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Federal Communications Commission
Authorization and Evaluation Division
7435 Oakland Mills Road
Columbia, MD 21046

March 22, 2000

RE:	**Response to FCC Requests**	
	Correspondence Reference Numbers:	**12596, 12674**
	FCC IDs:	**HZB-S58-04**
	Form 731 Confirmation Numbers:	**EA96458**

Attn: Joe Dichoso

Dear Mr. Dichoso:

1. I have instructed ITS to re-submit the test report for this product separately.

2. According to the ITS test report, the rated RF power output is 0.209W. The frequency range is 5730 – 5845 MHz.

3. Please refer to attachment 1 for explanations on processing gain. The same questions were asked earlier with the applications of HZBLYNX96, HZB-S58-12 and HZB-S58-12, and we provided similar responses. Approvals were granted to all the above mentioned products.

4. As you know, the telecommunications market changes rapidly. New manufacturers and products will emerge, and some products and vendors that exist today could vanish at a later time. For this reason, we tried to make recommendations on antennas based on their specifications rather than by brand name and model numbers, even though we do mention some typical vendors and models as examples. We believe as long as the antennas are consistent in their technical specifications, the differences in brand name, model number, and type should not cause discernable differences in radiated emission and RF exposure. We hope when grant conditions are necessary, these conditions will be made in the form of specifications (for example, size, gain range, or EIRP) rather than in the form of model names and vendors as the Commission has recently done on some of our applications.

   In addition to brand name issues, we are unclear why the Commission makes a distinction between panel antennas and parabolic dish antennas, when the gains, beamwidths, and other related performance specifications are nearly identical.

   We would like to be able to recommend 2-8 foot parabolic antennas, and 1 and 2 foot panel antennas to our customers, with antenna gain up to 41dBi. For your reference, the following table gives a list of the typical models of those antennas made by various manufacturers with the antenna gain specifications. As you can see, though of different made and model, antennas of the same size are very consistent in antenna gains. So even though the equipment was tested with a parabolic antenna, we truly believe a panel antenna of a similar gain will not introduce any negative impact on the radio emission and RF exposure. Please reconsider allowing the radio to be used with 1 and 2 foot panel antenna without additional testing.

Antenna Type	Manufacturer	Model Number	Mid-band Gain (dBi)
1 Foot Flat Panel	Gabriel	DFPD1-52	23.5
2 Foot Flat Panel	Gabriel	DFPD2-52	28
2 Foot Parabolic	Gabriel	SSP2-52B	28.5
	RSI	P-57C24	29
	Radio Waves	SP2-5.2	28.3
3 Foot Parabolic	Radio Waves	SP3-5.2	31.4
4 Foot Parabolic	Gabriel	SSP4-52A	34.2
	RSI	P-57B48	34.7
	Radio Waves	SP4-5.2	34.6
6 Foot Parabolic	Gabriel	SSP6-52A	37.5
	RSI	P-57A72	38.2
	Radio Waves	SP6-5.2	37.7
8 Foot Parabolic	Gabriel	DRFB8-55ASE	40.7
	RSI	P-57A96	40.8

It is our desire to certify the radio with a maximum antenna gain of 41dBi. When a minimum RF cable loss of 3.5dB is taken into consideration, the radio maximum EIRP is +60.7dBm, which is below the limit of 62.1dBm (1640W) as described in 1.1307(b). Please refer to attachment 2.

I hope I have addressed all your concerns. If you may have any further questions, please address to the undersigned.
Yours truly,

Caroline Yu
International Product Manger
Western Multiplex Corporation

Attachment 1

Re. Processing Gain

Western Multiplex considers the response to this specific question as proprietary, as this information would be consistent with that included in the theory of operation, which has already been submitted for proprietary consideration under Section 0.457(d). Please maintain this level of confidentiality with the following response.

The Commission has previously approved several Western Multiplex devices with this identical spreading rate. The first few models that implemented this technology were simply approved without comment. Subsequently, it was determined during the review and approval of HZB-LYNX62, that the theoretical processing gain is of no significance, but instead that it is the demonstration of the specification by means of Commission-approved test procedures that should acknowledge compliance of any device. To support this original decision, it is acknowledged the Commission’s test methods include deletion of a portion of the data along with 2 dB implementation loss. These factors, in turn, allow for devices with less than 10 dB theoretical processing gain to meet the 10 dB requirement, so long as the design is very robust. Once again, Western Multiplex expresses that a design that has less spreading and can demonstrate 10 dB processing gain using these test methods is more efficient than a design that has more spreading and demonstrates 10 dB processing gain. The Commission is directed to the correspondence within the HZB-LYNX62 application, where the Commission (knowingly) approved a device with identical spreading rate.

At this time, it appears that the Commission may be considering “coding methods” other than spreading to attribute to processing gain. With this in mind, the Commission may wish to know that this device also implements forward error correction (FEC) coding, which manifests as additional processing gain to the basic spreading function. The FEC is Reed-Solomon coding with a factor of T=4 (corrects 4 error events within each 8-bit block). Reed-Solomon coding processing gain is dependent upon the nature of the interference source, however, based on our tests, can attribute for at least 2 dB of processing gain under all interference conditions, and higher processing gain for coherent interference sources.

Attachment 2

The HZB-S58-04 radios are fixed-mount equipment designed for point-to-point outdoor communications. The antennas must be highly directional, and the transmission path must have line-of-sight clearance. The radio antennas must be installed either on top of a tower or a very high building so that the line-of-sight condition can be met. Therefore, the antenna sites are not accessible to the general public. Installation of the radios and antennas must be performed by professional installation engineers. The transmission paths of the radios are well above ground level radiating in a beam point to point rather than omnidirectional to the general public like a paging transmitter. Given all the conditions mentioned above, the radiation of our radios should be considered in the Occupational/Controlled exposure category, rather than of General Population/Uncontrolled Exposure category. However, we still comply with the limit set for General Population/uncontrolled exposure as specified in 1.1310, as calculated in the RF exposure cover letter in the application submission. We have included a warning message in our manual informing installers to keep at least five meters away from the antenna while the equipment is in operation.

Due to the fact that the HZB-S58-04 radio is used for fix-mount point-to-point communication that requires line-of –sight clearance in the path and that the radio is single-unit in-door equipment, the antenna sites are always far away from the radio equipment room. The typical length of RF cable that runs from the output of the radio to the antenna input is over 100 feet. In situations where an antenna site is extremely far from the equipment room, waveguide may be used as a means to reduce the loss from RF transmission. A typical distance between antenna and radio when waveguide is used is over 200 feet. To give a worst example, let's assume 100 feet Andrew 5/8" foam coax cable or 200 feet Andrew waveguide is used. Given 0.5dB loss for the connectors on each end, the loss introduced by RF cabling is at least 3.5-5.5 dB (please refer to the table below for Loss/100' data). As for the majority of cases, the transmission line loss is usually in the range of over 10dB.

When this loss is taken into consideration, the maximum possible EIRP will be:
Maximum Output power + Maximum Antenna Gain – Minimum Implementation Loss = 23.2 + 41 – 3.5 = 60.7 dBm, which is equivalent to 1175W.

Many transmitters and facilities subject to EA listed in Table 1 of 1.1307 are of a broadcasting nature that radiate into the general public, while our radio radiates with a very narrow beam high above the general population. Even though, when taken the transmission line loss into consideration, we are still below the limit of 1640 EIRP set for the broadcasting stations.

In summary, our radio will not introduce RF radiation exceeding any FCC limits when using with antennas of up to 41dB, even when more stringent standards for other types of transmitters are applied. We are open to limiting antenna gain to 41dBi if FCC deems it necessary.

Feeder Loss Type	Manufacturer	Model Number	Loss/100'
1/2" foam coax	Andrew	LDF 4-50	6.6 dB
5/8" foam coax	Andrew	LDF 4.5-50	4.7 dB
Waveguide	Andrew	EW-52	1.2 dB