wwPDB X-ray Structure Validation Summary Report (i)

Feb 1, 2016 – 08:23 AM GMT

PDB ID	:	3EG5
Title	:	Crystal structure of MDIA1-TSH GBD-FH3 in complex with CDC42-GMPPNP
Authors	:	Lammers, M.; Meyer, S.; Kuehlmann, D.; Wittinghofer, A.
Deposited on	:	2008-09-10
Resolution	:	2.70 Å(reported)

This is a wwPDB X-ray Structure 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/validation/2016/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

The following versions of software and data (see references (1)) were used in the production of this report:

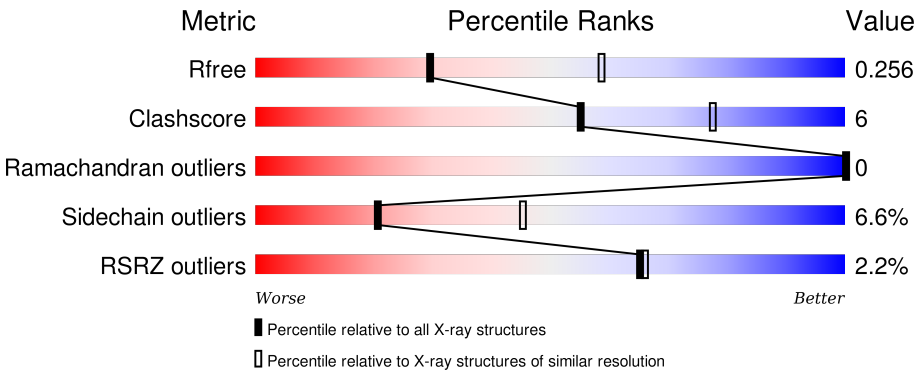
MolProbity	:	4.02b-467
Mogul	:	1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix)	:	1.9-1692
EDS	:	rb-20026688
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac	:	5.8.0135
CCP4	:	6.5.0
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	trunk26865

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 2.70 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}	91344	2103 (2.70-2.70)
Clashscore	102246	2422 (2.70-2.70)
Ramachandran outliers	100387	2382 (2.70-2.70)
Sidechain outliers	100360	2382 (2.70-2.70)
RSRZ outliers	91569	2107 (2.70-2.70)

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. 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	178	% 83% 17% •
1	C	178	% 86% 13% •
2	B	383	3% 69% 17% • 12%
2	D	383	3% 69% 17% • 12%

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 8341 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 Cell division control protein 42 homolog.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	178	1391	893	223	268	7	0	0	0
1	C	178	1391	893	223	268	7	0	0	0

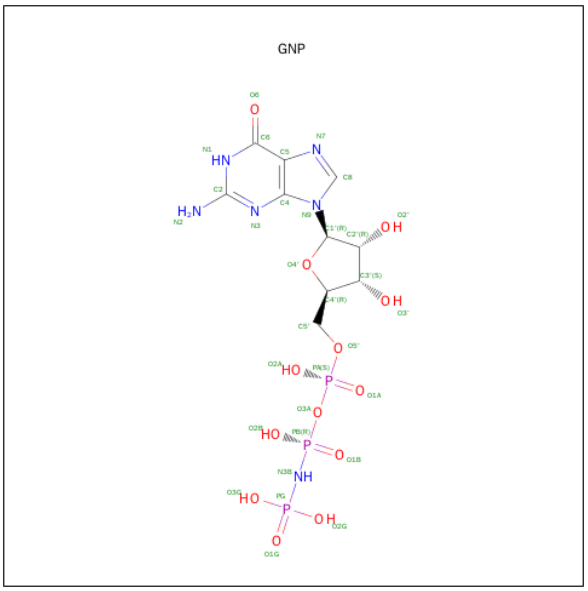
- Molecule 2 is a protein called Protein diaphanous homolog 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	337	2723	1718	466	515	24	0	0	0
2	D	337	2723	1718	466	515	24	0	0	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	164	THR	ASN	ENGINEERED	UNP O08808
B	165	SER	ASN	ENGINEERED	UNP O08808
B	166	HIS	ASN	ENGINEERED	UNP O08808
D	164	THR	ASN	ENGINEERED	UNP O08808
D	165	SER	ASN	ENGINEERED	UNP O08808
D	166	HIS	ASN	ENGINEERED	UNP O08808

- Molecule 3 is PHOSPHOAMINOPHOSPHONIC ACID-GUANYLATE ESTER (three-letter code: GNP) (formula: $C_{10}H_{17}N_6O_{13}P_3$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
3	A	1	32	10	6	13	3	0	0
3	C	1	32	10	6	13	3	0	0

- Molecule 4 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Mg		
4	A	1	1	1	0	0
4	C	1	1	1	0	0

- Molecule 5 is water.

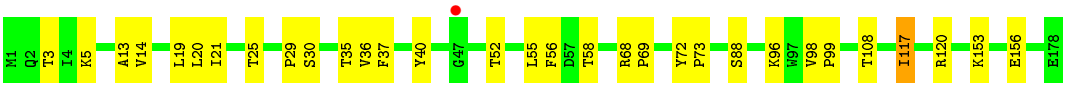
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
5	A	15	15	15	0	0
5	B	7	7	7	0	0
5	C	15	15	15	0	0
5	D	10	10	10	0	0

3 Residue-property plots (i)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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: Cell division control protein 42 homolog

Chain A:

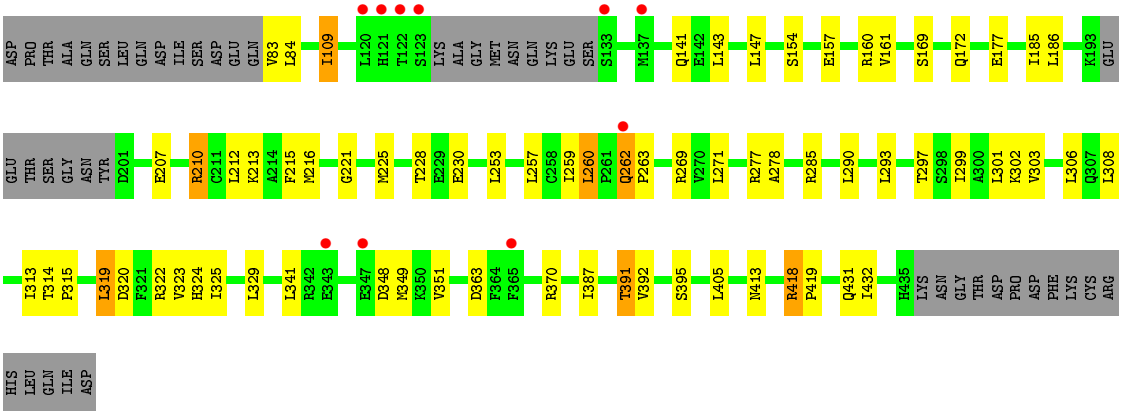


- Molecule 1: Cell division control protein 42 homolog

Chain C:

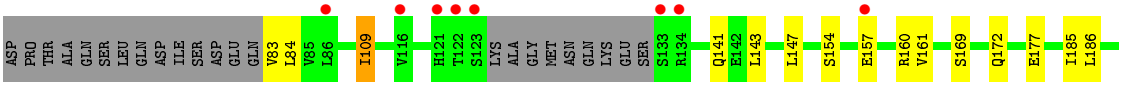
- Molecule 2: Protein diaphanous homolog 1

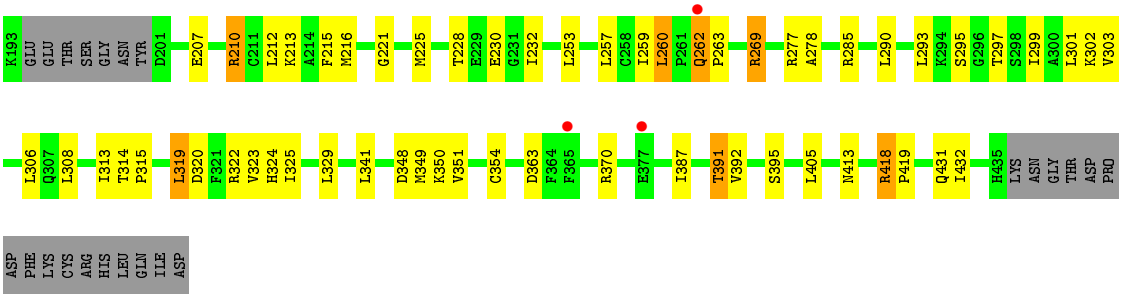
Chain B:



- Molecule 2: Protein diaphanous homolog 1

Chain D:




K193
GLU
GLU
THR
SER
GLY
ASN
TYR
D201
E207
R210
C211
L212
K213
A214
F215
M216
G221
M225
T228
E229
E230
G231
I232
L253
L257
C258
I259
L260
P261
Q262
P263
R269
R277
A278
R285
L290
L293
K294
S295
G296
T297
S298
I299
A300
L301
K302
V303
L306
Q307
L308
I313
T314
P315
L319
D320
F321
R322
V323
H324
I325
L329
L341
D348
M349
K350
V351
C354
D363
F364
F365
R370
E377
I387
T391
V392
S395
L405
N413
R418
P419
Q431
I432
H435
LYS
ASN
GLY
THR
ASP
PRO
ASP
PHE
LYS
CYS
ARG
HIS
LEU
GLN
ILE
ASP

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 32	Depositor
Cell constants a, b, c, α, β, γ	71.27Å 71.27Å 244.96Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	43.47 – 2.70 43.47 – 2.70	Depositor EDS
% Data completeness (in resolution range)	99.5 (43.47-2.70) 99.5 (43.47-2.70)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	0.08	Depositor
$< I/\sigma(I) >$ [1]	2.79 (at 2.69Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.206 , 0.243 0.224 , 0.256	Depositor DCC
R_{free} test set	1908 reflections (5.28%)	DCC
Wilson B-factor (Å^2)	50.7	Xtriage
Anisotropy	0.155	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 16.6	EDS
Estimated twinning fraction	0.048 for -h,-k,l 0.470 for h,-h-k,-l 0.049 for -k,-h,-l	Xtriage
L-test for twinning[2]	$< \|L\| > = 0.45$, $< L^2 > = 0.27$	Xtriage
Outliers	0 of 38038 reflections	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	8341	wwPDB-VP
Average B, all atoms (Å^2)	53.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.74% 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, 0.375 respectively for untwinned datasets, and 0.333, 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: GNP, MG

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	0.42	0/1421	0.57	1/1933 (0.1%)
1	C	0.42	0/1421	0.57	1/1933 (0.1%)
2	B	0.39	0/2759	0.52	1/3711 (0.0%)
2	D	0.38	0/2759	0.52	1/3711 (0.0%)
All	All	0.40	0/8360	0.54	4/11288 (0.0%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	319	LEU	CA-CB-CG	5.53	128.01	115.30
2	D	319	LEU	CA-CB-CG	5.33	127.56	115.30
1	A	19	LEU	CA-CB-CG	5.08	126.98	115.30
1	C	19	LEU	CA-CB-CG	5.02	126.84	115.30

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	1391	0	1403	16	0
1	C	1391	0	1403	13	0
2	B	2723	0	2760	39	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	D	2723	0	2760	41	0
3	A	32	0	13	2	0
3	C	32	0	13	2	0
4	A	1	0	0	0	0
4	C	1	0	0	0	0
5	A	15	0	0	1	0
5	B	7	0	0	0	0
5	C	15	0	0	1	0
5	D	10	0	0	0	0
All	All	8341	0	8352	105	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.

The worst 5 of 105 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)
2:B:432:ILE:HD11	2:D:432:ILE:HD11	1.37	1.04
2:B:262:GLN:HG3	2:B:263:PRO:HD3	1.60	0.83
2:D:262:GLN:HG3	2:D:263:PRO:HD3	1.61	0.82
2:B:432:ILE:CD1	2:D:432:ILE:HD11	2.12	0.80
2:B:432:ILE:HD11	2:D:432:ILE:CD1	2.13	0.75

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	176/178 (99%)	172 (98%)	4 (2%)	0	100	100
1	C	176/178 (99%)	172 (98%)	4 (2%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	B	331/383 (86%)	327 (99%)	4 (1%)	0	100	100
2	D	331/383 (86%)	327 (99%)	4 (1%)	0	100	100
All	All	1014/1122 (90%)	998 (98%)	16 (2%)	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	158/158 (100%)	150 (95%)	8 (5%)	29	59
1	C	158/158 (100%)	150 (95%)	8 (5%)	29	59
2	B	309/350 (88%)	286 (93%)	23 (7%)	17	39
2	D	309/350 (88%)	286 (93%)	23 (7%)	17	39
All	All	934/1016 (92%)	872 (93%)	62 (7%)	21	45

5 of 62 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	405	LEU
1	C	35	THR
2	D	329	LEU
1	C	14	VAL
1	C	108	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
2	B	324	HIS
2	D	324	HIS

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates (i)

There are no carbohydrates in this entry.

5.6 Ligand geometry (i)

Of 4 ligands modelled in this entry, 2 are monoatomic - leaving 2 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
3	GNP	A	179	4	28,34,34	1.76	6 (21%)	33,54,54	2.34	6 (18%)
3	GNP	C	179	4	28,34,34	1.73	6 (21%)	33,54,54	2.39	6 (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
3	GNP	A	179	4	-	1/12/38/38	0/3/3/3
3	GNP	C	179	4	-	1/12/38/38	0/3/3/3

The worst 5 of 12 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	179	GNP	PB-O3A	-4.47	1.53	1.59

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	179	GNP	PB-O3A	-4.41	1.53	1.59
3	C	179	GNP	PB-O2B	-3.01	1.48	1.56
3	A	179	GNP	PB-O2B	-2.98	1.48	1.56
3	A	179	GNP	C8-N7	-2.14	1.30	1.34

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	C	179	GNP	C5-C6-N1	-8.57	111.87	123.59
3	A	179	GNP	C5-C6-N1	-8.47	112.01	123.59
3	C	179	GNP	O3G-PG-O1G	-3.83	103.30	113.49
3	A	179	GNP	O3G-PG-O1G	-3.60	103.91	113.49
3	A	179	GNP	O1G-PG-N3B	-2.32	108.34	111.90

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	C	179	GNP	O1B-PB-N3B-PG
3	A	179	GNP	O1B-PB-N3B-PG

There are no ring outliers.

2 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	179	GNP	2	0
3	C	179	GNP	2	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	178/178 (100%)	0.44	1 (0%)	90	91	40, 48, 57, 59	0
1	C	178/178 (100%)	0.37	1 (0%)	90	91	40, 48, 57, 59	0
2	B	337/383 (87%)	0.45	10 (2%)	54	54	41, 54, 73, 83	0
2	D	337/383 (87%)	0.44	11 (3%)	50	50	41, 54, 73, 83	0
All	All	1030/1122 (91%)	0.43	23 (2%)	65	66	40, 51, 69, 83	0

The worst 5 of 23 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	133	SER	5.7
2	B	122	THR	5.2
2	D	122	THR	4.4
2	B	123	SER	4.3
2	D	121	HIS	4.1

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

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

6.3 Carbohydrates (i)

There are no carbohydrates 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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	LLDF	B-factors(Å^2)	Q<0.9
3	GNP	C	179	32/32	0.98	0.17	-0.70	36,46,48,49	0
3	GNP	A	179	32/32	0.98	0.17	-0.93	36,46,48,50	0
4	MG	C	180	1/1	0.97	0.14	-2.24	41,41,41,41	0
4	MG	A	180	1/1	0.96	0.14	-2.58	45,45,45,45	0

6.5 Other polymers (i)

There are no such residues in this entry.