Before the
Federal Communications Commission
Washington DC 20554

In the Matter of	
SafeView, Inc., Request for Waiver of Section 15.35 of the Commission's Rules to Permit the Deployment of Security Screening Portal Devices that Operate in the 24.25-30 GHz Range	ET Docket No. 04-373

REPLY TO OPPOSITIONS

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TABLE OF CONTENTS

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On August 18, 2004, SafeView, Inc. filed a request for waiver of Sections 15.31(c) and 15.35(b) of the Commission's Rules.[1] Oppositions were filed by XO Communications, Inc. (XO) and Hughes Network Systems, Inc. (HNS). SafeView hereby replies to those oppositions.

A. Summary

SafeView seeks to market equipment for screening people at security-critical locations such as airports, government buildings, and prisons. Far more effective than metal detectors, faster and less intrusive than hand searches, the SafeView device exposes both metallic and non-metallic objects, including weapons, explosives, and other contraband, hidden in and under a subject's clothing.

The device operates by measuring reflections from a radio signal that sweeps very quickly through the 24.25-30 GHz range. SafeView seeks waivers of Section 15.31(c), which requires emissions measurements with the frequency sweep stopped, and Section 15.35(b), which limits

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[1] *Office of Engineering and Technology Declares Safeview Request for a Waiver of Part 15 to Be a "Permit-but-Disclose" Proceeding for Ex Parte Purposes*, ET Docket No. 04-373, DA 04-3038 (released Sept. 22, 2004). SafeView filed its waiver request on August 18, 2004, replacing an earlier version filed on August 13, 2004.

peak emissions. The device exceeds the peak limit by 21 dB, complies with the Commission's average limits when measured wit the sweep running, and complies with the RF exposure rules.

XO and HNS filed oppositions out of concern about interference into their 24 GHz and LMDS (28 GHz) systems.

HNS's opposition uses the familiar tactic of combining multiple worst-case conditions while overlooking the extreme improbability of all occurring at once. For example, although SafeView has committed to installing equipment under the waiver indoors, and although HNS and XO market their systems only for outdoor use, they ignore the protective benefits of building attenuation. HNS invokes the directivity of LMDS/24 GHz antennas to amplify receiver interference, but overlooks that the same directivity also yields high attenuation in most directions. HNS uses values for SafeView's duty cycle that are wrong by orders of magnitude. And the SafeView sweep across the LMDS/24 Ghz receiver bandwidth is fast enough, relative to the symbol time, to prevent actual interference from occurring.

There is only one plausible interference scenario: an LMDS/24 GHz antenna installed indoors, in the same room as the SafeView device (*e.g.*, in the same airport terminal area), oriented toward the SafeView device with minimal obstructions, after the LMDS/24 GHz industry has moved to wider-bandwidth systems. But even under those conditions, the waiver is still appropriate, because the SafeView device and LMDS/24 GHz system are both under control of the same airport (or other facility). If the airport wants the benefits of both technologies, the chances are good it can resolve any interference by reorienting the LMDS/24 GHz antennas, or possibly putting in a shielded partition near the SafeView device. Alternatively, it may elect to

abandon the SafeView device, or to do without the LMDS/24 GHz system. But those decisions should rest with the airport, not the Commission.

Considering that building attenuation, distance considerations, antenna directivity, and other such factors eliminate any appreciable likelihood of interference to off-site third parties, and in view of the important safety and security benefits of the SafeView device, the Commission should grant the waiver.

B. Introduction

SafeView's product is intended for security screening at sensitive sites such as airports, government buildings, and prisons. A person seeking to enter, such as an airline passenger or prison visitor, steps into a chamber for two seconds and exits. Within seconds a three-dimensional image shows both metallic and non-metallic objects, including plastic or ceramic objects, hidden in or under the subject's clothing. Features include automatic object identification, privacy algorithms, remote viewing, and data logging.

Present screening methods are inadequate. Covert tests at major airports show they miss weapons fully a quarter of the time.[2] Present methods are especially poor at detecting non-metallic threats, such as weapons made of plastic or ceramics and many types of explosives. They are also slow and intrusive, resulting in long airport security lines and high levels of passenger frustration. The SafeView device will help to alleviate all of these problems.

The device operates by measuring the reflections of radio waves in the 24.25-30 GHz range. It contains two vertical masts, each carrying 192 transmit antenna elements arranged

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[2] *Report: Undercover agents slipped through fake bomb, knife*, USA Today (Jan. 21, 2003) (emphasis added), http://www.usatoday.com/travel/news/2003/2003-01-21-bdl-security.htm

vertically. While the masts rotate around the subject over a 2 second interval, each antenna element in turn sweeps from 24.25 though 30 GHz. The sweep runs at 1.1 MHz/ns, taking less than 6 microseconds to cover the entire frequency range.

SafeView seeks to certify the device under Section 15.209. We request waivers of two technical rules: Section 15.31(c), which requires emissions measurements with the frequency sweep stopped; and Section 15.35(b), which limits peak emissions to no more than 20 dB above maximum average emissions. To resolve its targets adequately, the SafeView system must transmit 100μW peak into an antenna with 10 dB gain, for a peak power of about 0 dBm EIRP, which is 21 dB higher than the peak limit. Measured with the frequency sweep running, as we request, the device complies with the Commission's average limits. It also complies with the Commission's RF exposure safety rules by a very wide margin.

Our waiver request identified several factors that limit interference to other spectrum users, including HNS and XO. First, the size and expense of these units (over 1,500 pounds and $100,000) means that relatively few will ever be deployed. Second, all devices manufactured under the waiver will be installed indoors. Third, the duty cycle of the SafeView device is extremely low. And fourth, the devices will be permanently installed at a small number of fixed, known locations. SafeView proposes to maintain a database of installations, and to limit installations to 100 units during the first year under the waiver, and to 200 units during the second year.

Oppositions filed by XO and HNS express concern about interference from the SafeView device into 27.5-31.225 GHz (XO) and 24.25-24.45, 25.05-25.25, and 27.5-28.35, and 29.10-29.25 GHz (HNS) -- collectively, the LMDS and 24 GHz bands.

C. SafeView Has Justified the Waiver.

HNS objects that SafeView has not "demonstrated good cause" for its waiver.[3] Specifically, HNS is not satisfied with SafeView's showing that it will not cause interference to 24 GHz and LMDS.[4] We show below that HNS's predictions of interference are overstated. But neither HNS nor XO takes into account the compelling public interest in the waiver.

The Commission has said:

> Spectrum management is a complex subject and interference protection goals in general must consider both the benefits of authorizing new emitters as well as the interference risk to other systems.[5]

The benefits of authorizing SafeView's waiver are considerable. As noted above, present methods are not only inconvenient, but alarmingly ineffective. SafeView offers a fast, reliable method to detect hidden weapons, explosives, and contraband of many kinds that would otherwise require intrusive manual searches, or be missed entirely. The promise of elevating confidence in public safety, as measured against the near-zero risk of harmful interference to third parties (explained below), easily constitutes good cause for the waiver.

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[3] HNS at 3.

[4] HNS at 3-4.

[5] *Ultra-Wideband Transmission Systems*, 17 FCC Rcd 7435 at para. 85 (2002).

D. Security-Critical Facilities Should Have the Choice Between the SafeView Device and Indoor Microwave Communications.

We show below there is no realistic likelihood of actual interference from an indoor SafeView device to an outdoor victim receiver. And SafeView has already committed to installing all units under the waiver indoors.[6]

Thus, the only situation that can plausibly result in a signal at the victim receiver is one in which the SafeView device and the microwave receiver are both installed indoors, both in the same room.[7] HNS mentions the Dulles Airport main terminal as one example of a place where that could happen.[8] In exploring the possibility, we can overlook that HNS appears to have marketed its equipment solely for outdoor use;[9] and we assume for the sake of discussion here that a signal received under these conditions causes harmful interference.[10]

If the Commission denies the waiver on interference grounds, it will be primarily to accommodate this one particular scenario: (1) Dulles Airport (for example) installs a SafeView device; and (2) Dulles Airport also installs LMDS/24 GHz equipment in the same room as the SafeView device; and (3) the geometries place the SafeView device within or close to a receiver boresight. No other configuration can reasonably result in interference.

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[6] SafeView Request for Waiver at 11.

[7] HNS at 13; XO at 2-3.

[8] HNS at Exh. 1 p. 3.

[9] *See* http://www.hns.com/HNS/Doc/0/11QIK8H244U495QP3S2MDLO59B/H31607%20-%20AB9400%20LMDS%20Brochure.pdf

[10] In Part E(1)(d) below, we show that a received signal from the SafeView device is unlikely to cause interference to HNS.

Denying the waiver to prevent interference in the above case would deny Dulles Airport the right to make its own choice between the SafeView device and an LMDS/24 GHz network. Perhaps the airport values the security benefits of the SafeView device over the benefits of the network. Or perhaps the airport is willing to take the extra trouble to have the benefits of both, by reorienting the antenna geometry or by installing a shielded partition near the SafeView device. **These decisions should belong to the airport** -- and to give the airport its full range of options, among other reasons, the Commission should grant the waiver.

This view is consistent with the Commission rule that bars an unlicensed device from causing harmful interference to a licensed service.[11] The rule does not require an end user to choose a licensed service over an incompatible unlicensed device. If a consumer's microwave oven interferes with his cordless phone, he is free to turn off the oven and use the phone, or to take the phone to another room, even though the oven has priority in the band. Similarly here, it does not violate any Commission rule to let an airport or other facility choose a SafeView device over indoor LMDS/24 GHz service, or to let it make arrangements to use both.

E. HNS Has Greatly Overstated the Risk of Interference.

HNS's interference predictions result in part from using incorrect information and in part from piling on unlikely worst-case conditions.

1. HNS misinterprets key data.

(a) SIGNAL LEVEL. HNS is incorrect in its repeated claim that the SafeView device exceeds the Commission's limits by a factor of 12,600.[12] A stationary tone

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[11] 47 C.F.R. Sec. 15.5(b).

[12] HNS at 2, 4, 5.

operating continuously at SafeView's peak power would exceed the limit by that amount. But the SafeView device does not do that. When measured with the sweep running, the SafeView device complies with the average limits. It exceeds the peak limits by 21 dB. Because of the fast sweep, the peak power is unlikely to cause interference even if it reaches a victim receiver (as shown below).[13]

(b) RECEIVER BANDWIDTH. SafeView's calculations used a receiver bandwidth of 10 MHz. HNS says it projects interference using channel bandwidths of 100 MHz to "almost 1 GHz."[14] But the only equipment it cites, its AB9000 line, has a bandwidth of 12.5 MHz. That changes SafeView's results insignificantly, by less than 1 dB. In any event, a wider receiver bandwidth would affect the outcome only in the scenario of Part D, above, where the same entity controls both the SafeView device and the LMDS/24 GHz equipment in the same room.

(c) DUTY CYCLE. HNS disputes SafeView's calculation of duty cycle using 20*log(time ratios), and says we should have used 10*log instead.[15] SafeView's calculation is correct because the property specified in the duty cycle is measured in volts/meter,

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[13] HNS also misquotes SafeView as saying its peak and average values are the same. HNS at 5. This is obviously untrue, considering SafeView's extremely low duty cycle. We said: "'Average' emissions, *if measured with the sweep stopped* under Section 15.31(c), would no longer be average, but would be artificially forced to the same value as the peak emissions." SafeView Request for Waiver at 10 (emphasis added). The passage merely emphasizes that measuring emissions with the sweep stopped overstates the interference potential.

[14] HNS at 9.

[15] HNS at 8-10.

while dB is a measurement of relative power, proportional to the square of voltage, which is equivalent to doubling the logarithm.[16]

But even if HNS's use of 10*log were right, the duty cycle into a 10 MHz receiver would still be fully half of SafeView's result in dB, or –41.4 dB. Correcting for HNS's 12.5 MHz receiver yields –40.4 dB. But all of HNS's link budgets assume a far higher duty cycle of –9.43 dB, which greatly inflates the predictions of interference.[17]

(d) SYMBOL TIME. Assuming an HNS receiver can detect SafeView's signal at all, the signal is present in the 12.5 MHz receiver bandwidth for only 13.8 nanoseconds per sweep.[18] HNS states that its system symbol time is 100 nanoseconds.[19] Thus, even an HNS antenna in the same room as a SafeView device and pointed directly at it is unlikely to experience actual harmful interference.

(e) INDOOR OPERATION. HNS states there is nothing in SafeView's waiver request to ensure that its devices are installed only indoors.[20] To the contrary, SafeView

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[16] *See, e.g.*, Washington Laboratories, Ltd., *Regulations for Global Compliance Workshop* at slide 43 (Sept. 24, 2004), http://www.wll.com/downloads/Wireless%20Compliance%209.04.pdf

[17] HNS at Annex 1 (six tables).

[18] 1.1 ns/MHz (sweep rate) x 12.5 MHz (receiver bandwidth) = 13.75 ns. HNS uses a slightly smaller figure of 11.4 ns, but the difference is inconsequential. HNS at Annex 1.

[19] HNS at Annex 1.

[20] HNS at 13.

committed to installing all equipment under the waiver indoors.[21] We reaffirm that commitment here, and expect the Commission to include it as a condition of the waiver.

(f) BUILDING ATTENUATION. HNS's analyses ignore building attenuation.[22] HNS assumes either the LMDS/24 GHz will be mounted indoors in the same room as the SafeView device, or else will be mounted outside with only window glass separating the systems.[23] The vastly more probable situation has SafeView indoors and LMDS/24 GHz outdoors, with at least one building wall between them. We have no data specifically on building attenuation at 24-30 GHz; but at half that frequency, in the 12.75-13.25 GHz band, the Commission places signal loss due to building attenuation at "considerably higher than 10 dB."[24] Attenuation goes up with frequency, and so would be higher still at 24-30 GHz. We are confident that building attenuation, combined with free-space attenuation both inside and outside the building, will more than account for the 21 dB by which the SafeView peak emissions exceed the Commission's limit. In consequence, an outdoor LMDS/24 GHz receiver should be at no significant risk of interference from an indoor SafeView unit, even in the unlikely case that its axis happens to line up with the unit.

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[21] SafeView Request for Waiver at 11 ("All devices produced under this waiver will be installed for indoor use.")

[22] One case allows 10 dB for "partial obstruction." HNS Exh. 1 p. 3. See Part E(2) below.

[23] HNS Exh. 1 p. 3.

[24] *Interference Temperature Metric*, 18 FCC Rcd 25309 at Appendix B, n.73 (2003) (Notice of Inquiry and Notice of Proposed Rulemaking).

(g) ANTENNA GAIN. HNS's link budgets specify LMDS/24 GHz antenna gains of 43 dBi and 16 dBi for remote and hub units, respectively. These numbers contribute greatly to HNS's interference predictions. But high antenna gain also helps to *prevent* interference, by providing substantial attenuation most of the way around the antenna. Accordingly, high antenna gain cuts deeply into the probability of an LMDS/24 GHz unit ever receiving measurable signals from a SafeView device.

(h) AGGREGATION OF SAFEVIEW UNITS. HNS speculates that an airport might operate multiple SafeView devices in close proximity and asks the Commission to take into account of their aggregated signals.[25] As noted, the SafeView devices can realistically cause interference only to LMDS/24 GHz receivers mounted in the same room. Two devices would have to be lined up in or near the boresight of the antenna, and even in that unlikely event, would increase the duty cycle only by a negligible 3 dB at most.

2. HNS combines improbable worst-case conditions.

HNS analyzes three cases, specifying attenuation between the SafeView device and the LMDS/24 GHz antenna of zero, 5, or 10 dB.[26]

The zero dB case assumes the following conditions:

- the LMDS/24 GHz antenna is installed indoors, in the same room as the SafeView device; and
- the LMDS/24 GHz antenna is oriented directly toward the SafeView device; and

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[25] HNS at 9.

[26] HNS at Exh. 1 p. 3.

- there are no obstacles between the LMDS/24 GHz antenna and the SafeView device; and
- the SafeView duty cycle is –9.43 dB (11% -- several orders of magnitude too high); and
- there are no other sources of interference to LMDS/24 GHz.

Not surprisingly, this combination of assumptions yields high separation distances needed to prevent interference.

The Commission wrote elsewhere:

> Based on the low probability that all worst case conditions would apply at the same time, it is likely that considerably shorter separation distances would apply in actual practice.[27]

Here, too, and for the same reason, much shorter separation distances will apply in practice. The combination of the listed conditions occurring together is vastly improbable.

HNS's 5 dB case is meant to account for an off-axis antenna alignment, and the 10 dB case, for "partial obstructions."[28] These are hardly more realistic. A Category B antenna in the 24 GHz band is require to attenuate by 20 dB just 5 degrees off the axis, increasing to 45 dB in the region behind the antenna.[29] The Category A standards are even more stringent.[30] While these requirements are not binding on 24 GHz licensees in the absence of interference,[31] they

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27 *Ultra-Wideband Transmission Systems*, 18 FCC Rcd 3857 at para. 14 (2003).

28 HNS at Exh. 1 p. 3.

29 47 C.F.R. Sec. 101.115(b) (table).

30 *Id*.

31 *Id*. n.10.

suggest that HNS's allowance of 5 dB badly underestimates antenna performance. Allowing only 10 dB for obstructions, at these frequencies, is no better.

In short, HNS's analysis relies on unrealistic assumptions contrived to make the threat of interference appear far worse than it really is.

3. HNS's proposed mitigation measures are not feasible.

HNS proposes that SafeView eliminate interference by operating at lower power or by shielding its device.[32]

If SafeView had a technical solution that permitted certification without a waiver, we would have adopted it. Lower power is not possible because the return signal from the subject is extremely weak, on the order of –80 to –60 dBm. With present technology, any smaller signal would make it impossible to resolve the target sufficiently for reliable detection. As for shielding, research that concluded after we filed the Request for Waiver shows that the chamber in which the subject stands will have to be transparent. At airports, small children and claustrophobic adults must be able to see out. At prisons, guards must be able to see in. The need for transparency rules out shielding the entire device. HNS also suggests a smaller shield that rotates with the antenna assembly.[33] But the need to maintain full visibility in the chamber would limit its horizontal size; and the SafeView antennas are not highly directional (about 10 dBi), so we estimate a rotating shield would provide only about 1-2 dB of protection overall.

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[32] HNS at 10, 11-13.

[33] HNS at 11 & Exh. 2.

4. Interference into *the SafeView device is not a matter of regulatory concern*.

XO is concerned that interference from LMDS/24 GHz systems could adversely impact operation of the SafeView device.[34]

In a word, this is our problem. We doubt it will occur, because most of the same factors that protect LMDS/24 GHz from SafeView also protect SafeView from LMDS/24 GHz. If a SafeView unit does experience interference, it will almost certainly come from an indoor LMDS/24 GHz system controlled by the same entity, which can reposition equipment or add shielding as necessary. It is all but impossible for interference originating outside the building and controlled by a third party to affect the SafeView device. But if that happens, the Commission's Rules require SafeView to accept the interference.[35]

CONCLUSION

The SafeView device offers a greatly needed tool for promoting public safety. HNS and XO have not made a case that SafeView will cause them interference, except perhaps when the same entity (such as an airport) operates both the SafeView device and the LMDS/24 GHz network. In that event the entity can choose the technology it wants, or take needed measures to use both.

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[34] XO at 3.

[35] 47 C.F.R. Sec. 15.5(b).

In the interest of public safety, and with no realistic possibility of harm to third parties, we urge the Commission to grant the waiver promptly.

Respectfully submitted,

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November 8, 2004

TECHNICAL CERTIFICATION

I am a technically qualified person who contributed to and reviewed the foregoing Reply to Oppositions. I certify that the technical statements therein are correct to the best of my knowledge.

Bryson Wallace
Consultant to SafeView, Inc.

CERTIFICATE OF SERVICE

I, Deborah N. Lunt, a secretary with the law firm of Fletcher, Heald & Hildreth, PLC, hereby state that true copies of the foregoing Reply to Oppositions were mailed by first class mail, postage prepaid, this 8th day of November, 2004, to the following:

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