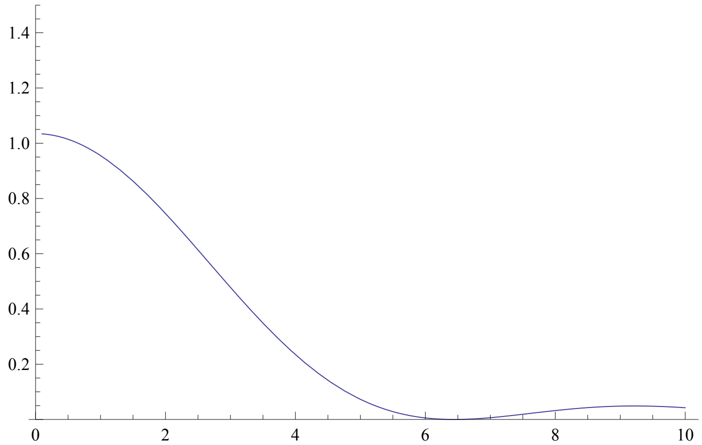
```
(* We want to consider the "classical" noise source,
i.e. temperature fluctuation at core inlet plus an
 additional noise source from fuel assembly gap variations.
*)
(* reference [1]: Pazsit: investogation of thr space-
  dependent noise induced by propagating perturbations,
Ann.Nucl.En. 37 (2010) *)
(* we take formula (16) from [1]; G0 is the point reactor
 transfer function and rho is the induced reactivity change *)


deltaP[w_] := G0[w] * rho[w];

(* in the frequency range of interest we assume G0 approximately constant: *)

G0[w_] := 1 / beta;
beta = 0.002;

(* the reactivity change is written as follows from (18) in [1] *)

H = 3.90; (* core height *)
phi[z_] := 1; (* approximately flat flux along axial direction *)
nu = 2.5;
Sf = 0.0014;
C0 = 1 / (nu * Sf);
v = 4.0; (* speed 4m/s *)

rho[w_] := C0 * Integrate[phi[z] * phi[z] * deltaSa[z, w], {z, 0, H}];

deltaSa[z_, w_] := f1[w] + f2[z, w];

(* f1 is the reactivity perturbation from a z-
 independent source like from the gap variation *)
(* if f1 is white noise this means that f1 is constant *)

f1[w_] := a1;

(* f2 is the perturbation which comes from the
 traveling reactivity perturbation introduced at core inlet *)
(* if the core inlet perturbation is white noise, then it follows: *)

f2[z_, w_] := a2 * Exp[-i * w * z / v];

a1 = 1;
a2 = 1;

PSD[w_] := rho[w] * Conjugate[rho[w]]; (* proxy for power spectral density *)
```

```
a1 = 0; (* no noise from fuel assembly gaps *)
Plot[PSD[w] / (1.2 * 10^6), {w, 0.1, 10}, PlotRange → {0, 1.5}]
```



```
a1 = 1;
a2 = 1; (*  noise from both fuel assembly gaps and inlet T variation *)
Plot[PSD[w] / (5 * 10^6), {w, 0.1, 10}, PlotRange → {0, 1.5}]
```