

## Sharing of computing resources according to the modified PhD fraction (August 30, 2024)

The estimate of the computing resource levels (CRL) needed by the Belle II collaboration in the years from 2025 to 2028, as presented to the BPAC, is summarized in Table 1.

	2025	2026	2027	2028
Total tape (PB)	11.8	15	20.4	25.9
Total disk (PB)	19.4	25.3	30.3	37.7
Total CPU (kHS06)	247	492	547	643

Table 1: The resource estimate for years 2025 to 2028. CPU needs drop in 2025 due to the reduced rate of data reprocessing and MC production. The storage units are PB =  $10^{15}$  Bytes.

For JFY 2025, we propose to pledge an amount of tape, storage and CPU equal to the CRL estimated for 2025, as shown in Table 2.

	2019	2020	2021	2022	2023	2024	2025
Total tape (PB)	10	1.4	3.2	8.8	8.6	9.6	11.8
Total disk (PB)	11	11	11	16.5	19.6	25	19.4
Total CPU (kHS06)	299	207	498	385	404	520	247

Table 2: CRL pledged for JFY for 2019 through 2024 and the proposal for 2025.

Each country participating to the Belle II collaboration is expected to provide a fraction of the total computing resources necessary for Monte Carlo production, skimming and analysis equal to its PhD fraction. However, some countries with small Belle II groups are unable to provide sufficient resources. Their expected contributions are therefore removed. The following tables show the amount of resources that each country should provide.

Resource requirements for individual countries were also adjusted to take into account reported concerns from these countries. The assessment for Germany is adjusted to avoid a drop in resources in 2025 which would complicate resource management at those facilities. Based on reporting from Chinese representatives, computing resource funding depends on a new five-year plan, which is not expected to be in place in the near term. The resources to be provided by China have been reduced accordingly. Russian contributions are also reduced, reflecting the inability to complete an MoU between Russia and KEK for Belle II M&O funding.

The Belle II Computing Steering Group encourages contributions to Data Production Expert shifts from these countries to offset their reduced contributions to physical computing resources.

Site	2025	2026	2027	2028
BNL	0.30	0.30	0.30	0.30
CNAF	0.20	0.20	0.20	0.20
IN2P3	0.15	0.15	0.15	0.15
UVic	0.15	0.15	0.15	0.15
GridKa	0.10	0.10	0.10	0.10
DESY	0.10	0.10	0.10	0.10

Table 3: Sharing of the copy of raw data (%).

The following tables give the size of planned to be pledged (JFY 2025-2028) Computing Resource Levels of the sites participating in the Belle II distributed computing effort.

Armenia	2025	2026	2027	2028
Tape (PB)	0	0	0	0
Disk (PB)	0	0	0	0
CPU (kHS06)	0	0	0	0
Resource share	0	0	0	0
Australia	2025	2026	2027	2028
Tape (PB)	0	0	0	0
Disk (PB)	0.25	0.36	0.44	0.56
CPU (kHS06)	3.09	6.85	7.73	8.9
PhD share	1.5	1.63	1.69	1.7
Austria	2025	2026	2027	2028
Tape (PB)	0	0	0	0
Disk (PB)	0.3	0.43	0.53	0.67
CPU (kHS06)	3.61	7.99	9.02	10.38
PhD share	1.76	1.91	1.98	1.98
Canada	2025	2026	2027	2028
Tape (PB)	0.53	0.77	1.18	1.58
Disk (PB)	0.66	0.93	1.18	1.46
CPU (kHS06)	8.5	21.8	25.03	31.94
PhD share	3.51	3.81	3.95	3.96
China	2025	2026	2027	2028
Tape (PB)	0	0	0	0
Disk (PB)	0.25	0.25	0.25	0.25
CPU (kHS06)	13.56	14.6	15.08	15.12
PhD share	1.43	1.09	0.93	0.74
Czech	2025	2026	2027	2028
Tape (PB)	0	0	0	0
Disk (PB)	0.17	0.25	0.3	0.38
CPU (kHS06)	2.06	4.56	5.16	5.93
PhD share	1	1.09	1.13	1.13
France	2025	2026	2027	2028
Tape (PB)	0.53	0.77	1.18	1.58
Disk (PB)	0.79	1.12	1.41	1.75
CPU (kHS06)	10.05	25.22	28.9	36.39
PhD share	4.26	4.63	4.8	4.81

Germany	2025	2026	2027	2028
DESY	2025	2026	2027	2028
Tape (PB)	0.36	0.52	0.79	1.06
Disk (PB)	2.04	2.04	2.1	2.64
CPU (kHS06)	24.8	40.65	38.91	46.73
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GridKa	2025	2026	2027	2028
Tape (PB)	0.36	0.52	0.79	1.06
Disk (PB)	2.04	2.04	2.1	2.64
CPU (kHS06)	24.8	40.65	38.91	46.73
MPI	2025	2026	2027	2028
Tape (PB)	0	0	0	0
Disk (PB)	0.26	0.26	0.27	0.34
CPU (kHS06)	3.17	5.19	4.97	5.97
PhD share	24.83	18.8	16.09	16.12
India	2025	2026	2027	2028
Tape (PB)	0	0	0	0
Disk (PB)	0.69	0.98	1.21	1.53
CPU (kHS06)	8.25	18.25	20.62	23.72
PhD share	4.01	4.36	4.52	4.52
Israel	2025	2026	2027	2028
Tape (PB)	0	0	0	0
Disk (PB)	0	0	0	0
CPU (kHS06)	0	0	0	0
PhD share	0	0	0	0
Italy	2025	2026	2027	2028
Tape (PB)	0.71	1.03	1.57	2.11
Disk (PB)	2.36	3.36	4.16	5.24
CPU (kHS06)	29.04	68.24	77.63	93.5
PhD share	13.29	14.44	14.96	14.99
KEK	2025	2026	2027	2028
Tape (PB)	5.92	7.5	10.21	12.93
Disk (PB)	5	6.79	8.47	10.3
CPU (kHS06)	58.77	109.78	129.04	144.15
PhD share	19.56	21.25	22.02	22.06
Korea	2025	2026	2027	2028
Tape (PB)	0	0	0	0
Disk (PB)	0.64	0.92	1.13	1.43
CPU (kHS06)	7.73	17.11	19.33	22.24
PhD share	3.76	4.09	4.23	4.24

Malaysia	2025	2026	2027	2028
Tape (PB)	0	0	0	0
Disk (PB)	0	0	0	0
CPU (kHS06)	0	0	0	0
Resource share	0	0	0	0
Mexico	2025	2026	2027	2028
Tape (PB)	0	0	0	0
Disk (PB)	0.26	0.37	0.45	0.57
CPU (kHS06)	3.09	6.85	7.73	8.9
PhD share	1.5	1.63	1.69	1.7
Poland	2025	2026	2027	2028
Tape (PB)	0	0	0	0
Disk (PB)	0.13	0.18	0.23	0.29
CPU (kHS06)	1.55	3.42	3.87	4.45
PhD share	0.75	0.82	0.85	0.85
Russia	2025	2026	2027	2028
Tape (PB)	0	0	0	0
Disk (PB)	0	0	0	0
CPU (kHS06)	0	0	0	0
Resource share	0	0	0	0
Saudi Arabia	2025	2026	2027	2028
Tape (PB)	0	0	0	0
Disk (PB)	0	0	0	0
CPU (kHS06)	0	0	0	0
Resource share	0	0	0	0
Slovenia	2025	2026	2027	2028
Tape (PB)	0	0	0	0
Disk (PB)	0.56	0.8	0.98	1.24
CPU (kHS06)	6.7	14.83	16.76	19.27
PhD share	3.26	3.54	3.67	3.68
Spain	2025	2026	2027	2028
Tape (PB)	0	0	0	0
Disk (PB)	0	0	0	0
CPU (kHS06)	0	0	0	0
Resource share	0	0	0	0
Sweden	2025	2026	2027	2028
Tape (PB)	0	0	0	0
Disk (PB)	0	0	0	0
CPU (kHS06)	0	0	0	0
Resource share	0	0	0	0

Taiwan	2025	2026	2027	2028
Tape (PB)	0	0	0	0
Disk (PB)	0.34	0.49	0.6	0.76
CPU (kHS06)	4.13	9.13	10.31	11.86
PhD share	2.01	2.18	2.26	2.26
Thailand	2025	2026	2027	2028
Tape (PB)	0	0	0	0
Disk (PB)	0	0	0	0
CPU (kHS06)	0	0	0	0
Resource share	0	0	0	0
Turkey	2025	2026	2027	2028
Tape (PB)	0	0	0	0
Disk (PB)	0.09	0.12	0.15	0.19
CPU (kHS06)	1.03	2.28	2.58	2.97
PhD share	0.5	0.54	0.56	0.57
UK	2025	2026	2027	2028
Tape (PB)	0	0	0	0
Disk (PB)	0.09	0.12	0.15	0.19
CPU (kHS06)	1.03	2.28	2.58	2.97
PhD share	0.5	0.54	0.56	0.57
Ukraine	2025	2026	2027	2028
Tape (PB)	0	0	0	0
Disk (PB)	0	0	0	0
CPU (kHS06)	0	0	0	0
Resource share	0	0	0	0
USA	2025	2026	2027	2028
Tape (PB)	3.43	3.9	4.72	5.53
Disk (PB)	2.47	3.42	4.22	5.23
CPU (kHS06)	32.35	72.7	82.42	100.5
PhD share	12.54	13.62	14.11	14.14
Vietnam	2025	2026	2027	2028
Tape (PB)	0	0	0	0
Disk (PB)	0	0	0	0
CPU (kHS06)	0	0	0	0
Resource share	0	0	0	0