

# Move up to the next level!

The future of digital broadcasting is in your hands

**Preliminary round  
exercises**

# Introduction

- I In the 1990s, the MPEG and DVB standards provided the prerequisites for the transition from analog to digital TV.
- I In Germany, this transition was completed for terrestrial TV in 2008. For satellite TV, it is almost finished. The remaining analog transponders are scheduled to be switched off in 2012. As regards cable TV, however, it is still unclear when the transition will be completed.
- I The adoption of DVB-S2 in 2004 marked the phase-in of the second generation of the DVB transmission standards. It was followed by DVB-T2 in 2008 and DVB-C2 in 2009.



# Exercises

In the preliminary round of the 2010 case study competition, your task is to deliver a presentation.

Your presentation should be designed to convince service or network providers such as the German broadcasters ARD or ZDF to implement DVB-T2 as their new broadcast standard as soon as possible.

Base your line of argumentation on as many results as possible from the following nine independent exercises.

When prioritizing the subexercises, also consider the number of points to be achieved in each case and substantiate all computational results by showing intermediate steps.



# Digital terrestrial television



# Exercise 1 (10 points)

- I Create a rough block diagram of a digital TV transmission link from the studio to the receiver (including the transmission link). → 6 points
- I Add the globally used source coding methods and transmission standards to this diagram. → 4 points



## Exercise 2 (11 points)

- I What are the general types of interference that occur during data transmission? → 5 points
  
- I Assign the dominant types of interference to each of the following three transmission links, and state the reasons: → 6 points
  - I Terrestrial
  - I Satellite
  - I Cable



## Exercise 3 (3 points)

There are different network-planning receive scenarios for terrestrial digital TV broadcast reception.

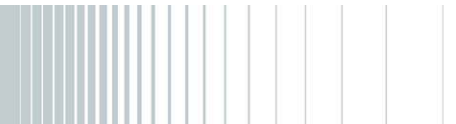
- 1 Specify these scenarios and give the network operator an estimate of the signal-to-noise ratios that exist in each scenario.



## Exercise 4 (5 points)

For DVB-T in Germany, the minimum required signal-to-noise ratio currently is approx. 13 dB.

- I Identify the DVB-T net data rate common in Germany and the number of programs in a multiplex. → 2 points
  
- I Calculate the maximum data rate that is theoretically possible in this data channel (UHF range). → 3 points



## Exercise 5 (3 points)

- I What are currently the two main advantages of digital TV over analog TV (specifically in the area of DVB-T)? → 2 points
- I Apart from launching new broadcast standards, how can existing digital TV networks be enhanced in the future? → 1 point



# Exercise 6 (11 points)

- I What are the essential technical innovations of DVB-T2, and which benefits do they yield? → 8 points
- I Which three main arguments (derived from the primary benefits of DVB-T2) do you choose to convince the network operator to implement DVB-T2? → 3 points



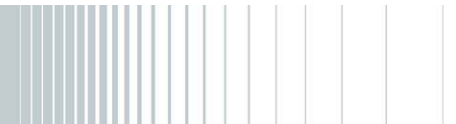
## Exercise 7 (13 points)

Reliable coverage by a UHF broadcast tower is limited to locations with line of sight to the tower.

- I Derive a formula for calculating the diameter of the coverage area as a function of the height of the mast and the receive antenna. → 7 points

Assuming a 300 m tower and rooftop reception:

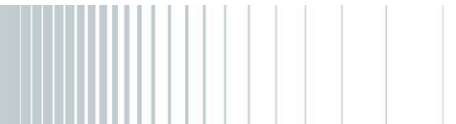
- I How large is the coverage area, and what is the maximum propagation time of the electromagnetic wave? → 2 points
- I What role does the DVB-T guard interval play here? What does this mean for DVB-T2 networks? → 4 points



## Exercise 8 (6 points)

The launch scenarios for DVB-T2 vary in the different countries.

- I Describe three different scenarios. → 3 points
  
- I Which supporting marketing measures are suitable in each case?  
→ 3 points



## Exercise 9 (6 points)

- I Calculate the minimum DVB-T receiver input level based on the DVB-T transmitter network planning predominantly used in Germany, on one Gaussian channel and a tuner noise figure of 7 dB. → 5 points
- I What is the benefit yielded by using the same planning guideline in the case of DVB-T2? → 1 point



# Now get going – and good luck!

Each of the nine exercises can normally be solved independently of the previous ones. Most of the exercises do not require complex calculations.

We hope you enjoy solving these exercises and wish you the best of luck with them.

