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# HSPA Air Interface

## Course Description

With the ever increasing demand for bandwidth, service providers have upgraded their third generation network based on UMTS to support mobile broadband. Termed HSPA (High Speed Packet Access), this course focuses on the modifications that have been made to the packet channels operating across the radio interface in terms of throughput enhancement methods, HSPA+ sessions and HSPA+ operational procedures.

**Prerequisites:** UMTS Air Interface, or equivalent knowledge.

6

Hours Learning  
(OnlineAnytime)

6

CPD Learning  
Credits



Level: 3  
(Advanced)

**This course will contain the following sections:**

## 1. Introducing HSPA

**Topic areas covered include:**

- Evolution to HSPA+:
  - UMTS vs HSPA.
- HSDPA:
  - HSDPA Features.
  - HSDPA Physical Structure.
  - High Speed - Physical Downlink Shared Channel.
  - High Speed - Shared Control Channel.
  - High Speed - Dedicated Physical Control Channel.
  - Channel Relationships.
  - H-ARQ Techniques.
- Release 5/6 MAC-hs:
  - MAC PDU for HS-DSCH.
  - HSDPA UE Capabilities (Release 5).
- The HSUPA Concept:
  - HSUPA Improvements.
  - HSUPA Performance.
- HSUPA Channels:
  - Uplink HSUPA Channels.
  - Downlink HSUPA Channels.
- HSUPA MAC Entities:
  - MAC-e/es.
  - MAC-e.
  - MAC-es.
  - Release 6 HSUPA MAC PDU Structure.
  - HSUPA Timing and HARQ Retransmission.
  - Release 6 HSUPA UE Capabilities.

## Introducing HSPA (cont.)

- HSDPA Release 6 Additions:
  - Fractional - Dedicated Physical Channel.
  - HARQ Preamble and Postamble to Reduce HS-DPCCH Transmit Power.
  - SRBs on HS-DSCH.
  - Active Set Update - HSDPA Cell Information.

## 2. HSPA+ Throughput Enhancement Methods

**Topic areas covered include:**

- High Order Modulation:
  - Downlink 64QAM (R7).
  - Uplink 16QAM (R7):
    - 4PAM.
- Multiple Input Multiple Output (R7):
  - Radio Propagation Basics.
  - Multi-Antenna Systems.
  - MIMO Operation in HSPA+.
  - Non-MIMO Mode Space Time Transmit Diversity.
  - Transmit Antenna/Adaptive Array.
- Release 8 MIMO Improvements.
- Dual Cell Operation (Release 8):
  - DC-HSDPA Categories.
  - Dual Cell verses MIMO.
- Flexible Downlink Layer 2 (Release 7):
  - The RLC AMD PDU.
  - RLC TM Mode.
- Enhancements to the MAC Layer.
- MAC-i/is.

6

**Hours Learning**  
(OnlineAnytime)

6

**CPD Learning**  
**Credits**



**OnlineAnytime**

### 3. The HSPA+ Session

#### Topic areas covered include:

- Session Establishment:
  - System Information.
  - HSPA+ Key Identities.
  - Initial Access.
- The HSPA+ RRC Connection:
  - RRC Connection Request.
  - RRC Connection Setup.
  - RRC Connection Setup Complete.
- Data Delivery:
  - HSDPA Data Delivery.
  - HSUPA Data Delivery.
- CS voice over HSPA+:
  - Benefits.
  - Voice Deployment Options.
- Mobility:
  - Cell\_DCH Mobility.
  - E-DCH Mobility.
  - Cell\_FACH, Cell\_PCH and URA\_PCH Mobility.

### HSPA+ Operational Procedures (cont.)

- Interworking with GERAN:
  - Interworking Options.
  - GERAN to UTRAN Packet Switched Handover.
- HSPA+ Release 9 and Beyond:
  - HSPA+ Release 9.
  - HSPA+ Release 10.
  - HSPA+ Release 11.

### 4. HSPA+ Operational Procedures

#### Topic areas covered include:

- MIMO Scheduling and Feedback:
  - MIMO Scheduling.
  - Precoding Control Indication.
  - Channel Quality Indicator.
  - Feedback Process.
  - CQI Signalling.
  - MIMO HARQ Feedback.
- Continuous Packet Connectivity (Release 7):
  - DTX (Discontinuous Transmission).
  - DRX (Discontinuous Reception).
  - HS-SCCH-less Operation.
  - HS-SCCH Types.
- Enhanced Cell\_FACH:
  - HS-DSCH in Connected States.
  - Release 8 Enhanced Cell\_FACH in the Uplink.
  - RRC Connection Setup.
  - Data in the Enhanced Cell\_FACH State.
  - Cell Update in the Enhanced Cell\_FACH State.
  - Enhanced Paging on the HS-DSCH.



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