# Stationary-systems based relaying part: Frame structure

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Purpose:

Descriptions of some common relay scenarios and the relay characteristic and frame structure derived from these scenarios.

# Users' stationary-systems based relaying Frame structure

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# Scope

- Starting from a relay deployment scenario we derive the most suitable relay characteristics and frame structure
- The relay deployment is based on users' stationary systems
- Taking advantage of WiMAX stationary and mobile features

# Rational

- Operators can use their base of deployed stationary-stations as relays and provide service to mobile stations and remote stationary-stations
- Examples of stationary stations at fine locations: DBS subscribers, Multi-tenet buildings, Municipals, Utility
- **No location rental fees**
- Opportunity based relay deployment (activation of stationary station) Dedicated relay deployment as last option

We need to be able to add the relay functionality to a stationary station at a low added cost

# Outline

- DBS operator scenario

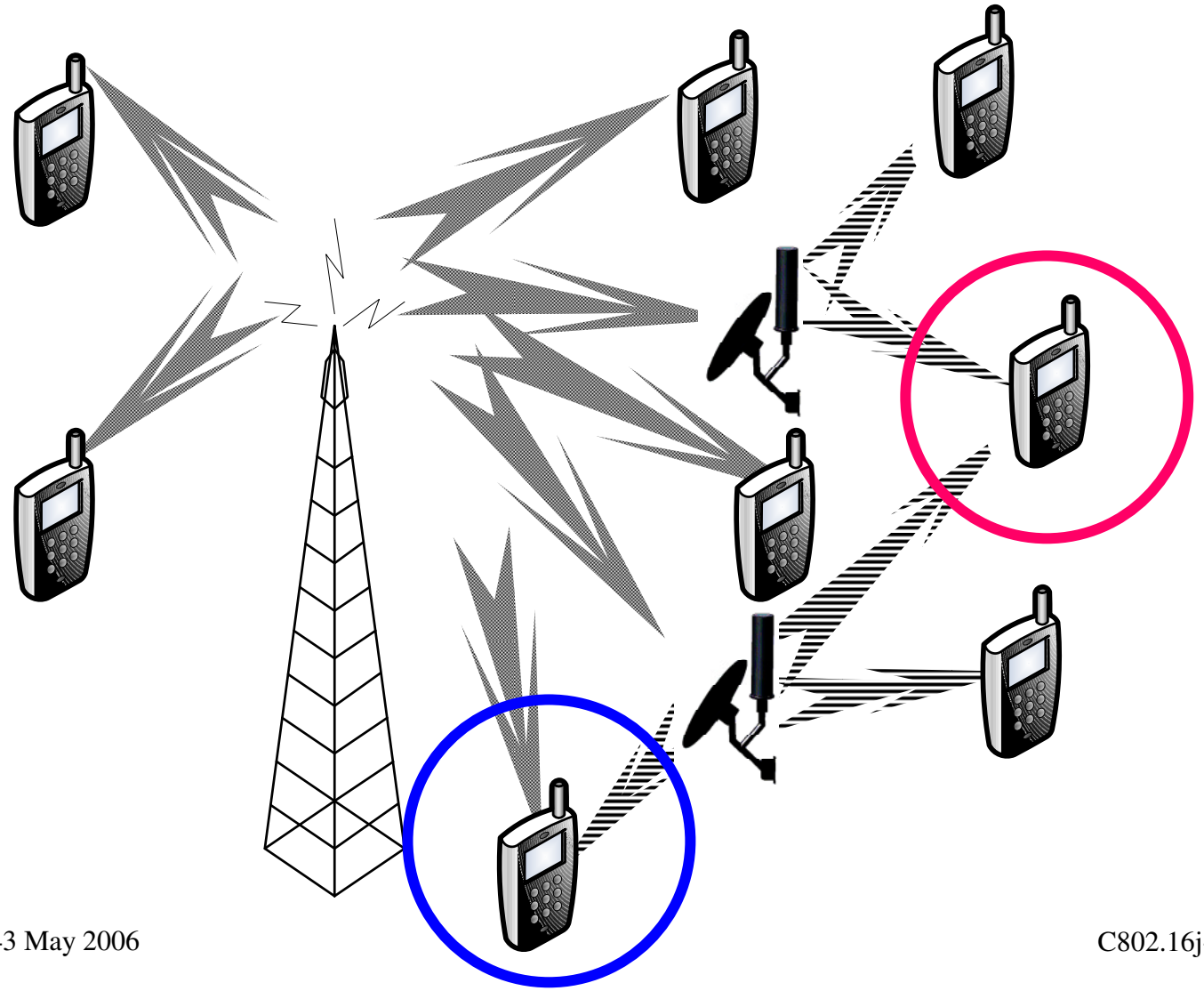
  ➔ Stationary station  with added relay functionality

- Relay characteristics

- Radio planning

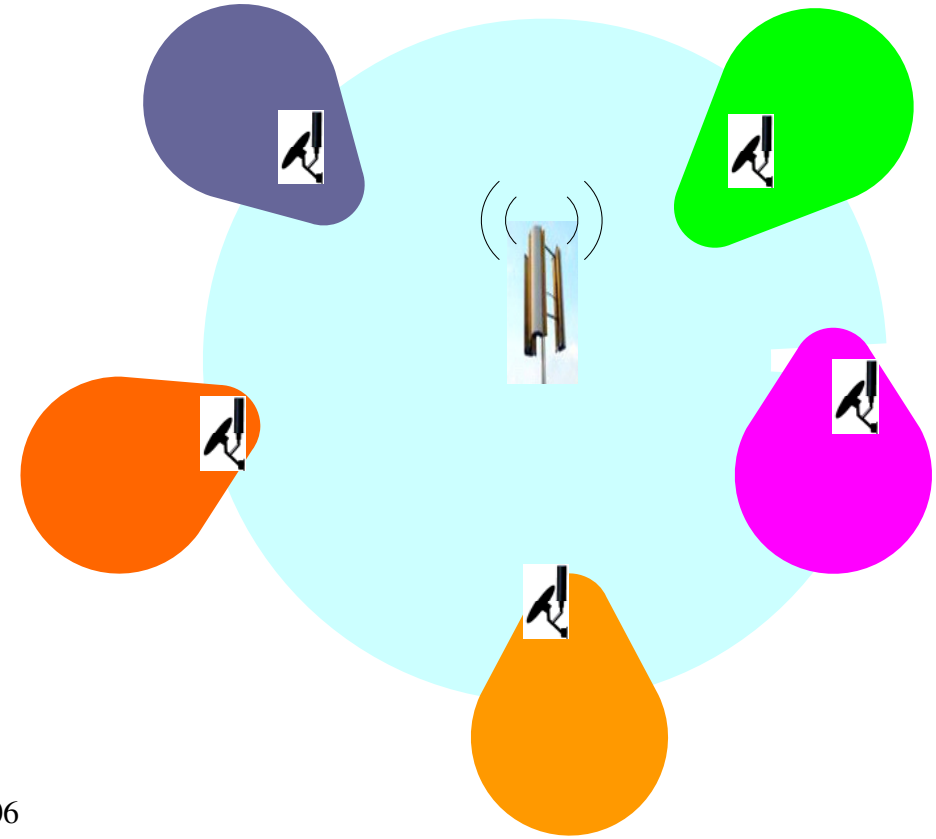
- Frame structure

# System with relays



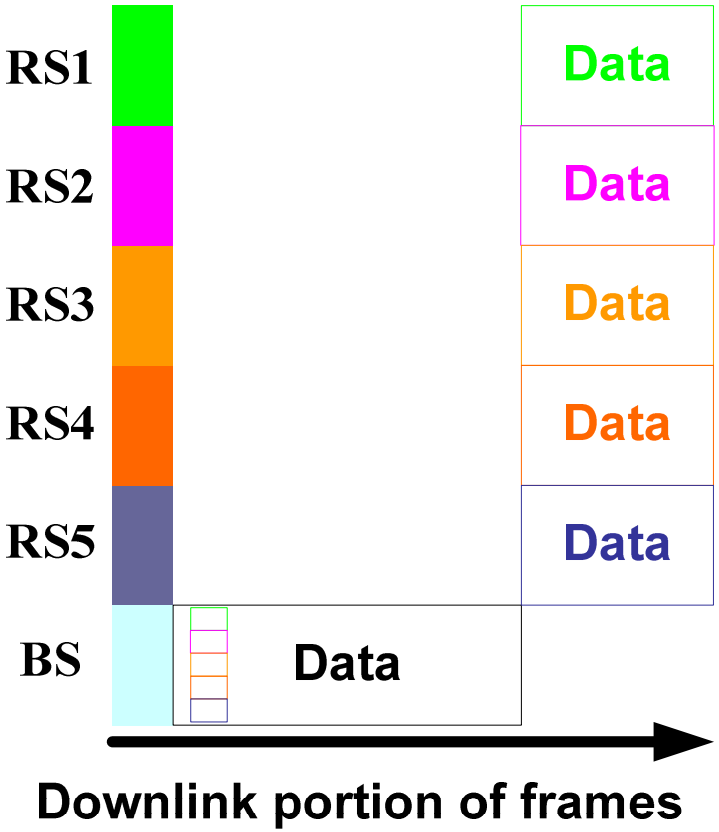
# Frame example - Sector extension

- Relays' coverage areas do not overlap
- Utilizes bandwidth best if fringe regions are small
- More susceptible to interference from other RS

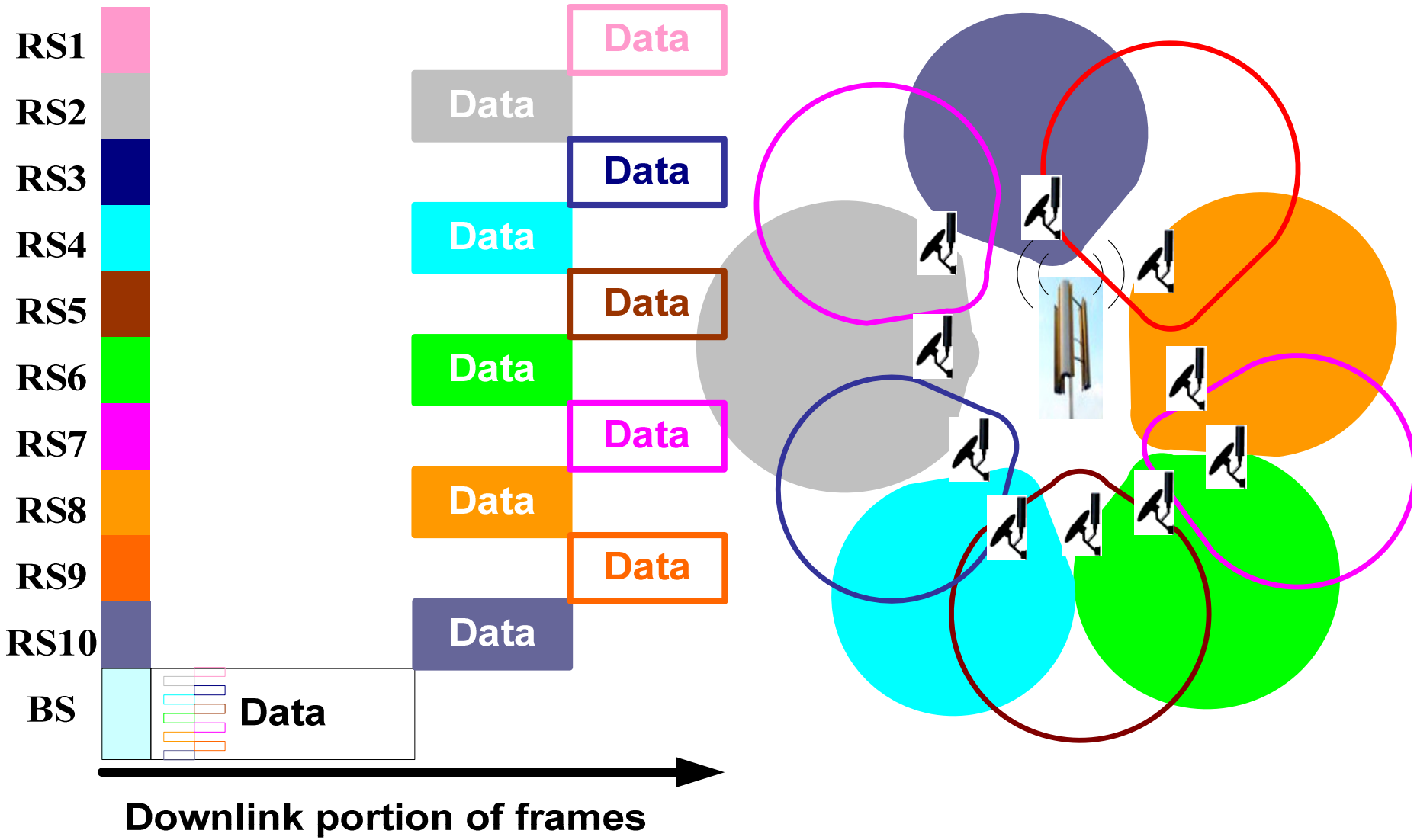


# Frame example - Sector extension

- Per each part of the frame (time and subchannel) the BS decides which RS works in sector extension mode

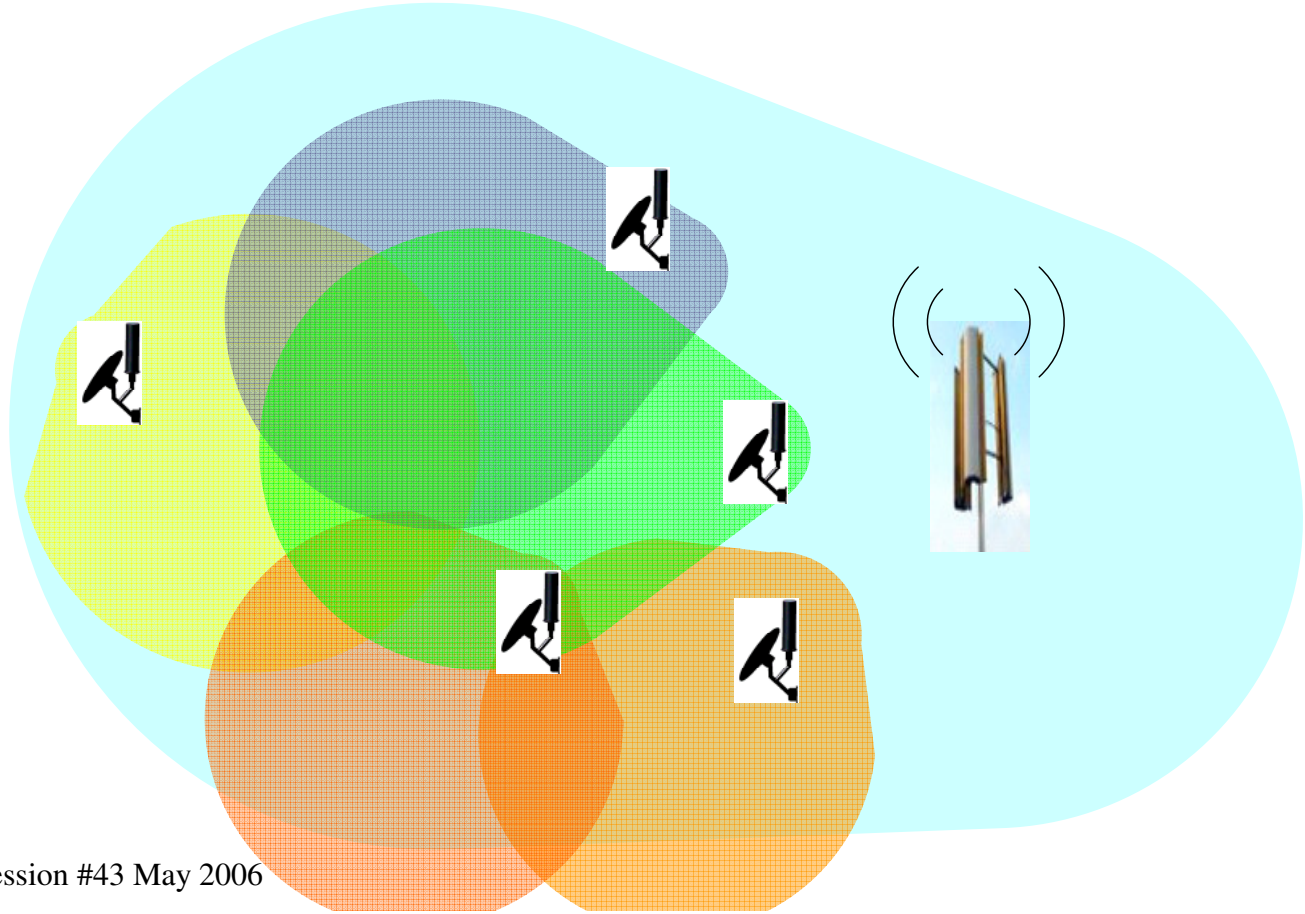


# Radio planning – Simple example



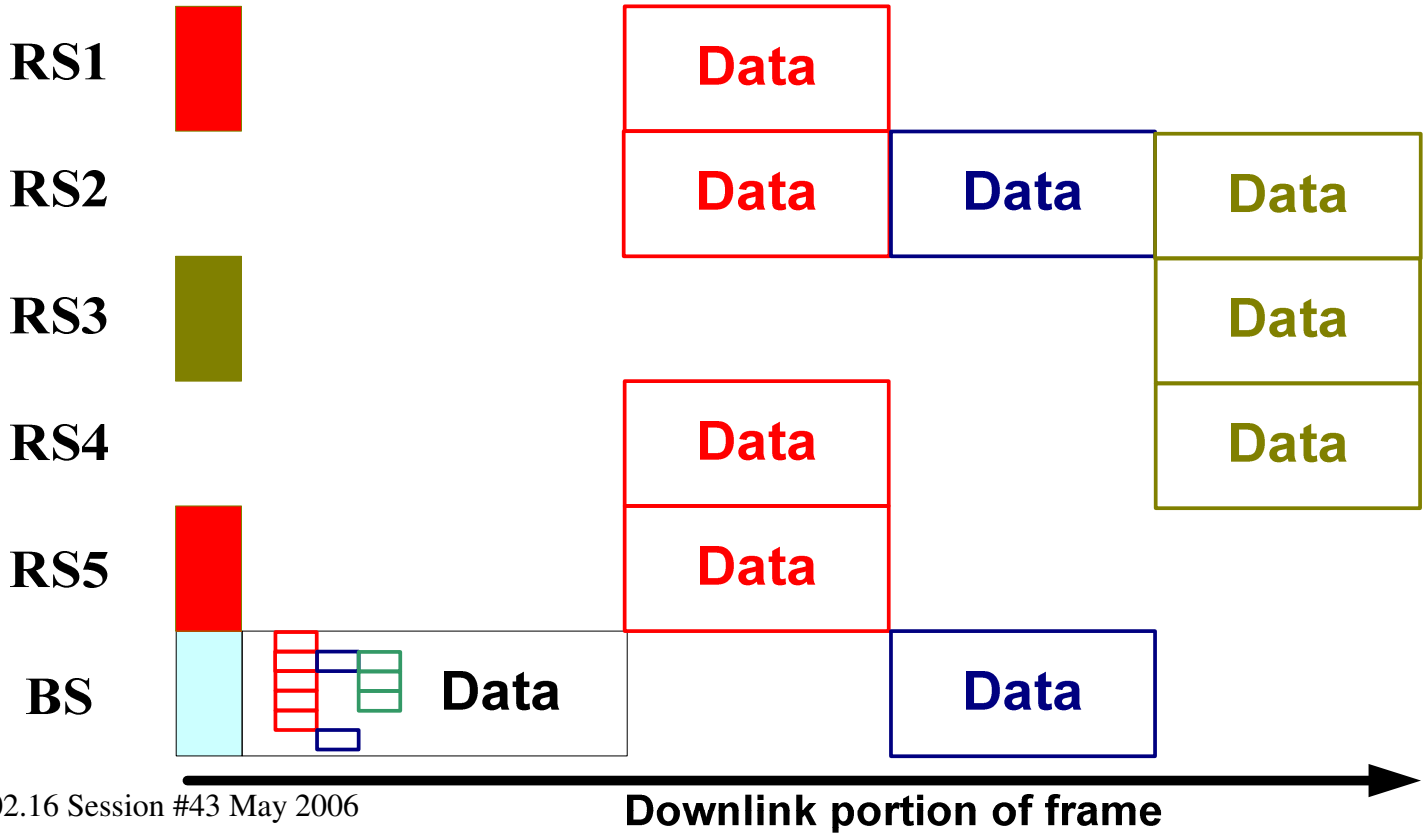
# Frame example - Diversity

- Relay coverage overlap
- Relays are used as the BS (and as other relays) diversity antennas



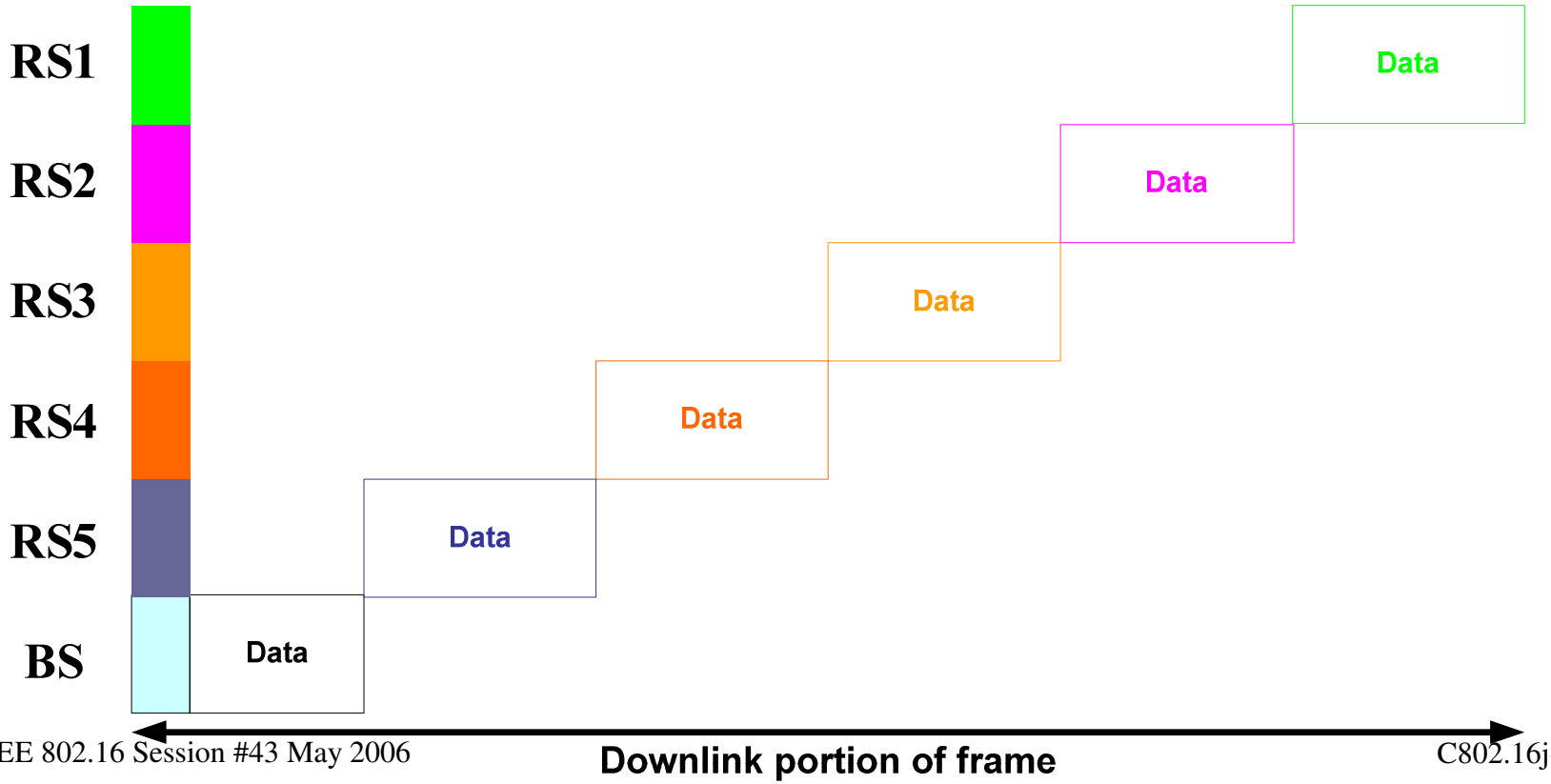
# Frame example - Diversity

- Diversity helps with RS coverage areas overlapping
- Enables RS redundancy
- In this example MS sees 3 BS



# Frame example - TDM

- TDM is degenerated Diversity
  RS cannot help other RS and keeps quiet
- Diversity has better granularity
- TDM used when some RS do not have a good link to BS



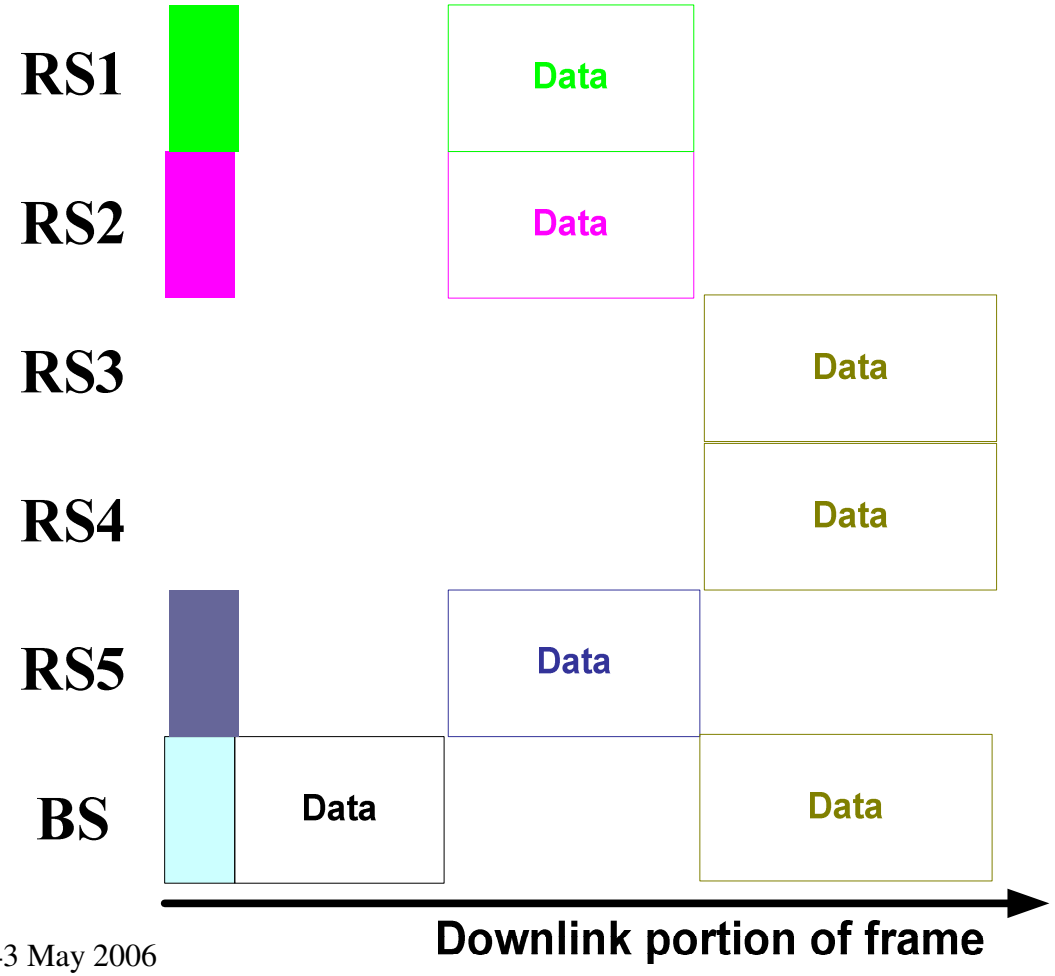
# Adaptive air frame

- RS is used dynamically as:
  - Subscriber (user)
  - Another BS (TDM or sector extension with some RS)
  - Tx diversity antenna of the BS
  - Tx diversity antenna of a RS (now serving as BS)

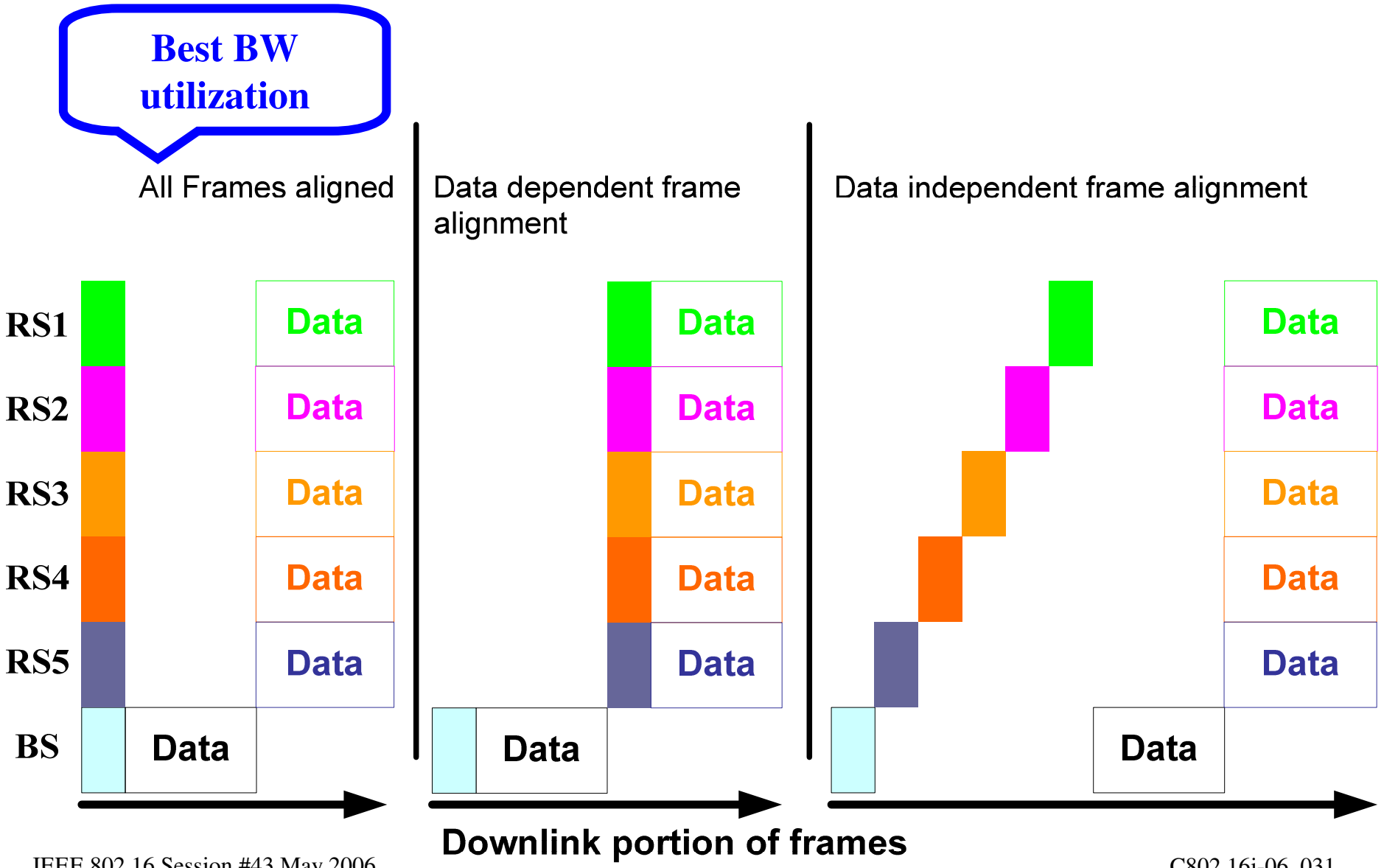
# Adaptive air frame

- Different frame modes corresponds to different
  - User and relay locations (e.g., density)
  - Traffic scenarios
  - Topographic constraints
  - Interference fringes
  - BS⇔RS link quality
- Monitoring and scheduling algorithms at the BS use all modes, possibly in the same frame
- RS is unaware of frame modes!
- Uplink considerations are similar to the downlink with one exception - Usually one RS relays MS (two when MS "handoff" between relays)

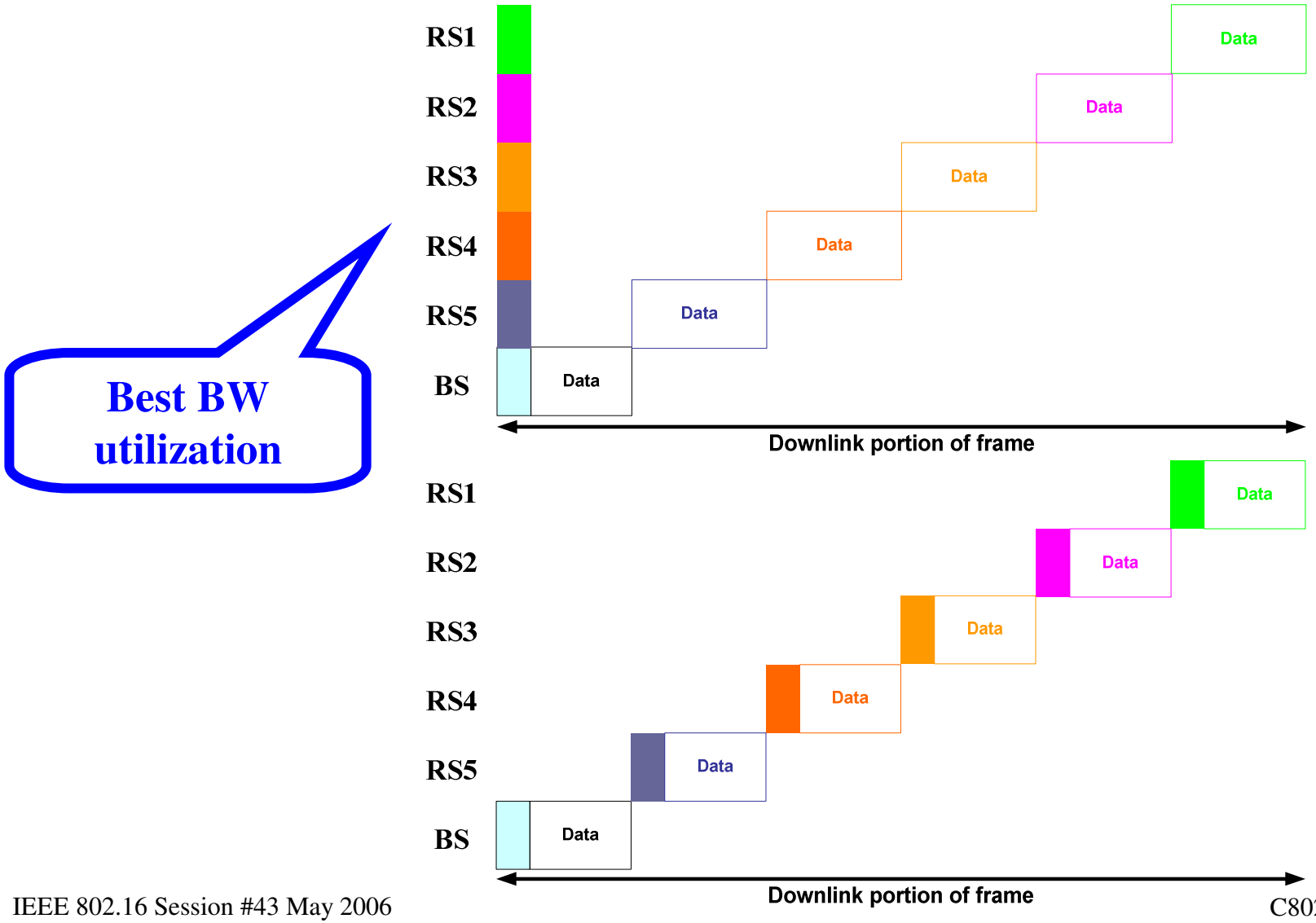
# Frame example



# Frame alignment options



# Frame alignment options



Thank you