



wwPDB X-ray Structure Validation Summary Report i

Feb 27, 2014 – 12:38 PM GMT

PDB ID : 1I3R
Title : CRYSTAL STRUCTURE OF A MUTANT IEK CLASS II MHC MOLECULE
Authors : Kappler, J.W.; Wilson, N.
Deposited on : 2001-02-15
Resolution : 2.40 Å(reported)

This is a wwPDB validation summary report for a publicly released PDB entry.

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

A user guide is available at <http://wwpdb.org/ValidationPDFNotes.html>

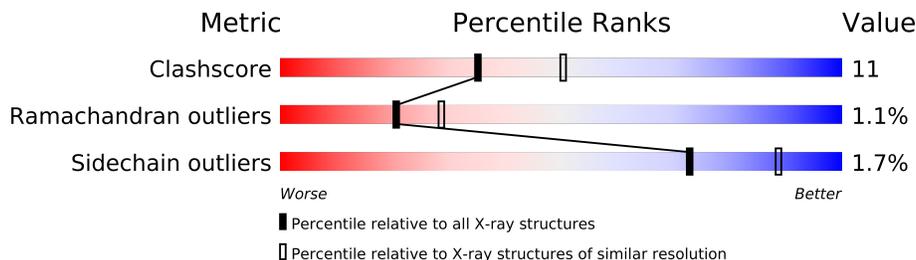
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.15 2013
Xtriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 21963
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : stable22683

1 Overall quality at a glance

The reported resolution of this entry is 2.40 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	79885	2789 (2.40-2.40)
Ramachandran outliers	78287	2736 (2.40-2.40)
Sidechain outliers	78261	2737 (2.40-2.40)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	192	
1	C	192	
1	E	192	
1	G	192	
2	B	228	
2	D	228	
2	F	228	
2	H	228	

2 Entry composition i

There are 6 unique types of molecules in this entry. The entry contains 13325 atoms, of which 0 are hydrogen and 0 are deuterium.

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 H-2 CLASS II HISTOCOMPATIBILITY ANTIGEN, E-K ALPHA CHAIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	182	1495	963	247	281	4	0	0	0
1	C	182	1491	961	247	279	4	0	0	0
1	E	182	1491	961	247	279	4	0	0	0
1	G	182	1491	961	247	279	4	0	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	11	GLN	GLU	engineered	UNP P04224
A	66	ASN	ASP	engineered	UNP P04224
C	11	GLN	GLU	engineered	UNP P04224
C	66	ASN	ASP	engineered	UNP P04224
E	11	GLN	GLU	engineered	UNP P04224
E	66	ASN	ASP	engineered	UNP P04224
G	11	GLN	GLU	engineered	UNP P04224
G	66	ASN	ASP	engineered	UNP P04224

- Molecule 2 is a protein called FUSION PROTEIN CONSISTING OF MHC E-BETA-K PRECURSOR, GLYCINE RICH LINKER, AND HEMOGLOBIN BETA-2 CHAIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	216	1701	1076	295	324	6	0	0	0
2	D	216	1711	1082	299	324	6	0	0	0
2	F	216	1701	1076	295	324	6	0	0	0

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	H	216	1701	1076	295	324	6	0	0	0

There are 76 discrepancies between the modelled and reference sequences:

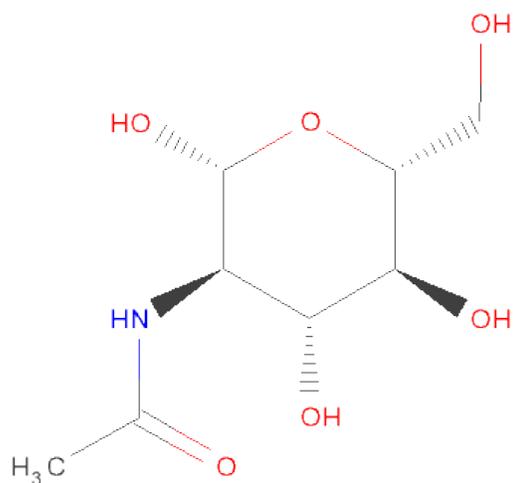
Chain	Residue	Modelled	Actual	Comment	Reference
B	-3	ARG	-	CLONING ARTIFACT	UNP P02089
B	-2	ASP	-	CLONING ARTIFACT	UNP P02089
B	-1	SER	-	CLONING ARTIFACT	UNP P02089
B	0	ARG	-	CLONING ARTIFACT	UNP P02089
B	14	GLY	-	linker	UNP P02089
B	15	GLY	-	linker	UNP P02089
B	16	GLY	-	linker	UNP P02089
B	17	GLY	-	linker	UNP P02089
B	18	SER	-	linker	UNP P02089
B	19	LEU	-	linker	UNP P02089
B	20	VAL	-	linker	UNP P02089
B	21	GLY	-	linker	UNP P02089
B	22	GLY	-	linker	UNP P02089
B	23	GLY	-	linker	UNP P02089
B	24	SER	-	linker	UNP P02089
B	25	GLY	-	linker	UNP P02089
B	26	GLY	-	linker	UNP P02089
B	27	GLY	-	linker	UNP P02089
B	28	GLY	-	linker	UNP P02089
D	-3	ARG	-	CLONING ARTIFACT	UNP P02089
D	-2	ASP	-	CLONING ARTIFACT	UNP P02089
D	-1	SER	-	CLONING ARTIFACT	UNP P02089
D	0	ARG	-	CLONING ARTIFACT	UNP P02089
D	14	GLY	-	linker	UNP P02089
D	15	GLY	-	linker	UNP P02089
D	16	GLY	-	linker	UNP P02089
D	17	GLY	-	linker	UNP P02089
D	18	SER	-	linker	UNP P02089
D	19	LEU	-	linker	UNP P02089
D	20	VAL	-	linker	UNP P02089
D	21	GLY	-	linker	UNP P02089
D	22	GLY	-	linker	UNP P02089
D	23	GLY	-	linker	UNP P02089
D	24	SER	-	linker	UNP P02089
D	25	GLY	-	linker	UNP P02089
D	26	GLY	-	linker	UNP P02089

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Chain	Residue	Modelled	Actual	Comment	Reference
D	27	GLY	-	linker	UNP P02089
D	28	GLY	-	linker	UNP P02089
F	-3	ARG	-	CLONING ARTIFACT	UNP P02089
F	-2	ASP	-	CLONING ARTIFACT	UNP P02089
F	-1	SER	-	CLONING ARTIFACT	UNP P02089
F	0	ARG	-	CLONING ARTIFACT	UNP P02089
F	14	GLY	-	linker	UNP P02089
F	15	GLY	-	linker	UNP P02089
F	16	GLY	-	linker	UNP P02089
F	17	GLY	-	linker	UNP P02089
F	18	SER	-	linker	UNP P02089
F	19	LEU	-	linker	UNP P02089
F	20	VAL	-	linker	UNP P02089
F	21	GLY	-	linker	UNP P02089
F	22	GLY	-	linker	UNP P02089
F	23	GLY	-	linker	UNP P02089
F	24	SER	-	linker	UNP P02089
F	25	GLY	-	linker	UNP P02089
F	26	GLY	-	linker	UNP P02089
F	27	GLY	-	linker	UNP P02089
F	28	GLY	-	linker	UNP P02089
H	-3	ARG	-	CLONING ARTIFACT	UNP P02089
H	-2	ASP	-	CLONING ARTIFACT	UNP P02089
H	-1	SER	-	CLONING ARTIFACT	UNP P02089
H	0	ARG	-	CLONING ARTIFACT	UNP P02089
H	14	GLY	-	linker	UNP P02089
H	15	GLY	-	linker	UNP P02089
H	16	GLY	-	linker	UNP P02089
H	17	GLY	-	linker	UNP P02089
H	18	SER	-	linker	UNP P02089
H	19	LEU	-	linker	UNP P02089
H	20	VAL	-	linker	UNP P02089
H	21	GLY	-	linker	UNP P02089
H	22	GLY	-	linker	UNP P02089
H	23	GLY	-	linker	UNP P02089
H	24	SER	-	linker	UNP P02089
H	25	GLY	-	linker	UNP P02089
H	26	GLY	-	linker	UNP P02089
H	27	GLY	-	linker	UNP P02089
H	28	GLY	-	linker	UNP P02089

- Molecule 3 is SUGAR (N-ACETYL-D-GLUCOSAMINE) (three-letter code: NAG) (formula: C₈H₁₅NO₆).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
3	A	1	14	8	1	5	0	0
3	B	1	14	8	1	5	0	0
3	C	1	14	8	1	5	0	0
3	E	1	14	8	1	5	0	0
3	F	1	14	8	1	5	0	0
3	G	1	14	8	1	5	0	0
3	H	1	14	8	1	5	0	0

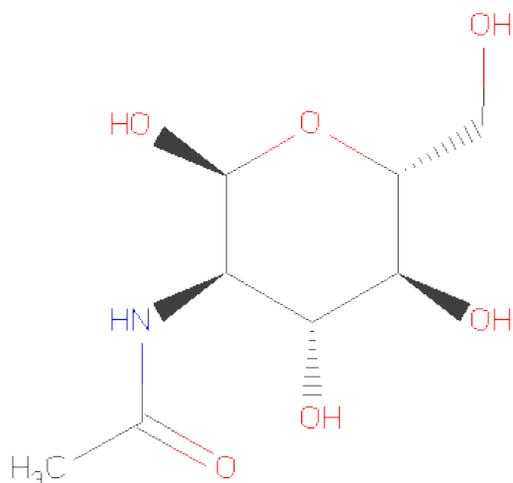
- Molecule 4 is a polymer of unknown type called SUGAR (NAG-NAG).

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
4	A	2	28	16	2	10	0	0
4	C	2	28	16	2	10	0	0
4	E	2	28	16	2	10	0	0
4	G	2	28	16	2	10	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	11	GLN	GLU	engineered	UNP P04224
A	66	ASN	ASP	engineered	UNP P04224
C	11	GLN	GLU	engineered	UNP P04224
C	66	ASN	ASP	engineered	UNP P04224
E	11	GLN	GLU	engineered	UNP P04224
E	66	ASN	ASP	engineered	UNP P04224
G	11	GLN	GLU	engineered	UNP P04224
G	66	ASN	ASP	engineered	UNP P04224

- Molecule 5 is SUGAR (2-(ACETYLAMINO)-2-DEOXY-A-D-GLUCOPYRANOSE) (three-letter code: NDG) (formula: C₈H₁₅NO₆).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
5	D	1	14	8	1	5	0	0

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	42	Total	O	0	0
			42	42		
6	B	31	Total	O	0	0
			31	31		
6	C	46	Total	O	0	0
			46	46		
6	D	35	Total	O	0	0
			35	35		

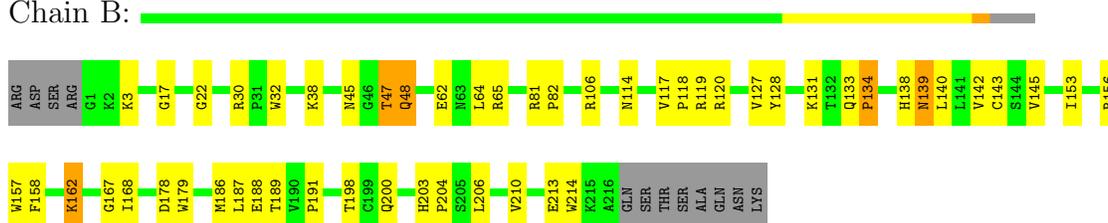
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	E	35	Total 35	O 35	0	0
6	F	41	Total 41	O 41	0	0
6	G	58	Total 58	O 58	0	0
6	H	31	Total 31	O 31	0	0

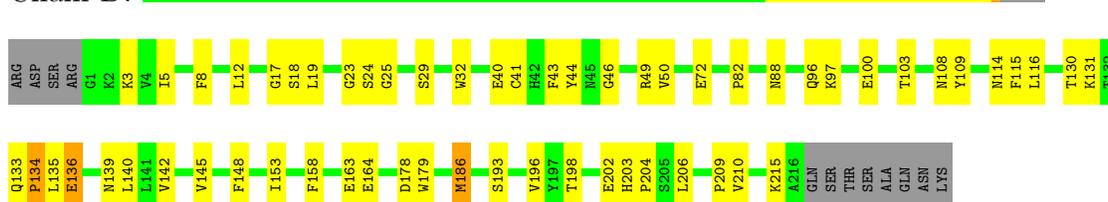
- Molecule 2: FUSION PROTEIN CONSISTING OF MHC E-BETA-K PRECURSOR, GLYCINE RICH LINKER, AND HEMOGLOBIN BETA-2 CHAIN

Chain B:



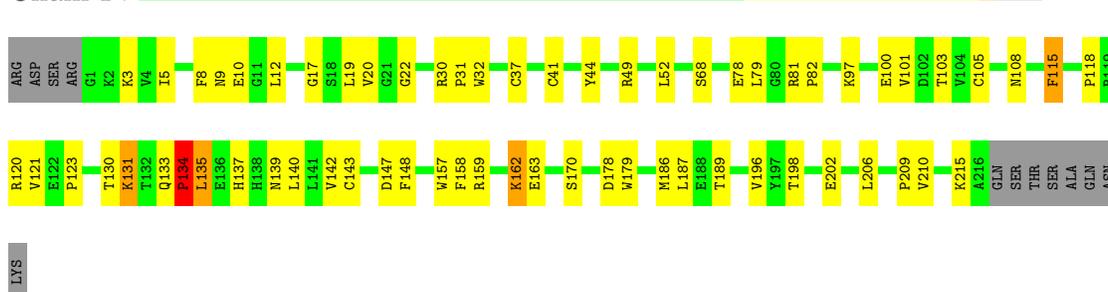
- Molecule 2: FUSION PROTEIN CONSISTING OF MHC E-BETA-K PRECURSOR, GLYCINE RICH LINKER, AND HEMOGLOBIN BETA-2 CHAIN

Chain D:



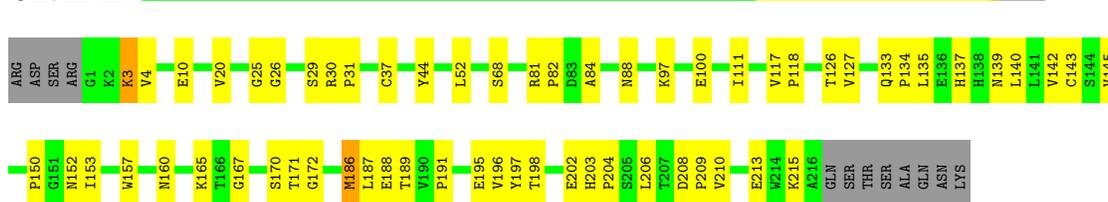
- Molecule 2: FUSION PROTEIN CONSISTING OF MHC E-BETA-K PRECURSOR, GLYCINE RICH LINKER, AND HEMOGLOBIN BETA-2 CHAIN

Chain F:



- Molecule 2: FUSION PROTEIN CONSISTING OF MHC E-BETA-K PRECURSOR, GLYCINE RICH LINKER, AND HEMOGLOBIN BETA-2 CHAIN

Chain H:



4 Data and refinement statistics

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

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	117.06Å 58.02Å 143.22Å 90.00° 93.24° 90.00°	Depositor
Resolution (Å)	25.00 – 2.40	Depositor
% Data completeness (in resolution range)	96.9 (25.00-2.40)	Depositor
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	CNS 0.9	Depositor
R, R_{free}	0.229 , 0.270	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	13325	wwPDB-VP
Average B, all atoms (Å ²)	51.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

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

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	0.39	0/1538	0.62	0/2091
1	C	0.40	0/1534	0.61	0/2086
1	E	0.41	0/1534	0.63	0/2086
1	G	0.43	0/1534	0.65	0/2086
2	B	0.36	0/1743	0.61	1/2368 (0.0%)
2	D	0.37	0/1755	0.61	1/2384 (0.0%)
2	F	0.38	0/1743	0.63	1/2368 (0.0%)
2	H	0.37	0/1743	0.61	1/2368 (0.0%)
All	All	0.39	0/13124	0.62	4/17837 (0.0%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	H	134	PRO	N-CA-CB	5.71	110.15	103.30
2	B	134	PRO	N-CA-CB	5.57	109.99	103.30
2	F	134	PRO	N-CA-CB	5.42	109.81	103.30
2	D	134	PRO	N-CA-CB	5.38	109.76	103.30

There are no chirality outliers.

There are no planarity outliers.

5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the

chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1495	0	1421	30	0
1	C	1491	0	1417	33	0
1	E	1491	0	1417	32	0
1	G	1491	0	1417	23	0
2	B	1701	0	1602	38	0
2	D	1711	0	1613	38	0
2	F	1701	0	1603	40	0
2	H	1701	0	1603	44	0
3	A	14	0	13	0	0
3	B	14	0	13	0	0
3	C	14	0	13	0	0
3	E	14	0	13	0	0
3	F	14	0	13	0	0
3	G	14	0	13	0	0
3	H	14	0	13	1	0
4	A	28	0	25	5	0
4	C	28	0	25	2	0
4	E	28	0	25	1	0
4	G	28	0	25	2	0
5	D	14	0	13	0	0
6	A	42	0	0	0	0
6	B	31	0	0	0	0
6	C	46	0	0	1	0
6	D	35	0	0	0	0
6	E	35	0	0	2	0
6	F	41	0	0	0	0
6	G	58	0	0	1	0
6	H	31	0	0	0	0
All	All	13325	0	12297	267	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 11.

The worst 5 of 267 close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
2:F:196:VAL:HG22	2:F:215:LYS:HG2	1.56	0.86
2:F:78:GLU:OE1	2:H:172:GLY:HA3	1.78	0.84
2:H:3:LYS:HE3	2:H:3:LYS:HA	1.62	0.82
1:A:2:LYS:H	1:A:2:LYS:HD2	1.44	0.81
2:B:3:LYS:HE3	2:B:114:ASN:HD21	1.46	0.81

There are no symmetry-related clashes.

5.3 Torsion angles

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	180/192 (94%)	174 (97%)	5 (3%)	1 (1%)	33	47
1	C	180/192 (94%)	170 (94%)	9 (5%)	1 (1%)	33	47
1	E	180/192 (94%)	168 (93%)	11 (6%)	1 (1%)	33	47
1	G	180/192 (94%)	171 (95%)	9 (5%)	0	100	100
2	B	214/228 (94%)	193 (90%)	17 (8%)	4 (2%)	12	14
2	D	214/228 (94%)	191 (89%)	18 (8%)	5 (2%)	10	10
2	F	214/228 (94%)	193 (90%)	16 (8%)	5 (2%)	10	10
2	H	214/228 (94%)	196 (92%)	17 (8%)	1 (0%)	38	53
All	All	1576/1680 (94%)	1456 (92%)	102 (6%)	18 (1%)	21	29

5 of 18 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	D	133	GLN
2	D	134	PRO
2	F	133	GLN
2	F	134	PRO
2	H	137	HIS

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	164/175 (94%)	163 (99%)	1 (1%)	92	98

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	C	163/175 (93%)	161 (99%)	2 (1%)	82	93
1	E	163/175 (93%)	160 (98%)	3 (2%)	71	88
1	G	163/175 (93%)	158 (97%)	5 (3%)	52	74
2	B	181/200 (90%)	178 (98%)	3 (2%)	73	89
2	D	183/200 (92%)	180 (98%)	3 (2%)	75	89
2	F	181/200 (90%)	177 (98%)	4 (2%)	64	83
2	H	181/200 (90%)	179 (99%)	2 (1%)	84	94
All	All	1379/1500 (92%)	1356 (98%)	23 (2%)	73	89

5 of 23 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	116	VAL
2	F	115	PHE
2	H	3	LYS
1	E	159	ASP
2	F	139	ASN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 25 such sidechains are listed below:

Mol	Chain	Res	Type
2	D	114	ASN
1	E	57	GLN
2	H	96	GLN
2	D	137	HIS
1	E	149	HIS

5.3.3 RNA ⓘ

There are no RNA chains 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 i

8 carbohydrates are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the chemical component dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# $ Z > 2$	Counts	RMSZ	# $ Z > 2$
4	NAG	A	302	1,4	12,14,15	0.55	0	15,19,21	0.93	0
4	NAG	A	303	4	12,14,15	0.48	0	15,19,21	0.70	0
4	NAG	C	306	1,4	12,14,15	0.46	0	15,19,21	0.61	0
4	NAG	C	307	4	12,14,15	0.43	0	15,19,21	0.51	0
4	NAG	E	310	1,4	12,14,15	0.44	0	15,19,21	0.64	0
4	NAG	E	311	4	12,14,15	0.54	0	15,19,21	0.78	0
4	NAG	G	314	1,4	12,14,15	0.46	0	15,19,21	0.87	0
4	NAG	G	315	4	12,14,15	0.42	0	15,19,21	0.72	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
4	NAG	A	302	1,4	-	0/6/23/26	0/1/1/1
4	NAG	A	303	4	-	0/6/23/26	0/1/1/1
4	NAG	C	306	1,4	-	0/6/23/26	0/1/1/1
4	NAG	C	307	4	-	0/6/23/26	0/1/1/1
4	NAG	E	310	1,4	-	0/6/23/26	0/1/1/1
4	NAG	E	311	4	-	0/6/23/26	0/1/1/1
4	NAG	G	314	1,4	-	0/6/23/26	0/1/1/1
4	NAG	G	315	4	-	0/6/23/26	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

5.6 Ligand geometry (i)

8 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the chemical component dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	NAG	A	301	1	12,14,15	0.51	0	15,19,21	0.77	0
3	NAG	B	304	2	12,14,15	0.39	0	15,19,21	0.81	0
3	NAG	C	305	1	12,14,15	0.44	0	15,19,21	0.73	0
5	NDG	D	308	2	12,14,15	0.50	0	15,19,21	0.76	0
3	NAG	E	309	1	12,14,15	0.41	0	15,19,21	0.75	0
3	NAG	F	312	2	12,14,15	0.52	0	15,19,21	0.72	0
3	NAG	G	313	1	12,14,15	0.42	0	15,19,21	0.75	0
3	NAG	H	316	2	12,14,15	0.47	0	15,19,21	0.67	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
3	NAG	A	301	1	-	0/6/23/26	0/1/1/1
3	NAG	B	304	2	-	0/6/23/26	0/1/1/1
3	NAG	C	305	1	-	0/6/23/26	0/1/1/1
5	NDG	D	308	2	-	0/6/23/26	0/1/1/1
3	NAG	E	309	1	-	0/6/23/26	0/1/1/1
3	NAG	F	312	2	-	0/6/23/26	0/1/1/1
3	NAG	G	313	1	-	0/6/23/26	0/1/1/1
3	NAG	H	316	2	-	0/6/23/26	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

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

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

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

6.3 Carbohydrates

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

6.4 Ligands

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

6.5 Other polymers

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