

## Low Noise Active Receiver Feeds for Multibeam Systems at Ka-Band

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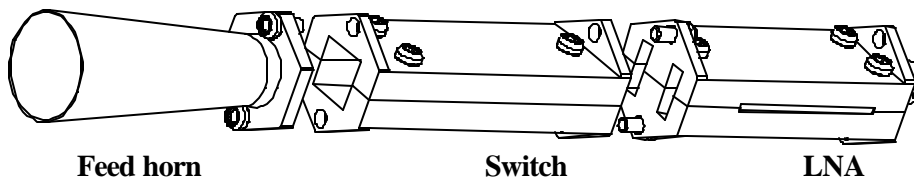
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Saab Ericsson Space is working with the development of one of the key components for multibeam systems at Ka-Band, the active receive feed. Part of this development is in the frame of MultiKaRa, a project partly funded by the EC and run by a European consortium coordinated by Alcatel Space Industries.

The increasing demand on broadband capacity for Internet and multimedia applications is also reflected in the development of satellite based systems. Such systems include relatively small ground terminals with limited size of the antennas and low RF output power. Typical size is  $< 1\text{m}$  antenna diameter and power levels around 5 watts. The antenna size and RF output power puts a very stringent requirement on the G/T value for the satellite based receive channels. The noise temperature has to be minimised and the gain of the antenna has to be maximised. To increase the gain of the antenna the beamwidth has to be reduced. This leads to the use of multibeam antennas as the total coverage cannot be reduced (also the amount of traffic to be handled requires multibeam concepts).

Multibeam antennas use clusters of active receive feeds illuminating a common reflector. The active receive feed comprises the radiating horn, redundancy switch and the low noise amplifiers. The active feeds are combined in a hexagonal pattern into the required clusters, providing the appropriate coverage on the earth. The cc spacing is 12.8 mm.

A single active feed chain is shown below.



The design of the feed horn has a strong impact on the efficiency of the reflector antenna system. The requirement on efficiency leads to horn designs which as effectively as possible should utilize the area of the allocated hexagonal cell, i.e. an efficiency as close as possible to 100%.

The redundancy switch is required to obtain a sufficiently high reliability of the whole system where no single point failures are allowed. The switch must have low losses not to deteriorate the overall noise figure of the active feed. Today the low loss requirement excludes the use of semiconductor switches i.e. waveguide switches are used.

The low noise amplifier is the key element to obtain a very good noise figure. The amplifiers are MMIC's mounted on a ceramic substrate (LTCC) with a hermetic seal. The overall noise figure target for the active receive feed is 2 dB.