



Wise Raman™: Integrated Design for Operational Simplicity



“Frankenstein”
implementation



Wise Raman™
design

From its inception, Xtera’s objective was to develop a Raman-centric solution that brings together operational excellence and simplicity, as well as outstanding reach and capacity in optical transmission performances, in field conditions.

Unlike competitive offerings where integrating optical Raman amplifiers with EDFAs is an afterthought, Xtera designed its optical networking platform from the ground up to combine different optical amplification flavors, ranging from simple EDFA to all-distributed Raman amplification. The approach followed by all the other vendors was to first optimize their products around EDFA amplifiers with no plan for interoperating with Raman amplifiers. When pushed by the technical challenges of 100G, these vendors then added a Raman box, often coming from a third party supplier. Such an approach results in a suboptimal hybrid Raman/EDFA implementation with poor levels of functional integration, two different racks or shelves to house the whole amplification subsystem, higher optical pump power requirement, and two distinct management systems. Furthermore, competitive Raman implementations offer only limited reach extension capabilities, but do not address the spectral dimension for wider bandwidth.

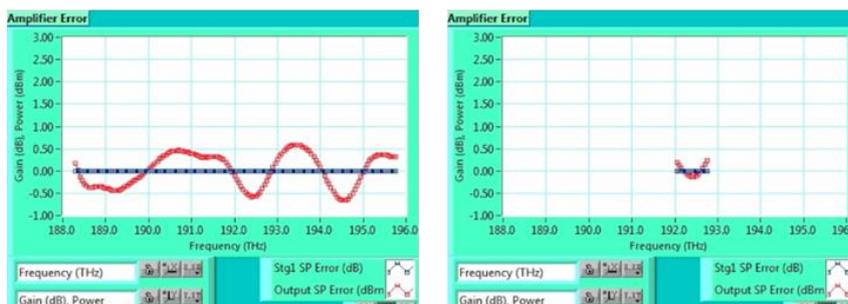


Wise Raman™ is Xtera's solution for introducing Raman optical amplification seamlessly into optical networks, with a specific focus on combining high-end optical reach and capacity performances with operational excellence and simplicity in real network environments. Wise Raman™ solution is not only about the photonic and hardware design of the Raman optical amplifier module; it is also about its integration and operation in both the equipment and the network.

Today, Xtera is backed by an unrivalled 16 years of tremendous and unique R&D experience covering all the aspects of optical networks relying on Raman amplification: modeling, photonics, link engineering, network design, hardware, firmware, software, and network management. This long and thorough R&D background is combined with unparalleled operational experience in the field, built on more than a decade of commercial deployments worldwide in diverse environments (densely populated areas, rain forest, deserts, etc.), in different applications (terrestrial and submarine transmission infrastructures) and for multiple types of customers (telecom network operators, service providers, power utilities, oil & gas, governments, etc.).

One key concern in the original design of Xtera's Raman amplifiers was to offer a product as simple, if not simpler, to operate as EDFA-based equipment. Since its first deployments in 2004, Xtera's Raman amplifier sub-system has demonstrated flawless operation, high efficiency, excellent reliability and unparalleled reach-capacity performances in the field due to the high integration of the different optical amplification technologies and development of a powerful controller.

Xtera's Wise Raman™ solution is designed to be transparent to operators in their networks and facilitate operation in the various daily tasks. With software embedded at different levels inside the product (from hardware to management system), automation and control loops are present in the equipment to facilitate its installation, turning up, testing, commissioning and operation. This includes optimization of span and link performances, Automatic Laser Shutdown (ALS) and power restart, addition of new channels, and more. In service in the field for over 10 years, the robust control algorithm works continuously to adjust optical amplifiers setting points and optimize performance for changing line conditions, including slowly increasing fiber attenuation or transients like sudden cable cuts. Deployments in more than 40 countries and in a variety of environments (including Brazil, Mexico and Togo) illustrate the maturity and transparent introduction of Xtera's Wise Raman™ solution into existing networks.



Control loop in action: gain error over 61nm spectrum before and after 135 out of 150 channels are turned off.
(Vertical scale: 0.5 dB/div.)

As demonstrated by Xtera with seamless integration into existing networks in the past decade, issues commonly blamed on Raman technology (like performance sensitivity on non-ideal fiber plants or issues with ALS mechanisms in case of fiber cuts) are the results of poor implementation by other vendors, not of the technology itself. Xtera achieved the challenge of making Raman amplification a new high-performance network technology without imposing new constraints or practices to operations teams.

Wise Raman™ is Xtera's field-proven, future-proof solution to extend optical reach and expand the optical spectrum in both existing and future long-haul optical transmission infrastructures, enabling an unrivalled Capacity – Reach combination in field conditions. Wise Raman™ represents a critical tool in solving the Capacity – Cost equation in both the short- and midterms for operators.