

## Chapter 12 Test Setup Photos

### Overview

This section contains test setup photos.

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## 12.1 Radiated Emissions Test Setup

Radiated emissions measurements shall be made over the frequency range specified by the regulatory agency. In this case, per FCC Part 15, subpart 15.207. Measurements shall be made at the EUT azimuth and antenna height such that the maximum radiated emissions level will be detected. This was accomplished using both an automated 360 degree turntable and 1 to 4 meter height antenna positioners. Sixteen azimuth cuts at 22.5 degrees and 1 to 4 meter antenna scans in both polarizations were utilized. The Remote Unit was setup in a typical field configuration, as shown in [Figure 12.1](#), consisting of the R3 being attached to the mounting bracket and the bracket being mounted to a vertical piece of typical house siding which was placed on the center of a wooden table located in the center of the turntable. An RG-6 coaxial cable with field compression connectors was utilized from the R3 Indoor Unit to the R3 Outdoor Unit via a surge protection device. One meter telco cabling was utilized, along with longer pieces of RG-6 coaxial cable, to simulate actual installations. A Base Station antenna was placed in the chamber for R3 wireless communication. All radiated emissions testing was completed in four configurations; 1) Lucent power supply with two voice channels and the high speed data (HSD) uplink continuously utilized, 2) Lucent power supply with four voice and HSD uplink channels continuously utilized, 3) Panasonic power supply with two voice channels and HSD uplink continuously utilized, and 4) Panasonic power supply with four voice channels and HSD continuously utilized. Testing was completed from 30 MHz to 26 GHz. Testing from 30 MHz-3.5 GHz was completed as discussed above, i.e., 360 degrees turntable rotation at 22.5 degree intervals and 1 to 4 meter antenna scan. Testing from 3.5 GHz-26.5 GHz was completed with an Intentional Radiator System, with the antenna placed 1 meter high and 1 meter back. The Spectrum Analyzer was placed on maximum hold and the turntable scanned to find the highest amplitude peaks. When testing close to or over the fundamental frequency range, a notch filter tuned to the R3 and Base Station fundamental frequencies was utilized to prevent receiver overload and/or damage.

The R3 system was subjected to both radiated and conducted emissions as shown in [Figure 12.5](#) and [Figure 12.6](#), respectively. Both units, indoor and outdoor, have power supplies that are UL recognized and will be UL listed as a system. Only the R3 Indoor Unit power supply required conducted emission testing, which was completed in the appropriate configurations.

Figure 12.1 Radiated Emissions Test Setup

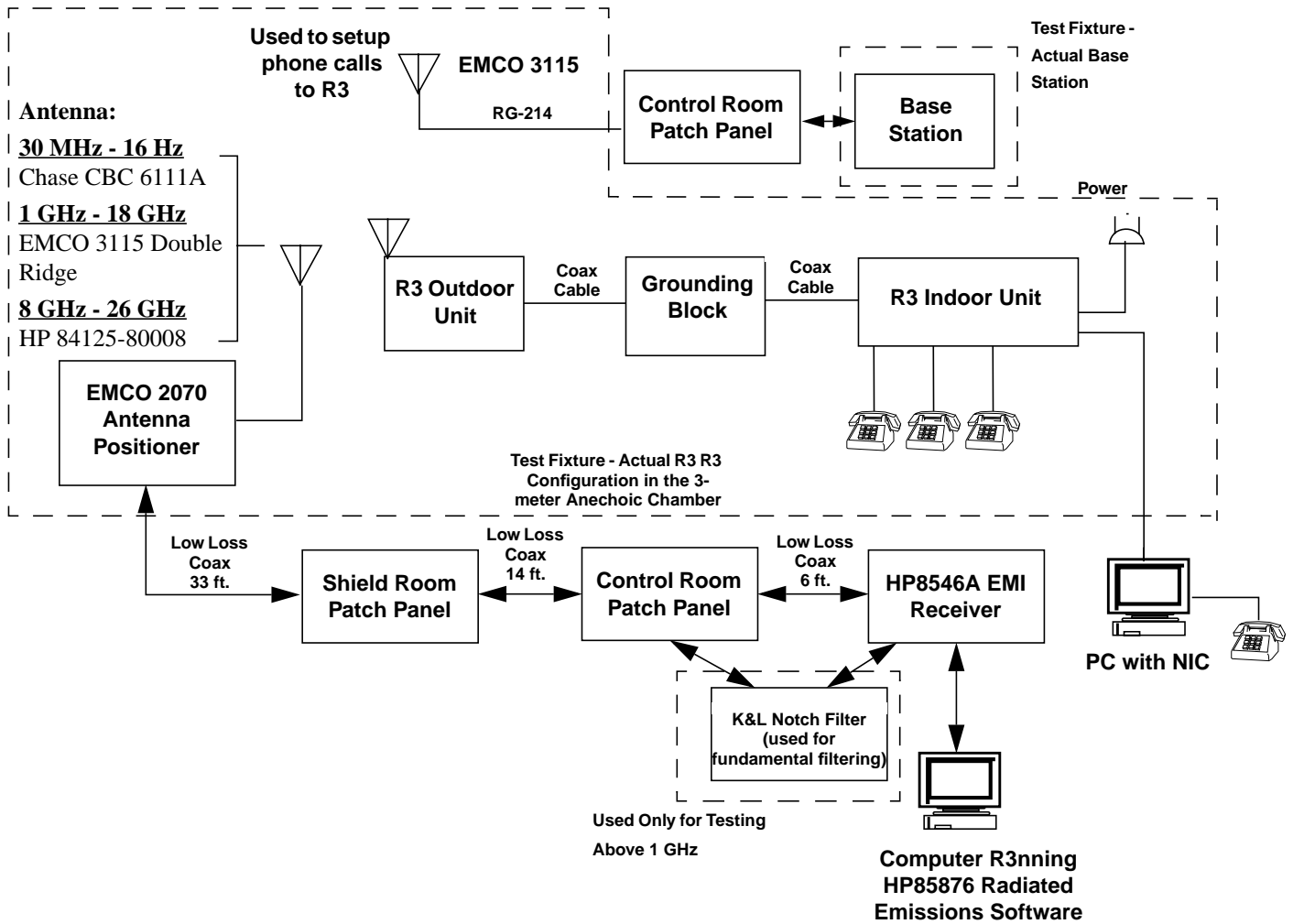


Figure 12.2 shows the test setup utilized for radiated emissions testing in the range from 3.5 GHz-26.5 GHz. An EMCO 3115 horn antenna is shown here during the 3.5 GHz - 18.0 GHz testing phase, horizontal polarization (additional high frequency horn antennas were used for testing above 18.0 GHz). Also shown is the HP 84300A E62 microwave intentional radiator system in the background. A portable laptop served as the software control and data capturing system.

*Figure 12.2 HP 84300A E62 Microwave Intentional Radiator System*



Figure 12.3 shows the HP8546A EMI Receiver system together with K&L notch filter used to take all radiated emission measurements between 1 GHz-3.5 GHz. The K&L tunable notch filter was utilized to protect the HP8546A EMI receiver system from the EUT fundamental transmit frequency.

Figure 12.3 HP8546A EMI Receiver with K&L notch filter



Figure 12.4 shows the HP8546A EMI receiver system used to take all radiated emission measurements below 1 GHz.

Figure 12.4 HP8546A EMI Receiver, No Filter



Figure 12.5 shows the overall test setup of the R3 Remote Unit system, R3 Outdoor Unit shown in the foreground, contains the RF and antenna sections (Radio). The Indoor Unit, shown in the background, contains the digital section and was used to initiate the HSD and voice calls.

*Figure 12.5 Overall EUT Setup Picture*





## 12.2 Conducted Emission Test Setup

Figure 12.6 reveals the overall conducted emissions test setup. Shown are the R3 Outdoor Unit containing the RF/antenna sections and the associated RG-6 cabling; R3 digital indoor unit and four telephones to simulate a worst case-loading scenario. In the background, 40 cm away, is the required vertical ground plane with LISN behind.

*Figure 12.6 Overall Conducted Emissions Test Setup*





Figure 12.7 shows the EMCO 3825/2 conducted emissions LISN utilized for measurements on both the Lucent and Panasonic power supplies. As required per ANSI C63.4, the vertical ground plane is located 40cm away from the EUT with the LISN bonded to the ground plane.

Figure 12.7 EMCO 3825/2 Conducted Emissions LISN



### 12.3 Testing Facility and Location

During the month of July 2000, a series of radio frequency interference measurements were performed on the AT&T Remote Unit Version R3, consisting of the following boards: digital board S/N 505, 2-line expansion board S/N 425, and RF board S/N 503. For Class B digital devices/intentional radiator, the tests were performed according to the procedures of the FCC as stated in the *Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic*

*Equipment in the range of 9 kHz to 40 GHz* found in the American National Standards Institute, ANSI C63.4-1992 (Revision of the ANSI C63.4-1988). These tests were performed by personnel of AT&T, located at the AT&T Wireless Services EMC Laboratory on Willows Road in Redmond, Washington. Additionally, FCC Part 15 radiated emissions testing was completed at the same location within an FCC certified 3-meter semi-anechoic chamber.