RF COMMUNICATIONS UP TO 40 GHZ THROUGH OPTICAL FIBER FOR SATELLITES IN CAMPAIGN ON KOUROU LAUNCH BASE

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Abstract:

For more than 30 years, the Kourou launch base has offered payloads a service, called STFO, of RF communications by optical fiber allowing them to provide command and control of the satellite in preparation until launch.

The idea is to convert the Telemetry and Command RF signals, at the interface between the control bench and the satellite, through optical fiber in order to be transported on the launch base over several tens of kilometers, when the satellite is in integration, in filling, in encapsulation, in transfer with the launcher on the launch pad, and in launch countdown.

The system must be versatile and configurable in order to adapt to the wide field of use, from S to Ka band, and with very variable Telemetry and Command power levels.
Since its origin, the system has never ceased to evolve to adapt to increasingly high frequencies, in particular for telecommunications satellites.

The new Ariane 6 launcher will carry telecommunications satellites with TM/TC frequencies up to 40 GHz. To meet the needs of communication with their control bench at this very high frequency, the STFO system has been completely revised, the current system, used on Ariane 5, having reached its performance limits.

After a reminder of the needs to be covered by the STFO system (frequencies, levels, distances, interfaces, etc.), and a description of its architecture, the article will present the main technical issues that the new system for Ariane 6 had to resolve until its qualification during the combined preparatory tests for the first Ariane 6 FM1 campaign:

- Studies of the different long-distance RF transport technologies by optical fiber (RF digitalization, analog modulations) and justification of the choice of indirect analog modulation by interferometry
- Choice of optical wavelengths, optimization between attenuation and chromatic dispersion
- Interface with the satellite's TM and TC signals through the fairing and associated issues (antenna under or outside the fairing, cavity and polarization effects)
- Amplification and filtering chain to guarantee a correct signal up to the control bench