PRIVATE 4G LTE NETWORK

for mobile broadcast services

NEP Broadcast Services BV
Part of NEP Worldwide
Redert Steens
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Four LTE Use Cases

1. Wireless camera in studios
   Centralised Infrastructure

2. LTE Bubble
   Action Cameras

3. Macro LTE network
   Large broadcast events

4. Billboard/ VIP’s
   Own content

LTE TDD 20MHz@2300MHz
Guaranteed service availability (QoS)
Often chaotic spectrum usage at race finish

Small ‘Action cameras’/UE
Smartphones, sensor activated bandwidths

Streaming bandwidth & latency
Robustness

Aerial deployment
Terrestrial mobile networks
Relaying vs Flying network

Frequency limitations for PMSE
Spectrum efficiency/ spectrum ‘guarantee’

Operational ease-of-use
Non-specialist engineers
Coverage from the air
(‘Cells on Wings’)

Image courtesies:
theverge.com
dailywireless.org
att.com
Coverage from the air
(‘Cells on Wings’)

LTE Radio network
(‘Bubble’)

LTE Core network

Core network
Radio network

Action Cameras

LTE uplink
LTE downlink

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### LTE TDD 20MHz@2300MHz

<table>
<thead>
<tr>
<th>Use Case 1</th>
<th>Use Case 2</th>
<th>Use Case 3</th>
<th>Use Case 4</th>
<th>Generic items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studio cameras</td>
<td><strong>Small UE</strong></td>
<td><strong>Heli ‘moving coverage’</strong></td>
<td><strong>Very robust signal in urban area</strong></td>
<td><strong>Not tested</strong></td>
</tr>
<tr>
<td><strong>Now 15 MBps ‘only’ (one camera) H.265 @TDD</strong></td>
<td><strong>Link budget limiting (max 3km height@int. UE-ant.)</strong></td>
<td><strong>No smooth handover without special techn.</strong></td>
<td><strong>Set up relatively complicated (parameters)</strong></td>
<td><strong>Many extra’s (VoIP intercom, tally etc)</strong></td>
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<tr>
<td><strong>Re-use for adjacent studios</strong></td>
<td><strong>Aircraft ‘moving coverage’ in progress</strong></td>
<td></td>
<td><strong>Reconnect time after signal loss USB UE</strong></td>
<td></td>
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