Nemo Handy-A 2.30 is an Android-based solution for measuring and monitoring the air interface of GSM, WCDMA, HSDPA, HSUPA, HSPA+, LTE/ LTE Cat 4, and WiFi (HetNet) wireless networks, and mobile application QoS/QoE. Nemo Handy-A features include indoor measurements, forcing features, YouTube video streaming, and live outdoor map support with BTS icons. Nemo Handy-A provides you with the best real-time measurement visualization on the handheld market. Nemo Handy-A’s extensive application testing features offer full application level metrics on voice calls, FTP/HTTP data transfers, Iperf, HTML browsing, YouTube streaming, Facebook testing, SMS messaging, and ping.

<table>
<thead>
<tr>
<th></th>
<th>GSM</th>
<th>WCDMA</th>
<th>LTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samsung Galaxy Core LTE SM-G386F</td>
<td>850/900/1800/1900</td>
<td>850/900/2100</td>
<td>Cat. 4: 800 (band 20) / 900 (band 8) / 1800 (band 3) / 2600 (band 7)</td>
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<tr>
<td></td>
<td>850/900/1800/1900</td>
<td>HSDPA UE Cat. 24 (42.2 Mbps)</td>
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<tr>
<td></td>
<td></td>
<td>HSUPA UE Cat. 6 (5.76Mbps)</td>
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</tbody>
</table>

**NEMO HANDY-A FEATURES**

- Supports measurements on GSM, WCDMA, HSDPA, HSUPA, HSPA+, LTE/ LTE Cat 4, and WiFi (HetNet) networks.
- Support for voice call, HTTP, FTP, Iperf, HTML, YouTube, Facebook, SMS, and ICMP ping testing
- GPS data associated with all metrics. Recorded using internal or Bluetooth GPS
- Real-time display of key RF and application level metrics
- Support for DRT4311B scanner (see DRT4311 datasheet)
- Instant playback functionality
- Service testing manually or automatically with scripts
- Automated testing mode
- Indoor map with markers and geodetic coordinates
- Live outdoor map with base station overlay
- Ability to view decoded L3 signaling messages
- Notifications: audio, icons, and pop-up messages
- Samsung Galaxy Core LTE includes Broadcom M320 chipset

**NEMO HANDY-A LOCKING FEATURES**

- System lock
- Band lock
- Cell barring
- Channel (ARFCN) lock in GSM
- Carrier (UARFCN) and scrambling code in UMTS
- Carrier (EARFCN) and PCI lock in LTE
- For controlling handovers:
  - Measurement suppression (to prevent handovers)
  - Measurement biasing (for assisted handovers)
REAL-TIME PARAMETERS

Below are listed all parameters that are displayed real-time in Nemo Handy-A FT, Nemo Handy-A, and Nemo Handy-A Pro views.

GENERAL

Location Information
- Distance
- GPS fix quality
- GPS satellites
- Altitude
- Latitude
- Longitude
- Velocity
- Heading

Serving Cell Information
- Cellular system and band
- Channel number
- Service information
- Cell ID
- MCC, MNC, LAC, TAC

Packet Data Information
- PDP context IP address
- APN
- NSAPI

User Level Data Information
- Data transfer protocol
- Data transfer direction
- Data transfer attempt number
- Data transfer host address
- Data transfer host port
- Application data throughput UL/DL
- Iperf PER
- Iperf jitter

Statistics
- Voice call statistics
- FTP transfer statistics
- HTTP transfer statistics
- Browsing statistics
- Ping statistics
- SMS statistics
- Handover/handoff statistics

YouTube Streaming Parameters
- Stream status
- Buffer length

WHEN IN WCDMA

Network and RF Parameters
- UARFCN
- Carrier RSSI
- RRC State
- Active/monitored/detected set Ec/N0, RSCP, SCR
- BLER
- SIR
- Percentage of UL / DL power commands
- TX power

AMR Information
- AMR codec UL/DL

RACH Parameters
- Random access preamble count
- Random access message TX power
- AICH status

HSDPA Parameters
- Number of allocated HS-SCCH channelization codes
- Modulation
- Transport block size
- MAC downlink throughput
- MAC-hs residual block error rate downlink
- CQI
- Activity rate

HSUPA Parameters
- E-TFCI
- E-DCH transport block size
- Activity rate
- Serving grant
- Serving grant index
- TTI
- SI total E-DCH buffer status/min/max
- Happy bit
- MAC-e retransmission
- E-DCH spreading factor
- MAC-e throughput
- SI UE power headroom
- Serving SCR
- Non-serving SCRs

WHEN IN LTE

Cell Measurement
- RSSI
- RSRP
- RSRQ
- Channel number (EARFCN)
- Physical cell identity
- Cyclic prefix
- Rank 2 percentage
- CSFB call setup time
- RSRQ per antenna port
- RSRP per antenna port
- EMM state
- EMM substate

Link Adaptation
- PDSCH rank
- PUSCH rank
- PDSCH modulation codeword 0 and 1
- PDSCH MCS modulation codeword 0 and 1
- PDSCH PRB allocation
- PUSCH PRB allocation
- PUSCH modulation
- PUSCH MCS modulation
- PDSCH number of PRBs

CQI
- CQI wideband codeword
LOGGED PARAMETERS
Below are listed all parameters that are logged with Nemo Handy-A, Nemo Handy-A Pro, and Nemo Handy-A Autonomous.

YouTube Streaming Parameters
- Data connection attempts
- Data connection success
- Data connection failures
- Data disconnects
- Streaming setup delay [s]
- Stream duration
- Streamed duration
- Streaming status
- Playback position
- Video resolution

Facebook Parameters
- Operation type
- Attempt/ success/failure
- Time elapsed
- Amount of data received/sent
- Content information (logged to data content event )

GSM/WCDMA/HSPA
Serving Cell Information
- Cellular system
- Channel number
- Service information
- Cell ID
- RAC, MCC, MNC, LAC

AMR Information
- AMR link quality estimation
- AMR mode UL/DL
- AMR initial codec mode
- Number of active codecs
- AMR codecs
- AMR codec mode information in UMTS

WCDMA Signaling Messages
- Layer 3
- RRC messages
- RLC messages
- Logical subchannels for all messages

RACH Parameters
- Random access maximum preamble count
- Random access preamble count
- Random access preamble step
- Random access message TX power
- UL interference level

HSDPA Parameters
- HSDPA UE category
- Current HSDPA serving scrambling code
- Number of allocated HS-SCCH channelization codes
- Distribution of used modulation scheme, effective coding, TB size, and HS-DSCCH allocation
- Distribution of reported CQIs
- MAC-hs bit and block throughput
- MAC-hs BLER
- MAC-hs retransmission rate (for first, second, and third attempts separately)
- HSDPA MAC-hs redundant retransmission rate
- HSDPA MAC-hs residual block error rate downlink
- HSDPA measurement power offset
- HARQ process usage
- HS-SCCH usage
- ACK/NACK and CQI reporting configuration
- HS-PDSCH throughput
- Retransmission rate per TB size
- HSDPA DTX percentage

### HSDPA Parameters
- HSDPA UE category
- Primary and secondary E-RNTI
- Rate matching mode
- E-DCH active set
- E-TFC selection reason
- Distribution of used E-TFCI, TB size, SF and channelization codes and retransmission rates
- E-DPDCH throughput
- MAC-e retransmission rates (for first, second and remaining attempts separately)
- Absolute grant, index, power, scope and selector
- Serving grant distribution (index and serving grant power)
- ACK/NACK status per RLS
- Relative grant commands per RLS
- Average serving grant per E-TFCI
- E-RNTI selector
- Scheduling information
- Granted throughput
- MAC-e throughput
- E-TFCI
- E-DCH Transport Block Size
- Activity Rate
- Serving Grant
- Serving Grant Index
- TTI
- SI Total E-DCH Buffer Status
- Happy bit
- MAC-e Retransmission
- E-DCH DTX

### Physical Layer Parameters
- BLER, RSSI, RSCP
- Physical channel UL throughput
- TX power
- Ec/No for active/neighbor/ detected set
- S and R criterion for active and monitored set
- RAKE finger allocation

### Power Control Parameters
- BLER
- SIR
- TX power control algorithm
- TX power control step size
- Number of increase/decrease UL / DL power commands

### Soft Handover Parameters
- Ec/No for active/neighbor/detected set
- Soft handover status
- Soft handover event
- Addition window
- Drop window
- Replacement window
- Time to trigger 1A/1B/1C
- Added scrambling code number
- Removed scrambling code number
- Cell count active
- Cell count monitored

### GSM Signaling Messages
- Layer 3
- RLC/MAC control messages
- Logical subchannels for all messages

### GSM Serving Cell RF Parameters
- RXLEV (full & sub)
- RXQUAL (full & sub)
- DTX UL
- C1 & C2
- TXPOWER
- RLT
- Timing advance
- C value
- Signal variance
- I levels
- Packet RXQUAL
- Mean BEP (8-PSK & GMSK)
- Mean BEP coefficient variance (8-PSK & GMSK)
- C/I average (idle & dedicated mode)
- C/I per hopping channel
- C/I per timeslot (with GPRS)
- RSSI per hopping channel

### GSM Serving Channel Information
- HSN, BSIC
- MAIO, TCH (HR, FR, EFR)
- Timeslot number
- Channel number
- Hopping status

### GSM Neighbor Information
- BCCH, BSIC, RXLEV
- C1 & C2
- GSM neighbor list with WCDMA neighbors
- Inter-system WCDMA neighbor measurement results

### RLC/MAC Information
- RLC/MAC data throughput UL/DL
- Number of timeslots UL / DL
- TLLI
- TFI UL/DL
- EDGE modulation and coding scheme UL/DL
- GPRS/EDGE indication
- RLC window size

### Packet Data Information
- PDP activation attempt time
- PDP active duration
- PDP activation failure time
- PDP activation failure cause
- PDP context deactivation time
- PDP context deactivation cause
- Packet state
- Packet protocol address
- Attach failure time
- Attach failure cause
- Attach attempt time
* Attach duration
* Detach time
* GMM/SM state
* QoS settings

**User Level Data Information**
* Data transfer protocol
* Data transfer direction
* Data transfer attempt number
* Data transfer host address
* Data transfer host port
* Application data throughput UL/DL
* Application packet error rate
* Transferred bytes UL/DL
* PPP layer data throughput
* Data connection establishment time
* Data connection rate UL/DL
* Data connection duration
* Data connection failure time
* Data connection failure cause
* Data transfer failure cause
* Data size UL/DL
* Data disconnect cause

**Statistics**
* Handover/handoff statistics
* Soft handover statistics
* Intersystem handover statistics
* Intersystem cell reselections
* Location area statistics
* Attach statistics
* PDP context statistics
* Routing area statistics
* User level data statistics
* Facebook statistics

**LTE**

**Cell Measurement (for each cell)**
* Cell type (serving, listed, detected)
* Band
* Channel number (EARFCN)
* Physical cell identity
* RSSI
* RSRP
* RSRQ
* Cyclic prefix
* Rank 2 percentage
* CSFB call setup time
* RSRQ per antenna port
* RSRP per antenna port

**RACH Parameters**
* RACH type
* Reason
* Preamble ID
* RACH result
* RACH access delay
* Maximum allowed preambles
* Preamble step size
* Number of transmitted preambles
* Number of received preamble responses (success and backoff cases separated)
* Number of contention resolution failures
* Preamble initial TX power

**Physical Channel Information**
* PDSCH throughput
* PDSCH throughput per codeword
* PDSCH throughput per PRB
* PDSCH BLER
* PDSCH block rate
* PBCH block rate
* PBCH BLER
* Timing advance
* PUSCH throughput
* PUSCH TX power
* PUSCH TX power headroom
* PUCCH TX power
* SNR
* SNR per antenna

**Link Adaptation (reported values are distributions over the reporting period)**
* PDSCH rank
* PDSCH modulation and MCS per codeword
* PDSCH PRB allocation
* PDSCH DTX TTIs
* PUSCH rank
* PUSCH modulation and MCS
* PUSCH PRB allocation
* PUSCH DTX TTIs

**Current Cell Information**
* Physical cell identity
* Channel number (EARFCN)
* Cell ID
* Tracking area code
* Mobile country code
* Mobile network code
* MME group ID
* MME code
* M-TMSI
* RRC state
* Cell bandwidth
* Maximum allowed TX power
* Transmission mode
* Detected downlink antenna ports
* Service status
* TDD UL/DL configuration

**CQI**
* Wideband CQI per codeword
* Subband CQI per codeword
* Requested rank

**Cell Reselection/Handover/Tracking Area Parameters**
* Cell reselections events
* Handover events (attempt/success/failure)
* Handover type
* Defines the handover duration containing handover processing and interrupt time
* Tracking area update events (attempt/success/failure)
* interrupt time
* Tracking area update type
* Tracking are update failure cause
Radio Resource Connections
- RRC connection attempts
- RRC establishment cause
- RRC connection success/failures
- Number of RRC connection requests before RRC connection
- Number of RRC connection requests before abort
- RRC rejection status
- RRC connection release
- RRC connection release status
- RRC connection release cause
- RRC re-establishment status
- RRC re-establishment cause

MAC
- MAC downlink and uplink throughput
- MAC downlink and uplink block rate
- MAC downlink BLER (total, 1st, 2nd, and 3rd+ retransmission BLER)
- MAC uplink retransmission rate (total, 1st, 2nd, and 3rd+ retransmission rates)
- MAC downlink residual BLER
- MAC uplink residual BLER

RLC/PDCP
- RLC downlink throughput
- RLC downlink throughput per RB
- RLC uplink throughput
- RLC uplink throughput per RB
- RLC downlink BLER
- RLC downlink BLER per RB
- RLC uplink retransmission rate
- RLC uplink retransmission rate per RB
- PDCP downlink throughput
- PDCP downlink throughput per RB
- PDCP uplink throughput
- PDCP uplink throughput per RB

Upper Layers
- RRC signaling
- NAS signaling

WiFi
- WiFi state
- WiFi connection
- SSID, BSSID
- Link speed
- IP address
- Security mode
- RSSI