

Sistemi di Telecomunicazioni

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*Alcuni esercizi al calcolatore su
tecniche di codifica di canale*


```

In[1]:= ClearAll["Global`*"];
<< Graphics`Graphics`
<< Graphics`Colors`
(*<<Graphics`Legend`*)
<< Statistics`ContinuousDistributions`

In[5]:= (* BEP sistema BPSK in AWGN con e senza codifica *)

Pb[ρ_] := 0.5 Erfc[√ρ]

Pbcod[ρ_, n_, k_, t_] :=
  ( (2 t + 1) / n ) ( 1 - ∑_{i=0}^t Binomial[n, i] Pb[ρ k / n]^i (1 - Pb[ρ k / n])^(n - i) )

n := 255;
k := 123;
t := 19;

BEPawgn = Plot[{Log[10, Pb[10^(0.1 ρdB)]]}, {ρdB, 0, 12}, PlotStyle →
  {{Blue, Thickness[.005]}, {Red, Thickness[.005]}, {Green, Thickness[.005]}},
  Frame → False, PlotRange → {-14, 0}, GridLines → Automatic,
  AxesLabel → {"ρdB", "Log Pb"}, TextStyle → {FontSize → 18}];

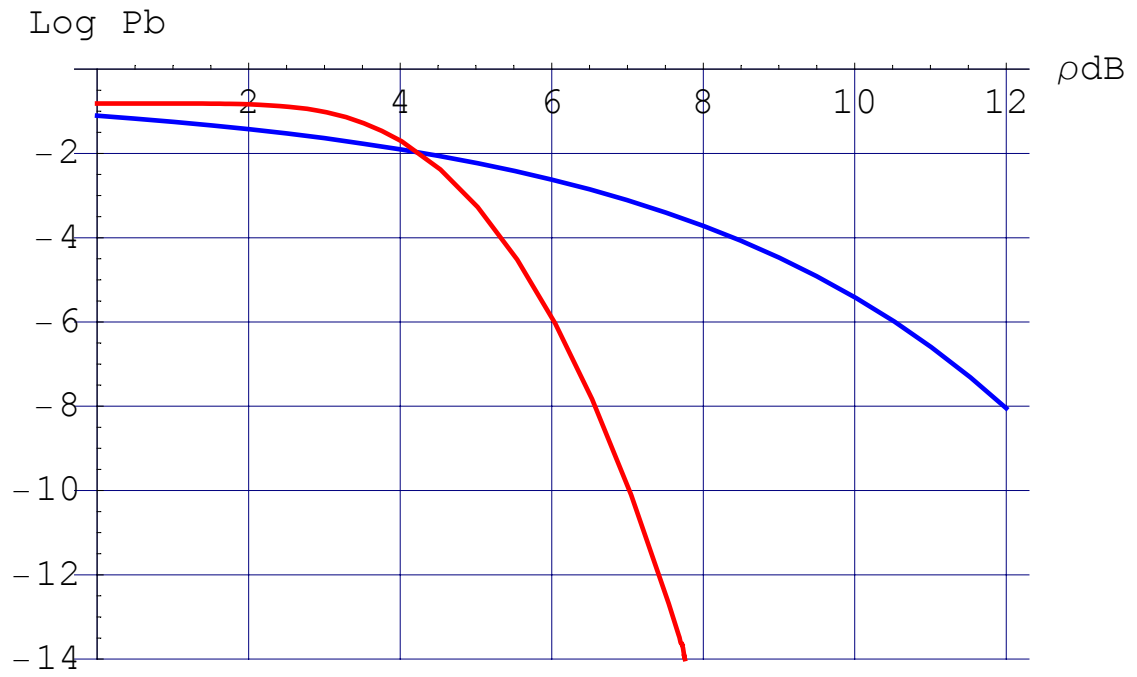
BEPcodawgn = Plot[{Log[10, Pbcod[10^(0.1 ρdB), n, k, t]]}, {ρdB, 0, 12}, PlotStyle →
  {{Red, Thickness[.005]}, {Red, Thickness[.005]}, {Green, Thickness[.005]}},
  Frame → False, PlotRange → {-14, 0}, GridLines → Automatic,
  AxesLabel → {"ρdB", "Log Pb"}, TextStyle → {FontSize → 18}];

Pbplot = Show[BEPawgn, BEPcodawgn];

Log Pb
-14 0 dB

Log Pb
-14 0 dB

```



In[13]:=

(* BEP sistema BPSK in AWGN con diverse codifiche a parità di n *)

$P_b[\rho_]:=0.5 \operatorname{Erfc}[\sqrt{\rho}]$

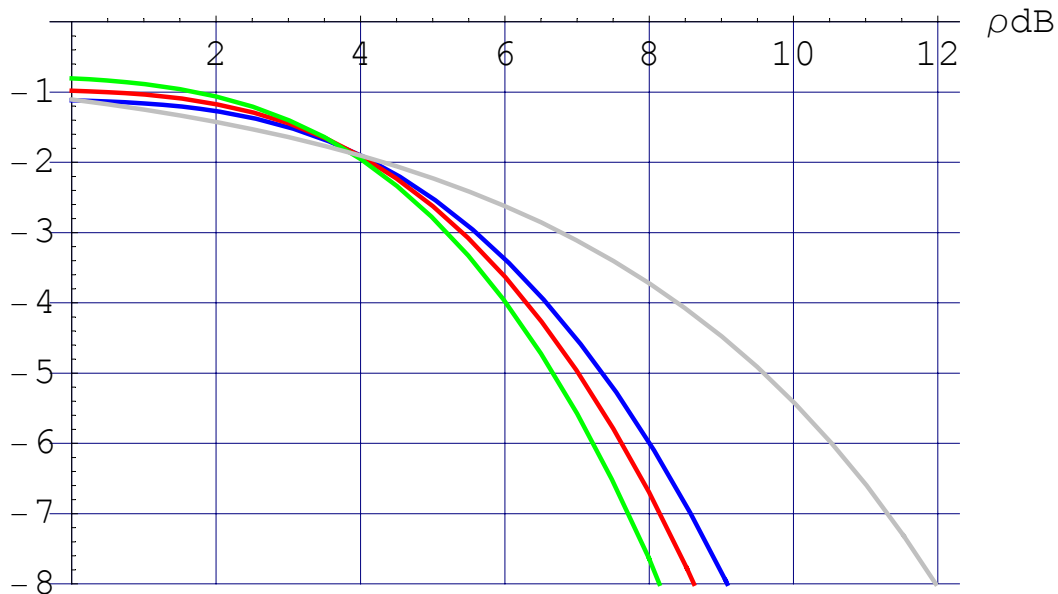
$P_{bcod}[\rho_ , n_ , k_ , t_] :=$

$$\left(\frac{2t+1}{n}\right) \left(1 - \sum_{i=0}^t \operatorname{Binomial}[n, i] P_b[\rho k/n]^i (1 - P_b[\rho k/n])^{n-i}\right)$$

BEPcodawgn = Plot[

{Log[10, Pbcod[10^(0.1 ρdB), 63, 51, 2]], Log[10, Pbcod[10^(0.1 ρdB), 63, 45, 3]],
 Log[10, Pbcod[10^(0.1 ρdB), 63, 36, 5]], Log[10, Pb[10^(0.1 ρdB)]]},
 {ρdB, 0, 12}, PlotStyle → {{Blue, Thickness[.005]}, {Red, Thickness[.005]},
 {Green, Thickness[.005]}, {Gray, Thickness[.005]}},
 Frame → False, PlotRange → {-8, 0}, GridLines → Automatic,
 AxesLabel → {"ρdB", "Log Pb"}, TextStyle → {FontSize → 18}];

Log Pb



In[22]:=

(* BEP sistema BPSK in Rayleigh fading e AWGN con diverse codifiche *)

$$\text{Pbm}[\rho m_] := 0.5 \left(1 - \sqrt{\frac{\rho m}{1 + \rho m}} \right)$$

Pbcodm[\rho m_, n_, k_, t_] :=

$$\left(\frac{2t+1}{n} \right) \left(1 - \sum_{i=0}^t \text{Binomial}[n, i] \text{Pbm}[\rho m k / n]^i (1 - \text{Pbm}[\rho m k / n])^{n-i} \right)$$

```
BEPcodRayleighawgn = Plot[{Log[10, Pbcodm[10^(0.1 \rho mdB), 63, 51, 2]],
  Log[10, Pbcodm[10^(0.1 \rho mdB), 63, 45, 3]],
  Log[10, Pbcodm[10^(0.1 \rho mdB), 63, 36, 5]], Log[10, Pbm[10^(0.1 \rho mdB)]}],
{\rho mdB, 0, 20}, PlotStyle -> {{Blue, Thickness[.005]}, {Red, Thickness[.005]},
{Green, Thickness[.005]}, {Gray, Thickness[.005]}},
Frame -> False, PlotRange -> {-8, 0}, GridLines -> Automatic,
AxesLabel -> {"\rho mdB", "Log Pbm"}, TextStyle -> {FontSize -> 18}];
```

Log Pbm

