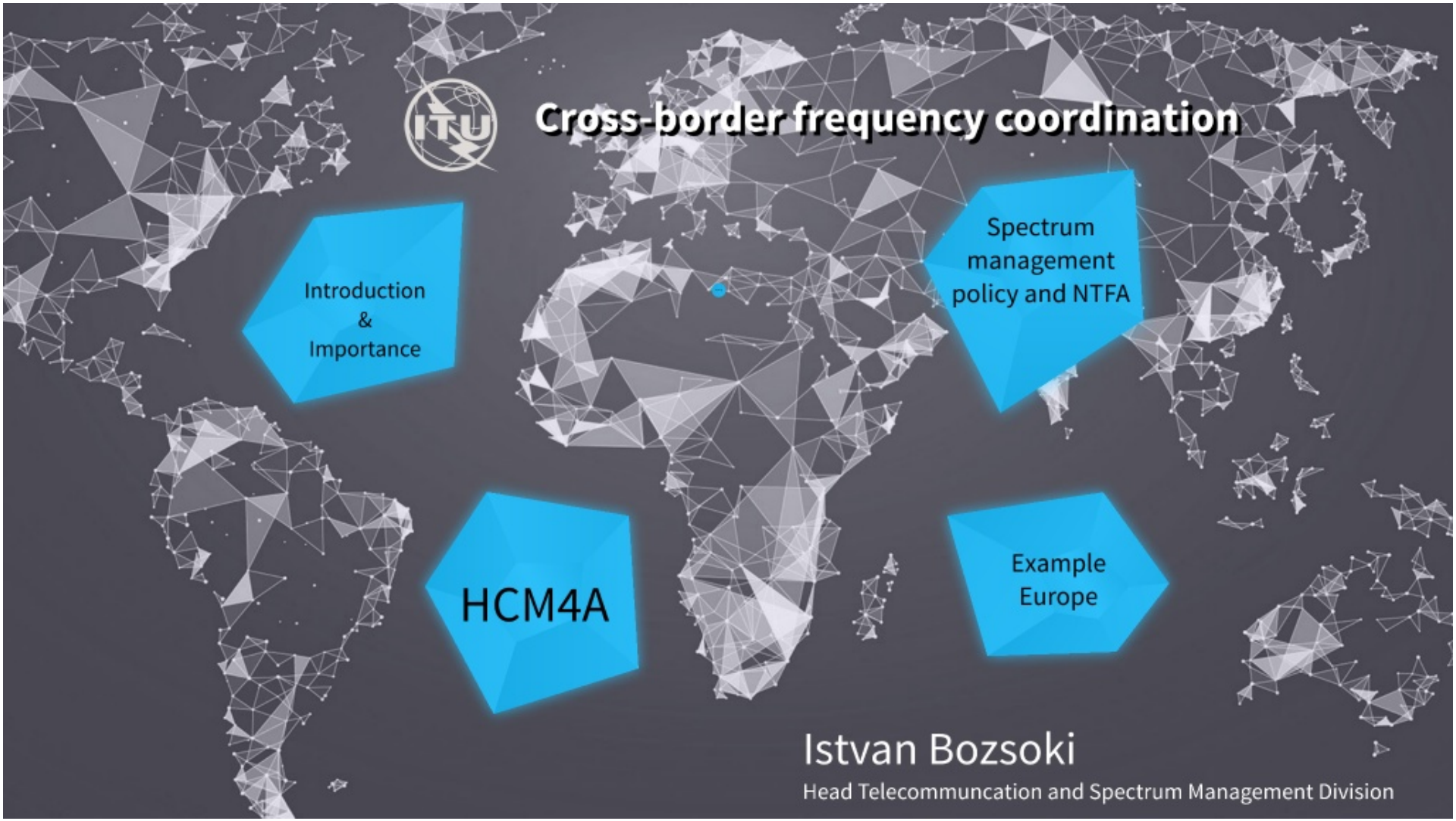
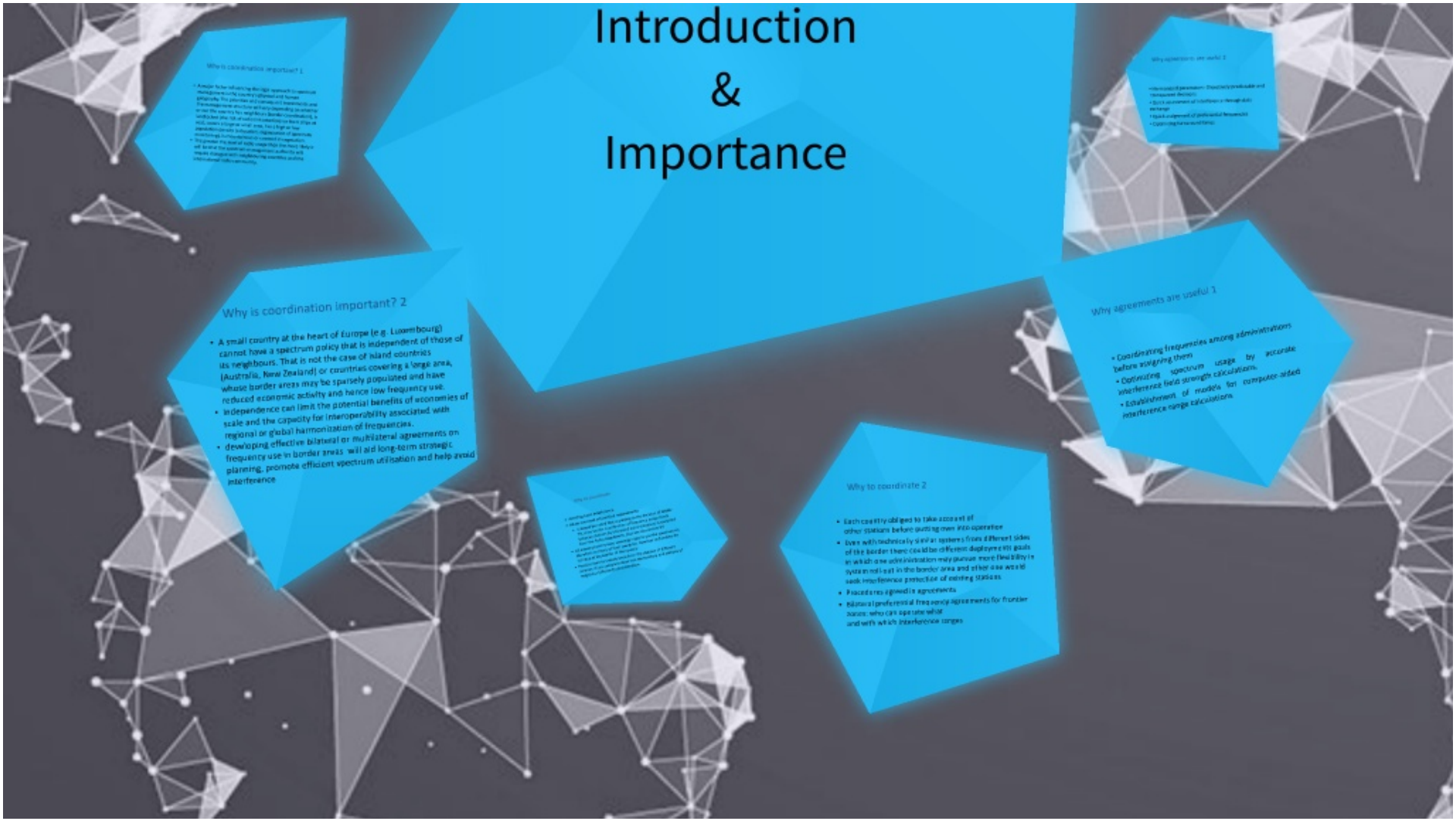

Cross-border frequency coordination
Introduction & Importance
Spectrum management policy and NTFA
HCM4A
Example Europe
Istvan Bozsoki
Head Telecommuncation and Spectrum Management Division


Introduction
&
Importance
Why is coordination important? 2
• A small country at the heart of Europe (e.g. Luxembourg) cannot have a spectrum policy that is independent of those of its neighbours. That is not the case of island countries (Australia, New Zealand) or countries covering a large area, whose border areas may be sparsely populated and have reduced economic activity and hence low frequency use.
• Independence can limit the potential benefits of economies of scale and the capacity for interoperability associated with regional or global harmonization of frequencies.
• developing effective bilateral or multilateral agreements on frequency use in border areas will aid long-term strategic planning, promote efficient spectrum utilisation and help avoid interference
Why to coordinate 2
• Each country obliged to take account of other stations before putting own into operation
• Even with technically similar systems from different sides of the border there could be different deployment goals in which one administration may pursue more flexibility in system roll-out in the border area and other one would seek interference protection of existing stations
• Procedures agreed in agreements
• Bilateral preferential frequency agreements for frontier zones: who can operate what and with which interference ranges
Why agreements are useful 1
• Coordinating frequencies among administrations before assigning them
• Optimizing spectrum usage by accurate interference field strength calculations.
• Establishment of models for computer-aided interference range calculations


Why is coordination important? 1
• A major factor influencing the legal approach to spectrum management is the country's physical and human geography. The priorities and consequent investments and the management structure will vary depending on whether or not the country has neighbours (border coordination), is landlocked (the risk of radio link interference from ships at sea), covers a large or small area, has a high or low population density (saturation, organization of spectrum monitoring), is mountainous or covered in vegetation.
• The greater the level of radio usage then the more likely it will be that the spectrum management authority will require dialogue with neighbouring countries and the international radio community.


Why is coordination important? 2
• A small country at the heart of Europe (e.g. Luxembourg) cannot have a spectrum policy that is independent of those of its neighbours. That is not the case of island countries (Australia, New Zealand) or countries covering a large area, whose border areas may be sparsely populated and have reduced economic activity and hence low frequency use.
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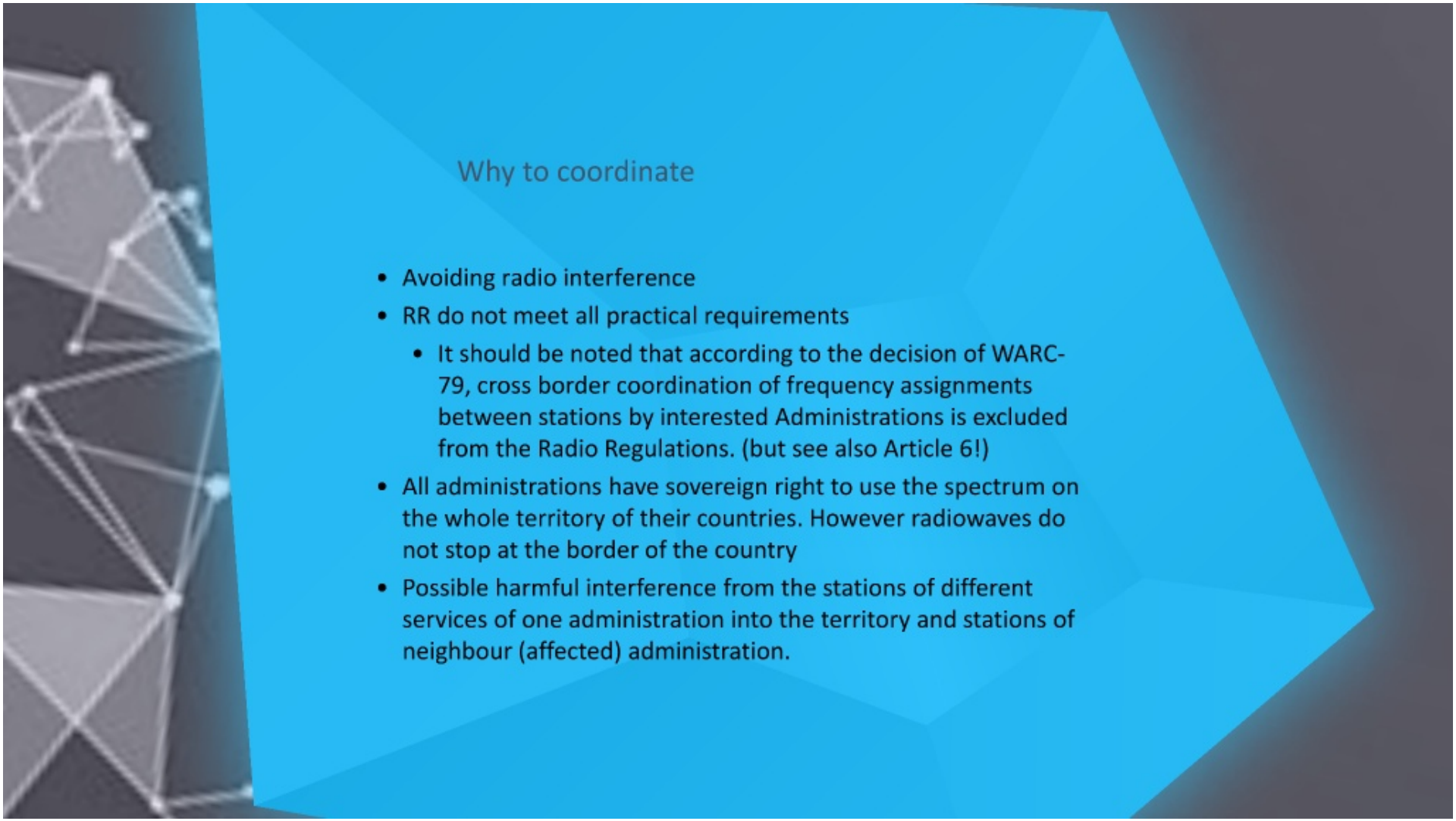
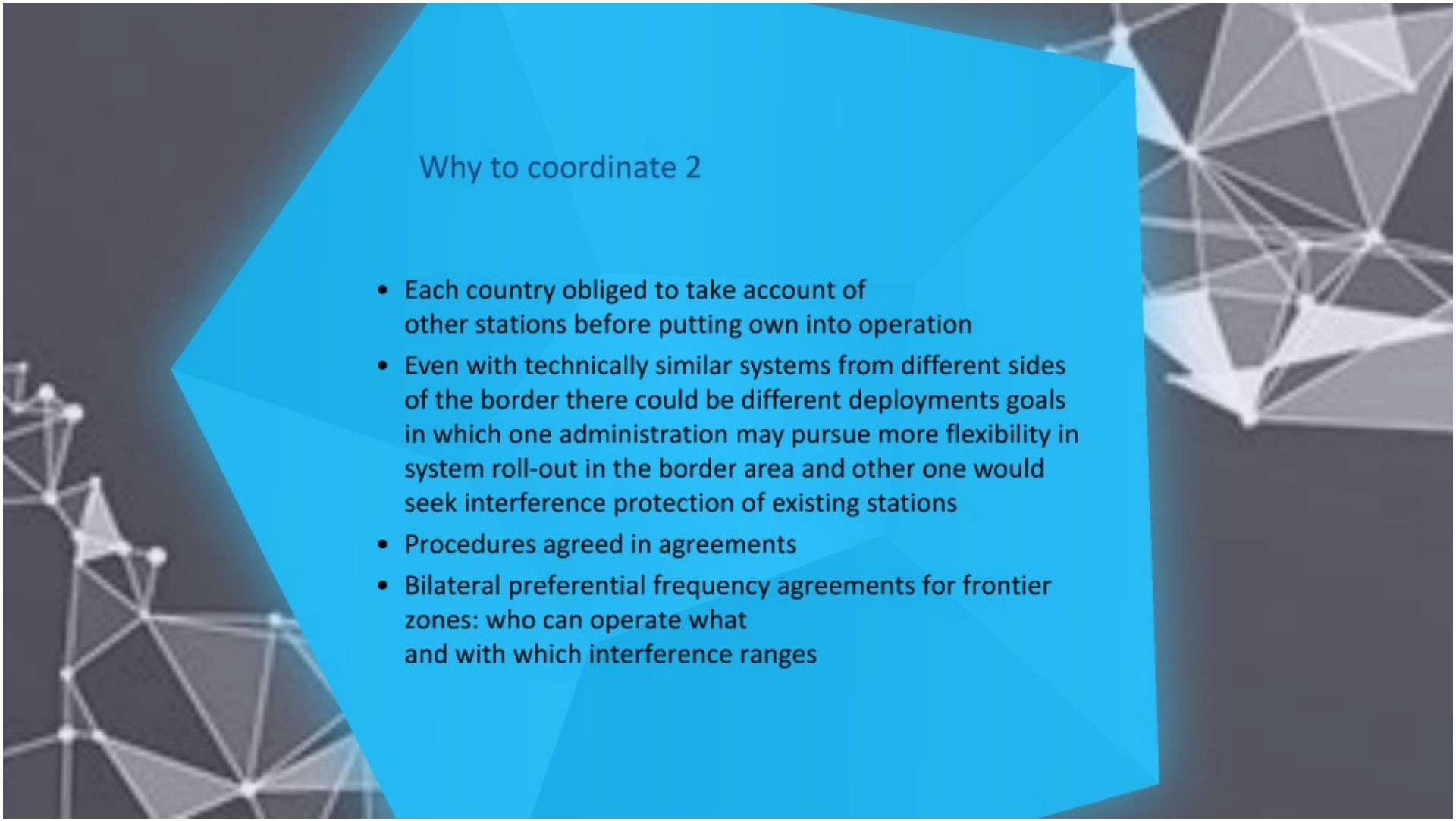

Why to coordinate
• Avoiding radio interference
• RR do not meet all practical requirements
• It should be noted that according to the decision of WARC-79, cross border coordination of frequency assignments between stations by interested Administrations is excluded from the Radio Regulations. (but see also Article 6!)
• All administrations have sovereign right to use the spectrum on the whole territory of their countries. However radiowaves do not stop at the border of the country
• Possible harmful interference from the stations of different services of one administration into the territory and stations of neighbour (affected) administration.


Why to coordinate 2
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Why agreements are useful 1

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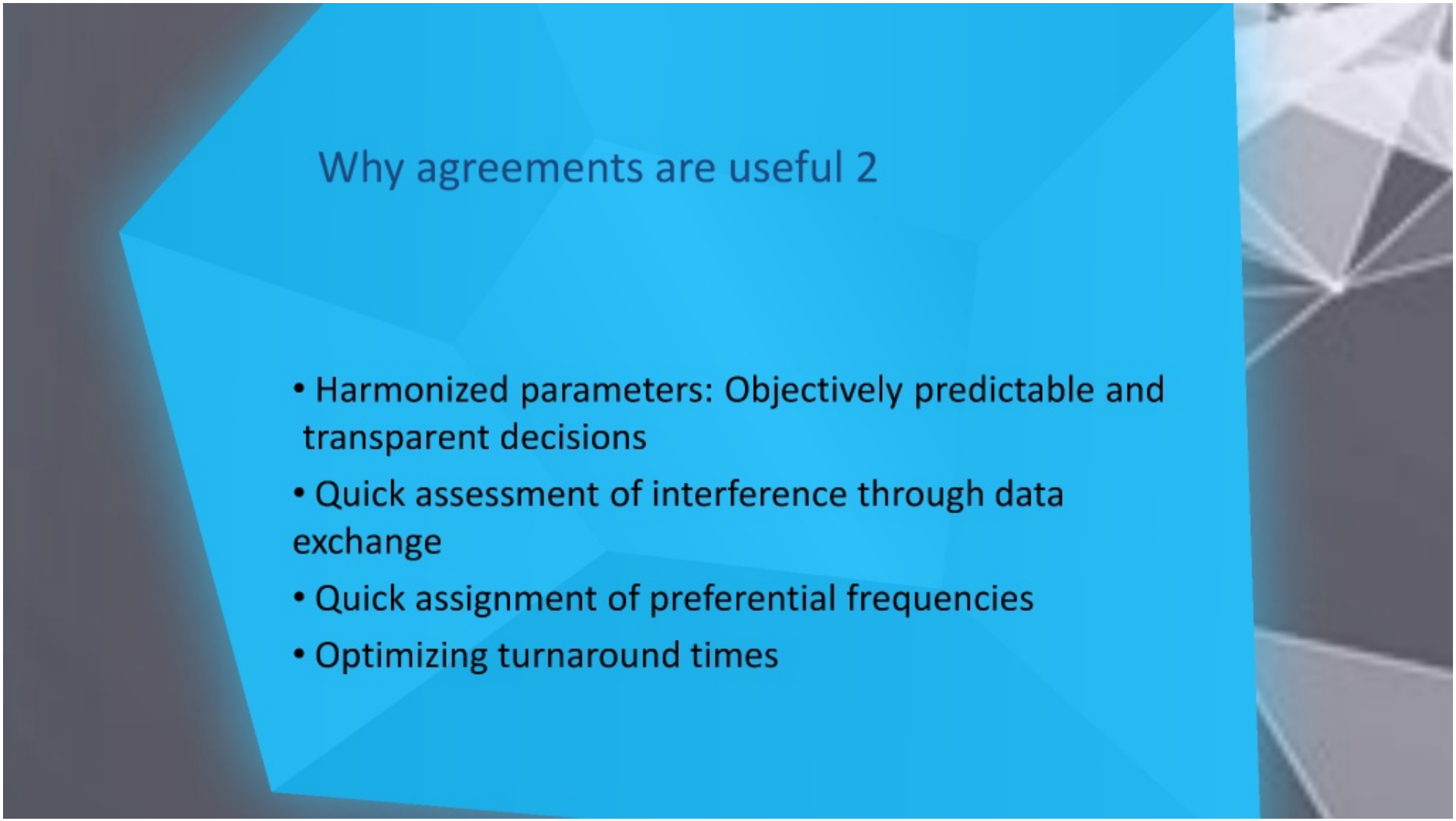
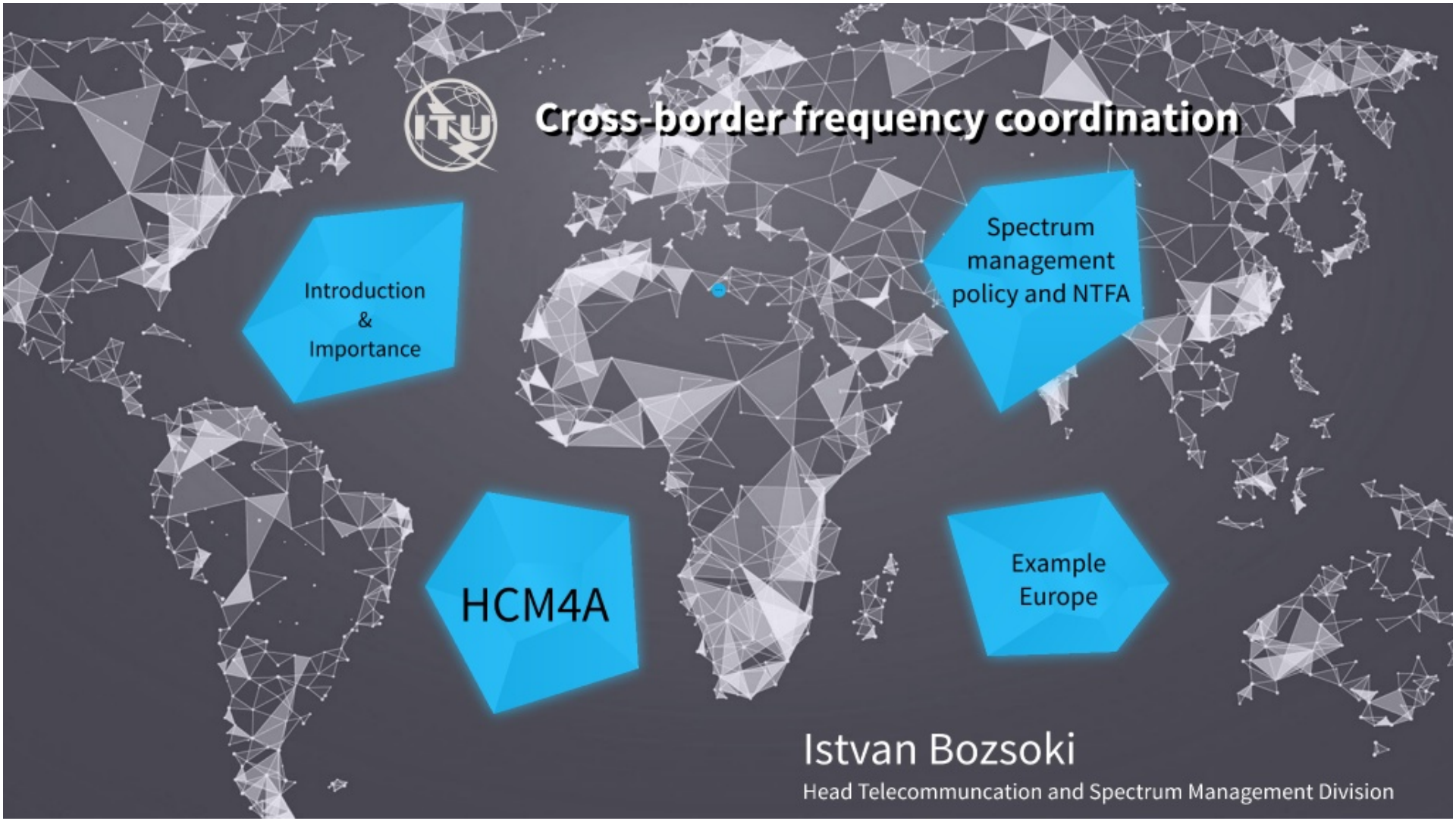
- Optimizing spectrum usage by accurate interference field strength calculations.
- Establishment of models for computer-aided interference range calculations


Why agreements are useful 2
• Harmonized parameters: Objectively predictable and transparent decisions
• Quick assessment of interference through data exchange
• Quick assignment of preferential frequencies
• Optimizing turnaround times


Cross-border frequency coordination
Introduction & Importance
Spectrum management policy and NTFA
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Example Europe
Istvan Bozsoki
Head Telecommuncation and Spectrum Management Division

Spectrum management policy and NTFA

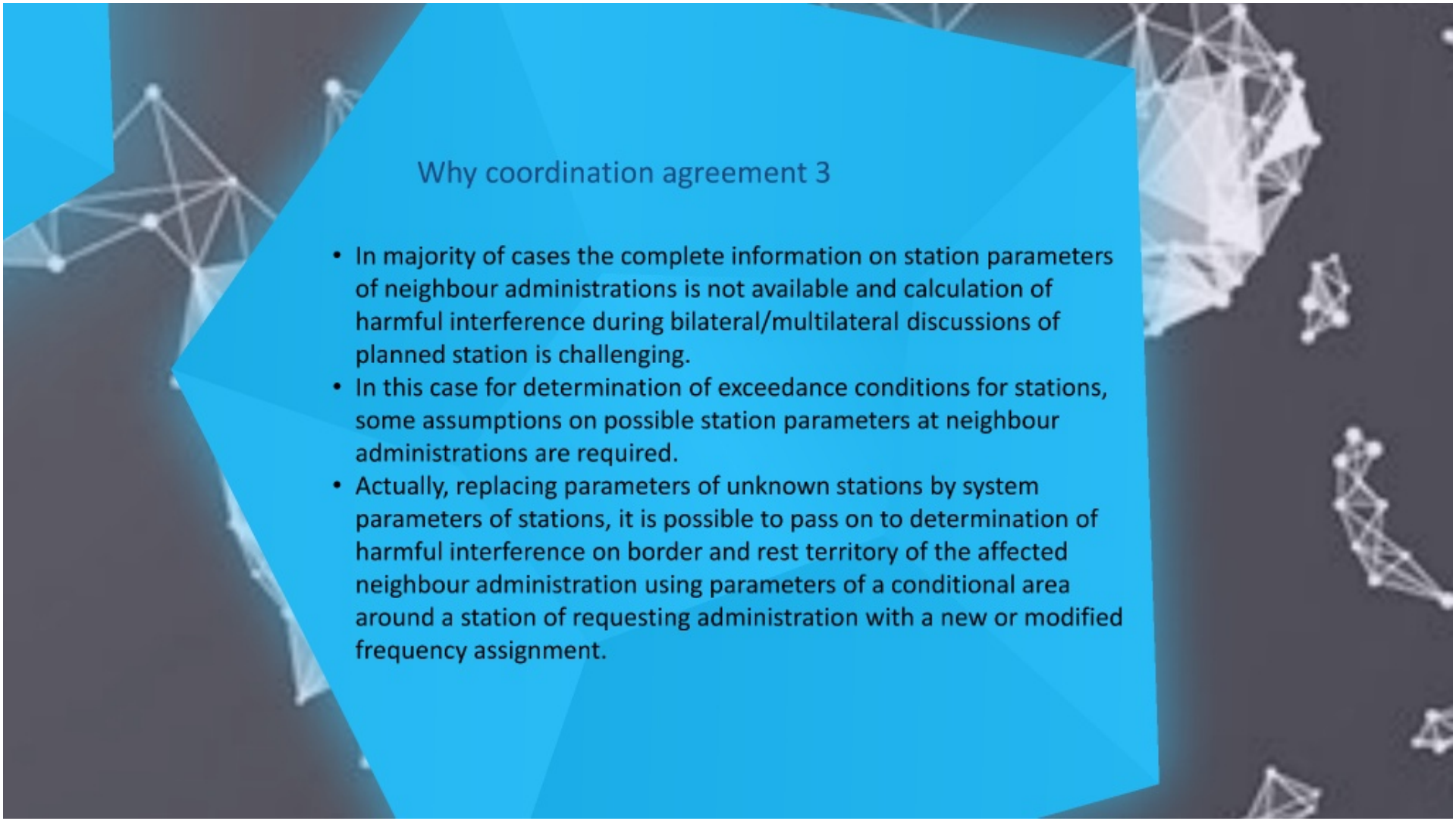

Spectrum management policy and NTFA
• It is a government responsibility to develop spectrum management policies that conform to the international treaty obligations of the Radio Regulations while meeting national spectrum needs.
• Within the national legal framework for telecommunications a spectrum management organisation has the delegated authority to prepare spectrum plans that meet government policies.
  • National spectrum plans should be reviewed regularly and, when necessary, be updated to keep pace with technology and changing demands.
• One of the most important tools for effective spectrum management is the National Table of Frequency Allocation (NTFA). This shows how the spectrum can be used in the country.

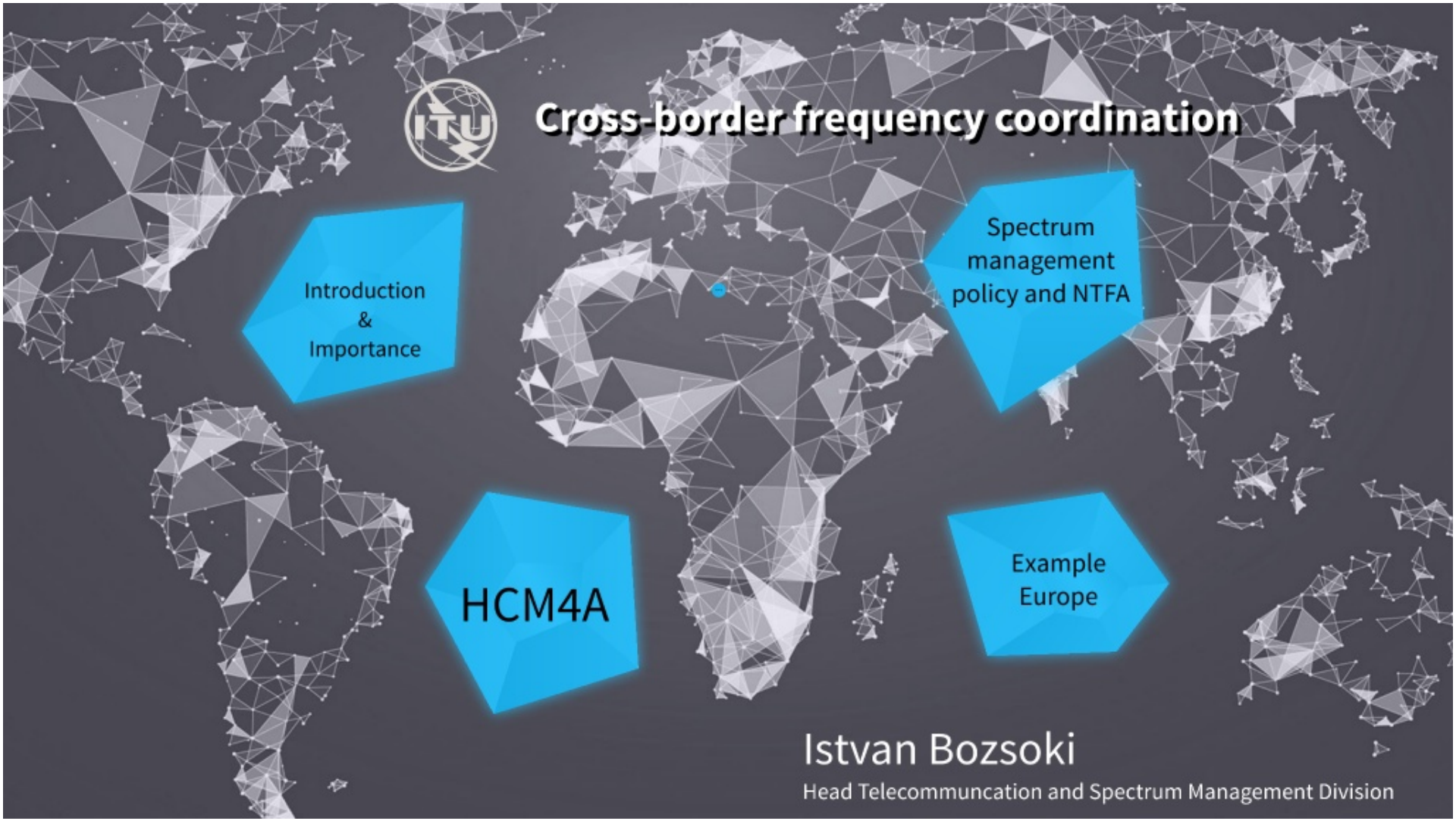
Why coordination agreement

- The most efficient method for resolving interference of stations in a border region is frequency assignment planning, when neighboring administrations possess entire information regarding parameters of planned and operated stations of the affected administrations.
- In such a case the impact of harmful interference can be calculated during bilateral/multilateral discussions of the planned station.
- And although the situation described above is not typical in cross-border discussions between administrations , such approach shows the idealized course of action process providing maximum efficiency at minimum probability of neglected harmful interference.
- This approach has no difference between determination of technical conditions and the calculation to determine the mutual impact of a new or modified frequency assignment of requesting administration to stations of the affected administrations.

Why coordination agreement 2

- To calculate the effect of harmful interference during bilateral/multilateral discussions of a planned station, a parameter for permissible harmful interference needs to be determined.
- When defining the parameter for permissible impact of harmful interference on receiving station, it is recommended to use condition of protection of the receiving station from “long-term” harmful interference at a minimum (threshold) signal level.
- “Long-term” interference is defined as harmful interference with permissible level exceeded more than 1% of time. During bilateral/multilateral discussions on harmonization of planned frequency assignments to stations, it is recommended to use the requirement for protection from “long-term” interference not exceeded more than 20% of time.


Why coordination agreement 3
• In majority of cases the complete information on station parameters of neighbour administrations is not available and calculation of harmful interference during bilateral/multilateral discussions of planned station is challenging.
• In this case for determination of exceedance conditions for stations, some assumptions on possible station parameters at neighbour administrations are required.
• Actually, replacing parameters of unknown stations by system parameters of stations, it is possible to pass on to determination of harmful interference on border and rest territory of the affected neighbour administration using parameters of a conditional area around a station of requesting administration with a new or modified frequency assignment.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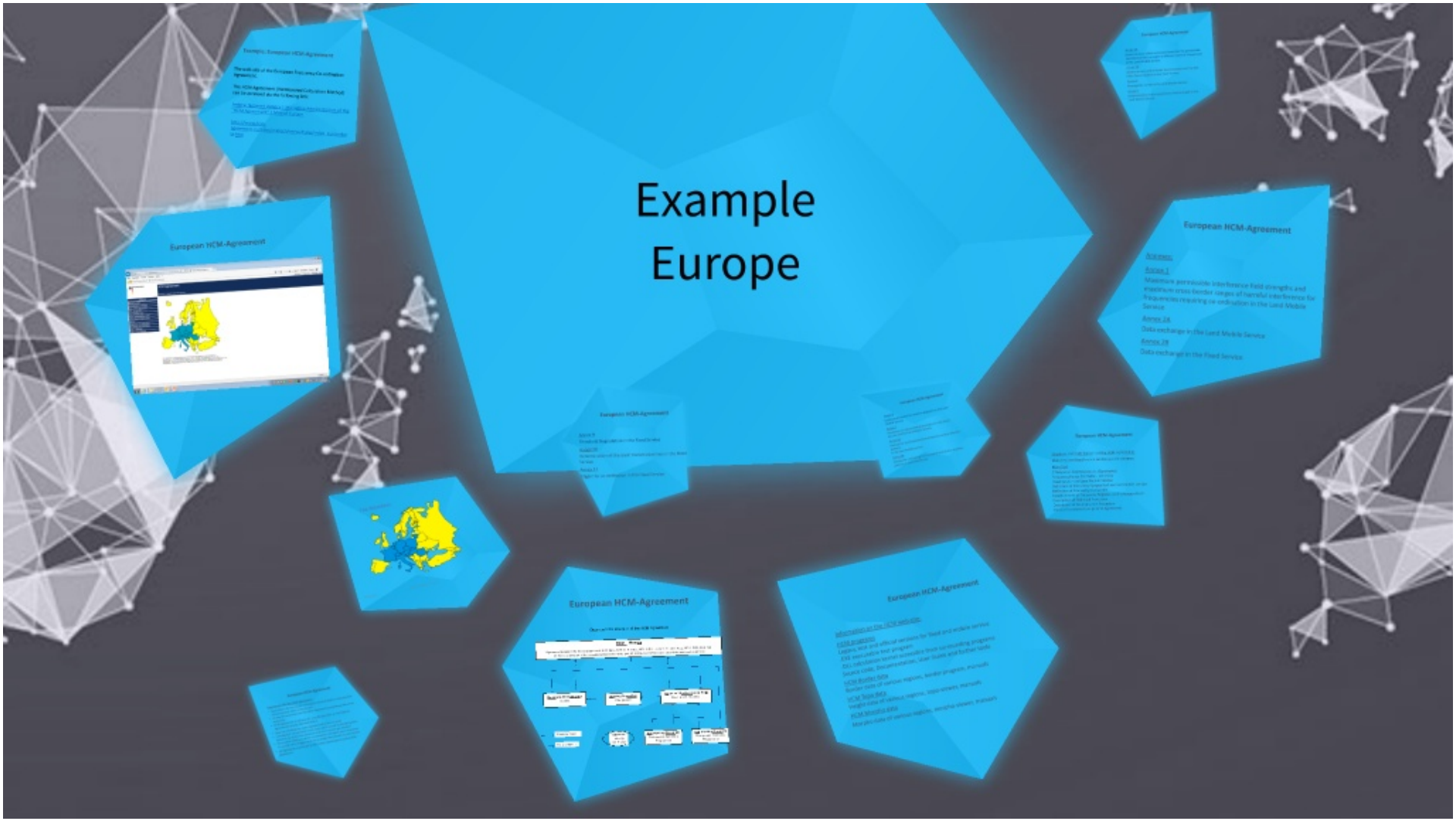

Example
Europe
European HCM-Agreement
European HCM-Agreement
European HCM-Agreement
European HCM-Agreement

Example: European HCM-Agreement

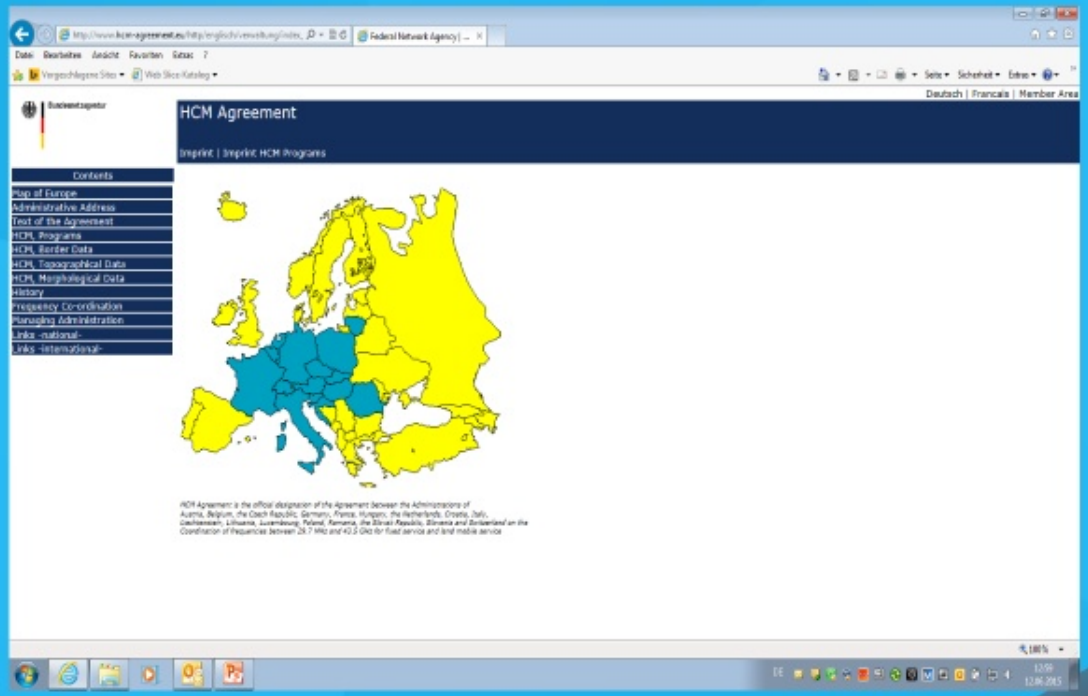
The web-site of the European Frequency Co-ordination Agreement.

The HCM-Agreement (Harmonized Calculation Method) can be accessed via the following link:

Federal Network Agency | Managing Administration of the "HCM Agreement" | Map of Europe

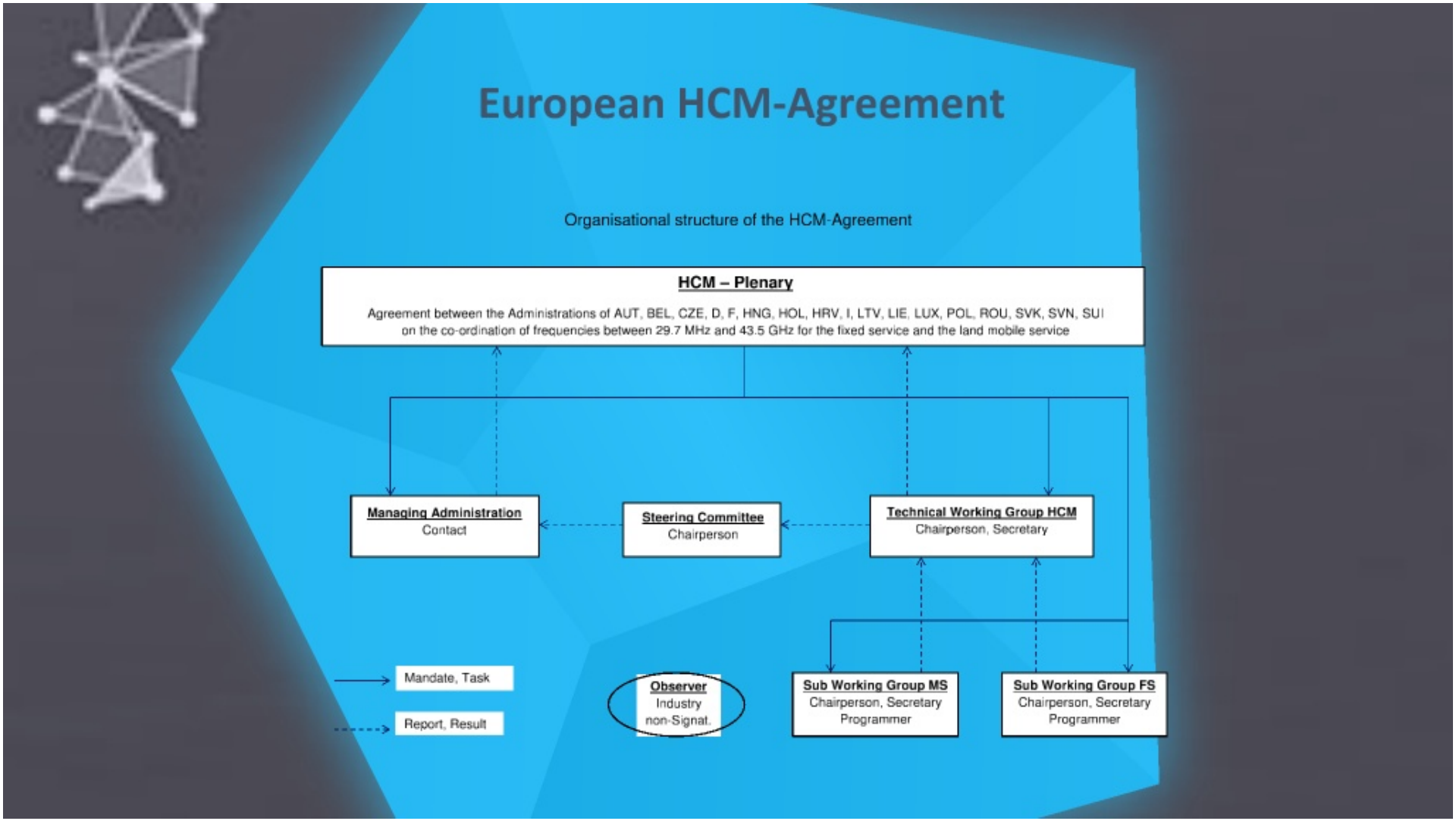
http://www.hcm-agreement.eu/http/englisch/verwaltung/index_europakarte.htm

European HCM-Agreement




The Members
30 May 2019
ITU SM Workshop, Gaborone
14

European HCM-Agreement



European HCM-Agreement

Information on the HCM web-site:

HCM programs

Legacy, test and official versions for fixed and mobile service
.EXE executable test program
.DLL calculation kernel accessible from surrounding programs
Source code, Documentation, User Guide and further tools

HCM Border data

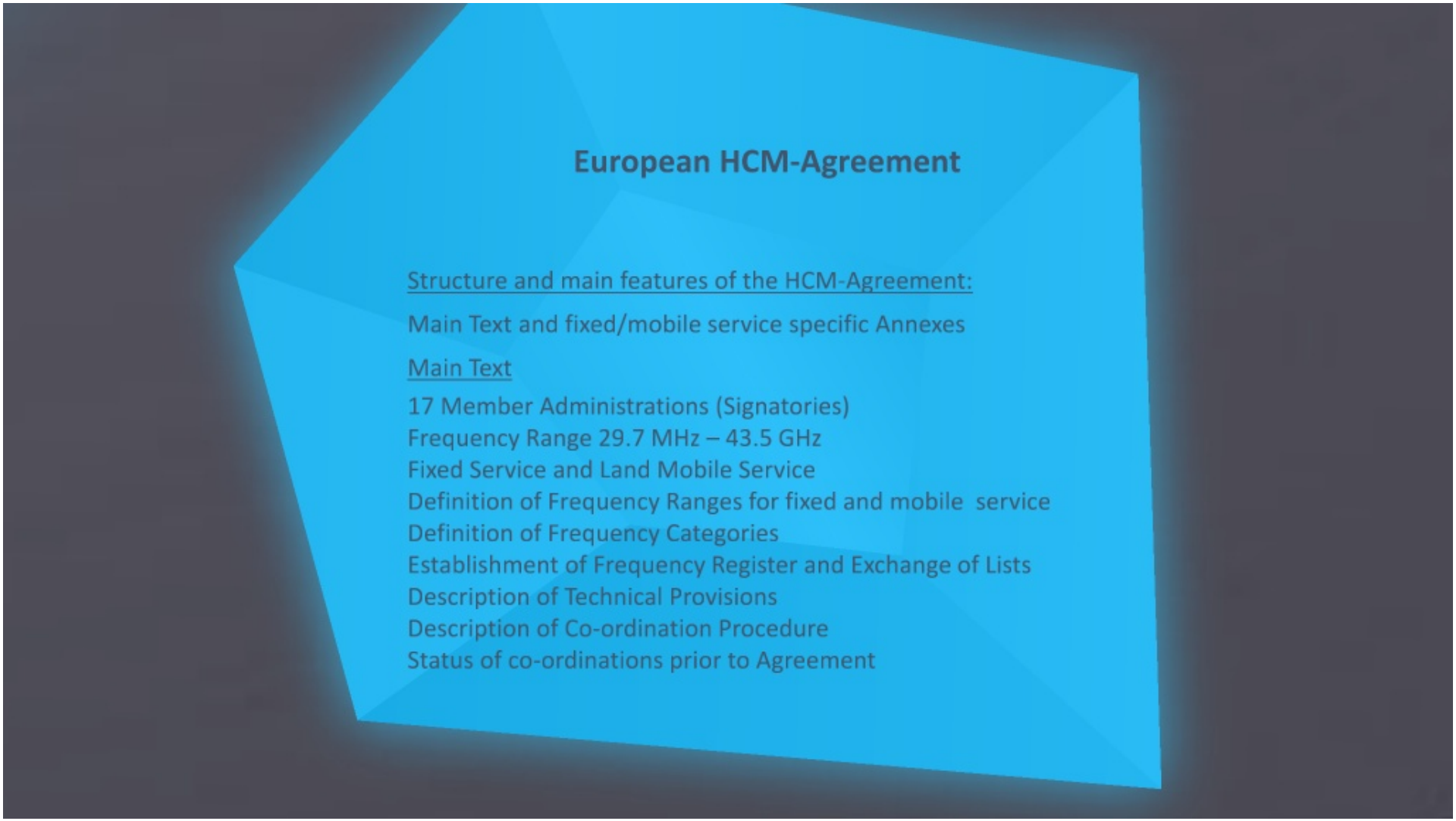
Border data of various regions, border program, manuals

HCM Topo data

Height data of various regions, topo-viewer, manuals

HCM Morpho data

Morpho data of various regions, morpho-viewer, manuals


European HCM-Agreement
Structure and main features of the HCM-Agreement:
Main Text and fixed/mobile service specific Annexes
Main Text
17 Member Administrations (Signatories)
Frequency Range 29.7 MHz – 43.5 GHz
Fixed Service and Land Mobile Service
Definition of Frequency Ranges for fixed and mobile service
Definition of Frequency Categories
Establishment of Frequency Register and Exchange of Lists
Description of Technical Provisions
Description of Co-ordination Procedure
Status of co-ordinations prior to Agreement

European HCM-Agreement

Annexes:

Annex 1

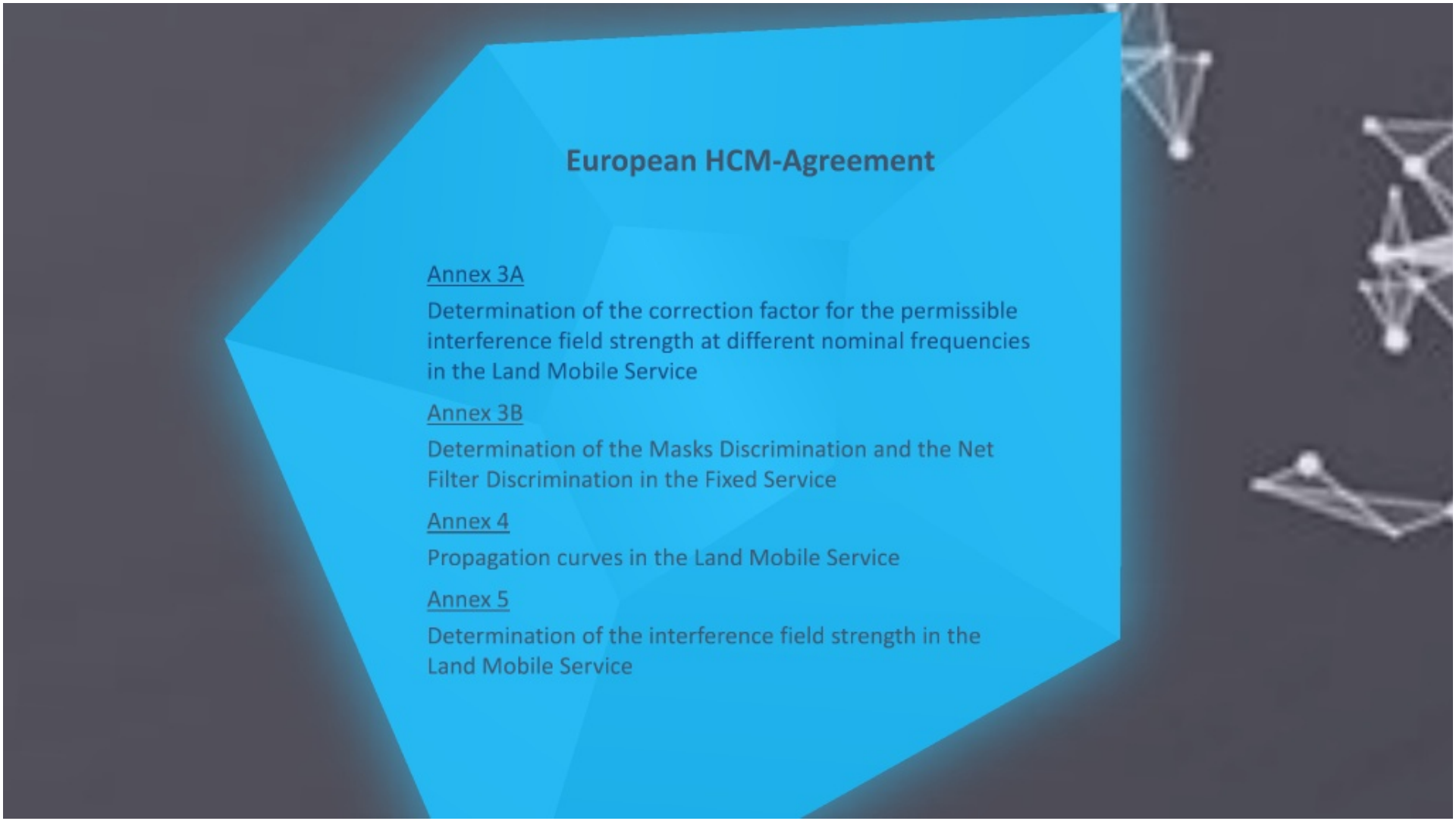
Maximum permissible interference field strengths and maximum cross-border ranges of harmful interference for frequencies requiring co-ordination in the Land Mobile Service

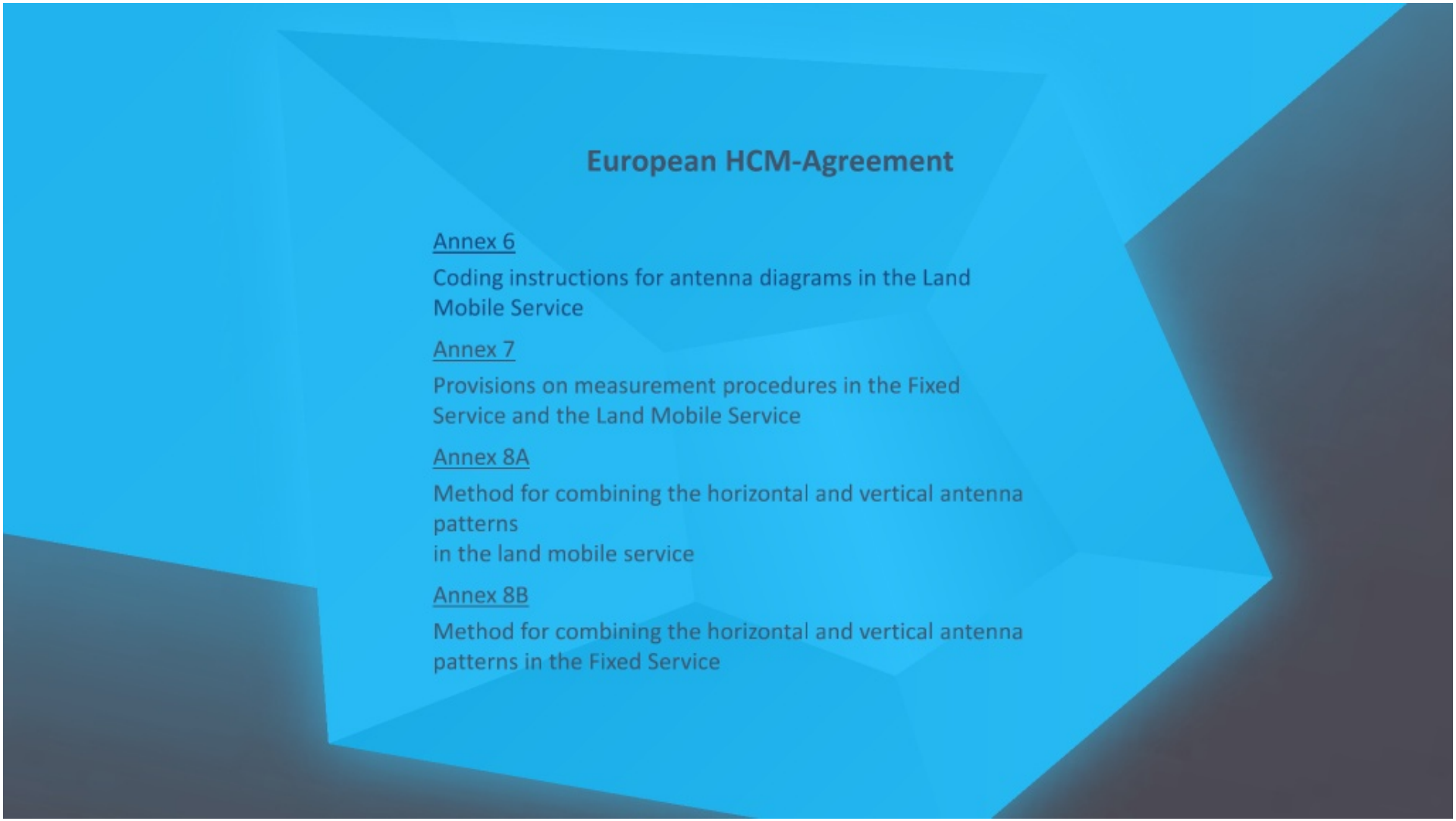
Annex 2A

Data exchange in the Land Mobile Service

Annex 2B

Data exchange in the Fixed Service


European HCM-Agreement
Annex 3A
Determination of the correction factor for the permissible interference field strength at different nominal frequencies in the Land Mobile Service
Annex 3B
Determination of the Masks Discrimination and the Net Filter Discrimination in the Fixed Service
Annex 4
Propagation curves in the Land Mobile Service
Annex 5
Determination of the interference field strength in the Land Mobile Service


European HCM-Agreement
Annex 6
Coding instructions for antenna diagrams in the Land Mobile Service
Annex 7
Provisions on measurement procedures in the Fixed Service and the Land Mobile Service
Annex 8A
Method for combining the horizontal and vertical antenna patterns
in the land mobile service
Annex 8B
Method for combining the horizontal and vertical antenna patterns in the Fixed Service

European HCM-Agreement

Annex 9

Threshold Degradation in the Fixed Service

Annex 10

Determination of the basic transmission loss in the Fixed Service

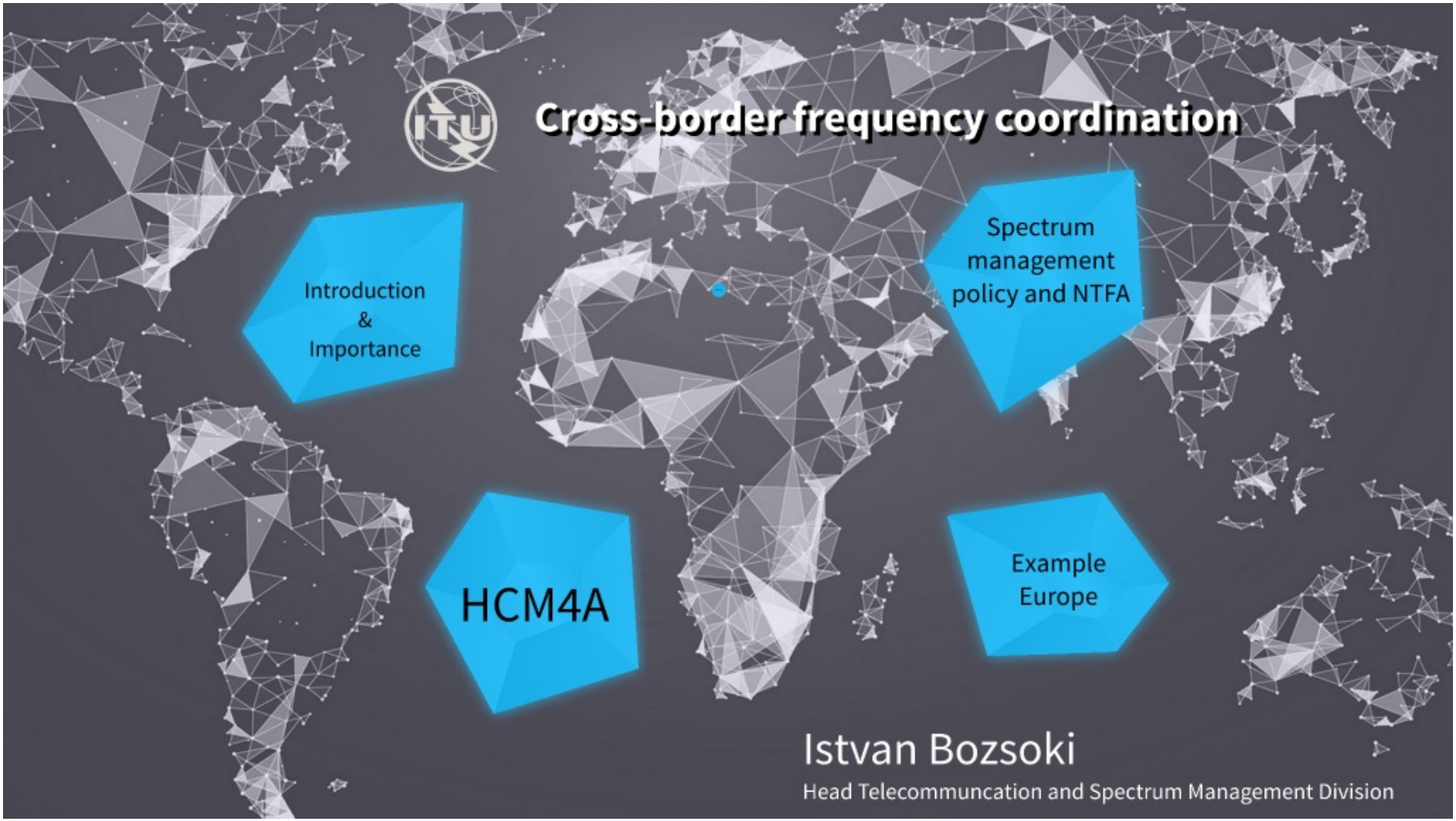
Annex 11

Trigger for co-ordination in the Fixed Service

European HCM-Agreement

Experience with the HCM-Agreement:

- Application of harmonized calculation method leads to reproducible results on both sides of the border
- In case of inconsistencies the HCM-Agreement provides guidance on resolution
- HCM-Agreement solid basis for a multitude of bi- or multilateral Agreements among Administrations
- Very low interference cases experienced in recent years
- Investigation showed that most cases were caused by deviating data between co-ordination database and real transmit parameters
- Permissible levels are rather conservative, therefore some tolerance in co-ordination triggers and status assignment based on calculations
- All Signatories contribute to the further development of the HCM-Agreement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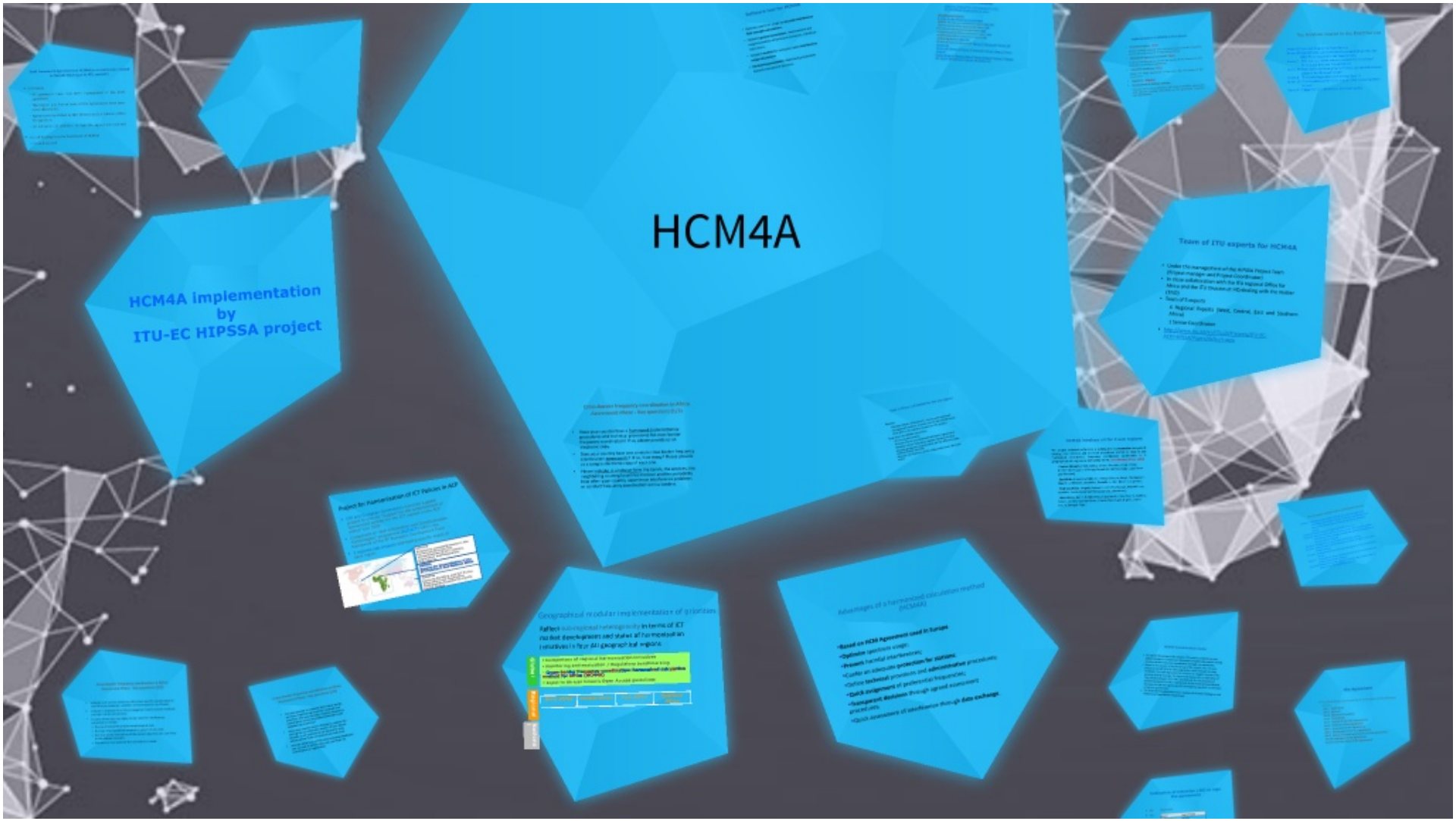
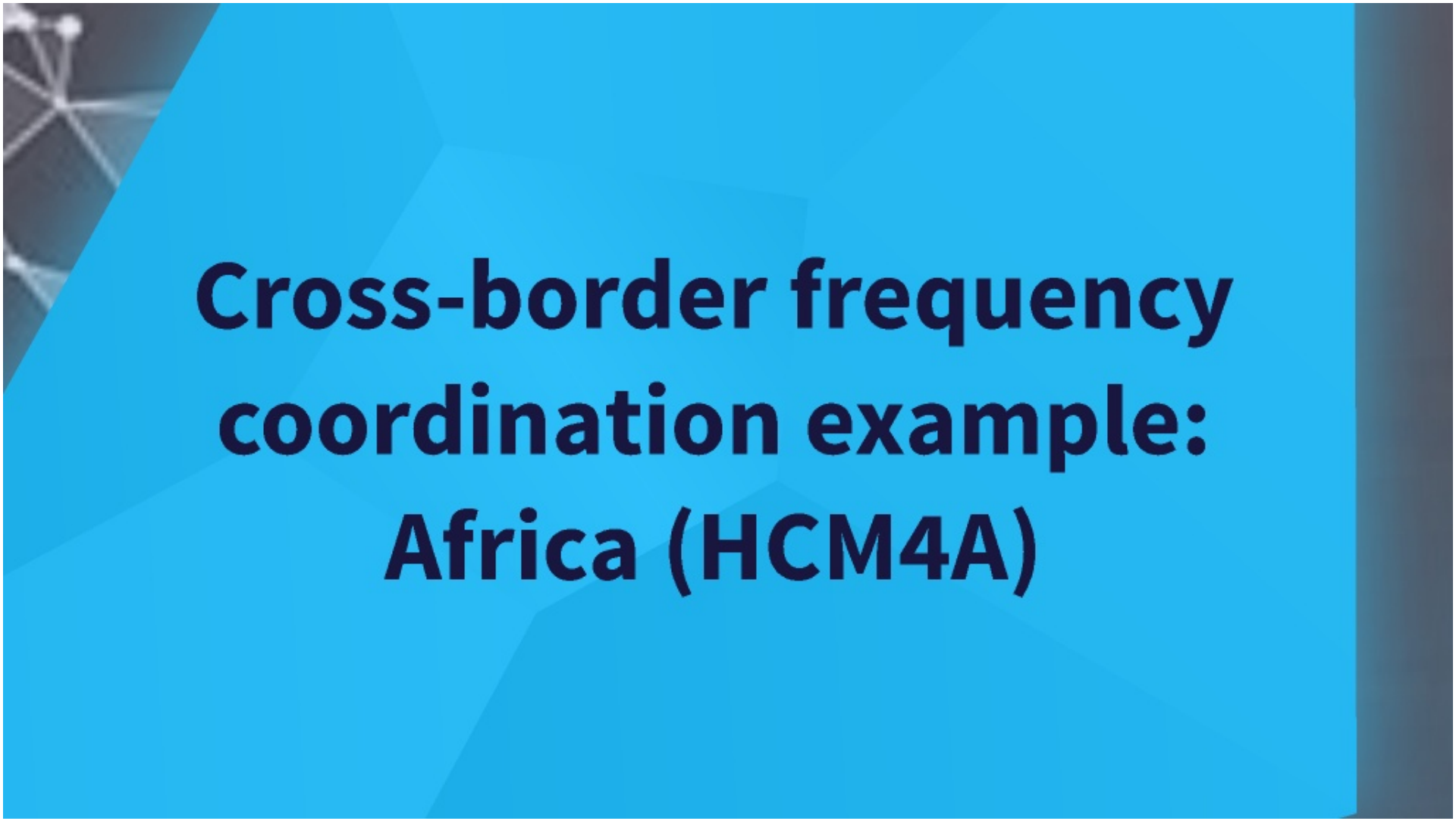

HCM4A
HCM4A impiementation
by
ITU-EC HIPSSA project
Team of ITU experts for HCM4A
Project for Harmonization of ICT Policies in ACP
Geographical modular implementation of priorities
Advantages of a harmonized calculation method
(HCM4A)


Cross-border frequency coordination example: Africa (HCM4A)


HCM4A implementation
by
ITU-EC HIPSSA project

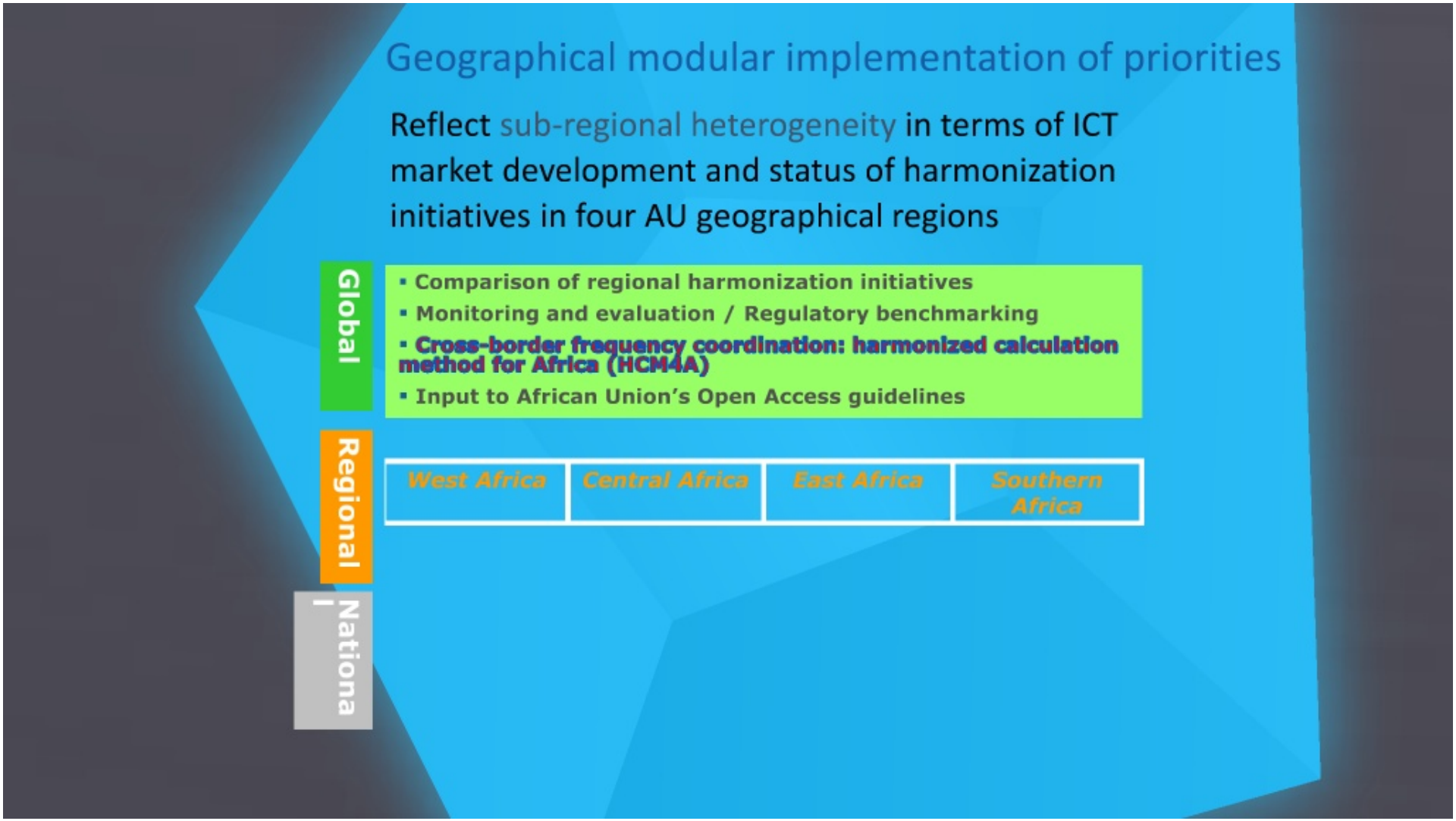
Project for Harmonization of ICT Policies in ACP

- ITU and European Commission launched a global project to provide "*Support for the establishment of harmonized policies for the ICT market in the ACP states*" end 2008
- Component of "ACP-Information and Communication Technologies" programme (ACP-ICT) within the framework of the 9th European Development Fund
- 3 regional sub-projects addressing specific needs of each region

HIPCAR
Enhancing competitiveness in the Caribbean through the harmonization of ICT Policies, Legislation and Regulatory Procedures

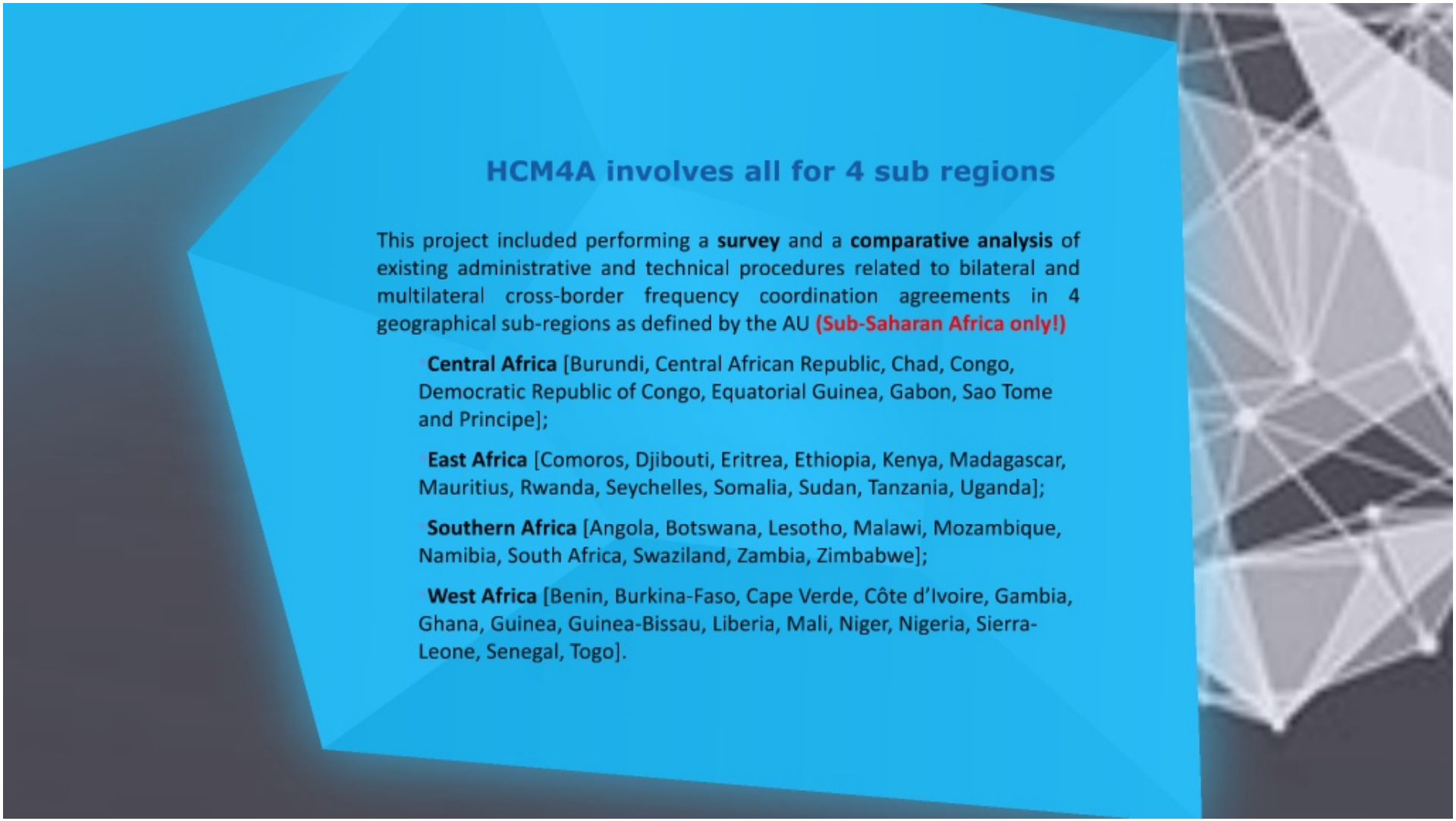
HIPSSA
Support for Harmonization of the ICT Policies in Sub-Saharan Africa

ICB4PIS
Capacity Building and ICT Policy, Regulatory and Legislative Frameworks Support for Pacific Island States


Geographical modular implementation of priorities
Reflect sub-regional heterogeneity in terms of ICT market development and status of harmonization initiatives in four AU geographical regions
Global
Comparison of regional harmonization initiatives
Monitoring and evaluation / Regulatory benchmarking
Cross-border frequency coordination: harmonized calculation method for Africa (HCM4A)
Input to African Union's Open Access guidelines
Regional
West Africa
Central Africa
East Africa
Southern Africa
Nationa
l

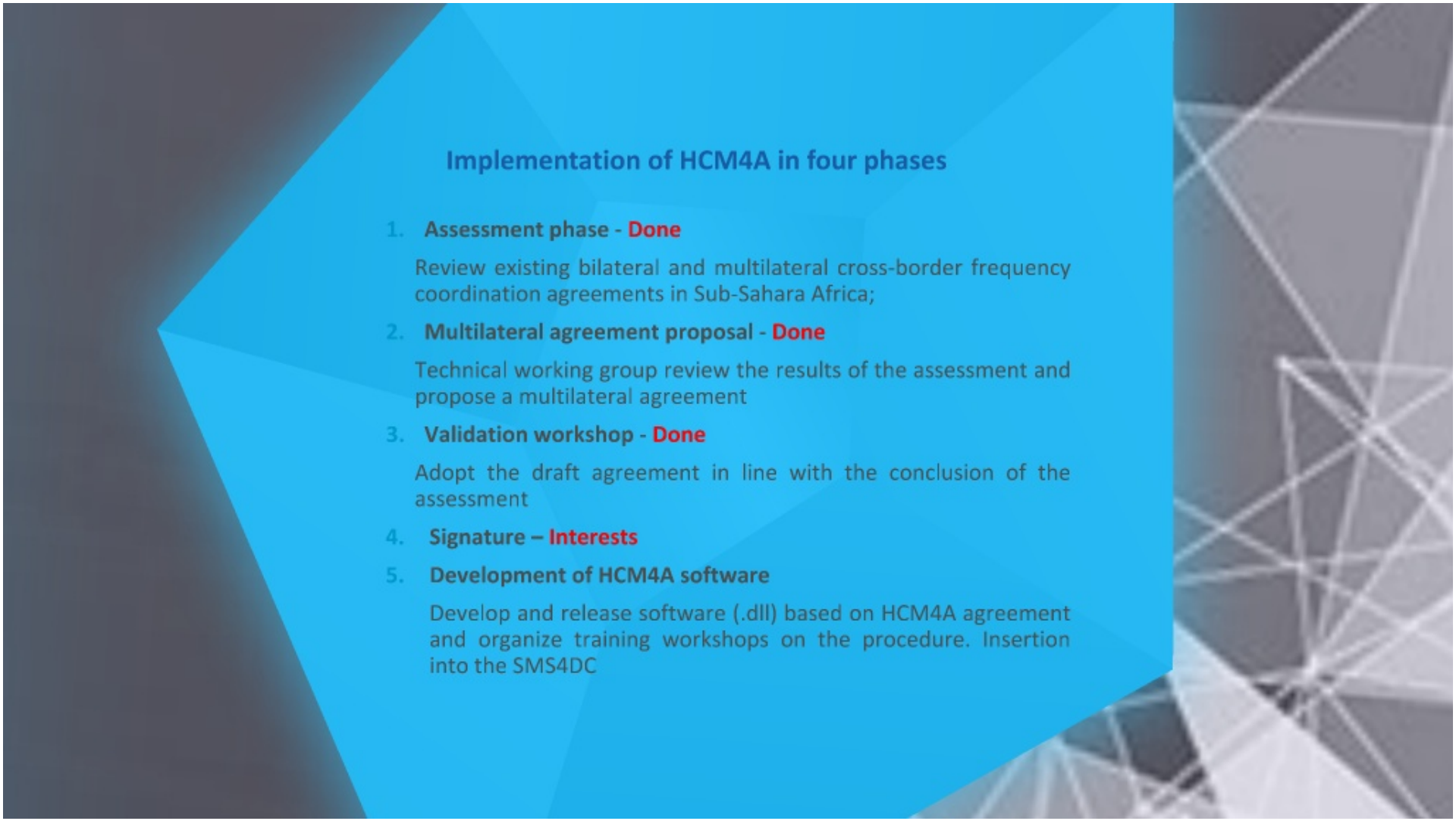
Advantages of a harmonized calculation method (HCM4A)

- **Based on HCM Agreement used in Europe**
- **Optimize** spectrum usage;
- **Prevent** harmful interferences;
- Confer an adequate **protection for stations**;
- Define **technical** provisions and **administrative** procedures;
- **Quick assignment** of preferential frequencies;
- **Transparent decisions** through agreed assessment procedures;
- Quick assessment of interference through **data exchange**.


HCM4A involves all for 4 sub regions
This project included performing a survey and a comparative analysis of existing administrative and technical procedures related to bilateral and multilateral cross-border frequency coordination agreements in 4 geographical sub-regions as defined by the AU (Sub-Saharan Africa only!)
Central Africa [Burundi, Central African Republic, Chad, Congo, Democratic Republic of Congo, Equatorial Guinea, Gabon, Sao Tome and Principe];
East Africa [Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Mauritius, Rwanda, Seychelles, Somalia, Sudan, Tanzania, Uganda];
Southern Africa [Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia, Zimbabwe];
West Africa [Benin, Burkina-Faso, Cape Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Sierra-Leone, Senegal, Togo].

Team of ITU experts for HCM4A

- Under the management of the HIPSSA Project Team (Project manager and Project Coordinator)
- In close collaboration with the ITU regional Office for Africa and the ITU Division at HQ dealing with the matter (TND)
- Team of 5 experts
  - 4 Regional Experts (West, Central, East and Southern Africa)
  - 1 Senior Coordinator
- http://www.itu.int/en/ITU-D/Projects/ITU-EC-ACP/HIPSSA/Pages/default.aspx


Implementation of HCM4A in four phases
1. Assessment phase - Done
Review existing bilateral and multilateral cross-border frequency coordination agreements in Sub-Sahara Africa;
2. Multilateral agreement proposal - Done
Technical working group review the results of the assessment and propose a multilateral agreement
3. Validation workshop - Done
Adopt the draft agreement in line with the conclusion of the assessment
4. Signature – Interests
5. Development of HCM4A software
Develop and release software (.dll) based on HCM4A agreement and organize training workshops on the procedure. Insertion into the SMS4DC

Tasks in Phase 1 of HCM4A for the sub-regions

Request

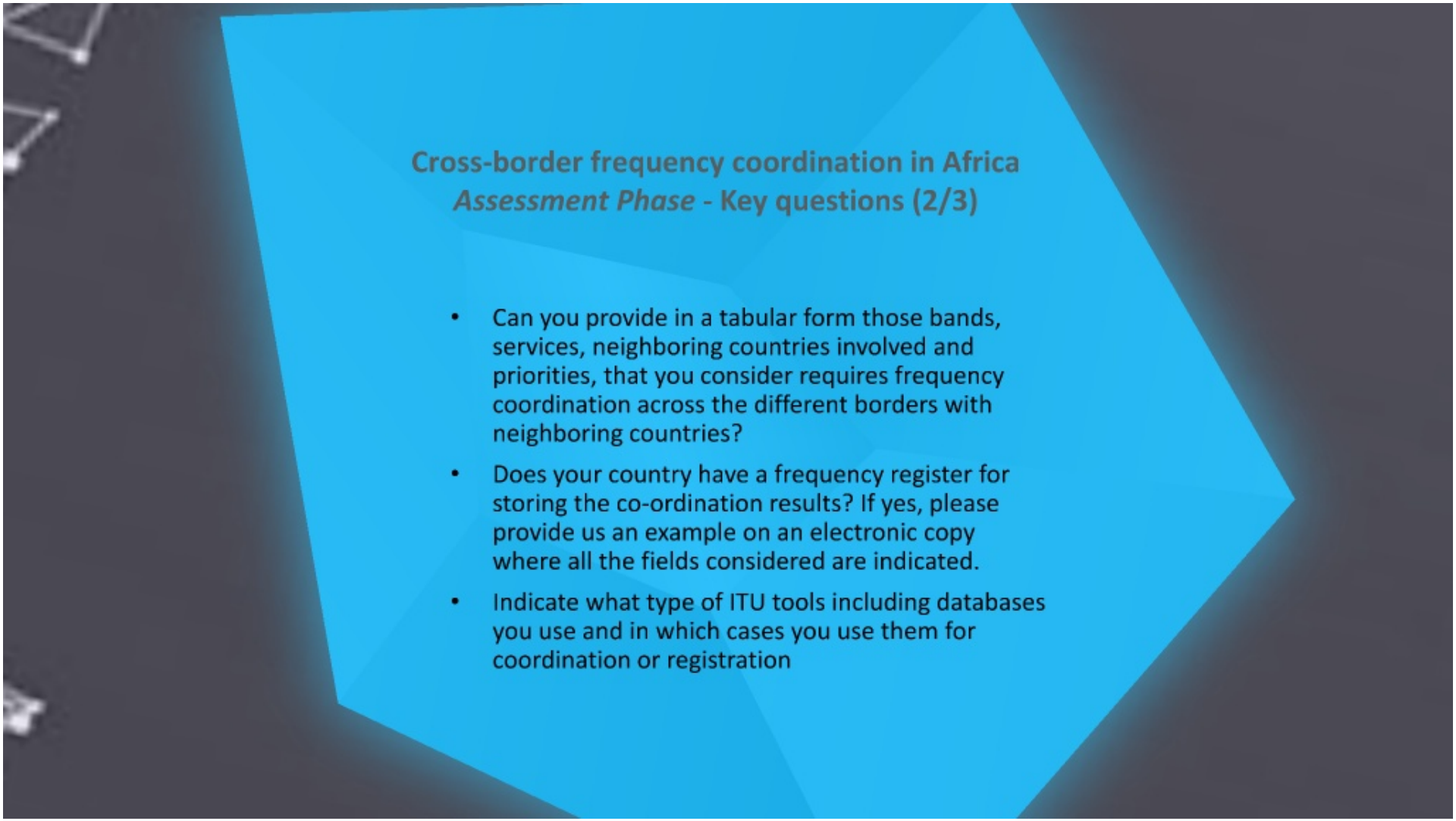
- *Contact* details of the person, dealing with spectrum management matters, and who will be the HCM4A Focal Point (FP) in the relevant country for this project.

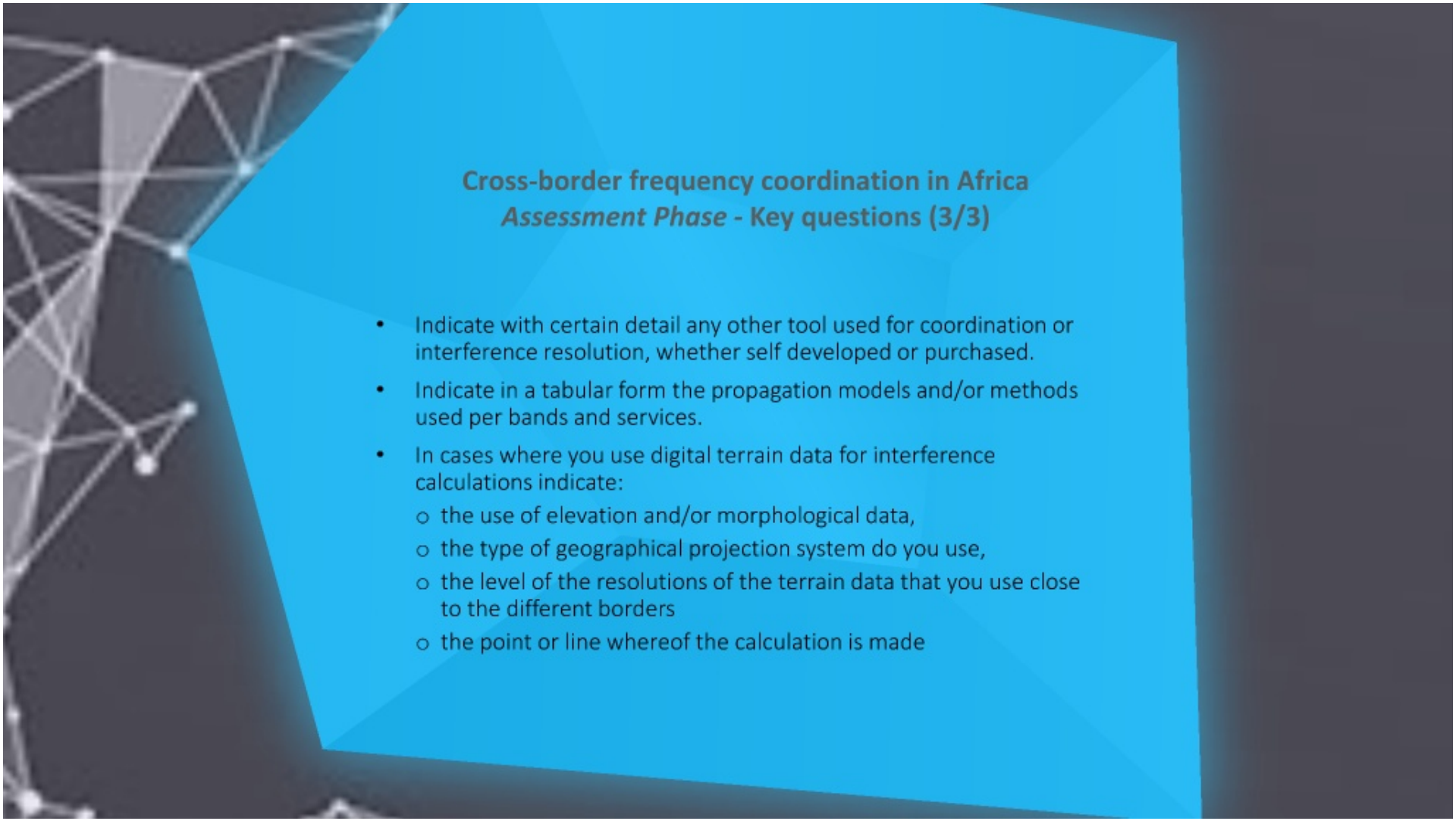
Tasks from the HCM4A Focal Point

- Fill in a questionnaire;
- Provide info on any bilateral/multilateral agreement;
- Provide current frequency register database format;
- Provide protection requirements for the different radio-communication services;
- Provide clarifications on the subject whenever the need arises.

Cross-border frequency coordination in Africa
Assessment Phase - Key questions (1/3)

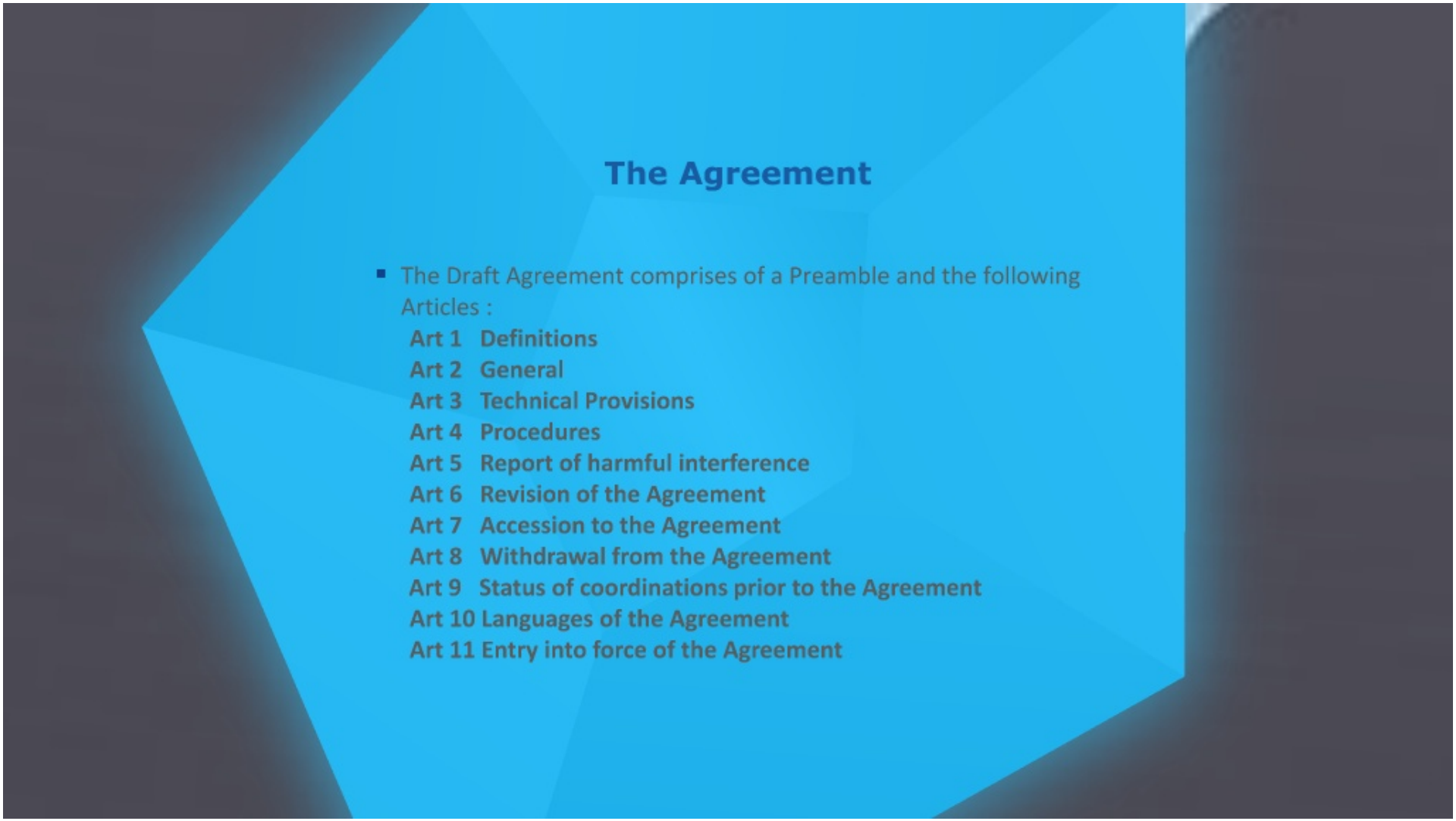
- Does your country have a framework (administrative procedures and technical provisions) for cross-border frequency coordination? If so, please provide us an electronic copy.
- Does your country have one or more cross border frequency coordination agreements? If so, how many? Please provide us a sample electronic copy of each one.
- Please indicate in a tabular form the bands, the services, the neighboring country/countries involved and the periodicity how often your country experience interference problems or conduct frequency coordination across borders.

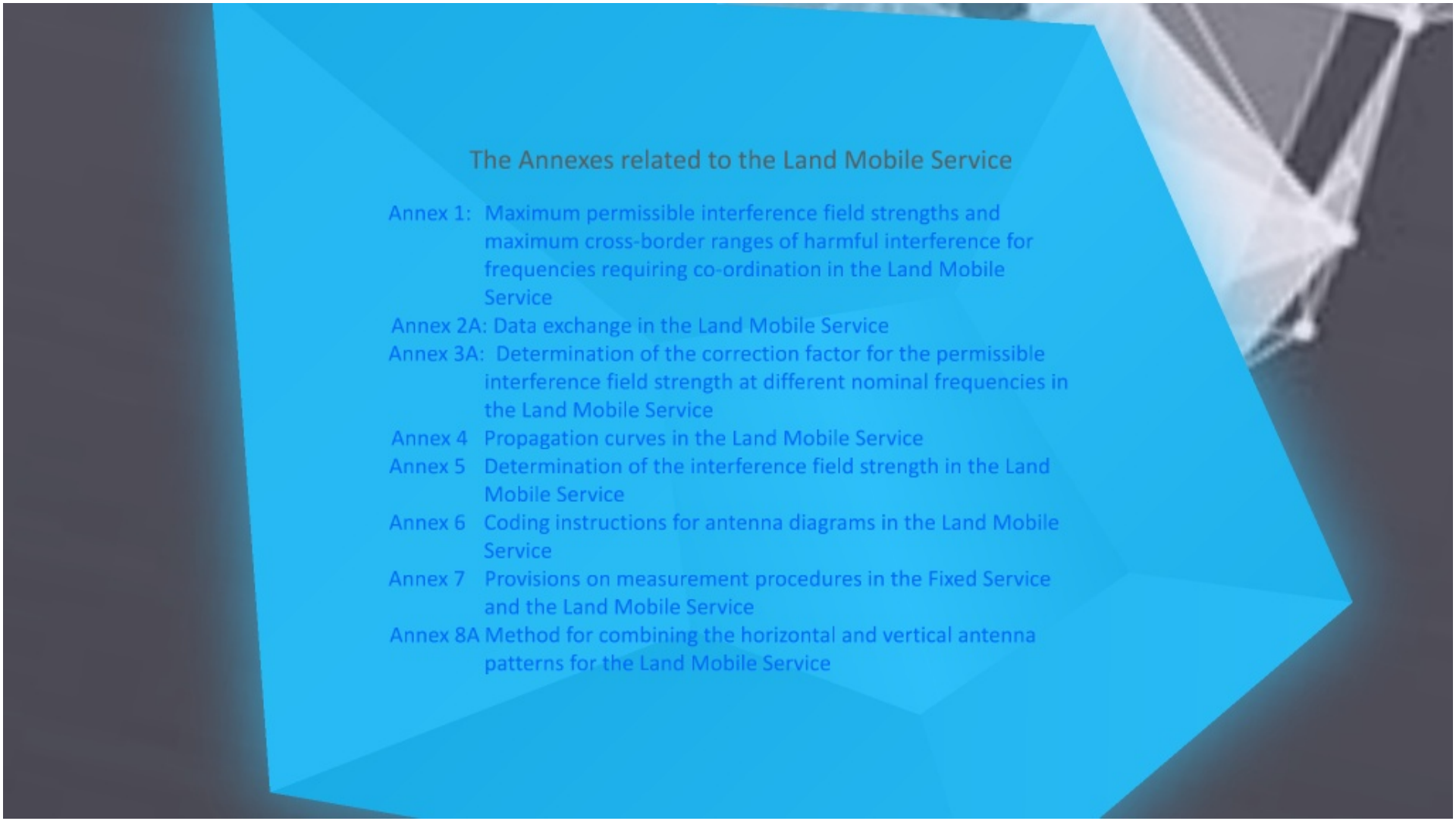

Cross-border frequency coordination in Africa
Assessment Phase - Key questions (2/3)
• Can you provide in a tabular form those bands, services, neighboring countries involved and priorities, that you consider requires frequency coordination across the different borders with neighboring countries?
• Does your country have a frequency register for storing the co-ordination results? If yes, please provide us an example on an electronic copy where all the fields considered are indicated.
• Indicate what type of ITU tools including databases you use and in which cases you use them for coordination or registration

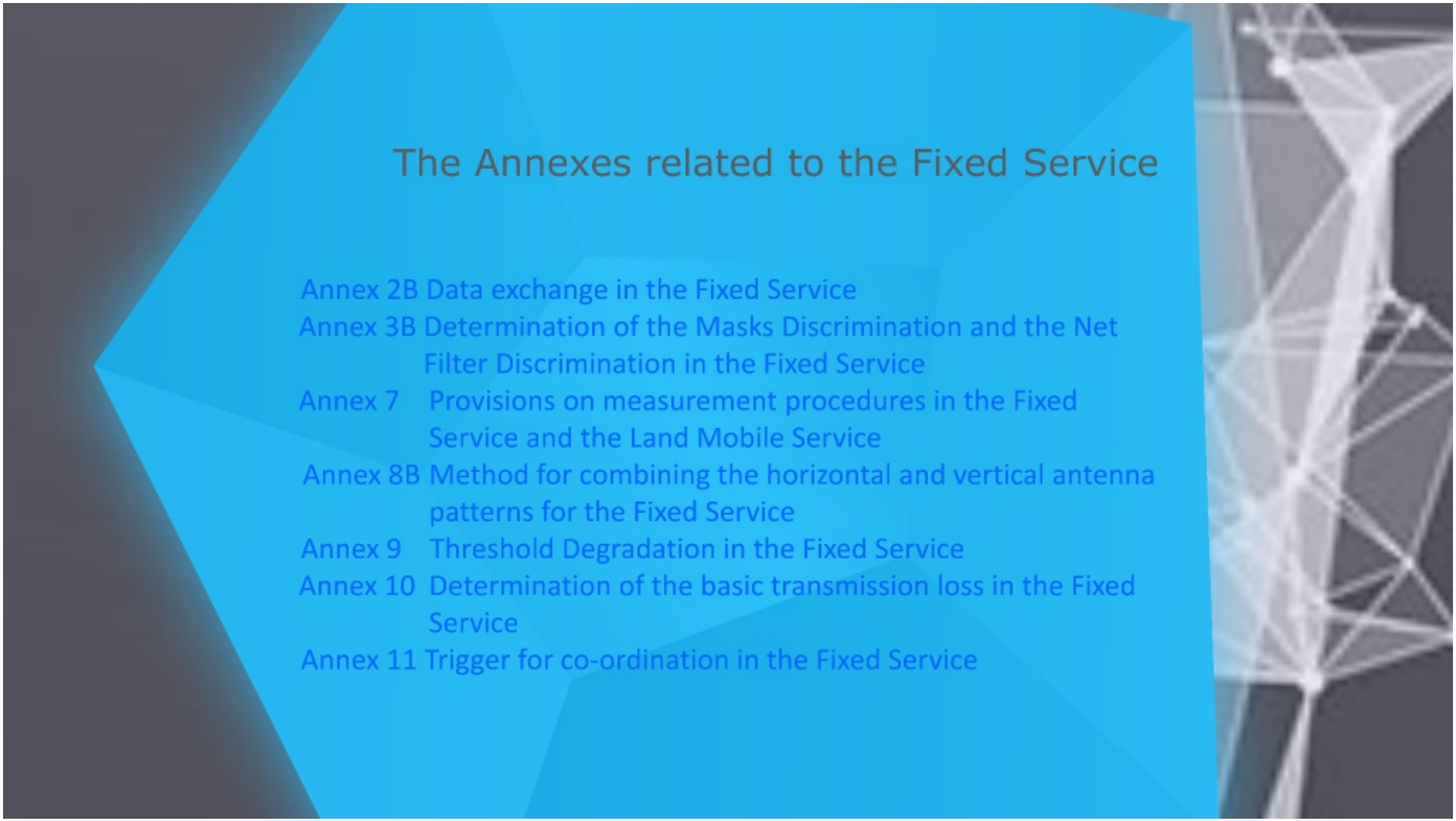

Cross-border frequency coordination in Africa
Assessment Phase - Key questions (3/3)
• Indicate with certain detail any other tool used for coordination or interference resolution, whether self developed or purchased.
• Indicate in a tabular form the propagation models and/or methods used per bands and services.
• In cases where you use digital terrain data for interference calculations indicate:
o the use of elevation and/or morphological data,
o the type of geographical projection system do you use,
o the level of the resolutions of the terrain data that you use close to the different borders
o the point or line whereof the calculation is made

HCM4A implementation studies

- During the first phase of the project, ITU experts contacted various administrations in subSaharan Africa and compiled information related to cross border frequency coordination through a questionnaire.
- Based on the results of the first phase of the project, the ITU team prepared a draft HCM for Africa Agreement with relevant Annexes (HCM4A). The draft Agreement for Africa is an adapted version of the existing HCM for Europe. The Agreement deals with co-ordination of frequencies between 29.7 MHz and 43.5 GHz for the purposes of preventing mutual harmful interference to the Fixed and Land Mobile Services and optimising the use of the frequency spectrum on the basis of mutual agreements.
- The Draft HCM4A Agreement has a number of Annexes relating to Land Mobile and Fixed Service respectively.

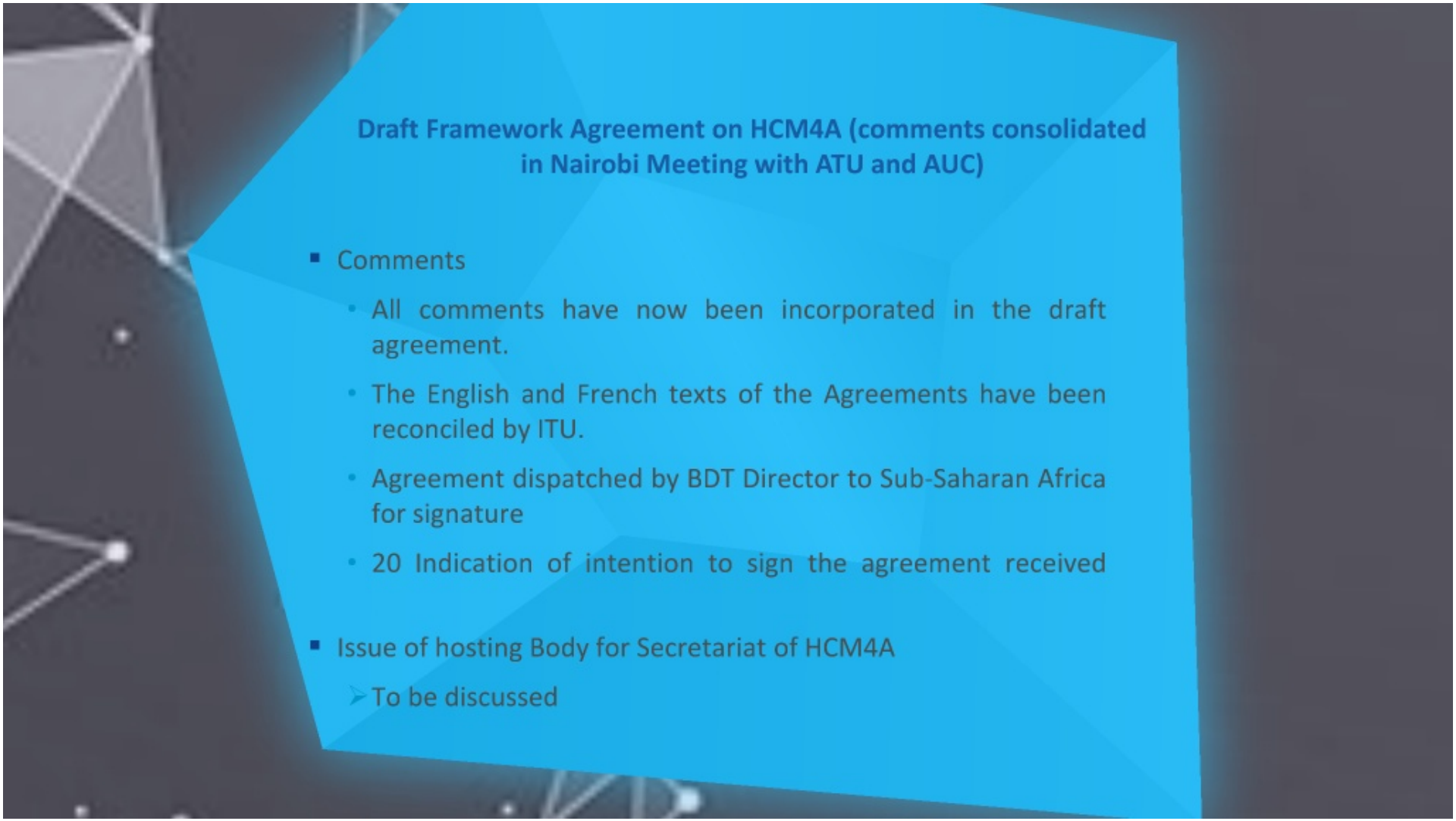

The Agreement
The Draft Agreement comprises of a Preamble and the following Articles :
Art 1 Definitions
Art 2 General
Art 3 Technical Provisions
Art 4 Procedures
Art 5 Report of harmful interference
Art 6 Revision of the Agreement
Art 7 Accession to the Agreement
Art 8 Withdrawal from the Agreement
Art 9 Status of coordinations prior to the Agreement
Art 10 Languages of the Agreement
Art 11 Entry into force of the Agreement


The Annexes related to the Land Mobile Service
Annex 1: Maximum permissible interference field strengths and maximum cross-border ranges of harmful interference for frequencies requiring co-ordination in the Land Mobile Service
Annex 2A: Data exchange in the Land Mobile Service
Annex 3A: Determination of the correction factor for the permissible interference field strength at different nominal frequencies in the Land Mobile Service
Annex 4 Propagation curves in the Land Mobile Service
Annex 5 Determination of the interference field strength in the Land Mobile Service
Annex 6 Coding instructions for antenna diagrams in the Land Mobile Service
Annex 7 Provisions on measurement procedures in the Fixed Service and the Land Mobile Service
Annex 8A Method for combining the horizontal and vertical antenna patterns for the Land Mobile Service


The Annexes related to the Fixed Service
Annex 2B Data exchange in the Fixed Service
Annex 3B Determination of the Masks Discrimination and the Net Filter Discrimination in the Fixed Service
Annex 7 Provisions on measurement procedures in the Fixed Service and the Land Mobile Service
Annex 8B Method for combining the horizontal and vertical antenna patterns for the Fixed Service
Annex 9 Threshold Degradation in the Fixed Service
Annex 10 Determination of the basic transmission loss in the Fixed Service
Annex 11 Trigger for co-ordination in the Fixed Service

Software tool for HCM4A

- Optimise spectrum usage by **accurate interference field strength calculations**;
- Establish **general parameters**, improvement and supplementation of technical provisions, individual restrictions;
- Establish **models** for computer-aided **interference range calculations**
- **Harmonise parameters**: objectively predictable towards transparent decisions


Draft Framework Agreement on HCM4A (comments consolidated in Nairobi Meeting with ATU and AUC)
Comments
All comments have now been incorporated in the draft agreement.
The English and French texts of the Agreements have been reconciled by ITU.
Agreement dispatched by BDT Director to Sub-Saharan Africa for signature
20 Indication of intention to sign the agreement received
Issue of hosting Body for Secretariat of HCM4A
To be discussed

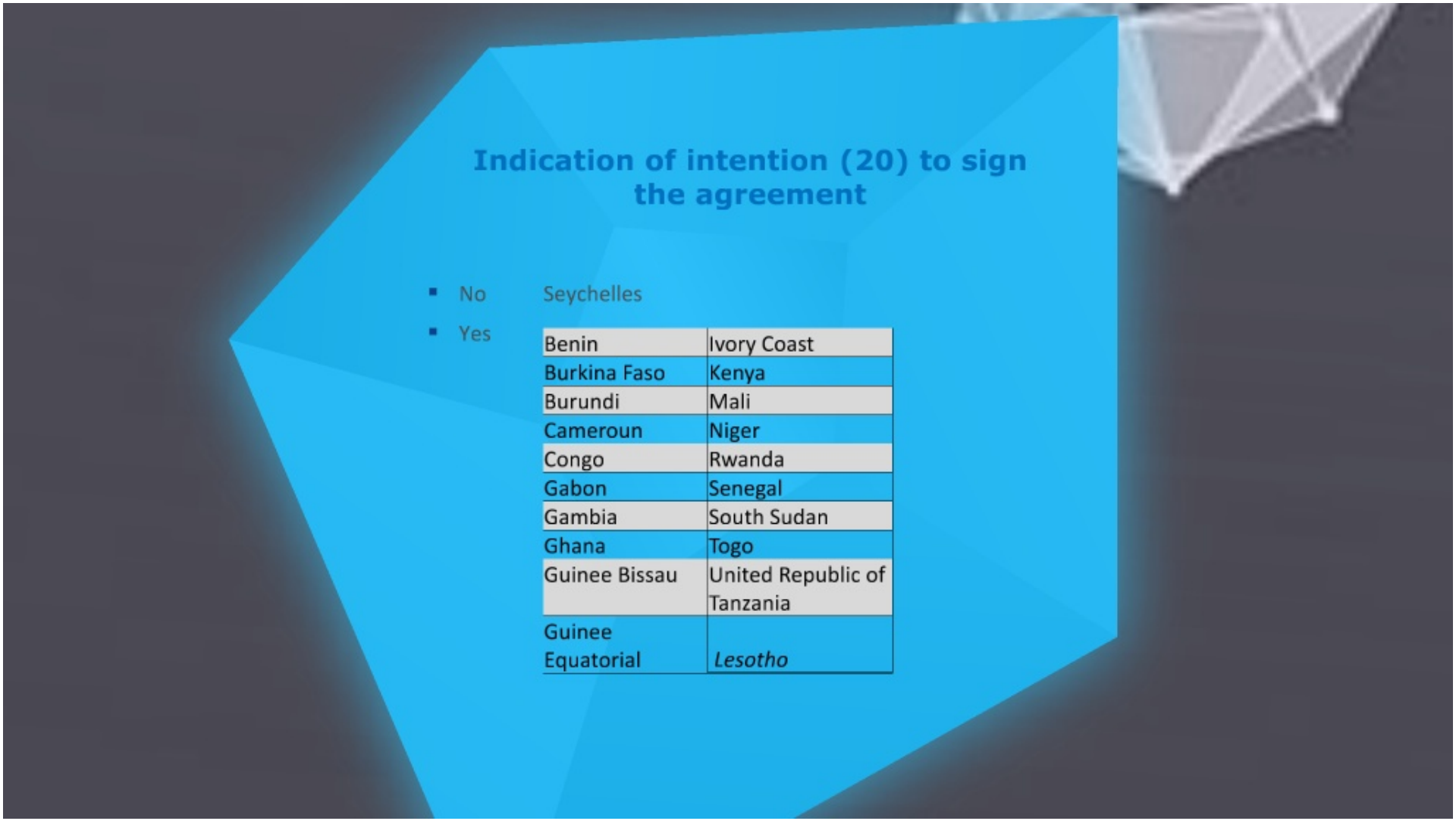
HIPSSA website

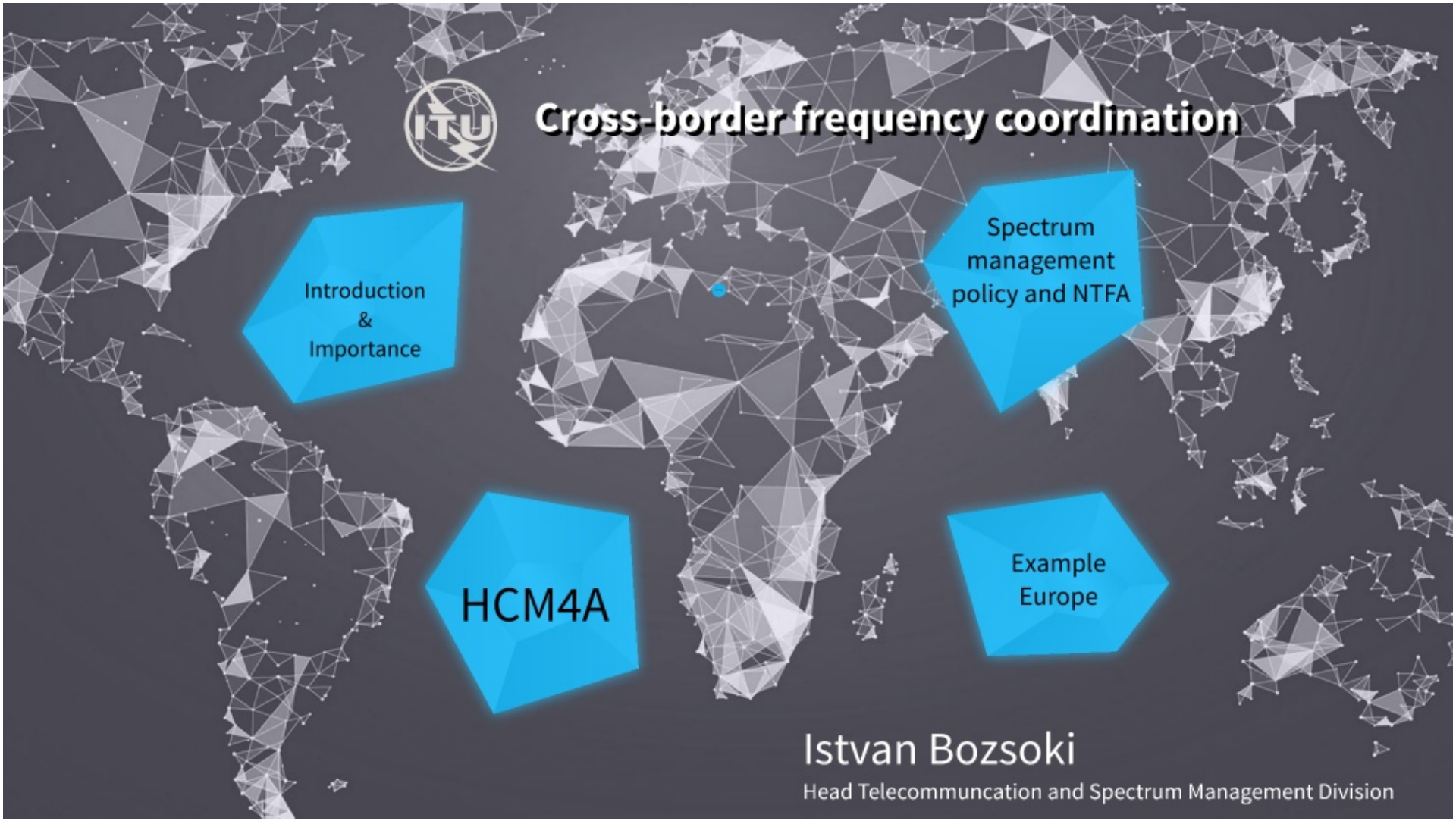
www.itu.int/en/ITU-D/Projects/ITU-EC-ACP/HIPSSA/Pages/default.aspx

REGIONAL OUTCOMES

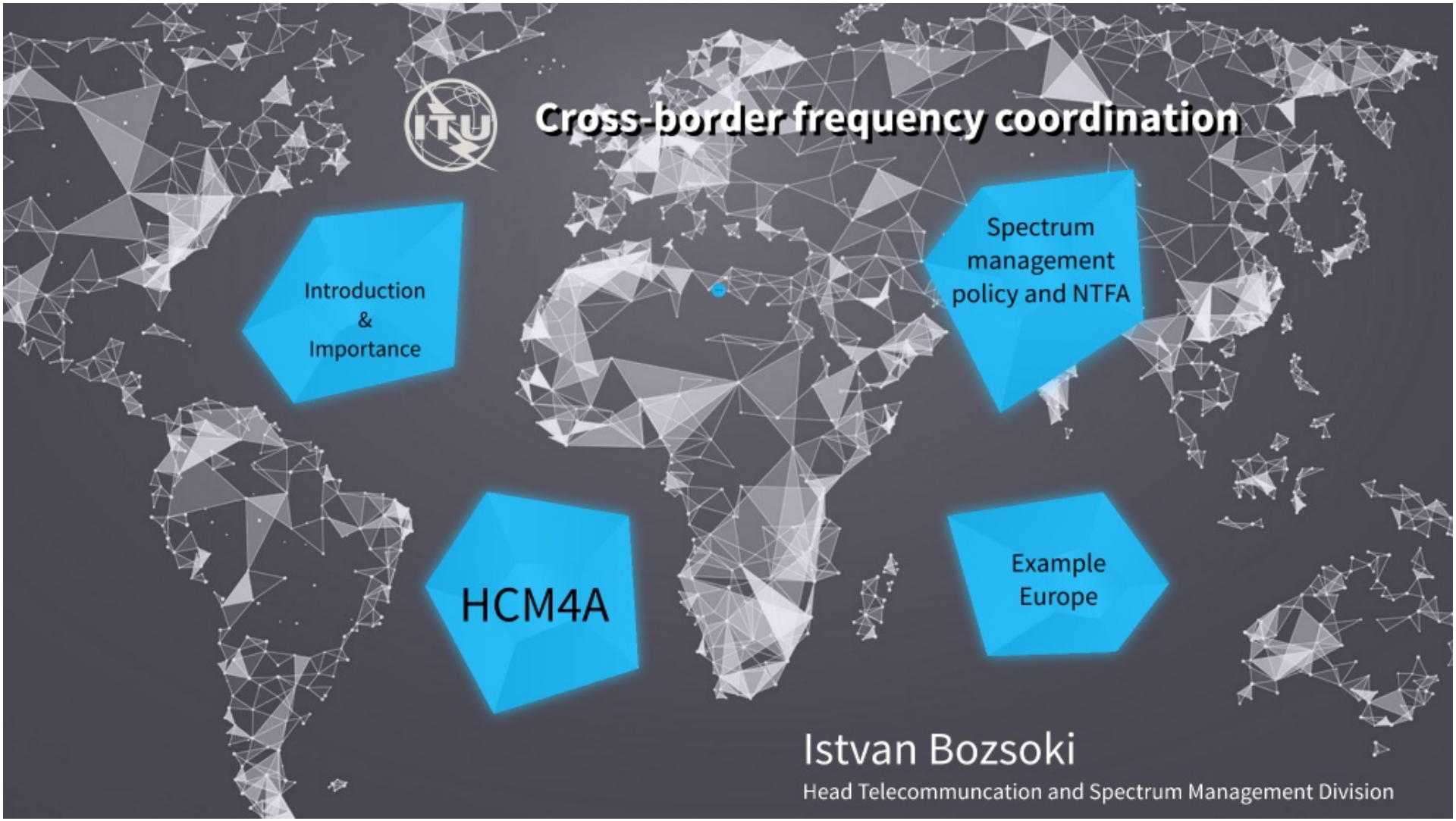
3. Cross-border frequency coordination

HCM4A Sub-Saharan assessment report [EN] [FR]
HCM4A Central Africa assessment report [EN]
HCM4A East Africa assessment report [EN]
HCM4A Southern Africa assessment report [EN]
HCM4A West Africa assessment report [EN]
HCM4A Agreement [EN] [FR]
HCM4A Annexes to Agreement [Annex 1] [Annex 2A] [Annex 2B] [Annex 3A]
[Annex 3B] [Annex 4] [Annex 5] [Annex 6] [Annex 6 App.1] [Annex 6 App.2]
[Annex 6 App.3] [Annex 6 App.4] [Annex 6 App.5] [Annex 7] [Annex 8A] [Annex 8B] [Annex 9] [Annex 10] [Annex 11]


Indication of intention (20) to sign the agreement
No
Seychelles
Yes
Benin
Burkina Faso
Burundi
Cameroun
Congo
Gabon
Gambia
Ghana
Guinee Bissau
Guinee Equatorial
Ivory Coast
Kenya
Mali
Niger
Rwanda
Senegal
South Sudan
Togo
United Republic of Tanzania
Lesotho


Cross-border frequency coordination
Introduction & Importance
Spectrum management policy and NTFA
HCM4A
Example Europe
Istvan Bozsoki
Head Telecommuncation and Spectrum Management Division


THANK YOU
Istvan Bozsoki
Head Telecommunciation Networks and
Spectrum Management


Cross-border frequency coordination
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