Stan Baaijens

3rd GE06 ASMG coordination meeting 2015

Marrakech, 13-16 April 2015

Cooperation & innovation in relation to the spectrum discussion 2015

Overview

- About Funke
- Introduction DigiTAG
- DTT Overview
- Cooperation to realize a successful implementation of DVB-T/T2
- Trends in Transmission & Coverage
- Innovation at the reception side to avoid harmful interference

About us: History

- Dutch family business
- Almost 60 years of experience
  Since 1957
- A pioneer in TV reception
  - First compact packaging for retail
  - First DIY Yagi (Rooftop antenna)
  - First compact DTT indoor antenna
  - Developer of first 4G LTE filtering technology

About us: Present

- Active in over 50 countries worldwide
- Our own Research & Development
- Represented in DVB + DigiTAG + FOBTV
- Collaboration / studies with BBC, IRT, TUB
- Frequently invited as expert + speaker

About us: Present

- Present at the most relevant international trade shows
  e.g. IBC, NAB, ANGA, IFA, BCA, ABTA, etc .

- Attendee of the most relevant workshops, conferences and forums
  e.g. ASBU, ABU, SAKT, ITVF, DMB World, FOBTV, etc.

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Introduction - DigiTAG

Global organisation to:

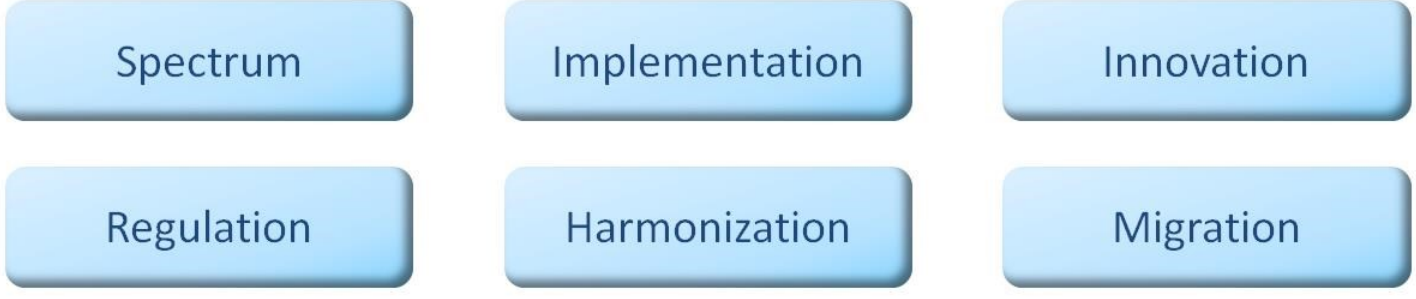
- promote spectrum for broadcasting
- bring it back on the agenda
- help in the implementation of Digital TV / DTT

Introduction - DigiTAG

DigiTAG members:

DigiTAG mission

- Promote and defend digital terrestrial television (DTT) on a worldwide basis bringing together industry players to protect spectrum for broadcasting, regardless of the technical standard used on the DTT platform.
- Advance and safeguard the development of digital terrestrial television. It encourages and aims to facilitate the introduction and implementation of national DTT platforms regardless of the business model, regulatory regime or technology adopted.



DTT overview

Types DTT Technologies

- Core to DTT (traditional linear TV)
- Complementary to DTT (on-demand, hybrid TV)
- Mobile DTT to devices (smartphones, tablets)

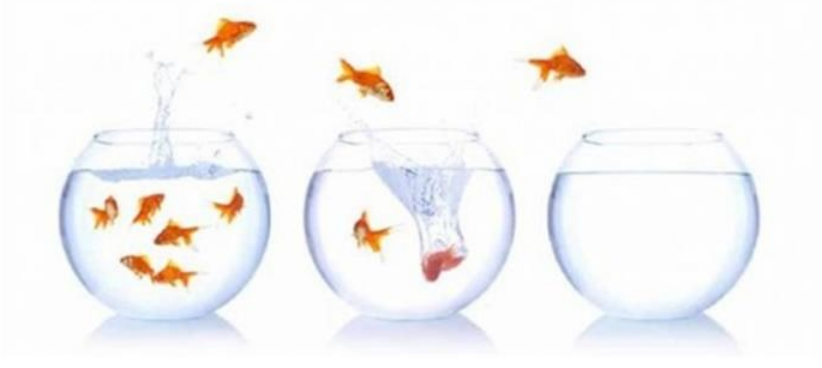
Core DTT technologies

- Offer broadcasters and consumers increased choice and quality
- Channel formats are improving and evolving quality of video experience
- Encoding standards are offering greater gains in capacity (MPEG-2, MPEG-4, HEVC)
- Broadcast transmission standards (DVB-T2) available to increasing the capacity to offer new services

Market migration is led by viewers' demands for innovation, increased quality and the highest standard of viewing experience

Status of development

- The speed of take-up is influenced by three drivers
  - DTT market characteristics
  - Key players in a market
  - Regulation and policy within a market
- Migration to new standards needs to show a clear benefit to the viewer with clear support and national coordination.



Stakeholders DTT market

- Broadcasters
- Operators
- Manufacturers
- Consumers

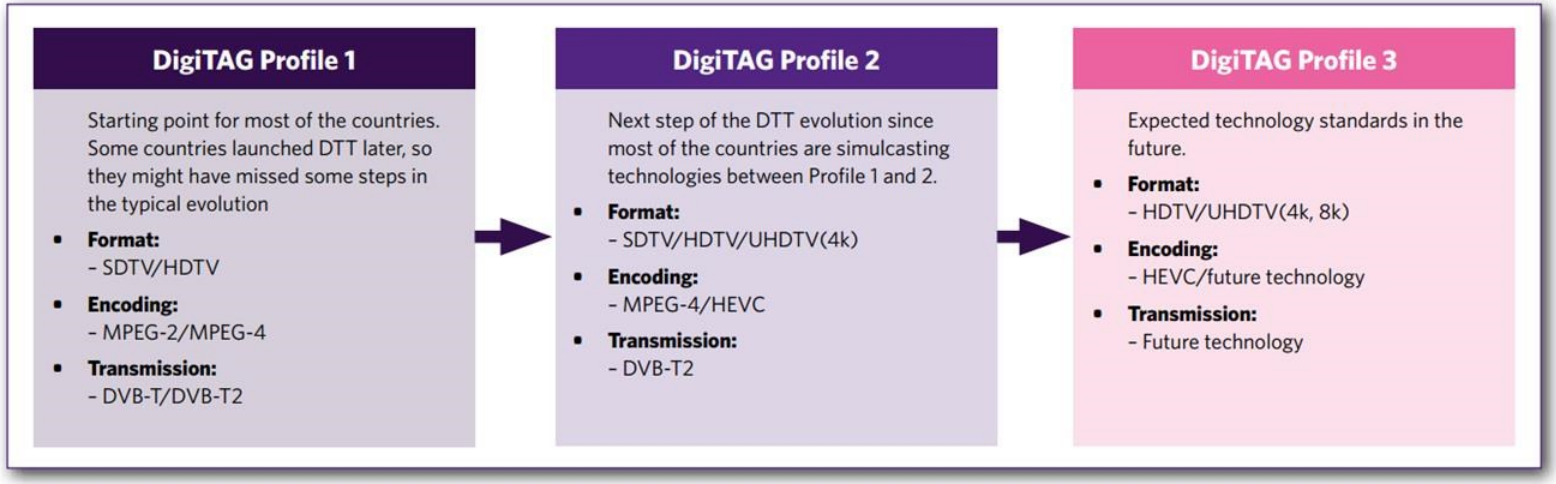
- Vertical integrated markets (pay TV) move faster towards DTT
- Horizontal integrated markets (FTA) move slower towards DTT

DTT in Europe

- Majority of European countries completed their DSO and DVB-T
- Markets around Europe are now migrating or planning to DVB-T2
- Markets where DSO has not yet taken place or which have little DVB-T penetrating are moving to DVB-T2 in first instance
- MPEG-2 is the predominant encoding standard although many countries established a MPEG-4 ecosystem
- Majority of new consumer equipment is MPEG-4 compatible
- The expected speed of adoption of advanced encoding standards will increase and more devices with high technology standards become available in the market
- HbbTV services for hybrid TV are being deployed

Levels of development

- Profile 1 - Early adopter/innovative → countries which quickly migrate to new standards
- Profile 2 - Early majority → countries where conditions are favourable for the migration to new profiles
- Profile 3 - Late majority → countries that evolve towards new standards at a slower pace



Profile 1

Starting point for most of the countries. Some countries launched DTT later, so they might have missed some steps in the typical evolution.

- **Format:**
  - SDTV / HDTV
- **Encoding:**
  - MPEG-2 / MPEG-4
- **Transmission:**
  - DVB-T / DVB-T2

DigiTAG Profile 1

Starting point for most of the countries. Some countries launched DTT later, so they might have missed some steps in the typical evolution

- **Format:**
  - SDTV/HDTV
- **Encoding:**
  - MPEG-2/MPEG-4
- **Transmission:**
  - DVB-T/DVB-T2

Profile 2

Next step of the DTT evolution since most of the countries are simulcasting technologies between Profile 1 and 2.

- **Format:**
  - SDTV / HDTV / UHDTV (4k)
- **Encoding:**
  - MPEG-4 / HEVC
- **Transmission:**
  - DVB-T2

DigiTAG Profile 2

Next step of the DTT evolution since most of the countries are simulcasting technologies between Profile 1 and 2.

- **Format:**
  - SDTV/HDTV/UHDTV(4k)
- **Encoding:**
  - MPEG-4/HEVC
- **Transmission:**
  - DVB-T2

Profile 3

Expected technology standards in the future.

- **Format:**
  - HDTV / UHDTV (4k, 8k)
- **Encoding:**
  - HEVC / future technology, status in Germany & Turkey
- **Transmission:**
  - Future technology

DigiTAG Profile 3

Expected technology standards in the future.

- **Format:**
  - HDTV/UHDTV(4k, 8k)
- **Encoding:**
  - HEVC/future technology
- **Transmission:**
  - Future technology

Predictions DigiTAG

- Transition to new standards taking between 3 and 12 years
- An early adopter between 3–6 years to move from Profile 1 to 2, which will led by consumer demand and expectations for HD and UHD TV
- A late majority may take between 8-12 years to make the same transition
- Most countries are likely to fully adopt DigiTAG Profile 2 between 2017 and 2026
- Final transition to Profile 3 is expected to occur between 2023 and 2030 and beyond

A bright future for DTT

- DTT will remain the pre-eminent television viewing platform which offers significant benefits to consumers
- DTT platform development is underway but will require the ongoing support of governments, industry stakeholders and viewers
- DTT platform will require continued access to sufficient and clear spectrum to provide security and stability, promote innovation, and assure long-term investments

To conclude…

- The DTT industry continues to work to ensure it meets consumers' expectations to 2030 and beyond
- Different DTT technology adoption roadmaps ensure a clear future roadmap for the next 10-20 years
- The DTT platform remains a strong TV distribution platform with a bright future

Cooperation to realize a successful implementation of DVB-T/T2

Experience has led to 6 important points for implementation

Overview 6 points

Network Quality

- At the end of the launch process, digital TV coverage must be at least the same as analogue TV.
- Viewers will simply not tolerate losses in coverage.

Added value in content

- The content proposition needs to be strong, with clear added-value for digital services over the analogue portfolio.
- Adding extra features will help even if they are not seen as a priority for the viewers currently.

Affordable pricing

- Bringing in new technology can be costly: distribution costs and production costs for new content.
- Digital transmission is cheaper than analogue, fully realized only with analogue switch off.
- To minimize the costs new content production, you must maximise the economies of scale.

Stakeholder cooperation

- The basis moto is “Compete on content but cooperate in technology”.
- All the stakeholders must work together:
  - Network operators
  - Regulators
  - Governments
  - Industry bodies
  - Manufacturers
  - Distributors
  - Device retailers

Promotion & Communication

- Public communication is an essential part of any new technology introduction: making the citizens aware of the new platform and its associated services.
- Also a central tool to involve the other stakeholder industries.
- Message must be consistent and aimed at avoiding confusion in the market.
- Finally, it is important to keep it simple: promote ‘digital TV’ and not ‘DVB’, since it is easier to understand.

Promotion & Communication

SMART ANTENNA

- ✓ **For you who live in apartment**
- ✓ **Perfect for windowsill**

Requires purchase of a TV package, for example.

Boxer Flex overall minimum subscription and

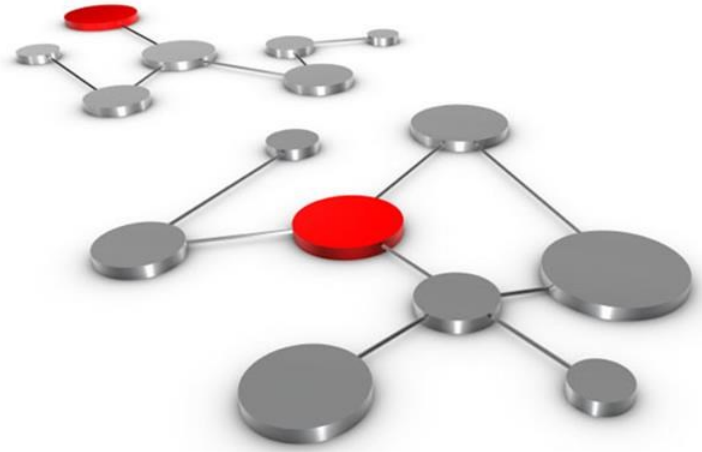
Smart Antenna

ABOUT THE ANTENNA

If you live in an apartment, you can receive Boxer with our new little smart antenna. In Copenhagen and the metropolitan area, we have strengthened the TV signal into apartments. Smart antenna is not bigger that it can stand on the windowsill, and it is easy to install.

Together clearly the best

- Above five points do imply a sixth one: Together clearly the best!
- Commitment clearly shows the goals and ambitions of the industry and sends the strongest possible signal to viewers.
- Digital technology can help broadcasters better address the needs of the viewers.
- Challenge is to find the balance between the needs and the viability of the market.



Trends in Transmission & Coverage

BBC R&D

LS telcom

Fraunhofer

drm

ENENSYS Technologies

WORLD DMB Digital Multimedia Broadcasting
Radio • Mobile TV • Multimedia • Traffic Data

IRT

EBU·UER

ROHDE&SCHWARZ

Technische Universität Braunschweig

harmonic

MAINDATA digital tv and ip technologies

GATESAIR

DVB Digital Video Broadcasting

PROGIRA

Dielectric

Trend: Transmission

- Reliable SFN broadcasting for network frequency optimization
- MultiPLP broadcasting for multiple Business Cases applications
- Regionalization for local content insertion
- DTH and DTT co-existence for delivery network optimization

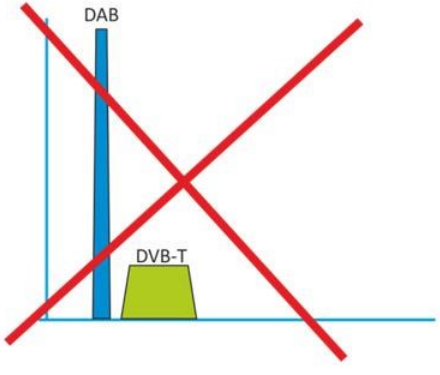
Trend: band 3 (Digital Radio)

In case of scenario 1

Network planning

- The network should be planned so that the interferer can not affect the receiver that much that reception will fail.
- How?

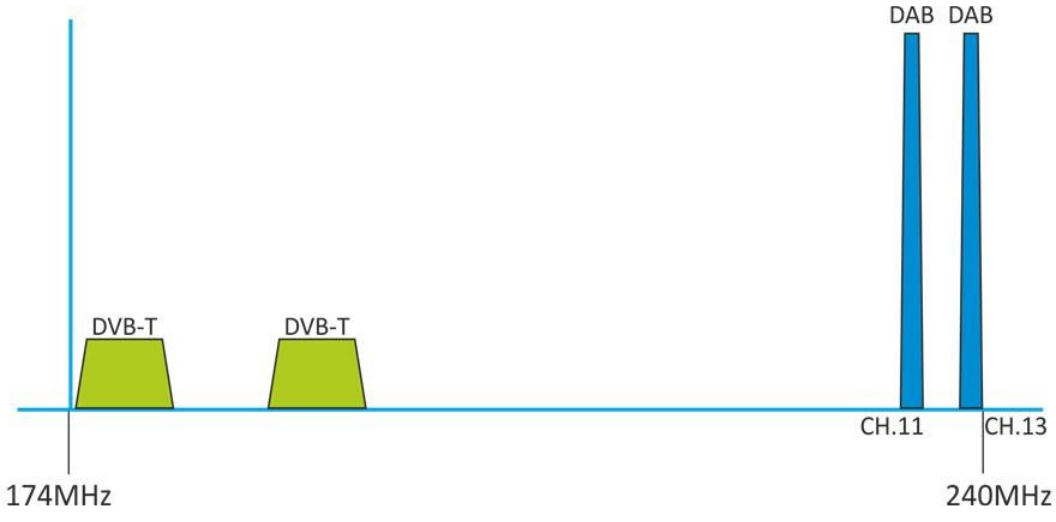
- In areas where high levelled DAB signals are present, do not let it be the nearby interferer of DVB-T.



Trend: band 3 (Digital Radio)

In case of scenario 2

- In case of multiple High levelled DAB signals it is recommended to have DAB transmissions on frequencies as far as possible from the DAB signals.



- DVB-T frequencies make calculations of Intermodulations to be expected in different areas. If levels are too high (depends on OIP3 of amplifier = Output 3rd order Intercept Point) the interferer can affect the reception.

Trend: band 3 (Digital Radio)

Additions

- According to the R138 from the EBU, it is recommended to use the VHF band 3 for DAB transmissions. In that case it is better to prevent using this band for DVB-T transmissions.

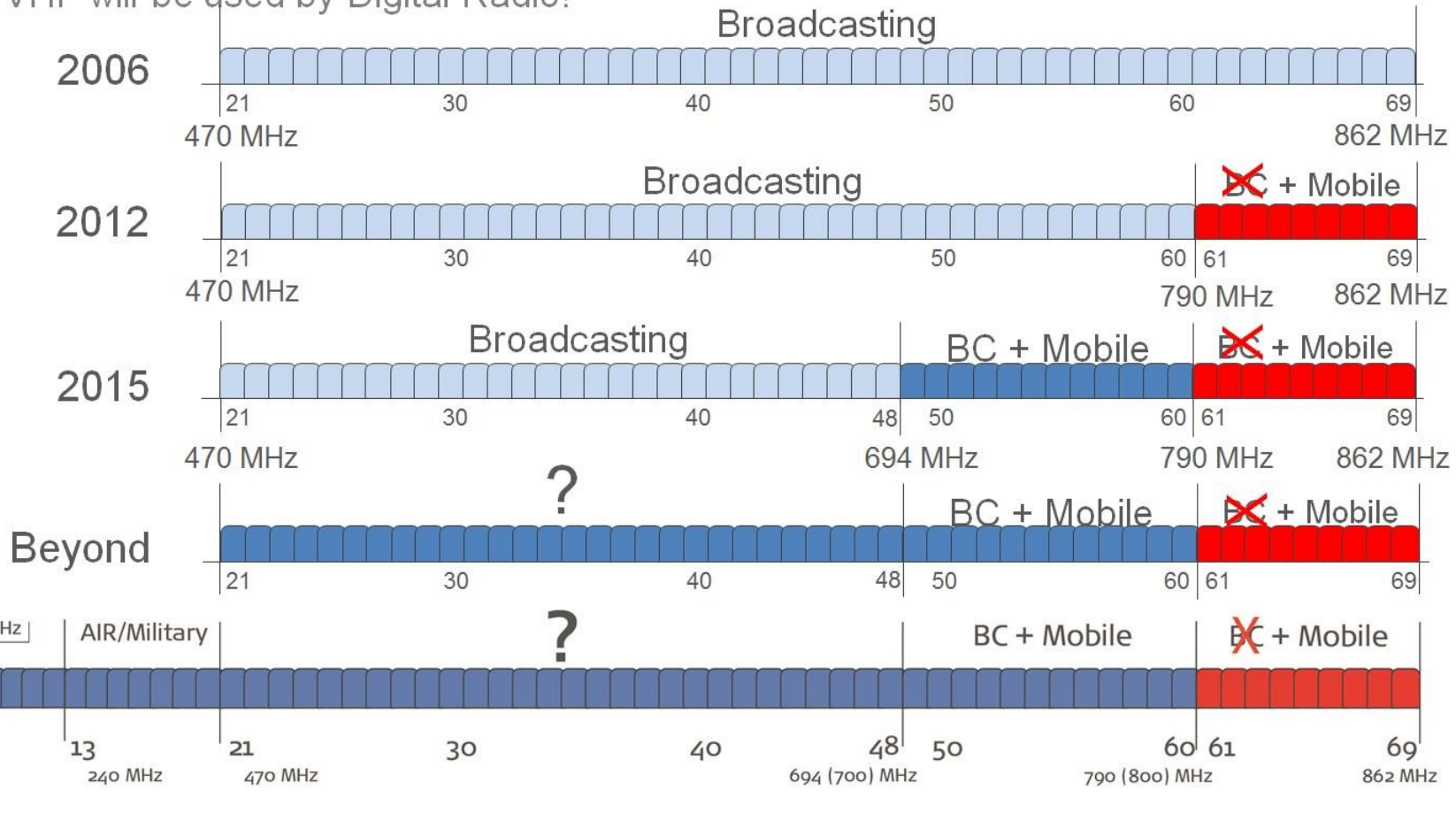
- Using band 3 for DVB-T means that large antennas are used to get proper reception. Especially when DVB-T uses band IV/V as well, an antenna for both bands is necessary. Unfortunately the antenna will be a compromise between these two bands with less performance and a higher price.

- In some countries DVB-T is based on indoor reception. Small indoor antennas for VHF often do not have sufficient performance.

- DAB signals are more robust (less data, audio only) and can be received with a small indoor antenna.

Trend: Coverage

- Changes in UHF spectrum allocations
- VHF will be used by Digital Radio!



Trend: Active vs Passive

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Active antenna

- Will improve Noise Figure of a system (antenna, cable, amplifier, STB)
- Amplifiers with gain higher than 15dB will not give an excessive Noise improvement anymore
- Positive effect Figure of Merit
- Can handle longer cables without adding an excessive amount of Noise
- Amplifiers with moderate gain and high OIP3 will give best IMA

Passive antenna

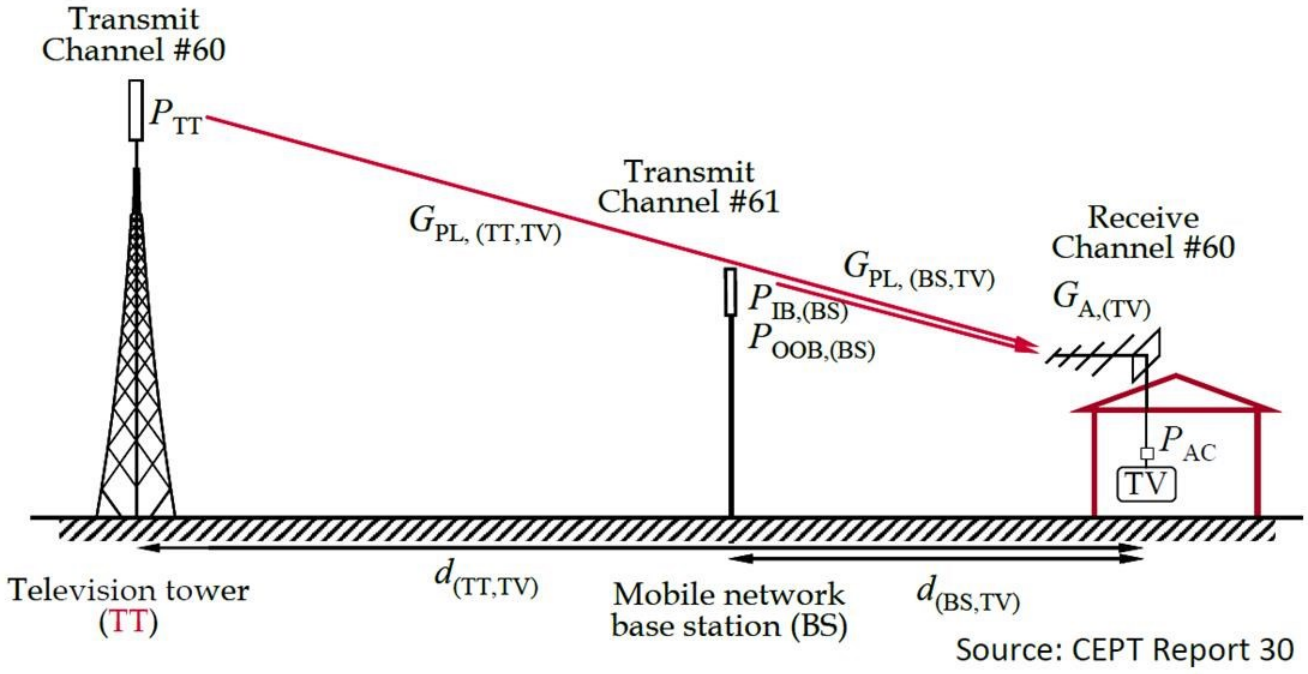
- Will increase Noise Figure due to cable loss.
- No amplifiers, biggest antennas will be needed
- Negative effect Figure of Merit
- Longer cable imply higher rate of noise
- OIP3 not applicable

Innovation at the reception side to avoid harmful interference

Co-existence

- Terrestrial Broadcasts have already started to co-exist with LTE
- Co-existence presents a number of potential challenges for Terrestrial TV Consumer

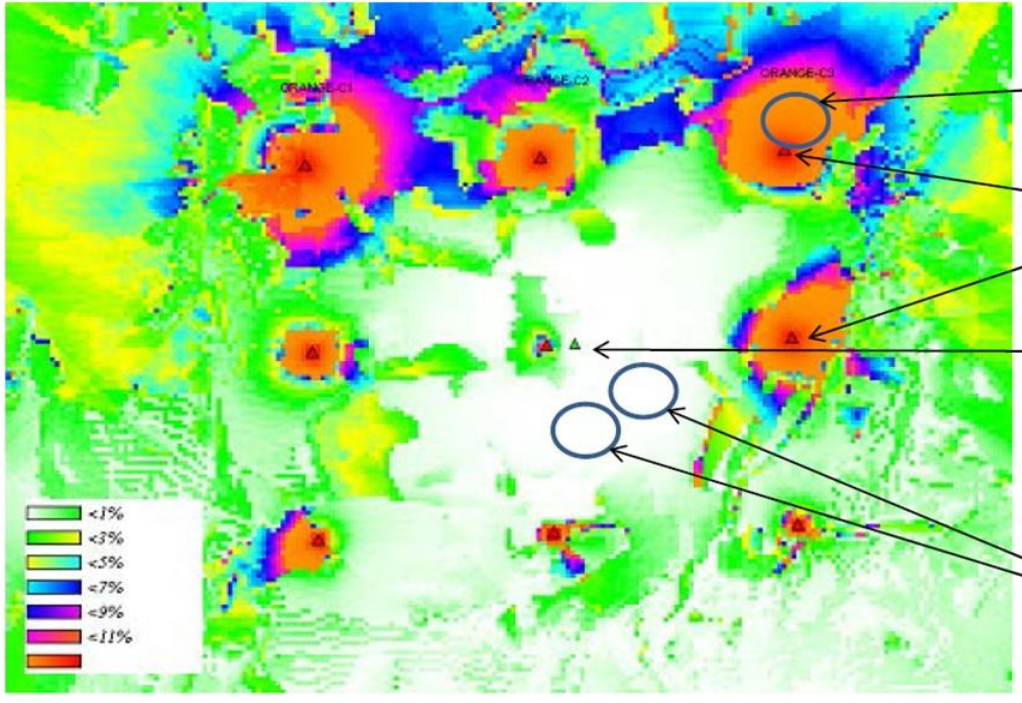
Base station Interference case



Source: CEPT Report 30

- LTE Base Station closer to Home than Broadcast Tower
  - DTT cells: 30 km radius (average)
  - UMTS cells 400 m radius (average in cities)
  - GSM cells 5 km radius (average)
    - LTE cells will reuse the GSM an UMTS sites

Interference effect – “Hole Punching”



Strongly impacted area

Base Stations

DTT transmitter

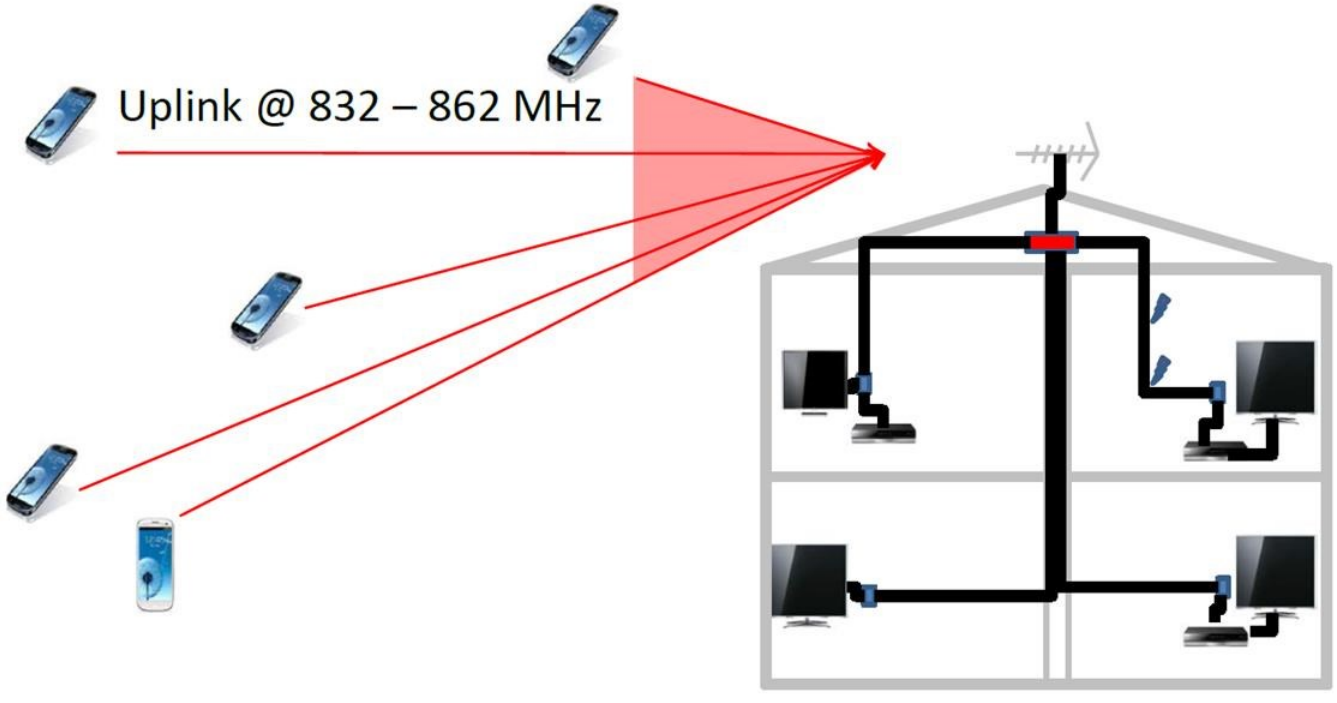
Non impacted areas

Source: IRT contribution to ECCPT1

- Interference Impact increases with distance of the transmitter
- The holes are difficult to predict (e.g. topography)
- Aggregation of Interference is possible

LTE800 Interference

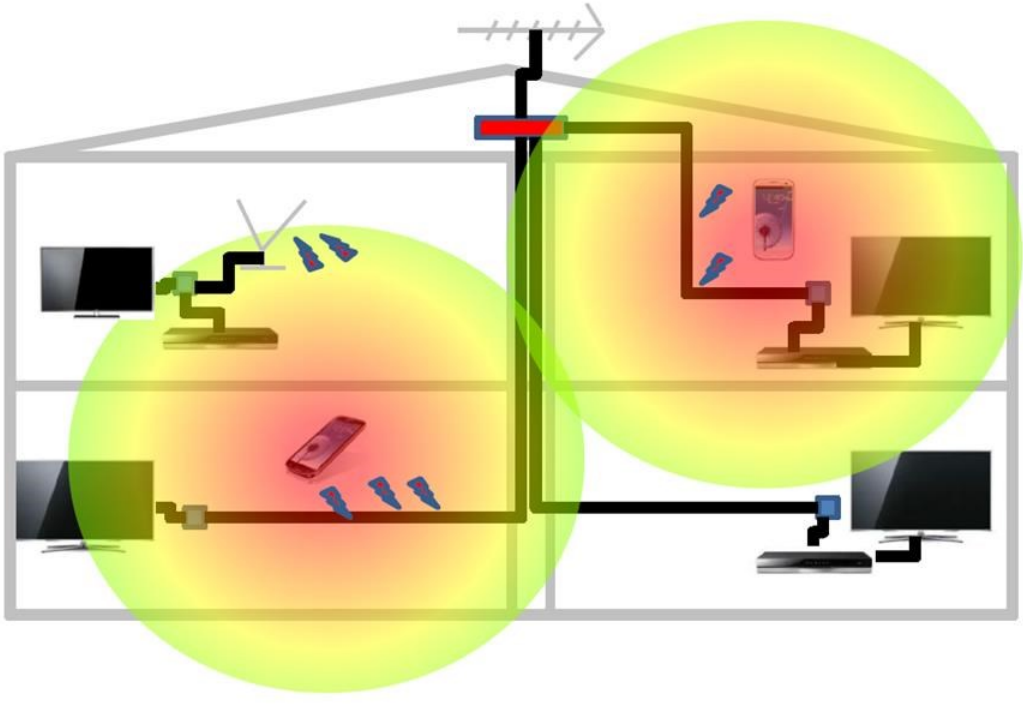
Handset as Interference source (outdoor)



- Individual handsets unlikely to cause interference
- Groups/multiples of handsets could cause problems

LTE800 Interference Case

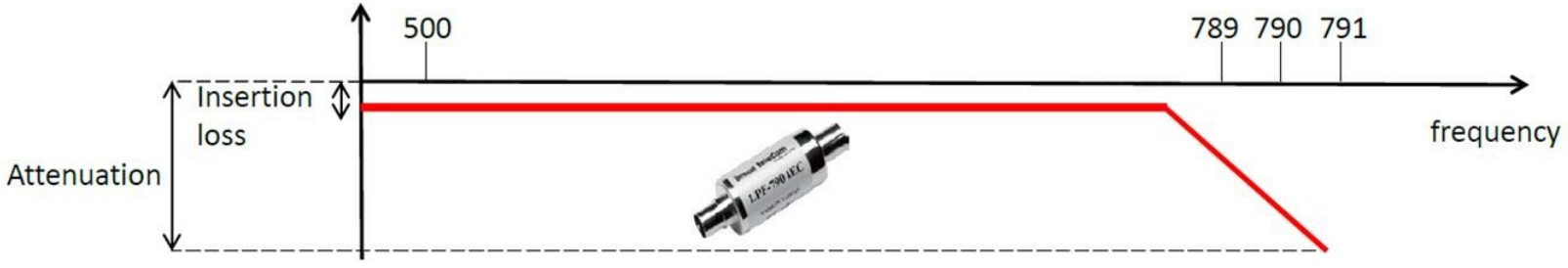
Handset Indoor Interference Case



- Handsets in proximity to cables and connectors might cause interference
- Domestic terrestrial installations are often old and vary in quality

Focus on filters

Advantages and limitations



Advantages

- Affordable to produce
- Easy to dispatch
- Easy to manipulate

Disadvantages

- Insertion losses
- Limited attenuation
- Overall system (TV + Filter) performance yet to verify
- Filter installation is not consumer “friendly”

- Filters can help but can also create a problem

NRK investigation

Conclusion: Simple messages to be remembered…

- Yes, LTE is causing interference
- Filters are helping, overload is manageable
- Real DTT protection will only be ensured if conditions are specified in the terms, when selling the LTE license (existence of a national organization to support end users, means a mitigation, economical aspects)
- The real situation is difficult to assess; very little information about interference is made public
- Upfront work on sharing studies and technical conditions, prior to international resolutions, is essential

LTE… Don’t plug & wait

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Some future issues of concern

- "Efficient use of spectrum"; "Bridge the digital divide"
  - How to ensure that reallocated spectrum is actually used efficiently by IMT?
- Dense deployment of LTE800 in urban areas
- Protection of active antennas and indoor antennas
- DTT protection in secondary homes
  (important market share in several countries)
- Future challenge with LTE700 to assess interference from mobile terminal (spurious)
- "Silent" migration of DTT end users to other platforms

Possible direction…

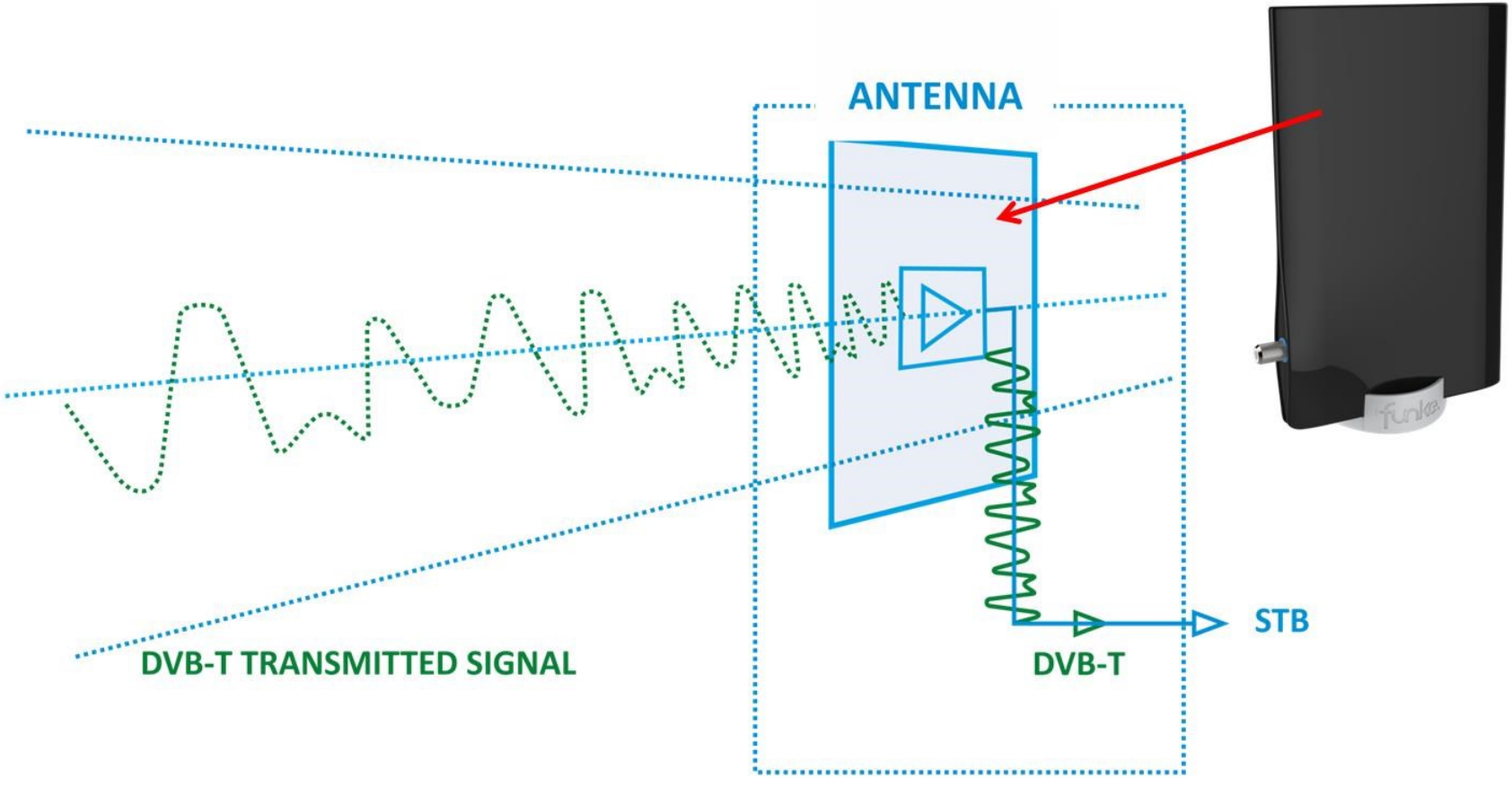
…for a future update of the survey

- Update with other countries not currently listed
- Update with new interference reports when made available
- Add cross-border interference issues (e.g. France-Spain, Spain-Portugal)
- Challenges:
  - Tedious and time-consuming to answer the questionnaire
  - Difficulty to gather data

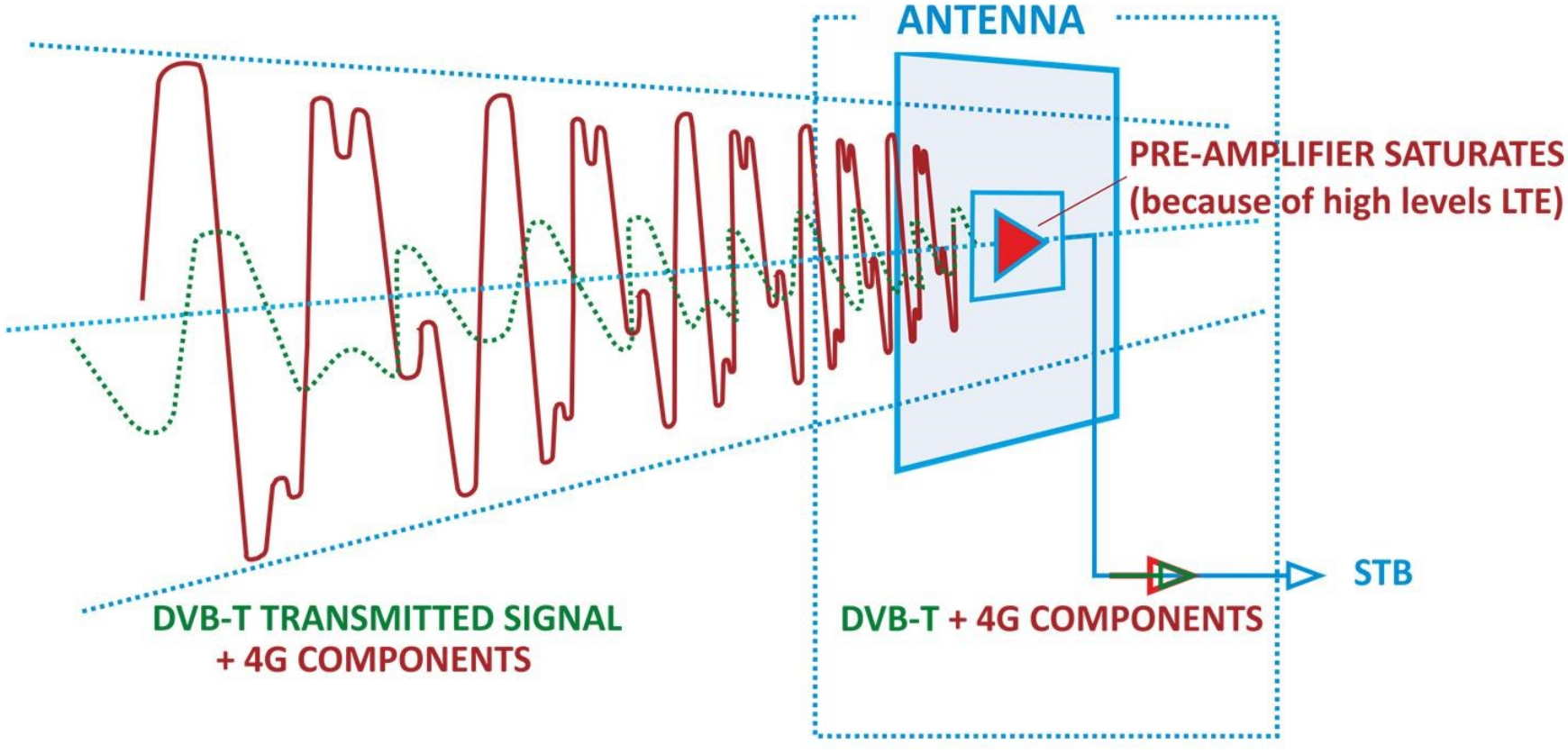
Funke INERT technology

- Relevance of filtering becomes more relevant now spectrum becomes over-crowded, often with (very close by) adjacents with relatively high power, like 4G LTE, GSM…
- Since ‘neighbours’ are very close by (in frequency), steepness of gain curve must be high and fall-off frequency reproducible (in mass production).
- As explicit Funke IP, the compact PCB implementation is very well suitable to fulfil these requirements.
- Can be adapted – by design – for future LTE requirements
  (A first 700 MHz solution is ready as well!)
- Of course this only works with an active antenna

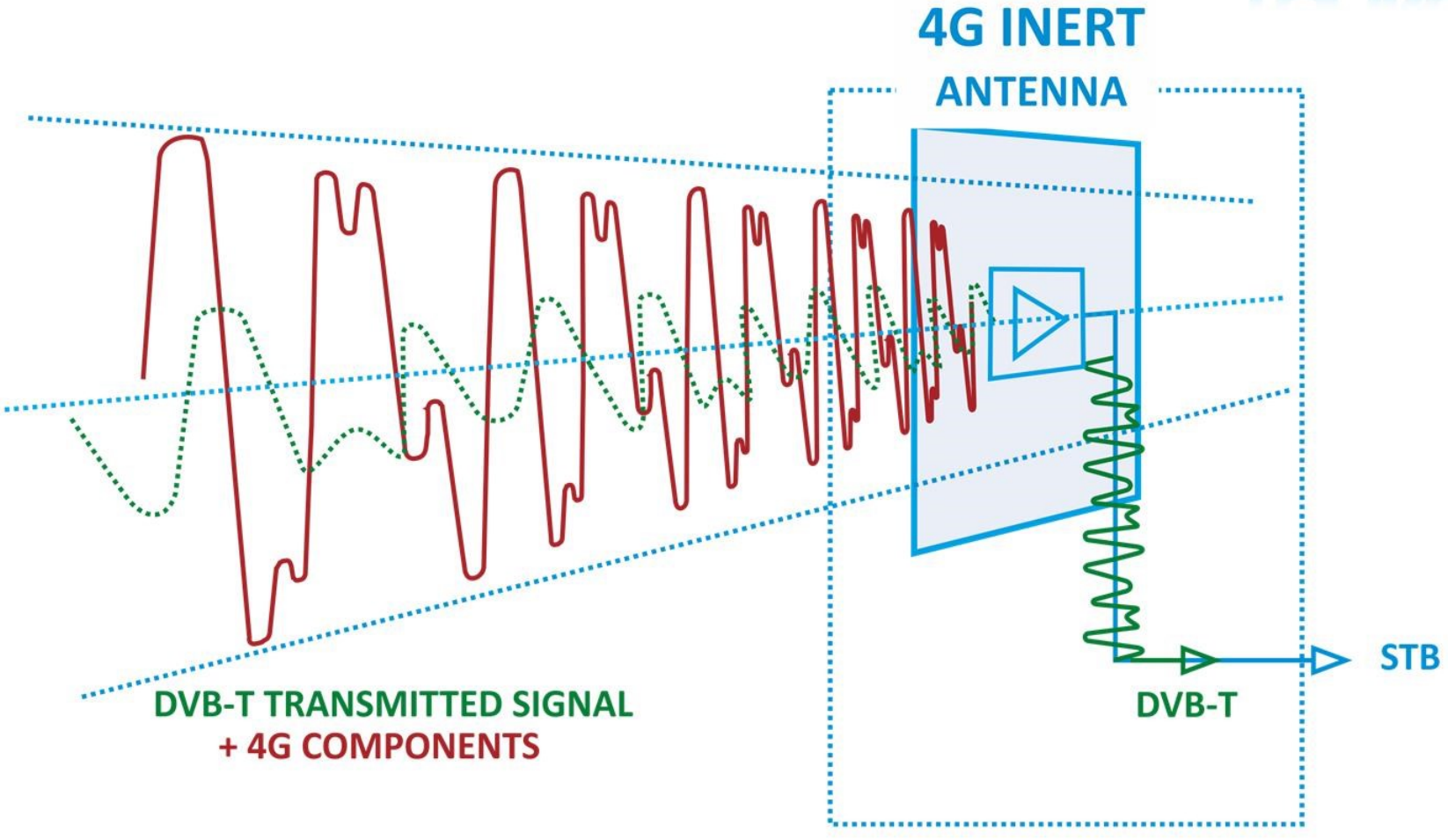
Standard DTT transmission



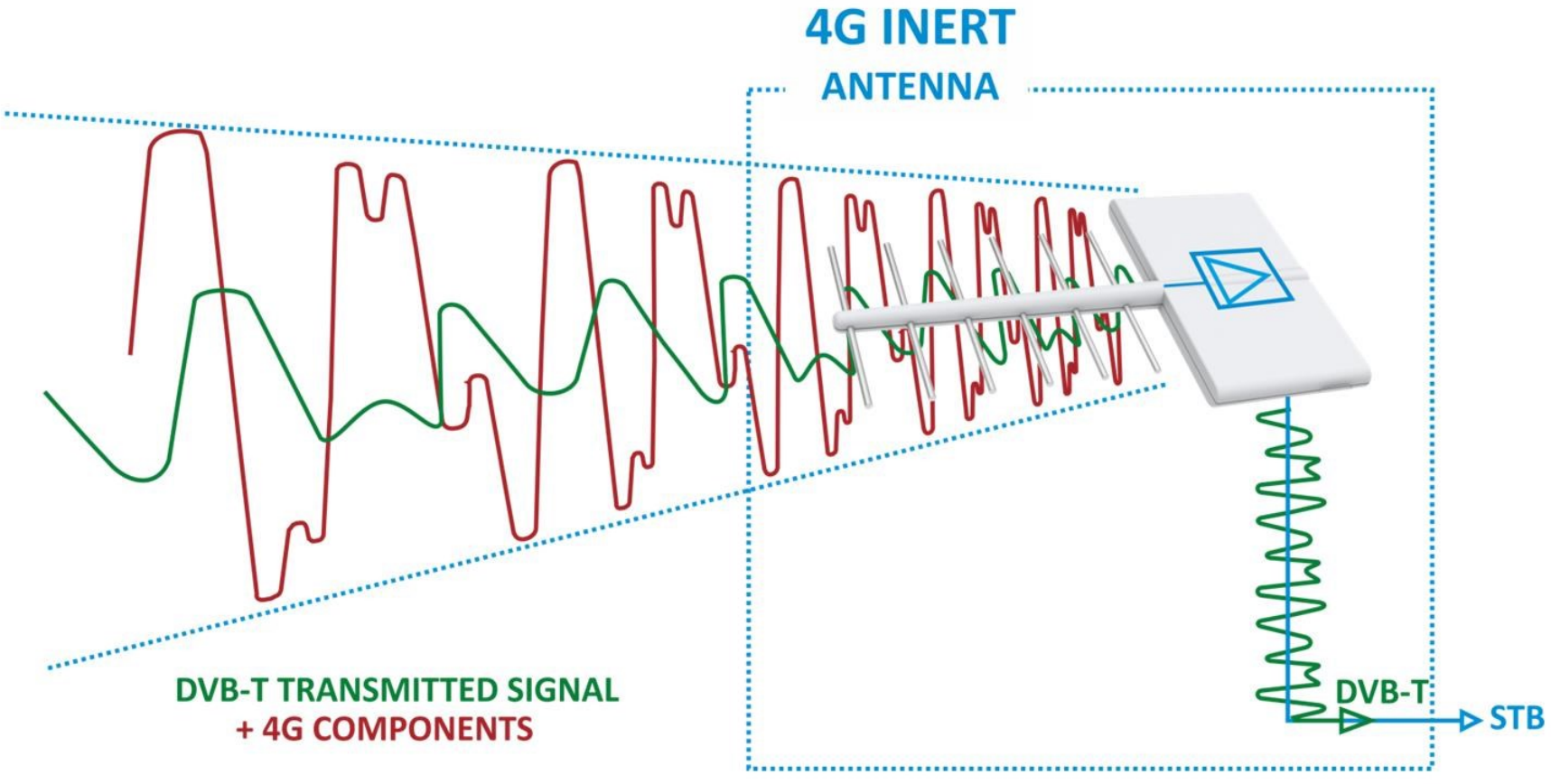
4G LTE signal distortion



Funke 4G LTE INERT



Funke 4G LTE INERT



Cheapest Solution

Advantages

- High performance
- Superb LTE suppression
- Easy to install
- Low transport costs CO2
- Low stock costs

Disadvantages

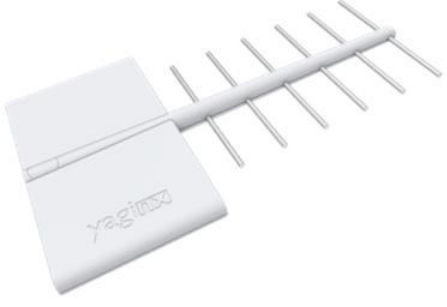
- Appearance too modern for traditional markets?
- Optional VHF performance is (relatively) low

Some examples

Ready for LTE and right now available







Summary

> New technologies can help to avoid harmful interferences in the spectrum discussion

BUT

> Cooperation of stakeholders is necessary to realize this

Let's keep in touch!

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Become a DigiTAG Member!
Find more info on
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Thank