



KRATOS

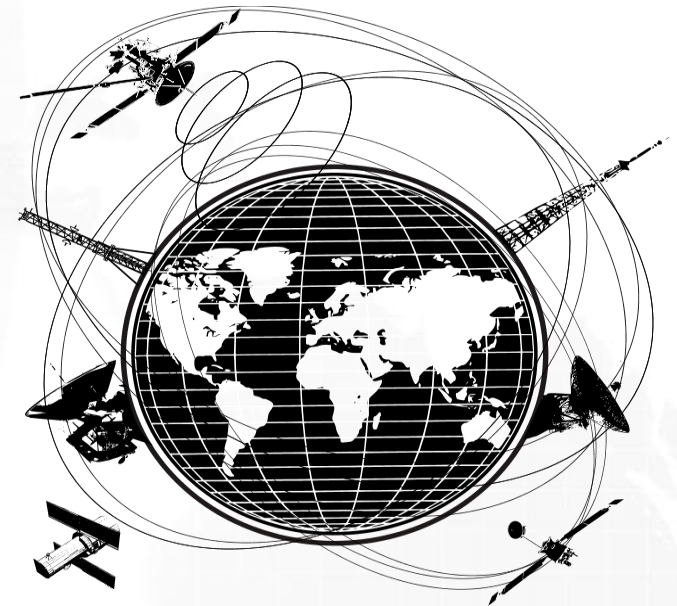

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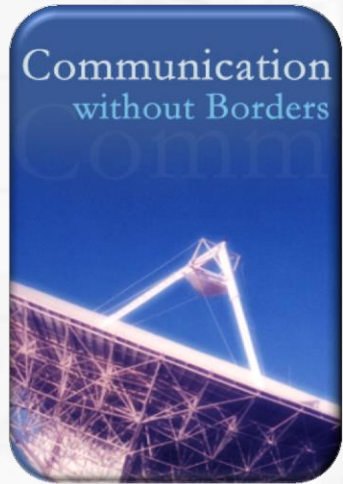
Preparing RF Situational Awareness On Major Events

Jérôme Duboé
ITU Regional Seminar for CIS and Europe Kyiv,
Ukraine, 10-12 July 2013

Presentation Agenda

- Major Events Ever Impacted by Satellites Interferences ?
- Examples of Interference & Characterization.
- Organization & Systems Preparation prior Major Events
- Conclusion.

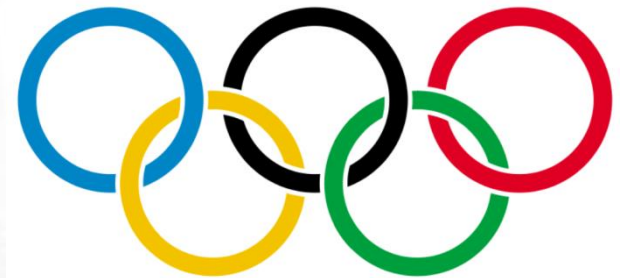




Major Events Ever Impacted By Satellites Interferences ?

What is a Major Event ?

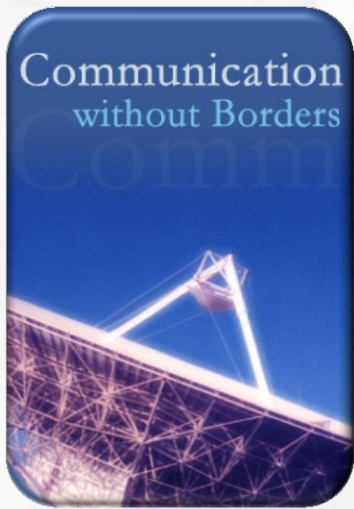
- **International Sport Events:**
 - Summer Olympic Games (London 2012 First CarrierID) (Rio 2016).
 - Winter Olympic Games (Sochi 2014) (PyeongChang 2018).
 - Football World Cup (Brazil 2014) (Russia 2018) (Qatar 2022).
 - Football Euro Cup (France 2016) .
 - Rugby World Cup (England 2015) (Asia2019).
 - Champions leagues finals
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- **Major Political and Public event:**
 - Elections in major country as USA.
 - National funerals.
 - Royal Weeding.
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Al Jazeera Sports FIFA World Cup 2010

- Official press release : <http://www.integ-europe.com/news/al-jazeera-tv-resolves-interference-issue-during-fifa-world-cup>
- Event description :
 - Al Jazeera Sports Channel suffered disruptions during broadcasts of FIFA World Cup™ football matches in South Africa 2010.
 - Several matches have been impacted during few minutes.
 - TV broadcasts were performed on several satellites and several transponders.
- Direct impact : millions of Al Jazeera Sports subscribers across the Middle East and North Africa.
- Mid term impact : Al Jazeera Sports subscription cancelation.
- Investigations on this case :
 - No preparation regarding geolocation scenarios and satellite ephemeris
 - Integral Systems Europe geolocated the transmitter and provided results.

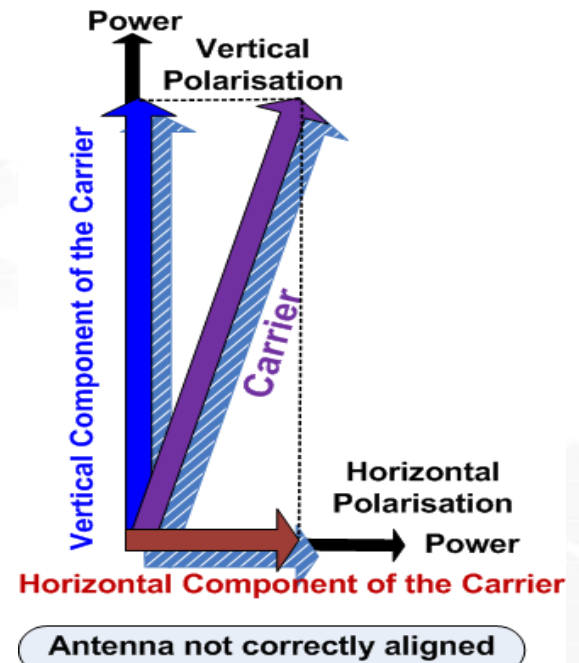
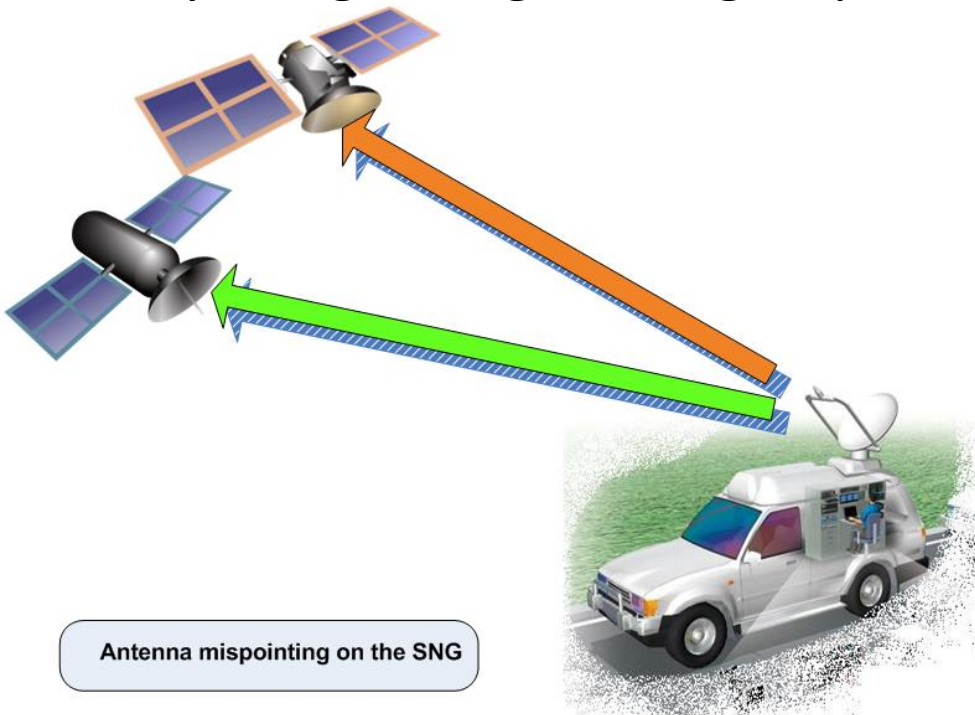




Examples of Interference & Characterizations

Accidental Interference

- Wrong polarization, wrong frequency, wrong satellite, wrong symbol rate, wrong timeslot...
- Inaccurate uplink antenna polarization.
- Many things can go wrong, especially in a busy SNG environment?

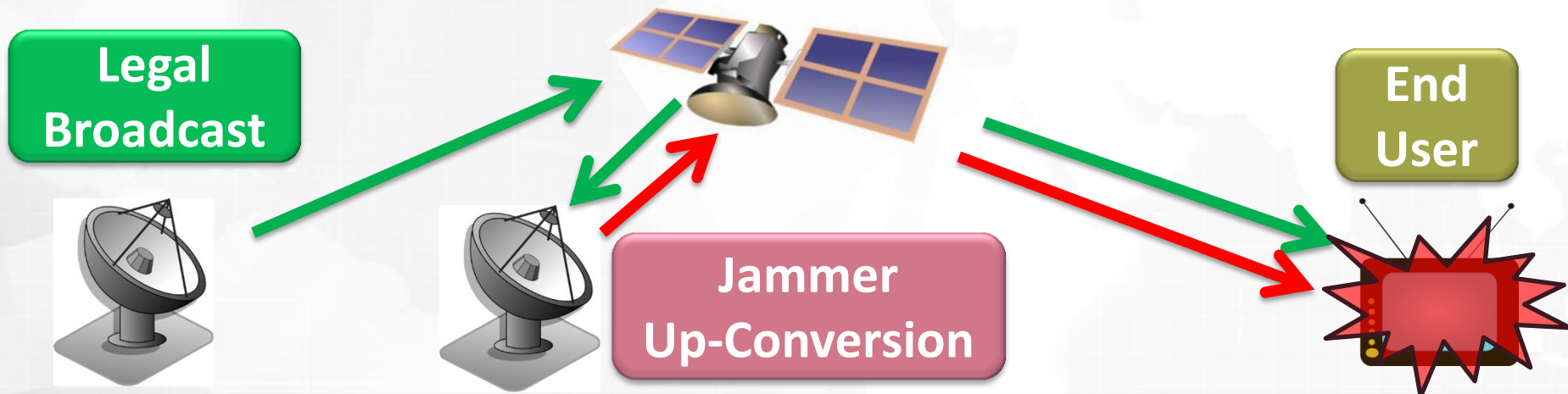


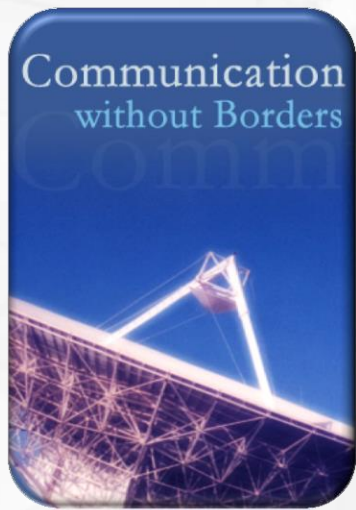
Deliberate Jamming

- Deliberate jamming is becoming a practice in some regions.
- Jamming can be motivated by political or economic aims.
- An unauthorized carrier could be:
 - An illegal user of a satellite channel from a satellite operator point of view (i.e., user stealing the satellite operator's capacity).
 - An illegal transmitter from a regulator point of view (i.e., user who doesn't pay a national license fee).
- Example of deliberate jamming technics :
 - Basic : jamming carrier transmitted on top of an existing carrier.
 - Medium : jamming carrier transmitted under the carrier (Eb/No impact).
 - Advanced: re-uplink of the legal broadcast channel.

Interference Characterisation

- Accidental Interference
 - If the carrier ID is set, user data collection allows to identify the source.
 - If transmission is suspected to be on-site, UpLink Geolocation points the antenna.
- Deliberate Jamming Carrier Characterisation:
 - Basic : a Spectrum Analyser displays the interfering spectrum.
 - Medium : stop the main carrier or DSP characterises carrier under carrier.
 - Advanced: re-uplink of the legal broadcast channel : DSP is the only solution (difficult to analyse : stopping the broadcast stops the interference).





Organization & Systems Preparation prior Major Events

Preparation & Ready To Use Systems

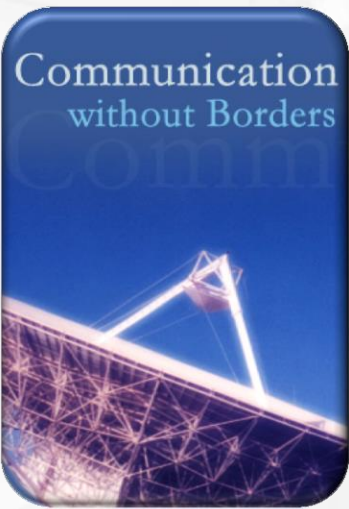
- Coordination Regulatory Office on the Event site.
 - Carrier ID set by each local satellite user.
 - Transmissions plans collection by the regulator.
- Advanced Spectrum Management tools :
 - Advanced Carrier Monitoring System based on Digital Signal Processing.
 - Carrier ID Reading System.
- Ready to use Geolocation systems :
 - Accurate up-to-date ephemeris or compensated ephemeris.
 - Satellite payload configuration (Transponders configuration , oscillators, ...).
 - Reference emitter population.



World Wide 24/7 Network for Services

- Investing in materials, teams and training could be impossible.
- On site and remote service run by RF experts is the alternative.





Conclusion

Conclusion

- Major Events Ever Impacted by Satellites Interferences ?
 - Major events are either sport or political.
 - Al Jazeera Sports Interference during the FIFA World Cup 2010.
- Examples of interference & Characterization.
 - Accidental Interference.
 - Deliberate Jamming using simple or advanced technics.
 - DSP technology characterizes most interferences and provides Carrier ID
- Organization & Systems Preparation prior Major Events:
 - On site coordination and advanced ready to use DSP systems.
 - Service from RF expert engineers is an alternative.
 - Advanced Airborne on site system speed up harmful interference stop.

Preparing RF Situational Awareness On Major Events

Thank You

Preparing RF Situational Awareness On Major Events

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