"HARMFUL INTERFERENCE: Regional Security Consequences"

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• FIGHTING WITH SATELLITE INTERFERENCE
• EXAMPLES OF INTERFERENCE
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• Harmful Interference aims to prevent a satellite from performing its desired function.

• It is a continuous danger that any nation utilizing space could face at any time.

• Harmful Interference could:
  • damage a satellite
  • damage only communication traffic on a satellite
Satellite interference is a major problem that all satellite operators and users face with all the time.

Interference is a big challenge avoiding uninterrupted transmission environment and harming both the operators and users.

Interference can be categorized into two main groups:
- Deliberate interference
- Accidental interference
Accidental interference categorization:

- Uplink personnel mistakes (human error)
- Cross-pole interference caused by misaligned uplink signal in opposite transponders.
- Unknown carriers (Interference source is not identified, rogue carrier)
- Hardware problems
- Adjacent satellite interference
- Terrestrial service interference
Harms caused by interference:

- A tremendous drain on company resources including man power
- Degradation of available satellite capacity
- Financial impact
EXAMPLES OF INTERFERENCE

1. CROSSPOLE EFFECT

Before the transmission, every user must set their antennas to correct polarization alignment.

This setting can minimize cross-pole effect however sometimes uplink personnel doesn’t obey the uplink procedures and try to carry its content to the head end immediately causing such interferences.
EXAMPLES OF INTERFERENCE

SNG CROSSPOLE EFFECT

DEVICE SETTINGS:

Plan: TURKSAT-3A
SITE INFO:
CoPo1 -- Site: Turksat_Operations_Center
XPo1 -- Site: Turksat_Operations_Center

Carrier: Bandwidth
Device: M1000-1
Device Type: DSP
Device: M1010x2--1
Device Type: DSP
2. HUMAN ERROR

Uplink personnel may enter incorrect parameters such as center frequency or symbol rate resulting in interference to other carriers.
3. EQUIPMENT ERROR

Equipment faults such as malfunctioning of Uplink Power Control systems could cause the carrier to increase its power level dramatically impacting other carriers.
3. EQUIPMENT ERROR

EXAMPLES OF INTERFERENCE

INTERRUPTED TRANSMISSIONS

NORMAL TRANSMISSIONS
Uplink systems trying to uplink to a close by satellite may cause interference if the antenna is not aligned correctly to the intended satellite.
For the industry, the most frequent interference sources for communication satellites in 2012 have been:

- Unknown Carriers
- Human Error
- Cross Polarization Effect
- Deliberate Interferences
- Adjacent Satellite Interference
- Hardware Problems

Recently, an increase in Deliberate Interferences have been observed.
The interferences occurred on satellites in 2012 have been categorized as below:

- **Unknown Carriers**: 28%
- **Crosspole**: 35%
- **Hardware Problems**: 7%
- **Human Error**: 3%
- **Deliberate Interferences**: 3%

Biggest share belongs to cross pole interferences.

Overall, in most of the interference cases we see human factor since we can consider cross pole interference and unknown carrier as human error too.
TURKSAT AS is putting major efforts to avoid interference occurrences and when happens to resolve them. We can categorize precautions taken in three groups:

• Registration Process and Uplink Personnel Training
• Geolocation
• Carrier ID
STUDIES and PRECAUTIONS

1. TURKSAT REGISTRATION CODE PROCESS

Fixed and mobile uplink systems, which are used for transmission via TURKSAT A.S satellites, are being subjected to the required tests to check compliance with the international standards.

TURKSAT trains users’ uplink personnel through this registration process and through different events in order to give them an insight why interference occurs and what the harmful results could be.
2. Geographical Location Search of Interference Source

Turksat has set up a Geolocation System to detect the uplink location of interferences. This tool along with regular techniques to identify the cause of the problem helps us to locate the place of interference and to resolve it.
3. CARRIER ID

The Carrier ID technology embeds and detects a small message and unique ID within a video or data satellite carrier. This embedded message and ID significantly reduce the time to identify and clear interference sources.

Carrier ID standard is undergoing formal approval, bluebook A164 specification file is already published by DVB.
• Most of the interferences are caused by human error and they are easy to resolve once the source of the signal is determined.

• Carrier ID is a promising technology that will ease the solution process dramatically and Satellite communication community has to work together to spread the use of Carrier ID.

• It is important to resolve interference once it occurs whereas it is more desirable to avoid and reduce the number of interference cases

=> Training, Awareness
• Close cooperation with all countries in a spirit of understanding of the concept that space is a common heritage of humankind.
Thank you