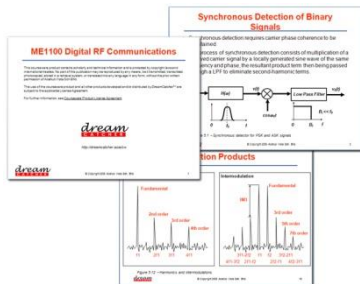# ME1120
Mobile Communications Courseware

Teaching slides
- Editable Microsoft® PowerPoint® slides
- Covers 45 hours of teaching

Training kit
- Digital RF communications kit
- IQ signal generation software
- Lab sheets & model answers
- Problem-based assignments
- Covers 18 hours of labs

Target university subject	Target year of study	Prerequisite(s)
Mobile Communications	2nd or 3rd year undergraduate	Basic Communications

The ME1120 serves as a ready-to-teach-package in the area of mobile communications focusing on various mobile communications standards. This is a lecturer resource consisting of teaching slides and lab sheets.

Designed to impart knowledge in

- ➢ Wireless concept and standard
- ➢ Advanced modulation techniques
- ➢ Multiple access techniques
- ➢ Wireless system design fundamentals
- ➢ Measurement and Analysis tools

Teaching Slides

More than 400 editable Microsoft PowerPoint teaching slides, covering 45 hours of teaching for one full semester are provided.
The slides cover the following topics:

- Wireless Technology Overview
- Cellular Concepts and Fundamentals
- Signal Propagation Path Loss and Channel Modelling
- Modulation Techniques
- Source and Channel Coding
- Multiple Access Techniques
- Wireless Data Networks
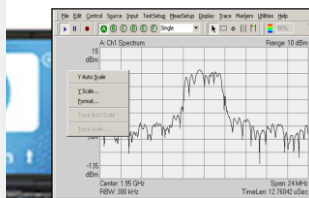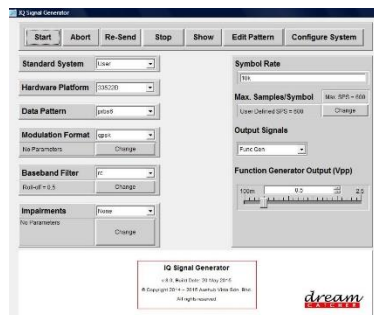- Current and Upcoming Wireless Systems

Experimental Setup

Mobile communication standard signals are generated by the provided IQG software through the recommended function generator. The I& Q signals are then fed into the IQ modulator (on board of the digital RF communications kit) to modulate and up-convert to 10MHz carrier.

DreamCatcher IQG

PC running IQG software and 89601B VSA software

USB-to-USB connection

Function Generator

USB-to-USB connection

DSOX 1202A Oscilloscope

I-signal   *Q-signal*

Digital RF communications kit

The digital RF communications kit requires two function generators to provide the IQ baseband signals.
The low-frequency module contains a 10 MHz IQ modulator used to generate an IQ modulated RF signal, which is then analyzed by the VSA software on the oscilloscope.

IQ signal generation (IQG) software

The IQ Signal Generator software is an Keysight VEE (Visual Engineering Environment) program that controls the function generators via USB to generate various IQ baseband signals. It requires the Keysight VEE runtime (downloadable from Keysight website) engine to be installed on the PC.

IQG setings:

Modulation schemes: BPSK, QPSK, OQPSK, 8PSK, 16QAM, 32QAM, 64QAM and MSK

Filter types: Raise Cosine, Root Raise Cosine, Gaussian, Chebyshev and Rectangular

Data formats: PRBS6, PRBS7, PRBS9, PRBS10 and PRBS11

Impairments: In-band noise, Wide-band noise, IQ imbalance, IQ offset, Quadrature error, IQ rotation, Interference tone, Quantization

Note: A PC with Windows® OS is required to run the IQ Signal Generator software.

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Lab sheets

The training kit includes 6 lab sheets in editable Microsoft Word format. Each lab requires 3 hours to complete. Model answers are provided with all lab sheets. The required instruments for the labs are listed below.

	Required Items
Lab Sheet	Function Generator, Oscilloscope with VSA software
Error Vector Magnitude Measurement for GSM Signals	√
Spectrum Analysis of CDMA Signals	√
Spectrum Analysis of GSM Signals	√
Occupied Bandwidth Measurement for GSM and CDMA Signals	√
Adjacent Channel Power Ratio Measurement for GSM and CDMA Signals	√
Noise and Errors Influence for GSM Signals	√

Problem-based assignments

The problem-based assignments below allow students to enhance their problem-solving skills.

- RF Transceiver Architectures in Digitall Communication System

- Impairments in Analog and Digital Transmission System

Accessories

The following accessories are provided with the training kit.

Item	Quantity
BNC(m)-to-BNC(m) coaxial cable, 0.3 m	2
BNC(m)-to-BNC(m) coaxial cable, 1.0 m	2
SMA(m)-to-SMA(m) coaxial cable, 0.18 m	3
SMA(m)-to-SMA(m) coaxial cable, 1.0 m	2
SMA(m)-to-BNC(m) coaxial cable, 1.0 m	4
USB cable	3
Power adapter, 5 Vdc, 2 A	1

Instruments

The recommended instruments and software from Keysight Technologies, to be purchased separately, are listed below.

Instrument / Software	Model
Function Generator	1 unit of 33512B Dual-channel Function Generator [with option MEM]
Oscilloscope with VSA Software	Minimum 100 MHz Oscilloscope: DSOX1202A with option 100 PathWave VSA 89600C Custom Modulation Package includes 89601200C/89601AYAC/89601BHFC
	For qualified education customers: 89600EDU-E01: 89600 VSA software, educational instructor license 89600EDU-E15 : 89600 VSA software, educational student license, 15 seats, floating license

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Training Kit Hardware Specifications

	Low-Frequency Module	High-Frequency Module
RF		
IQ modulator conversion loss	< 7.0 dB	
IQ modulator DC offset	< 0.09 mV	
Filter passband (3 dB)	5.4 MHz to 13.3 MHz	794 MHz to 1233 MHz
General		
Input voltage		4.5 V (min)
		5.5 V (max)
Input current		22 mA (typical)
EMC designed to		IEC61326-1:2005 / EN61326-1:2006
		CISPR11:2003/EN55011:2007
		Group 1, Class A
Warranty		1 year

Ordering Information

Description	Package	Product Number
Teaching Slides	1 user license	ME1120-100
Training Kit (same HW kit as in ME1100)	1 set	ME1120-200
Teaching Slides + Training Kit	1 user license + 1 set	ME1120-300
Instruments	where applicable	Purchase separately from Keysight or its distributor

Note: Pictures in this document are for illustration purposes only, and they may be different from the actual product.

Training courses related to subject matter are available on request. Visit dreamcatcher.asia for details.

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dream CATCHER

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