THE POLARISATION SKEW OF THE EUTELSAT SATELLITES USING DUAL LINEAR POLARISATION

GENERAL

The linear polarisation planes (defined as X and Y and orthogonal to each other) of most of the Eutelsat satellites are not parallel/orthogonal to the equatorial plane.

For historical reasons, the polarisation planes are inclined by an angle with respect to the equatorial plane. This angle is referenced as the polarisation skew.

This value is of fundamental importance for the following types of antennas, whenever the polarisation alignment is performed in open loop (calculated):

- Earth Stations on Vessels (ESVs)
- Satcom-On -The Move (SOTM)
- Auto-pointing antennas

If the pointing and polarisation alignment software of an antenna falling in the categories above did not take duly into account this value of skew, the polarisation discrimination achieved at the end of the alignment would suffer a major degradation with respect to the value which the antenna optics could theoretically yield, with a consequent high risk of interference to other services on the opposite polarisation and the achievable performance would not be met.

VALUE OF THE SKEW OF THE EUTELSAT SATELLITES

The reference X-polarisation is defined as that polarisation whose plane makes an angle of 93.535° in an anti-clockwise direction, looking towards the earth, about a reference vector with respect to a plane containing this vector and the pitch axis. The reference vector is defined as the vector from the satellite in the direction 0.21° towards west and 6.07° towards north in satellite coordinates.

The reference Y-polarisation is defined as that polarisation whose plane is orthogonal to the X-polarisation plane and the reference vector defined above.

In other words the skew of the Eutelsat satellites is **+3.535°, clock-wise** when looking at the satellite from the earth, from anywhere on the meridian (**in the northern hemisphere**) corresponding to the orbital location of the satellite.

In the southern hemisphere the skew of the Eutelsat satellites is **+183.535°, clock-wise**, from anywhere on the meridian corresponding to the orbital location of the satellite.

There are six satellites of the Eutelsat fleet using linear polarisation which make exception.

These are:

SESAT 2,
EUTELSAT 5 WA,
Telstar 12.
EUTELSAT 172A

for which the skew is 0.0 °

EUTELSAT SATELLITES USING DUAL CIRCULAR POLARISATION

To provide additional guidance to the development of automatic pointing and polarization alignment systems of antennas, it must be noted that Eutelsat operates part of the payload capacity of the following satellites:

EUTELSAT 5WA

EUTELSAT 36A

in dual circular polarization

and part of the payload capacity of:

Telstar-12

in left hand circular polarization