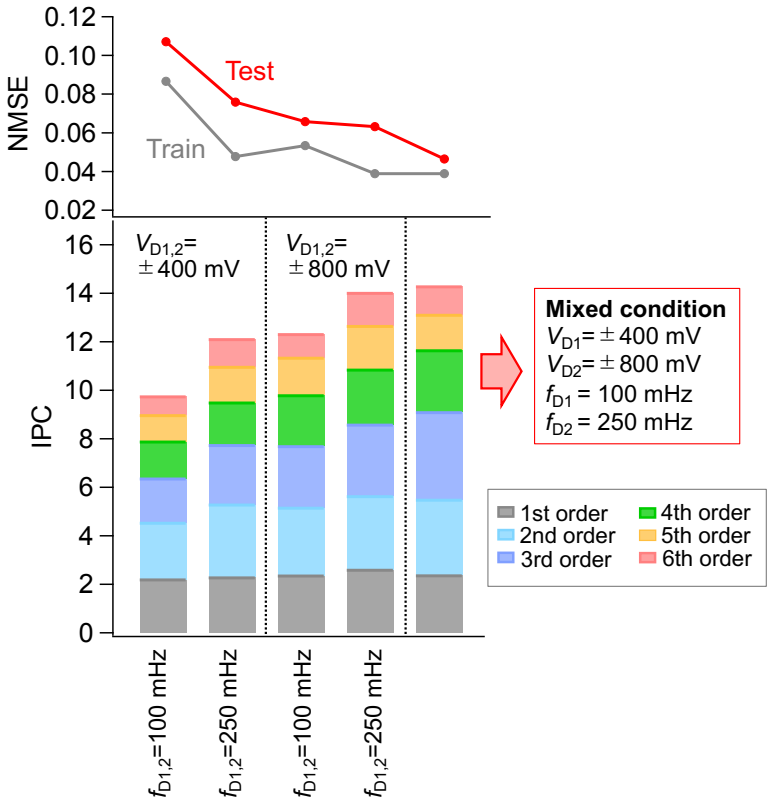
Supplementary information

Physical Masking-Induced Enhancement of Information Processing Capacity in a Redox-Type Ion-Gating Reservoir

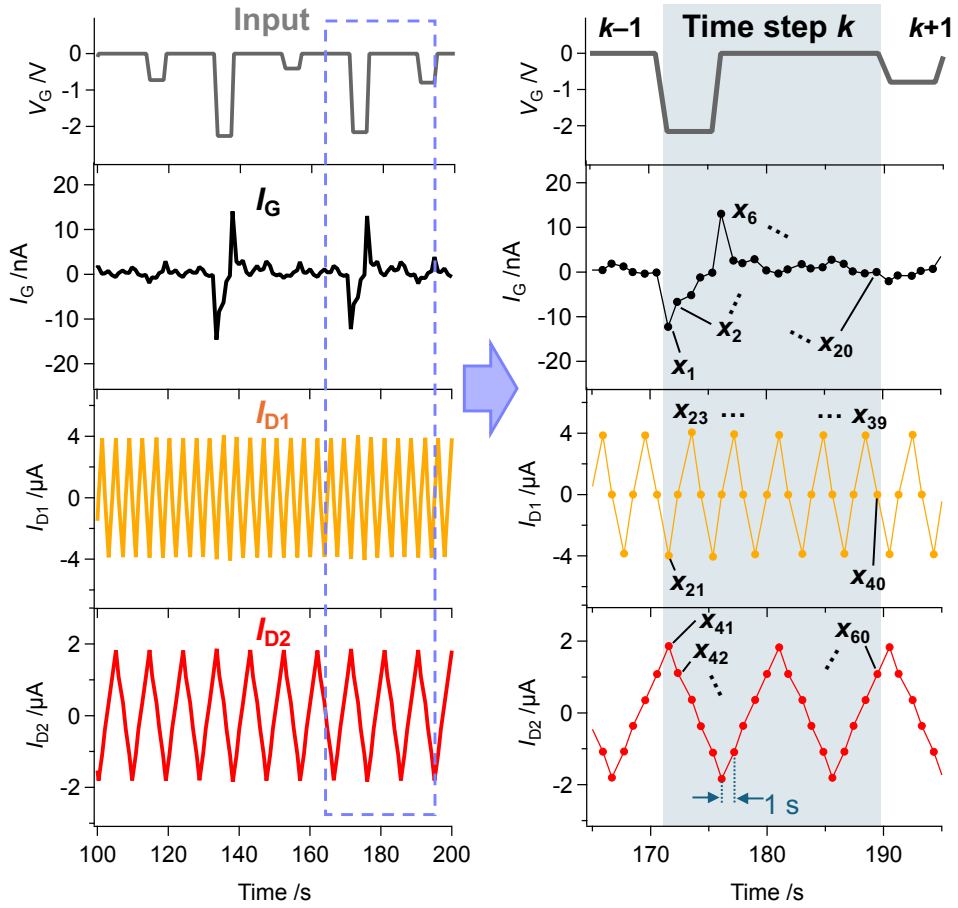
Daiki Nishioka[1*], Kaoru Shibata[2,3], Wataru Namiki[2], Kazuya Terabe[2], Takashi Tsuchiya[2,3*]

[1]International Center for Young Scientists (ICYS), National Institute for Materials Science (NIMS), 1-1 Namiki, Tsukuba, Ibaraki, 305-0044, Japan.
[2]Research Center for Materials Nanoarchitectonics (MANA), National Institute for Materials Science (NIMS), 1-1 Namiki, Tsukuba, Ibaraki, 305-0044, Japan.
[3]Department of Applied Physics, Tokyo University of Science, Katsushika, Tokyo 125-8585, Japan

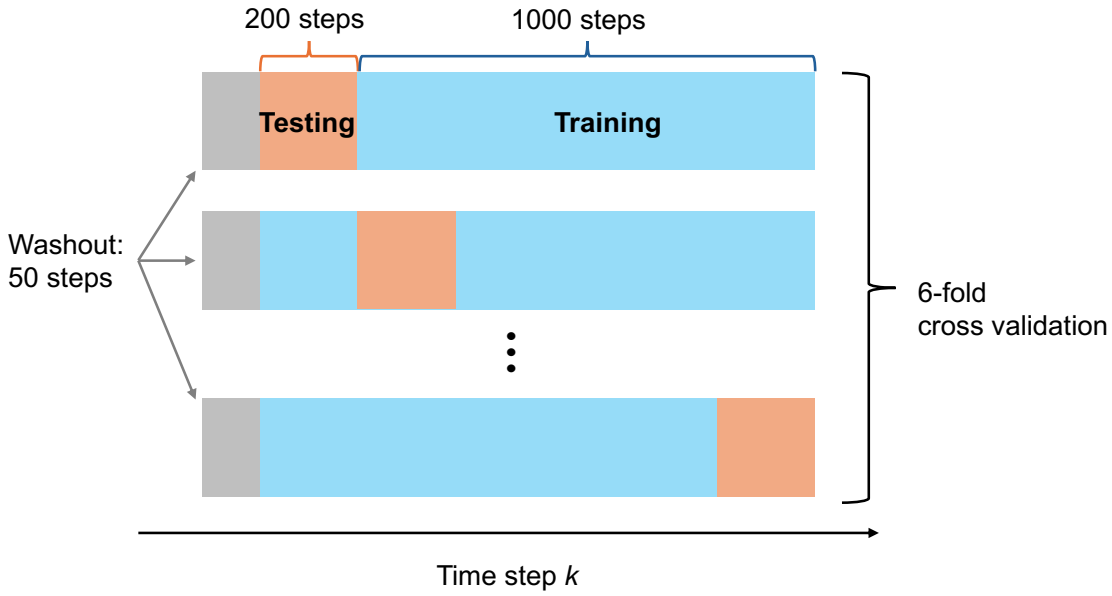
[*]Corresponding author
NISHIOKA.Daiki@nims.go.jp, TSUCHIYA.Takashi@nims.go.jp



Supplementary Fig. 1 | Effect of physical masking conditions on the computational performance of the redox-type IGR. Normalized mean squared error (NMSE, top) in the NARMA2 task and information processing capacity (IPC, bottom) as functions of the amplitude ($V_{D1,2}$) and frequency ($f_{D1,2}$) of the triangular drain voltages. To focus solely on the effect of the physical masking conditions, the results shown here were obtained without using the inveted input method and were based only on 60 reservoir states.



Supplementary Fig. 2 | Gate voltage V_G input applied to the device and the corresponding current responses (left). The right panel shows the virtual nodes sampled at discrete time step *k*, indicated by circular markers.



Supplementary Fig. 3 | Schematic illustration of the six-fold cross-validation procedure used for the NARMA2 task. Among the total of 1250 data points, the initial 50 data points were used for reservoir washout, and the remaining 1200 data points were subjected to six-fold cross-validation. The results shown in the main text correspond to those obtained from the bottom segment of the schematic.

Supplementary Table 1 | Results of the six-fold cross-validation for the NARMA2 task.

		NMSE	
Train range	**Test range**	**Train**	**Test**
$250<k\leq1250$	$50<k\leq250$	0.0219	0.0442
$50<k\leq250$, $450<k\leq1250$	$250<k\leq450$	0.0209	0.0316
$50<k\leq450$, $650<k\leq1250$	$450<k\leq650$	0.0211	0.0322
$50<k\leq650$, $850<k\leq1250$	$650<k\leq850$	0.0205	0.0357
$50<k\leq850$, $1050<k\leq1250$	$850<k\leq1050$	0.0216	0.0270
$0<k\leq1050$	$1050<k\leq1250$	0.0215	0.0333
Average		**0.0212**	**0.0340**