Abstract

Transmission Properties of 2R and 3R repeaters
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This thesis is about jitter and its effect on bit errors in different combinations of 2R and 3R repeaters. Theory and practice are based on repeaters with electrical signal processing but optical interfaces.

Jitter terminology is rather confusing. A comprehensive description of every possible term in the area is produced. Among these are timing jitter, rms jitter, jitter transfer and many more.

The Erion system has been used for measurements of cascaded repeaters. A complete description about how these measurements were done is given. The equipment in use consisted of, at a maximum, five Optical Line Amplifiers and two completely equipped 16 channel Optical Terminal Multiplexers. The maximum transmission distance was 640 km.

It is shown that 2R jitter can be effectively reduced if a 3R repeater is placed after one or several 2R repeaters. On the other hand, it is also shown that if only 3R repeaters are used, ripple originating in 3R repeaters will grow to extremely high values. These two attributes are both to be considered for a system of cascaded repeaters.

Physics behind jitter is described leading to the employment of the Chapman model and, what is more important, that the Chapman model can be used for systems of both 2R and 3R repeaters. This is shown by measurements and by simulations. The Chapman model was originally derived for pure 3R systems and only for systematic jitter. All together this means that we can show a complete theoretical model for jitter growth in mixed systems of 2R and 3R repeaters.