



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2023 – 01:57 AM EST

PDB ID : 1AYM  
Title : HUMAN RHINOVIRUS 16 COAT PROTEIN AT HIGH RESOLUTION  
Authors : Hadfield, A.T.; Rossmann, M.G.  
Deposited on : 1997-11-06  
Resolution : 2.15 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>.

---

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 : 2.32.1  
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) : 2.32.1

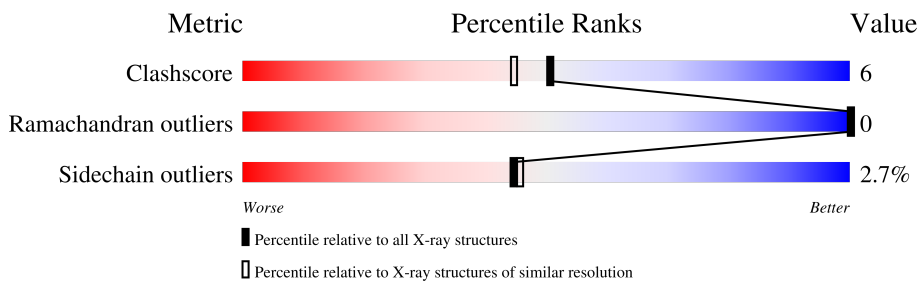
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.15 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	1585 (2.16-2.16)
Ramachandran outliers	138981	1560 (2.16-2.16)
Sidechain outliers	138945	1559 (2.16-2.16)

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  $\leq 5\%$

Mol	Chain	Length	Quality of chain
1	1	285	
2	2	261	
3	3	238	
4	4	68	

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
6	DAO	1	7009	-	-	X	-

## 2 Entry composition [i](#)

There are 8 unique types of molecules in this entry. The entry contains 6975 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 HUMAN RHINOVIRUS 16 COAT PROTEIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	1	285	2350	1479	407	451	13	0	9	0

- Molecule 2 is a protein called HUMAN RHINOVIRUS 16 COAT PROTEIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	2	252	1985	1256	344	375	10	0	1	0

- Molecule 3 is a protein called HUMAN RHINOVIRUS 16 COAT PROTEIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	3	238	1853	1192	299	347	15	0	1	0

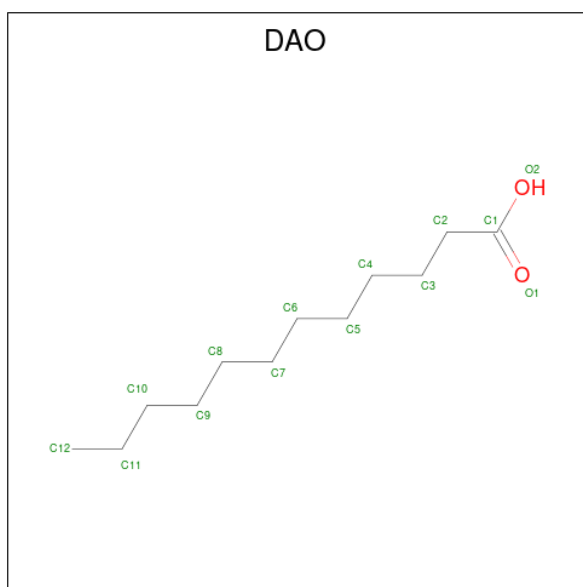
- Molecule 4 is a protein called HUMAN RHINOVIRUS 16 COAT PROTEIN.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
4	4	29	224	138	41	45	0	0	0

- Molecule 5 is ZINC ION (three-letter code: ZN) (formula: Zn).

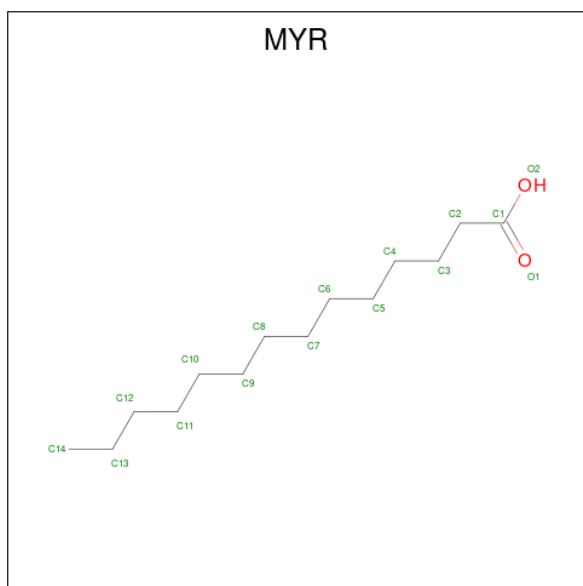
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Zn		
5	1	1	1	1	0	0

- Molecule 6 is LAURIC ACID (three-letter code: DAO) (formula: C<sub>12</sub>H<sub>24</sub>O<sub>2</sub>).



Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	1	1	Total	C O	0	0
			14	12 2		

- Molecule 7 is MYRISTIC ACID (three-letter code: MYR) (formula:  $C_{14}H_{28}O_2$ ).



Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	4	1	Total	C O	0	0
			15	14 1		

- Molecule 8 is water.

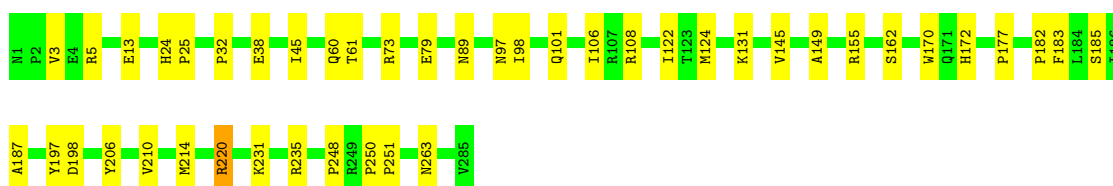
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	1	185	Total 185	O 185	0	0
8	2	187	Total 187	O 187	0	0
8	3	148	Total 148	O 148	0	0
8	4	13	Total 13	O 13	0	0

### 3 Residue-property plots [i](#)

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. 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.

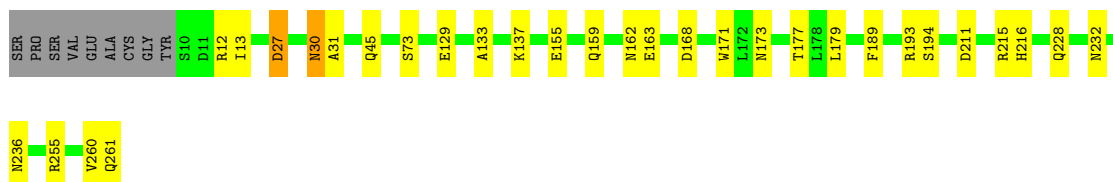
- Molecule 1: HUMAN RHINOVIRUS 16 COAT PROTEIN

Chain 1: 85% 15%



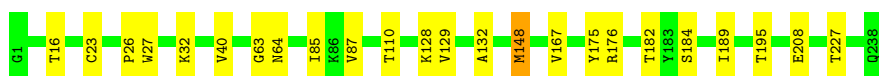
- Molecule 2: HUMAN RHINOVIRUS 16 COAT PROTEIN

Chain 2: 85% 11% . .



- Molecule 3: HUMAN RHINOVIRUS 16 COAT PROTEIN

Chain 3: 90% 10%



- Molecule 4: HUMAN RHINOVIRUS 16 COAT PROTEIN

Chain 4: 25% 16% . 57%



## 4 Data and refinement statistics i

Property	Value	Source
Space group	P 2 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	362.60Å 347.10Å 334.90Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	8.00 – 2.15 20.00 – 2.15	Depositor EDS
% Data completeness (in resolution range)	44.5 (8.00-2.15) 52.8 (20.00-2.15)	Depositor EDS
$R_{merge}$	0.10	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.10 (at 2.15Å)	Xtrriage
Refinement program	X-PLOR	Depositor
R, $R_{free}$	0.230 , 0.233 0.132 , (Not available)	Depositor DCC
$R_{free}$ test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	16.9	Xtrriage
Anisotropy	0.012	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.02 , 28.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.009 for -h,l,k	Xtrriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	6975	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	18.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 1.89% 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: DAO, ZN, MYR

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	1	0.39	0/2412	0.69	2/3290 (0.1%)
2	2	0.43	0/2037	0.72	0/2781
3	3	0.41	0/1905	0.70	1/2607 (0.0%)
4	4	0.58	0/226	1.15	2/301 (0.7%)
All	All	0.42	0/6580	0.72	5/8979 (0.1%)

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	1	5	ARG	NE-CZ-NH2	7.36	123.98	120.30
4	4	42	ARG	NE-CZ-NH2	7.33	123.96	120.30
4	4	6	ARG	NE-CZ-NH2	7.25	123.92	120.30
1	1	220	ARG	NE-CZ-NH2	6.94	123.77	120.30
3	3	148	MET	CG-SD-CE	5.34	108.74	100.20

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	1	2350	0	2261	33	0
2	2	1985	0	1923	23	0

*Continued on next page...*



*Continued from previous page...*

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	3	1853	0	1836	22	0
4	4	224	0	208	8	0
5	1	1	0	0	0	0
6	1	14	0	21	7	0
7	4	15	0	27	0	0
8	1	185	0	0	2	0
8	2	187	0	0	8	0
8	3	148	0	0	0	0
8	4	13	0	0	1	0
All	All	6975	0	6276	73	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 6.

All (73) 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)
3:3:85:ILE:HD11	3:3:189[B]:ILE:HD11	1.40	1.02
2:2:159:GLN:HG2	8:2:5493:HOH:O	1.61	1.01
3:3:167:VAL:HG21	3:3:189[A]:ILE:HD11	1.53	0.88
1:1:122:ILE:HG12	6:1:7009:DAO:H112	1.58	0.85
3:3:167:VAL:CG2	3:3:189[A]:ILE:HD11	2.09	0.83
3:3:85:ILE:CD1	3:3:189[B]:ILE:HD11	2.13	0.78
2:2:173:ASN:HD21	2:2:179:LEU:HA	1.52	0.75
1:1:98:ILE:HD13	6:1:7009:DAO:H123	1.67	0.74
3:3:87:VAL:HG23	3:3:189[B]:ILE:HG23	1.68	0.74
2:2:159:GLN:CG	8:2:5493:HOH:O	2.26	0.72
2:2:260:VAL:O	2:2:261:GLN:HB2	1.90	0.70
8:2:5515:HOH:O	3:3:208:GLU:HG3	1.95	0.66
1:1:24:HIS:HB3	1:1:25:PRO:HD2	1.77	0.65
1:1:98:ILE:CD1	6:1:7009:DAO:H123	2.26	0.65
3:3:87:VAL:CG2	3:3:189[B]:ILE:HG23	2.26	0.65
1:1:124:MET:HB2	1:1:177:PRO:HG2	1.80	0.64
2:2:12:ARG:HH11	2:2:12:ARG:HG3	1.63	0.63
1:1:13:GLU:HA	1:1:61:THR:HG21	1.81	0.63
2:2:13:ILE:HD11	8:2:5464:HOH:O	1.99	0.63
2:2:137:LYS:NZ	2:2:162:ASN:O	2.29	0.61
1:1:98:ILE:HG21	6:1:7009:DAO:H101	1.83	0.60
2:2:211:ASP:OD2	2:2:216:HIS:HD2	1.85	0.59
1:1:38:GLU:HA	2:2:189:PHE:HB2	1.84	0.59
2:2:215:ARG:NH1	8:2:5439:HOH:O	2.35	0.59

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:1:187:ALA:HA	8:1:5481:HOH:O	2.03	0.57
1:1:98:ILE:CG2	6:1:7009:DAO:H101	2.34	0.57
2:2:129:GLU:OE1	2:2:216:HIS:HE1	1.87	0.57
4:4:43:LEU:O	4:4:44:ASP:CB	2.52	0.57
1:1:60:GLN:HG3	3:3:175:TYR:OH	2.05	0.57
2:2:12:ARG:NH2	2:2:27:ASP:OD1	2.39	0.55
2:2:137:LYS:HD3	2:2:163:GLU:O	2.07	0.54
1:1:3:VAL:CG1	4:4:7:GLN:OE1	2.55	0.54
3:3:85:ILE:CG1	3:3:189[B]:ILE:HD11	2.37	0.54
1:1:79:GLU:HG2	1:1:235:ARG:HG2	1.91	0.52
4:4:1:GLY:O	4:4:29:ILE:HA	2.10	0.52
1:1:32:PRO:HB2	1:1:45:ILE:HD12	1.92	0.52
4:4:43:LEU:O	4:4:44:ASP:HB2	2.09	0.51
1:1:98:ILE:HD13	6:1:7009:DAO:C12	2.41	0.50
2:2:255:ARG:HH11	2:2:255:ARG:HG3	1.75	0.50
1:1:183:PHE:CZ	1:1:185:SER:HB3	2.48	0.49
8:2:5479:HOH:O	3:3:32:LYS:HE3	2.12	0.49
1:1:250:PRO:HB2	2:2:177:THR:HB	1.95	0.49
1:1:89:ASN:HD22	1:1:155:ARG:HD3	1.77	0.48
4:4:30:ASN:HB2	8:4:5587:HOH:O	2.12	0.48
1:1:263:ASN:HA	2:2:133:ALA:HB1	1.96	0.48
1:1:182:PRO:HD3	3:3:23:CYS:SG	2.53	0.48
2:2:155:GLU:HG3	8:2:5487:HOH:O	2.13	0.48
1:1:248:PRO:HD3	3:3:40:VAL:CG2	2.44	0.47
1:1:170:TRP:CD1	1:1:177:PRO:HD3	2.50	0.47
3:3:132:ALA:O	3:3:189[A]:ILE:HA	2.16	0.46
1:1:3:VAL:HB	4:4:7:GLN:OE1	2.17	0.45
2:2:73:SER:HB2	2:2:228:GLN:HE21	1.82	0.45
2:2:171:TRP:CE2	3:3:63:GLY:HA2	2.51	0.45
1:1:131:LYS:HD2	1:1:231:LYS:HB2	1.99	0.44
2:2:171:TRP:CD2	3:3:63:GLY:HA2	2.52	0.43
4:4:4:VAL:HA	4:4:26:TYR:O	2.18	0.43
4:4:4:VAL:HG22	4:4:27:PHE:CD1	2.53	0.43
8:2:5477:HOH:O	3:3:32:LYS:HD2	2.19	0.43
3:3:128:LYS:HB2	3:3:195:THR:OG1	2.19	0.43
2:2:12:ARG:HG3	2:2:12:ARG:NH1	2.33	0.42
2:2:30:ASN:ND2	2:2:31:ALA:H	2.17	0.42
1:1:101:GLN:NE2	8:1:5219:HOH:O	2.51	0.42
3:3:26:PRO:O	3:3:27:TRP:HB2	2.19	0.42
1:1:197:TYR:CE2	1:1:206:TYR:HB2	2.55	0.42
1:1:145:VAL:HG13	1:1:149:ALA:HB3	2.02	0.41

*Continued on next page...*

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:1:250:PRO:HA	1:1:251:PRO:HD3	1.94	0.41
1:1:108:ARG:NH1	3:3:227:THR:HG21	2.35	0.41
3:3:176:ARG:HG2	3:3:184:SER:HB2	2.02	0.41
1:1:198:ASP:HB3	1:1:210[A]:VAL:HG13	2.02	0.40
1:1:60:GLN:HG2	3:3:110:THR:HG21	2.04	0.40
1:1:73:ARG:HG2	3:3:16:THR:HG22	2.03	0.40
1:1:214[B]:MET:CE	6:1:7009:DAO:H81	2.49	0.40
2:2:173:ASN:ND2	2:2:179:LEU:HA	2.28	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	1	292/285 (102%)	285 (98%)	7 (2%)	0	100	100
2	2	251/261 (96%)	239 (95%)	12 (5%)	0	100	100
3	3	237/238 (100%)	229 (97%)	8 (3%)	0	100	100
4	4	25/68 (37%)	24 (96%)	1 (4%)	0	100	100
All	All	805/852 (94%)	777 (96%)	28 (4%)	0	100	100

There are no Ramachandran outliers to report.

### 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	1	264/256 (103%)	259 (98%)	5 (2%)	57	61
2	2	222/228 (97%)	214 (96%)	8 (4%)	35	33
3	3	211/210 (100%)	207 (98%)	4 (2%)	57	61
4	4	23/59 (39%)	21 (91%)	2 (9%)	10	6
All	All	720/753 (96%)	701 (97%)	19 (3%)	44	47

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	1	97	ASN
1	1	106	ILE
1	1	162	SER
1	1	172	HIS
1	1	220	ARG
2	2	27	ASP
2	2	30	ASN
2	2	45	GLN
2	2	168	ASP
2	2	193	ARG
2	2	194	SER
2	2	232	ASN
2	2	236	ASN
3	3	64	ASN
3	3	129	VAL
3	3	148	MET
3	3	182	THR
4	4	3	GLN
4	4	6	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	1	12	ASN
1	1	60	GLN
1	1	89	ASN
1	1	97	ASN
1	1	171	GLN
2	2	30	ASN
2	2	55	GLN
2	2	159	GLN

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type
2	2	173	ASN
2	2	216	HIS
2	2	232	ASN
3	3	174	GLN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

### 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

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

Of 3 ligands modelled in this entry, 1 is 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	$\# Z  > 2$
7	MYR	4	4000	4	14,14,15	0.41	0	13,13,15	0.61	0
6	DAO	1	7009	1	13,13,13	1.24	1 (7%)	13,13,13	0.76	0

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
7	MYR	4	4000	4	-	6/11/12/13	-
6	DAO	1	7009	1	-	6/11/11/11	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	1	7009	DAO	C2-C1	2.64	1.56	1.50

There are no bond angle outliers.

There are no chirality outliers.

All (12) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	1	7009	DAO	C1-C2-C3-C4
6	1	7009	DAO	C5-C6-C7-C8
6	1	7009	DAO	C6-C7-C8-C9
6	1	7009	DAO	C3-C4-C5-C6
7	4	4000	MYR	C4-C5-C6-C7
7	4	4000	MYR	C6-C7-C8-C9
7	4	4000	MYR	C11-C12-C13-C14
7	4	4000	MYR	C3-C4-C5-C6
7	4	4000	MYR	C9-C10-C11-C12
7	4	4000	MYR	C10-C11-C12-C13
6	1	7009	DAO	O2-C1-C2-C3
6	1	7009	DAO	O1-C1-C2-C3

There are no ring outliers.

1 monomer is involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	1	7009	DAO	7	0

## 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.