In[716]:=

```
(*----------------------------CLEAN SETUP----------------------------*)
ClearAll["Global`*"]



(* Use previously stated 1mm wormhole parameters *)
R0 = 1.0*10^-3; (* 1 mm throat *)
A0 = 1;     (* Amplitude *)
w = 1.5*R0;   (* Width *)

(* Previously stated potential - with explicit precision control *)
potential[r_, A0_, R0_, w_] := -A0*(1 - R0/r)*Exp[-((r - R0)/w)^2];

dPotential[r_, A0_, R0_, w_] := D[potential[r, A0, R0, w], r];
ddPotential[r_, A0_, R0_, w_] := D[potential[r, A0, R0, w], {r, 2}];

(* Omega integrand with precision control *)
omegaIntegrand[r_, A0_, R0_, w_] :=
 Module[{phi, dphi, ddphi, rSafe},
  rSafe = SetPrecision[r, 30]; (* Ensure high precision *)
  phi = potential[rSafe, A0, R0, w];
  dphi = dPotential[rSafe, A0, R0, w];
  ddphi = ddPotential[rSafe, A0, R0, w];
  Exp[2 phi]*(ddphi + dphi / rSafe)* rSafe / (8 Pi)];

(* Calculate total Omega with suppressed messages *)
Print["Calculating total Ω for 1mm wormhole..."];
Print["Parameters: R0 = ", R0, ", A0 = ", A0, ", w = ", w];

totalOmega = Quiet@NIntegrate[
 omegaIntegrand[r, A0, R0, w],
 {r, R0, R0 + 5*w},
 Method → "GlobalAdaptive",
 WorkingPrecision → 30,
 PrecisionGoal → 8,
 AccuracyGoal → Infinity
];

Print["\n☑ Total Ω = ", ScientificForm[totalOmega, 5]];
Print["Raw value: ", totalOmega];
```

Calculating total Ω for 1mm wormhole...

Parameters: R0 = 0.001, A0 = 1, w = 0.0015

☑ Total Ω = 1.6325×10^{-2}

Raw value: 0.016325091222581303570401313488O