FRAUNHOFER IIS

The Competence in Digital Radio Systems

Martin Speitel

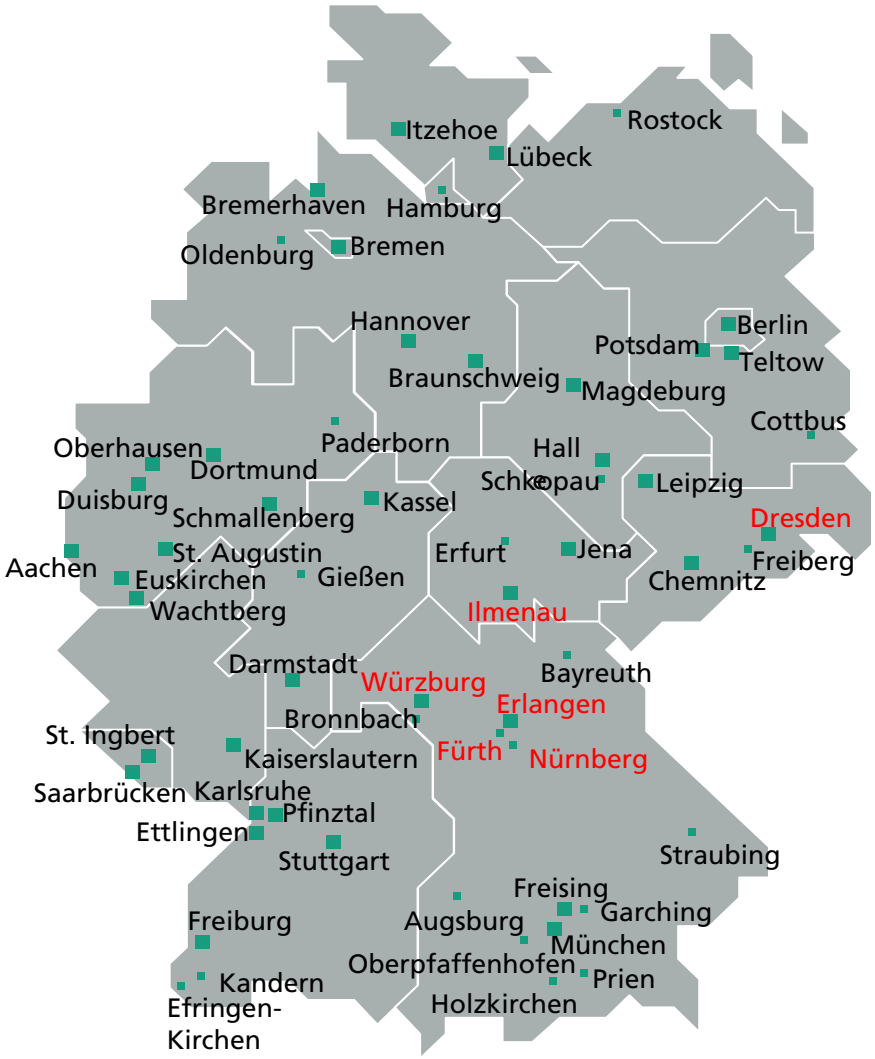
Fraunhofer IIS

Fraunhofer IIS

Fraunhofer: Europe's Leader in Applied Research

Fraunhofer in Germany

- 60 Institutes plus research institutions, working groups, branch labs and application center at 40 locations
- 22,000 staff
- € 1.9 billion annual research budget
- More than 70% raised through contract research



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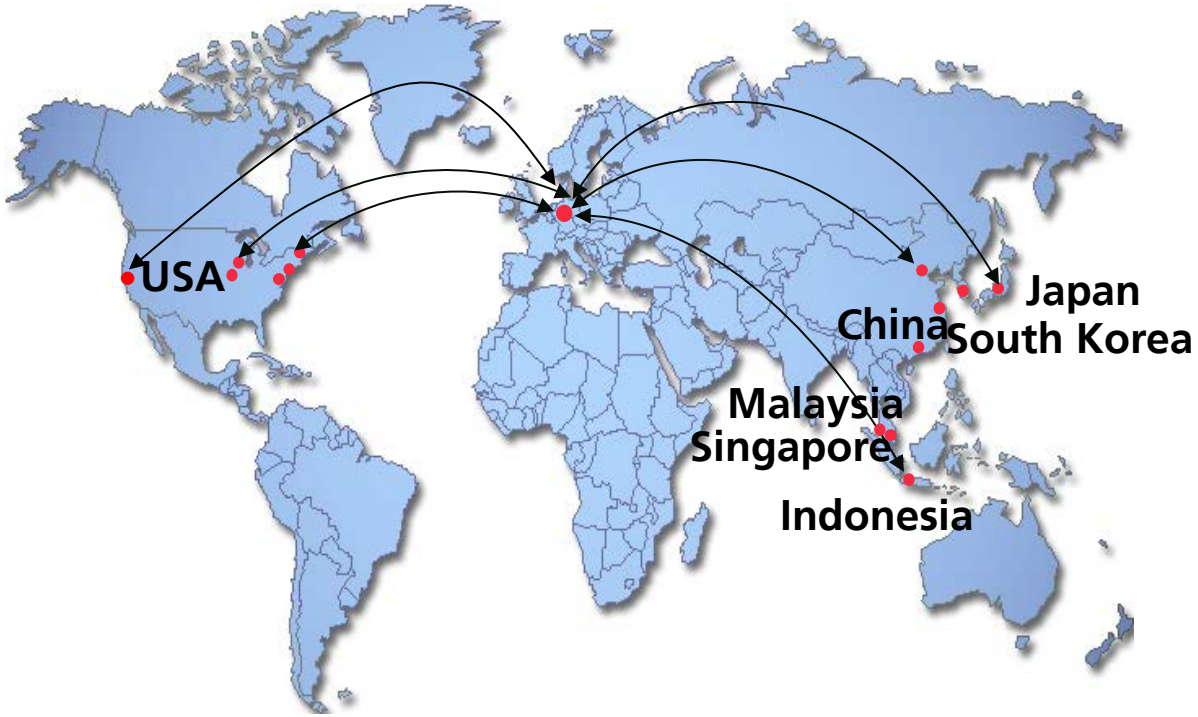
Fraunhofer: Europe's Leader in Applied Research

Fraunhofer Worldwide

- Europe's largest organization for applied research
- Representations in Europe, Asia and USA



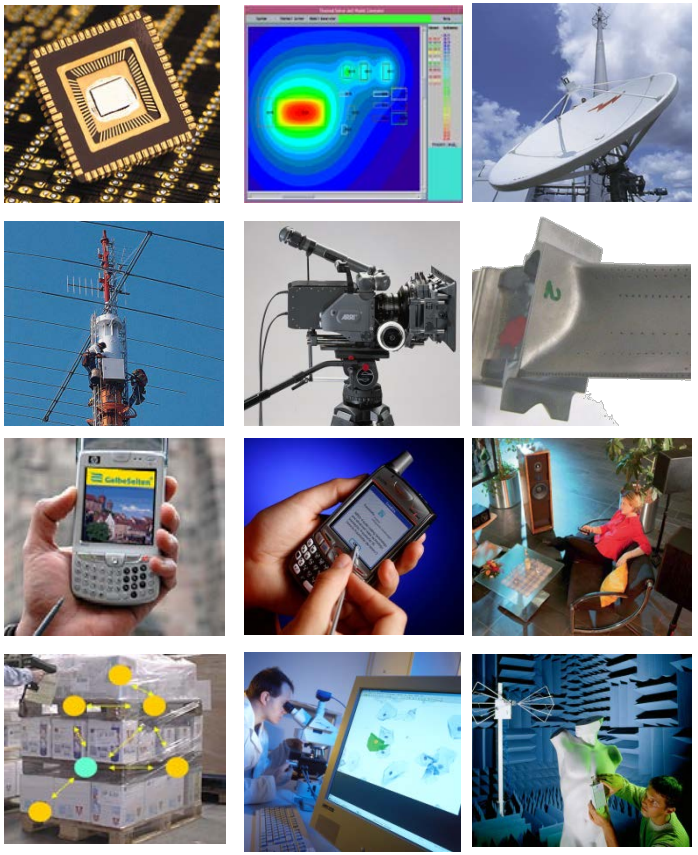
Fraunhofer IIS

- Founded: 1985
- Locations: Erlangen, Fürth, Nuremberg, Dresden
- Staff: more than 750
- Budget: approx. 95 Mio Euro
- Revenue sources:
  > 75% income from projects
  < 25% public funding

www.iis.fraunhofer.de

Fraunhofer IIS
Business Fields

- IC design and design automation
- Digital broadcasting systems
- Communications networks
- Imaging systems and quality assurance
- Navigation and robotics
- Embedded systems
- Audio and multimedia
- Logistics
- Medical engineering



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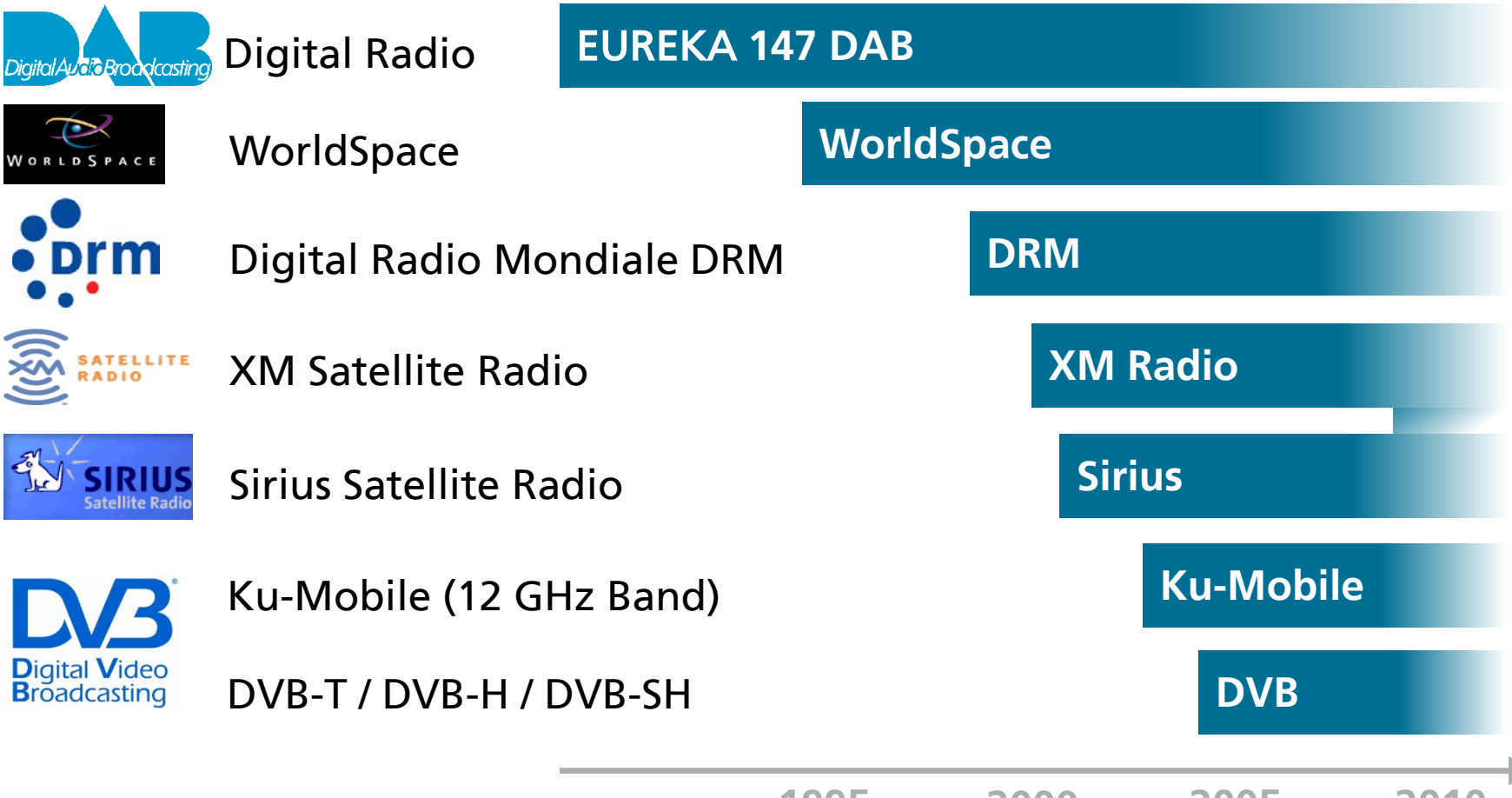
Contributions to Digital Broadcasting Systems



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Contributions to Digital Broadcasting Systems

Contributions

- Committee and standardization work
  - DRM, WorldDMB, TISA, ETSI, …
- Development of fundamental technology
  - Channel Coding
  - Audio codecs
  - Data services
- Implementations
  - on transmitter and receiver side
- Tests and Demos
- Consulting
- Licensing

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Digital Radio
Technologies

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Contributions to the DRM transmission chain

ContentServer Family

Encryption HECA

Audio Encoder
- DRM (DRM30, DRM+)
- xHE-AAC, HE-AAC v2
- Surround

Dataservice Encoder
- Journaline
- Dynamic Label
- Slideshow
- Broadcast Website
- Proprietary Services, e.g. SIBB

Tower with DRM Transmitter

Monitoring/ Analysing

„One-Stop Shop“

DRM chipsets

Protocoldecoder

Decryption HECA

Audio Decoder
- DRM (DRM30, DRM+)
- xHE-AAC, HE-AAC v2
- Surround

Dataservice Decoder e.g. TPEG

MM-Player
- Audio + Dataservices
- for PCs and embedded

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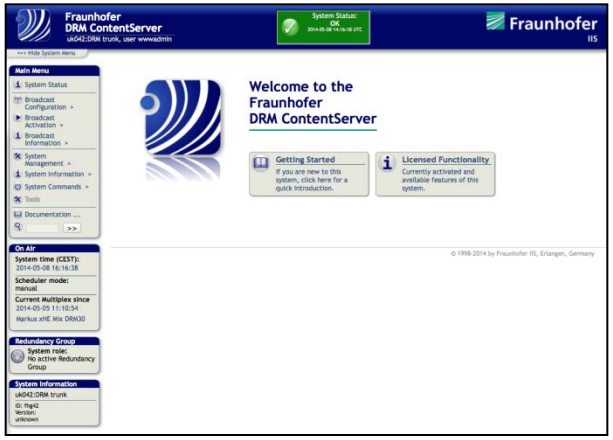
DRM ContentServer technologies



- DRM30/DRM+ audio encoding
- Multimedia and data service management
- DRM multiplex Generation
- Redundancy group feature
- Cross audio redundancy

Integrated in products from

- Ampegon
- Transradio Sendersysteme Berllin
- RFMondial
- Nautel, …

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Audio Codecs: DRM

- HE-AAC v2 for DRM30 and DAB+
- xHE-AAC, the enhanced audio codec adopted by DRM
- Optimizations for a wide variety of platforms available
- Optional MPEG Surround decoding

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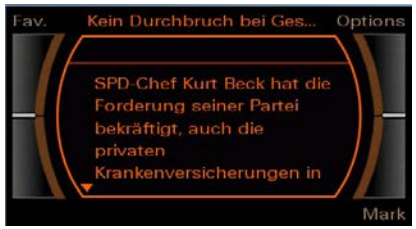
Journaline – Data service for hybrid radio

- Teletext for Digital Radio
  - Hierarchically categorized text information
  - Including menus, text pages, tables, images
- Push & store service
  - Simple to generate from existing content e.g. automatically via RSS feed or XML files
  - Optimized for very low bitrate, e.g. 200 bps
  - Text-to-Speech - for in-car use or disabled users
  - May include geo-referencing information
- Linkage to other applications
  - Internet-Websites, Navigation system
  - Telephone link, SMS



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Journaline – Data service for hybrid radio

Digital Radio Transmission

NewsService Journaline®

Location based information filtering (GPS)

Links to Internet

Internet

Phone calls

Destination for Navigation System

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Journaline – in commercial receivers

UniWave Development

UniWave Di-Wave 100

Graphic by www.universal-radio.com/catalog/portable/0023.html

Total Traffic+ HD NETWORK

Traffic | Headline News | Sports Scores | Weather

First HD Radio Receiver – JVC KW-NT3HDT

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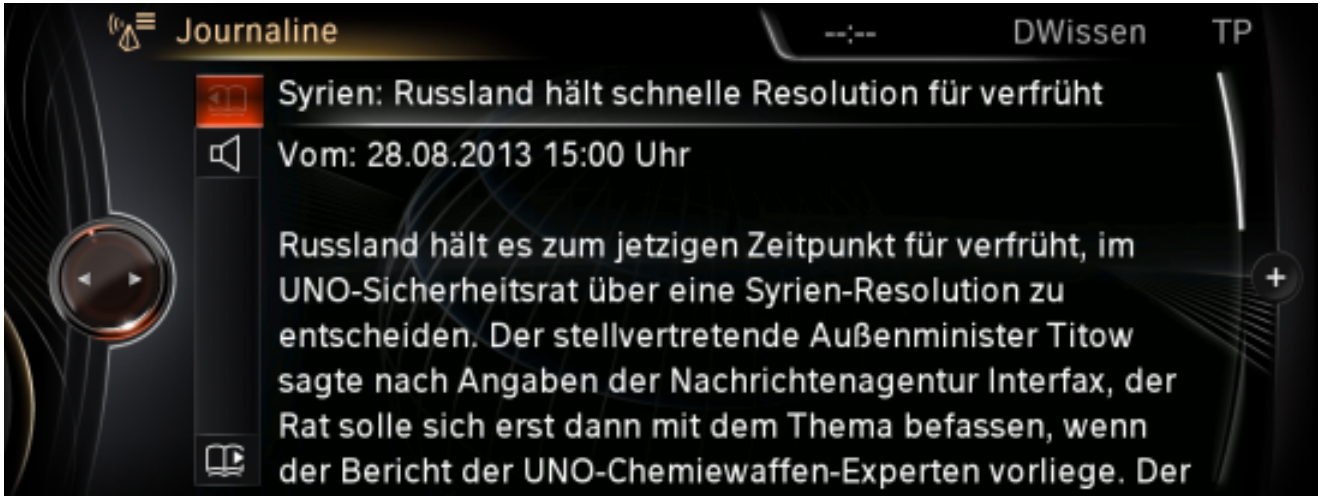
Journaline – In-Car Radio

- Standard feature in BMW's DAB radio sets
- starting 2013-07
- Support for Journaline text-to-speech output, Hot-Button interactivity



worlddabeureka.org/2013/09/05/bmw-a-car-manufacturers-view-on-digital-radio-in-car/

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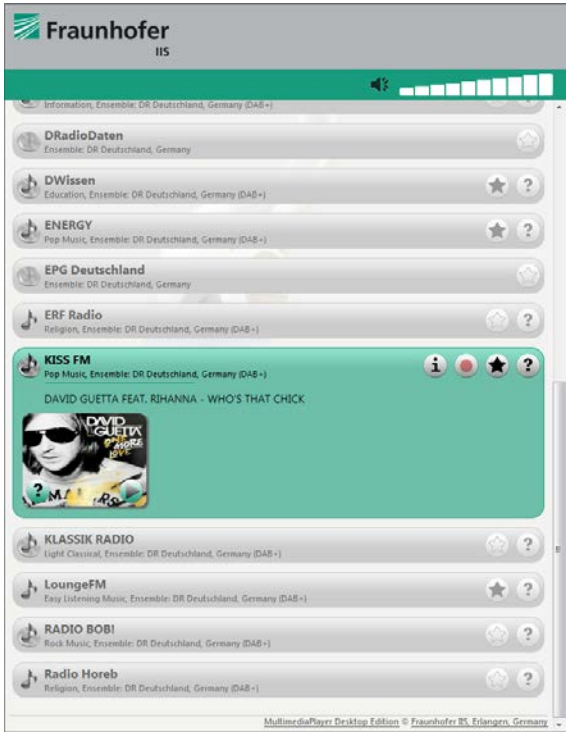
Fraunhofer MultimediaPlayer



- Playback of DAB and DRM Content
  - Audio:
    DAB Classic, DAB+, DRM30, DRM+,
    Recording Feature, (MPEG Surround)
  - Data:
    DL+, Journaline, (Cat.) SlideShow, TPEG,
    BroadcastWebsite, IntelliText, (EPG)
- Simple and easy to modify HTML user interface
- Remote control via HTML
- Platform independent Framework:
  Windows, Mac, Unix, Maemo, Android
  (soon: Windows Phone/Metro, possibly iOS)
- Different Input Possibilities
  - Monitoring of DAB/DRM ContentServer
  - NOXON DAB Stick+FunCube for Live Reception

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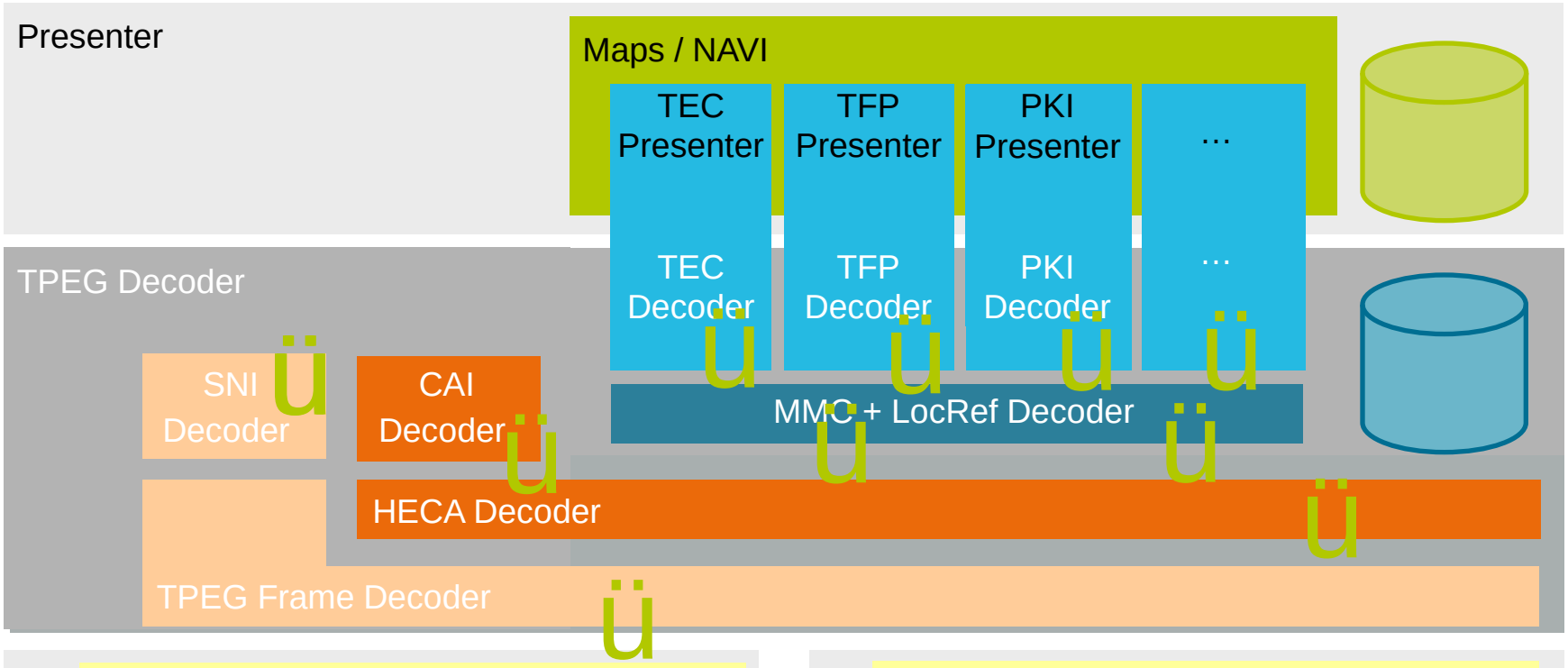
TPEG Decoder for embedded architectures



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DRM30 / DRM+ Receiver Kit

Baseband Decoding:

- Fraunhofer IIS provides its DRM30 / DRM+ software solution
- Full range of DRM30 / DRM+ feature set, fully compliant with ETSI ES 201 980, the basic feature set includes baseband processing as well as high quality audio and data decoding.
- 4,5 kHz, 5 kHz, 9 kHz, 10 kHz, 18 kHz, 20 kHz bandwidth (Mode A-D)
- 96 kHz (Mode E)

Service Layer Decoding:

- De-Multiplexer, Signalling Decoder
- Audio Decoder
- Data Service Decoders (TM/DL+, Journaline, SLS, EPG, TPEG, etc.)

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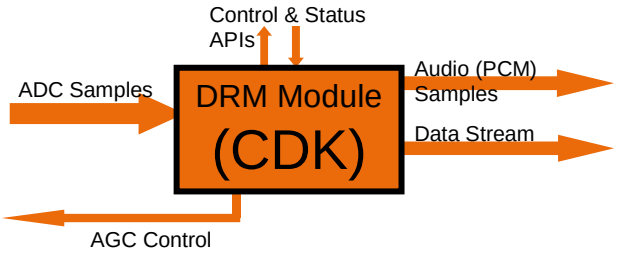
DRM30 / DRM+ Receiver Kit (Baseband)

DRM Channel decoder

Fully compliant with

ETSI ES 201 980



DRM LW, SW and MW, VHF

Automatic Mode Detection for DRM mode A-E

Decoding of full Multiplex

Fast Synchronization and Channel Switching

48, 24 or 12 kSamples complex input signal (DRM30)

- **Frontend independent**
- **BB AGC included, FE AGC to be adopted**
- **Internal Channel Estimation**

Optional IF Samplerate Converter

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DRM Transmitter tower in Erlangen/Tennenlohe

- Experimental DRM Transmitter
  - License from Bundesnetzagentur
  - 15,785 MHz (new!)
  - ground plane
  - Transmission power 100W DRM
  - Hight: 54m (301m above see level)
- Testbed for Fraunhofer research activities
  - Reconfigurations
  - New Services
  - Compliance testing

bit express

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MM-Player
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