Full wwPDB X-ray Structure Validation Report (i)

Mar 10, 2024 – 06:43 AM EDT

PDB ID	:	4N0I
Title	:	Crystal structure of S. cerevisiae mitochondrial GatFAB in complex with glutamine
Authors	:	Araiso, Y.; Ishitani, R.; Nureki, O.
Deposited on	:	2013-10-02
Resolution	:	2.00 Å(reported)

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

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the (i) 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 (i)) were used in the production of this report:

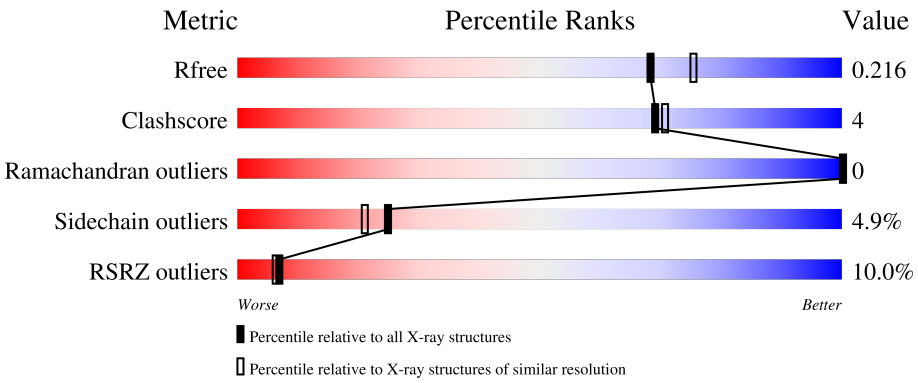
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA,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

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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	8085 (2.00-2.00)
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RSRZ outliers	127900	7900 (2.00-2.00)

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 >=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 <=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	464	3%, 87%, 8%
2	B	325	22%, 76%, 10%, 12%
3	F	160	70%, 6%, 22%

2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 6933 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 Glutamyl-tRNA(Gln) amidotransferase subunit A, mitochondrial.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	450	3439	2202	571	653	13	0	5	0

- Molecule 2 is a protein called Glutamyl-tRNA(Gln) amidotransferase subunit B, mitochondrial.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	285	2199	1397	376	420	6	0	0	0

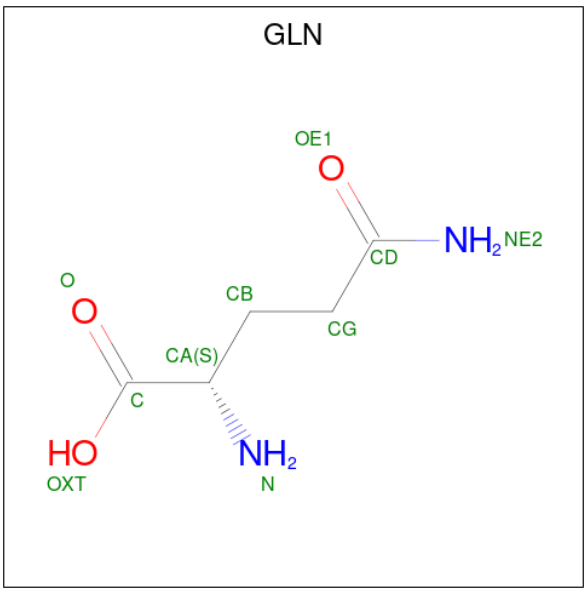
There are 11 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	330	LEU	-	expression tag	UNP P33893
B	331	GLU	-	expression tag	UNP P33893
B	332	SER	-	expression tag	UNP P33893
B	333	SER	-	expression tag	UNP P33893
B	334	GLY	-	expression tag	UNP P33893
B	335	GLU	-	expression tag	UNP P33893
B	336	ASN	-	expression tag	UNP P33893
B	337	LEU	-	expression tag	UNP P33893
B	338	TYR	-	expression tag	UNP P33893
B	339	PHE	-	expression tag	UNP P33893
B	340	GLN	-	expression tag	UNP P33893

- Molecule 3 is a protein called Glutamyl-tRNA(Gln) amidotransferase subunit F, mitochondrial.

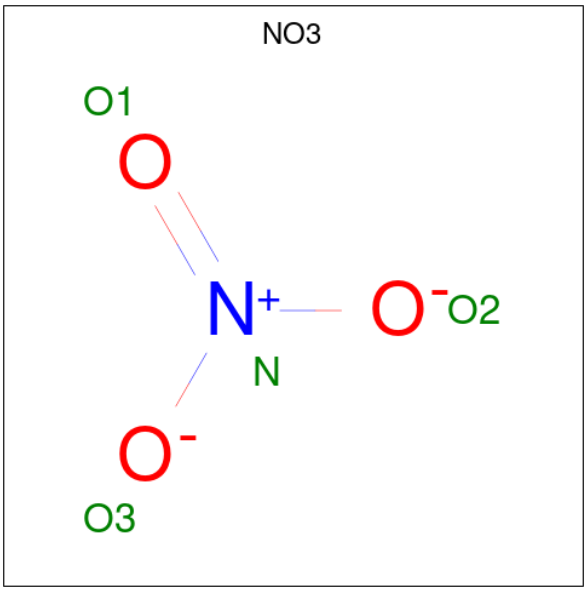
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	F	125	955	611	167	176	1	0	0	0

- Molecule 4 is GLUTAMINE (three-letter code: GLN) (formula: $C_5H_{10}N_2O_3$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
4	A	1	9	5	1	3	0	0

- Molecule 5 is NITRATE ION (three-letter code: NO3) (formula: NO_3).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	N	O			
5	A	1	4	1	3		0	0

- Molecule 6 is water.

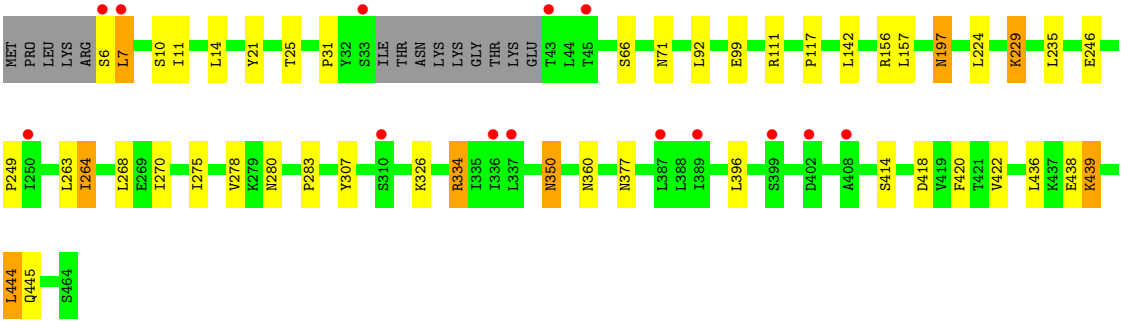
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
6	A	218	218	218	0	0
			Total	O		
6	B	54	54	54	0	0
			Total	O		
6	F	55	55	55	0	0

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 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.

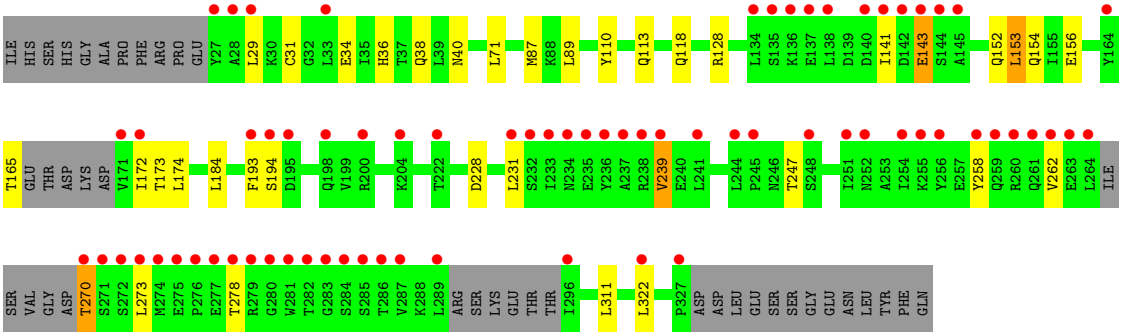
• Molecule 1: Glutamyl-tRNA(Gln) amidotransferase subunit A, mitochondrial

Chain A:



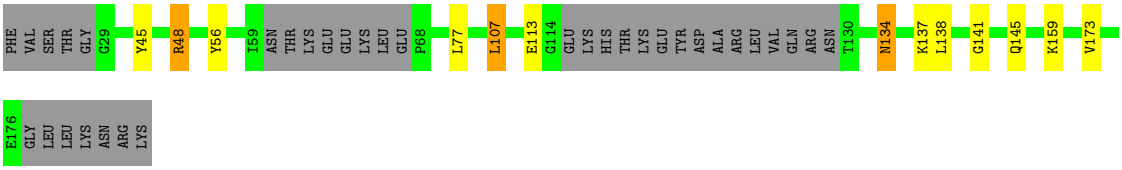
• Molecule 2: Glutamyl-tRNA(Gln) amidotransferase subunit B, mitochondrial

Chain B:



• Molecule 3: Glutamyl-tRNA(Gln) amidotransferase subunit F, mitochondrial

Chain F:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	62.44Å 85.43Å 194.78Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	26.46 – 2.00 26.46 – 2.00	Depositor EDS
% Data completeness (in resolution range)	96.9 (26.46-2.00) 96.9 (26.46-2.00)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	4.88 (at 1.99Å)	Xtriage
Refinement program	PHENIX 1.7.2_869	Depositor
R, R_{free}	0.189 , 0.219 0.184 , 0.216	Depositor DCC
R_{free} test set	3448 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å^2)	30.3	Xtriage
Anisotropy	0.175	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 57.6	EDS
L-test for twinning[2]	$< \|L\| > = 0.46$, $< L^2 > = 0.29$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	6933	wwPDB-VP
Average B, all atoms (Å^2)	50.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.90% of the height of the origin peak. No significant pseudotranslation is detected.*

[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ 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: NO3

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	0.35	0/3518	0.55	0/4772
2	B	0.31	0/2241	0.52	0/3048
3	F	0.30	0/971	0.49	0/1308
All	All	0.33	0/6730	0.53	0/9128

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	3439	0	3445	28	0
2	B	2199	0	2147	17	0
3	F	955	0	951	8	0
4	A	9	0	5	1	0
5	A	4	0	0	0	0
6	A	218	0	0	3	0
6	B	54	0	0	1	0
6	F	55	0	0	0	0
All	All	6933	0	6548	49	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 4.

All (49) 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:334:ARG:NH2	4:A:501:GLN:OXT	2.15	0.79
1:A:436:LEU:HD21	1:A:444:LEU:HD22	1.73	0.70
2:B:270:THR:O	2:B:270:THR:OG1	2.12	0.68
1:A:418:ASP:OD2	6:A:684:HOH:O	2.15	0.62
2:B:152:GLN:OE1	2:B:154:GLN:NE2	2.32	0.62
1:A:249:PRO:HB3	1:A:396:LEU:HG	1.83	0.60
1:A:377:ASN:ND2	6:A:779:HOH:O	2.33	0.60
3:F:134:ASN:ND2	3:F:137:LYS:H	2.01	0.59
1:A:283:PRO:HB2	3:F:107:LEU:HD13	1.87	0.57
1:A:229:LYS:NZ	6:A:773:HOH:O	2.39	0.55
1:A:263:LEU:HB3	1:A:268:LEU:HD11	1.88	0.55
2:B:31:CYS:HB3	2:B:193:PHE:HB2	1.89	0.54
2:B:89:LEU:HD23	2:B:153:LEU:HD21	1.92	0.52
2:B:128:ARG:NH2	6:B:429:HOH:O	2.37	0.52
1:A:307:TYR:CE2	1:A:326:LYS:HG3	2.45	0.52
2:B:113:GLN:NE2	2:B:118:GLN:HB2	2.24	0.52
2:B:29:LEU:O	2:B:194:SER:HA	2.11	0.50
1:A:7:LEU:O	1:A:11:ILE:HG12	2.12	0.50
1:A:264:ILE:HG13	1:A:270:ILE:HD12	1.93	0.49
1:A:275:ILE:O	1:A:278:VAL:HG22	2.13	0.49
2:B:113:GLN:HE22	2:B:118:GLN:HB2	1.78	0.48
1:A:438:GLU:HG2	1:A:439:LYS:HD3	1.96	0.48
1:A:156:ARG:HH11	1:A:445:GLN:HE22	1.63	0.47
1:A:66:SER:HB2	1:A:99:GLU:HG3	1.96	0.47
1:A:156:ARG:HH11	1:A:445:GLN:NE2	2.13	0.46
1:A:350:ASN:HD22	1:A:350:ASN:HA	1.58	0.46
3:F:45:TYR:HA	3:F:48:ARG:HD3	1.97	0.46
2:B:87:MET:HE2	2:B:311:LEU:HD13	1.98	0.46
2:B:165:THR:O	2:B:165:THR:OG1	2.34	0.45
1:A:21:TYR:CE1	1:A:117:PRO:HA	2.52	0.45
1:A:197[B]:ASN:ND2	1:A:197[B]:ASN:H	2.14	0.45
2:B:34:GLU:HB2	2:B:228:ASP:HB2	2.00	0.44
2:B:38:GLN:HA	2:B:184:LEU:HD23	2.00	0.43
2:B:231:LEU:HD12	2:B:239:VAL:HG13	2.01	0.43
3:F:141:GLY:O	3:F:145:GLN:HG3	2.18	0.43
1:A:156:ARG:HD2	1:A:445:GLN:HE21	1.83	0.43
2:B:174:LEU:HD23	3:F:173:VAL:HG12	2.00	0.43
1:A:11:ILE:HD12	1:A:31:PRO:HG2	2.01	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:246:GLU:HG3	1:A:420:PHE:CZ	2.53	0.43
2:B:141:ILE:HG22	2:B:143:GLU:H	1.84	0.42
1:A:280:ASN:ND2	3:F:56:TYR:OH	2.45	0.42
1:A:360:ASN:HD21	3:F:113:GLU:H	1.67	0.42
1:A:418:ASP:HB3	1:A:422:VAL:HG13	2.02	0.42
3:F:134:ASN:HD21	3:F:137:LYS:HG2	1.84	0.42
1:A:25:THR:O	1:A:111:ARG:NH1	2.45	0.41
2:B:36:HIS:HD2	2:B:156:GLU:OE1	2.03	0.41
1:A:156:ARG:HD2	1:A:445:GLN:NE2	2.36	0.41
2:B:258:TYR:O	2:B:262:VAL:HG23	2.21	0.40
1:A:6:SER:O	1:A:10:SER:N	2.51	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	451/464 (97%)	444 (98%)	7 (2%)	0	100	100
2	B	277/325 (85%)	275 (99%)	2 (1%)	0	100	100
3	F	119/160 (74%)	117 (98%)	2 (2%)	0	100	100
All	All	847/949 (89%)	836 (99%)	11 (1%)	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	A	384/407 (94%)	367 (96%)	17 (4%)	28	25
2	B	238/292 (82%)	225 (94%)	13 (6%)	21	17
3	F	97/137 (71%)	91 (94%)	6 (6%)	18	13
All	All	719/836 (86%)	683 (95%)	36 (5%)	25	20

All (36) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	7	LEU
1	A	14	LEU
1	A	71	ASN
1	A	92	LEU
1	A	142	LEU
1	A	157	LEU
1	A	197[A]	ASN
1	A	197[B]	ASN
1	A	224	LEU
1	A	229	LYS
1	A	235	LEU
1	A	264	ILE
1	A	334	ARG
1	A	350	ASN
1	A	414	SER
1	A	439	LYS
1	A	444	LEU
2	B	40	ASN
2	B	71	LEU
2	B	110	TYR
2	B	143	GLU
2	B	153	LEU
2	B	172	ILE
2	B	173	THR
2	B	239	VAL
2	B	247	THR
2	B	270	THR
2	B	273	LEU
2	B	278	THR
2	B	322	LEU
3	F	48	ARG
3	F	77	LEU

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Mol	Chain	Res	Type
3	F	107	LEU
3	F	134	ASN
3	F	138	LEU
3	F	159	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (14) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	265	ASN
1	A	280	ASN
1	A	350	ASN
1	A	360	ASN
1	A	377	ASN
1	A	445	GLN
2	B	36	HIS
2	B	40	ASN
2	B	113	GLN
2	B	118	GLN
2	B	152	GLN
2	B	154	GLN
2	B	261	GLN
3	F	134	ASN

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.

5.6 Ligand geometry (i)

2 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
5	NO3	A	502	-	1,3,3	3.70	1 (100%)	0,3,3	-	-
4	GLN	A	501	-	7,8,9	0.94	1 (14%)	7,9,11	1.16	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	GLN	A	501	-	-	0/7/8/9	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	502	NO3	O1-N	3.70	1.41	1.24
4	A	501	GLN	OXT-C	-2.03	1.23	1.30

There are no bond angle outliers.

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
4	A	501	GLN	1	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)

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, 95th 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^2)	Q<0.9
1	A	450/464 (96%)	-0.07	14 (3%) 49 48	20, 36, 65, 105	0
2	B	285/325 (87%)	1.40	72 (25%) 0 0	26, 53, 166, 180	0
3	F	125/160 (78%)	-0.10	0 100 100	28, 46, 70, 85	0
All	All	860/949 (90%)	0.41	86 (10%) 7 6	20, 42, 134, 180	0

All (86) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	279	ARG	15.9
2	B	28	ALA	15.0
2	B	236	TYR	12.1
2	B	281	TRP	10.6
2	B	259	GLN	9.9
2	B	233	ILE	9.9
2	B	289	LEU	9.7
2	B	276	PRO	9.6
2	B	272	SER	9.5
2	B	256	TYR	8.9
2	B	27	TYR	8.2
2	B	258	TYR	8.1
2	B	262	VAL	8.1
2	B	263	GLU	8.0
2	B	280	GLY	7.9
2	B	231	LEU	7.8
2	B	274	MET	7.2
2	B	145	ALA	7.0
2	B	144	SER	7.0
2	B	278	THR	6.7
2	B	261	GLN	6.2
2	B	286	THR	6.2
2	B	141	ILE	6.2

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Mol	Chain	Res	Type	RSRZ
2	B	284	SER	6.0
2	B	198	GLN	6.0
2	B	138	LEU	5.8
2	B	239	VAL	5.7
2	B	29	LEU	5.6
2	B	171	VAL	5.6
2	B	273	LEU	5.5
2	B	140	ASP	5.4
2	B	237	ALA	5.4
2	B	234	ASN	5.3
2	B	135	SER	4.9
2	B	282	THR	4.8
1	A	43	THR	4.7
2	B	238	ARG	4.6
2	B	287	VAL	4.4
1	A	6	SER	4.4
2	B	137	GLU	4.4
2	B	248	SER	4.2
2	B	142	ASP	4.1
2	B	270	THR	4.1
2	B	235	GLU	3.9
2	B	164	TYR	3.7
2	B	271	SER	3.7
2	B	283	GLY	3.6
1	A	408	ALA	3.5
2	B	264	LEU	3.2
2	B	134	LEU	3.0
2	B	255	LYS	3.0
2	B	285	SER	3.0
2	B	254	ILE	2.9
2	B	33	LEU	2.9
2	B	241	LEU	2.8
2	B	193	PHE	2.8
2	B	322	LEU	2.8
2	B	252	ASN	2.7
2	B	260	ARG	2.7
2	B	245	PRO	2.7
2	B	232	SER	2.7
1	A	337	LEU	2.7
1	A	402	ASP	2.6
1	A	7	LEU	2.6
2	B	275	GLU	2.5

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Mol	Chain	Res	Type	RSRZ
2	B	277	GLU	2.5
2	B	172	ILE	2.5
1	A	387	LEU	2.4
1	A	45	THR	2.4
2	B	194	SER	2.4
2	B	200	ARG	2.4
2	B	195	ASP	2.4
2	B	143	GLU	2.3
2	B	327	PRO	2.3
1	A	389	ILE	2.3
2	B	251	ILE	2.3
2	B	244	LEU	2.2
2	B	136	LYS	2.2
1	A	310	SER	2.2
1	A	250	ILE	2.1
1	A	336	ILE	2.1
2	B	204	LYS	2.1
2	B	222	THR	2.1
1	A	33	SER	2.0
1	A	399	SER	2.0
2	B	296	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 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, 95th 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^2)	Q<0.9
4	GLN	A	501	9/10	0.96	0.09	33,40,47,48	0
5	NO3	A	502	4/4	0.98	0.11	36,37,38,43	0

6.5 Other polymers (i)

There are no such residues in this entry.