International, Regional & National regulation of wireless communications

Presentation based on intense activities in ITU; lectures in 5 Continents, consultation to Administrations (Bhutan, Cameroon, **China**, Columbia, Zambia…) & Industry (Given Imaging/**Medtronic**, Go-Global, Levitection, Magos, Neteera, Powermat…) & Author's 2016 Wiley book 'Radio Spectrum Management: Policies, Regulations, Standards and Techniques'

Dr. Haim Mazar, Vice Chair ITU-R Study Group 5 (terrestrial services)
ITU & World-Bank Expert h.mazar@atdi-group.com

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Theories and Policies

1. So begins Leo Tolstoy's Anna Karenina : ‘All happy families are alike; each unhappy family is unhappy in its own way’
2. Between 2 points in planar geometry there is only one simple line, but indefinite curves
3. 'Great minds think alike' (Michaelian)
4. ‘Stand on the shoulders of giants‘ (also I. Newton)
5. 'Okham’s Razor': ‘if you have to choose between competing theories, choose the simplest theory- it is most likely to be true’
6. Developed countries manage their RF likely (transparent; industry-driven; serve their clients, the public); undeveloped countries invent their rules

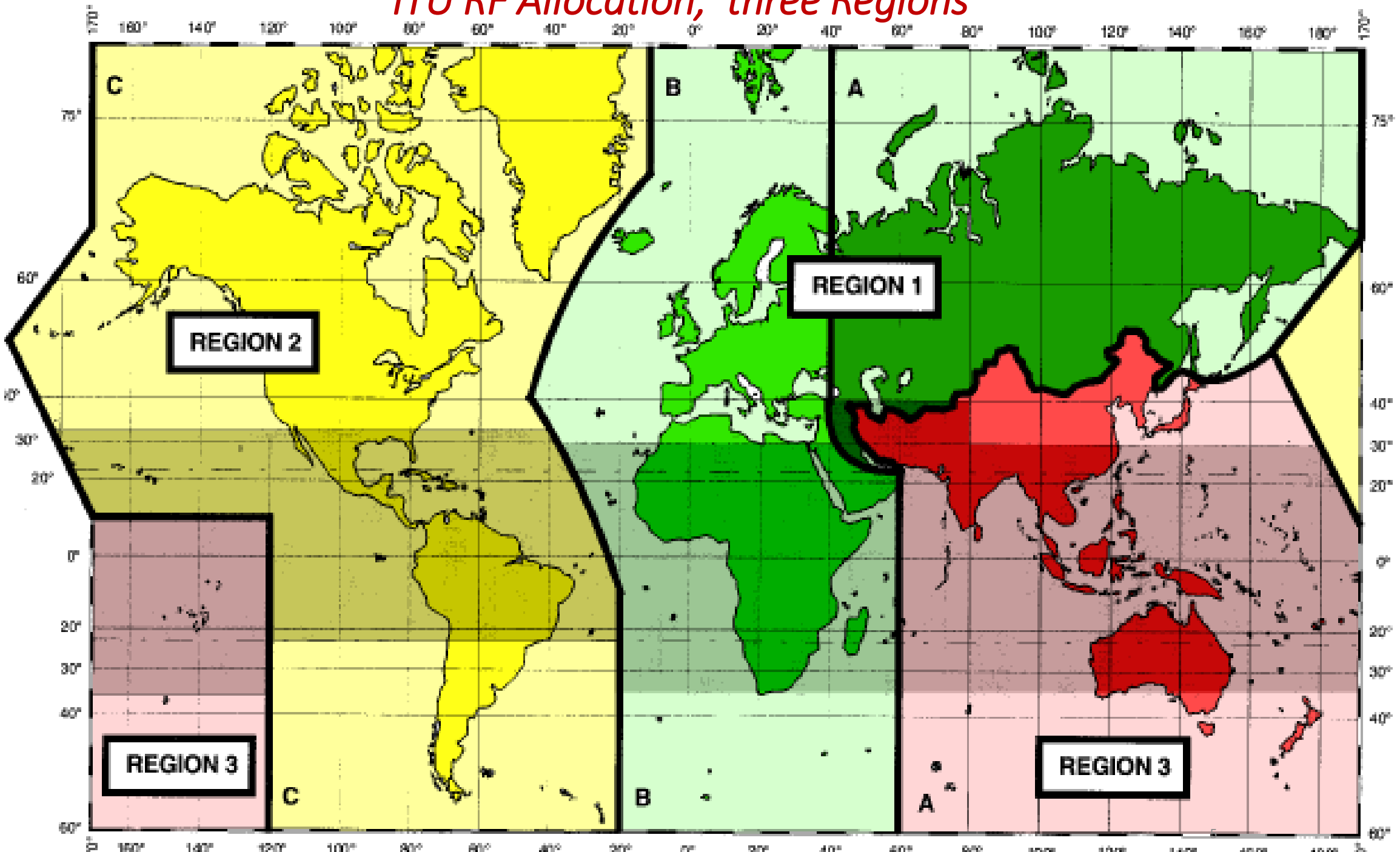
Items which need to be regulated

1. RF allocations to radio services; follow ITU Radio Regulations
2. Assignment of licence and RF to Tx Stations
3. Fee collection: RF License & annual fees
4. Equipment Type approval; EU R&TTE now RED is liberal
5. Coordination with neighbour countries (no borders to the Electro Magnetic waves)
6. Notifying ITU to the Master International Frequency Register (MIFR) e.g. http://www.itu.int/ITU-R/eBCD/ePub.aspx
7. External relations: toward ITU, International and Regional orgs, see http://eprints.mdx.ac.uk/133/2/MazarAug08.pdf p. 179

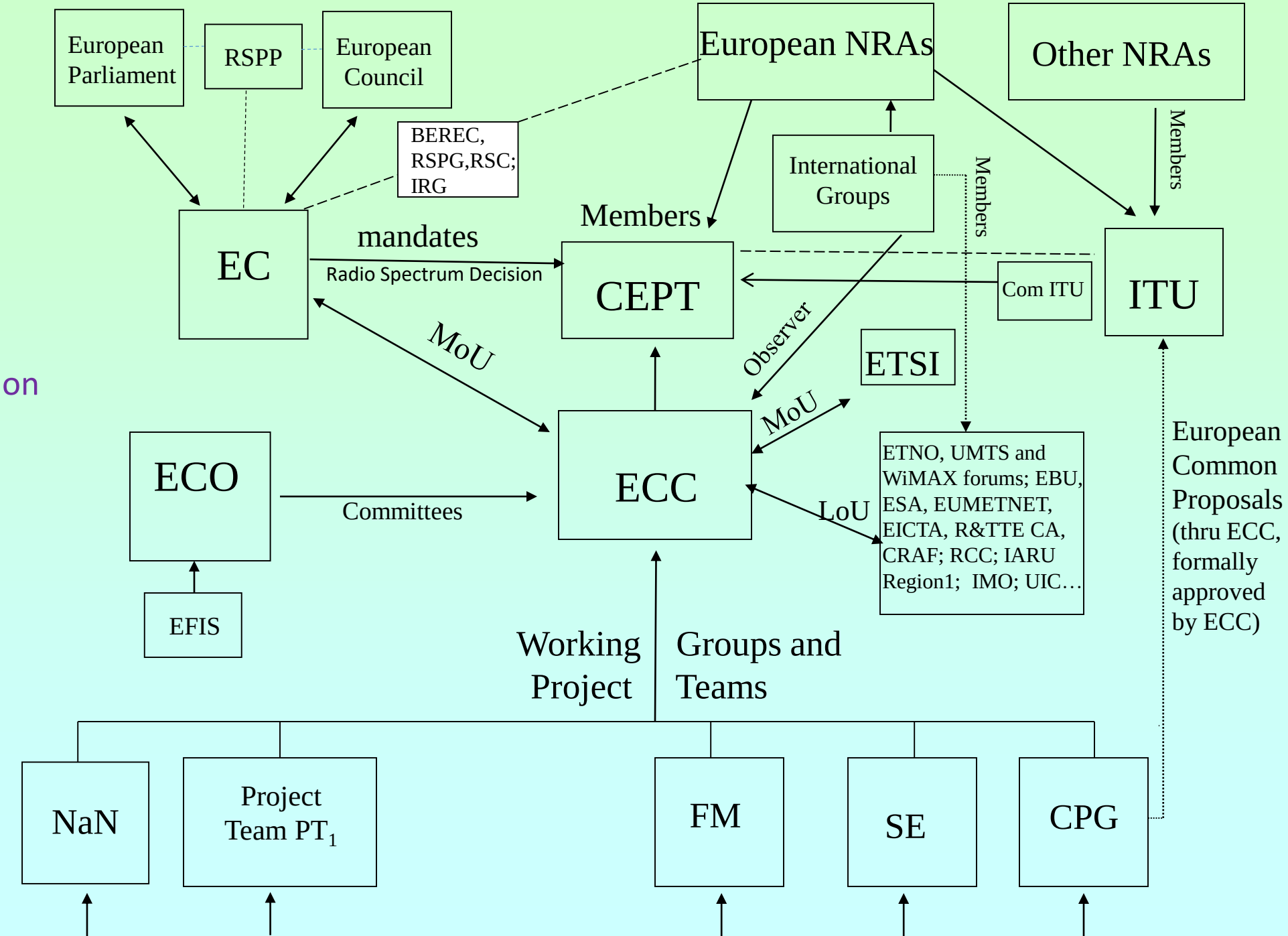
Roles of the National Spectrum Management

1. Avoid and solve interference
2. Design long and short range RF spectrum
3. Support Engineering: propagation, coverage, RFI…
4. Coordinate with military wireless services
5. Evolve efficient import
6. Advance new wireless technologies (such as 5G, cognitive radios, digital audio & video
7. Coordinate with Administrations, mainly neighbors
8. Reduce RF human hazards

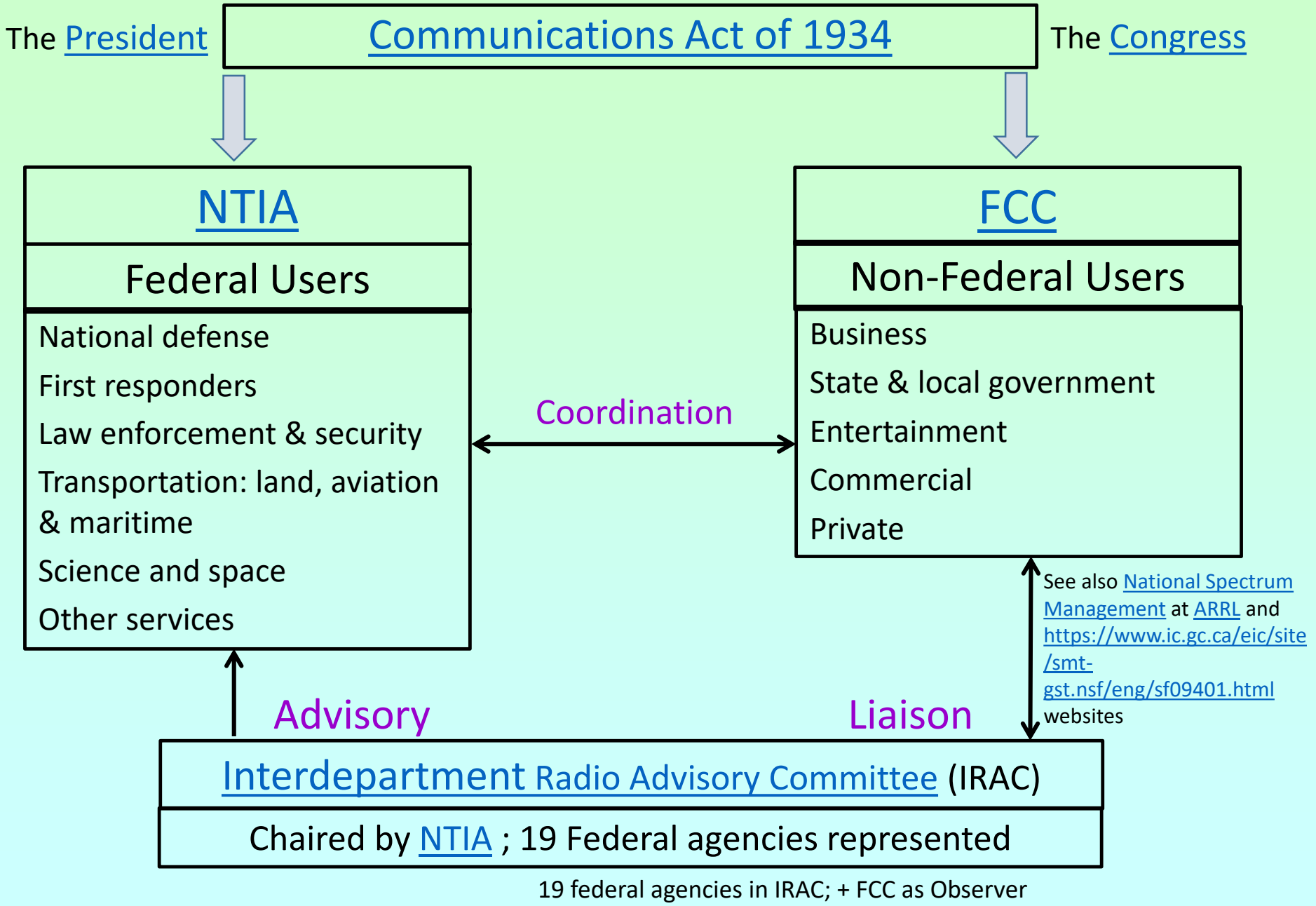
ITU RF Allocation; three Regions



European regulation & standardization



US National Spectrum Management



Frequency Bands for SRDs

Global
Only in Europe
Only in Americas

ISM bands for SRDs

6,780 kHz; 13,560 kHz
27,120 kHz; 40.68 MHz
433.92 MHz
915 MHz
2,450 MHz; 5,800 MHz
24.125 GHz;61.25 GHz
122.5 GHz ;245 GHz

non-ISM candidate bands for SRDs

9-148.5 kHz; 3,155-3,400 kHz
9 kHz- 47 MHz (specific SRDs)
7,400-8,800 kHz
138.20-138.45 MHz
169.4-216 MHz
312-315MHz (non Europe)
402-405 MHz medical devices
470-489 MHz (normally individually licensed)
823-832 MHz and 1,785-1,805 MHz
862-875 MHz in some Asian counties
862-876MHz Non-Specific SRDs
915-921 MHz (in some countries)
5,150-5,350 & 5,470-5,725 MHz
57-64GHz, 76-77GHz, 77-81GHz

h.mazar@atdi.com

Typical Smart House: Z-Wave

Current sub-1GHz

designed mainly for remote controls, smoke alarms and security sensors

- Z-Wave uses a single frequency FSK
- Data rate up to 100 Kbps; unlike IEEE 802.11, designed primarily for high-bandwidth data flow
- Range between controllers & slave devices up to 100 ft

Country/Region	Standard	Z-Wave RF
Australia	AS/NZS 4268	921.4 MHz
Brazil	ANATEL Resolution 506	921.4 MHz
CEPT	EN 300 220	868.4 MHz
Chile	FCC CFR47 Part 15.249	908.4 MHz
China	CNAS/EN 300 220	868.4 MHz
Hong Kong	HKTA 1035	919.8 MHz
India	CSR 564 (E)	865.2 MHz
Israel	MoC Wireless Act	915-917 MHz
Japan 950 (obsolete by end of 2015)	ARIB T96	951-956 MHz
Japan 920 (since Feb 2012)	ARIB STD-T108	922-926 MHz
Malaysia	SKMM WTS SRD/EN 300 220	868.1 MHz
Mexico	FCC CFR47 Part 15.249	908.4 MHz
New Zealand	AS/NZS 4268	921.4 MHz
Russia	GKRCh/EN 300 220	869.0 MHz
Singapore	TS SRD/EN 300 220	868.4 MHz
South Africa	ICASA/EN 300 220	868.4 MHz
Taiwan	NCC/LP0002	922-926 MHz
UAE	EN 300 220	868.4 MHz
USA/Canada	FCC CFR47 Part 15.249	908.4 MHz

Rec. SM.1896 ann.1: SRDs global harmonization

RF Range	Remarks
9-148.5 kHz	Inductive SRD applications
3 155-3 400 kHz	Inductive SRD applications RR No. 5.116
6 765-6 795 kHz	Inductive SRD applications ISM band (RR No. 5.138) Centre frequency 6 780 kHz
13.553-13.567 MHz	Inductive SRD applications; ISM band (RR No. 5.150); Centre frequency 13.560 MHz; Level of side band suppression is dependent on national regulations
26.957-27.283 MHz	Inductive SRD applications/non-specific SRDs; ISM band (RR No. 5.150); Centre frequency 27 120 kHz
40.66-40.7 MHz	ISM band (RR No. 5.150); Centre frequency 40.68 MHz
2 400-2 500 MHz	ISM band (RR No. 5.150); Centre frequency 2 450 MHz
5 725-5 875 MHz	ISM band (RR No. 5.150); Centre frequency 5 800 MHz
24.00-24.25 GHz	ISM band (RR No. 5.150); Centre frequency 24.125 GHz
61.0-61.5 GHz	ISM band (RR No. 5.138); Centre frequency 61.25 GHz
122-123 GHz	ISM band (RR No. 5.138); Centre frequency 122.5 GHz
244-246 GHz	ISM band (RR No. 5.138); Centre frequency 245 GHz

SRDs regulation & standardisation are divided into 3 major camps: Europe, N. America & Asia

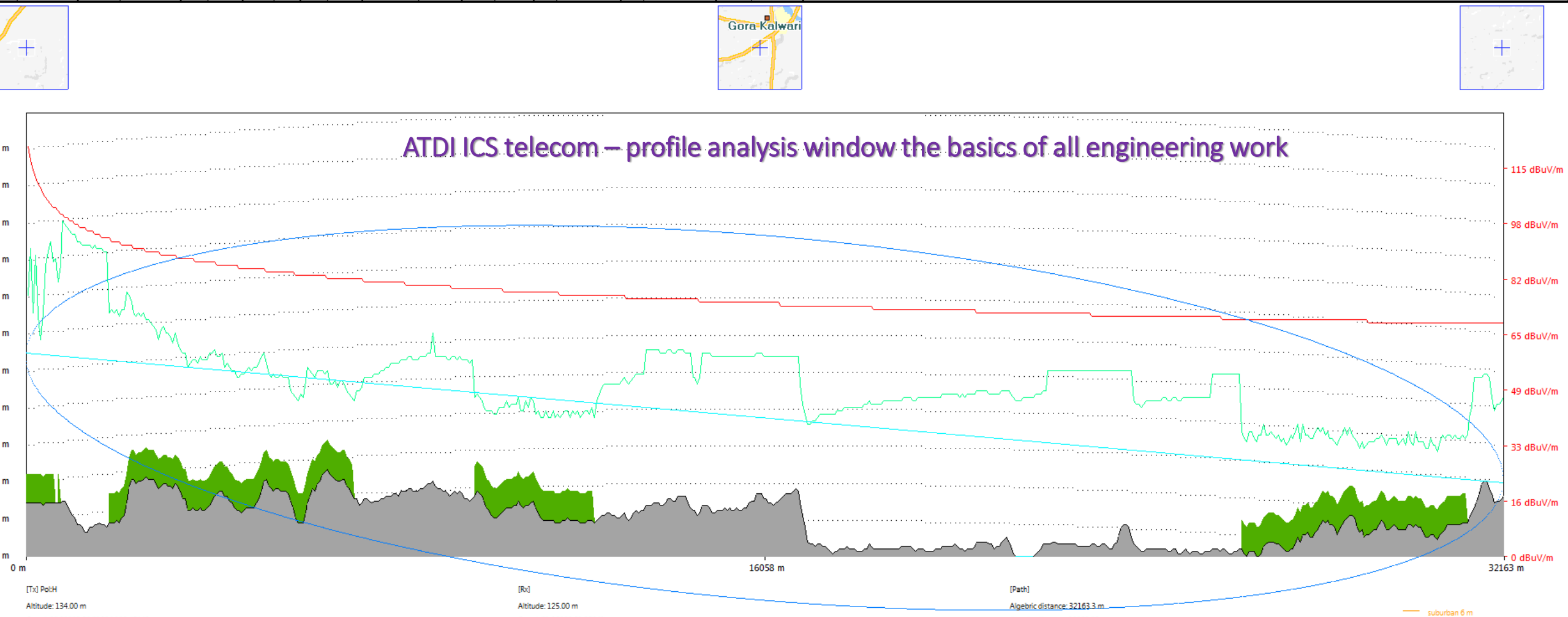
Europe constrains Wideband Data Transmission in 5150–5350 MHz, to only indoor use; The Radio Equipment Directive 2014/53/EU (RED) is more liberal: self-conformity not FCC *ex-ante* certification; *laissez passer;* tests *ex-post* . Different processes to update the 70-03 and part 15

Part 15 American *Licence-Exempt Devices vs. European Short Range Devices.* Europe permits lower emissions: e.g., e.i.r.p. 0.1W versus 4W at 2.4 GHz

FCC Part 15 originated in 1938, inspired the European SRD concept (~1990) and ERC/REC 70-03. In US and Canada most of the RF is available to SRD

Placing on the market in the US. Any Part 15 must be tested and authorized before it may be marketed. There are two ways to obtain authorization: Certification & Verification

ATDI ICS telecom – profile analysis window the basics of all engineering work



[Tx] PolH
Altitude: 134.00 m
Coord: 20.59023 52.01294 122 4DMS
Antenna: 50.00 m
EIRP (max): 251.18864 W 24.00 dBW 54.00 dBm
Radiated power: 224.24232 W
Angles - V: -0.20°(E) H: 110.38° OA: 110.38°
Pattern loss - V: 0.09 dB H: 0.40 dB

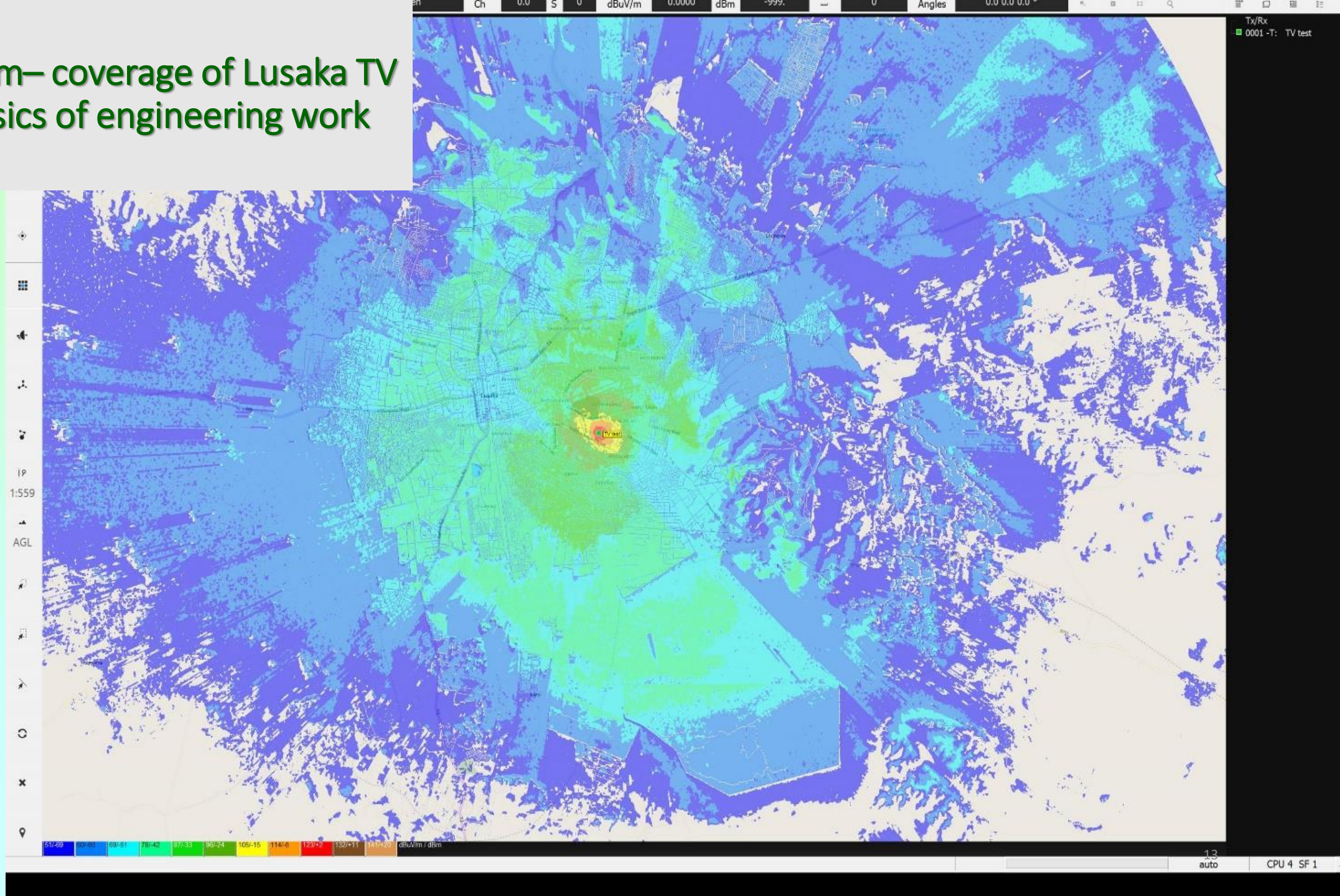
[Rx]
Altitude: 125.00 m
Coord: 21.25208 51.55241
Antenna: 5.00 m
Threshold: 30.0 dBuV/m, -100.0 dBm - Target: 10.0 dB
Gain: 0.00
OAA: 0.00°
Pattern loss: 0 dB

[Path]
Algebric distance: 32163.3 m
Angular distance: 32083.25 m
H1 (m): 66.4(G) 65.5(W) 64.8 (Oku)
PSO: 16.5 dB
FSR: 46.5 dBuV/m, -83.3 dBm, S(uV): 15.34
Free space loss: 115 dB - EndToEnd: 137.3 dB
Model atten: 0.0 dB

Frequency: 425.50000 Mhz - Propagation losses: 136.8 dB - Ducting: 0.0 dB
Model: ITU525 - Deygout 6.5 dB - Subpath: 15.2 dB - Ground reflections: 0.0 dB - Clutter: 0.0 dB
1st 1/2 ellips.: 75.29 m - Earth: 8500 km (land) 8500 km (sea) - Rain: 0 dB - Gaz/Fog: 0.0000 dB

suburban 6 m
urban 8 m 8 m
urban 15 m 15 m
urban 30 m 30 m
urban 50 m 50 m
forest 12 m
wood 4 m
road or roof 0 m
Hydro
terrain
free space

ATDI ICS telecom– coverage of Lusaka TV UHF ch. the basics of engineering work



Conclusion

Providers of wireless equipment should

1. Know international regulations, in addition to standards
2. Fit the RF to the rulings in their markets
3. Learn the regulatory framework
4. Guide their product to worldwide common RF allocations

My Wiley book 'Radio Spectrum Management: Policies, Regulations and Techniques; see at Amazon

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U may visit my website http://mazar.atwebpages.com/

Any Questions?

The author

Geneva, October 2007
ITU Radio Assembly

Dr. Haim Mazar; Vice Chair ITU-R Study Group 5