:GLU:OE2	2:B:307:LYS:HE2	2.03	0.59
1:A:891:VAL:HG11	2:B:1101:LEU:HD21	1.85	0.58
1:A:20:VAL:HG21	1:A:68:GLY:CA	2.32	0.58
1:A:622:PRO:HD3	1:A:695:VAL:HG22	1.86	0.58
1:A:165:TYR:CZ	1:A:174:GLY:HA3	2.39	0.58
2:B:854:ARG:HE	2:B:859:ASP:CG	2.11	0.58
1:A:126:GLY:O	1:A:147:VAL:HG23	2.04	0.58
2:B:532:THR:HG23	2:B:928:THR:HG23	1.86	0.58
1:A:422:GLU:HA	1:A:425:GLU:HB2	1.84	0.57
1:A:124:SER:HB2	1:A:125:PRO:HD2	1.85	0.57
1:A:361:ASN:O	1:A:364:GLU:HB3	2.04	0.57
2:B:987:TYR:CE2	2:B:992:VAL:HG23	2.39	0.57
1:A:213:LEU:O	1:A:217:ILE:HG13	2.05	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:723:SER:HB2	1:A:726:MET:HB3	1.85	0.57
1:A:574:GLN:O	1:A:578:VAL:HG23	2.04	0.57
1:A:838:LYS:O	1:A:842:GLU:HG2	2.05	0.57
2:B:629:PHE:CE2	2:B:633:VAL:HG21	2.39	0.57
2:B:1063:VAL:HG23	2:B:1066:LEU:HD12	1.86	0.57
2:B:1060:GLY:O	2:B:1063:VAL:HG12	2.05	0.57
4:E:37:DA:H2''	4:E:38:DG:O5'	2.05	0.57
1:A:193:GLN:HE22	1:A:299:TYR:HB2	1.69	0.57
1:A:534:ARG:HE	2:B:752:VAL:HB	1.70	0.57
1:A:726:MET:HE1	2:B:1063:VAL:HG13	1.87	0.57
4:E:39:DC:H2''	4:E:40:DT:H5'	1.87	0.56
4:E:39:DC:H2'	4:E:40:DT:C6	2.40	0.56
1:A:148:VAL:HG23	1:A:165:TYR:HB3	1.88	0.56
1:A:236:ASP:HB3	1:A:240:ASP:OD1	2.04	0.56
1:A:729:MET:HA	1:A:729:MET:HE2	1.86	0.56
2:B:702:LEU:HD22	2:B:702:LEU:H	1.69	0.56
2:B:1057:ARG:NH1	2:B:1082:LYS:HA	2.20	0.56
1:A:607:SER:O	1:A:611:VAL:HG23	2.04	0.56
2:B:555:LEU:HD21	2:B:906:MET:HE3	1.87	0.56
2:B:942:THR:HG23	2:B:945:GLU:H	1.71	0.56
1:A:785[B]:HIS:HE1	1:A:822:CYS:HB3	1.70	0.56
1:A:147:VAL:HG12	1:A:148:VAL:N	2.20	0.56
1:A:425:GLU:CA	1:A:430:LYS:HG2	2.31	0.56
3:D:7:DT:H2''	3:D:8:DC:H5'	1.87	0.56
1:A:125:PRO:HG2	1:A:223:LEU:HD21	1.88	0.56
1:A:836:PHE:HB3	1:A:841:ILE:HG23	1.87	0.56
1:A:472:PRO:O	1:A:479:SER:HB2	2.06	0.56
1:A:400:ASN:OD1	1:A:402:GLN:HB3	2.06	0.55
1:A:658:GLU:HG2	1:A:661:LYS:HG3	1.87	0.55
1:A:534:ARG:HH21	1:A:534:ARG:CB	2.14	0.55
1:A:535:ASN:CG	1:A:536:ASN:N	2.63	0.55
2:B:987:TYR:HE2	2:B:992:VAL:HG23	1.71	0.55
1:A:681:GLN:O	1:A:685:ILE:HG12	2.06	0.55
1:A:29:LYS:HB3	1:A:35:ARG:CZ	2.36	0.55
2:B:978:ILE:HD13	2:B:1004:PRO:HG2	1.87	0.55
2:B:1006:CYS:HB3	2:B:1018:ASN:HD21	1.69	0.55
1:A:430:LYS:HA	1:A:433:LEU:HB2	1.89	0.55
2:B:439:VAL:CG1	2:B:440:GLN:H	2.20	0.55
1:A:439:PRO:O	1:A:443:LEU:HD23	2.07	0.55
3:D:11:DA:H2'	3:D:12:DA:C8	2.41	0.54
1:A:788:THR:HG22	1:A:799:ASN:ND2	2.22	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:512:LYS:HD2	2:B:514:GLU:OE1	2.07	0.54
1:A:709:LEU:HD12	1:A:739:ALA:HB2	1.89	0.54
2:B:571:VAL:HA	2:B:909:ILE:HD11	1.90	0.54
2:B:833:LYS:O	2:B:833:LYS:HG2	2.06	0.54
1:A:359:ARG:O	1:A:363:VAL:HG23	2.07	0.54
2:B:513:PRO:HA	2:B:516:PHE:CE1	2.43	0.54
2:B:521:SER:OG	2:B:524:GLU:HG3	2.08	0.54
1:A:514:ASP:O	1:A:521:TYR:HA	2.08	0.54
1:A:617:VAL:HG22	1:A:638:ARG:NH2	2.23	0.54
1:A:678:TYR:CD1	1:A:817:VAL:HG21	2.43	0.53
1:A:789:ALA:HB2	1:A:855:GLN:OE1	2.08	0.53
2:B:245:TYR:O	2:B:278:THR:HG23	2.08	0.53
4:E:28:DA:H2'	4:E:29:DT:H71	1.91	0.53
2:B:413:GLN:N	2:B:414:PRO:HD3	2.23	0.53
1:A:807:THR:HB	1:A:810:THR:HB	1.89	0.53
2:B:985:LEU:O	2:B:989:ILE:HG13	2.08	0.53
2:B:364:GLU:HB3	2:B:379:ILE:HG12	1.89	0.53
1:A:425:GLU:HA	1:A:430:LYS:CG	2.34	0.53
1:A:916:ILE:HD11	2:B:1102:TRP:HZ2	1.73	0.53
3:D:11:DA:H4'	3:D:12:DA:OP1	2.08	0.53
1:A:424:HIS:HE1	1:A:428:HIS:CE1	2.27	0.53
1:A:436:PHE:CZ	1:A:602:LEU:HD13	2.44	0.53
1:A:819:LYS:HG2	1:A:820:GLY:H	1.72	0.53
2:B:575:LEU:HD11	2:B:584:ARG:CZ	2.38	0.53
1:A:639:HIS:HD2	1:A:641:CYS:H	1.56	0.53
2:B:896:TYR:O	2:B:900:VAL:HG23	2.08	0.53
2:B:904:THR:CG2	2:B:926:ILE:HD11	2.38	0.53
2:B:282:PHE:CE1	2:B:337:PRO:HG3	2.43	0.53
2:B:286:ARG:NH1	2:B:335:VAL:HG13	2.24	0.53
2:B:987:TYR:C	2:B:987:TYR:CD2	2.86	0.53
1:A:782:THR:HG21	1:A:787:LEU:HD23	1.91	0.52
1:A:679:ILE:HD12	1:A:746:ILE:HG23	1.91	0.52
3:D:16:DG:H2'	3:D:17:DA:C8	2.43	0.52
1:A:436:PHE:C	1:A:439:PRO:HD2	2.35	0.52
1:A:627:LYS:HE2	1:A:742:ASP:CG	2.34	0.52
2:B:949:ASP:O	2:B:953:ILE:HG13	2.08	0.52
1:A:145:ILE:HD11	1:A:147:VAL:O	2.09	0.52
1:A:519:PHE:HE1	1:A:542:VAL:HG12	1.74	0.52
1:A:726:MET:HE2	1:A:726:MET:HA	1.90	0.52
2:B:282:PHE:CD1	2:B:337:PRO:HG3	2.45	0.52
1:A:171:ARG:NH2	1:A:392:LYS:HE3	2.25	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:589:VAL:HA	1:A:592:MET:SD	2.50	0.52
2:B:747:ILE:HD12	2:B:747:ILE:O	2.09	0.52
1:A:658:GLU:HG2	1:A:661:LYS:CG	2.40	0.52
2:B:1019:TYR:CD2	2:B:1052:ARG:HA	2.45	0.52
2:B:346:ASN:CG	2:B:347:VAL:H	2.18	0.52
4:E:40:DT:H2''	4:E:41:DT:H5''	1.90	0.52
1:A:196:PRO:HG2	1:A:222:ILE:HD13	1.92	0.51
1:A:425:GLU:C	1:A:427:LYS:H	2.17	0.51
1:A:413:GLN:HA	1:A:413:GLN:OE1	2.11	0.51
2:B:265:CYS:HA	2:B:273:THR:O	2.11	0.51
1:A:337:GLN:CD	1:A:337:GLN:H	2.18	0.51
1:A:284:SER:O	1:A:288:GLN:HG3	2.10	0.51
1:A:434:ALA:C	1:A:436:PHE:H	2.19	0.51
1:A:454:ILE:HG23	1:A:458:LEU:HD13	1.91	0.51
2:B:778:GLU:HG3	2:B:779:ASN:N	2.24	0.51
1:A:419:GLN:HG2	1:A:423:LYS:HE3	1.91	0.51
1:A:668:THR:O	1:A:801:HIS:HB2	2.09	0.51
1:A:711:ARG:NH2	1:A:711:ARG:CG	2.61	0.51
1:A:484:ILE:HG21	1:A:566:ASN:ND2	2.26	0.51
1:A:887:PHE:O	1:A:891:VAL:HG23	2.10	0.51
2:B:632:ILE:O	2:B:636:LEU:HG	2.11	0.51
2:B:865:GLN:NE2	2:B:868:TYR:HB2	2.24	0.51
1:A:601:GLN:O	1:A:605:VAL:HG13	2.10	0.51
1:A:638:ARG:HA	1:A:650:PHE:HE2	1.76	0.51
2:B:604:ASN:HA	2:B:607:ARG:HG3	1.92	0.51
1:A:438:THR:HB	1:A:439:PRO:HD3	1.92	0.51
1:A:532:VAL:HG12	1:A:535:ASN:ND2	2.25	0.51
1:A:220:GLY:HA2	1:A:304:ILE:HD12	1.92	0.50
2:B:232:GLN:O	2:B:235:LYS:HD2	2.12	0.50
3:D:4:DC:H2''	3:D:5:DT:OP2	2.11	0.50
1:A:651:ILE:O	1:A:651:ILE:HG13	2.11	0.50
1:A:210:MET:O	1:A:214:ARG:HG3	2.11	0.50
1:A:831:ALA:O	1:A:836:PHE:HB2	2.11	0.50
1:A:525:VAL:HG23	1:A:551:PHE:HE2	1.76	0.50
1:A:481:LEU:HD23	1:A:570:TYR:HA	1.93	0.50
2:B:1089:ASN:O	2:B:1093:LYS:HD2	2.10	0.50
2:B:1104:MET:HB3	2:B:1109:ASP:HB3	1.92	0.50
4:E:40:DT:H2''	4:E:41:DT:C5'	2.42	0.50
1:A:534:ARG:HE	2:B:752:VAL:CG1	2.25	0.50
1:A:849:LEU:O	1:A:852:GLU:HG2	2.11	0.50
1:A:132:GLU:HG2	1:A:389:ARG:HH21	1.75	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:533:LEU:HA	1:A:536:ASN:OD1	2.11	0.50
1:A:535:ASN:O	1:A:536:ASN:C	2.54	0.50
1:A:588:TYR:C	1:A:591:PRO:HD2	2.36	0.50
1:A:728:GLU:OE2	1:A:750:LEU:HD12	2.12	0.50
2:B:539:LEU:HD11	2:B:572:THR:HG22	1.93	0.50
4:E:28:DA:C2'	4:E:29:DT:H5'	2.37	0.50
1:A:58:PHE:O	1:A:60:THR:HG22	2.12	0.50
1:A:513:LEU:H	1:A:513:LEU:CD2	2.24	0.50
2:B:765:THR:HG22	2:B:767:ALA:H	1.77	0.50
2:B:865:GLN:NE2	2:B:868:TYR:H	2.10	0.50
1:A:21:ARG:HE	1:A:21:ARG:HA	1.75	0.49
1:A:804:ALA:HB2	1:A:813:MET:SD	2.52	0.49
2:B:660:ARG:O	2:B:664:LEU:HG	2.12	0.49
1:A:24:GLN:HE21	1:A:24:GLN:HA	1.77	0.49
1:A:780:PHE:CE1	1:A:782:THR:HB	2.47	0.49
2:B:218:SER:C	2:B:220:TYR:H	2.20	0.49
3:D:13:DG:H2'	3:D:14:DC:O4'	2.12	0.49
1:A:147:VAL:CG1	1:A:148:VAL:N	2.74	0.49
1:A:811:LEU:HD12	1:A:829:HIS:HD2	1.77	0.49
2:B:526:MET:HE3	2:B:574:PRO:HB2	1.93	0.49
2:B:671:SER:OG	2:B:672:PRO:HD3	2.13	0.49
1:A:685:ILE:HD12	1:A:696:PRO:HD2	1.93	0.49
2:B:439:VAL:CG1	2:B:440:GLN:N	2.75	0.49
2:B:765:THR:C	2:B:767:ALA:H	2.19	0.49
4:E:30:DC:H2''	4:E:31:DG:OP2	2.13	0.49
1:A:421:LEU:CD2	1:A:437:VAL:HG23	2.42	0.49
1:A:421:LEU:HD22	1:A:437:VAL:HG23	1.94	0.49
1:A:823:ASP:OD2	1:A:824:GLN:HG2	2.12	0.49
1:A:684:VAL:O	1:A:688:MET:HG3	2.13	0.49
1:A:769:TYR:CE2	1:A:773:LYS:HG2	2.48	0.49
1:A:144:SER:HB2	1:A:167:ASP:OD1	2.12	0.49
1:A:638:ARG:HD3	1:A:638:ARG:N	2.27	0.49
1:A:625:LEU:HD22	1:A:631:ARG:HB2	1.95	0.49
2:B:598:VAL:O	2:B:602:ILE:HG13	2.13	0.49
1:A:650:PHE:HA	5:A:935:ADP:C2	2.47	0.48
1:A:153:SER:O	1:A:160:GLN:HB3	2.14	0.48
1:A:193:GLN:NE2	1:A:299:TYR:HB2	2.28	0.48
1:A:712:VAL:HA	1:A:748:ASP:HB3	1.94	0.48
2:B:431:ILE:HD12	2:B:432:HIS:N	2.28	0.48
4:E:47:DA:H2''	4:E:48:DG:C8	2.48	0.48
2:B:398:ASP:CG	2:B:404:GLU:HB2	2.37	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:132:GLU:HG2	1:A:389:ARG:NH2	2.28	0.48
1:A:202:PRO:C	1:A:204:GLY:H	2.20	0.48
1:A:301:LYS:O	1:A:302:LEU:HD23	2.13	0.48
1:A:335:THR:HB	1:A:337:GLN:OE1	2.13	0.48
1:A:424:HIS:CE1	1:A:428:HIS:CE1	3.02	0.48
1:A:904:ILE:HG21	2:B:1107:ALA:HA	1.95	0.48
2:B:219:ILE:HD13	2:B:219:ILE:H	1.77	0.48
2:B:312:ASN:HD22	2:B:312:ASN:H	1.60	0.48
2:B:514:GLU:CD	2:B:514:GLU:H	2.22	0.48
1:A:66:TYR:OH	2:B:340:LYS:HB2	2.14	0.48
1:A:531:LYS:O	1:A:534:ARG:NH2	2.47	0.48
1:A:838:LYS:HA	1:A:841:ILE:HD11	1.95	0.48
1:A:899:MET:CE	1:A:903:ASN:HB3	2.42	0.48
1:A:274:ILE:HG23	1:A:279:LEU:HD12	1.95	0.48
2:B:580:GLU:O	2:B:583:ALA:HB3	2.12	0.48
3:D:9:DT:H2"	3:D:10:DG:N7	2.28	0.48
2:B:408:ARG:O	2:B:412:LEU:HB2	2.13	0.48
2:B:593:HIS:O	2:B:594:SER:C	2.57	0.48
2:B:822:VAL:O	2:B:826:PHE:HD1	1.97	0.48
2:B:1096:LYS:O	2:B:1100:LYS:HG3	2.14	0.48
1:A:630:GLY:HA2	1:A:777:PHE:HZ	1.79	0.47
2:B:883:MET:HG3	2:B:1019:TYR:CD1	2.49	0.47
1:A:723:SER:HB2	1:A:726:MET:CB	2.43	0.47
1:A:371:GLU:OE2	1:A:423:LYS:HG2	2.15	0.47
1:A:424:HIS:CE1	1:A:428:HIS:NE2	2.82	0.47
1:A:807:THR:HG22	1:A:808:GLU:N	2.30	0.47
1:A:900:SER:O	1:A:904:ILE:HD12	2.14	0.47
1:A:381:LEU:C	1:A:383:ARG:H	2.23	0.47
1:A:564:THR:O	1:A:568:THR:HG22	2.15	0.47
1:A:568:THR:O	1:A:572:GLU:HG2	2.14	0.47
2:B:958:THR:O	2:B:994:SER:HB3	2.14	0.47
1:A:907:LYS:HB2	1:A:907:LYS:NZ	2.29	0.47
2:B:541:ASN:ND2	2:B:544:ASP:HB3	2.29	0.47
2:B:752:VAL:O	2:B:755:ILE:HG13	2.15	0.47
1:A:178:PHE:HE2	1:A:190:LEU:HD22	1.79	0.47
1:A:346:ILE:HA	1:A:691:ILE:CD1	2.45	0.47
1:A:477:ASN:O	1:A:481:LEU:HD13	2.15	0.47
2:B:904:THR:HG21	2:B:926:ILE:HD11	1.97	0.47
1:A:215:GLN:O	1:A:219:ARG:HG3	2.15	0.46
1:A:419:GLN:HG2	1:A:423:LYS:CE	2.45	0.46
1:A:492:MET:HE1	1:A:560:ASN:HD22	1.81	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:891:VAL:HG21	2:B:1101:LEU:HD21	1.96	0.46
1:A:926:ILE:O	1:A:930:ILE:HG13	2.15	0.46
1:A:224:ILE:HG22	1:A:225:THR:N	2.30	0.46
1:A:658:GLU:HG3	1:A:659:LYS:H	1.79	0.46
1:A:814:LEU:HB2	6:A:940:HOH:O	2.14	0.46
2:B:882:VAL:HG11	2:B:985:LEU:HD11	1.97	0.46
1:A:124:SER:HB2	1:A:125:PRO:CD	2.45	0.46
1:A:534:ARG:HE	2:B:752:VAL:CB	2.28	0.46
1:A:679:ILE:HG13	1:A:680:ARG:N	2.31	0.46
1:A:743:SER:O	1:A:776:ALA:HB1	2.15	0.46
2:B:855:HIS:HB3	2:B:858:ILE:HB	1.97	0.46
1:A:526:THR:O	1:A:527:CYS:C	2.59	0.46
1:A:411:ILE:HG22	1:A:411:ILE:O	2.14	0.46
1:A:635:LYS:HB2	1:A:699:SER:HB3	1.97	0.46
1:A:687:LEU:HD23	1:A:687:LEU:C	2.40	0.46
2:B:382:VAL:HG23	2:B:493:SER:OG	2.15	0.46
2:B:487:GLU:HB3	2:B:489:PRO:HD2	1.97	0.46
2:B:512:LYS:N	2:B:513:PRO:HD3	2.29	0.46
2:B:701:PRO:C	2:B:703:ILE:H	2.21	0.46
3:D:13:DG:H4'	3:D:14:DC:OP1	2.15	0.46
1:A:78:VAL:HG12	1:A:79:VAL:N	2.30	0.46
1:A:162:GLY:HA3	1:A:265:VAL:HG12	1.97	0.46
1:A:826:PHE:O	1:A:830:VAL:HG23	2.15	0.46
2:B:633:VAL:HG12	2:B:677:LEU:HB2	1.97	0.46
2:B:245:TYR:HB3	3:D:14:DC:H2''	1.97	0.46
2:B:528:ILE:HG21	2:B:533:LEU:HD13	1.98	0.46
2:B:650:VAL:HG21	2:B:663:ILE:HG21	1.98	0.46
2:B:890[A]:MET:HE2	2:B:1021:MET:CB	2.44	0.46
1:A:61:GLN:HB2	2:B:348:ASP:OD1	2.15	0.46
1:A:64:ILE:HG23	1:A:76:GLN:HB3	1.98	0.46
1:A:340:ARG:NH2	1:A:386:ASP:OD2	2.48	0.46
1:A:414:LEU:HD12	1:A:414:LEU:HA	1.81	0.46
1:A:532:VAL:HG12	1:A:532:VAL:O	2.16	0.46
1:A:671:ASN:O	1:A:672:MET:HB2	2.15	0.46
2:B:346:ASN:CG	2:B:347:VAL:N	2.74	0.46
1:A:269:SER:O	1:A:273:VAL:HG23	2.15	0.46
1:A:724:THR:HG23	2:B:889:ASN:HB3	1.98	0.46
1:A:785[B]:HIS:CE1	1:A:822:CYS:HB3	2.49	0.46
2:B:246:LYS:HE3	2:B:248:ARG:HD3	1.98	0.46
2:B:671:SER:N	2:B:672:PRO:CD	2.79	0.46
1:A:76:GLN:H	1:A:76:GLN:CD	2.24	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:577:ILE:O	1:A:581:ILE:HG12	2.16	0.46
2:B:528:ILE:CG2	2:B:533:LEU:HD13	2.46	0.46
2:B:755:ILE:HD12	2:B:756:PRO:O	2.16	0.46
1:A:554:SER:O	1:A:557:THR:HG22	2.16	0.45
2:B:568:LYS:O	2:B:572:THR:HG23	2.15	0.45
1:A:615:ALA:O	1:A:616:PRO:C	2.59	0.45
1:A:664:PHE:HB3	1:A:797:VAL:HA	1.97	0.45
1:A:821:VAL:HG12	1:A:822:CYS:N	2.31	0.45
4:E:41:DT:H6	4:E:41:DT:H5'	1.80	0.45
4:E:42:DC:H2''	4:E:43:DA:C8	2.51	0.45
1:A:627:LYS:HE2	1:A:742:ASP:CB	2.46	0.45
2:B:571:VAL:HA	2:B:909:ILE:CD1	2.46	0.45
2:B:772:HIS:HB3	2:B:777:VAL:HG23	1.97	0.45
1:A:29:LYS:HB3	1:A:35:ARG:NH1	2.31	0.45
1:A:173:LEU:O	1:A:291:LEU:HD12	2.17	0.45
1:A:764:TRP:CD1	2:B:1080:LYS:HG3	2.51	0.45
1:A:363:VAL:O	1:A:367:VAL:HG22	2.16	0.45
1:A:426:GLY:HA3	1:A:428:HIS:CE1	2.52	0.45
1:A:524:ARG:C	1:A:525:VAL:HG22	2.41	0.45
1:A:639:HIS:HB2	1:A:681:GLN:HB2	1.99	0.45
2:B:404:GLU:OE1	2:B:404:GLU:HA	2.17	0.45
2:B:412:LEU:HA	2:B:412:LEU:HD12	1.72	0.45
2:B:598:VAL:CG2	2:B:649:ALA:HB1	2.45	0.45
2:B:890[A]:MET:HE3	2:B:892:GLY:HA3	1.98	0.45
2:B:317:PHE:CE1	3:D:16:DG:H5''	2.52	0.45
2:B:755:ILE:HG12	2:B:771:PHE:CE2	2.52	0.45
2:B:1100:LYS:O	2:B:1104:MET:HE3	2.16	0.45
1:A:237:ILE:HG23	1:A:238:TYR:N	2.32	0.45
2:B:452:ILE:HD12	2:B:452:ILE:N	2.31	0.45
2:B:656:SER:HB3	2:B:659:LEU:HB2	1.98	0.45
2:B:795:SER:O	2:B:798:TRP:HB3	2.17	0.45
1:A:224:ILE:HG22	1:A:225:THR:H	1.82	0.45
1:A:522:TYR:CZ	1:A:550:LYS:HD3	2.52	0.45
2:B:340:LYS:HA	2:B:344:ALA:O	2.16	0.45
2:B:1062:ASN:O	2:B:1065:LYS:HE2	2.17	0.45
2:B:360:LEU:HB3	2:B:417:LEU:HD23	1.97	0.45
4:E:47:DA:H2''	4:E:48:DG:H8	1.81	0.45
1:A:338:GLY:HA3	1:A:603:ASP:OD2	2.17	0.44
1:A:515:SER:HA	1:A:520:GLY:O	2.17	0.44
2:B:276:ILE:O	2:B:276:ILE:HG13	2.16	0.44
1:A:203:GLY:O	1:A:204:GLY:C	2.60	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:296:GLY:HA2	2:B:324:LEU:HD23	1.99	0.44
2:B:987:TYR:O	2:B:991:ASP:HB2	2.17	0.44
1:A:145:ILE:O	1:A:145:ILE:HG13	2.16	0.44
1:A:658:GLU:HG3	1:A:659:LYS:N	2.32	0.44
1:A:780:PHE:C	1:A:780:PHE:CD1	2.95	0.44
2:B:612:ILE:HG21	2:B:636:LEU:HD21	2.00	0.44
2:B:837:TYR:HE2	2:B:906:MET:HE1	1.82	0.44
4:E:39:DC:H2''	4:E:40:DT:C5'	2.46	0.44
1:A:375:THR:O	1:A:379:ASP:HB2	2.16	0.44
2:B:747:ILE:HD11	2:B:771:PHE:CE2	2.47	0.44
3:D:14:DC:H3'	3:D:15:DC:C6	2.52	0.44
1:A:366:PHE:CZ	1:A:602:LEU:HD11	2.53	0.44
1:A:642:VAL:HG12	1:A:642:VAL:O	2.17	0.44
2:B:865:GLN:HE21	2:B:868:TYR:CB	2.29	0.44
2:B:588:VAL:HG13	2:B:829:ALA:HA	1.98	0.44
2:B:622:LYS:HD3	2:B:802:LEU:HB2	1.98	0.44
4:E:39:DC:H3'	4:E:40:DT:H72	2.00	0.44
1:A:193:GLN:HB2	1:A:348:GLN:HG2	2.00	0.44
1:A:311:ASN:HD22	1:A:311:ASN:HA	1.61	0.44
2:B:422:ALA:H	2:B:451:ASN:HD21	1.64	0.44
1:A:590:GLU:HB3	1:A:591:PRO:CD	2.45	0.44
2:B:512:LYS:HB3	2:B:512:LYS:HE3	1.76	0.44
2:B:741:GLN:HE22	2:B:762:VAL:HB	1.83	0.44
2:B:893:LYS:O	2:B:897:ILE:HG12	2.17	0.44
1:A:632:ILE:C	1:A:633:ILE:HG13	2.43	0.44
2:B:431:ILE:HD12	2:B:431:ILE:C	2.43	0.44
2:B:675:HIS:O	2:B:679:ILE:HG23	2.18	0.44
2:B:746:GLU:HG2	2:B:768:VAL:HG21	2.00	0.44
2:B:843:GLN:HE22	2:B:847:LYS:NZ	2.16	0.44
2:B:930:MET:CB	2:B:966:ASP:HB3	2.47	0.44
2:B:987:TYR:HE2	2:B:992:VAL:CG2	2.30	0.44
1:A:563:TYR:O	1:A:567:LYS:HB2	2.18	0.43
1:A:711:ARG:HG3	1:A:711:ARG:O	2.18	0.43
2:B:347:VAL:O	2:B:348:ASP:C	2.61	0.43
1:A:387:LEU:CD1	1:A:595:LEU:HD23	2.46	0.43
1:A:807:THR:O	1:A:829:HIS:CE1	2.71	0.43
2:B:581:ILE:HD13	2:B:908:GLN:HA	2.00	0.43
2:B:762:VAL:HG11	2:B:772:HIS:CD2	2.53	0.43
2:B:1020:HIS:CE1	2:B:1051:THR:HB	2.53	0.43
4:E:40:DT:C2'	4:E:41:DT:H5''	2.48	0.43
1:A:30:PRO:HD2	1:A:33:THR:HB	2.01	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:769:TYR:O	1:A:773:LYS:HB3	2.16	0.43
2:B:990:ARG:HG3	2:B:991:ASP:OD1	2.18	0.43
4:E:30:DC:H1'	4:E:31:DG:H5''	1.99	0.43
1:A:377:GLN:HE21	1:A:377:GLN:HB3	1.57	0.43
2:B:402:ARG:NH2	2:B:426:GLN:HB2	2.34	0.43
2:B:513:PRO:HA	2:B:516:PHE:CD1	2.53	0.43
2:B:665:GLU:HB3	2:B:818:HIS:HD2	1.84	0.43
1:A:557:THR:O	1:A:561:GLU:HG3	2.19	0.43
1:A:638:ARG:HA	1:A:650:PHE:CE2	2.53	0.43
1:A:425:GLU:O	1:A:425:GLU:HG2	2.18	0.43
1:A:435:VAL:HG12	1:A:435:VAL:O	2.19	0.43
1:A:608:PHE:CD1	1:A:693:CYS:HB2	2.53	0.43
2:B:392:VAL:HG11	2:B:519:LEU:HD13	1.99	0.43
2:B:640:LYS:HD3	2:B:640:LYS:C	2.43	0.43
1:A:545:GLN:NE2	1:A:545:GLN:HA	2.32	0.43
2:B:575:LEU:HB2	2:B:581:ILE:HG12	2.00	0.43
1:A:83:MET:HB3	2:B:262:ASN:HB3	2.01	0.43
1:A:780:PHE:C	1:A:780:PHE:HD1	2.27	0.43
2:B:223:LEU:HA	2:B:316:LEU:HD21	1.99	0.43
2:B:720:HIS:CD2	2:B:724:ILE:HG13	2.54	0.43
2:B:883:MET:HG3	2:B:1019:TYR:CE1	2.54	0.43
1:A:401:LEU:HG	1:A:458:LEU:HD11	1.99	0.43
1:A:627:LYS:HE2	1:A:742:ASP:OD2	2.18	0.43
1:A:15:ALA:C	1:A:17:VAL:H	2.27	0.43
1:A:188:GLU:OE2	1:A:304:ILE:HG12	2.18	0.43
1:A:251:GLU:HG3	1:A:252:GLN:H	1.83	0.43
1:A:481:LEU:HD21	1:A:569:GLU:OE1	2.19	0.43
1:A:752:ARG:HH22	1:A:783[A]:HIS:HD2	1.63	0.43
1:A:801:HIS:HD2	1:A:803:THR:HG23	1.80	0.43
1:A:332:LYS:N	1:A:332:LYS:HD2	2.33	0.42
2:B:755:ILE:HA	2:B:756:PRO:HD3	1.94	0.42
1:A:462:GLN:HA	1:A:465:ASN:ND2	2.33	0.42
1:A:682:THR:O	1:A:686:VAL:HG23	2.20	0.42
2:B:577:LYS:NZ	2:B:577:LYS:HA	2.34	0.42
2:B:702:LEU:CD2	2:B:702:LEU:N	2.82	0.42
1:A:171:ARG:HH21	1:A:392:LYS:HG3	1.83	0.42
1:A:877:ARG:HG3	1:A:922:PHE:CD1	2.54	0.42
2:B:880:GLU:OE1	2:B:1017:GLY:HA3	2.20	0.42
2:B:354:THR:HG21	2:B:413:GLN:HB2	2.02	0.42
2:B:534:ARG:HA	2:B:542:GLN:NE2	2.34	0.42
2:B:575:LEU:O	2:B:581:ILE:HD11	2.19	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:747:ILE:C	2:B:768:VAL:HG23	2.45	0.42
2:B:877:GLU:C	2:B:879:SER:H	2.27	0.42
1:A:534:ARG:NE	2:B:752:VAL:HB	2.32	0.42
1:A:180:ASP:CG	1:A:186:ASN:HB2	2.44	0.42
1:A:204:GLY:O	1:A:205:GLU:O	2.37	0.42
1:A:534:ARG:HD2	2:B:752:VAL:HB	2.01	0.42
1:A:619:TYR:HB3	1:A:694:PHE:HB3	2.01	0.42
3:D:11:DA:C2'	3:D:12:DA:C8	3.03	0.42
2:B:513:PRO:HD2	2:B:514:GLU:OE2	2.19	0.42
4:E:41:DT:H2''	4:E:42:DC:C6	2.55	0.42
1:A:166:VAL:HG22	1:A:173:LEU:HD22	2.02	0.42
1:A:783[B]:HIS:CD2	1:A:783[B]:HIS:H	2.38	0.42
1:A:833:LEU:C	1:A:835:ASN:H	2.27	0.42
2:B:441:ASP:OD2	2:B:442:ASP:N	2.41	0.42
2:B:532:THR:HG23	2:B:928:THR:CG2	2.49	0.42
3:D:14:DC:H5''	3:D:15:DC:H5	1.79	0.42
1:A:390:LEU:HD21	1:A:407:LEU:HB2	2.01	0.42
1:A:313:PHE:CZ	1:A:347:LYS:HG2	2.54	0.41
1:A:423:LYS:HE3	1:A:423:LYS:HB2	1.82	0.41
1:A:651:ILE:HD11	1:A:815:TYR:O	2.20	0.41
1:A:708:ILE:C	1:A:709:LEU:HD23	2.44	0.41
1:A:801:HIS:CD2	1:A:822:CYS:HA	2.54	0.41
2:B:721:LEU:O	2:B:725:ARG:HG3	2.20	0.41
1:A:95:VAL:C	1:A:97:GLN:N	2.77	0.41
2:B:1085:GLU:O	2:B:1086:GLY:C	2.62	0.41
1:A:630:GLY:HA2	1:A:777:PHE:CZ	2.56	0.41
1:A:175:LEU:HD12	1:A:291:LEU:HD11	2.03	0.41
2:B:243:CYS:HB3	2:B:248:ARG:HG3	2.03	0.41
2:B:867:GLN:HG2	2:B:1045:THR:O	2.20	0.41
1:A:384:PHE:CZ	1:A:413:GLN:HB2	2.56	0.41
1:A:807:THR:CB	1:A:810:THR:HB	2.50	0.41
4:E:44:DG:H2''	4:E:45:DA:OP2	2.19	0.41
1:A:245:LEU:O	1:A:287:GLY:HA2	2.21	0.41
2:B:842:VAL:HG12	2:B:843:GLN:N	2.36	0.41
2:B:846:ARG:HA	2:B:921:GLY:C	2.45	0.41
1:A:391:ALA:HB1	1:A:589:VAL:HG13	2.01	0.41
2:B:679:ILE:HD11	2:B:801:PHE:CE1	2.48	0.41
3:D:13:DG:H2'	3:D:14:DC:C6	2.56	0.41
1:A:324:GLN:HG2	1:A:325:SER:H	1.86	0.41
1:A:378:GLU:HG2	1:A:379:ASP:OD2	2.20	0.41
2:B:456:TYR:HA	2:B:492:CYS:SG	2.61	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:526:MET:HE2	2:B:908:GLN:CD	2.45	0.41
2:B:1006:CYS:HB3	2:B:1018:ASN:ND2	2.35	0.41
1:A:81:SER:O	1:A:82:LYS:C	2.64	0.41
1:A:144:SER:HA	1:A:169:ILE:HG13	2.02	0.41
1:A:534:ARG:HG2	2:B:753:SER:HB3	2.03	0.41
1:A:673:GLY:O	1:A:802:VAL:HG21	2.21	0.41
1:A:894:MET:HE1	1:A:908:LEU:HD23	2.02	0.41
1:A:899:MET:HB2	1:A:904:ILE:HD11	2.03	0.41
1:A:901:GLU:OE2	1:A:901:GLU:HA	2.21	0.41
2:B:483:ILE:O	2:B:483:ILE:HG22	2.21	0.41
2:B:700:PHE:CB	2:B:703:ILE:HB	2.51	0.41
1:A:46:HIS:ND1	1:A:77:SER:HB3	2.35	0.41
1:A:248:LYS:HE3	1:A:253:MET:HE1	2.03	0.41
1:A:352:ASP:OD2	1:A:354:ASN:HB2	2.21	0.41
1:A:505:LEU:O	1:A:506:ASP:C	2.64	0.41
1:A:886:GLU:OE2	1:A:890:LYS:HE3	2.21	0.41
2:B:602:ILE:HG12	2:B:646:ILE:HD13	2.04	0.41
2:B:730:ASN:C	2:B:732:SER:H	2.29	0.41
2:B:880:GLU:H	2:B:880:GLU:HG2	1.61	0.41
1:A:420:ALA:O	1:A:423:LYS:HB3	2.21	0.40
2:B:317:PHE:CD1	3:D:16:DG:H5''	2.56	0.40
1:A:417:VAL:C	1:A:419:GLN:N	2.79	0.40
1:A:807:THR:HG22	1:A:808:GLU:H	1.86	0.40
3:D:8:DC:H1'	3:D:9:DT:H5'	2.02	0.40
1:A:80:LEU:HD23	1:A:84:ASN:HB3	2.03	0.40
1:A:95:VAL:C	1:A:97:GLN:H	2.29	0.40
1:A:424:HIS:CE1	1:A:426:GLY:HA3	2.56	0.40
1:A:450:PHE:HD2	1:A:451:GLN:HE21	1.69	0.40
1:A:524:ARG:C	1:A:525:VAL:CG2	2.95	0.40
1:A:619:TYR:N	1:A:619:TYR:CD2	2.89	0.40
1:A:309:ALA:O	1:A:680:ARG:HD2	2.22	0.40
1:A:615:ALA:HB1	1:A:616:PRO:HD2	2.03	0.40
1:A:687:LEU:HD23	1:A:688:MET:N	2.37	0.40
2:B:299:LYS:HB2	2:B:322:THR:HG21	2.03	0.40
2:B:658:LEU:O	2:B:662:VAL:HG23	2.22	0.40
2:B:826:PHE:O	2:B:830:LYS:HG2	2.21	0.40
2:B:874:ASP:OD1	2:B:874:ASP:C	2.64	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	875/934 (94%)	778 (89%)	86 (10%)	11 (1%)	9	32
2	B	850/918 (93%)	754 (89%)	90 (11%)	6 (1%)	18	48
All	All	1725/1852 (93%)	1532 (89%)	176 (10%)	17 (1%)	12	39

All (17) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	205	GLU
1	A	645	GLN
1	A	235	LYS
1	A	525	VAL
1	A	536	ASN
1	A	544	ILE
1	A	854	PHE
1	A	155	VAL
1	A	509	LYS
2	B	311	ASP
1	A	612	SER
1	A	749	GLU
2	B	870	PRO
2	B	437	VAL
2	B	1044	VAL
2	B	922	ILE
2	B	756	PRO

### 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	742/808 (92%)	685 (92%)	57 (8%)	12	35
2	B	752/818 (92%)	706 (94%)	46 (6%)	17	46
All	All	1494/1626 (92%)	1391 (93%)	103 (7%)	14	41

All (103) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	21	ARG
1	A	24	GLN
1	A	32	THR
1	A	61	GLN
1	A	96	ARG
1	A	106	ARG
1	A	119	LEU
1	A	138	ASN
1	A	145	ILE
1	A	148	VAL
1	A	223	LEU
1	A	239	GLN
1	A	257	VAL
1	A	283	ASP
1	A	314	GLN
1	A	332	LYS
1	A	337	GLN
1	A	359	ARG
1	A	377	GLN
1	A	378	GLU
1	A	382	ARG
1	A	388	ASN
1	A	412	ASN
1	A	433	LEU
1	A	437	VAL
1	A	452	GLU
1	A	458	LEU
1	A	459	ASP
1	A	464	GLU
1	A	467	GLU
1	A	481	LEU
1	A	486	ASN
1	A	516	SER
1	A	525	VAL

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Mol	Chain	Res	Type
1	A	534	ARG
1	A	535	ASN
1	A	538	ASN
1	A	545	GLN
1	A	549	VAL
1	A	560	ASN
1	A	569	GLU
1	A	579	LYS
1	A	617	VAL
1	A	633	ILE
1	A	644	VAL
1	A	651	ILE
1	A	661	LYS
1	A	681	GLN
1	A	687	LEU
1	A	691	ILE
1	A	705	VAL
1	A	711	ARG
1	A	724	THR
1	A	852	GLU
1	A	853	GLU
1	A	898	GLU
1	A	907	LYS
2	B	219	ILE
2	B	248	ARG
2	B	309	ILE
2	B	311	ASP
2	B	312	ASN
2	B	335	VAL
2	B	347	VAL
2	B	392	VAL
2	B	404	GLU
2	B	412	LEU
2	B	442	ASP
2	B	497	ILE
2	B	507	GLU
2	B	531	THR
2	B	533	LEU
2	B	534	ARG
2	B	543	THR
2	B	577	LYS
2	B	604	ASN

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Mol	Chain	Res	Type
2	B	614	ARG
2	B	627	GLN
2	B	632	ILE
2	B	646	ILE
2	B	659	LEU
2	B	673	VAL
2	B	702	LEU
2	B	718	ARG
2	B	719	MET
2	B	772	HIS
2	B	778	GLU
2	B	781	ARG
2	B	787	ARG
2	B	845	GLU
2	B	851	LYS
2	B	866	ASP
2	B	869	VAL
2	B	880	GLU
2	B	885	ILE
2	B	894	SER
2	B	899	GLN
2	B	904	THR
2	B	929	ARG
2	B	930	MET
2	B	1075	LYS
2	B	1090	THR
2	B	1110	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (51) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	24	GLN
1	A	97	GLN
1	A	170	GLN
1	A	193	GLN
1	A	239	GLN
1	A	242	ASN
1	A	285	ASN
1	A	288	GLN
1	A	311	ASN
1	A	314	GLN
1	A	409	GLN

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Mol	Chain	Res	Type
1	A	419	GLN
1	A	424	HIS
1	A	429	GLN
1	A	451	GLN
1	A	465	ASN
1	A	535	ASN
1	A	545	GLN
1	A	574	GLN
1	A	639	HIS
1	A	645	GLN
1	A	798	ASN
1	A	799	ASN
1	A	801	HIS
1	A	816	GLN
1	A	829	HIS
2	B	262	ASN
2	B	312	ASN
2	B	461	GLN
2	B	515	ASN
2	B	535	ASN
2	B	573	GLN
2	B	582	ASN
2	B	627	GLN
2	B	653	HIS
2	B	655	GLN
2	B	720	HIS
2	B	734	GLN
2	B	741	GLN
2	B	772	HIS
2	B	779	ASN
2	B	784	ASN
2	B	785	GLN
2	B	808	HIS
2	B	843	GLN
2	B	865	GLN
2	B	867	GLN
2	B	960	GLN
2	B	1001	HIS
2	B	1020	HIS
2	B	1106	ASN

### 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 ⓘ

There are no oligosaccharides in this entry.

## 5.6 Ligand geometry ⓘ

1 ligand is 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$
5	ADP	A	935	-	28,29,29	1.42	4 (14%)	43,45,45	1.83	8 (18%)

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
5	ADP	A	935	-	-	0/16/32/32	0/3/3/3

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	935	ADP	C5-C4	4.82	1.47	1.39
5	A	935	ADP	C5-C6	2.75	1.48	1.41
5	A	935	ADP	C8-N7	2.27	1.36	1.31
5	A	935	ADP	C5-N7	-2.17	1.35	1.39

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	935	ADP	C5-C4-N3	-5.74	118.82	126.72
5	A	935	ADP	N3-C4-N9	4.62	135.03	127.17
5	A	935	ADP	C2-N3-C4	3.57	120.54	111.83
5	A	935	ADP	C4-C5-N7	-3.36	106.74	110.58
5	A	935	ADP	N3-C2-N1	-3.02	124.01	128.58
5	A	935	ADP	C4-N9-C8	2.69	108.56	105.74
5	A	935	ADP	C5-N7-C8	2.42	107.26	103.45
5	A	935	ADP	C3'-C2'-C1'	2.37	105.95	101.46

There are no chirality outliers.

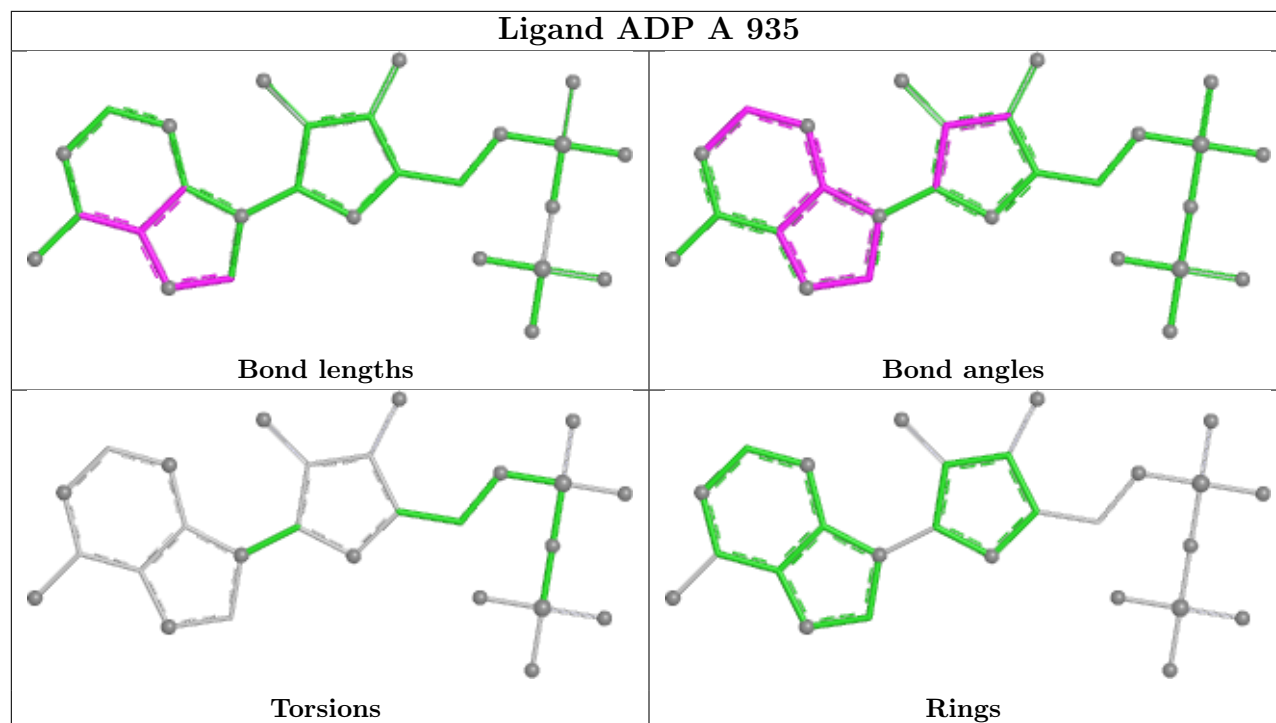
There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	935	ADP	1	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	883/934 (94%)	-0.00	19 (2%) 62 53	32, 83, 179, 343	5 (0%)
2	B	857/918 (93%)	-0.24	4 (0%) 87 83	25, 68, 133, 222	6 (0%)
3	D	21/24 (87%)	0.20	1 (4%) 35 28	67, 124, 266, 297	0
4	E	24/24 (100%)	0.02	0 100 100	58, 118, 196, 244	0
All	All	1785/1900 (93%)	-0.12	24 (1%) 75 67	25, 75, 162, 343	11 (0%)

All (24) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	529	GLU	4.5
1	A	436	PHE	4.0
1	A	527	CYS	3.7
1	A	855	GLN	3.2
1	A	547	ASN	2.9
2	B	341	LEU	2.9
1	A	432	LEU	2.7
1	A	144	SER	2.6
1	A	543	ASP	2.6
1	A	525	VAL	2.5
1	A	873	CYS	2.5
1	A	204	GLY	2.4
1	A	540	SER	2.4
1	A	552	THR	2.3
2	B	351	MET	2.3
2	B	347	VAL	2.3
1	A	71	GLY	2.3
1	A	551	PHE	2.2
1	A	205	GLU	2.2
3	D	3	DT	2.1
1	A	72	ALA	2.1

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Mol	Chain	Res	Type	RSRZ
2	B	338	LEU	2.0
1	A	68	GLY	2.0
1	A	648	ILE	2.0

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

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

## 6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

## 6.4 Ligands [i](#)

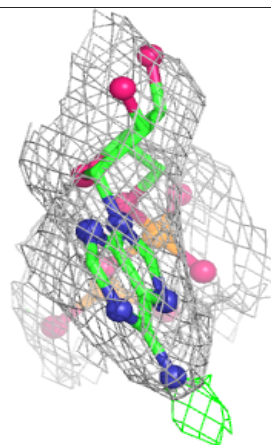
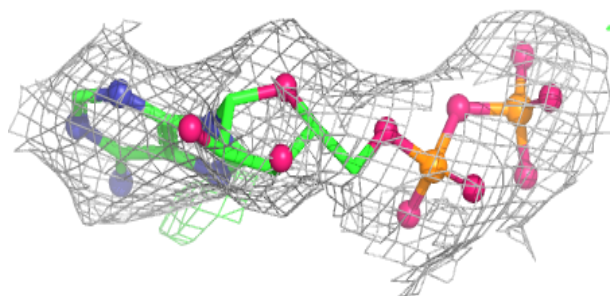
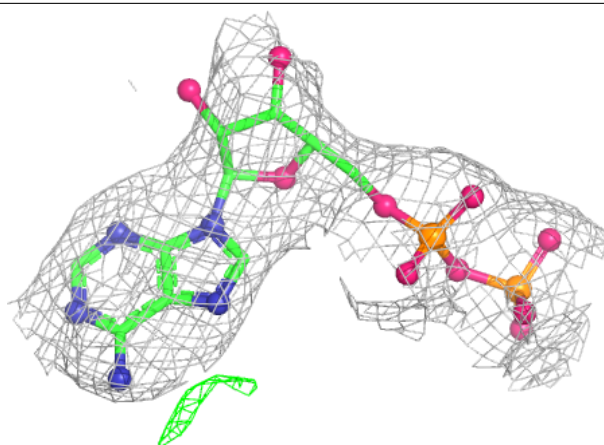
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 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
5	ADP	A	935	27/27	0.93	0.08	74,94,97,98	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 ADP A 935:**

$2mF_o - DF_c$  (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.