

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.

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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

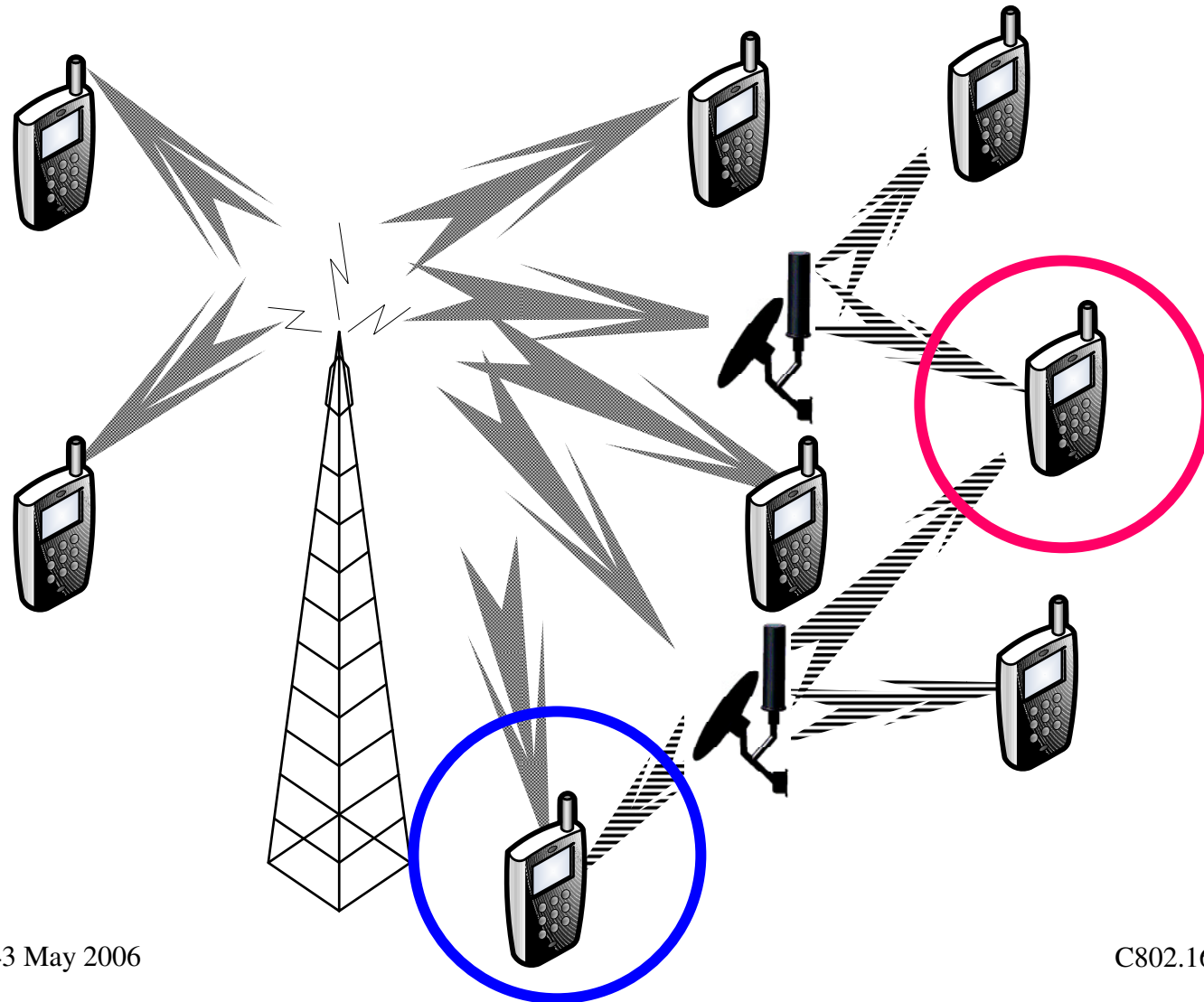


We need to be able to add the relay functionality to a stationary station at a low added cost

Outline

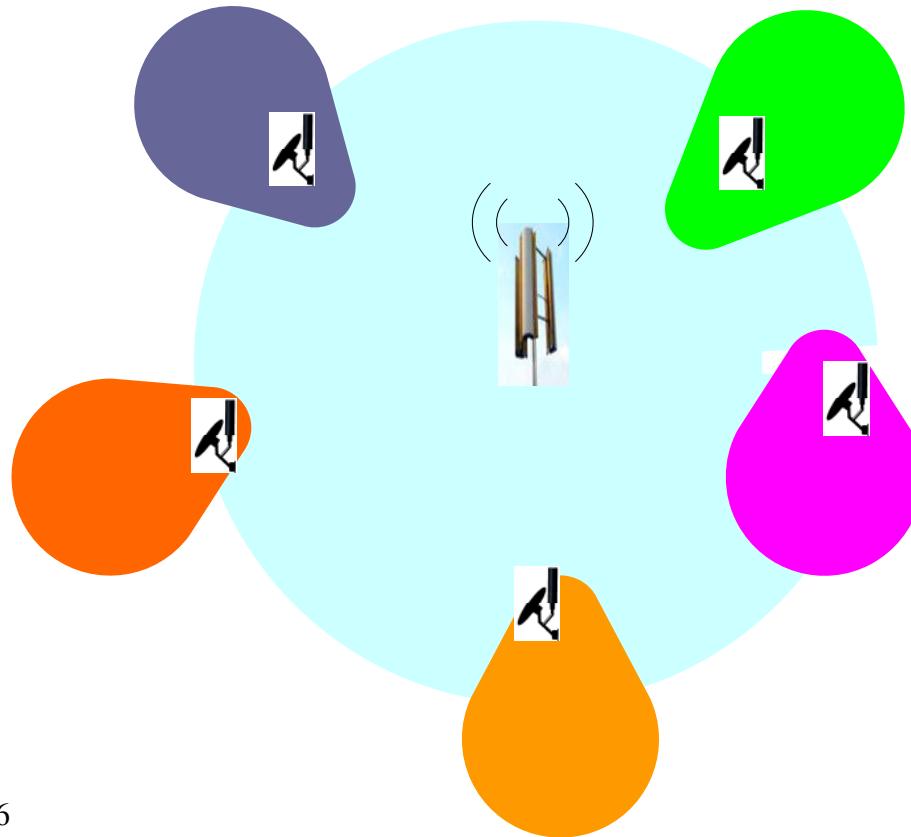
- DBS operator scenario
 - ➔ Stationary station with added relay functionality
- Relay characteristics
- Radio planning
- Frame structure

System with relays



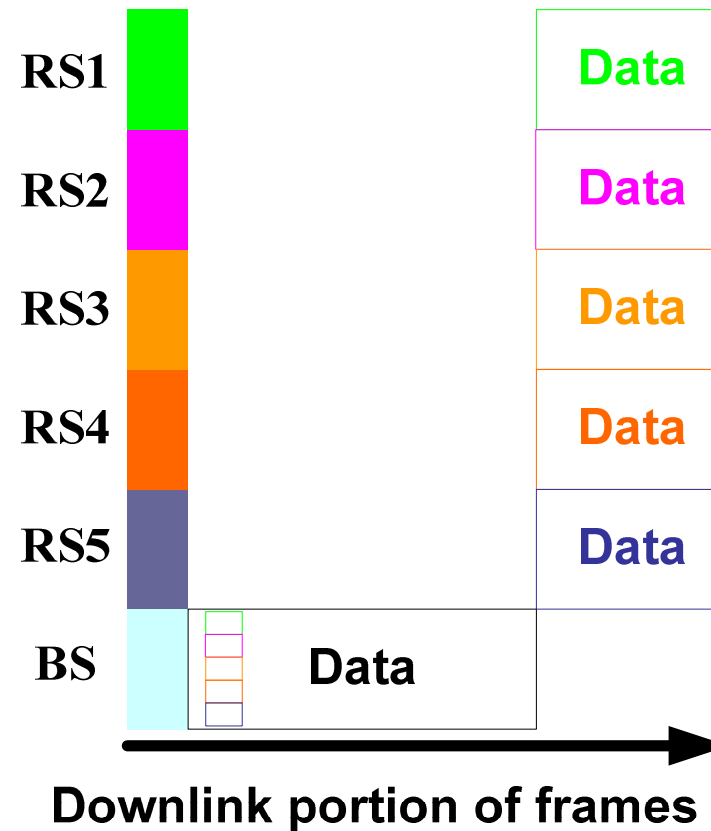
Frame example - Sector extension

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

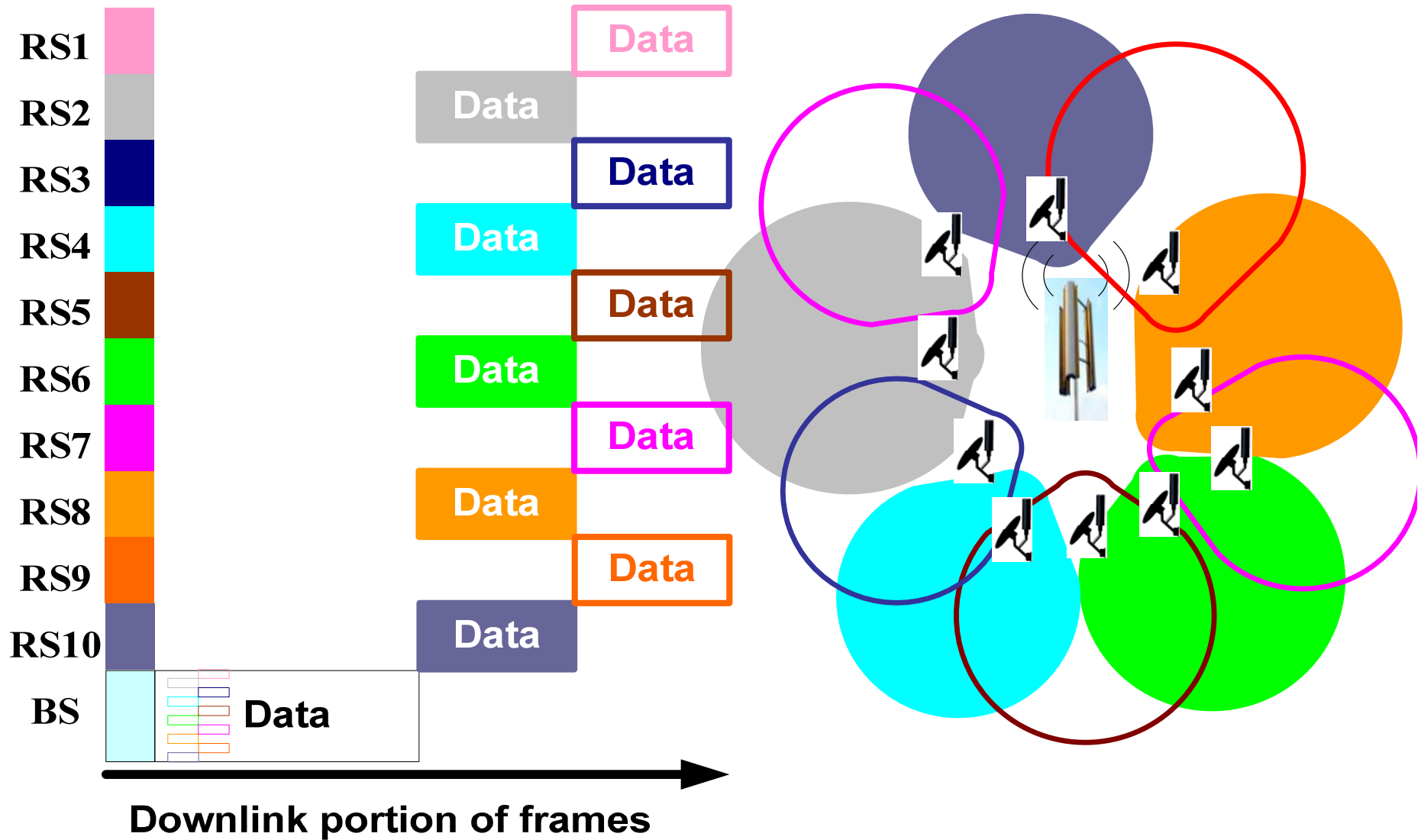


Frame example - Sector extension

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

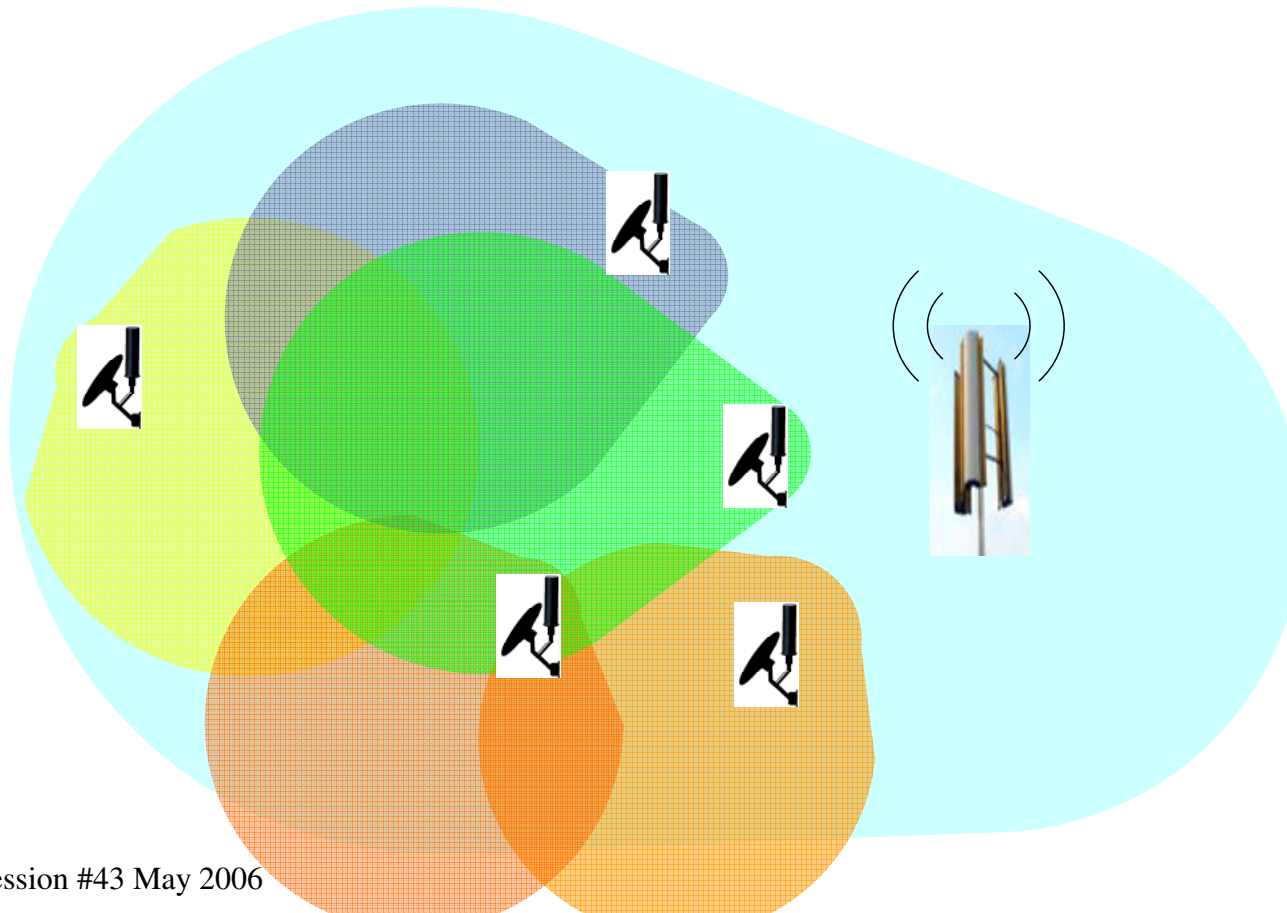


Radio planning – Simple example



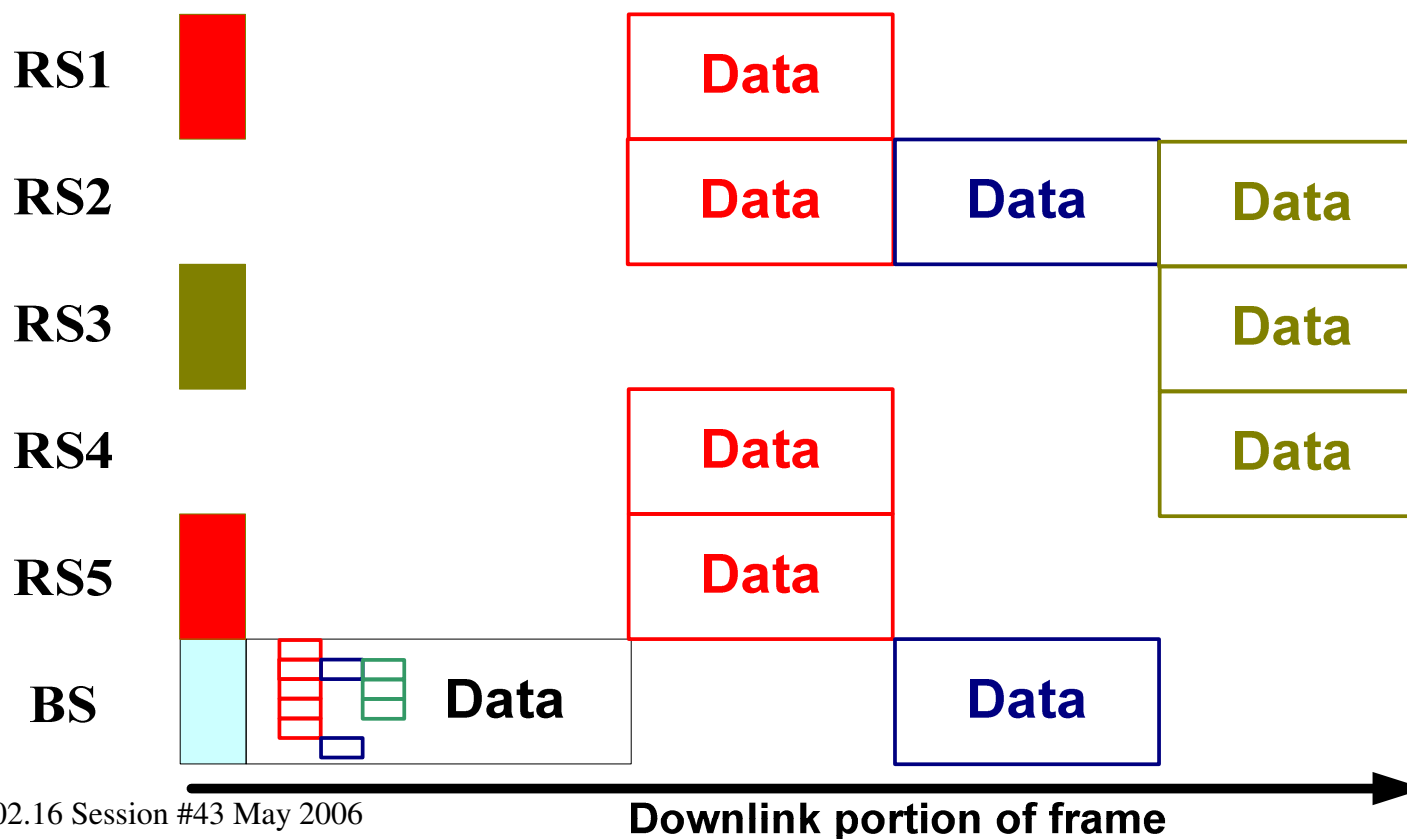
Frame example - Diversity

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



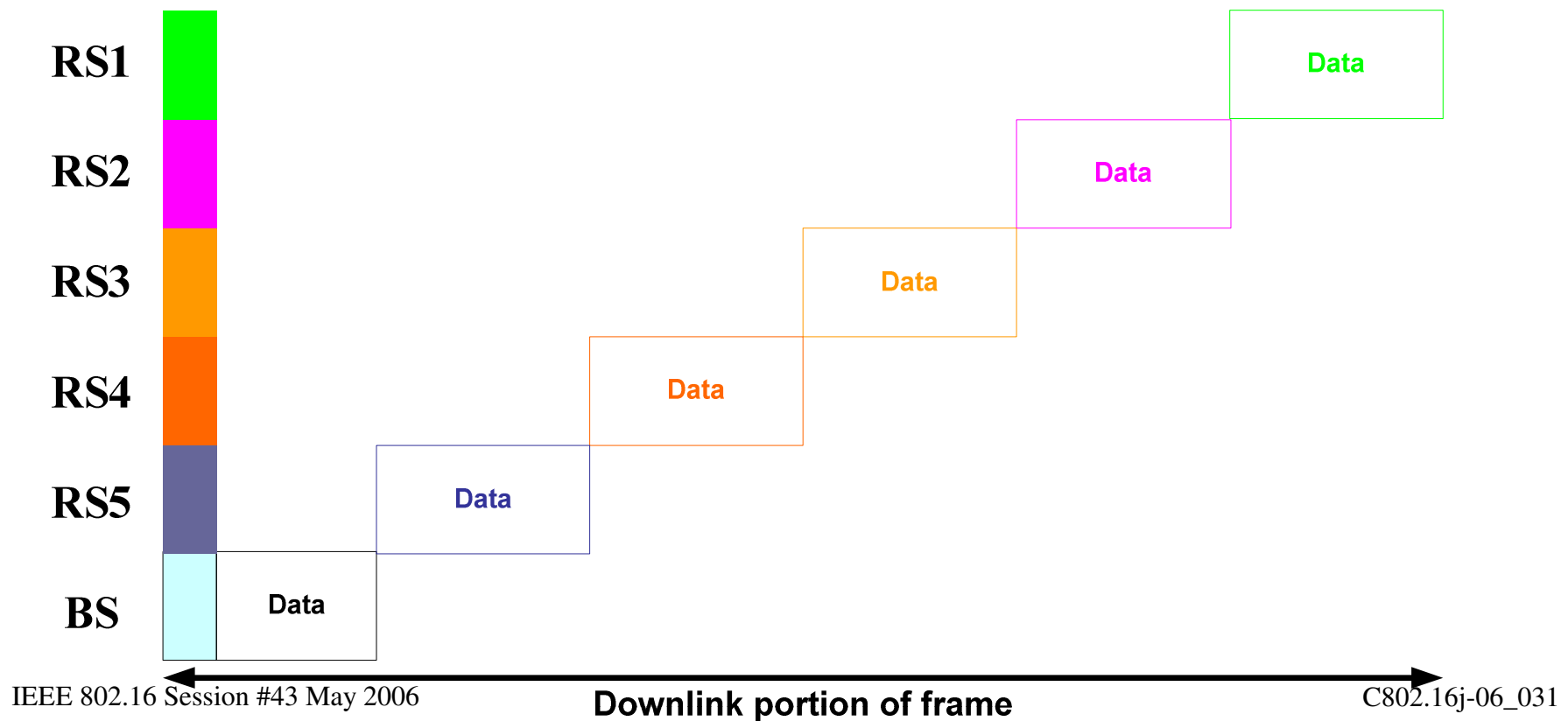
Frame example - Diversity

- 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



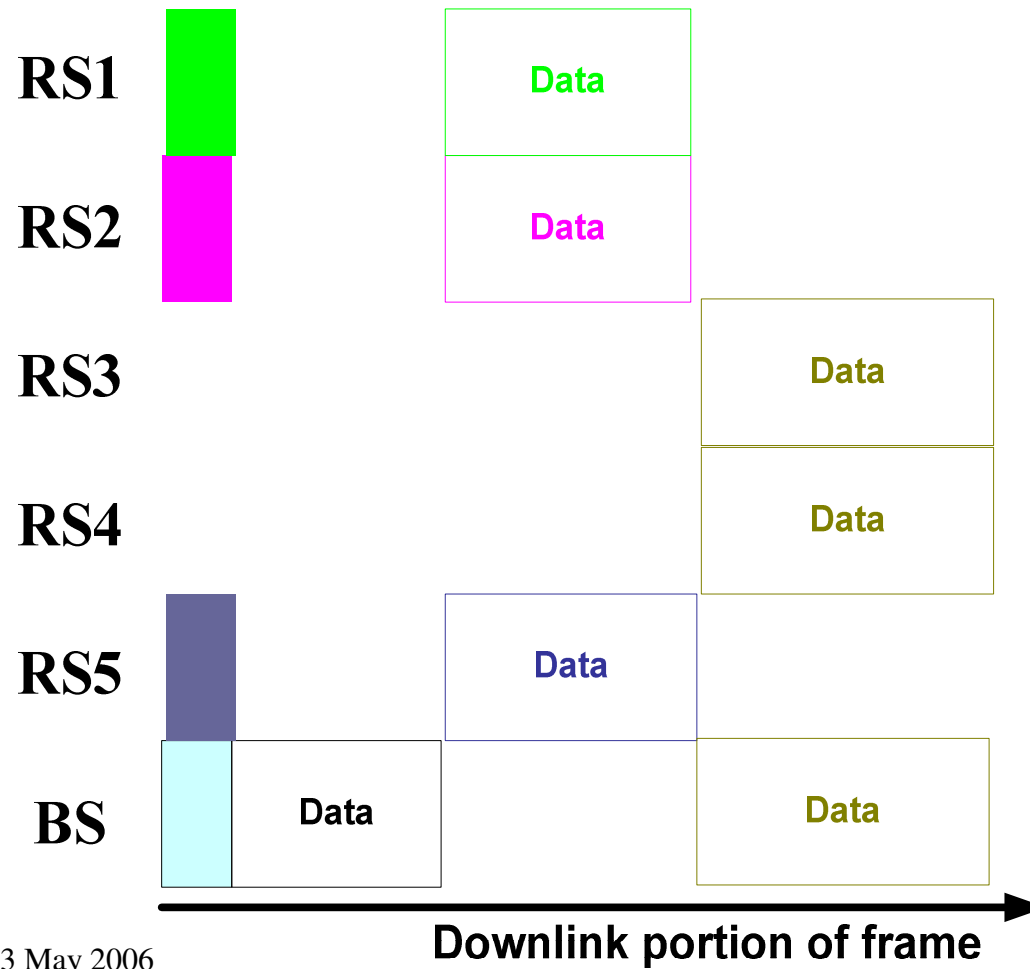
Adaptive air frame

- 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 \leftrightarrow 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)

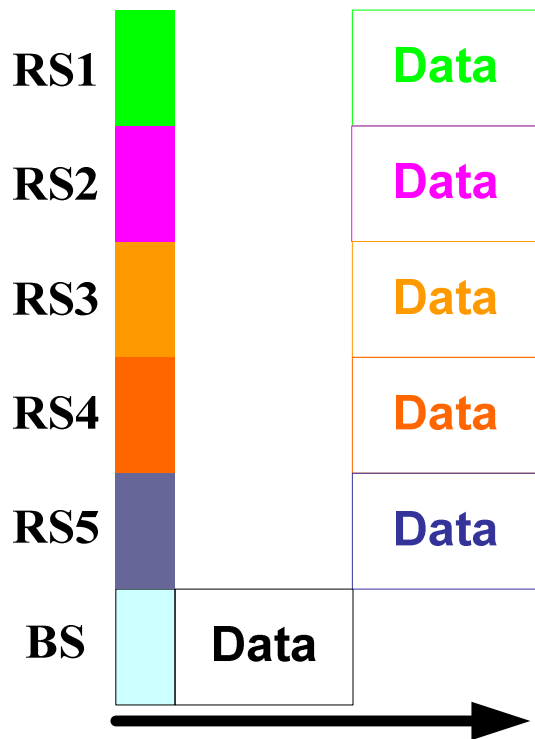
Frame example



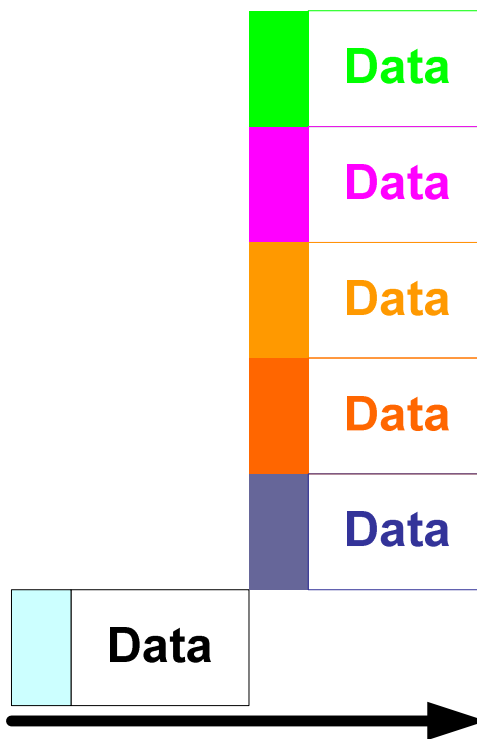
Frame alignment options

Best BW utilization

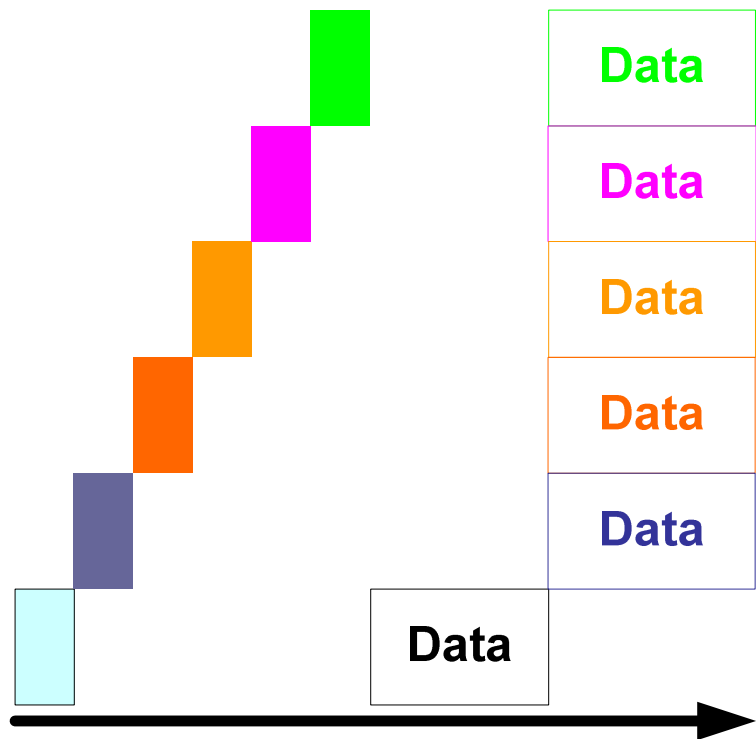
All Frames aligned



Data dependent frame alignment



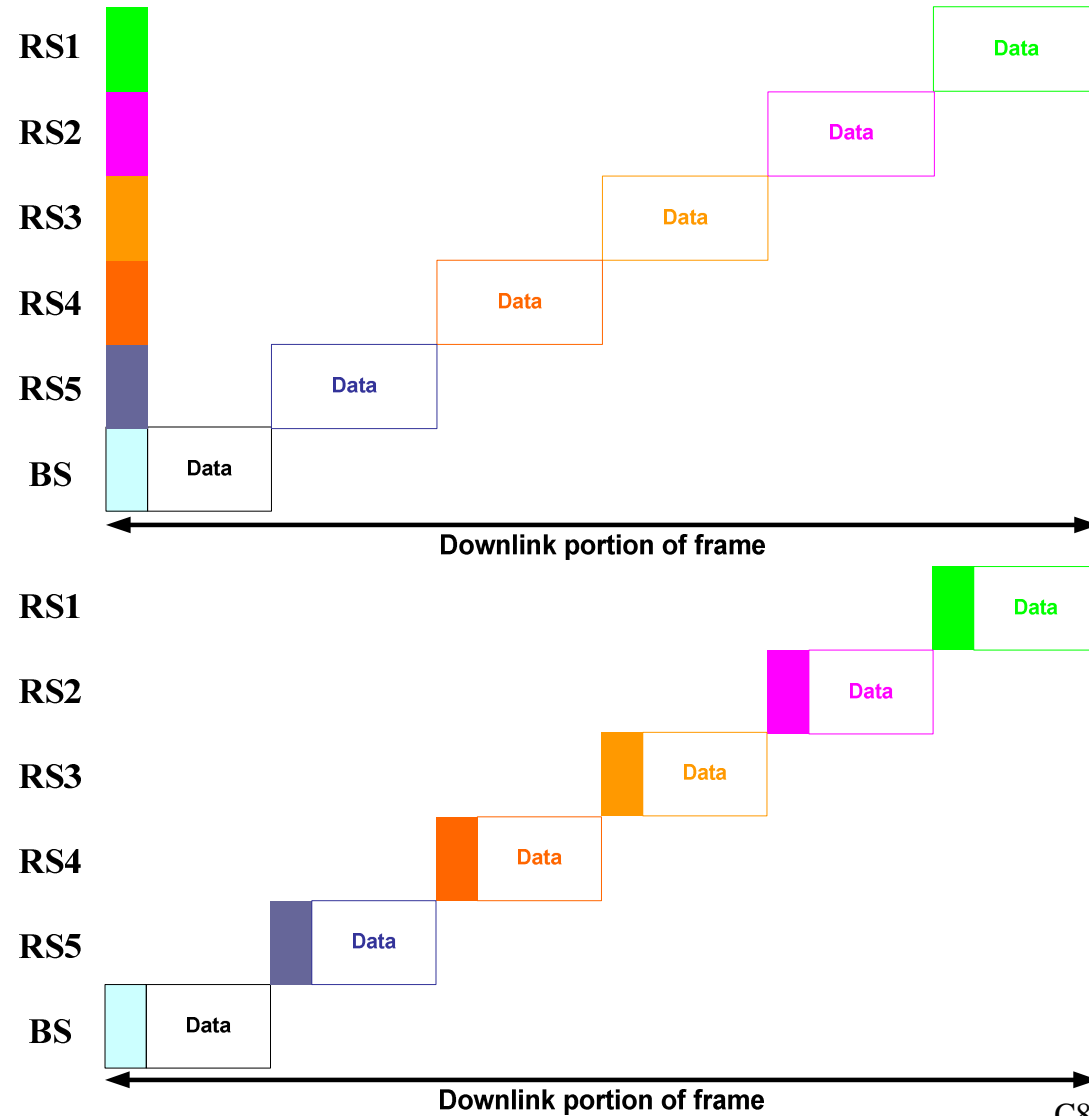
Data independent frame alignment



Downlink portion of frames

Frame alignment options

Best BW utilization



Thank you