

# ISO/IEC 30193:2020-03 (E)

## Information technology - Digitally recorded media for information interchange and storage - 120 mm Triple Layer (100,0 Gbytes per disk) BD Rewritable disk

---

<b>Contents</b>		<b>Page</b>
Foreword .....		ix
Introduction .....		x
1	Scope .....	1
2	Normative references .....	1
3	Terms and definitions .....	1
4	Symbols and abbreviated terms .....	6
5	Conformance .....	9
5.1	Optical disk .....	9
5.2	Generating system .....	9
5.3	Receiving system .....	9
5.4	Compatibility statement .....	9
6	Conventions and notations .....	9
6.1	Levels of grouping .....	9
6.2	Representation of numbers .....	10
6.3	Integer calculus .....	11
7	General description of disk .....	11
8	General requirements .....	12
8.1	Environments .....	12
8.1.1	Test environment .....	12
8.1.2	Operating environment .....	13
8.1.3	Storage environment .....	14
8.1.4	Transportation .....	15
8.2	Safety requirements .....	15
8.3	Flammability .....	16
9	Reference drive .....	16
9.1	General .....	16
9.2	Measurement conditions .....	16
9.3	Optical system .....	16
9.4	Optical beam .....	17
9.5	HF read channel .....	18
9.6	Radial PP read channel .....	18
9.7	Disk clamping .....	18
9.8	Rotation of disk and measurement velocity .....	19
9.9	Normalized servo transfer function .....	19
9.10	Measurement velocities and reference servos for axial tracking .....	20
9.10.1	General .....	20
9.10.2	Reference servo for axial tracking for 1x measurement velocity .....	20
9.10.3	reference servo for axial tracking for 2x measurement velocity .....	21
9.11	Measurement velocities and reference servos for radial tracking .....	22
9.11.1	General .....	22
9.11.2	Reference servo for radial tracking for 1x measurement velocity .....	22

9.11.3	Reference servo for radial tracking for 2x measurement velocity .....	24
10	Dimensional characteristics .....	25
10.1	General .....	25
10.2	Disk reference planes and reference axis .....	25
10.3	Overall dimensions .....	27
10.4	First transition area .....	27
10.5	Protection ring .....	27
10.6	Clamping zone .....	27
10.7	Second transition area .....	28
10.8	Information area .....	28
10.8.1	General .....	28
10.8.2	Subdivision of information zone on TL disk .....	29
10.9	Rim area .....	30
11	Mechanical characteristics .....	30
11.1	Mass .....	30
11.2	Moment of inertia .....	30
11.3	Dynamic imbalance .....	30
11.4	Axial runout .....	30
11.4.1	General .....	30
11.4.2	Residual axial tracking error for 1x measurement velocity .....	31
11.4.3	Residual axial tracking error for 2x measurement velocity .....	31
11.5	Radial runout .....	31
11.5.1	General .....	31
11.5.2	Residual radial tracking error for 1x measurement velocity .....	32
11.5.3	Residual radial tracking error for 2x measurement velocity .....	32
11.6	Durability of cover layer .....	32
11.6.1	Impact resistance of cover layer .....	32
11.6.2	Scratch resistance of cover layer .....	33
11.6.3	Repulsion of fingerprints by cover layer .....	33
12	Optical characteristics in information area .....	33
12.1	General .....	33
12.2	Refractive index of transmission stacks (TS) .....	33
12.3	Thickness of transmission stacks (TS) .....	33
12.4	Example of target thickness of spacer layers for TL disks .....	34
12.5	Reflectivity of recording layers .....	35
12.6	Birefringence .....	36
12.7	Angular deviation .....	36
13	Data format .....	37
13.1	General .....	37
13.2	Data frame .....	40
13.3	Error-detection code (EDC) .....	40
13.4	Scrambled data frame .....	41
13.5	Data block .....	42
13.6	LDC block .....	42
13.7	LDC code-words .....	43
13.8	LDC cluster .....	44
13.8.1	General .....	44
13.8.2	First interleaving step .....	44
13.8.3	Second interleaving step .....	44
13.9	Addressing and control data .....	46
13.9.1	General .....	46
13.9.2	Address units .....	46
13.9.3	User-control data .....	51
13.9.4	Byte/Bit assignment for user-control data .....	52
13.10	Access block .....	54
13.11	BIS block .....	54
13.12	BIS code-words .....	55

13.13	BIS cluster .....	56
13.14	ECC cluster .....	59
13.15	Recording frames .....	60
13.16	Physical cluster .....	61
13.17	17PP modulation for recordable data .....	61
13.17.1	General .....	61
13.17.2	Bit conversion rules .....	61
13.17.3	dc-control procedure .....	62
13.17.4	Frame sync .....	62
13.18	Modulation and NRZI conversion .....	64
14	Physical data allocating and linking .....	64
14.1	General .....	64
14.2	Recording-unit block (RUB) .....	64
14.2.1	General .....	64
14.2.2	Data run-in .....	65
14.2.3	Data run-out .....	66
14.2.4	Guard_3 field .....	67
14.3	Locating data relative to wobble addresses .....	67
14.3.1	General .....	67
14.3.2	Start-position shift (SPS) .....	67
15	Track format .....	69
15.1	General .....	69
15.2	Track shape .....	69
15.3	Track path .....	71
15.4	Track pitch .....	71
15.4.1	Track pitch in BCA zone .....	71
15.4.2	Track pitch in embossed HFM areas .....	71
15.4.3	Track pitch in rewritable areas .....	71
15.4.4	Track pitch between embossed HFM area and rewritable area .....	72
15.5	Track layout of HFM grooves .....	72
15.5.1	General .....	72
15.5.2	Data format .....	72
15.5.3	Addressing and control data .....	73
15.5.4	Recording frames .....	76
15.6	Track layout of wobbled grooves .....	78
15.6.1	General .....	78
15.6.2	Modulation of wobbles .....	79
15.6.3	Wobble polarity .....	80
15.7	ADIP information .....	80
15.7.1	General .....	80
15.7.2	ADIP-unit types .....	81
15.7.3	ADIP word structure .....	82
15.7.4	ADIP data structure .....	83
15.7.5	ADIP error correction .....	86
15.8	Disk information in ADIP aux frame .....	88
15.8.1	General .....	88
15.8.2	Error protection for disk information aux frames .....	89
15.8.3	Disk-Information data structure .....	90
16	General description of information zone .....	139
16.1	General .....	139
16.2	Format of information zone .....	140
17	Layout of rewritable area of information zone .....	140
18	Inner zone .....	144
18.1	General .....	144
18.2	Permanent information and control data (PIC) zone .....	148
18.2.1	General .....	148
18.2.2	Content of PIC zone .....	148

18.2.3	Emergency brake .....	149
18.3	Rewritable area of inner zone(s) .....	151
18.3.1	Protection-zone 2 .....	151
18.3.2	Buffer .....	151
18.3.3	INFO 2/Reserved 8 .....	151
18.3.4	INFO 2/Reserved 7 .....	152
18.3.5	INFO 2/Reserved 6 .....	152
18.3.6	INFO 2/Reserved 5 .....	152
18.3.7	INFO 2/PAC 2 .....	152
18.3.8	INFO 2/Reserved .....	152
18.3.9	INFO 2/DMA 2 .....	152
18.3.10	INFO 2/Control data 2 .....	152
18.3.11	INFO 2/Buffer 2 .....	152
18.3.12	OPC/Test zone .....	153
18.3.13	Reserved .....	153
18.3.14	INFO 1/Buffer 1 .....	153
18.3.15	INFO 1/Drive area (optional) .....	153
18.3.16	INFO 1/Reserved 3 .....	154
18.3.17	INFO 1/Reserved 2 .....	154
18.3.18	INFO 1/Reserved 1 .....	154
18.3.19	INFO 1/DMA 1 .....	154
18.3.20	INFO 1/Control Data 1 .....	154
18.3.21	INFO 1/PAC 1 .....	154
18.3.22	INFO 1/Reserved .....	154
19	Data zone .....	155
20	Outer zone(s) .....	155
20.1	General .....	155
20.2	INFO 3/Buffer 3 .....	155
20.3	INFO 3/DMA 3 .....	156
20.4	INFO 3/Control data 3 .....	156
20.5	Angular buffer .....	156
20.6	INFO 4/DMA 4 .....	156
20.7	INFO 4/Control data 4 .....	156
20.8	INFO 4/Buffer 4 .....	156
20.9	DCZ 0/Test zone, DCZ 1/Test zone and DCZ 2/Test zone .....	156
20.10	Protection-zone 3 .....	156
21	Physical-access control clusters .....	156
21.1	General .....	156
21.2	Layout of PAC zones .....	157
21.3	General structure of PAC clusters .....	157
21.4	Primary PAC cluster (mandatory) .....	162
21.5	Disk write-protect PAC cluster (optional) .....	165
21.6	IS1 and IS2 PAC clusters .....	169
22	Disk management .....	170
22.1	General .....	170
22.2	Disk-management structure (DMS) .....	171
22.2.1	General .....	171
22.2.2	Disk-definition structure (DDS) .....	172
22.2.3	Defect list (DFL) .....	176
23	Assignment of logical-sector numbers (LSNs) .....	181
24	Characteristics of grooved areas .....	182
25	Method of testing for grooved area .....	182
25.1	General .....	182
25.2	Environment .....	182
25.3	Reference drive .....	182

25.3.1	General .....	182
25.3.2	Read power .....	182
25.3.3	Read channels .....	182
25.3.4	Tracking requirements .....	183
25.3.5	Scanning velocities .....	183
25.4	Definition of signals .....	183
26	Signals from HFM grooves .....	184
26.1	Push-pull polarity .....	184
26.2	Push-pull signal .....	184
26.3	Wobble signal .....	185
26.4	Jitter of HFM signal .....	185
27	Signals from wobbled grooves .....	185
27.1	Phase depth .....	185
27.2	Push-pull signal .....	185
27.3	Wobble signal .....	186
27.3.1	General .....	186
27.3.2	Measurement of NWS .....	186
27.3.3	Measurement of the wobble CNR .....	186
27.3.4	Measurement of harmonic distortion of wobble .....	186
28	Characteristics of recording layer .....	187
29	Method of testing for recording layer .....	187
29.1	General .....	187
29.2	Environment .....	187
29.3	Reference drive .....	187
29.3.1	General .....	187
29.3.2	Read power .....	187
29.3.3	Read channels .....	187
29.3.4	Tracking requirements .....	187
29.3.5	Scanning velocities .....	188
29.4	Write conditions .....	188
29.4.1	Write-pulse waveform .....	188
29.4.2	Write powers .....	188
29.4.3	Average power .....	189
29.4.4	Write conditions for i-MLSE measurement .....	189
29.4.5	Write conditions for cross-erase measurements .....	189
29.5	Definition of signals .....	189
30	Signals from recorded areas .....	189
30.1	HF signals .....	189
30.2	Modulated amplitude .....	189
30.3	Reflectivity-modulation product .....	191
30.4	Asymmetry .....	191
30.5	i-MLSE@DOW(n) .....	191
30.6	Cross-erase @ DOW(n)XE .....	191
30.7	Read stability .....	192
31	Local defects .....	193
32	Characteristics of user data .....	193
33	Method of testing for user data .....	193
33.1	General .....	193
33.2	Environment .....	193
33.3	Reference drive .....	193
33.3.1	General .....	193
33.3.2	Read power .....	193
33.3.3	Read channels .....	193
33.3.4	Error correction .....	194

33.3.5	Tracking requirements .....	194
33.3.6	Scanning velocities .....	194
33.4	Definition of signals .....	194
34	Minimum quality of recorded information .....	195
34.1	General .....	195
34.2	Random symbol error rate .....	195
34.3	Maximum burst errors .....	195
34.4	User-written data .....	195
35	Burst-cutting area (BCA) .....	195
Annex A (normative) Thickness of transmission stacks in case of multiple layers .....		197
Annex B (normative) Measurement of reflectivity .....		200
Annex C (normative) Measurement of scratch resistance of cover layer .....		206
Annex D (normative) Measurement of repulsion of grime by cover layer .....		208
Annex E (normative) Measurement of wobble amplitude .....		211
Annex F (normative) Write-pulse waveform for testing .....		216
Annex G (normative) Optimum power control (OPC) procedure for disk .....		223
Annex H (normative) HF signal pre-processing for integrated-maximum likelihood sequence error estimation (i-MLSE) measurements .....		226
Annex I (normative) Measurement procedures .....		238
Annex J (informative) Measurement of birefringence .....		250
Annex K (informative) Measurement of thickness of cover layer and spacer layer .....		253
Annex L (informative) Measurement of impact resistance of cover layer .....		256
Annex M (informative) Groove deviation and wobble amplitude .....		258
Annex N (informative) Guidelines for write pulse adjustment using L-SEAT edge-shift .....		260
Bibliography .....		269