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Periodic structures

- Periodic structure analysis applies to the following SCSI elements:
  - Backplanes with connectors, w/wo drives
  - Ribbon cable with connectors, w/wo drives
  - Flat sections of twisted-flat cable
- Period structures have the following properties
  - Decreased impedance
  - Comb filter characteristics
  - Decreased propagation velocity

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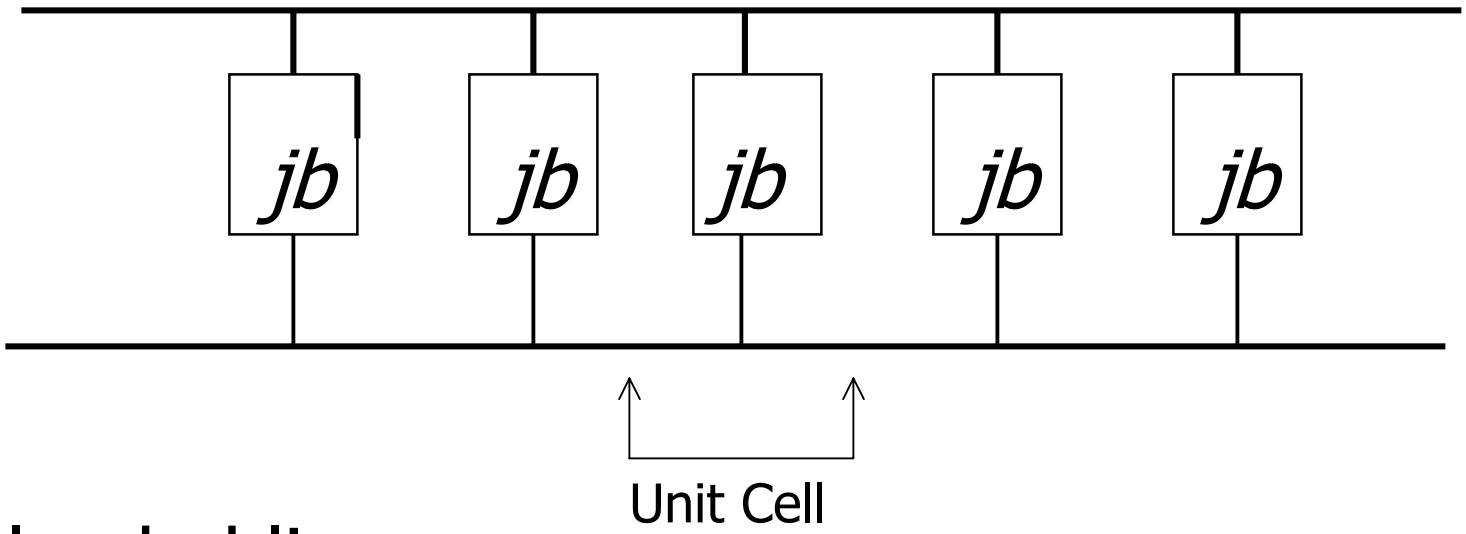
Equivalent Circuit



Unloaded line

- Impedance of Z_0
- Propagation constant of k

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Solutions of Transfer Function

- Case 1, $\alpha = 0$ $\beta \neq 0$
  - Corresponds to non-attenuating propagating wave
  - Defines a passband
  - Solved for β if magnitude of right-hand side is less than unity
  - Infinite number of values of β

$$\cos \beta d = \cos \phi - \frac{b}{2} \sin \theta$$

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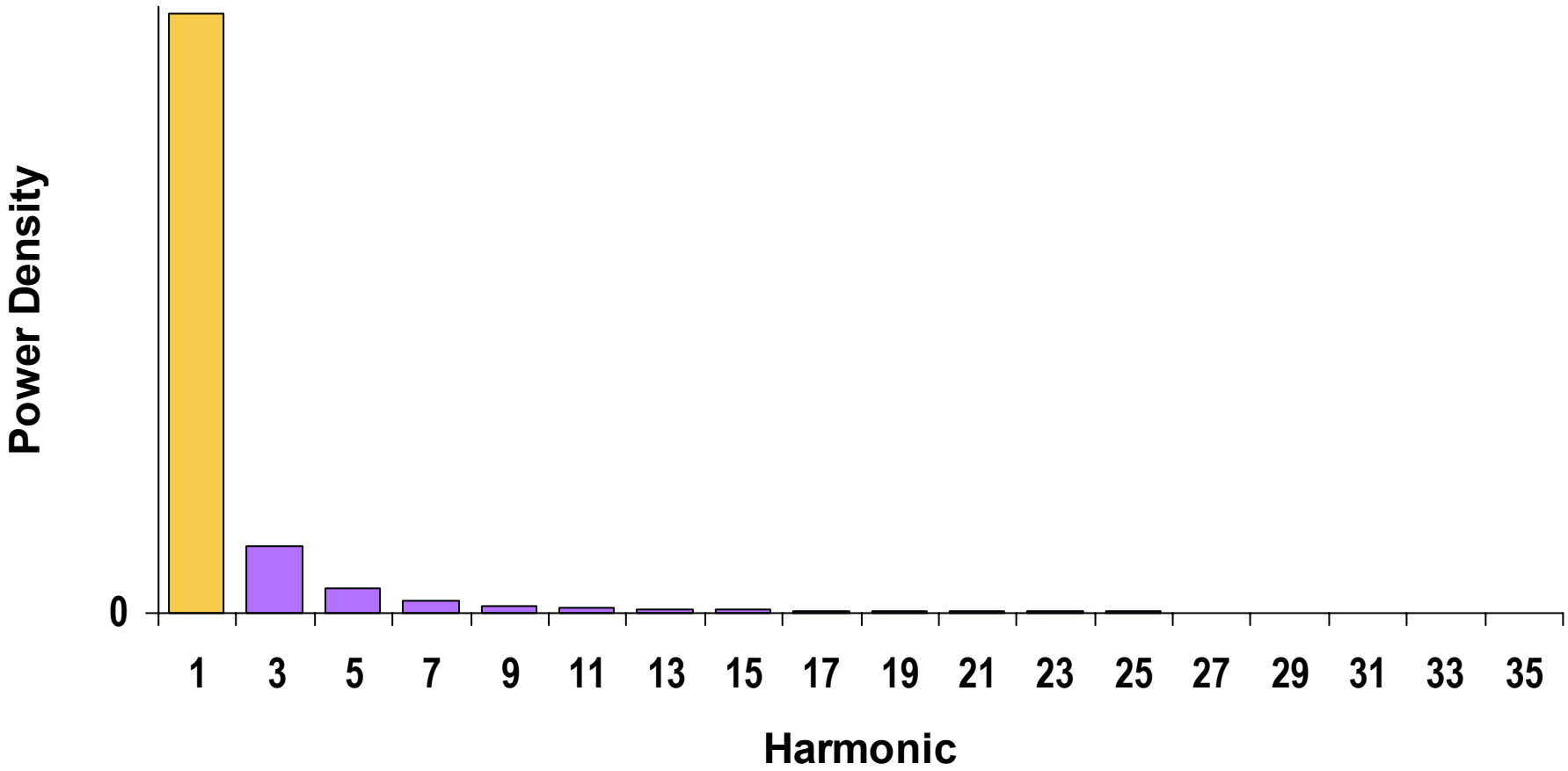
Power Spectrum 80 MHz SCSI Signal



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Bloch impedance

- Backplane conditions
  - Distance between devices - 1.5”
  - Total capacitance of stubs - 15 pF
  - Backplane impedance - 120 ohms
  - Frequency 80MHz
- Bloch impedance - 30.68 ohms
- Propagation velocity - 1.312E7 m/s

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Attenuation

- **Attenuation is dissipation of energy in a circuit**
  - DC resistance - small but will produce some heat.
  - AC losses, loss tangent, - dielectric heating and some energy is lost.
  - Radiation losses - the cable acts like an antenna
  - Impedance discontinuities.

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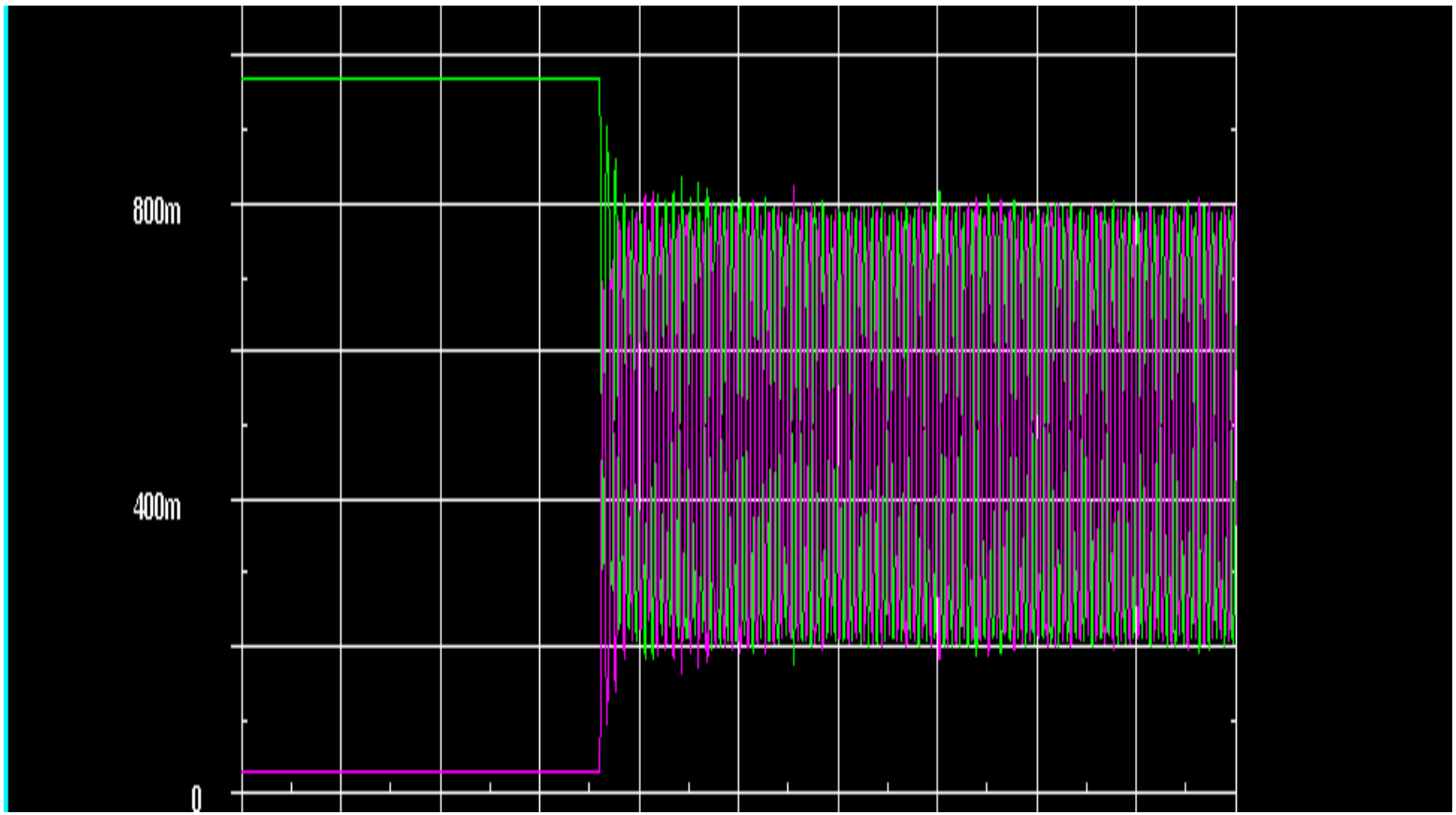
Differential signal



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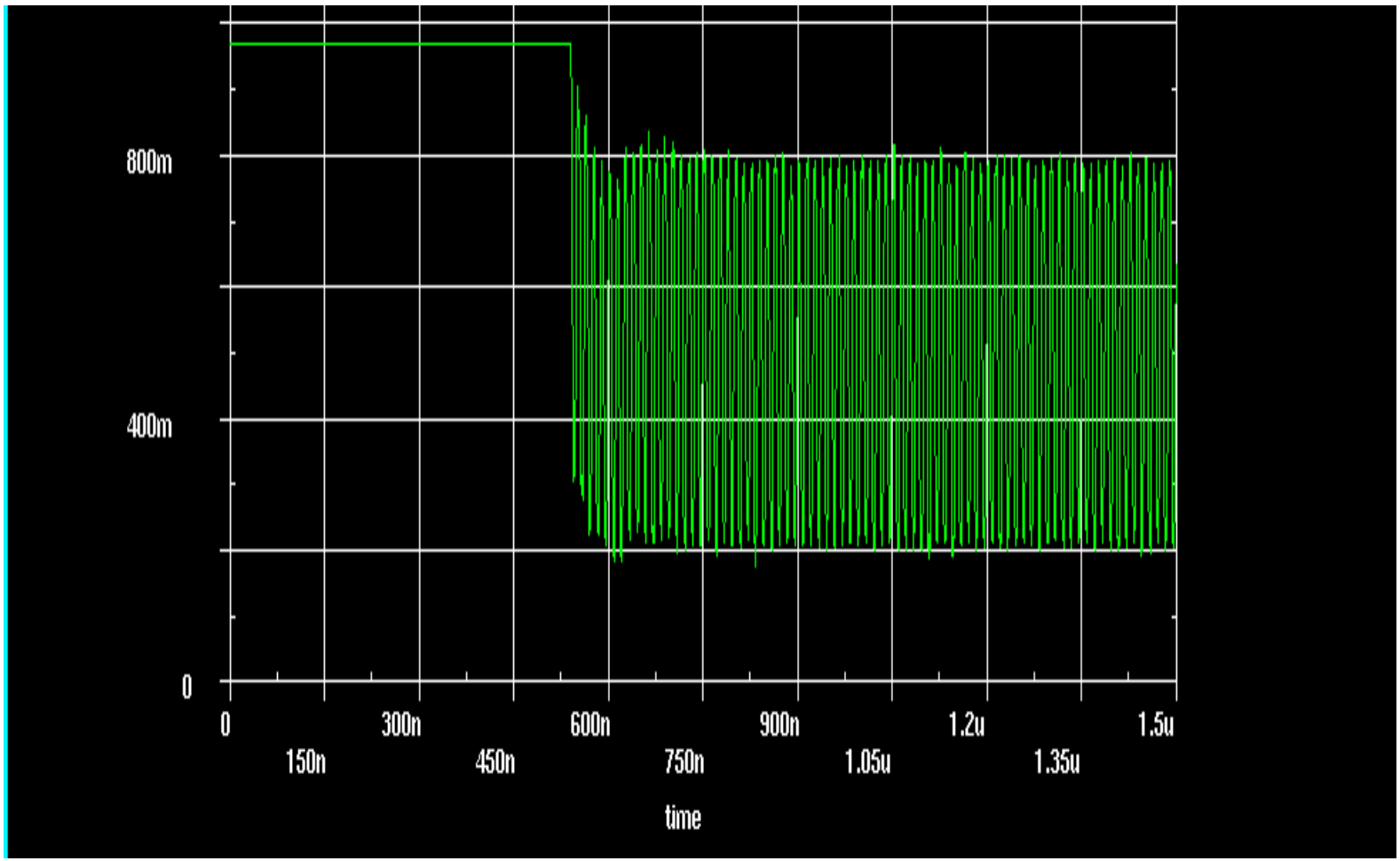
One half of differential signal



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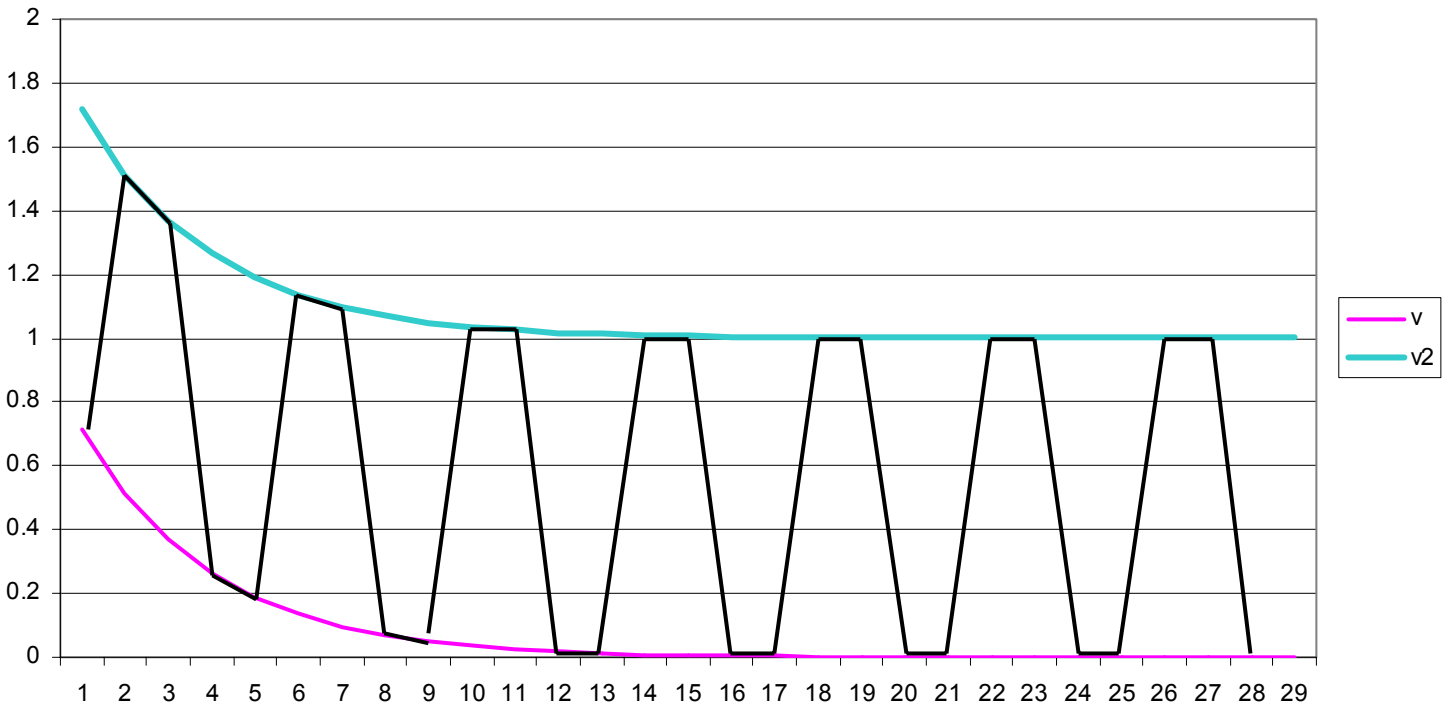
Charge conservation



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Conclusions

- 1st pulse is not attenuated !!
  - mechanism is conservation of charge
  - charge curve can be overcome by overdrive
- Cable attenuation should be derived from 80MHz
- Significantly less than attenuation specified at 200MHz