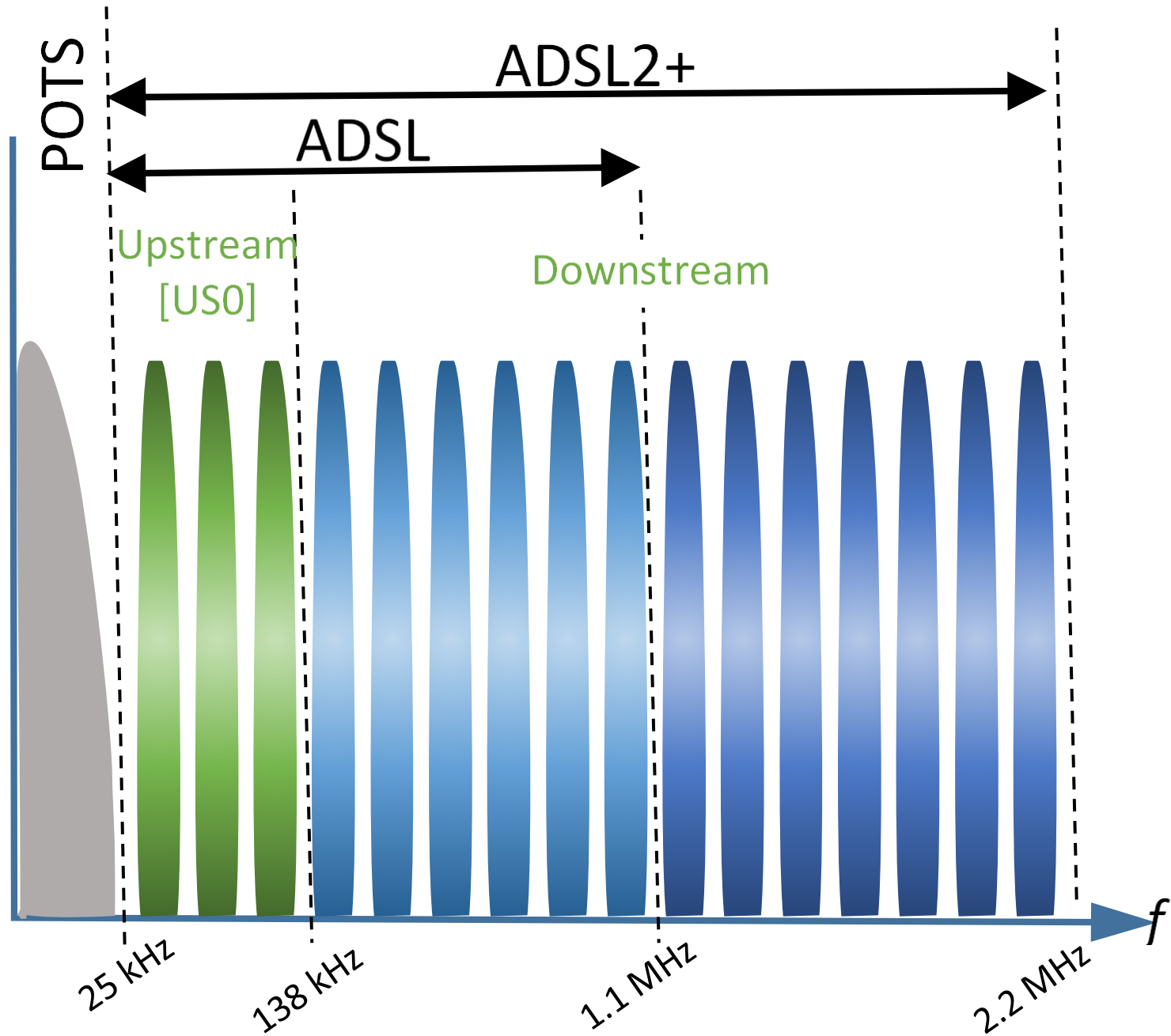




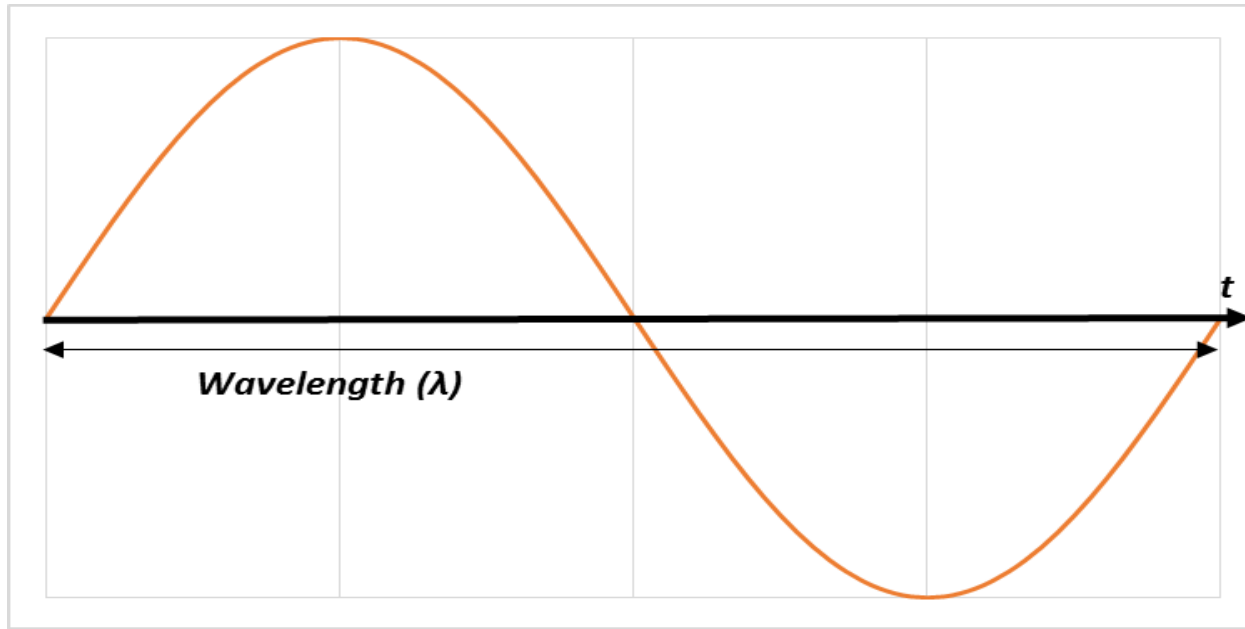
# Broadband and Interference

Christmas lectures 2020





Low Frequency



And

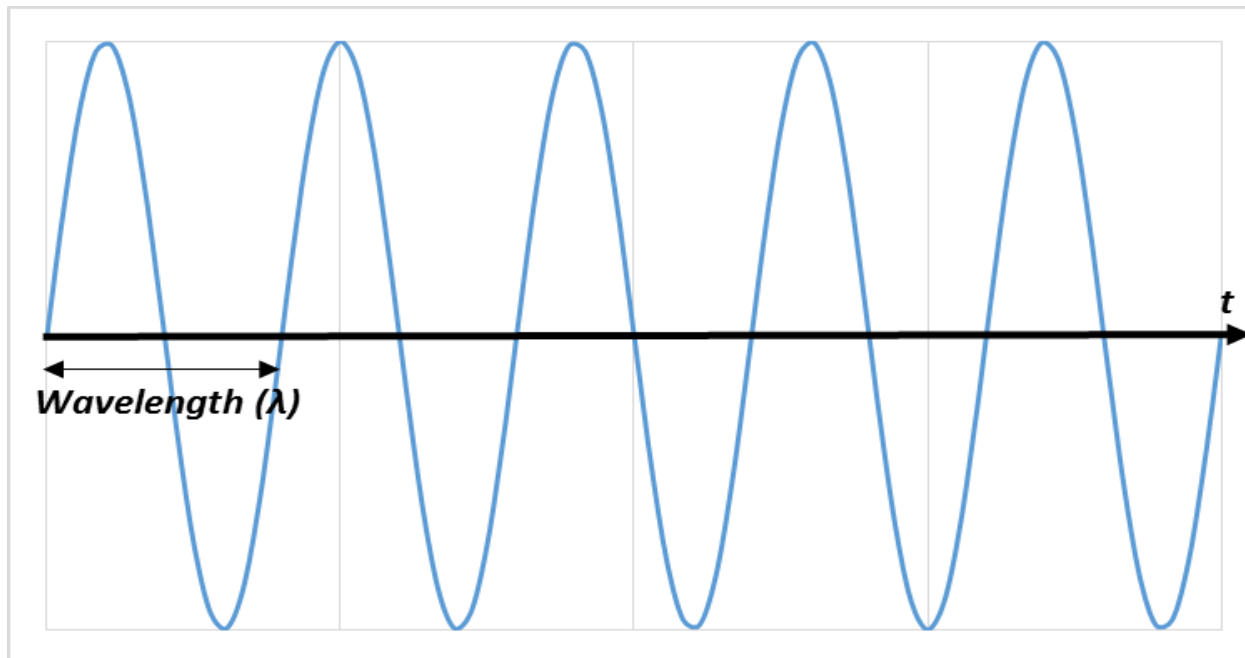
$$\text{Frequency [Hz]} = \frac{1}{t \text{ [s]}}$$

$$\text{Frequency [Hz]} = \frac{\text{Speed of light}}{\lambda \text{ [m]}}$$

Where

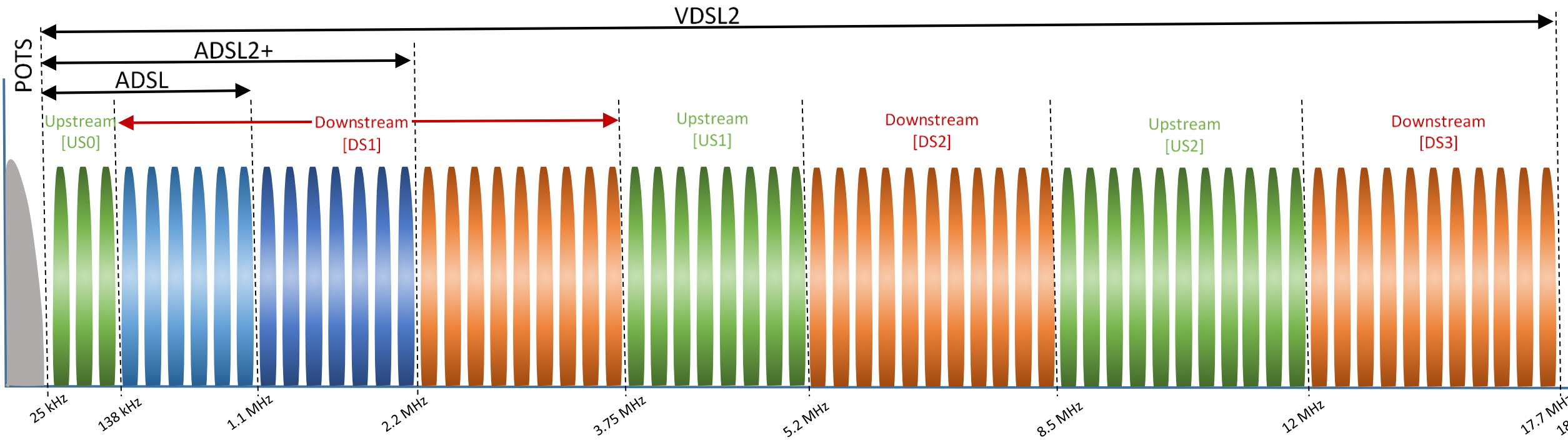
$$\text{Speed of light} = 3 \times 10^8 \text{ [m/s]}$$

Higher Frequency



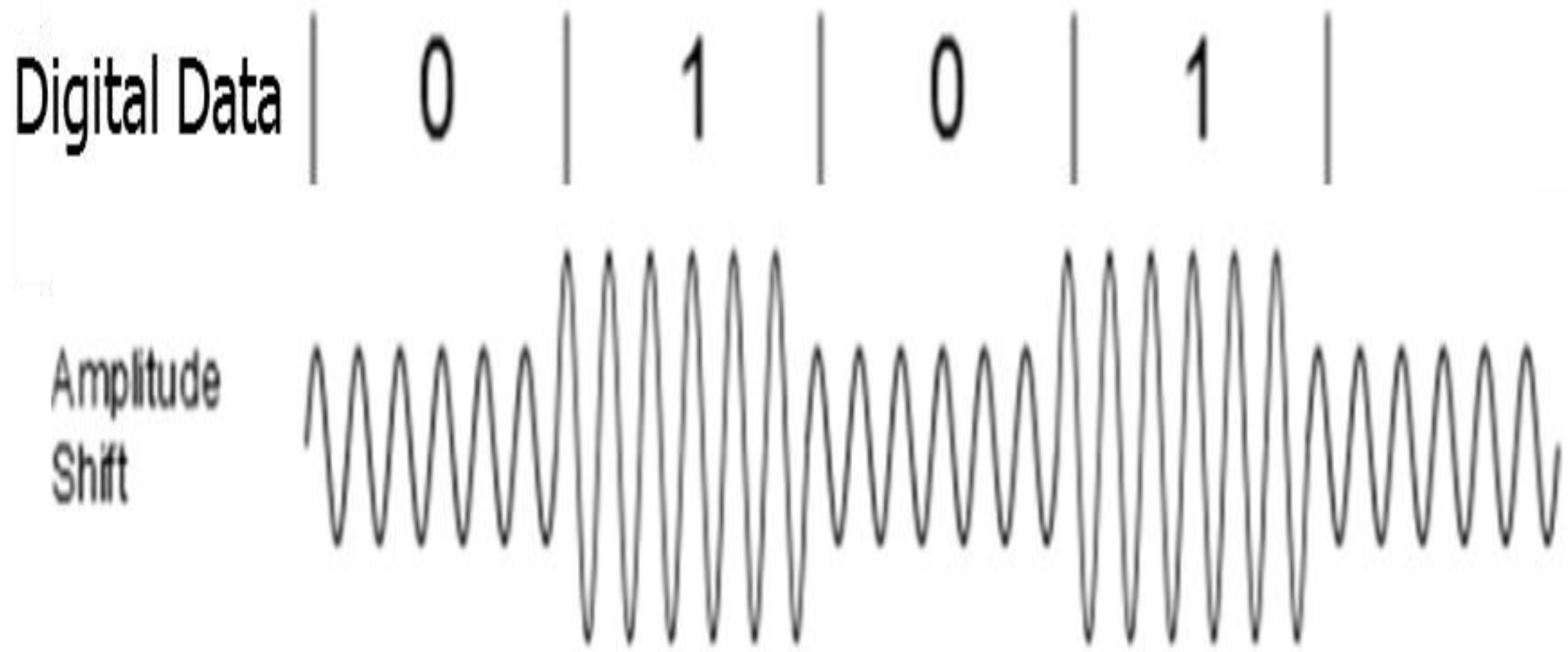


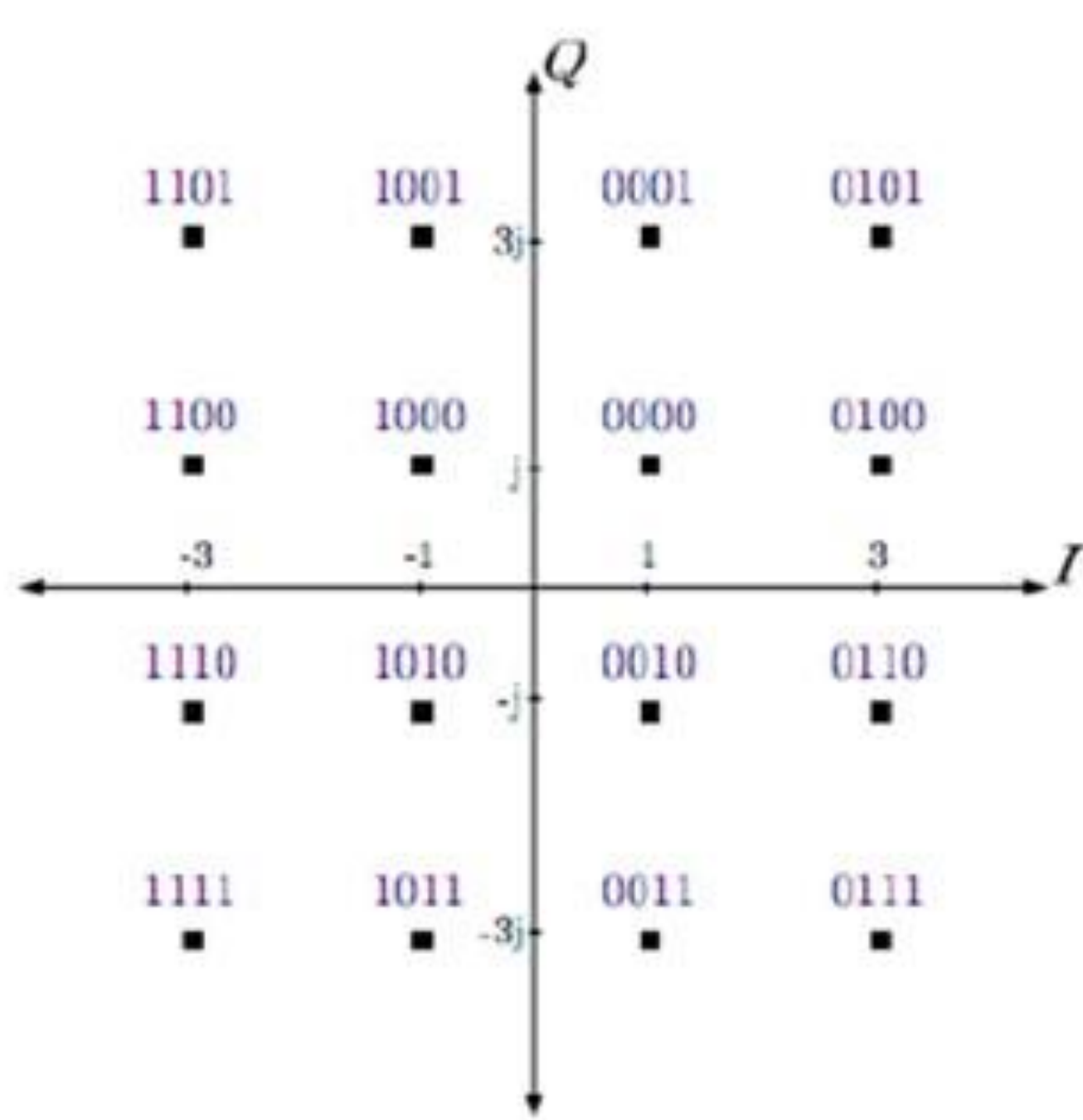
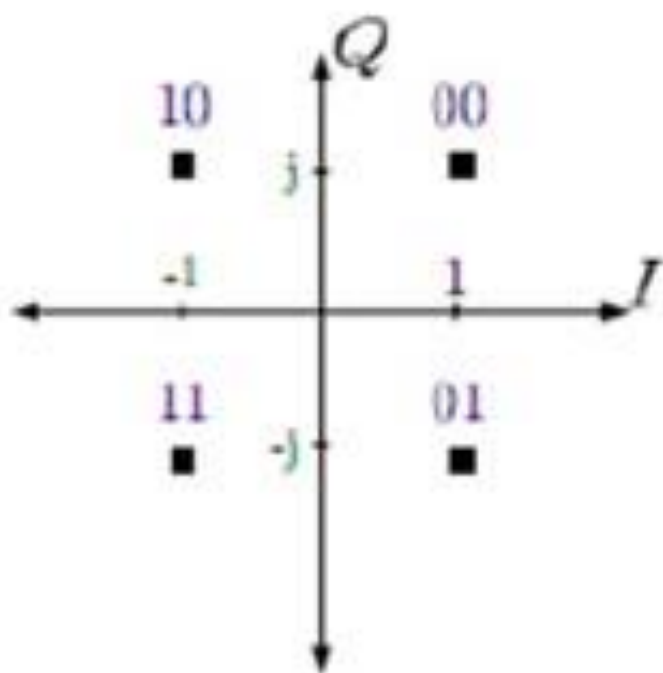
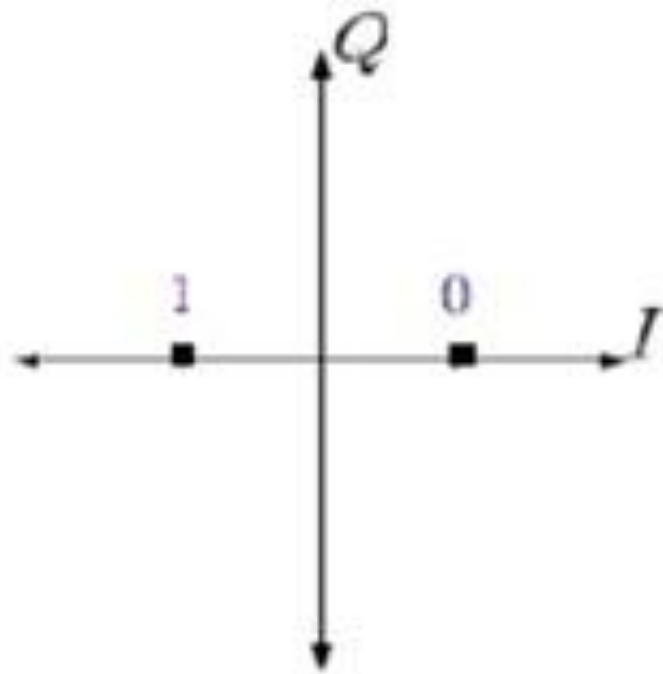


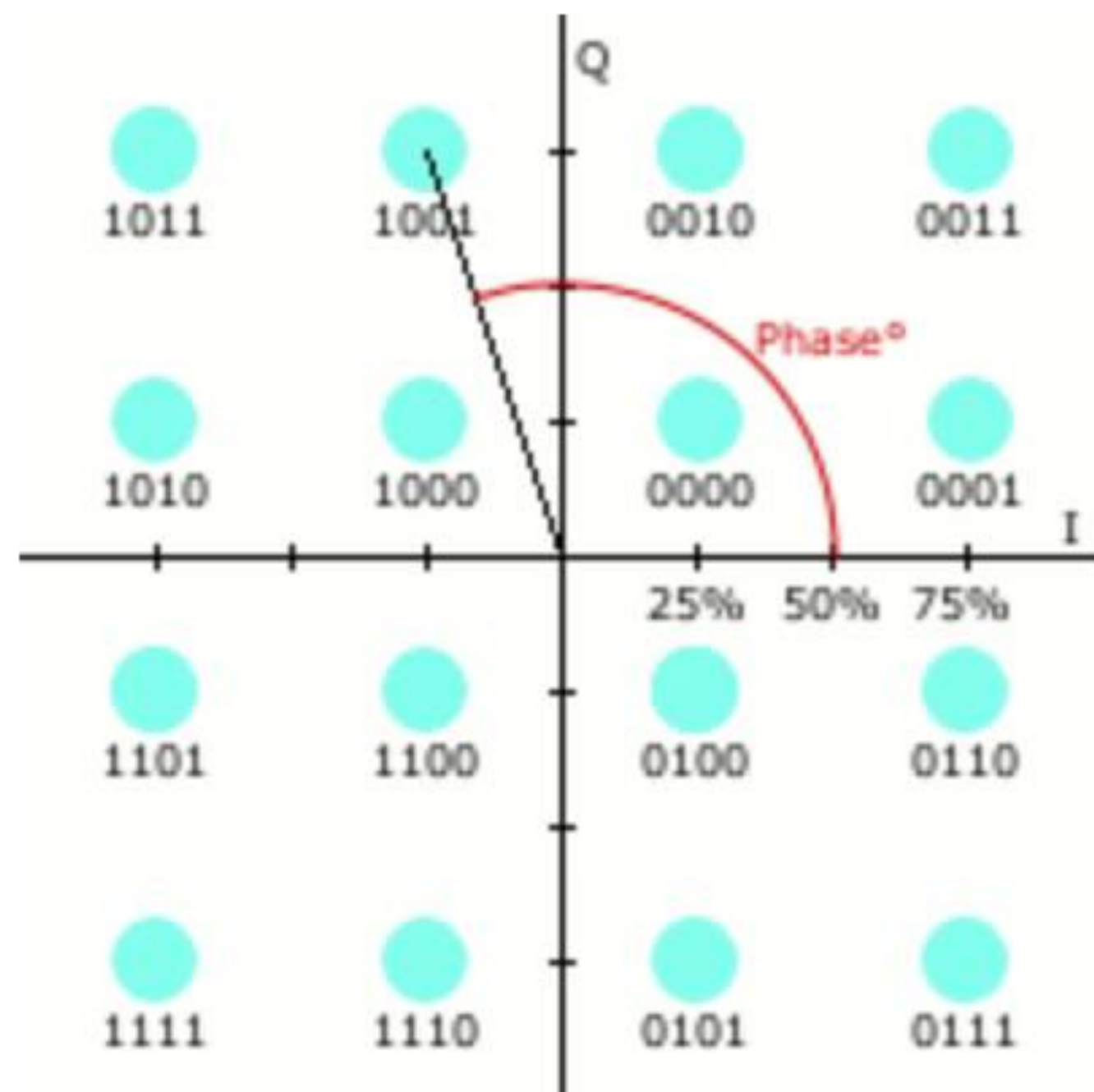




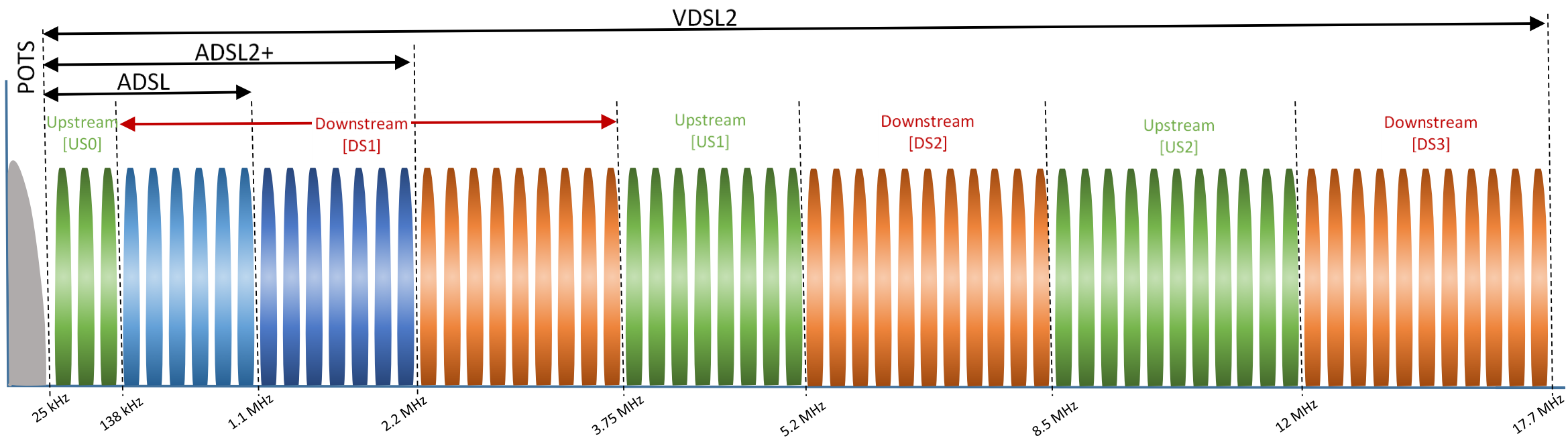








Amp	Phase	Data
25%	225°	1100
75%	135°	1001



$$\begin{matrix} \sim 2500 & \times & 15 & = & 61,440 & \times & 4000 & = & \mathbf{150,000,000 \text{ bits/sec}} \\ \text{downstream tones} & & \text{bits} & & \text{bits} & & \text{Symbol rate} & & \text{or} \\ & & & & & & & & \mathbf{150 \text{ Mega bits/sec}} \end{matrix}$$

*In reality we cant use all tones or get 15 bits on every tone!*



Transmitted signal (e.g. from the DSLAM)



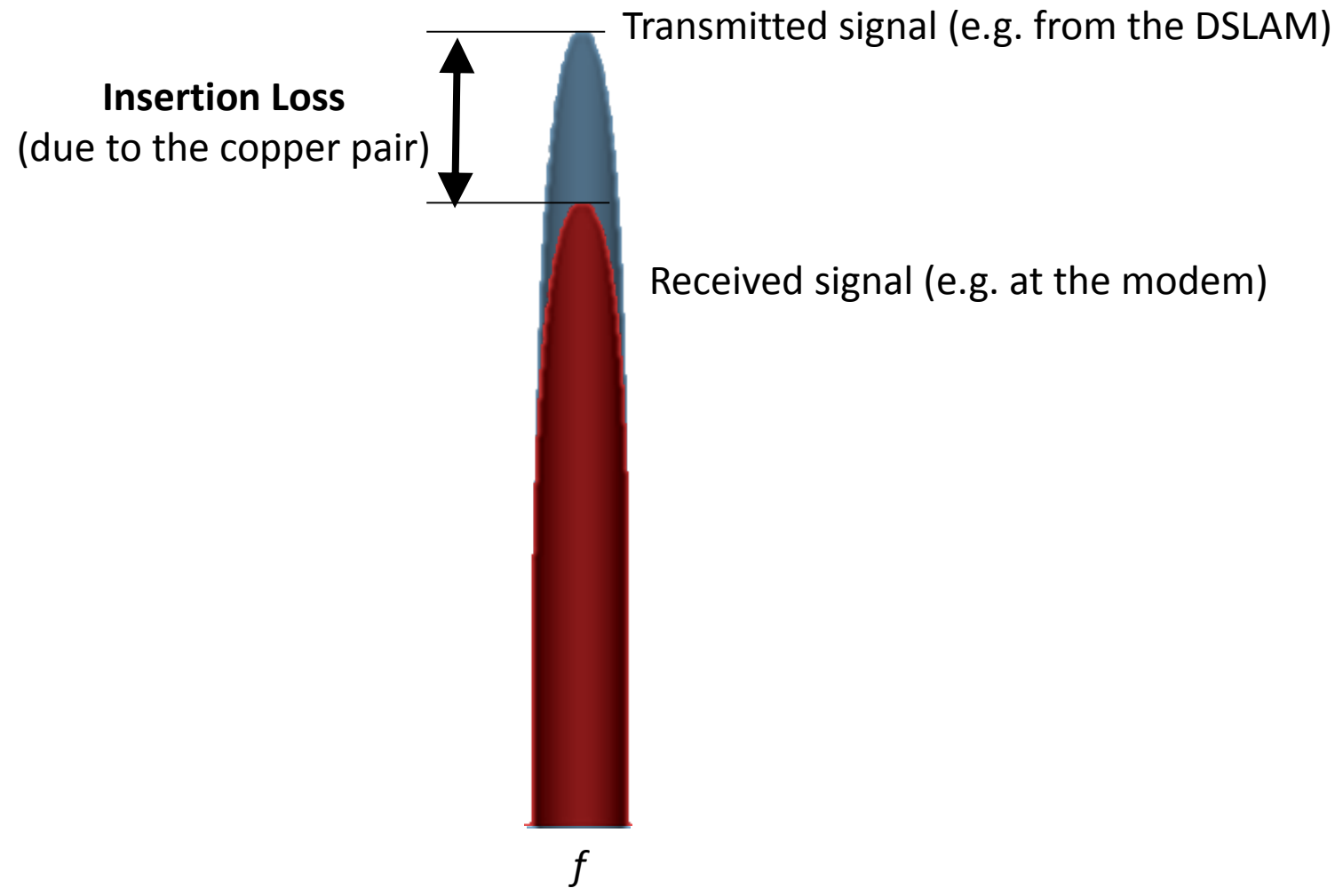
$f$

Transmitted signal (e.g. from the DSLAM)

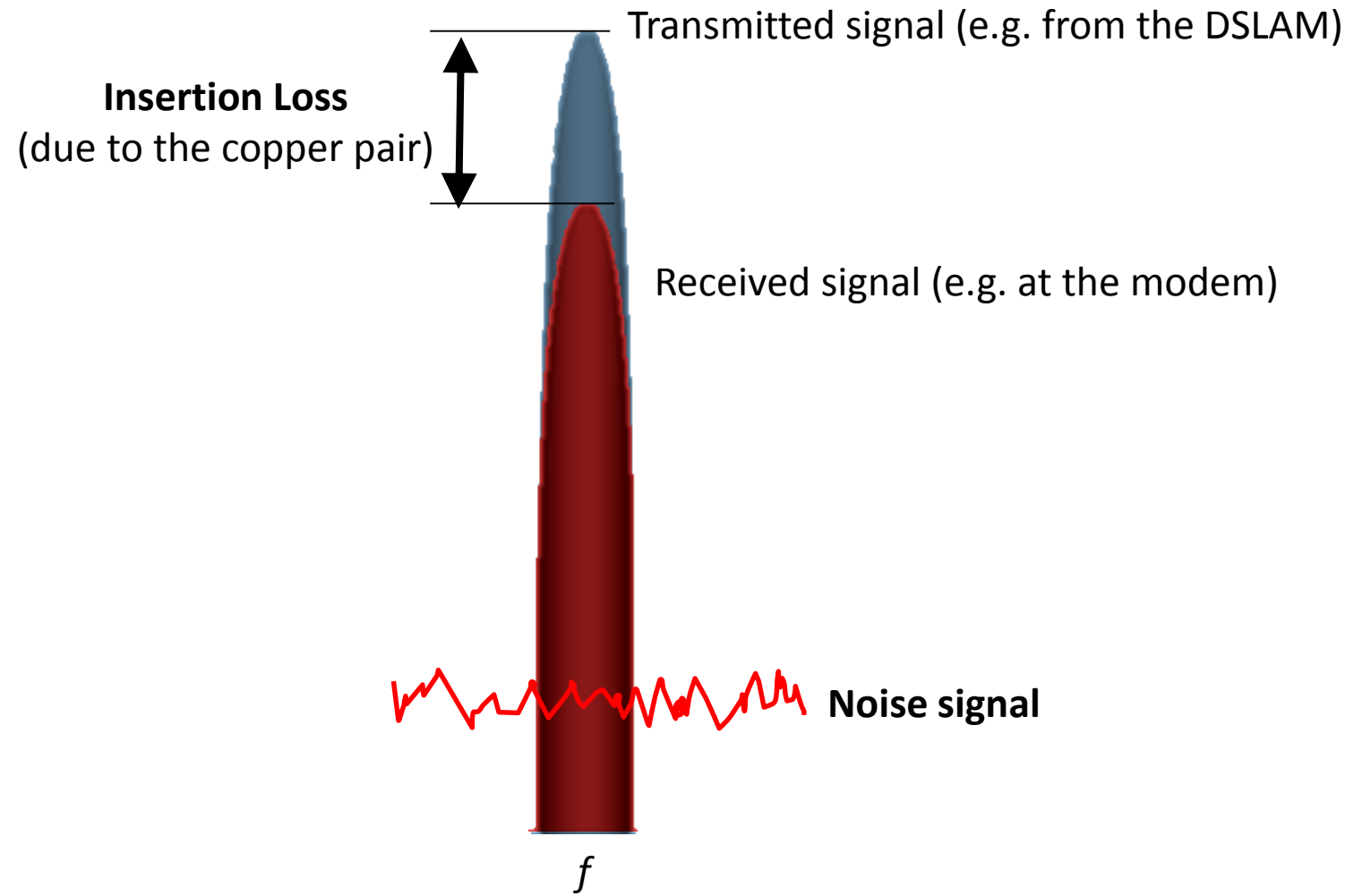
Received signal (e.g. at the modem)

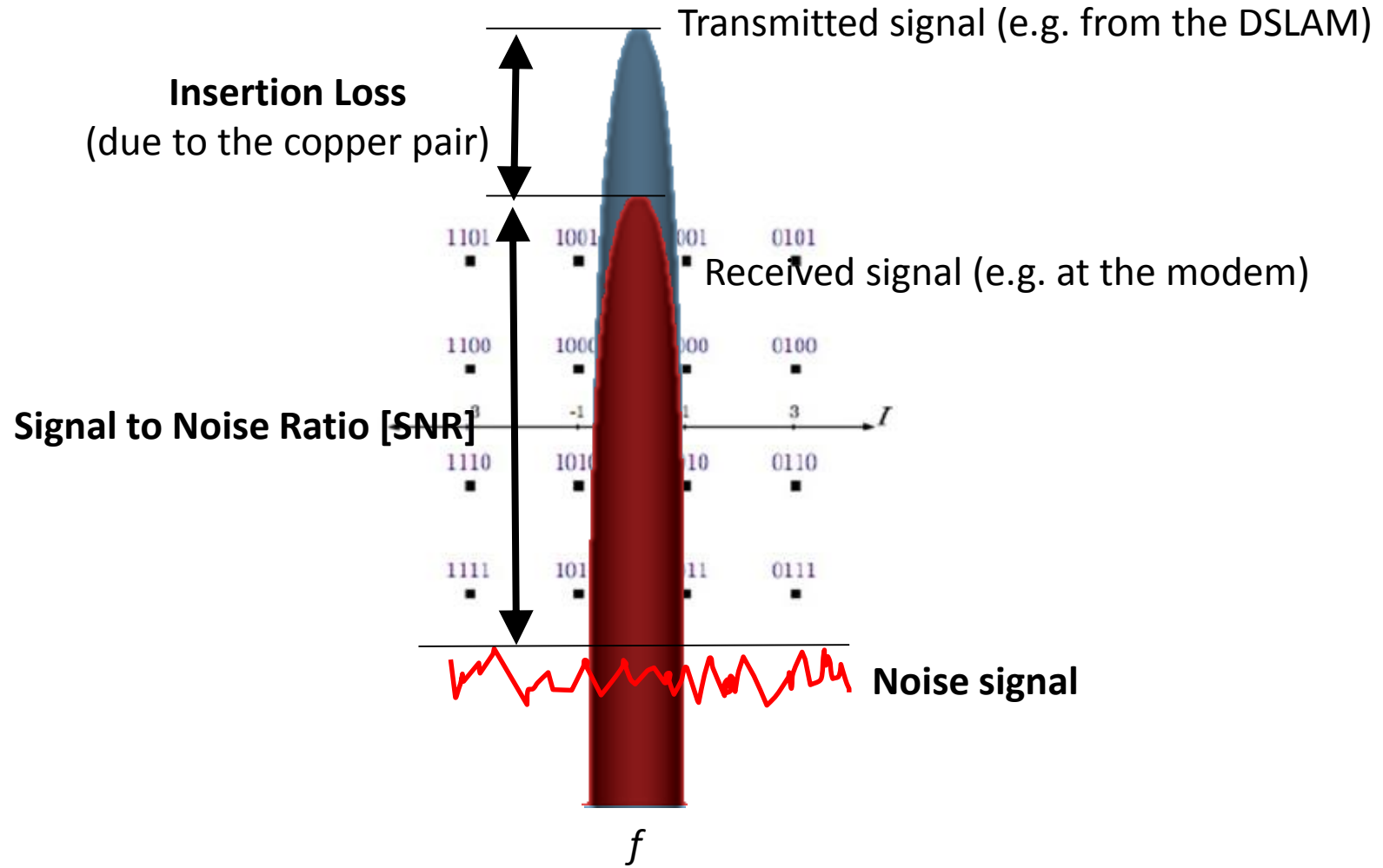


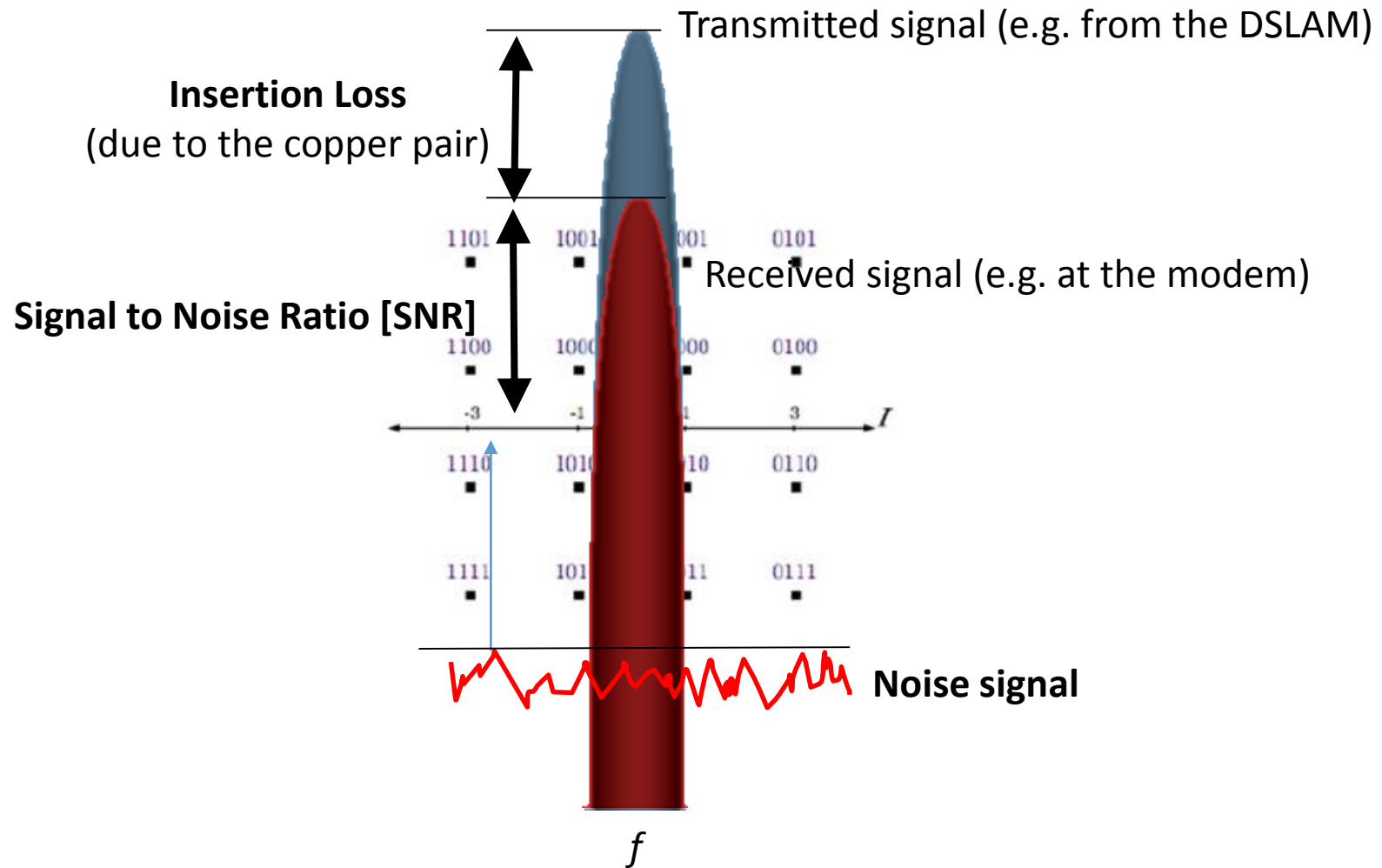
$f$











Less SNR -> less space for a higher order modulation constellation -> less information we can carry

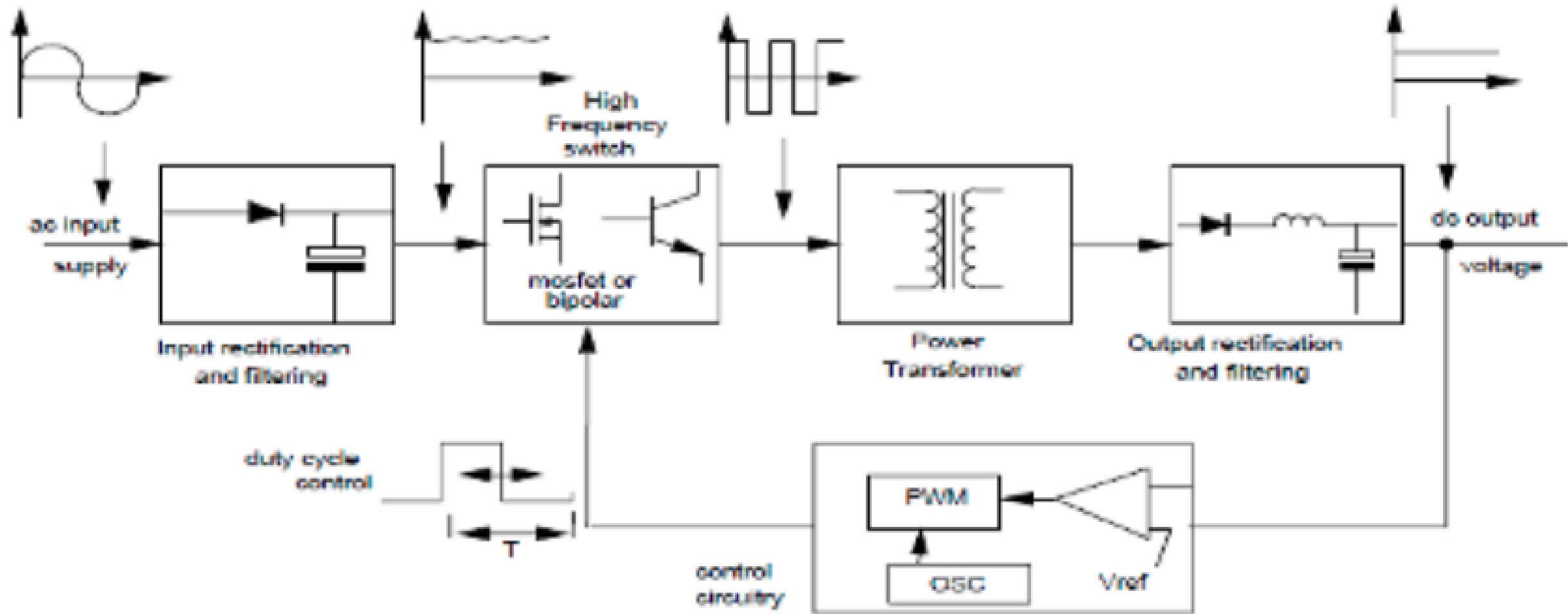


# Internet: Old TV caused village broadband outages for 18 months

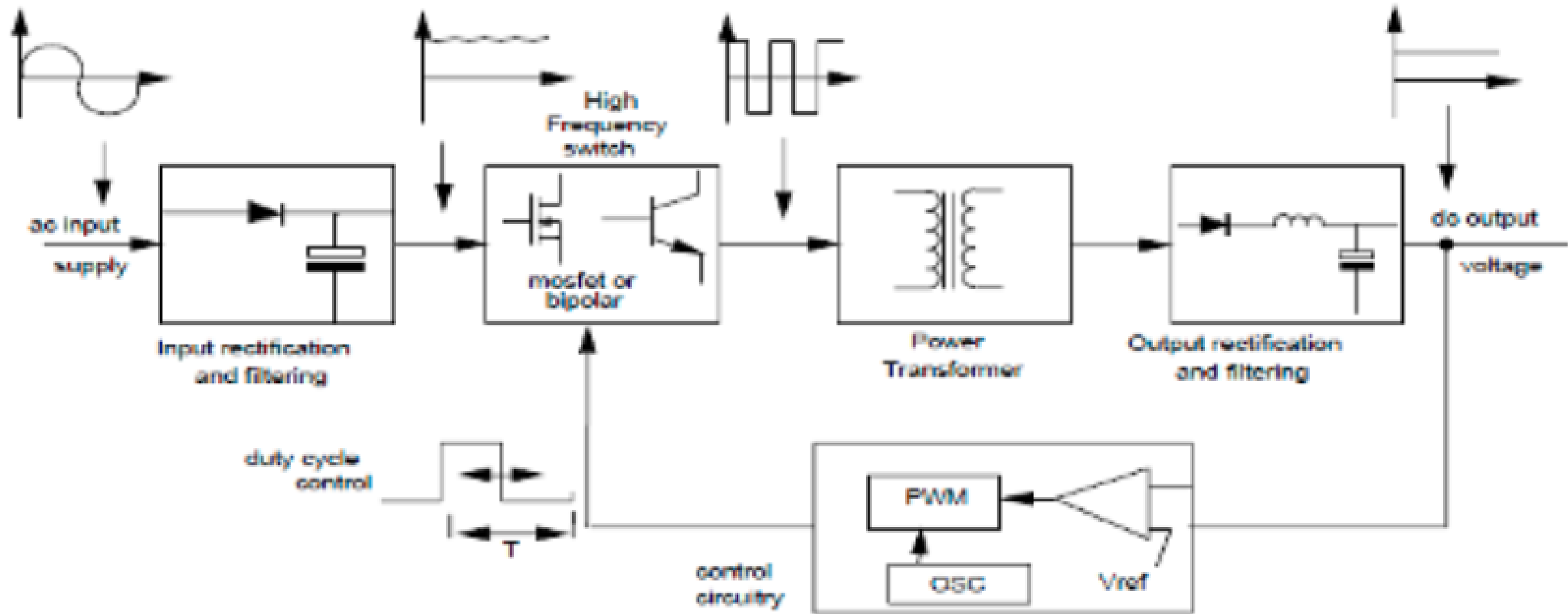
🕒 22 September



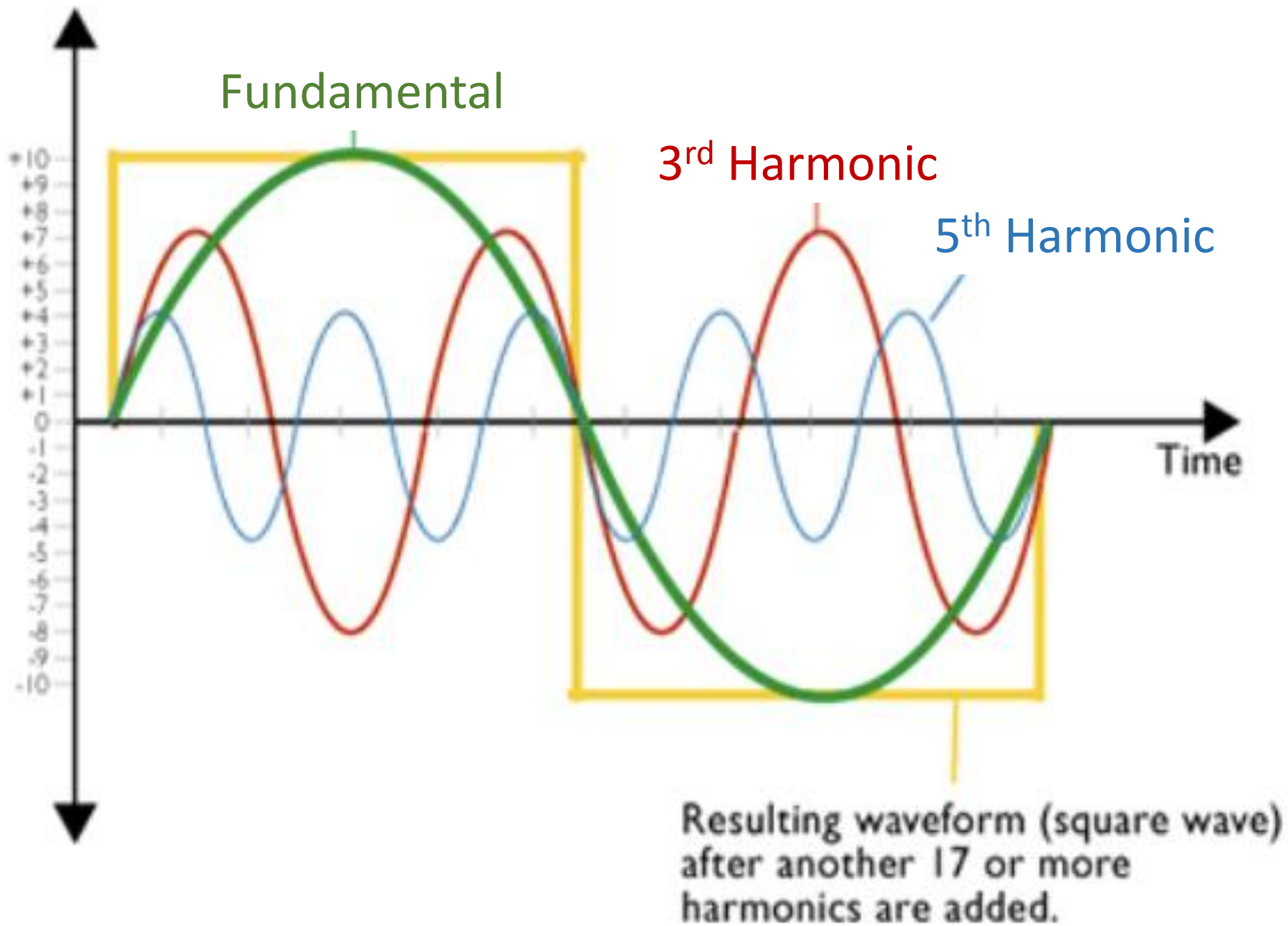
Switching off the problem television fixed the issue for Aberhosan villagers, Openreach says



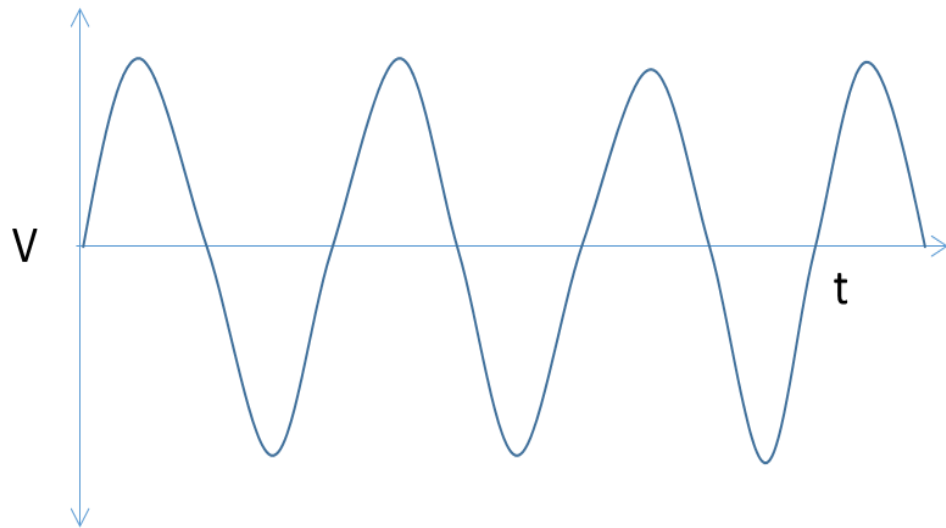




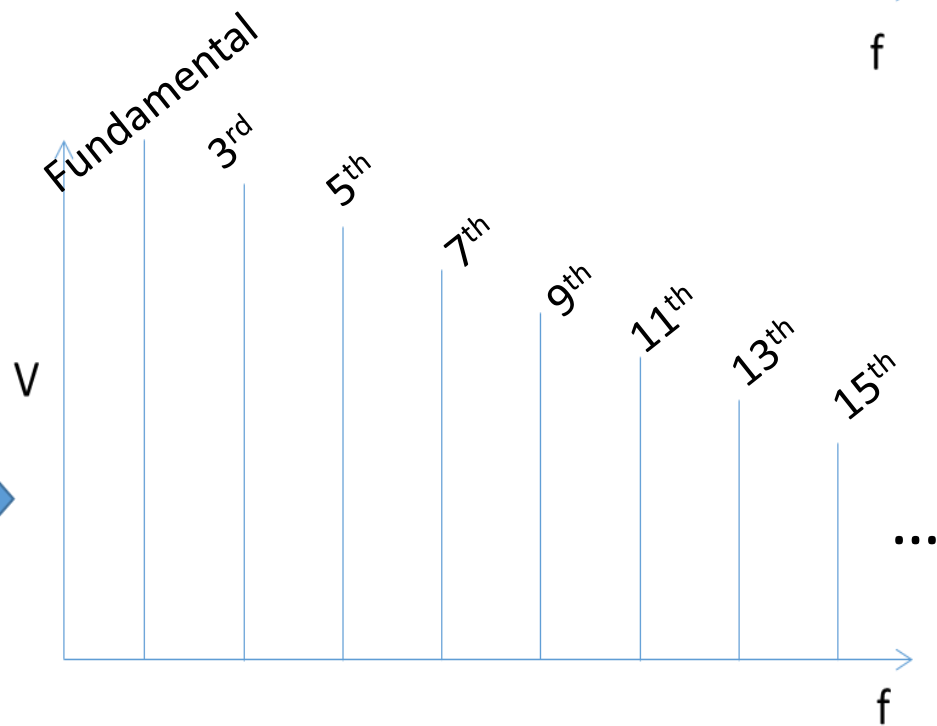
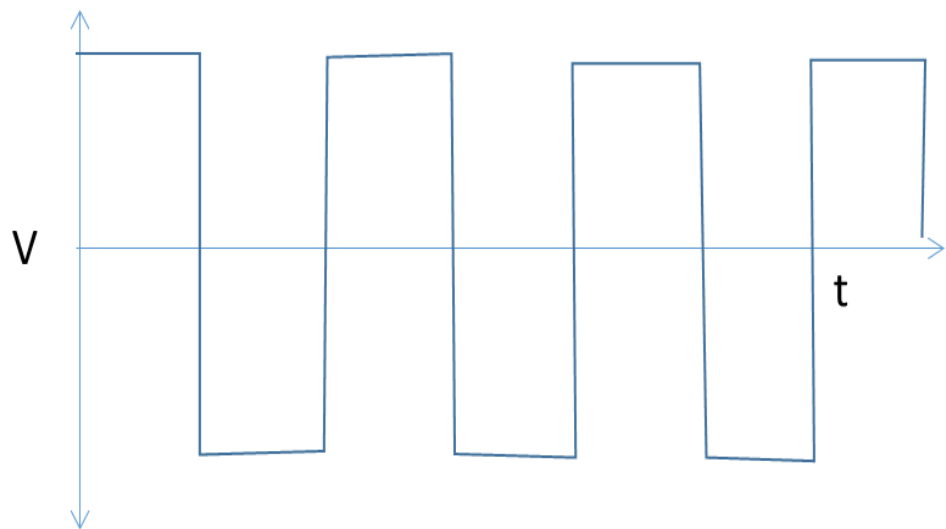
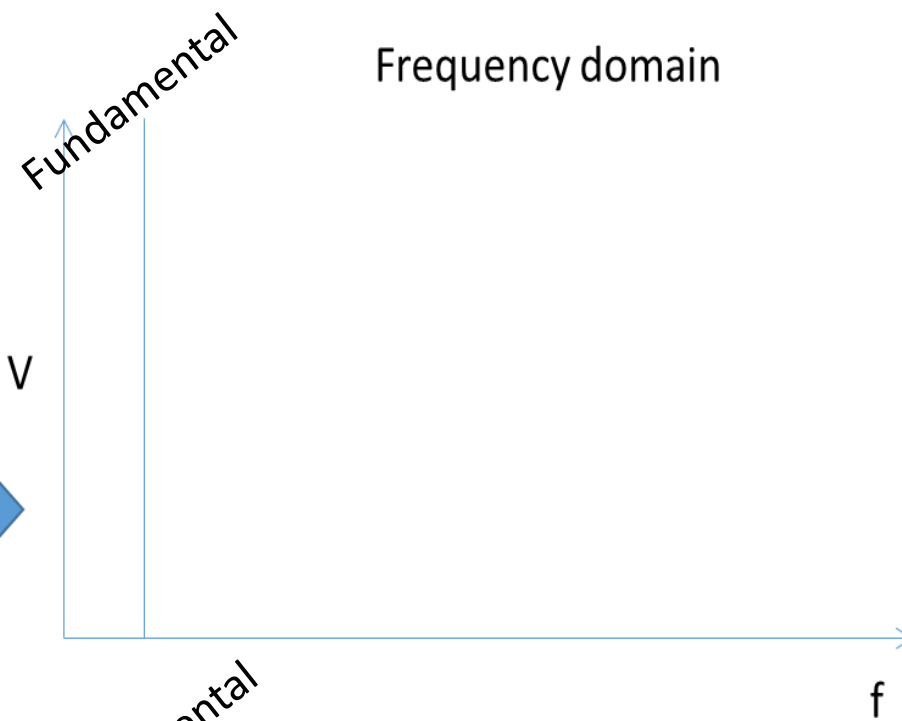




Time domain



Frequency domain



AC INPUT : 100-240V ~ 1.6A 50-60Hz

DC OUTPUT : 12V = 5A

EFFICIENCY LEVEL 



LPS

CAUTION : INDOOR USE ONLY.

WARNING : SHOCK HAZARD. DO NOT OPEN.



STATUTORY INSTRUMENTS

2016 No. 1091

# ELECTROMAGNETIC COMPATIBILITY

## The Electromagnetic Compatibility Regulations 2016

Made - - - -

Laid before Parliament - - - -

Coming into force - - - -

15th November 2016

16th November 2016

8th December 2016

The Secretary of State is a Minister designated(a) for the purposes of section 2(2) of the European Communities Act 1972(b) in relation to measures relating to apparatus which is liable to cause electromagnetic disturbance and to apparatus the performance of which could be affected by such disturbance.

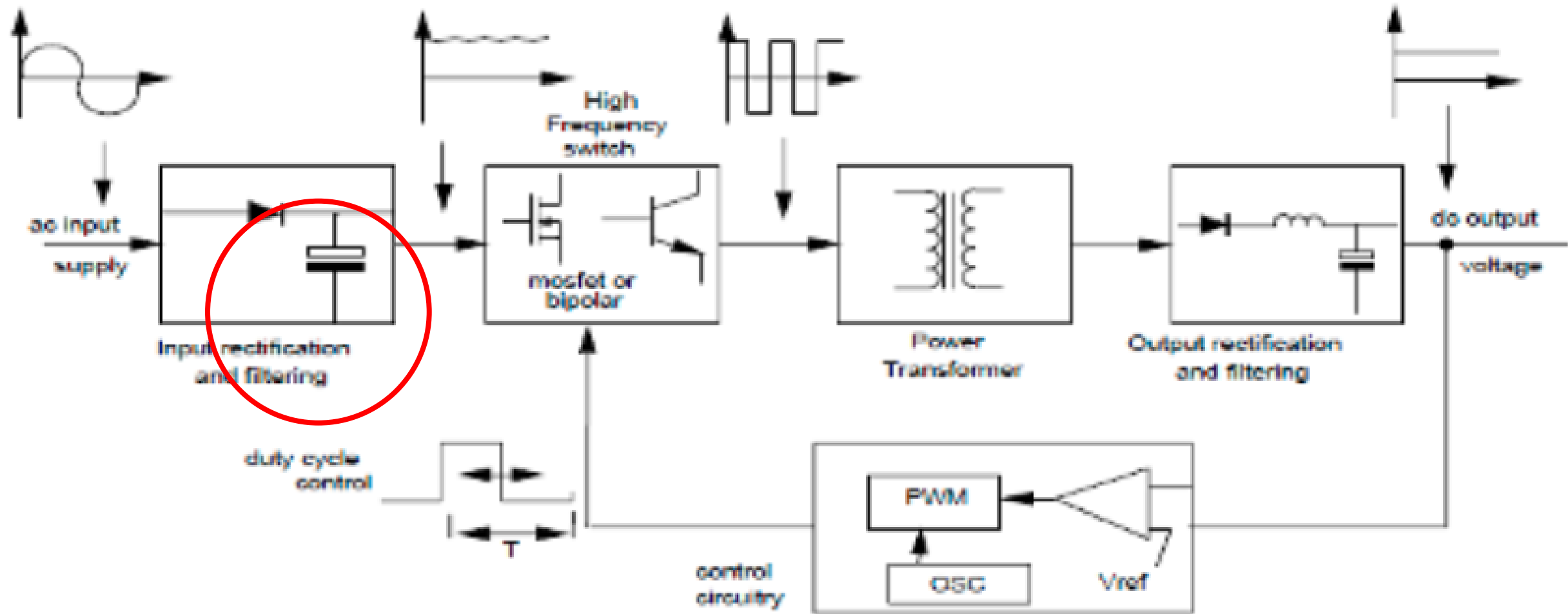
These Regulations make provision for a purpose mentioned in section 2(2) of the European Communities Act 1972 and it appears to the Secretary of State that it is expedient for certain references to provisions of EU instruments to be construed as references to those provisions as amended from time to time.

The Secretary of State makes these Regulations in exercise of the powers conferred by section 2(2) of, and paragraph 1A(c) of Schedule 2 to, the European Communities Act 1972.

### Citation and commencement

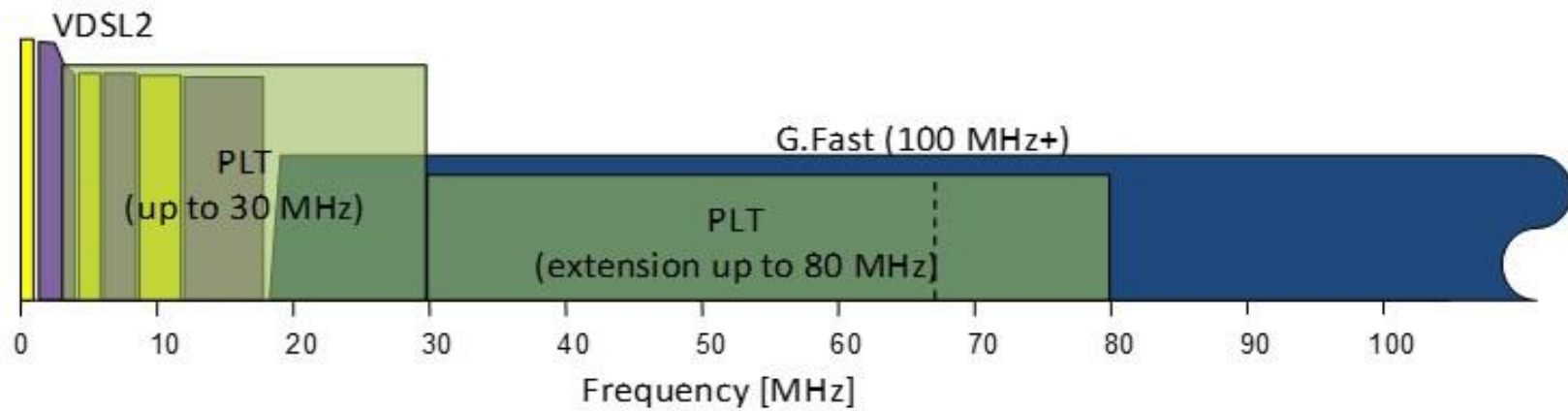
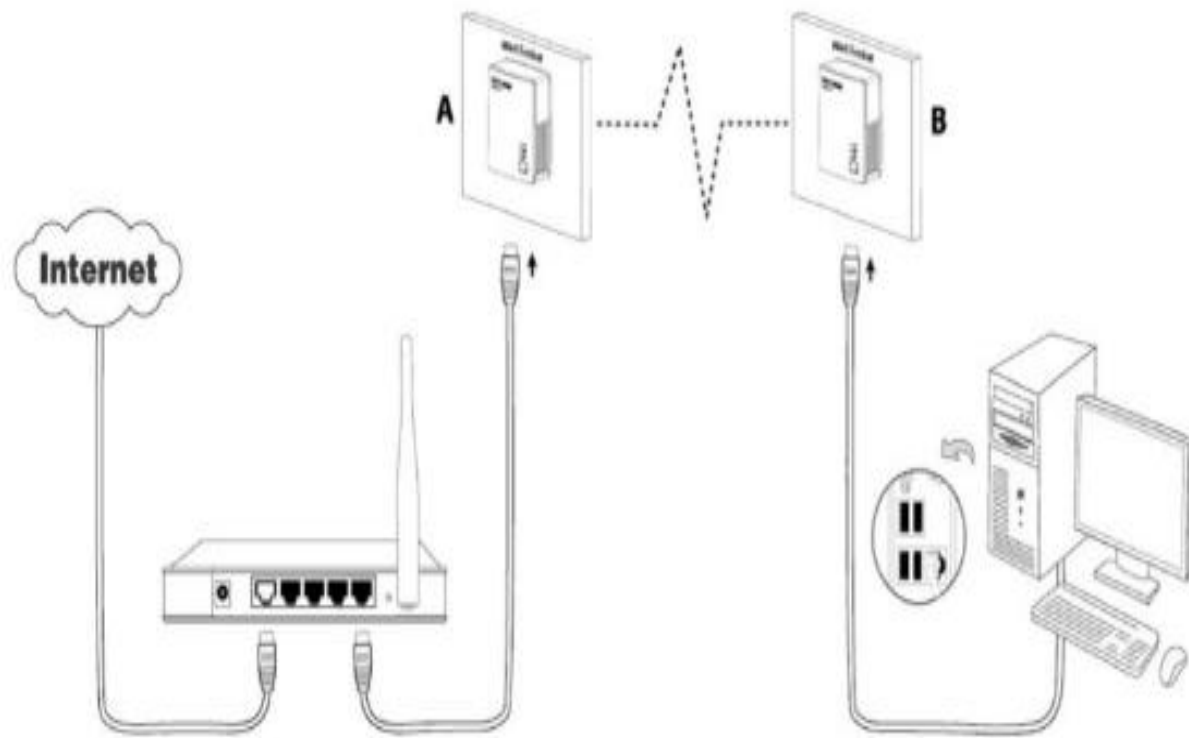
1. These Regulations may be cited as the Electromagnetic Compatibility Regulations 2016 and come into force on 8th December 2016.

### PART 1





# LAB DEMO





Car Alarms and Microwaves

Licence Exempt

Model Remote Control, Wireless Audio and Video

